Report of Exploration Activities on the Tom Fox Project, Argyle Township, Plan M203 NTS: 42A2 Larder Lake Mining Division

Joutel Resources Ltd.

OMIP Designation No. OM91-018

V. J. McGuinty
January 1992

42A02SW0003 91-018 ARGYLE

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1.0 Introduction

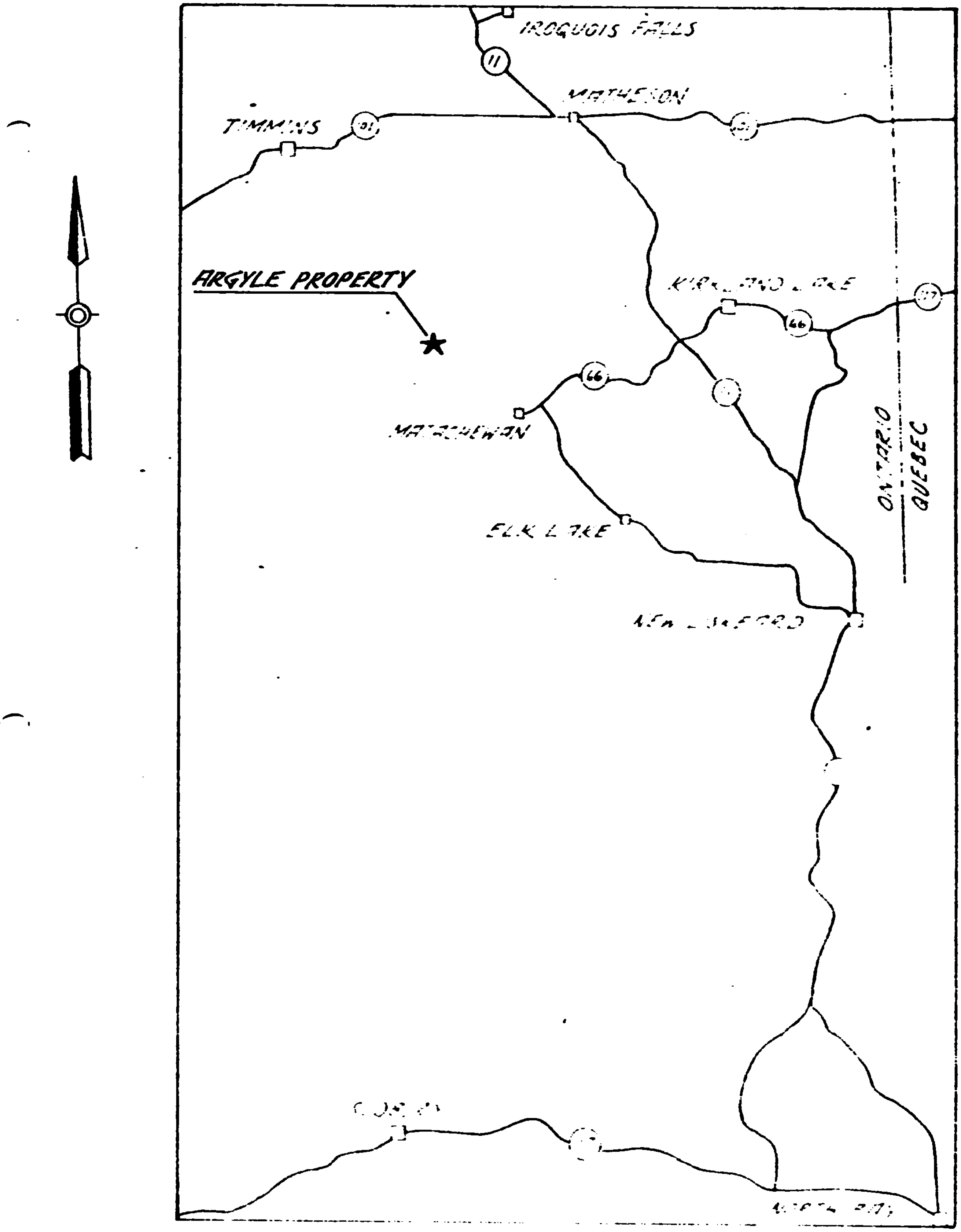
From May to December 1991, Joutel Resources Limited conducted geological mapping, helicopter borne and ground based geophysics on a 46 claim property in central Argyle township. The claims were acquired by Joutel under option agreement from F. Kiernicki of Kirkland Lake. The purpose of the acquisition was to re-evaluate the area of a known zinc occurrence for further base metal potential. Previous drill results during a gold exploration program in the early 1970's returned assays as high as 3.0% zinc over 7.2 feet in a quartz sulphide rich breccia. Similar results were obtained in the 1980's.

Remapping of the area with a view to evaluating strata form mineral deposition and regional structural implications was undertaken by Joutel.

2.0 Property Description, Location and Access

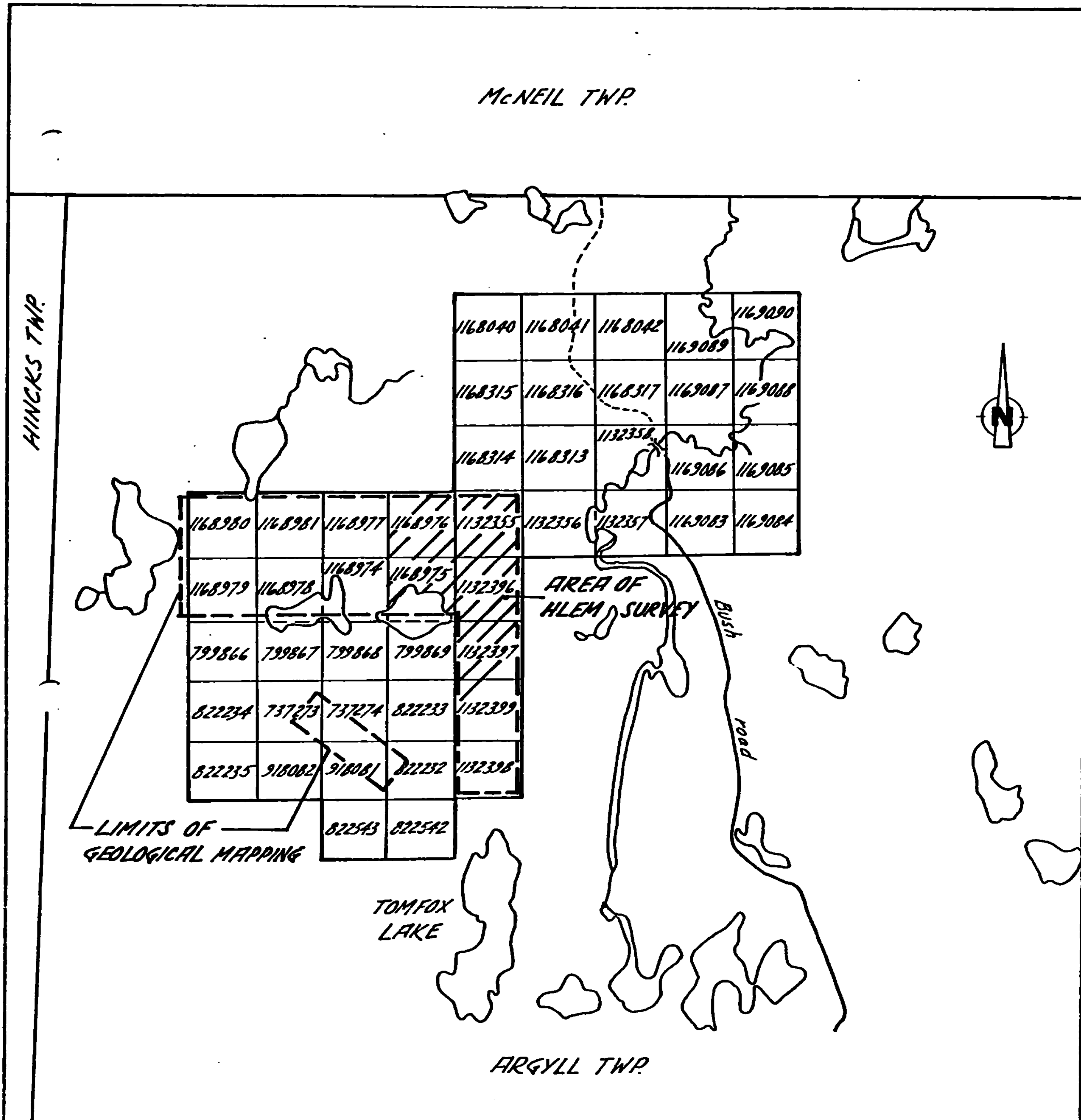
The Tom Fox property consists of 46 unpatented 16 hectare claims located in northwestern Argyle township, plan M-203, Larder Lake Mining Division. The claims are held under two separate options from F. Kiernicki of 26 claims (SW group) and 20 claims (NE group).

Access to the claims is primarily from Matachewan, Ontario and can be achieved by proceeding westerly from the village along Highway 566 for 20km to the turn off for the Argyle Lake Camp



JOUTEL RESOURCES LTD.
PROPERTY LOCATION MAP
ARGYLE TWP. PROPERTY
SCALE-1"=20 Mi MAY/91

FIG. 1



JOUTEL RESOURCES LTD.

CLAIM MAP

ARGYLE PROPERTY

SCALE 1"=2640' OCT./91

FIG. 2

Property	Claim No.	Recorded Date	Work ($)	Expiry Date
Argyle	1132355	03/18/91	1760.00	03/18/96
Argyle	1132356	03/18/91	1760.00	03/18/96
Argyle	1132357	03/18/91	1760.00	03/18/96
Argyle	1132358	03/18/91	1760.00	03/18/96
Argyle	1168040	03/19/91	1760.00	03/19/96
Argyle	1168041	03/18/91	1760.00	03/18/96
Argyle	1168042	03/19/91	1760.00	03/19/96
Argyle	1168313	03/18/91	1760.00	03/18/96
Argyle	1168314	03/18/91	1760.00	03/18/96
Argyle	1168315	03/18/91	1760.00	03/18/96
Argyle	1168316	03/18/91	1760.00	03/18/96
Argyle	1168317	03/18/91	1760.00	03/18/96
Argyle	1169083	03/18/91	1760.00	03/18/96
Argyle	1169084	03/18/91	1760.00	03/18/96
Argyle	1169085	03/18/91	1760.00	03/18/95
Argyle	1169086	03/18/91	1760.00	03/18/96
Argyle	1169087	03/18/91	1760.00	03/18/96
Argyle	1169088	03/18/91	1760.00	03/18/96
Argyle	1169089	03/18/91	1760.00	03/18/96
Argyle	1169090	03/18/91	1760.00	03/18/96
Tom Fox	737273	12/28/83	4400.00	12/28/95
Tom Fox	737274	12/28/83	4400.00	12/28/95
Tom Fox	799866	09/26/84	4400.00	09/26/96
Tom Fox	799867	09/26/84	4400.00	09/26/96
Tom Fox	799868	09/26/84	4400.00	09/26/96
Tom Fox	799869	09/26/84	4400.00	09/26/96
Tom Fox	822232	11/27/84	4400.00	11/27/96
Tom Fox	822233	11/27/84	4400.00	11/27/96
Tom Fox	822234	11/27/84	4400.00	11/27/96
Tom Fox	822235	11/27/84	4400.00	11/27/96
Tom Fox	822542	03/25/85	4400.00	03/25/97
Tom Fox	822543	03/25/85	4400.00	03/25/92
Tom Fox	918081	09/10/86	4400.00	09/10/98
Tom Fox	918082	09/10/86	4400.00	09/10/98
Tom Fox	1132396	03/12/91	1760.00	03/12/96
Tom Fox	1132397	03/12/91	1760.00	03/12/96
Tom Fox	1132398	03/12/91	1760.00	03/12/96
Tom Fox	1132399	03/12/91	1760.00	03/12/96
Tom Fox	1168974	02/11/91	1760.00	02/11/96
Tom Fox	1168975	02/11/91	1760.00	02/11/96
Tom Fox	1168976	02/11/91	1760.00	02/11/96
Tom Fox	1168977	02/11/91	1760.00	02/11/96
Tom Fox	1168978	02/11/91	1760.00	02/11/96
Tom Fox	1168979	02/11/91	1760.00	02/11/96
Tom Fox	1168980	02/11/91	1760.00	02/11/96
Tom Fox	1168981	02/11/91	1760.00	02/11/96

and northerly along this road for 7km. A small bush track leads west to the Whitefish river which can be traversed by canoe. A well marked foot-trail leads to the original showings in the south west claim group.

Alternately, access to the west side of the property can be achieved by following Highway 566 to its end then westerly along a timber access road to an abandoned sawmill site and from there north for 3.5km. From this point a trail suitable for tracked vehicles leads the main showing in the south west group. Both accesses are limited to snowmobile only from highway 566 during winter months.

The property is generally flat. Several low rock or moraine covered ridges with less than 15m relative elevation change support spruce, alder and birch growth with considerable blow down. Swampy areas generally have peat floor and host small black spruce growth. In the northern section of the south west group a thick cedar grove can be found. Poor drainage allows the cedar to flourish on high ground in this vicinity.

3.0 Exploration History

Prospecting activity in the Matachewan area began in earnest in 1916 with gold discoveries by Davidson and Otisse and revived in the 1930's with the discovery of the Ashley mine in Bannockburn township. Parts of the Bannockburn gold area were mapped as parts of surveying projects from 1896 to 1918. H. C. Rickaby completed the first synthesis of the Bannockburn area in 1932 which includes mention of prospects in Argyle township. Two showings are documented by Rickaby in Argyle, a granite hosted gold-copper-molybdenite vein on the eastern boundary and the Tom Fox claims. Tom Fox's original discovery was described as rusty carbonate schist with pyrite in several pits.

In 1974, the Ontario Department of Mines flew an airborne Mag-E.M. survey over the Matachewan area including Argyle township. No significant E.M. anomalies were reported within the current Tom Fox property boundaries.

In 1975 Texas Gulf Canada optioned the property from Tom Fox and carried out geophysical, geological and soil geochemical surveys. Two holes totalling 810 feet were also drilled into a sulphidic "felsic" unit. Anomalous zinc mineralization was obtained in both holes.

In 1983 and 1984, limited geophysical surveys and trenching were carried out by F. Kiernicki and P. Fox. Anomalous gold assays were obtained from sampling. 2 VLF E.M. conductors were also identified of 900 and 600 feet in length respectively.

The property was optioned in 1985 by McAdam Resources Inc. who performed ground geophysical and geological surveys prior to completing 6 diamond drill holes totalling 2455 feet. Drilling intersected pyroclastic breccias which were locally sericitized, carbonate altered and sulphide mineralized. A black quartz sulphide breccia vein was intersected in several holes, returning anomalous zinc mineralization. Based on low precious metal values McAdam returned the property to the owners in 1990.

4.0 Regional Geology

The Tom Fox property is situated in the western part of the archean Abitibi greenstone belt.

The Abitibi greenstone belt consists of a thick assemblage of Precambrian mafic to felsic metavolcanics and metasediments intruded by small to large masses of mafic to felsic plutonic rocks. Greenstones have an easterly regional strike and steep dips. The rocks are commonly isoclinally folded and are faulted in east, northeast and northwest directions. Metamorphism is commonly low greenschist facies.

Geological mapping of Argyle township by government agencies was initially done in 1932 (Rickaby) and revised as recently as 1991 (Kresz) This mapping shows that the township is underlain by calc-alkaline volcanics arrayed in a large synclinorium opening to the east. These calc-alkaline rocks are inferred to be the equivalent of the Blake River group which hosts the extensive base metal mineral deposits of the Noranda Camp (Jensen MERQ-OGS, 1983). The outer volcanic series of the synclinorium consists of tholeiitic to komatiitic flows, tuffs, granitic intrusives and associated sediments belonging to the Kinojevis group. This package of rocks hosts the Robertson copper-zinc occurrence located 10km to the northeast. The Kinojevis group rocks are easily identifiable by their strong magnetic relief on airborne geophysical maps. Figure 3 is an adaption of the lithostragraphic MERQ-OGS map obtained from assessment files.

All archean rocks in this area have been intruded by northerly trending Matachewan period diabase.

5.0 1991 Exploration Program

Joutel Resources Ltd. undertook an airborne survey, horizontal loop E.M. survey and geological mapping of the Tom Fox property from May 1991 to December 1991. The airborne survey included the entire claim group while HLEM and mapping were confined to the southwestern group. Type samples from previous core drilling and from mapping were analysed using whole rock methods to assist in understanding the geological frame work.

MATACHEWAN AREA COPPER DISCOVERY
GENERAL GEOLOGICAL and LOCATION SKETCH

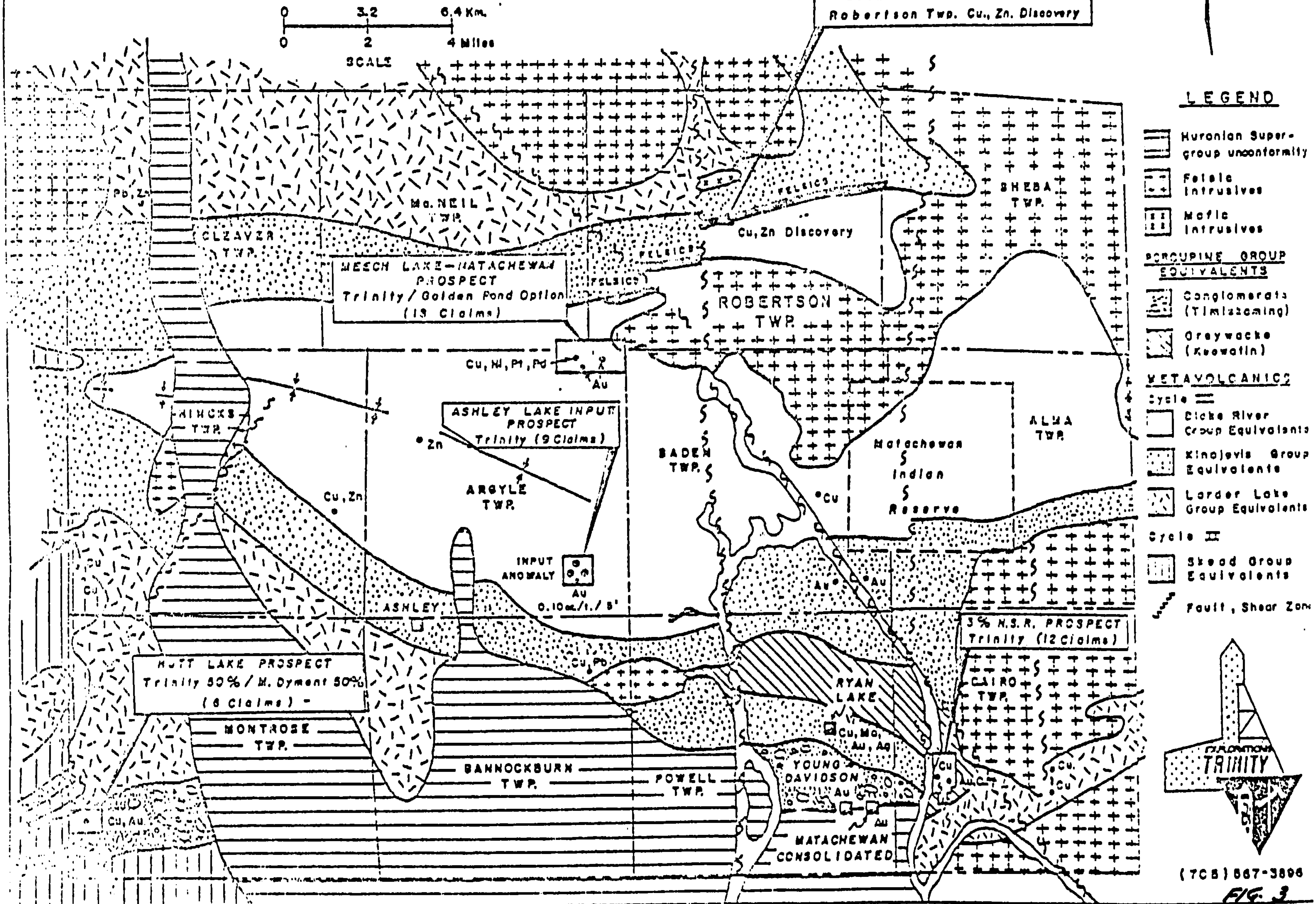


FIG. 3

5.1 Geological Mapping

Mapping at 1 inch to 200 feet was undertaken in October of 1991. Approximately 22 miles of line cutting was completed prior to this survey. This included refurbishing McAdam Resources grid lines in the vicinity of the Tom Fox showings and cutting lines on 13 of 32 claims added to the original property prior to acquisition by Joutel. Lines were cut on 300 foot centres to conform with the previous grid with base and tie line trends of 135 degrees and 045 degree grid, lines.

i) Tom Fox Showing Area

Remapping of this area included inspection of McAdam drill core from the 1988 drill program. 95% of the volcanic rocks which underlay the showing area appear to be andesitic in composition and pyroclastic in nature. These vary from tuffaceous to very coarse blocky breccias with coarser breccias or fragmentals predominating. Some areas of fine grained massive andesite flow are also seen. Many pyroclastic breccia fragments are broken pieces of flow rock. All flows and breccias are amygdaloidal with quartz carbonate fill and are grey to grey green in colour. Some breccias show zoned or pulse mineralization in amygdules with dark cherty type rinds and drusy cores. Amygdules are so concentrated locally that outcrops have of frothy texture. Flows, fragments and breccia groundmasses all have abundant thin chloritic wisps.

Bedding and other evidence of water hosted deposition are rare in the showing area. One or two outcrops show inconclusive pillow type selvages which may be thin deformational zones filled by sericite. Similarly, the east trending fold axis of the synclinorium which spans Argyle township is supposed to traverse the showing area. Due to the lack of lithological variation the fold is not accurately located. Foliation and deformational and shear banding trend east to southeasterly with the most pronounced deformation trending 135 to 140 degrees in the vicinity of the Tom Fox pits and trenches.

Small amounts of darker green, more mafic appearing rock are noted near the Tom Fox showing. Because of their lack of brecciation and their coloration, these rocks were identified as basalts. This rock type is mainly seen near lines 15N and 12N.

Pyroclastic rocks are intruded by four types of dyke near the Tom Fox showing. Early dyking includes southeast trending grey to reddish coarse feldspar porphyry dykes and 020 degree trending lamprophyres which are highly carbonate altered. No crosscutting relationship has been noted for these to establish relative timing. Small mafic dykes have been noted which trend easterly. The last intrusive event is the late Matachewan dyke intrusions. These are northerly trending and generally medium to coarse grained.

The Tom Fox showing consists of two related alteration zones extending from 4+80N 2+20W to 5+00S 3+00W. 4 McAdam drill holes 88-1 to 88-4 inclusive intersected the zone over the known 1000 foot strike length. At the core of the zone is a thin hydrothermal breccia consisting of polymict, angular fragments of coarse pyrite clots and pyroclastic breccia from the host in a matrix of fine grained quartz, tourmaline and pyrite with minor sphalerite. The quartz tourmaline core is located within a schistose sericite-carbonate (calcite, ankerite) zone with bands of pyrite, grey sphalerite and disseminated patchy tourmaline and chalcopyrite. Foliation and schistosity in this area trend 135-145 degrees and dip vertically. A second zone of quartz-tourmaline breccia has been mapped near L15+00N 6+00W. At this point a limited contact exposure indicates an easterly strike which projects into the Tom Fox showing. However other outcrops of silicification and tourmalinization suggest a second zone parallel to the Tom Fox may extend to 4+00N, 5+00W. This zone is untested by drilling.

The schistose, carbonate-sericite-quartz zone is bounded to the north by a parallel trending feldspar porphyry dyke. The dyke contact is itself altered to a schistose texture as are narrow zones along a 020 degree joint set parallel present throughout the dyke. The bulk of the porphyry is massive and unaltered suggesting that this bifurcated foliation is the result of hydrothermal streaming in the altered zone. To the south of the schistose alteration zone, carbonate and sericite alteration continue to be strong for several tens of feet and is recognized by a yellowish irregular cleavage and minor carbonate. Quartz and tourmaline mineralization is restricted to brittle irregular quartz filled fracturing and incipient silicification and tourmalinization of the pyroclastic host keyed to these fractures. Sulphide mineralization in the alteration zone outside the schistose core is restricted to disseminated fine pyrite varying from 1 to 5%. Dark chlorite in thin wisps is often associated to pyrite.

Considerable sericite-carbonate mineralization is seen throughout the remapped area. One by product of the alteration is the change to chlorite in pyroclastic rocks. A colour change from deep green to pale chrome green similar to fucbsite is visible in areas of strong carbonate-sericite mineralization and particularly where stronger foliation exists.

ii) New Grid Area

New grid lines cover 13 additional claims tied to the original Tom Fox property. Outcrop exposure in these areas is low at 5 to 10%. Virtually all the exposures found consist of the three main lithologies identified in the showing area near the base line; andesitic pyroclastic breccias, massive "basaltic" rocks and diabase. Basalts are found mainly in the north west corner of the new claims while pyroclastic, agglomeratic breccias are ubiquitous.

Two diabase dykes traverse the new grid area, intersecting near L12+60N 26+00E and trending 345 degrees and 030 degrees respectively. The intersection is not seen in the field.

No apparent bedding is noted in the pyroclastics in the new grid area. Foliation is the only noted fabric present and is most prevalent in the L0+00 36+00E area where a shear zone is interpreted, trending approximately 145 degrees. Sericite, carbonate and sulphide mineralization as well as the "fuchsitic" type alteration of chlorite are all present, suggesting a common origin with the Tom Fox showings to the south.

Lack of bedding or sedimentary features suggest the pyroclastic breccias observed in both map areas may be sub-areal in nature although this evidence is not conclusive. Mass deposition on the scale indicated by the presence of one lithology over such an area could preclude water deposition controls. The broad extent of particular lithologies on the Tom Fox and in other areas of the calc-alkaline suite in Argyle and Eaden townships suggests the strata in the Argyle synform is roughly flat lying. Contact specific, strataform VMS type deposits may be effectively masked as a result.

5.2 Airborne Geophysical Survey

In May, 1991 Areodat Ltd. was contracted by Joutel to conduct an helicopter borne combined magnetic, electromagnetic, VLF survey over the 46 claim block. A one hundred metre line spacing was used on a 045-225 degree azimuth so as to best detail both northerly and easterly trending targets believed to be important to control of mineralization. 180 line kilometres were completed.

The original review of data by the company did not identify any strong electromagnetic conductors. The information was reviewed a second time with a view to identifying weaker bedrock responses as a guide to exploration. Several clusters of E.M. conductors were established during the second review and have been plotted on the original survey maps. These anomalies occur west and northwest of the Tom Fox showing, outside the area re-mapped by Joutel but could be a more responsive strike extension of mineralization at the Tom Fox showing. Other anomalies occur in the northwest claim group and are currently unexplained.

A discussion of edge effect conductors in the Aerodat report is consistent with the observation by the author that strata within the Argyle township syncline is essentially flat lying. This will inevitably create problems for further geophysical testing.

A complete report of the Aerodat survey is provided in Appendix 2.

5.3 Horizontal Loop E.M. Survey

In December 1991, Joutel contracted JVX limited to perform an horizontal loop E.M. survey over the Tom Fox showing area and the central portion of the new grid area. A Max-Min I-9 was used and three frequencies of response were collected. 2.7 line miles were completed. A 400 foot coil separation was used during the survey. Figures 5, 6 and 7 display results from the 220, 880 and 3520 Hz frequencies.

The 220 Hz and 880 Hz frequencies were not successful in outlining deep or mid level conductive sources. Fluctuations in the inphase responses are random and have no discernible source. Quadrature responses are generally flat.

The 3520 Hz frequency is responsive to near surface conductors. Lines of HLEM testing the new grid area show several wide swings in quadrature response. This is an area of relatively strong topagraphic relief and two fault or shear zones are known to traverse the area. No bedrock source conductor is readily definable.

6.0 Rock Geochemistry and Mineralization

Seven grab samples obtained during the mapping program were analyzed by whole rock geochemical methods. Eight whole rock analyses from drill core samples were supplied by F. Kiernicki.

14 of 15 rock samples analyzed fall into the categories of calc-alkaline andesite and basalt with no distinct groupings within these categories (see Jensen cation plots appendix II). SiO_2 and TiO_2 show narrow ranges consistent with the calc-alkaline suite. 13 of the 14 chemically comparable samples are visually identified as andesitic flows and pyroclastic breccias, the 14th is a feldspar porphyry dyke. The last sample falls into the calc-alkaline dacite range. This sample was taken from a feldspar porphyry dyke in hole 88-1. This dyke is similar in aspect to the other porphyry dykes seen in core and at surface with the notable absence of ferromagnesian minerals occupying 5 to 10% of the mode in other dykes.

Of particular interest is the strong variation in Na_2O content in the sample group. Pyroclastic and flow samples as a whole display a wide range of Na_2O content from very depleted (0.3%) to enriched (6 to 7%). Enriched samples were obtained from unaltered pyroclastic breccia and flow outcrops at the northwest end of the new grid area. These rocks show no sericite or carbonate mineralization and have no alteration of primary chlorite. All samples depleted below 2% Na_2O are taken from the Tom Fox showing area or the northern shear zone near line 0+00 36+00E. All of these rocks are altered by sericite and carbonate with additional chloritization in several samples. Whole rock analyses and various plots are presented in Appendix II.

7.0 Conclusions and Recommendations

Based on geological and geochemical evaluation, the potential for base metal deposition and mineralization exists on the Tom Fox property. Broadly distributed soda depletion, strong alteration and sulphide mineralization including chloritization indicate an active hydrothermal system capable of generating massive sulphides.

Further exploration of the current showing is warranted to more fully understand the controls to known hydrothermal systems. A stripping program with detailed mapping of the Tom Fox showing near L3+00N 2+00W is proposed to meet this need. Once structural control of mineralization is established, a drill program to test the strata adjacent to controlling structures should be undertaken. If strata is found to be flat lying then vertical or steep hole parallel to structure would test as many stratigraphic units as possible. Extensive whole rock geochemistry and bore hole electromagnetic surveys could be used to maximize the drill hole separation along the structure.

Aggressive surface evaluation of airborne geophysical anomalies throughout the property should be undertaken in conjunction with detailed evaluation of the Tom Fox showing with a view to drill testing the most promising areas. Should these conductors be identified as flat lying, the adjacent vertical structures which may be hydrothermal control features should be identified as a guide for drilling.

References

Desautels, S. — McAdam Resources, diamond drill logs A88-1 to A88-6 inclusive, February 1988.

Hanych W. — Report on the Tom Fox property Argyle township, Northeastern Ontario for McAdam Resources Inc. December 1986.

Merq-OGS, 1983 — Lithostratigraphic Map of the Abitibi Subprovince. Ontario Geological Survey/Ministere de l'Energie et de Ressources, Quebec; 1:500,000; Catalogued as Map 2484 in Ontario and DV 83-16 in Quebec.

McAdam, J. — Report on VLF-electromagnetic Surveys performed on the Tom Fox Property, Argyle Township, Larder Lake Mining Division, McAdam Resources Report, November 1985.

Pyke, D.R., Ayres, L.R. and Innes, D.G. 1970, 1971 — Map 2205, Timmins - Kirkland Lake, Geological Compilation Series: Cochrane, Sudbury and Timiskaming Districts, Scale 1:253,440 or inch equals 4 miles; Ontario Division of Mines.

Rickaby H. C. — Bannockburn Gold Area, Ontario Department of Mines Annual Report, Volume 41 part 2 pp1-24, 1932.

Watkins, J. — Texas Gulf Limited, diamond drill holes A-51-1 and A-51-2, February 1975.

CERTIFICATE OF QUALIFICATIONS

I, William John McGuinty of 63 Rand Avenue, West in the town of Kirkland Lake in the Province of Ontario,

Do hereby certify:

1. That I am a graduate of the University of Ottawa (1983) with a degree of Bachelor of Science (B.Sc.) with Honours in Geology.

2. That I have been practicing my profession as a geologist and been engaged in mineral exploration since 1981.

3. That this report is based on visits to the property and personal appraisal of available data.

4. That I have disclosed in this report all relevant material which to the best of my knowledge might have a bearing on the viability or recommendations to the project.

5. That I do not have, nor do I expect to receive, directly or indirectly any interest in the property reported on herein.

6. That I am exploration manager for Joutel Resources Ltd.

February 1992

W. J. McGuinty,

Kirkland Lake

Appendix I

Report on a Combined Helicopter Borne Magnetic, Electromagnetic and VLF Survey, Argyle township Porperty. Aerodat Ltd. July 12, 1991

42A02SW0003 91-018 ARGYLE

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REPORT ON A COMBINED HELICOPTER BORNE MAGNETIC, ELECTROMAGNETIC AND VLF SURVEY ARGYLE TOWNSHIP PROPERTY LARDER LAKE MINING DIVISION ONTARIO

FOR

JOUTEL RESOURCES LIMITED

BY

AERODAT LIMITED

JULY 12, 1991

J9127B

R.J. de Carle
Consulting Geophysicist

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LIST OF MAPS
(Scale 1:10,000)

MAPS: (As listed under Appendix "B" of the Agreement)

1. **PHOTOMOSAIC BASE MAP;**
prepared from a semi controlled photo laydown, showing registration crosses on the map corresponding to UTM co-ordinates.

2. **FLIGHT LINE MAP;**
showing all flight lines, anomalies and fiducials with the photomosaic base map.

3. **AIRBORNE ELECTROMAGNETIC SURVEY INTERPRETATION MAP;**
showing flight lines, fiducials, conductor axes and anomaly peaks along with inphase amplitudes and conductivity thickness ranges for the 4600 Hz coaxial coil system with the photomosaic base map.

4. **TOTAL FIELD MAGNETIC CONTOURS;**
showing magnetic values contoured at 2 nanoTesla intervals, flight lines and fiducials with the photomosaic base map.

5. **VERTICAL MAGNETIC GRADIENT CONTOURS;**
showing magnetic gradient values contoured at 0.1 nanoTeslas per metre with the photomosaic base map.

6. **APPARENT RESISTIVITY CONTOURS;**
showing contoured apparent resistivity values for the 4600 Hz. coaxial coil, flight lines and fiducials with the base map.

7. **VLF-EM TOTAL FIELD CONTOURS;**
showing VLF-EM values contoured at 1% intervals, flight lines and fiducials with the photomosaic base map.

1. INTRODUCTION

This report describes an airborne geophysical survey carried out on behalf of Joutel Resources Limited by Aerodat Limited. Equipment operated included a five frequency electromagnetic system, a high sensitivity cesium vapour magnetometer, a two frequency VLF-EM system, a video tracking camera and a radar altimeter. Electromagnetic, magnetic and altimeter data were recorded both in digital and analog form. Positioning data were recorded on VHS video tapes as well as being marked on the flight path mosaic by the operator while in flight.

The survey area, comprised of a block of ground in the Matachewan area, is located approximately 55 kilometres southeast of Timmins, Ontario. Two (2) flights, which were flown on May 15, 1991, were required to complete the survey. Flight lines were oriented at an Azimuth of 045-225 degrees and flown at a nominal line spacing of 100 metres. Coverage and data quality were considered to be well within the specifications described in the contract.

The survey objective is the detection and location of mineralized zones which can be directly or indirectly related to precious metal or base metal exploration targets. In reference to the electromagnetic data, the writer will pay particular attention to poorly defined EM responses which may reflect poorly mineralized conductors within gold bearing structural features. Weak conductors associated with sheared and altered metavolcanic and metasedimentary rock types are also considered primary targets for precious metals. In regards to base metal targets, short isolated or [illegible] conductors displaying good conductivity and having either magnetic correlation or no magnetic correlation, are all considered to be areas of extreme interest. Interpretation of the magnetic data should reveal cross-cutting or splay-type structures and it may also reveal stratigraphically controlled sheared or deformation zones. An analysis of the VLF-EM data will also be carried out, in order to locate structures, as well as any weakly conductive horizons that may lead to the location of primary precious metal targets.

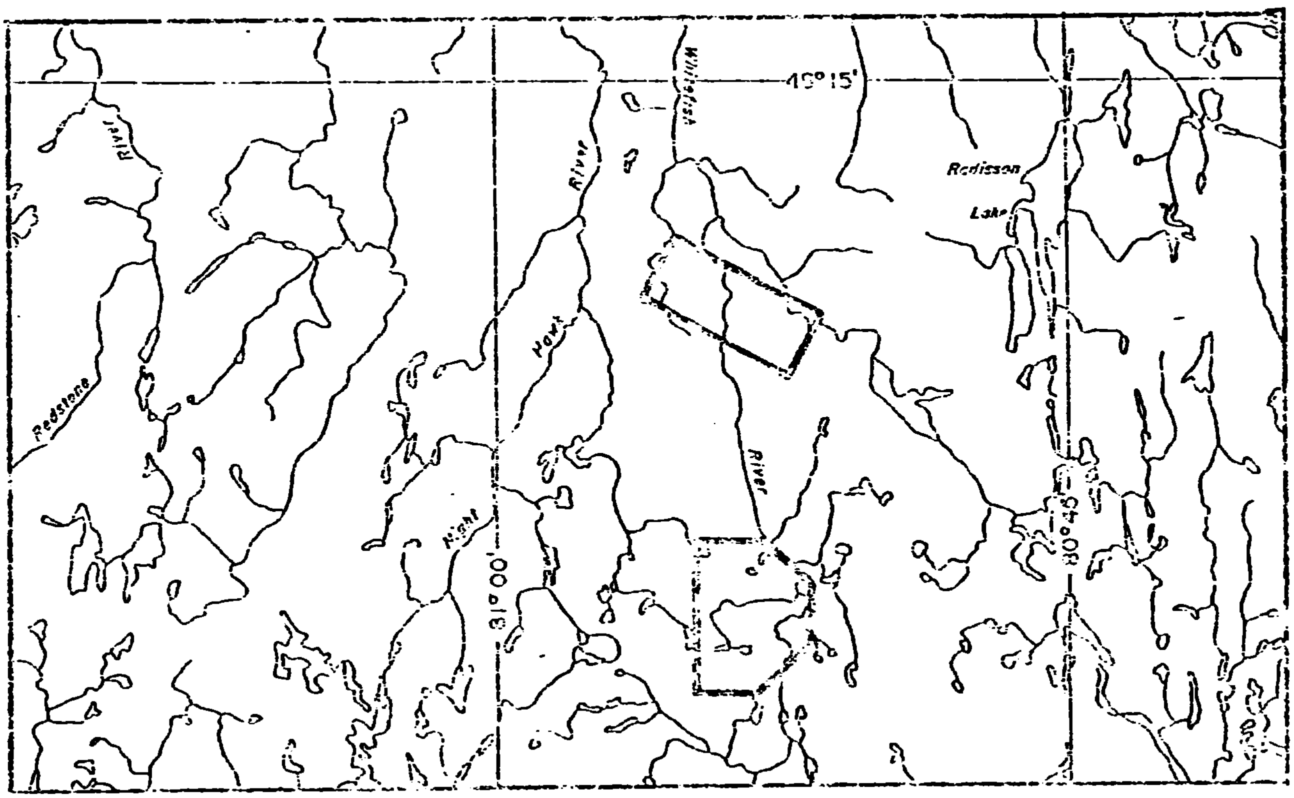
A total of 180 line kilometres of the recorded data were compiled in map form and are presented as part of this report according to specifications outlined by Joutel Resources Limited.

2. SURVEY AREA LOCATION

The survey area is depicted on the index map as shown. It is centred at Latitude 48 degrees 06 minutes north, Longitude 80 degrees 53 minutes west, approximately 55 kilometres southeast of Timmins, Ontario. The survey block is also located approximately 24 kilometres northwest of the village of Matachewan (N.T.S. Reference Map 42 A 2).

Means of access to the survey area can be made from Provincial Highway 566, which traverses across the southern boundary of Argyle Township. This road can be gained from Matachewan. From Highway 566, there are also what appear to be a number of lumber roads traversing throughout much of the region.

The terrain throughout much of the Argyle Property is characterized by gently rolling hills, with relief about 50 feet. For the most part, the elevation is approximately 1050 feet above sea level, with some areas being as high as 1100 feet A.S.L.



AIRBORNE GEOPHYSICAL SURVEY
on behalf of
JOUTEL RESOURCES LIMITED

ARGYLE TOWNSHIP, ONTARIO

BY

AERODAT LIMITED
[illegible]

3. AIRCRAFT AND EQUIPMENT

3.1 Aircraft

An Aerospatiale A-Star 350D helicopter, (C-GIBU), owned and operated by Canadian Helicopters Limited, was used for the survey. Installation of the geophysical and ancillary equipment was carried out by Aerodat. The survey aircraft was flown at a mean terrain clearance of 60 metres.

3.2 Equipment

3.2.1 Electromagnetic System

The electromagnetic system was an Aerodat 5-frequency system. Two vertical coaxial coil pairs were operated at 935 Hz. and 4600 Hz. and three horizontal coplanar coil pairs were operated at 865 Hz., 4175 Hz. and 32 kHz. The transmitter-receiver separation was 7 metres. Inphase and quadrature signals were measured simultaneously for the 5 frequencies with a time constant of 0.1 seconds. The electromagnetic bird was towed 30 metres below the helicopter.

3.2.2 VLF-EM System

The VLF-EM System was a Herz Totem 2A. This instrument measures the total field and quadrature components of two selected transmitters, preferably oriented at right angles to one another. The sensor was towed in a bird 15 metres below the helicopter. The VLF transmitters monitored were NAA, Cutler, Maine broadcasting at 24.0 kHz for the Line Station and NLK, Seattle, Washington broadcasting at 24.8 kHz for the Orthogonal Station.

3.2.3 Magnetometer

The magnetometer employed was an Aerodat/Scintrex Model VIW-2321 H8 cesium, optically pumped magnetometer sensor. The sensitivity of this instrument was 0.1 nanoTeslas at a 0.2 second sampling rate. The sensor was towed in a bird 15 metres below the helicopter.

3.2.4 Magnetic Base Station

An IFG (GSM-8) proton precession magnetometer was operated at the base of operations near Matachewan to record diurnal variations of the earth's magnetic field. The clock of the base station was synchronized with that of the airborne system to facilitate later correlation.

3.2.5 Radar Altimeter

A King Air KRA-10 radar altimeter was used to record terrain clearance. The output from the instrument is a linear function of altitude for maximum accuracy.

3.2.6 Tracking Camera

An Aerodat colour video tracking camera was used to record flight path on VHS video tape. The camera was operated in continuous mode and the fiducial numbers and time marks for cross reference to the analog and digital data were encoded on the video tape.

3.2.7 Analog Recorder

An RMS dot-matrix recorder was used to display the data during the survey. In addition to manual and time fiducials, the following data were recorded:

Channel	Input	Scale
CXI1	935 Hz Coaxial Inphase	2.5 ppm/mm
CXQ1	935 Hz Coaxial Quadrature	2.5 ppm/mm
CXI2	4600 Hz Coaxial Inphase	2.5 ppm/mm
CXQ2	4600 Hz Coaxial Quadrature	2.5 ppm/mm
CPI1	865 Hz Coplanar Inphase	10 ppm/mm
CPQ1	865 Hz Coplanar Quadrature	10 ppm/mm
CPI2	4175 Hz Coplanar Inphase	10 ppm/mm
CPQ2	4175 Hz Coplanar Quadrature	10 ppm/mm
CPI3	32 kHz Coplanar Inphase	20 ppm/mm
CPQ3	32 kHz Coplanar Quadrature	20 ppm/mm
PWRL	Power Line	60 Hz
VLT	VLF-EM Total Field, Line	2.5%/mm
VLQ	VLF-EM Quadrature, Line	2.5%/mm
VOT	VLF-EM Total Field, Ortho	2.5%/mm
VOQ	VLF-EM Quadrature, Ortho	2.5%/mm

RALT	Radar Altimeter	10 ft/mm
MAGF	Magnetometer, fine	2.5 nT/mm
MAGC	Magnetometer, coarse	25 nT/mm

3.2.8 Digital Recorder

A DGR 33 data system recorded the survey on magnetic tape. Information recorded was as follows:

Equipment	Recording Interval
EM System	0.1 seconds
VLF-EM	0.2 seconds
Magnetometer	0.2 seconds
Altimeter	0.2 seconds

3.2.9 Global Positioning System

A Trimble (Pathfinder) Global Positioning System (GPS) was used for both navigation and flight path recovery. Navigational satellites were interrogated by the GPS antennae and the navigational computer calculated the position of the helicopter in either UTM co-ordinates or Latitude and Longitudes. The navigational computer used was a Picodas PNAV 2001 display unit and Processor, which also displays to the pilot and navigator the flight path of the helicopter. The positional data were recorded on magnetic tape for subsequent flight path [illegible].

4. DATA PRESENTATION

4.1 Base Map

A photomosaic base map at a scale of 1:10,000 was prepared from a semi-controlled photo laydown and has been presented on a screened mylar Cronaflex base map.

4.2 Flight Path Map

The flight path was derived from the Global Positioning System. The flight lines have the time and the navigator's manual fiducials for cross reference to both analog and digital data.

The manual fiducials are shown as a small circle and labelled by fiducial number. The 24 hour clock time is shown as a small square, plotted every 30 seconds. Small tick marks are plotted every 2 seconds. Larger tick marks are plotted every 10 seconds. The line and flight numbers are given at the start and end of each survey line.

The flight path map is merged with the base map by matching UTM coordinates from the base maps and the flight path record. The match is confirmed by checking the position of prominent topographic features as recorded by manual fiducial marks or as seen on the flight path video record.

4.3 Airborne Electromagnetic Survey Interpretation Map

The electromagnetic data were recorded digitally at a sample rate of 10 per second with a time constant of 0.1 seconds. A two stage digital filtering process was carried out to reject major sferic events and to reduce system noise.

Local sferic activity can produce sharp, large amplitude events that cannot be removed by conventional filtering procedures. Smoothing or stacking will reduce their amplitude but leave a broader residual response that can be confused with geological phenomena. To avoid this possibility, a computer algorithm searches out and rejects the major sferic events.

The signal to noise ratio was further enhanced by the application of a low pass digital filter. It has zero phase shift which prevents any lag or peak displacement from occurring, and it suppresses only variations with a wavelength less than about 0.25 seconds. This low effective time constant permits maximum profile shape resolution.

Following the filtering process, a base level correction was made. The correction applied is a linear function of time that ensures the corrected amplitude of the various inphase and quadrature components is zero when no conductive or permeable source is present. The filtered and levelled data were used in the interpretation of the electromagnetics. An interpretation map was prepared showing peak locations of anomalies and conductivity thickness ranges along with the inphase amplitudes (computed from the 4600 Hz coaxial [illegible] map.

4.4 Magnetic Total Field Contours

The aeromagnetic data were corrected for diurnal variations by adjustment with the digitally recorded base station magnetic values. The corrected profile data were interpolated onto a regular grid at a 25 metre true scale interval using an Akima spline technique. The grid provided the basis for threading the presented contours at a 2 nanoTesla interval.

The contoured aeromagnetic data have been presented on a Cronaflex copy of the photomosaic base map.

4.5 Vertical Magnetic Gradient Contours

The vertical magnetic gradient was calculated from the gridded total field magnetic data. Contoured at a 0.1 nT/m interval, based on a 25 metre grid, the gradient data were presented on a Cronaflex copy of the photomosaic base map.

4.6 Apparent Resistivity Contours

The electromagnetic information was processed to yield a map of the apparent resistivity of the ground.

The approach taken in computing apparent resistivity was to assume a model of 200 metre thick conductive layer (i.e., effectively a half space) over a resistive bedrock. The computer then generated [illegible] for this model, the resistivity that would be [illegible] 4600 Hz coaxial [illegible] frequency of EM data. The apparent resistivity profile data were interpolated onto a regular grid at a 25 metres true scale interval using a cubic spline technique.

The contoured apparent resistivity data were presented on a screened Cronaflex copy of the photomosaic base map with the flight lines.

4.7 VLF-EM Total Field Contours

The VLF electromagnetic data derived from Cutler, Maine was processed to produce a total field contour map on a 25 metre grid with a 1% contour interval. The VLF data for the Line Station is presented on a screened copy of the Cronaflex photomosaic base map.

5. INTERPRETATION

5.1 Geology

Most of the underlying rock types have been designated as being the equivalent to the Blake River Group. These Archean rocks within the survey area consist mainly of calcalkalic basalt and andesite, along with massive, pillowed and fragmental lava with some magnesium-rich tholeiitic lava as well. There are also known to exist within these Blake River Group sequences, calcalkalic dacite and rhyolite flows, breccia and tuff.

Towards the northern portion of the survey area are believed to be ultramafic rocks, consisting of gabbro and diorite.

A few north-south to northwest-southeast Matachewan type diabase dikes traverse through the survey block as well.

Structurally, the writer is not aware of any fault zones within the survey area. There is however, a major splay type fault that cuts across the northeast survey boundary, coinciding with the Whitefish River. This fault is believed to be an off-shoot from the Montreal River Fault.

With respect to any mineralization within the survey area, or previous exploration work carried out, the writer did not have access to any of this information in order to assist with the geophysical interpretation. The potential in this area is for both base and precious metals. The closest known past producer to this survey area is the former Ashley Gold Mining Corp. Ltd. gold producer. It's located approximately 10 kilometres to the south of the survey area, just outside Bannockburn Township.

5.2 Magnetics

The most obvious magnetic feature within this survey area is the large expanse of relatively low magnetic background throughout most of the region. This would be the area that has previously been described as being associated with the calcalkalic basalt and andesite. Differentiating between these rock types and magnesium-rich tholeiitic lavas based on the magnetics, would seem to be rather difficult.

The north-south to north-northwest trending magnetic features are interpreted as being associated with the Matachewan type diabase dikes. These dikes will be much more obvious with the calculated magnetic vertical gradient presentation. Any change in magnetic intensities along the dikes could be related to the depths of these intrusives.

It is believed that a large ultramafic sill is responsible for the high intensity magnetic feature located towards the northern survey boundary. A mapped gabbro sill is seen just to the northeast of the survey area, suggesting the presence of the one immediately to the north of the survey block. The Matachewan diabase dikes have in turn, intruded the ultramafic sill.

5.3 Vertical Gradient Magnetics

The areas of high intensity magnetics have been broken up into unique trends as a result of the computation of the vertical gradient. These areas are particularly related to the Matachewan type diabase dikes. It is also interesting to note that the central north-south dike has apparently been offset by the north-northwest trending dike, indicating that the latter dike is the younger. Towards the northwest corner of the survey block, note the northwest trending magnetic feature. Is this another diabase dike?

The Blake River metavolcanics are basically showing a rather low intensity magnetic background. The magnetics in these areas are generally indicating strike directions which will be helpful in any follow-up.

A few fault zones have been indicated on the Interpretation Map by the writer. Most are either cross-cutting faults or splay-type faults. Any fault structures in close proximity to the ultramafic sill towards the north, will be of interest for their possible precious metal mineralogical controls.

5.4 Electromagnetics

The electromagnetic data was first checked by a line-by-line examination of the anomaly records. Record quality was good and any instrument noise was well within the specifications of the contract. Any subtle noise that did exist was removed by an appropriate digital filter. [illegible] in the form of [illegible] conductivity, is present on the high coplanar coil, the mid coplanar frequency coil and to a lesser degree on the high frequency coaxial coil. These areas tend to be associated with lake bottom sediments, river bottom silts and swamps.

Anomalies were picked off the analog traces of the low and high frequency coaxial responses and then validated on the coplanar profile data. The data were then edited and re-plotted on a copy of the profile map. This procedure ensured that every anomalous response spotted on the analog data was plotted on the final map and allowed for the rejection - or inclusion if warranted - of obvious surficial conductors. Each conductor or group of conductors was evaluated on the basis of magnetic (and lithologic, where applicable) correlations apparent from the analog data and man-made or surficial features not obvious on the analog charts.

RESULTS

The results of this airborne survey clearly show an extremely resistive overlying overburden cover, as well as underlying basement rocks. Much more apparent is the moderate to highly conductive lake bottom sediments that are scattered throughout the survey block. This is most noticeable within Tomfox Lake and East Night Hawk Lake.

A phenomenon which is [illegible] over these types of environments is the so-called "edge effect". This [illegible] flat-lying, [illegible] conductors that are displaying

EM signatures at the edges, that give the appearance of widely spaced vertical or near vertical bedrock conductors. These phenomena most often exhibit two widely spaced, positive coaxial responses with one positive coplanar response in between. The writer may have outlined one such zone on the Interpretation Map. However, there may be occasions where fault zones along the edge of grabens may give rise to a little stronger EM response. If the EM responses are sharp enough, there is a very good chance that mineralization may be the cause.

There were no electromagnetic responses intercepted within this survey block, including Zone A1, that one could clearly associate with a bedrock source. It does not seem that the nature of the overlying conductive materials would inhibit the detection of any weak bedrock conductor either. In reference to both the lower coaxial and coplanar frequencies, if any deep seated conductors do exist here, they have not been picked up with either frequency.

A great deal more work will have to be carried out within the survey block before a full understanding of the geological and structural implications are known. The nature of the sulphides within any base metal target or fracture filled horizon may be such that the airborne system will not detect them. Any alteration processes that may have taken place within the survey area are probably varied and complex and it is not within the realm of this report to discuss their relationship with mineralization any further.

5.5 Apparent Resistivity

This data presentation did not extract any new information from that of the 5 frequency EM profile presentation. As a result of a 200 metre model being used in the calculation of the apparent resistivity data set, it is clear that any near vertical conductor that may exist in this area, would not be resolved with this presentation, even though some of the so-called "edge effects" may be due to mineralized fault structures.

It will be noted that most lakes have been outlined with this presentation and tend to exhibit apparent resistivities in the order of 1000 ohm-metres. Swamps will generally be in the range of 2500-3000 ohm-metres. Because the apparent resistivity background of the underlying rock types are typically over 4000 ohm metres, this would tend to suggest that, if any bedrock conductors did exist within the survey area, the airborne 5 frequency EM system probably would have detected them. This may be another reason to believe that there are insufficient amounts of sulphides within the survey block.

With the exception of the conductive lake bottom sediments and swamps that exist within the survey block, some of the other anomalous features should be investigated further. It is suggested that northwest-southeast trending features be investigated, especially those that exist towards the northern portion of the survey boundary. There is also a region within the central portion of the block that should be examined further as well.

With the assistance of more detailed geological information, this data set may or may not be of any further help in interpreting zones of interest.

5.6 VLF-EM Total Field

There is little, if any, semblance of correlation with the magnetic data, suggesting a probable absence of any relationship with the basement rocks. Depending on what the geological implications are within the survey area, some of the more subtle VLF responses may warrant a further look. This would be particularly true towards the north, in close proximity to the ultramafic sill, as well as the dikes.

In comparing the VLF data with the apparent resistivity data presentation, it will be seen that there is reasonable correlation. Based on this comparison, this would tend to suggest that the VLF-EM system has responded to the conductive lake bottom sediments, as well as to the swamps. In fact, the correlation is quite good. There are some discrepancies however, and these may be the areas that are bedrock related. However, it is felt that the apparent resistivity more accurately outlines the conductive surficial materials compared with the VLF data.

The writer is not sure of the thickness of the overlying Pleistocene materials, but there is a good chance that the VLF is not penetrating through to the bedrock. It seems that the depth of [illegible] system is 100 feet at the best of times.

It is suggested that with the assistance of all available geology, that coincident VLF anomalies with magnetic features be looked at. These signatures may be reflecting disseminated pyrrhotite, that was unable to be picked up with the 5 frequency EM system. Structures in close proximity to the ultramafic sill will be of interest as well.

5.7 Conclusion and Recommendations

On the basis of the results of this airborne survey, ground follow up is suggested for a few areas as indicated by the writer in Section 5.5 of this report. It is felt that each of these targets would be of primary interest for their base metal potential. However, this is also an area that has geological implications to having precious metal potential as well, as noted towards the northwest corner of Bannockburn Township.

There were no 5 frequency EM responses intercepted that one could associate with bedrock sources. However, the apparent resistivity data presentation may be of interest in a couple of areas for their possible relationship with bedrock sources, one being located near the contact with the ultramafic sill.

Structural information should be obtained through a more comprehensive evaluation of the magnetic data and possibly, to a lesser degree, through an overview of the VLF data. Cross cutting and splay type faults are evident within some portions of the survey block. There are [illegible] [illegible] [illegible] precious metal [illegible] logical controls and [illegible] [illegible] through interpreting the magnetic data will be strongly advised. The development of any possible deformation zones will be important, particularly near the contact with the ultramafic sill.

Prospecting and soil geochemical surveying could be carried out in the vicinity of Zone A1, as well as in the region of a few of the apparent resistivity features.

Because of the absence of any strong electromagnetic responses in this area, it is felt that an induced polarization (IP) survey would be more conducive to the type of mineralogical environment that may be found as a result of following up on some of these anomalous features.

In summary, only one, very weak conductor has been outlined on the Interpretation Map by the writer. However, this is certainly not a priority target. Apparent resistivity trends in the vicinity of the large ultramafic sill may be associated with a metamorphosed aureole. As such, these should be looked at further. Fault structures in this same region should also be important targets. At this point, the writer is not familiar with the importance, if any, or the implications of the diabase dikes with respect to mineralization controls.

It is a matter of using all resources including the various geophysical data presentations, previous drill hole and geological information, that may lead to an interesting on-going exploration program.

Respectfully submitted,

Robert J. de Carle
Consulting Geophysicist
for
AERODAT LIMITED
July 12, 1991

J9127B

APPENDIX I

REFERENCES

MERQ-OGS
1983: Lithostratigraphic map of the Abitibi Subprovince; Ontario Geological Survey/Ministere de l'Energie et des Ressources, Quebec; 1:500,000; catalogued as Map 2484 in Ontario and DV 83-16 in Quebec.

Pyke, D. R., Ayres, L. D., Innes, D. G.
1973: Timmins - Kirkland Lake Sheet, Geological Compilation Series, Map 2205, Cochrane, Sudbury and Timiskaming Districts, Scale 1:253,440.

APPENDIX II

PERSONNEL

FIELD

Flown	May 11, 1991
Pilots	Greg Charbonneau
Operators	Scott Wessler

OFFICE

Processing	Tom Furuya George McDonald
Report	R.J. de Carle

I. [illegible]

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

6. [illegible]

[illegible]

[illegible]
July [illegible]

[illegible]

APPENDIX [illegible]

GENERAL INTERPRETIVE CONSIDERATIONS

Electromagnetic

The Aerodat four frequency system utilizes two different transmitter-receiver coil geometries. The traditional coaxial coil configuration is operated at two widely separated frequencies. The horizontal coplanar coil configuration is similarly operated at two different frequencies where one pair is approximately aligned with one of the coaxial frequencies.

The electromagnetic response measured by the helicopter system is a function of the "electrical" and "geometrical" properties of the conductor. The "electrical" property of a conductor is determined largely by its electrical conductivity, magnetic susceptibility and its size and shape; the "geometrical" property of the response is largely a function of the conductor's shape and orientation with respect to the measuring transmitter and receiver.

Electrical Considerations

For a given conductive body the measure of its conductivity or conductance is closely related to the measured phase shift between the received and transmitted electromagnetic field. A small phase shift indicates a relatively high conductance, a large phase shift lower conductance. A small phase shift results in a large inphase to quadrature ratio and a large phase shift a low ratio. This relationship is shown quantitatively for a non-magnetic vertical half-plane model on the accompanying phasor diagram. Other physical models will show the same trend but different quantitative relationships.

The phasor diagram for the vertical half-plane model, as presented, is for the coaxial coil configuration with the amplitudes in parts per million (ppm) of the primary field as measured at the response peak over the conductor. To assist the interpretation of the survey results the computer is used to identify the apparent conductance and depth at selected anomalies. The results of this calculation are presented in table form in Appendix IV and the conductance and inphase amplitude are presented in symbolized form on the map presentation.

The conductance and depth values as presented are correct only as far as the model approximates the real geological situation. The actual geological source may be of limited length, have significant dip, may be strongly magnetic, its conductivity and thickness may vary with depth and/or strike and adjacent bodies and overburden may have modified the response. In general the conductance estimate is less affected by these limitations than is the depth estimate, but both should be considered as relative rather than absolute guides to the anomaly's properties.

Conductance in mhos is the reciprocal of resistance in ohms and in the case of narrow slab-like bodies is the product of electrical conductivity and thickness.

Most overburden will have an indicated conductance of less than 2 mhos; however, more conductive clays may have an apparent conductance of say 2 to 4 mhos. Also in the low conductance range will be electrolytic conductors in faults and shears.

[illegible] significant fraction of the

electrical conduction is electronic rather than electrolytic in nature. Materials that conduct electronically are limited to certain metallic sulphides and to graphite. High conductance anomalies, roughly 10 mhos or greater, are generally limited to sulphide or graphite bearing rocks.

Sulphide minerals, with the exception of such ore minerals as sphalerite, cinnabar and stibnite, are good conductors; sulphides may occur in a disseminated manner that inhibits electrical conduction through the rock mass. In this case the apparent conductance can seriously underrate the quality of the conductor in geological terms. In a similar sense the relatively non-conducting sulphide minerals noted above may be present in significant consideration in association with minor conductive sulphides, and the electromagnetic response only relate to the minor associated mineralization. Indicated conductance is also of little direct significance for the identification of gold mineralization. Although gold is highly conductive, it would not be expected to exist in sufficient quantity to create a recognizable anomaly, but minor accessory sulphide mineralization could provide a useful indirect indication.

In summary, the estimated conductance of a conductor can provide a relatively positive identification of significant sulphide or graphite mineralization; however, a moderate to low conductance value does not rule out the possibility of significant economic mineralization.

[illegible]

[illegible]

shape of the anomaly. The change in shape is primarily related to the change in inductive coupling among the transmitter, the target, and the receiver.

In the case of a thin, steeply dipping, sheet-like conductor, the coaxial coil pair will yield a near symmetric peak over the conductor. On the other hand, the coplanar coil pair will pass through a null couple relationship and yield a minimum over the conductor, flanked by positive side lobes. As the dip of the conductor decreases from vertical, the coaxial anomaly shape changes only slightly, but in the case of the coplanar coil pair the side lobe on the down dip side strengthens relative to that on the up dip side.

As the thickness of the conductor increases, induced current flow across the thickness of the conductor becomes relatively significant and complete null coupling with the coplanar coils is no longer possible. As a result, the apparent minimum of the coplanar response over the conductor diminishes with increasing thickness, and in the limiting case of a fully 3 dimensional body or a horizontal layer or half-space, the minimum disappears completely.

A horizontal conducting layer such as overburden will produce a response in the coaxial and coplanar coils that is a function of thickness (and conductivity if not uniform). The profile shape will be similar in both coil configurations with an amplitude ratio (coplanar:coaxial) of about 4:1*.

In the case of [illegible]

sphere, but considerably restricted [illegible] coplanar [illegible] in the case of a sheet-like form. The response of the coplanar coil pair directly over the sphere may be up to 8* times greater than that of the coaxial pair.

In summary, a steeply dipping, sheet-like conductor will display a decrease in the coplanar response coincident with the peak of the coaxial response. The relative strength of this coplanar null is related inversely to the thickness of the conductor; a pronounced null indicates a relatively thin conductor. The dip of such a conductor can be inferred from the relative amplitudes of the side lobes.

Massive conductors that could be approximated by a conducting sphere will display a simple single peak profile form on both coaxial and coplanar coils, with a ratio between the coplanar to coaxial response amplitudes as high as 8*.

Overburden anomalies often produce broad poorly defined anomaly profiles. In most cases, the response of the coplanar coils closely follows that of the coaxial coils with a relative amplitude ratio of 4*.

Occasionally, if the edge of an overburden zone is sharply defined with some significant depth extent, an edge effect will occur in the coaxial coils. In the case of a horizontal conductive [illegible] [illegible]

* It should be noted at this point that Aerodat's definition of the measured ppm unit is related to the primary field sensed in the receiving coil without normalization to the maximum coupled (coaxial configuration). If such normalization were applied to the Aerodat units, the amplitude of the coplanar coil pair would be halved.

Magnetics

The Total Field Magnetic Map shows contours of the total magnetic field, uncorrected for regional variation. Whether an EM anomaly with a magnetic correlation is more likely to be caused by a sulphide deposit than one without depends on the type of mineralization. An apparent coincidence between an EM and a magnetic anomaly may be caused by a conductor which is also magnetic, or by a conductor which lies in close proximity to a magnetic body. The majority of conductors which are also magnetic are sulphides containing pyrrhotite and/or magnetite. Conductive and magnetic bodies in close association can be, and often are, graphite and magnetite. It is often very difficult to distinguish between these cases. If the conductor is also magnetic, it will usually produce an EM anomaly whose general pattern resembles that of the magnetics. Depending on the magnetic permeability of the conducting body, the amplitude of the inphase EM anomaly will be weakened, and if the conductivity is also weak, the inphase EM anomaly may even be reversed in sign.

VLF Electromagnetics

The VLF-EM method employs the radiation from powerful military radio transmitters as the primary signals. The magnetic field associated with the primary field is elliptically polarized in the vicinity of electrical conductors. The Herz Totem uses three coils in the X, Y, Z configuration to measure the total field and vertical quadrature component of the polarization ellipse.

The relatively high frequency of VLF (15-25) kHz provides high response factors for bodies of low conductance. Relatively "disconnected" sulphide ores have been found to produce measurable VLF signals. For the same reason, poor conductors such as sheared contacts, breccia zones, narrow faults, alteration zones and porous flow tops normally produce VLF anomalies. The method can therefore be used effectively for geological mapping. The only relative disadvantage of the method lies in its sensitivity to conductive overburden. In conductive ground to depth of exploration is severely limited.

The effect of strike direction is important in the sense of the relation of the conductor axis relative to the energizing electromagnetic field. A conductor aligned along a radius drawn from a transmitting station will be in a maximum coupled orientation and thereby produce a stronger response than a similar conductor at a different strike angle. Theoretically, it would be possible for a conductor, oriented tangentially to the transmitter to produce no signal. The most obvious effect of the strike angle consideration is that conductors favourably oriented with respect to the transmitter location and also near perpendicular to the flight direction are most clearly rendered and usually dominate the map presentation.

The total field [illegible] generally

The response will be a maximum over the conductor, without any special filtering, and strongly favour the upper edge of the conductor even in the case of a relatively shallow dip.

The vertical quadrature component over steeply dipping sheet-like conductor will be a cross over type response with the cross-over closely associated with the upper edge of the conductor.

The response is a cross-over type due to the fact that it is the vertical rather than total field quadrature component that is measured. The response shape is due largely to geometrical rather than conductivity considerations and the distance between the maximum and minimum on either side of the cross-over is related to target depth. For a given target geometry, the larger this distance the greater the depth.

The amplitude of the quadrature response, as opposed to shape is function of target conductance and depth as well as the conductivity of the overburden and host rock. As the primary field travels down to the conductor through conductive material it is both attenuated and phase shifted in a negative sense. The secondary field produced by this altered field at the target also has an associated phase shift. This phase shift is positive and is larger for relatively poor conductors. This secondary field is attenuated and phase shifted in a negative sense during return travel to the surface. The net effect of these 3 phase shifts determine the phase of the secondary field sensed at the surface.

A relatively [illegible] A relatively

good conductor is more conductive than the ground it will yield a net negative phase shift. A combination is possible whereby the net phase shift is zero and the response is purely in-phase with no quadrature component.

A net positive phase shift combined with the geometrical cross-over shape will lead to a positive quadrature response on the side of approach and negative on the side of departure. A net negative phase shift would produce the reverse. A further sign reversal occurs with a 180 degree change in instrument orientation as occurs on reciprocal line headings. During digital processing of the quadrature data for mapping purposes this is corrected for by normalizing the sign to one of the flight line headings.

APPENDIX V

ACRONYM LIST

[illegible] - [illegible] PROPERTY

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS
5	20030	A	0	0.1	5.5	0.0	11	-11

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

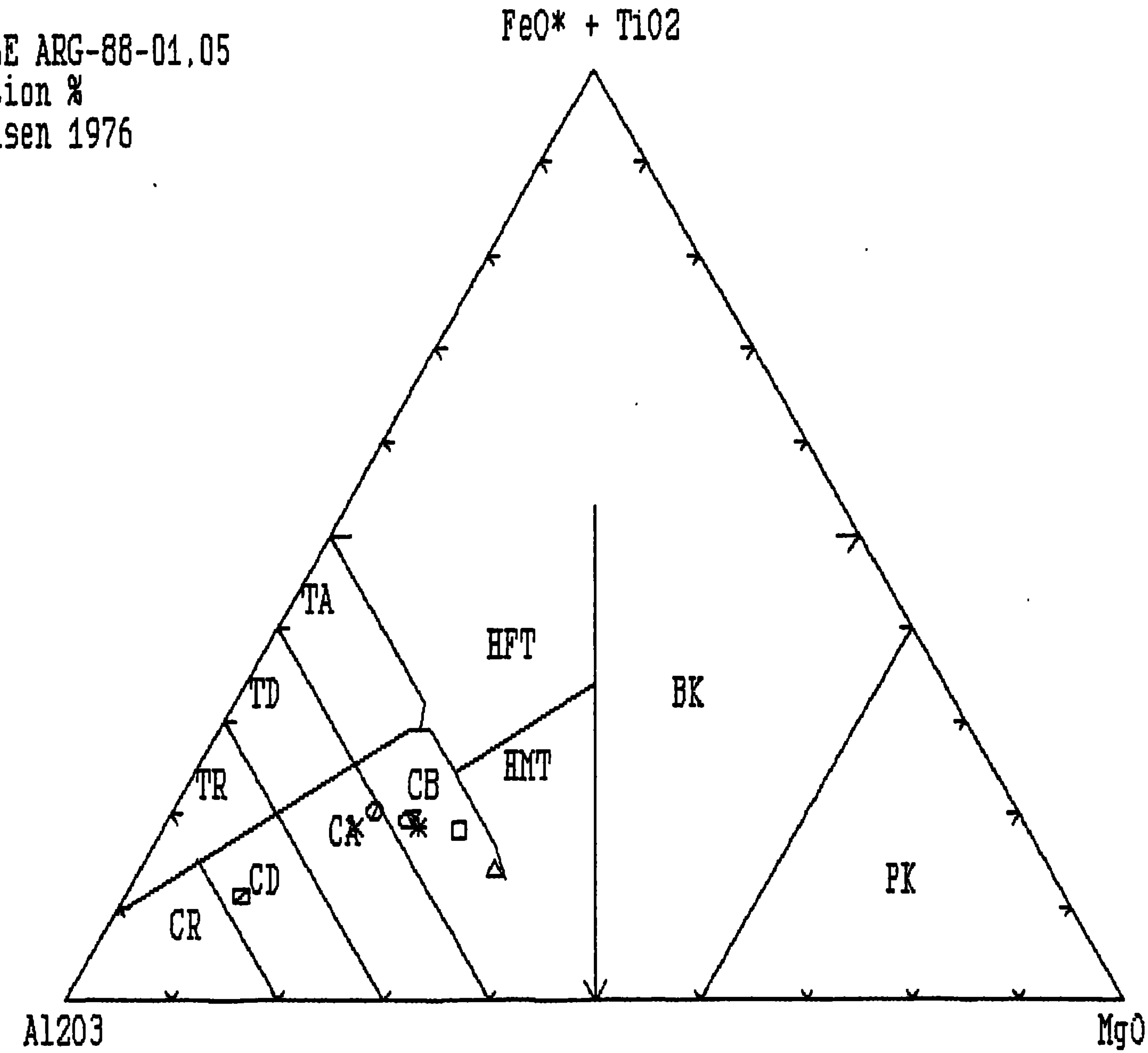
Appendix II
Argyle Property Whole Rock
Geochemical Analyses and Plots

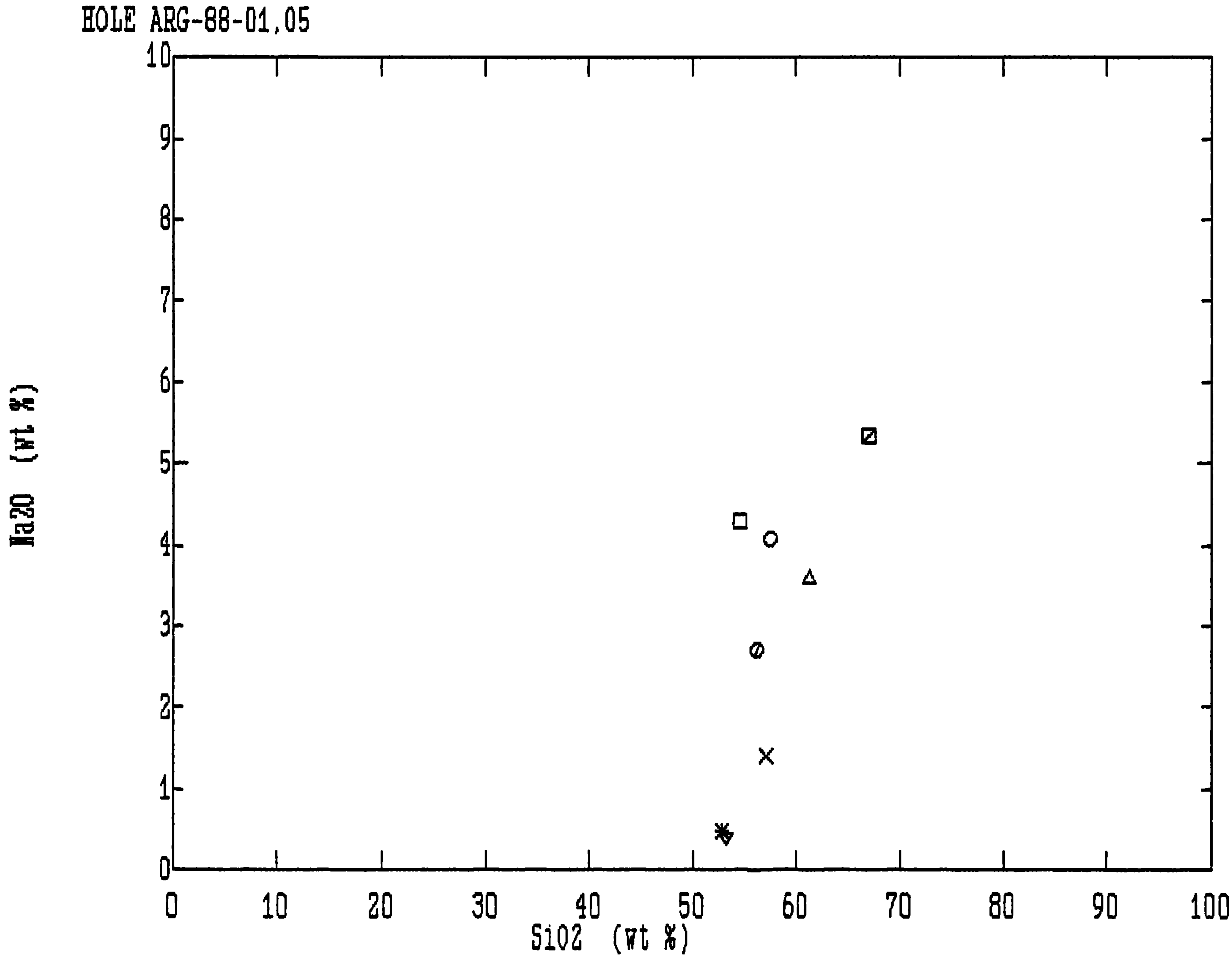
Hole 01, 05

Sample	01-039.0-0	01-099.0-0	01-135.0-1	01-146.0-1	01-213.0-2	01-244.0-2	01-262.0-2	05-392.0-3
SiO2	57.50	56.20	54.50	67.10	61.30	53.20	52.80	57.10
TiO2	0.71	0.66	0.48	0.27	0.53	0.64	0.65	0.76
Al2O3	14.20	13.90	12.30	14.60	13.90	14.20	14.00	15.50
Fe2O3	6.71	6.69	6.06	3.03	5.35	6.98	6.46	6.38
MgO	4.36	3.45	5.06	1.62	7.00	4.48	4.63	3.48
CaO	5.40	6.42	6.00	3.08	2.07	6.56	7.67	5.13
Na2O	4.07	2.70	4.30	5.34	3.61	0.38	0.47	1.42
K2O	0.29	0.84	0.35	1.53	0.27	1.39	1.34	1.12
P2O5	0.21	0.21	0.27	0.16	0.11	0.21	0.21	0.23
Total	93.45	91.07	89.32	96.73	94.14	88.04	88.23	91.12
LOI	6.55	7.55	9.45	3.85	5.60	9.00	9.90	8.70
Mg #	56.27	50.53	62.32	51.43	72.15	55.97	58.67	51.93
Cr	340	220	552	379	664	433	412	480
K	2407	6973	2905	12701	2241	11539	11124	9297
Ba	134	207	330	1840	116	256	339	230
Sr	123	167	469	598	118	112	130	210
Zr	100	100	70	60	60	90	90	110
Ti	4250	3981	2890	1643	3201	3813	3873	4562
Density	2.46	2.46	2.46	2.37	2.43	2.49	2.49	2.45

○ 01-039.0-039.0
⊘ 01-099.0-099.0
□ 01-135.0-135.0
⊠ 01-146.0-146.0
△ 01-213.0-213.0
▽ 01-244.0-244.0
✱ 01-262.0-262.0
× 05-392.0-392.0

HOLE ARG-88-01,05
Cation %
Jensen 1976





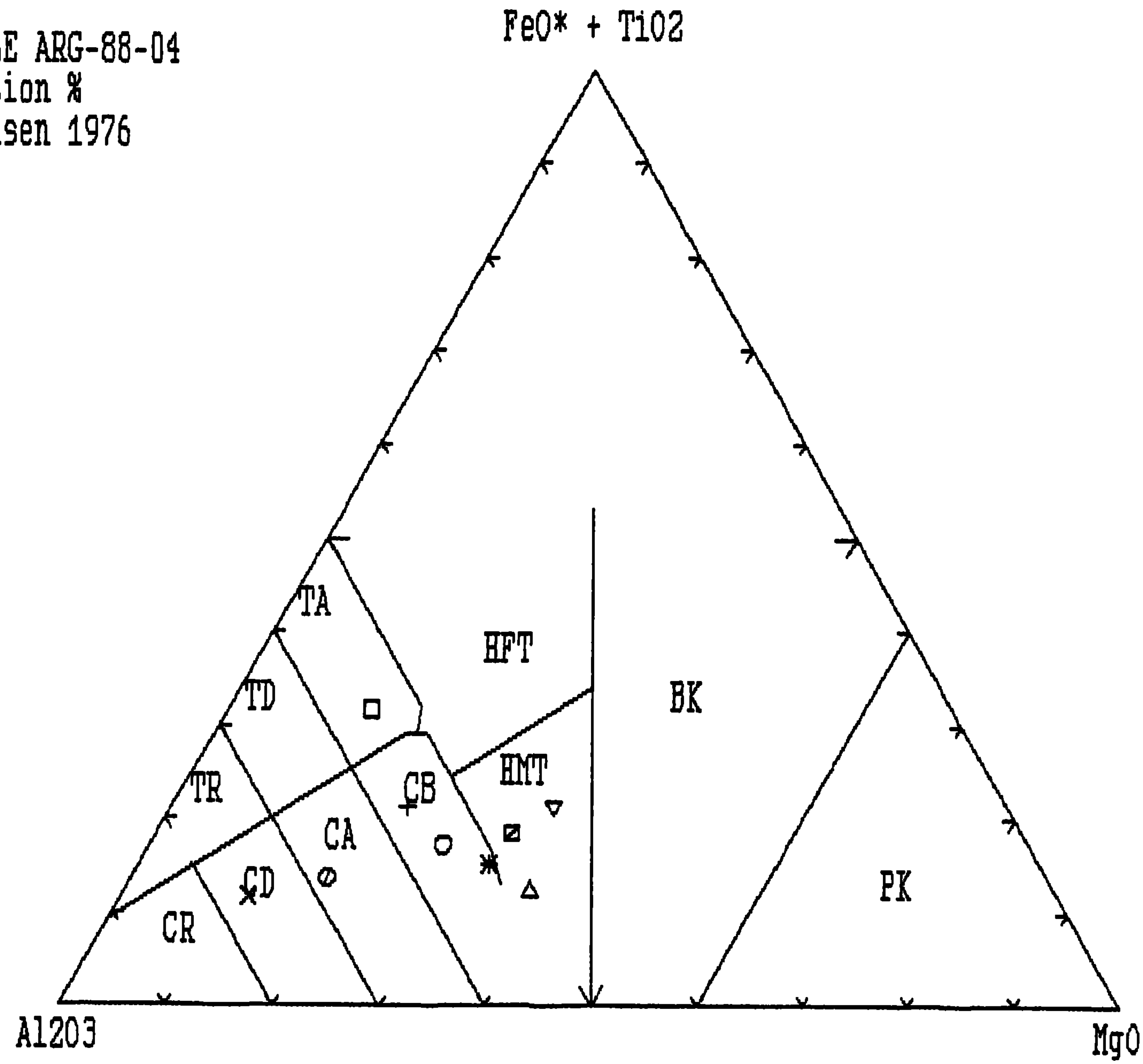
HOLE ARG-88-01,05
Na2O (wt %)
SiO2 (wt %)
0
1
2
3
4
5
6
7
8
9
10
0
10
20
30
40
50
60
70
80
90
100

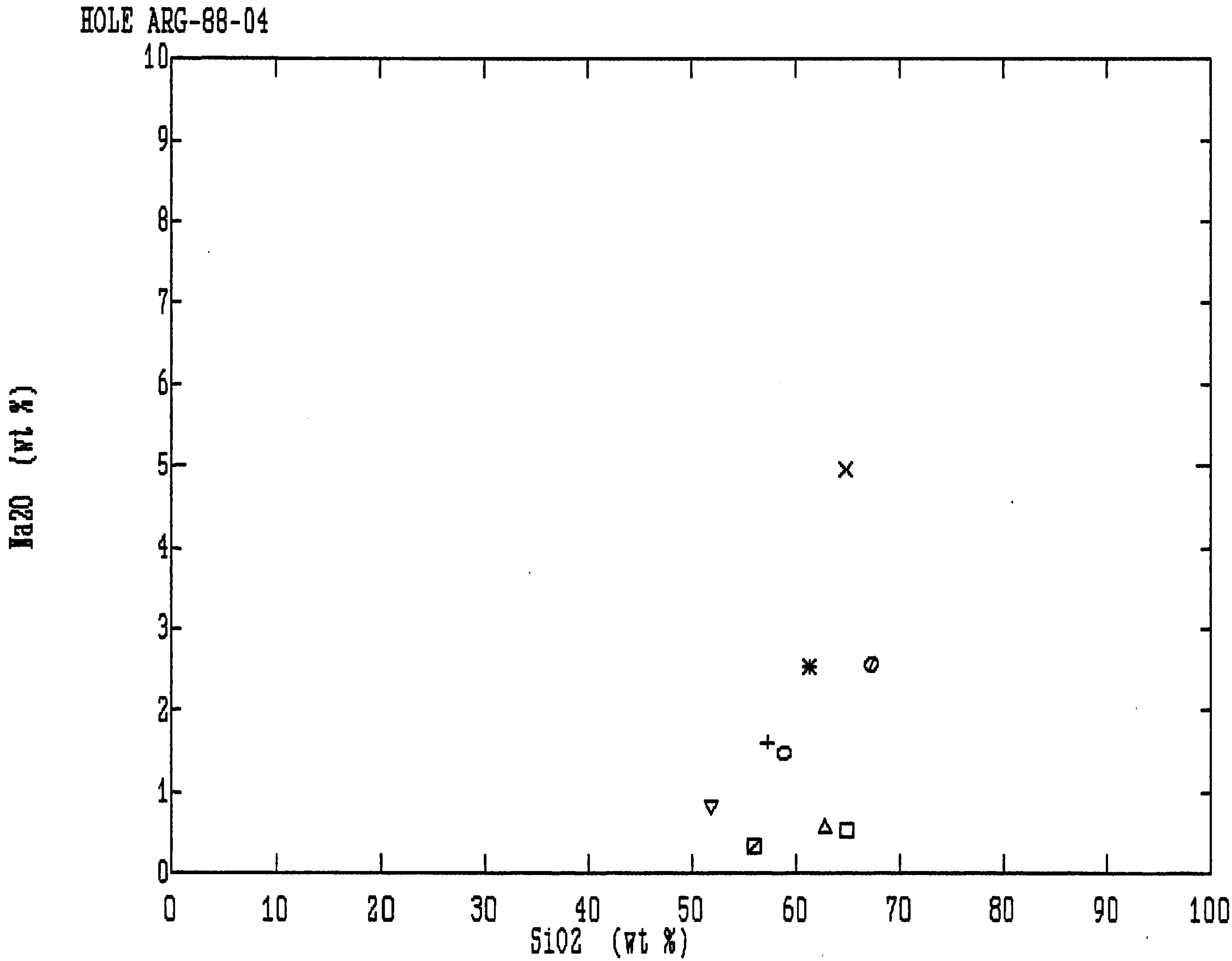
Hole 04

Sample	04-005.0-0	04-043.0-0	04-090.0-0	04-174.0-1	04-210.0-2	04-284.0-2	04-337.0-3	04-404.0-4	04-477.0-4
Northing									
Easting									
Symbol	1	2	4	5	7	9	11	12	13
Sym Colour	1	1	1	1	1	1	1	1	1
Rock Type									
SiO2	58.80	67.30	64.90	56.00	62.80	51.90	61.30	64.80	57.30
TiO2	0.49	0.43	0.56	0.47	0.47	0.54	0.47	0.28	0.70
Al2O3	13.90	13.40	13.40	11.50	11.10	12.20	12.00	13.40	14.00
Fe2O3	6.32	3.79	11.50	6.42	3.90	8.84	5.05	2.93	7.45
MgO	5.45	2.84	2.60	6.27	6.75	8.06	5.99	1.66	4.31
CaO	5.44	3.02	2.94	5.40	4.59	4.52	4.39	3.97	5.29
Na2O	1.48	2.56	0.53	0.34	0.58	0.81	2.53	4.95	1.62
K2O	1.05	1.05	3.28	1.94	1.19	0.34	0.23	1.78	1.46
P2O5	0.14	0.14	0.14	0.14	0.09	0.16	0.14	0.18	0.23
Total	93.07	94.53	99.85	88.48	91.47	87.37	92.10	93.95	92.36
LOI	7.60	5.40	7.90	10.10	7.65	9.70	7.65	5.25	7.35
Mg #	63.07	59.74	30.93	65.92	77.41	64.36	70.14	52.87	53.40
Cr	322	480	574	763	824	473	540	352	272
K	8716	8716	27228	16105	9879	2822	1909	14776	12120
Ba	192	237	152	343	74	102	186	3250	258
Sr	102	133	100	68	70	107	191	650	96
Zr	70	100	70	60	50	70	60	60	100
Ti	2932	2602	3381	2848	2830	3261	2830	1649	4208
Density	2.46	2.38	2.43	2.47	2.44	2.51	2.44	2.37	2.46

○ 04-005.0-005.0
⊘ 04-043.0-043.0
□ 04-090.0-090.0
⊠ 04-174.0-174.0
△ 04-210.0-210.0
▽ 04-284.0-284.0
✳ 04-337.0-337.0
× 04-404.0-404.0
\+ 04-477.0-477.0

HOLE ARG-88-04
Cation %
Jensen 1976




HOLE ARG-88-04
Na2O (wt %)
SiO2 (wt %)
0
1
2
3
4
5
6
7
8
9
10
0
10
20
30
40
50
60
70
80
90
100

Grab Samples

Sample	213158	213159	213160	213161	213162	213163	213164
Northing							
Easting							
Symbol	1	2	4	5	7	9	11
Sym Colour	1	1	1	1	1	1	1
Rock Type							
SiO2	56.60	54.70	54.10	60.70	64.80	56.90	60.30
TiO2	0.52	0.69	0.46	0.70	0.72	0.43	0.59
Al2O3	13.90	14.50	13.40	14.40	14.80	15.60	16.90
Fe2O3	9.51	7.46	7.38	10.00	6.06	9.15	6.23
MgO	4.89	4.39	4.78	3.58	2.65	3.54	3.38
CaO	2.98	7.04	7.60	1.76	3.50	2.73	4.13
Na2O	0.49	1.11	0.33	0.29	6.66	1.43	5.77
K2O	1.88	2.02	1.43	1.98	0.11	1.30	0.40
P2O5	0.14	0.22	0.20	0.21	0.18	0.15	0.16
Total	90.92	92.13	89.67	93.62	99.48	91.23	97.86
LOI	6.30	7.30	7.60	3.85	1.10	4.80	1.90
Mg #	50.45	53.82	56.19	41.49	46.41	43.38	51.79
Cr	958	408	477	425	772	606	729
K	15606	16769	11871	16437	913	10792	3321
Ba	438	405	238	443	41	424	182
Sr	72	101	106	84	188	85	241
Zr	97	134	115	146	134	121	123
Ti	3147	4119	2728	4202	4340	2548	3519
Density	2.46	2.48	2.49	2.43	2.40	2.45	2.43

○ 213158

⊘ 213159

□ 213160

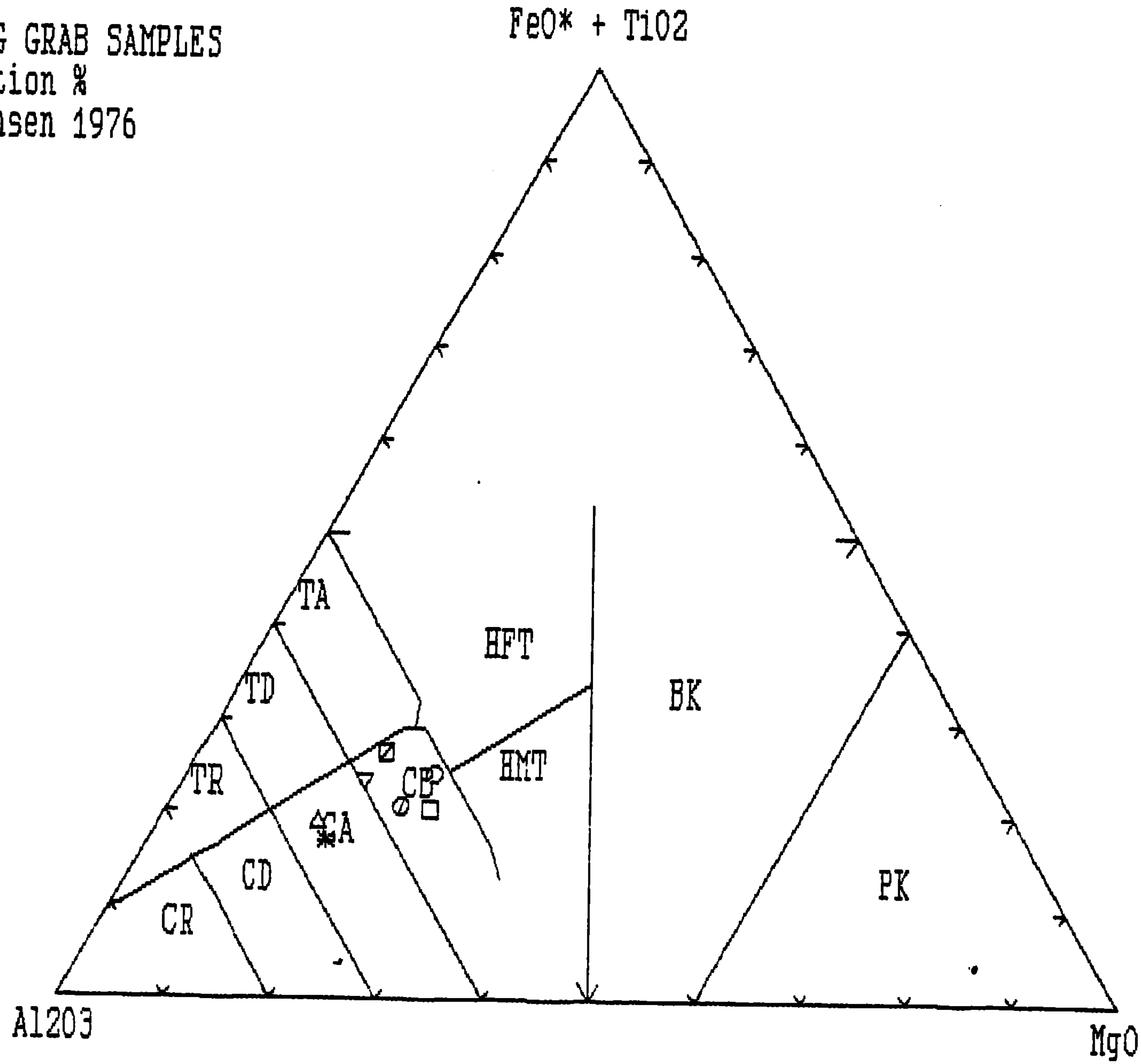
⊠ 213161

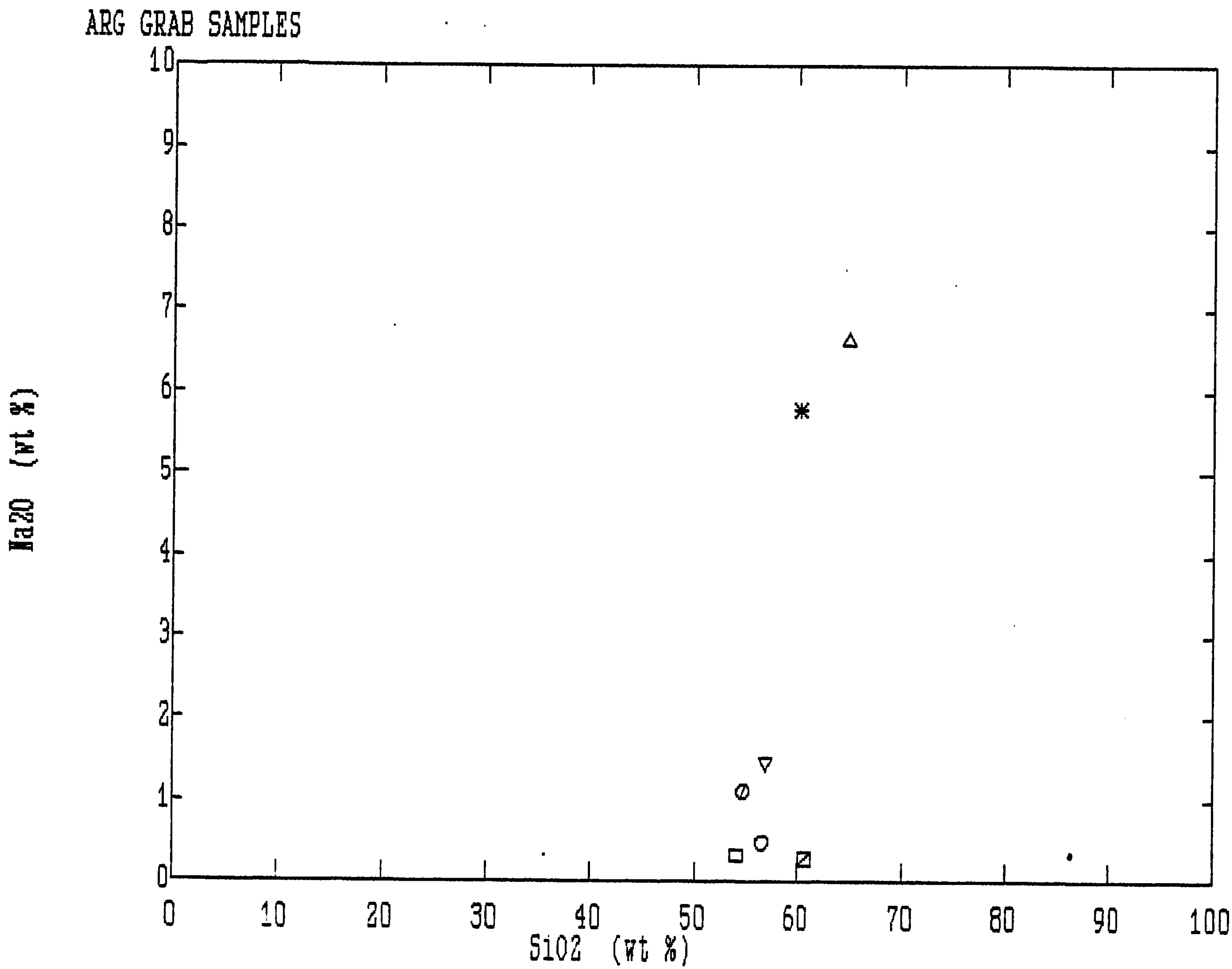
△ 213162

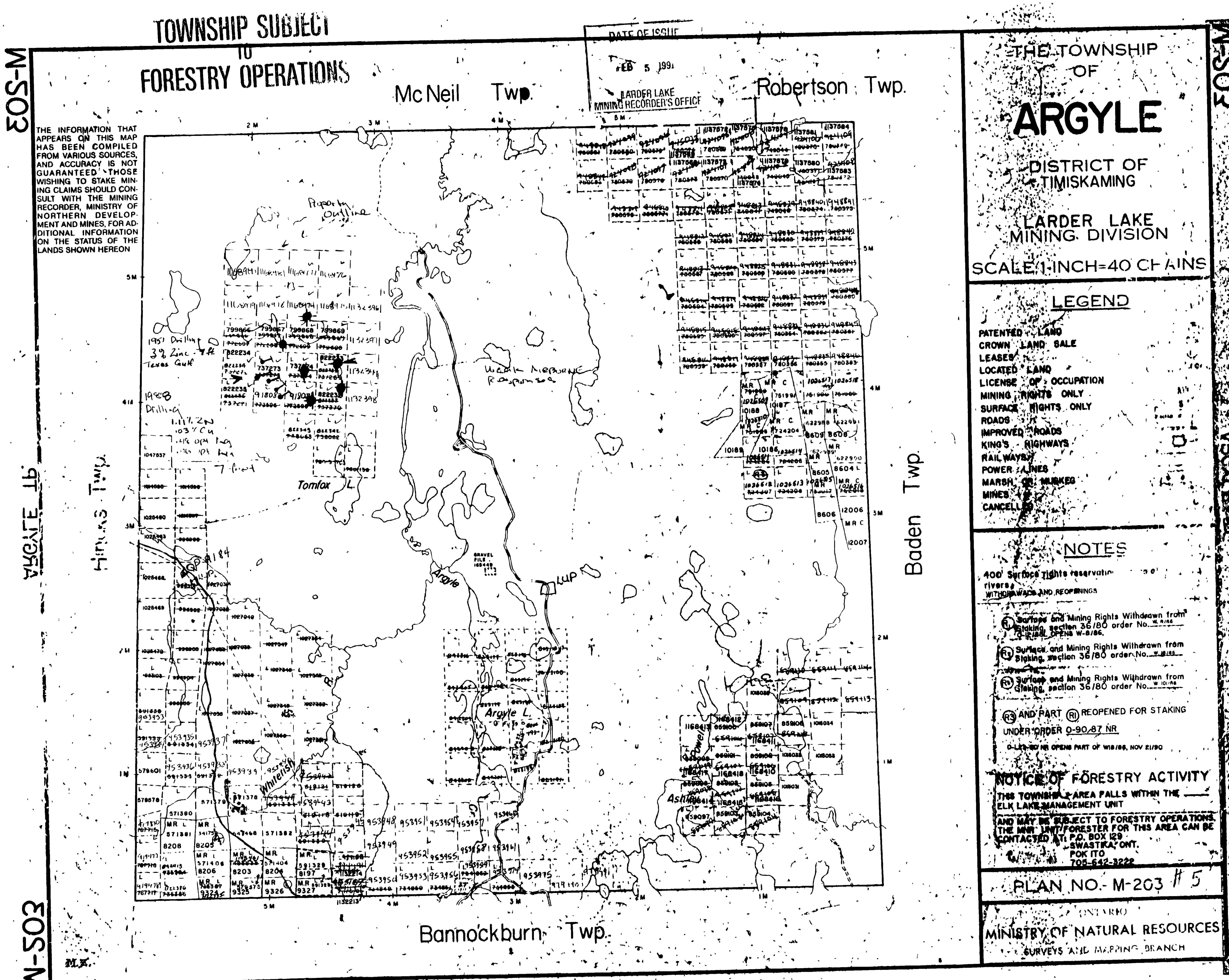
▽ 213163

✳ 213164

ARG GRAB SAMPLES
Cation %
Jensen 1976

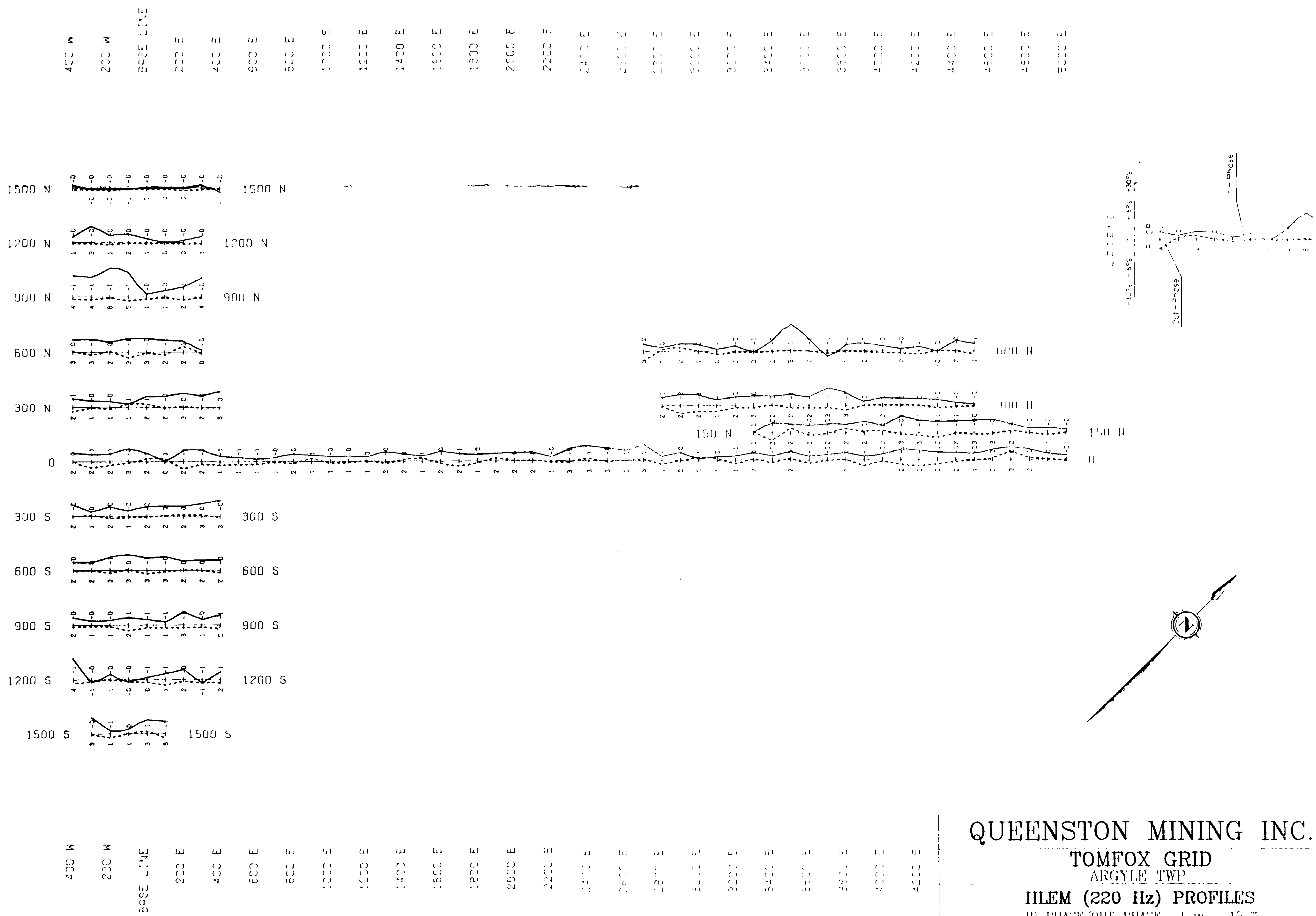



ARG GRAB SAMPLES
Na2O (wt %)
SiO2 (wt %)
0
1
2
3
4
5
6
7
8
9
10
0
10
20
30
40
50
60
70
80
90
100



42A0/SW0001 91 01R ARGYLE

200



QUEENSTON MINING INC.

TOMFOX GRID

ARGYLE TWP

HLEM (220 Hz) PROFILES

IN PHASE/OUT PHASE 1 in = 15 %
COIL SEPARATION (Tx Rx) 400 ft
APEX MaxMin I-9

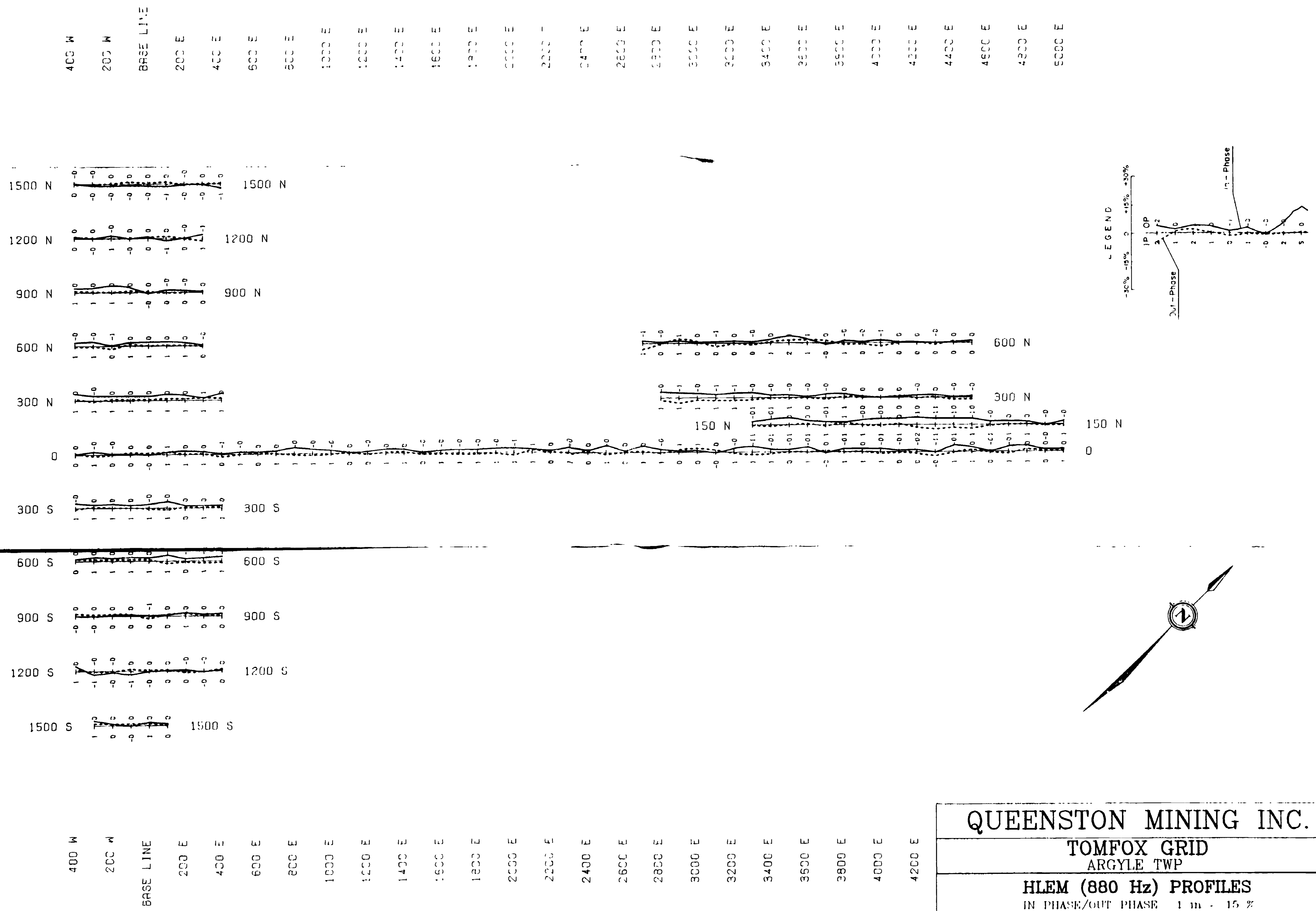
SCALE 1:4800

SURVEY BY JVX LTD JANUARY 199?	1 in = 400 ft	PLATE 1 F

FIG. 5

42A02SW0003 91-018 ARGYLE

210



QUEENSTON MINING INC.

TOMFOX GRID

ARGYLE TWP

HLEM (880 Hz) PROFILES

IN PHASE/OUT PHASE 1 in - 15 %

COIL SEPARATION (Tx-Rx) 400 ft

APEX MaxMin I-9

SCALE 1:4800

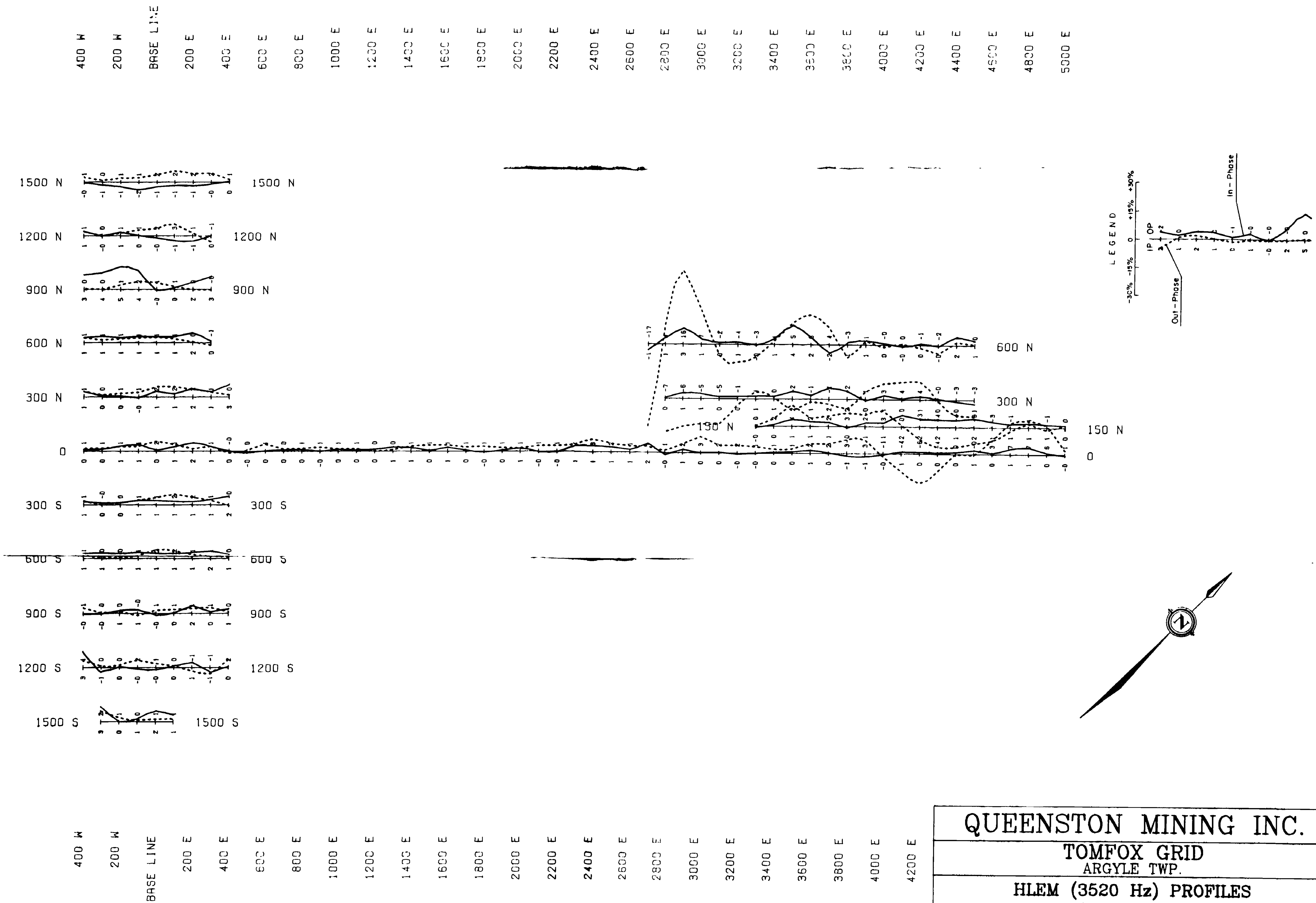
SURVEY BY
JVX LTD
JANUARY 1992

1 in = 400 ft

PLATE 2 T

FIG. 6

220



QUEENSTON MINING INC.

TOMFOX GRID
ARGYLE TWP.

HLEM (3520 Hz) PROFILES
IN-PHASE/OUT-PHASE 1 in = 15 %
COIL SEPARATION (Tx-Rx) 400 ft
APEX MaxMin I-9

SCALE 1:4800

SURVEY BY JVX LTD. JANUARY 1992	1 in = 400 ft	**PLATE** 3 T

42A028W0003 91-018 ARGYLE

230

FIG. 7

- LEGEND -

1a - BASALTIC FLOW
b - BASALTIC TUFF

2a - ANDESITE FLOW
b - ANDESITE TUFF/FLOW BRECCIA, AGGLOMERATE
C - ANDESITE TUFF

3a - DACITE
4 - FELDSPAR PORPHYRY DYKES
5 - MAFIC DYKES
6 - LAMPROPHYRE DYKES
7 - DIABASE DYKES

- ABBREVIATIONS -

porp - porphyritic
carb - carbonate
fuch - fuchite
fol - foliated
amyg - amygdaloidal
ser - sericite
mt - magnatite
chl. - chlorite
tourm. - tourmaline
dol. - dolomite
sil - silicified
py - pyrite
sph - sphalerite
cpy - galena
Bldrs - Boulders

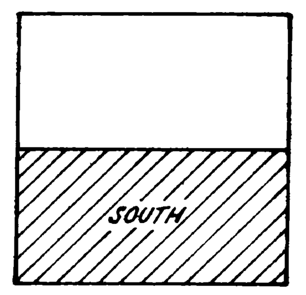
- SYMBOLS -

- Shear
- fault
- Bedding, contact
- Foliation
- Jointing
- Trench
- Pit
- Drill hole
- Slope, swamp or wetland boundary
- Outcrop
- Swamp

CLAIM POSTS

■ FOUND
□ NOT FOUND

240



0 200 400 FT.

PROV.	ONTARIO
TWP.	ARGYLL
NTS	42A2
REF.	MAPPED BY: G.M., S.C. & W.J.M
DWN. BY	RJ
REVISIONS	DATE / BY

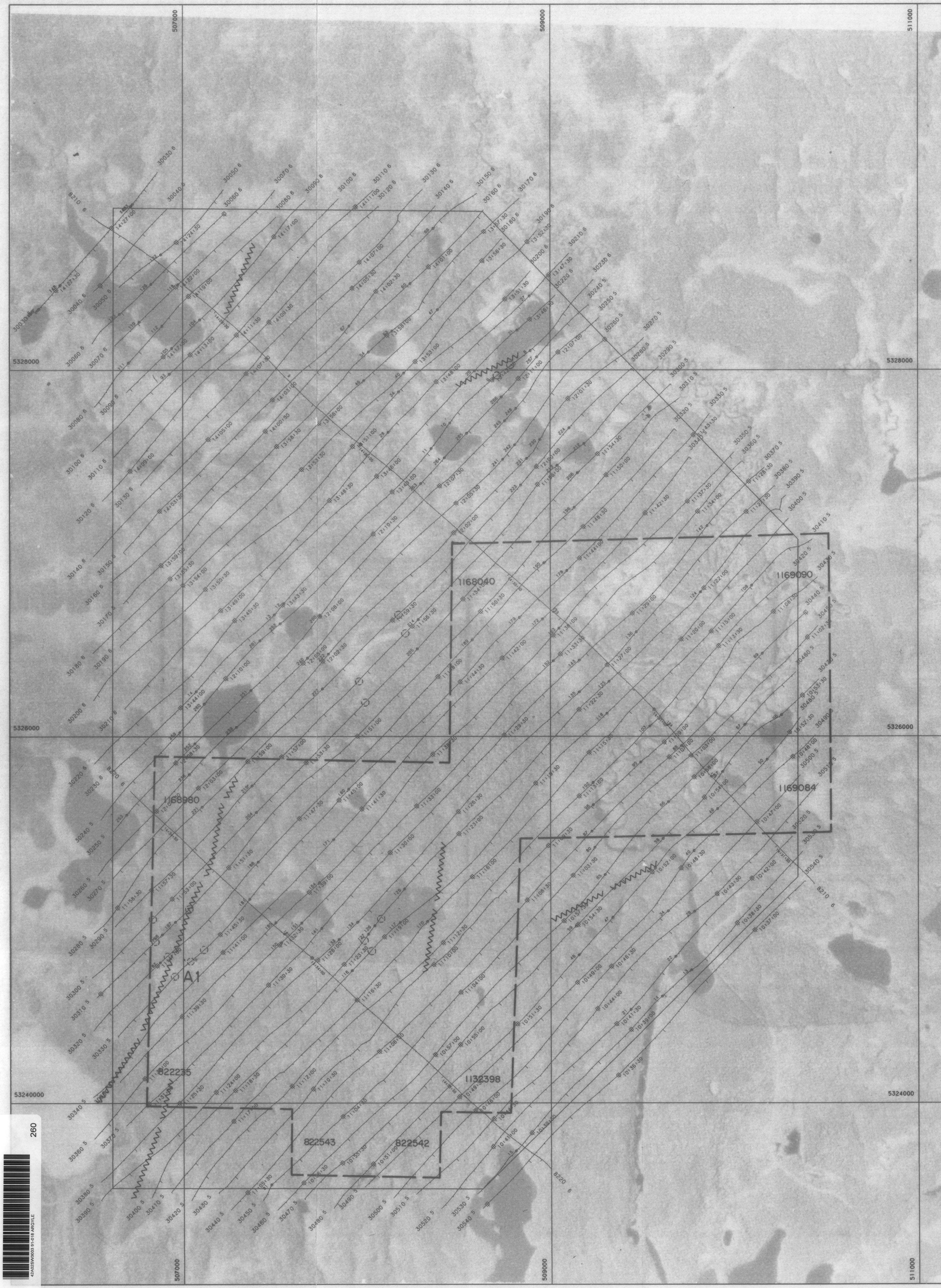
JOUTEL RESOURCES LTD.

GENERAL GEOLOGY
TOM FOX PROPERTY
SOUTH SHEET

SCALE 1" = 200' | DATE OCT./91 | PLATE FIG. 4


NOTE SEE SOUTH SHEET FOR LEGEND ¢ SYMBOLS
PROV. ONTARIO
TWP. ARGYLL
NTS 42A2
REF. MAPPED BY G.J.M. S.C. ¢ W.J.M.
DWN. BY
REVISIONS DATE BY
JOUTEL RESOURCES LTD.
GENERAL GEOLOGY
TOM FOX PROPERTY
NORTH SHEET
SCALE 1" = 200'
DATE OCT/91
PLATE FIG. 4
NORTH
N
LAKE
Pond
Camp
Esker ridge
Beaver dam
1168980
1168981
1168977
1168976
1132355
1168979
1168978
1168974
1168975
1132396
0 200 400 FT.

250



N

Flight Path

Navigation and recovery using a Global Positioning (GPS) navigation system.

Average terrain clearance 60m
Average line spacing 100m

EM Anomalies

Conductivity Thickness (mhos)

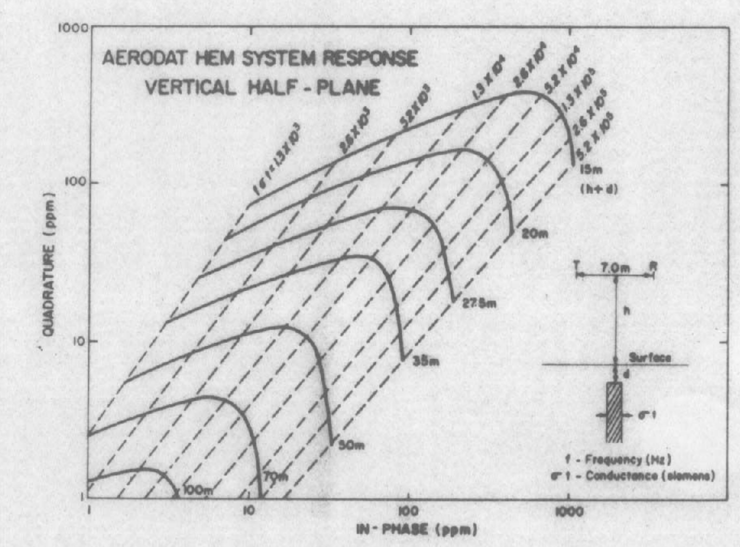
- 0 - 1
- 1 - 2
- 2 - 4
- 4 - 8
- 8 - 15
- 15 - 30
- > 30

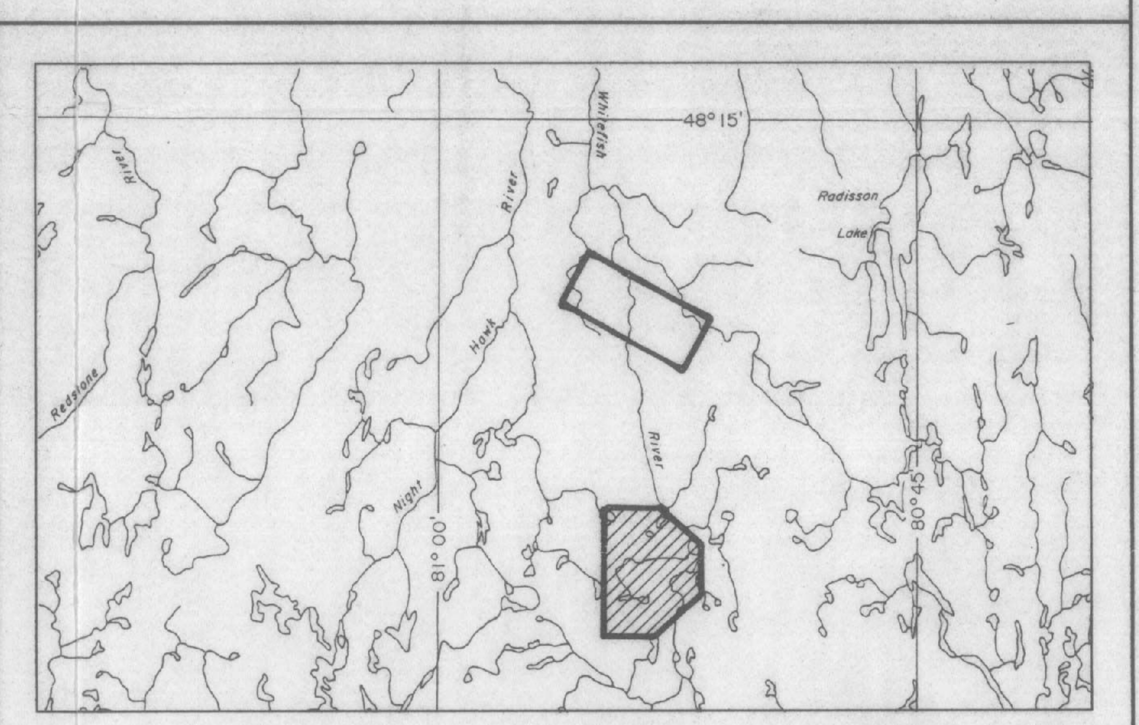
EM Anomaly A, 4600 Hz inphase amplitude 7 ppm. Conductivity thickness 1-2 mhos (see code).

INTERPRETATION LEGEND

Interpreted bedrock conductor axis

Fault





JOUTEL RESOURCES LIMITED

INTERPRETATION

ARGYLE PROPERTY

ONTARIO

SCALE 1:10,000

0 330 660 1320 2640 Feet

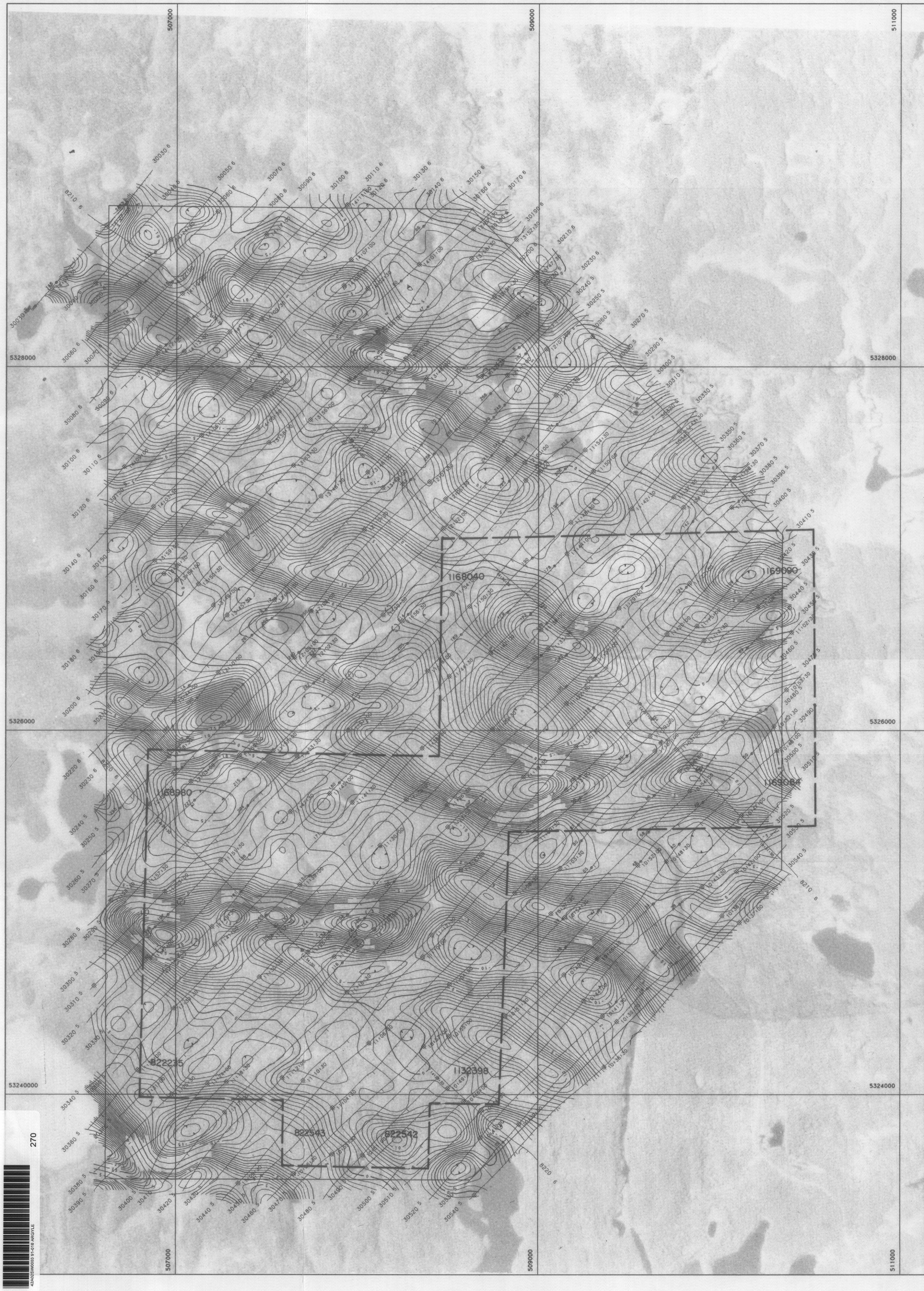
0 100 200 500 1000 Metres

AERODAT LIMITED

DATE: MAY 1991

NTS No: 42 A

MAP No: 3 J9127- 1



N

Flight Path

Navigation and recovery using a Global Positioning (GPS) navigation system.

Average terrain clearance 60m
Average line spacing 100m

VLF-EM

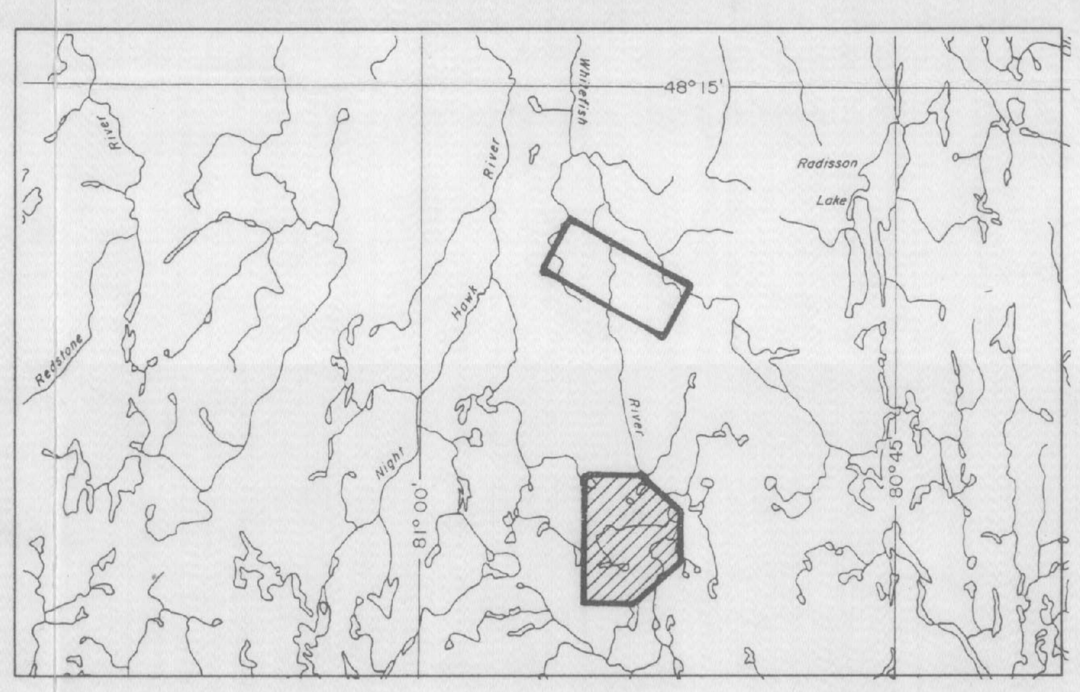
VLF-EM Total Field Intensity in percent.

Station: NAA
Cutler, Maine
24.0 kHz

Sensor elevation 45m

Map contours are multiples of those listed below

1 %
5 %
25 %
100 %



JOUTEL RESOURCES LIMITED

VLF-EM TOTAL FIELD CONTOURS (LINE CHANNEL)

ARGYLE PROPERTY

ONTARIO

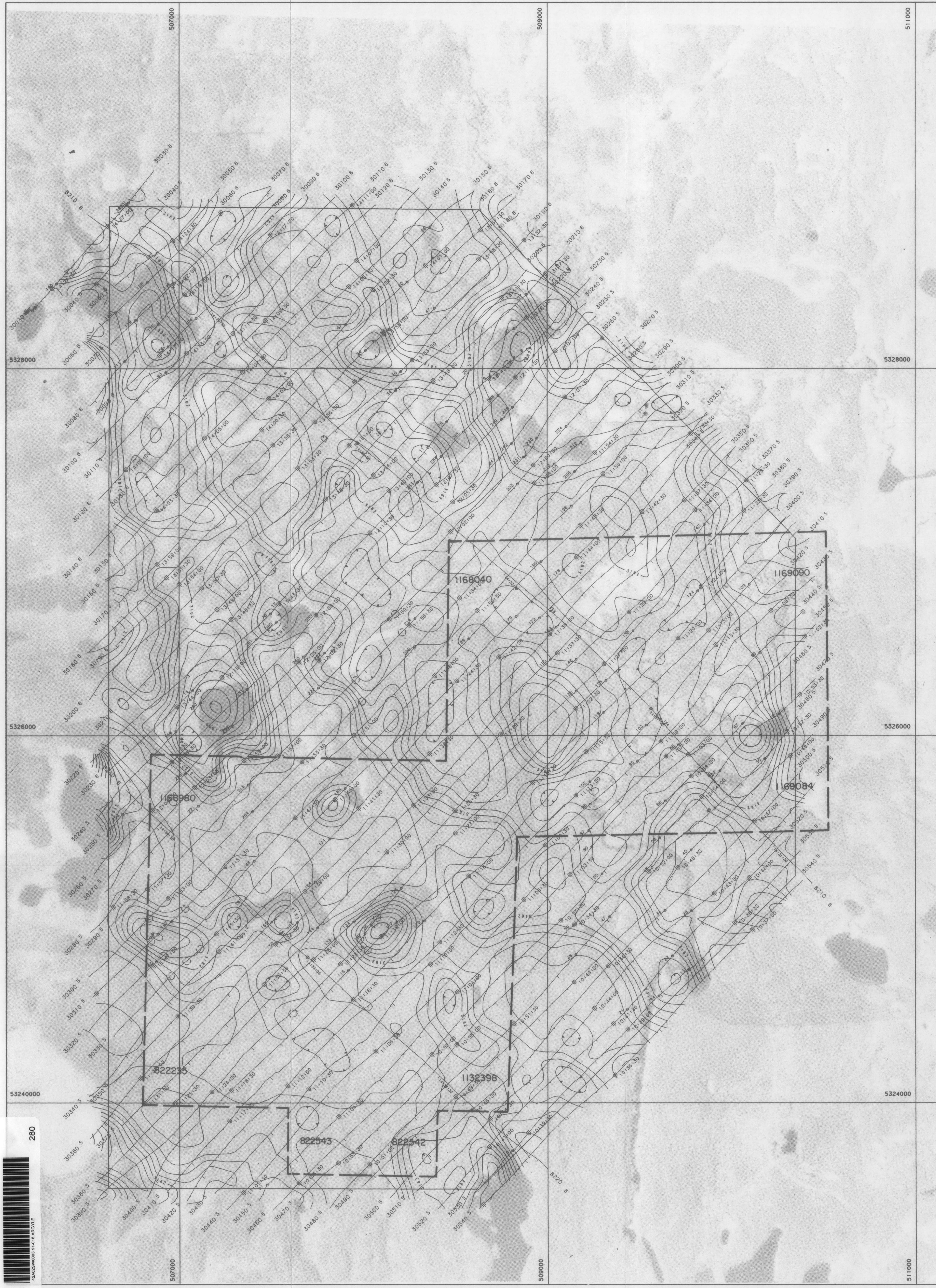
SCALE 1:10,000

0 330 660 1320 2640 Feet

0 100 200 500 1000 Metres

AERODAT LIMITED

DATE:	MAY 1991
NTS No:	42 A
MAP No:	6 J9127- 1



N

Flight Path

Navigation and recovery using a Global Positioning (GPS) navigation system.

Average terrain clearance 60m
Average line spacing 100m

Apparent Resistivity

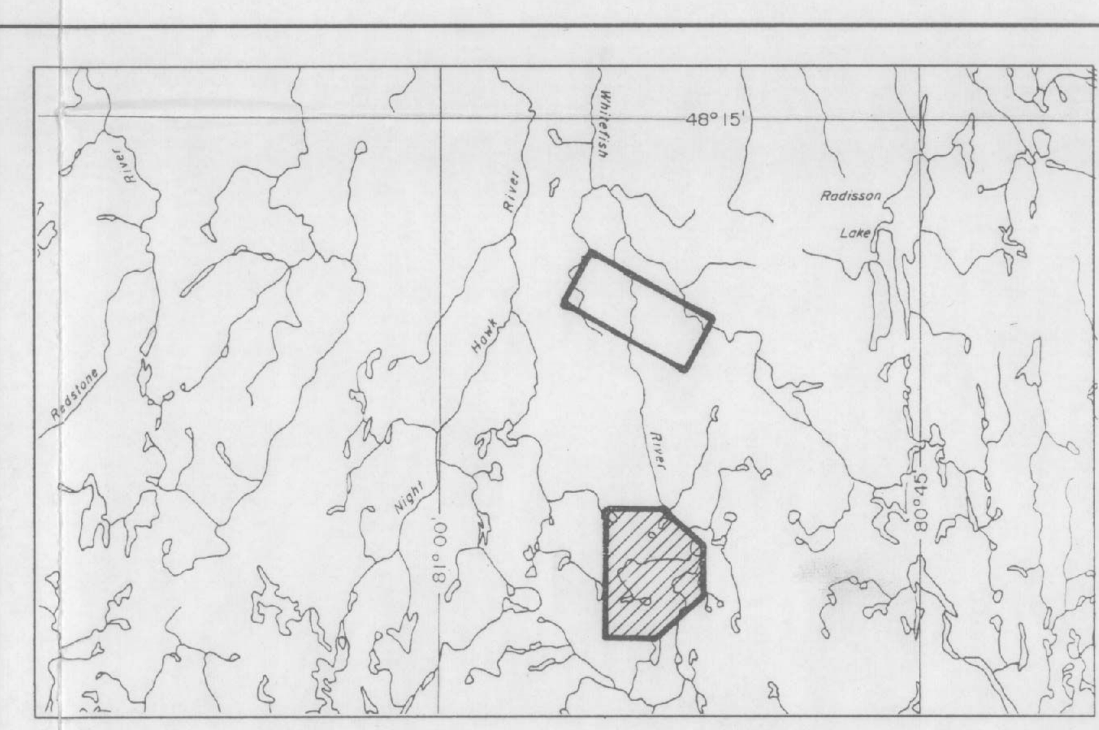
Calculated from 4600 Hz coaxial EM response assuming a 200 m conductive layer.

Contouring in ohm*m at logarithmic intervals.

Sensor elevation 30m

Map contours are multiples of those listed below

0.1 log(ohm*m)
0.5 log(ohm*m)
1.0 log(ohm*m)
5.00 log(ohm*m)



JOUTEL RESOURCES LIMITED

APPARENT RESISTIVITY CONTOURS (4600 Hz)

ARGYLE PROPERTY

ONTARIO

SCALE 1:10,000

0 330 660 1320 2640 Feet

0 100 200 500 1000 Metres

AERODAT LIMITED

DATE:	MAY 1991
NTS No:	42 A
MAP No:	7 J9127- 1