# MobileMT survey over the IOCG-AYLMER property (a greenfield case study)

***Summary***

*The Aylmer Property prospective for IOCG (iron oxide copper gold)-style mineralization is located in the Sudbury-Wanapitei Lake area. A heliborne MobileMT survey of naturally occurring electromagnetic fields was conducted over the property in an effort to highlight evidence of a buried controlling mineralization system at depth. Deep weakly conductive structures and structural resistivity contrasts were revealed along with magnetic features. Comparison of the data from a line also flown by an airborne time-domain EM survey demonstrates the MobileMT technology's capability to detect comparatively slight but meaningful differentiations in a resistive environment.*

***Introduction***

The Aylmer Property is situated in the Sudbury-Wanapitei Lake area attributed, based on the structural position, geology, specific alterations, and copper showings, to IOCG mineralization. Extensive operations like bedrock stripping and diamond drilling should be assisted by preliminary targeting with geophysics. Magnetic field analysis could show features potentially associated with the mineralization, but the unassociated Nipissing Diabase and Sudbury Dykes create prominent anomalies as well. A historical airborne time-domain survey over a part of the property indicates a resistive background with subtle differentiations which that technique was unable to distinguish between. In contrast, the MobileMT helicopter EM prospecting system which has performed surveys for a wide variety of exploration programs in difficult geoelectrical conditions is able to detect variations in this resistive environment.

***Regional position, geology, and mineralization***

The Aylmer property belongs to a regional structural zone and is located northeast of the Sudbury igneous complex, and 8 km north of Wanapitei Lake in Northern Ontario (Figure 1).

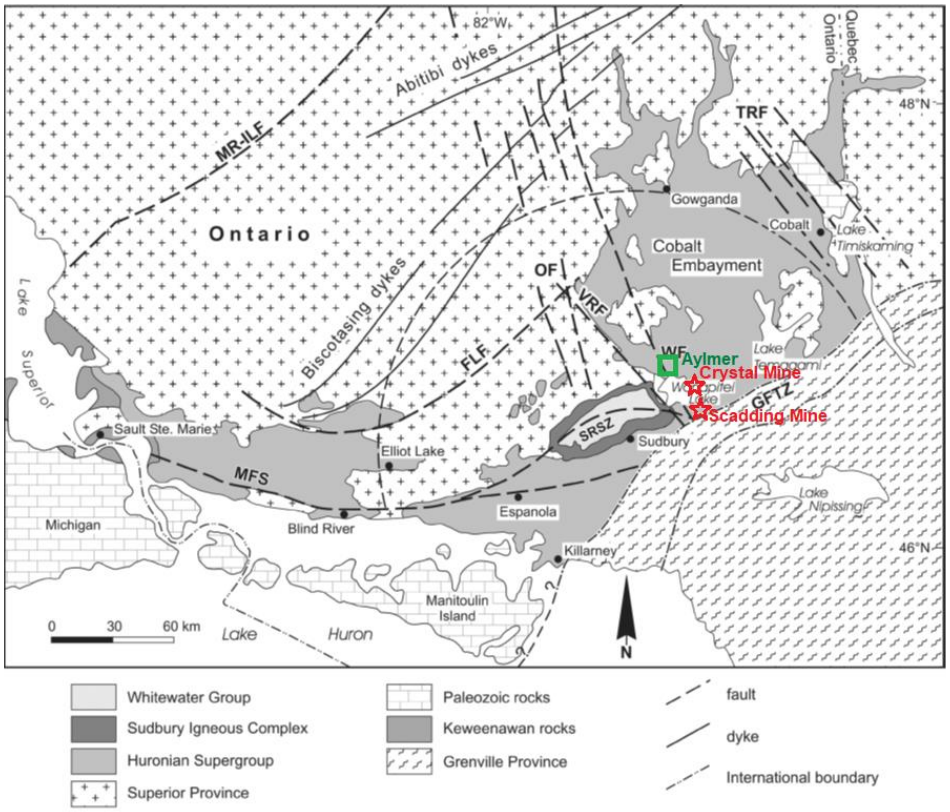


*Figure 1 – Regional geological position of the Aylmer property (Source: Spray et al. (2003))*

The Wanapitei Lake area "has a strong potential to host IOCG-type deposits" (Schandl and Gorton, 2007). The wide (15 km) regional structural deformation and alteration zone in the Huronian sediments (Proterozoic, 2.45-2.2 Ga) consists of over 30 mineral showings and occurrences associated with extensive sodic metasomatism, quartz veins, and breccia bodies with pyrite-chalcopyrite (Transition Metals Corp., 2020). The gold past-producing Scadding and Crystal Mines are in this structural setting (Figure 2). According to the IOCG exploration model in the region (Transition Metals Corp., 2020), high-temperature quartz matrix breccias on the background of extensive regional soda metasomatism expressed by albitization in rocks and regional structures observed on adjacent properties form a favourable environment for the copper-gold mineralization. The known Scadding polymetallic gold mineralization is associated with brecciated and deformed chlorite and sodic alteration zones as preferential hosts (MacDonald Mines Exploration Ltd., 2019), similar to those specified on the Aylmer property.

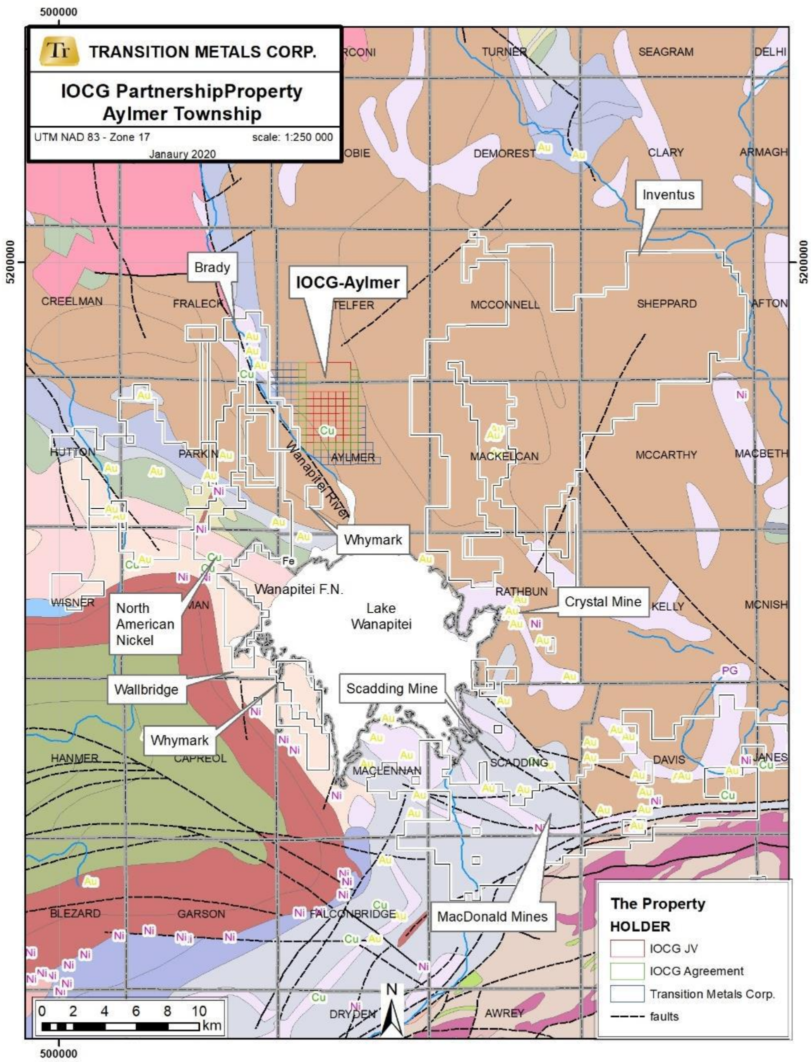


*Figure 2 – position of the Aylmer property in the township scale (Source: Transition Metals Corp.)*

The albitization process in the Sudbury - Wanapitei Lake area occurred at ~1700 Ma (Schandl et. al., 1994) and "the source of the fluid may have been a deep-seated granitic or alkaline intrusion emplaced in the area during the 1.75–1.7 Ga magmatism" (Schandl and Gorton, 2007). Other magmatic events in the Aylmer property could be represented by Nipissin diabase (2.22 Ga) and Sudbury diabase dykes (1.24 Ga). The high-temperature quartz matrix breccias, as one of the main elements of the IOCG model, are not associated with the diabase complexes (Transition Metals Corp., 2020).

### *Property geophysics and its interpretation*

A heliborne MobileMT electromagnetic survey with 200 m flight line spacing was executed over the Aylmer Property in order to highlight evidence of a buried controlling mineralization system at depth for future exploration.

The magnetic field indicates a series of Northwest-trending linear structures or dykes (Figure 3) and an edge of a deep and comparatively large magnetic source (such as an igneous intrusion) in the Southeast part of the area (Figure 4).

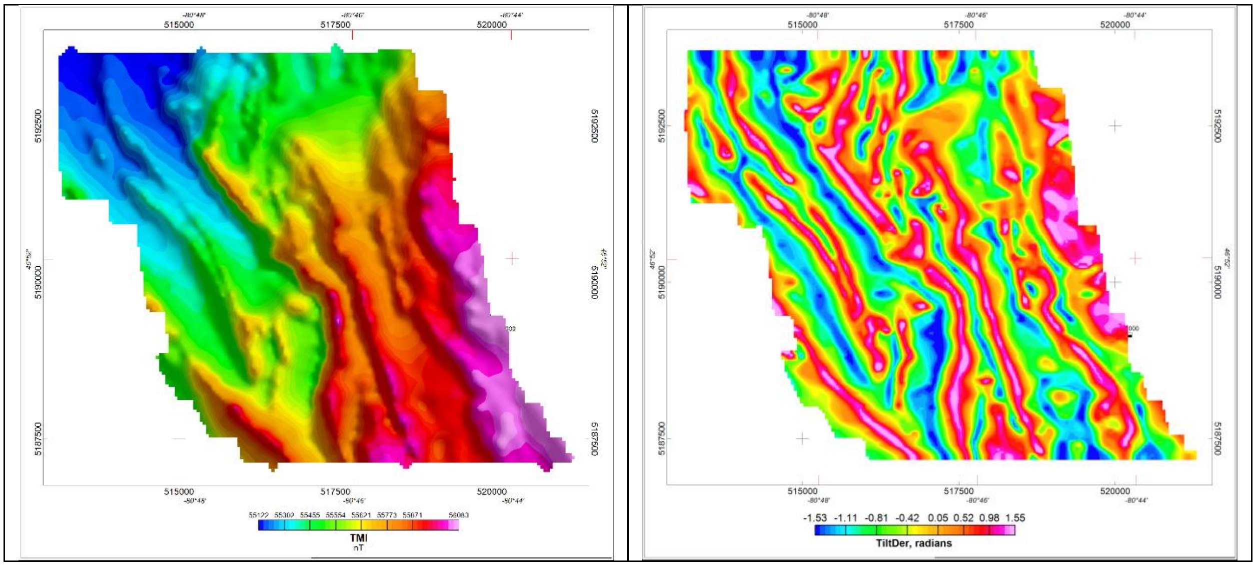


*Figure 3 – Magnetic field (left, TMI) and tilt derivative of TMI (right) over the Aylmer property*

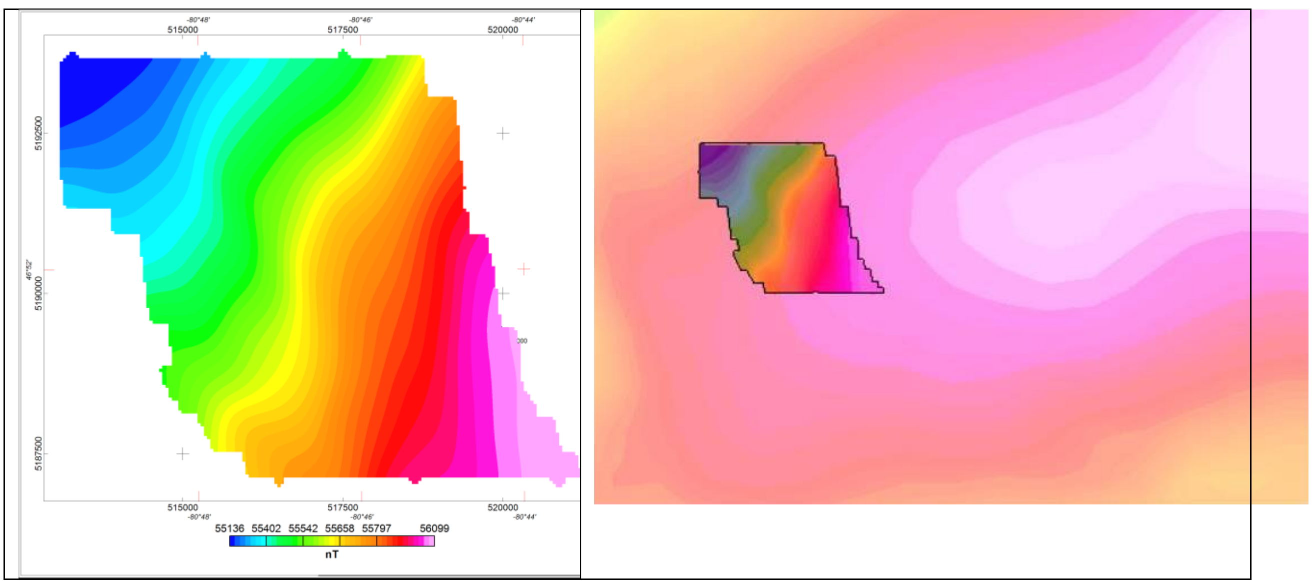


*Figure 4 – Magnetic field upward continued 500 m (left) and the upward continued magnetic field over the regional magnetic field (right)*

This regional magnetic anomaly is known as the Temagami magnetic anomaly.

The electromagnetic MobileMT data is represented by 12 frequency windows from 42 Hz to 13619 Hz. Apparent conductivity grids for each frequency are shown in 3D view with each frequency window shown at its relative skin depth, and the data inverted into resistivity-depth is in the continuous 3D chart (Figure 5). Two resistivity-depth slices show the upper part of the resistivity distribution on the property and the lower part, at 250 m ASL and -500 m ASL, respectively (Figure 6). In order to see hard rock geology, the 250 m ASL resistivity slice was taken from the data inversions without considering the highest frequencies which detect on-surface conductive sediments in valleys and terrain depressions.

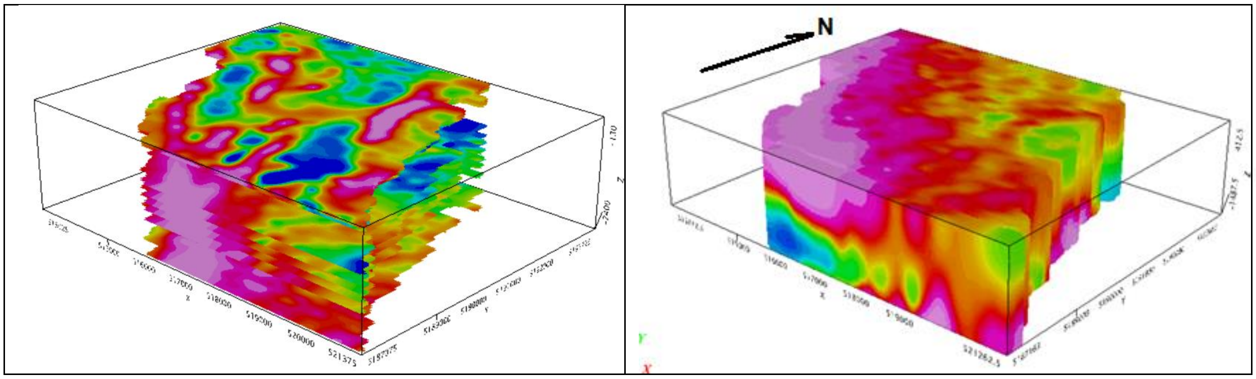


*Figure 5 – MobileMT 3D view of apparent conductivity grids for 12 frequencies distributed by skin depth (left) and resistivity chart (right)*

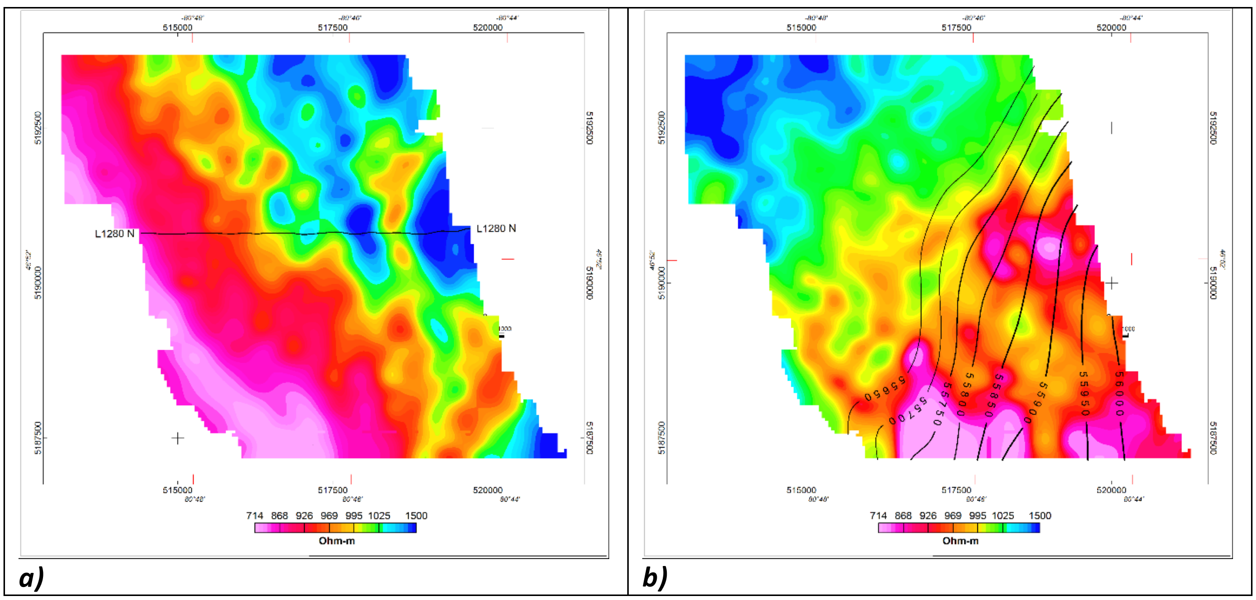


*Figure 6- MobileMT resistivity depth slices for a) 250 m (left) and b) -500 m ASL with the upward continued magnetic field anomaly contours (right)*

The long and most conductive linear Northwest-trending zone along the west boundary of the area, visible on the near-surface 250 m ASL resistivity depth slice, corresponds to the Upper Wanapitei Fault. The conductor is limited in depth and is accompanied by a resistive zone underneath it on the northern part of the property (Figure 6b; Figure 7). Conductive zones on the central and southeast parts of the surveyed area are either extended to depth or buried at depth around 1 km from the surface (Figure 7). The conductive zones are most probably related to the magnetic masses at depth which are illustrated on the combined map (Figure 6b).

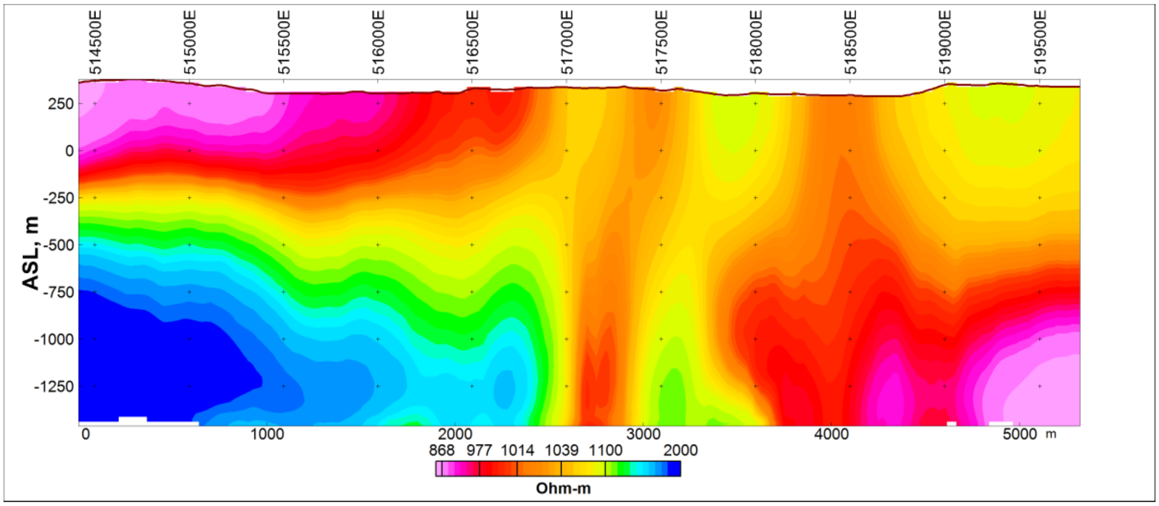


*Figure 7 – MobileMT resistivity section along L1280*

The deep-seated and subvertical downward-conductive zones could be two components of the controlling mineralization system – the source and feeding zones for hydrothermal fluids.

The main interpreted resistivity boundaries and lineaments are presented over a colour grid of anomalies in the magnetic derivative (Figure 8).

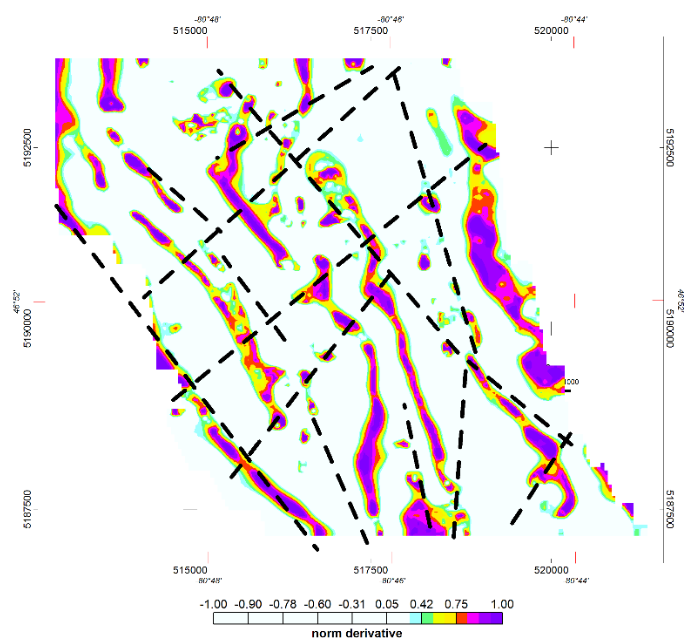


*Figure 8 – main EM structural boundaries and lineaments (black dash lines) over colour grid of generalized magnetic derivative anomalies*

The derived linear electromagnetic features could identify structures unrelated to magnetic sources from the list of mineralization controlling factors. These are the Nipissing and Sudbury diabase dykes which are clearly reflected in the magnetic field, but most likely not detectable by differences in resistivity.

### *Comparison with previous airborne EM*

A part of the property was previously surveyed with an EM time-domain system (Fiset, 2011). There is a known limitation of impulse-source transient EM systems to measure off-time response in resistive terrain (Annan et. al., 1996). Resistivity differentiation of the Canadian Shield rocks and structures is usually outside the capabilities of transient electromagnetic systems due to their low threshold sensitivity. As can be seen in the comparison below along an overlapped line, the time-domain response is detectable only over near-surface sediments in the terrain depressions (Figure 9, top), while MobileMT demonstrates a capability to detect deeper weakly conductive features that are important for mineral exploration in this geological setting.

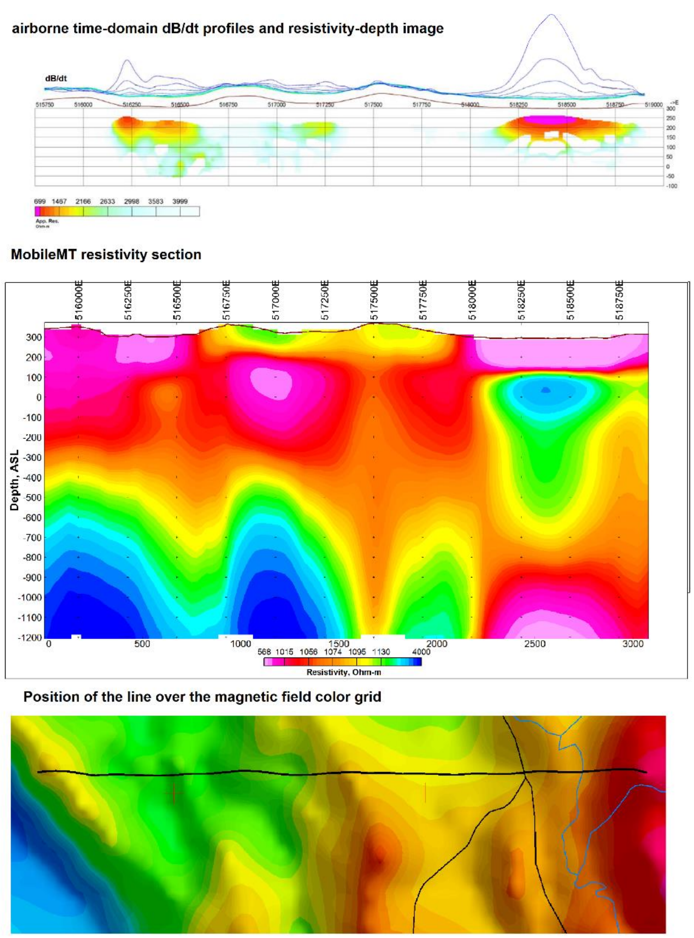


*Figure 9 - A survey line from the Aylmer Property. Airborne time-domain dB/dt profiles and resistivity section (top, from Fiset, 2011), MobileMT resistivity section (center) and the survey line position over the magnetic field colour grid (bottom)*

***Conclusion***

MobileMT has been able to characterize local signatures of a buried, potentially controlling IOCG mineralization system on the Alymer property. These signatures include:

deep-seated conductive zones spatially correlated with a magnetic anomaly which could be created by a granitic or alkaline intrusion – a potential source of fluids and metasomatic alterations involving the introduction of iron;

down-dip extended conductive structures which could reflect feeder zones as faults and shear systems;

resistivity boundaries and lineaments not related to magnetic structures and considered to not be associated with the mineralization and its attributes.

The results of the MobileMT survey in Northern Ontario demonstrate the superior performance of this airborne EM technology in its ability to detect weakly conductive features in resistive terrain.

***References***

Annan A.P., Smith R.S., Lemieux J., O'Connell M.D., Pederson R.N., 1996, Resistive-limit, time-domain AEM apparent conductivity. Geophysics, vol.61, No 1., p.93-99.

Fiset N., 2011, Report on a helicopter-borne Versatile time-domain electromagnetic (VTEM-plus) and horizontal magnetic gradiometer geophysical survey. Geotech Ltd., 65 p.

MacDonald Mines Exploration Ltd., 2019, The Scadding Gold Deposit in the Wanapitei area – an emerging gold camp in the shadow of the SIC

Schandl E.S., and Gorton M.P., 2007, The Scadding gold mine, east of the Sudbury Igneous Complex, Ontario: an IOCG-type deposit? The Canadian Mineralogist, vol. 45, pp. 1415-1441.

Schandl E.S., Gorton M.P., Davis D.W., 1994, Albitization at 1700 + 2 Ma in the Sudbury - Wanapitei Lake area, Ontario: implications for deep-seated alkalic magmatism in the Southern province, Can. J. Earth Sci. 31, p.p.597-607.

Transition Metals Corp., 2020, IOCG – AYLMER properties highlights.