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## MEMORANDUM

**To: Andrew Haythorpe  
Stunalara Metals Pty Ltd**

**From: Stephen Mudge**

**Subject: Comments on existing Thomas Creek, Tasmania, geophysical data.**

**Date : 30 June 2021**

The conclusions and recommendations expressed in this memo are the opinions of the authors based on the data available to them. The opinions and recommendations provided from this information are in response to a request from the client and no liability is accepted for commercial decisions or actions resulting from them.

I have made a brief inspection of various images from a number of existing geophysical datasets from the Sorrell/Thomas Creek area in South West Tasmania and make the following comments, these may assist with future exploration work in the area.

### 1. Airborne magnetics and radiometrics

Various reports make reference to the airborne magnetic and radiometric radiometric data from the 2010 Government regional survey (200 metre line spacing).

It appears from the available images that only the three radiometric channels have been imaged, i.e. K, Th and U. In addition, there is no reference anywhere to channel ratio images having been prepared or used in the geological analysis. That is surprising given the use made of the K image. The raw radiometric channels show radiation intensity which is determined not only by the type of lithologies present, but also by the attenuation caused by soil moisture and soil cover. Given that radiation levels are attenuated approximately equally for all three channels, their ratios, i.e. K/Th, U/Th and U/K, tend to 'cancel' the effect of attenuation and provide higher resolution of lithologies than the raw channels. See Dentith and Mudge (2014), Section 4.5.3, page 210 for further details.

I recommend that consideration be given to reprocessing the radiometric data to produce a range of channel ratio images to assist with surface geological mapping.

### 2. VTEM survey

The VTEM survey conducted in 2010 by Macquarie Harbour Mining Ltd comprises several small survey areas, Area 4 covering the Thomas Creek prospect. The data were analysed by Geoforce Ltd. The data would benefit from reprocessing with TargetTEM to accurately resolve anomalous decays and account for distorting negative IP-effects which are referred to in the interpretation report.

I recommend that consideration be given to reprocessing the 2010 VTEM data to produce a range of section plots and plans resolving anomalous decays to assist targeting of electrical conductors.

### **3. MobileMT survey**

The MobileMT survey conducted in 2019 by Accelerate Resources Ltd was chiefly confined to the Thomas Creek prospect. The data were analysed by Southern Geoscience Consultants based upon conductivity-depth inversions provided by the survey contractor, and with additional 3D modelling by Computational Geoscience Inc. in Utah.

The MobileMT makes use of the natural EM fields sourced from the atmosphere which range in frequency from a low of about 10 Hz to a high frequency of about 20,000 Hz. The low frequencies provide depth of investigation for large features to more than 1000 metres. In addition to the magnetic sensing coils carried by the survey aircraft, the system also measures the electric field at a ground base-station. Combining the electrical and magnetic measures allows the true resistivity of the subsurface to be calculated. Hence, the system is capable of mapping the ground resistivity over a wide range, in contrast to conventional airborne EM systems, such as VTEM, GEOTEM etc, which are only sensitive to higher conductivity targets located at shallower depths. These EM systems cannot map the full range of resistivities, they are really just detectors of higher conductivity regions, but they do this with far greater spatial resolution than the lower frequency MobileTM system.

The results of the survey demonstrate that it has been successful in resolving the whole intrusive complex and large resistivity variations within the complex. In addition, it has resolved several large structures that the intrusive complex appears to be associated with, evident in the 56 Hz to 282 Hz channels, whilst resolution of resistivity zones internal to the complex improves with increasing frequency.

Given the two classes of computer modelling already applied to the MobileMT data and the limited spatial resolution of the system, there is little more that can be done to the data to improve target resolution. Increased resolution of 'good' conductors can only be achieved by resurveying the area with a modern helicopter EM system such as VTEM (having both Z-component and X-component measurements).

### **4. Terrain effects in EM data**

It is worth mentioning that, when working with electrical geophysical data from rugged terrains, that the data should always be analysed with the aid of a digital terrain map. This helps to identify anomalous responses that could be induced by the terrain.

For the case of airborne EM, conductivity anomalies are often related to the hills (the terrain), which appear as conductors surrounded by the non-conductive air, so they respond as such. Need to correlate the EM anomalies in the frequency channels (time channels for VTEM and GEOTEM) closely with the terrain-clearance data from the survey (the survey height-above-terrain channel), and with contours of the terrain (DTM). Caution needs to be applied when interpreting anomalies or groups of anomalies that mimic the creeks or the hills. This is always a big problem in the analysis of EM data.

### **5. Recommendations**

- 1 It is recommended that radiometric data from the 2010 regional airborne survey be reprocessed to produce a range of channel ratio images to assist with surface geological mapping.
- 2 It is recommended that the 2010 VTEM data be reprocessed with TargetTEM to produce a range of section plots and plans resolving anomalous decays to assist targeting of electrical conductors.
- 3 It is recommended that no further processing be applied to the MobileMT data; the existing 3D models and resistivity-depth sections are adequate for the resolution of this type of data.
- 4 In order to obtain higher resolution of conductive zones for drill targeting, it is recommended that a modern helicopter VTEM survey be conducted.

## 6. Reference

Dentith, M. and Mudge, S. T., 2014. *Geophysics for the Mineral Exploration Geoscientist*, Cambridge University Press, ISBN 978-0-521-80951-1.  
For further details and online resources see: [www.cambridge.org/9780521809511](http://www.cambridge.org/9780521809511)

Signed.

Stephen Mudge  
Consulting Geophysicist