Gap GeoPhysics
Exploration Services

Background

Gap Geophysics Australia (GAP) performed a series of test surveys over the Forrestania EM Test Range in Western Australia.

The surveys were designed to provide proof-of-concept for Sub-Audio Magnetics (SAM) as a mineral exploration EM technique that features:

- *Rapid, Cost effective data acquisition*
- *High spatial resolution*
- *Deep search capabilities*
- *Moving / Dynamic platform*

The surveys were undertaken with a Gap GeoPak HPTX-70 transmitter that transmitted 150 amps into the survey loops. High current improves signal-to-noise by generating very large dipole moments.

Geology

The two bedrock conductors defined and successfully drill tested by Image Resources. The drilling intersected barren, semi-massive to massive sulphides (po-rich). The western conductor (IR2) is of limited size (<75x75m), shallow depth <100m, high conductance >7000S and dips northward ~30-40 degrees. This conductor is strongly defined by surface and downhole TEM and makes for an interesting airborne TEM target.

The eastern conductor (IR4) is extensive in strike/ plunge extent (~500-600m+) and reasonably well constrained in depth extent (~100-150m). The conductive source is situated at considerable depth ~300-325m (western side) to ~400m+ (eastern side), is highly conductive ~5000-10000S and dips northward ~30-40 degrees. IR4 is a more challenging conductive target for surface TEM methods with smaller transmitter loops.

The local electrical environment is characterized by the presence of a conductive overburden (~10-20S), highly resistive bedrock units and lack of any other bedrock conductors in the immediate area other than the IR2 and IR4.

Survey Design and Parameters

Two survey loops were designed. L1 and L2 were modelled such that they were well coupled with IR2 and IR4 respectively. SAM survey lines were planned to cover a large portion of the site and were followed up by SAMSON over a subset of the survey area as shown in Figure 1. The parameters of each survey type are defined in Table 1.

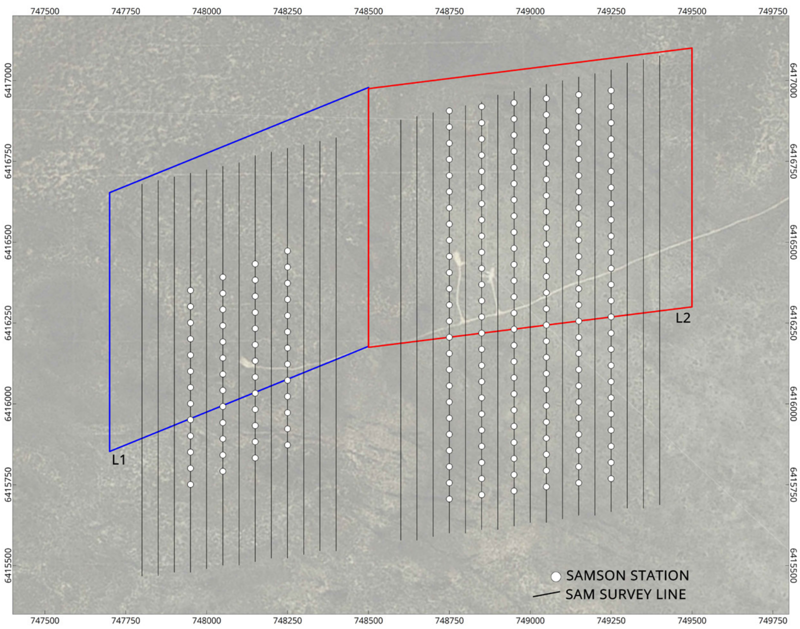


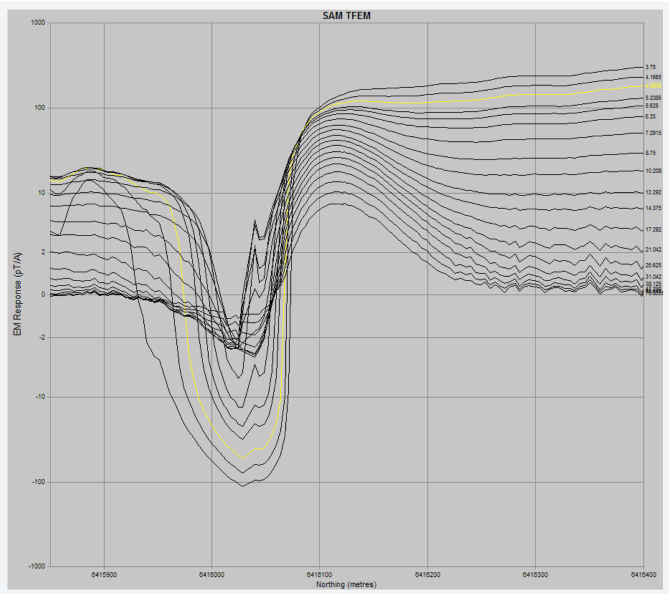
FIG. 1 SURVEY LOOPS

Table 1: *SAM / SAMSON Efficiency Comparison*

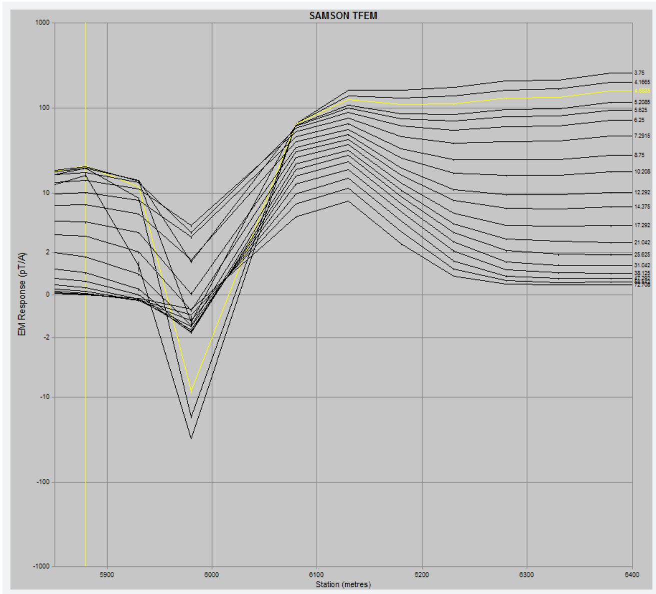
	SAM	SAMSON
Station Spacing	*~5m*	*50m*
Transmitter Frequency	*3.125 Hz*	*0.125 Hz*
Line Spacing	*50m*	*100m*
Acquisition Time	*15 minutes per km (200 stations / km)*	*4 x 20 stacks (5.3 minutes)*
Acquisition Rate	*4 km/h (800 stations / hour)*	*0.4 km/h (8 stations / hour)*

Results

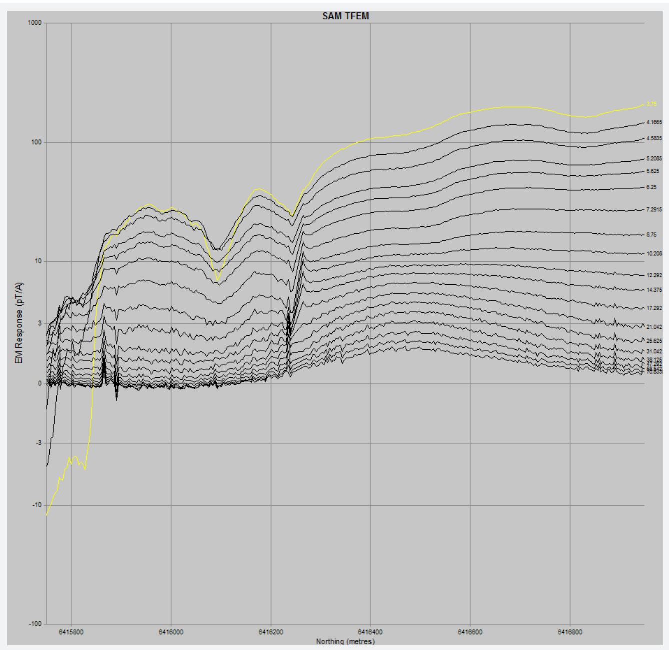
The profiles below show a comparison between the SAM and SAMSON data over the ore bodies. The profiles have been configured to show the same channels over the same portion of the survey line. The SAMSON and SAM surveys detected the IR2 and IR4 bodies.



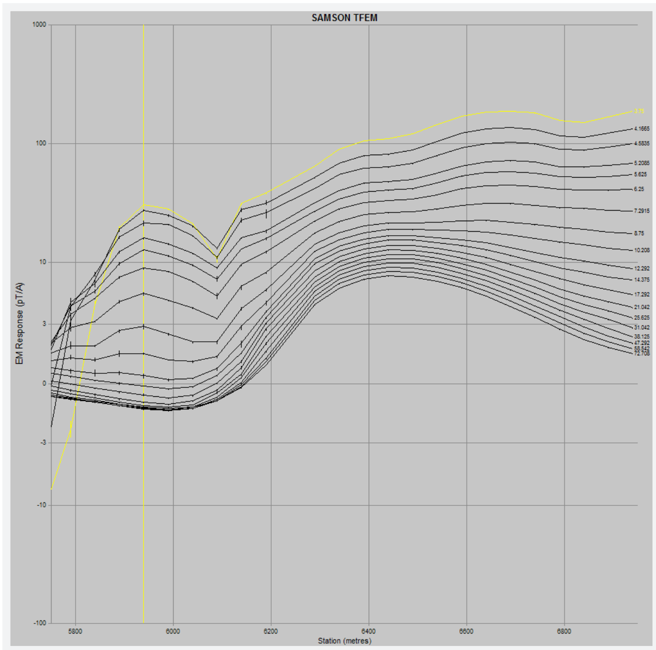
IR2 – SAM TFEM



IR2 – SAMSON



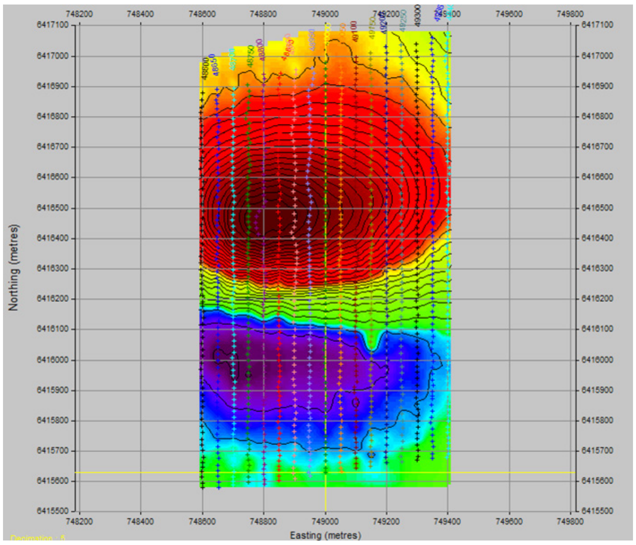
IR4 – SAM TFEM



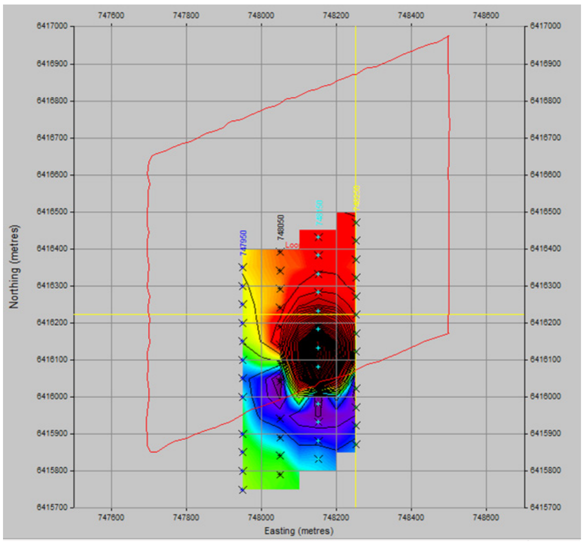
IR4 - SAMSON

The SAM data is noisier but with the increased density and closer line spacing, the anomaly is still clear. The data can also be gridded and observed in plan view.

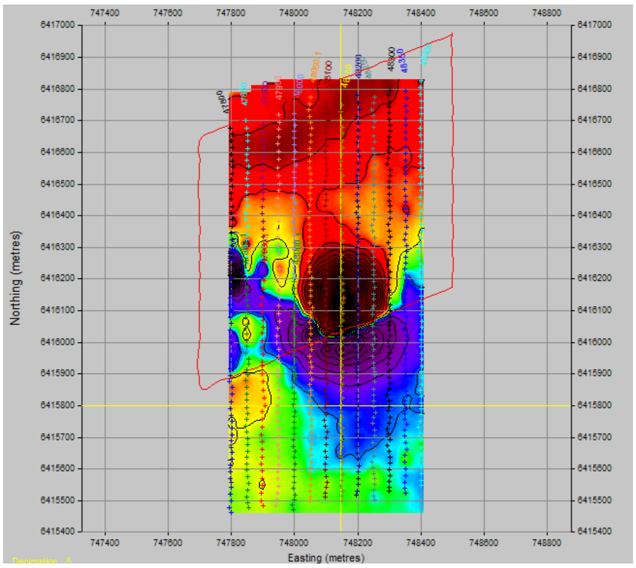
Some decays from the SAMSON survey of IR4 have also been included. The shape of each of the conductors can easily be seen in the SAM and SAMSON datasets.



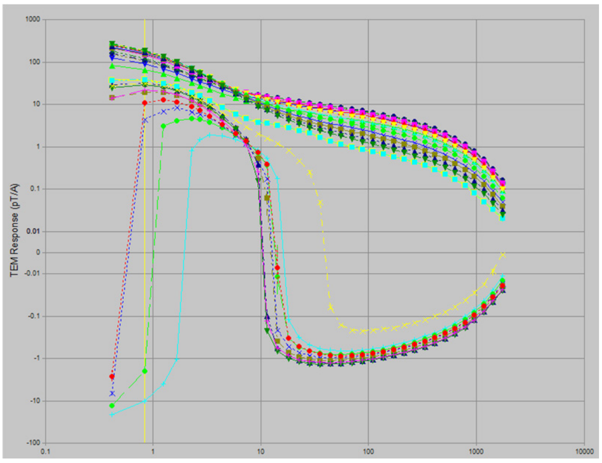
IR2, SAM, Channel 15



IR2, SAMSON, Channel 20



IR4, SAM, Channel 15



SAMSON IR4 decays

Conclusions

EM data can be efficiently acquired from a moving platform using SAM total B-field technologies and high power transmitters. This has significant implications in terms of survey efficiency and cost-effectiveness of deep search EM surveys.

The production rate of SAM is 10 times faster than the SAMSON and provides 100 times the number of stations acquired in the same period. Resolution is vastly improved with stations approximately every 5m vs 50m station spacing for static readings.