Mitre Geophysics Pty Ltd
Mineral Exploration and Engineering Consultants

NICKEL REWARD AREA (Melba Flat, Tas)
MAGNETICS PROCESSING

NICK DIREEN PHD FAIG FSEG FGSL
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SUMMARY

In 2022, Avebury requested a suite of magnetic grids over the Nickel Reward Project Area, located near Melba Flat, near Zeehan, western Tasmania. Mitre completed a search of the currently available magnetics data over the prospect, evaluating the datasets to determine the highest quality datasets for stitching. Four surveys were evaluated, with the final grid stich composing of the Allegiance Melba Flats and the RGC Zeehan surveys acquired in 2000 and 1989 respectively. Filtering of the grids produced vertical, horizontal and tilt derivatives, ZS filter and analytic signal products. The final ERS grids are provided in GDA94/MGA55 ERS with a cell size of 40m.

DISCLAIMER

SURVEY SPECIFICATIONS

Four historical surveys dating from 1985 to 2001 were evaluated for the compilation. Figure 1 displays the spatial distribution of the magnetics surveys over the Melba Flat area.

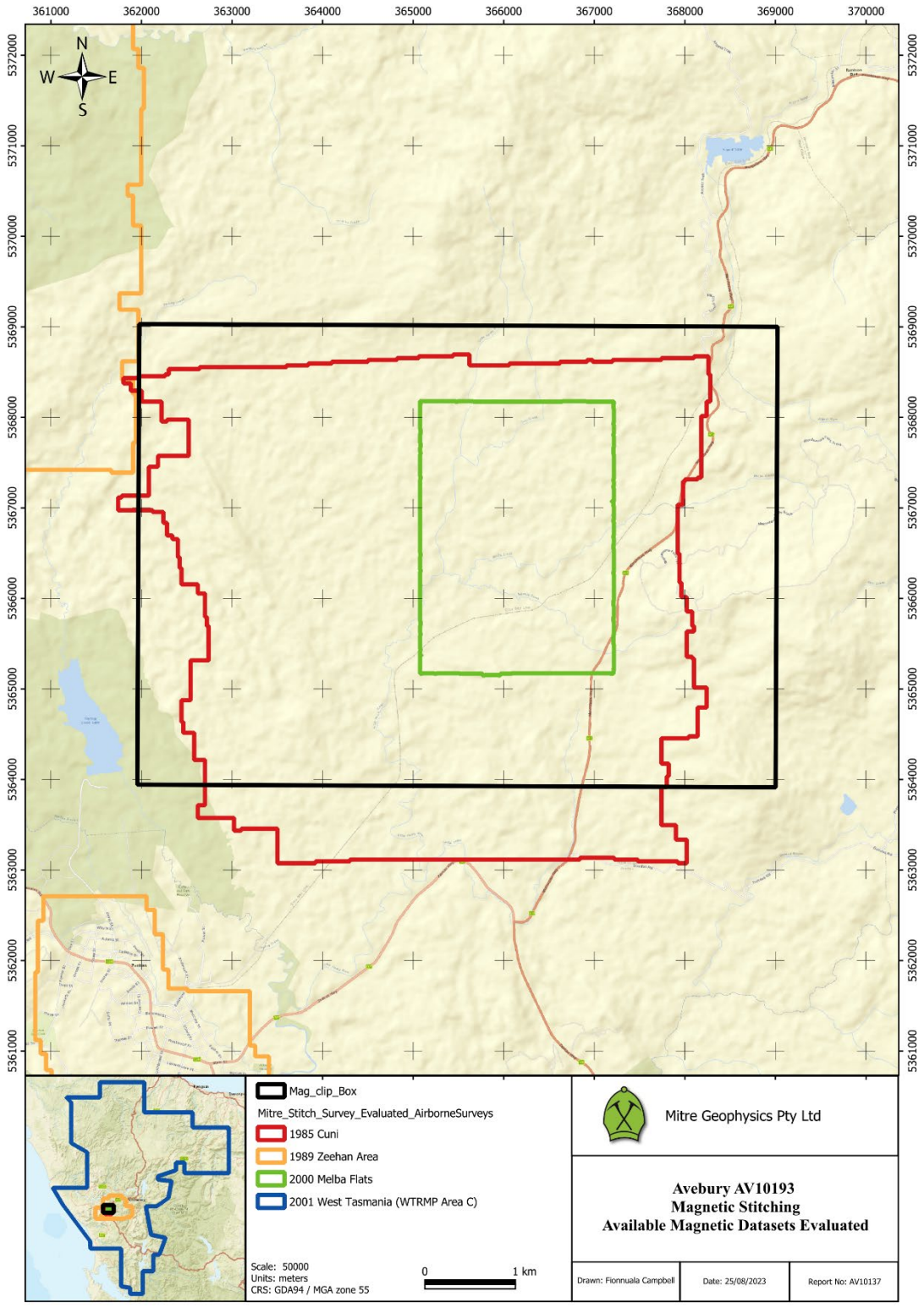

Figure 1: Magnetic coverage available for Melba Flat compilation.

CSR Cuni -Geometrics 1985 (MRT Survey ID 116)

Ellis (1986) described the Cuni aeromagnetic survey, which was acquired in 1985 by contractor Geometrics, using a low flying light fixed wing aircraft with 3 magnetometers fitted to the wingtips and tail stinger (also allowing calculation of the horizontal gradients). Nominal terrain clearance was 70m, but the data on the MRT portal is listed as having been relevelled, with ground clearance of 105m. Flight lines were oriented at 090-270^{o}, and 100m spacings; tie lines were flown 000-180^{o} at 1000m spacing. The data dynamic range was 1664-4709 nT, meaning a main field datum has been removed, and the data is only a residual magnetic intensity (RMI). As no information could be found about the value of the main field that was removed, this data could not be easily / quickly merged with the other datasets in the time/budget permitted, so was excluded from further consideration.

RGC Zeehan-Geoterrex 1989 (MRT Survey ID 191)

Crossing and Halley (1990) document a March 1989 helicopter magnetic survey flown by Geoterrex Pty Ltd for RGC Exploration. It covered approximately 270 square kilometres, with 2100 line km of data on 103 flight lines and 17 tie lines. The survey was flown at a nominal 75m canopy clearance / 110 metres terrain clearance along east-west lines spaced 150 metres apart. Tie lines were flown 000-180^{o} at 1500m spacing. The data on the MRT portal is listed as having been relevelled, with ground clearance of 117m. This data was chosen to extend the Allegiance survey below, as it has the second best line spacing of the 4 surveys evaluated.

Allegiance Melba Flats-GeoInstruments 2000 (MRT Survey ID 621)

A February 2000 helicopter survey at Melba Falts is described by Hungerford (2000). Survey lines were flown 90-270^{0} with spacings of 25 metres. The magnetometer was installed in a boom on the helicopter flown at a nominal height of 30 metres (The actual height varied from 54 to 23 metres). Reporting on the MRT portal suggests an average mean terrain clearance of 33m was achieved. As this data was the most detailed over the area of interest, it was chosen as the base dataset.

MRT- Western Tasmania-GeoInstruments 2001 (MRT Survey ID 225)

GeoInstruments (2001) describes a major helicopter airborne geophysical survey of 44773 line kilometres, 7890 square kilometres in area, which covered most of western Tasmania, including the Melba Flat area (Figure 1). Traverse lines for the project were oriented east-west, at 200 m line spacing. Tie lines were acquired north-south at 2 km spacing. All geophysical sensors were carried in, or on the helicopter, which flew at a nominal 80 metres mean terrain clearance; reporting on the MRT portal suggests an average mean terrain clearance of 76m was actually achieved. The wide line spacing of this survey meant anomaly definition was inferior to the RGC survey in the area of interest, so it was excluded from further consideration.

MAGNETICS PROCESSING WORKFLOW

TMI data was reduced to pole to allow accurate location of the anomalies above their sources (in the absence of remanence) (Baranov and Naudy, 1964).

The RGC and Allegiance Reduced to Pole TMI grids were loaded into Geosoft Oasis Montaj and combined using the Grid Knitting functionality with the suturing method (GRIDSTCH.GX) and detrending to each other, as opposed to a regional grid. The final grid cell size used was 40 m, as a compromise between the 150m spaced RGC data and the 25m spaced Allegiance data. This choice does lose some of the higher frequency information from the Allegiance grid. The data was then clipped to an area of interest box, covering EL's 5/2020, 43/1992, 5/2023, and RL5/2009 (figure 2).

MAGNETICS FILTERING AND IMAGES

The following filters were applied to the merged datasets: first and second vertical derivatives (1VD, 2VD), and a fractional 1.5VD (see Gunn et al. (1997) for discussion of the meaning of this), as well as the ZS family of filters for edge enhancement and lithological classification (Shi and Butt, 2004). The Analytic Signal Amplitude (Li and Pilkington, 2016), Modulus of the Horizontal Gradients (Cordell and Grauch, 1985) and the Tilt filter (Miller and Singh, 1994) were also generated.

Data were supplied via Dropbox, as ERMapper .ers grid files, projected in GDA94 MGA Zone 55 coordinates. The base grid is called Allegiance_RGC_suture_40m_TMI.ers, and the filtered versions are named Allegiance_RGC_suture_40m_TMI_XXX.ers, where XXX is a brief descriptor acronym of the filters applied.

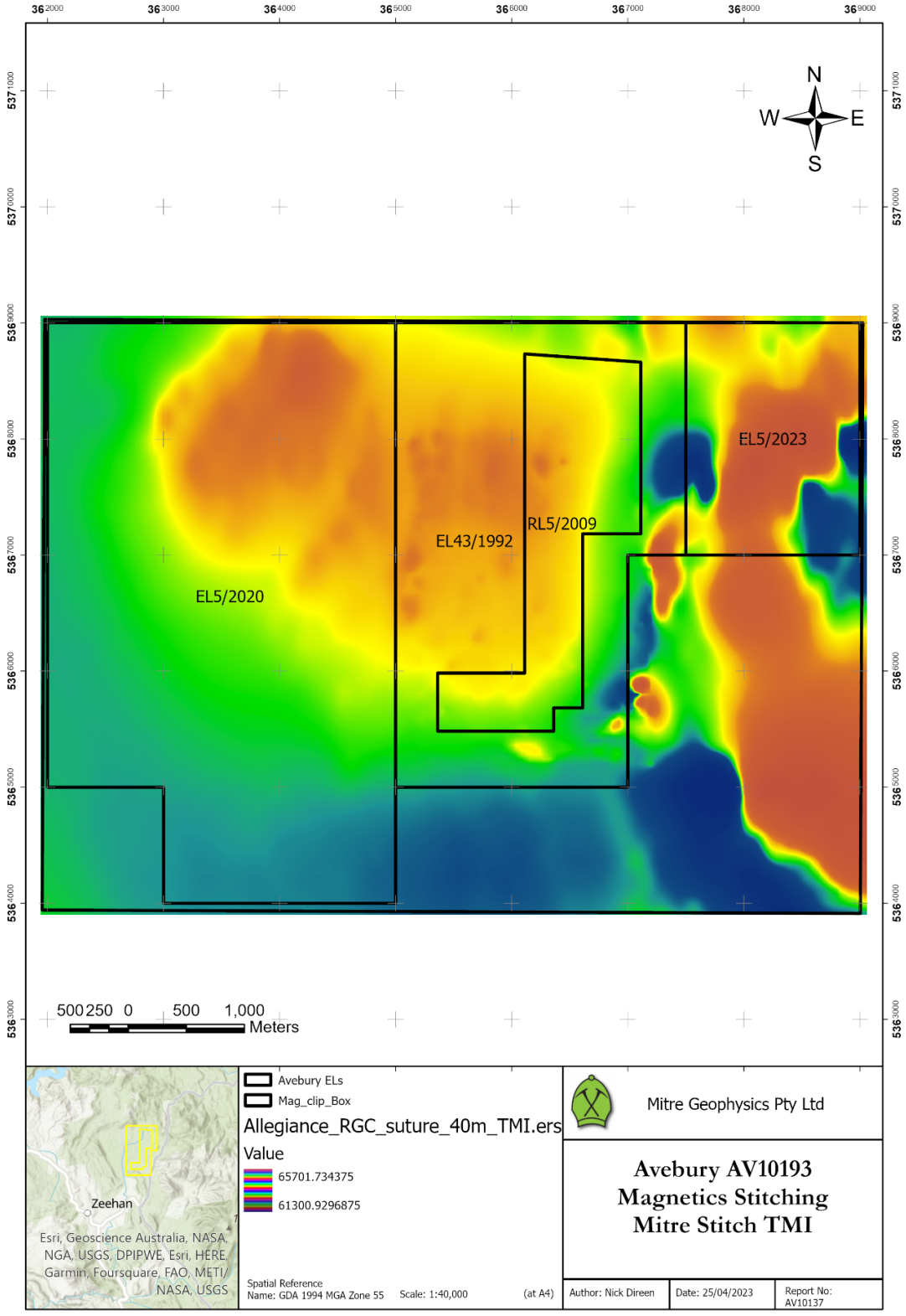

Figure 2: Stitched, clipped TMI grid from this work.

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