AEROSYSTEMS SURVEY SUMMARY REPORT
RED METAL LIMITED
TENNANT CREEK AIRBORNE SURVEY

Project 14048

SURVEY CONTRACTOR

AEROSYSTEMS PTY. LTD
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MURRAY BRIDGE S.A. 5253
Tel: (08) 8531 0349
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CONTRACTOR CONTACT

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Mob: 0418 800 122
Email: david.daish@daishsat.com

Survey Specifications:

Date of Survey:	25/10/2014 – 28/10/2014
Survey Type:	Aeromagnetics/Radiometrics
Survey Height:	30m
Line Spacing:	50m
Line Direction:	0/180
Tie Line Spacing:	500m
Total Line Kilometres:	1,010 km
Area Surveyed:	Red 1 – Red 6
Datum:	Geocentric Datum of Australia (GDA94)

Equipment:

Aircraft Type:	R44 Helicopter (VH-DTZ).
Magnetometer:	Boom (stinger) mounted in a Robinson R44 helicopter - Geometrics Cs vapour magnetometer assembly, G823B with precision counter. - Billingsley TFM100G2 vector magnetometer.
Base Magnetometer:	2 x Geometrics portable proton precession base magnetometers (SN 278172 & SN 278171).
Spectrometer:	Model RSX-4 16L integrated gamma detector & spectrometer.
Radar Altimeter:	Model PT200 allied signal (Bendix-King) KRA-405B radar altimeter and accessories.
Climatic Observations:	Vaisala barometric and temperature/humidity module. (SN D3250014)
Onboard Computers:	ZDAS Acquisition and navigational control module.

Aerosystems Daily Field Production Summary

Job Number	14048	Client	Red Metal Ltd		
Location	Tennant Creek	Start Date	25/10/2014	End Date	28/10/2014

Date	Job Number	Location	Supervisor	Staff	Survey Production	Cumulative Production	Ln km Remaining	Estimated Days To Finish	% Standby	% Mob/Demob
25-October-2014	14048	Mobilisation	AM	PO,PM	0	0	1010	0.8	0	100
26-October-2014	14048	Tennant Creek	AM	PO,PM	375	375	635	0.5	0	50
27-October-2014	14048	Tennant Creek	AM	PO,PM	635	1010	0	0.0	0	0
28-October-2014	14048	Mobilisation	AM	PO,PM	0	1010	0	0.0	0	100

Processing and QC by Baigent Geosciences

- Report Attached.

BAIGENT GEOSCIENCES

Red Metals Limited
Geophysical Survey
Processing Report

October 2014

Project: Red 1,2,3,4,5,6

Table of Contents

1.   Datum Specification

The output survey coordinates are based on the Geocentric Datum of Australia 1994 (GDA94), zone 53.

It has the following parameters:

Projection name:	Map Grid of Australia
Datum:	Geocentric Datum of Australia (GDA94)
Reference Frame:	ITRF92 (International Terrestrial Reference 1992)
Epoch:	1994.0
Ellipsoid:	GRS80
Semi-major axis:	6.378.137.0 metres
Inverse flattening:	298,257222101
False Northing:	10,000,000 m N
False Easting:	500,000 m E
Scale Factor:	0.9996

2.   Parallax

Parallax corrections were applied as follows:

1. -1 fiducials for magnetics data.

2. 0.5 fiducials for radiometric data.

3. -4 fiducials for dtm

3. Magnetic processing

3.1 Processing Flow

The diurnal base station data was checked for spikes and steps, and suitably filtered prior to the removal of diurnal variations from the aircraft magnetic data.

The diurnal data was filtered with a second difference filter to identify and remove spikes of less than 0.05nT. A second smoothing filter, a 13 point moving average filter is used to reduce noise levels.

The filtered diurnal are then applied to the survey data by synchronising the diurnal data time with the aircraft survey time. The average diurnal base station value was added to the survey data.

An eighth difference filter was run on the raw magnetic survey data in order to identify any remaining spikes in the data, which were manually edited from the data.

The X and Y positioning of the data was then checked for spikes before applying the IGRF correction. Any spikes in the positions were manually edited.

The IGRF 2010 (updated to 2014.8) correction was calculated at each data point taking into account the height above sea level using a constant altitude. This regional magnetic gradient was subtracted from the survey data points.

The data was then tie-line levelled and micro-levelled.

3.2 Compensation

The data was delivered already compensated and filtered.

3.3 Diurnal Base Value

The average diurnal base value was   50,414.65 nT

3.4 Magnetic Model

IGRF was removed using a constant height 350 metres above sea level.
The magnetic model for the centre of each area is detailed below:

Model	IGRF 2010 updated to 2014.80
Declination	4.5677 degrees
Inclination	-50.3619 degrees
Field strength	50594.18 nT
Grid zone	53
Grid central meridian	135.00000 degrees
Input latitude	-19.88639 degrees
Input longitude	134.75750 degrees
Grid convergence	-0.08249 degrees
Grid magnetic angle	4.48523 degrees
Secular variation	-0.04071 degrees

3.5 Tie Line levelling Method

Tie line levelling was applied to the data by least squares minimisation, using a polynomial fit of order 0, of the differences in elevation values at the crossover points of the survey traverse and tie line data.

The least squares tie line levelling process employs a two pass Gauss-Seidel iterative scheme. The essential steps in this process are:

In the first pass the tie lines were first adjusted to minimise, in the least squares sense, the crossover values with the traverse line values being held constant.

The second pass held the levelled tied line values constant, and minimised in the least squares sense, the crossover values with traverses.

The DC correction values are then applied to the traverse line and tie line data.

To reduce the effects of radar altimeter and gps errors on the recorded elevation data at the crossover points, data having a radar altimeter difference greater than 100 metres in a radius of 100 metres on the traverse or tie lines were excluded from the tying process.

3.6 Micro-levelling Method

Micro-levelling techniques were then selectively applied to the tie line levelled data to remove minor residual variations in profile intensity Selective micro-levelling was applied in order to leave unaffected any data having no residual levelling artefacts. Selective micro-levelling proceeds using the following steps:

Areas of interest that required micro-levelling were identified through the use of image processing visualisation.

Polygons were used to define areas requiring micro-levelling.

"Pseudo-ties" were constructed from the gridded data by extracting traverses from the grid normal to the flight direction.

Line dependent artefacts were removed from the pseudo lines using custom filters.

Crossover values were calculated between traverse lines and pseudo tie lines.

The traverse lines were adjusted in the pre-defined sections to minimise the crossover values.

This process was repeated in order to remove various wavelength line dependent artefacts from the pseudo-ties. The object of each micro-levelling iteration was to produce a smooth control surface to which the traverse lines are levelled. This control surface was provided through the use of "pseudo-ties".

3.7 Interpolation Method

The interpolation used is a minimum curvature algorithm. The algorithm is based on the worked published by Briggs 1974, Briggs I. C.: Machine contouring using minimum curvature. *Geophysics*. Vol. 39, No. 1. February 1974. pp. 39-48.

A tension factor of 0 was used to interpolate the magnetics

The mesh size for data interpolation was 10 x 10 metres

4.   Radiometric Processing

4.1   Processing Flow

The processing steps radiometric data were as follows:

1.   Application of necessary parallax corrections to data

2.   Check radar altimeter data for spikes

3.   NASVD spectral smoothing
- Examine the output to determine the number of components required.
- Select 8 components for spectral reconstruction.

4.   Standard 256 channel radiometric corrections:
- Dead-time correction performed on 256 channel data.
- Check if energy recalibration required
- Remove background radon from window data using Minty's method (1996)
- Perform STP height corrected spectral stripping
- Perform STP height correction of window data to average survey height (30 m).

5.   Micro-levelling

Spectral smoothing was applied using the NASVD process, and spectral reconstruction was employed using 8 spectral components.

Micro-levelling was applied in the method as described below.

4.2   Window Energy Limits

The energy bounds for the windows were

Window Name	Energy Range (Mev)
Potassium	1.374 – 1.566
Thorium	2.416 – 2.799
Uranium	1.662 – 1.854
Total Count	0.414 – 2.799

4.3 Spectral Stripping Ratios

The stripping ratios used in the processing were:

Alpha	0.277
Beta	0.408
Gamma	0.776
a	0.045
b	0.001
g	0.000

4.4 Tie Line Levelling

No tie line levelling was applied.

4.5 Micro-levelling Method

Micro-levelling techniques were then selectively applied to the tie line levelled data to remove minor residual variations in profile intensity Selective micro-levelling was applied in order to leave unaffected any data having no residual levelling artefacts. Selective micro-levelling proceeds using the following steps:

Areas of interest that required micro-levelling were identified through the use of image processing visualisation.

Polygons were used to define areas requiring micro-levelling.

"Pseudo-ties" were constructed from the gridded data by extracting traverses from the grid normal to the flight direction.

Line dependent artefacts were removed from the pseudo lines using custom filters.

Crossover values were calculated between traverse lines and pseudo tie lines.

The traverse lines were adjusted in the pre-defined sections to minimise the crossover values.

This process was repeated in order to remove various wavelength line dependent artefacts from the pseudo-ties. The object of each micro-levelling iteration was to produce a smooth control surface to which the traverse lines are levelled. This control surface was provided through the use of "pseudo-ties".

4.6 Interpolation Method

The interpolation used is a minimum curvature algorithm. The algorithm is based on the worked published by Briggs 1974, Briggs I. C.: Machine contouring using minimum curvature. *Geophysics*. Vol. 39, No. 1. February 1974. pp. 39-48.

A tension factor of 0 was used to interpolate the radiometrics.

The mesh size for data interpolation was 10 x 10 metres.

5. Elevation Processing

5.1 Processing Flow

The processing steps for digital elevation data were as follows:

1. Application of necessary parallax corrections to data
2. Calculation of raw digital elevation data by subtracting the radar altimeter from the gps altitude
3. Tie line levelling
4. Micro-levelling

5.2 Tie Line levelling Method

Tie line levelling was applied to the data by least squares minimisation, using a polynomial fit of order 0, of the differences in elevation values at the crossover points of the survey traverse and tie line data.

The least squares tie line levelling process employs a two pass Gauss-Seidel iterative scheme. The essential steps in this process are:

In the first pass the tie lines were first adjusted to minimise, in the least squares sense, the crossover values with the traverse line values being held constant.

The second pass held the levelled tied line values constant, and minimised in the least squares sense, the crossover values with traverses.

The DC correction values to be applied to the traverse lines and tie lines were then applied to the magnetic data.

To reduce the effects of radar altimeter and gps errors on the recorded elevation data at the crossover points, data having a radar altimeter difference greater than 10 metres in a radius of 100 metres on the traverse or tie lines were excluded from the tying process.

5.3 Micro-levelling Method

Micro-levelling techniques were then selectively applied to the tie line levelled data to remove minor residual variations in profile intensity Selective micro-levelling was applied in order to leave unaffected any data having no residual levelling artefacts. Selective micro-levelling proceeds using the following steps:

Areas of interest that required micro-levelling were identified through the use of image processing visualisation.

Polygons were used to define areas requiring micro-levelling.

"Pseudo-ties" were constructed from the gridded data by extracting traverses from the grid normal to the flight direction.

Line dependent artefacts were removed from the pseudo lines using custom filters.

Crossover values were calculated between traverse lines and pseudo tie lines.

The traverse lines were adjusted in the pre-defined sections to minimise the crossover values.

This process was repeated in order to remove various wavelength line dependent artefacts from the pseudo-ties. The object of each micro-levelling iteration was to produce a smooth control surface to which the traverse lines are levelled. This control surface was provided through the use of "pseudo-ties".

5.4 Adjust to AHD

N values were removed in real time in the GPS receiver.

5.5 Interpolation Method

The interpolation used is a minimum curvature algorithm. The algorithm is based on the worked published by Briggs 1974, Briggs I. C.: Machine contouring using minimum curvature. *Geophysics*. Vol. 39, No. 1. February 1974. pp. 39-48.

A tension factor of 0 was used to interpolate the dtm.

The mesh size for data interpolation was 10 x 10 metres.

6.   Deliverable Items

The deliverable items included all digital data. The located data conformed to ASEG-GDF format and the gridded data was suppled in ERMapper format. The description of the located data is below:

There was six area's supplied:

Red 1,2,3,4,5,6

Located data supplied in ASEG GDF

File name	Definition
*_magdtm	Raw magnetics & elevation data
* _rad256	Raw 256 channel data
* _rads	Final Radiometric Window Data

Gridded data supplied in ER Mapper format

File name	Definition	Units
* _TMI	Final magnetic gridded data	nT
*_ELEV	Final elevation gridded data	m
* _TOT	Final radiometric dose rate gridded data	CPS
* _POT	Final radiometric potassium gridded data	CPS
* _TH	Final radiometric uranium gridded data	CPS
* _URA	Final radiometric thorium gridded data	CPS

* Denotes the area name as described above

6.1 Final Magnetic Located Data file

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```
COMM
COMM  Baigent Geosciences Pty. Ltd.
COMM  -----------------------------
COMM
COMM  LOCATED DATA
COMM  ------------
COMM Area  :  Red 1,2,3,4,5,6
COMM Company Flown by:   Daishsat Pty. Ltd.
COMM Company Flown for:  Red Metal Limited
COMM Company Processed:  Baigent Geosciences Pty. Ltd.
COMM
COMM AIRBORNE SURVEY EQUIPMENT:
COMM -------------------------
COMM
COMM Aircraft                       : Robinson R44
COMM Magnetometer                   : Geometrics G822 Caesium Vapour
COMM Magnetometer Resolution        : 0.01 nT
COMM Magnetometer Compensation      : Post Flight
COMM Magnetometer Sample Interval   : 20 Hz, Approx 2.1 metres
COMM Data Acquisition               : GeoOZ Model 2009
COMM Spectrometer                   : Radiation Solutions RS 500
COMM Crystal Size                   : 16 lt downward array
COMM Spectrometer Sample Interval   : 1.0 Seconds (approx 42 metres)
COMM GPS Navigation System          : Novatel 951R GPS Receiver
COMM
COMM
COMM
COMM AIRBORNE SURVEY SPECIFICATIONS
COMM
COMM Flight Line Direction      :    000 - 180  degrees
COMM Flight Line Separation     :         50  metres
COMM Tie Line Direction         :    090 - 270  degrees
COMM Tie Line Separation        :        500  metres
COMM Terrain Clearance          :      30 metres (MTC)
COMM
COMM
COMM Survey flown               :      October 2014
COMM
COMM
COMM Flight path calculated from GPS Data using a Novatel 951R GPS Receiver.
COMM
COMM
COMM Grid notation refers to GDA/MGA Zone  53
COMM
COMM
COMM MAGNETIC DATA CORRECTIONS:
COMM -------------------------
COMM Diurnal variations removed
COMM IGRF(2010) updated to 2014.8 removed
COMM Average survey base station value added to datum
COMM
COMM RADIOMETRIC CORRECTIONS AND COEFFICIENTS:
COMM ----------------------------------------
COMM Spectral data reconstructed using NASVD
COMM Data has been corrected for aircraft and cosmic backgrounds.
COMM Height corrected to a constant datum of 30 metres,
```

```
COMM minimum height of 5 and a maximum of 300 metres.
COMM Data has also been corrected for radon using the method described by Minty
COMM and corrected for channel interaction.
COMM
COMM                     Tot.Count    Potassium    Uranium      Thorium
COMM Arcft Bkg             26.6         10.37          0            0
COMM Cosmic Bkg            0.986        0.0514       0.041       0.0549
COMM Height Attn           0.007434     0.009432     0.008428    0.007510
COMM
COMM
COMM STRIPPING RATIOS:
COMM ----------------
COMM   Alpha = 0.269,   Beta = 0.404, Gamma = 0.758,
COMM   a = 0.056,  b = 0.004,  g = -0.001
COMM
COMM                    Channel name         Format     Units        Null Value
COMM_____
COMM
COMM                       Job code            A5
COMM                    Line number            A9
COMM                         Flight            I5
COMM                    Flight date            A9      YYYYMMDD
COMM                       fiducial          f12.1                 -999999.000000
COMM                       mga_east          f11.2     METRES       -99999.000000
COMM                      mga_north          f11.2     METRES       -99999.000000
COMM                       gda_long          f12.6     degrees        -999.000000
COMM                        gda_lat          f11.6     degrees         -99.000000
COMM                        rad_alt           f8.2     METRES         -999.000000
COMM                     gps_height           f8.2     METRES         -999.000000
COMM                        raw_mag          f10.3          nT       -9999.000000
COMM                       mag_gammas        f10.3          nT       -9999.000000
COMM                   diurnal_gammas         f10.3          nT       -9999.000000
COMM                      igrf_gammas        f10.3          nT       -9999.000000
COMM                         fin_mag         f10.3          nT       -9999.000000
COMM                            dtm           f8.2     METRES          -99.000000
COMM


DEFN    ST=RECD,RT=COMM;RT:A4;COMMENTS:A80
DEFN  1 ST=RECD,RT=;BGSJOB:I5:NULL=999:NAME=BGS Job Code
DEFN  2 ST=RECD,RT=;LINE:A9:NULL=999999:NAME=line
DEFN  3 ST=RECD,RT=;FLIGHT:F5.0:NULL=999:NAME=flight
DEFN  4 ST=RECD,RT=;DATE:A9:NULL=999999:UNIT=YYYYMMDD
DEFN  5 ST=RECD,RT=;FIDUCIAL:f12.1:NULL=-999999.000000:NAME=FIDUCIAL
DEFN  6 ST=RECD,RT=;MGAEAST:f11.2:UNIT=METRES:NULL=-99999.000000:NAME=MGA_EAST
DEFN  7 ST=RECD,RT=;MGANORTH:f11.2:UNIT=METRES:NULL=-99999.000000:NAME=MGA_NORTH
DEFN  8 ST=RECD,RT=;GDA94LNG:f12.6:UNIT=degrees:NULL=-999.000000:NAME=GDA94LNG
DEFN  9 ST=RECD,RT=;GDA94LAT:f11.6:UNIT=degrees:NULL=-99.000000:NAME=GDA94LAT
DEFN 10 ST=RECD,RT=;RAD_ALT:f8.2:UNIT=METRES:NULL=-999.000000:NAME=RAD_ALT
DEFN 11 ST=RECD,RT=;GPS_HT:f8.2:UNIT=METRES:NULL=-999.000000:NAME=GPS_ALT
DEFN 12 ST=RECD,RT=;MAGUNCMP:f10.3:UNIT=nT:NULL=-9999.000000:NAME=MAGUNCMP
DEFN 13 ST=RECD,RT=;MAGCOMP:f10.3:UNIT=nT:NULL=-9999.000000:NAME=MAGCOMP
DEFN 14 ST=RECD,RT=;DIURNAL:f10.3:UNIT=nT:NULL=-9999.000000:NAME=DIURNAL
DEFN 15 ST=RECD,RT=;IGRF:f10.3:UNIT=nT:NULL=-9999.000000:NAME=IGRF
DEFN 16 ST=RECD,RT=;FINMAG:f10.3:UNIT=nT:NULL=-9999.000000:NAME=FINMAG
DEFN 17 ST=RECD,RT=;DEM:f8.2:UNIT=METRES:NULL=-99.000000:NAME=DTM
;END DEFN
```

6.2 Final Radiometric Located Data file

```
                   .
COMM
COMM  Baigent Geosciences Pty. Ltd.
COMM  ----------------------------
COMM
COMM  LOCATED DATA
COMM  ------------
COMM Area  :  Red 1,2,3,4,5,6
COMM Company Flown by:   Daishsat Pty. Ltd.
COMM Company Flown for:  Red Metal Limited
COMM Company Processed:  Baigent Geosciences Pty. Ltd.
COMM
COMM AIRBORNE SURVEY EQUIPMENT:
COMM -------------------------
COMM
COMM Aircraft                       : Robinson R44
COMM Magnetometer                   : Geometrics G822 Caesium Vapour
COMM Magnetometer Resolution        : 0.01 nT
COMM Magnetometer Compensation      : Post Flight
COMM Magnetometer Sample Interval   : 20 Hz, Approx 2.1 metres
COMM Data Acquisition               : GeoOZ Model 2009
COMM Spectrometer                   : Radiation Solutions RS 500
COMM Crystal Size                   : 16 lt downward array
COMM Spectrometer Sample Interval   : 1.0 Seconds (approx 42 metres)
COMM GPS Navigation System          : Novatel 951R GPS Receiver
COMM
COMM
COMM
COMM AIRBORNE SURVEY SPECIFICATIONS
COMM
COMM Flight Line Direction     :    000 - 180  degrees
COMM Flight Line Separation    :         50  metres
COMM Tie Line Direction        :    090 - 270  degrees
COMM Tie Line Separation       :        500  metres
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COMM Survey flown               :      October 2014
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COMM Flight path calculated from GPS Data using a Novatel 951R GPS Receiver.
COMM
COMM
COMM Grid notation refers to GDA/MGA Zone  53
COMM
COMM
COMM MAGNETIC DATA CORRECTIONS:
COMM -------------------------
COMM Diurnal variations removed
COMM IGRF(2010) updated to 2014.8 removed
COMM Average survey base station value added to datum
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COMM RADIOMETRIC CORRECTIONS AND COEFFICIENTS:
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COMM Spectral data reconstructed using NASVD
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COMM                 Tot.Count    Potassium   Uranium    Thorium
COMM Arcft Bkg          26.6        10.37         0          0
COMM Cosmic Bkg        0.986       0.0514      0.041      0.0549
COMM Height Attn      0.007434    0.009432    0.008428   0.007510
COMM
COMM
COMM STRIPPING RATIOS:
COMM ----------------
COMM   Alpha = 0.269,  Beta = 0.404, Gamma = 0.758,
COMM   a = 0.056,  b = 0.004,  g = -0.001
COMM
COMM                 Channel name        Format    Units      Null Value
COMM_____
COMM
COMM                     Job code          A5
COMM                  Line number          A9
COMM                       Flight          I5
COMM                  Flight date          A9     YYYYMMDD
COMM                     fiducial        f12.1              -999999.000000
COMM                     mga_east        f11.2    METRES      -99999.000000
COMM                    mga_north        f11.2    METRES      -99999.000000
COMM                      gda_lat        f12.7    degrees        -99.000000
COMM                     gda_long        f13.7    degrees       -999.000000
COMM                      rad_alt         f8.2    METRES        -999.000000
COMM                   gps_height         f8.2    METRES        -999.000000
COMM                baro_pressure         f8.2       hPa        -999.000000
COMM                temp_air_deg_c         f5.1      DEGC          -9.000000
COMM                    live_time         f6.0      MSEC          -9.000000
COMM                  raw_tot_cps         f8.0       CPS         -99.000000
COMM                  raw_pot_cps         f7.0       CPS         -99.000000
COMM                  raw_ura_cps         f7.0       CPS         -99.000000
COMM                  cosmicd_cps         f5.0       CPS        -999.000000
COMM                  fin_tot_cps         f8.1       CPS         -99.000000
COMM                  fin_pot_cps         f7.1       CPS         -99.000000
COMM                  fin_ura_cps         f7.1       CPS         -99.000000
COMM                   fin_th_cps         f7.1       CPS         -99.000000
COMM


DEFN    ST=RECD,RT=COMM;RT:A4;COMMENTS:A80
DEFN  1 ST=RECD,RT=;BGSJOB:I5:NULL=999:NAME=BGS Job Code
DEFN  2 ST=RECD,RT=;LINE:A9:NULL=999999:NAME=line
DEFN  3 ST=RECD,RT=;FLIGHT:F5.0:NULL=999:NAME=flight
DEFN  4 ST=RECD,RT=;DATE:A9:NULL=999999:UNIT=YYYYMMDD
DEFN  5 ST=RECD,RT=;FIDUCIAL:f12.1:NULL=-999999.000000:NAME=FIDUCIAL
DEFN  6 ST=RECD,RT=;MGAEAST:f11.2:UNIT=METRES:NULL=-99999.000000:NAME=MGA_EAST
DEFN  7 ST=RECD,RT=;MGANORTH:f11.2:UNIT=METRES:NULL=-99999.000000:NAME=MGA_NORTH
DEFN  8 ST=RECD,RT=;GDA94LAT:f12.7:UNIT=degrees:NULL=-99.000000:NAME=GDA94LAT
DEFN  9 ST=RECD,RT=;GDA94LON:f13.7:UNIT=degrees:NULL=-999.000000:NAME=GDA94LON
DEFN 10 ST=RECD,RT=;RAD_ALT:f8.2:UNIT=METRES:NULL=-999.000000:NAME=RAD_ALT
DEFN 11 ST=RECD,RT=;GPS_HT:f8.2:UNIT=METRES:NULL=-999.000000:NAME=GPS_ALT
DEFN 12 ST=RECD,RT=;BAROPRES:f8.2:UNIT=hPa:NULL=-999.000000:NAME=PRESSURE
DEFN 13 ST=RECD,RT=;TEMP:f5.1:UNIT=DEGC:NULL=-9.000000:NAME=TEMP_DEG
DEFN 14 ST=RECD,RT=;LIVETIME:f6.0:UNIT=MSEC:NULL=-9.000000:NAME=LIVETIME
DEFN 15 ST=RECD,RT=;RAW_TOT:f8.0:UNIT=CPS:NULL=-99.000000:NAME=RAW_TC
```

```
DEFN 16 ST=RECD,RT=;RAW_POT:f7.0:UNIT=CPS:NULL=-99.000000:NAME=RAW_POT
DEFN 17 ST=RECD,RT=;RAW_URA:f7.0:UNIT=CPS:NULL=-99.000000:NAME=RAW_URA
DEFN 18 ST=RECD,RT=;COSMIC:f5.0:UNIT=CPS:NULL=-999.000000:NAME=COSMIC
DEFN 19 ST=RECD,RT=;FIN_TOT:f8.1:UNIT=CPS:NULL=-99.000000:NAME=FIN_TC
DEFN 20 ST=RECD,RT=;FIN_POT:f7.1:UNIT=CPS:NULL=-99.000000:NAME=FIN_POT
DEFN 21 ST=RECD,RT=;FIN_URA:f7.1:UNIT=CPS:NULL=-99.000000:NAME=FIN_URA
DEFN 22 ST=RECD,RT=;FIN_TH:f7.1:UNIT=CPS:NULL=-99.000000:NAME=FIN_TH
;END DEFN
```

6.3   Final 256 Radiometric Data

```
COMM
COMM  Baigent Geosciences Pty. Ltd.
COMM  ----------------------------
COMM
COMM  LOCATED DATA
COMM  ------------
COMM Area  :  Red 1,2,3,4,5,6
COMM Company Flown by:  Daishsat Pty. Ltd.
COMM Company Flown for: Red Metal Limited
COMM Company Processed: Baigent Geosciences Pty. Ltd.
COMM
COMM AIRBORNE SURVEY EQUIPMENT:
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COMM
COMM Aircraft                       : Robinson R44
COMM Magnetometer                   : Geometrics G822 Caesium Vapour
COMM Magnetometer Resolution        : 0.01 nT
COMM Magnetometer Compensation      : Post Flight
COMM Magnetometer Sample Interval   : 20 Hz, Approx 2.1 metres
COMM Data Acquisition               : GeoOZ Model 2009
COMM Spectrometer                   : Radiation Solutions RS 500
COMM Crystal Size                   : 16 lt downward array
COMM Spectrometer Sample Interval   : 1.0 Seconds (approx 42 metres)
COMM GPS Navigation System          : Novatel 951R GPS Receiver
COMM
COMM
COMM
COMM AIRBORNE SURVEY SPECIFICATIONS
COMM
COMM Flight Line Direction      :    000 - 180  degrees
COMM Flight Line Separation     :         50  metres
COMM Tie Line Direction         :    090 - 270  degrees
COMM Tie Line Separation        :        500  metres
COMM Terrain Clearance          :     30 metres (MTC)
COMM
COMM
COMM Survey flown               :      October 2014
COMM
COMM
COMM Flight path calculated from GPS Data using a Novatel 951R GPS Receiver.
COMM
COMM
COMM Grid notation refers to GDA/MGA Zone  53
COMM
COMM
COMM MAGNETIC DATA CORRECTIONS:
COMM ------------------------
```

```
COMM Diurnal variations removed
COMM IGRF(2010) updated to 2014.8 removed
COMM Average survey base station value added to datum
COMM
COMM RADIOMETRIC CORRECTIONS AND COEFFICIENTS:
COMM -----------------------------------------
COMM Spectral data reconstructed using NASVD
COMM Data has been corrected for aircraft and cosmic backgrounds.
COMM Height corrected to a constant datum of 30 metres,
COMM minimum height of 5 and a maximum of 300 metres.
COMM Data has also been corrected for radon using the method described by Minty
COMM and corrected for channel interaction.
COMM
COMM                       Tot.Count     Potassium    Uranium     Thorium
COMM Arcft Bkg               26.6          10.37         0           0
COMM Cosmic Bkg              0.986         0.0514       0.041       0.0549
COMM Height Attn             0.007434      0.009432     0.008428    0.007510
COMM
COMM
COMM STRIPPING RATIOS:
COMM ----------------
COMM   Alpha = 0.269,  Beta = 0.404, Gamma = 0.758,
COMM   a = 0.056,  b = 0.004,  g = -0.001
COMM
COMM                      Channel name          Format      Units       Null Value
COMM_____
COMM
COMM                         Job code             A5
COMM                      Line number             A9
COMM                           Flight             I5
COMM                      Flight date             A9      YYYYMMDD
COMM                          fiducial          f12.1                 -999999.000000
COMM                          mga_east          f11.2     METRES       -99999.000000
COMM                         mga_north          f11.2     METRES       -99999.000000
COMM                           gda_lat          f12.6     degrees        -999.000000
COMM                          gda_long          f11.6     degrees         -99.000000
COMM                           rad_alt           f8.2     METRES         -999.000000
COMM                        gps_height           f8.2     METRES         -999.000000
COMM                     baro_pressure           f8.2     hPa            -999.000000
COMM                     temp_air_deg_c           f5.1    DEGC             -9.000000
COMM                         live_time           f6.0     MSEC             -9.000000
COMM        raw 256 channel spectra            256i5      CPS              -9
COMM


DEFN    ST=RECD,RT=COMM;RT:A4;COMMENTS:A80
DEFN  1 ST=RECD,RT=;BGSJOB:I5:NULL=999:NAME=BGS Job Code
DEFN  2 ST=RECD,RT=;LINE:A9:NULL=999999:NAME=line
DEFN  3 ST=RECD,RT=;FLIGHT:F5.0:NULL=999:NAME=flight
DEFN  4 ST=RECD,RT=;DATE:A9:NULL=999999:UNIT=YYYYMMDD
DEFN  5 ST=RECD,RT=;FIDUCIAL:f12.1:NULL=-999999.000000:NAME=FIDUCIAL
DEFN  6 ST=RECD,RT=;MGAEAST:f11.2:UNIT=METRES:NULL=-99999.000000:NAME=MGA_EAST
DEFN  7 ST=RECD,RT=;MGANORTH:f11.2:UNIT=METRES:NULL=-99999.000000:NAME=MGA_NORTH
DEFN  8 ST=RECD,RT=;GDA94LAT:f11.6:UNIT=degrees:NULL=-99.000000:NAME=GDA94LAT
DEFN  9 ST=RECD,RT=;GDA94LNG:f12.6:UNIT=degrees:NULL=-999.000000:NAME=GDA94LNG
DEFN 10 ST=RECD,RT=;RAD_ALT:f8.2:UNIT=METRES:NULL=-999.000000:NAME=RAD_ALT
DEFN 11 ST=RECD,RT=;GPS_HT:f8.2:UNIT=METRES:NULL=-999.000000:NAME=GPS_ALT
DEFN 12 ST=RECD,RT=;BAROPRES:f8.2:UNIT=hPa:NULL=-999.000000:NAME=PRESSURE
DEFN 13 ST=RECD,RT=;TEMP:f5.1:UNIT=DEGC:NULL=-9.000000:NAME=TEMP_DEG
DEFN 14 ST=RECD,RT=;LIVETIME:f6.0:UNIT=MSEC:NULL=-9.000000:NAME=LIVETIME
```

```
DEFN 15 ST=RECD,RT=;SPEC256:256I5:UNIT=CPS:NULL=-9:NAME=Raw 256 channel
spectrometer
;END DEFN
```

7.   Magnetic Data Processing Flow Chart

```
                                          ┌─────────────────────┐
                                          │  Import Raw Aircraft │
                                          │        Data          │
                                          └──────────┬──────────┘
                                                     │
                                                     ▼
                                          ┌─────────────────────┐
                                          │  Check, despike and  │
                                          │     noise checks     │
        ┌─────────────────────┐          └──────────┬──────────┘
        │  Import Raw Diurnal  │                     │
        │                      │                     ▼
        └──────────┬──────────┘          ┌─────────────────────┐
                   │                      │   Flight Path Plots  │
                   ▼                      │                      │
        ┌─────────────────────┐          └──────────┬──────────┘
        │  Despike and Filter  │                     │
        │                      │                     ▼
        └──────────┬──────────┘          ┌─────────────────────┐
                   │    Apply filtered    │  Diurnally corrected │
                   └────── diurnal ──────▶│        data          │
                                          └──────────┬──────────┘
                                                     │
                                                     ▼
                                          ┌─────────────────────┐
                                          │     Remove IGRF      │
                                          └──────────┬──────────┘
                                                     │
                                                     ▼
                                          ┌─────────────────────┐
                                          │    Tie Line Level    │
                                          └──────────┬──────────┘
                                                     │
                                                     ▼
                                          ┌─────────────────────┐
                                          │     Interpolate      │
                                          └──────────┬──────────┘
                                                     │
                  No                                 ▼
        ┌───────────────────────────────▶┌─────────────────────┐
        │                                 │     Micro Level      │
        │                                 │     (Selective)      │
        │                                 └──────────┬──────────┘
        │         ◇                                  │
        │        ╱ ╲      Image                      ▼
        │       ╱   ╲    Finished     ┌─────────────────────┐
        └──────◀     ◀────  ?    ◀────│     Interpolate      │
                ╲   ╱                  └─────────────────────┘
                 ╲ ╱
                  ◇
                  │ Yes
                  ▼
        ┌─────────────────────┐       ┌─────────────────────┐
        │        Final         │       │    Production of    │
        │    Located Data      │──────▶│   Images and maps   │
        │    Grided Data       │       │                     │
        └─────────────────────┘       └─────────────────────┘
```
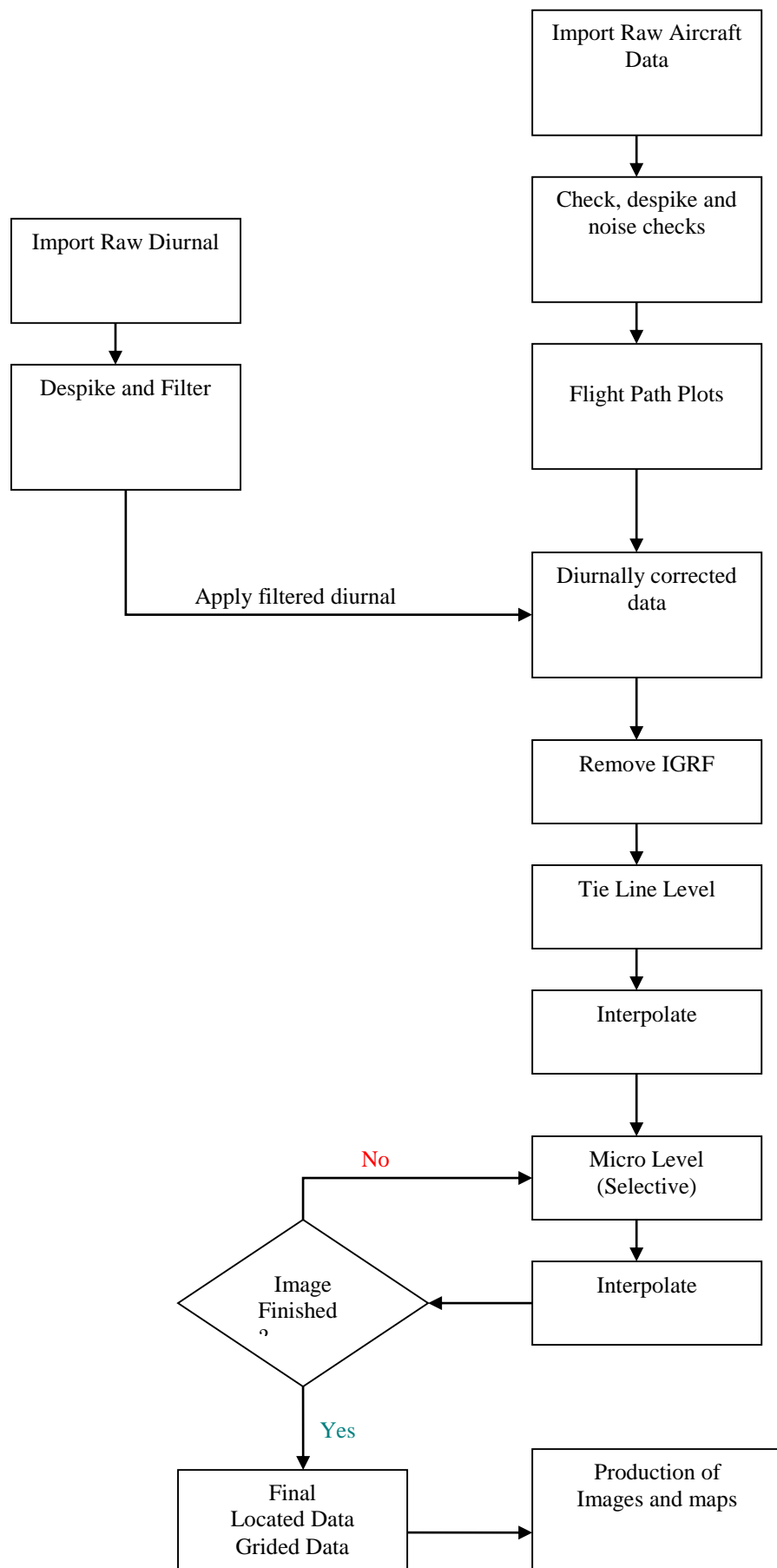
8. Elevation Data Processing Flow Chart


```
                                    ┌─────────────────┐
                                    │ Import Raw Aircraft
                                    │      Data       │
                                    └────────┬────────┘
                                             │
                                    ┌────────▼────────┐
                                    │ Check, despike and
                                    │   noise checks  │
                                    └────────┬────────┘
                                             │
                                    ┌────────▼────────┐
                                    │ Flight Path Plots │
                                    └────────┬────────┘
                                             │
                                    ┌────────▼────────┐
                                    │ Create dtm channel
                                    │   GPS - radalt  │
                                    └────────┬────────┘
                                             │
                                    ┌────────▼────────┐
                                    │  Tie Line Level │
                                    └────────┬────────┘
                                             │
                                    ┌────────▼────────┐
                                    │   Interpolate   │
                                    └────────┬────────┘
                                             │
              No ─────────────────►┌────────▼────────┐
                                   │   Micro Level   │
                                   │   (Selective)   │
                                   └────────┬────────┘
                                             │
                 ◆ Image            ┌────────▼────────┐
                   Finished ◄───────│   Interpolate   │
                   ?                └─────────────────┘
                   │
                 Yes
                   │
          ┌────────▼────────┐      ┌─────────────────┐
          │      Final      │─────►│  Production of  │
          │  Located Data   │      │ Images and maps │
          │   Grided Data   │      └─────────────────┘
          └─────────────────┘
```
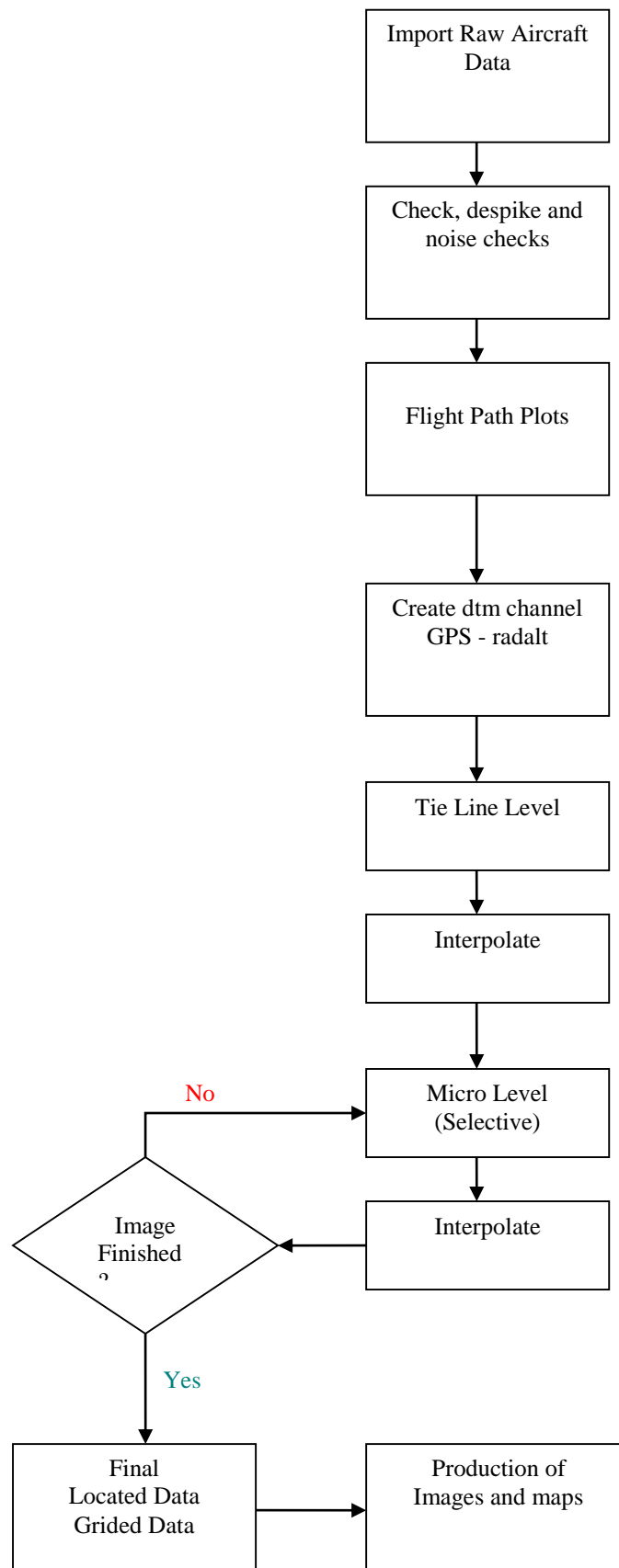
9.   Radiometric Processing Flow Chart
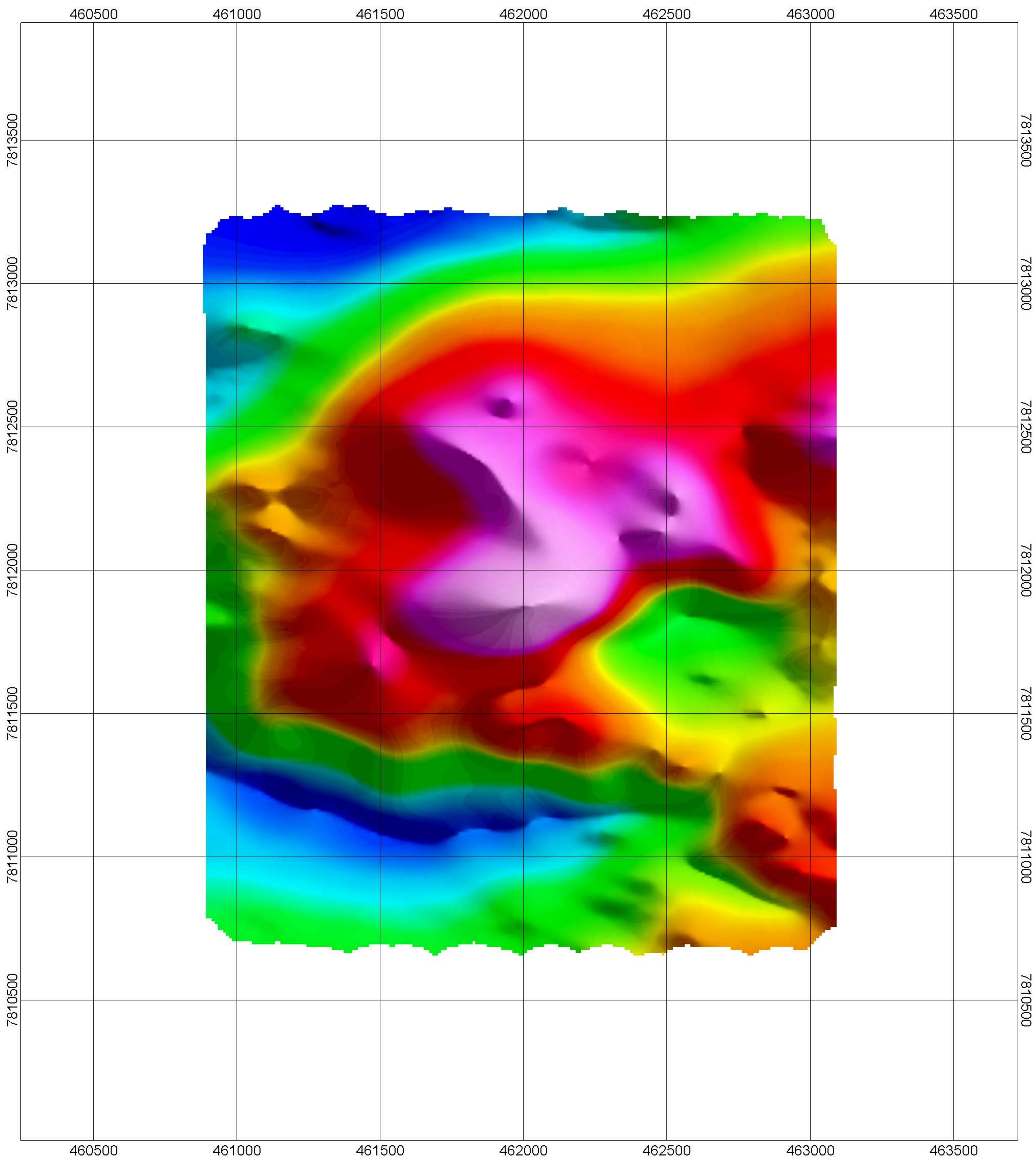
```
                          ┌─────────────────────┐
                          │  Import Raw Aircraft │
                          │        Data          │
                          └──────────┬──────────┘
                                     │
                                     ▼
                          ┌─────────────────────┐
                          │  Check, despike and  │
                          │    noise checks      │
                          └──────────┬──────────┘
                                     │
                                     ▼
                          ┌─────────────────────┐
                          │   Flight Path Plots  │
                          └──────────┬──────────┘
                                     │
                                     ▼
                          ┌─────────────────────┐
                          │  Spectral Smoothing  │
                          │        NASVD         │
                          └──────────┬──────────┘
                                     │
                                     ▼
                          ┌─────────────────────┐
                          │     Radiometric      │
                          │     Corrections      │
                          └──────────┬──────────┘
                                     │
                                     ▼
                          ┌─────────────────────┐
                          │     Interpolate      │
                          └──────────┬──────────┘
                                     │
                                     ▼
          No                ┌─────────────────────┐
       ────────────────────▶│     Micro Level      │
      │                     │     (Selective)      │
      │                     └──────────┬──────────┘
      │                                │
      │                                ▼
  ┌────────┐                ┌─────────────────────┐
  │ Image  │◀───────────────│     Interpolate      │
  │Finished│                └─────────────────────┘
  │   ?    │
  └───┬────┘
      │ Yes
      ▼
┌─────────────┐            ┌─────────────────────┐
│   Final     │            │    Production of     │
│Located Data │───────────▶│   Images and maps    │
│ Grided Data │            └─────────────────────┘
└─────────────┘
```

Appendix A -   Images

Magnetic Intensity
(nT)
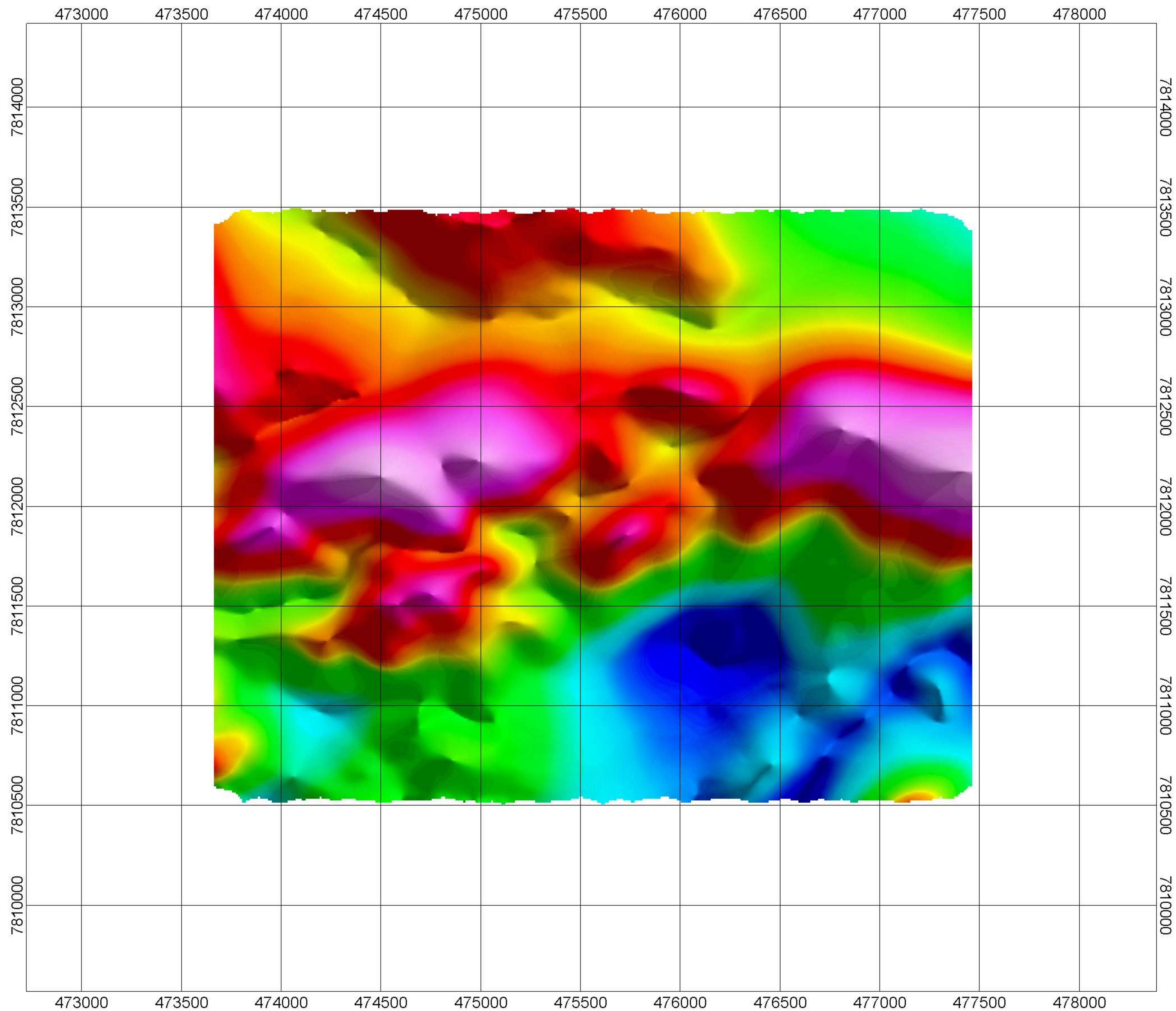
196 224 236 245 255 266 275 281 288 295 305 314 327 346 369 399

Scale 1:14000

250   0   250

(meters)

GDA94 / MGA zone 53

14048 RED METALS LTD

Tennant Creek Airborne Survey
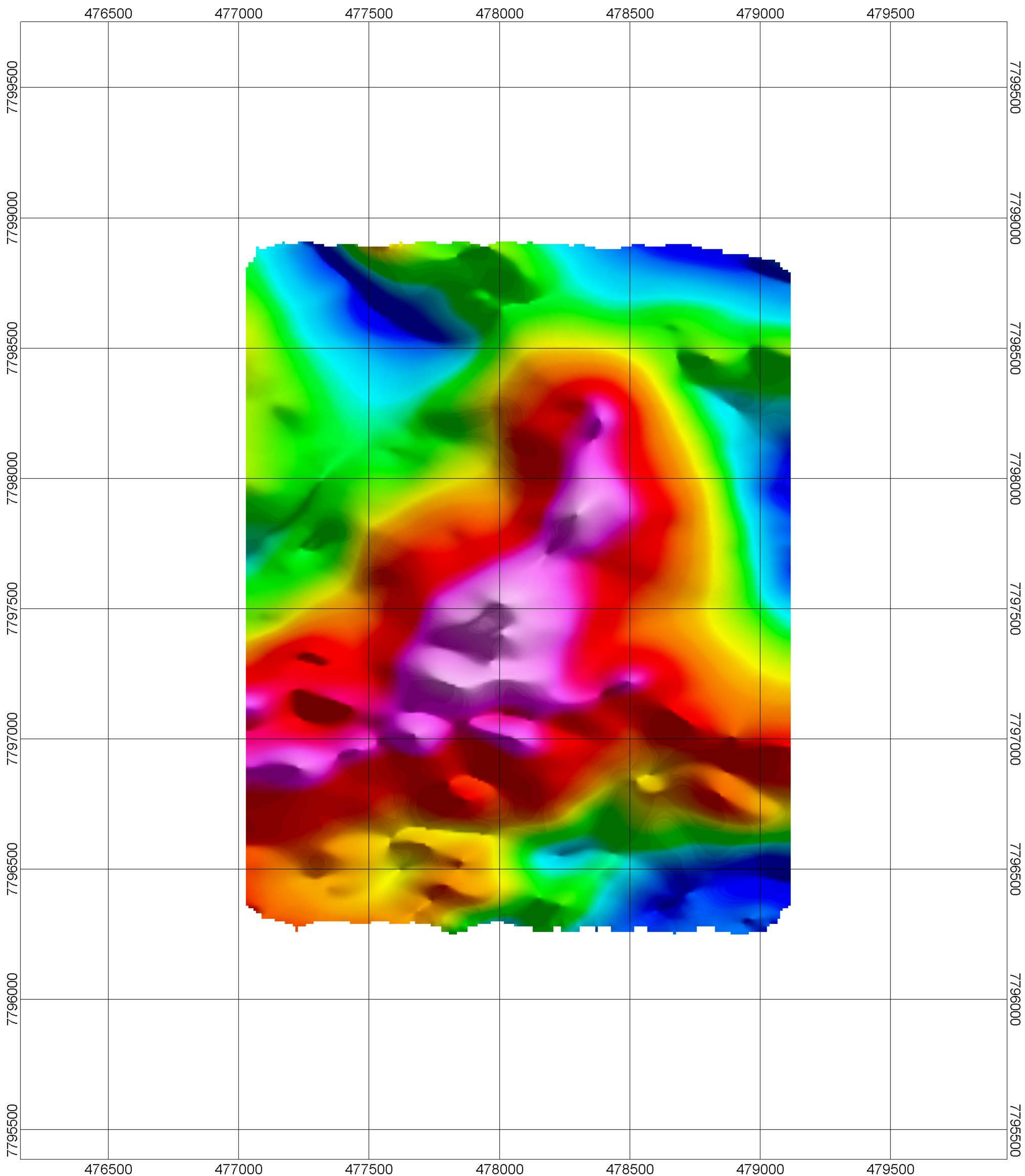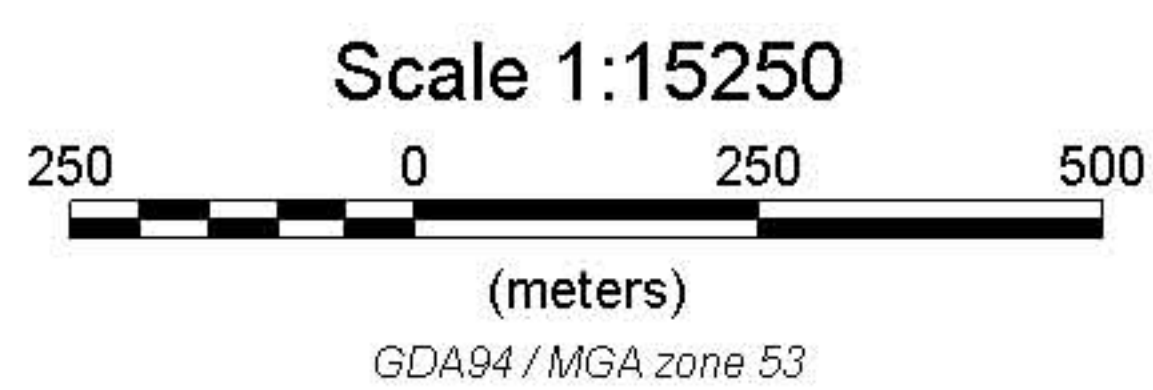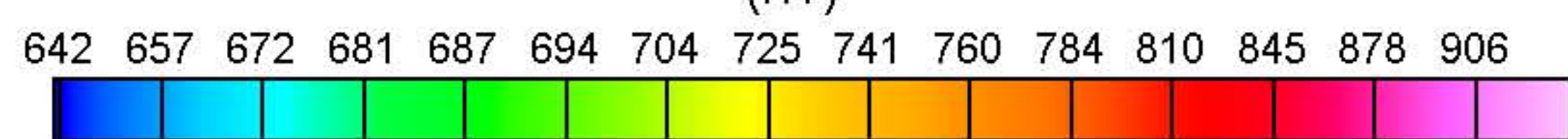**Survey Area: Red 1**
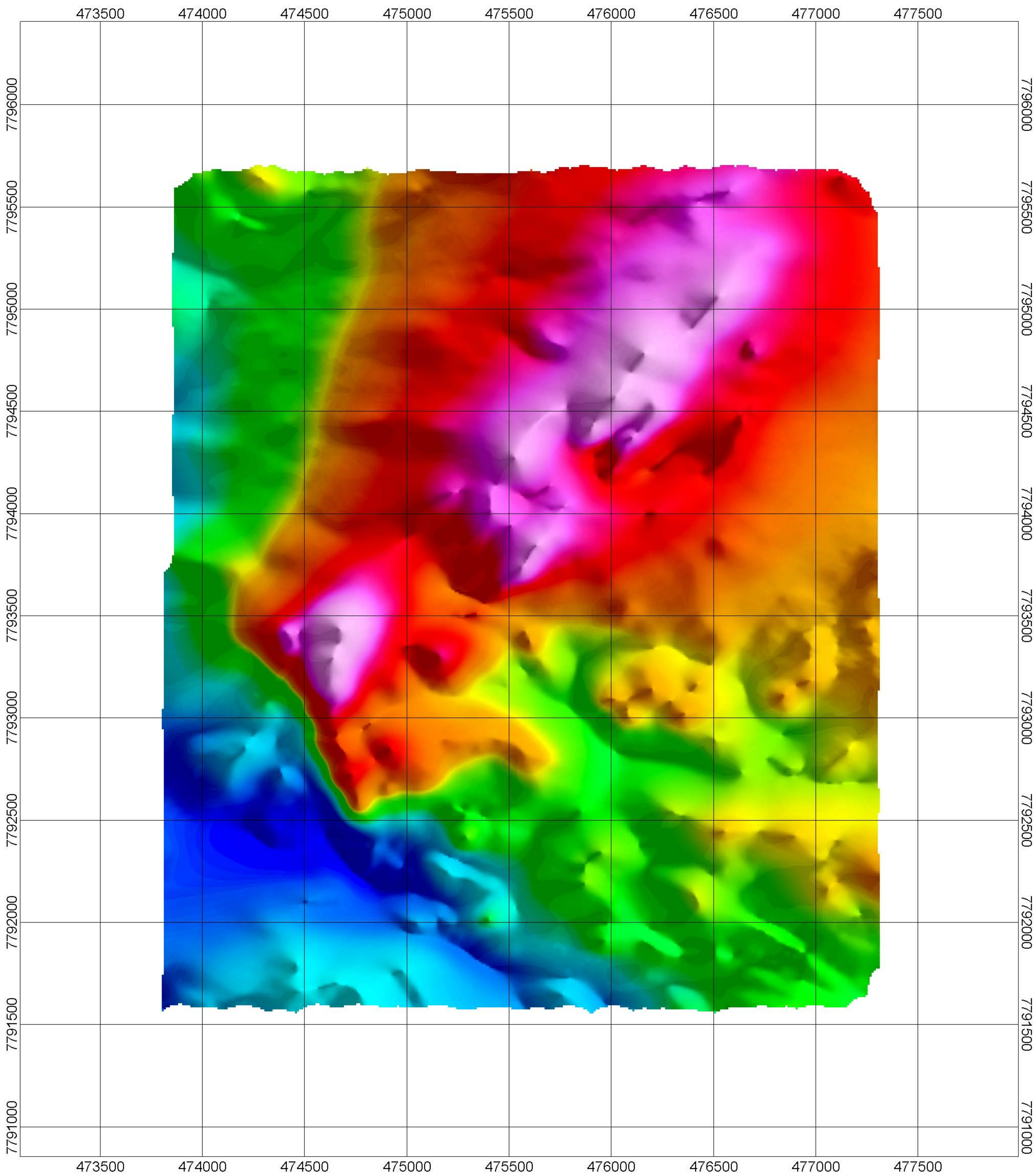**Total Magnetic Intensity**
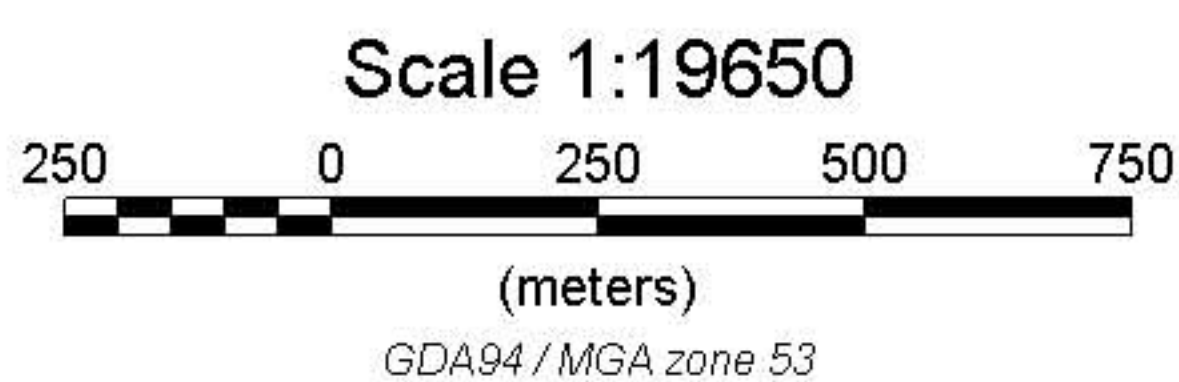
Survey By: Aerosystems

Magnetic Intensity
(nT)

405 424 444 473 495 515 537 552 564 574 586 597 609 628 680

Scale 1:22200

250 0 250 500 750 1000 1250

(meters)

GDA94 / MGA zone 53

14048 RED METALS LTD

Tennant Creek Airborne Survey
Survey Area: Red 2
Total Magnetic Intensity

Survey By: Aerosystems

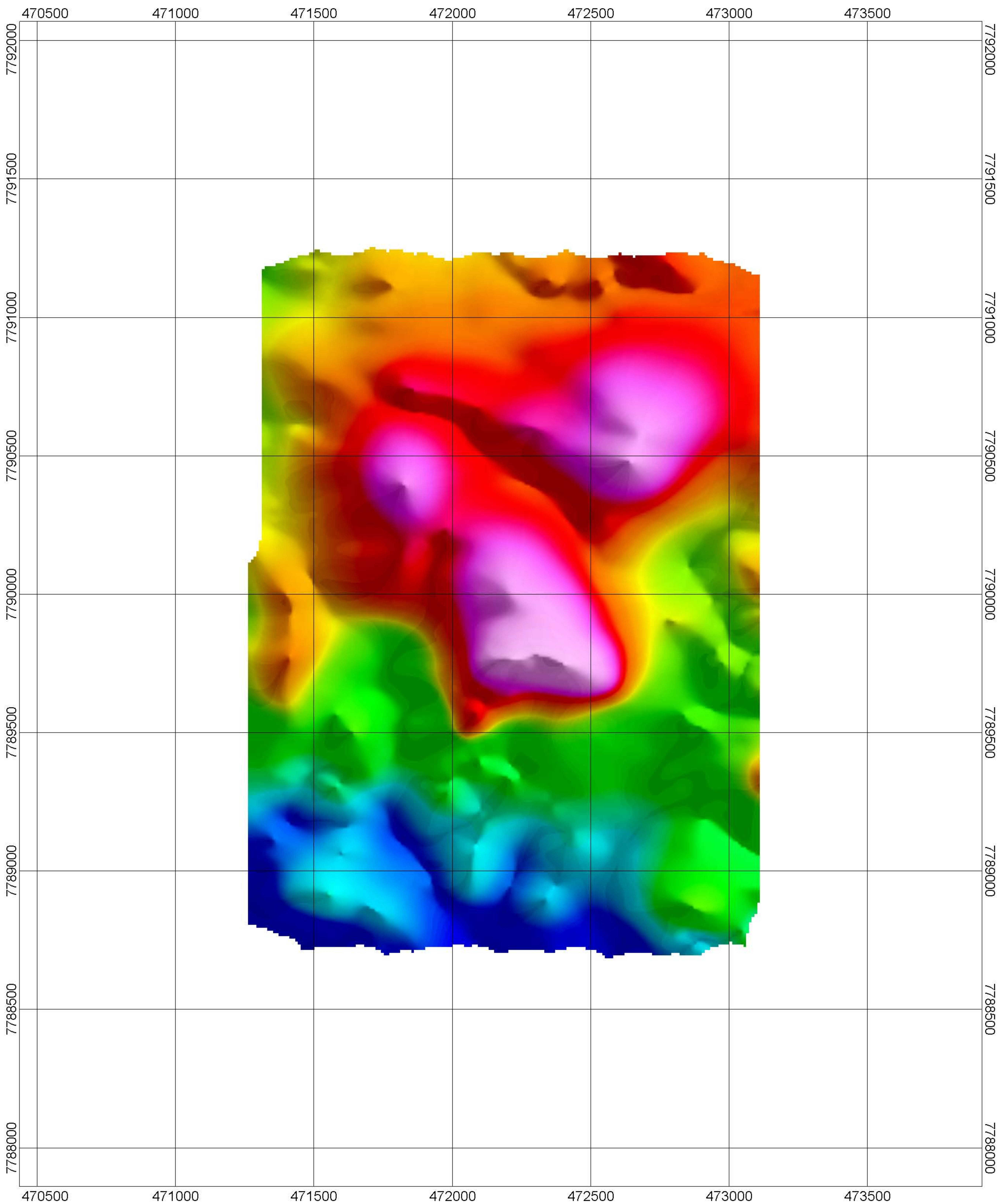**Magnetic Intensity**
(nT)

642 657 672 681 687 694 704 725 741 760 784 810 845 878 906

Scale 1:15250

250   0   250   500

(meters)

GDA94 / MGA zone 53

14048 RED METALS LTD

Tennant Creek Airborne Survey
Survey Area: Red 3
Total Magnetic Intensity

Survey By: Aerosystems

Magnetic Intensity
(nT)

204 339 398 448 485 508 532 550 569 606 652 690 722 765 813

Scale 1:19650

250   0   250   500   750

(meters)

GDA94 / MGA zone 53

14048 RED METALS LTD

Tennant Creek Airborne Survey
Survey Area: Red 4
Total Magnetic Intensity

Survey By: Aerosystems

Magnetic Intensity
(nT)

-6 33 50 70 93 116 156 193 211 226 241 261 274 287 302 334 425
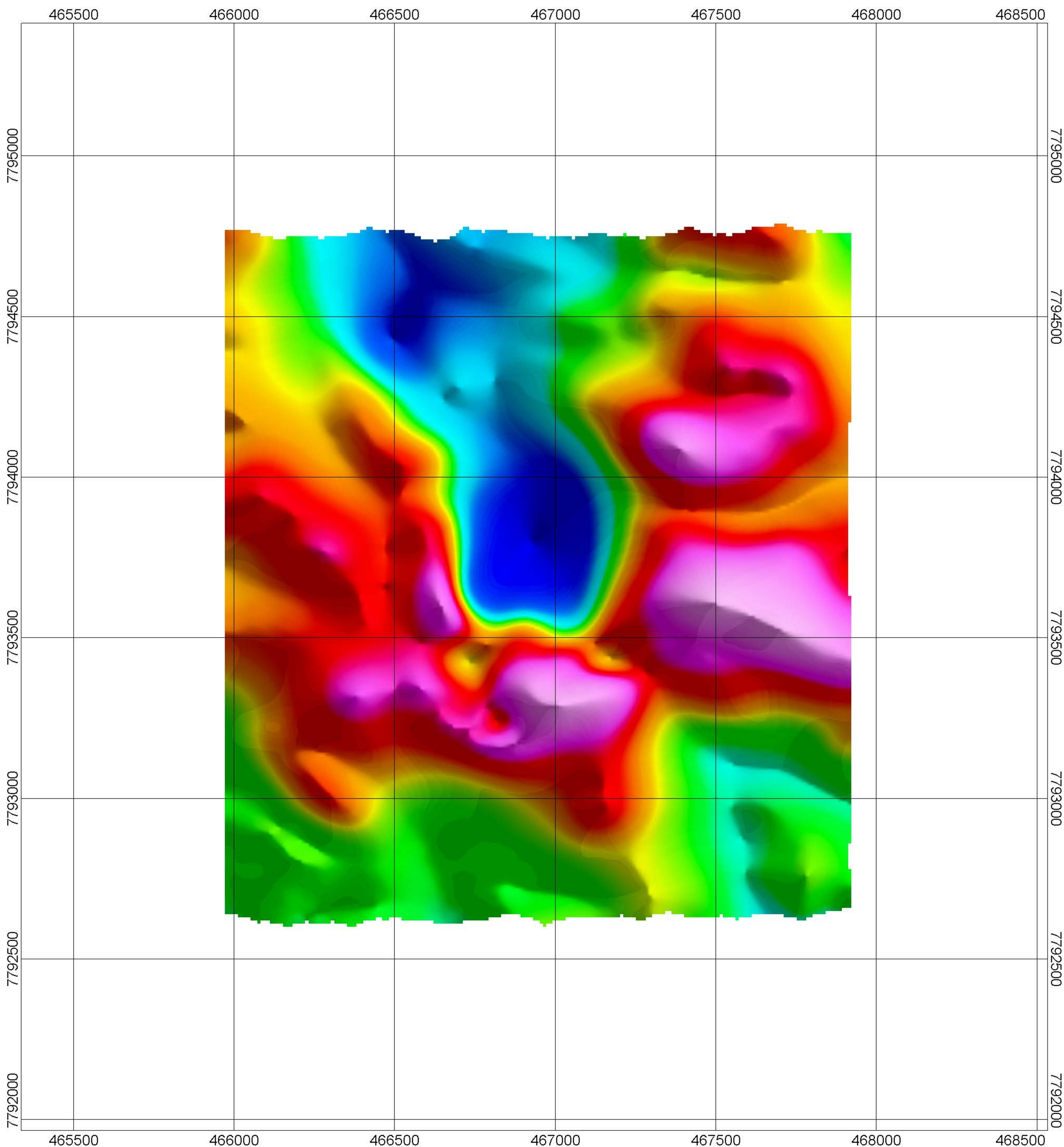
Scale 1:14000
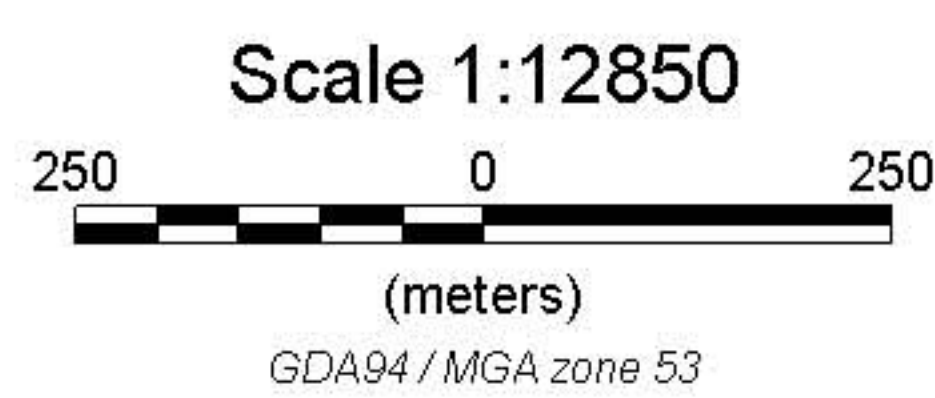
250   0   250

(meters)

GDA94 / MGA zone 53

14048 RED METALS LTD

Tennant Creek Airborne Survey
Survey Area: Red 5
Total Magnetic Intensity

Survey By: Aerosystems

Magnetic Intensity
(nT)

-154 108 139 153 159 165 174 181 188 194 200 206 211 218 236

Scale 1:12850

250   0   250

(meters)

GDA94 / MGA zone 53

14048 RED METALS LTD

Tennant Creek Airborne Survey
Survey Area: Red 6
Total Magnetic Intensity

Survey By: Aerosystems