Spirit Hills, NT (GA#1274)
Delamere, NT (GA#1274)
Geophysical Survey
Processing Report

January 2016
Table of Contents

1. Datum Specification ................................................................................................................3

2. Magnetic processing ................................................................................................................4
   2.1 Processing Flow .................................................................................................................. 4
   2.2 Compensation .................................................................................................................... 4
   2.3 Magnetic Model .................................................................................................................. 5
   2.4 Diurnal Base Value .......................................................................................................... 5
   2.5 Tie Line levelling Method .................................................................................................. 5
   2.6 Polynomial levelling Method ............................................................................................. 5
   2.7 Micro-levelling Method ...................................................................................................... 5
   2.8 Gridding Method ................................................................................................................. 6

3. Radiometric Processing ............................................................................................................ 7
   3.1 Processing Flow .................................................................................................................. 7
   3.2 Principal Component Spectral Vectors ............................................................................... 8
   3.3 Window Energy Limits ....................................................................................................... 9
   3.4 Spectral Stripping Ratios .................................................................................................... 9
   3.5 Aircraft, Cosmic Backgrounds and Height Attenuation coefficients ................................ 9
   3.6 Conversion to Ground Concentrations ............................................................................... 10
   3.7 Micro-levelling Method ...................................................................................................... 10
   3.8 Gridding Method ................................................................................................................. 10

4. Elevation Processing .................................................................................................................. 11
   4.1 Processing Flow .................................................................................................................. 11
   4.2 Tie Line levelling Method .................................................................................................. 11
   4.3 Polynomial levelling Method ............................................................................................. 11
   4.4 Micro-levelling Method ...................................................................................................... 12
   4.5 Aircraft elevation ............................................................................................................... 12
   4.6 Adjusting to AHD .............................................................................................................. 12
   4.7 Gridding Method ................................................................................................................. 12

5. Deliverable Items ...................................................................................................................... 13

6. References ............................................................................................................................... 14

7. Appendix B: ASEG-GDF II description files ............................................................................ 15
   7.1 Common header .................................................................................................................. 15
   7.2 Additional details ............................................................................................................... 16
1. **Datum Specification**

The output survey coordinates are based on the Geocentric Datum of Australia 1994 (GDA94), zone 52.

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. Magnetic processing

2.1 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 3 point wide Naudy filter to identify and remove noise below 0.05nT.

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.

The aircraft data was subject to field QC during the acquisition phase, and then additional QC during the final processing.

Parallax correction of 0.135 seconds was applied to the magnetic data.

A fourth 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 2015 (Geosoft) correction was calculated at each data point taking into account the height above sea level using the GPS altitude. This regional magnetic gradient was subtracted from the survey data points. Average of IGRF was added back to the data.

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

2.2 Compensation

The data was compensated post flight using a 16 term model based on the work done by C.D. Hardwick.

Magnetic compensation sequences were flown before acquisition commenced and after routine maintenance was performed, as required. The resulting coefficients were used for post flight magnetic compensation.
2.3 Magnetic Model

IGRF was removed using the GPS altitude.

The magnetic model for the centre of the area is detailed below:

<table>
<thead>
<tr>
<th>Model</th>
<th>IGRF 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declination</td>
<td>3.231 degrees</td>
</tr>
<tr>
<td>Inclination</td>
<td>-43.885 degrees</td>
</tr>
<tr>
<td>Field strength</td>
<td>47870.642nT</td>
</tr>
<tr>
<td>Grid zone</td>
<td>52</td>
</tr>
</tbody>
</table>

Table 1. IGRF details

2.4 Diurnal Base Value

The average diurnal base value was 47266.378nT.

2.5 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 magnetic 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 data.

2.6 Polynomial levelling Method

In order to remove any residual long wavelength variations in the tie line levelled data along the traverse lines, least squares polynomial levelling was applied. A polynomial order of 0 was used for both traverses and ties.

Polynomial levelling was used in the magnetic levelling process.

2.7 Micro-levelling Method
Micro-levelling was applied to the Polynomial levelled data to remove any residual levelling artifacts using Intrepid Data Processing software. The software uses a two step process involving de-corrugation and micro-levelling. De-corrugation is first applied to the Polynomial levelled gridded data, which detects residual features parallel to the acquisition line direction and produces a grid of the corrections required to remove the levelling artifacts. Micro-levelling is then applied, which extrapolates the correction values from the de-corrugation grid to an appropriate value for each point in the traverse lines. It then applies the corrections to the point data to remove the residual levelling artifacts.

This micro-levelling process is based on a paper by Minty, 1991.

2.8 Gridding Method

The interpolation used is a minimum curvature algorithm. The algorithm is based on the worked published by Briggs, 1974. The algorithm has been modified to include a tension parameter based on the work published by Smith and Wessel.

A tension factor of 0 was used to interpolate the magnetic data.

The mesh size for data interpolation was 20% of the line spacing.
3. Radiometric Processing

3.1 Processing Flow

The processing steps radiometric data were as follows:

1. A parallax correction of 0.3 sec was applied to the data.
2. Checked radar altimeter, pressure and temperature data for spikes. No filter was applied.
3. NASVD spectral smoothing done
   ▪ Examine the output to determine the number of components required.
   ▪ Select 8 components for spectral reconstruction.
4. Standard 256 channel radiometric corrections done:
   ▪ Dead-time correction performed on 256 channel data.
   ▪ Check if energy recalibration required
   ▪ Remove 256 channel aircraft and cosmic backgrounds from the data
   ▪ 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 specified survey height (80m).
5. Micro-levelling

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

Micro-levelling was applied.
3.2 Principal Component Spectral Vectors

Figure 1. Principal components. Aircraft: SUX
3.3 Window Energy Limits

The energy bounds for the windows were

<table>
<thead>
<tr>
<th>Window Name</th>
<th>Energy Range (Mev)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium</td>
<td>1.374 – 1.566</td>
</tr>
<tr>
<td>Thorium</td>
<td>2.416 – 2.799</td>
</tr>
<tr>
<td>Uranium</td>
<td>1.662 – 1.854</td>
</tr>
<tr>
<td>Total Count</td>
<td>0.414 – 2.799</td>
</tr>
</tbody>
</table>

Table 2. Energy range

3.4 Spectral Stripping Ratios

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Detector #</th>
<th>Alpha</th>
<th>Beta</th>
<th>Gamma</th>
<th>a</th>
<th>b</th>
<th>g</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUX</td>
<td>5427</td>
<td>0.272</td>
<td>0.400</td>
<td>0.767</td>
<td>0.047</td>
<td>0.001</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>5428</td>
<td>0.283</td>
<td>0.415</td>
<td>0.786</td>
<td>0.043</td>
<td>0.004</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>0.278</td>
<td>0.408</td>
<td>0.777</td>
<td>0.045</td>
<td>0.003</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Table 3. Stripping ratios

The reverse stripping ratios were adopted from theoretical physical constants. Note that the reverse stripping ratios 'b' and 'g' are not used in the processing.

3.5 Aircraft, Cosmic Backgrounds and Height Attenuation coefficients

The Aircraft and Cosmic Background values are for the windows only. During processing the equivalent 256 channel aircraft and cosmic backgrounds are removed.

The Height attenuation coefficients were determined from communication with Mr Jens Hovgaard. These values are based on his testing and IAEA values. These ratios are determined by the natural laws of radiometric attenuation, so one set of ratios was used for the survey.
### Aircraf Background

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Background</th>
<th>Total Count</th>
<th>Potassium</th>
<th>Uranium</th>
<th>Thorium</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUX</td>
<td>Aircraft</td>
<td>28.611</td>
<td>13.163</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Cosmic</td>
<td>1.124</td>
<td>.064</td>
<td>0.054</td>
<td>0.064</td>
</tr>
<tr>
<td></td>
<td>Height Atttn</td>
<td>-0.007434</td>
<td>-0.009432</td>
<td>-0.008428</td>
<td>-0.007510</td>
</tr>
</tbody>
</table>

Table 4. Background and height attenuation coefficients

### 3.6 Conversion to Ground Concentrations

<table>
<thead>
<tr>
<th>Conversion Factor</th>
<th>Total Count Cps to Dose rate</th>
<th>Potassium Cps to Percent</th>
<th>Uranium Cps to PPM</th>
<th>Thorium Cps to PPM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30.332</td>
<td>86.212</td>
<td>14.914</td>
<td>5.030</td>
</tr>
</tbody>
</table>

Table 5. Ground concentration convention coefficients

Above coefficients were derived from a flight over the test range in WA performed on March, 2015.

### 3.7 Micro-levelling Method

Micro-levelling was applied to the processed data to remove any residual artifacts using Intrepid Data Processing software. The software uses a two step process involving decorrugaion and micro-levelling. Decorrugaion is first applied to the Polynomial levelled gridded data, which detects residual features parallel to the acquisition line direction and produces a grid of the corrections required to remove the levelling artifacts. Micro-levelling is then applied, which extrapolates the correction values from the decorrugation grid to an appropriate value for each point in the traverse lines. It then applies the corrections to the point data to remove the residual levelling artifacts.

This micro-levelling process is based on a paper by Minty, 1991.

### 3.8 Gridding Method

The interpolation used is a minimum curvature algorithm. The algorithm is based on the worked published by Briggs, 1974.

The algorithm has been modified to include a tension parameter based on the work published by Smith and Wessel, 1990.

A tension factor of 0 was used to interpolate the data

The mesh size for data interpolation was 20% of the line spacing.
4. **Elevation Processing**

4.1 **Processing Flow**

The processing steps for digital elevation data were as follows:

1. **Parallax check.** No parallax correction is required for the GPS data.
2. **Calculation of raw digital elevation data by subtracting the radar altimeter from the GPS altitude.** Height difference between GPS antenna and radar altimeter (1.60m) were also included.
3. **Tie line levelling**
4. **Micro-levelling**
5. **Aircraft elevation**
6. **Adjusting to AHD**

4.2 **Tie Line levelling Method**

Tie line levelling was applied to the data by least squares minimization, using a polynomial fit of order 0, of the differences in data 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 minimize, 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 minimized 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 elevation data.

4.3 **Polynomial levelling Method**

In order to remove any residual long wavelength variations in the tie line levelled data along the traverse lines, least squares polynomial levelling was applied. A polynomial order of 3 was used for both traverses and ties.

Polynomial levelling was used in the elevation levelling process.
4.4 Micro-levelling Method

Micro-levelling was applied to the Polynomial levelled data to remove any residual levelling artifacts using Intrepid Data Processing software. The software uses a two step process involving decorruagtion and micro-levelling. Decorruagtion is first applied to the Polynomial levelled gridded data, which detects residual features parallel to the acquisition line direction and produces a grid of the corrections required to remove the levelling artifacts. Micro-levelling is then applied, which extrapolates the correction values from the decorruagtion grid to an appropriate value for each point in the traverse lines. It then applies the corrections to the point data to remove the residual levelling artifacts. This micro-levelling process is based on a paper by Minty, 1991.

4.5 Aircraft elevation

Aircraft elevation (ElevAC) channel was calculated by subtracting radar altimeter channel from processed elevation channel before adjusting to AHD.

4.6 Adjusting to AHD

N value correction to AHD was acquired from AusGeoid09 grid version 1.01. Data interpolation was done using GeoidInterpolation software version 1.03 (Inter-government Committee on Surveying & Mapping, 2011) based on Long, Lat coordinates. N value was then subtracted from the levelled elevation data.

4.7 Gridding Method

The interpolation used is a minimum curvature algorithm. The algorithm is based on the worked published by Briggs, 1974. The algorithm has been modified to include a tension parameter based on the work published by Smith and Wessel, 1990. A tension factor of 0 was used to interpolate the data. The mesh size for data interpolation was 20% of the line spacing.
5. Deliverable Items

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

Located data supplied in ASEG GDF2 format

<table>
<thead>
<tr>
<th>File name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAW_MAG</td>
<td>Raw magnetic data</td>
</tr>
<tr>
<td>RAW_ELEV</td>
<td>Raw elevation data</td>
</tr>
<tr>
<td>RAW_RAD</td>
<td>Raw 256 channel and window radiometric data</td>
</tr>
<tr>
<td>FINAL_MAG</td>
<td>Final magnetic data</td>
</tr>
<tr>
<td>FINAL_ELEV</td>
<td>Final elevation data</td>
</tr>
<tr>
<td>FINAL_RAD</td>
<td>Final Radiometric Data</td>
</tr>
</tbody>
</table>

Gridded data supplied in ER Mapper format

<table>
<thead>
<tr>
<th>File name</th>
<th>Definition</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MagLev</td>
<td>Final magnetic gridded data</td>
<td>nT</td>
</tr>
<tr>
<td>MagLev_1VD</td>
<td>Final 1st Vertical derivative</td>
<td>nT/m</td>
</tr>
<tr>
<td>MagLev_2VD</td>
<td>Final 2nd Vertical derivative</td>
<td>nT/m</td>
</tr>
<tr>
<td>MagLev_RTP</td>
<td>Final RTP magnetic gridded data</td>
<td>nT</td>
</tr>
<tr>
<td>MagLev_RTP_1VD</td>
<td>Final 1st Vertical derivative of RTP</td>
<td>nT/m</td>
</tr>
<tr>
<td>MagLev_RTP_2VD</td>
<td>Final 2nd Vertical derivative of RTP</td>
<td>nT/m</td>
</tr>
<tr>
<td>ElevAHD</td>
<td>Final elevation (AHD) gridded data</td>
<td>m</td>
</tr>
<tr>
<td>NASVDTotDose</td>
<td>Final smooth radiometric dose rate gridded data</td>
<td>nGy/hr</td>
</tr>
<tr>
<td>NASVDKperc</td>
<td>Final smooth radiometric potassium gridded data</td>
<td>percent</td>
</tr>
<tr>
<td>NASVDThppm</td>
<td>Final smooth radiometric thorium gridded data</td>
<td>ppm</td>
</tr>
<tr>
<td>NASVDUppm</td>
<td>Final smooth radiometric uranium gridded data</td>
<td>ppm</td>
</tr>
<tr>
<td>NonNASVDTotDose</td>
<td>Final radiometric dose rate gridded data</td>
<td>nGy/hr</td>
</tr>
<tr>
<td>NonNASVDKperc</td>
<td>Final radiometric potassium gridded data</td>
<td>percent</td>
</tr>
<tr>
<td>NonNASVDThppm</td>
<td>Final radiometric thorium gridded data</td>
<td>ppm</td>
</tr>
<tr>
<td>NonNASVDUppm</td>
<td>Final radiometric uranium gridded data</td>
<td>ppm</td>
</tr>
</tbody>
</table>
6. References


Geoscience Australia, 2010. 1 Second SRTM Derived DSM and DEM User Guide, 2010. (Distributed by Geoscience Australia with the 1 second DEM products.)


Smith, W. H. F, and P. Wessel, 1990, Gridding with continuous curvature splines in tension, Geophysics 55, 293-305
7. Appendix B: ASEG-GDF II description files

7.1 Common header

CLIENT DETAILS
--------------
Company Flown for:  Geoscience Australia  
Company Flown by :  Thomson Aviation Pty. Ltd. 
Company Processed:  Thomson Aviation Pty. Ltd. 
Company Job      :  Thomson 15027  
GA Project       :  1274 NT

AIRBORNE SURVEY EQUIPMENT:
---------------------------
Aircraft                         :  Cessna 210  
Magnetometer                     :  Kroum 
Magnetometer Resolution          :  0.001 nT 
Magnetometer Compensation        :  Post Flight 
Magnetometer Sample Interval     :  20 Hz, Approx 3.75 meters 
Data Acquisition                 :  GeOZ Model 2013 
Spectrometer                     :  Radiation Solutions RS 500 
Crystal Size                      :  33 lt downward array 
Spectrometer Sample Interval     :  0.5 Seconds (approx 37 meters) 
GPS Navigation System            :  Novatel 951R GPS Receiver

AIRBORNE SURVEY SPECIFICATIONS
-------------------------------
Area: Delamere/Spirit Hills, WA  
Flight Line Direction            :  000 - 180 degrees 
Flight Line Separation           :  400 metres
Tie Line Direction               :  090 - 270 degrees
Tie Line Separation             :  4000 metres
Terrain Clearance               :  80 metres (MTC)
Survey flown                    :  2015.7 - 2015.8

DATUM and PROJECTION
---------------------
Datum                     :  Geodetic Datum of Australia 94. GDA94
Projection                :  Map Grid of Australia. MGA
Zone                      :  Zone 52

### Additional details

- Raw elevation data

<table>
<thead>
<tr>
<th>Field name</th>
<th>Format</th>
<th>Dummy</th>
<th>Unit</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLTLINE</td>
<td>F10.1</td>
<td>NA</td>
<td>-</td>
<td>Line number. Generated by Geosoft.</td>
</tr>
<tr>
<td>Project</td>
<td>I5</td>
<td>-99</td>
<td>-</td>
<td>Project number</td>
</tr>
<tr>
<td>Flt</td>
<td>I4</td>
<td>-9</td>
<td>-</td>
<td>Flight number</td>
</tr>
<tr>
<td>Line</td>
<td>I7</td>
<td>-9999</td>
<td>-</td>
<td>Line number</td>
</tr>
<tr>
<td>Fid</td>
<td>I8</td>
<td>-99999</td>
<td>-</td>
<td>Fid</td>
</tr>
<tr>
<td>Date</td>
<td>I9</td>
<td>-99999</td>
<td>YYYYMMDD</td>
<td>Date</td>
</tr>
<tr>
<td>Bearing</td>
<td>I4</td>
<td>-9</td>
<td>dega</td>
<td>Bearing</td>
</tr>
<tr>
<td>Long</td>
<td>F11.6</td>
<td>-99.999999</td>
<td>dega</td>
<td>Long</td>
</tr>
<tr>
<td>Lat</td>
<td>F11.6</td>
<td>-99.999999</td>
<td>dega</td>
<td>Lat</td>
</tr>
<tr>
<td>EAST</td>
<td>F10.2</td>
<td>-99999.99</td>
<td>m</td>
<td>Easting, DATUM: GDA94, PROJECTION: MGA52</td>
</tr>
<tr>
<td>NORTH</td>
<td>F11.2</td>
<td>-999999.99</td>
<td>m</td>
<td>Northing, DATUM: GDA94, PROJECTION: MGA52</td>
</tr>
<tr>
<td>RadAlt</td>
<td>F7.2</td>
<td>-99.99</td>
<td>m</td>
<td>RadAlt</td>
</tr>
<tr>
<td>Press</td>
<td>F8.2</td>
<td>-999.99</td>
<td>mbar</td>
<td>Press</td>
</tr>
<tr>
<td>Temp</td>
<td>F6.2</td>
<td>-9.99</td>
<td>deg C</td>
<td>Temp</td>
</tr>
<tr>
<td>GPSTime</td>
<td>F9.2</td>
<td>-99999.99</td>
<td>S</td>
<td>GPS time after midnight in seconds</td>
</tr>
<tr>
<td>GPSHt</td>
<td>F7.2</td>
<td>-99.99</td>
<td>m</td>
<td>GPS Height</td>
</tr>
</tbody>
</table>
- **Raw radiometric data**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Format</th>
<th>Dummy</th>
<th>Unit</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLTLINE</td>
<td>F10.1</td>
<td>NA</td>
<td>-</td>
<td>Line number. Generated by Geosoft.</td>
</tr>
<tr>
<td>Project</td>
<td>I5</td>
<td>-99</td>
<td>-</td>
<td>Project number</td>
</tr>
<tr>
<td>Flt</td>
<td>I4</td>
<td>-9</td>
<td>-</td>
<td>Flight number</td>
</tr>
<tr>
<td>Line</td>
<td>I7</td>
<td>-9999</td>
<td>-</td>
<td>Line number</td>
</tr>
<tr>
<td>Fid</td>
<td>I8</td>
<td>-9999</td>
<td>-</td>
<td>Fid</td>
</tr>
<tr>
<td>Date</td>
<td>I9</td>
<td>-99999</td>
<td>YYYYMMDD</td>
<td>Date</td>
</tr>
<tr>
<td>Bearing</td>
<td>I4</td>
<td>-9</td>
<td>dega</td>
<td>Bearing</td>
</tr>
<tr>
<td>Long</td>
<td>F11.6</td>
<td>99.999999</td>
<td>dega</td>
<td>Long</td>
</tr>
<tr>
<td>Lat</td>
<td>F11.6</td>
<td>99.999999</td>
<td>dega</td>
<td>Lat</td>
</tr>
<tr>
<td>EAST</td>
<td>F10.2</td>
<td>999999.99</td>
<td>m</td>
<td>Easting, DATUM: GDA94, PROJECTION: MGA52</td>
</tr>
<tr>
<td>NORTH</td>
<td>F11.2</td>
<td>999999.99</td>
<td>m</td>
<td>Northing, DATUM: GDA94, PROJECTION: MGA52</td>
</tr>
<tr>
<td>RadAlt</td>
<td>F7.2</td>
<td>-99.99</td>
<td>m</td>
<td>RadAlt</td>
</tr>
<tr>
<td>Press</td>
<td>F8.2</td>
<td>-999.99</td>
<td>mbar</td>
<td>Press</td>
</tr>
<tr>
<td>Temp</td>
<td>F6.2</td>
<td>-9.99</td>
<td>deg C</td>
<td>Temp</td>
</tr>
<tr>
<td>RawTC</td>
<td>I6</td>
<td>-99</td>
<td>cps</td>
<td>Raw Total count</td>
</tr>
<tr>
<td>RawK</td>
<td>I5</td>
<td>-99</td>
<td>cps</td>
<td>Raw Potassium</td>
</tr>
<tr>
<td>RawU</td>
<td>I5</td>
<td>-99</td>
<td>cps</td>
<td>Raw Uranium</td>
</tr>
<tr>
<td>RawTh</td>
<td>I5</td>
<td>-99</td>
<td>cps</td>
<td>Raw Thorium</td>
</tr>
<tr>
<td>Cosm</td>
<td>I5</td>
<td>-99</td>
<td>cps</td>
<td>Cosmic</td>
</tr>
<tr>
<td>Samp</td>
<td>F4.1</td>
<td>-0.9</td>
<td>sec</td>
<td>Sampling time</td>
</tr>
<tr>
<td>LowE</td>
<td>F4.1</td>
<td>-0.9</td>
<td>MeV</td>
<td>Low Energy bound of Spectrum</td>
</tr>
<tr>
<td>HighE</td>
<td>F4.1</td>
<td>-0.9</td>
<td>MeV</td>
<td>High Energy bound of Spectrum</td>
</tr>
<tr>
<td>Live</td>
<td>F6.3</td>
<td>-0.999</td>
<td>sec</td>
<td>Live time</td>
</tr>
<tr>
<td>Spectrum</td>
<td>256I5</td>
<td>-9999</td>
<td>cps</td>
<td>Spectrum (256 channels)</td>
</tr>
</tbody>
</table>
- Raw magnetic data

<table>
<thead>
<tr>
<th>Field name</th>
<th>Format</th>
<th>Dummy</th>
<th>Unit</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLTLINE</td>
<td>F10.1</td>
<td>NA</td>
<td>-</td>
<td>Line number. Generated by Geosoft.</td>
</tr>
<tr>
<td>Project</td>
<td>I5</td>
<td>-99</td>
<td>-</td>
<td>Project number</td>
</tr>
<tr>
<td>Flt</td>
<td>I4</td>
<td>-9</td>
<td>-</td>
<td>Flight number</td>
</tr>
<tr>
<td>Line</td>
<td>I7</td>
<td>-9999</td>
<td>-</td>
<td>Line number</td>
</tr>
<tr>
<td>Fid</td>
<td>I8</td>
<td>-99999</td>
<td>-</td>
<td>Fid</td>
</tr>
<tr>
<td>Date</td>
<td>I9</td>
<td>-99999</td>
<td>YYYYMMDD</td>
<td>Date</td>
</tr>
<tr>
<td>Bearing</td>
<td>I4</td>
<td>-9</td>
<td>dega</td>
<td>Bearing</td>
</tr>
<tr>
<td>Long</td>
<td>F11.6</td>
<td>-99.999999</td>
<td>dega</td>
<td>Long</td>
</tr>
<tr>
<td>Lat</td>
<td>F11.6</td>
<td>-99.999999</td>
<td>dega</td>
<td>Lat</td>
</tr>
<tr>
<td>EAST</td>
<td>F10.2</td>
<td>-99999.99</td>
<td>m</td>
<td>Easting,DATUM: GDA94,PROJECTION:MGA52</td>
</tr>
<tr>
<td>NORTH</td>
<td>F11.2</td>
<td>-999999.99</td>
<td>m</td>
<td>Northing,DATUM: GDA94,PROJECTION:MGA52</td>
</tr>
<tr>
<td>RadAlt</td>
<td>F7.2</td>
<td>-99.99</td>
<td>m</td>
<td>RadAlt</td>
</tr>
<tr>
<td>Press</td>
<td>F8.2</td>
<td>-999.99</td>
<td>mbar</td>
<td>Press</td>
</tr>
<tr>
<td>Temp</td>
<td>F6.2</td>
<td>-9.99</td>
<td>deg C</td>
<td>Temp</td>
</tr>
<tr>
<td>FluxX</td>
<td>F10.2</td>
<td>-99999.99</td>
<td>nT</td>
<td>Fluxgate X</td>
</tr>
<tr>
<td>FluxY</td>
<td>F10.2</td>
<td>-99999.99</td>
<td>nT</td>
<td>Fluxgate Y</td>
</tr>
<tr>
<td>FluxZ</td>
<td>F10.2</td>
<td>-99999.99</td>
<td>nT</td>
<td>Fluxgate Z</td>
</tr>
<tr>
<td>MagRaw</td>
<td>F11.4</td>
<td>-99999.9999</td>
<td>nT</td>
<td>Raw magnetics</td>
</tr>
<tr>
<td>MagLev</td>
<td>F11.4</td>
<td>-99999.9999</td>
<td>nT</td>
<td>Compensated magnetics</td>
</tr>
<tr>
<td>Diurnal</td>
<td>F9.2</td>
<td>-9999.99</td>
<td>nT</td>
<td>Diurnal</td>
</tr>
<tr>
<td>IGRF</td>
<td>F9.2</td>
<td>-9999.99</td>
<td>nT</td>
<td>IGRF</td>
</tr>
</tbody>
</table>
- Final elevation data

<table>
<thead>
<tr>
<th>Field name</th>
<th>Format</th>
<th>Dummy</th>
<th>Unit</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLTLINE</td>
<td>F10.1</td>
<td>NA</td>
<td>-</td>
<td>Line number. Generated by Geosoft.</td>
</tr>
<tr>
<td>Project</td>
<td>I5</td>
<td>-99</td>
<td>-</td>
<td>Project number</td>
</tr>
<tr>
<td>Flt</td>
<td>I4</td>
<td>-9</td>
<td>-</td>
<td>Flight number</td>
</tr>
<tr>
<td>Line</td>
<td>I7</td>
<td>-9999</td>
<td>-</td>
<td>Line number</td>
</tr>
<tr>
<td>Fid</td>
<td>I8</td>
<td>-9999</td>
<td>-</td>
<td>Fid</td>
</tr>
<tr>
<td>Date</td>
<td>I9</td>
<td>-999999</td>
<td>YYYYMMDD</td>
<td>Date</td>
</tr>
<tr>
<td>Bearing</td>
<td>I4</td>
<td>-9</td>
<td>dega</td>
<td>Bearing</td>
</tr>
<tr>
<td>Long</td>
<td>F11.6</td>
<td>-</td>
<td>dega</td>
<td>Long</td>
</tr>
<tr>
<td>Lat</td>
<td>F11.6</td>
<td>-</td>
<td>dega</td>
<td>Lat</td>
</tr>
<tr>
<td>EAST</td>
<td>F10.2</td>
<td>-99999.99</td>
<td>m</td>
<td>Easting, DATUM: GDA94, PROJECTION: MGA52</td>
</tr>
<tr>
<td>NORTH</td>
<td>F11.2</td>
<td>-</td>
<td>m</td>
<td>Northing, DATUM: GDA94, PROJECTION: MGA52</td>
</tr>
<tr>
<td>RadAlt</td>
<td>F7.2</td>
<td>-99.99</td>
<td>m</td>
<td>RadAlt</td>
</tr>
<tr>
<td>Press</td>
<td>F8.2</td>
<td>-999.99</td>
<td>mbar</td>
<td>Press</td>
</tr>
<tr>
<td>Temp</td>
<td>F6.2</td>
<td>-9.99</td>
<td>deg C</td>
<td>Temp</td>
</tr>
<tr>
<td>ElevAHD</td>
<td>F7.2</td>
<td>-99.99</td>
<td>m</td>
<td>Elevation (AHD)</td>
</tr>
<tr>
<td>ElevAC</td>
<td>F7.2</td>
<td>-99.99</td>
<td>m</td>
<td>Aircraft Elevation</td>
</tr>
<tr>
<td>Nvalue</td>
<td>F6.2</td>
<td>-9.999</td>
<td>m</td>
<td>N value to AHD</td>
</tr>
</tbody>
</table>
• Final radiometric data

<table>
<thead>
<tr>
<th>Field name</th>
<th>Format</th>
<th>Dummy</th>
<th>Unit</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLTLINE</td>
<td>F10.1</td>
<td>NA</td>
<td>-</td>
<td>Line number. Generated by Geosoft.</td>
</tr>
<tr>
<td>Project</td>
<td>I5</td>
<td>-99</td>
<td>-</td>
<td>Project number</td>
</tr>
<tr>
<td>Flt</td>
<td>I4</td>
<td>-9</td>
<td>-</td>
<td>Flight number</td>
</tr>
<tr>
<td>Line</td>
<td>I7</td>
<td>-9999</td>
<td>-</td>
<td>Line number</td>
</tr>
<tr>
<td>Fid</td>
<td>I8</td>
<td>-9999</td>
<td>-</td>
<td>Fid</td>
</tr>
<tr>
<td>Date</td>
<td>I9</td>
<td>-99999</td>
<td>YYYYMMDD</td>
<td>Date</td>
</tr>
<tr>
<td>Bearing</td>
<td>I4</td>
<td>-9</td>
<td>dega</td>
<td>Bearing</td>
</tr>
<tr>
<td>Long</td>
<td>F11.6</td>
<td>-</td>
<td>dega</td>
<td>Long</td>
</tr>
<tr>
<td>Lat</td>
<td>F11.6</td>
<td>99.999999</td>
<td>dega</td>
<td>Lat</td>
</tr>
<tr>
<td>EAST</td>
<td>F10.2</td>
<td>-9999.99</td>
<td>m</td>
<td>Easting,DATUM: GDA94,PROJECTION:MGA5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>NORTH</td>
<td>F11.2</td>
<td>-</td>
<td>999999.99</td>
<td>Northing,DATUM: GDA94,PROJECTION:MGA5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>RadAlt</td>
<td>F7.2</td>
<td>-99.99</td>
<td>m</td>
<td>RadAlt</td>
</tr>
<tr>
<td>Press</td>
<td>F8.2</td>
<td>-999.99</td>
<td>mbar</td>
<td>Press</td>
</tr>
<tr>
<td>Temp</td>
<td>F6.2</td>
<td>-9.99</td>
<td>deg C</td>
<td>Temp</td>
</tr>
<tr>
<td>NASVDTotDose</td>
<td>F7.2</td>
<td>-99.99</td>
<td>nGy/h</td>
<td>Total Dose. NASVD smoothed</td>
</tr>
<tr>
<td>NASVDK</td>
<td>F7.3</td>
<td>-9.999</td>
<td>%</td>
<td>Potassium. NASVD smoothed</td>
</tr>
<tr>
<td>NASVDU</td>
<td>F7.3</td>
<td>-9.999</td>
<td>ppm</td>
<td>Uranium. NASVD smoothed</td>
</tr>
<tr>
<td>NASVDTh</td>
<td>F7.3</td>
<td>-9.999</td>
<td>ppm</td>
<td>Thorium. NASVD smoothed</td>
</tr>
<tr>
<td>NonNASVDTotDose</td>
<td>F7.2</td>
<td>-99.99</td>
<td>nGy/h</td>
<td>Total Dose. Not smoothed</td>
</tr>
<tr>
<td>NonNASVDK</td>
<td>F7.3</td>
<td>-9.999</td>
<td>%</td>
<td>Potassium. Not smoothed</td>
</tr>
<tr>
<td>NonNASVDU</td>
<td>F7.3</td>
<td>-9.999</td>
<td>ppm</td>
<td>Uranium. Not smoothed</td>
</tr>
<tr>
<td>NonNASVDTh</td>
<td>F7.3</td>
<td>-9.999</td>
<td>ppm</td>
<td>Thorium. Not smoothed</td>
</tr>
</tbody>
</table>
- Final magnetic data

<table>
<thead>
<tr>
<th>Field name</th>
<th>Format</th>
<th>Dummy</th>
<th>Unit</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLTLINE</td>
<td>F10.1</td>
<td>NA</td>
<td>-</td>
<td>Line number. Generated by Geosoft.</td>
</tr>
<tr>
<td>Project</td>
<td>I5</td>
<td>-99</td>
<td>-</td>
<td>Project number</td>
</tr>
<tr>
<td>Flt</td>
<td>I4</td>
<td>-9</td>
<td>-</td>
<td>Flight number</td>
</tr>
<tr>
<td>Line</td>
<td>I7</td>
<td>-9999</td>
<td>-</td>
<td>Line number</td>
</tr>
<tr>
<td>Fid</td>
<td>I8</td>
<td>-9999</td>
<td>-</td>
<td>Fid</td>
</tr>
<tr>
<td>Date</td>
<td>I9</td>
<td>-99999</td>
<td>YYYYMMDD</td>
<td>Date</td>
</tr>
<tr>
<td>Bearing</td>
<td>I4</td>
<td>-9</td>
<td>dega</td>
<td>Bearing</td>
</tr>
<tr>
<td>Long</td>
<td>F11.6</td>
<td>-99.999999</td>
<td>dega</td>
<td>Long</td>
</tr>
<tr>
<td>Lat</td>
<td>F11.6</td>
<td>-99.999999</td>
<td>dega</td>
<td>Lat</td>
</tr>
<tr>
<td>EAST</td>
<td>F10.2</td>
<td>-99999.99</td>
<td>m</td>
<td>Easting, DATUM: GDA94, PROJECTION: MGA52</td>
</tr>
<tr>
<td>NORTH</td>
<td>F11.2</td>
<td>-999999.99</td>
<td>m</td>
<td>Northing, DATUM: GDA94, PROJECTION: MGA52</td>
</tr>
<tr>
<td>RadAlt</td>
<td>F7.2</td>
<td>-99.99</td>
<td>m</td>
<td>RadAlt</td>
</tr>
<tr>
<td>Press</td>
<td>F8.2</td>
<td>-999.99</td>
<td>mbar</td>
<td>Press</td>
</tr>
<tr>
<td>Temp</td>
<td>F6.2</td>
<td>-9.99</td>
<td>deg C</td>
<td>Temp</td>
</tr>
<tr>
<td>MagTie</td>
<td>F11.4</td>
<td>-9999.9999</td>
<td>nT</td>
<td>Tie line levelled magnetics</td>
</tr>
<tr>
<td>MagLev</td>
<td>F11.4</td>
<td>-9999.9999</td>
<td>nT</td>
<td>Final levelled magnetics</td>
</tr>
</tbody>
</table>