Logistics Report

for a

DETAILED AIRBORNE MAGNETIC, RADIOMETRIC AND DIGITAL ELEVATION SURVEY

for the

TANUMBIRINI PROJECT

carried out on behalf of

GEOSCIENCE AUSTRALIA

by

UTS GEOPHYSICS

(UTS Job #A869)

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1 GENERAL SURVEY INFORMATION

From July 2007 to September 2007, UTS Geophysics conducted a low level airborne geophysical survey for the following company:

Geoscience Australia
Cnr Jerrabomberra Ave and Hindmarsh Drive
Symonston
Canberra ACT 2609

Acquisition for this survey commenced on the 19th July 2007 and was completed on the 16th September 2007.

2 SURVEY LOCATION

The area surveyed was located approximately 100 kilometers west of Daly Waters in Northern Territory. Survey boundary coordinates are provided in Appendix C of this report.

The survey was flown using the MGA94 coordinate system (a Universal Transverse Mercator projection) derived from the Australian Geodetic Datum and was contained within zone 53 with a central meridian of 135 degrees. Details of the datum and projection system are provided in Appendix B of this report.

3 AIRCRAFT AND SURVEY EQUIPMENT

The UTS navigation flight control computer, data acquisition system and geophysical sensors were installed into a specialized geophysical survey aircraft.

The list of geophysical and navigation equipment used for the survey is as follows:

General Survey Equipment

- Cessna 210 fixed wing survey aircraft.
- UTS proprietory flight planning and survey navigation system.
- UTS proprietory high speed digital data acquisition system.
- Novatel 39xx series, 12 channel precision navigation GPS.
- Omnistar Omnilite 132 real time differential GPS system.
- UTS LCD pilot navigation display and external track guidance display.
- UTS post mission data verification and processing system.
- Bendix King KRA-10 radar altimeter.

Magnetic Data Acquisition Equipment

- UTS tail stinger magnetometer installation.
- Scintrex Cesium Vapour CS-2 total field magnetometer.
- Fluxgate three component vector magnetometer.
- RMS Aeromagnetic Automatic Digital Compensator (AADC II).
- Diurnal monitoring magnetometer (Scintrex Envimag).

Radiometric Data Acquisition Equipment

- Exploranium GR-820 gamma ray spectrometer.
- Exploranium gamma ray detectors.
- Barometric altimeter (height and pressure measurements).
- Temperature and humidity sensor.

3.1 *Survey Aircraft*

The aircraft used for this survey was a Cessna 210 fixed wing survey aircraft, operated by UTS Geophysics, registration VH-TKQ. The specifications for these aircraft are as follows:

Power Plant

- Engine Type Continental, IO-520
- Brake Horse Power 285 bhp
- Fuel Type AV-GAS

Performance

- Cruise speed 150 Kn
- Survey speed 130 Kn
- Stall speed 60 Kn
- Range 1185 Km
- Endurance (no reserves) 5.2 hours
- Fuel tank capacity 246 litres

3.2 *Data Positioning and Flight Navigation*

Survey data positioning and flight line navigation was derived using real-time differential GPS (Global Positioning System).

Navigation was provided through UTS designed and built electronic pilot navigation system providing computer controlled digital navigation instrumentation mounted in the cockpit as well as an externally mounted track guidance system.

GPS derived positions were used to provide both aircraft navigation and survey data location information.

The GPS systems used for the survey were:

- Aircraft GPS Model Novatel 39xx series
- Sample rate 0.5 Seconds (2 Hz)
- GPS satellite tracking channels 12 parallel
- Typical differentially corrected accuracy 1-2 metres (horizontal)
3-5 metres (vertical)

3.3 UTS Data Acquisition System and Digital Recording

All geophysical sensor data and positional information measured during the survey were recorded using UTS developed, high speed, and precision data acquisition system. Survey data was downloaded on completion of each survey flight.

Instrument synchronization times were measured and removed in real-time by the UTS data acquisition system.

3.4 Altitude Readings

Accurate survey heights above the terrain were measured using a King radar altimeter installed in the aircraft. The height of each survey data point was measured by the radar altimeter and stored by the UTS data acquisition system.

- Radar altimeter models King KRA-10
- Accuracy 0.3 metres
- Resolution 0.1 metres
- Range 0 - 500 metres
- Sample rate 0.1 Seconds (10Hz)

The digital terrain model is calculated by subtracting the terrain clearance (radar altimeter) from the GPS height (interpolated to 0.1 Hz), and as such the accuracy is constrained by the differentially corrected GPS position. The GPS height is acquired relative to the Australian Height Datum (AHD).

3.5 UTS Stinger Mounted Magnetometer System

The installation platform used for the acquisition of magnetic data was a tail mounted stinger. This proprietory stinger system was constructed of carbon fibre and designed for maximum rigidity and stability.

Both the total field magnetometer and three component vector magnetometer were located within the tail stinger.

3.6 Total Field Magnetometer

Total field magnetic data readings for the survey were made using a Scintrex Cesium Vapour CS-2 Magnetometer. This precision sensor has the following specifications:

- Model   Scintrex Cesium Vapour CS-2 Magnetometer
- Sample Rate   0.1 seconds (10Hz)
- Resolution   0.001nT
- Operating Range   15,000nT to 100,000nT
- Temperature Range   -20^{o}C to +50^{o}C

3.7 Three Component Vector Magnetometer

Three component vector magnetic data readings for the survey were made using a Develco Fluxgate Magnetometer. This precision sensor has the following specifications:

- Model   Develco Fluxgate Magnetometer
- Sample Rate   0.1 seconds (10Hz)
- Resolution   0.1nT
- Operating Range   -100,000nT to 100,000nT
- Temperature Range   -20^{o}C to +50^{o}C

3.8 Aircraft Magnetic Compensation

At the start of the survey, the system was calibrated for reduction of magnetic heading error. The heading and maneuver effects of the aircraft on the magnetic data were removed using an RMS Automatic Airborne Digital Compensator (AADC II).

Calibration of the aircraft heading effects were measured by flying a series of pitch, roll and yaw maneuvers at high altitude while monitoring changes in the three axis magnetometer and the effect on total field readings. A 26 term polynomial model of the aircraft magnetic noise covering permanent, induced and eddy current fields was determined. These coefficients were then applied to the data collected during the survey in real-time. The coefficients are listed in Appendix F.

The compensation flight data was recorded and then checked to ensure the acquisition of the compensation solution was without artifacts. A testbox flight was then recorded repeating the series of pitch, roll and yaw maneuvers on all cardinal headings as with the compensation flight but now using the approved solution stored in the AADC II. This testbox flight data was then processed to test the validity of the compensation for all cardinal headings, north, south, east and west.

UTS static compensation techniques were also employed to reduce the initial magnetic effects of the aircraft upon the survey data.

3.9 Diurnal Monitoring Magnetometer

A base station magnetometer was located in a low gradient area beyond the region of influence of any man made interference to monitor diurnal variations during the survey.

The specifications for the magnetometers used are as follows:

- Model Scintrex Envimag
- Resolution 0.1 nT
- Sample interval 2 seconds (0.5 Hz)
- Operating range 20,000nT to 90,000nT
- Temperature $-20^{o}C$ to $+50^{o}C$

3.10 Barometric Altitude

An Air DB barometric altimeter was installed in the aircraft so as to record and monitor barometric height and pressure. The data was recorded at 0.10 second intervals and is used for the reduction of the radiometric data.

- Model Air DB barometric altimeter
- Accuracy 2 metres
- Height resolution 0.1 metres
- Height range 0 - 3500 metres
- Maximum operating pressure: 1,300 mb
- Pressure resolution: 0.01 mb
- Sample rate 10 Hz

3.11 Temperature and Humidity

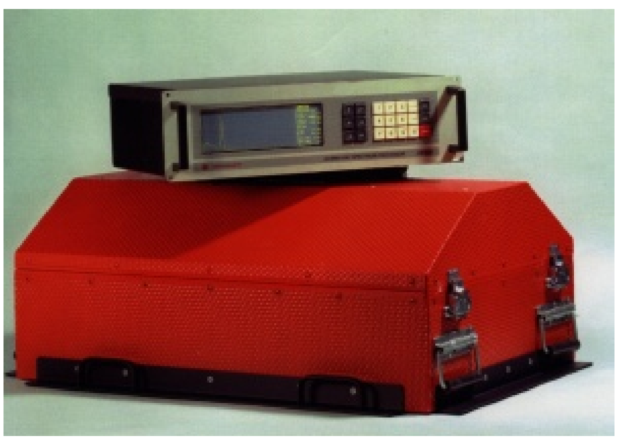
Temperature and humidity measurements were made during the survey at a sample rate of 10Hz. Ambient temperature was measured with a resolution of 0.1 degree Celsius and ambient humidity to a resolution of 0.1 percent.

3.12 Radiometric Data Acquisition

The gamma ray spectrometer used for the survey was capable of recording 256 channels and was self stabilising in order to minimise spectral drift. The detectors used contain thallium activated sodium iodide crystals.

Thorium source measurements were made each survey day to monitor system resolution and sensitivity. A calibration line was also flown at the start and end of each survey day to monitor ground moisture levels and system performance. The background and height corrected thorium channel from the test lines, along with the source measurement results are presented in Appendix E.

- Spectrometer model   Exploranium GR820
- Detector volume   32 litres
- Sample rate   1 Hz



The following table lists the spectral windows used.

Window Name	Total Count	K	U	Th
Energy Range (MeV)	0.4-2.81	1.370-1.570	1.660-1.860	2.410-2.810

4 PERSONNEL

4.1 Field Operations

UTS Geophysics operators and data processors	Graham Hancox Patrick Scahill
UTS Geophysics Survey Pilots	J. Alders A. Conner G. Simpson T. Turcsanyi

4.2 Project Management

Geoscience Australia	Ross Franklin
UTS Geophysics Perth Office	Nino Tufilli David Abbott Cameron Johnston Rebecca Steadman

5 SURVEY PARAMETERS

The survey data acquisition specifications for each area flown are specified in the following table:

AREA No.	PROJECT NAME	LINE SPACING	LINE DIRECTION	TIE LINE SPACING	TIE LINE DIRECTION	SENSOR HEIGHT	TOTAL LINE KM
01	Tanumbirini	400m	090-270	4000m	000-180	80m	49,314
TOTAL							49,314

The total number of line kilometres of survey data collected over the survey area specified in the above table was 49,314.

The specified sensor height for the magnetic samples is as stated in the above table. This sensor height may be varied where topographic relief or laws pertaining to built up areas do not allow this altitude to be maintained, or where the safety of the aircraft and equipment is endangered.

The coordinate boundaries for the survey areas flown are detailed in Appendix C.

6 SURVEY LOGISTICS

The base locations used for operating the aircraft and performing in-field quality control and data processing of the survey data was Daly Waters NT.
The flight logs are summarized in Appendix G.

6.1 Diurnal Magnetometer Locations

The following table contains the approximate locations where the diurnal base station magnetometers were located for the survey duration.

Period	LATITUDE	LONGITUDE	Location
19/07/07 – 16/09/07 (GR856)	-16 15.768	133 22.670	Daly Waters

7 DATA PROCESSING PROCEDURES

7.1 Data Pre-processing

At the commencement of each acquisition flight, all the instrumentation clocks were synchronized to local time, and the error and latency of each instrument in providing its data measurement calculated. The results of these latency measurements were recorded into a synchronization file, and the results used to assign GPS positions to the magnetic, radiometric and elevation data. As a result of the physical separation of the sensors, a small residual offset still exists between instrument timings.

The raw survey data was downloaded from the aircraft after each flight and transferred to the field computer where it was then trimmed to the correct survey boundary extents. Any survey lines subsequently reflown were removed from the raw field dataset.

To compensate for this residual parallax error, an adjustment was made to the instrument clocks. The magnetic and radar altimeter data was adjusted by 0.600 seconds, and the radiometric data was adjusted by 1.375 seconds for each flight.

The synchronized, parallax corrected data was then exported as located ASCII data and loaded into field data bases for further quality control procedures.

7.2 Magnetic Data Processing

The diurnal data was filtered with a 13 point moving average filter to reduce noise levels, followed by second difference filter was to identify and remove spikes of less than 0.25 nT.

The filtered diurnal measurements were subtracted from the diurnal base field and the residual corrections applied to the survey data by synchronising the diurnal data time and 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 updated IGRF 2005 correction was calculated at each data point (taking into account the height above sea level).

This regional magnetic gradient was subtracted from the survey data points.

An assessment of the data at this point showed that no major levelling problems existed in the residual magnetic data.

Survey tie line leveling was then applied to improve the DC component of the magnetic data. A single micro-levelling pass was then applied to the data to correct any minor level errors due to variations in terrain clearance or other factors. This micro-levelling process was only used in selective areas targeting wavelengths of 2 x line spacing interval (in this case, 400m) using a proprietary method.

For a given target wavelength a reference grid is constructed and then filtered by two dimensional operators. A file of levelling corrections is generated from comparing the survey line data and the reference grid for each target wavelength and then subjected to statistical analysis. Limits are established for the leveling corrections based on these statistics, and the levelling corrections restricted to these limits. The microlevelling corrections are then applied to the survey line data and the resulting line data is interrogated. Limits of +/- 50 nT were used for the levelling corrections to selected areas.

Located and gridded data were generated from the final processed magnetic data.

7.3 Radiometric Data Processing

Statistical noise reduction of the 256 channel data was performed using the Noise Adjusted Singular Variable Decomposition (NASVD) method described by Hovgaard and Grasty (1997).

Noise-adjusted singular value decomposition is performed, and the number of components to be used is determined by inspection of plots of the spectral components and by a statistical analysis of the contributions of the components. If the spectral shapes show any unusual characteristics, further analysis of the concentrations of the spectral components in the line data is performed in order to identify and eliminate any corrupt spectra. If such spectra were eliminated, the NASVD process is re-performed, in order to obtain spectral components free of any bias from corrupt spectra.

Only the dominant spectral shapes (identified as described above) were used in the spectral reconstruction process. The first 10 NASVD components were used for this process.

Channels 30-250 only are spectrally smoothed, as these contain the regions of interest and are not dominated by the lower end of the Compton continuum. The energy spectrum between the potassium and thorium peaks was recalibrated from the spectrally smoothed 256 channel measurements.

The aircraft background spectrum and the scaled unit cosmic spectrum were then subtracted from the 256 channel data. This 256 channel data was then windowed to the 5 primary channels of total count, potassium, uranium, thorium and low-energy uranium. Dead time corrections were then applied to the data. Radon background removal was performed using the Minty Spectral Ratio method (1992).

The radar altimeter data was corrected to standard temperature and pressure, and height corrected spectral stripping was then applied to the windowed data. Height attenuation corrections based on the STP radar altimeter were then performed to remove any altitude variation effects from the data.

The Uranium and Total Count channels were tie-levelled to remove the effects of residual radon background. The tie-levelling process employed was a least-squares/median filter procedure, which generated a single correction for each line of data. Mis-matches were calculated at each tie-traverse intersection and the median mismatch for each flight line was calculated as the residual levelling error for that line.

Final micro-levelling techniques were then selectively applied to the tie line levelled data to remove minor residual variations in profile intensities, as per the method outlined for magnetic data micro-levelling in 7.2 above. Limits were applied to the radiometric channels in selected areas only during the micro-levelling process are shown in the table below.

CHANNEL	TOTAL COUNT	POTASSIUM	URANIUM	THORIUM
Micro-levelling Correction limit (+/- cps)	300	20	10	10

The corrected count rate data was then converted to ground concentrations for potassium, uranium and thorium (sensitivity coefficients are supplied in Appendix F).

References

Hovgaard, J., and Grasty, R.L., 1997. Reducing statistical noise in airborne gamma-ray data through spectral component analysis. In *"Proceedings of Exploration 97: Fourth Decennial Conference on Mineral Exploration" edited by A.G.Gubins,* 1997, 753-764.

Minty, B. R. S., 1992 - Airborne gamma-ray spectrometric background estimation using full spectrum analysis. *Geophysics,* **57**, 279-287.

7.4 Digital Elevation Model Data Processing

The raw radar altimeter data was checked for spikes, and any found were manually edited.

The GPS Height acquired by the acquisition system is relative to the Australian Height Datum (AHD).

The GPS altimeter data was checked for spikes and steps, and any found were manually edited.

The radar altimeter data was then subtracted from the GPS altimeter data. The separation distance between the GPS antenna and the radar altimeter of 1.4 metres was subtracted from the digital terrain data.

The digital terrain data thus derived was tie line levelled and gridded. The tie-levelling process employed was a least-squares/median filter procedure, which generated a single correction for each line of data. Mis-matches were calculated at each tie-traverse intersection and the median mismatch for each flight line was calculated as the residual levelling error for that line. The tie-levelled data was then examined and subjected to a 2-pass microlevelling procedure targetting wavelengths of 800m and 400m, with correction limits of 20.0m and 8.0m respectively, to produce the final digital terrain model data channel. The final digital terrain model grid displayed no line dependent artifacts.

This elevation model was compared to the 9 second digital elevation data downloaded from the Geoscience Australia website.

The following table contains spot height checks between the final processed digital elevation model data and the 9 second DEM.

LATITUDE	LONGITUDE	A781 DEM	9 SEC DEM	Difference
-15 59 13.7	134 39 25.04	129.968m	129.289m	0.679m
-16 21 36.01	134 34 40.24	223.400m	222.619m	0.781m
-16 39 51.28	134 12 29.97	250.723m	252.470m	1.747m
-17 02 23.63	134 05 24.95	215.689m	215.759m	0.070m
-15 34 56.47	134 16 49.43	142.366m	142.660m	0.294m

For further information concerning the survey flown, please contact the following office:

Head Office Address:

UTS Geophysics
Fauntleroy Avenue, Perth Airport
REDCLIFFE WA 6104

Tel: +61 8 9479 4232
Fax: +61 8 9479 7361

Postal Address:

UTS Geophysics
P.O. Box 126
BELMONT WA 6984

Quoting reference number: A869

APPENDIX A - LOCATED DATA FORMATS

FINAL MAGNETIC LOCATED DATA

FIELD	FORMAT	DESCRIPTION	UNITS
1	I5	PROJECT NUMBER	
2	I4	FLIGHT/AREA NUMBER	AAFF (Area/Flight)
3	I8	LINE NUMBER	
4	I8	FIDUCIAL NUMBER	
5	I9	DATE	YYYYMMDD
6	F6.1	BEARING	degrees
7	F12.6	LONGITUDE (GDA94)	degrees
8	F11.6	LATITUDE (GDA94)	degrees
9	F11.2	EASTING (MGA94)	metres
10	F11.2	NORTHING (MGA94)	metres
11	F8.2	RADAR ALTIMETER HEIGHT	metres
12	F10.3	TIE LEVELLED TMI	nT
13	F10.3	MICRO LEVELLED TMI	nT

FINAL DIGITAL ELEVATION MODEL LOCATED DATA

FIELD	FORMAT	DESCRIPTION	UNITS
1	I5	PROJECT NUMBER	
2	I4	FLIGHT/AREA NUMBER	AAFF (Area/Flight)
3	I8	LINE NUMBERDATE	
4	I8	FIDUCIAL NUMBER	
5	I9	DATE	YYYYMMDD
6	F6.1	BEARING	degrees
7	F12.6	LONGITUDE (GDA94)	degrees
8	F11.6	LATITUDE (GDA94)	degrees
9	F11.2	EASTING (MGA94)	metres
10	F11.2	NORTHING (MGA94)	metres
11	F8.2	RADAR ALTIMETER HEIGHT	metres
12	F8.2	GPS Height (GEOID)	metres
13	F8.2	DIGITAL ELEVATION MODEL (AHD)	metres

FINAL RADIOMETRIC LOCATED DATA

FIELD	FORMAT	DESCRIPTION	UNITS
1	I5	PROJECT NUMBER	
2	I4	FLIGHT/AREA NUMBER	AAFF (Area/Flight)
3	I8	LINE NUMBERDATE	
4	I8	FIDUCIAL NUMBER	
5	I9	DATE	YYYYMMDD
6	F6.1	BEARING	degrees
7	F12.6	LONGITUDE (GDA94)	degrees
8	F11.6	LATITUDE (GDA94)	degrees
9	F11.2	EASTING (MGA94)	metres
10	F11.2	NORTHING (MGA94)	metres
11	F8.2	RADAR ALTIMETER HEIGHT	metres
12	F7.1	BAROMETRIC PRESSURE	hPa
13	F6.1	TEMPERATURE	degrees C
14	F10.4	DOSE RATE	nG/H
15	F9.4	POTASSIUM CONCENTRATION	%
16	F9.4	URANIUM CONCENTRATION	ppm
17	F9.4	THORIUM CONCENTRATION	ppm

RAW MAGNETIC LOCATED DATA

FIELD	FORMAT	DESCRIPTION	UNITS
1	I5	PROJECT NUMBER	
2	I4	FLIGHT/AREA NUMBER	AAFF (Area/Flight)
3	I8	LINE NUMBER	
4	F11.1	FIDUCIAL NUMBER	
5	I9	DATE	YYYYMMDD
6	F6.1	BEARING	degrees
7	F12.6	LONGITUDE (GDA94)	degrees
8	F11.6	LATITUDE (GDA94)	degrees
9	F11.2	EASTING (MGA94)	metres
10	F11.2	NORTHING (MGA94)	metres
11	F8.2	RADAR ALTIMETER HEIGHT	metres
12	F10.2	FLUXGATE_X	nT
13	F10.2	FLUXGATE_Y	nT
14	F10.2	FLUXGATE_Z	nT
15	F10.2	UNCOMPENSATED MAG	nT
16	F10.2	COMPENSATED MAG	nT
17	F10.2	DIURNAL MAG	nT

RAW DIGITAL TERRAIN MODEL LOCATED DATA

FIELD	FORMAT	DESCRIPTION	UNITS
1	I5	PROJECT NUMBER	
2	I4	FLIGHT/AREA NUMBER	AAFF (Area/Flight)
3	I8	LINE NUMBERDATE	
4	F11.1	FIDUCIAL NUMBER	
5	I9	DATE	YYYYMMDD
6	F6.1	BEARING	degrees
7	F12.6	LONGITUDE (GDA94)	degrees
8	F11.6	LATITUDE (GDA94)	degrees
9	F11.2	EASTING (MGA94)	metres
10	F11.2	NORTHING (MGA94)	metres
11	F8.2	RADAR ALTIMETER HEIGHT	metres
12	F10.1	GPS TIME	seconds
13	F8.2	GPS HEIGHT (GEOID)	metres

RAW RADIOMETRIC LOCATED DATA

FIELD	FORMAT	DESCRIPTION	UNITS
1	I5	PROJECT NUMBER	
2	I4	FLIGHT/AREA NUMBER	AAFF (Area/Flight)
3	I8	LINE NUMBERDATE	
4	F11.1	FIDUCIAL NUMBER	
5	I9	DATE	YYYYMMDD
6	F6.1	BEARING	degrees
7	F12.6	LONGITUDE (GDA94)	degrees
8	F11.6	LATITUDE (GDA94)	degrees
9	F11.2	EASTING (MGA94)	metres
10	F11.2	NORTHING (MGA94)	metres
11	F8.2	RADAR ALTIMETER HEIGHT	metres
12	F7.1	BAROMETRIC PRESSURE	hPa
13	F6.1	TEMPERATURE	degrees C
14	I7	RAW TOTAL COUNT	counts/sec
15	I5	RAW POTASSIUM COUNT	counts/sec
16	I5	RAW URANIUM COUNT	counts/sec
17	I5	RAW THORIUM COUNT	counts/sec
18	I5	COSMIC	counts/sec
19	I7	UPWARD RAW TOTAL COUNT	counts/sec
20	I5	UPWARD RAW POTASSIUM COUNT	counts/sec
21	I5	UPWARD RAW URANIUM COUNT	counts/sec
22	I5	UPWARD RAW THORIUM COUNT	counts/sec
23	I5	UPWARD COSMIC	counts/sec
24	F11.1	SPEC FID	
25	I7	SAMPLE TIME	milliseconds
26	I4	ENERGY LOW	
27	I4	ENERGY HIGH	
28	I7	LIVE TIME	
29	F5.1	CRYSTAL RESOLUTION	
30	256I5	RAW RADIOMETRIC CHANNELS	counts/sec

GRIDDED DATASET FORMATS

Gridding was performed using a MinC algorithm.

The following grid formats have been provided:

- ER-Mapper format

LINE NUMBER FORMATS

Line numbers are identified with a six digit composite line number and have the following format - ALLLLB, where:

A	Survey area number
LLLL	Survey line number
	0001-8999 reserved for traverse lines
	9001-9999 reserved for tie lines
B	Line attempt number, 0 is attempt 1, 1 is attempt 2 etc..

UTS FILE NAMING FORMATS

Located and gridded data provided by UTS Geophysics uses the following 8 character file naming convention to be compatible with PC DOS based systems.

File names have the following general format - JJJJAABB.EEE, where:

JJJJ	UTS Job number	
AA	Area number if the survey is broken into blocks	
BB	M	Magnetic data
	R	Radiometric data
	TC	Total count data
	K	Potassium counts
	U	Uranium counts
	Th	Thorium counts
	DT	Digital terrain data
EEE	File name extension	
	LDT	Located digital data file
	FMT	Located data format definition file
	ERS	Ermapper gridded data header file
		Ermapper data portion has no extension
	GRD	Geosoft gridded data file

APPENDIX B - COORDINATE SYSTEM DETAILS

Locations for the survey data are provided in both geographical latitude and longitude and Universal Transverse Mercator metric projection coordinate systems.

WGS84	World Geodetic System 1984
Coordinate Type	Geographical
Semi Major Axis	6378137m
Flattening	1/298.257223563

MGA94	Map Grid of Australia 1994
Coordinate type	Universal Transverse Mercator Projection Grid
Geodetic datum	Geocentric Datum of Australia
Semi major axis	6378137m
Flattening	1/298.257222101

APPENDIX C - SURVEY BOUNDARY DETAILS

COORDINATES REPORT

Job ID code: A8690101
Client: Geoscience Australia
Job: Tanumbirini
Coordinates MGA94 zone 53

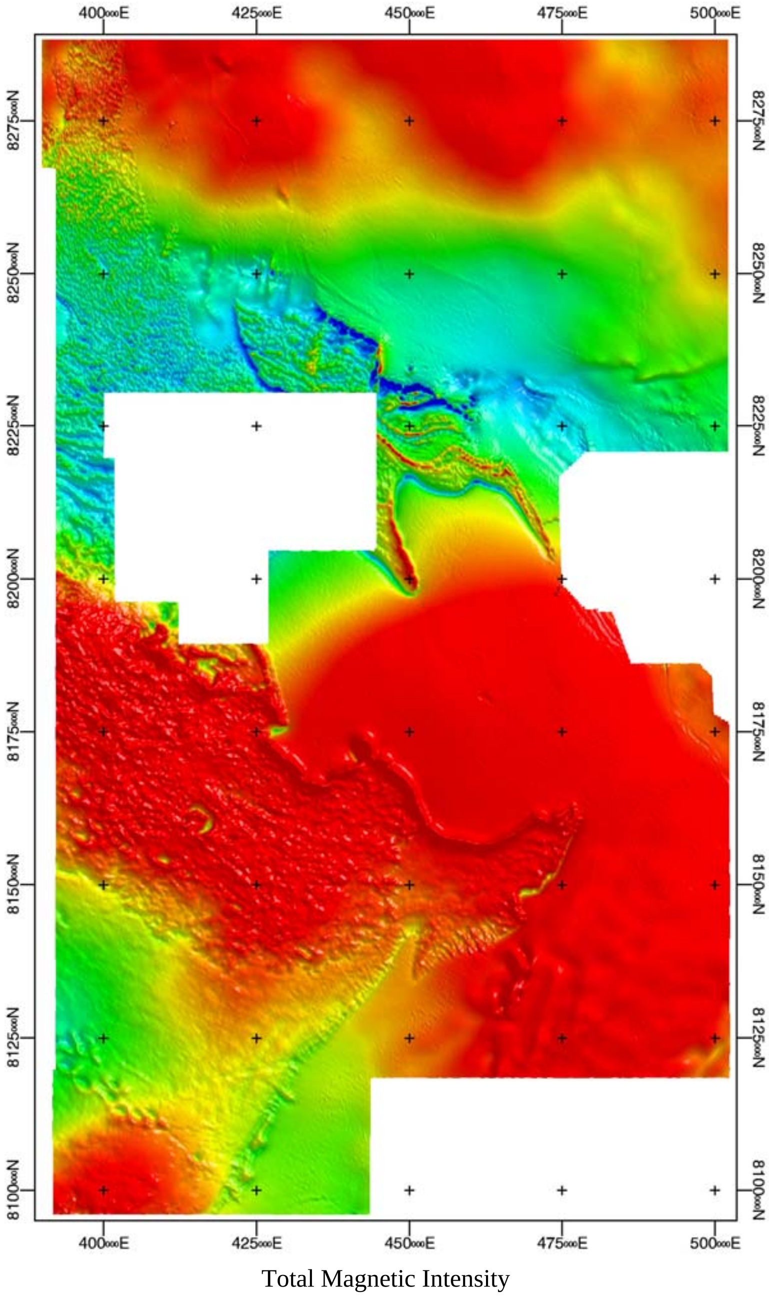
392100.000	8230100.000
392100.000	8267000.000
389800.000	8267000.000
389800.000	8288500.000
502100.000	8288500.000
502100.000	8220700.000
478800.000	8220700.000
474300.000	8216400.000
474800.000	8199600.000
478400.000	8195600.000
483100.000	8194800.000
486200.000	8186500.000
497400.000	8186500.000
499400.000	8184400.000
499700.000	8178400.000
502300.000	8176600.000
502300.000	8118300.000
443500.000	8118300.000
443500.000	8095800.000
391600.000	8095800.000
391600.000	8120100.000
392100.000	8120100.000
392100.000	8189600.000
426900.000	8189600.000
426900.000	8205100.000
444500.000	8205100.000
444500.000	8230100.000

Job ID code: A8690201
Client: Geoscience Australia
Job: Tanumbirini
Coordinates MGA94 zone 53

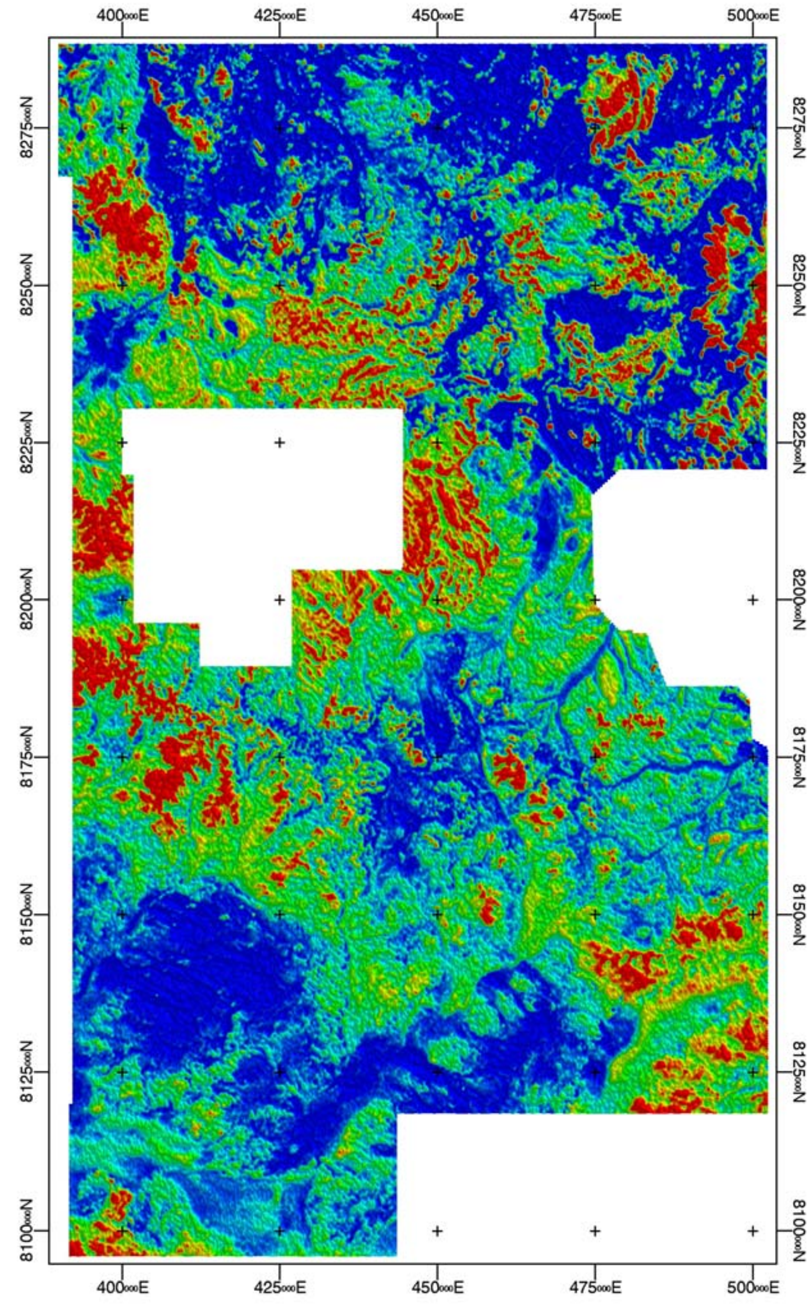
392100.000	8230095.000
399900.000	8230095.000
399900.000	8220100.000
401700.000	8220100.000
401700.000	8196500.000
412200.000	8196500.000
412200.000	8189605.000
392100.000	8189605.000

APPENDIX D - PROJECT DATA OVERVIEW

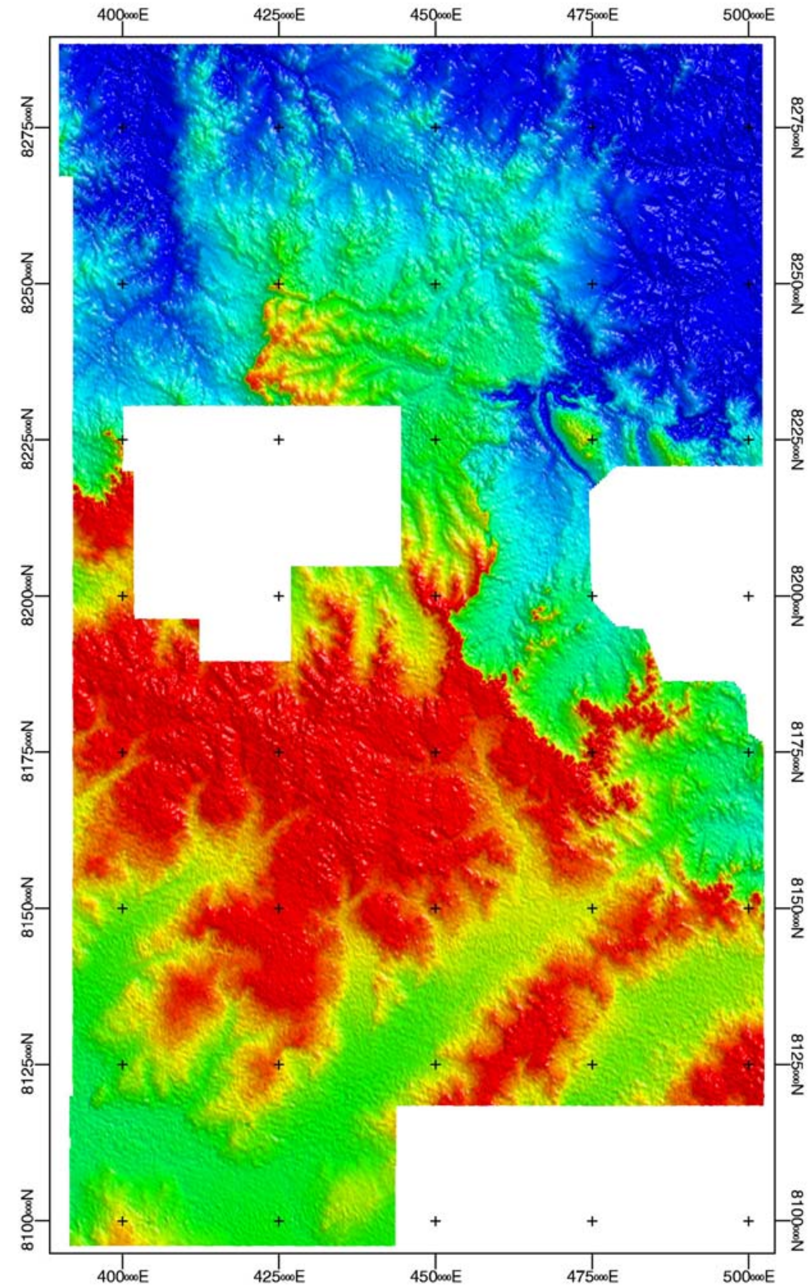
Tanumbirini Project



Total Magnetic Intensity



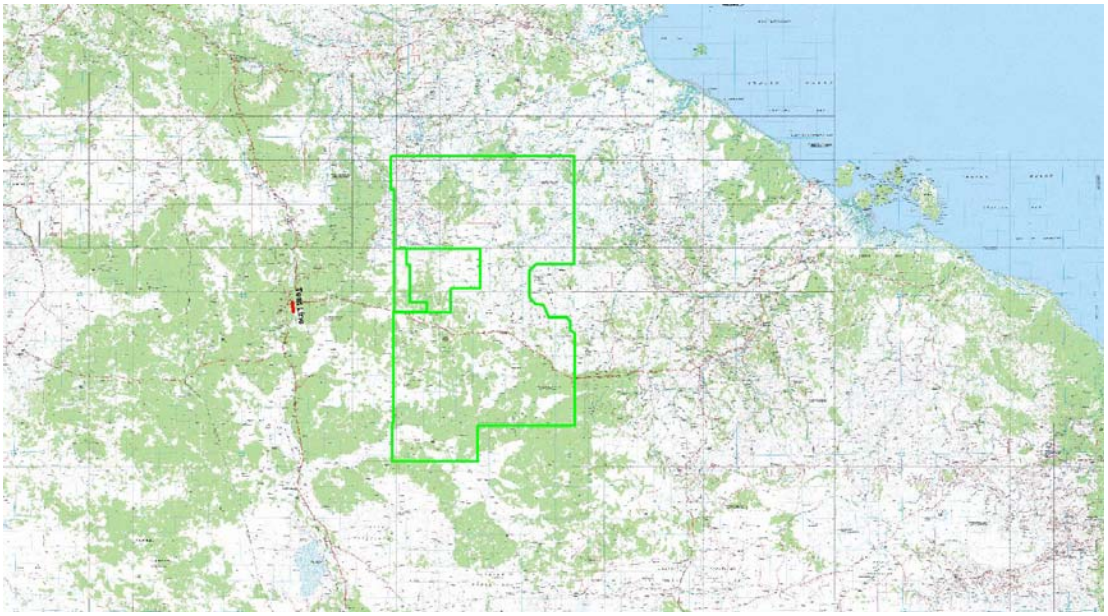
Radiometric Dose Rate



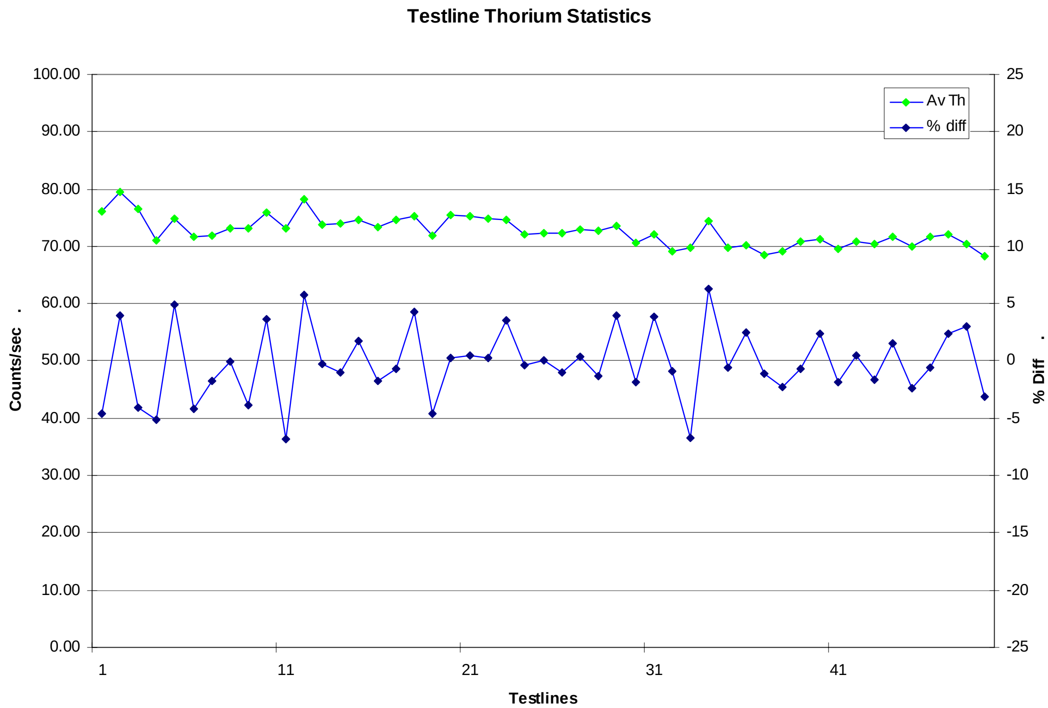
Digital Elevation Model

APPENDIX E – RADIOMETRIC CALIBRATION RESULTS

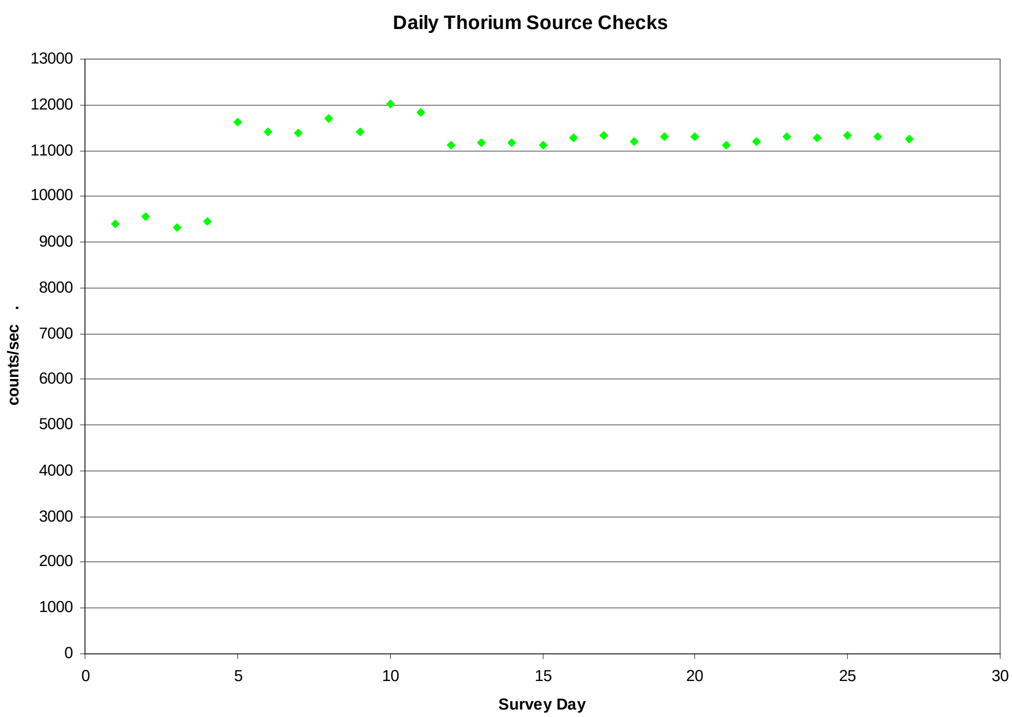
The map below shows the survey boundary and the location of the radiometric test line.



The chart below shows the average thorium value for each test line flown.



The chart below shoes the results of the daily thorium source tests for each day.



APPENDIX F – ACQUISITION AND PROCESSING PARAMETERS

Magnetic Data

RMS AADC Coefficients

Solution Date: **19/07/2007** Solution Altitude: 8000 ft AGL

Standard Deviation Total Field Uncompensated	5.711 $x10^{-1}$
Standard Deviation Total Field Compensated	2.116 $x10^{-2}$
Improvement Ratio	27
Norm	34.4

Solution Date: **20/08/2007** Solution Altitude: 8000 ft AGL

Standard Deviation Total Field Uncompensated	4.210 $x10^{-1}$
Standard Deviation Total Field Compensated	1.674 $x10^{-2}$
Improvement Ratio	25.2
Norm	32.8

Magnetic Processing Parameters

IGRF date - 2007.67
IGRF mean value - 48648.54 nT
Magnetic inclination - -45.7 deg
Magnetic declination - 4.6 deg
Diurnal base value - 48415.00 nT

Radiometric Data

Height Attenuation Coefficients

Total Count: -0.0074000
Potassium: -0.0094000
Uranium: -0.0084000
Thorium: -0.0074000

Aircraft Background Coefficients

Total Count: 33.69
Potassium: 9.27
Uranium: 0.59
Thorium: 0.05

Cosmic Correction Coefficients

Total Count: 1.615
Potassium: 0.092
Uranium: 0.087
Thorium: 0.051

Sensitivity Coefficients

Total Count: 30.486 cps/dose rate
Potassium: 116.498 cps/%k
Uranium: 14.365 cps/ppm
Thorium: 6.477 cps/ppm

Final Reduction - All data reduced to STP height datum 80m

APPENDIX G – SURVEY FLIGHT LOGS

The following table summarises the flight logs for A869 – Tanumbirini Project.

Date	Flight #	Dist-Km
70719	102	899.754
70720	103	449.908
70721	104	674.857
70721	105	449.841
70722	106	674.825
70723	107	674.849
70723	108	449.915
70724	109	674.782
70724	110	674.799
70725	111	667.931
70727	112	661.007
70727	113	440.631
70728	114	881.321
70728	115	881.286
70729	116	884.98
70729	117	728.819
70730	118	660.935
70730	119	440.638
70731	120	660.954
70820	121	881.413
70820	122	330.476
70821	123	991.471
70821	124	1106.875
70824	126	440.664
70825	127	1049.402
70825	128	1155.123
70826	129	947.037
70826	130	1192.52
70827	131	855.258
70827	132	720.061
70828	133	1041.102
70828	134	1231.041
70829	135	1076.239
70829	136	650.299
70830	137	661.948
70901	138	1103.59
70902	139	1103.627
70902	140	1324.493
70903	141	1103.765
70903	142	1103.567
70904	143	1103.676
70905	144	1103.779
70905	145	1103.581
70906	146	1103.6
70906	147	1103.709

70907	148	1103.788
70907	149	1103.603
70908	150	1103.622
70908	151	1047.867
70909	152	208.26
70914	153	553.063
70909	191	771.494
70909	192	1192.598
70914	193	340.732
70914	194	1022.23
70915	196	1735.792
70913	201	490.637
70914	202	68.32
70914	203	39.859
70915	204	135.28
70915	205	185.42
70916	206	209.177