

North East Tasmania Offshore Airborne Magnetic Survey

for

Geoscience Australia

Acquisition and Processing Report

Prepared by : W. Irvine

L. Stenning

Authorised for release by :

Survey flown: December 2008 – January 2009

by



Fugro Airborne Surveys

435 Scarborough Beach Road, Osborne Park WA 6017, Australia

Tel: (61-8) 9273 6400 Fax: (61-8) 9273 6466

FAS JOB# 2030

GA JOB# 1193

CONTENTS

1. INTRODUCTION	3
2. SURVEY DETAILS	3
2.1 Project Identification	3
2.2 Survey Location	3
2.3 Specifications and Tolerances.....	5
2.4 Job Safety Plan	5
2.5 General Disclaimer	6
3. PROJECT PERSONNEL	7
4. ACQUISITION	8
4.1 Aircraft and Equipment	8
4.2 Base Stations	8
4.3 Survey Operations.....	9
4.4 Recorded Parameters	9
4.5 Calibrations and System Checks.....	10
4.5.1 Magnetic Compensation	10
4.5.2 Radar Altimeter Stacks	11
5. PROCESSING	12
5.1 Hardware and Software.....	12
5.2 GPS Positioning	12
5.2.1 Spheroids, Datums and Zones	12
5.2.2 Quality Control.....	12
5.3 Magnetics	12
5.3.1 Quality Control.....	12
5.3.2 Parallax Correction	12
5.3.3 Diurnal Correction.....	13
5.3.4 IGRF Correction.....	13
5.3.5 Levelling	13
5.3.6 Gridding & Further Enhancements	14
5.4 Digital Terrain Model	14
5.4.1 Processing.....	14
5.4.2 Australian Height Datum.....	15
5.4.3 Gridding	15
PRELIMINARY PRODUCTS	16

6.1	Corrected MI TIFF	16
6.2	Raw Located Data	16
7.	FINAL PRODUCTS.....	16
7.1	Final Located Data	16
7.2	Final Gridded Data	16

APPENDICES

A	BASE STATION LOGS
B	OPERATIONS REPORT
C	RAW LOCATED DATA FORMATS
D	FINAL LOCATED DATA FORM

LIST OF TABLES

TABLE 1 – OPERATIONS SUMMARY	9
TABLE 2 – MAGNETIC COMPENSATION STATISTICS	10
TABLE 3 – RADAR ALTIMETER STACKS	11
TABLE 4 – PARALLAX VALUES.....	13
TABLE 5 – DIURNAL BASE VALUES.....	13
TABLE 6 – IGRF BASE VALUES	13
TABLE 7 – MAGNETIC TIE-LINE LEVELLING PARAMETERS	14
TABLE 8 – MAGNETIC MICRO-LEVELLING PARAMETERS.....	14
TABLE 9 – N-VALUE STATISTICS	15
TABLE 10 –DEM AND GADDS STATISTICS	15

1. INTRODUCTION

This report provides details of the NE Tasmania offshore airborne magnetic survey, carried out in Tasmania. The survey area consists of 29,288 line kilometres flown in one block over 26 flights. The survey was flown for the Commonwealth of Australia through Geoscience Australia (GA), and was undertaken by Fugro Airborne Surveys Pty Ltd.

2. SURVEY DETAILS

2.1 Project Identification

Area Name:	NE Tasmania Offshore, Tas
Contractor:	Fugro Airborne Surveys Pty Ltd
Geoscience Job No.:	1193
Fugro Job No.:	2030

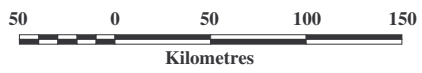
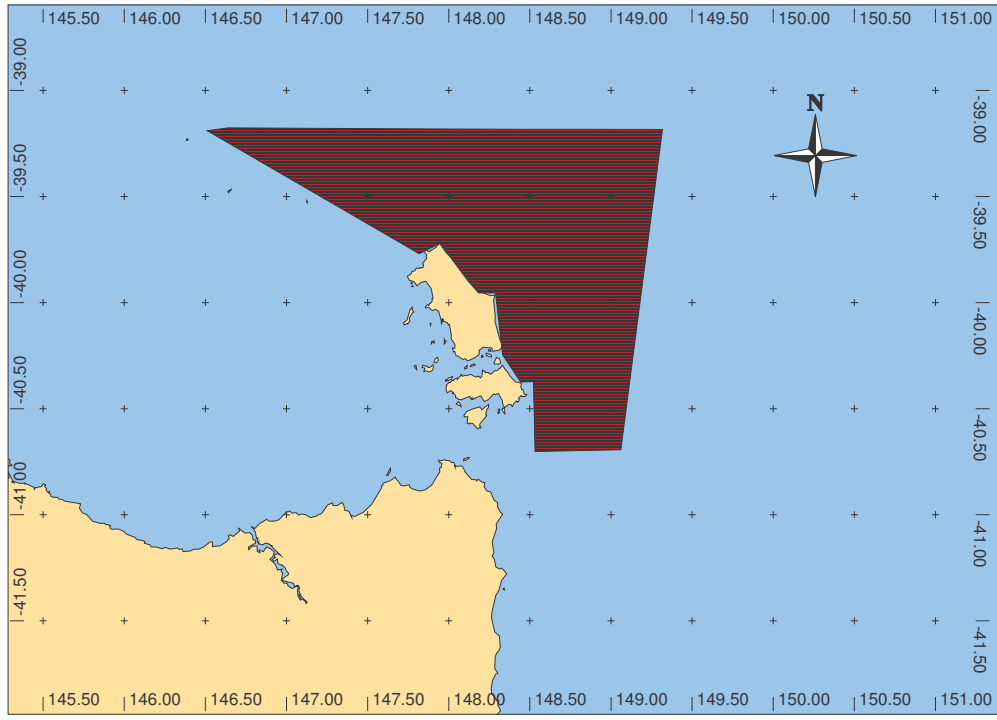
2.2 Survey Location

The survey location is shown in Figure 1.

Survey boundary co-ordinates for 800 m line spacing in GDA94 MGA Zone 55

	Longitude	Latitude
1	149.316965	-39.184103
2	149.060686	-40.693870
3	148.531687	-40.702102
4	148.522650	-40.371718
5	148.443433	-40.374212
6	148.331797	-40.245751
7	148.288339	-39.953820
8	148.183961	-39.954204
9	147.948535	-39.720139
10	147.817550	-39.768943
11	146.512102	-39.189541
12	146.636649	-39.176155
13	147.381948	-39.179233
14	147.980928	-39.181993
15	148.483393	-39.182933
16	148.861377	-39.183448

Figure 1 NE Tasmania Offshore, Tas



**Legend: Offshore NE Tasmania
Airborne Geophysical Survey**

Survey Area:
 Line Spacing: 800 metres
 Line Direction: East - West
 Flying Height: 90 metres

Landmass

Ocean

Drawn by: PJ Percival
 Date: 21st August, 2008
 Directory: C:\Peter\MapInf\Workspaces
 Workspace: p1193_NE_Tas_detailed.WOR
 Layout: 2 NE Tas Detailed Locality

2.3 Specifications and Tolerances

Fugro job number	2030
Geoscience Australia project number	1193
Line kilometres (including ties)	29,288 km
Traverse direction	090°-270°
Traverse spacing	800 m
Traverse line numbers	1000101 – 1021801
Tie-line direction	000°-180°
Tie-line spacing	4,000 m
Tie line numbers	1900101 – 1906101
Nominal Terrain Clearance	90 m

Sample Intervals:

Magnetics (aircraft)	10 Hz (approx. 6.8 m)
GPS positions	1 Hz
Radar altimeter	10 Hz
Temperature & pressure	1 Hz
Magnetics (base stations)	2 s

Contracted tolerances:

Flight or tie lines	must not exceed 20 m off course for 1 km or more
Position accuracy	5 m horizontal; 10 m height
Radar altimeter accuracy	0.3 m
Temperature accuracy	1 °C
Pressure accuracy	0.1%

Magnetic base stations:

Noise envelope	0.1 nT
Variation	5 nT in 5 minutes and less than 1 nT from any chord 1 minute long across the diurnal record

Aircraft magnetometer:

Non-geological noise envelope	0.1 nT
Variation with heading	+/- 1 nT
Total noise on unfiltered profiles	0.2 nT

Terrain clearance envelope	80 to 100 m
----------------------------	-------------

2.4 Job Safety Plan

A Job Safety Plan was prepared and implemented in accordance with the Fugro Airborne Surveys Occupational Safety & Health Management System.

2.5 General Disclaimer

It is Fugro Airborne Survey's understanding that the data and report provided to the client is to be used for the purpose agreed between the parties. That purpose was a significant factor in determining the scope and level of the Services being offered to the Client. Should the purpose for which the data and report is used change, the data and report may no longer be valid or appropriate and any further use of, or reliance upon, the data and report in those circumstances by the Client without Fugro Airborne Survey's review and advice shall be at the Client's own or sole risk.

The Services were performed by Fugro Airborne Survey exclusively for the purposes of the Client. Should the data and report be made available in whole or part to any third party, and such party relies thereon, that party does so wholly at its own and sole risk and Fugro Airborne Survey disclaims any liability to such party.

Where the Services have involved Fugro Airborne Survey's use of any information provided by the Client or third parties, upon which Fugro Airborne Survey was reasonably entitled to rely, then the Services are limited by the accuracy of such information. Fugro Airborne Survey is not liable for any inaccuracies (including any incompleteness) in the said information, save as otherwise provided in the terms of the contract between the Client and Fugro Airborne Survey.

3. PROJECT PERSONNEL

PROJECT SUPERVISION	Bart Anderson – Fugro: data acquisition Adam Shales – Fugro: data processing
SURVEY PILOTS	Tim Millsteed, Kobus Terblanche, Neil Davies Terry Miller
SURVEY OPERATORS	Richard Butterfield (crew Leader), John Black, Steve Richards,
FIELD PROCESSING	Richard Butterfield (crew leader)
TECHNICIAN/ENGINEER	Clint Hazelwood
DATA PROCESSING	Wayne Irvine

4. ACQUISITION

4.1 Aircraft and Equipment

VH-FGO

Aircraft Model	Diamond Twin Star DA42
Aircraft Registration	VH-FGO
Aircraft Magnetometer	Scintrex CS-3 Caesium vapour
Magnetic Compensator	Fugro FASDAS mag decoupler unit
Vector Magnetometer	Billingsley TFM-100G2 3-axis
Base station magnetometer	2 x Scintrex ENVI Mag magnetometer
Altimeter	Collins ALT55 radio altimeter
Barometer	Paroscientific Digibaro
Thermometer	Vaisala HMY133 temperature & humidity sensor
Navigation system	Fugro Omnistar in VBS (Virtual Base Station) Novatel OEM5 GPS receiver
Data acquisition system	FAS digital acquisition system

4.2 Base Stations

Base Station Logs can be found in Appendix A.

GPS Receiver

Model Novatel OEM5 GPS Receiver

The acquired WGS84 GPS positions (latitude, longitude and altitude) were differentially post-processed in the field. Final co-ordinates reference GDA94, MGA Zone 55.

Magnetometers

Two Scintrex ENVI mag base station magnetometers were used to measure the daily variations of the Earth's magnetic field. The base stations were established in an area of low gradient, away from cultural influences. These data were displayed and recorded on a laptop computer. The base stations were run continuously throughout the survey flying period with a sampling interval of 2 seconds and a sensitivity of 0.1 nT.

The base station data were closely examined after each days production flying to determine if any data had been acquired during periods of out-of-specification diurnal variation.

4.3 Survey Operations

A summary of the acquisition phase is given in Table 1. Full operations reports are provided in Appendix B.

Date	Aircraft	Base	Comment
December 7, 2008	VH-FGO	Flinders Island	Acquisition commenced
Dec 23 2008 – Jan 7, 2009	VH-FGO	Flinders Island	Christmas break
January 30, 2009	VH-FGO	Flinders Island	Acquisition complete

TABLE 1 – OPERATIONS SUMMARY

4.4 Recorded Parameters

All acquired data were recorded digitally.

The following parameters are recorded at 10 Hz:

<i>Parameter</i>	<i>Resolution</i>	<i>units</i>
Fiducial number	1.0	unit
Uncompensated Total Magnetic Intensity (TMI)	0.001	nT
Fluxgates X, Y & Z	0.01	nT
Fluxgate Total Field	0.01	nT
Compensated TMI	0.001	nT
Terrain clearance (radar altimeter)	0.01	m

The following parameters are recorded at 1 Hz:

<i>Parameter</i>	<i>Resolution</i>	<i>units</i>
GPS time	1.0	s
Latitude	0.0000001	°
Longitude	0.0000001	°
GPS height	0.01	m
Outside air temperature	1.0	°C
Barometric pressure	0.01	hPa
Number of satellites	1.0	
Position dilution of precision (PDOP)	0.1	
HDOP	0.1	

4.5 Calibrations and System Checks

4.5.1 Magnetic Compensation

Magnetic compensation sequences were flown before acquisition commenced and after routine maintenance was performed, as required. The resulting coefficients were used for real-time magnetic compensation:

Aircraft	Date	Flight	StdDev (UnC)	StdDev (Cmp)	IR
VH-EXS	8/12/08	1	0.156	0.015	10.400
	18/12/08	7	0.252	0.032	7.865
	10/01/08	13	0.137	0.012	11.700
	23/01/08	20	0.168	0.015	11.528

TABLE 2 – MAGNETIC COMPENSATION STATISTICS

UNC: Standard deviation of uncompensated TMI (nT)

CMP: Standard deviation of compensated TMI (nT)

IR: Improvement ratio (UNC/CMP)

4.5.2 Radar Altimeter Stacks

Prior to commencement of acquisition, radar altimeter stacks were flown as accurately as possible with reference to the radar altimeter indicator, which was set at a pre-determined height. The results are shown below in Table 3.

RADAR ALTIMETER/BAROMETRIC ALTIMETER CHECK VH-FGO

Flown 17th October, 2008

Planned Height (feet)	Planned Height (metres)	Radar Altimeter (metres)	Barometric Height (metres)	GPS Height (metres)	Hr – Hb (metres)	Hr – Hg (metres)
100	30	33	32	34	1	-1
150	46	48	48	49	0	-1
200	61	62	60	63	3	0
250	76	79	80	79	-1	0
300	91	95	94	94	1	0
350	107	111	114	111	-3	0
400	122	127	125	126	2	1
500	152	161	164	162	-3	0
600	183	198	199	198	-1	1
800	244	253	255	253	-1	1
1000	305	316	316	315	0	1

TABLE 3 – RADAR ALTIMETER STACKS

5. PROCESSING

5.1 Hardware and Software

All data processing was carried out by Fugro Airborne Surveys Pty Ltd in its Western Australia office in Osborne Park, Perth.

Hardware	Xeon PC (Windows XP) HP Designjet T1100 plotters Pioneer DVD writer
Software	Fugro in-house software Oasis Montaj 6.4.2

5.2 GPS Positioning

5.2.1 Spheroids, Datums and Zones

The acquired GPS positions (latitude, longitude and altitude) were differentially post-processed in the field. Final co-ordinates reference GDA94, MGA Zone 55.

The 1 Hz position data was interpolated to coordinate all 10 Hz data.

5.2.2 Quality Control

The following position quality control plots were produced:

- flight path
- ground speed

5.3 Magnetics

5.3.1 Quality Control

The following quality control plots were produced:

- diurnal variation
- radar altimeter

This visual aspect of quality control was aided by the determination of statistics (max., min., mean and SD.) for all parameters for every line.

System spikes were removed from the magnetic data but cultural responses were retained.

5.3.2 Parallax Correction

Parallax error is caused by the physical difference in distance between the various sensors, the electronic delay and software timing in the acquisition system. Hence all variables are subjected to a displacement from the GPS co-ordinates. If these variables are processed without a position offset a parallax error will occur. The co-ordinates were moved by linear interpolation.

Data	Parallax
GPS easting	-0.5 sec (~34.2 m)
GPS northing	-0.5 sec (~34.2 m)
GPS height	-0.5 sec (~34.2 m)
Magnetics	-0.8 sec (~54.8 m)
Radar altitude	0 sec
Pressure	1 sec (~68.5 m)
Temperature	0 sec

TABLE 4 – PARALLAX VALUES

5.3.3 Diurnal Correction

The magnetic data were corrected for diurnal variations. The correction formula was:

diurnal corrected TMI = compensated TMI *minus* diurnal *plus* mean diurnal value

Area Name	Flights	Mean Diurnal Value
NE Tasmania Offshore	2-11	60688 nT
NE Tasmania Offshore	12 - 25	60700 nT
NE Tasmania Offshore	14	60708.6
NE Tasmania Offshore	21	60703.4

TABLE 5 – DIURNAL BASE VALUES

5.3.4 IGRF Correction

The International Geophysical Reference Field (IGRF) was removed from the data using the 2005 model extrapolated to the survey date 30/12/2008. The correction formula was:

IGRF corrected MI = diurnal corrected TMI *minus* local IGRF.

Area Name	Mean IGRF Value
NE Tasmania Offshore	60540 nT

TABLE 6 – IGRF BASE VALUES

5.3.5 Levelling

Using the tie lines (flown at 90 degrees to the traverse lines) a set of miss-tie values were determined. These miss-tie values reflected the differences in the magnetic value between the tie lines and the traverse lines over the same geographical point. Using a least squares fit algorithm, which also takes into account the statistical variation inherent in DGPS positioning, a series of corrections were applied to the traverse line data. These allowed the data to be levelled to the same base value.

Tie line levelling and further micro-levelling produced the final levelled magnetics. The parameters used for levelling the magnetics are shown in Table 7 and 8.

Tie Lines	Mean Correction
Traverse Lines	To all crossovers 5 point median filter, 5 point Hanning filter

TABLE 7 – MAGNETIC TIE-LINE LEVELLING PARAMETERS

Filter Type	High Pass	Threshold (nT)
Hanning	23 cells	0.1
Hanning	11 cells	0.2

TABLE 8 – MAGNETIC MICRO-LEVELLING PARAMETERS

5.3.6 Gridding & Further Enhancements

A bi-cubic spline algorithm was used to produce gridded data of 160 metre cell size.

The RMI gridded data was then reduced to the pole and a first vertical derivative of the RTP grid calculated.

Inputs into the RTP algorithm:

Inclination: - 70.221°

Declination: 13.833°

5.4 Digital Terrain Model

5.4.1 Processing

The form of the calculation used was:

$$\text{Digital Terrain} = \text{GPS altitude} - \text{Radar Altimeter} - 1.65 \text{ m}$$

where,

GPS Altitude is flying height above ellipsoid (WGS84),
Radar Altimeter is flying height above ground and,
a 1.65 m correction was made to allow for the vertical distance
between the GPS antenna and the radar altimeter.

The DTM was then clipped approximately to “over land” areas only.

5.4.2 Australian Height Datum

Minimum N-value (m)	Maximum N-value (m)	Mean N-value (m)	StdDev N-value (m)
-1.43	3.34	1.61	0.84

TABLE 9 – N-VALUE STATISTICS

The final AHD corrected terrain values were then compared to national gravity database elevations (GADDS) in order to check the accuracy of the heights. This was done by subtracting the AHD grid elevations (interpolated from the grid for each GADDS elevation point) from the GADDS elevations. Due to the paucity of “over land data”, only 7 GADDS points coincided with the DTM grid. The results are shown in Table 10.

Min	-3.7
Max	3.5
Mean	0.1
StdDev	2.5

TABLE 10 – DEM AND GADDS STATISTICS

5.4.3 Gridding

A bi-cubic spline algorithm was used to produce gridded data of 160 metre cell size.

PRELIMINARY PRODUCTS

6.1 Corrected RMI TIFF

A TIFF image of the corrected RMI channel was made and delivered, where:

$$\text{RMI} = \text{mag} - \text{diurnal} + \text{"diurnal base"} - \text{IGRF}$$

6.2 Raw Located Data

- 0.1 second magnetics
- 0.1 second digital terrain

Preliminary raw located data is in ASEG-GDF II format. Descriptions of each are shown in Appendix C.

7. FINAL PRODUCTS

7.1 Final Located Data

- 0.1 second magnetics
- 0.1 second digital terrain

Final located data is in ASEG-GDF II format. Descriptions are shown in Appendix D.

7.2 Final Gridded Data

Final gridded data was produced in ERMapper format.

- Digital terrain model (DTM), AHD m
- Residual magnetic intensity (mag), nT
- Residual magnetic intensity reduced to the pole (RTP), nT
- RTP 1st vertical derivative (RTP1VD), nT/m

APPENDIX A

BASE STATION LOGS

VH-FGO Base Records

GPS Base Records

Job Number:	2030	Client:	Geoscience Australia
Aircraft:	VH-FGO	Job Name:	Flinders Island Offshore NE, Tasmania
Date Calculated:	08-Dec-08	Crew Leader:	Richard Butterfield
Calculated by:	Richard Butterfield	Signature:	

BASE GPS - Calculated Base GPS Co-ordinates

Latitude: ° ' " Longitude: ° ' " Height: m

Antenna Location: On the roof of the Hotel above the office

Magnetic Base Station Records

Date:

UTC Offset: (i.e. GMT +/- {?} Hours) Hrs

Base Magnetometer # 1

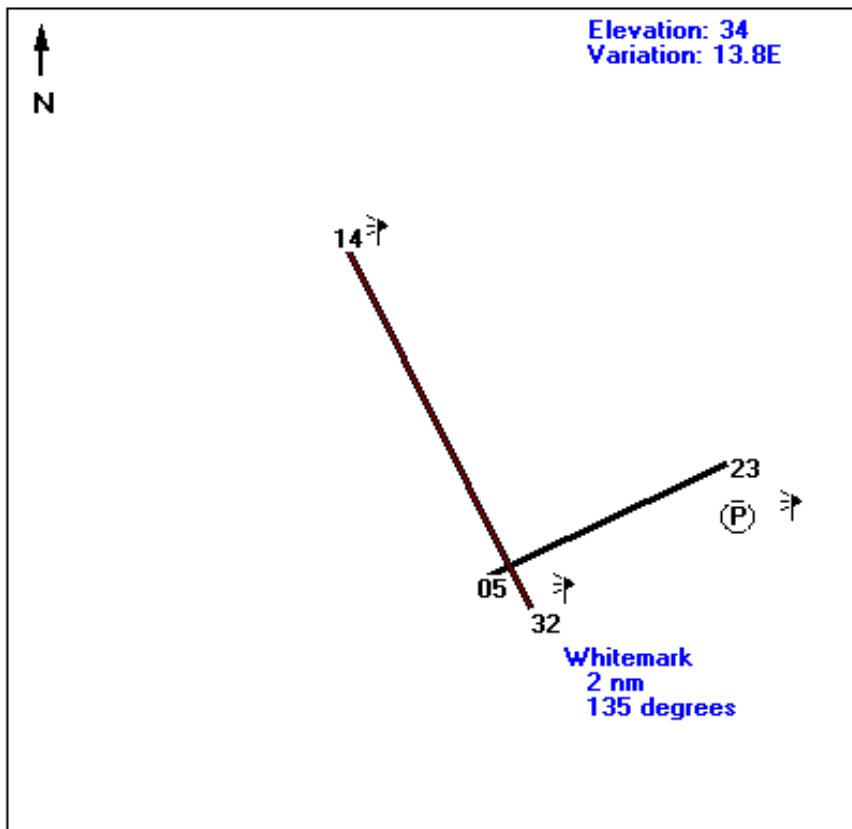
Date 12/6/2008

Location:	<input type="text" value="South of runway 23, behind the offices"/>	<input type="text" value="60719.7"/> nT		
Type:	<input type="text" value="Envi"/>		2m N	
Serial No.:	<input type="text" value=""/>	<input type="text" value="60719.3"/> nT	2m W	<input type="text" value="60719.4"/> nT
				2m E <input type="text" value="60718.9"/> nT
Cycle Rate:	<input type="text" value="2"/>		2m S	
Sensor Height:	<input type="text" value="2"/> m AGL	<input type="text" value="60719.1"/> nT		

Base Magnetometer # 2

Date 12/6/2008

Location:	<input type="text" value="Roughly 100m E of Mag1"/>	<input type="text" value="60707.8"/> nT		
Type:	<input type="text" value="Envi"/>		2m N	
Serial No.:	<input type="text" value=""/>	<input type="text" value="60708.4"/> nT	2m W	<input type="text" value="60708.8"/> nT
				2m E <input type="text" value="60709.2"/> nT
Cycle Rate:	<input type="text" value="2"/>		2m S	
Sensor Height:	<input type="text" value="2"/> m AGL	<input type="text" value="60708.6"/> nT		



APPENDIX B

OPERATIONS REPORT

System: **FASDAS**
 Aircraft: **VH-FGO**

881.1 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Job Number: **2030**
 Contract Number: **QM5864**
 Job Name: **Airborne Survey Offshore NE Tasmania**
 Area Names: **Flinders Island Offshore, NE**
 Client: **Geoscience Australia**

Total Job kms: **29263.000** Kms

53.2 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: **29263.000** Kms

% Complete: **0.000** %

Date	Flt	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdb Days	Activity Contribution	Activity	COMMENTS <u>Weather, Data delivery</u> <u>Aircraft movement, etc</u>
						Start	End									
01-December-2008																
Julian Day 336																
Monday									53.2							
Date 2-Dec																
Julian Day 337																
Tuesday									53.2							
Date 3-Dec																
Julian Day 338																
Wednesday									53.2							
Date 4-Dec																
Julian Day 339																
Thursday									53.2							
Date 5-Dec	Ferry	TM	ND											0.50	MO	T.Millsteed and N.Davies Mobilise Perth to Ceduna
Julian Day 340														0.50	MO	R.Butterfield mobilises from Perth to Launceston
Friday									53.2							
Date 6-Dec	Ferry	TM	ND											0.50	MO	T.Millsteed and N.Davies Mobilise Ceduna to Flinders Is
Julian Day 341														0.25	MO	R.Butterfield flies from Launceston to Flinders Island
														0.25	SETUP	R.Butterfield sets up base stations and office area
Saturday									53.2							
Date 7-Dec	TF	TM	ND											0.50	SAF	Reece flight conducted
Julian Day 342	1	TM	RB					11:00:00	12:12:00	1.2				0.50	TF	Compbox and FOM completed successfully.
								13:30:00	14:30:00	1.0						Comment light bar was plugged into the wrong output on the
Sunday																Comment Morning flight was delayed waiting for airport refueller
										48.8	2.2					
Totals This Week: ▶								Week Hours: ▶		2.2	▲: A/C Hrs to Next Service			3.00		

System: FASDAS
Aircraft: VH-FGO

881.1 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Job Number: 2030
Contract Number: QM5864
Job Name: Airborne Survey Offshore NE Tasmania
Area Names: Flinders Island Offshore, NE
Client: Geoscience Australia

Total Job kms: 29263.000 Kms

53.2 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: 20858.854 Kms

% Complete: 28.719%

Date	Flt	Pilot initials	On board Oper initials	Production inc. Re flights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdbdy Days	Activity Contribution	Activity	COMMENTS <u>Weather, Data delivery</u> <u>Aircraft movement, etc</u>
						Start	End									
08-December-2008	2	ND	RB	470.998		10:01:00	13:02:00	3.0						0.40	P	Sortie 1
Julian Day 343		TM	JB	582.012		14:45:00	18:14:00	3.5						0.40	P	Sortie 2
Monday														0.20	E	Start of day delayed due to basestation issues
									35.8	8.7	1053.010				Comment	John Black arrives on site
Date 9-Dec	3	TM	JB	1010.785		7:05:00	12:15:00	5.2						0.50	P	Sortie 1
Julian Day 344		ND	RB	827.773		13:06:00	17:29:00	4.4						0.50	P	Sortie 2
Tuesday																
Date 10-Dec	4	ND	RB	1112.038		7:24:00	12:30:00	5.1						0.50	P	Sortie 1
Julian Day 345		TM	JB	880.173		13:10:00	18:01:00	4.9						0.50	P	Sortie 2
Wednesday															Comment	Clint Hazelwood arrives on site
Date 11-Dec	5	TM	JB	1081.248		7:15:00	12:22:00	5.1		28.2	4883.779			0.50	P	Sortie 1
Julian Day 346		ND	RB	986.686		13:09:00	18:00:00	4.9						0.50	P	Sortie 2
Thursday																
Date 12-Dec	6	ND	RB	851.681		7:10:00	11:20:00	4.2		38.2	6951.713			0.50	P	
Julian Day 347		TM	JB	600.752		12:30:00	15:40:00	3.2						0.50	P	
Friday															Comment	Operations suspended due to bad weather
										38.0	45.5	8404.146				
Date 13-Dec														1.00	PDO	Pilots both due for a days rest
Julian Day 348																
Saturday																
										38.0	45.5	8404.146				
Date 14-Dec														1.00	W	Extreme weather stopped operations for the day
Julian Day 349																
Sunday																
										38.0	45.5	8404.146				
Totals This Week:				8404.146		Week Hours:		43.3	▲: A/C Hrs to Next Service					7.00		

System: FASDAS
Aircraft: VH-FGO

881.1 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Job Number: 2030
Contract Number: QM5864
Job Name: Airborne Survey Offshore NE Tasmania
Area Names: Flinders Island Offshore, NE
Client: Geoscience Australia

Total Job kms: 29263.000 Kms

53.2 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: 14520.302 Kms
% Complete: 50.380 %

Date	Fit	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdby Days	Activity Contribution	Activity	COMMENTS <u>Weather, Data delivery</u> <u>Aircraft movement, etc</u>
						Start	End									
15-December-2008 Julian Day 350	Ferry	ND	CH			6:45:00	8:15:00	1.5						0.20	MA	Aircraft to Essendon for scheduled
Monday									-41.0	47.0	8404.146			0.80	MA	CH begins maintenance on VH-FGO
Date 16-Dec Julian Day 351														1.00	MA	Scheduled maintenance
Tuesday									-41.0	47.0	8404.146					
Date 17-Dec Julian Day 352	Ferry	ND	CH			15:30:00	16:51:00	1.4						0.70	MA	Scheduled maintenance
Wednesday														0.30	MA	Aircraft returned to Flinders Island
Date 18-Dec Julian Day 353	7	RB	ND			7:15:00	9:10:00	1.9						0.50	TF	Compbox completed successfully
Thursday	8	TM	JB	841.726		12:00:00	16:12:00	4.2						0.50	P	
										98.9	54.5	9245.872				
Date 19-Dec Julian Day 354	9	TM	JB	524.211		9:30:00	13:45:00	4.3						0.20	W	Take off delayed a few hrs due to bad
Friday		ND	RB	1097.463		13:15:00	17:30:00	4.3						0.40	P	
										90.4	63.0	10867.546				
Date 20-Dec Julian Day 355	10	ND	RB	886.953		7:30:00	11:55:00	4.4						0.50	P	Sortie 1
Saturday		TM	JB	941.510		12:45:00	17:35:00	4.8						0.50	P	Sortie 2
										81.2	72.2	12696.009				
Date 21-Dec Julian Day 356	11	TM	JB	966.066		7:15:00	12:25:00	5.2						0.50	P	Sortie 1
Sunday		ND	RB	1080.623		12:53:00	17:59:00	5.1						0.50	P	Sortie 2
										70.9	82.5	14742.698				
Totals This Week:				6338.552		Week Hours:		37.0	▲ : A/C Hrs to Next Service					7.00		

System: FASDAS
 Aircraft: VH-FGO

881.1 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Job Number: 2030
 Contract Number: QM5864
 Job Name: Airborne Survey Offshore NE Tasmania
 Area Names: Flinders Island Offshore, NE
 Client: Geoscience Australia

Total Job kms: 29263.000 Kms

53.2 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: 13034.606 Kms
 % Complete: 55.457%

Date	Fit	Pilot initials	On board Oper initials	Production inc. Refflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	StdbY Days	Activity Contribution	Activity	COMMENTS Weather, Data delivery Aircraft movement, etc
						Start	End									
22-December-2008	12	ND	RB	730.724		6:00:00	10:00:00	4.0						0.50	P	Sortie 1
Julian Day 357		TM	JB	754.972		11:00:00	15:10:00	4.2						0.50	P	Sortie 2
Monday									62.8	90.7	16228.394					Comment RB, TM, ND, CH all demob for christmas break
Date 23-Dec														1.00	Comment	JB demob for christmas break
Julian Day 358																
Tuesday									62.8	90.7	16228.394					
Date 24-Dec																
Julian Day 359																
Wednesday									62.8	90.7	16228.394					
Date 25-Dec																
Julian Day 360																
Thursday									62.8	90.7	16228.394					
Date 26-Dec																
Julian Day 361																
Friday									62.8	90.7	16228.394					
Date 27-Dec																
Julian Day 362																
Saturday									62.8	90.7	16228.394					
Date 28-Dec																
Julian Day 363																
Sunday									62.8	90.7	16228.394					
Totals This Week: ▶				1485.696		Week Hours: ▶		8.2	▲: A/C Hrs to Next Service					2.00		

System: FASDAS
Aircraft: VH-FGO

881.1 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Job Number: 2030
Contract Number: QM5864
Job Name: Airborne Survey Offshore NE Tasmania
Area Names: Flinders Island Offshore, NE
Client: Geoscience Australia

Total Job kms: 29263.000 Kms

53.2 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: 10615.553 Kms
% Complete: 63.723 %

Date	Fit	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdbys Days	Activity Contribution	Activity	COMMENTS <u>Weather, Data delivery</u> <u>Aircraft movement, etc</u>
						Start	End									
05-January-2009																
Julian Day 5																
Monday									62.8	90.7	16228.394					
Date 6-Jan																
Julian Day 6																
Tuesday									62.8	90.7	16228.394					
Date 7-Jan														1.00	MO	mobilisation to job, overnight in Launceston
Julian Day 7																
Wednesday									62.8	90.7	16228.394					
Date 8-Jan														0.50	MO	Crew arrive on Flinders Island
Julian Day 8														0.50	SETUP	RB and SR setup base stations ready for survey
Thursday									62.8	90.7	16228.394					
Date 9-Jan	Check	TM,KH	MH			9:00:00	12:12:00	3.2						1.00	TR	MH on site to conduct check flights with TM and KH
Julian Day 9															Comment	Pilots debriefed in the afternoon
Friday									59.6	93.9	16228.394					
Date 10-Jan	13	KT	SR			6:00:00	7:20:00	1.3						0.20	TF	Compbox due to starter motor change.
Julian Day 10	14	KT	SR	386.578	15.683	11:30:00	14:20:00	2.8						0.40	P & S	Sortie1
Saturday		TM	RB	267.089		15:00:00	17:55:00	2.9						0.40	P	Sortie2
Date 11-Jan	15	TM	RB	866.011		7:30:00	12:10:00	4.7						0.50	P	Sortie1
Julian Day 11		KT	SR	899.375		13:00:00	18:00:00	5.0						0.50	P	Sortie2
Sunday																
									42.8	110.6	18647.447	15.683				
Totals This Week: ▶				2419.053	15.683	Week Hours: ▶		20.0	▲: A/C Hrs to Next Service					5.00		

System: FASDAS
Aircraft: VH-FGO

881.1 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Job Number: 2030
Contract Number: QM5864
Job Name: Airborne Survey Offshore NE Tasmania
Area Names: Flinders Island Offshore, NE
Client: Geoscience Australia

Total Job kms: 29263.000 Kms

53.2 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: 5020.830 Kms

% Complete: 82.842%

Date	Flt	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdb Days	Activity Contribution	Activity	COMMENTS <u>Weather, Data delivery</u> <u>Aircraft movement, etc</u>
						Start	End									
12-January-2009	16	KT	SR	792.794		7:20:00	12:20:00	5.0						0.50	P	Sortie1
Julian Day 12		TM	RB	781.911		13:45:00	18:30:00	4.8						0.50	P	Sortie2
Monday									33.1	120.4	20222.152	15.683				
Date 13-Jan	17	TM	RB	849.367	170.452	7:25:00	12:20:00	4.9						0.50	P & S	Sortie1
Julian Day 13		KT	RB	1021.986		13:15:00	18:30:00	5.3						0.50	P	Sortie2
Tuesday									22.9	130.5	22093.505	186.135			Comment	Mag failed to start when FASDAS started
Date 14-Jan	18	SR	KT	887.270	63.302	7:30:00	12:10:00	4.7						0.50	P & S	Sortie1
Julian Day 14		TM	RB	947.647		13:00:00	18:05:00	5.1						0.50	P	Sortie2
Wednesday									13.1	140.3	23928.422	249.437				
Date 15-Jan	19	TM	RB	313.748		7:20:00	9:55:00	2.6						0.50	P	
Julian Day 15													0.50	0.50	W	Strong winds and very rough seas ended ops
Thursday									10.6	142.9	24242.170	249.437				
Date 16-Jan													1.00	1.00	W	No flying due to bad weather
Julian Day 16															Comment	RB, SR, TM all return to Perth for maintenance
Friday									10.6	142.9	24242.170	249.437				
Date 17-Jan	Ferry	KT	GB			7:30:00	8:45:00	1.3						1.00	MA	Aircraft flown to Essendon for periodic maintenance
Julian Day 17																
Saturday									9.3	144.1	24242.170	249.437				
Date 18-Jan														1.00	MA	Periodic maintenance
Julian Day 18																
Sunday									9.3	144.1	24242.170	249.437				
Totals This Week:				5594.723	233.754	Week Hours:		33.5	▲: A/C Hrs to Next Service			1.50	7.00			

System: FASDAS
Aircraft: VH-FGO

881.1 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Job Number: 2030
Contract Number: QM5864
Job Name: Airborne Survey Offshore NE Tasmania
Area Names: Flinders Island Offshore, NE
Client: Geoscience Australia

Total Job kms: 29263.000 Kms

53.2 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: 4013.675 Kms
% Complete: 86.284 %

Date	Flt	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdby Days	Activity Contribution	Activity	COMMENTS <u>Weather, Data delivery</u> <u>Aircraft movement, etc</u>
						Start	End									
19-January-2009 Julian Day 19														1.00	MA	Periodic maintenance
Monday									9.3	144.1	24242.170	249.437				
Date 20-Jan Julian Day 20														1.00	MA	Periodic maintenance
Tuesday									9.3	144.1	24242.170	249.437				
Date 21-Jan Julian Day 21														1.00	MA	Periodic maintenance
Wednesday									9.3	144.1	24242.170	249.437				
Date 22-Jan Julian Day 22														1.00	MA	Periodic maintenance
Thursday															Comment	RB travels from Perth to Launceston
Date 23-Jan Julian Day 23	Test Ferry	KT KT	GB GB			8:00:00 10:00:00	8:20:00 11:12:00	0.3 1.2						0.20 0.20	TF MO	test flight after maintenance to ensure safety Aircraft is returned to Flinders Island
Friday														0.20	SETUP	RB arrives on Flinders Is and setups base stations
														0.20	SAF	Safety meeting held prior to start of survey
						14:30:00	15:40:00	1.2	106.6	146.8	24242.170	249.437		0.20	TF	Compbox and FOM carried out due to maintenance
Date 24-Jan Julian Day 24													1.00	1.00	W	Operations suspended due to bad weather
Saturday									106.6	146.8	24242.170	249.437				
Date 25-Jan Julian Day 25	21	KT	RB	1007.155		9:30:00	14:50:00	5.3						1.00	P & R	T19006 reflow from flt 0014 due to diurnal out of
Sunday																
									101.3	152.1	25249.325	249.437				
Totals This Week: ▶				1007.155		Week Hours: ▶		8.0	▲: A/C Hrs to Next Service				1.00	7.00		

System: FASDAS
Aircraft: VH-FGO

881.1 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Total Job kms: 29263.000 Kms

53.2 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: 0.000 Kms
% Complete: 100.000 %

Job Number: 2030
Contract Number: QM5864
Job Name: Airborne Survey Offshore NE Tasmania
Area Names: Flinders Island Offshore, NE
Client: Geoscience Australia

Date	Fit	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdb Days	Activity Contribution	Activity	COMMENTS Weather, Data delivery Aircraft movement, etc	
						Start	End										
26-January-2009 Julian Day 26	22	KT	RB	1016.159		7:50:00	14:00:00	6.2						1.00	P & R	T19045 reflown from fit 0017	
Monday																	
Date 27-Jan Julian Day 27	23	KT	RB	1228.948		9:00:00	15:20:00	6.3	88.8	158.3	26265.484	249.437		1.00	P & R	T19027 reflown from Fit 0018	
Tuesday																	
Date 28-Jan Julian Day 28	24	KT	RB	1166.667		12:30:00	18:25:00	5.9						1.00	P		
Wednesday																	
Date 29-Jan Julian Day 29	25	KT	RB	786.454		9:30:00	14:25:00	4.9	82.8	170.6	28661.099	249.437		1.00	P	Survey complete, await confirmation 2	
Thursday																	
Date 30-Jan Julian Day 30	26	KT	RB			10:00:00	11:12:00	1.2	77.9	175.5	29447.553	249.437		0.50	TF	Radalt stacks carried out	
Friday																	
Date 31-Jan Julian Day 31	Ferry	KT	RB			10:00:00	14:30:00	4.5	76.7	176.7	29447.553	249.437		0.50	Comment	Awaiting demob from Flinders Island	
Saturday																	
Date 1-Feb Julian Day 32									72.2	181.2	29447.553	249.437					
Sunday																	
Totals This Week: ▶				4198.228		Week Hours:▶		29.0	▲: A/C Hrs to Next Service					6.00			

APPENDIX C

RAW LOCATED DATA FORMATS

MAGNETICS – RAW

COMM RAW POINT LOCATED DATA
 COMM
 COMM GEOSCIENCE AUSTRALIA PROJECT NUMBER: 1193
 COMM
 COMM JOB NUMBER: 2030
 COMM SURVEY COMPANY: Fugro Airborne Surveys
 COMM CLIENT: Geoscience Australia
 COMM SURVEY TYPE: Magnetic Survey
 COMM AREA NAME: Offshore NE Tasmania
 COMM STATE: TAS
 COMM COUNTRY: Australia
 COMM SURVEY FLOWN: December 2008 – January 2009
 COMM LOCATED DATA CREATED: Tue Feb 10 09:18 2008
 COMM
 COMM SURVEY SPECIFICATIONS:
 COMM
 COMM TRAVERSE LINE SPACING: 800 m
 COMM TRAVERSE LINE DIRECTION: 090 – 270 deg
 COMM TIE LINE SPACING: 4000 m
 COMM TIE LINE DIRECTION: 000 – 180 deg
 COMM NOMINAL TERRAIN CLEARANCE: 90 m
 COMM RAW LINE KILOMETRES: 29331 km
 COMM
 COMM LINE NUMBERING
 COMM
 COMM TRAVERSE LINE NUMBERS: 1000101 – 1021801
 COMM TIE LINE NUMBERS: 1900101 – 1906101
 COMM
 COMM AREA BOUNDARY
 COMM DATUM GDA94
 COMM PROJECTION MGA
 COMM ZONE 55
 COMM
 COMM longitude latitude
 COMM 149.316965 -39.184103
 COMM 149.060686 -40.693870
 COMM 148.531687 -40.702102
 COMM 148.522650 -40.371718
 COMM 148.443433 -40.374212
 COMM 148.331797 -40.245751
 COMM 148.288339 -39.953820
 COMM 148.183961 -39.954204
 COMM 147.948535 -39.720139
 COMM 147.817550 -39.768943
 COMM 146.512102 -39.189541
 COMM 146.636649 -39.176155
 COMM 147.381948 -39.179233
 COMM 147.980928 -39.181993
 COMM 148.483393 -39.182933
 COMM 148.861377 -39.183448
 COMM
 COMM SURVEY EQUIPMENT
 COMM
 COMM AIRCRAFT: VH-FGO Diamond DA42
 COMM
 COMM MAGNETOMETER: Scintrex CS-3 CV Magnetometer
 COMM INSTALLATION: Tail stinger installation

COMM RESOLUTION: 0.001 nT
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM BASE MAGNETOMETER: Scintrex Envi-mag
 COMM RECORDING INTERVAL: 2 s
 COMM LOCATION: Narrogin Airport
 COMM
 COMM THERMOMETER: Vaisala HMY133 Temperature and Humidity sensor
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM BAROMETER: Paroscientific Digibaro
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM RADAR ALTIMETER: Collins ALT55 Radio Altimeter
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM NAVIGATION: real-time differential GPS
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM ACQUISITION SYSTEM: Fugro DAS
 COMM
 COMM DATA PROCESSING
 COMM
 COMM CO-ORDINATES
 COMM PARALLAX CORRECTION (RAW DATA, NOT APPLIED): -0.5 s
 COMM
 COMM RADAR ALTIMETER DATA
 COMM PARALLAX CORRECTION (RAW DATA, NOT APPLIED): 0 s
 COMM
 COMM MAGNETIC DATA
 COMM PARALLAX CORRECTION (RAW DATA, NOT APPLIED): 0 s
 COMM
 COMM TEMPERATURE DATA
 COMM PARALLAX CORRECTION (RAW DATA, NOT APPLIED): 0 s
 COMM
 COMM PRESSURE DATA
 COMM PARALLAX CORRECTION (RAW DATA, NOT APPLIED): 1.0 s
 COMM
 COMM -----
 COMM DISCLAIMER
 COMM -----
 COMM It is Fugro Airborne Survey's understanding that the data provided to
 COMM the client is to be used for the purpose agreed between the parties.
 COMM That purpose was a significant factor in determining the scope and
 COMM level of the Services being offered to the Client. Should the purpose
 COMM for which the data is used change, the data may no longer be valid or
 COMM appropriate and any further use of, or reliance upon, the data in
 COMM those circumstances by the Client without Fugro Airborne Survey's
 COMM review and advice shall be at the Client's own or sole risk.
 COMM
 COMM The Services were performed by Fugro Airborne Survey exclusively for
 COMM the purposes of the Client. Should the data be made available in whole
 COMM or part to any third party, and such party relies thereon, that party
 COMM does so wholly at its own and sole risk and Fugro Airborne Survey
 COMM disclaims any liability to such party.
 COMM
 COMM Where the Services have involved Fugro Airborne Survey's use of any
 COMM information provided by the Client or third parties, upon which
 COMM Fugro Airborne Survey was reasonably entitled to rely, then the

COMM Services are limited by the accuracy of such information. Fugro
 COMM Airborne Survey is not liable for any inaccuracies (including any
 COMM incompleteness) in the said information, save as otherwise provided
 COMM in the terms of the contract between the Client and Fugro Airborne
 COMM Survey.

COMM -----
 COMM

COMM LINE DATA FORMAT

COMM A space is left between fixed fields so that a field of, for example,
 COMM A8 should only ever have a maximum of 7 characters in it, even when it
 COMM is a null, thus:

COMM

COMM GA Project number		-999	I4
COMM Flight number		-99	I4
COMM Line number		-999999	I8
COMM Fiducial number		-999999	I8
COMM Date (YYYYMMDD)		-9999999	I9
COMM Bearing	deg	-99	I4
COMM Raw longitude	deg	-999.999999999	F14.8
COMM Raw latitude	deg	-99.999999999	F13.8
COMM Raw easting	m	-99999.99	F10.2
COMM Raw northing	m	-999999.99	F11.2
COMM Raw altimeter	m	-999.99	F8.2
COMM Raw pressure	hPa	-999.99	F8.2
COMM Raw temperature	deg C	-9.9	F5.1
COMM Fluxgate X component	nT	-999999.999	F12.3
COMM Fluxgate Y component	nT	-999999.999	F12.3
COMM Fluxgate Z component	nT	-999999.999	F12.3
COMM Uncompensated TMI	nT	-99999.999	F11.3
COMM Compensated TMI	nT	-99999.999	F11.3
COMM Magnetic Diurnal	nT	-99999.999	F11.3

DIGITAL TERRAIN MODEL – RAW

COMM RAW POINT LOCATED DATA

COMM

COMM GEOSCIENCE AUSTRALIA PROJECT NUMBER: 1193
 COMM

COMM JOB NUMBER: 2030

COMM SURVEY COMPANY: Fugro Airborne Surveys

COMM CLIENT: Geoscience Australia

COMM SURVEY TYPE: Magnetic Survey

COMM AREA NAME: Offshore NE Tasmania

COMM STATE: TAS

COMM COUNTRY: Australia

COMM SURVEY FLOWN: December 2008 – January 2009

COMM LOCATED DATA CREATED: Tue Feb 10 09:04 2008

COMM

COMM SURVEY SPECIFICATIONS:

COMM

COMM TRAVERSE LINE SPACING: 800 m

COMM TRAVERSE LINE DIRECTION: 090 – 270 deg

COMM TIE LINE SPACING: 4000 m

COMM TIE LINE DIRECTION: 000 – 180 deg

COMM NOMINAL TERRAIN CLEARANCE: 90 m

COMM RAW LINE KILOMETRES: 29331 km

COMM

COMM LINE NUMBERING

COMM

```

COMM TRAVERSE LINE NUMBERS:                1000101 - 1021801
COMM TIE LINE NUMBERS:                    1900101 - 1906101
COMM
COMM AREA BOUNDARY
COMM DATUM                                GDA94
COMM PROJECTION                            MGA
COMM ZONE                                  55
COMM
COMM      longitude      latitude
COMM      149.316965     -39.184103
COMM      149.060686     -40.693870
COMM      148.531687     -40.702102
COMM      148.522650     -40.371718
COMM      148.443433     -40.374212
COMM      148.331797     -40.245751
COMM      148.288339     -39.953820
COMM      148.183961     -39.954204
COMM      147.948535     -39.720139
COMM      147.817550     -39.768943
COMM      146.512102     -39.189541
COMM      146.636649     -39.176155
COMM      147.381948     -39.179233
COMM      147.980928     -39.181993
COMM      148.483393     -39.182933
COMM      148.861377     -39.183448
COMM
COMM SURVEY EQUIPMENT
COMM
COMM AIRCRAFT:                            VH-FGO Diamond DA42
COMM
COMM MAGNETOMETER:                        Scintrex CS-3 CV Magnetometer
COMM INSTALLATION:                        Tail stinger installation
COMM RESOLUTION:                          0.001 nT
COMM RECORDING INTERVAL:                  0.1 s
COMM
COMM BASE MAGNETOMETER:                   Scintrex Envi-mag
COMM RECORDING INTERVAL:                  2 s
COMM LOCATION:                            Flinders Island Airport
COMM
COMM THERMOMETER:                         Vaisala HMY133 Temperature and Humidity sensor
COMM RECORDING INTERVAL:                  1.0 s
COMM
COMM BAROMETER:                           Paroscientific Digibaro
COMM RECORDING INTERVAL:                  1.0 s
COMM
COMM RADAR ALTIMETER:                     Collins ALT55 Radio Altimeter
COMM RECORDING INTERVAL:                  0.1 s
COMM
COMM NAVIGATION:                          real-time differential GPS
COMM RECORDING INTERVAL:                  1.0 s
COMM
COMM ACQUISITION SYSTEM:                  Fugro DAS
COMM
COMM DATA PROCESSING
COMM
COMM CO-ORDINATES
COMM PARALLAX CORRECTION (RAW DATA, NOT APPLIED): -0.5 s
COMM
COMM RADAR ALTIMETER DATA

```

```

COMM PARALLAX CORRECTION (RAW DATA, NOT APPLIED):           0 s
COMM
COMM MAGNETIC DATA
COMM PARALLAX CORRECTION (RAW DATA, NOT APPLIED):           -0.8 s
COMM
COMM TEMPERATURE DATA
COMM PARALLAX CORRECTION (RAW DATA, NOT APPLIED):           0 s
COMM
COMM PRESSURE DATA
COMM PARALLAX CORRECTION (RAW DATA, NOT APPLIED):           1.0 s
COMM
COMM -----
COMM DISCLAIMER
COMM -----
COMM It is Fugro Airborne Survey's understanding that the data provided to
COMM the client is to be used for the purpose agreed between the parties.
COMM That purpose was a significant factor in determining the scope and
COMM level of the Services being offered to the Client. Should the purpose
COMM for which the data is used change, the data may no longer be valid or
COMM appropriate and any further use of, or reliance upon, the data in
COMM those circumstances by the Client without Fugro Airborne Survey's
COMM review and advice shall be at the Client's own or sole risk.
COMM
COMM The Services were performed by Fugro Airborne Survey exclusively for
COMM the purposes of the Client. Should the data be made available in whole
COMM or part to any third party, and such party relies thereon, that party
COMM does so wholly at its own and sole risk and Fugro Airborne Survey
COMM disclaims any liability to such party.
COMM
COMM Where the Services have involved Fugro Airborne Survey's use of any
COMM information provided by the Client or third parties, upon which
COMM Fugro Airborne Survey was reasonably entitled to rely, then the
COMM Services are limited by the accuracy of such information. Fugro
COMM Airborne Survey is not liable for any inaccuracies (including any
COMM incompleteness) in the said information, save as otherwise provided
COMM in the terms of the contract between the Client and Fugro Airborne
COMM Survey.
COMM -----
COMM
COMM LINE DATA FORMAT
COMM A space is left between fixed fields so that a field of, for example,
COMM A8 should only ever have a maximum of 7 characters in it, even when it
COMM is a null, thus:
COMM
COMM GA Project number           -999           I4
COMM Flight number              -99           I4
COMM Line number                 -9999999     I8
COMM Fiducial number            -999999     I8
COMM Date (YYYYMMDD)            -9999999     I9
COMM Bearing                     deg          -99           I4
COMM Raw longitude               deg          -999.99999999 F14.8
COMM Raw latitude                deg          -99.99999999  F13.8
COMM Raw easting                 m           -99999.99     F10.2
COMM Raw northing                m           -999999.99    F11.2
COMM Raw altimeter               m           -999.99       F8.2
COMM Raw pressure                 hPa         -999.99       F8.2
COMM Raw temperature             deg C       -9.9          F5.1
COMM Time (GPS)                  s           -99999.9      F9.1
COMM Raw GPS height              m           -999.99       F8.2

```

APPENDIX D

FINAL LOCATED DATA FORMATS

MAGNETICS – FINAL

COMM FINAL POINT LOCATED DATA
 COMM
 COMM GEOSCIENCE AUSTRALIA PROJECT NUMBER: 1193
 COMM
 COMM JOB NUMBER: 2030
 COMM AREA NUMBER: 1
 COMM SURVEY COMPANY: Fugro Airborne Surveys
 COMM CLIENT: Geoscience Australia
 COMM SURVEY TYPE: Airborne Magnetic Survey
 COMM AREA NAME: Offshore NE Tasmania
 COMM STATE: Tasmania
 COMM COUNTRY: Australia
 COMM SURVEY FLOWN: December 2008 – January 2009
 COMM LOCATED DATA CREATED: Mon Feb 23 07:12:04 2009
 COMM
 COMM SURVEY SPECIFICATIONS:
 COMM
 COMM TRAVERSE LINE SPACING: 800 m
 COMM TRAVERSE LINE DIRECTION: 090 – 270 deg
 COMM TIE LINE SPACING: 4000 m
 COMM TIE LINE DIRECTION: 000 – 180 deg
 COMM NOMINAL TERRAIN CLEARANCE: 90 m
 COMM FINAL LINE KILOMETRES: 29,288 km
 COMM
 COMM LINE NUMBERING
 COMM
 COMM TRAVERSE LINE NUMBERS: 1000101 – 1021801
 COMM TIE LINE NUMBERS: 1900101 – 1906101
 COMM
 COMM AREA BOUNDARY
 COMM DATUM GDA94
 COMM PROJECTION MGA
 COMM ZONE 55
 COMM
 COMM longitude latitude
 COMM 149.316965 -39.184103
 COMM 149.060686 -40.693870
 COMM 148.531687 -40.702102
 COMM 148.522650 -40.371718
 COMM 148.443433 -40.374212
 COMM 148.331797 -40.245751
 COMM 148.288339 -39.953820
 COMM 148.183961 -39.954204
 COMM 147.948535 -39.720139
 COMM 147.817550 -39.768943
 COMM 146.512102 -39.189541
 COMM 146.636649 -39.176155
 COMM 147.381948 -39.179233
 COMM 147.980928 -39.181993
 COMM 148.483393 -39.182933
 COMM 148.861377 -39.183448
 COMM
 COMM SURVEY EQUIPMENT
 COMM
 COMM AIRCRAFT: VH-FGO Diamond DA42
 COMM
 COMM MAGNETOMETER: Scintrex CS-3 CV Magnetometer

```

COMM INSTALLATION: Tail stinger installation
COMM RESOLUTION: 0.001 nT
COMM RECORDING INTERVAL: 0.1 s
COMM
COMM BASE MAGNETOMETER: Scintrex Envi-mag
COMM RECORDING INTERVAL: 2 s
COMM LOCATION: Flinders Island Airport
COMM
COMM THERMOMETER: Vaisala HMY133 Temperature & Humidity Sensor
COMM RECORDING INTERVAL: 1.0 s
COMM
COMM BAROMETER: Paroscientific Digibaro
COMM RECORDING INTERVAL: 1.0 s
COMM
COMM RADAR ALTIMETER: Collins ALT55 radio altimeter
COMM RECORDING INTERVAL: 0.1 s
COMM
COMM NAVIGATION: real-time differential GPS
COMM RECORDING INTERVAL: 1.0 s
COMM
COMM ACQUISITION SYSTEM: Fugro DAS
COMM
COMM DATA PROCESSING
COMM
COMM CO-ORDINATES
COMM PARALLAX CORRECTION APPLIED: -0.5 s
COMM
COMM RADAR ALTIMETER DATA
COMM PARALLAX CORRECTION APPLIED: 0 s
COMM
COMM MAGNETIC DATA
COMM DIURNAL CORRECTION APPLIED: base value 60700 nT
COMM PARALLAX CORRECTION APPLIED: -0.8 s
COMM IGRF CORRECTION APPLIED: base value 0 nT
COMM IGRF MODEL 2005 extrapolated to: 2008/12/30
COMM DATA HAVE BEEN TIE LINE LEVELLED
COMM DATA HAVE BEEN MICROLEVELLED
COMM
COMM TEMPERATURE DATA
COMM PARALLAX CORRECTION APPLIED: 0 s
COMM
COMM PRESSURE DATA
COMM PARALLAX CORRECTION APPLIED: 1 s
COMM
COMM -----
COMM DISCLAIMER
COMM -----
COMM It is Fugro Airborne Survey's understanding that the data provided to
COMM the client is to be used for the purpose agreed between the parties.
COMM That purpose was a significant factor in determining the scope and
COMM level of the Services being offered to the Client. Should the purpose
COMM for which the data is used change, the data may no longer be valid or
COMM appropriate and any further use of, or reliance upon, the data in
COMM those circumstances by the Client without Fugro Airborne Survey's
COMM review and advice shall be at the Client's own or sole risk.
COMM
COMM The Services were performed by Fugro Airborne Survey exclusively for
COMM the purposes of the Client. Should the data be made available in whole

```

COMM or part to any third party, and such party relies thereon, that party
 COMM does so wholly at its own and sole risk and Fugro Airborne Survey
 COMM disclaims any liability to such party.

COMM

COMM Where the Services have involved Fugro Airborne Survey's use of any
 COMM information provided by the Client or third parties, upon which
 COMM Fugro Airborne Survey was reasonably entitled to rely, then the
 COMM Services are limited by the accuracy of such information. Fugro
 COMM Airborne Survey is not liable for any inaccuracies (including any
 COMM incompleteness) in the said information, save as otherwise provided
 COMM in the terms of the contract between the Client and Fugro Airborne
 COMM Survey.

COMM -----

COMM

COMM

COMM LINE DATA FORMAT

COMM A space is left between fixed fields so that a field of, for example,
 COMM A8 should only ever have a maximum of 7 characters in it, even when it
 COMM is a null, thus:

COMM

COMM GA Project number		-999	I4
COMM Flight number		-99	I4
COMM Line number		-99999	I7
COMM Fiducial number		-999999	I8
COMM Date (YYYYMMDD)		-9999999	I9
COMM Bearing	deg	-99	I4
COMM Longitude	deg	-999.999999999	F14.8
COMM Latitude	deg	-99.999999999	F13.8
COMM Easting	m	-99999.99	F10.2
COMM Northing	m	-999999.99	F11.2
COMM Altimeter	m	-999.99	F8.2
COMM Barometric Pressure	hPa	-999.99	F8.2
COMM Temperature	deg C	-9.9	F5.1
COMM Levelled RMI	nT	-99999.999	F11.3
COMM Final RMI	nT	-99999.999	F11.3

DIGITAL TERRAIN – FINAL

COMM FINAL POINT LOCATED DATA

COMM

COMM GEOSCIENCE AUSTRALIA PROJECT NUMBER: 1193

COMM

COMM JOB NUMBER: 2030

COMM AREA NUMBER: 1

COMM SURVEY COMPANY: Fugro Airborne Surveys

COMM CLIENT: Geoscience Australia

COMM SURVEY TYPE: Airborne Magnetic Survey

COMM AREA NAME: Offshore NE Tasmania

COMM STATE: Tasmania

COMM COUNTRY: Australia

COMM SURVEY FLOWN: December 2008 – January 2009

COMM LOCATED DATA CREATED: Mon Feb 23 09:19:19 2009

COMM

COMM SURVEY SPECIFICATIONS:

COMM

COMM TRAVERSE LINE SPACING: 800 m

COMM TRAVERSE LINE DIRECTION: 090 – 270 deg

COMM TIE LINE SPACING: 4000 m

COMM TIE LINE DIRECTION: 000 – 180 deg

COMM NOMINAL TERRAIN CLEARANCE: 90 m
 COMM FINAL LINE KILOMETRES: 29,288 km
 COMM
 COMM LINE NUMBERING
 COMM
 COMM TRAVERSE LINE NUMBERS: 1000101 - 1021801
 COMM TIE LINE NUMBERS: 1900101 - 1906101
 COMM
 COMM AREA BOUNDARY
 COMM DATUM GDA94
 COMM PROJECTION MGA
 COMM ZONE 55
 COMM
 COMM longitude latitude
 COMM 149.316965 -39.184103
 COMM 149.060686 -40.693870
 COMM 148.531687 -40.702102
 COMM 148.522650 -40.371718
 COMM 148.443433 -40.374212
 COMM 148.331797 -40.245751
 COMM 148.288339 -39.953820
 COMM 148.183961 -39.954204
 COMM 147.948535 -39.720139
 COMM 147.817550 -39.768943
 COMM 146.512102 -39.189541
 COMM 146.636649 -39.176155
 COMM 147.381948 -39.179233
 COMM 147.980928 -39.181993
 COMM 148.483393 -39.182933
 COMM 148.861377 -39.183448
 COMM
 COMM SURVEY EQUIPMENT
 COMM
 COMM AIRCRAFT: VH-FGO Diamond DA42
 COMM
 COMM THERMOMETER: Vaisala HMY133 Temperature & Humidity Sensor
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM BAROMETER: Paroscientific Digibaro
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM RADAR ALTIMETER: Collins ALT55 radio altimeter
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM NAVIGATION: real-time differential GPS
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM ACQUISITION SYSTEM: Fugro DAS
 COMM
 COMM DATA PROCESSING
 COMM
 COMM CO-ORDINATES
 COMM PARALLAX CORRECTION APPLIED: -0.5 s
 COMM
 COMM GPS HEIGHT DATA (HAE)
 COMM PARALLAX CORRECTION APPLIED: -0.5 s
 COMM
 COMM HEIGHT ABOVE GROUND DATA (HAG)
 COMM PARALLAX CORRECTION APPLIED: 0 s

COMM
 COMM DIGITAL TERRAIN DATA
 COMM DTM CALCULATED [DTM = HAE - (HAG + SENSOR SEPARATION)]
 COMM DATA CORRECTED TO AUSTRALIAN HEIGHT DATUM
 COMM DATA HAVE BEEN TRIMMED TO "OVER LAND" AREAS
 COMM
 COMM TEMPERATURE DATA
 COMM PARALLAX CORRECTION APPLIED: 0 s
 COMM
 COMM PRESSURE DATA
 COMM PARALLAX CORRECTION APPLIED: 1 s
 COMM
 COMM
 COMM -----
 COMM DISCLAIMER
 COMM -----
 COMM It is Fugro Airborne Survey's understanding that the data provided to
 COMM the client is to be used for the purpose agreed between the parties.
 COMM That purpose was a significant factor in determining the scope and
 COMM level of the Services being offered to the Client. Should the purpose
 COMM for which the data is used change, the data may no longer be valid or
 COMM appropriate and any further use of, or reliance upon, the data in
 COMM those circumstances by the Client without Fugro Airborne Survey's
 COMM review and advice shall be at the Client's own or sole risk.
 COMM
 COMM The Services were performed by Fugro Airborne Survey exclusively for
 COMM the purposes of the Client. Should the data be made available in whole
 COMM or part to any third party, and such party relies thereon, that party
 COMM does so wholly at its own and sole risk and Fugro Airborne Survey
 COMM disclaims any liability to such party.
 COMM
 COMM Where the Services have involved Fugro Airborne Survey's use of any
 COMM information provided by the Client or third parties, upon which
 COMM Fugro Airborne Survey was reasonably entitled to rely, then the
 COMM Services are limited by the accuracy of such information. Fugro
 COMM Airborne Survey is not liable for any inaccuracies (including any
 COMM incompleteness) in the said information, save as otherwise provided
 COMM in the terms of the contract between the Client and Fugro Airborne
 COMM Survey.
 COMM
 COMM With regard to DIGITAL TERRAIN DATA, the accuracy of the elevation
 COMM calculation is directly dependent on the accuracy of the two input
 COMM parameters, radar altitude and GPS altitude. The radar altitude value
 COMM may be erroneous in areas of heavy tree cover, where the altimeter
 COMM reflects the distance to the tree canopy rather than the ground. The
 COMM GPS altitude value is primarily dependent on the number of available
 COMM satellites. Although post-processing of GPS data will yield X and Y
 COMM accuracies in the order of 1-2 metres, the accuracy of the altitude
 COMM value is usually much less, sometimes in the ±5 metre range. Further
 COMM inaccuracies may be introduced during the interpolation and gridding
 COMM process. Because of the inherent inaccuracies of this method, no
 COMM guarantee is made or implied that the information displayed is a true
 COMM representation of the height above sea level. Although this product
 COMM may be of some use as a general reference,
 COMM THIS PRODUCT MUST NOT BE USED FOR NAVIGATION PURPOSES.
 COMM -----
 COMM
 COMM
 COMM LINE DATA FORMAT

COMM A space is left between fixed fields so that a field of, for example, COMM A8 should only ever have a maximum of 7 characters in it, even when it is a null, thus:

COMM			
COMM GA Project number		-999	I4
COMM Flight number		-99	I4
COMM Line number		-99999	I7
COMM Fiducial number		-999999	I8
COMM Date (YYYYMMDD)		-9999999	I9
COMM Bearing	deg	-99	I4
COMM Longitude	deg	-999.999999999	F14.8
COMM Latitude	deg	-99.999999999	F13.8
COMM Easting	m	-99999.99	F10.2
COMM Northing	m	-999999.99	F11.2
COMM Altimeter	m	-999.99	F8.2
COMM Barometric Pressure	hPa	-999.99	F8.2
COMM Temperature	deg C	-9.9	F5.1
COMM GPS height	m	-999.99	F8.2
COMM Digital Terrain Model	m	-999.99	F8.2