

St Barbara Limited

Nyngan, New South Wales
Airborne Magnetic and Radiometric
Geophysical Survey

Survey Details

June 2008

1. SURVEY OPERATIONS AND LOGISTICS

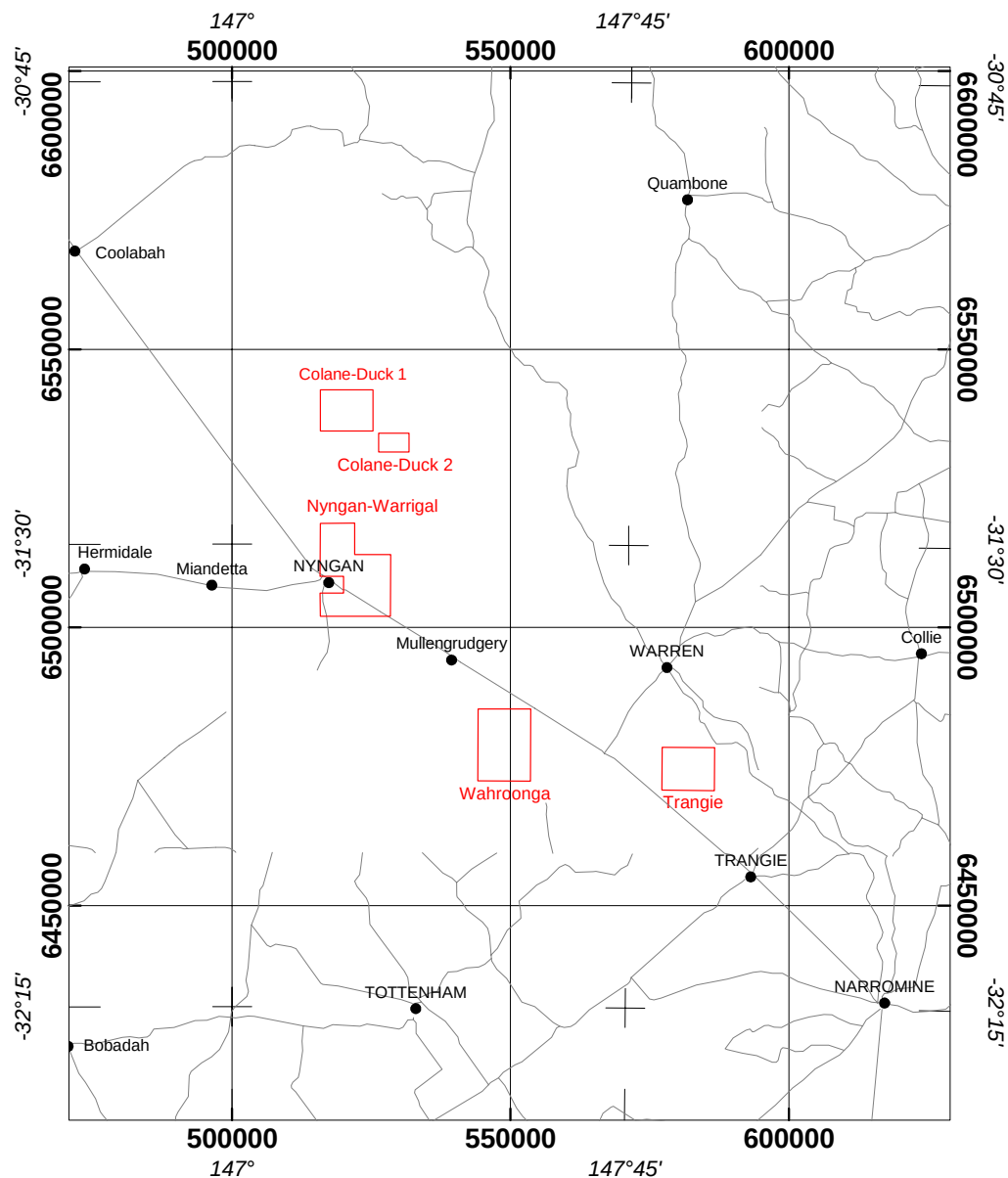
1.1 Introduction

Between the 5th of March 2008 and the 19th of March 2008, Fugro Airborne Surveys Pty. Ltd. (FAS) undertook an airborne magnetic and radiometric survey for St Barbara Limited, over the Nyngan area in New South Wales. The survey consisted of five areas, flown in 12 flights. Total coverage of the survey area amounted to 10,144.61 line kilometres. The survey was based out of Nyngan and was flown using an Aerocommander Shrike 500-S aircraft, registration VH-KAV owned and operated by FAS.

1.2 Survey Equipment

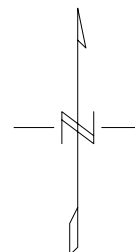
Survey Platform	-	Aerocommander Shrike 500-S VH-KAV
Data Acquisition System	-	FAS digital acquisition system
Total Field Magnetometer	-	Geometrix G-822A Caesium vapour
Vector Magnetometer	-	Billingsley TFM100-1E 3-axis
Magnetometer Compensator Aeromagnetic Digital	-	Fugro FASDAS Mag Decoupler Unit,
Gamma-ray Spectrometer	-	Exploranium GR820 256 Channels
Gamma-ray Detector	-	8 NaI(Tl) crystals; 33.56 L down
Navigation System GPS mode, Novatel OEM4 GPS receiver	-	Fugro Omnistar in VBS (Virtual Base Station)
Base Station Magnetometers	-	2 x Scintrex Envi Mag
Altimeter	-	Sperry Stars RT-220 radio altimeter
Barometer	-	Paroscientific Digibaro altimeter
Thermometer	-	Vaisala HMY 133 temperature and humidity sensor

1.3 Area Map



St Barbara Ltd
Nyngan, NSW
Airborne Magnetic and Radiometric Survey

Datum : GDA94
Projection : MGA
Zone : 55



2. SURVEY SPECIFICATIONS AND PARAMETERS

2.1 Area Co-ordinates

The survey area was located within MGA Zone 55, Central Meridian = 147
(Note - Co-ordinates in GDA94/MGA Zone 55)

Area 1 – Colane-Duck 1

Easting	Northing
525430	6542786
525430	6535186
515751	6535186
515772	6542808
525430	6542786

Area 2 – Nyngan-Warrigal

Easting	Northing
515711	6506175
519892	6506175
519892	6509150
515712	6509150
515735	6518750
522129	6518750
522129	6513160
528578	6513160
528548	6501902
515739	6501925
515711	6506175

Area 3 – Trangie

Easting	Northing
577174	6478565
586812	6478489
586746	6470587
577115	6470664

Area 4 – Wahrenonga

Easting	Northing
544093	6485466
553737	6485419
553668	6472263
544037	6472309

Area 5 – Colane-Duck 2

Easting	Northing
526256	6535011
531879	6535011
531879	6531474
526256	6531474

2.2 Survey Area Parameters

Job Number	-	1957
Survey Company	-	Fugro Airborne Surveys Pty Ltd
Date Flown	-	5 th March – 19 th March 2008
Client	-	St Barbara Limited
Project Name	-	Nyngan, New South Wales
Area Names	-	Colane-Duck 1, Nyngan-Warrigal, Trangie, Wahroonga & Colane-Duck 2.
Nominal Terrain Clearance	-	30 m
Traverse Line Spacing	-	50 m
Traverse Line Direction	-	090 – 270 deg
Traverse Lines	-	1000101 – 1015101, 2000101 – 2033701, 3000101 – 3015601, 4000101 – 4026201, 5000101 - 5007001
Tie Line Spacing	-	500 m
Tie Line Direction	-	000 – 180 deg
Tie Lines	-	1900101 – 1902001, 2900101 – 2902601, 3900101 – 3902001, 4900101 – 4902001, 5900101 - 5901201
Line Kilometres	-	Area 1 = 1600.03 km Area 2 = 3698.11 km Area 3 = 1648.01 km Area 4 = 2768.57 km Area 5 = 429.89 km
Total Line Kilometres	-	10,144.61 km

2.3 Data Sample Intervals

Nominal data sample intervals.

Magnetometer	-	7 m (@10 Hz)
Radar Altimeter	-	7 m (@10 Hz)
Thermometer	-	70 m (@1 Hz)
Barometer	-	70 m (@1 Hz)
GPS	-	70 m (@1 Hz)
Spectrometer	-	70 m (@1 Hz)
Magnetic Base Station (ENVI Mag)	-	5 s

3. AIRCRAFT EQUIPMENT AND SPECIFICATIONS

3.1 Aircraft

Manufacturer	-	Aerocommander
Model	-	Shrike 500S
Registration	-	VH-KAV
Ownership	-	Fugro Airborne Surveys Pty Ltd

3.2 Navigation System

The GPS receiver was integrated as part of the acquisition system. Navigation displays were generated by the acquisition system software that displayed to the pilot a graphical representation of the line being flown. A pre-defined flight plan, with area boundaries and the start and end of the line co-ordinates, was loaded into memory and used for real-time navigation information. Position co-ordinates and other relevant GPS information were output and recorded by the acquisition computer.

3.3 Aircraft Magnetometers

The survey was flown using a Geometrix G-822A ultra-high sensitivity Caesium vapour magnetometer sensor with the sensor mounted in the tail stinger of the aircraft. The sensor provides a Larmor signal that is processed by high precision counters embedded within the FASDAS to provide an operating range of 20,000 to 100,000 nT.

Specifications

Nominal Sensitivity:	-	0.001 nT
Still Air RMS Noise:	-	0.05 nT
Digital Recording Resolution:	-	0.001 nT
Magnetic Gradient Tolerance	-	>20,000 nT/m

3.4 Automatic Compensator

The magnetometer data, together with data from the 3-axis fluxgate, was integrated in the acquisition system to produce real time compensation for the effects of the aircraft's motion, i.e. from changes in attitude and heading. The compensation coefficients were calculated from compensation flights carried out before the survey commenced. The compensated output data, with a resolution and sensitivity of 0.001 nT at a sampling rate of 10 times per second, were recorded digitally.

3.5 Gamma Ray Spectrometer System

The radiometric acquisition system consisted of a 256 channel gamma-ray spectrometer and detector system with the following specifications:

Manufacturer:	Exploranium Inc.
Model:	GR-820
Number of channels:	256
Crystal Volume:	33.56 L downward looking (thermally insulated)
Sampling interval:	1 s
Windows (keV):	Potassium: 1370 to 1570 Uranium: 1660 to 1860 Thorium: 2410 to 2810 Total Count: 410 to 2810 Cosmic: 4000 to >6000

Data checking in the survey system was carried out by the use of resolution procedures using known radiometric sources. To verify the system, real time display of individual crystal resolutions and system resolutions, real time display peak channel tracking information, real time display of the energy spectrum showing counts, cosmic level and system deadtime was available. The survey system displayed to the operator any errors encountered in the spectrometer system.

3.6 Radar Altimeter

A Sperry RT-220 radio altimeter system was used to measure ground clearance. The radio altimeter indicator provides an absolute altitude display from 0 - 750 metres (0 - 2,500 feet) with a sensitivity of 4 mV/ft. Radar altimeter data were digitally recorded every 0.1 seconds.

Specifications

Range:	- 0 - 2500 ft
Accuracy:	- 1%
Resolution:	- 4 mV/ft

3.7 Barometric Altimeter

The output of the Paroscientific pressure transducer was used for calculating the barometric altitude of the aircraft. The atmospheric pressure was taken from a probe and fed to the transducer. The transducer uses a precise quartz crystal resonator whose frequency of oscillation varies with pressure induced stress. The temperature of the pressure sensor was also recorded. In conjunction with the area QNH pressure and ambient temperature, the barometric altitude was calculated.

Specifications

Range:	- sea level to 10,000 ft
Accuracy:	- 5 ft
Resolution:	- 1 mV/ft

3.8 Flight Data Recording

All data recorded by the data acquisition system were stored in a digital format on the removable media drive located in the DAS. This data were then transferred to the field office computers for post-flight quality control examination.