Marsh Creek, Queensland
TEMPEST
Geophysical Survey

Acquisition and Processing Report

for

NGM Resources Limited

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Authorised for release by :		…………………………..
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Survey flown: May 2007

by

FUGRO

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FAS JOB # 1872

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1. SURVEY OPERATIONS AND LOGISTICS

1.1 Introduction

Between the 5th of May 2007 and the 12th of May 2007, Fugro Airborne Surveys Pty. Ltd. (FAS) undertook an airborne TEMPEST electromagnetic and magnetic survey for NGM Resources Limited, over the Marsh Creek project area in Queensland. Total coverage of the survey area amounted to 834.2 line kilometres flown in 5 flights. The survey was flown using a Shorts Skyvan SC-3-200 aircraft, registration VH-WGT owned and operated by FAS. This report summarises the procedures and equipment used by FAS in the acquisition, verification and processing of the airborne geophysical data.

1.2 Survey Base

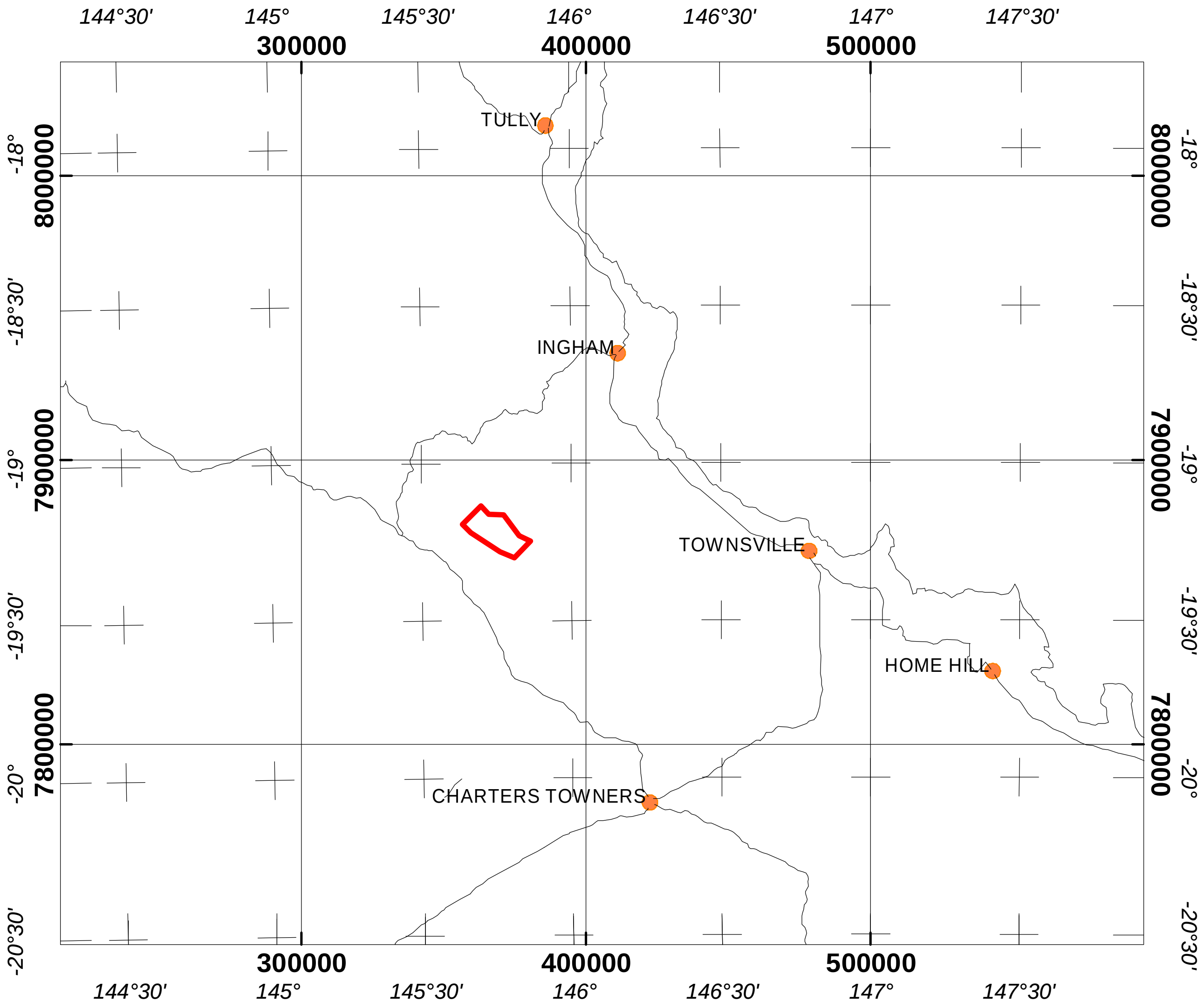
The survey was based out of Townsville, Queensland. The survey aircraft was operated from the Townsville airport with the aircraft fuel available on site. A temporary office was set up at the Castle Lodge Motel, Townsville, where all survey operations were run and the post-flight data verification was performed.

1.3 Survey Personnel

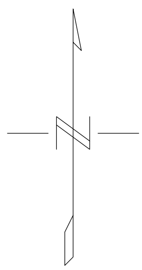
The following personnel were involved in this project:

Project Supervision - Acquisition	Caleb Plunkett
- Processing	Matthew Owers, Kathlene Oliver
On-site Crew Leader	Stephen Carter
Pilot/s	Grant Hamilton
System Operator/s	Scott Miller
Engineer	Graeme Sambell
Field Data Processing	Stephen Carter
Office Data Processing	Martyn Allen

1.4 Area Map



NGM Resources Ltd
Marsh Creek, QLD
Airborne Electromagnetic Survey



Datum	:	GDA94
Projection	:	MGA
Zone	:	55

2. SURVEY SPECIFICATIONS AND PARAMETERS

2.1 Area Co-ordinates

The survey area was located within UTM Zone 55 S
(Note - Co-ordinates in WGS84 Zone 55)

Easting	Northing
359534.00	7874474.00
356545.00	7877291.00
363013.00	7883857.00
365880.00	7880893.00
371061.00	7880685.00
376537.00	7873298.00
380629.00	7871485.00
374945.00	7865629.00
369924.00	7867671.00
359534.00	7874474.00

2.2 Survey Area Parameters

Job Number	-	1872
Survey Company	-	Fugro Airborne Surveys Pty Ltd
Date Flown	-	5th May 2007 – 12th May 2007
Client	-	NGM Resources Limited
EM System	-	25 Hz TEMPEST
Navigation	-	Real-time differential GPS
Datum	-	GDA94
Projection	-	MGA Zone 55 S
Area Name	-	Marsh Creek, Queensland
Nominal Terrain Clearance	-	110 m
Traverse Line Spacing	-	300 m
Traverse Line Direction	-	045 – 225 deg
Traverse Line Numbers	-	10010 – 10700
Tie Line Direction	-	135 – 315 deg
Tie Line Numbers	-	17010 - 17110
Total Survey Line Kilometres	-	834.2 km

2.3 Flight Plans

The flight plans are given in Appendix 1.

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.

3. AIRCRAFT EQUIPMENT AND SPECIFICATIONS

3.1 Aircraft

Manufacturer	-	Shorts Skyvan
Model	-	SC-3-200
Registration	-	VH-WGT
Ownership	-	Fugro Airborne Surveys Pty Ltd

3.2 TEMPEST System Specifications

Specifications of the TEMPEST Airborne EM System (Lane et al., 2000) are:

- Base frequency - 25 Hz
- Transmitter area - 186 m^2
- Transmitter turns - 1
- Waveform - Square
- Duty cycle - 50%
- Transmitter pulse width - 10 ms
- Transmitter off-time - 10 ms
- Peak current - 300 A
- Peak moment - 55800 Am^2
- Average moment - 27900 Am^2
- Sample rate - 75 kHz on X and Z
- Sample interval - 13 microseconds
- Samples per half-cycle - 1500
- System bandwidth - 25 Hz to 37.5 kHz
- Flying height - 110 m (subject to safety considerations)
- EM sensor - Towed bird with 3 component dB/dt coils
- Tx-Rx horizontal separation - 115 m (nominal)
- Tx-Rx vertical separation - 40 m (nominal)
- Stacked data output interval - 200 ms (~12 m)
- Number of output windows - 15
- Window centre times - 13 µs to 16.2 ms
- Magnetometer - Stinger-mounted cesium vapour
- Magnetometer compensation - Fully digital
- Magnetometer output interval - 200 ms (~12 m)
- Magnetometer resolution - 0.001 nT
- Typical noise level - 1.0 nT
- GPS cycle rate - 1 second

3.2.1 EM Receiver and Logging Computer

The EM receiver computer is a Picodas PDAS-1000 data acquisition system. The EM receiver computer executes a proprietary program for system control, timing, data acquisition and recording. Control, triggering and timing is provided to the TEMPEST transmitter and DSP signal processing boards by the timing card, which ensures that all waveform generation and sampling is accomplished with high accuracy. The timing card is synchronised to GPS through the use of the PPS output from the system GPS card. Synchronisation is also provided to the magnetometer processor card for the purpose of accurate magnetic sampling with respect to the EM transmitter waveform.

The EM receiver computer displays information on the main screen during system calibrations and survey line acquisition to enable the airborne operator to assess the data quality and performance of the system.

3.2.2 TEMPEST Transmitter

The transmitted waveform is a square wave of alternating polarity, which is triggered directly from the EM receiver computer. The nominal transmitter base frequency was 25 Hz with a pulse width of 10ms (50 % duty cycle). Loop current waveform monitoring is provided by a current transformer located directly in the loop current path to allow for full logging of the waveform shape and amplitude, which is sampled by the EM receiver.

3.2.3 TEMPEST 3-Axis Towed Bird Assembly

The TEMPEST 3-axis towed bird assembly provides accurate low noise sampling of the X (horizontal in line), Y (horizontal transverse) and Z (vertical) components of the electromagnetic field. The receiver coils measure the time rate of change of the magnetic field (dB/dt). Signals from each axis are transferred to the aircraft through a tow cable specifically designed for its electrical and mechanical properties.

3.3 PDAS 1000 Survey Computer

The SURVEY computer is a PICODAS PDAS 1000 data acquisition system. The SURVEY computer executes a proprietary program for acquisition and recording of location, magnetic and ancillary data. Data are presented both numerically and graphically in real time on the VGA LCD display, which provides an on-line display capability. The operator may alter the sensitivity of the displays on-line to assist in quality control. Selected EM data are transferred from the EM receiver computer to the SURVEY computer for QC display.

3.3.1 Cesium Vapour Magnetometer Sensor

A cesium vapour magnetometer sensor is utilised on the aircraft and consists of the sensor head and cable, and the sensor electronics. The sensor head is housed at the end of a composite material tail stinger.

3.3.2 Magnetometer Processor Board

A Picodas magnetometer processor board is used for de-coupling and processing the Larmor frequency output of the magnetometer sensor. The processor board interfaces with the PDAS 1000 survey computer, which initiates data sampling and transfer for precise sample intervals and also with the EM receiver computer to ensure that the magnetic samples remain synchronised with the EM system.

3.3.3 Fluxgate Magnetometer

A tail stinger mounted Bartington MAG-03MC three-axis fluxgate magnetometer is used to provide information on the attitude of the aircraft. This information is used for compensation of the measured magnetic total field.

3.3.4 GPS Receiver

A Novatel GPScard 951R is utilised for airborne positioning and navigation. Satellite range data are recorded for generating post processed differential solutions.

3.3.5 Differential GPS Demodulator

The OMNISTAR differential GPS service provides real time differential corrections.

3.4 Navigation System

A Picodas PNAV 2001 Navigation Computer is used for real-time navigation. The PNAV computer loads a pre-programmed flight plan from disk which contains boundary co-ordinates, line start and end co-ordinates, local co-ordinate system parameters, line spacing, and cross track definitions. The WGS-84 latitude and longitude positional data received from the Novatel GPScard contained in the SURVEY computer is transformed to the local co-ordinate system for calculation of the cross track and distance to go values. This information, along with ground heading and ground speed, is displayed to the pilot numerically and graphically on a two line LCD display, and on an analog HSI indicator. It is also presented on a LCD screen in conjunction with a pictorial representation of the survey area, survey lines, and ongoing flight path.

The PNAV is interlocked to the SURVEY computer for auto selection and verification of the line to be flown. The GPS information passed to the PNAV 2001 navigation computer is corrected using the received real time differential data, enabling the aircraft to fly as close to the intended track as possible.

3.5 Altimeter System

3.5.1 Radar Altimeter

Model:	Sperry Stars RT-220 radio altimeter system
Sample interval:	0.2 second
Accuracy:	+/- 1.5 % of indicated altitude.

The Sperry radio altimeter is a high quality instrument whose output is factory calibrated. It is fitted with a test function which checks the calibration of a terrain clearance of 100 feet, and altitudes which are multiples of 100 feet. The aircraft radio altitude is recorded onto digital tape as well as displayed on the aircraft chart recorder. The recorded value is the average of the altimeters output during the previous second.

3.5.2 Barometric Altimeter

Output of a Digiquartz 215A-101pressure transducer is used for calculating the barometric altitude of the aircraft. The atmospheric pressure is taken from a gimbal-mounted probe projecting 0.5 metres from the wing tip of the aircraft and fed to the transducer mounted in the aircraft wingtip.

3.6 Video Tracking System

The video tape recorded by a PAL VHS colour video system is synchronised with the geophysical record by a digital fiducial display, which is recorded along with GPS latitude and longitude information and survey line number.

3.7 Data Recorded by the Airborne Acquisition Equipment

Raw EM data including fiducial, local time, X, Y, Z axis sensor response, current monitor and bird auxiliary sensor output are recorded on the EM receiver computer as "**G**" EM files.

The Survey computer records all other survey data including aeromagnetic and GPS data using as "**S**" Survey files, and "**R**" Rover files containing GPS raw range data for post processing.

4. GROUND DATA ACQUISITION EQUIPMENT AND SPECIFICATIONS

4.1 Magnetic Base Station

Two Geometrics G856 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. The base stations were run continuously throughout the survey flying period with a sampling interval of 5 seconds at a sensitivity of 0.01 nT. The base station data were closely examined after each day's production flying to determine if any data had been acquired during periods of out-of-specification diurnal variation. The base stations were located approximately 80 m apart along the Townsville Airport apron.

4.2 GPS Base Station

A GPS base logging station was set up at the survey base office. The GPS antenna was positioned on the roof of the Castle Lodge Motel, Townsville.

The GPS base system was comprised of a Novatel GPS PC card mounted in a portable IBM computer. The computer is connected to a mains UPS backup, with a reserve capacity of approximately 100 minutes, to ensure continuous data logging in the event of mains power interruptions.

The GPS base station position was calculated by logging data continuously at the base position over a period of approximately 24 hours. These data were then statistically averaged to obtain the position of the base station using GrafNav software.

The calculated GPS base position was (in WGS84):

Lat: 19° 14' 44.40260" S
Long: 146° 48' 12.07310" E
Height: 71.086 m. (WGS84 Ellipsoidal Height)

5. EM AND OTHER CALIBRATIONS AND MONITORING

At the beginning and end of each individual survey flight, the EM system is checked for background noise levels and performance. All of these checks are conducted at a nominal terrain clearance of 600 m (2000 ft) to eliminate ground response.

These checks include:-

5.1 Pre-Flight Barometer Calibration: Line C1511

A recording of the barometer output at a known elevation is carried out before take-off to assist with calibration and determination of drift during the flight. The barometer is used as a back-up to the GPS for aircraft altitude.

5.2 Pre-Flight Zero: Line C9001

This manoeuvre is performed once the aircraft is established en route to the survey area. Background EM levels are recorded and assessed by the airborne operator to determine if:-

a. the system noise level is acceptable,
b. the response had not varied significantly from previous flights, and
c. the sferic level is acceptable.

These data are recorded for approximately 90 seconds.

5.3 Pre-Flight Swoops: Line C9002

This manoeuvre is conducted immediately after the pre sortie zero. During this manoeuvre the relative position of the towed sensor is deliberately made to vary relative to the aircraft. The EM data are monitored by the airborne operator to confirm correct operation of the system during the manoeuvre.

5.4 Post-Flight Zero: Line C9003

This calibration is performed immediately following the completion of the survey sorties. Background EM levels are recorded to characterise any changes occurred in the system over the duration of the flight. These data are recorded for approximately 90 seconds.

5.5 Post-Flight Barometer Calibration: Line C1611

A recording of the barometer output is repeated following landing at the end of the flight to assist with calibration and determination of drift during the flight.

5.6 Additive EM Measurements: Lines C9004, C9005, and C9007

A recording of the background signal through the X, Y and Z receiver coil inputs is carried out before and/or after acquisition of data for survey lines on each flight. These measurements may be made with the transmitter on (C9004, C9005) or with the transmitter off (C9007). The signal from the receiver coils is removed from the signal pathway by disconnecting the power to the bird at the winch inside the aircraft.

5.7 Dynamic Magnetometer Compensation

To limit aircraft manoeuvre effects on the magnetic data that can be of the same spatial wavelength as the signals from geological sources, compensation calibration lines are flown in a low magnetic gradient area close to the survey. This involves flying a series of tests on the survey line heading and approximately 15 degrees either side to accommodate small heading variations whilst flying survey lines. The data for each heading consists of a series of aircraft manoeuvres, including pitches, rolls and yaws. This is done to artificially create the most extreme possible attitude the aircraft may encounter whilst on survey. Data from these lines are used to derive compensation coefficients for removing magnetic noise induced by the aircraft's attitude in the naturally occurring magnetic field.

Compensation data were acquired on the 5th of May 2007.

5.8 Parallax Checks

Due to the relative positions of the EM towed bird and the magnetometer instruments on the aircraft and to processing / recording time lags, raw readings from each vary in position. To correct for this and to align selected anomaly features on lines flown in opposite directions, magnetics, EM data and the altimeters are 'parallaxed' with respect to the position information. System parallax is checked occasionally or following any major changes in the aircraft system which are likely to affect the parallax values.

Variable	Parallax Value
Magnetics	0.4 s
GPS	0 s
Radar Altimeter	0.6 s
EM - X	0.2 s
EM – Z	1.4 s

5.9 Radar Altimeter Calibration

The radar altimeter is checked for accuracy and linearity every 12 months or when any change in a key system component requires this procedure to be carried out. This calibration allows the radar altimeter data to be compared and assessed with other height data (GPS and barometric) to confirm the accuracy of the radar altimeter over it's operating range.

Absolute radar and barometric altimeter calibration was carried out over water at Mandurah, Western Australia and was successful in calibrating the radar altimeter to information provided by the GPS and barometer instrument. Calibration factors were as expected. The calibration procedure also provides parallax information required for positional correction of the radar and GPS altimeters.

5.10 Heading Error Checks

Historically, heading error checks have been part of the aeromagnetic data acquisition procedure but they are no longer used. Fugro Airborne Surveys now calculates these effects using the aircraft magnetic compensation system and specially developed software. The precision to which these effects are now calculated and corrected for is far in excess of the manual methods used in the past.

6. DATA PROCESSING

6.1 Field Data Processing

6.1.1 Quality Control Specifications

6.1.1.1 Navigation Tolerance

The re-flight specifications applied for the duration of the survey were:

Electronic Navigation - absence of electronic navigation data (e.g. GPS base station fails).

Flight Line Spacing - where the actual flight line spacing exceeds 50 % percent of the nominal spacing over a continuous distance exceeding 5 kilometres or where lines cross.

Altitude - terrain clearance continuously exceeds the nominal terrain clearance by plus or minus 30 m over a distance of 5 km or more unless to do so would, in the sole opinion of the pilot, jeopardise the safety of the aircraft or the crew or the equipment or would be in contravention of the Civil Aviation Safety Authority regulation such as those pertaining to built up areas.

6.1.1.2 Magnetics Noise And Diurnal Tolerance

The re-flight specifications applied for the duration of the survey were:

Magnetic Diurnal - where the magnetometer base station data exceeds a 10 nT change in 10 minutes.

6.1.1.3 Electromagnetic Data

The quality control checks on the electromagnetic data were:

Noise - where RMS noise in the last channel of the EM data exceeds 0.1 fT over 3 km for B-field (assessed in a resistive region) or where FAS believes an important anomaly is rendered un-interpretable.

Sferics – where sferic activity renders a potential anomaly un-interpretable.

6.1.2 In-Field Data Processing

Following acquisition, multiple copies of the EM data are made onto DVDs or CDs. The EM, location, magnetic and ancillary data are then processed at the field base to the point that the quality of the data from each flight can be fully assessed. Copies of the raw and processed data are then transferred to Perth for final data processing. A more comprehensive statement of EM data processing is given in section 6.2.3.

6.2 Final Data Processing

6.2.1 Magnetics

Magnetic data were compensated for aircraft manoeuvre noise using coefficients derived from the appropriate compensation flight. Base station data is edited so that all significant spikes, level shifts and null data are eliminated.

A diurnal base value was then added.

Area	Base Value
Marsh Creek	49000 nT

A lag was applied to synchronise the magnetic data with the navigation data.

The International Geomagnetic Reference Field (IGRF) 2000 model (updated for secular variation 2007.4) was removed from the levelled total field magnetics. An IGRF base value was then added to the data.

Area	Base Value
Marsh Creek	49100 nT

Following this, a FAS proprietary microlevelling process was applied in order to more subtly level the data.

6.2.2 Derived Topography

Aircraft navigation whilst in survey mode is via real time differential GPS, obtained by combining broadcast differential corrections with on-board GPS measurements. Terrain clearance is measured with a radar altimeter.

The ground elevation, relative to the WGS84 spheroid used by GPS receiver units, is obtained by subtracting the terrain clearance from the aircraft altitude, noting the vertical separation between the GPS antenna and the radar altimeter, and applying suitable parallax corrections between the two measurements.

Following this, a FAS proprietary microlevelling process was applied in order to more subtly level the data.

The digital elevation model derived from this survey can be expected to have an absolute accuracy of +/- several metres in areas of low to moderate topographic relief. Sources of error include uncertainty in the location of the GPS base station, variations in the radar altimeter characteristics over ground of varying surface texture, and the finite footprint of the radar altimeter.

The accuracy of the elevation calculation is directly dependent on the accuracy of the two input parameters, radar altitude and GPS altitude. The radar altitude value may be erroneous in areas of heavy tree cover, where the altimeter reflects the distance to the tree canopy rather than the ground. The GPS altitude value is primarily dependent on the number of available satellites. Although post-processing of GPS data will yield X and Y accuracies in the order of 1-2 metres, the accuracy of the altitude value is usually much less, sometimes in the ±5 metre range. Further inaccuracies may be introduced during the interpolation and gridding process.

Because of the inherent inaccuracies of this method, no guarantee is made or implied that the information displayed is a true representation of the height above sea level. Although this product may be of some use as a general reference, THIS PRODUCT MUST NOT BE USED FOR NAVIGATION PURPOSES.

6.2.3 Electromagnetic Data Processing

Details of the pre-processing applied to TEMPEST data can be found in Lane et al. (2000).

6.2.3.1 Standard EM Processing

Calibration
High altitude calibration data are used to characterise the system response in the absence of any ground response.

Cleaning and Stacking
Routines to suppress sferic noise, powerline noise, VLF noise, coil motion noise (collectively termed "cleaning") and to stack the data are applied to the survey line data. Output from the stacking filter is drawn at 0.2 second intervals. The stacked data are saved to file as an internal data management practice.

Deconvolution and Binning
The survey height stacked data are deconvolved using the high altitude reference waveform. The effect of currents in the transmitter loop and airframe ("primary") are then removed, leaving a "pure" ground response. The deconvolved ground response data are then transformed to B-field response for a perfect 100% duty cycle square wave. Finally, the evenly spaced samples are binned into a number of windows.

Table of TEMPEST window information for 25Hz base frequency

Window #	Start sample	End sample	No of samples	start time (s)	End time (s)	centre time (s)	centre time (ms)
1	1	2	2	0.000007	0.000020	0.000013	0.013
2	3	4	2	0.000033	0.000047	0.000040	0.040
3	5	6	2	0.000060	0.000073	0.000067	0.067
4	7	10	4	0.000087	0.000127	0.000107	0.107
5	11	16	6	0.000140	0.000207	0.000173	0.173
6	17	26	10	0.000220	0.000340	0.000280	0.280
7	27	42	16	0.000353	0.000553	0.000453	0.453
8	43	66	24	0.000567	0.000873	0.000720	0.720
9	67	102	36	0.000887	0.001353	0.001120	1.120
10	103	158	56	0.001367	0.002100	0.001733	1.733
11	159	246	88	0.002113	0.003273	0.002693	2.693
12	247	384	138	0.003287	0.005113	0.004200	4.200
13	385	600	216	0.005127	0.007993	0.006560	6.560
14	601	930	330	0.008007	0.012393	0.010200	10.200
15	931	1500	570	0.012407	0.019993	0.016200	16.200

The data are reviewed after windowing. Any decisions involving re-flights due to AEM factors are made at this point.

Raw and Final EM Data
The "raw" or "uncorrected" EM amplitudes reflect, not only the variations in ground conductivity, but the variations in geometry of the various parts of the EM measurements (i.e. transmitter loop pitch, transmitter loop roll, transmitter loop terrain clearance, transmitter loop to receiver coil horizontal longitudinal separation, transmitter loop to receiver coil horizontal transverse separation, and transmitter loop to receiver coil vertical separation) during the survey. For example, the largest influence on the early time EM amplitude is the terrain clearance of the transmitter loop. The larger the terrain clearance, the smaller the amplitude. Later window times (larger window number) show diminished variations due to terrain clearance.

"Final" or "geometry-corrected" located data are produced for optimum presentation of the EM amplitude data in image format (e.g. window amplitude images, principal component analysis images derived from the window amplitudes (Green,1998b)). Between "raw" and "final" states, the ground response data undergo an approximate correction to produce data from a nominated standard geometry. A dipole-image method (Green, 1998a) is used to adjust the data to the response that would be expected at a standard terrain clearance (110m), standard transmitter loop pitch and roll (zero degrees), and a standard transmitter loop to receiver coil geometry (115m behind and 40 below the aircraft). These variables have been set to their respective standard values in the "final" located data (whereas the "raw" located data file contains the variable field data). Zero parallax is applied to transmitter loop pitch, roll, terrain clearance, X component EM and Z component EM data prior to geometry correction. Over extremely conductive ground (e.g. > 100 S conductance), the estimates for transmitter loop to receiver coil separation determined from the primary field coupling factors may be in error at the metre scale due to uncertainty in the estimation of the primary field. This will influence the accuracy of very early time window amplitude information in the "geometry-corrected" located data. Receiver coil pitch has a significant effect on early time Z component response and late time X component response (Green and Lin, 1996). Receiver coil roll impacts early time Z component response.

Levelling
Limited range micro-levelling may be applied to the final window amplitudes for presentation purposes, principally for multi-flight surveys or when isolated re-flight lines are present.

6.2.3.2 Factors and Corrections

Geometric Factor
The geometric factor gives the ratio of the strength of the primary field coupling between the transmitter loop and the receiver coil at each observation relative to the coupling observed at high altitude during acquisition of reference waveform data. Variations in this factor indicate a change in the attitude and/or relative separation of the transmitter loop and the receiver coil.

Transmitter-Receiver Geometry
Transmitter to receiver geometry values for each observation are derived from the high altitude reference waveforms and knowledge of the system characteristics. These data are available in the located data (see section 6.2.6.1 for "standardised" values)

GPS Antenna, Laser Altimeter and Transmitter Loop Offset Corrections
The transmitter loop was mounted 0.1m above the GPS antenna on the aircraft. The GPS antenna is 3.3m above the belly of the aircraft. The laser altimeter sensor is mounted in the belly of the aircraft. Therefore a total of 3.05m (-0.25m + 3.3m) was added to the laser altimeter data to determine the transmitter loop height above the ground.

Transmitter Loop Pitch and Roll Correction
Measured vertical gyro aircraft pitch and roll attitude measurements are converted to transmitter loop pitch and roll by adding 0.45 degrees for pitch and 0.6 degrees for roll. Nose up is positive for pitch, and left wing up is positive for roll.

6.2.3.3 Primary Sources of EM Noise

A number of "monitor" values are calculated during processing to assist with interpretation. They generally represent quantities that have been removed as far as is practical from the data, but may still be present in trace amounts. These are more significant for interpretation of discrete conductors than for general mapping applications.

Sferic Monitor
Sferics are the electromagnetic signals associated with lightning activity. These signals travel large distances around the Earth. Background levels of sferics are recorded at all times from lightning activity in tropical areas of the world (eg tropical parts of Asia, South America and Africa). Additional higher amplitude signals are produced by "local" lightning activity (ie at distances of kilometres to hundreds of kilometres).

The sferic monitor is the sum of the absolute differences brought about by the sferic filter operations, summed over 0.2 second intervals, normalised by the receiver effective area. It is given in units of uV/sq.m/0.2s. Many sferics have a characteristic form that is well illustrated by figure 2 in Garner and Thiel (2000). The high frequency, initial part of a sferic event can be detected and filtered more easily than the later, low frequency portion. The sferic monitor indicates where at least the high frequency portion of a sferic has been successfully removed, but it is quite possible that lower frequency elements of the sferic event may have eluded detection, passing through to the window amplitude data. Thus, discrete anomalies coincident with sferic activity as indicated by the sferic monitor should be down-weighted relative to features clear of any sign of sferic activity.

Low Frequency Monitor
The Low Frequency Monitor (LFM) makes use of amplitudes at frequencies below the base frequency which are present in the streamed data to estimate the amplitude of coil motion (Earth magnetic field) noise at the base frequency in log10(pV/sqrt(Hz)/sq.m). The coil motion noise below the base frequency is rejected through the use of tapered stacking, but the coil motion noise at the base frequency itself is not easily removed. A sharp spike in the LFM can be an indicator of a coil motion event (eg the bird passing through extremely turbulent air). Note that the LFM will also respond to sferic events with an appreciable low frequency (sub-base frequency) component. This situation can be inferred when both the LFM and sferic monitors show a discrete kick.

Powerline Monitor
The powerline monitor gives the amplitude of the received signal at the powerline frequency (50 or 60 Hz) in log10(pV/sqrt(Hz)/sq.m). Careful selection of the base frequency (such that the powerline frequency is an even harmonic of the base frequency) and tapered stacking combine to strongly attenuate powerline signals. When passing directly over a powerline, the rapid lateral variations in the strength and direction of the magnetic fields associated with the powerline can result in imperfect cancellation of the powerline response during stacking. Some powerline-related interference can manifest itself in a form that is similar to the response of a discrete conductor. The exact form of the monitor profile over a powerline depends on the line direction, powerline direction, powerline current, and receiver component, but the monitor will show a general increase in amplitude approaching the powerline.

Grids (or images) of the powerline monitor reveal the location of the transmission lines. Note that the X component (horizontal receiver coil axis parallel with the flight line direction) does not register any response from powerlines parallel to the flight line direction since the magnetic fields associated with powerlines only vary in a direction perpendicular to the powerline. Note also that the Z component (vertical receiver coil axis) shows a narrow low directly over the powerline where the magnetic fields are purely horizontal.

Very Low Frequency Monitors
Wide area VLF communication signals in the 15 to 25 kHz frequency band are monitored by the TEMPEST system. In the Australian region, signals at 18.2 kHz, 19.8 kHz, 21.4 kHz and 22.2 kHz are monitored as the amplitude of the received signal at these frequencies in log10(pV/sqrt(Hz)/sq.m). The strongest signal comes from North West Cape (19.8 kHz). The signal at 18.2 kHz is often observed to pulse in a regular sequence. These strong narrow band signals have some impact on the high frequency response of the system, but they are strongly attenuated by selection of the base frequency and tapered stacking. The VLF transmissions are strongest in amplitude, in the horizontal direction at right angles to the direction to the VLF transmitter. This directional dependence enables the VLF monitors to be used to indicate the receiver coil attitude.

6.2.3.4 Other Sources of EM Noise

Man-made periodic discharges
If an image of the Z component sferic monitor shows the presence of spatially coherent events, then pulsed cultural interference would be strongly suspected. Since sferic signals are much stronger in the horizontal plane than in the vertical plane, few sferics of significant amplitude are recorded in Z component data. In contrast, evidence of cultural interference is generally swamped by true sferics in X component sferic monitor images.

Electric fences are the most common source of pulsed cultural interference. Periodic discharges (eg every second or so) into a large wire loop (fence) produce very large spikes in raw data. These are attenuated to a large degree by the sferic filter, but a residual artefact can still be present in the processed data.

Coil motion / Earth field noise
A change in coupling between the receiver coil and the ambient magnetic field will induce a voltage in the receiver coil. This noise is referred to as coil motion or Earth field noise. Receiver coils in the towed bird are suspended in a fashion that attempts to keep this noise below the noise floor at frequencies equal to and above the base frequency of the system. Severe turbulence, however, can result in 'coil knock events' that introduce noise into the processed data.

Grounded metal objects
Grounded extensive metal objects such as pipelines and rail lines can qualify as conductors and may produce a response that is visible in processed data. Grounded metal objects produce a response similar to shallow, highly conductive, steeply dipping conductors. These objects can sometimes be identified from good quality topographic maps, from aerial photographs, by viewing the tracking video, from their unusual spatial distribution (ie often a series of linear segments) and in some circumstances from their effect on the powerline monitor. A powerline running close to a long metal object will induce a 50 Hz response in the object.

6.2.4 Conductivity Depth Images (CDI)

CDI conductivity sections for TEMPEST data were calculated using EMFlow and then modified to reflect the finite depth of investigation using an in-house routine, *Sigtime*.

The *Sigtime* routine removes many of the spurious conductive features that appear at depth as a result of fitting long time constant exponential decays to very small amplitude features in the late times. For each observation, the time when the response falls below a signal threshold amplitude is determined. This time is transformed into a diffusion depth with reference to the conductivity values determined for that observation. Anomalous conductivity values below this depth are replaced by background values or set to undefined, reflecting the uncertainty in their origin. The settings and options applied are indicated in the appropriate header files for *Sigtime* output. This procedure is different to that which would be obtained by filtering conductivity values using either a constant time or constant depth across the entire line.

The "final" data for each area were input into version 5.10 of EMFlow to calculate Conductivity Depth Images (CDI). Conductivity values were calculated at each point then run through *Sigtime.* This processing was completed for the Z component data.

EMFlow was developed within the CRC-AMET through AMIRA research projects (Macnae et al, 1998, Macnae and Zonghou, 1998, Stolz and Macnae, 1998). The software has been commercialised by Encom Technology Pty Ltd. Examples of TEMPEST conductivity data can be seen in Lane et al. (2000), Lane et al. (1999), and Lane and Pracillio (2000).

Conductivity values were calculated to a depth of 200 m below surface at each point, using a depth increment of 2 m and a conductivity range of 1-100mS/m.

6.2.5 System Specifications for Modelling TEMPEST Data

Differences between the specifications for the acquisition system, and those of the virtual system for which processed results are given, must be kept in mind when forward modelling, transforming or inverting TEMPEST data.

Acquisition is carried out with a 50% duty cycle square transmitter current waveform and dB/dt sensors.

During processing, TEMPEST EM data are transformed to the response that would be obtained with a B-field sensor for a 100% duty cycle square waveform at the base frequency, involving a 1A change in current (from -0.5A to +0.5A to -0.5A) in a 1sq.m transmitter. Data are given in units of femtotesla (fT = 10^{-15} Tesla). It is this configuration, rather than the actual acquisition configuration, which must be specified when modelling TEMPEST data.

Window timing information is given above (see section 6.2.3).

6.2.5.1 Standard Height and Geometry

The "final" EM data have been standardised through an approximate transformation to a standard transmitter loop terrain clearance, transmitter loop pitch and roll of zero degrees, and a fixed transmitter loop to receiver coil geometry (roughly equal to the average "raw" geometry values). Transmitter loop pitch, transmitter loop roll and transmitter loop terrain clearance values for each observation have been modified to reflect the standard values. Hence, the "final" (fixed) geometry values should be used if modelling with the final X- and Z-component amplitude data - the following table summarises the values used to correct the transmitter height/pitch/roll/geometry to.

Table of values used to standardise transmitter loop height, pitch, roll and geometry

Variable	Standardised value
Transmitter loop pitch	0 degrees
Transmitter loop roll	0 degrees
Transmitter loop terrain clearance	110 metres
Transmitter loop – to – receiver coil geometry	115 metres behind and 40 metres below the aircraft

6.2.5.2 Parallax

The located data files utilise the following parallax values :-

- magnetics = 0.4 fiducials (2 observations from the zero parallax position),
- radar altimeter = 0.6 fiducials (3 observations from the zero parallax position),
- EM X-component = 0.2 fiducials (1 observation from the zero parallax position),
- EM Z-component = 1.4 fiducials (7 observations from the zero parallax position),

These EM parallax values are optimised for aligning the EM response amplitudes for horizontal or broad steeply dipping conductors, which account for the majority of responses in regolith-dominated terrains such as this.

For optimum gridded display of the response for discrete vertical or narrow conductors, the following EM parallax values are appropriate :-

- EM X-component = 1.8 fiducials (9 observations from the zero parallax position, or 8 observations from the "horizontal" parallax position),
- EM Z-component = 0.6 fiducials (3 observations from the zero parallax position, or -4 observations from the "horizontal" parallax position).

(NB Positive parallax values are defined in this case as shifting the indicated quantity back along line to smaller fiducial values. Location information remains in the zero parallax state.)

6.2.6 Delivered Products

Appendix V contains a complete list of all data supplied digitally.

Digital ascii located data in flat ascii format and Geosoft GDB format was produced, containing the raw and final, X and Z EM data as well as magnetics and digital elevation. The header file can be found in Appendix IV.

Stacked CDI sections and CDI-multiplots (of Z component) were produced and delivered as digital png files.

Gridded data was delivered in ERMapper format GDA94 MGA55, and included TMI, 1VDTMI, DEM, EM Time Constant for X and Z Components and 15 EM amplitude windows for X and Z component.

A flight path map was also delivered in hardcopy as a digital png file.

Acquisition and processing report in hardcopy and digital format.

7. REFERENCES

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APPENDIX I – Flight Plan

```
JOB_Number   1872                                                                           *
CLIENT       NGM                                                                            *
AREA_NAME    Marsh Creek                                                                    *
PLANNED_BY   gps2                                                                           *
|                                                                                           *
SPHEROID     22  W.G.S_1984 6378137.0 298.257223563 0.9996                                  *
DELTAXYZ     0.0 0.0 0.0 0.0 0.0 0.0 0.0                                                    *
HEMISPHERE   SOUTH                                                                          *
UTM_ORIGIN   55   147   147                                                                 *
BOUNDARY     1   359717  7874759 -19.215779 +145.665507 -191256.8 +1453955.8 12 *
BOUNDARY     2   359726  7880602 -19.162988 +145.666024 -190946.8 +1453957.7 12 *
BOUNDARY     3   371061  7880685 -19.162990 +145.773799 -190946.8 +1454625.7 12 *
BOUNDARY     4   378787  7869380 -19.265613 +145.846554 -191556.2 +1455047.6 12 *
BOUNDARY     5   375715  7867604 -19.281474 +145.817210 -191653.3 +1454902.0 12 *
BOUNDARY     6   369924  7867671 -19.280508 +145.762106 -191649.8 +1454543.6 12 *
SQUARE_KMS   165.514                                                                        *
|                                                                                           *
NAVTYPE      NOVATEL                                                                        *
NAVMODE      U.T.M                                                                          *
PLAN_TYPE    Normal                                                                         *
LINE_TYPE    S.LINE    X.LINE    0         0                                                *
HEADING      45        135                                                                  *
SPACING      300       1000      300       300                                              *
OVER_LINE    1         1                                                                    *
OVERFLY      0         0                                                                    *
MIN_LENGTH   8         8                                                                    *
FIRST_LINE   10        10                                                                   *
INCREMENT    1         1                                                                    *
X_TRACK      100       100                                                                  *
MASTER_PT    1   359717  7874759 -19.215779 +145.665507                                     *
MASTER_NEW   0  Not implemented.                                                            *
KM_IN_AREA   644       191                                                                  *
KM+OVERFLY   644       191                                                                  *
```

APPENDIX II – Weekly Acquisition Reports

Total Job kms:	834.200 Kms	Area Names:	Marsh Creek
		Accommodation:	Castle Lodge Motel Warburton Drv, Townsville QLD 4810
Plan Kms Remain:	834.200 Kms	Flying Base:	Townsville
% Complete:	0.000 %	Client:	NGM Resources

Date	Flt	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	AGG Scrub	FAS Scrub	Time Take Off	Time Land	Flt Hrs on M/R	Hours to Periodic Inspection	Job Hrs to Date	Prod. to Date	AGG Scrubs to Date	FAS Scrubs to Date	Stdby Days	Lost Days	Activity	COMMENTS Weather, Data delivery Aircraft movement, etc
Date 1-May																		
Julian Day 121																		
Monday																		
					0.000					**104.9**			0.000				Weather►	
Date 2-May																		
Julian Day 122																		
Tuesday																		
	`				0.000					**104.9**			0.000				Weather►	
Date 3-May																	F	Aircraft arrived Townsville 1500
Julian Day 123																		
Wednesday																		
					0.000					**104.9**			0.000			1.0	Weather►	Clear and sunny +32C
Date 4-May																	MO	Unpack and set up equipment for Base mags, Permission was required for placing Mag stations on Airport land
Julian Day 124																		
Thursday																		
					0.000					**104.9**			0.000			1.0	Weather►	Clear & Sunny +31C
Date 5-May																	E	Base Magnetometer Cable had been damaged, mst likely by vehicle. No flight possible other than Comp Box
Julian Day 125	1	GH	SM				11:19	12:25	1.1								TF	Comp Box completed.
Friday																		
					0.000				1.1	**103.8**	1.1		0.000			1.0	Weather►	Some rain in afternnon, sunny AM +32C
Date 6-May																	E	Waited for parts for repairs to Base Mag, repaired an tested Mag OK, cleared safe area in tall grass for Base Mag away from any vehicular access.
Julian Day 126																		
Saturday																		
					0.000					**103.8**	1.1		0.000			1.0	Weather►	Clear & Sunny +30C
Date 7-May	2	GH	SM			32.000	6:45	8:25	1.7								E	TX current dropped below acceptable levels, TX was under 270A with noise and spikes. All production from the flight was scrubbed. Fault found Loop termination had burnt out.
Julian Day 127																	MA	100 Hourly completed
Sunday																		
					0.000	32.000			1.7	**102.1**	2.8		0.000	32.000		1.0	Weather►	Some heavy clouds +30C
			Totals This Week: ►	**0.000**	**0.000**	**32.000**	Week Hours:►		**2.8**	▲: A/C Hrs to Next Service					**0.0**	**5.0**		

Total Job kms:	834.2	Kms	
Plan Kms Remain:	0.000	Kms	
% Complete:	100.000	%	

Area Names:	Marsh Creek
Accommodation:	Castle Lodge Motel Warburton Drv, Townsville QLD 4810
Flying Base:	Townsville
Client:	NGM Resources

Date	Flt	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	AGG Scrub	FAS Scrub	Time Take Off	Time Land	Flt Hrs on M/R	Hours to Periodic Inspection	Job Hrs to Date	Prod. to Date	AGG Scrubs to Date	FAS Scrubs to Date	Stdby Days	Lost Days	Activity	COMMENTS Weather, Data delivery Aircraft movement, etc
Date 8-May																	E	Loop repairs, found suitable parts and borrowed tools from Hawker
Julian Day 128																		Public Holiday in QLD
Monday																		
					0.000					**102.1**	2.8			32.000		1.0	Weather▶	18C AM, rain in afternoon, 28C
Date 9-May																	E	Base mag failures, spare part arrived in morning
Julian Day 129																		
Tuesday																		
					0.000					**102.1**	2.8		0.000	32.000		1.0	Weather▶	Low clouds and rain in morning, 18C AM Rain in Afternoon +28C
Date 10-May	3	GH	SM	270.500		18.100	6:20	10:00	3.7								P	Mag base station A failed,
Julian Day 130																		
Wednesday																		
				270.500	0.000	18.100			3.7	**98.4**	6.5	270.500	0.000	50.100			Weather▶	22C AM RAIN IN AFTERNOON +28C
Date 11-May	4	GH	SM	304.000			6:48	10:20	3.5								P	Mag A failed again, delayed take off as Mag B was also affected by heavy rain overnight
Julian Day 131																		
Thursday																		
				304.000	0.000				3.5	**94.9**	10.0	574.500	0.000	50.100			Weather▶	20C AM heavy rain in afternoon 30C
Date 12-May	5	GH	SM	259.700			6:46	10:24	3.6								P	Completed flight & re flights, high turbulence. At 1400 aircraft was refuelled for reflights. Proceesor worked on editing lines until 2100 and informed crew that we did not need reflights.
Julian Day 132																		
Friday																		
				259.700	0.000				3.6	**91.3**	13.6	834.200	0.000	50.100			Weather▶	20C AM, Low cloud and rain in afternoon 28C
Date 13-May																	MO	
Julian Day 133																		
Saturday																		
					0.000					**91.3**	13.6	834.200	0.000	50.100		1.0	Weather▶	Rain showers in early morning, then at lunch and again in afternnon
Date 14-May																	MO	Trailer packed and all equipment sorted for MOB to Booraloola
Julian Day 134																		
Sunday																		
					0.000					**91.3**	13.6	834.200	0.000	50.100		1.0	Weather▶	rain and heavy cloud in morning and midday, heavy showers in afternoon
			Totals This Week: ▶	**834.200**	**0.000**	**18.100**	Week Hours:▶		**10.8**	▲: A/C Hrs to Next Service					**0.0**	**4.0**		

APPENDIX III – Flight Summary (Line Listing)

```
COMM  Total number of lines :   81
COMM
COMM   Flt    Line   Start X   Start Y     End X     End Y       Kms
COMM
COMM     3   10010    363234   7883686    356728   7877180      9.20
COMM     3   10020    356892   7876913    363383   7883408      9.18
COMM     3   10030    363639   7883242    357164   7876762      9.16
COMM     3   10040    357355   7876540    363838   7883020      9.17
COMM     3   10050    364070   7882805    357563   7876317      9.19
COMM     3   10060    357745   7876110    364246   7882575      9.17
COMM     3   10070    364462   7882357    358044   7875942      9.07
COMM     5   10081    358187   7875698    364649   7882126      9.11
COMM     3   10090    364910   7881956    358445   7875497      9.14
COMM     3   10100    358626   7875273    365054   7881681      9.08
COMM     3   10110    365319   7881527    358903   7875103      9.08
COMM     3   10120    359067   7874852    365469   7881249      9.05
COMM     3   10130    365728   7881081    359319   7874678      9.06
COMM     3   10140    359548   7874480    365935   7880872      9.04
COMM     3   10150    366389   7880896    359795   7874300      9.33
COMM     3   10160    360037   7874122    366726   7880828      9.47
COMM     3   10170    367188   7880845    360303   7873966      9.73
COMM     3   10180    360526   7873767    367540   7880789      9.92
COMM     3   10190    368048   7880839    360852   7873660     10.16
COMM     3   10200    361049   7873435    368402   7880789     10.40
COMM     3   10210    368816   7880773    361360   7873330     10.54
COMM     5   10221    361559   7873122    369181   7880726     10.77
COMM     3   10230    369628   7880738    361855   7872972     10.99
COMM     3   10240    362068   7872767    370030   7880726     11.26
COMM     3   10250    370455   7880706    362361   7872626     11.44
COMM     3   10260    362596   7872440    370845   7880690     11.67
COMM     3   10270    371185   7880589    362890   7872308     11.72
COMM     3   10280    363097   7872098    371335   7880331     11.65
COMM     3   10290    371512   7880089    363400   7871976     11.47
COMM     3   10300    363611   7871751    371696   7879838     11.44
COMM     3   10310    371863   7879587    363889   7871615     11.28
COMM     4   10320    364126   7871431    372043   7879331     11.18
COMM     4   10330    372220   7879125    364433   7871306     11.04
COMM     4   10340    364663   7871115    372387   7878832     10.92
COMM     4   10350    372576   7878618    364948   7870978     10.80
COMM     4   10360    365168   7870778    372757   7878344     10.72
COMM     4   10370    372989   7878167    365458   7870635     10.65
COMM     4   10380    365655   7870419    373129   7877885     10.56
COMM     4   10390    373343   7877674    365984   7870302     10.42
COMM     4   10400    366188   7870097    373485   7877382     10.31
COMM     4   10410    373684   7877172    366474   7869957     10.20
COMM     4   10420    366687   7869739    373831   7876889     10.11
COMM     5   10431    374067   7876698    367001   7869636      9.99
COMM     5   10440    367220   7869430    374188   7876398      9.85
COMM     5   10450    374390   7876188    367490   7869274      9.77
COMM     5   10460    367702   7869063    374563   7875927      9.71
COMM     5   10470    374795   7875712    368010   7868962      9.57
COMM     5   10480    368245   7868748    374913   7875423      9.43
COMM     5   10490    375133   7875222    368517   7868605      9.36
COMM     5   10500    368759   7868426    375290   7874952      9.23
COMM     5   10510    375487   7874723    369060   7868294      9.09
COMM     5   10520    369259   7868075    375634   7874447      9.01
COMM     5   10530    375856   7874244    369545   7867934      8.92
COMM     5   10540    369774   7867751    376006   7873971      8.80
COMM     5   10551    376233   7873780    370106   7867642      8.67
COMM     5   10560    370367   7867499    376392   7873507      8.51
```

COMM	5	10570	376581	7873274	370703	7867400	8.31
COMM	5	10580	370940	7867213	376844	7873119	8.35
COMM	5	10590	377211	7873044	371277	7867148	8.37
COMM	5	10600	371585	7866999	377434	7872865	8.28
COMM	5	10610	377759	7872754	371909	7866904	8.27
COMM	5	10620	372183	7866753	378033	7872604	8.27
COMM	5	10630	378339	7872497	372501	7866633	8.27
COMM	5	10640	372793	7866516	378646	7872369	8.28
COMM	5	10650	378953	7872250	373109	7866408	8.26
COMM	5	10660	373362	7866237	379232	7872105	8.30
COMM	5	10670	379576	7871997	373689	7866136	8.31
COMM	5	10681	373970	7865993	379793	7871825	8.24
COMM	5	10690	380134	7871736	374320	7865925	8.22
COMM	5	10700	374580	7865756	380390	7871562	8.21
COMM	4	17010	357575	7878320	364966	7870927	10.45
COMM	4	17020	369100	7868196	358286	7879021	15.30
COMM	4	17030	358964	7879758	371799	7866924	18.15
COMM	4	17040	374267	7865898	359685	7880447	20.60
COMM	4	17050	360375	7881179	375397	7866161	21.24
COMM	4	17060	376179	7866836	361151	7881805	21.21
COMM	4	17070	361764	7882618	376823	7867554	21.30
COMM	4	17080	377530	7868270	363413	7882371	19.95
COMM	4	17090	366315	7880886	378191	7869011	16.79
COMM	4	17100	378908	7869714	367789	7880823	15.72
COMM	4	17110	369269	7880759	379584	7870442	14.59
COMM							
COMM	Total Kilometres :			834.2 km			

APPENDIX IV – Located Data Format

Header for final data file

```
COMM JOB NUMBER:                                                  1872
COMM AREA NUMBER:                                                    1
COMM SURVEY COMPANY:                            Fugro Airborne Surveys
COMM CLIENT:                                        NGM Resources Ltd
COMM SURVEY TYPE:                                 25Hz TEMPEST Survey
COMM AREA NAME:                                           Marsh Creek
COMM STATE:                                                       Qld
COMM COUNTRY:                                               Australia
COMM SURVEY FLOWN:                                          May, 2007
COMM LOCATED DATA CREATED:                                   Jun 2007
COMM
COMM DATUM:                                                     GDA94
COMM PROJECTION:                                                  MGA
COMM ZONE:                                                         55
COMM
COMM SURVEY SPECIFICATIONS
COMM
COMM TRAVERSE LINE SPACING:                                     300 m
COMM TRAVERSE LINE DIRECTION:                              45-225 deg
COMM TIE LINE SPACING:                                         1000 m
COMM TIE LINE DIRECTION:                                  135-315 deg
COMM NOMINAL TERRAIN CLEARANCE:                                 110 m
COMM FINAL LINE KILOMETRES:                                  834.2 km
COMM
COMM LINE NUMBERING
COMM
COMM TRAVERSE LINE NUMBERS:                             10010 - 10700
COMM TIE LINE NUMBERS:                                  17010 - 17110
COMM
COMM AREA BOUNDARY (WGS84, UTM55)
COMM
COMM    poly 1
COMM    359534.00    7874474.00
COMM    356545.00    7877291.00
COMM    363013.00    7883857.00
COMM    365880.00    7880893.00
COMM    371061.00    7880685.00
COMM    376537.00    7873298.00
COMM    380629.00    7871485.00
COMM    374945.00    7865629.00
COMM    369924.00    7867671.00
COMM    359534.00    7874474.00
COMM
COMM SURVEY EQUIPMENT
COMM
COMM AIRCRAFT:                                   Skyvan SC-3-200, VH-WGT
COMM
COMM MAGNETOMETER:                           Scintrex Cs-2 Cesium Vapour
COMM INSTALLATION:                                          stinger mount
COMM RESOLUTION:                                               0.001 nT
COMM RECORDING INTERVAL:                                            5 s
COMM
COMM ELECTROMAGNETIC SYSTEM:                                25Hz TEMPEST
COMM INSTALLATION:                   Transmitter loop mounted on the aircraft
COMM                                          Receiver coils in a towed bird
COMM COIL ORIENTATION:                                              X,Z
COMM RECORDING INTERVAL:                                          0.2 s
```

```
COMM SYSTEM GEOMETRY:
COMM RECEIVER DISTANCE BEHIND THE TRANSMITTER:                       -115 m
COMM RECEIVER DISTANCE BELOW THE TRANSMITTER:                         -40 m
COMM
COMM RADAR ALTIMETER:                                        Sperry RT-220
COMM RECORDING INTERVAL:                                             0.2 s
COMM
COMM NAVIGATION:                                 real-time differential GPS
COMM RECORDING INTERVAL:                                             1.0 s
COMM
COMM ACQUISITION SYSTEM:                                         PDAS-1000
COMM
COMM DATA PROCESSING
COMM
COMM MAGNETIC DATA
COMM DIURNAL BASE VALUE APPLIED                                   49000 nT
COMM PARALLAX CORRECTION APPLIED                                     0.4 s
COMM IGRF BASE VALUE APPLIED                                      49100 nT
COMM IGRF MODEL 2005 EXTRAPOLATED TO                                2007.4
COMM DATA HAVE BEEN MICROLEVELLED
COMM
COMM ELECTROMAGNETIC DATA
COMM SYSTEM PARALLAX REMOVED, AS FOLLOWS
COMM X-COMPONENT EM DATA                                             0.2 s
COMM Y-COMPONENT EM DATA                     <not relevant for TEMPEST>
COMM Z-COMPONENT EM DATA                                             1.4 s
COMM DATA CORRECTED FOR TRANSMITTER HEIGHT, PITCH AND ROLL
COMM DATA CORRECTED FOR TRANSMITTER-RECEIVER GEOMETRY VARIATIONS
COMM DATA HAVE BEEN MICROLEVELLED
COMM CONDUCTIVITY DEPTH INVERSION CALCULATED                  EMFlow V5.10
COMM CONDUCTIVITIES CALCULATED USING corrected EM DATA
COMM
COMM DIGITAL TERRAIN DATA
COMM PARALLAX CORRECTION APPLIED TO RADAR ALIMETER DATA              0.6 s
COMM PARALLAX CORRECTION APPLIED TO GPS ALIMETER DATA                0.0 s
COMM DTM CALCULATED [DTM = GPS ALTITUDE - RADAR ALTITUDE]
COMM DATA HAVE BEEN MICROLEVELLED
COMM ---------------------------------------------------------------------
COMM The accuracy of the elevation calculation is directly dependent on
COMM the accuracy of the two input parameters, radar altitude and GPS
COMM altitude.  The radar altitude value may be erroneous in areas of heavy
COMM tree cover, where the altimeter reflects the distance to the tree
COMM canopy rather than the ground.  The GPS altitude value is primarily
COMM dependent on the number of available satellites. Although
COMM post-processing of GPS data will yield X and Y accuracies in the
COMM order of 1-2 metres, the accuracy of the altitude value is usually
COMM much less, sometimes in the ±5 metre range.  Further inaccuracies
COMM may be introduced during the interpolation and gridding process.
COMM Because of the inherent inaccuracies of this method, no guarantee is
COMM 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 ELECTROMAGNETIC SYSTEM
COMM
COMM TEMPEST IS A TIME-DOMAIN SQUARE-WAVE SYSTEM,
COMM TRANSMITTING AT A BASE FREQUENCY OF 25Hz,
COMM WITH 2 ORTHOGONAL-AXIS RECEIVER COILS IN A TOWED BIRD.
COMM FINAL EM OUTPUT IS RECORDED 5 TIMES PER SECOND.
COMM THE TIMES (IN MILLISECONDS) FOR THE 15 WINDOWS ARE:
COMM
COMM WINDOW      START       END      CENTRE
```

```
COMM    1        0.007      0.020      0.013
COMM    2        0.033      0.047      0.040
COMM    3        0.060      0.073      0.067
COMM    4        0.087      0.127      0.107
COMM    5        0.140      0.207      0.173
COMM    6        0.220      0.340      0.280
COMM    7        0.353      0.553      0.453
COMM    8        0.567      0.873      0.720
COMM    9        0.887      1.353      1.120
COMM   10        1.367      2.100      1.733
COMM   11        2.113      3.273      2.693
COMM   12        3.287      5.113      4.200
COMM   13        5.127      7.993      6.560
COMM   14        8.007     12.393     10.200
COMM   15       12.407     19.993     16.200
COMM
COMM PULSE WIDTH: 10 ms
COMM
COMM TEMPEST EM data are transformed to the response that would be
COMM obtained with a B-field sensor for a 100% duty cycle square
COMM waveform at the base frequency, involving a 1A change in
COMM current (from -0.5A to +0.5A to -0.5A) in a 1sq.m transmitter.
COMM It is this configuration, rather than the actual acquisition
COMM configuration, which must be specified when modelling TEMPEST data.
COMM
COMM
COMM
COMM LOCATED DATA FORMAT
COMM
COMM  Output field format : DOS  - Flat ascii
COMM  Number of fields    : 197
COMM
COMM Field  Channel         Description                        Units  Undefined Format
COMM -----  -------         -----------                        -----  --------- ------
COMM
COMM     1  LINE            Line                                       -9999999  i6
COMM     2  FLIGHT          Flight                                     -9999999  i4
COMM     3  FID             Fiducial                             (s)   -9999999  f8.1
COMM     4  LATITUDE        Latitude  GDA94                    (deg)   -9999999  f13.6
COMM     5  LONGITUDE       Longitude GDA94                    (deg)   -9999999  f13.6
COMM     6  EASTING         Easting   MGA55                     (m)    -9999999  f11.2
COMM     7  NORTHING        Northing  MGA55                     (m)    -9999999  f12.2
COMM     8  TxHeight        GPS height                           (m)   -9999999  f8.2
COMM     9  TxRalt_raw      Raw Radar Altimeter                  (m)   -9999999  f8.2
COMM    10  TxRalt_final    Final Radar Altimeter                (m)   -9999999  f8.2
COMM    11  DTM             DTM                                  (m)   -9999999  f8.2
COMM    12  MAG             Compensated TMI                     (nT)   -9999999  f10.3
COMM    13  MAG_1VD         Levelled TMI 1VD                  (nT/m)   -9999999  f12.5
COMM    14  Pitch_Raw       Raw Tx loop pitch                  (deg)   -9999999  f10.5
COMM    15  Roll_Raw        Raw Tx loop roll                   (deg)   -9999999  f10.5
COMM    16  HSep_Raw        Raw Tx-Rx horizontal separation      (m)   -9999999  f8.2
COMM    17  VSep_Raw        Raw Tx-Rx vertical separation        (m)   -9999999  f8.2
COMM    18  Pitch_Final     Final Tx loop pitch                (deg)   -9999999  f10.5
COMM    19  Roll_Final      Final Tx loop roll                 (deg)   -9999999  f10.5
COMM    20  HSep_Final      Final Tx-Rx horizontal separation    (m)   -9999999  f8.2
COMM    21  VSep_Final      Final Tx-Rx vertical separation      (m)   -9999999  f8.2
COMM    22  EMX_Raw[1]      Raw EMX01 Window                    (fT)   -9999999  f12.6
COMM    23  EMX_Raw[2]      Raw EMX02 Window                    (fT)   -9999999  f12.6
COMM    24  EMX_Raw[3]      Raw EMX03 Window                    (fT)   -9999999  f12.6
COMM    25  EMX_Raw[4]      Raw EMX04 Window                    (fT)   -9999999  f12.6
COMM    26  EMX_Raw[5]      Raw EMX05 Window                    (fT)   -9999999  f12.6
COMM    27  EMX_Raw[6]      Raw EMX06 Window                    (fT)   -9999999  f12.6
COMM    28  EMX_Raw[7]      Raw EMX07 Window                    (fT)   -9999999  f12.6
COMM    29  EMX_Raw[8]      Raw EMX08 Window                    (fT)   -9999999  f12.6
COMM    30  EMX_Raw[9]      Raw EMX09 Window                    (fT)   -9999999  f12.6
COMM    31  EMX_Raw[10]     Raw EMX10 Window                    (fT)   -9999999  f12.6
COMM    32  EMX_Raw[11]     Raw EMX11 Window                    (fT)   -9999999  f12.6
```

COMM	33	EMX_Raw[12]	Raw EMX12 Window			(fT)	-9999999	f12.6
COMM	34	EMX_Raw[13]	Raw EMX13 Window			(fT)	-9999999	f12.6
COMM	35	EMX_Raw[14]	Raw EMX14 Window			(fT)	-9999999	f12.6
COMM	36	EMX_Raw[15]	Raw EMX15 Window			(fT)	-9999999	f12.6
COMM	37	EMX_Final[1]	Final EMX01 Window			(fT)	-9999999	f12.6
COMM	38	EMX_Final[2]	Final EMX02 Window			(fT)	-9999999	f12.6
COMM	39	EMX_Final[3]	Final EMX03 Window			(fT)	-9999999	f12.6
COMM	40	EMX_Final[4]	Final EMX04 Window			(fT)	-9999999	f12.6
COMM	41	EMX_Final[5]	Final EMX05 Window			(fT)	-9999999	f12.6
COMM	42	EMX_Final[6]	Final EMX06 Window			(fT)	-9999999	f12.6
COMM	43	EMX_Final[7]	Final EMX07 Window			(fT)	-9999999	f12.6
COMM	44	EMX_Final[8]	Final EMX08 Window			(fT)	-9999999	f12.6
COMM	45	EMX_Final[9]	Final EMX09 Window			(fT)	-9999999	f12.6
COMM	46	EMX_Final[10]	Final EMX10 Window			(fT)	-9999999	f12.6
COMM	47	EMX_Final[11]	Final EMX11 Window			(fT)	-9999999	f12.6
COMM	48	EMX_Final[12]	Final EMX12 Window			(fT)	-9999999	f12.6
COMM	49	EMX_Final[13]	Final EMX13 Window			(fT)	-9999999	f12.6
COMM	50	EMX_Final[14]	Final EMX14 Window			(fT)	-9999999	f12.6
COMM	51	EMX_Final[15]	Final EMX15 Window			(fT)	-9999999	f12.6
COMM	52	X_Sferics	X_Sferics				-9999999	f10.3
COMM	53	X_Lowfreq	X_Lowfreq				-9999999	f10.3
COMM	54	X_Powerline	X_Powerline				-9999999	f10.3
COMM	55	X_VLF1	X_18.2kHz				-9999999	f10.3
COMM	56	X_VLF2	X_19.8kHz				-9999999	f10.3
COMM	57	X_VLF3	X_21.4kHz				-9999999	f10.3
COMM	58	X_VLF4	X_22.2kHz				-9999999	f10.3
COMM	59	X_Geofact	X_Geometric factor				-9999999	f10.3
COMM	60	EMZ_Raw[1]	Raw EMZ01 Window			(fT)	-9999999	f12.6
COMM	61	EMZ_Raw[2]	Raw EMZ02 Window			(fT)	-9999999	f12.6
COMM	62	EMZ_Raw[3]	Raw EMZ03 Window			(fT)	-9999999	f12.6
COMM	63	EMZ_Raw[4]	Raw EMZ04 Window			(fT)	-9999999	f12.6
COMM	64	EMZ_Raw[5]	Raw EMZ05 Window			(fT)	-9999999	f12.6
COMM	65	EMZ_Raw[6]	Raw EMZ06 Window			(fT)	-9999999	f12.6
COMM	66	EMZ_Raw[7]	Raw EMZ07 Window			(fT)	-9999999	f12.6
COMM	67	EMZ_Raw[8]	Raw EMZ08 Window			(fT)	-9999999	f12.6
COMM	68	EMZ_Raw[9]	Raw EMZ09 Window			(fT)	-9999999	f12.6
COMM	69	EMZ_Raw[10]	Raw EMZ10 Window			(fT)	-9999999	f12.6
COMM	70	EMZ_Raw[11]	Raw EMZ11 Window			(fT)	-9999999	f12.6
COMM	71	EMZ_Raw[12]	Raw EMZ12 Window			(fT)	-9999999	f12.6
COMM	72	EMZ_Raw[13]	Raw EMZ13 Window			(fT)	-9999999	f12.6
COMM	73	EMZ_Raw[14]	Raw EMZ14 Window			(fT)	-9999999	f12.6
COMM	74	EMZ_Raw[15]	Raw EMZ15 Window			(fT)	-9999999	f12.6
COMM	75	EMZ_Final[1]	Final EMZ01 Window			(fT)	-9999999	f12.6
COMM	76	EMZ_Final[2]	Final EMZ02 Window			(fT)	-9999999	f12.6
COMM	77	EMZ_Final[3]	Final EMZ03 Window			(fT)	-9999999	f12.6
COMM	78	EMZ_Final[4]	Final EMZ04 Window			(fT)	-9999999	f12.6
COMM	79	EMZ_Final[5]	Final EMZ05 Window			(fT)	-9999999	f12.6
COMM	80	EMZ_Final[6]	Final EMZ06 Window			(fT)	-9999999	f12.6
COMM	81	EMZ_Final[7]	Final EMZ07 Window			(fT)	-9999999	f12.6
COMM	82	EMZ_Final[8]	Final EMZ08 Window			(fT)	-9999999	f12.6
COMM	83	EMZ_Final[9]	Final EMZ09 Window			(fT)	-9999999	f12.6
COMM	84	EMZ_Final[10]	Final EMZ10 Window			(fT)	-9999999	f12.6
COMM	85	EMZ_Final[11]	Final EMZ11 Window			(fT)	-9999999	f12.6
COMM	86	EMZ_Final[12]	Final EMZ12 Window			(fT)	-9999999	f12.6
COMM	87	EMZ_Final[13]	Final EMZ13 Window			(fT)	-9999999	f12.6
COMM	88	EMZ_Final[14]	Final EMZ14 Window			(fT)	-9999999	f12.6
COMM	89	EMZ_Final[15]	Final EMZ15 Window			(fT)	-9999999	f12.6
COMM	90	Z_Sferics	Z_Sferics				-9999999	f10.3
COMM	91	Z_Lowfreq	Z_Lowfreq				-9999999	f10.3
COMM	92	Z_Powerline	Z_Powerline				-9999999	f10.3
COMM	93	Z_VLF1	Z_18.2kHz				-9999999	f10.3
COMM	94	Z_VLF2	Z_19.8kHz				-9999999	f10.3
COMM	95	Z_VLF3	Z_21.4kHz				-9999999	f10.3
COMM	96	Z_VLF4	Z_22.2kHz				-9999999	f10.3
COMM	97	Z_Geofact	Z_Geometric factor				-9999999	f10.3
COMM	98	CNDZ[1]	Conductivity_Z001	0-2	m	(mS/m)	-9999999	f10.3
COMM	99	CNDZ[2]	Conductivity_Z002	2-4	m	(mS/m)	-9999999	f10.3
COMM	100	CNDZ[3]	Conductivity_Z003	4-6	m	(mS/m)	-9999999	f10.3
COMM	101	CNDZ[4]	Conductivity_Z004	6-8	m	(mS/m)	-9999999	f10.3
COMM	102	CNDZ[5]	Conductivity_Z005	8-10	m	(mS/m)	-9999999	f10.3
COMM	103	CNDZ[6]	Conductivity_Z006	10-12	m	(mS/m)	-9999999	f10.3

COMM	104	CNDZ[7]	Conductivity_Z007	12-14	m	(mS/m)	-9999999	f10.3
COMM	105	CNDZ[8]	Conductivity_Z008	14-16	m	(mS/m)	-9999999	f10.3
COMM	106	CNDZ[9]	Conductivity_Z009	16-18	m	(mS/m)	-9999999	f10.3
COMM	107	CNDZ[10]	Conductivity_Z010	18-20	m	(mS/m)	-9999999	f10.3
COMM	108	CNDZ[11]	Conductivity_Z011	20-22	m	(mS/m)	-9999999	f10.3
COMM	109	CNDZ[12]	Conductivity_Z012	22-24	m	(mS/m)	-9999999	f10.3
COMM	110	CNDZ[13]	Conductivity_Z013	24-26	m	(mS/m)	-9999999	f10.3
COMM	111	CNDZ[14]	Conductivity_Z014	26-28	m	(mS/m)	-9999999	f10.3
COMM	112	CNDZ[15]	Conductivity_Z015	28-30	m	(mS/m)	-9999999	f10.3
COMM	113	CNDZ[16]	Conductivity_Z016	30-32	m	(mS/m)	-9999999	f10.3
COMM	114	CNDZ[17]	Conductivity_Z017	32-34	m	(mS/m)	-9999999	f10.3
COMM	115	CNDZ[18]	Conductivity_Z018	34-36	m	(mS/m)	-9999999	f10.3
COMM	116	CNDZ[19]	Conductivity_Z019	36-38	m	(mS/m)	-9999999	f10.3
COMM	117	CNDZ[20]	Conductivity_Z020	38-40	m	(mS/m)	-9999999	f10.3
COMM	118	CNDZ[21]	Conductivity_Z021	40-42	m	(mS/m)	-9999999	f10.3
COMM	119	CNDZ[22]	Conductivity_Z022	42-44	m	(mS/m)	-9999999	f10.3
COMM	120	CNDZ[23]	Conductivity_Z023	44-46	m	(mS/m)	-9999999	f10.3
COMM	121	CNDZ[24]	Conductivity_Z024	46-48	m	(mS/m)	-9999999	f10.3
COMM	122	CNDZ[25]	Conductivity_Z025	48-50	m	(mS/m)	-9999999	f10.3
COMM	123	CNDZ[26]	Conductivity_Z026	50-52	m	(mS/m)	-9999999	f10.3
COMM	124	CNDZ[27]	Conductivity_Z027	52-54	m	(mS/m)	-9999999	f10.3
COMM	125	CNDZ[28]	Conductivity_Z028	54-56	m	(mS/m)	-9999999	f10.3
COMM	126	CNDZ[29]	Conductivity_Z029	56-58	m	(mS/m)	-9999999	f10.3
COMM	127	CNDZ[30]	Conductivity_Z030	58-60	m	(mS/m)	-9999999	f10.3
COMM	128	CNDZ[31]	Conductivity_Z031	60-62	m	(mS/m)	-9999999	f10.3
COMM	129	CNDZ[32]	Conductivity_Z032	62-64	m	(mS/m)	-9999999	f10.3
COMM	130	CNDZ[33]	Conductivity_Z033	64-66	m	(mS/m)	-9999999	f10.3
COMM	131	CNDZ[34]	Conductivity_Z034	66-68	m	(mS/m)	-9999999	f10.3
COMM	132	CNDZ[35]	Conductivity_Z035	68-70	m	(mS/m)	-9999999	f10.3
COMM	133	CNDZ[36]	Conductivity_Z036	70-72	m	(mS/m)	-9999999	f10.3
COMM	134	CNDZ[37]	Conductivity_Z037	72-74	m	(mS/m)	-9999999	f10.3
COMM	135	CNDZ[38]	Conductivity_Z038	74-76	m	(mS/m)	-9999999	f10.3
COMM	136	CNDZ[39]	Conductivity_Z039	76-78	m	(mS/m)	-9999999	f10.3
COMM	137	CNDZ[40]	Conductivity_Z040	78-80	m	(mS/m)	-9999999	f10.3
COMM	138	CNDZ[41]	Conductivity_Z041	80-82	m	(mS/m)	-9999999	f10.3
COMM	139	CNDZ[42]	Conductivity_Z042	82-84	m	(mS/m)	-9999999	f10.3
COMM	140	CNDZ[43]	Conductivity_Z043	84-86	m	(mS/m)	-9999999	f10.3
COMM	141	CNDZ[44]	Conductivity_Z044	86-88	m	(mS/m)	-9999999	f10.3
COMM	142	CNDZ[45]	Conductivity_Z045	88-90	m	(mS/m)	-9999999	f10.3
COMM	143	CNDZ[46]	Conductivity_Z046	90-92	m	(mS/m)	-9999999	f10.3
COMM	144	CNDZ[47]	Conductivity_Z047	92-94	m	(mS/m)	-9999999	f10.3
COMM	145	CNDZ[48]	Conductivity_Z048	94-96	m	(mS/m)	-9999999	f10.3
COMM	146	CNDZ[49]	Conductivity_Z049	96-98	m	(mS/m)	-9999999	f10.3
COMM	147	CNDZ[50]	Conductivity_Z050	98-100	m	(mS/m)	-9999999	f10.3
COMM	148	CNDZ[51]	Conductivity_Z051	100-102	m	(mS/m)	-9999999	f10.3
COMM	149	CNDZ[52]	Conductivity_Z052	102-104	m	(mS/m)	-9999999	f10.3
COMM	150	CNDZ[53]	Conductivity_Z053	104-106	m	(mS/m)	-9999999	f10.3
COMM	151	CNDZ[54]	Conductivity_Z054	106-108	m	(mS/m)	-9999999	f10.3
COMM	152	CNDZ[55]	Conductivity_Z055	108-110	m	(mS/m)	-9999999	f10.3
COMM	153	CNDZ[56]	Conductivity_Z056	110-112	m	(mS/m)	-9999999	f10.3
COMM	154	CNDZ[57]	Conductivity_Z057	112-114	m	(mS/m)	-9999999	f10.3
COMM	155	CNDZ[58]	Conductivity_Z058	114-116	m	(mS/m)	-9999999	f10.3
COMM	156	CNDZ[59]	Conductivity_Z059	116-118	m	(mS/m)	-9999999	f10.3
COMM	157	CNDZ[60]	Conductivity_Z060	118-120	m	(mS/m)	-9999999	f10.3
COMM	158	CNDZ[61]	Conductivity_Z061	120-122	m	(mS/m)	-9999999	f10.3
COMM	159	CNDZ[62]	Conductivity_Z062	122-124	m	(mS/m)	-9999999	f10.3
COMM	160	CNDZ[63]	Conductivity_Z063	124-126	m	(mS/m)	-9999999	f10.3
COMM	161	CNDZ[64]	Conductivity_Z064	126-128	m	(mS/m)	-9999999	f10.3
COMM	162	CNDZ[65]	Conductivity_Z065	128-130	m	(mS/m)	-9999999	f10.3
COMM	163	CNDZ[66]	Conductivity_Z066	130-132	m	(mS/m)	-9999999	f10.3
COMM	164	CNDZ[67]	Conductivity_Z067	132-134	m	(mS/m)	-9999999	f10.3
COMM	165	CNDZ[68]	Conductivity_Z068	134-136	m	(mS/m)	-9999999	f10.3
COMM	166	CNDZ[69]	Conductivity_Z069	136-138	m	(mS/m)	-9999999	f10.3
COMM	167	CNDZ[70]	Conductivity_Z070	138-140	m	(mS/m)	-9999999	f10.3
COMM	168	CNDZ[71]	Conductivity_Z071	140-142	m	(mS/m)	-9999999	f10.3
COMM	169	CNDZ[72]	Conductivity_Z072	142-144	m	(mS/m)	-9999999	f10.3
COMM	170	CNDZ[73]	Conductivity_Z073	144-146	m	(mS/m)	-9999999	f10.3
COMM	171	CNDZ[74]	Conductivity_Z074	146-148	m	(mS/m)	-9999999	f10.3
COMM	172	CNDZ[75]	Conductivity_Z075	148-150	m	(mS/m)	-9999999	f10.3
COMM	173	CNDZ[76]	Conductivity_Z076	150-152	m	(mS/m)	-9999999	f10.3
COMM	174	CNDZ[77]	Conductivity_Z077	152-154	m	(mS/m)	-9999999	f10.3

COMM	175	CNDZ[78]	Conductivity_Z078	154-156 m	(mS/m)	-9999999	f10.3
COMM	176	CNDZ[79]	Conductivity_Z079	156-158 m	(mS/m)	-9999999	f10.3
COMM	177	CNDZ[80]	Conductivity_Z080	158-160 m	(mS/m)	-9999999	f10.3
COMM	178	CNDZ[81]	Conductivity_Z081	160-162 m	(mS/m)	-9999999	f10.3
COMM	179	CNDZ[82]	Conductivity_Z082	162-164 m	(mS/m)	-9999999	f10.3
COMM	180	CNDZ[83]	Conductivity_Z083	164-166 m	(mS/m)	-9999999	f10.3
COMM	181	CNDZ[84]	Conductivity_Z084	166-168 m	(mS/m)	-9999999	f10.3
COMM	182	CNDZ[85]	Conductivity_Z085	168-170 m	(mS/m)	-9999999	f10.3
COMM	183	CNDZ[86]	Conductivity_Z086	170-172 m	(mS/m)	-9999999	f10.3
COMM	184	CNDZ[87]	Conductivity_Z087	172-174 m	(mS/m)	-9999999	f10.3
COMM	185	CNDZ[88]	Conductivity_Z088	174-176 m	(mS/m)	-9999999	f10.3
COMM	186	CNDZ[89]	Conductivity_Z089	176-178 m	(mS/m)	-9999999	f10.3
COMM	187	CNDZ[90]	Conductivity_Z090	178-180 m	(mS/m)	-9999999	f10.3
COMM	188	CNDZ[91]	Conductivity_Z091	180-182 m	(mS/m)	-9999999	f10.3
COMM	189	CNDZ[92]	Conductivity_Z092	182-184 m	(mS/m)	-9999999	f10.3
COMM	190	CNDZ[93]	Conductivity_Z093	184-186 m	(mS/m)	-9999999	f10.3
COMM	191	CNDZ[94]	Conductivity_Z094	186-188 m	(mS/m)	-9999999	f10.3
COMM	192	CNDZ[95]	Conductivity_Z095	188-190 m	(mS/m)	-9999999	f10.3
COMM	193	CNDZ[96]	Conductivity_Z096	190-192 m	(mS/m)	-9999999	f10.3
COMM	194	CNDZ[97]	Conductivity_Z097	192-194 m	(mS/m)	-9999999	f10.3
COMM	195	CNDZ[98]	Conductivity_Z098	194-196 m	(mS/m)	-9999999	f10.3
COMM	196	CNDZ[99]	Conductivity_Z099	196-198 m	(mS/m)	-9999999	f10.3
COMM	197	CNDZ[100]	Conductivity_Z100	198-200 m	(mS/m)	-9999999	f10.3
COMM							

APPENDIX V – List of all Supplied Data and Products

Final Located Data

Marsh_Creek.hdr - header file describing the contents of…
Marsh_Creek.asc - flat ascii file containing located magnetic, EM and elevation data (see App IV).
Marsh_Creek.gdb - Geosoft database.

Preliminary Gridded Products (delivered in ERMapper format GDA94 MGA55)

- Digital Elevation Model
- Total Magnetic Intensity (TMI)
- 1st Vertical Derivative of TMI (1VDTMI)
- 15 X Component Windowed Amplitude
- 15 Z Component Windowed Amplitude
- EM Time Constant for X-component
- EM Time Constant for Z-component

Final Gridded Products (delivered in ERMapper format GDA94 MGA55)

- Digital Elevation Model
- Total Magnetic Intensity (TMI)
- 1st Vertical Derivative of TMI (1VDTMI)
- 15 X Component Windowed Amplitude
- 15 Z Component Windowed Amplitude
- EM Time Constant for X-component
- EM Time Constant for Z-component

Final Hardcopy and Digital Products

- Flight Path
- Conductivity Depth Image Multiplots & Stacked Sections for Z component

Final Acquisition and Processing Report

Delivered as hardcopy and digitally