

Mount Windsor Volcanics Project EPM 14161 – Liontown Relinquishment Report for the period 15 June 2004 - 14 June 2009

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February 2010

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TABLE OF CONTENTS

SUMMARY

1	IN	TRODUCTION	2
	1.1 1.2 1.3	LOCATION TENURE PROJECT PHILOSOPHY AND OBJECTIVES	2 2 3
2	RE	GIONAL GEOLOGY	4
	2.1 2.2 2.3	Geology Structure Regolith	4 5 8
3	SUI	MMARY OF EXPLORATION FOR PERIOD OF TENURE	8
	3.1 3.2 3.2.	HISTORICAL DATA COMPILATION, 2004-2005 ANALYSIS OF HISTORICAL DATA — TARGET GENERATION, 2005-2006 Solid Geological Interpretation	10 11
	3.2.	2 Mount Windsor Volcanics Exploration Targets	11
	3.2.	3 Review of Historical Electrical Geophysics	11
	3.3	AIRBORNE GEOPHYSICS, 2006-2007	13
	3.3.	1 Aeromagnetic/Radiometric Survey	13
	3.3.	2 VTEM Survey	
	3.4	TARGET GENERATION, 2006-2007	14
	3.5	REVIEW OF HISTORICAL GEOPHYSICAL DATA, 2007-2008	15
	3.6	INTERPRETATION OF 2006 AEROMAGNETIC/RADIOMETRIC SURVEY, 2007-2008	15
	3.7	INTERPRETATION OF VTEM 2007 SURVEY, 2007-2008	
	5.8 3.0	IKONOS SATELLITE IMAGERY 2008-2009 CROUND MACNETICS 2008-2009	17
	5.9	GROUND MAGNETICS 2000-2009	1/
4	CO	NCLUSION	18
5	RE	FERENCES	19

LIST OF FIGURES

Figure 1.	Location of EPM 141616
Figure 2.	Regional geology7
Figure 3.	Exploration Index Map9
Figure 4.	Location of historical aerial geophysics surveys (Morrell, 2008a)15
Figure 5.	Location of historical IP surveys (Morrell, 2008a)15
Figure 6.	Fresh capture IKONOS Image17
Figure 7. pipe	Grid J anomaly - RTP. Interpreted multi-phase intrusive stock or breccia complex

LIST OF TABLES

Table 1.	Tenement details for EPM 14161 for 2009-2010 2
Table 2.	Block and sub-block details for EPM 14161 prior to 2009 relinquishment 3
Table 3.	Relinquished block and sub-block details for EPM 14161
Table 4.	Summary of exploration activities for relinquished area
Table 5.	Open-file or multi-client aeromagnetic datasets 10
Table 6.	Exploration targets within relinquished area from 2004-2005 data review. 12
Table 7.	Survey specifications for Airborne geophysical survey
Table 8.	VTEM survey specifications

APPENDICES

Appendix 1	Terra Search Pty Ltd Report – Exploration Data Compilation, 2005
Appendix 2	St Arnaud Data Management Report – Database validation and import, cross-section production, GIS map production, 2005
Appendix 3	Digital Rock Services Pty Ltd Report - Regional targeting and Liontown review, 2005
Appendix 4	Southern Geoscience Consultants Memorandum – 16 Oct 2006
Appendix 5	Fugro Airborne Surveys Report — Liontown, Queensland Airborne Magnetic and Radiometric Geophysical Survey, 2006

Appendix 6	SGC Report –VTEM Survey: Interpretation & Logistics Report, January 2008				
Appendix 7	Digital Rock Services Pty Ltd Report — Review of high-priority regional prospects in the Mount Windsor Volcanics Project, 2007				
Appendix 8	Digital Rock Services Pty Ltd Report — Summary of field visit to the Mount Windsor Volcanics Project				
Appendix 9	SGC Memorandum — Historical geophysical data compilation, February 2008				
Appendix 10	Lithos-X Mineral Exploration Consultants Report — Geological Interpretation of the detailed aeromagnetic and radiometric data, 2007				
Appendix 11	AAMHatch Pty Ltd Report — IKONOS Satellite Imagery, 2008				

Appendix 12 Terra Search Pty Ltd report – Ground Magnetic Survey, 2009

SUMMARY

The Liontown tenement (EPM 14161) is part of Liontown Resources Limited's Mount Windsor Volcanics Project and is located approximately 40 km south of Charters Towers, north Queensland within the Thalanga Province.

The tenement is underlain by the Mount Windsor Volcanics — a sequence of rhyolitic to dacitic volcanic and volcaniclastic rocks with minor andesite. In the vicinity, the Mount Windsor Volcanics host the Thalanga and Highway-Reward VHMS related Zn-Pb-Cu-Au-Ag and Cu-Au mines. The tenements of the project were acquired to target VHMS style base metal and gold mineralisation, and epithermal style or granite breccia hosted gold mineralisation.

This relinquishment report covers exploration activities carried out on parts of EPM 14161 for the period 15 June 2004 - 14 June 2009.

Exploration activities carried out during the reporting period include:

- historical data compilation and database compilation;
- solid geological interpretation and exploration targeting;
- review of historical geophysics;
- airborne aeromagnetic radiometric survey;
- airborne VTEM survey;
- further target generation and field checking;
- aeromagnetic and radiometric survey interpretation;
- VTEM survey interpretation;
- acquisition of IKONOS satellite imagery;
- a ground magnetic survey.

In 2009 Liontown Resources Limited has recently recognized the potential for breccia-related gold deposits within the MWV Project area, similar to the Mt Leyshon and Mt Wright deposits. Exploration has now re-commenced on the MWV Project; however, exploration focus is now on gold.

Many of the exploration targets identified on the relinquished ground during the period were focused on the search for base metals and were of a low priority. Therefore, they were not followed up with further work. It remains that many of these targets are still untested.

1 INTRODUCTION

This partial relinquishment report summarises exploration activities on relinquished ground of EPM 14161 (Liontown) for the period 15 June 2004 - 14 June 2009.

EPM 14161 has been under various companies' management since it was granted in 2004 and is currently part of Liontown Resources Limited's (LRL) Mount Windsor Volcanics Project (MWVP).

1.1 Location

EPM 14161 is located approximately 40 km south of Charters Towers, north Queensland (Figure 1), within the Thalanga Province.

The tenement falls within the Charters Towers (SF55-02) 1:250 000 map sheet, and the Homestead (8057) and Charters Towers (8157) 1:100 000 map sheets.

Access to EPM 14161 is via the Gregory Developmental Road, then west along local station tracks. The area is typically flat with a few sparsely vegetated, gently undulating slopes.

1.2 Tenure

EPM 14161 is part of LRL's Mount Windsor Volcanics Project. LRL acquired the MWVP ground from Uranium Equities Limited (UEL) (previously Bullion Minerals Ltd) following successful floating and ASX listing of LRL in December 2006. Tenure transfer of EPM14161 from UEL to LRL was registered on 19 December 2008.

EPM 14161 was originally applied for by Bullion Minerals Limited (BML) on 15 July 2003 and comprised 320 km² (100 sub-blocks) when granted in 2004.

Applications to vary the required reductions of EPM 14161 occurred at the end of the second, third, and forth years, and were all approved.

In 2006, 19 sub-blocks (instead of 50) were relinquished from EPM 14161 and no further ground was relinquished up until 2009.

A further 3-year extension of tenure was applied for on 4 March 2009 over 40 subblocks — renewal is pending. The other 41 sub-blocks were relinquished on 14 June 2009.

Current tenement details are shown in Table 1, sub-block details before 50% relinquishment are shown in Table 2, sub-blocks relinquished in June 2009 are shown in Table 3 and a tenement location map is shown as Figure 1.

Tenement	Holder	Grant Date	Expiry Date	Sub- Blocks/km ²	Rent (incl GST)	Expenditure Commitment
EPM 14161	Liontown Resources Limited	15/06/04	14/06/09 pending renewal	40/128.8	\$5,236.00	\$240,000

Table 1. Tenement details for EPM 14161 for 2009-2010

BIM Code	Block Number	Sub-blocks	Number of Sub-blocks
CLER	312	P, U, Z	3
CLER	313	L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z	15
CLER	314	F, G, H, J, P, U, V, W, X, Y, Z	11
CLER	315	Q, R, S, T, V, W, X, Y, Z	9
CLER	316	Q, R, S, T, U, V, W, X, Y, Z	10
CLER	317	Q, R, S, T, U, V, W, X, Y, Z	10
CLER	318	F, G, L, M, N, Q, V	7
CLER	385	B, C, D, E	4
CLER	387	C, D, E	3
CLER	388	A, B, C, D, E	5
CLER	389	A, B, C, D	4
Total			81

Table 2. Block and sub-block details for EPM 14161 prior to 2009 relinquishment

Table 3. Relinquished block and sub-block details for EPM 14161

BIM Code	Block Number	Sub-block	Number of Sub-blocks
CLER	312	P, U, Z	3
CLER	313	L, Q, V	3
CLER	315	Τ, Υ, Ζ	3
CLER	316	Q, R, S, T, U, V, W, X, Y, Z	10
CLER	317	Q, R, S, T, U, V, Z	7
CLER	318	F, G, L, M, N, Q, V	7
CLER	387	D, E	2
CLER	388	A, B, C, D, E	5
CLER	389	A	1
Total			41

1.3 Project Philosophy and Objectives

The Mount Windsor Project area held by LRL is targeted for gold and base metal deposits. Ground selection was based on the following geological concepts:

- The continuation of a SW-trending gold anomalous corridor that includes the Ravenswood, Nolans and Pajingo gold deposits;
- The continuation of a SW-trending gold and base metal anomalous corridor that includes the Mount Leyshon, Highway-Reward and Liontown deposits. Both corridors are characterized by the presence of Upper Carboniferous intrusives;
- The presence of gold and base metal occurrences in parts of LRL's tenement application areas;
- The presence of the Mount Windsor Volcanics, which hosts the Thalanga, and Highway-Reward VMS base metal deposits. The Mount Windsor Volcanics contain a number of small base metal occurrences and are considered to have further potential for these types of deposits;
- Likely extensions to prospective Mount Windsor Volcanics stratigraphy under transported Tertiary Campaspe Beds; and
- The presence of a number of major structures noted from aeromagnetics.

2 REGIONAL GEOLOGY

Bedrock geology of the area is shown in Figure 2 (based on GIS data from Department of Natural Resources and Mines' Geoscience and Resources Database on 18 November 2003).

2.1 Geology

Basement rocks in the area comprise Neoproterozoic to early Cambrian metasediments and orthogneisses of the Cape River and Charters Towers metamorphics.

Deposition of the Seventy Mile Range Group commenced in the late Cambrian, within a fault-controlled basin. The base of the Seventy Mile Range Group, the Puddler Creek Formation, is dominated by terrigenous sediments, and comprises sandstone and greywacke with minor tholeiitic basalt.

This is conformably overlain by the Cambro-Ordovician Mount Windsor Formation, which comprises massive lavas dominated by rhyolite, and the Trooper Creek Formation, which is composed of mainly dacite, andesite, and rhyolite lavas and volcaniclastics with fine-grained sediments at the top. Conformably overlying the Trooper Creek Formation is the final unit of the Seventy Mile Range Group, the Rollston Range Formation, which comprises volcaniclastic sandstones and siltstones.

During the deposition of the Seventy Mile Range Group, sub-volcanic intrusions of Cambro-Ordovician age were emplaced. After deposition of the Seventy Mile Range Group ceased, intrusive activity occurred in the area, accompanied by deformation and gold mineralization. First was a series of Ordovician granitoids, dominated by magnetic granodiorite, and including the Bend Granodiorite in the eastern part of the project area.

The next event comprised the mid-Ordovician to late-Silurian intrusives of the Ravensworth Granodiorite Complex, which is composed of granite, adamellite, microgranite, granodiorite, gabbro, diorite and tonalite, and exists mostly in the east of the project area.

During the late-Silurian to early-Devonian, intrusive activity was renewed in the Ravenswood Batholith which dominates the north-eastern part of the project area, and the Lolworth Igneous Complex was also intruded. The Lolworth Batholith dominates the northern-western part of the project area, and is composed of banded muscovite granite and massive biotite adamellite. This was followed in the early Permian by igneous breccias, quartz-bearing trachytes and rhyolite porphyry of the Mount Leyshon Complex, and in the late Permian by leucogranite, volcanic breccia, dacite, rhyolite, dolerites and microgranites of the Mundic Igneous Complex.

During the late Permian to early Triassic, sediments of the Galilee Basin, including the Warang Sandstone, which outcrops in the project area, were deposited in an apparently linear, northwest trending basin.

The Campaspe Formation, comprising conglomerate, sandstone and pebbly sandstone, was deposited in the Pliocene and covers much of the southern half of the project area, up to maximum depths of 120 m. Quaternary sediments, commonly unconsolidated, are also common in the southern part of the project area.

2.2 Structure

The structure of the northern part of the Mount Windsor Volcanics Project area is dominated by east-west trending ridge of granitoid formed by the Lolworth Batholith in the northwest and the Ravenswood Batholith in the northeast. The Seventy Mile Range Formation, which is intruded by units of these igneous complexes, drapes off this granitoid ridge, dipping moderately south. Mylonites have been recorded near the contact of the Seventy Mile Range Formation and the Charters Towers Metamorphics, and the relationship between the two units is likely to be structural.

Significant syn-sedimentary faulting is preserved within the Seventy Mile Range Formation, usually defined by abrupt thickening or thinning of individual lithostratigraphic packages. Major syn-sedimentary faults commonly originate on the boundaries of or within the Cambro-Ordovician intrusives found structurally below the Seventy Mile Range Formation, and are associated with base and precious metals mineralisation.

Four deformations have been interpreted in the area by previous workers (Withnall et al, 2003). D1 rarely displays a fabric, and is detected by a change in the S0/S2 lineation. D2 is represented by a penetrative east-west striking, steeply dipping schistosity, which is present in the Seventy Mile Range Group. In the project area, D3 is most prominent within the Ravenswood Batholith, where it forms prominent magnetic lineaments striking east-northeast to northeast. D3 extends into the Seventy Mile Range Group, where it occurs as steep, south-side-up faults with localised fabric development. D4 represents the shallow to moderately dipping east to northeast striking dip-slip faults which control the Charters Towers Gold Mineralisation.

In addition to these documented deformations, prominent northwest trending lineaments are evident in both the gravity and magnetics across the entire project area, and show some offset in the Seventy Mile Range Group. The three major deposits that make up Pajingo are aligned along one of these prominent northwest trending lineaments.





2.3 Regolith

The northern part of the project area is dominated by subcrop and outcrop, and is comprised of moderately rough terrain with incised drainage systems. The far south-eastern part of the project area is extensively lateritised, commonly with a stripped profile and the occurrence of mesas.

In the south, the majority of the area is covered by Campaspe Formation, over which modern fluviatile deposits are common.

3 SUMMARY OF EXPLORATION FOR PERIOD OF TENURE

Table 4 summarises exploration activities on the relinquished areas of EPM 14161 and Figure 3 the locations — the activities are discussed in the following sections.

Work done	Year conducted	Conducted by	Year reported
Historical data compilation, open-file data search	2005	Terra Search Pty Ltd	2004-2005
Historical data compilation, GBis database	2005	St Arnaud Data Management	2004-2005
Historical data compilation, aeromagnetic data	2005	Southern Geoscience Consultants	2004-2005
Solid geological interpretation	2005	Digital Rock Services Pty Ltd	2005-2006
Exploration targeting	2005	Digital Rock Services Pty Ltd	2005-2006
Review of historical electrical geophysics	2005	Southern Geoscience Consultants	2005-2006
Airborne aeromagnetic - radiometric survey	2006	Fugro Airborne Surveys Pty Ltd	2006-2007
Airborne VTEM survey	2007	Geotech Airborne Surveys	2006-2007
Target generation	2007	Digital Rock Services Pty Ltd	2006-2007
Field checking of targets	2007	Digital Rock Services Pty Ltd	2006-2007
Review of historical geophysical data	2008	Southern Geoscience Consultants	2007-2008
Aeromagnetic and radiometric survey interpretation	2007	Lithos-X	2007-2008
VTEM interpretation	2008	Southern Geoscience Consultants	2007-2008
IKONOS satellite imagery	2008	AAMHatch Pty Ltd	2008-2009
Ground magnetics	2008-2009	Terra Search	2008-2009

Table 4. Summary of exploration activities for relinquished area



3.1 Historical Data Compilation, 2004-2005

Terra Search Pty Ltd (TS) of Townsville were contracted to undertake an open-file data search for EPM 14161 and 14162. The work is summarised in Camuti, 2005 – see Appendix 1.

St Arnaud Data Management (SADM) were contracted to compile a GBis based relational database of all the open file exploration data and produce and image a series of data extracts. The work is summarised in SADM, 2005 – see Appendix 2.

Southern Geoscience Consultants of Perth, W.A. (SGC), were contracted to acquire and digitally stitch the available open-file aeromagnetic data for the Project Area. The datasets combined in the stitch are listed in Table 5. A range of images and processing treatments were applied by SCG and a series of TMI or 1VD images were plotted onto gloss paper at 1:100 000, 1:50 000 and 1:25 000 scale.

Dataset	Contractor	Year	Line spacing	<i>Mean Terrane Clearance</i>	Data Source
Charters Towers Multiclient	Fugro	May 1987- Feb 1989	200m	60m	Multiclient purchase
BMR P482	BMR	Oct 1982- Oct 1983	1500m	150m	Geoscience Australia
Gains Creek	Unknown	July 1986	300m	80m	Open File
Homestead	Unknown	Oct 1998	200m	60m	Open File
Rocky Creek	Unknown	1988	200m	Unknown	Open File
Braceborough	Unknown	Nov 1983	250m	80m	Open File
Kangerong	Unknown	1994	400m	60m	Open File

Table 5. Open-file or multi-client aeromagnetic datasets

TS, SADM and SGC compiled geological, geochemical and geophysical data going back over 50 years for Bullion's Charters Towers Project area (now LRL's Mount Windsor Volcanics Project). The data was compiled as either scanned reports, Access-based digital tables of surface geochemistry and drilling information, or stitched raster datasets. The geology data used was sourced from the Queensland Department of Natural Resource and Mines's GIS datasets.

All the data above is either open-file or commercial multi-client data and is therefore, not reproduced here.

3.2 Analysis of Historical Data – Target Generation, 2005-2006

Analysis of historical data compiled in 2004-2005 was carried out by Digital Rock Services Pty Ltd (DRS) and Southern Geoscience Consultants (SGC). A solid geological interpretation and targeting exercise was conducted by DRS and a review of historical geophysics was carried out by SCG over the Mount Windsor Volcanics Project for BML.

3.2.1 Solid Geological Interpretation

Jennifer Gunter of DRS completed a solid geological interpretation of the tenement area using the following datasets compiled during the 2004-2005 year:

- detailed mapping from previous explorers;
- Queensland DNRM solid and surface geological mapping;
- stitched open-file radiometric and aeromagnetic datasets;
- regional gravity images; and
- bottom-of-hole geology from historical drilling.

The interpretation is presented in Appendix 3.

3.2.2 Mount Windsor Volcanics Exploration Targets

Jennifer Gunter of DRS completed a detailed review of the historical drilling and surface geochemical datasets (open-file data) based on the data compiled in the 2004-2005 year, with the aim of identifying further targets for detailed exploration by Uranium Equities Ltd (UEL – previously BML). The solid geological model was interrogated for further conceptual targets. All targets were prioritised.

10 targets were identified on the relinquished area (see Table 6 and Figure 3): 6 were surface geochemical targets; 3 were conceptual targets and 3 were also defined by anomalous drill intercepts.

This regional targeting exercise is presented in Appendix 3. All the targets are described in Table 6, and have recommendations for follow-up work but none of these recommendations were carried out.

3.2.3 Review of Historical Electrical Geophysics

SGC reviewed the historical geophysics (from survey outlines and metadata compiled by Terrasearch in 2004-2005). The report in presented in Appendix 4.

65 surveys were summarized. Of these 36 are IP, 27 ground TEM and 2 unclassified. Only 4 of these IP surveys were considered effective and 10 moderately effective. 4 were reported with untested anomalies. Of the TEM surveys, 2 were reported as effective and 8 as moderately effective.

Table 6. Exp	loration targets	\$ 2005												
AMGE (GDA94)	AMGN (GDA94)	NUMBER	NAME	PRIORITY	COMMODITY	TARGET TYPE	LOCATION	GEOLOGY AND STRUCTURE	REGOLITH	SURFACE_GE	DRILLING	GEOPHYSICS	COMMENTS	RECOMMENDATIONS
427110	7742870	6	Trooper Creek Au-Cu	1	Au-Cu	Surface Geochemistry	1.8km South East of Trooper Creek	Siltstones of the Trooper Creek Formation. On major Syn-sed fault, adjacent major alteration zone and Cambro-Ordovician gabbro.	Outcropping	Very coherent high level Cu anomalism in soils, with Pb and Zn absent. Au not assayed in soils, but coherent Au anomalism in stream seds.	8 shallow scout holes on very western edge of anomaly with best results TAR024; 3m @ 0.36ppm Au and TAR023; 3m @ 331ppm Cu	EM over whole target. No information about effectiveness or anomalies.	Cu only anomaly, with very minor Pb and Zn. Soil samples not assayed for Au. Au anomalism in drilling. Very good Au anomaly in stream seds. Adjacent gabbro / dolerite.	Ground-check. Acquire historical EM and IP to assess effectiveness. Rock chip and soil sample for Au.
423500	7743800	3	Trooper Creek Base Metals	2	Base Metals	Surface Geochemistry, Drilling	Trooper Creek Prospect	At the Mount Windsor - Trooper Creek boundary, within dacites and rhyolites of the Trooper Creek Formation, on major Syn-sed structure.	Mostly outcropping, minor unconsolidated Quaternary cover	Coherent, moderate to high level Zn-Cu-Pb anomalism in soils over subcrop.	No drilling within anomaly area, significant drilling along strike where stratigraphy goes under cover	EM over whole target. No information about effectiveness or anomalies.	Anomalism largely contained to a specific fragmental dacitic lava.	Ground-check outcrop. Acquire historical EM data and assess. May have potential for non- outcropping mineralisation.
427620	7743700	5	Trooper Creek East	2	Base Metals	Surface Geochemistry	1.5km East of Trooper Creek	Siltatones of the Trooper Creek Formation. On major Syn-sed fault, and adjacent major alteration zone as indicated by demagnetisation.	Outcropping	Coherent, low level Zn-Cu-Pb anomalism in soils over subcrop. Au not assayed.	No Drilling	IP & EM over approximately 1/3 of anomaly. Results and effectiveness unknown.	Anomaly clearly extends f past the growth fault along a stratigraphic horizon to the east, where it is completely untested by drilling or geophysics, however outcrops.	Ground-check. Acquire historical EM and IP to assess effectiveness. Geophysics or drilling over stratigraphic strike extent to assess for targets at depth.
432070	7745010	7	Prisoner Creek East	2	Base Metals	Surface Geochemistry, Drilling	5km ENE of Trooper Creek	Dacites and rhyolites of the Mount Windsor formation with sediments of the Puddler Creek formation. Adjacent major? Syn-sed fault.	Outcropping	Patchy, low level Zn-Cu-Pb anomalism in solis over subcrop. Au not assayed.	No Drilling	IP over approximately 1/2 of anomaly. Moderate to strong anomaly with shallow depth to top (25m), attributed to lithological contact.	Dismissal of IP anomaly I seems odd without additional data. Contact refers to the contact between rhyolitic tuff and rhyolitic flow-dome in the Mt Windsor Volcanics.	Ground check for drilling not captured by database. Acquire historical IP data and assess. Drill test if anomaly is robust.
417000	7743500	30	Jack	2	Base Metals, Au	Conceptual	7.5km South of Highway- Reward	At the top of the Trooper Creek Fm, where it intersects a combination Syn- sedimentary and Highway-Reward associated fault.	Approx 65m of cover, Tertiary with possible Campaspe Fm underlying	None Available	One drillhole within 3.3km radius target zone. No significant anomalism, target not tested.	No recorded geophysics.	Moderate conceptual target for polymetallic deposits.	Consider a small program of drilling to assess the target for anomalous base metals or gold values.
433860	7743720	32	Drew	2	Au	Conceptual	Immediately NNW of Brittania	Interpreted extension of the NW "Pajingo" structure which is a subtle lineament in the magnetics, and a prominent feature in the gravity.	Approximately equal amounts of outcrop and Quaternary cover.	Patchy soil sampling shows no significant anomalism, most stream sediment sampling not assayed for gold.	Drilling within the target area at the Donut prospect, and further north. No drilling over main structure. No significant anomalism.	Limited ground magnetics has been completed over a small portion of the target area, away from the main structure.	Lack of anomalism in the small number of geochemical samples in the area downgrades the target.	Complete supplementary stream sediment sampling for gold.
429200	7740700	35	Super Trooper	2	Base Metals	Conceptual	14km East- South-East of Highway- Reward	Sediments and Rhyolites of the Trooper Creek formation. Adjacent major Syn-sedimentary fault. Potassium alteration in Radiometrics?	Mostly Outcrop. Minor Quaternary and Campaspe cover.	No soil sampling, very slightly elevated base metals in stream sediment sampling.	No drilling recorded.	No recorded geophysics.	Potential for buried orebody with visible alteration halo and very minor anomalism at surface.	Ground check. Conduct EM survey to test for conductors. Drill test any conductors.
426600	7743400	4	Trooper Creek Breccia	3	Base Metals	Surface Geochemistry	500m South of Trooper Creek Prospect	Trooper Creek Breccia. Mt Leyshon Complex Carboniferous intrusive breccia.	Mostly outcropping, minor unconsolidated Quaternary cover	Coherent, low level Zn-Cu-Pb anomalism in soils over subcrop. Au not assayed.	4 shallow holes in anomaly area. Max assay in TAR048, drilled to 27m. EOH assay only, 3m @ 0.189% Zn and 71ppm Cu.	EM over whole target. No information about effectiveness or anomalies.	Coherent and co-incident, but low level Cu-Pb-Zn anomalism. Appears to be associated with outcrop of Mt Leyshon Complex Lithologies.	Ground-check outcrop. Acquire historical EM data and assess. May have potential for non- outcropping mineralisation.
433880	7745270	8	Donut Base Metals	3	Base Metals	Surface Geochemistry	7km ENE of Trooper Creek	Dactes and rhyolites of the Mount Windsor formation with sediments of the Puddler Creek formation. Adjacent major? Syn-sed fault.	Outcropping	Patchy, low level Zn-Cu-Pb anomalism in soils over subcrop. Au not assayed.	11 Shallow drill holes on the edge of anomaly area. Max assay 3m @ 0.115% Pb and 0.36% Zn. Max cu 161ppm.	Most of the anomaly covered with EM. Moderate anomalies returned, attributed to resistivity contrast between units.	No different units mapped to attribute resistivity contrasts to some comments in geophysics about Campaspe, so there may be unmapped Campaspe in the area?	Ground check. Acquire historical EM data and assess. May have potential for non- outcropping mineralisation.
396180	7743240	28	Trafalgar	4	Base Metals	Drilling, geophysics	6.5km west of Liontown	Drilling in Trooper Creek Formation covered by Campaspe Formation and Quaternary sediments.	Campaspe Formation and Quaternary cover.	Significant Cu-Au-As anomaly immediately adjacent, but no surface geochemistry available for the drill traverse.	Single line of moderate depth, 100m spaced drill holes. Very minor anomalous Cu, no other anomalism, not assayed for Au.	EM completed over most of the traverse. Moderate effectiveness, no significant anomalies.	Target unclear, as geophysical notes indicated no significant anomalies.	No further work.

3.3 Airborne Geophysics, 2006-2007

Two new geophysical surveys were carried out over the 2006-2007 reporting year: an aeromagnetic/radiometric survey and a VTEM survey.

3.3.1 Aeromagnetic/Radiometric Survey

Between 26/07/2006 - 30/07/2006 Fugro Airborne Surveys Pty Ltd was contracted to undertake an airborne magnetic/radiometric survey over the Liontown area including a small western portion of the relinquished ground on EPM 14161 (Error! Reference source not found. shows survey location). The survey consisted of 1 area, flown in seven flights — Table 7 gives the survey specifications. Total coverage was approximately 2999.2 line km. The survey was flown using an Aerocommander Strike 500-S aircraft. The survey's ID number is 1147 on the Department's IRTM system.

For the detailed report covering procedures and survey equipment used in the acquisition, verification and processing of the data see Appendix 5.

Geophysical Survey flown by Fugro						
Survey dimensions	Approximately 133 km ²					
Line spacing	50 m					
Line orientation	000-180 degrees					
Flight height	30-35 m MTC					
Estimated size	2999.22 line km including tie lines					

Table 7. Survey specifications for Airborne geophysical survey

3.3.2 VTEM Survey

From the 28 May - 12 June 2007 Geotech Airborne Surveys carried out a heli-borne Versatile Time Domain Electro-Magnetic (VTEM) survey. The survey covered most of the relinquished ground of EPM 14161 — see Figure 3 for survey location.

The VTEM survey specifications for entire survey are listed in Table 8 with the logistical report presented in Appendix 6 (Appendix 4 of Appendix 6).

The survey was reported in to the Department of Mines and Energy - Survey ID 1144 on their IRTM system.

Block	Area (km2)	Line Spacing (m)	Line direction	Line (km)	Infill line (km)
Liontown	74	400	N-S	185	
Liontown infill	74	400	N-S	185	185
Kagara	61	200	N-S	305	
Blenheim	10.5	200	N-S	53	
Brittania	66.1	200	N-S	330	
Brittania Extension	21.4	200	N-S	107	
Gregory	54.7	400	N-S	137	
Gregory infill	53.5	400	N-S	134	134
Bullseye	77	200	E-W	385	
			TOTAL	1821	319

 Table 8.
 VTEM survey specifications

3.4 Target generation, 2006-2007

In June 2007, Jennifer Gunter (Gunter, 2007a) of Digirock Services undertook a review of LRL's prospects in the Mount Windsor Volcanics region. The Trooper Creek Cu-Au prospect (see Figure 3) falls within the relinquished ground on EPM 14161 and was reviewed by this work — it was upgraded with the intercept of 6 m @ 1.65 g/t Au and the recommendation was that exploration be undertaken over this prospect as a priority.

In July 2007 Jennifer Gunter made a field visit to the Trooper Creek Cu-Au prospect (Gunter, 2007b). Whilst this area has had substantial work for base metals, no significant work has been completed on the gold mineralisation so far located in the area. It was recommended that mapping to define the controls on gold, and soil sampling to identify the distribution of the gold, be completed as a priority for regional exploration. It is expected that this would be followed up by RAB or RC drilling to test the area for significant gold mineralisation. However, none of these recommendations were carried out and no further work has been completed since.

See Appendix 7 and 8 for a detailed overview of Jennifer Gunter's work.

3.5 Review of Historical Geophysical Data, 2007-2008

During 2007-2008, historical geophysical data covering the Mount Windsor Volcanics Project area was forwarded to Southern Geoscience Consultants (SGC) for review. The data on these disks was originally collected or compiled by RGC who started to compile and review the data in 1995. This earlier review was terminated before completion.

SGC re-compiled the data and focused on locating historical IP data in the Liontown Prospect area (within EPM 14161).

Many of the historical surveys covered parts of EPM 14161 — see Figure 4 for extents of airborne geophysical surveys and Figure 5 for locations of IP surveys. The full report is presented in Appendix 9.



Figure 4. Location of historical aerial geophysics surveys (Morrell, 2008a)



Figure 5. Location of historical IP surveys (Morrell, 2008a)

3.6 Interpretation of 2006 Aeromagnetic/Radiometric Survey, 2007-2008

John McIntyre of Lithos-X was contracted to complete a geological interpretation based on the detailed aeromagnetic and radiometric data collected over the Liontown Prospect area (western area on EPM 14161 which is now partially relinquished) in July 2006, in conjunction with data compiled from various sources.

The interpretation was designed to support the interpretation of the heliborne VTEM data.

The interpretation report contains four interpretive maps: (1) solid geology interpreted from aeromagnetics; (2) surface geology interpreted from radiometrics; (3) alteration zones interpreted from both aeromagnetics and radiometrics; and (4) a map of exploration target areas.

The solid geology map shows the four regionally mapped formations within the Seventy Mile Range Group, and the Thalanga, Waterloo and Liontown Horizons (favourable horizons for the development of VHMS mineralisation), have been interpreted.

The Thalanga Horizon is defined as the Mt Windsor Volcanics - Trooper Creek Formation contact, which is mapped across the survey area. Anomalism and alteration at Esso's Waterloo prospect is correlated with this position. Potassic alteration is recorded in areas to the west, with no reported soil sampling.

The Waterloo Horizon is defined as an interval within the Trooper Creek Formation, and at Waterloo is associated with volcaniclastics within an andesitic unit. Equivalent positions have been identified including through the Oakvale area.

The Liontown Horizon, located near the top of the Trooper Creek Formation, has been interpreted to the west and east.

A series of exploration targets were identified, with the next phase of exploration proposed. Two VHMS targets, focussed on the3 key horizons, and three miscellaneous targets were identified on the relinquished ground – see Figure 3 for locations.

For the full report see Appendix 10.

3.7 Interpretation of VTEM 2007 Survey, 2007-2008

Interpretation of the 2007 VTEM survey was conducted by Southern Geoscience Consultants and their report is presented as Appendix 6. The logistics report by Geotech Airborne is included as 'Appendix 4' of Appendix 6.

The survey was undertaken to identify conductive zones potentially related to sulphide mineralisation within the Mount Windsor Volcanics, particularly along the prospective Thalanga, Waterloo and Liontown Horizons, and to map conductive overburden to define extent and thickness.

The interpretation identified a total of 127 anomalies, of which 92 were on EPM 14161 and 68 were on the relinquished area (see Figure 3 for location). Most of these were from non-bedrock conductive sources. The primary source is Tertiary sediments of the Campaspe Formation which cover much of the project area and are highly conductive. A residual total of 26 anomalies (representing 15 interpreted conductors) were interpreted as potential bedrock conductors and ranked for exploration priority. Of these anomalies, 13 are located on relinquished ground of EPM 14161. A total of 9 anomalies (BREM-2, 3, 4, 6, 9, 10, 11, 13, 15) representing 2 potential bedrock conductors were ranked as Priority 1 targets (MWE-10, and MWE-11).

• MWE-10 is defined by 4 moderate to strong anomalies with a strike length of approximately 650 m. It is a definite bedrock conductor and one of the strongest targets from this survey. A drillhole targeting the modelled conductor was designed but was not tested.

• MWE-11 is a moderate to strong anomaly across 5 lines defining an E-W strike length of approximately 800 m. Two drillholes targeting these modelled conductors were designed not tested.

3.8 IKONOS Satellite Imagery 2008-2009

Colour IKONOS satellite imagery of the area of LRL's granted tenures (including the entire relinquished area of EPM 14161) at 0.8m resolution, was captured on 11 July 2008 and supplied by AAMHatch Pty Ltd. The day of capture was cloud free and covered the entired tenement area. The imagery was supplied to LRL as 3-band Geotiff and ECW formats with corresponding georeference files.

The image will be used to support regional soil sampling, regolith and geological mapping, and other exploration planning requirements.

Ground survey control points for geo-referencing the image were captured with DGPS in September 2008.

Figure 3 shows the survey location, Figure 6 shows the IKONOS image. Further information and metadata details are presented in Appendix 11. The data files have previously been supplied to the Department of Mines and Energy on DVD with 2008-09 annual report EPM 15102 (Hall, 2009).



Figure 6. Fresh capture IKONOS Image

3.9 Ground Magnetics 2008-2009

A ground magnetic survey was conducted over part of the relinquished portion of EPM 14161 from 19 December 2008 - 9 January 2009 by Terra Search of Townsville.

The survey grid area J (Mountain View) was part of a test programme designed to better-define the magnetic anomalies identified in the airborne survey, with survey lines at 50 m intervals. The survey lines were oriented north-south. The final survey grid had 61 lines, 3 km in length for a total of 183 line-km, over an area of 9 km^2 – see Figure 3 for location of the grid.

Grid J (Figure 7) revealed a complex anomaly suggesting a multi-phase intrusive or breccia complex with some similarities to Mt Leyshon.

This anomaly doesn't have any surface exposure, being covered by Tertiary Campaspe Formation. The ground magnetic survey has provided significantly better definition of the anomaly than previous airborne surveys and can be regarded as a technical success in that regard. However, direct sampling of the anomalies will still be necessary, using either RAB or RC to determine the source of the anomalies and their gold potential.

A detailed report on the survey and the results is presented in Appendix 12.



Figure 7. Grid J anomaly - RTP. Interpreted multi-phase intrusive stock or breccia pipe complex.

4 CONCLUSION

LRL (and their predecessors) carried out a substantial amount of data compilation and review over the relinquished ground which was followed up by various geophysical surveys and targeting exercises.

Most of the targets identified on the relinquished ground were of low priority, except 2 potential bedrock conductors identified from the VTEM survey which had drillhole plans designed. Therefore, when budgetary constraints were applied these areas were never followed up.

In 2009 LRL has recognized the potential for breccia-related gold deposits within the MWV Project area, similar to the Mt Leyshon and Mt Wright deposits. LRL recommenced exploration on the MWV Project; however, exploration focus is now on gold.

5 REFERENCES

Bain, J. H. C. and Draper, J. J. (eds.), 1997: North Queensland geology, Australian Geological Survey, Bulletin 240/Queensland Geology 9.

Hall, G. J., 2009: Annual Report, EPM 15102 — Trafalgar, Mount Windsor Volcanics Project for the period 28 March 2008 to 27 March 2009, Liontown Resources Ltd, unpublished.

Whitnall, I. W., Hutton, L. J., and Blight, R. L., 2003: North Queensland gold and base metal study, stage 2 data release — Charters Towers GIS, Geological Survey of Queensland, Department of Natural Resources and Mines, digital data released on CD-ROM.

APPENDIX 1

Terra Search Pty Ltd Report - Exploration Data Compilation, 2005

BULLION MINERALS LIMITED

Charters Towers Project

EXPLORATION DATA COMPILATION

August 2005

Report compiled by: Kaylene Camuti on behalf of Terra Search Pty Ltd Townsville, Queensland

SUMMARY

This report has been prepared for Bullion Minerals Limited and presents a summary of a recent program of historical data acquisition and compilation for the Bullion Charters Towers Project. The data compilation project was carried out by the Townsville office of Terra Search Pty Ltd.

The Charters Towers Project area covered by this report consists of two exploration permits of 100 subblocks each - EPMs 14161 and 14162 - and mining lease ML 10277 over the Liontown deposit.

Data acquired, sorted, compiled and copied for this data acquisition project included:

Data Type	Number
Historical Tenement Outlines	121 EPMs
Open File Company Reports	318 Scanned Reports
Open File Geochemical Database	> 50,000 data points
Liontown Plans & Sections	464 Scanned Plans & Sections
Liontown Internal Reports	11 Scanned & Photocopied
Liontown Drill Hole Database	525 Drill Holes (assays, drill logs, survey data)
Extent of Liontown Geophysical Surveys	3 Scanned Plans showing outlines of geophysical surveys.

CONTENTS

1.	INTRODUCTION									
2.	LOCATION & TENURE									
3.	COMPILATION OF HISTORICAL DATA									
	3.1 TENEMENT COVERAGE									
	3.2 GEOCHEMICAL DATABASE									
	3.3 COMPANY REPORTS									
	3.4 LIONTOWN PLANS & SECTIONS									
	3.5 LIONTOWN	REPORTS	р4							
	3.6 LIONTOWN	DRILL HOLE DATABASE	р4							
	3.7 LIONTOWN	GEOPHYSICAL SURVEYS	p 5							
	APPENDIX 1	Subblocks in EPMs 14161 and 14162	p 6							
	APPENDIX 2	Historical Tenements	DVD1							
	File Name	Bullion_ChTwers_Historical_EPMs.ppt								
	File Format	Powerpoint								
	Contents	Plots of historical tenement coverage and distribution of geochemical data points								
	APPENDIX 3	Geochemical Database	DVD1							
	File Name	Numerous								
	File Format	Access, Explorer 3								
	Contents	Geochemical data from the Bullion Project area								
	APPENDIX 4	Open File Company Reports	DVD1							
	APPENDIX 4A									
	File Name	Bullion_ChTowers_Historical_EPMs&CRs.xls								
	File Format	Excel								
	Contents	List of Historical EPMs and Company Reports; includes company report metadata and listing of Explorer 3 geochemical data points.								
	APPENDIX 4B									
	File Name	Various: directories named according to Company Report Number								
	File Format	Tiff, pdf								
	Contents	Digital copies of open file company reports for historical tenements covering the area of the Bullion Minerals EPMs.								

APPENDIX 5	Liontown Plans & Sections	DVD2 DVD3
APPENDIX 5A		
File Name	List of Liontown Plans & Sections.xls	DVD2 DVD3
File Format	Excel	
Contents APPENDIX 5B	List of Liontown Plans and Section with Drawing Numbers	
File Name	Various: named according to Drawing Number	
File Format	Tiff (zipped according to company)	
Contents	Scanned Plans/Sections from:	
	Charters Towers JV	DVD2
	Esso	DVD2
	Great Mines	DVD2
	Jododex	DVD2
	Pancontinental	DVD2
	Penarroya	DVD2
	Unknown source	DVD2
	Scanned Plans/Sections from:	
	RGC	DVD3
APPENDIX 6	Liontown Reports	DVD1
APPENDIX 6A		
File Name	List of Liontown Reports.xls	
File Format	Excel 2002	
Contents	Listing of Liontown internal reports	
APPENDIX 6B		
File Name	Various: according to company and report date	
File Format	Pdf	
Contents	Scanned Liontown reports	
APPENDIX 7	Liontown Drill Hole Database	DVD1
File Name	Numerous	
File Format	Access, Ascii, Explorer 3, Excel, MapInfo, pdf, Word	
Contents	Drill hole data – drill logs, assays, surveys	

APPENDIX 8	Geophysical Surveys	DVD1
File Names	Pancon Geophys Index	
	Aber Geophys Surv-001	
	Aber Geophys Surv-002	
File Format	Tiff	
Contents	Scanned plans showing outlines of geophysical surveys:	
	Pancontinental 1988	
	Aberfoyle 1994	

1. INTRODUCTION

This report has been prepared for Bullion Minerals Limited and presents a summary of a recent program of historical data acquisition and compilation for the Bullion Charters Towers Project. The data compilation program was carried out by the Townsville office of Terra Search Pty Ltd, and involved identifying, sorting and copying relevant historical data from exploration programs that had encompassed the Bullion Charters Towers Project area.

The data compiled for this program are included with this report as Appendices 2 to 8, and are on accompanying DVDs 1, 2 and 3.

2. LOCATION & TENURE

The Bullion Minerals Exploration Permits, each comprising 100 subblocks, are located in the Charters Towers area in northern Queensland (Figure 1). EPM 14161 is located south and southwest of the city of Charters Towers, on the Charters Towers 1:100 000 sheet (Sheet 8157) and the Homestead 1:100 000 sheet (Sheet 8057). EPM 14162 is located southeast of Charters Towers, on the Charters Towers 1:100 000 sheet and the Ravenswood 1:100 000 sheet (Sheet 8257). The subblocks comprising the EPMs are listed in Appendix 1.

Mining Lease ML 10277, held by Bullion, is located over the Liontown deposit in the southwest of EPM 14161 (Figure 1).



3. COMPILATION OF HISTORICAL DATA

3.1 TENEMENT COVERAGE

In order to identify the relevant historical tenements and associated company reports, the tenements that had covered the area of current Bullion tenure since the 1950s were identified. Each of the 121 EPMs identified was individually plotted and the plots were compiled into a Powerpoint file which is included as Appendix 2. The EPMs are listed in a worksheet included in the Excel file included as Appendix 4A (see section 3.3 below).

EPM tenement data up until 1990 were sourced from historical data that Terra Search had previously compiled from government data. Tenement data for 1990 to 2000 were compiled and supplied by the Queensland DNRME in May 2005, and data for post-2000 were extracted from DNRME tenement updates in 2001, 2002 and 2003. The Queensland DNRME Interactive Resource and Tenure Map system was largely inoperable during the time the data were being compiled, and therefore could not be used as a source of tenement boundary information.

All efforts were made to include a comprehensive coverage of the historical exploration tenements, however, we cannot guarantee that there are no gaps in the available historical tenement data. Although we also attempted to ensure the tenement boundaries presented were the boundaries at the time of tenement grant, we cannot guarantee that this condition was met for all tenements due to time-gaps in some data sets (and errors in some of the government data).

3.2 GEOCHEMICAL DATABASE

Data points showing the distribution of historical geochemical data within the Bullion Project area were also plotted for the historical tenements; these plots are included in the Powerpoint file included as Appendix 2. This geochemical dataset comprises the data points compiled from open file reports that had been entered into the Terra Search Database System (Explorer 3) by July 2005, and consists of over 50,000 data points. A copy of the geochemical data is included as a database in Appendix 3, in both Access and Explorer 3 format. A read-only version of Explorer 3 is also included.

The number of Explorer 3 data points from the EPMs in the Bullion Project area (at July 2005) are listed according to EPM and data type in a worksheet in the Excel file included as Appendix 4A (see section 3.3 below).

3.3 COMPANY REPORTS

A list of company reports relating to the historical EPMS was compiled. Metadata for each report were also compiled from data provided in QDEX, the Queensland DNRM Digital reporting system. The report listing and metadata were incorporated into a worksheet in an Excel file which is included as Appendix 4A. The number of Explorer 3 data points from each company report (at July 2005) is also included in the worksheet.

Over 320 open file company reports relating to historical tenements from the area of the Bullion Minerals EPMs were identified. At the time of compiling the data, 226 of these open file reports were available in a digital form (the DRNM are part-way through scanning all open file

reports), and copies of these reports were supplied to Bullion. An additional 92 open file reports have since been scanned. Appendix 4B contains digital copies of the 318 reports, comprising the 226 initially supplied and the additional 92 reports that have since been scanned.

3.4 LIONTOWN PLANS & SECTIONS

Over 650 Liontown hard copy sections and plans were acquired, sorted and catalogued. This collection of sections and plans incorporates the early Liontown work by Carpentaria Exploration in the 1960s, through to the most recent work by RGC Exploration in the late 1990s. Bullion Minerals requested digital copies of 464 sections and plans, which were scanned and saved as tiff files. A list of the sections and plans is included as an Excel file in Appendix 5A; scanned copies of the plans and sections are included as Appendix 5 on DVDs 2 and 3.

The Pancontinental and RGC drill data that occur within the former Great Mines Leases are not in the public domain, as there was no requirement to report exploration results within mining leases. (The Great Mines Leases have since been relinquished.) Some drilling occurred over the lease boundaries in the adjacent EPM and was reported by Pancontinental.

3.5 LIONTOWN REPORTS

Eleven reports relating to the Liontown project were scanned and a copy of a 1974 thesis by Glendinning was photocopied; the reports and thesis were sent to Bullion. The reports include exploration reports, geophysical reports, resource assessment reports, and environmental management reports. A list of the reports is included as Appendix 6A, and the scanned copies of the reports, plus miscellaneous figures relating to the Liontown mineralisation, are included as Appendix 6B.

3.6 LIONTOWN DRILL HOLE DATABASE

A database of drill hole data was compiled. All 525 holes drilled by the various companies involved in exploration over the Mt Windsor JV area since 1975 were checked, spatially validated, and systematically attributed, mainly by reference to original hard copy logs. In addition, 22945 downhole assays, 2914 downhole geology records, and 1425 surveys were checked, attributed and validated. The drill hole database contains all regional exploration bedrock, exploration target and resource drill holes. Extensive validation was carried out in Excel, Explorer 3 and MapInfo. The database is included as Appendix 7.

As mentioned in section 3.4 above, the Pancontinental and RGC drill data that occur within the former Great Mines Leases have not been reported to open file, as there was no requirement to report exploration results within mining leases.

3.7 LIONTOWN GEOPHYSICAL SURVEYS

Three plans presenting the outlines of geophysical surveys that have been carried out over the Liontown area are presented as Appendix 8. One of the plans covers the Pancontinental Mining EPM 3798 and was compiled in 1988; two of the plans cover the Aberfoyle Mt Windsor EPM 3380, and were compiled in 1994. The Pancontinental plan is from company report CR19691, which is still closed file. The Aberfoyle map was recently included in the final report for EPM 3380 (compiled by Terra Search); this report has not yet been released to open file.

APPENDIX 1

Subblocks in EPMs 14161 and 14162

EPM 14161 Sub Block Details																											
Sheet Name	Sheet Index	Block	Sı	ıbBl	ock																						
Clermont	SF55	312										k					р					u					z
Clermont	SF55	313						f	g	h	j	k	Ι	m	n	0	р	q	r	s	t	u	v	w	х	У	z
Clermont	SF55	314		b	С			f	g	h	j						р					u	v	w	х	у	z
Clermont	SF55	315																q	r	s	t		v	w	х	у	z
Clermont	SF55	316																q	r	s	t	u	v	w	х	У	z
Clermont	SF55	317																q	r	S	t	u	v	w	х	у	z
Clermont	SF55	318						f	g				Ι	m	n			q					v				
Clermont	SF55	385	а	b	С	d	е																				
Clermont	SF55	386	а	b	С	d		f	g	h	j																
Clermont	SF55	387	а	b	С	d	е																				
Clermont	SF55	388	а	b	С	d	е																				
Clermont	SF55	389	а	b	С	d																					
EPM 14162	Sub Blo	ck Detai	ls																								
Sheet	Sheet																										
Name	Index	Block	Sı	ıbBl	ock																						
Clermont	SF55	173													n	0	р					u					z
Clermont	SF55	1/4											I	m	n	0		q	r	S	t		V	w	X	У	
Clermont	SF55	245		<u> </u>		<u> </u>	е	_		<u> </u>	<u> </u>	K					р										
Clermont	SF55	246	a	b	С	d		t	g	h	J		1	m	n	0		q	r	S	t			w	Х	У	
Clermont	SF55	247																		S	t	u			Х	У	Z
Clermont	SF55	248																q	r	V	w						
Clermont	SF55	318		b	С	d	е			h	j	k															
Clermont	SF55	319	а	b	С			f	g			k					р				t	u			Х	у	z
Clermont	SF55	320	а	b				f	g				Ι	m				q	r	S			v	w	х	у	
Clermont	SF55	391			С	d	е		g	h	j	k			n	0					t	u					
Clermont	SF55	392	а			d	f				j				n			q	r	S							
APPENDIX 2

St Arnaud Data Management Report – Database validation and import, cross-section production, GIS map production, 2005



<u>Bullion Minerals</u> <u>Charters Towers Project</u>

> Database validation and import Cross-section production GIS map production

1) Database Review, Cross-section and GIS Map Production

Terra Search Explorer 3 Database Validation

The Explorer 3 (EX3) database was investigated for content. A MS Access validation database was created. Necessary tables (drill hole - collar, survey, coded_geology and assay) were uploaded to Micromine .DAT files for validation.

A Micromine validation was carried out for the entire EX3 database with errors and missing data indentified (ChartTowValid.xls). Suggestions were made to correct data errors and obtain missing information. MS Excel worksheets were created for all drill holes with missing lithology, survey and assay. All unique lithology codes were also extracted to an Excel spreadsheet (ChartTow_LithCodes.xls).

Liontown Cross-sections

Collar, survey, coded_geology and assay data tables were filtered to extract all drill holes for the Liontown prospect. Unique rock type codes were extracted from the lithology field in the coded_geology table. Lithology codes were grouped into 11 categories to simplify cross-sections (Liontown_Litho_formset.xls).

One Liontown drill hole location plan was plotted at 1: 7,500 scale and 43 cross-sections were produced at 1: 1,000 scale on A0 sheets (Liontown_XSection_list.xls).

Queensland NRM Charters Towers GIS CD

The contents of the Geological Survey of Queensland, Department of Natural Resources, Mines and Energy data CD were copied to the SADM MapInfo GIS file structure. GIS layers and metadata were viewed and investigated with MapInfo. All data was supplied in GDA_94 Lat/Long coordinate system.

GIS Map Production

GIS maps were created covering three 100k map sheets for Homestead (8057), Charters Towers (8157) and Ravenswood (8257). 141 GIS maps were plotted at 25k, 50k and 100k scales on A0 sheets in MGA Zone 55 projection system(GIS_Map_report_July_2005.xls).

Maps were grouped into three main themes showing drilling, geochemistry and geology with topographical and cultural features. Table 1 shows the source and type of layers used for GIS map production.

Table 1.	GIS laye	rs and dat	a source.
----------	----------	------------	-----------

Theme	Source	Projection	Description
place_names	QNRM CD	GDA_94	town/city locations
major_mines	QNRM CD	GDA_94	major mine locations
mine_locations	QNRM CD	GDA_94	all mine locations
roads	QNRM CD	GDA_94	roads
roads_major	QNRM CD	GDA_94	state highways
railways	QNRM CD	GDA_94	railways
detailed_drainage	QNRM CD	GDA_94	rivers and streams
major_drainage	QNRM CD	GDA_94	major rivers
water_bodies	QNRM CD	GDA_94	lakes
grid_25k	SADM	MGA_55	25k sheet boundaries
grid_50k	SADM	MGA_55	50k sheet boundaries
100k_map_sheets	SADM	MGA_55	100k sheet boundaries
Fr_gda_r	QNRM CD	GDA_94	100k sheet boundaries (Lat/Long)
surface_geology	QNRM CD	GDA_94	surface geology (i.e. not basement)
geology_linework_category	SADM/QNRM CD	GDA_94	filtered and categorised by line type
Drilling	Terra Search EX3	AGD_84	all drill hole collars
Rocks (Au, Ag, Cu, Pb, Zn)	Terra Search EX3	AGD_84	rock chip location and assay
Seds (Au, Ag, Cu, Pb, Zn)	Terra Search EX3	AGD_84	stream sediment location and assay
Soils (Au, As, Cu, Pb, Zn)	Terra Search EX3	AGD_84	soil sample location and assay
10k_AurionGold_Interp_Qld_R	Aurion Gold	GDA_94	1: 10,000 scale geology mapping
			(polygons)
10k_AurionGold_Interp_Qld_L	Aurion Gold	GDA_94	1: 10,000 scale geology mapping
			(polylines)
ML_outlines_AMG_55	Bullion Minerals	AGD_84	mining lease boundary
EL_outlines_AMG_55	Bullion Minerals	AGD_84	exploration lease boundary

Note: QNRM CD = Queensland Department of Natural Resources, Mines and Energy data CD. Terra Search EX3 = Terra Search Explorer 3 database. SADM = St Arnaud Data Management.

The geology_linework layer was grouped and simplified by SADM showing categories for inferred and known geological contacts and faults etc (ChartTow_Geol_line_category.xls). A geology legend was created for the surface_geology layer clipped to a map area covering the three 100k map sheets (8057, 8157 and 8257).

Drill hole and surface sample location maps classified by drilling and sampling method were created at 25k, 50k and 100k scales.

Geochemistry maps were created at 25k and 50k for rock chip, stream sediment and soil sampling showing assay ranges for selected elements (Table 2).

Table 2. Geochemistry elements.	
Sample type	Element
Rock chip	Au, Ag, Cu, Pb, Zn
Stream sediment	Au, Ag, Cu, Pb, Zn
Soil sample	Au, As, Cu, Pb, Zn

2) Micromine cross-section production

Appendix 2 shows a list of all cross-sections produced for the entire Charters Towers project area using Micromine.

3) Database import and validation

The following data (Table 3) has been imported into the SADM database model from a Terra Search Explorer 3 database (tsxpldat.MDB) using GBIS.

Source Table	GBIS Table	Description	No Rec.	Issues
-	AdProject	Project info	1	Only Charters Towers project added.
lib_Prospect	AdProspect	Prospect info	225	Duplicate prospect codes given unique code.
h_Sample	AdSample	All samples	199961	Duplicate samples renamed.
s_RC				Composite samples assigned priority of 2 to
s_Soil				avoid overlaps.
s_Seds				
h_Loc	AdSite	Collar info	135941	Drillhole ID's renamed with leading zeros for
s_RC		(includes drill		easy sorting.
s_Soil		holes and point		
s_Seds	4.101:0	data)	125041	
h_Loc	AdSiteSurvey	Collar cords and	135941	Used AMG coordinates. Grid assign is
s_RC		grids		'AMG66_55'.
s_S011				
s_Seas	A 10% T 1	T 1 4 1 4 14	11(1	
n_Loc	AdSiteTask	Tasks attributed to	1161	All drill holes entered with task of 'DRILL'
		Site		and where Log_By entered, another task of
h Cadad Caalaary	Dh Alteration	Alteration data	26152	22 holes not imported as they do not exist in
n_Coded_Geology	DhAlteration	Anteration data	20132	72 holes not imported as they do not exist in Collar table
b Survey	DhDownholeSurvey	Down hole survey	7161	1085 holes do not exist in Collar table (1245
II_Survey	Dibowinoiesuivey	data	/101	records which have not been imported)
		uata		Used Regional Azimuth as AzimOrig
				Used 'AMC66_55' as GridOrig.
				Azimuth with null values changed to 0
h Loc	DhEvents	Data such as	6975	Azimutii witii nuli values enangeu to 0.
h_Loc	Dill vents	BOCO COVER	0775	
"_water		WATER		
h Coded Geology	DhGeology	Geology data	53537	5 holes (APPH0216-220) not imported as they
s RC	All data currently in temp table	0101085		don't exist in Collar table.
s Soil	ZZ DhGeology until confirmed			Descriptor codes split into separate fields for
s Seds	which fields are needed			Texture, Grain Size and Weathering. The rest
h Regolith				of the codes were left combined.
h Coded Geology	DhMineralisation	Mineralization	27660	68 holes not imported as they do not exist in
s RC			_,	Collar table.
				Mineral percent converted to number code
				only
h loc	DhSpecifications	Drilling data such	6532	
—	1	as drill type, rig,		
		equipment, etc.		
-				
		SAMPLE TRACKER		
Still to do: setup of Lab	generic methods, elements and deta	uls. Until this is done,	import of as	say results is on hold.
lib_Job	ST_DESPATCH	Despatch data	30944	'Job_no' used as 'DESPATCH_ID'
	ST_DESPATCH_DETAIL	Detailed data	-	To be done, lab methods need to be setup first.
		about methods,		
		elements, limits		
		etc for each		
		despatch		
	ST_DESPATCH_PREP	Preparation type	-	To be done, lab methods need to be setup first.
		for each despatch		
h Sample	I ST DESPATCH SAMPLE	Samples	199961	I Duplicates (DESPATCH ID and

 Table 3. Source and destination tables.

lib Job		despatched		SAMPLE TAG) renamed.
s RC				
s_Soil				
s_Seds				
lib_Standards	ST_DESPATCH_STANDARD	Standard samples despatched	52	'STANDARD_ID' is unknown.
lib_Job	ST_RECEIPT	Receipts data of	30944	'Alias_Job' used as 'LAB_JOB_NO"
-	_	despatched		'Receipt_Date' set to be the same as
		samples		'Send_Date'
				Where date was null, set to $1/1/2000$ as an
				arbitrary date.
h_Sample	ST_RESULT	Assay results for	890236	Units are wrong, mixture of ppm and ppb (still
lib_Job	All data currently in temp table	samples		needs to be sorted out)
s_RC	ZZ_ST_RESULT until lab methods	despatched		Generic method is not setup yet.
s_Soil	are set up			
s_Seds	OT DECLUT CTANDADD	A 14- £	207	(DECRATCH ID'
IID_Standards	SI_KESULI_SIANDARD	Assay results for	297	DESPATCH_ID same as LAB_JOB_NO.
	77 ST DESULT STANDADD	despatabad		No methods defined.
	until lab methods are set up	despatched		Onits are mixture of ppin and ppo.
	until lab methods are set up			
		LAB SETUP		
Still to do: setup of Lab	o generic methods, elements and detai	ls.		
•				
lib_Lab	ST_MD_LAB	List of all labs	173	
		used		
	ST_MD_LAB_COMBO	Method, elements,	-	To be done
		units, limits etc for		
111 × 1 ×		each lab	21.6	
lib_Lab_Loc	ST_MD_LAB_LOCATION	Lab location	316	
	ST MD LAD METHOD	details		Ta ha dawa
	SI_MD_LAB_METHOD	method, digest,	-	To be done
		for each lab		
	ST MD LAB DDED	Preparation details		To be done
	SI_MD_LAD_I KEI	for each lab	-	10 be done
	ST MD TEXT RULE	Description of	-	To be done
		assav results such		
		as what value is		
		represented to		
		below detection		
		limit, not received		
		etc.		
	ST_MD_TOLERANCE	Method, element,	-	To be done
		range and		
		tolerance for each		
	OT VO ELEMENIT	lad		Ta ha dawa
	SI_AS_ELEMENT	elements and units	-	To be done
		used		
	ST XS METHOD	List of all lab	-	To be done
		methods		
	ST_XS_METHOD_ELEMENT	List of elements	-	To be done
		assigned to a		
		method		
	SI_XS_PREP_FIELD	List of lab	-	l o be done
	ST VS STANDARD	List of standards		To be done
	ST XS STANDARD DETAILS	Standard details	-	To be done
		Standard details		
	1	1		1
		LOOKUP CODES		
In progress		<u>.</u>		
	lkpCategory	Main categories		
lib_Colour	lkpCode	Codes		
lib_Descriptor				
lib_Parameters				
lib_Drill_Meth				
lib_Drill_Rig				
lib_Drill_Type				
IIU LIUI		1	1	

Appendix 1

EX3 database validation (ChartTowValid.xls) EX3 unique lithology codes (ChartTow_LithCodes.xls) Liontown lithology codes (Liontown_Litho_formset.xls) Liontown cross-sections (Liontown_XSection_list.xls) Charter Towers GIS Map list (GIS_Map_report_July_2005.xls) Surface geology line type categories (ChartTow_Geol_line_category.xls) Geochemistry sample method (ChartTow_GeochemType.xls)

Chaters Towers Explorer 3 Database

No. of records in h_Loc table

Drilling_Type	Description	CountOfDrilling_Type	Comments
BEDRK	Bedrock Drillhole	4602	
DD	Diamond Hole	202	
PERC	Open Hole Percussion	366	
RAB	RAB Hole	488	
	Reverse Circulation		
REVC	Percussion	699	
ТСН	Trench	175	Sampled as horizontal drillhole
		P	· -

TOTAL

6532

(ChartTow_Valid.xls)

Micromine Validation for Charters Towers data

Table validated: h_Coded_Geology

using:

h_Loc h_Survey

FILE	WARNING	CountOfWARNING	SADMComments	EDITS
h_Loc	Duplicate collar entry	1	CW001	Company DAL and ESSO data
h_Loc	Total depth missing (Hole: 59081	1	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: BAH00	1	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: BAH05	1	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: BAH10	1	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: BAH25	1	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: BATC0	4	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: RFT02	2	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR90	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR91	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR92	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR93	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR94	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR95	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR96	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR97	5	collar, litho, samp & survey depth = 0	
h_Survey	Missing hole (survey file)	169	not in survey file	need survey data
			276 not in collar file, 85 depth = 0	
h_Coded_Geology	Collar missing or wrong	361	(above)	276 have lithology data but no collar record
h_Coded_Geology	From >= To	16	NBR001-16 same from & to depth	need to correct depth_from to = 0
h_Coded_Geology	Missing hole (geology file)	3789	not in lithology file	need lihtology data
h_Coded_Geology	Missing interval	1523	insert missing interval	insert with Micormine

(ChartTow_Valid.xls)

Micromine Validation for Charters Towers data

Table validated: h_Sample

ł

using:

h_Loc h_Survey

FILE	WARNING	CountOfWARNING	SADMComments	EDITS
h_Loc	Duplicate collar entry	1	CW001	Company DAL and ESSO data
h_Loc	Total depth missing (Hole: 59081	1	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: BAH00	1	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: BAH05	1	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: BAH10	1	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: BAH25	1	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: BATC0	4	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: RFT02	2	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR90	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR91	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR92	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR93	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR94	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR95	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR96	10	collar, litho, samp & survey depth = 0	
h_Loc	Total depth missing (Hole: TAR97	5	collar, litho, samp & survey depth = 0	
h_Survey	Missing hole (survey file)	169	not in survey file	need survey data
h_Survey	Non Consecutive Surveys	1	LLD003	correct survey depth
h_Sample	Collar missing or wrong	85	collar depth, from & to depth = 0 (above)	change depth_to = 1
h_Sample	Duplicate hole	1	CW001	Company DAL and ESSO data
h_Sample	From < last To	1789	resplits of composite samples	correct depth
h_Sample	From >= To	26	from and to depth = 0	correct depth
h_Sample	Missing hole (sample file)	204	not in sample file	need assay data
h_Sample	Missing interval	5837	insert missing interval	insert with Micromine
h_Sample	Record beyond total depth	1	MEMD137 (129.00)	collar corrected to 129.40

(ChartTow_Valid.xls)

Lith1 codes from h_Coded_Geology with description from lib_Lith

Lithology_Code	Coding_System	Lithology	Standard_ID
ALUV	EX3	Alluvium	ALUV
AMP	EX3	Amphibolite	AMP
ANT	EX3	Andesite	ANT
APL	EX3	Aplite	APL
ARKS	EX3	Arkose	ARKS
BLSH	EX3	Black Shale	BLSH
BLT	EX3	Basalt	BLT
CHRT	EX3	Chert	CHRT
CLCR	EX3	Calcrete	CLCR
CLY	EX3	Clay, mud	CLY
CLY	XXOL	Clay	
CNGL	EX3	Conglomerate	CNGL
COAL	EX3	Coal	COAL
DAC	EX3	Dacite	DAC
DLT	EX3	Dolerite	DLT
DRT	EX3	Diorite	DRT
DUN	EX3	Dunite	DUN
FRCT	EX3	Ferricrete	FRCT
FVOL	EX3	Felsic Volcanic	FVOL
GAB	EX3	Gabbro	GAB
GO	EX3	Gossan	GO
GO	MIMEX	Gossan	
GR	FX3	Granitoid	GR
		GRANITE	
		GM MICROGRANITE	
GR	REDDAM	GRE GREISEN	
GRD	EX3	Granodiorite	GRD
GRIT	EX3	Grit	GRIT
GRT	EX3	Granite	GRT
GVL	EX3	Gravel	GVL
GYWK	EX3	Greywacke	GYWK
HARD	EX3	Hardpan	HARD
HFL	EX3	Hornfels	HFL
IRST	EX3	Ironstone	IRST
IVOL	EX3	Intermediate Volcanic	IVOL
КОМВ	EX3	Komatiitic Basalt	KOMB
KTT	EX3	Komatiite	KTT
LATT	EX3	Laterite	LATT
LOM	EX3	Loam	LOM
METS	EX3	Metasediment	METS
MGBS	EX3	High-Mg Basalt	MGBS
MIRK	EX3	Mafic Intrusive	MIRK
MRK	EX3	Mafic Rock	MRK
PEG	EX3	Pegmatite	PEG
PHY	EX3	Porphyry	PHY
PIST	EX3	Pisolitic Ironstone	PIST
PLDZ	EX3	Pallid Zone	PLDZ
QFPY	EX3	Quartz feldspar porphyry	QFPY
QMSC	EX3	Quartz-Muscovite Schist	SCHT
QSCV	EX3	Quartz phyrric schistose volcanic	QSCV

QTZ	EX3	Quartz	MSI
QZT	EX3	Quartzite	QZT
QZVN	EX3	Quartz Vein	QZVN
RHD	EX3	Rhyodacite	RHD
RHY	EX3	Rhyolite	RHY
SAN	EX3	Sannaite	SAN
SAN	REDDAM	SAND	
SCHT	EX3	Schist	SCHT
SCSC	EX3	Sericite-Quartz-Chlorite Schist	SCHT
SDST	EX3	Sandstone	SDST
SED	EX3	Unclassified Sediment	SED
SHLE	EX3	Shale	SHLE
SLCT	EX3	Silcrete	SLCT
SLST	EX3	Siltstone	SLST
SLT	EX3	Silt	SLT
SLT	REDDAM	SLATE	
SLT	XXOL	Siltstone	
SND	EX3	Sand	SND
SND	XXOL	Sand	
SOIL	EX3	Soil	SOIL
SPLT	EX3	Saprolite	SPLT
TGWK	EX3	Tuffaceous Greywacke	TGWK
TMST	EX3	Tuffaceous Mudstone	TMST
TRC	EX3	Trachyte	TRC
TSDS	EX3	Tuffaceous Sandstone	TSDS
TSST	EX3	Tuffaceous Siltstone	TSST
TUF	EX3	Tuff	TUF
UMRK	EX3	Ultramafic Rock	UMRK
VBX	EX3	Volcanic Breccia	VBX
VC	EX3	Volcaniclastic Rock	VC
VC	NENA	VOLCANOCLASTIC	VC
WRK	EX3	Weathered rock	ROCK

(ChartTow_LithCodes.xls)

Lith1	CountOfLith1	Cross-section Group
ALUV	31	Transported Sediments
AMP	7	Mafic
ANT	112	Mafic
ARKS	8	Sediments
BLT	37	Mafic
CHRT	12	Chemical sediments
CLCR	21	Regolith Undifferentiated
CLY	7040	Regolith Undifferentiated
CNGL	1	Sediments
COAL	6	Sediments
DAC	214	Felsic
DLT	40	Mafic
DRT	6	Intermediate Intrusives
FRCT	489	Regolith Undifferentiated
FVOL	117	Felsic
GAB	8	Mafic
GO	11	Regolith Undifferentiated
GR	8	Granitic Intrusives
GRD	1022	Granitic Intrusives
GRT	7728	Granitic Intrusives
GVL	1087	Transported Sediments
HFL	8	Unknown
LATT	8	Regolith Undifferentiated
LOM	1	Regolith Undifferentiated
METS	3	Sediments
MIRK	1	Mafic
PEG	1	Granitic Intrusives
PHY	5	Granitic Intrusives
PIST	293	Regolith Undifferentiated
PLDZ	9	Regolith Undifferentiated
QFPY	80	Granitic Intrusives
QMSC	16	Felsic
QSCV	60	Felsic
QTZ	2	Veins
QZT	6	Sediments
QZVN	40	Veins
RHD	1	Felsic
RHY	435	Felsic
SAN	7	Felsic
SCHT	903	Unknown
SCSC	2	Felsic
SDST	735	Sediments
SED	24	Sediments
SHLE	29	Sediments
SLCT	1331	Regolith Undifferentiated
SLST	1862	Sediments
SLT	6	Sediments
SND	18343	Unconsolidated Sediments
SOIL	76	Regolith Undifferentiated
TGWK	12	Sediments
TMST	4	Sediments

Charters Towers Liontown Prospect cross-section lithology categories

TRC	5	Felsic	
TSDS	5	Sediments	
TSST	55	Sediments	
TUF	6	Sediments	
VBX	3	Unknown	
VC	74	Sediments	
WRK	1	Unknown	
(Liontown_Litho_formset.xls)			

Liontown prospect cross-section list

Section	No. of sections	
DHLP_Liontown.pdf		1
LTO_401000E.pdf		1
LTO_401100E.pdf		1
LTO_401200E.pdf		1
LTO_401300E.pdf		1
LTO_401400E.pdf		1
LTO_401500E.pdf		1
LTO_401600E.pdf		1
LTO 401600E STH.pdf		1
LTO 401700E.pdf		1
LTO_401800E.pdf		1
LTO_401900E.pdf		1
LTO 402000E.pdf		1
LTO 402050E.pdf		1
LTO 402100E.pdf		1
LTO 402150E.pdf		1
LTO 402200E.pdf		1
LTO 402250E.pdf		1
LTO 402300E.pdf		1
LTO 402350E.pdf		1
LTO 402400E.pdf		1
LTO_402450E.pdf		1
LTO 402500E.pdf		1
LTO_402550E.pdf		1
LTO_402600E.pdf		1
LTO_402650E.pdf		1
LTO_402700E.pdf		1
LTO_402750E.pdf		1
LTO_402800E.pdf		1
LTO_402850E.pdf		1
LTO_402900E.pdf		1
LTO_402950E.pdf		1
LTO_403000E.pdf		1
LTO_403100E.pdf		1
LTO_403200E.pdf		1
LTO_403300E.pdf		1
LTO_403400E.pdf		1
LTO_403400E_STH.pdf		1
LTO_403500E.pdf		1
LIO_403600E.pdf		1
LIO_403700E.pdf		1
LTO_403800E.pdf		1
LTO_403900E.pdf		1
LIU_404000E.pdf		Т

TOTAL (Liontown_XSection_list.xls)

44

				No. of	
Theme	Scale	Sheet ID	Туре	Maps	PDF
Aurion Gold Geology	25k	8157-31	GIS map	1	Yes
Aurion Gold Geology	25k	8157-32	GIS map	1	Yes
Aurion Gold Geology	25k	8157-33	GIS map	1	Yes
Aurion Gold Geology	25k	8157-34	GIS map	1	Yes
Aurion Gold Geology	50k	8057-2	GIS map	1	Yes
Aurion Gold Geology	50k	8157-2	GIS map	1	Yes
Aurion Gold Geology	50k	8157-3	GIS map	1	Yes
Aurion Gold Geology	50k	8257-3	GIS map	1	Yes
Drilling	100k	Homestead	GIS map	1	Yes
Drilling	100k	Charters Towers	GIS map	1	Yes
Drilling	100k	Ravenswood	GIS map	1	Yes
Drilling	25k	8157-31	GIS map	1	Yes
Drilling	25k	8157-32	GIS map	1	Yes
Drilling	25k	8157-33	GIS map	1	Yes
Drilling	25k	8157-34	GIS map	1	Yes
Drilling	50k	8057-2	GIS map	1	Yes
Drilling	50k	8157-1	GIS map	1	Yes
Drilling	50k	8157-2	GIS map	1	Yes
Drilling	50k	8157-3	GIS man	1	Ves
Drilling	50k	8257-3	GIS man	1	Ves
Geology	100k	Homestead	GIS man	1	Ves
Geology	100k	Charters Towers	GIS man	1	Ves
Geology	100k	Pavenswood	CIS man	1	Ves
Geology	25k	8157 31	CIS map	1	Ves
Geology	25k 25k	8157-32	GIS man	1	Ves
Geology	25k 25k	8157-33	GIS man	1	Ves
Geology	25k	8157-34	GIS map	1	Yes
Geology	50k	8057-2	GIS map	1	Yes
Geology	50k	8157-1	GIS map	1	Yes
Geology	50k	8157-2	GIS map	1	Yes
Geology	50k	8157-3	GIS map	1	Yes
Geology	50k	8257-3	GIS map	1	Yes
Rock chip (location)	100k	Homestead	GIS map	1	Yes
Rock chip (location)	100k	Charters Towers	GIS map	1	Yes
Rock chip (location)	100k	Ravenswood	GIS map	1	Yes
Rock-Seds (5 X element)	25k	8157-31	GIS map	5	Yes
Rock-Seds (5 X element)	25k	8157-32	GIS map	5	Yes
Rock-Seds (5 X element)	25k	8157-33	GIS map	5	Yes
Rock-Seds (5 X element)	25k	8157-34	GIS map	5	Yes
Rock-Seds (5 X element)	50k	8057-2	GIS map	5	Yes
Rock-Seds (5 X element)	50k	8157-1	GIS map	5	Yes
Rock-Seds (5 X element)	50k	8157-2	GIS map	5	Yes
Rock-Seds (5 X element)	50k	8157-3	GIS map	5	Yes
Rock-Seds (5 X element)	50k	8257-3	GIS map	5	Yes
Sheet Index	250k	All	GIS map	1	Yes
Soil sample (location)	100k	Homestead	GIS map	1	Yes
Soil sample (location)	100k	Charters Towers	GIS map	1	Yes
Soil sample (location)	100k	Ravenswood	GIS map	1	Yes
Soils (5 X element)	25k	8157-31	GIS map	5	Yes
Soils (5 X element)	25k	8157-32	GIS map	5	Yes
Soils (5 X element)	25k	8157-33	GIS map	5	Yes

Soils (5 X element)	25k	8157-34	GIS map	5	Yes
Soils (5 X element)	50k	8057-2	GIS map	5	Yes
Soils (5 X element)	50k	8157-1	GIS map	5	Yes
Soils (5 X element)	50k	8157-2	GIS map	5	Yes
Soils (5 X element)	50k	8157-3	GIS map	5	Yes
Soils (5 X element)	50k	8257-3	GIS map	5	Yes
Soils (Au, Cu, Pb)	100k	Homestead	GIS map	3	Yes
Soils (Au, Cu, Pb)	100k	Charters Towers	GIS map	3	Yes
Soils (Au, Cu, Pb)	100k	Ravenswood	GIS map	3	Yes
Stream seds (location)	100k	Homestead	GIS map	1	Yes
Stream seds (location)	100k	Charters Towers	GIS map	1	Yes
Stream seds (location)	100k	Ravenswood	GIS map	1	Yes
Total				141	

(GIS_Map_report_July_2005.xls)

(ChartTow_Geol_line_catergory.xls) Queensland NRM surface_geology line type categories

Category	CountOfCategory
Anticline Accurate	3
Anticline Inferred	5
Antiform Inferred	3
Coastline	1
Dam Wall	1
Dyke or Vein	36
Escarpment	1
Fault Accurate	3
Fault Inferred	9
Geological Boundary Accurate	1
Geological Boundary Inferred	5
Joint Pattern	1
Lake, Lagoon or Waterhole	1
Lineament	1
Lineament Inferred	2
Map Frame	1
Monocline	2
Mylonite Zone	1
Open Cut or Quarry	1
Overturned Anticline Accurate	2
Overturned Anticline Inferred	1
Overturned Antiform Inferred	1
Overturned Syncline Accurate	2
Overturned Syncline Inferred	2
Overturned Synform Inferred	2
Shear Zone	2
Syncline Accurate	3
Syncline Inferred	6
Synform Inferred	3
Trend Line	5
Trend of Fold Axes	1
Type Section	1
Upright Antiform Accurate	2
Volcano	1

Rockchip sample method from s_RC

Data_Type	Collection_Method	CountOfCollection_Method
LAG		0
RC		0
RC	С	335
RC	DS	1
RC	F	68
RC	G	1740
RC	Μ	7
RC	S	647
SELV	S	10
TRENCH		0
TRENCH	С	4585
TRENCH	G	5

(ChartTow_GeochemType.xls)

Soil sample method from s_Soil

Data_Type	Mesh	CountOfMesh
AUGER	NA	139
BCL	-2mm	735
BCL	-3#	28
BCL	-3/8"	11
BCL	-4mm	1144
BCL	-6MM	154
BCL	N/A	17
BULK	-4mm	358
BULK	N/A	20
CONC	-3/16"	99
DUP	-2mm	6
LAG	-80#	103
ORIENT	-40+80#	9
ORIENT	-4mm+40#	9
ORIENT	-80+200#	9
SOIL	+40#	810
SOIL	-10#	265
SOIL	-20#	196
SOIL	-200#	2105
SOIL	-2mm	2329
SOIL	-80#	69612
SOIL	BULK	72
SOIL	N/A	5233
SOIL	NA	1689
TERM	-80#	20

(ChartTow_GeochemType.xls)

Stream sediment sample method from s_Seds

Data_Type	Mesh	CountOfMesh
BCL	-1/4"	58
BCL	1/8	54
BCL	-1/8"	24
BCL	-10#	91
BCL	-1mm	141
BCL	-20#	75
BCL	-2mm	539
BCL	-3#	1675
BCL	-3mm	211
BCL	-6#	64
BCL	-6mm	297
BCL	-80#	176
BCL	-9#	22
BCL	N/A	3154
BCL	NA	955
CFSS	+25#	20
ORIENT	+44#	20
ORIENT	+60#	20
ORIENT	+85#	20
ORIENT	-100#	104
ORIENT	-60#	104
PC	-1/8"	53
PC	N/A	863
PC	NA	10
PCBW	N/A	25
PCTH	N/A	6
SSS	+80#	76
SSS	-200#	14
SSS	-2mm	1
SSS	-40#	44
SSS	-60#	179
SSS	-80	9
SSS	-80#	15761
SSS	-85#	20
SSS	N/A	2327
SSS	NA	153

(ChartTow_GeochemType.xls)

Appendix 2

Charters Towers cross-section list (DHLP_XS_PLOTLIST.xls)

CHARTERS TOWERS PROJECT			
PLANS AND CROSS SECTIONS			
Jun-05			
PLOT FILE / PDF	PROSPECT	PDF	NO. OF SECTIONS
AMG OBLIQUE XS			
TRANS ABMW 1	Mount Windsor (Aberfovle)	Yes	1
TRANS ABMW 10	Mount Windsor (Aberfoyle)	Yes	1
TRANS ABMW 11	Mount Windsor (Aberfoyle)	Yes	1
TRANS ABMW 12	Mount Windsor (Aberfoyle)	Yes	1
TRANS ABMW 13	Mount Windsor (Aberfoyle)	Yes	1
TRANS ABMW 2	Mount Windsor (Aberfoyle)	Yes	1
TRANS ABMW 3	Mount Windsor (Aberfoyle)	Yes	1
TRANS ABMW 4	Mount Windsor (Aberfoyle)	Yes	1
TRANS ABMW 5	Mount Windsor (Aberfoyle)	Yes	1
TRANS ABMW 6	Mount Windsor (Aberfoyle)	Yes	1
TRANS ABMW 7	Mount Windsor (Aberfoyle)	Yes	1
TRANS ABMW 8	Mount Windsor (Aberfoyle)	Yes	1
TRANS ABMW 9	Mount Windsor (Aberfoyle)	Yes	1
TRANS ABMW ESTA 10	Trooper Creek Grid (ES Mt Windsor)	Yes	1
TRANS ABMW ESTA 11	Trooper Creek Grid (ES Mt Windsor)	Ves	1
TRANS ARMW ESTA 12	Trooper Creek Grid (ES Mt Windsor)	Ves	1
TRANS_ADMW_ESTA_12	Trooper Creek Grid (ES Mt Windsor)	Ves	1
TDANS PMILL 1		Vos	1
TRANS_DIVILIT_1	Lighthouse	Ves	1
	Lighthouse	Yee	1
TRANS_DIVILIT_3	Loveborgiow	Ves	1
	Rulleove (Delamate Weewerre)	Yes	1
	Bullseye (Dalrympie Weewarta)	Yes	1
TRANS_DEDE_2	Bullseye (Dalrympie Weewarta)	Vos	1
TRANS_DEDE_S	Bullseye (Dalrympie Weewarta)	Ves	1
TRANS_DEDE_4	Bullseye (Dalrympie Weewarta)	Vos	1
	Bullseye (Dalrympie Weewarta)	Ves	1
TRANS_DLDL_0	Bullseye (Dalrympie Weewarta)	Yes	1
TRANS_DEBE_7	Bullseye (Dairyinple Weewarta)	Vos	1
TRANS_ESEM_1	Trachar Crack Crid (ES Mt Windsor)	Ves	1
TRANS_ESTA_I	Trooper Creek Grid (ES Mt Windsor)	Yes	1
TRANS_ESTA_2	Trooper Creek Grid (ES Mt Windsor)	Vos	1
TRANS_ESTA_3	Trooper Creek Grid (ES Mt Windsor)	Ves	1
TRANS_ESTA_4	Trooper Creek Grid (ES Mt Windsor)	Yes	1
TRANS_ESTA_5	Trooper Creek Grid (ES Mt Windsor)	Yee	1
TRANS_ESTA_0	Trooper Creek Grid (ES Mt Windsor)	Yes	1
TRANS_ESTA_7	Trooper Creek Grid (ES Mt Windsor)	Yes	1
TRANS_ESTA_8	Driseper Creek Grid (ES Mt Windsor)	Yes	1
TRANS_ESTE_T	Prisoner Creek East (ES Mt Windsor)	Yes	1
TRANS_ESTE_2	Prisoner Creek East (ES Mt Windsor)	Yes	1
TRANS_ESTE_3	Misoner Greek East (ES Mit Windsor)	Yes	1
		Yes	1
		Yes	1
		Yes	1
TRANS_EZMW_2		Yes	1
IRANS_EZMW_3	Nit Windsor (Electrolytic ∠inc)	Yes	1

TRANS_EZMW_4	Mt Windsor (Electrolytic Zinc)	Yes	1
TRANS_EZMW_5	Mt Windsor (Electrolytic Zinc)	Yes	1
TRANS_EZMW_6	Mt Windsor (Electrolytic Zinc)	Yes	1
TRANS EZMW 7	Mt Windsor (Electrolytic Zinc)	Yes	1
TRANS EZMW 8	Mt Windsor (Electrolytic Zinc)	Yes	1
TRANS EZMW 9	Mt Windsor (Electrolytic Zinc)	Yes	1
TRANS MLCK 1	Clarke (Mt Leyshon)	Yes	1
TRANS MLCK 2	Clarke (Mt Leyshon)	Yes	1
TRANS MLCK 3	Clarke (Mt Levshon)	Yes	1
TRANS MLCK 4A	Clarke (Mt Leyshon)	Yes	1
TRANS MLCK 4B	Clarke (Mt Leyshon)	Yes	1
TRANS MLCK 5	Clarke (Mt Leyshon)	Yes	1
TRANS MLCK 6	Clarke (Mt Leyshon)	Yes	1
TRANS MLCK 7	Clarke (Mt Leyshon)	Yes	1
TRANS MLCK 7	Clarke (Mt Levshon)	Yes	1
TRANS MLCK 8	Clarke (Mt Levshon)	Yes	1
TRANS MLCK 9	Clarke (Mt Levshon)	Yes	1
TRANS NCMD 1	Mount Deane	Yes	1
TRANS NCMD 10	Mount Deane	Yes	1
TRANS NCMD 11	Mount Deane	Yes	1
TRANS NCMD 12	Mount Deane	Yes	1
TRANS NCMD 13	Mount Deane	Yes	1
TRANS NCMD 14	Mount Deane	Yes	1
TRANS NCMD 2	Mount Deane	Yes	1
TRANS NCMD 3	Mount Deane	Yes	1
TRANS NCMD 4	Mount Deane	Yes	1
TRANS NCMD 5	Mount Deane	Yes	1
TRANS NCMD 6	Mount Deane	Yes	1
TRANS NCMD 7	Mount Deane	Yes	1
TRANS NCMD 8	Mount Deane	Yes	1
TRANS NCMD 9	Mount Deane	Yes	1
TRANS NXDC 1A	Deadman Ceek WEST	Yes	1
TRANS NXDC 1B	Deadman Ceek FAST	Yes	1
TRANS NXDC 2A	Deadman Ceek WEST	Yes	1
TRANS NXDC 2B	Deadman Ceek EAST	Yes	1
TRANS NXDC 3A	Deadman Ceek WEST	Yes	1
TRANS NXDC 3B	Deadman Ceek FAST	Yes	1
TRANS NXDC 4	Deadman Ceek	Yes	1
TRANS NXDC 5	Deadman Ceek	Yes	1
TRANS NXDC 6	Deadman Ceek	Yes	1
TRANS NXDC 7	Deadman Ceek	Yes	1
TRANS NXDC 8A	Deadman Ceek WEST	Yes	1
TRANS NXDC 8B	Deadman Ceek EAST	Yes	1
TRANS PAPC 1	Puddler Creek Regional	Yes	1
TRANS PAPC 2	Puddler Creek Regional	Yes	1
TRANS PAPC 3	Puddler Creek Regional	Yes	1
TRANS SGDO 1	The Donut (Gwalia Minerals)	Yes	1
TRANS SGDO 2	The Donut (Gwalia Minerals)	Yes	1
TRANS SGDO 3	The Donut (Gwalia Minerals)	Yes	1
		Sub total	94
LOCAL GRIDS - ORTHOGONAL XS AND			
DHLP			

AREA1 LOCAL GRID		
DHLP_AREA1_GRID	Yes	1
AREA1 XS16600E	Yes	1
AREA1 XS16700E	Yes	1
AREA1 XS16800E	Yes	1
	Sub total	4
AREA3 LOCAL GRID		
DHLP_AREA3_GRID	Yes	1
AREA3_XS14100E	Yes	1
	Sub total	2
AREA5 LOCAL GRID		
DHLP_AREA5_GRID	Yes	1
AREA5_XS8500E	Yes	1
	Sub total	2
BRIT LOCAL GRID		
DHLP_BRIT_GRID	Yes	1
BRIT_XS8000E	Yes	1
BRIT_XS8200E	Yes	1
BRIT XS8300E	Yes	1
BRIT_XS8400E	Yes	1
BRIT XS8500E	Yes	1
BRIT XS8700E	Yes	1
BRIT XS9000E	Yes	1
BRIT XS9025E	Yes	1
BRIT XS9200E	Yes	1
BRIT XS9300E	Yes	1
BRIT XS9450E	Yes	1
BRIT XS9650E	Yes	1
BRIT XS9800E	Yes	1
BRIT XS9845E	Yes	1
BRIT XS9975E	Yes	1
BRIT_XS10020E	Yes	1
BRIT XS10100E	Yes	1
BRIT_XS10200E	Yes	1
BRIT_XS10300E	Yes	1
BRIT XS10400E	Yes	1
BRIT_XS10650E	Yes	1
	Sub total	22
BRUMBY LOCAL GRID		
DHLP_BRUMBY_GRID	Yes	1
BRUMBY_XS93885E	Yes	1
	Sub total	2
DION LOCAL GRID		
DHLP_DION_GRID	Yes	1
DION_XS-14500E	Yes	1
DION_XS-14700E	Yes	1
DION_XS-14900E	Yes	1
DION_XS-15100E	Yes	1
DION_XS-15300E	Yes	1
DION_XS-15700E	Yes	1
DION_XS-15900E	Yes	1
DION_XS-16000E	Yes	1

DION_XS-16100E	Yes	1
DION XS-16200E	Yes	1
DION XS-16300E	Yes	1
 DION_XS-16400E	Yes	1
DION_XS-16500E	Yes	1
	Sub total	14
ESDT LOCAL GRID		
DHLP ESDT GRID	Yes	1
ESDT_XS-16100E	Yes	1
	Sub total	2
LION LOCAL GRID		
LION XS11000E	Yes	1
	Sub total	1
OAK LOCAL GRID		
DHLP OAK GRID	Yes	1
OAK XS-50E	Yes	1
OAK XS-150E	Yes	1
OAK XS-300E	Yes	1
OAK XS-400E	Yes	1
OAK XS0E	Yes	1
OAK XS150E	Yes	1
OAK XS300E	Yes	1
OAK_XS450E	Yes	1
OAK XS600E	Yes	1
OAK_XS700E	Yes	1
OAK_XS800E	Yes	1
OAK XS950E	Yes	1
OAK_XS1000F	Yes	1
OAK_XS1200E	Yes	1
OAK_XS1600E	Yes	1
	Sub total	16
SUN LOCAL GRID		
DHIP SUN GRID	Yes	1
SUN XS9600F	Yes	1
SUN_XS9930E	Yes	1
SUN_XS10100F	Yes	1
SUN XS10400E	Yes	1
SUN XS10450E	Yes	1
SUN_XS11100E	Yes	1
SUN_XS11150E	Yes	1
SUN_XS11290E	Yes	1
SUN_XS11775E	Yes	1
	Sub total	10
WIN LOCAL GRID		
DHLP WIN GRID	Yes	1
WIN X\$13700N	Yes	1
WIN XS14500N	Yes	1
WIN XS14900N	Yes	1
WIN XS15300N	Yes	1
WIN XS15500N	Yes	1
	Sub total	6
GRAND TOTAL		175

Appendix 3

Validation issues and queries (ChartTowValid_SampleTracker.xls)

	Table s_RC		
Data_Type	Descr	NoOfRec	Sample Type
LAG	Coarse lag sample	59	
SELV	Vein Selvedge	10	
RC	Rock Chip sample	12183	
TRENCH	Trench sample, continuous channel	5231	

Tabel s_Seds				
	NoOfRec	Sample Type		
Bulk Cyanide Leach sample	7536			
Coarse fraction stream sediment	20			
Stream Sediment orientation sample	268			
Pan Concentrate or Heavy Mineral Conc.	926			
Pan con:bottom wash of drill hole/pit	25			
Panned Concentrate top of drillhole.	6			
Sieved Stream Sediment Samples	18584			
	Tabel s_Seds Bulk Cyanide Leach sample Coarse fraction stream sediment Stream Sediment orientation sample Pan Concentrate or Heavy Mineral Conc. Pan con:bottom wash of drill hole/pit Panned Concentrate top of drillhole. Sieved Stream Sediment Samples	Tabel s_SedsNoOfRecBulk Cyanide Leach sample7536Coarse fraction stream sediment20Stream Sediment orientation sample268Pan Concentrate or Heavy Mineral Conc.926Pan con:bottom wash of drill hole/pit25Panned Concentrate top of drillhole.6Sieved Stream Sediment Samples18584		

Table s_Soil				
Data_Type		NoOfRec	Sample Type	
AUGER	Shallow auger Soil sample	139		
BCL	Soil Sample, by Bulk Cyanide Leach	2089		
BULK	Bulk unsieved soil sample, not BCL.	378		
CONC	Heavy Mineral Concentrate from soil	99		
DUP	Duplicate of a sample	6		
LAG	Coarse lag sample 103			
ORIENT	Soil Orientation sampling	27		
SOIL	Sieved soil sample	82311		
TERM	Termite mound sampling.	20		

	Table h_Sample		
Data_Type		NoOfRec	Sample Type
COMP	Composite sample	13879	
INT	Interval Sampling	56147	
SLG	Sludge sample	45	

QUESTION:

1. What is the sample type for each Data type?

Sample Type is RockChip for s_RC - Stream Sediment for s_Seds and Soil for s_Soil.

2. Is it possible that wrong data type has been put in Rock Chip data? Eg LAG, perhaps should be SOIL data? Lags are a different sort of sample really - half way between a rock and a soil - usually we put these in soils - these may have been put in Rocks due to the way they were collected bing more like a rockchip than a soil (ChartTowValid_SampleTracker.xls)

Examples of Sar	mple Types used in SADM GBIS database
CHIPS-GRAB	Drill Chips: grab samples
CHIPS-RFSPT	Drill Chips: riffle split samples
CHIPS-SHOVE	Drill Chips: samples mixed and split with shovel
CHIPS-SPEAR	Drill Chips: scoop/spear sample
CHIPS-UNKN	Drill Chips: unknown sample type
CORE-HALF	Drill Core: half diamond core; normally split by saw
CORE-QUART	Drill Core: quarter diamond core; normally split by saw
CORE-SLIVER	Drill Core: slivered diamond core, normally split by saw
CORE-UNKN	Drill Core: unknown sample amount
CORE-WHOLE	Drill Core: whole diamond core sample
NS-CAVITY	Not sampled - Cavity
NS-INSERT	Not sampled - inserted interval during validation
NS-LOSS	Not sampled - core or sample loss, insufficient sample
NS-NAVI	Not sampled - navigation run from diamond hole
NS-STOPE	Not sampled - Stope
NS-UNKN	Not sampled - unspecified
NS-VAL	Not Sampled - Insert for Validation
ROCK-FACE	Rock: face sample
ROCK-FLOAT	Rock: sample of rock float
ROCK-MULL ROCK-	Rock: mullock sample
OUTCRP	Rock: sample of outcrop
ROCK-UNKN	Rock: unknown type
SOIL-CARB	Soil: carbonate sample
SOIL-LAG	Soil: lag soil sample
SOIL-LAGM	Soil: mag lag soil sample
SOIL-LAGR	Soil: rock lag soil sample
SOIL-PIS	Soil: pisolite sample
SOIL-SIEVE	Soil: sieved sample, fraction designated in GB_sample
SOIL-UNKN	Soil: unknown type
STD	Standard sample
UNKN	Unknown
ChartTowV	alid SampleTracker.xls)

APPENDIX 3

Digital Rock Services Pty Ltd Report – Regional targeting and Liontown review, 2005



DRS Report BUL-CHTO200501JG

Regional Targeting and Liontown Review

Mt Windsor Volcanics Project

Jennifer Gunter Senior Project Geologist, Digital Rock Services for Bullion Minerals Pty Ltd



December 2005

P:\Charters Towers\R2 Reports\Other\DRS Report Dec 2005\Parts of report\BUL-CHTO200501JG Mt Windsor Volcanics Project – Summary.doc

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Executive Summary

This document details the results and recommendations of a 4 week targeting exercise conducted by Digital Rock Services over the Mount Windsor Volcanics Project for Bullion Minerals Pty Ltd. A total of 35 regional targets were assessed, with 4 high priority targets resulting. Extensions to Liontown were also assessed. Major recommendations are summarised below.



1 Introduction

Jennifer Gunter, of Digital Rock Services Pty Ltd, was engaged for a 4 week period to review the Bullion Minerals Mt Windsor Volcanics Project. This comprised a regional targeting exercise, including the preparation of a solid geology interpretation, a review of Liontown data, and collaboration with Southern Geoscience Consultants (SGC) on an evaluation of ground electrical geophysics completed in the area (Morrel 2006, in print).

The project area covers rocks of the Seventy Mile Range Group, the Lolworth Batholith, the Ravensworth Batholith, the Mt Leyshon Intrusive suite, and a range of other intrusive lithologies, as well as significant Campaspe Formation and Quaternary cover (see Figure 1). A brief description of Solid Geology is outlined below, and is accompanied by a Tectono-stratigraphic column (see Figure 2). Regional geology is discussed in detail in Beams and Camuti, 2004.

2 Solid Geology

The solid geological interpretation was compiled using the datasets available, including

- 25k fact mapping from Aurion (digital)
- 10k interpretation maps from Aurion (digital)
- 250k solid geology from Queensland Natural Resources and Mines (digital)
- 250k surface geology from Queensland Natural Resources and Mines (digital)
- Stitched aeromagnetic images (from SGC)
- Stitched radiometric images (from SGC)
- Regional gravity images
- End of Hole geology from the SADM database (derived from the Terrasearch explorer3 government database, as well as other sources, see Terrasearch's August 2005 data compilation report for details).
- The Explanatory Notes to accompany the Queensland Natural Resources and Mines digital GIS.

The solid geology interpretation is presented, with all of the targets, in Drawing 1, and a description is provided below.

2.1 Litho-Stratigraphy

The oldest lithologies in the project area are comprised of Neoproterozoic to early Cambrian metasediments and orthogneisses of the Cape River and Charters Towers Metamorphics.

Deposition of the Seventy Mile Range Group commenced in the late Cambrian, within a fault-controlled basin. The first unit of the Seventy Mile Range Group, the Puddler Creek Formation, is dominated by terrigenous sediments and is comprised of sandstone and greywacke with minor tholeiitic basalt. This is conformably overlain by the Cambro-Ordovician Mount Windsor Formation, which is comprised of massive lavas dominated by rhyolite, and the Trooper Creek Formation, which is comprised mainly of dacite, andesite, and rhyolite lavas and volcaniclastics with fine-grained sediments at the top. Conformably overlying the Trooper Creek Formation is the final unit of the Seventy Mile Range Group, the Rollston Range Formation, which is comprised of volcaniclastic sandstones and siltstones. A magnetic unit which appears to be a part of the Rollston Range Formation, but does not outcrop, has been previously logged in drill chips as a felsic extrusive, and may represent a rhyolitic or dacitic unit within the Rollston Range Formation.

During the deposition of the Seventy Mile Range Group, sub-volcanic intrusions of Cambro-Ordovician age also occurred. These are commonly granodiorites, and include the Schreibers granodiorite, which has been dated at 490 + 6 Ma (Hutton and Crouch, 1993). The relationship between the Seventy Mile Range Group and these intrusions is unclear, as geochemistry indicates that they may belong to different igneous suites despite the similarity of their ages (Bain & Draper, 1997).

After deposition of the Seventy Mile Range Group ceased, intrusive activity occurred in the area, accompanied by deformation and gold mineralization. First was a series of Ordovician granitiods, dominated by magnetic granodiorite, and including the Bend Granodiorite in the eastern part of the project area. The next event comprised the mid-Ordovician to late-Silurian intrusives of the Ravensworth Granodiorite Complex, which is composed of granite, adamellite, microgranite, granodiorite, gabbro, diorite and tonalite, and occurs mostly in the east of the project area. During the late-Silurian to early-Devonian, intrusive activity was renewed in the Ravenswood Batholith which dominates the northeastern part of the project area, and the Lolworth Igneous Complex was also intruded. The Lolworth Batholith dominates the northern-western part of the project area, and is composed of banded muscovite granite and massive biotite adamellite. This was followed in the early Permian by igneous breccias, quartz bearing trachytes and rhyolite porphyry of the Mount Leyshon Complex, and in the late Permian by leucogranite, volcanic breccia, dacite, rhyolite, dolerites and microgranites of the Mundic Igneous Complex.

During the late Permian to early Triassic, sediments of the Galilee Basin, including the Warang Sandstone, which outcrops in the project area, were deposited in an apparently linear, north-west trending basin.

The Campaspe Formation, comprised of conglomerate, sandstone and pebbly sandstone, was deposited in the Pliocene and covers much of the southern half of the project area, up to maximum depths of 120m. Quaternary sediments, commonly unconsolidated, are also common in the southern part of the project area.

2.2 Structure

The structure of the northern part of the Mount Windsor Volcanics Project area is dominated by east-west trending ridge of granitoid formed by the Lolworth Batholith in the north-west and the Ravenswood Batholith in the north-east. The Seventy Mile Range Formation, which is intruded by units of these igneous complexes, drapes off this granitoid ridge, dipping moderately south. Mylonites have been recorded near the contact of the Seventy Mile Range Formation and the Charters Towers Metamorphics, and the relationship between the two units is likely to be structural. Significant syn-sedimentary faulting is preserved within the Seventy Mile Range Formation, usually defined by abrupt thickening or thinning of individual litho-stratigraphic packages. Major syn-sedimentary faults commonly originate on the boundaries of or within the Cambro-Ordovician intrusives found structurally below the Seventy Mile Range Formation, and are associated with base and precious metals mineralisation.

A number of interpretations have been previously completed for the structure of the Seventy Mile Range Group. The group displays a pervasive east-west schistosity (D2), which is interpreted by Withnall et al, 2003, to be axial planar to a major syncline. Fact mapping from the GIS package supplied by the Queensland Department of Natural Resources and Mines (Withnall et al, 2003), indicates however that the facing direction of sediments mapped in the south-west of the project area is inconsistent with the presence of a syncline. In addition to this, aeromagnetics images do not indicate the presence of folded or repeated stratigraphy on this scale, therefore the solid geology interpretation presented in Drawing 1 shows a continuous stratigraphic sequence. Minor folding, probably associated with faulting, occurs in some units of the Seventy Mile Range Group.

Four deformations have been interpreted in the area by previous workers (Withnall et al, 2003). D1 rarely displays a fabric, and is detected by a change in the S0/S2 lineation. D2 is represented by a penetrative east-west striking, steeply dipping schistosity, which is present in the Seventy Mile Range Group. In the project area, D3 is most prominent within the Ravenswood Batholith, where it forms prominent magnetic lineaments striking east-north-east to north-east. D3

extends into the Seventy Mile Range Group, where it occurs as steep, south-sideup faults with localised fabric development. D4 represents the shallow to moderately dipping east to north-east striking dip-slip faults which control the Charters Towers Gold Mineralisation. In addition to these documented deformations, prominent north-west trending lineaments are evident in both the gravity and magnetics across the entire project area, and show some offset in the Seventy Mile Range Group. The three major deposits that make up Pajingo are aligned along one of these prominent NW trending lineaments.

2.3 Alteration

Alteration styles within the area are documented in detail within the Mineralisation section of Withnall et al, 2003, and in Beams, 1995. Only two styles of alteration were observed in the datasets reviewed during this study; demagnetisation, visible in the RTP aeromagnetics, and potassium alteration, visible in the radiometrics.

The relationship of the demagnetisation to mineralisation is unclear. Demagnetisation is visible in two areas within the project area; the first is located 3.1km south-west of Highway-Reward. The second is located between the Trooper Creek and Donut Prospects, and is bounded by a north-west trending structure which may represent the offset continuation of the structure which runs through Pajingo.

An increase in potassium is correlated with the mineralisation at Mount Leyshon, where an intense high is observed in the radiometrics, and at Highway-Reward, where a diffuse zone of slightly elevated potassium surrounds the orebodies for approximately 0.5km, and a larger zone (approximately 3km long and 2km wide) sits in the footwall. Potassium is also a likely product of alteration in the sericite rich footwall of VHMS deposits. Zones of potassium alteration are difficult to discern within the Seventy Mile Range Group due to the sporadic outcrop and cover by Campaspe Formation. One possible zone of alteration occurs within Trooper Creek Formation, 13.6km east-south-east of Highway-Reward, at the Super Trooper target.

2.4 Regolith

Regolith was not studied in detail, however basic regolith units from the Queensland Department of Natural Resources and Mines were taken into account during the assessment of the surface geochemistry. The northern part of the project area is dominated by subcrop and outcrop, and the DTM indicates that it is relatively hilly, with incised drainage. The far south-eastern part of the project area shows extensive laterisation, commonly with a stripped profile and the

occurrence of mesas. In the south, the majority of the area is covered by Campaspe formation, over which modern fluviatile deposits are common.

3 Mt Windsor Volcanics Regional Targeting

The Mt Windsor Volcanics Project is comprised of EPMs 14161, 14162, 15100, 15192, 15102, and 15197, and ML 10277, totalling 1,036.48 km2. The project area is prospective for a range of deposit styles, including VHMS Base Metals deposits (eg Thalanga, Liontown), VHMS Au-Cu deposits (eg Highway-Reward), Mesothermal Gold deposits (eg Charters Towers, Ravenswood), and Epithermal Gold deposits (eg Pajingo). Combined historical production of gold from the district is over 12 million ounces Au, with base metals resources of greater than 8Mt @ 9.3% Zn, 1.6% Cu, 3.0% Pb, 77 g/t Ag and 0.4 g/t Au. Mineralisation styles are discussed in detail in Beams and Camuti, 2004, and in Beams (ed.), 1995.

3.1 Data Review

The data reviewed and discussed below was sourced from the Bullion Mt Windsor Volcanics Project Database, prepared by SADM and sourced from data compiled by Terra Search. Preparation of the dataset is discussed in Camuti, 2005 and SADM, 2005.

3.1.1 Surface Geochemistry

There are 130,018 surface geochemistry samples in the Bullion Mt Windosor Volcanics Project database. 31,442 of these lie within Bullion tenure. Both soil and stream sediment samples taken within the area were routinely assayed for Zn, Cu and Pb, with assay for Au or As uncommon. Rock chips were routinely assayed for all of these, plus a variety of other elements.

3.1.2 Historical Prospects and Drilling

There are 6,603 drill holes in the Bullion Charters Towers database. 2,180 of these lie within Bullion tenure. 175 Sections were produced by SADM for the Charters Towers Project, excluding those produced for Liontown, which is discussed separately. Shallow drilling (0-20m) was commonly used to drill through cover or weathered subcrop to the fresh rock interface where dispersion patterns appear to be visible. End of hole samples were usually the only samples assayed in this case, and geological information for this type of drilling is rare. Moderate drilling (20-80m) was commonly used to test below historical gold workings, and as an initial test for base metal prospects. Complete down hole intervals were assayed for the base metals prospects. Complete down hole geology is rare.

Deep drilling (>80m) was generally only used in areas where resources exist (eg Liontown), or as two or three holes to test down dip of near surface base metals or gold mineralisation. Complete down hole assays and geology are more common for deep drill holes.

3.1.3 Ground Geophysics

A total of 428 line km of Ground EM, 94 line km of IP, 761 line km of Ground Magnetics, and 40 line km of Ground Gravity was completed over the tenement area. The geophysics in the project area has been comprehensively documented by Terra Search, in their report "Report on Metadata to Accompany Polygons of Historical Ground Geophysical Surveys for the Mt Windsor Volcanic Belt, EPM 14161, October 2005". Much of the electrical geophysics was of poor quality due to significant conductive cover. As a part of this targeting project, Southern Geoscience Consultants have completed an evaluation (Morrel, 2006, in print) of the effectiveness of the electrical geophysics compiled by Terra Search, with accompanying thematically coloured polygons in Mapinfo. This information was used in the assessment of prospect areas.

3.2 Exploration Potential

Assessment of exploration potential was undertaken in three steps;

- Assessment of surface geochemistry
- Assessment of historical workings and drilling
- Interpretation of solid geology and generation of conceptual targets

For each of the 3 types of targets, a Mapinfo file with polygons detailing the location was created. The accompanying Mapinfo Table holds detailed descriptions of the target, including Number, Name, Priority, Commodity, Target Type, Location, Geology and Structure, Regolith, Surface Geochemistry, Drilling, Geophysics, Comments, and Recommendations. This data has been compiled into a single master document which shows targets as a point, and holds all of the accompanying descriptive information ("JG TARGETS – All.tab"). For each target, a Priority was assigned; 1 = robust target, immediate action, 2 = good potential, requires follow up, 3 = moderate to low potential, not fully tested, 4 = very low potential and / or fully tested. A total of 35 targets were generated, with four priority 1 targets, twelve priority 2 targets, eight priority 3 targets, and eleven priority 4 targets. Targets are presented, colour coded for priority, in Drawing 1, and the detailed descriptions for each target are presented in tabulated form in Appendix 1.

Due to the restricted timeframe, targeting focussed on the tenement area currently held by Bullion Minerals Ltd, and targets outside this area were not assessed. It is noted that a number of conceptual and empirical geological targets do occur in
adjacent tenure, however they do not appear to be of higher priority than the high priority targets within Bullion's current tenement package.

3.2.1 Surface Geochemistry

10 targets defined by surface geochemical anomalies were outlined. Of these, three are Priority 1 targets, and five are Priority 2 targets.

The geochemical anomaly outlines were compiled from the SADM database, using a combination of soil geochemistry, stream sediments, and rock chips. Anomalies were assessed for coherence, amplitude, size, and geological setting, including the effects of regolith. All significant anomalies within Bullion's tenure were outlined and described in the standard format detailed above. Detailed recommendations have been supplied with each target, as a part of the descriptive attributes in the Mapinfo table (JG TARGETS Surface Geochemistry.tab), and are documented in Appendix 1. Recommendations for high priority targets are given below.

3.2.2 Drilling and Historical Prospects

20 targets defined by anomalous drilling and historical prospects were outlined and reviewed. This resulted in one Priority 1 target and three Priority 2 targets.

Review of the drilling and historical prospects was completed by reviewing the regional sections provided by SADM (175 sections in total). These were reviewed by drilling grid, which generally represents a historical prospect or target area. Each of these were assessed against the regional geology, geochemistry, and geophysics, and were outlined and described in the standard format detailed above. Detailed recommendations have been supplied with each target, as a part of the descriptive attributes in the Mapinfo table (JG TARGETS Drilling and Historical Prospects.tab), and are documented in Appendix 1. Recommendations for high priority targets are given below.

3.2.3 Conceptual Targets

5 conceptual targets were generated. Of these, four are a Priority 2, and one is a Priority 3.

Conceptual targets were generated using the Solid Geology Interpretation, and characteristics common to deposits in the area. Initial targets were generated on the basis of similar structural – stratigraphic setting to existing deposits, taking into account the timing of structures, stratigraphy and intrusives. No formal criteria were developed, however features considered positive included;

Base Metals

- Mt Windsor / Trooper Creek or Trooper Creek / Rollston Range stratigraphic contact position
- Presence of a significant syn-sedimentary fault system
- Proximity and structural connectivity to a syn-mineralisation intrusive

Gold

- Continuation of major known mineralisation associated structures (such as the Pajingo structure)
- Evidence of activity at the time of mineralisation on major structures parallel to mineralisation associated structures

Detailed recommendations have been supplied with each target, as a part of the descriptive attributes in the Mapinfo table (JG TARGETS Conceptual.tab), and are documented in Appendix 1. Recommendations for high priority targets are given below. Due to time constraints, conceptual target generation was limited, and there is significant scope for additional target generation in this area.





CHTO Targeting December 2005



5 References

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Figure 2 Tectono-stratigraphic Column

Bullion Minerals Limited Tectono-stratigraphic column

Project: Mount Windsor Volcanics Province: Charters Towers

Absolute	Age	Те	ectono-	Stratigraphic rela	tionships	Descriptions	Testere stret	
Age	Ref	Stratigraphy	Defm.	Intrusives	Minzn.	Strat. Period	name	Description
U		Quaternary						-
		Unconsolidated						
	l	Seaments	l					
		Campaspe						
3.8 - 1.35	2	Formation				Pliocene		Conglomerate, sandstone, pebbly sandstone
			1					
65	1				Numerous small gold and tin occurrences			
	••••••							
				Mundic Igneous				Leucogranite, volcanic breccia, dacite, rhyolite, dolerite,
				Complex		Late Permian		microgranite
								Mudstone, siltstone and sandstone; minor conglomerate,
		Galilee Basin				Early Triassic		carbonaceous shale, altered tuff, calcareous claystone and
			I		l			
					Au, Mount Leyshon, Mount			
280	2				Success			
				Mount Levshop				Igneous breccia pipe with guartz bearing trachyte and rhyolite
				Complex		Early Permian		porphyry
					Au, Ravenswood -			
					Sarsfield - Mount Wright			
310 - 296	2				Group			Mesothermal gold-sulphide veins
342	2				Au, Pajingo			Epithermal vein - carboniferous sediment host.
					Wide variety of many small			
354	1				occurrences including Au,			
			1	I		I		
	1		D4					Shallow to moderately dipping, E to NE striking dip-slip faults which control Charters Towers Gold mineralisation.
416 - 397	2				Au, Charters Towers Gold			Mesothermal gold-carbonate veins, dominantly granite hosted
				Deversered		Lata Cilurian ta		
				Batholith		Early Devonian		tonalite
				Lolworth Batholith		Late Silurian to Farly Devonian		Banded muscovite granite and massive biotite adamellite
								steep, ENE to NE striking localised fabric development and
	1		D3					with south-side-up in the Seventy Mile Range Group
				-		-	•	
					Au Mount Emu, Lucky			Porphry related gold in mesothermal veins with associated Mo
434	2				Surprise, Tito			and Cu
	1		D2					Penetrative schistosity, subvertical and striking E-W
					· 	 I		
				Ravenswood		Mid Ordovician		Granite, adamellite, microgranite, granodiorite, gabbro, diorite.
				Batholith		to Late Silurian		tonalite
								Very rarely seen as a fabric - detected by occasional
	1		D1					inconsistent orientation of the S0/S2 lineation
			Ì	Ordovician				
				Granodiorites				Magnetic Granodiorites including the Bend granodiorite
		Rollston Range						
		Formation				Ordovician		Sandstone and siltstone
					Zn-Pb-Cu, Magpie			Lens massive sulphide
<u>4</u> 90	1				Zn-Pb-Cu, Liontown			rapular sulphide poor
		Trooper Creek			Zn-Pb-Cu-Au, Handcuff,			
490	1	Formation			Waterloo, Brittania			Tabular / lens sulphide poor

490 490	1		Granodiorite	Zn-Pb-Cu-Au, Thalanga	Ordovician	Deformed, variably to highly magnetic granodiorite Dacite, andesite, rhyolite and minor basalt with volcaniclastics
		Mount Windsor Formation			Ordovician	Massive lavas dominated by rhyolite
		Formation			Cambrian	Sandstone and Greywacke with minor Tholeiitic basalt
Notes:						
	Refe	rences:	1 Withnall, IW, H Geological Sur	lutton, LJ and Blight, RL. 200 vey of Queensland, Departm	03. North Queensland G ent of Natural Resource	Gold and Base Metal Study Stage 2 data release – Charters Towers GIS. s and Mines, digital data released on CD-ROM.
			2 Beams, SD (ed University, Tov	d.). 1995. Mineral Deposits ov vnsville.	of Northeast Queensland	d: Geology and Geochemistry, EGRU Contribution 52. James Cook







BULLION MINERALS LIMITED Mount Windsor Volcanics Project Liontown Prospect CARRINGTON LODE LONG SECTION 1:5000

Open

position

AMGE (GDA94)	AMGN (GDA94) NUMBER	RNAME	PRIORITY COMMOD	TY TARGET TYPE	LOCATION	GEOLOGY AND STRUCTURE	REGOLITH	SURFACE_GE	DRILLING	GEOPHYSICS	COMMENTS	RECOMMENDATIONS
						Formation Located adjacent prospective intrusive		Small but coherent Zn-Cu-Ph anomaly in soils in		IP IP Effectiveness rated moderate IP anomalies	Anomaly over outcrop significantly smaller than	Ground-check outcrop. Acquire historical IP data an
						associated structure	Outcropping	outcropping / subcropping Trooper Creek formation	No Drilling	attributed to pyrite instead of base metals	Liontown	minera isation
	· · · · · · · · · · · · · · · · · · ·					associated structure.	Odiciopping	outcropping / subcropping mooper creek formation.	No Drining	attributed to pyrite instead of base metals.	Cu only anomaly, with your minor Ph and Zn. Soil	
						Siltstones of the Trooper Creek Formation. On major		Very coherent high level Cu anomalism in soils with	8 shallow scout holes on very western edge of		samples not assaved for Au Au anomalism in drilling	Ground-check Acquire historical EM and IP to
					1.8km South East of	Syn-sed fault, adjacent major alteration zone and		Pb and Zn absent. Au not assaved in soils, but	anomaly with best results TAR024: 3m @ 0.36ppm	EM over whole target. No information about	Very good Au anomaly in stream seds. Adjacent	assess effectiveness. Rock chip and soil sample fo
42711	0 7742870.6	Trooper Creek Au-Cu	1 Au-Cu	Surface Geochemist	Trooper Creek	Cambro-Ordovician gabbro.	Outcropping	coherent Au anomalism in stream seds.	Au and TAR023 3m @ 331ppm Cu	effectiveness or anomalies.	gabbro / dolerite.	Au
						Siltstones and Dacites of the Trooper Creek						
						Formation, Adjacent the Liontown Syn-sed and	Mostly outcrop. Some Campaspe and Quaternary	Coherent moderate level Cu-Au-As anomalism in			Untested Cu-Au soil anomaly in prospective	Ground check and complete additional rock chip
						Intrusive assoc faults.	cover.	soils. 1000m Strike.	No drilling recorded.	No recorded aeophysics.	lithologies and very appealing structural position.	sampling and mapping. Drill test soil anomaly.
					-						Drilling indicates that although Campaspe and	
						Drilling under Quaternary cover and Campaspe		Some soil sampling completed over adjacent outcrop	Mostly very shallow RAB drilling to basement to		Quaternary cover are present, they are very shallow.	Ground check. Gain access to drill chips / cores to
						Formation in Trooper Creek Formation adjacent a		however no coherent significant anomalism was	outline anomalism. 3 deep dr II holes, best assay 1m		however no geophysics has been done in the area.	assess cover. Conduct EM survey over target area
						major Syn-sed? fault.	Campaspe Formation and Quaternary cover.	found.	@ 4.33% Zn.	No geophysics recorded in the area.	Good conceptual target.	and str ke extents.
						Sediments and Rhyolites of the Puddler Creek and						
						Mount Windsor formation. Adjacent major NW faulting	Mostly Outcrop. Minor Quaternary and Campaspe	Moderate level Au anomalism in stream sediments				Ground check. Complete rock chip sampling if
						active.	cover.	with very minor zinc anomalism, no soil sampling.	No drilling recorded.	No recorded geophysics.	Small, moderate to low-level loca ised anomaly.	possible to ascertain source of anomaly.
						Within siltstones and dacites of the Trooper Creek			2 RC holes - LLRC022 & LLRC064, 100-150m, no	EM & IP. Both EM & IP Effectiveness rated		Find accurate assays for drill holes, acquire historica
						Formation. Located on prospective intrusive		Small but coherent Zn-Cu-Pb anomaly in soils in	geology, unknown problem with assays (anomalously	moderate. No EM anomalies noted, IP anomalies	Anomalously low base metals results indicate	IP data and assess whether anomalism has been
						associated structure.	Quaternary unconsolidated - depth unknown	quaternary cover.	low - suspect conversion error)	attibuted to pyrite instead of base metals.	problems with assays.	tested.
						At the Mount Windsor - Trooper Creek boundary,						Ground-check outcrop. Acquire historical EM data
				Surface Geochemist	try,	within dacites and rhyolites of the Trooper Creek	Mostly outcropping, minor unconso idated Quaternary	Coherent, moderate to high level Zn-Cu-Pb	No drilling within anomaly area, significant drilling	EM over whole target. No information about	Anomalism largely contained to a specific fragmental	and assess. May have potential for non-outcropping
42350	0 7743800 3	Trooper Creek Base Me	tals 2 Base Meta	s Drilling	Trooper Creek Prospect	Formation, on major Syn-sed structure.	cover	anomalism in soils over subcrop.	along strike where stratigraphy goes under cover	effectiveness or anomalies.	dacitic lava.	minera isation.
											Anomaly clearly extends past the growth fault along a	Ground-check. Acquire historical EM and IP to
						Siltstones of the Trooper Creek Formation. On major					stratigraphic horizon to the east, where it is	assess effectiveness. Geophysics or drilling over
					1.5km East of Trooper	Syn-sed fault, and adjacent major alteration zone as		Coherent, low level Zn-Cu-Pb anomalism in soils over	r	IP & EM over approximately 1/3 of anomaly. Results	completely untested by drilling or geophysics,	stratigraphic strike extent to assess for targets at
42762	0 7743700 5	Trooper Creek East	2 Base Meta	s Surface Geochemist	ry Creek	indicated by demagnetisation.	Outcropping	subcrop. Au not assayed.	No Drilling	and effectiveness unknown.	however outcrops.	depth.
											Dismissal of IP anomaly seems odd without additional	al de la constante de la const
						Dacites and rhyolites of the Mount Windsor formation				IP over approximately 1/2 of anomaly. Moderate to	data. Contact refers to the contact between rhyolitic	Ground check for dr lling not captured by database.
				Surface Geochemist	ry,	with sediments of the Puddler Creek formation.		Patchy, low level Zn-Cu-Pb anomalism in soils over		strong anomaly with shallow depth to top (25m),	tuff and rhyolitic flow-dome in the Mt Windsor	Acquire historical IP data and assess. Drill test f
43207	0 7745010 7	Prisoner Creek East	2 Base Meta	s Drilling	5km ENE of Trooper Cree	Adjacent major? Syn-sed fault.	Outcropping	subcrop. Au not assayed.	No Drilling	attributed to lithological contact.	Volcanics.	anomaly is robust.
						Within Dacites and Siltstones of the Trooper Creek		Coherent moderate Zn-Cu-Pb anomalism in soils.				Ground check. Acquire details of any previous
						Formation. Very late WNW structure visible in K Rad		1500m Strike. Minor As anomalism. No Au assays			Tenor of anomaly may be somewhat upgraded by	geophysics and re-assess. Small drill program to
-						appears to ottset the anomaly.	Mostly outcrop. Some duricrusts and Ferricrete.	recorded.	No ariling recorded.	UNKNOWN - NOT WITHIN GEOPHYSICS COMPILATION AREA.	auricrust / terricrete development.	assess tenor of mineralisation.
						Rhyolites and Dacites of the Mount Windsor and		Coherent moderate level Zn-Cu-Pb anomalism in	4 RC holes drilled to moderate depths well off the		Main overlapping area of anomaly not tested,	Ground check. Complete soil sampling and rock chil
						Trooper Creek Formation. Very minor Syn-sed	Partly outcrop. Campaspe and Quaternary cover in	stream sediments. No soil sampling over main,	edge of main overlapping anomaly, intercepted		however outlying areas are not supported by soil	sampling over main part of anomaly where possible.
					• • • • • • • • • • • • • • • • • • •	rauiting.	centre of anomaly.	overlapping part of anomaly.	anomaious base metals.	No recorded geophysics.	geocnemistry or drilling.	Assess for possible geophysical follow up.
1						Prilling within Poone Grandiante Mineralis			Van forward drilling implice super-		Post intercent has not have tested down die sector	complete detailed review of historical work, as well
						Drilling within Deane Granodiorite. Minera ised veins		A	very focused drilling implies quartz veining that		Best intercept has not been tested down dip or along	as new mapping to establish mineralisation controls
			_			dip 26 to 355, and have good continuities. Best	Quterrenting.	Anomalous Au in stream seds common for the whole	controls mineralisation outcrops. Mineralisation open	No see busing recorded	strike. Very good vein continuities give this prospect	Small drill program to test potential for better widths
						At the ten of the Treeper Creek Em where it	Outcropping	alea.	down up and along sinke to the easi.	No geophysics lecolded.	potential.	grades.
					7 Ekm South of Highwov	intersects a combination Sun codimentary and	Approx 65m of cover. Tertiany with possible		One drillhole within 2.3km radius target zone. No			Consider a small program of drilling to appage the
41700	0 7742500 20	look	3 Bass Moto	a Au Concentual	Roward	Highway Reward accepted fault	Composing Em underlying	None Available	circulation of the second seco	No recorded geophysics	Moderate concentual terract for polymotallia deposite	torget for anomalous base metals or gold values
41700	0 1143500 50	Jack	2 Base Weta	s Au Conceptual	Rewald	Interpreted extension of the NW/ "Paiingo" structure	Campaspe Fill undenying	None Available	Drilling within the target area at the Doput prospect	Limited ground magnetics has been completed over a	I ack of anoma ism in the small number of	target for anomalous base metals of gold values.
					Immediately NNW of	which is a subtle lineament in the magnetics and a	Approximately equal amounts of outcrop and	Patchy soil sampling shows no significant anomalism	and further north. No drilling over main structure. No	small portion of the target area, away from the main	acchemical samples in the area downgrades the	Complete supplementary stream sediment sampling
43386	0 7743720 32	Drew	2 Au	Concentual	Brittania	prominent feature in the gravity	Quaternary cover	most stream sediment sampling not assaved for gold	significant anomalism	structure	tarnet	for gold
10000	0 1110120 02	5101	2710	Concopidai	Difficinta	Interpreted contact between Mt Windsor Em and	quaternary cover.	No soils completed in the area minor Zn anomalism	olgrinouri, unornalioni.	on dotaro.	Lack of anoma ism in the small number of	lor gold.
						Trooper Ck Fm, adjacent a major fault, which may be		in stream sediment sampling, appears to originate			geochemical samples in the area downgrades the	Ground check to establish contact location and
						a combination syn-sedimentary fault.	Outcrop, Quaternary cover, and laterised regolith.	from Wedgetail Prospect	No Drilling Recorded	Unknown - outside geophysical compilation area.	target.	conduct small rock chipping / soil sampling program
						Sediments and Rhyolites of the Trooper Creek						
					14km East-South-East of	formation. Adjacent major Syn-sedimentary fault.	Mostly Outcrop, Minor Quaternary and Campaspe	No soil sampling, very slightly elevated base metals			Potential for buried orebody with visible alteration	Ground check. Conduct EM survey to test for
42920	0 7740700 35	Super Trooper	2 Base Meta	s Conceptual	Highway-Reward	Potassium alteration in Radiometrics?	cover.	in stream sediment sampling.	No drilling recorded.	No recorded aeophysics.	halo and very minor anoma ism at surface.	conductors. Drill test any conductors.
									4 shallow holes in anomaly area. Max assay in		Coherent and co-incident, but low level Cu-Pb-Zn	Ground-check outcrop. Acquire historical EM data
					500m South of Trooper	Trooper Creek Breccia. Mt Levshon Complex	Mostly outcropping, minor unconso idated Quaternary	Coherent, low level Zn-Cu-Pb anomalism in soils over	TAR048, drilled to 27m. EOH assay only, 3m @	EM over whole target. No information about	anomalism. Appears to be associated with outcrop of	f and assess. May have potential for non-outcropping
42660	0 7743400 4	Trooper Creek Breccia	3 Base Meta	s Surface Geochemist	ry Creek Prospect	Carbon ferous intrusive breccia.	cover	subcrop. Au not assayed.	0.189% Zn and 71ppm Cu.	effectiveness or anomalies.	Mt Leyshon Complex Lithologies.	minera isation.
											No different un ts mapped to attribute resistivity	
						Dacites and rhyolites of the Mount Windsor formation			11 Sha low drill holes on the edge of anomaly area.	Most of the anomaly covered with EM. Moderate	contrasts to - some comments in geophysics about	Ground check. Acquire historical EM data and
						with sediments of the Puddler Creek formation.		Patchy, low level Zn-Cu-Pb anomalism in soils over	Max assay 3m @ 0.115% Pb and 0.36% Zn. Max cu	anomalies returned, attributed to resistivity contrast	Campaspe, so there may be unmapped Campaspe in	assess. May have potential for non-outcropping
43388	0 7745270 8	Donut Base Metals	3 Base Meta	s Surface Geochemist	ry 7km ENE of Trooper Cree	Adjacent major? Syn-sed fault.	Outcropping	subcrop. Au not assayed.	161ppm.	between units.	the area?	minera isation.
						Dacites and rhyolites of the Mount Windsor formation			5 RC holes within main anomaly. Max assay from	EM covers whole area. Effectiveness moderate.		Adequately tested for mineralisation < 100m from
						with sediments of the Puddler Creek formation.		Patchy, low level Zn-Cu-Pb anomalism in soils over	different intervals in SMD017 are 1m @ 1.7% Zn, 1m	Weak anomalies on northern ends of some lines,	Potential for near-surface mineralisation well tested	surface. Acquire historical EM data and assess for
						Adjacent major? Syn-sed fault.	Outcropping	subcrop. Au not assayed.	@ 620ppm Cu 2m @ 0.21% Pb.	considered to be insignificant.	by drilling and geophysics.	deeper targets.
											Unclear why the bulk of drilling sits off the edge of the	9
						On the contact between Mount Windsor rhyolites and			25 RC holes targeting adjacent horizon - not through	EM covers whole area. Effectiveness poor. Weak	geochemical anomaly - check grid transformations?	Tested for mineralisation < 100m from surface.
				Surface Geochemist	try, Cattle Creek Prospect,	Trooper Creek dacites and sediments. Adjacent		Patchy, low level Zn-Cu-Pb anomalism in soils over	main part of anomaly??. Max assay 1.57% Zn,	anomalies on 10200E and 10800E drill tested. Others	Deep dr II holes are collared mostly to target the	Partially tested for deeper targets. Acquire historica
44011	0 7743550 10	Cattle Creek	3 Base Meta	s Drilling	14km E of Trooper Creek	major? Syn-sed fault.	Mostly outcrop. Some Quaternary cover	subcrop. Au not assayed.	820ppm Cu 0.6% Pb in different holes.	interpreted as resistivity contrasts.	anomaly however.	EM data and assess.
						Within Trooper Creek Formation, adjacent ?? Age					Surveys show diamond hole drilled to the north (ie	Ground check. Acquire original data for drill hole
				_		magnetic granite. No significant structures		Coherent moderate Zn-Cu-Pb anomalism in soils.	1 diamond drill hole to 344m with best assay of		000), instead of under anomaly. Likely to be a data	NDD001 and confirm drilling direction. Consider EN
						interpreted.	Mostly outcrop. Some Quaternary cover	800m Strike. No As or Au assays recorded.	0.89% Zn and 0.15% Cu.	No Geophysics Recorded.	error? Hole also drilled in weakest part of anomaly.	survey.
1						Drilling on the contact between two phases of the			6 moderate depth RC holes, probably on old		Only two intercepts have been made, so strike of vein	Ground check. If possible, use historical reports
I						Deane Granodior te. North dipping, best intercept 2m		Anomalous Au in stream seds common for the whole	workings or quartz veins. Unclear whether strike	the second se	is unkown and whether strike extents have been	and/or mapping to establish strike of vein to assess
						@ 4.4/ppm.	Outcropping	area.	extent has been tested.	No geophysics recorded.	tested by drilling is also unknown.	wnetner strike extents have been tested.
1		1				Interpreted contact between the Mt Windsor Fm and		N			Projected stratigraphic position speculative, and no	Ground check outcrop within target area and rock
I						the Trooper Creek Fm, where a combination Syn-		No soil sampling recorded, stream sediment sampling		No	significant geochemical response from stream	cnip, define Mt Windsor - Trooper Creek Fm contact
						seurnentary rauit occurs.	wosily Quaternary cover with minor outcrop.	covers the area well and shows no anomalism.	NU utilling recorded.	INO LECORDED GEODINASICS.	Securient sampling downgrades the target.	II POSSIDIE.
1		1				to be doop Compact and New York appears			Bost appay 0 16pps Av. Accession 1 arget unknown.		drilling Shows that there may be	
						in be deep Campaspe cover. No major structures	Doop Composing ocurre	None available	est assay u. roppin Au. Anomalous down the length	No goophysics reacted	placer style gold in the serve	No further work
-						Dominantly on During st over and asitic/baseltic	Doop Campaspe COVEL	Coherent moderate Zn-Cu-Ph anomaliam in acit-	Initial grid of shallow - moderate PAP drilling for	no geophysics recolded.	piacoi siyie yolu ili tile alea.	Anomaly small and we litested for poor surface
1		1				Trooper Creek Formation Just north of very late	Mostly duricrust and ferricrete with minor weathered	500m Strike. Minor As anomalism. No Au accourt	up by percussion dri ling. Broad zones of anomaliam		Tenor of anomaly may be somewhat upgraded by	minera isation. Acquire details of any previous
						WNW structure visible in K Rad	outcrop.	recorded.	best assav 1m @ 1 48% 7n	Unknown - not within geophysics compilation area	duricrust / ferricrete development	deophysics and re-assess
						Dacites and rhvolites of the Mount Windsor			Initial close-spaced grid of shallow PAR defined good		and the second s	13
1		1				Volcanics. Immediately adiacent the Liontown Syn-		Coherent moderate Zn-Cu-Pb anomalism in soils	anomalism 450m strike. Further drilled with RC &	Well covered by IP and EM with variable	Soil anomaly tested, low potential for mineralisation at	t
						sedimentary Fau t.	Mostly outcrop. Some Quaternary cover.	1000m Strike. No Au or As assavs recorded	DD best assay 1m @ 3.3% Zn	effectiveness.	depth.	No further work.
	·····									have a second second second	1	1
						Cherts, Shales, and Dacites of the Trooper Creek				Well covered by IP and EM with variable		
						Cherts, Shales, and Dacites of the Trooper Creek Formation. Immediately adjacent the Liontown Syn-	Mostly outcrop. Some Campaspe and Quaternary	Coherent high level Zn-Cu-Pb-As anomalism in soils.	Old mine and current resource. See separate	Well covered by IP and EM with variable effectiveness. See separate detailed discussion on		Further work discussed in separate section on
						Cherts, Shales, and Dacites of the Trooper Creek Formation. Immediately adjacent the Liontown Syn- sed and Intrusive assoc faults.	Mostly outcrop. Some Campaspe and Quaternary cover.	Coherent high level Zn-Cu-Pb-As anomalism in soils. 2700m Strike.	Old mine and current resource. See separate detailed discussion on Liontown.	Well covered by IP and EM with variable effectiveness. See separate detailed discussion on Liontown.	Soil anomaly tested (historical mine).	Further work discussed in separate section on Liontown.
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Appendix 2 – Data Sources

The first part of this appendix (Part A) documents the digital data created for the Mount Windsor Volcanics Project Summary, while the second part (Part B) documents the digital data used to produce the report. In all cases, "P:" refers to *projects on 'bm-sbs01'*. The third part, part C, documents the paper based data available.

Part A

All files created as a part of the Mount Windsor Volcanics Project Summary reside on

P:\Charters Towers\R2 Reports\Other\DRS Report Dec 2005

and are on the accompanying DVD. Where new data has been created, it has been dispersed within the project structure (ie the geological interpretation is now under G2 Geology, and all micromine files are in the W3 Workspace MM directory). Where existing data has been modified using simple spatial cuts or simple queries, it has not been dispersed into the file structure due to the hazards of duplication, however remains within the above directory, and on the DVD. Files are listed below in directory structure. Where multiple files create a single working document (eg Mapinfo tables), only the main file, ie *.tab is listed.

P:\Charters Towers\R2 Reports\Other\DRS Report Dec 2005

BUL-CHT200501JG Mt Windsor Volcanics Project – Summary in Full.pdf

Parts of report

Appendix 1 - Target Summaries.xls Appendix 2 - Data Sources.doc BUL-CHTO200501JG Mt Windsor Volcanics Project - Summary.doc BUL-CHTO200501JG01 Drawing 1 - Interpreted Geology and Targets BUL-CHTO200501JG02 Drawing 2 - Interpreted Geology and Surface **Geochem Anomalies** BUL-CHTO200501JG03 Drawing 3 - Interpreted Geology and Drilling and Historical Prospects BUL-CHTO200501JG04 Drawing 4 - Interpreted Geology and **Conceptual Targets** Figure 1 - Charters Towers Project Location.pdf Figure 2 - Tectono-Stratigraphic Column.xls Figure 3 - GW Long Section Carrington Lode.pdf *Mapinfo*\ Drawing 1 - Interpreted Geology and Targets Workspace.zip Drawing 2 - Interpreted Geology and Surface Geochem Anomalies Workspace.zip

Drawing 3 - Interpreted Geology and Drilling and Historical Prospects Workspace.zip Drawing 4 - Interpreted Geology and Conceptual Targets Workspace.zip P:\Charters Towers\R2 Reports\Other\DRS Report Dec 2005 Parts of report\ Mapinfo\ IC Tables

JG Tables $\$

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Mapinfo Themes etc\

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Modified Tables

CTPA All Mineral Occurrences.TAB CTPA Collar.TAB CTPA Depth of Cover in Drilling.TAB CTPA EOH Geology.TAB CTPA Faults.TAB CTPA Geology.TAB CTPA Lineaments.TAB CTPA Major Mineral Occurrences.TAB P:\Charters Towers\R2 Reports\Other\DRS Report Dec 2005 Parts of report\ Mapinfo\

Modified Tables\cont.CTPA Max Assays - Drilling.TABCTPA Max Assays - Rocks.TABCTPA Max Assays - Rocks.TABCTPA Max Assays - Seds.TABCTPA Max Assays - Soils.TABCTPA Mineral Occurrence Ages.TABCTPA Selected Mineral Occurrences.TABCTPA Solid geology.TABCTPA Stage 2 wholerock.TABCTPA Surface Geochemistry.TABCTPA Surface geology.TABSolid Geology - Deformed query.TABSurface Geology Legend.TAB

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Brittania.dhdb Brittania_Collar.DAT Charters Towers Regional.dhdb CHTO_Cover_for_Mapinfo.DAT CHTO_EOHGeology_for_Mapinfo.DAT CHTO_EOHGeology_Unique.DAT CHTO_MAXAssays_for_Mapinfo.DAT Leyshon View.dhdb LeyshonVeiw_Collar.DAT Liontown.dhdb Liontown_Collar.DAT Oakdale.dhdb Oakdale_Collar.DAT Part B

This section documents the digital data from Bullion Minerals server used to create and compile the report.

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SADM_Database_Aug2005\ChartTow_GIS_Report.doc TS_HistRev_Aug2005\TS_Bullion_Report_Aug05.doc TS_InfoMemo_March2004\Bull_Min_InfoMem_March2004_full.pdf

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P:\Charters Towers\G3 Geophysics

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SGC Geophysical evaluation Nov 2005

Priority 1.TAB Priority 2.TAB Priority 3.TAB Priority 4.TAB Priority 5.TAB Priority 6.TAB

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> Geophysics\ Gravity\ ct_gravity_drape.TAB

mineral_occurrence\ mine_locations.tab ore_mineralogy_age.tab faults.tab geology.tab lineaments.tab

Part C

This section details the paper documentation available in the Bullion Minerals collection on the Mount Windsor Volcanics Project. Much of this information was used as background information in the compilation of the report. Specific references are listed separately at the end of the main text of the report.

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Beams S and Camuti K. 2004. Bullion Minerals Limited Charters Towers Project Information Memorandum. Unbpublished report, Terra Search Pty Ltd for Bullion Minerals Ltd.

Camuti K. 2005. Bullion Minerals Limited Charters Towers Project Exploration Data Compilation. Unbpublished report, Terra Search Pty Ltd for Bullion Minerals Ltd.









APPENDIX 4

Southern Geoscience Consultants Memorandum – 16 Oct 2006



SOUTHERN GEOSCIENCE CONSULTANTS

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Memorandum

DATE: Monday, October 16, 2006 TIME: 12:41 PM PROJECT: Charters Towers, Queensland FROM: Anne Morrell, SGC

TO:

Bullion Minerals GPO Box 2890 Perth WA 6001

ATTN: John McIntyre

John,

Please find following a summary of the evaluation of the existing geophysical work across EPM14161.

JOB BRIEF: 1. Evaluate and classify EPM14161 into exploration priority areas. 2. Assess the effectiveness of the geophysical method in the priority areas.

The exploration focus across EPM14161 is on base metal sulfide mineralisation. Campaspe Formation is a highly conductive Quaternary cover present across the tenement that has impeded some electrical surveys in the region historically. The distribution of existing ground electromagnetic (GEM) and induced polarisation (IP) surveys (based on the TerraSearch report provided) and the occurrence of Campaspe Formation were used to define the six priority levels summarised below. IP coverage generates a higher priority target than GEM due to its lower effectiveness in exploring for base metal sulfides.

		Campaspe Formation	GEM	IP
Highest	Priority 1	×	×	×
	Priority 2	\checkmark	×	×
	Priority 3	×	×	\checkmark
	Priority 4	\checkmark	×	\checkmark
Ļ	Priority 5	×	\checkmark	×
Lowest	Priority 6	\checkmark	\checkmark	×

1. Priority classification

- A MapInfo map was produced using the GEM and IP survey coverage from TerraSearch with the known distribution of Campaspe Formation from the surface geology map provided by Bullion Minerals.
- A single polygon representing all Campaspe Formation units was produced from the surface geology table. NOTE: where narrow zones of Quaternary alluvial and colluvial deposits occurred along drainage lines between areas of Campaspe Formation, these were also included as Campaspe Formation as they most likely form a thin mantle over the conductive cover unit only.
- Priority areas were determined using the rankings above, eg. where a GEM survey covered an area
 over Campaspe Formation, a region was created and allocated to priority 6, etc. MapInfo tables were
 produced for each priority (Priority_1 etc.) and attributed (see 1 below). The TerraSearch_Polygon_ID
 was included for cross-referencing back to their database. NOTE: A second set of priority tables
 (Priority_1a etc.) was also produced using <u>all</u> Quaternary cover units as well as Campaspe Formation
 to classify the priority areas. This was done as other Quaternary sequences may potentially have a
 similar geophysical response to the Campaspe Formation.
- Where an area had both GEM and IP coverage the lower priority GEM rank was assigned.
- The priority of an area is denoted according to a colour code and also in their attribute table (see 2 below).

2. Method effectiveness ranking

- Each GEM and IP survey conducted was ranked by assessing its effectiveness based on the summary information in the TerraSearch report. (The "Results_Summary" for each survey from the TerraSearch database was included in the attribute table; see below).
- Four ranks were used: good, moderate, poor, untested anomalies. In cases where no summary information was provided, the rank "Unknown" was also used. The rank "Untested anomalies" was only used when explicitly stated in the survey results summary, however exploration since the survey date (eg. drilling) not known here may have already tested these.
- The effectiveness is included in the attribute tables for all priority areas. A thematic map for each priority was produced delineating rank by various hatching (see 3 below).

Info Tool		×	
TerraSearch_Polygon_ID:	MTWINIP0070	-	
Priority:	3		
Description:	Area of no Campaspe Fm with IP coverage.		
Data_Type:	IP		
Results_Summary: Method_Effectiveness:	Slightly weaker anomaly is associated with moderately resistive rocks		
	Moderate]	
<< >>> List	Priority_3	-	

1. Attributes included in tables for each priority area.

Priority Legend
Priority_1 Areas of no Campaspe Fm and no GEM or IP coverage.
Priority_2 Areas of Campaspe Fm and no GEM or IP coverage
Priority_3
Priority_4
Priority_5
Areas of no Campaspe Fm with GEM coverage. Priority_6
Areas of Campaspe Fm with GEM coverage.

2. Priority Leaend

3. Method Effectiveness Legend



400,000 mE	410,000 mE	420,000 mE
7,750,000 mN		
7,730,000 mN		
Priority 1 Area of no Campaspe Fm and no GEM or IP coverage. Priority 2 Area of Campaspe Fm with no GEM or IP coverage. Priority 3 Area of no Campaspe Fm with GEM coverage. Priority 4 Area of Campaspe Fm with GEM coverage. Priority 5 Area of no Campaspe Fm with IP coverage.		



400,000 mE		410.000 mE	420,000 mE
7 750 000 mN			
7,740,000 mN			
Priority 1a Area of no Campaspe Fm or Quaternary cover	and no GEM or IP coverage.		
Priority 2a Area of Campaspe Fm or Quaternary cover with	n no GEM or IP coverage.		
Area of no Campaspe Fm or Quaternary cover	with GEM coverage.		
Area of Campaspe Fm or Quaternary cover with Priority 5a	n GEM coverage.		
Area of no Campaspe Fm or Quaternary cover Priority 6a Area of Campaspe Fm or Quaternary cover with	with IP coverage. n IP coverage.		



APPENDIX 5

Fugro Airborne Surveys Report – Liontown, Queensland Airborne Magnetic and Radiometric Geophysical Survey, 2006

Liontown, Queensland Airborne Magnetic and Radiometric Geophysical Survey

Acquisition and Processing Report

for

Base Resources Limited

Prepared by :	D. Cowey	
	L. Stenning	
Authorised for rele	ease by :	

Survey flown: July 2006

by



Fugro Airborne Surveys 65 Brockway Road, Floreat. WA 6014, Australia Tel: (61-8) 9273 6400 Fax: (61-8) 9273 6466

FAS JOB # 1804

CONTENTS

1. SU	RVEY OPERATIONS AND LOGISTICS	. 4
1.1		.4
1.2	SURVEY BASE	.4
1.3	SURVEY PERSONNEL	.4
1.4		.4
1.5	AREA MAP	.5
		•
2. 50	RVEY SPECIFICATIONS AND PARAMETERS	. 6
2.1	AREA CO-ORDINATES	. 6
2.2	SURVEY AREA PARAMETERS	. 6
2.3	DATA SAMPLE INTERVALS	.6
2.4	SURVEY TOLERANCES	.6
3. AIF	RCRAFT EQUIPMENT AND SPECIFICATIONS	.7
3.1	AIRCRAFT	.7
3.2	NAVIGATION SYSTEM	.7
3.3	AIRCRAFT MAGNETOMETERS	.7
3.4	AUTOMATIC COMPENSATOR	.7
3.5	GAMMA RAY SPECTROMETER SYSTEM	.7
3.6	RADAR ALTIMETER	. 8
3.7	BAROMETRIC ALTIMETER	. 8
3.8	FLIGHT DATA RECORDING	. 8
3.9	FLIGHT FOLLOWING	. 8
4 GR	OUND DATA ACOUSTION FOURPMENT AND SPECIFICATIONS	a
4. ON		
4.1	MAGNETIC BASE STATION	.9
4.2	GPS BASE STATION	.9
5 EO		
J. EQ	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS	10
5. EQ	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS	10 10
5. EQ 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS	10 10
5. EQ 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS SURVEY CALIBRATIONS	10 10 10 10
5. EQ 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS	10 10 10 10
5. EQ 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS SURVEY CALIBRATIONS .1 Dynamic Magnetometer Compensation .2 Parallax .3 Pad Calibrations .4 Background and Cosmic Calibration Stacks	10 10 10 10 10
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS SURVEY CALIBRATIONS .1 Dynamic Magnetometer Compensation .2 Parallax .3 Pad Calibrations .4 Background and Cosmic Calibration Stacks .5 Height Attenuation Calibrations	10 10 10 10 10 10
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS SURVEY CALIBRATIONS .1 Dynamic Magnetometer Compensation .2 Parallax .3 Pad Calibrations .4 Background and Cosmic Calibration Stacks .5 Height Attenuation Calibrations .6 Daily Calibrations	10 10 10 10 10 11
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS SURVEY CALIBRATIONS .1 Dynamic Magnetometer Compensation .2 Parallax .3 Pad Calibrations .4 Background and Cosmic Calibration Stacks .5 Height Attenuation Calibrations .6 Daily Calibrations	10 10 10 10 10 10 11 11
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 6. DA	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS SURVEY CALIBRATIONS .1 Dynamic Magnetometer Compensation .2 Parallax .3 Pad Calibrations .4 Background and Cosmic Calibration Stacks .5 Height Attenuation Calibrations .6 Daily Calibrations TA VERIFICATION AND FIELD PROCESSING	10 10 10 10 10 11 11 11 12
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 6. DA 6.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS SURVEY CALIBRATIONS .1 Dynamic Magnetometer Compensation .2 Parallax .3 Pad Calibrations .4 Background and Cosmic Calibration Stacks .5 Height Attenuation Calibrations .6 Daily Calibrations TA VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA	10 10 10 10 10 11 11 12 12
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 6. DA 6.1 6.2	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS SURVEY CALIBRATIONS .1 Dynamic Magnetometer Compensation .2 Parallax .3 Pad Calibrations .4 Background and Cosmic Calibration Stacks .5 Height Attenuation Calibrations .6 Daily Calibrations TA VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA HEIGHT DATA	 10 10 10 10 10 11 11 112 112 112
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1 6. DA 6.1 6.2 6.2	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS SURVEY CALIBRATIONS .1 Dynamic Magnetometer Compensation .2 Parallax .3 Pad Calibrations .4 Background and Cosmic Calibration Stacks .5 Height Attenuation Calibrations .6 Daily Calibrations .6 Daily Calibrations TA VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA .1 Radar Altimeter Data	10 10 10 10 10 11 11 12 12 12
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1 6. DA 6.1 6.2 6.2 6.2 6.2	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS SURVEY CALIBRATIONS .1 Dynamic Magnetometer Compensation .2 Parallax .3 Pad Calibrations .4 Background and Cosmic Calibration Stacks .5 Height Attenuation Calibrations .6 Daily Calibrations .6 Daily Calibrations .7 TA VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA HEIGHT DATA .1 Radar Altimeter Data .2 GPS Height Data	10 10 10 10 10 11 11 12 12 12 12
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1 6. DA 6.1 6.2 6.2 6.2 6.2 6.2	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS SURVEY CALIBRATIONS .1 Dynamic Magnetometer Compensation .2 Parallax .3 Pad Calibrations .4 Background and Cosmic Calibration Stacks .5 Height Attenuation Calibrations .6 Daily Calibrations .6 Daily Calibrations .7 VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA HEIGHT DATA .1 Radar Altimeter Data .2 GPS Height Data .3 Barometric Altimeter Data	10 10 10 10 10 11 11 12 12 12 12
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 6. DA 6.2 6.2 6.2 6.2 6.2 6.2	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS Survey Calibrations 1 Dynamic Magnetometer Compensation 2 Parallax. 3 Pad Calibrations 4 Background and Cosmic Calibration Stacks 5 Height Attenuation Calibrations 6 Daily Calibrations 7 VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA 1 Radar Altimeter Data 2 GPS Height Data 3 Barometric Altimeter Data 4 Topographical Data	10 10 10 10 10 10 11 11 12 12 12 12 12
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1 6. DA 6.2 6.2 6.2 6.2 6.2 6.2	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS Survey CALIBRATIONS 1 Dynamic Magnetometer Compensation 2 Parallax 3 Pad Calibrations 4 Background and Cosmic Calibration Stacks 5 Height Attenuation Calibrations 6 Daily Calibrations 7 VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA HEIGHT DATA 1 Radar Altimeter Data 2 GPS Height Data 3 Barometric Altimeter Data 4 Topographical Data 5 Gridding and Inspection	10 10 10 10 10 10 11 11 12 12 12 12 12 12
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS Survey CALIBRATIONS 1 Dynamic Magnetometer Compensation 2 Parallax. 3 Pad Calibrations 4 Background and Cosmic Calibration Stacks 5 Height Attenuation Calibrations 6 Daily Calibrations 7 TA VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA 1 Radar Altimeter Data 2 GPS Height Data 3 Barometric Altimeter Data 4 Topographical Data 5 Gridding and Inspection	10 10 10 10 10 11 11 12 12 12 12 12 12 12 12
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS Survey Calibrations 1 Dynamic Magnetometer Compensation 2 Parallax 3 Pad Calibrations 4 Background and Cosmic Calibration Stacks 5 Height Attenuation Calibrations 6 Daily Calibrations 7 VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA HEIGHT DATA 1 Radar Altimeter Data 2 GPS Height Data 3 Barometric Altimeter Data 4 Topographical Data 5 Gridding and Inspection FLIGHT PATH DATA MAGNETIC DATA	10 100100101010101010101010101010101010
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS Survey Calibrations 1 Dynamic Magnetometer Compensation 2 Parallax 3 Pad Calibrations 4 Background and Cosmic Calibration Stacks 5 Height Attenuation Calibrations 6 Daily Calibrations 7 TA VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA HEIGHT DATA 1 Radar Altimeter Data 2 GPS Height Data 3 Barometric Altimeter Data 4 Topographical Data 5 Gridding and Inspection 5 FLIGHT PATH DATA 1 Diurnal Correction	10 10 10 10 10 10 10 11 11
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS Survey CALIBRATIONS .1 Dynamic Magnetometer Compensation .2 Parallax .3 Pad Calibrations .4 Background and Cosmic Calibration Stacks .5 Height Attenuation Calibrations .6 Daily Calibrations .7 VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA HEIGHT DATA .1 Radar Altimeter Data .2 GPS Height Data .3 Barometric Altimeter Data .4 Topographical Data .5 Gridding and Inspection .5 Gridding and Inspection .6 Dairual Correction .2 Parallax Correction	10 10 10 10 10 10 11 11
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS Survey CALIBRATIONS 1 Dynamic Magnetometer Compensation 2 Parallax 3 Pad Calibrations 4 Background and Cosmic Calibration Stacks 5 Height Attenuation Calibrations 6 Daily Calibrations 7 TA VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA HEIGHT DATA 1 Radar Altimeter Data 2 GPS Height Data 3 Barometric Altimeter Data 4 Topographical Data 5 Gridding and Inspection FLIGHT PATH DATA MAGNETIC DATA 1 Diurnal Correction 2 Parallax 3 Preliminary Gridding and Inspection 3 Preliminary Gridding and Inspection	10 10 10 10 10 10 10 10 10 10 10 10 10 10 10
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS Survey CALIBRATIONS 1 Dynamic Magnetometer Compensation 2 Parallax 3 Pad Calibrations 4 Background and Cosmic Calibration Stacks 5 Height Attenuation Calibrations 6 Daily Calibrations 7 VERIFICATION AND FIELD PROCESSING MAGNETIC DURNAL DATA HEIGHT DATA 1 Radar Altimeter Data 2 GPS Height Data 3 Barometric Altimeter Data 4 Topographical Data 5 Gridding and Inspection FLIGHT PATH DATA MAGNETIC DATA 1 Diurnal Correction 2 Parallax Correction 3 Preliminary Gridding and Inspection	10 10 10 10 10 10 11 12 12 12 12 13 13 13 13 13 13 13 13
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS SURVEY CALIBRATIONS 1 Dynamic Magnetometer Compensation 2 Parallax 3 Pad Calibrations 4 Background and Cosmic Calibration Stacks 5 Height Attenuation Calibrations 6 Daily Calibrations 7 VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA HEIGHT DATA 1 Radar Altimeter Data 2 GPS Height Data 3 Barometric Altimeter Data 4 Topographical Data 5 Gridding and Inspection 7 FLIGHT PATH DATA 1 Diurnal Correction 2 Parallax Correction 3 Preliminary Gridding and Inspection	10 10 10 10 10 10 10 10 10 10 10 10 10 10 10
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS Survey CALIBRATIONS 1 Dynamic Magnetometer Compensation 2 Parallax	10 10 10 10 10 10 11 11
5. EQ 5.1 5.1 5.1 5.1 5.1 5.1 5.1 5.1	UIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS Survey CALIBRATIONS 1 Dynamic Magnetometer Compensation 2 Parallax 3 Pad Calibrations 4 Background and Cosmic Calibration Stacks 5 Height Attenuation Calibrations 6 Daily Calibrations 7 VERIFICATION AND FIELD PROCESSING MAGNETIC DIURNAL DATA HEIGHT DATA HEIGHT DATA HEIGHT DATA 1 Radar Altimeter Data 2 GPS Height Data 3 Barometric Altimeter Data 4 Topographical Data 5 Gridding and Inspection FLIGHT PATH DATA MAGNETIC DATA 1 Diurnal Correction 2 Parallax Correction 3 Preliminary Gridding and Inspection 4 Topographical Data 5 Gridding and Inspection 1 Parallax Correction 2 Parallax Correction 3 Preliminary Gridding and Inspection 3 Preliminary Gridding and Inspection 3 Preliminary G	10 10 10 10 10 10 10 11 12 12 12 12 12 13 13 13 13 13 14

7.2 MA	GNETIC DATA PROCESSING	14
7.2.1	Gridding	14
7.3 RA	DIOMETRIC DATA PROCESSING	14
7.3.1	Energy Recalibration	15
7.3.2	NASVD Filtering	15
7.3.3	Dead Time	15
7.3.4	STP Altitude	15
7.3.5	Cosmic and Aircraft Background Removal	15
7.3.6	Window Definitions	16
7.3.7	Radon Correction	16
7.3.8	Spectral Stripping	16
7.3.9	Height Correction	16
7.3.10	Gridding	16
7.4 Dig	ITAL ELEVATION MODEL	17
7.4.1	Gridding	17
APPENDIX	I – WEEKLY OPERATIONS REPORT	18
APPENDIX	II – BUTTON CALIBRATION DATA	19
APPENDIX	III – LOW LEVEL STATISTICS	20
APPENDIX	IV – FINAL LOCATED DATA FORMATS	21
APPENDIX	V – LIST OF ALL SUPPLIED DATA	26

LIST OF TABLES

Table 1: Magnetometer Compensation Details	
Table 2: Parallax Values	
Table 3: Diurnal Base Values	
Table 4: IGRF Base Values	
Table 5 : Aircraft Background and Cosmic Stripping Ratios	
Table 6: IAEA Window Definitions	
Table 7: Radon Stripping Values	
Table 8: Spectral Stripping Ratios	
Table 9: STP Altitude Coefficients	

1. SURVEY OPERATIONS AND LOGISTICS

1.1 Introduction

Between the 26th of July 2006 and the 30th of July 2006, Fugro Airborne Surveys Pty. Ltd. (FAS) undertook an airborne magnetic and radiometric survey for Base Resources Limited, over the Liontown Project area, in Queensland. The survey consisted of one area, flown in 7 flights. Total coverage of the survey area amounted to 2999.2 line kilometres. The survey was flown using an Aerocommander Shrike 500-S aircraft, registration VH-WAM 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 Charters Towers, Queensland. The survey aircraft was operated from the Charters Towers airstrip with the aircraft fuel available on site. A temporary office was set up at the Park Motel, Charters Towers, 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	Rod Pullin
- Processing	Kathlene Oliver
On-site Crew Leader	Rob Doepel
Pilot/s	Dane Hughes / Terry Miller
System Operator/s	Rob Doepel
Technician	Peter McMullen
Data Processing	Denis Cowey

1.4 Survey Equipment

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

1.5 Area Map



Base Resources Ltd Liontown, Qld Mag/Spec

Datum: GDA94 Projection: MGA Zone: 55



2. SURVEY SPECIFICATIONS AND PARAMETERS

2.1 Area Co-ordinates

The survey area was located within UTM Zone 55S, Central Meridian = 147 (Note - Co-ordinates in WGS84 Zone 55)

Easting	Northing
393998	7749634
404423	7749648
406776	7747892
406812	7740410
404335	7737951
394031	7740210

2.2 Survey Area Parameters

Job Number	-	1804
Survey Company	-	Fugro Airborne Surveys Pty Ltd
Date Flown	-	26 th July 2006 –30 th July 2006
Client	-	Base Resources Limited
Area Name	-	Liontown, Queensland
Nominal Terrain Clearance	-	35 m
Traverse Line Spacing	-	50 m
Traverse Line Direction	-	000 – 180 deg
Traverse Lines	-	10001 – 10258
Traverse Line Kilometres	-	2729.88 km
Tie Line Spacing	-	500 m
Tie Line Direction	-	090 – 270 deg
Tie Lines	-	19001 – 19023
Tie Line Kilometres	-	269.34 km
Total Line Kilometres	-	2999.2 km

2.3 Data Sample Intervals

Nominal data sample intervals.		
Magnetometer	-	7 m (@10 Hz)
Radar Altimeter	-	7 m (@10 Hz)
Temperature	-	7 m (@10 Hz)
Pressure	-	7 m (@10 Hz)
GPS	-	70 m (@1 Hz)
Spectrometer	-	70 m (@1 Hz)
Magnetic Base Station (Envi Mag)	-	5 s `

2.4 Survey Tolerances

As specified in the contract the following	ng toler	ances were used:
Traverse line deviation	-	+/- 75% of nominated line spacing over 1 km or more
Tie line deviation	-	+/- 75% of nominated tie line spacing over 1 km or more
Terrain clearance deviation	-	+/-10 m of nominal terrain clearance over 1 km or more, except where such lines breach air regulations, or in the opinion of the pilot, put aircraft and crew at risk.
Total magnetometer system noise Magnetic diurnal variation	-	More than 0.1 nT continuously for more than 1 km More than 10 nT in 10 minutes non-linear either on flight lines or tie lines.

3. AIRCRAFT EQUIPMENT AND SPECIFICATIONS

3.1 Aircraft

Manufacturer	-	Aerocommander
Model	-	Shrike 500S
Registration	-	VH-WAM
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 Geometrics G822-A 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 down	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 Stars 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.

3.9 Flight Following

An integral part of the Safety Management System provides for the installation of a Flight Following System that transmits a position via satellite at pre determined intervals. The Fugro Omnistar Flight Following System was fitted to the aircraft and for this survey, position information was transmitted every 2 minutes to Fugro's premises in Perth. This information can be monitored by accessing the Fugro web page where the updated flight path is displayed. The aircraft was also fitted with an emergency switch and activation of this by the pilot or crew will notify the Omnistar Network control centre immediately. They in turn will contact FAS personnel as per the Emergency Response plan.

Aircraft are also fitted with Thrane & Thrane Inmarsat C reporting units which report every 5 minutes directly to the FAS office. A similar Emergency alarm system is in place.

4. GROUND DATA ACQUISITION EQUIPMENT AND SPECIFICATIONS

4.1 Magnetic Base Station

Two Scintrex Envi Mag 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 at the Charters Towers airport, approximately 100 m apart.

4.2 GPS Base Station

A GPS base logging station was set up at the Park Motel, Charters Towers. The GPS antenna was positioned on the roof of the Motel above the base office.

The GPS base system was comprised of a GPS receiver, a logging computer, an antenna and a power supply. Data was logged and displayed in real time on the logging computer screen. The logged base data was processed with the airborne GPS data to calculate the differentially post-processed position of the aircraft.

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.

The calculated GPS base position was (in WGS84): 20° 04' 18.37048" S, 146° 15' 35.12688" E, 362.16 m.

5. EQUIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS

5.1 Survey Calibrations

A series of calibrations were performed as follows:

5.1.1 Dynamic Magnetometer Compensation

Carrying a magnetometer through a varying field in a non-uniform orientation produces manoeuvre noise. To compensate for this manoeuvre noise a standard compensation test flight called a "comp box" was flown. The compensation file produced also removed the majority of the heading error. Aircraft compensation tests were flown on the 4 survey line headings and also at

+/- 7¹/₂ and 15⁰ to the line headings (to accommodate for cross wind flying conditions). The data for each heading consists of a series of aircraft manoeuvres with large angular excursions: specifically pitches, rolls and yaws. This was done to artificially create the worst possible attitudes and rates of attitudinal change likely to be encountered while on line and compensate for any magnetic noise created by the aircraft's motion within the earth's magnetic field. The data was processed to obtain the real-time compensation terms. These coefficients were applied in real-time or later during post-processing if required. Note that this form of compensation will only remove those noise effects modelled in the manoeuvre test flight. Random motions of the stinger with respect to the aircraft airframe generally establish the noise floor for this type of installation. Details of the comp boxes flown for this survey are shown in the table below.

Flown	Flights covered								
26/7/2006	All flights								
Table 1. Magnetometer Compensation Deta									

 Table 1: Magnetometer Compensation Details

5.1.2 Parallax

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 usually occur. The most suitable way to treat this problem is to use the 1 second radiometric data as a base with a zero correction. This will prevent interpolation of important variables (a filtering process). The co-ordinates were moved by linear interpolation and other data variables were displaced onto the radiometric data, without change.

Data	Parallax
Radiometrics	0 second
GPS	-0.5 second
Magnetics	1.2 second
Radar Altitude	0 second
Barometer	-2.0 second
Temperature	0
Table 2: Parallax Values	

5.1.3 Pad Calibrations

A series of tests were taken using a set of radiometric pads of known concentrations of Potassium, Uranium and Thorium. Each crystal pack was tested individually, with data accumulated for 15 minutes. The pad calibration data were processed to determine the radiometric stripping coefficients for each crystal pack. Where aircraft had more that one crystal pack installed, the average of the stripping coefficients were used in final data processing.

5.1.4 Background and Cosmic Calibration Stacks

High-level stacks were flown over the ocean away form the effects of any land based radon. Data were collected for ten minutes at altitudes starting at 1000 feet above sea level and incrementing to 10000 feet above sea level. The high-level stack data were processed to determine the cosmic and aircraft background coefficients.

5.1.5 Height Attenuation Calibrations

Low-level stacks were flown over the Carnamah Dynamic Test Range, Western Australia. Data were collected at altitudes of 130 feet above sea level (asl), 200 ft asl, 260 ft asl, 330 ft asl, 400 ft asl and 650 ft asl. The neighbouring salt lake was flown at the same altitudes, and the data were used as a radon test. A ground survey was carried out on the same day using a calibrated gamma-ray spectrometer.

The airborne and ground data were processed to determine radioelement sensitivity and height attenuation coefficients.

5.1.6 Daily Calibrations

A set of calibrations were performed each survey day as follows: Magnetic base station time check Spectrometer resolution test Spectrometer button test Low level test line

5.1.6.1 Magnetic Base Station Time Check

Prior to each day's survey all magnetic base stations were time checked and synchronised with the time on the aircraft survey system GPS receiver.

5.1.6.2 Spectrometer Resolution Test

Once the spectrometer had stabilised a Thorium source resolution check was carried out by placing the source in a cradle specially designed to ensure precisely repeatable locations.

5.1.6.3 Spectrometer Button Test

Thorium sample checks were performed on the spectrometer before and after each day's survey acquisition. Each sample was placed in a predetermined location and data recorded for 180 sec. Relative count rates above background were within +/- 5% of the average sample checks for the duration of the survey.

5.1.6.4 Low Level Test line

To monitor the effects of soil moisture and radon and to verify the system was functioning correctly a low level test line was flown at survey altitude prior to and after each day's production. The collected data were checked by the operator to ensure the Thorium for the low level test line was within +/- 10% of the initial average. The location of the low level test line is below.

The calculated test line location was (in WGS84 Zone 55):Point A397900 E7762312 NPoint B405720 E7765461 N

6. DATA VERIFICATION AND FIELD PROCESSING

All data verification was conducted at the field office in Charters Towers for the duration of the survey. At the conclusion of each days survey all magnetic, radiometric, altimeter, flight path and diurnal data were downloaded onto the field office computer for preliminary verification. All raw aircraft data were backed up at the end of each day's survey. One copy was sent to the FAS office in Perth, the other copy remaining at the field office.

6.1 Magnetic Diurnal Data

Diurnal data recorded from the primary base station was downloaded onto the field office computer. The data was checked for spikes and erroneous readings. If invalid diurnal data occurred whilst survey data was being acquired the affected section was re-flown. The diurnal data was also checked to see that the change in diurnal readings during the course of the survey did not exceed the specified tolerances. When this occurred the affected part of the survey line was re-flown. The diurnal data was merged with the aircraft data and used in the verification of the magnetic data. Diurnal data recorded on the secondary base station was also downloaded onto the field office computer.

6.2 Height Data

Radar altimeter, barometric altimeter and GPS height data from the aircraft was transferred onto the field office computer.

6.2.1 Radar Altimeter Data

The radar altimeter data was verified to check that a reasonably constant height above the terrain was flown, readings during the course of the survey did not exceed the specified tolerances and for equipment reliability.

6.2.2 GPS Height Data

The aircraft's height above the WGS84 ellipsoid each second was determined by differentially post-processing the synchronised GPS data from the aircraft and GPS base station data. The GPS height of the aircraft was verified to check for data masking and for equipment reliability.

6.2.3 Barometric Altimeter Data

As a backup to the aircraft's GPS height, barometric height was also recorded. The barometric height of the aircraft was verified to check for equipment reliability. The barometric data were also used in the processing of the radiometric data.

6.2.4 Topographical Data

After verification parallax corrections were applied, the radar altitude was subtracted from the GPS height to give the elevation of the terrain above the WGS84 ellipsoid. It was not considered necessary to make any further corrections as this data was for verification purposes only.

6.2.5 Gridding and Inspection

The topographical data was gridded and grid image enhancements were computed and displayed on screen. These were inspected for inconsistencies and errors.

6.3 Flight Path Data

The flight path data from the aircraft and the GPS base station were transferred onto the field office computer. The aircraft's precise location each second was determined by differentially post-processing the synchronised GPS data from the aircraft and GPS base station data. The flight path was recovered and plotted daily to ensure it was within specification. Any data not within specification was re-flown. The flight path data was then merged with the rest of the aircraft and diurnal data. Both the aircraft and GPS base station recorded the data in the WGS84 datum.

6.4 Magnetic Data

The real-time compensated and uncompensated magnetic data from the aircraft recorded every 0.1 second were transferred onto the field office computer. The raw magnetic data was checked to identify noise and spikes. If the noise exceeded the specified tolerances the part of the line affected was re-flown. After the magnetic data were merged with the digital flight path the following sequence of operations were carried out to allow inspection and verification of the data:

6.4.1 Diurnal Correction

The synchronised digital diurnal data collected by the base station was first subtracted from the corresponding airborne magnetic readings to calculate a difference. The resultant difference was then subtracted from the base value to produce diurnally corrected magnetic data.

6.4.2 Parallax Correction

The diurnally corrected magnetic data was corrected for system parallax using the calculated value.

6.4.3 Preliminary Gridding and Inspection

The magnetic data were gridded and grid image enhancements were computed and displayed on screen. These were inspected for inconsistencies and errors.

6.5 Spectrometer Data

Spectrometer data from the aircraft were transferred onto the field office computer. The data was verified to check that readings during the course of the survey did not exceed the specified tolerances and for equipment reliability.

6.5.1 Parallax Correction

The raw window data were corrected for system parallax using the calculated value.

6.5.2 Preliminary Gridding and Inspection

The spectrometer data were gridded and grid image enhancements were computed and displayed on screen. These were inspected for inconsistencies and errors.

7. FINAL DATA PROCESSING

7.1 Aircraft Location

The aircraft's location each second was determined by differentially post-processing the synchronised GPS data recorded on both the aircraft and GPS base station. This data is recorded in the WGS84 datum.

7.2 Magnetic Data Processing

The processing procedures applied to the magnetic data are summarised below:

- a) Apply any spike corrections to the compensated magnetic variables.
 - b) Interpolate undefined magnetic values.
 - c) Co-ordinate the data with post-processed GPS data.
 - d) Filter diurnal values and subtract them from individual compensated magnetic readings.

Area	Base Value							
Liontown	49788 nT							
Table 3. Diurnal Base Values								

e) Apply parallax correction.

f) Correct for regional effects of the earth's magnetic field by calculating the IGRF value at each fiducial using IGRF model 2005 and secular variation model. A base value was added back.

Area	IGRF Model	Base Value
Liontown	2006.7	49969 nT

Table 4: IGRF Base Values

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

7.2.1 Gridding

The final levelled magnetic data were gridded using a bi-directional spline algorithm. The data was gridded with a cell size of 10 m.

7.3 Radiometric Data Processing

The radiometric data was processed using the standard IAEA window processing technique as summarised below.

- a) Co-ordinate the data with post-processed GPS data.
- b) Apply spike corrections to the radar altimeter, temperature and pressure values.
- c) Apply parallax corrections to altimeter, temperature and pressure values.
- d) Apply NASVD filtering to the 256 channel radiometric data.
- e) Apply energy recalibration to the 256 channel radiometric data.
- f) Correct for dead time.
- g) Calculate the equivalent terrain clearance at STP (standard temperature and pressure).
- h) Remove aircraft background.
- i) Remove cosmic background.
- j) Window the 256 channel data using the IAEA standard energy windows.
- k) Remove radon background.
- I) Apply stripping ratios.
- m) Apply height corrections.
- n) 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 value between the tie lines

and 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.

o) Following this, a Fugro proprietary micro-levelling process was applied in order to more subtly level the data.

7.3.1 Energy Recalibration

The spectral drift was checked by monitoring the position of the Potassium, Uranium and Thorium peaks on average spectra along flight lines. The peak positions were determined by using a Gaussian fitting method. Energy recalibration was applied to the spectra using a linear regression (LSQ fit) to determine the slope and intercept.

7.3.2 NASVD Filtering

The radiometrics were produced with NASVD smoothing. Using the NASVD technique, the raw spectra were first smoothed using 6 principal components. Eigenvectors and statistics on the NASVD processing results were used for analysis.

7.3.3 Dead Time

Gamma-ray spectrometers require a finite time to process each pulse from the detectors. While one pulse is being processed, any other pulse that arrives will be rejected. Consequently the 'live time' of a spectrometer is reduced by the time taken to process all pulses reaching the spectrometer. The spectra are normalised to counts per second by dividing by the live time.

7.3.4 STP Altitude

The radar altimeter data was converted to effective height at standard temperature and pressure using the expression:

STPAIt = RAIt * (P/1013.25) * (273 / (T+273)) where: RAIt = the observed radar altitude in m T = the measured air temperature in deg C P = the barometric pressure in hPa

7.3.5 Cosmic and Aircraft Background Removal

The 256 channel aircraft and cosmic spectra for the aircraft were calculated from the high-level test data with the aircraft and cosmic backgrounds derived using least squares fitting applied on a channel by channel basis.

The aircraft background was removed by subtracting the computed aircraft background spectra from the dead time corrected spectra. The 256 channel cosmic background spectrum that is removed is calculated by multiplying the 256 channel cosmic factor values by the cosmic counts recorded. The effect of cosmic radiation is removed from the spectra by subtracting the resultant cosmic spectrum.

Window	Aircraft Background	Cosmic Stripping Ratio			
Total Count	57.8	0.8700			
Potassium	9.1	0.0510			
Uranium	2.7	0.4010			
Thorium	0.55	0.0530			

Table 5: Aircraft Background and Cosmic Stripping Ratios

7.3.6 Window Definitions

The 256 channel data were summed into the standard IAEA windows.

Window	Peak Energy (keV)	Energ (y Wir keV)	ndow	GR-820 Channel Window			
Total Count	-	410	-	2810	34	-	234	
Potassium	1460	1370	-	1570	115	-	131	
Uranium	1765	1660	-	1860	139	-	155	
Thorium	2614	2410	-	2810	201	-	234	
Cosmic	-	4000	-	6000		-		

Table 6: IAEA Window Definitions

7.3.7 Radon Correction

Radon corrections were applied using the spectral ratio method.

Stripping	Value
Total Count	13.15
Potassium	0.782
Thorium	0.061
Radon	1.95
Ground	0.606

 Table 7: Radon Stripping Values

7.3.8 Spectral Stripping

Spectral stripping was applied to the Potassium, Uranium and Thorium windows. The stripping coefficients were corrected for STP altitude.

Stripping	Value	STP adjustment (/m)
Alpha	0.2657	0.00049
Beta	0.4192	0.00065
Gamma	0.7963	0.00069
A	0.0621	0
В	0.0016	0
G	-0.0166	0

 Table 8: Spectral Stripping Ratios

7.3.9 Height Correction

The background corrected and stripped window data were corrected for variations in the density altitude of the detector.

Attenuation coefficient (m ⁻¹)
-0.00700
-0.00900
-0.00990
-0.00750

Table 9: STP Altitude Coefficients

7.3.10 Gridding

The final radiometric data were gridded using a minimum curvature algorithm. A grid cell size of 10 m was used.

7.4 Digital Elevation Model

The processing procedures applied to the terrain data are summarised below:

- a) Apply any spike corrections to the raw radar altimeter data.
- b) Interpolate undefined values.
- c) Co-ordinate the data with post-processed GPS data.
- d) Apply parallax corrections.
- e) Subtract the aircraft's height above ground from the aircraft's height above the WGS84 ellipsoid and correct for radar altimeter/GPS sensor separation.
- f) Derive surface topography values with respect to mean sea level (referenced to the geoid) by correcting the WGS84 ellipsoid values with geoid-ellipsoid separation values.
- g) 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 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.
- h) Following this, a FAS proprietary micro-levelling process was applied in order to more subtly level the data.

7.4.1 Gridding

The final levelled elevation data were gridded using a bi-directional spline algorithm. A grid cell size of 10 m was used.

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.

APPENDIX I – Weekly Operations Report

Week Commencing: Monday 24-Jul-06 Job Number: 1804 Total km: 3001			A Ca Area	Aircraft: VH-WAMOperators: Rob DoepelBase: Charters Towers, Country: AustraliaData Proc: Andrea ToveyCrew Leader: Rob DoepelArea Name: LiontownAccom: Park Motel						Rob Doep Andrea To Rob Doep Park Mote	oel ovey oel el	Pilots: Techs: Client: Contact #:	Dane Hughes, Terry Miller Peter McMullen Base Resources 0438231067			
Da	ite	Flight	Cr	ew _	Ti	me	M/R	C	Dil	Fuel	This	Flight	To D	Date	Standby	Comments
Manday	04 1-1-00	Number	Plt(s)	Ор	т/О	Land	Hrs	L	R	Added	Prod	Refly	Prod	Refly	(0, 0.5, 1)	
wonday	24-Jui-06															No Flights due to Radalt fault
Julian	205															
Day	5				Hours	Today	0.0				0.0	0.0	0.0	0.0		
Tuesday	25-Jul-06										0.0					
											0.0					No Flights due to Radalt and EGT install
Julian	206															
Day	6				Hours	Today	0.0				0.0	0.0	0.0	0.0		
Wednesday	26-Jul-06	comp	DH	RD	7:15	9:15	2.0									Comp flt and radalt test
		comp	DH	RD	10:00	10:48	0.8			423						figure of merit reflown
Julian	207	1	TM		13:00	17:12	4.2			602	576.2					All data OK
Day	7				Hours	Today	7.0				576.2	0.0	576.2	0.0		
Thursday	27-Jul-06	2	ТМ		7:30	12:24	4.9	2	1	500	690.0					All OK
Julian	208	3	DH		13:00	17:30	4.5	2		587	635.0					All OK
Day	8				Hours	Today	9.4				1325.0	0.0	1901.2	0.0		
Friday	28-Jul-06	4	DH		7:05	8:00	0.9	3			58.5					Flight aborted due to fog
Julian	209	5	TM		12:27	16:57	4.5	1		605	610.0					
Day	9				Hours	Today	5.4				668.5	0.0	2569.7	0.0		
Saturday	29-Jul-06															No AM Flight due to fog (Area forecast copied, possible standby)
		Radalt cal	DH	RD	12:30	15:18	2.8									Radalt cal OK
Julian	210	6	DH		15:30	17:24	1.9			556	183.0	35.0				PM Flight ok
Day	10				Hours	Today	4.7				183.0	35.0	2752.7	35.0		
Sunday	30-Jul-06	7	TM		7:30	7:48	0.3									AM Flight suspended due to fog in area
		7	TM		9:13	12:13	3.0	3	1	445	248.3	65.0				AM Flight OK 1804 completed
Julian	211				<u> </u>										-	
Day	11	00.4		A/	Hours	loday	3.3		0	0740	248.3	65.0	3001.0	100.0	0.0	
lotal	Job Hours	33.4	Tatal	Veekly	l otals		29.8	11	2	3/18	3001.0	100.0	Tata		0.0	4
			i otal Houre to	Movt D		3	10942.3	ᅥᆝ	us/Hľ Dupp		100 7	km/day		Complete	100.0	
		Anticio	atod Lo				40.0	ł	Runn	ing Avg	420.7	km/br	% (km P	omoining	100.0	
Survey I	Equipment I	Problems:			t week		00	1			100.6	NI()/11	KIII K	emaining	0.0	NII

APPENDIX II – Button Calibration Data

AIRCRAFT VH-WAM

Flt#	Peak Posn	Raw (cps)	B/G (cps)	Normalised (cps)	FHTM/ FHHM	Readings	Running average	% Change
1	218.0150	611.8868	93.32003	518.567	1.828420	181	518.56670	0.7%
2	218.1052	603.7903	92.95045	510.840	1.835091	184	514.70325	-0.8%
3	217.9208	609.9485	94.88293	515.066	1.854632	184	514.82403	0.0%
4	218.0701	608.7891	94.14761	514.642	1.848783	186	514.77840	-0.1%
5	217.9626	607.0565	93.52251	513.534	1.819314	188	514.52950	-0.3%
6	217.9515	609.9098	92.55067	517.359	1.835151	664	515.00110	0.5%
7	217.9601	604.2322	92.35254	511.880	1.845330	190	514.55519	-0.6%

FUGRO AIRBORNE SURVEYS Ground Calibration Check Background and Dead-Time Corrected Thorium Counts



APPENDIX III – Low Level Statistics

Flt#	Mean TC (cps)	Mean K (cps)	Mean U (cps)	Mean Th (cps)	Running Average	% Change	Min	Max
1	2174.438	87.100	82.885	112.150		U		
1	2265.907	86.953	90.351	117.911	115.031		98.6	133.1
2	2281.960	81.617	93.865	111.345	113.802	3.20%	99.2	129.4
3	2248.931	91.827	88.063	115.279	114.171	1.30%	100.3	128.8
4	2518.189	87.661	112.749	112.275	113.792	1.66%	100.5	127.7
5	2325.957	84.806	96.399	113.692	113.775	0.09%	100.8	127.2
6	2283.201	88.077	90.800	116.937	114.227	2.78%	101.4	127.4
6	2338.776	94.864	94.579	112.633	114.028	1.40%	101.4	127.0
7	2133.602	87.622	78.830	113.030	113.917	0.88%	101.4	126.7
7	2243.112	89.931	85.577	115.528	114.078	1.41%	101.7	126.7

TESTLINE RADIOMETRIC DATA VH-WAM





APPENDIX IV – Final Located Data Formats

Headers for final data files

Description File for 0.1 sec Magnetics and Elevation Data

COMM	JOB NUMBER:	1804
COMM	AREA NUMBER:	01
COMM	SURVEY COMPANY:	Fugro Airborne Surveys
COMM	CLIENT:	Base Resources Limited
COMM	SURVEY TYPE:	Magnetic and Radiometric
COMM	AREA NAME:	Liontown
COMM	STATE:	Qld
COMM	COUNTRY:	Australia
COMM	SURVEY FLOWN:	July 2006
COMM	LOCATED DATA CREATED:	September 2006
COMM	DATUM:	GDA94
COMM	PROJECTION:	MGA
COMM	ZONE:	55
COMM		
COMM	SURVEY SPECIFICATIONS	
COMM		
COMM	TRAVERSE LINE SPACING:	50 m
COMM	TRAVERSE LINE DIRECTION:	000 - 180 deg
COMM	TIE LINE SPACING:	500 m
COMM	TIE LINE DIRECTION:	090 - 270 deg
COMM	NOMINAL TERRAIN CLEARANCE:	35 m
COMM	FINAL LINE KILOMETRES:	2999.2 km
COMM		
COMM	LINE NUMBERING	
COMM		
COMM	TRAVERSE LINE NUMBERS:	10001 - 10258
COMM	TIE LINE NUMBERS:	19001 - 19023
COMM		
COMM	AREA BOUNDARY	
COMM		
COMM	easting northing	
COMM	393998 7749634	
COMM	404423 7749648	
COMM	406776 7747892	
COMM	406812 7740410	
COMM	404335 7737951	
COMM	394031 7740210	
COMM		
COMM	SURVEY EQUIPMENT	
COMM	-	
COMM	AIRCRAFT:	VH-WAM Aerocommander Shrike 500S
COMM		
COMM	MAGNETOMETER:	Geometrics G-822A CV
COMM	INSTALLATION:	Stinger
COMM	RESOLUTION:	0.001 nT
COMM	RECORDING INTERVAL:	0.1 s
COMM		
COMM	RADAR ALTIMETER:	Sperry RT220
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	BASE MAGNETOMETER:	Scintrex Envi-mag
COMM	RECORDING INTERVAL:	5 s

COMM COMM DATA PROCESSING COMM COMM CO-ORDINATES COMM PARALLAX CORRECTION APPLIED -0.5 s COMM COMM MAGNETIC DATA COMM DIURNAL CORRECTION APPLIED base value 49788 nT COMM PARALLAX CORRECTION APPLIED 1.2 s COMM IGRF CORRECTION APPLIED base value 49969 nT COMM IGRF MODEL 2005 extrapolated to July 2006 COMM DATA HAVE BEEN TIE LINE LEVELLED COMM DATA HAVE BEEN MICROLEVELLED COMM COMM RADAR ALTITUDE DATA COMM PARALLAX CORRECTION APPLIED 0 s COMM COMM GPS ALTITUDE DATA COMM PARALLAX CORRECTION APPLIED -0.5 s COMM COMM DIGITAL TERRAIN DATA COMM DTM CALCULATED [DTM = GPS ALTITUDE - (RADAR ALT + SENSOR SEPARATION)] COMM DATA CORRECTED TO AUSTRALIAN HEIGHT DATUM COMM DATA HAVE BEEN TIE LINE LEVELLED 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 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 FIELD UNITS NULL FORMAT -9999 COMM Line Number F8.1 -99 COMM Flight Number т4 -99999 Ι9 COMM Date (yyyymmdd) COMM Fiducial Number -999999 I10 COMM Time (GPS seconds of week) s -9999.9 F10.1 -99999.99 F11.2 COMM Easting m -999999.99 F12.2 COMM Northing m -999.9999999 F14.7 COMM Longitude deg -99.9999999 F14.7 COMM Latitude deg COMM GPS Altitude F8.2 -999.99 m -999.99 COMM Radar Altered COMM Compensated TMI COMM Radar Altitude F8.2 m F11.2 nT -99999.99 -99999.99 -99999.99 F11.2 COMM Diurnal nT F11.2 COMM Final TMI nT COMM Digital Terrain Model m -99.99 F8.2

Description File for 1.0 sec Windowed Radiometrics Data

COMM	JOB NUMBER:	1804
COMM	AREA NUMBER:	01
COMM	SURVEY COMPANY:	Fugro Airborne Surveys
COMM	CLIENT:	Base Resources Limited
COMM	SURVEY TYPE:	Magnetic and Radiometric
COMM	AREA NAME:	Liontown
COMM	STATE:	Qla
COMM	COUNTRY:	Australia
COMM	SURVEI FLOWN.	JULY 2006 Soptombor 2006
COMM	LOCATED DATA CREATED.	September 2000
COMM	MITTAC	GDA94
COMM	PROJECTION:	MGA
COMM	ZONE :	55
COMM		
COMM	SURVEY SPECIFICATIONS	
COMM		
COMM	TRAVERSE LINE SPACING:	50 m
COMM	TRAVERSE LINE DIRECTION:	000 - 180 deg
COMM	TIE LINE SPACING:	500 m
COMM	TIE LINE DIRECTION:	090 - 270 deg
COMM	NOMINAL TERRAIN CLEARANCE:	35 m
COMM	FINAL LINE KILOMETRES:	2999.2 km
COMM	I THE NUMPEDING	
COMM	LINE NOMBERING	
COMM	TRAVERSE LINE MUMBERS:	10001 - 10258
COMM	TIE LINE NUMBERS:	19001 - 19023
COMM		19001 19023
COMM	AREA BOUNDARY	
COMM		
COMM	easting northing	
COMM	393998 7749634	
COMM	404423 7749648	
COMM	406776 7747892	
COMM	406812 7740410	
COMM	404335 7737951	
COMM	394031 7740210	
COMM		
COMM	SURVEY EQUIPMENI	
COMM	ATRCRAFT:	VH-WAM Aerocommander Shrike 500S
COMM	ATRONALI .	VII WAM ACTOCOMMUNICE DITTAC 5005
COMM	SPECTROMETER:	256 Channel Exploranium GR820
COMM	CRYSTAL VOLUME:	33.56 L
COMM	RECORDING INTERVAL:	1 s
COMM		
COMM	RADAR ALTIMETER:	Sperry RT220
COMM	RECORDING INTERVAL:	0.1 s
COMM		
COMM	NAVIGATION:	real-time differential GPS
COMM	RECORDING INTERVAL:	1.0 s
COMM	A COLLECTION ON CONCERNA.	
	ACQUISITION SYSTEM:	Fugro DAS
	DATA DROCESSINC	
COMM	DUIN LIVOCEDDING	
COMM	CO-ORDINATES	
COMM	PARALLAX CORRECTION APPLIED	-0.5 s
COMM		
COMM	RADAR ALTITUDE DATA	
COMM	PARALLAX CORRECTION APPLIED	-0.0 s

COMM					
COMM	BAROMETRIC DATA				
COMM	PARALLAX CORRECTION APPLIE	ED			-2.0 s
COMM					
COMM	PARALLAX CORRECTION APPLIE	CD.			-0.0 s
COMM					
COMM					
COMM	RADIOMETRIC DATA				
COMM	NASVD FILTERING APPLIED TO) 256 CHANNEL I	ATA		
COMM	WINDOW DATA EXTRACTED USIN	NG IAEA STANDAF	RD WINDOWS		0 7
	COSMIC AIRCRAFT AND RADON	I BACKCROINDS F			0 8
COMM	STRIPPING CORRECTIONS APPI	LIED			
COMM	HEIGHT CORRECTED TO				35 m AGL
COMM	DATA HAVE BEEN TIE LINE LE	EVELLED			
COMM	DATA HAVE BEEN MICROLEVELI	LED			
COMM	AIRCRAFT BACKGROUND COEFFI	ICIENTS			
COMM	TOTAL COUNT				57.8
COMM	POTASSIUM				9.1 2.7
COMM	THORIUM				0.55
COMM	COSMIC COEFFICIENTS				0.00
COMM	TOTAL COUNT				0.870
COMM	POTASSIUM				0.051
COMM	URANIUM				0.401
COMM	THORIUM				0.053
COMM	STRIPPING COEFFICIENTS				0 2657
	АГЪНА				0.2057
COMM	GAMMA				0.7963
COMM	DELTA				0.0621
COMM	g				0.0016
COMM	b				-0.0166
COMM	STRIPPING HEIGHT ATTENUAT	ION COEFFICIENT	ſS		
COMM	ALPHA				0.00049
COMM	Commo BETA				0.00065
COMM	RADON STRIPPING COEFFICIEN	JTS			0.00009
COMM	TOTAL COUNT				13.150
COMM	POTASSIUM				0.782
COMM	THORIUM				0.061
COMM	SPECTRAL RATIOS				
COMM	RADON				1.950
COMM	GROUND				0.606
COMM	TOTAL COUNT				0 0070
COMM	POTASSIUM				0.0090
COMM	URANIUM				0.0099
COMM	THORIUM				0.0075
COMM	SENSITIVITY COEFFICIENTS A	AT 60 m			
COMM	TOTAL COUNT			33.84 (cps/	(nGy/h))
COMM	POTASSIUM			129.72	(cps/%)
COMM				0.15 (7 64 ((Cps/ppll)
COMM	Inortom			7.01 (CPB/PPIII/
COMM	LINE DATA FORMAT				
COMM	A space is left between f	ixed fields so	that a fiel	ld of, for e	example,
COMM	A8 should only ever have a	a maximum of 7	characters	in it, ever	n when it
COMM	is a null, thus:				
COMM		INITEO	NTIT T		
	rine Number	UNTIS	-0000 ПППИ		FORMAT F10 1
COMM	Flight Number		-99		I4

COMM	Date (yyyymmdd)		-99999	I10
COMM	Fiducial Number		-999999	I10
COMM	Time (local)	S	-99999.9	F10.1
COMM	Easting	m	-99999.99	F11.2
COMM	Northing	m	-999999.99	F12.2
COMM	Longitude	deg	-999.9999999	F14.7
COMM	Latitude	deg	-99.9999999	F13.7
COMM	GPS Altitude	m	-99.99	F8.2
COMM	Radar Altitude	m	-99.99	F8.2
COMM	Barometric Pressure	hPa	-99.99	F8.2
COMM	Temperature	deg C	-99.99	F8.2
COMM	Livetime	S	-9.	I5
COMM	Raw Cosmic	cps	-9.	I5
COMM	Uncorrected Total Count	cps	-9999.9	F9.1
COMM	Uncorrected Potassium	cps	-999.9	F8.1
COMM	Uncorrected Uranium	cps	-999.9	F8.1
COMM	Uncorrected Thorium	cps	-999.9	F8.1
COMM	Final Total Count	cps	-9999.9	F9.1
COMM	Final Potassium	cps	-999.9	F8.1
COMM	Final Uranium	cps	-999.9	F8.1
COMM	Final Thorium	cps	-999.9	F8.1
COMM	Raw 256 Channel Radiometrie	cs counts	-99999	25618

APPENDIX V – List Of All Supplied Data

Final Located Data

- 0.1 second magnetics and digital elevation data
- 1.0 second windowed radiometrics data

Final located data is in ASCII format. Contents of each are shown in Appendix IV.

Preliminary Gridded Data

Preliminary gridded data was produced in ERMapper format in GDA94/MGA55

- Total magnetic intensity
- Total count
- Potassium count
- Uranium count
- Thorium count
- Digital elevation model

Final Gridded Data

Final gridded data was produced in ERMapper format in GDA94/MGA55

- Total magnetic intensity
- Total count
- Potassium count
- Uranium count
- Thorium count
- Digital elevation model

APPENDIX 6

SGC Report –VTEM Survey: Interpretation & Logistics Report, January 2008

APPENDIX 7

Digital Rock Services Pty Ltd Report — Review of high-priority regional prospects in the Mount Windsor Volcanics Project, 2007



REVIEW OF HIGH PRIORITY REGIONAL PROSPECTS IN THE MOUNT WINDSOR VOLCANICS PROJECT

Trooper Creek Cu-Au,

June 2007

Prepared for: Liontown Resources Limited Level 2, 1292 Ord St West Perth WA 6005

Prepared by: Jennifer Gunter Digirock Pty Ltd 43 Great Eastern Hwy South Guildford WA 6055

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Contents

Exec	cutive Summary	1		
1.	Background	2		
2.	Purpose	4		
3.	Review Methodology			
	3.1 Stage 1	5		
	3.2 Stage 2	5		
	3.3 Stage 3	5		
4.	Prospect Reviews	6		
	4.1	6		
	4.2	7		
	4.3 Trooper Creek Cu-Au	8		
	4.4	10		
	4.5	11		
5.	Recommendations	12		

Figure Index

Figure 1	Location of the Mount Windsor Volcanics Project and Re	eviewed
	Prospects	1
Figure 2	Sub-blocks within Mount Windsor Volcanics Project	2

Appendices

- A Open File Reports List
- B Open File Reports Summary

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Executive Summary

Liontown Resources commenced exploration on the Mount Winsdor Volcanics Project in January 2007. The Mt Windsor Volcanics Project is comprised of EPMs 14161, 14162, 15100, 15192, 15102, and 15197, and ML 10277, totalling 1,062 km2 (Figure 1). The project area is prospective for a range of deposit styles, including VHMS Base Metals deposits (eg Thalanga, Liontown), VHMS Au-Cu deposits (eg Highway-Reward), Mesothermal Gold deposits (eg Charters Towers, Ravenswood), and Epithermal Gold deposits (eg Pajingo).

Work to date in the project area has focused on resource definition at the Liontown deposit. Regional exploration is planned to commence in July 2007, and this report is a review of high-priority regional targets in the context of new open file information. The targets reviewed for this report were (Figure 1).

Trooper Creek Cu-Au,



Location of the Mount Windsor Volcanics Project and Reviewed Prospects Figure 1

Substantial new data was reviewed for both Trooper Creek Cu-Au and Key findings from the review included;

- The Trooper Creek Cu-Au prospect has been upgraded with the intercept of 6m @ 1.65g/t Au, and it is recommended that exploration be undertaken over this prospect as a priority,
- Conduct field reconnaissance and necessary mapping over Trooper Creek Cu-Au, and control to formulate detailed exploration programs, and
- The remainder of the targets from Gunter (2005) should be reviewed focusing on the highest priority first, and all open file reports reviewed for any significant new information, to allow exploration programs to be planned for the 2008 field season.



1. Background

The Mt Windsor Volcanics Project is comprised of EPMs 14161, 14162, 15100, 15192, 15102, and 15197, and ML 10277, totalling 1,062 km2. The project area is prospective for a range of deposit styles, including VHMS Base Metals deposits (eg Thalanga, Liontown), VHMS Au-Cu deposits (eg Highway-Reward), Mesothermal Gold deposits (eg Charters Towers, Ravenswood), and Epithermal Gold deposits (eg Pajingo). Combined historical production of gold from the district is over 12 million ounces Au, with base metals resources of greater than 8Mt @ 9.3% Zn, 1.6% Cu, 3.0% Pb, 77 g/t Ag and 0.4 g/t Au. Mineralisation styles are discussed in detail in Beams and Camuti, 2004, and in Beams (ed.), 1995.

The Mount Windsor Volcanics Project covers 1,062 km², and is composed of 330 sub-blocks as shown in Figure 2, below.

165	166	167	168	169	170	171	172	173 U	174 L M N Q R S	175	176
237	238	239 Q R S T U V W X Y Z	240	241	242	243	244	245 K	A B F G U 246	247	248
309	310 Q R S T U V W X Y Z	A B C D E F G 311 L M N O P Q R S T U V W X Y Z	312 P U Z	313 LMN0P QRSTU VWXYZ		315 QRST VWXYZ	316 QRSTU VWXYZ	317 QRSTU VWXYZ	FG318 LMN QRS VW	E 319 S T W X Y	320
381	A B C D E F G H J K L M N O P	A B C D E F G H J K L M N O P Q R S T U V W X Y Z	F G H J K 384 L M N O P Q R S T U V W X Y Z	B C D E F G H J K L M N O P Q R S T U V W X Y Z	386 K K K K K K K K K K K K K K K K K K K	C D E F G H J K L M N O P Q R S T U V W X Y Z	A B C D E F G H J L M N O Q R S T V W X Y	A B C D 389	390	A B C D E F G H J K 391 P	A F 392 L M
453	454	A B C D E 455	A B C D E	A B C D E	A B C D E	A B C D E	A B C D 460	461	462	463	464

Figure 2 Sub-blocks within Mount Windsor Volcanics Project

The Mount Windsor Volcanics Project was originally composed of EPMs 14161 and 14162, located south of Charters Towers in NE Queensland. Terrasearch Pty Ltd were commissioned to conduct an open file search and data compilation over these two tenements, and this was completed in August 2005 (Camuti, 2005). A total of 322 open file reports were obtained, however the compilation did not include review of the open file reports.

The digital data from the compilation (geochemical, drilling and geophysical database) was used to complete target generation (Gunter, 2005) and program planning for regional exploration (Gunter, 2006), however neither included review of the open file reports from the compilation.

Since that time, EPMs 14161 and 14162 have undergone a partial relinquishment, and the additional EPMs 15100, 15102, 15192, and 15197 have been granted and now form a part of the Mount Windsor Volcanics Project. An update to the open file data compilation has been completed "Mount Windsor Volcanics Project, NE Queensland, Open File Data Summary Update" (Gunter 2007).

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Liontown Resources commenced exploration on the Mount Winsdor Volcanics Project in January 2007. Work to date in the project area has focused on resource definition at the Liontown deposit. Regional exploration is planned to commence in July 2007, and Digirock Pty Ltd have been commissioned to reassess the original regional target generation (Gunter, 2005) and program planning (Gunter, 2006) in the context of;

- the new area of tenure acquired since the original Terrasearch data compilation (Camuti, 2005),
- new data that has been made open file since the original compilation, and
- new data from the Liontown deposit.



2. Purpose

This report is designed to assist in initial program planning for regional exploration on the Mount Windsor Volcanics Project. This report is a detailed assessment of the five prospects highlighted as high-priority within the original regional program planning exercise (Gunter, 2006). These prospects are;



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A separate summary for each prospect is provided in the sections below, including a summary of geological setting, open file information, geochemistry, and geophysics, and a re-assessment of prospectivity.

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3. Review Methodology

Because no review has previously been undertaken of the open file reports for the Mount Windsor Volcanics Project, there were a total of 425 open file reports to be reviewed. Due to the urgency to formulate an initial exploration program to ensure active regional exploration could proceed quickly, it was decided to complete the review of the open file reports in three stages;

- Stage 1 Document the prospects covered by each of the reports
- Stage 2 Review the reports applicable to the high-priority regional prospects of Gunter (2006)
- Stage 3 Review the remainder of the reports

This targeted approach allowed rapid review of the reports required to complete planning for the initial regional exploration program, whilst documenting the prospects covered by the remaining reports to allow effective targeted review in Stage 3.

3.1 Stage 1

Spot checks of the Company Report metadata supplied with the Camuti (2005) compilation indicated that the prospects in the metadata were frequently not documented or incorrect. It is likely that this is a result of original inconsistencies in the data supplied by the lodging company to the Department of Mines, Queensland. As a result, the documentation of the prospects covered by each of the reports, included all of the original Camuti (2005) reports, as well as the additional reports. Prospect documentation has been completed for each of the 425 reports in the updated compilation, and is included in the updated Company Report metadata (Appendix A) of the compilation update (Gunter, 2007). Prospect documentation was carried out by review of the body text for each report, and assigning the appropriate prospects to the report in the Company Report Metadata.

3.2 Stage 2

Prospect review was completed for the five regional prospects highlighted in the Base Resources Business Plan as having a high potential (Cheetahtown, Max Cu-Au, Trooper Creek Cu-Au, Britannia, and Lighthouse Au). Prospect review consisted of the following steps for each prospect;

- Using the historical tenure files, a list of all historical tenure over the prospect was compiled
- All open file reports for these tenements, as well as open file reports for which the prospect was documented in Stage 1, were reviewed for content applicable to the specific prospect, and summaries were written for each Company Report with respect to the individual prospect
- Information within the historical reports was cross-referenced graphically with information within the 2005
 Terrasearch database compilation by using Mapinfo
- The prospect was re-assessed on the basis of the existing database and the historical reports.

Results are presented below, reports reviewed are listed in Appendix A, and full notes for each prospect are in Appendix B.

3.3 Stage 3

This report documents review and re-assessment of high priority regional prospects only, and Stage 3 is yet to be commenced.



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4. Prospect Reviews





4.3 Trooper Creek Cu-Au

The Trooper Creek Cu-Au target is defined by a very coherent moderate-low level Cu anomaly in soils, coincident with moderate-high level Au anomalism in stream sediments. The target is located adjacent a major syn-sedimentary fault within siltstones of the Trooper Creek Formation, approximately 27km East of Liontown.

4.3.1 Data Review

The following EPMs have covered or partly covered Trooper Creek Cu-Au at some point in the past;

- EPM 339
- EPM 1352
- ▶ EPM 1016
- EPM 3380

Searching on these EPMs, and within reports which specifically refer to Trooper Creek, returned a total of 34 open file reports (see listing in Appendix A).

4.3.2 Significant Results

Soil sampling was conducted over the Trooper Creek Cu-Au prospect by Esso in 1983, and assayed for Cu, Pb, and Zn (details in CR13180). This phase of soil sampling described in this report defines the Cu

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anomaly at the Trooper Creek Cu-Au prospect, with maximum results of 256ppm Cu. Rock chips and gossan samples returned low-level gold of up to 0.5ppm Au, with the best result from immediately adjacent the Cu-in-soil anomaly, and no other rock chips / gossans assayed for gold from within this area. RAB drilling was also completed to better define the geochemical anomaly, but was not assayed for Au.

This was followed up by Pulse EM and RC and diamond drilling. Pulse EM returned a number of anomalies around the periphery of the anomaly. Most of the drilling was designed to test the Pulse EM anomalies and also occurred around the periphery of the anomaly, however some significant results were returned. The most significant result was in TAR024, which returned 6m @ 1.65ppm Au from 4m downhole. The interval occurred within weathered siltstone, with no specific alteration noted on the geology log, and the entire siltstone (0-18m) is anomalous in Au. This hole was collared approximately 20m south east of the rock chip which returned 0.5ppm, and was drilled north east at 60 degrees. RAB drilling completed to the west of the anomaly intercepted 6m @ 0.28ppm Au.

BLEG Sampling by Barrack in 1988 outlined three anomalous drainages in the Trooper Creek Area. Followup BLEG sampling defined a coherent, co-incident Au-Ag anomaly at Trooper Creek Cu-Au. Aberfoyle Resources then farmed into the project, and carried out a number of RAB programs to extend the geochemical coverage in the Trooper Creek area. No results were presented for this work.

4.3.3 Prospectivity Assessment

Extensive reconnaissance and mapping indicate that there is no significant outcropping base-metals mineralisation at Trooper Creek Cu-Au. The sub-cropping nature of the geochemical anomaly indicates that high-grade gold mineralisation is unlikely.

Trooper Creek Cu-Au was identified as a geochemical anomaly by Esso prior to in 1984, however as Esso were focused on base-metals, all exploration carried out in the area was designed around the VHMS base metals exploration model. Whilst considerable exploration was carried out, it does not substantially downgrade the prospect for bulk-tonnage gold and copper mineralisation, and the best result of 6m @ 0.28ppm Au is encouraging.

BLEG sampling in the area resulted in a coherent Au-Ag anomaly which is of a similar tenor to the Highway-Reward stream sediment anomaly. There is no reported follow-up of this BLEG anomaly, and in combination with the drilling results presented above, the Trooper Creek Cu-Au prospect is considered to have good potential for economic gold mineralisation.

4.3.4 Recommendations

A program of geological reconnaissance, soil sampling, and follow-up RAB or RC drilling is recommended to test this target.



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5. Recommendations

The following actions are recommended as a result of review of the high priority prospects:

- The Trooper Creek Cu-Au prospect has been upgraded with the intercept of 6m @ 1.65g/t Au, and it is recommended that exploration be undertaken over this prospect as a priority,
- Conduct field reconnaissance and necessary mapping over contract the second seco
- Complete Stage 3 of the Review, focusing on the highest priority (see Gunter 2005) prospects first so that exploration programs can be planned for the 2008 field season.



Appendix A Open File Reports List

Listing of open file reports reviewed for each prospect. Digital File Appendix A.zip


Appendix B Open File Reports Summary

Summary of information by prospect from each open file report that is relevant to the prospect.

Digital File Appendix B.zip

APPENDIX 8

Digital Rock Services Pty Ltd Report — Summary of field visit to the Mount Windsor Volcanics Project



SUMMARY OF FIELD VISIT TO THE MOUNT WINDSOR VOLCANICS PROJECT

July 2007

- Prepared for: Liontown Resources Limited Level 2, 1292 Ord St West Perth WA 6005
- Prepared by: Jennifer Gunter Digirock Pty Ltd 43 Great Eastern Hwy South Guildford WA 6055

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Contents

Exec	cutive Summary	1						
1.	Introduction							
2.	Regional Prospect Field Checking							
	2.1							
	2.2							
		4						
	2.4 Trooper Creek Cu-Au	5						
	2.5	6						
	2.6	7						
	2.7	7						
3.	Liontown Extensions	9						
	3.1 Background	9						
	3.2 General Comments	9						
	3.3 Recommendations	10						
4.	Regional Exploration Approach	12						
	4.1 Map Compilation	12						
	4.2 Prospectivity	12						

Figure Index

Figure 1	Mount Windsor Volcanics Project and Prospects	2
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Executive Summary

The author recently undertook a field visit to the Liontown Resources Mount Windsor Volcanics Project near Charters Towers. This visit included field checking previously identified prospects, inspecting the Liontown core and trenches, and discussions regarding exploration approach. Major recommendations are summarised below.

Field checking indicated;

- The Trooper Creek Cu-Au prospect warrants follow up work, and substantial progress can be made cheaply by utilising mapping, rock chipping, and soil sampling
- warrants follow up work, and substantial progress can be made cheaply by utilising mapping, rock chipping, and soil sampling
- The second warrants follow up work, specifically to locate the potential eastern extension of the veins, and drill test these extensions

Observations with regard to

indicated;

- The data collected for the Liontown Resource Project must be interpreted to provide controls on mineralisation to allow exploration for Liontown Extensions to be targeted
- Drilling for geochemical purposes should be carried out in traverses based on these controls on mineralisation, with Aircore likely to be the most suitable technique, and drilling most useful in areas of deep cover
- IP can be useful in the identification of blind mineralisation, and should also be carried out based on the controls on mineralisation, with IP most useful in areas of shallow to moderate cover

Recommendations with regard to regional exploration approach include;

- A fact mapping compilation and check mapping should be completed so that a reliable interpretation map can be created
- Exploration strategy for the project should be developed based on the relative prospectivity of the different geological areas within the project, and this should be reflected in the budget



1. Introduction

Liontown Resources commenced exploration on the Mount Winsdor Volcanics Project in January 2007. The Mt Windsor Volcanics Project is comprised of EPMs 14161, 14162, 15100, 15192, 15102, and 15197, and ML 10277, totalling 1,062 km2 (Figure 1). The project area is prospective for a range of deposit styles, including VHMS Base Metals deposits (eg Thalanga, Liontown), VHMS Au-Cu deposits (eg Highway-Reward), Mesothermal Gold deposits (eg Charters Towers, Ravenswood), and Epithermal Gold deposits (eg Pajingo).

A number of targeting and review reports have been completed on the area previously, however field work to date in the project area by the Liontown team has focused on resource definition at the Liontown deposit. Regional exploration is planned to commence in the second half of 2007, and in order to assist in exploration planning, and ensure thorough knowledge transfer from consultant to the exploration team, a field visit including prospect checking was carried out.

This report is a summary of observations, interpretations, and recommendations made during this visit to the Mount Windsor Volcanics Project by the author in July 2007. Specific Prospects visited were;



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2. Regional Prospect Field Checking



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2.4 Trooper Creek Cu-Au

Location

427 100mE, 7 742 900mN

Background

Trooper Creek Cu-Au was identified and ranked highly in original target generation by the author (Gunter, 2005), and was recently reviewed and re-ranked as a high priority target (Gunter, 2007), and it was on this basis that field checking was undertaken.

Existing Data

The Trooper Creek Cu-Au target is defined by a very coherent moderate-low level Cu anomaly in soils, co-incident with moderate-high level Au anomalism in stream sediments. The target is located adjacent a major syn-sedimentary fault within siltstones of the Trooper Creek Formation, approximately 27km East of Liontown.

Soil sampling was conducted over the Trooper Creek Cu-Au prospect by Esso in 1983, and assayed for Cu, Pb, and Zn with maximum results of 256ppm Cu. Rock chips and gossan samples returned low-level gold of up to 0.5ppm Au, with the best result from immediately adjacent the Cu-in-soil anomaly, and no other rock chips / gossans assayed for gold from within this area. RAB drilling was also completed to better define the geochemical anomaly, but was not assayed for Au.

This was followed up by Pulse EM and RC and diamond drilling. Pulse EM returned a number of anomalies around the periphery of the anomaly. Most of the drilling was designed to test the Pulse EM anomalies and also occurred around the periphery of the anomaly, however some significant results were returned. The most significant result was in TAR024, which returned 6m @ 1.65ppm Au from 4m downhole. The interval occurred within weathered siltstone, with no specific alteration noted on the geology log, and the entire siltstone (0-18m) is anomalous in Au. This hole was collared approximately 20m south east of the rock chip which returned 0.5ppm, and was drilled north east at 60 degrees. RAB drilling completed to the west of the anomaly intercepted 6m @ 0.28ppm Au.

BLEG Sampling by Barrack in 1988 outlined three anomalous drainages in the Trooper Creek Area. Follow-up BLEG sampling defined a coherent, co-incident Au-Ag anomaly at Trooper Creek Cu-Au. Aberfoyle Resources then farmed into the project, and carried out a number of RAB programs to extend the geochemical coverage in the Trooper Creek area. No results were presented for this work.

Field Checking

The Trooper Creek Cu-Au prospect is located on a moderately steep hill with abundant siltstone float and minor subcrop. Subcrop of quartz veined siltstone with boxworks was located at the top of the hill, and a breccia was located within the siltstone adjacent the contact with a dolerite (pers comm. Gustav Nortje).

Recommendations

Whilst this area has had substantial work for base metals, no significant work has been completed on the gold mineralisation so far located in the area. It is recommended that mapping to define the controls on gold, and soil sampling to identify the distribution of the gold, be completed as a priority for regional exploration. It is expected that this would be followed up by RAB or RC drilling to test the area for significant gold mineralisation.













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3.2 General Comments

Although the origins of the mineralisation are not conclusive, and it may not represent a VHMS, the Liontown mineralisation has a clear, strong stratigraphic control, and this should be taken into account in any exploration strategy.

The concept of a NE-trending structure which intersects the stratigraphy which hosts Liontown and Carrington, with this intersection controlling the high-grade plunge, is very appealing. As yet, no robust data interpretation (ie confirmation by transforming the alpha and beta angles to planes, and subsequent measurement of intersections) has been undertaken, so no comment can be made on the accuracy of the concept.

All of the exploration approaches, based on geochemistry, geophysics, and drilling, hold merit in the Liontown area. The following limitations should be noted;

RAB Drilling As the RAB drilling will not substantially penetrate basement, it is likely to provide only a 2 dimensional view of potential mineralisation. This is a particularly serious limitation given the steeply plunging nature of the Liontown style of mineralisation, and the consequent very small footprint in the x-y plane.

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Historical accounts of attempts at RAB drilling through Campaspe indicate large amounts of water, coarse gravels, and unconsolidated sands, which will make RAB drilling in areas of deep cover difficult or not technically feasible.

3D IP Survey The 3D IP survey will give substantial 3 dimensional information, however as it is measuring a physical property, it does not necessarily directly correlate with mineralisation. As an example of this, it is likely that the shales in the hanging wall to Liontown would appear as a target in any IP survey. It is also historically established that sulphide targets with limited width extent can be very difficult to detect using electrical geophysical methods.

Previous electrical geophysics in the area has indicated that the Campaspe Formation, in particular, is very hard to penetrate, and commonly causes "edge effects" where it overlies the basement. Previous electrical geophysics was last conducted in the area in the 1980's, and new technology has significantly improved the performance of the technique since this time, however there is still a substantial risk that electrical geophysics will not be able to penetrate deep cover.

Deep Drilling Deep drilling can be considered to be a 2 dimensional technique (usually in the x-z or y-z plane), and can be useful in providing geological information particularly in the vertical dimension. Deep drilling can however very easily miss an orebody and associated alteration located along strike and up or down dip, so it is critical that the drilling be very carefully targeted.

Deep drilling can give very useful geological information, however because it is very expensive, only limited drilling can be undertaken, requiring substantial extrapolation from a very small sample.

It is likely that a mix of these approaches will be the most appropriate.

3.3 Recommendations

Because the Liontown mineralisation shows some deformation and metamorphism, it is unlikely that a conclusive assessment of its origins will be made on the basis of texture and mineralogy alone. Although the genetic origins of the deposit are not critical for effective exploration, it is useful to have an understanding of the origins, and in particular the timing, which would provide constraints on discovering other analogous orebodies. It is recommended that investigations should be made into whether the Liontown deposit can be accurately dated using radioactive dating techniques to provide an independent assessment of the age of mineralisation.

Much effort has gone into collecting large amounts of structural and lithological data during the Liontown ore resource drilling, however (most likely due to a lack of resources), these have not yet been converted into a robust geological model. As this would confirm the presence and importance of both the NE and EW trending fabrics and their relationship to ore, it is recommended that this be done as soon as possible.

Any information from this should then be used to narrow down the area over which exploration is conducted for Liontown extensions. Basic controls should be able to be established and linked to regional elements in the geology which can then be used to focus exploration (eg the NE trending shears, a major stratigraphic change etc). A possible way in which this could be achieved is as follows;

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- Establish the controls on the mineralisation at Liontown
- Locate these in regional datasets
- Extrapolate these (including repetitions of these if they occur in the datasets)
- Plan exploration to focus in areas where the same controls that occur at Liontown occur elsewhere within the Liontown extensions area

Grid drilling, IP, deep drilling or any other technique without utilising these controls to focus exploration is not recommended as a first pass. Given the range of regolith environments and target types for the Liontown extensions, it is likely that a combination of the exploration approaches discussed be used to explore for Liontown extensions. A possible combination is as follows;

Aircore Drilling Aircore drilling is recommended instead of RAB drilling, because it is generally much more suited to poorly consolidated overburden with substantial water, as occurs in the Liontown area. It is recommended that as a first pass, aircore drilling be used in areas that are under cover, and only in traverses over elements that are considered important controls for the Liontown mineralisation.

Grid drilling all areas under cover within a certain distance of Liontown is not recommended as a first pass because this does not capitalise on the opportunity to reduce risk by using the geological information gained from the Liontown deposit. Using this information to reduce the amount of drilling should allow high-priority areas to be drilled at less than 1/2 of the cost of covering the whole area.

3D IP 3D IP can be useful in the identification of blind mineralisation (for which the potential is considered high, given the characteristics of Liontown). As a first pass, it is recommended that IP be completed over areas of subcrop and shallow cover, particularly where some historical anomalism has been noted and not substantially investigated, such as at Cheetahtown and Max Cu-Au.

IP is not recommended as a first pass over areas of deep cover, as without any sort of calibration from areas of shallow cover, it is likely to result in ambiguous results at best.



4. Regional Exploration Approach

Some discussions were held with regard to the exploration approach on the wider lease area, although this was not the main focus of the trip. Major issues are discussed below.

4.1 Map Compilation

It was identified from the field checking that large areas which had been designated outcrop in the 250k scale surface geology were actually areas of mostly residual soil, with minor subcrop and rare outcrop. In order to complete a more accurate geological interpretation of the regional areas, and use existing mapping with more rigor, it was decided that a compilation of fact mapping is required. This compilation would be constructed from historical fact mapping and involve substantial check mapping and supplementary structural mapping.

Upon return from the field, a small number of reports were assessed to establish the best way to implement the map compilation. Many of the images are not maps, are not applicable to the area under tenure or within the immediate vicinity, or are general location maps which do not need to be scanned, and some of the smaller sketch maps are located within the body of the report. Because of this, the most efficient way to compile the maps would be for a geologist to assess each map and image individually, and nominate which require scanning and registering. The scanning and registering could then be completed by a drafter. It is possible that this entire process could be outsourced, or that only the scanning and registering be outsourced. It should be noted that a large number of the fact maps have been completed in local grids, and these grid definitions will also need to be extracted from the reports, or possibly may be purchased from Terrasearch.

4.2 Prospectivity

Discussions were had regarding the prospectivity of the Liontown Anomalous Group area and the rest of the tenure. Whilst a specific consensus was not reached, it was the opinion of Paul Cranney (pers comm.) that if a large orebody were to be found within the Mount Windsor Volcanics Tenements, it is 50% likely that it will be found within the Liontown Anomalous Group. Further discussion within the team and management is encouraged, and once consensus is reached, it is recommended that it would be appropriate to link the budget to the perceived prospectivity by apportioning the budget accordingly, and using this to guide exploration strategy.

APPENDIX 9

SGC Memorandum — Historical geophysical data compilation, February 2008

Liontown Resources Ltd MT WINDSOR VOLCANICS PROJECT Memo: Historical Geophysical Data Compilation February 2008

A. MORRELL



SOUTHERN GEOSCIENCE CONSULTANTS

SGC Report No. 1804

PROJECT NAME CLIENT COUNTRY PROVINCE / STATE METHOD KEYWORDS

COMMODITY 1:100 000 MAP SHEET

1:250 000 MAP SHEET

MT WINDSOR VOLCANICS LIONTOWN RESOURCES LIMITED AUSTRALIA QLD IP; DHEM; AEROMAGNETICS; RADIOMETRICS; GRAVITY; EM; GROUND MAGNETICS; VERTICAL ELECTRICAL SOUNDINGS COPPER; LEAD; ZINC HOMESTEAD (8057); CHARTERS TOWERS (8157); RAVENSWOOD (8257) CHARTERS TOWERS (SF5502)



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Telephone: Fax: Email: 61 8 9316 2074 61 8 9316 1624 anne@sgc.com.au

Memorandum

То:	Doug Jones Level 2, 1292 Hay Street West Perth, WA 6005	From: Anne Morrell			
Cc:	James Patterson				
Project:	Mt Windsor Volcanics data compilation	Date: 14/02/2008			

Doug,

Please find following a report on the results of the compilation of historical RGC data.

Kind regards,

Anne Morrell

INTRODUCTION

Three discs of historical data were received from Liontown Resources. The data consisted primarily of geophysical work carried out by RGC in the mid 1990s on their properties in the greater Mt Windsor Volcanics area which includes the Thalanga, Highway-Reward and Liontown projects. SGC were commissioned to re-compile the data and, in particular, focus on locating historical IP data from the Liontown area. The survey locations were reported in a Terra Search compilation for Bullion Resources in 2005 and rumoured to have been digitised and modelled by RGC in the mid 1990s.

The results of this data compilation are presented here together with recommendations for further work. A digital copy of the re-compiled data accompanies this report and includes attributed GIS layers of the recovered ground and airborne geophysical survey outlines.

DATA COMPILATION AND DIRECTORY STRUCTURE

Data from the discs were systematically sorted through and identified. The data have been recompiled by project area and then by method and data type. Aeromagnetic and other regional datasets form their own directories. The directory structure and folder contents are summarised in Table 1.

No further documentation or digitising to GIS has been carried out on data from the Thalanga, Highway Reward and Pentland projects as these fall outside of the Liontown tenement areas; this has been carried out on Liontown/Mt Windsor Volcanics data only and is discussed in the following sections.

GEOPHYSICAL DATA – MT WINDSOR VOLCANICS PROJECT

Airborne Surveys

Data from 14 aeromagnetic surveys have been recovered including two 50m spaced surveys and four 100m spaced surveys (Figure 1). The data comprise located magnetic data only and in the case where radiometric data were also collected (four surveys), this has not been found. Of the 14 surveys, eight are documented as open-file surveys, seven of which are included the state database however the digital data is registered as not available. Two surveys are confidential detailed (50m) surveys flown by RGC over the Thalanga and Highway Reward-Waterloo areas in 1997 and 1996 respectively. The remaining four surveys are previously known open-file surveys with obtainable data.



Figure 1. Outlines of the 14 airborne datasets recovered. Liontown tenements shown in white.

In ca. 1995, RGC commissioned Geoimage in Brisbane to carry out a regional merge of the magnetic data (S. Mudge, pers. comm., September 2007). The resulting grids have been recovered in this compilation and indicate that the merge excluded the detailed 50m data. Geoimage has since been contacted and has confirmed that they have the details of this job in their database and the data can be restored upon request. They also appear to have the radiometric data from the four surveys mentioned above that has not been recovered.

The outlines of these surveys have been digitised and attributed with their survey specifications into a GIS table. This is summarised in Table 2.

The recovery of these surveys is a significant result as they provide much higher resolution data coverage than previously known to Liontown Resources.

Ground Surveys

Limited ground geophysical data at Liontown has been recovered. Figure 2 shows the locations of the various surveys. These comprise:

- 1. DHEM Raw Crone PEM data files for two drillholes: LLD138 and LLRC127 (1996).
- <u>Radial downhole IP</u> Full suite of raw and processed data files including contours and grids for 20 drillholes surveyed (1995-1996).

- <u>Ground magnetics</u> Located and processed data including images from RGC work (1995-1996). A single ASCII file of processed station readings was also located for a 10km x 8 km area. The source of this data is unknown.
- <u>Dipole-dipole IP</u> Eight lines of DDIP from the Britannia area (30km east of Liontown) were digitised by Sam Roberts in July 1996. He documents that the origin of the data and the survey date are unknown.
- <u>Vertical electrical soundings</u> Four resistivity soundings were made during the 1995 downhole IP program. Raw and processed data files have been recovered however all are in an undocumented local grid and therefore could not be located and digitised into the GIS table.
- 6. <u>Gravity</u> A subset of located data from the open-file National Gravity Database. No new surveys have been identified.



Figure 2. Locations of recovered ground geophysical datasets. Green = ground magnetics, red = IP, dark blue = EM, light blue = gravity. Liontown tenements shown in grey.

IP Data

A primary aim of this compilation exercise was to locate the historical IP data over the Liontown area. These surveys were carried out mostly by Esso from 1974-1984 and Pan Con in 1992 (Figure 3). The surveys were documented in a Terra Search metadata compilation for Bullion Minerals in 2005 (Beams, 2005) and it was believed that RGC had commissioned Zonge in the mid 1990s to digitise the original data from hardcopy and model it (S. Mudge, pers. comm., October 2007).

This data has not been found on the discs provided for this compilation. I subsequently contacted Zonge and had them perform an archive search. They located records of this job however it was only for the Highway Reward project; they had no record of completing this exercise at Liontown. A copy of this restored archive data was received from Zonge and was found to be a duplicate of DDIP data already recovered from the original discs.

I was then given the names of the RGC geologist (Craig Miller) and geophysicist (Chris Dauth) working the project at the time from Stephen Mudge (former RGC chief geophysicist). I contacted both of them for their recollection of the work completed and both confirmed that the digitising of the

historical IP and modelling was only ever completed at Highway Reward, never at Liontown (C. Dauth, writ. com., 11 February 2008; C. Miller, pers. com., 5 February 2008). All three, however, recalled the great success they had in drilling the resulting IP targets.

Recent petrophysical testing of barren and mineralised core samples from the Liontown area show that mineralisation is moderately to highly chargeable in comparison to non-chargeable barren rock (excluding local chargeable black shales) (Peters, 2008). The IP method therefore has the strongest chance of success in direct detection of Liontown-type mineralisation. Peters (2008) also notes that sulfide mineralised samples have a consistently higher bulk density giving potential for the application of the gravity method.



Figure 3. Locations of IP surveys compiled by Terra Search.

RECOMMENDATIONS

Based on the results of this data compilation, the following recommendations are made for further geophysical work at the Mt Windsor Volcanics project.

- Seek permission from the owners (Barrick) to acquire the detailed aeromagnetic and airborne radiometric data held at Geoimage. These surveys should be included in future merges. They should also be consulted when planning new surveys in the area so as not to re-fly areas unnecessarily.
- 2. Digitise and model, with current techniques, the historical IP data across the Liontown area and other prospects if of interest. This will require acquiring the relevant historical reports. These can be sourced via QDEX, the Queensland Department of Mines and Energy online exploration reporting database, or possibly Simon Beams of Terra Search who was a project geologist for Esso at the time.
- 3. Model the radial downhole IP with current techniques.
- 4. Consider the use of the gravity method for detecting dense sulfide mineralisation.

REFERENCES

Beams, S. D., 2005. Report on Metadata to Accompany Polygons of Historical Surveys for Mt Windsor Volcanic Belt, Bullion Minerals Ltd EPM14161. Document #16776.1005, TS Shelf Ref #2005/7. Prepared by Terra Search Pty Ltd, Townsville, QLD, Australia. 87 p.

Peters, W. S., 2008. Core Physical Property Tests, Liontown Project. SGC Report #1800. Prepared by Southern Geoscience Consultants Pty Ltd, Perth, WA, Australia. 22 p.

Table 1. Directory structure of re-compiled data with data summaries.

AG \	Balfe Creek	\ Data	: Binary database of full located magnetic data (*.ANX). Data extracted to ASCII by SGC.							
\ Geotiffs			: Created by SGC from original ERMapper grids. Registration files included.							
		\ Grids	Intrepid and ERMapper grids of magnetic data.							
		Interpretation	ERMapper vector files of data interpretation.							
_		\ Intrepid	: Intrepid database and processing files of magnetic data.							
1	Braceborough	\ Data	: Binary database of full located magnetic data (*.ANX). Data extracted to ASCII by SGC.							
		\ Geotiffs	: Created by SGC from original ERMapper grids. Registration files included.							
		\ Grids	: Original ERMapper grid of magnetics.							
1	Broadway	\ Data	: Binary database of full located magnetic data (*.ANX). Data extracted to ASCII by SGC.							
		\ Geotiffs	: Created by SGC from original ERMapper grids. Registration files included.							
		\ Grids	: Original ERMapper grid of magnetics.							
\	Dreghorn	\ Data	: Binary database of full located magnetic data (* ANX). Data extracted to ASCII by SGC.							
	-	\ Geotiffs	: Created by SGC from original ERMapper grids. Registration files included.							
		\ Grids	: Original ERMapper grid of magnetics.							
1	GIS		: ERMapper vector and DXF files of aeromagnetic survey boundaries. DXF converted to MapInfo TAB by SGC.							
1	Highway Reward-Waterloo	\ Data	: Binary database of full located magnetic data (* ANX). Data extracted to ASCII by SGC.							
	0,	\ ERMapper	: ERMapper vector and algorithm files.							
		\ Geotiffs	: Original BMP images of magnetic data. Geotiff created by SGC from original ERMapper grid. Registration files included.							
		\ Grids	: Intrepid and ERMapper orids of magnetic data.							
		\ Interpretation	ERManner vector files ManInfo TAB Arc SHP and DXF of data interpretation (neology & structure) Arc and some ManInfo tables created from vector files by SGC							
		\ Intrepid	Intrenid database and processing files of magnetic data							
N	Homestead	\ Data	Binary database of full located manetic data (* ANX). Data extracted to ASCII by SGC							
	Tiomootoda	\ Geotiffs	Created by SGC from original FRManper or (in Registration files included							
		\ Grids	Original EMPanper grid of magnetics Original EMPAnper grid of magnetics							
	Horse Creek	\ Data	Gragman E-triangport and or magnetic data (* ANX). Data extracted to ASCII by SGC.							
`			Created by SSC from optimized EPManpar and Paritation files included							
		\ Gride								
V	Laka Viow	\ Doto	Original Extendeption of the located measurements Second State Action (2010) Second State Action Second State Acti							
`	Lake view		Epidadudad of full idealed indigited data (.AixA). Data extracted to ASCII by SSC. Epidanes under and algorithm Flog							
			. Envinapper vector and approximitinines.							
		\ Geotins	Ordened by Soci non original Extrapped gnd. Registration lies included. Ordened EDMonser and effective an							
1	Matthewa Bianagla	\ Gilus	Original Extinate in the integration of the second se							
1	Matthews Finhacie		Diriary database of full indexed inaginetic data (inv). Data extracted to ASCI by SGC.							
		\ Geotins								
-	Bar SAC - Janan	\ Grids	: Original Exmapper grid of magnetics.							
1	wit windsor	\ Data	: Binary database of full located magnetic data ("ANX). Data extracted to ASCII by SGC.							
		\ Geotiffs	: Created by SGC from original ERMapper grid. Registration files included.							
-		\ Grids	: Original ExMapper grid of magnetics.							
1	Regional Grids		: ERMapper grid of regional TMI magnetics.							
1	Regional Mt Windsor Merge	\ ERMapper	: EKMapper vector and algorithm files.							
		\ Grids	: Original ERMapper grids of merged magnetics.							
-		\ Images	: JPG and BMP images of merged magnetics with MapInto TAB files.							
١	Rocky Creek	\ Data	: Binary database of full located magnetic data (*.ANX). Data extracted to ASCII by SGC.							
		\ Geotiffs	: Created by SGC from original ERMapper grid. Registration files included.							
_		\ Grids	: Original ERMapper grid of magnetics.							
\	Rolston	\ Data	: Binary database of full located magnetic data (*.ANX). Data extracted to ASCII by SGC.							
		\ Geotiffs	: Created by SGC from original ERMapper grid. Registration files included.							
_		\ Grids	: Original ERMapper grid of magnetics.							
/	Thalanga	\ Data	: Binary database of full located magnetic data (*.ANX). Data extracted to ASCII by SGC.							
		\ ERMapper	: ERMapper vector and algorithm files.							
		\ Geotiffs	: Original BMP image of TMI magnetics. Geotiffs created by SGC from original ERMapper grids. Registration files included.							
		\ Grids	: Original ERMapper grids of magnetics.							
١	Warrawee	\ Data	: Binary database of full located magnetic data (*.ANX). Data extracted to ASCII by SGC.							
		\ Geotiffs	: Created by SGC from original ERMapper grid. Registration files included.							
		\ Grids	: Original ERMapper grid of magnetics.							

Table 1 con. Directory structure of re-compiled data with data summaries.

\ DTM				: ERMapper grids of regional DTM data.									
\ Gravity	\ Contours			: MapInfo TAB of regional gravity contours.									
,	\ Data			: ASCII files of regional gravity data from the Australian National Gravity Database.									
	\ Grids			: ERMapper and Model Vision grids of regional gravity data.									
\ Grid conversions				: Scripter files for converting between local and AMG coordinate systems. Contains useful information for grid conversions.									
\ Highway-Reward	\ DHEM			: Raw data files for 1992, 1994, 1997 and Truncheon DHEM campaigns.									
	\ Drilling			: ASCII output of drilling data: alteration, assays, collars, geology, mineralisation, RQD, structure, survey.									
	\ DTM			: ASCII data and ERMapper grids of DTM.									
	\ ERMapper			: ERMapper vector and algorithm files.									
	\ Fixed Loop EM			: Raw data files for 1991, 1993 and 1997 FLEM campaigns.									
	\ Geochem			: ASCII data, Model Vision grids, MapInfo TAB and Surfer workspaces of Cu, Zn, Pb data.									
	\ Geology			: MapInfo TAB of contoured Campaspe thickness.									
	\ GMAG	\ Data		: ASCII located data.									
		\ Grids		: Original ERMapper grids of magnetics.									
		\ Images		: JPEGS of Snake Oil and Truncheon area magnetics.									
	\ Gravity			: Point and gridded data for 1987 and 1997 campaigns including 1998 re-processing and merging of all data. Overburden models included in 1998 data.									
	\ IP	\ Dipole-dipole		: Spreadsheets of digitised old ESSO DDIP data from 1981, 1982, 1983 and 1986 and including merged and gridded data.									
		\ Radial Downhole		: Raw data, Model Vision grids and MapInfo contours of 1997 (Snake Oil) and 1998 campaigns by RGC.									
	\ Map Sheet Data	\ Sheet 8		: MapInfo tables of geology, structure and magnetics.									
	\ Orthophotos			: JPEG of orthophoto.									
\ Liontown	\ DHEM			: Raw data for 1996 Crone DHEM (LLD138 & LLRC127)									
	\ Drilling			: Various ASCII and Excel files containing old drillhole data.									
	\ DTM \ Data			: ASCII and DXF files of DTM data.									
	\ Images			: BMP of Mt Windsor topography.									
	\ GMAG	\ Liontown		: Raw and located data, ERMapper grids and images (TIF) of individual and merged ground magnetic surveys. Merging performed by Geoimage.									
		\ Liontown East											
		\ Liontown West											
		\ Merge											
	\ IP \ Dipole-dipole			: 8 lines of DDIP data from Britannia digitised by Sam Roberts. Source unknown and unlocated.									
		\ Radial Downhole		: Raw and processed data, contours, grids, images and Surfer files of RGC downhole radial IP (1995-1996).									
	\ Soundings			: Raw and processed data for 4 soundings by RGC in 1995. All in local grid and unlocated.									
\ Pentland	\ Documents			: Three communication documents regarding ground magnetic, MIP and aeromagnetic surveys in the Pentland area.									
\ Thalanga	\ DHEM			: Raw data for ~10 DHEM surveys from 1996.									
5	\ Documents			: Summary document on all geophysical surveys completed at Thalanga.									
	\ Drilling			: ASCII and Excel files containing old drillhole data.									
	\ GMAG	\ Data		: ASCII located data.									
		\ Grids		: Original ERMapper and Model Vision grids of magnetics.									
	\ Gravity	\ Grids		: Original ERMapper grids of gravity.									
		\ Old Gravity		: Located data and grids of an old recovered gravity survey.									
	\ IP	\ Dipole-dipole		: Raw data for 1996 survey (4 lines).									
		\ Gradient Array \	Contours	: MapInfo contours of chargeability and resistivity.									
		1	Data	: Original ASCII data for 1996 survey.									
		١	Geotiffs	: Created by SGC from original ERMapper grid. Registration files included.									
		1	Grids	: Original ERMapper and Model Vision grids of IP data. Surfer grids created by SGC from ERMapper grids.									
		1	Surfer	: Surfer workspaces of chargeability and resistivity.									
		\ MIP		: ASCII data, contours, Model Vision grids and Surfer workspaces for Orient and Thalanga Range MIP surveys.									
		\ Radial Downhole		: Raw data, Model Vision grids and Surfer workspaces of 1996 and 1997 campaigns.									

Table 2. Survey specification summary of discovered airborne magnetic-radiometric data.

Survey Name	Owner / Company / Source	Contractor	Flown For	Date Flown Data Format	Data Type	Line Bearing	Line Spacing	Flying Height	MAG Data	RAD Data	DTM Data	Gravity Data	EM Data	Confidential	Comments
Balfe Creek	Open file			LDT & GDT	MAG	0	100	0	т	F	F	F	F	F	Estimating 100m line spacing from image resolution. Data not available from government. Have located LDT & GDT from RGC archives (Sam Roberts).
Braceborough	Open file	Geoterrex Pty Ltd	CRA Exploration Ltd	30/11/1983 LDT & GDT	MAG,RAD	0	200	0	Т	т	F	F	F	F	Included in 2005 Bullion regional merge.
Broadway	Open file			LDT & GDT	MAG	0	200	0	т	F	F	F	F	F	Estimating 200m line spacing from image resolution. Data not in government database. Have located LDT & GDT from RGC archives (Sam Roberts).
Dreghorn	Open file	Aerodata McPhar Pty Ltd	Esso Australia Ltd	1/10/1982 LDT & GDT	MAG,RAD	0	100	60	т	т	F	F	F	F	Data not available from government. Have located mag LDT & GDT from RGC archives (Sam Roberts). Doesn't look to have rad data included.
Highway Reward - Waterloo	RGC Thalanga Pty Ltd	UTS Geophysics	RGC Thalanga Pty Ltd	1/04/1997 LDT & GDT	MAG	0	50	30	т	т	F	F	F	т	Have located LDT & GDT from RGC archives (Sam Roberts). Confidential to RGC.
Homestead	Open file	Aerodata Holdings Ltd	Dalrymple Resources	31/01/1988 LDT & GDT	MAG	160	200	60	т	F	F	F	F	F	Included in 2005 regional merge. Problem with Roberts' grid.
Horse Creek	Open file	Geoterrex Pty Ltd	Esso Australia Ltd	16/09/1984 GDT	MAG,RAD	135	200	80	т	т	F	F	F	F	Data not in government database. Have located LDT & GDT from RGC archives (Sam Roberts).
Lake View - Thalanga	RGC Thalanga Pty Ltd	Kevron Geophysics	RGC Thalanga Pty Ltd	1/01/1996 LDT & GDT	MAG	0	50	35	т	F	F	F	F	т	HMAG only flown, no rads. Have located LDT & GDT from RGC archives (Sam Roberts). Confidential to RGC?
Matthews Pinnacle	Open file			LDT & GDT	MAG	0	200	0	т	F	F	F	F	F	Data not in government database. Guessing N-S lines at 200m from gridded image. Have located LDT & GDT from RGC archives (Sam Roberts).
Mt Windsor	Open file	Aerodata McPhar Pty Ltd	Pancontinental Mining Ltd	30/05/1988 GDT	MAG,RAD	0	100	60	т	т	F	F	F	F	Data not available from government. Have located mag LDT & GDT from RGC archives (Sam Roberts).
Rocky Creek	Open file	Aerodata Holdings Ltd	Pan Australian Exploration Pty Ltd	1/01/1988 LDT & GDT	MAG RAD	0	200	60	т	Т	F	F	F	F	Included in 2005 regional merge.
Rollston	Open file	Geoterrex Pty Ltd	Esso Australia Ltd	30/06/1985 LDT & GDT	MAG,RAD	0	200	80	т	т	F	F	F	F	Data not available from government. Have located mag LDT & GDT from RGC archives (Sam Roberts).
Thalanga	Open file			GDT	MAG	0	100	0	т	F	F	F	F	F	Data not available from government. Have located mag LDT & GDT from RGC archives (Sam Roberts). Estimating a 100m line spacing based on 25m grid.
Warrawee	Open file	Geometrics International Corp.	Aberfoyle Resources Ltd	30/09/1980 LDT & GDT	MAG,RAD	0	250	70	т	т	F	F	F	F	Data in government database and on RGC archive CDs (mag only) (Sam Roberts).

APPENDIX 10

Lithos-X Mineral Exploration Consultants Report — Geological Interpretation of the detailed aeromagnetic and radiometric data, 2007

APPENDIX 11 AAMHatch Pty Ltd Report — IKONOS Satellite Imagery

APPENDIX 12

Terra Search Pty Ltd report – Ground Magnetic Survey, 2009