TOPTUNG LIMITED

ABN 12 118 788 846

THE TORRINGTON PROJECT

Tungsten exploration – a new approach; Light Detection And Ranging (LiDAR) & Deep Ground Penetrating Radar (DGPR)

AusIMM THE MINERALS INSTITUTE Hunter Region Branch

Armidale NSW August 2015

Mike Skinner

TOP TUNG

Resolve

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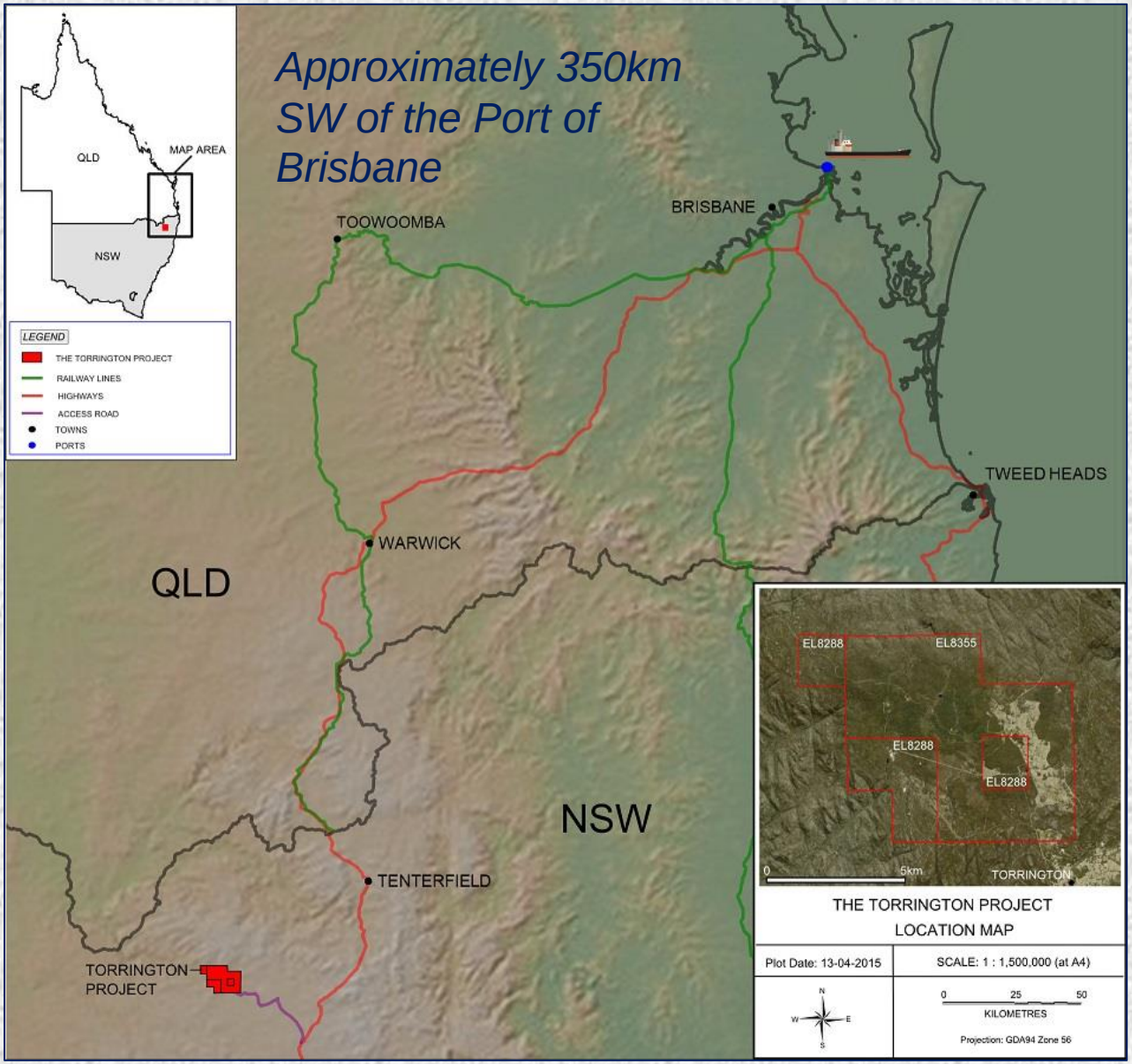
Torrington Project Location



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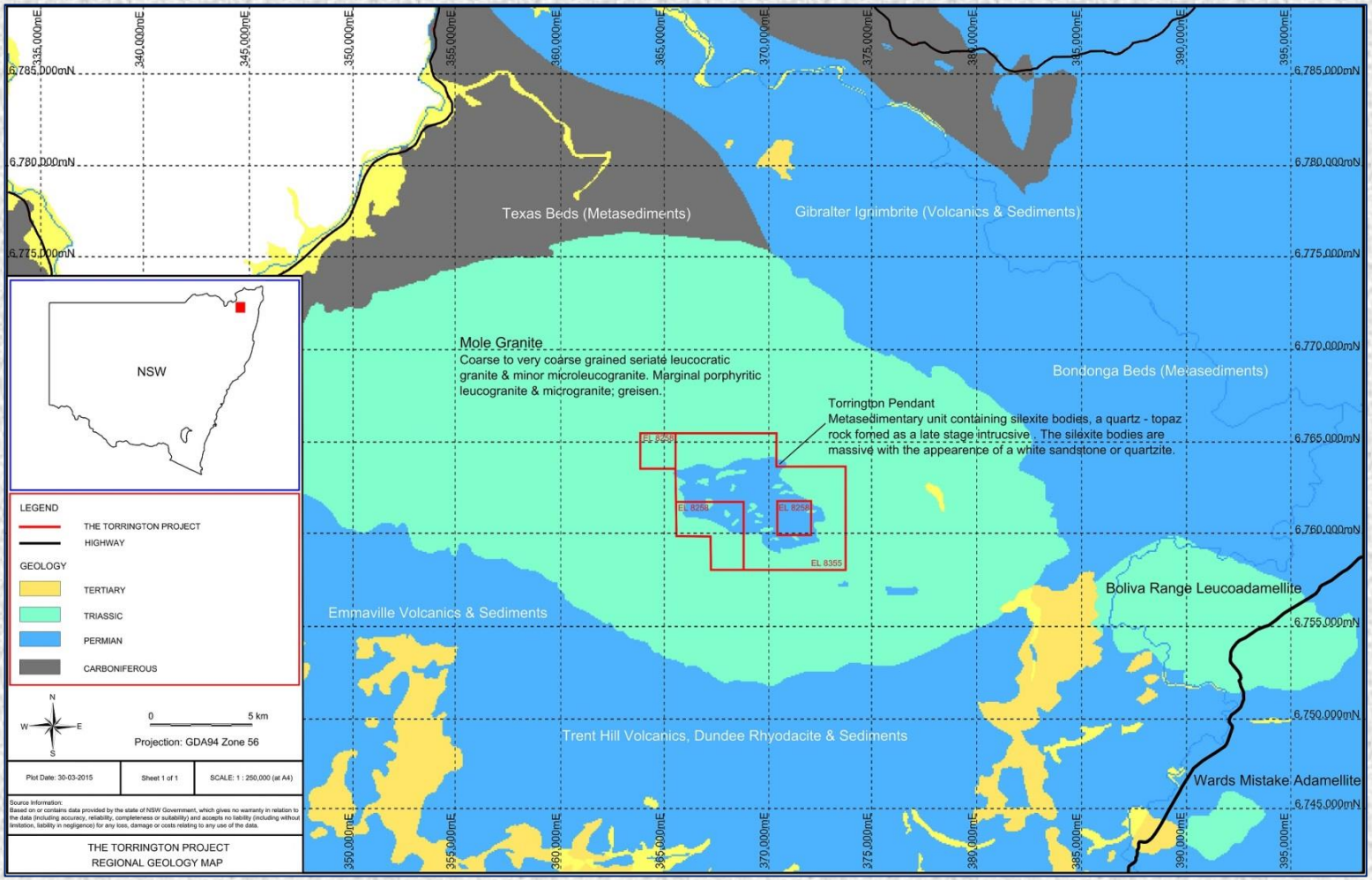
Torrington Geology

The Torrington Project lies within the Late Permian Mole Granite and covers the Torrington Pendant, an elliptical body of Carboniferous- Early Permian metasediments which is the remnant roof of the Mole Granite.



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What is Silexite??

The primary ore is silexite (called locally a quartz/topaz greisen), a topaz bearing (>5%, typically 5-30%) quartz rich rock, and at Torrington + wolfram and bismuth

Silexite genesis is somewhat complex with two silexite types being evidenced in the field

Intrusive type with a saccharoidal texture that forms sills and dykes in the granite and in the metasediment cap (Torrington Pendant).

Metasomatic type which displays relict granitic texture and forms prominent outcropping massive hills, largely on the outer edges of the Torrington Pendant.

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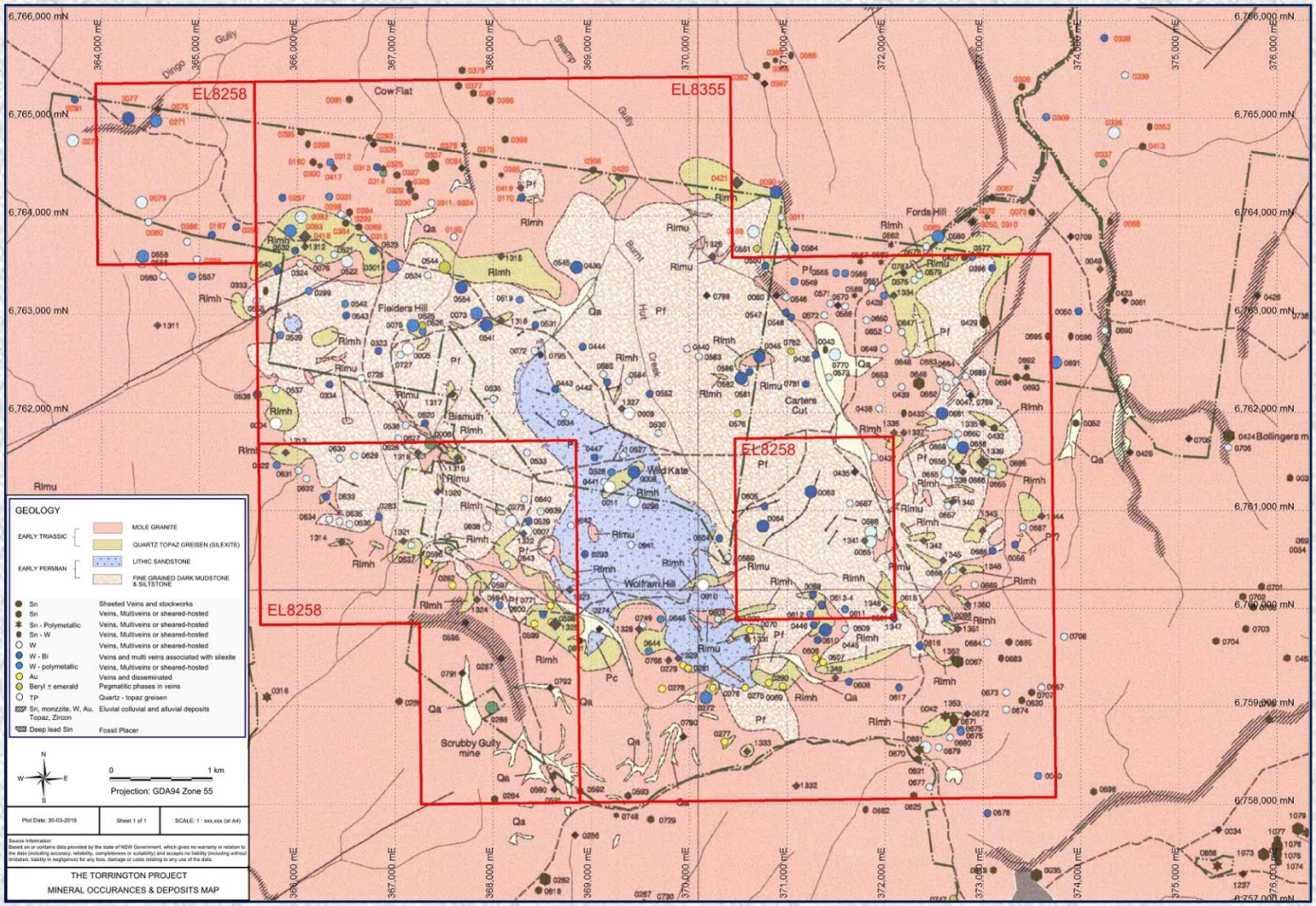
Torrington Pendant >300 Mineral Occurrences

More than 60 silexite occurrences known to date within the Torrington Project



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Torrington Historic Overview

History	• Historical, successful multi-element mining (tungsten, bismuth and topaz) • Contained largest single wolfram mass (12.5t) recorded in Australia from a 35 ton vug of wolfram • >100 years mining activity within the area, including BHP • Pacific Copper tungsten and topaz production from mid 1970's to early 80's
Resource Definition	• Previous resource defined of ~ 5.75Mt (Pre-JORC) • Current Resource JORC 2012 • LiDAR survey completed and has contributed to increased resources • 414 holes (from 434) in multiple drilling programmes (some for topaz) • Friable nature of the tungsten (ferberite) resulted in low recoveries in RAB • Mining and large bulk tests conducted from 1976-81
Successive price crashes, poor recoveries, small scale mining	• Tungsten prices peaked in 1917 and 1977 ($170/Mtu) and fell to $47/Mtu by 1986 with artisanal Chinese production – Mine closed • No fines circuit in previous mill design (30% topaz loss, >25% ferberite loss) • No recognition of potential other mineral credits • Historically small scale mining on small mining claims/tenements

- First company to control whole of the Torrington Pendant – economy of scale -

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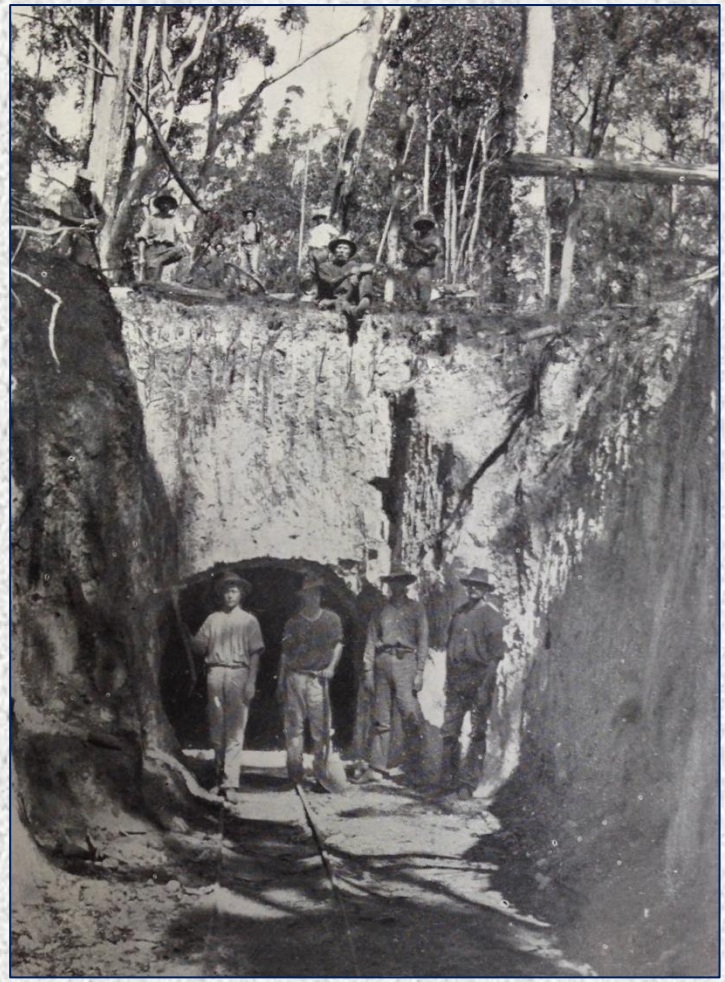
Torrington Historic Mining

Torrington Wolfram Proprietary's Krupp ball mill & concentration plant circa 1911

Rockvale Wolfram Company's battery & concentration plant circa 1911

Rockvale Wolfram Company tramway Hawkins quarry, Torrington circa 1911



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Torrington Historic Workings

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Torrington Historic Workings

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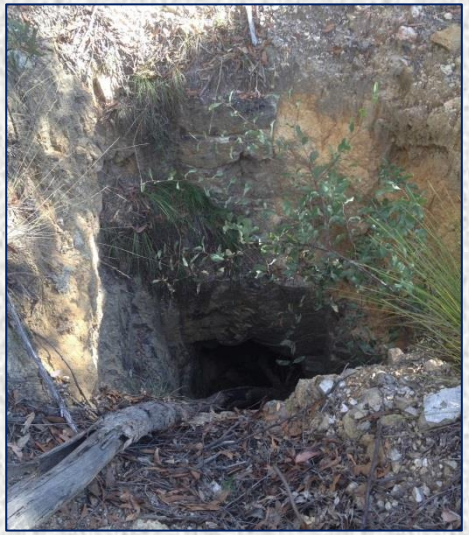
Numerous small scale operations



TUNGSTEN – Unique properties, difficult to replace

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Ferberite Crystals (iron end member of wolframite)

***Very Hard*:** Strongest of all metals - three times harder than chrome and titanium

Very Dense: Greater density than lead or uranium

Very Heat Resistant: 3400°C highest of all metals

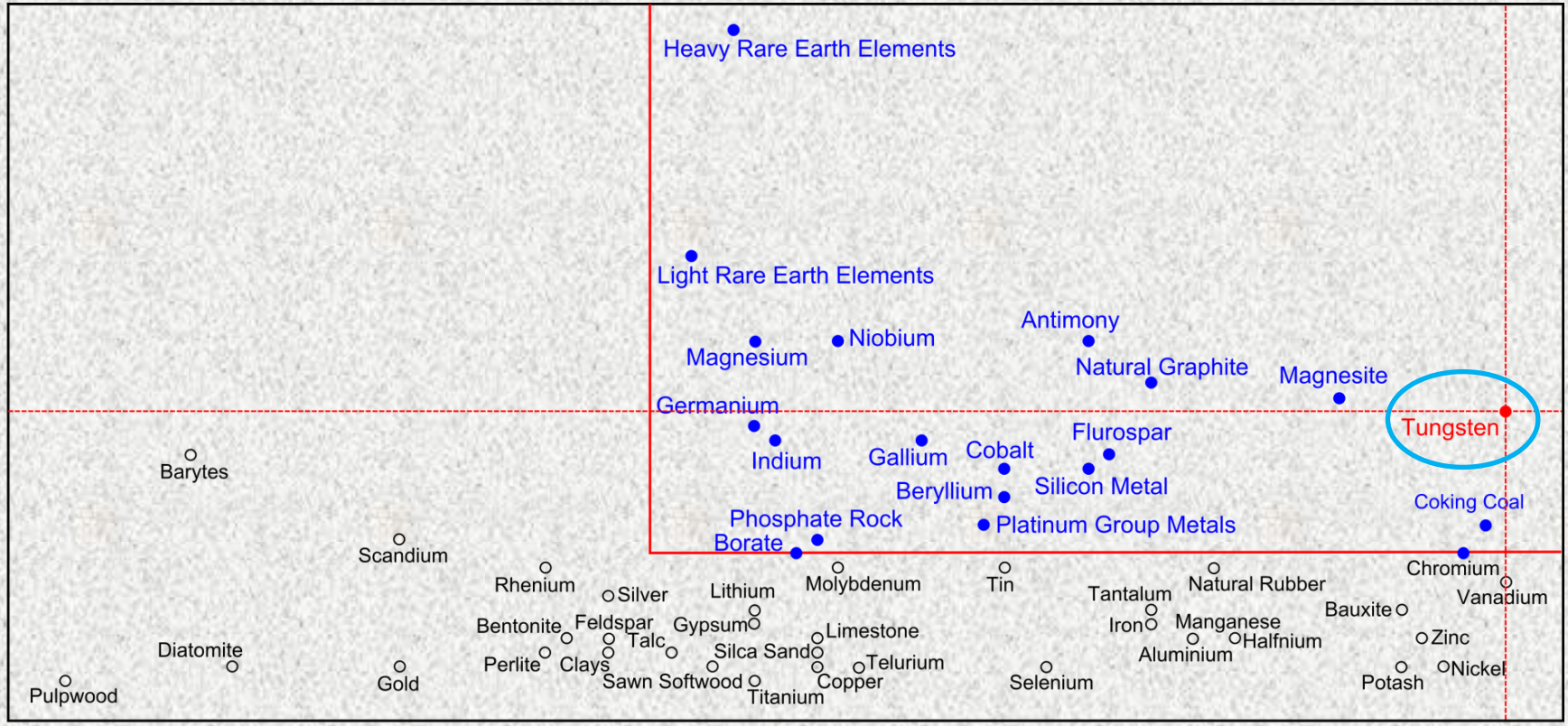
Environmentally Friendly: Very resistant to corrosion & completely non-toxic

Uses: > 60% in tungsten carbide for cutting tools, as an additive in the production of specialist steel; filament wire for lighting and increasingly in specialty uses - mobile phone handsets, military, ballistics and aerospace

***Importance*:** Classified as a "*Critical Raw Material*" by the EU and as a "*Strategic and Critical Material*" by the US Government

TUNGSTEN – Critical World Supply

Tungsten and its place in the list of critical raw materials



(*Report On Critical Raw Materials For The EU May 2014*)

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BISMUTH – A mineral that is defining our future

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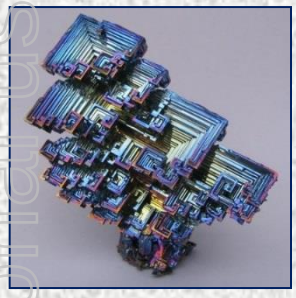


Bismuth Crystals

***High Electrical Resistance*:** Has highest Hall effect of any metal (greatest increase in electrical resistance when placed in a magnetic field)

Low Conductivity: Lower than any metal except mercury

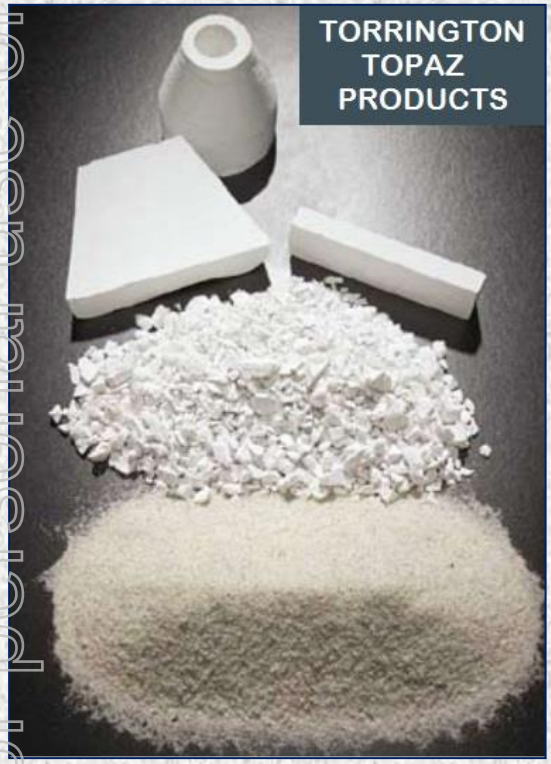
Environmentally Friendly: Non-toxic and increasingly used as a replacement for lead

Main Uses: Fire detectors & extinguishers, electrical fuses, solders, medicines, cosmetics, specialist low-melting alloys and in the automotive industry

***Importance*:** Classified as a "*Strategic and Critical Material*" by the US Government

TOPAZ – A superior refractory Mullite

Topaz ($Al_2SiO_4(F,OH)_2$ can be converted to mullite – an important aluminosilicate ceramic also known as porcelainite ($3Al_2O_3SiO_2$)



Torrington topaz refractory products

- Very high Al_2O_3/SiO_2 ratio in sintered product = 7/3 vs conventional Al_2O_3/SiO_2 of 3/2
- A higher refractory temperature of 1880^{o}c
- Fluorine removal during calcination and sintering scavenges free silica from matrix and may replace fluorspar as a source of fluorine compounds
- Formation of acicular ceramic matrix occurs at lower temperatures than conventional mullite - forming a product with higher (*ca*.30%) thermal and physical shock resistance
- Potential to lower life cycle costs for many refractory applications
- Processing topaz to mullite results in a significant credit from scavenging fluorine compounds – significantly offsetting mullite production costs

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Torrington Topaz – CSIRO Pyrometric Cone Test

CSIRO Refractory Test: Performed to Australian standard for pyrometric cone test

Left to right: Orton Reference Cone 39 (1865 degrees c), Torrington Mullite, a Japanese sintered mullite, an English mullite and a German fused mullite.

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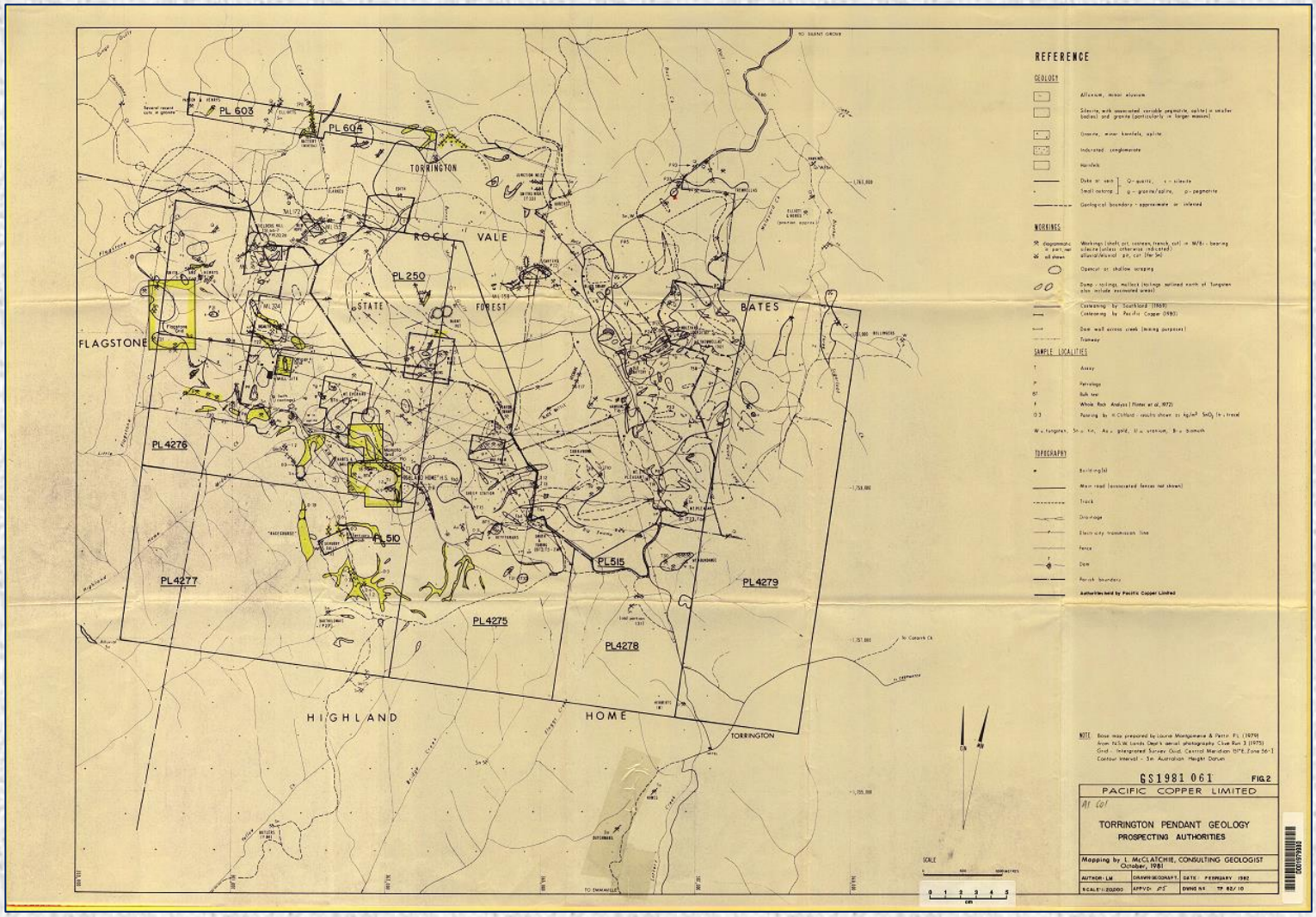
Torrington Silexite Deposit Map 1981

Good detail, but only in specific areas and on a local grid only



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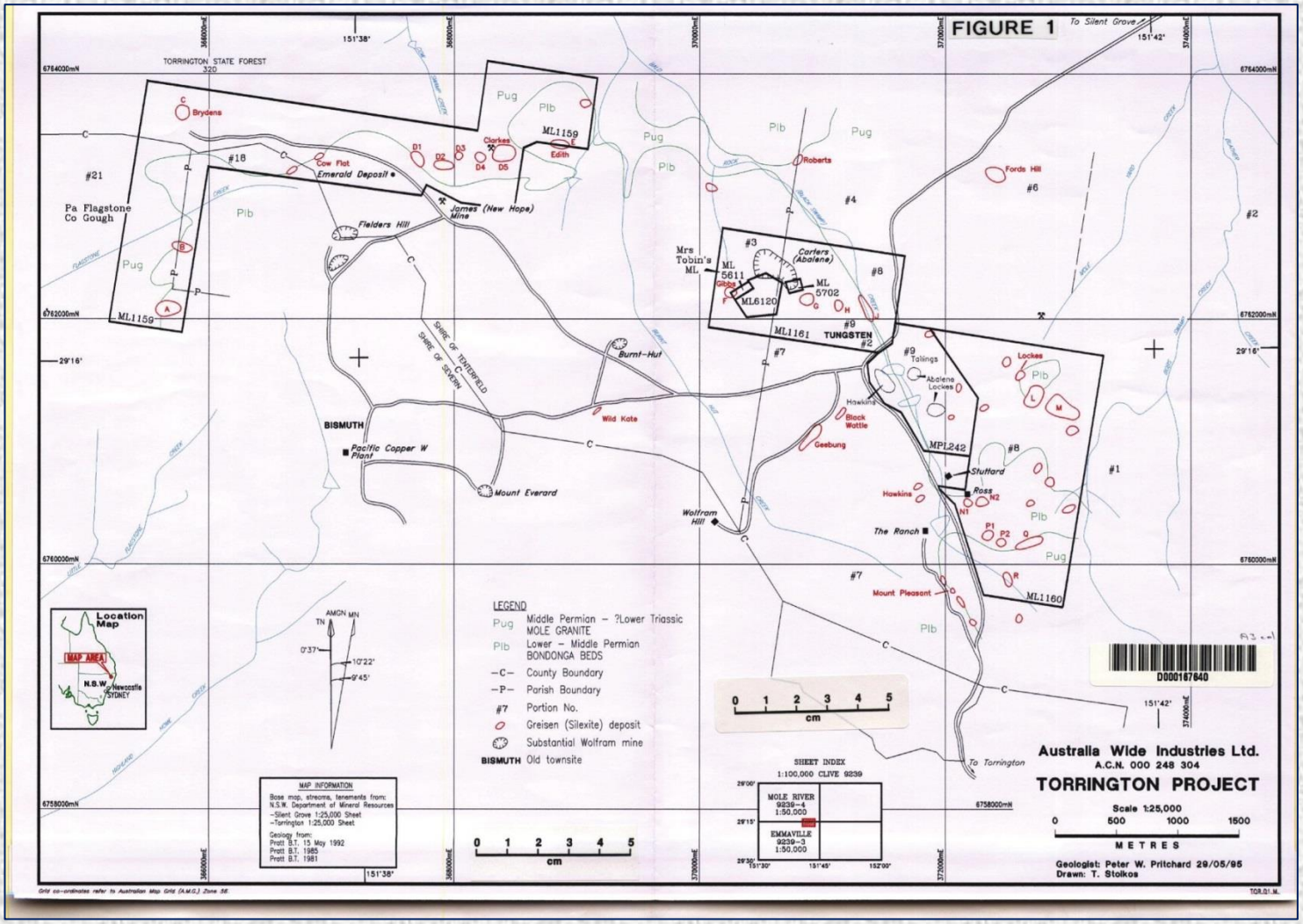
Torrington Silexite Deposit Map 1995

Good detail, on a universal coordinate system (but only in specific areas) and issues exist with the surveying the boundaries of the existing tenements



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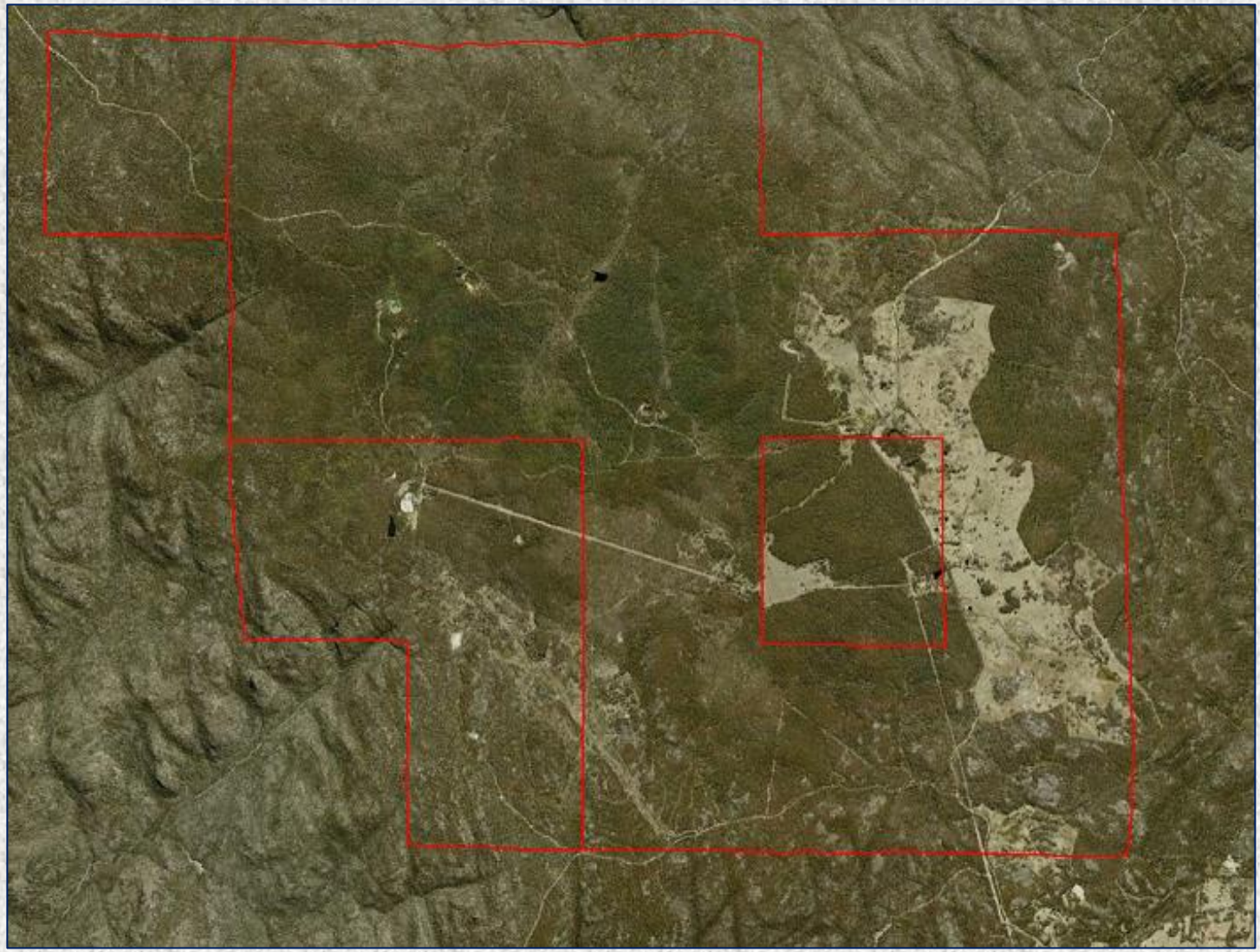
Torrington Map (Google, NSW Globe)

Excellent detail on infrastructure and regional structure with a universal coordinate system but no ground detail due to tree cover.



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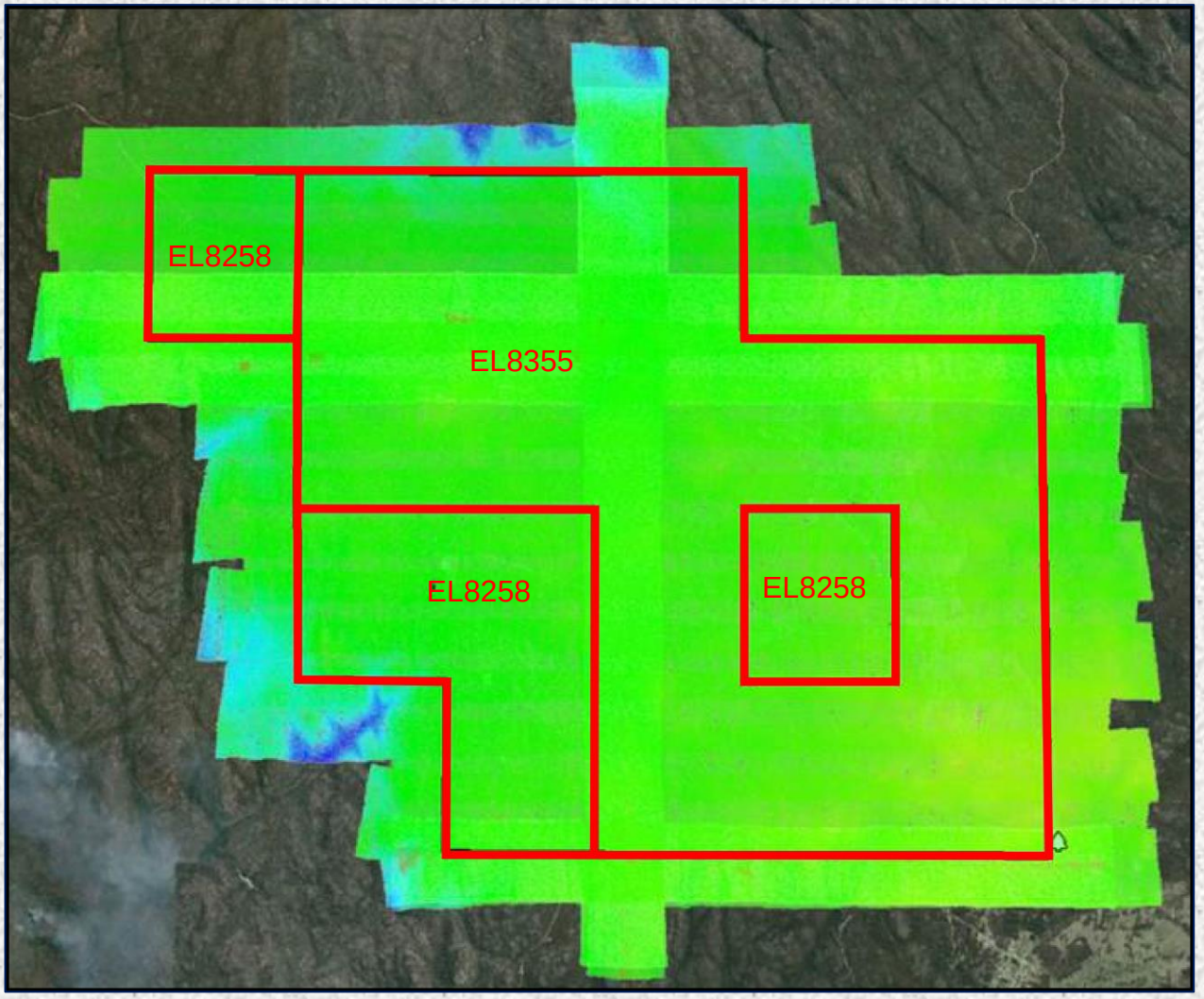
Light Detection And Ranging (LiDAR) Survey

The LiDAR survey was flown on the 12th and 15th March 2015 comprising 15 parallel runs in an east-west direction spaced at 500m intervals at an altitude of approximately 1,000m above ground level. The total survey area was approximately 53km^2. The LiDAR system defined the terrain surface, including in areas of dense vegetation, to an accuracy of 6 cm.



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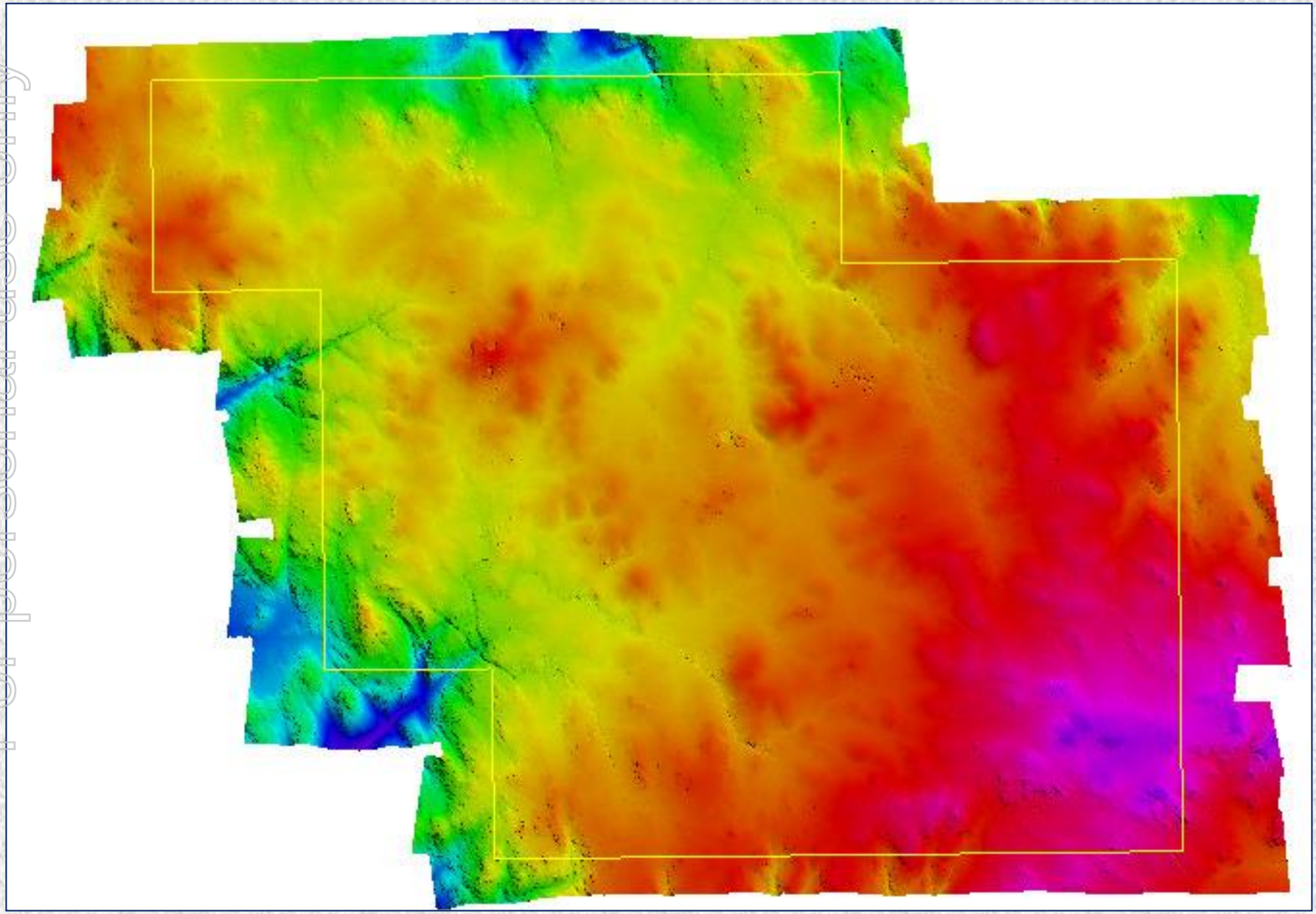
LiDAR Survey (DTM Model)



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Torrington Bathymetric Survey

Bathymetry was acquired during early May 2015 with handheld bathymetric sounding equipment. Data points were acquired at a density of approximately 1 point per 4 square metre, which, in conjunction with previous pit cross sections, allowed contoured surfaces for the pit floors below the water.

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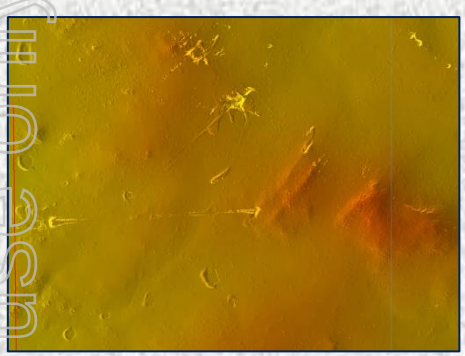
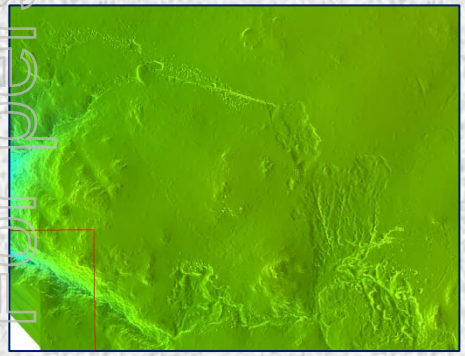
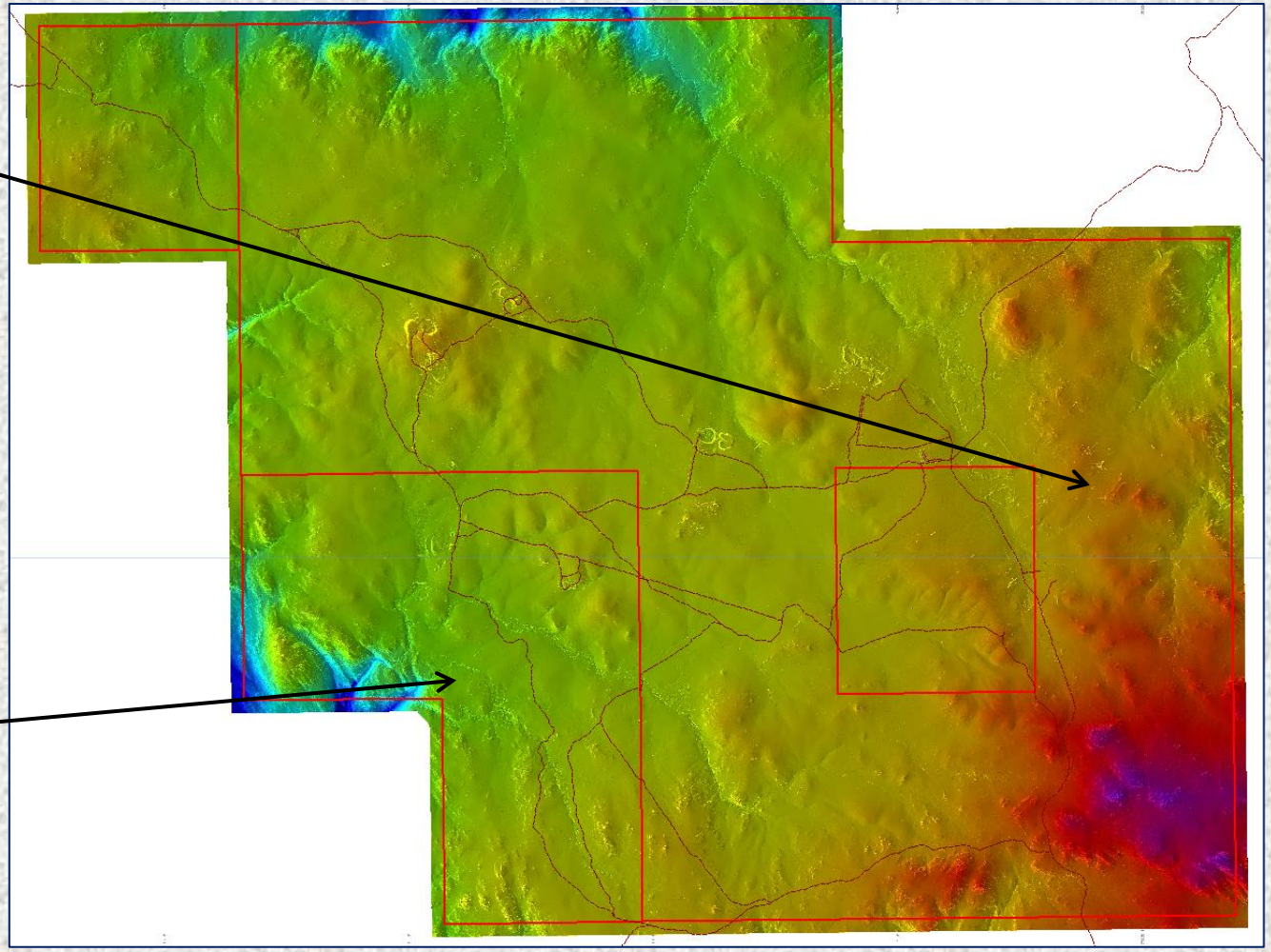
LiDAR Survey False Colour Elevation



Detail historic tramway to workings



Detail historic alluvial workings



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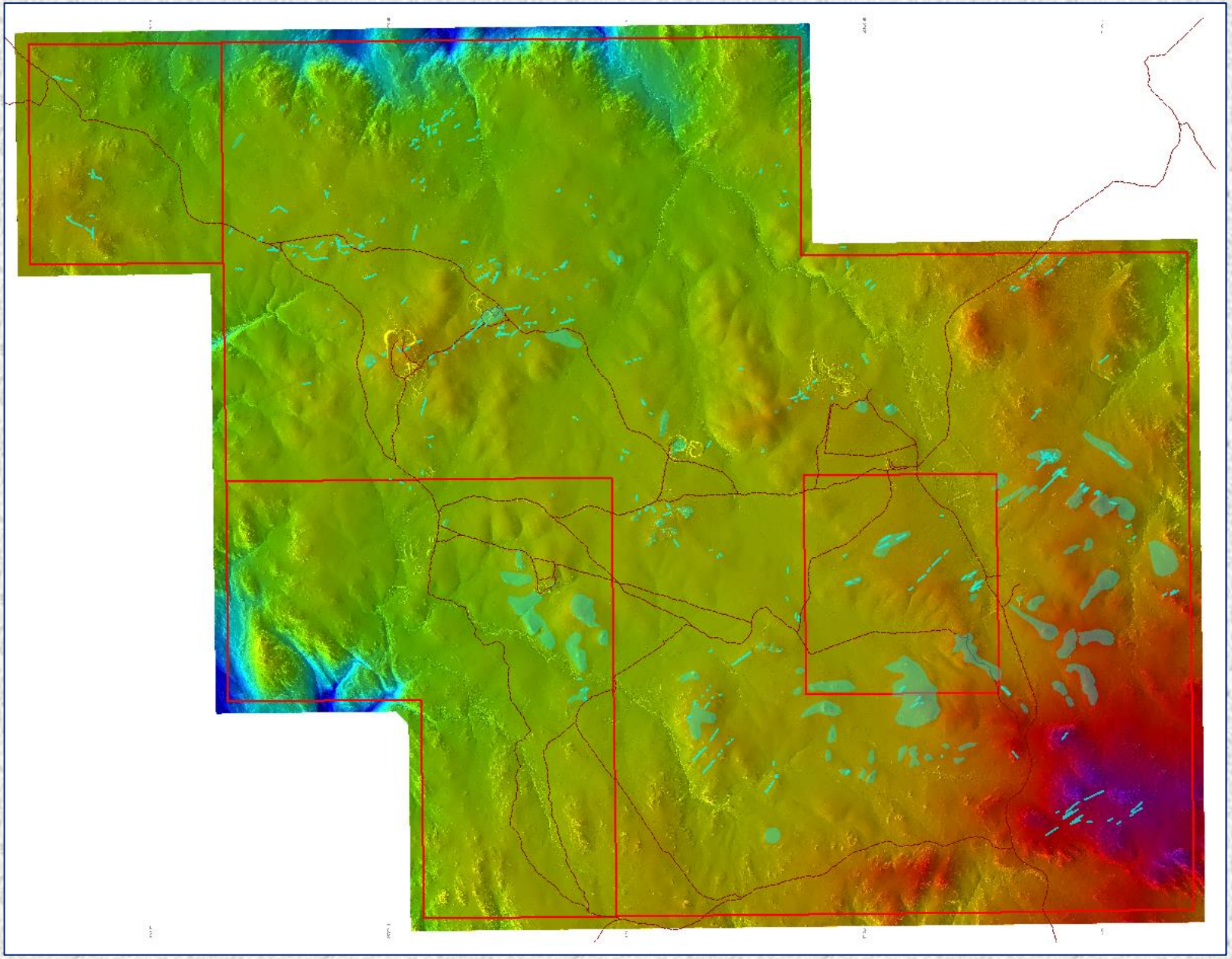
LiDAR Image With Silexite Bodies



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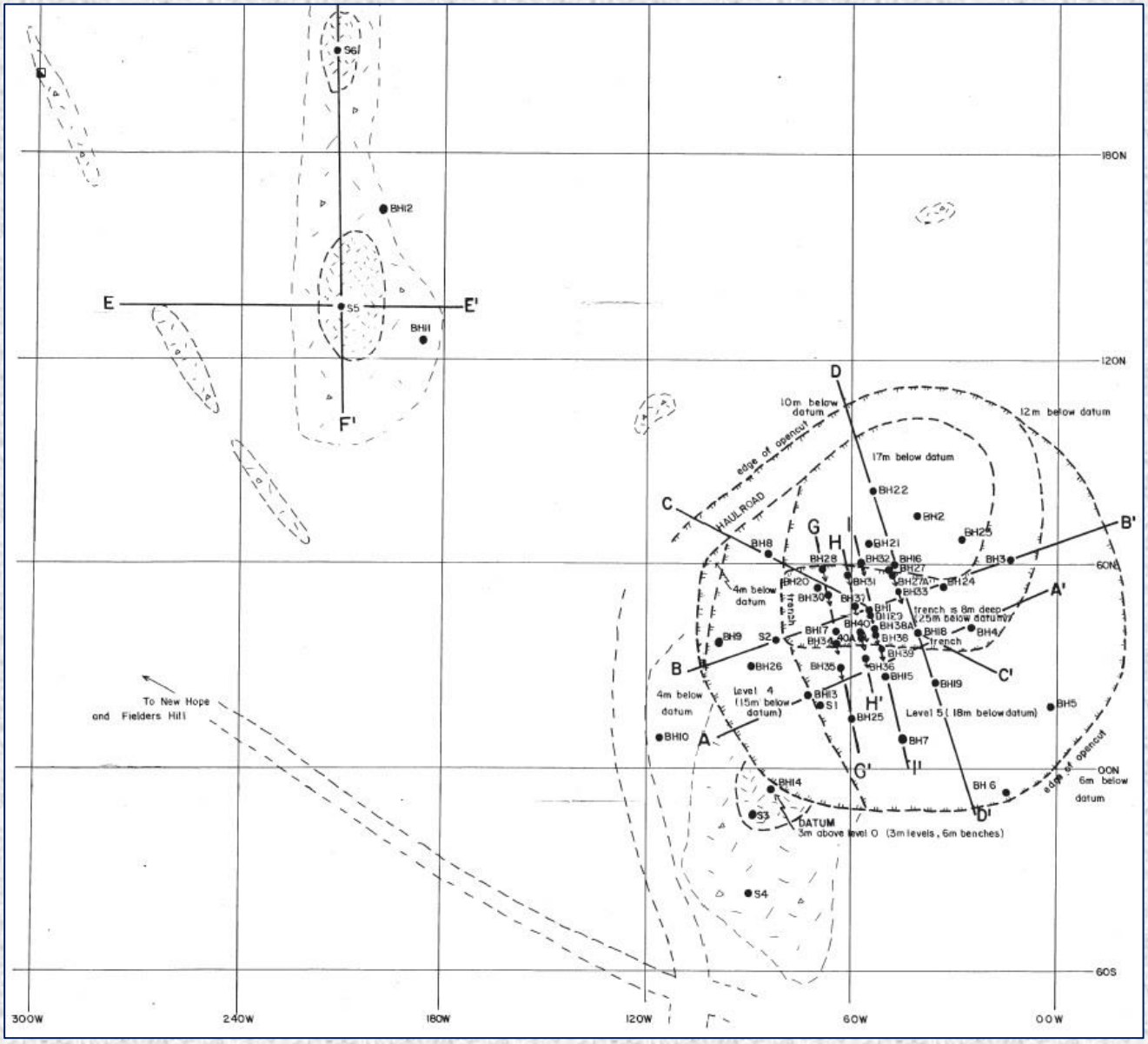
Example 1: Burnt Hut Deposit Map ~ 1981



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Burnt Hut Satellite Image (Google, NSW Globe)

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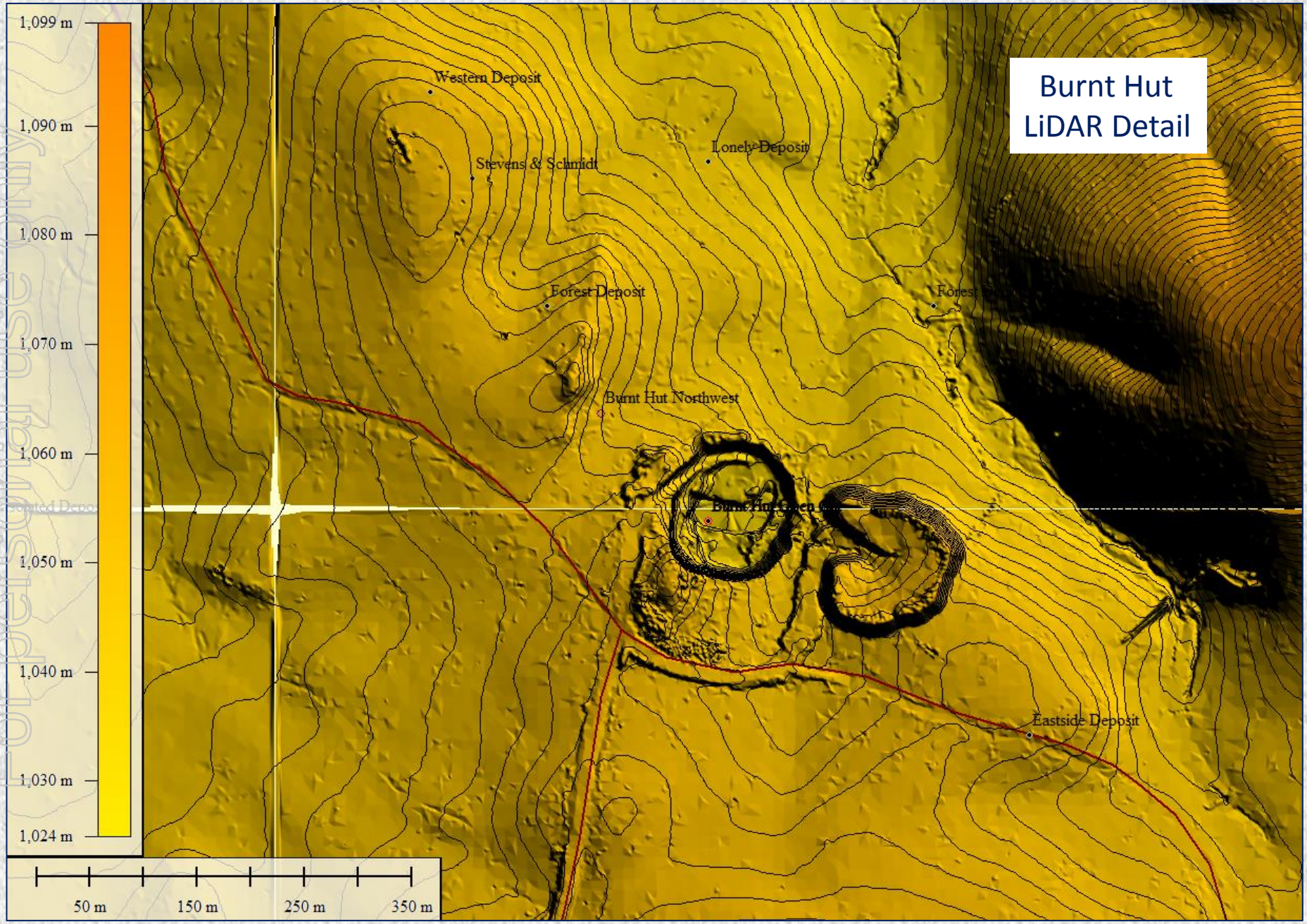
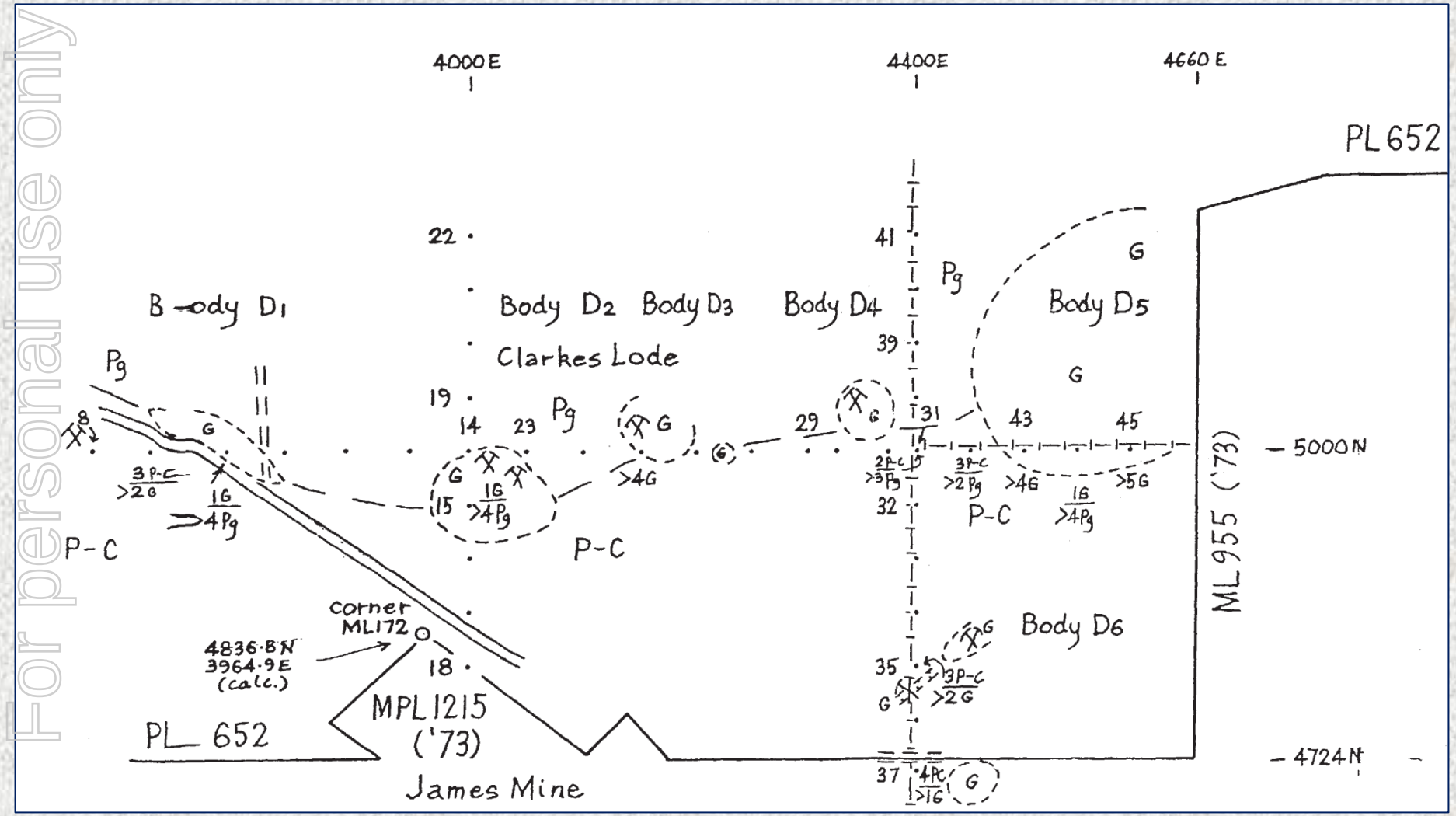

Burnt Hut LiDAR Detail
Western Deposit
Stevens & Schmidt
Lonely Deposit
Forest Deposit
Burnt Hut Northwest
Eastside Deposit
1,099 m
1,090 m
1,080 m
1,070 m
1,060 m
1,050 m
1,040 m
1,030 m
1,024 m
50 m
150 m
250 m
350 m

Example 2: D Bodies Deposit Map ~ 1982



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D Bodies Satellite Image (Google, NSW Globe)

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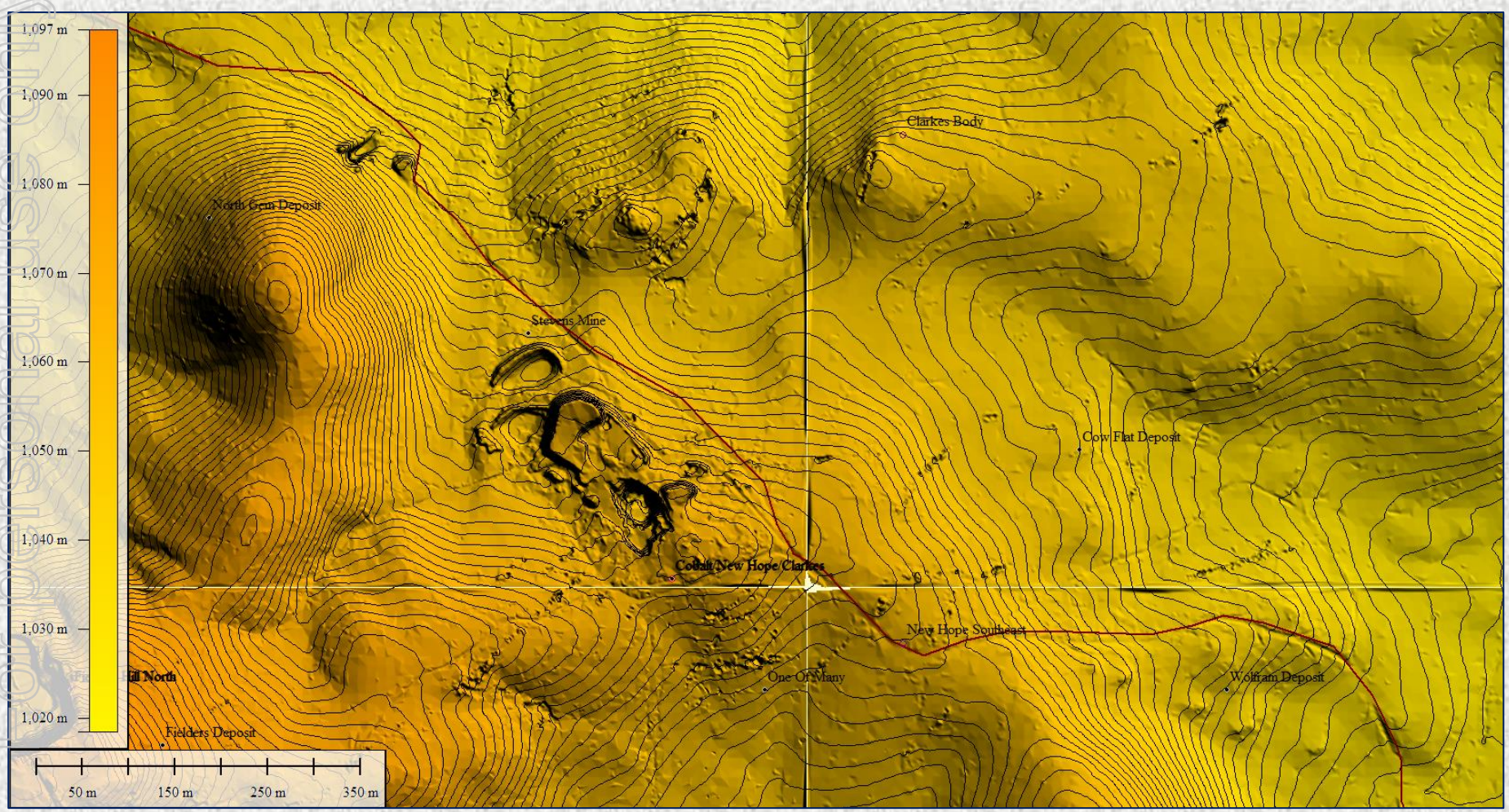
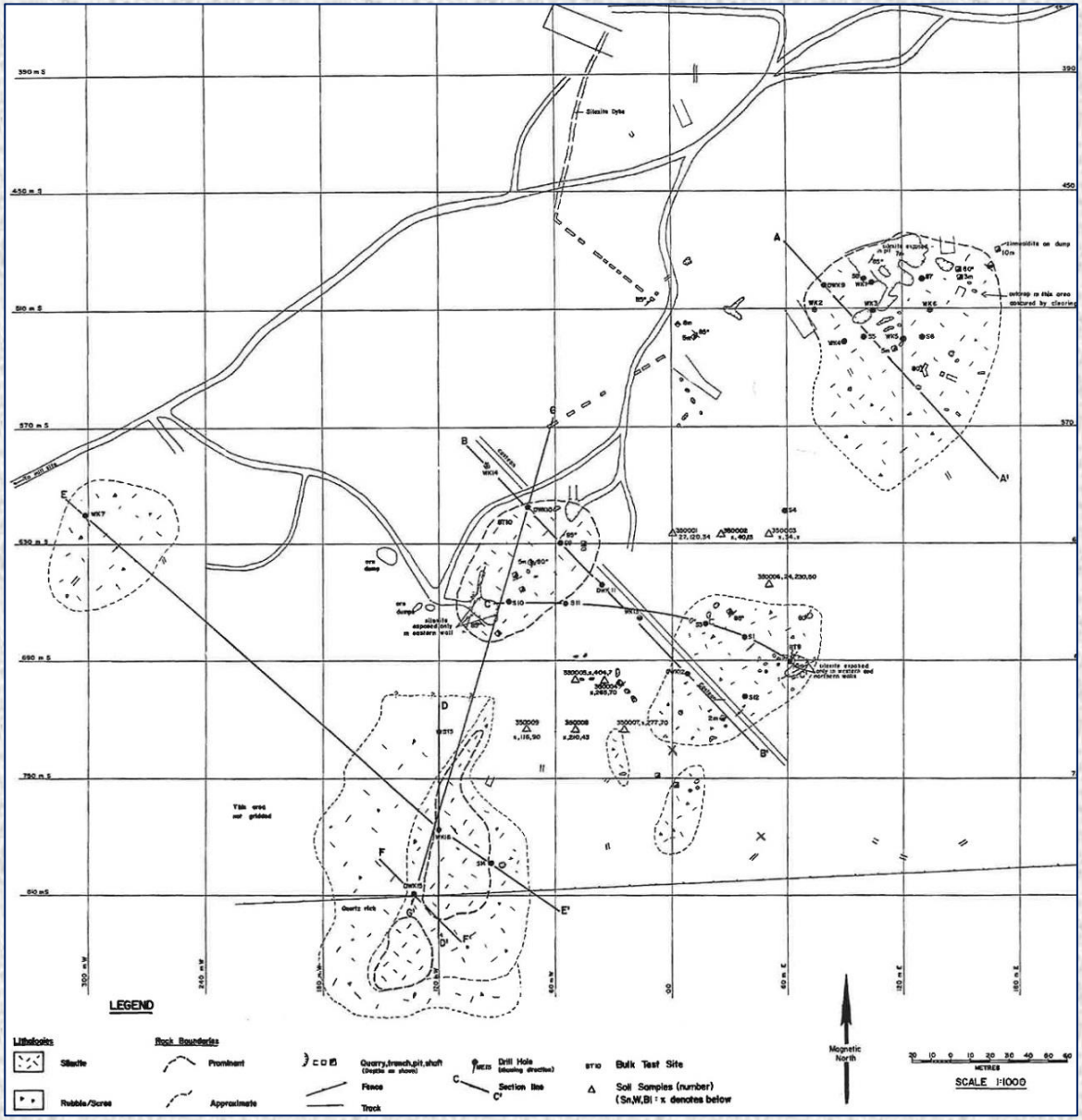
D Bodies LiDAR Detail



Example 3: Wild Kate Deposit Map ~ 1981



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Wild Kate Satellite Image (Google, NSW Globe)

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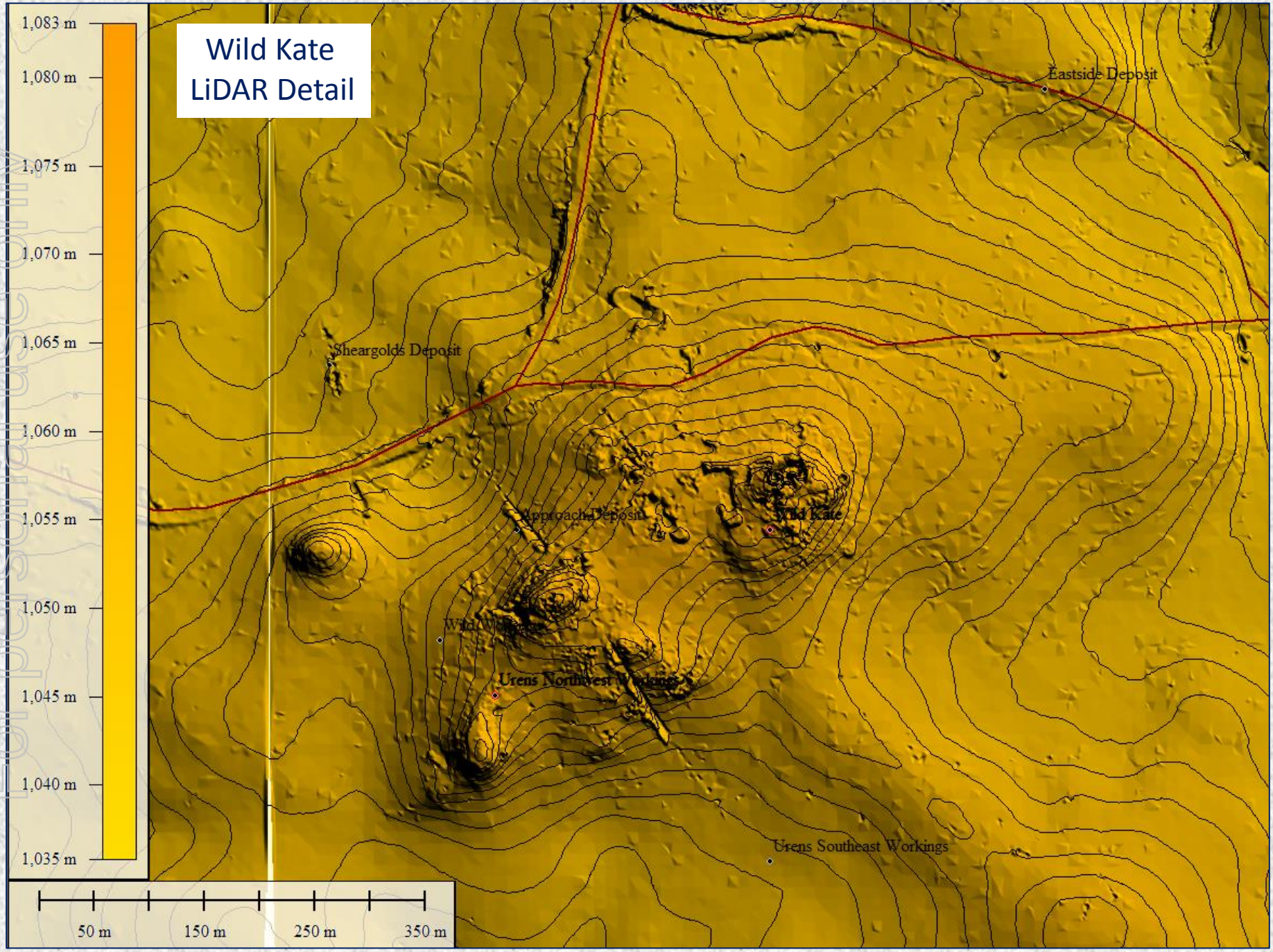
Wild Kate
LiDAR Detail
1,083 m
1,080 m
1,075 m
1,070 m
1,065 m
1,060 m
1,055 m
1,050 m
1,045 m
1,040 m
1,035 m
50 m
150 m
250 m
350 m
Eastside Deposit
Sheargolds Deposit
Approach Deposit
Wild Kate
Urens Northwest Workings
Urens Southeast Workings
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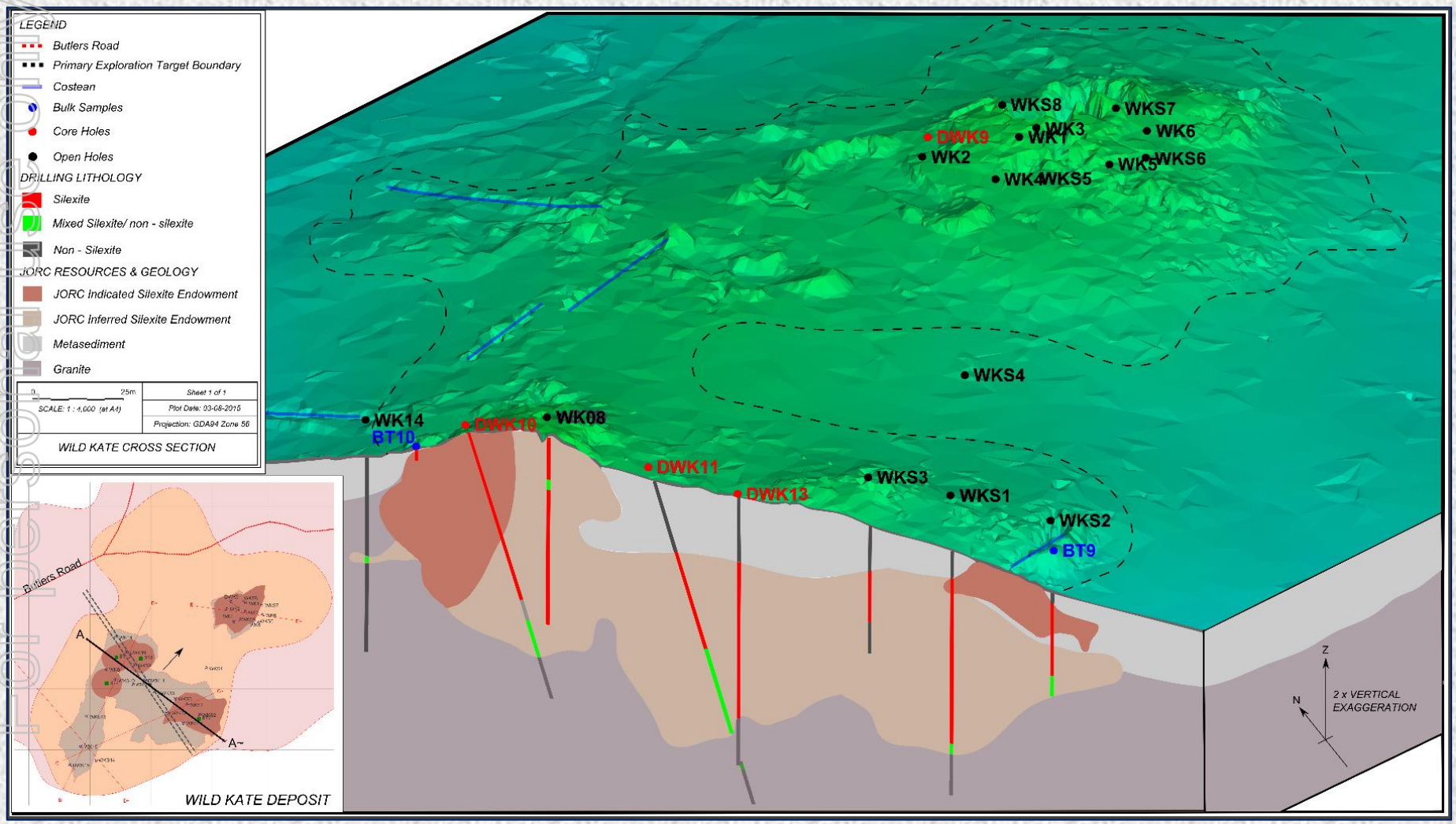
Wild Kate 3D Cross Section



Torrington Resources Update (JORC 2012)

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Original JORC Resource Estimates*

Orebody	Classification	Silexite (t)	Grade (%) W	Tungsten (t)
Wild Kate	Indicated	192,000	0.17	**330**
	Inferred	770,000	0.14	**1,100**
	Total	962,000		**1,430**

New JORC Indicated Resource Estimates*

Orebody	Silexite (t) >0.05 % W(1)	Grade (%) W	Tungsten (t)
Wild Kate	151,310	0.17	257
Wild Kate South	67,126	0.32	215
Wild Kate East (Upper)	77,474	0.20	154
Sub Total	**295,910**		**626**
Mt Everard	126,457	0.16	202
Total (rounded)	**422,000**	0.20	**827**

New JORC Inferred Resource Estimates*

Orebody	Silexite >0.05 % W(1)	Grade (%) W	Tungsten (t)
Wild Kate (exc. Indicated)	941,789	0.17	1,568
Wild Kate East (Lower)	56,093	0.20	93
Sub Total (all Wild Kate)	997,882		**1,661**
Fielders Hill North	134,232	0.21	287
Fielders Hill South	343,596	0.21	736
Burnt Hut	192,393	0.17	336
Mt Everard	55,572	0.16	89
Total (rounded)	1,724,000	0.18	**3,110**

***As reported to the ASX 12/08/2015

Deep Ground Penetrating Radar (DGPR)

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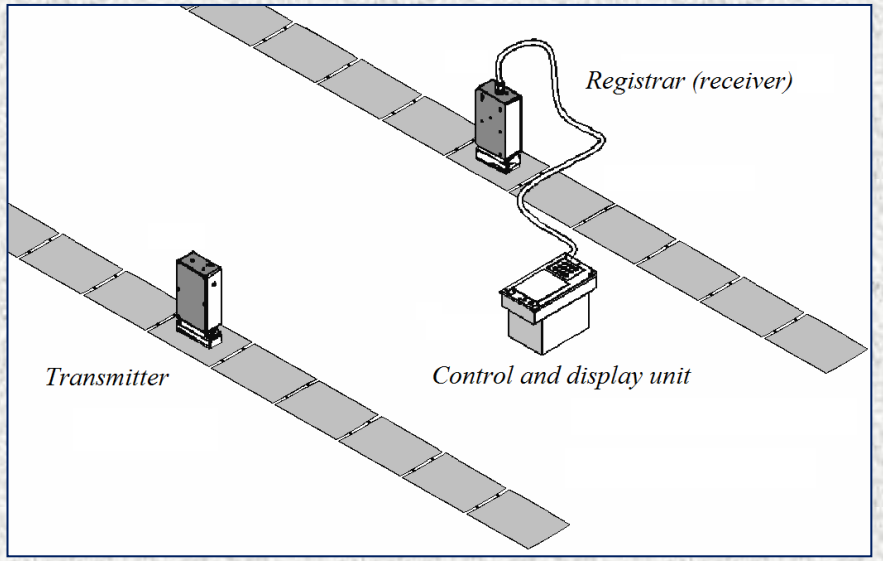
- New Ground Penetrating RADAR (GPR) that can image to several hundred meters depth through a wide range of geological terrain
- Operating principle is based on the transmission of super broadband electromagnetic pulses without spreading to the target(s) and registration of their reflections. Wherever the dielectric changes – a reflection is generated.
- High energy transmission allows mapping is areas of high conductivity, for example in loam or damp clay traditionally ‘off limits’ to conventional GPR (which is limited to ~10m depth).
- High resolution images.
- Depth calibrated through proprietary antennas offsets.
- Profile over rugged terrain (including stockpiles, bush).
- Up to 10 line km per day per crew.

Deep Ground Penetrating Radar (DGPR) Specifications



- Mean radiated power, 50 mW
- Peak pulse voltage, >5.5 kV
- Pulse duration, 3-5 ns
- Repetition rate, 1000 Hz
- Radar potential, 120 dB
- Sensitivity, 200 µV
- Discretisation rate, 1000/500MHz
- Frequency band, 1-50+ MHz
- Dynamic range, >95 dB
- Time resolution, 1, 2, 4 ns
- Registration range, 256,512,1024, 2048, 4096 nS
- Registration cycle (averaging on/off), s:-binary mode 0,2/0.015; -full waveform mode 2,2/0,6
- Operation modes: manual; automatic with period 1s, 2 s, 3s; with user-defined period
- Number of frames (128x256 format): -binary mode>500; -full waveform mode>30 000
- Averaging over shots 16
- Two manual threshold ranges, ± 16dB
- LCD b/w 240*320
- PC connection via RS232
- Data processing PC
- Consumed power, 3, 7 W
- Temperature range, -20 ° to 50° C
- Dimensions (CIU with batteries), 260*150*160 mm

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Deep Ground Penetrating Radar (DGPR)

DPGR typical survey layout

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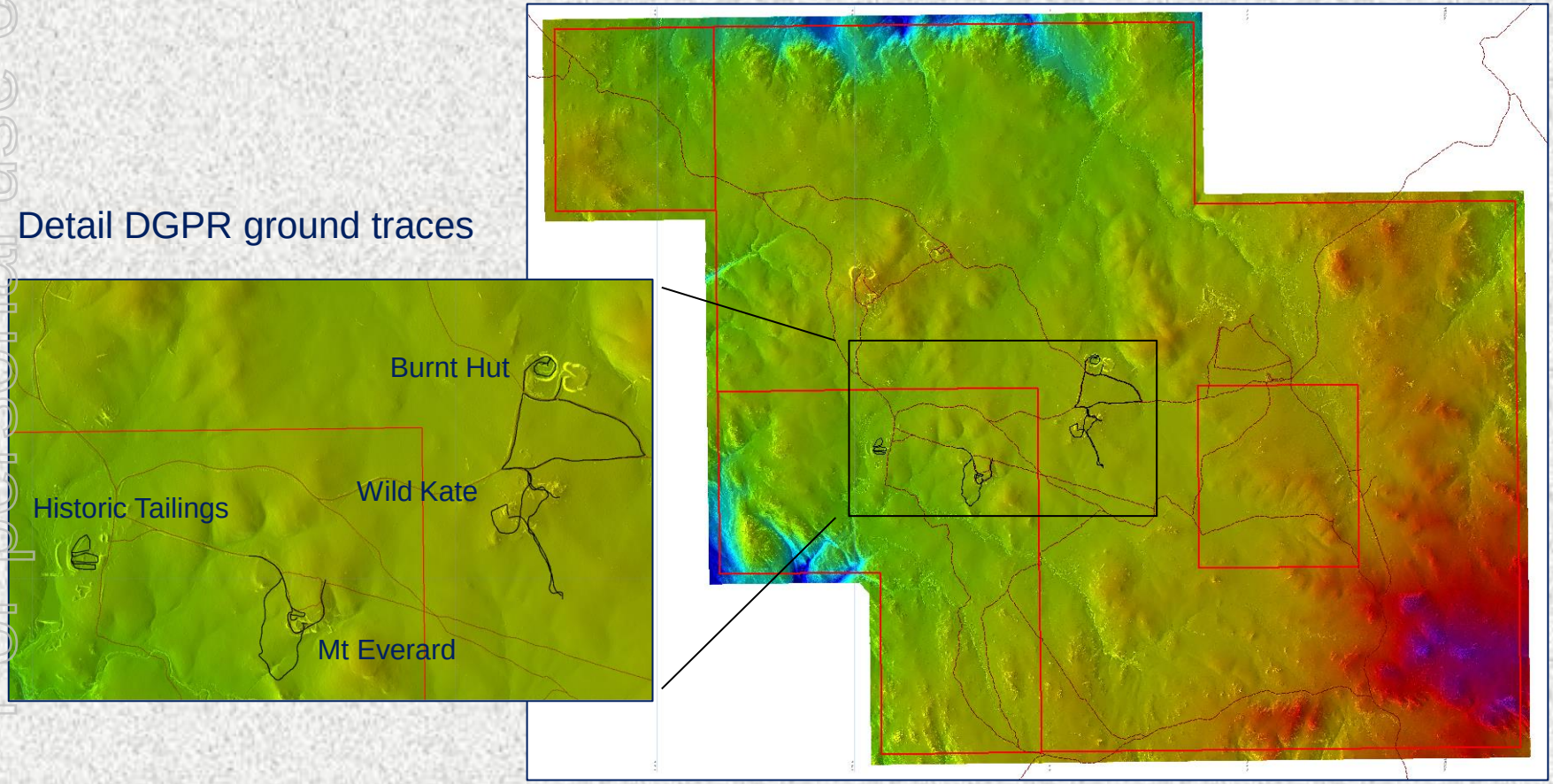
Deep Ground Penetrating Radar (DGPR)

On the 18th/19th June, 2015, a 2 day trial acquisition of DGPR was conducted as part of an exclusive 3 week trial of the DGPR technology in Australia.

Detail DGPR ground traces



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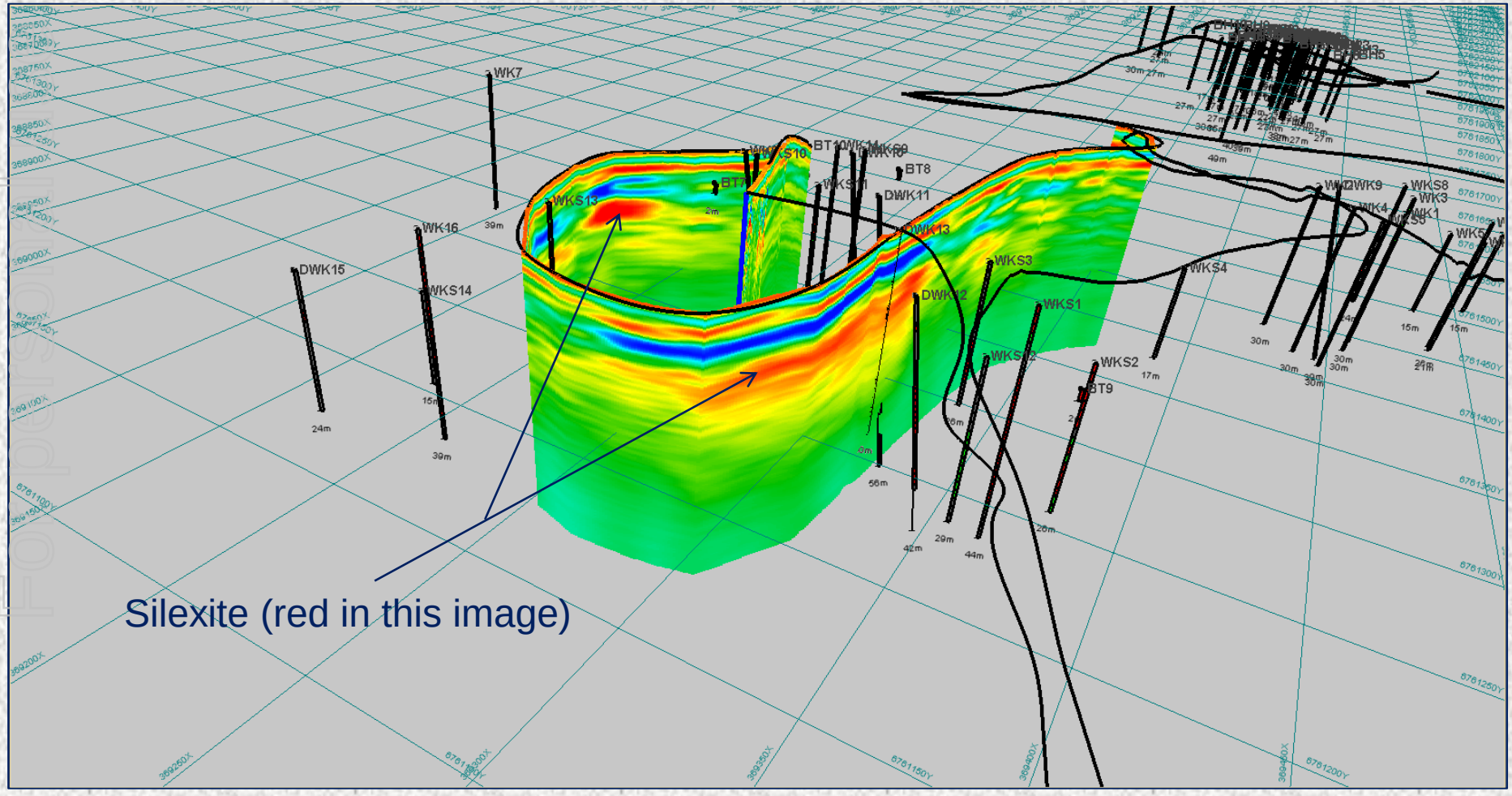
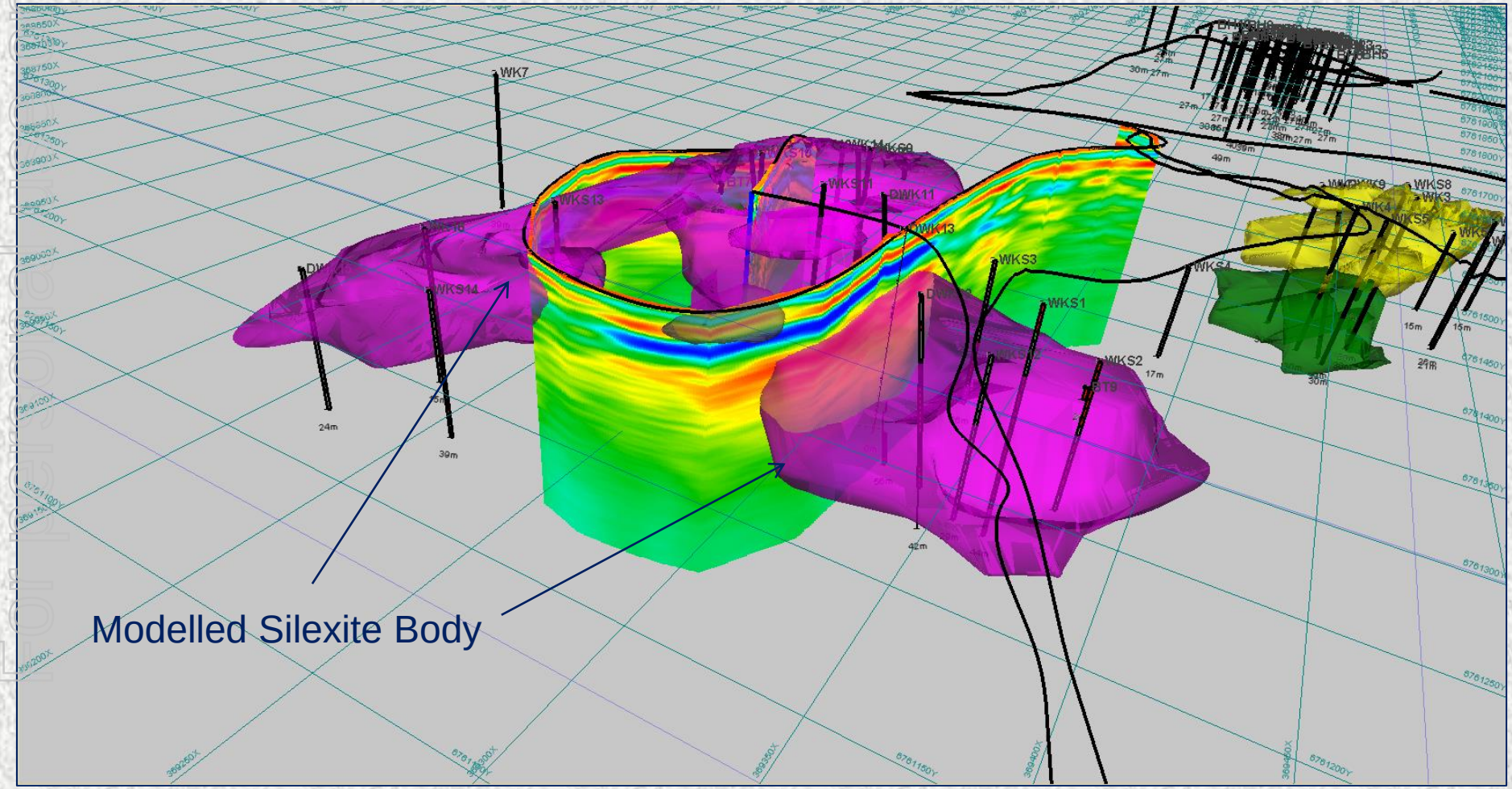
Wild Kate DGPR

The scope of the survey and follow up interpretation was to assess the ability for the DGPR system to successfully image key lithological changes at Torrington. The potential to be able to accurately image the granite basement material would be a useful exploration tool.



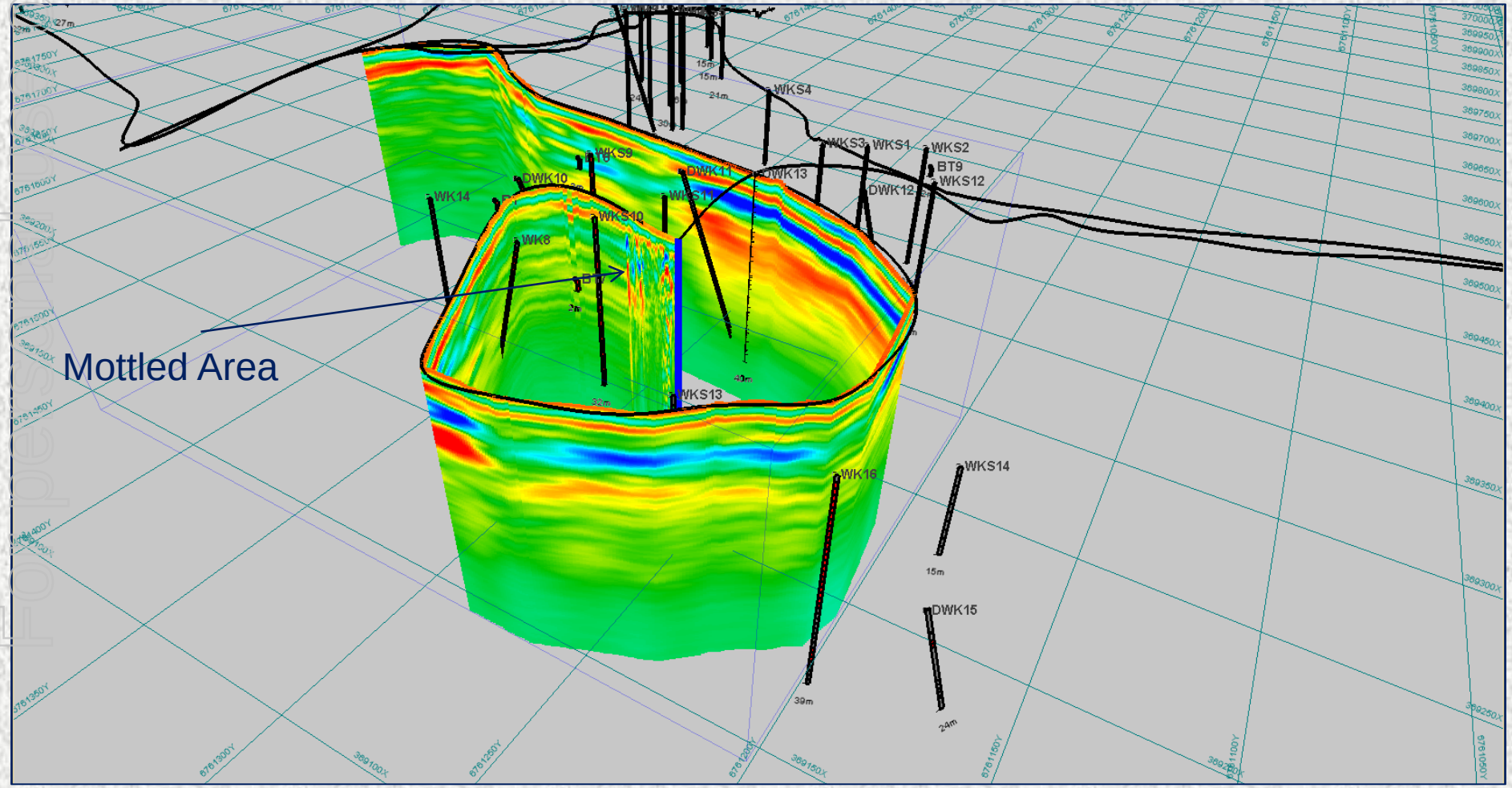
Wild Kate DGPR

How the DGPR trial compared to existing model?



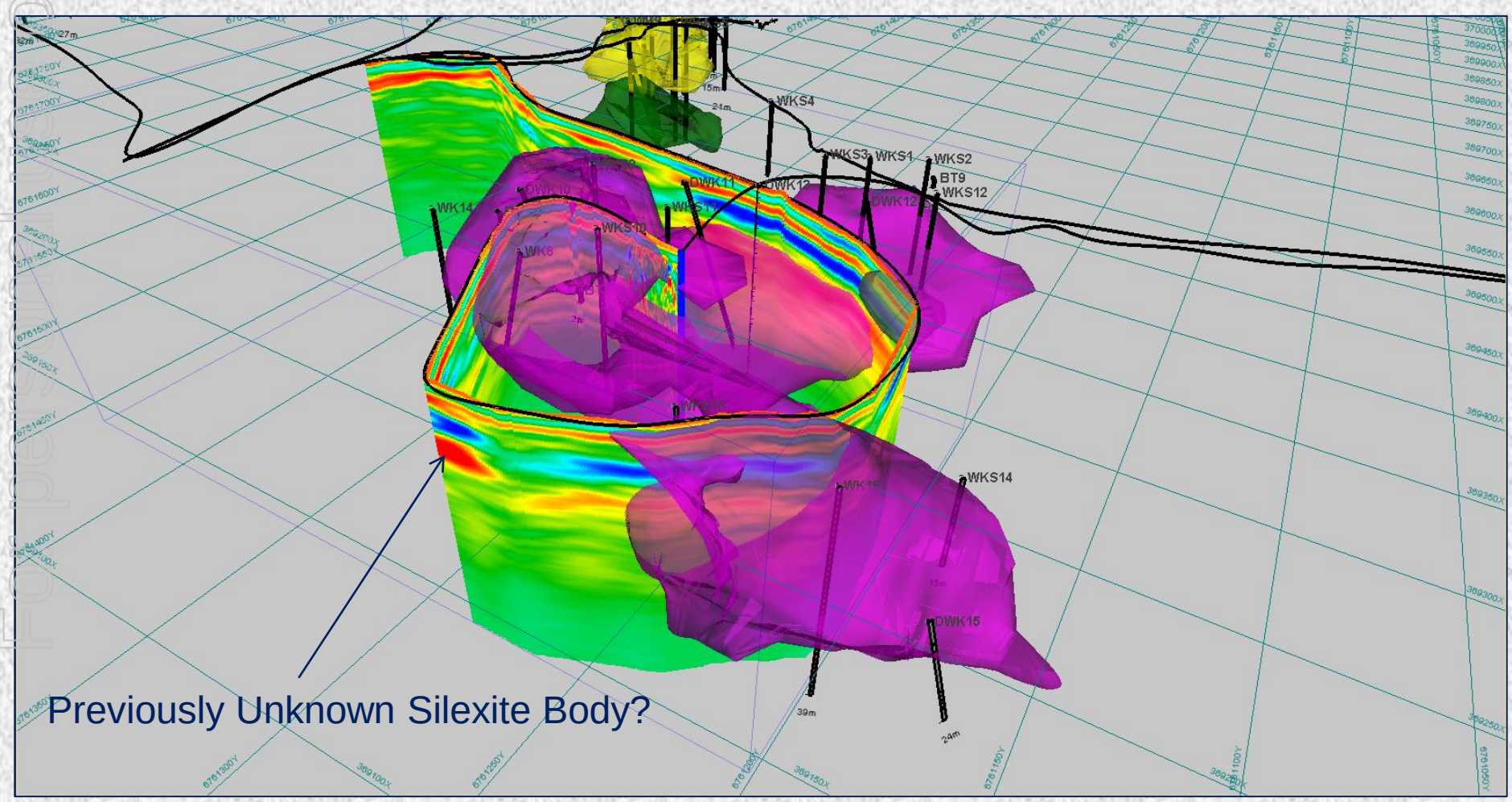
Wild Kate DGPR

The central mottled area is where we dragged the gear over the exposed outcrop, resulting in a different sort of response. This may be due to air gaps over the exposed outcrop



Wild Kate DGPR

Again the red patches (below the blue) are broadly correlative to the modelled orebodies but show that the models need refining after further drilling and correlation to DGPR. The DGPR does seem to illustrate a silling emplacement which reflects our assumptions and those of previous work by Pacific Copper. The DGPR also detected what could be new previously unknown silexite which will need to be confirmed by drilling.



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Competent Persons Statement

I, Gordon Saul, confirm that I am the Competent Person for the Report and:

- I have read and understood the requirements of the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code, 2012 Edition).
- I am a Competent Person as defined by the JORC Code, 2012 Edition, having five years experience that is relevant to the style of mineralisation and type of deposit described in the Report, and to the activity for which I am accepting responsibility.
- I am a Member of the Australian Institute of Geoscientists (Membership 3440)
- I have reviewed the Report to which this Consent Statement applies

I am a consultant and shareholder working for Resolve Geo Pty Ltd, and have been engaged by Krucible Metals to prepare the documentation for the Torrington tungsten and topaz deposit on which the Report is based, for the period ended 31 July 2015. I have disclosed to the reporting company the full nature of the relationship between myself and the company, including any issue that could be perceived by investors as a conflict of interest. Resolve Geo are the previous holders of the tenements prior to acquisition by Krucible and have been retained in a consultant capacity. Resolve Geo Pty Ltd maintain a 15 % shareholding in the tenements at the time of reporting.

I verify that the Report is based on and fairly and accurately reflects in the form and context in which it appears, and the information in my supporting documentation relating to Exploration Targets, Exploration Results & Mineral Resources.

I consent to the release of the Report and this Consent Statement by the directors of Krucible Metals Ltd.

	7th of August, 2015
Signature of Competent Person:	*Date:*
Australian Institute Of Geoscientists	*Membership No. 3440*
Professional Membership	*Membership Number:*
	Mike Skinner, Brisbane, QLD
Signature of Witness:	*Print Witness Name and Residence:*

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THANK YOU

QUESTIONS?

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