**PLUTON RESOURCES LTD**
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# EL29/2006 Lake Cethana
# Interim Report on Future Work

Volume 1 of 1

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## CONTENTS

## 1 Summary


- In EL29/2006 Pluton Resources Ltd has targeted the Cethana Magnetic Anomaly, which has a peak value of 2100nT and dimensions of a bit under 2km X 1km. The anomaly's source is in Cambrian felsic volcanics.
- IP surveying across the magnetic feature has delineated northern and southern chargeability anomalies.
- A total of 1929m of diamond drilling in four holes has tested the magnetic peak and the northern chargeability anomaly. Intervals of high magnetic susceptibility were found to be widespread and substantial thicknesses of hornfels and skarn containing garnet and magnetite are present at depth.
- Very low grade Cu-Au-Ag values were returned from scattered, narrow intervals in all four holes. It appears that no assays of Sn, W, F, etc. were carried out.
- Testing of the northern chargeability anomaly by Sn, W, F, etc. assaying is recommended. Drill testing of the southern chargeability anomaly is also recommended. This southern anomaly contains a fault that may mark a zone in which there was high flow of mineralising fluids.


## 2 Introduction

EL29/2006 Lake Cethana is operated by Pluton Resources Ltd on behalf of itself and its joint venture partners Gujarat NRE Minerals, Southern Ocean Science Pty Ltd and John McDougall. The tenement is located in northern central Tasmania (Figure 1) and straddles Lake Cethana, which is a hydroelectric impoundment on the Forth River. Land classifications within EL29/2006 include State Forest, Regional Reserve, Forestry Tasmania's Management Decision Classification (MDC) Reserve, Informal Reserve and land adjacent to Lake Cethana that is reserved to the Hydro Electric Commission. None of these classifications is necessarily a no-go for mineral exploration though regulatory approval of activities is required. The tenement falls within the Tasmanian Government's Mt Read Special Prospectivity Zone which provides some security for investment.

Up until April, 2012, the joint venture had spent about $712,000 on mineral exploration within the tenement. Most expenditure was on diamond drilling that targeted the Cethana Magnetic Anomaly. As well as targeting the magnetics the drilling targeted chargeability anomalies generated by an IP survey that was carried out across the magnetic anomaly. In addition to the drilling and IP work petrological studies were carried out with the aim of developing an understanding of the alteration styles affecting the Cambrian volcanic and volcaniclastic rocks that are the source of the magnetic and IP anomalies.

This interim report provides a brief summary of the exploration work that has been carried out in the area of EL29/2006 Lake Cethana before and during Pluton's tenure. The basis of the report has been Pluton's annual reports by

McDougall (2008, 2009, 2010, 2011 and 2012). Pluton's digital data base was not inspected. The purpose of this interim report is to identify avenues for further work in EL29/2006.

# 3 Regional setting

## 3.1 Magnetics

As part of their Western Tasmanian Regional Minerals Program (WTRMP) of 2000-2002 Mineral Resources Tasmania, a Tasmanian government agency, collected airborne magnetic, radiometric and electromagnetic data over much of western and northern Tasmania. This survey provided good definition of the Cethana Magnetic Anomaly (Figure 2, Morrison et al, 2003), a feature with a peak value of 2100nT that measures a little under 2km by 1km in size and which is elongated WNW. The anomaly had also been identified by mineral explorers in several previous airborne surveys.

The anomaly is located 2-3 km south of the Devonian-Carboniferous Dolcoath Granite, which is a mineralising granite. Deposits of Sn, W, F, Fe, Au, Mo-Sb-Bi, Cu and Ag-Pb-Zn that occur around the eastern, northern and western margins of the granite are considered to be genetically related to the granite. West of the granite, around Moina, the Bismuth Creek Fault appears to have been a conduit for the mineralising fluids that formed some of the deposits. This fault extends SSE to Lake Cethana where either it, or a splay from it, may have played a part in the genesis of the Cethana Magnetic Anomaly.

## 3.2 Gravity

Leaman and Richardson (2003) applied residual gravity data to determine the subsurface form of the main Devonian-Carboniferous granite intrusions in Tasmania. Their results for the Dolcoath Granite are combined with geology and mineral deposits in Figure 3 (after Morrison et al, 2003) and Figure 4 (after McClenaghan et al, 2008).

The gravity modelling indicates that the Dolcoath Granite is at a shallow depth of about 1 km beneath the Cethana Magnetic Anomaly. Seismic reflection results enhanced the gravity interpretation and led Leaman and Richardson (2003) to conclude that the form of the Dolcoath Granite east of 405,000mE and along its southern face is well defined.

## 3.3 Geology

The Back Peak Beds and the overlying Bull Creek Formation are the oldest rocks in EL29/2006 and both units are of Cambrian age (Figure 4). They are correlated with the Eastern Quartz Phyric Sequence of the Mt Read Volcanics (McClenaghan et al, 2008).

Quartz phyric, volcaniclastic sandstone and siltstone comprise the Back Creek Beds, but lithologies in the Bull Creek Formation are more diverse. They include felsic, feldspar phyric lava and quartz-feldspar-biotite phyric lava and breccia as well as volcaniclastic siltstone, sandstone and conglomerate that were derived from the quartz-feldspar-biotite phyric volcanics.

Siliceous, pebble conglomerate and quartz sandstone (Moina Sandstone) of Ordovician age overly the Cambrian rocks. In turn, the Ordovician rocks may be overlain by thin, non-marine deposits of Tertiary age then basalt and basaltic breccia, also of Tertiary age.

Intrusive as well as extrusive quartz-feldspar-biotite porphyry of Cambrian age occurs in the tenement. Devonian granite intrusions do not outcrop in the tenement, but as noted above interpretation of residual gravity data by Leaman and Richardson (2003) puts the Devonian Dolcoath Granite intrusion at a depth of about 1 km below the Cethana Magnetic Anomaly.

## 4 Previous exploration work

Pluton Resources Ltd has carried out what appears to be a comprehensive literature search and review of previous exploration work in EL29/2006. Pluton's research has not been duplicated and the following notes were largely derived from Pluton's review.

The only historical hard-rock prospect in EL29/2006 was the Campbell's Reward gold prospect. It attracted attention for a decade or so from 1882, but there appears to have been little gold produced though an adit over 73m long was excavated. Gold of high silver content occurred in a narrow kaolin vein that was partly barren.

In more modern times a number of companies have explored the area covered by EL29/2006 starting in 1965 with the Mt Lyell Company who were first to identify the magnetic feature that is here called the Cethana Magnetic Anomaly. Mt Lyell were followed by Comalco, Shell, CRAE and finally RGC in the period through to 1990.

Mt Lyell carried out ground magnetics over the Cethana Magnetic Anomaly and found that peak values were associated with a north-dipping, sheared, quartz-magnetite-chlorite schist on the southern flank of the aeromagnetic feature. Soil samples from the southern flank returned cobalt to 380ppm with anomalous zinc and copper to around 100ppm. Subsequently, Comalco carried out a program of stream sediment sampling in the surrounding district and a program of ground magnetics, mapping and soil sampling over the Cethana Magnetic Anomaly. They found weak zinc anomalism and moderate fluorine anomalism in stream sediments in the vicinity of the Cethana Magnetic Anomaly along with elevated values of copper and zinc in soils over the Cambrian rocks within the anomaly area. Neither Mt Lyell nor Comalco followed up their ground work with drilling.

Shell reanalysed Comalco's soil samples for copper, lead and zinc and found minor copper and lead anomalies over the Cambrian rocks (Smyth, 1981). They also analysed most of Comalco's samples for tin, tungsten, arsenic and bismuth and analysed a limited number of samples for gold. Minor tungsten anomalism was found, but the other elements were not of interest though the detection limit for gold was relatively high at 0.05ppm. Rock chips returned less than 10ppm tin and up to 120ppm tungsten.

Shell put down a vertical percussion hole to 144m near the centre of the Cethana Magnetic Anomaly. The collar was in the quarry where Pluton collared CETD1 (Figure 4). At 54m-144m the hole encountered Cambrian volcanics with magnetic susceptibilities that Shell thought were high enough (1000-7000 X $10^{-6}$ cgs units) to account for the Cethana Magnetic Anomaly. No mineralisation was seen in the chips or indicated by assay. Isolated values of 280ppm copper and 170ppm zinc were encountered at the bottom of the hole.

CRAE interpreted the Cethana Magnetic Anomaly as being due to magnetite-bearing basic volcanics. They did not undertake groundwork over the anomaly and nor did RGC though they had found mildly anomalous gold in stream sediments downstream of the magnetic anomaly.

## 5 Exploration by Pluton Resources Ltd

### 5.1 Induced polarisation

Three lines at a nominal spacing of 150m were IP surveyed using a dipole-dipole array for a total coverage of 5200m (Figures 4, 5). Two zones of elevated chargeability were identified on all three lines and the approximate outlines of the maxima of the two dimensional inversion models for the zones on Line 10150mN are shown in Figure 6.

Modelling of the northern zone indicated a source that dips steeply north. However, the southern zone is less well defined since it has not been closed off to the south. This may not be possible because of the proximity of Lake Cethana. Each zone has a generally north westerly strike similar to the strike of the Bismuth Creek Fault (Figure 5).

### 5.2 Drilling

Four diamond drill holes have been put down by Pluton for a total of 1929m of drilling (Figure 6). Drill hole CETD1 targeted the peak of the magnetic anomaly and intersected Cambrian rocks from 50.9m to the bottom of the hole at 600.9m.

The drill hole made a good intersection with the northern two dimensional chargeability model.

Scattered intervals of high magnetic susceptibility were encountered throughout CETD1 with chlorite-magnetite alteration and magnetite veining becoming continuous at 443.4-600.9m. Spotted hornfels also make an appearance in this lower part of the hole and garnet is present at 528m. Scattered intervals of very low grade copper-gold-silver were encountered at 213-562m with the chalcopyrite usually occurring in veins, commonly with magnetite.

Drill holes CETD2, 3 and 4 specifically targeted the northern chargeability zone with CETD2 making a good intersection with the two dimensional chargeability model. Substantial intervals of high magnetic susceptibility were encountered in CETD2 that reflect both veined and disseminated magnetite. CETD3 mostly penetrated rocks of very low magnetic susceptibility with higher values only appearing near the bottom of the hole where magnetite-bearing veins occur. Garnetiferous skarn occurs near the bottom of the hole at 307-341m depth.

No magnetic susceptibility records for CETD4 were located, but the hole resembles CETD3 in that magnetite was only logged towards the bottom of the hole where there is extensive magnetite-bearing, garnetiferous skarn at 435-622.5m, it being most intensely developed at 477.6-510.5m. Like CETD1 there is a substantial interval of hornfels at the bottom of CETD4. Also like CETD1 there are scattered intervals of very low grade copper-gold-silver in each of CETD2, 3 and 4. The highest grade copper intersections in each of the four drill holes are shown in Figure 6.

### 5.3 Petrology

Ashley Petrographic Services (in McDougall 2009, 2011) described four samples from CETD1, five samples from CETD2 and twenty nine field samples. The latter were mostly collected from along the Lorinna Road north of the magnetic anomaly and from the shores of Lake Cethana west of the anomaly. Ashley found that within the anomaly a multistage alteration sequence has been superimposed on the primary volcanic and volcaniclastic textures.

Early hydrothermal alteration of the primary materials produced an assemblage of fine grained quartz, chlorite and sericite that exhibits a foliation due to the alignment of layer silicates. Subsequently a thermal metamorphic overprint was imposed with the development of disseminated fine grained, randomly oriented biotite together with magnetite, pyrite and trace chalcopyrite. Intervals of abundant magnetite suggest metasomatic introduction of materials. Unfortunately, no samples from the skarn intervals in CETD3 and CETD4 were described.

This sequence of textural events is consistent with the metamorphic overprint being a consequence of the intrusion of the Dolcoath Granite (Figure 6) and the foliation being due to the pre-granite, early Devonian deformation that is a feature of Tasmanian geology. McDougall, Corbett (in McDougall, 2010) and Van Dongen (in McDougall, 2011) make a different interpretation of the textural evolution and argue for a porphyry copper-gold system related to the Cambrian Dove Granite, which outcrops 3 km south of the Cethana Magnetic Anomaly.

Ashley (in McDougall, 2011) counters that the intense fracturing of a high fluid pressure porphyry copper-gold system is not evident and that the biotite-magnetite alteration is pervasive rather than fracture related. It is noted that Leaman and Richardson (2003) had the support of both residual gravity data and reflection seismic data to give confidence to their interpretation of the form of the Dolcoath Granite that is shown in Figure 6. It is also noted that magnetite skarn is a feature of Devonian-Carboniferous granite-related mineralisation in north western and western Tasmania, notably around the Housetop Granite (Figure 2) and the Meredith Granite.

## 6 Future work

Whatever its genetic relations, the copper-gold-silver mineralisation that has been intersected by CETD1-4 is of very low grade. To drill deeper than 600 m in the northern chargeability zone for these metals without better encouragement would be courageous. However, the southern chargeability zone remains to be tested and offers the chance of better copper-gold-silver intersections at shallower depth. It would be advantageous if the southern zone could be better defined, but the proximity of Lake Cethana probably prevents this from being achieved. Therefore, the feature as presented in Figure 6 is the target.

No tin, tungsten, fluorine, etc. results are given in McDougall (2008-2012). If no results are recorded in Pluton's digital data base there should be test assaying for these elements, particularly of the skarn intervals in CETD3 and CETD4. Ultra violet lamping for scheelite would be a useful preliminary procedure.

Van Dongen (in McDougall, 2011) notes that whether Cambrian or Devonian the magnetite bodies represent zones of high fluid flow that have probably exploited pre-existing structures. With this in mind it is recommended that of the two options for CETD5 given in Figure 6 the hole directed south towards the fault should be drilled. It is likely that the fault is either the Bismuth Creek Fault or a related splay structure. As previously observed the Bismuth Creek Fault acted as a conduit for mineralising fluids at Moina.

## 7 References

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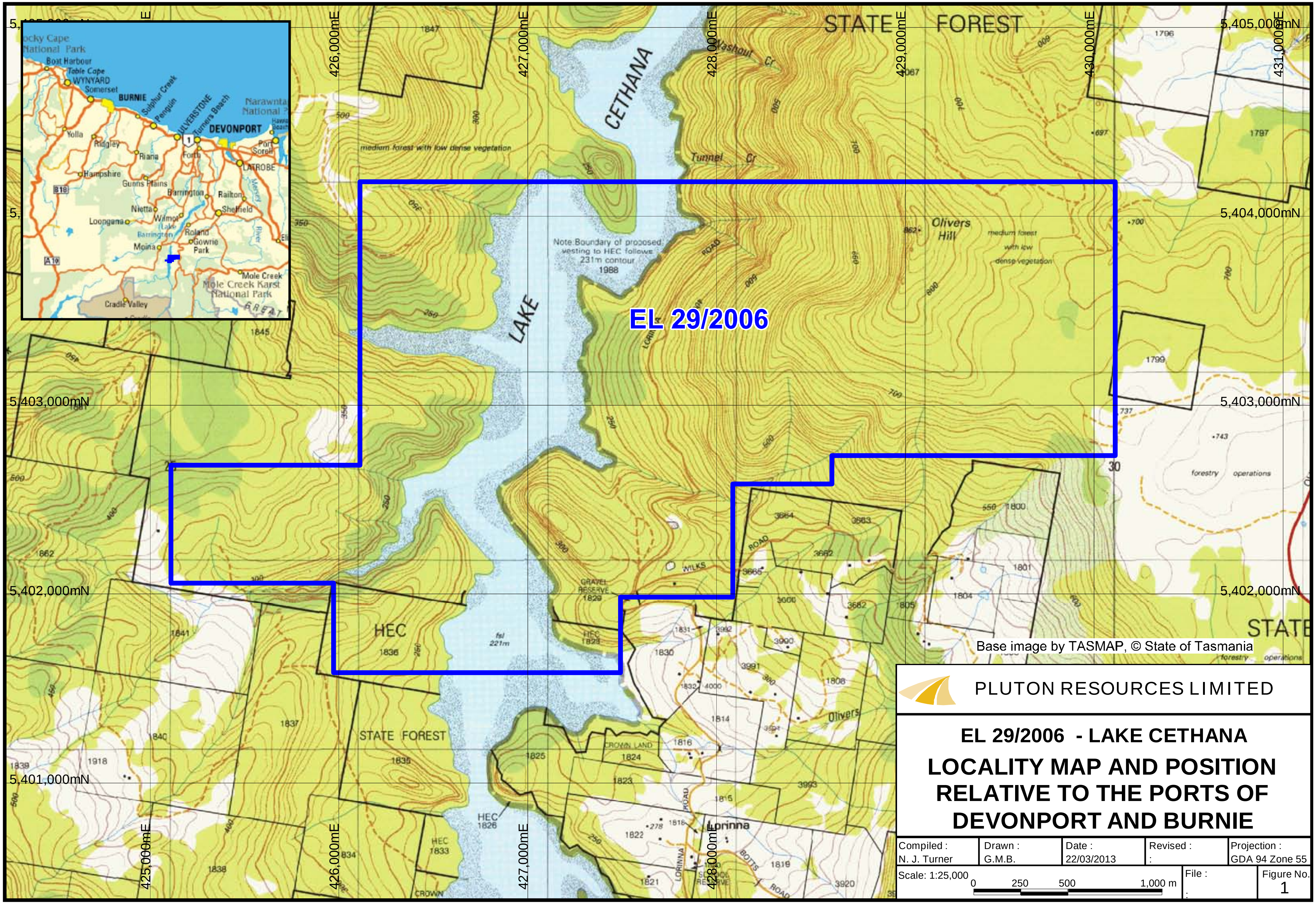


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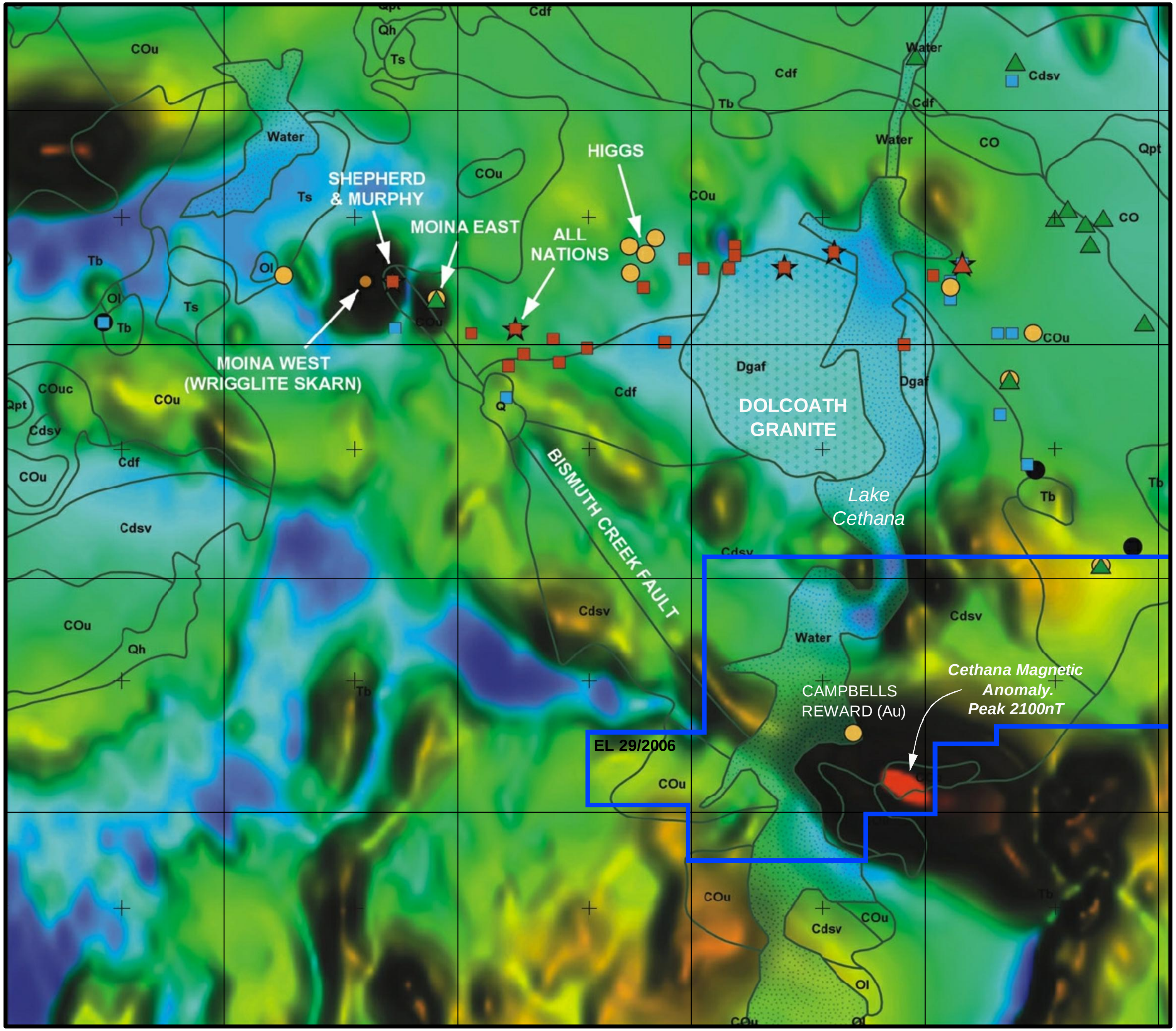
**EL 29/2006 - LAKE CETHANA**

**LOCALITY MAP AND POSITION RELATIVE TO THE PORTS OF DEVONPORT AND BURNIE**

| Compiled : | Drawn : | Date : | Revised : | Projection : |
|---|---|---|---|---|
| N. J. Turner | G.M.B. | 22/03/2013 | : | GDA 94 Zone 55 |

Scale: 1:25,000 — 0 250 500 1,000 m | File : | Figure No. 1




Legend

- Ag, Pb, Zn
- Au
- Cu
- W
- Sn
- Fe
- Fl
- Mo, Sb, Bi
- Outcropping Devonian granite
- Water
- 1:250 000 scale geology unit outline (see Geology of NW Tasmania map for unit descriptions)

Magnetic HIGH

(with overhead illumination)

Magnetic LOW

DATUM: GDA94 ZONE 55

SOURCE:
Mineral Resources Tasmania
Western Tasmanian Regional Minerals Program
Devonian Granite Aureoles Project

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**EL29/2006 - LAKE CETHANA**

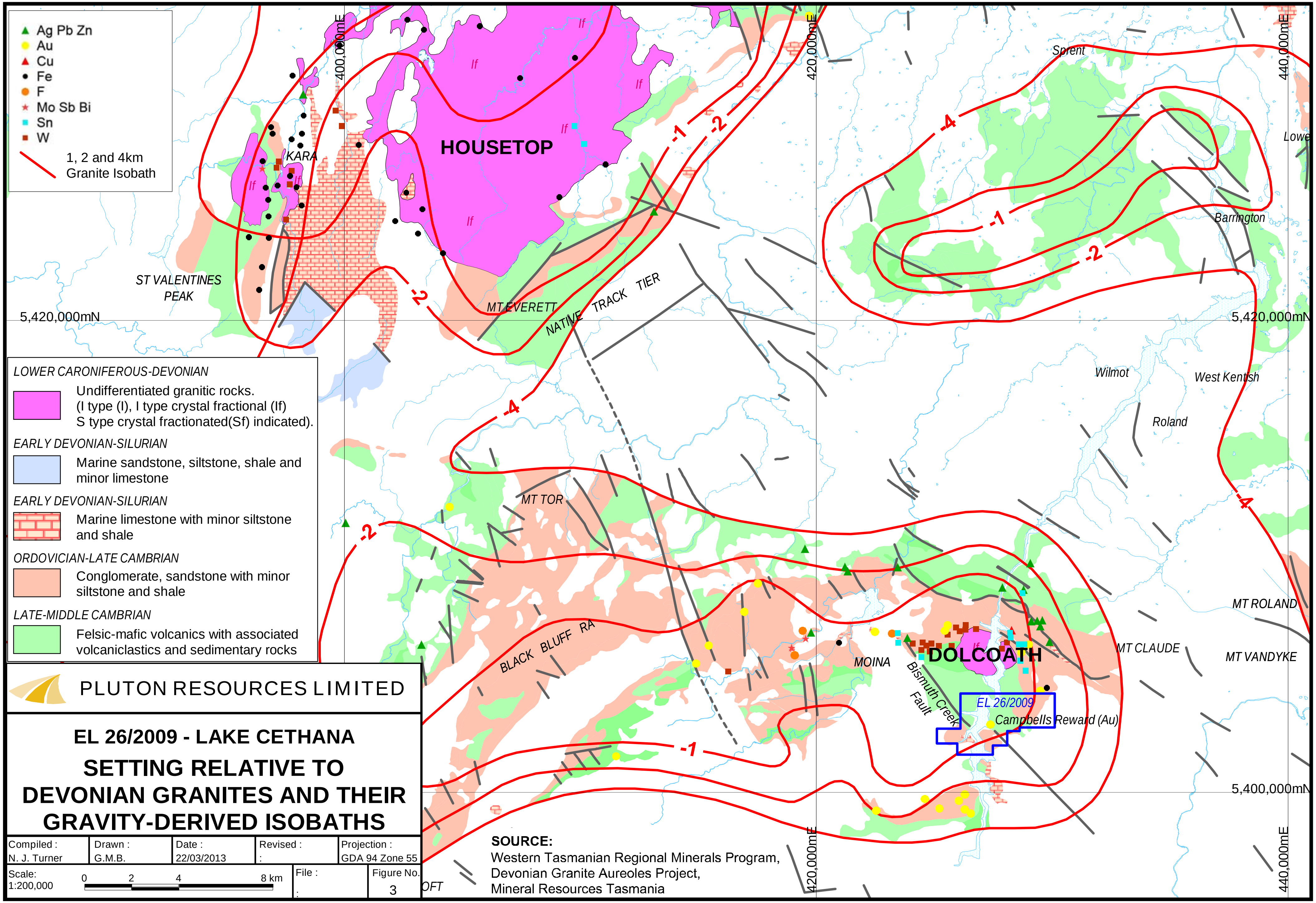
## MOINA AREA

# TOTAL MAGNETIC INTENSITY

**Image by Reed, 2003**

| Compiled: | Drawn : | Date : | Revised : | Projection : |
|---|---|---|---|---|
| N. J. Turner | G.M.B. | 22/03/2013 | : | GDA94 Zone 55 |

| Scale: | | File : | Figure No. |
|---|---|---|---|
| 1:50,000 | 0 750 1,500m | . | 2 |

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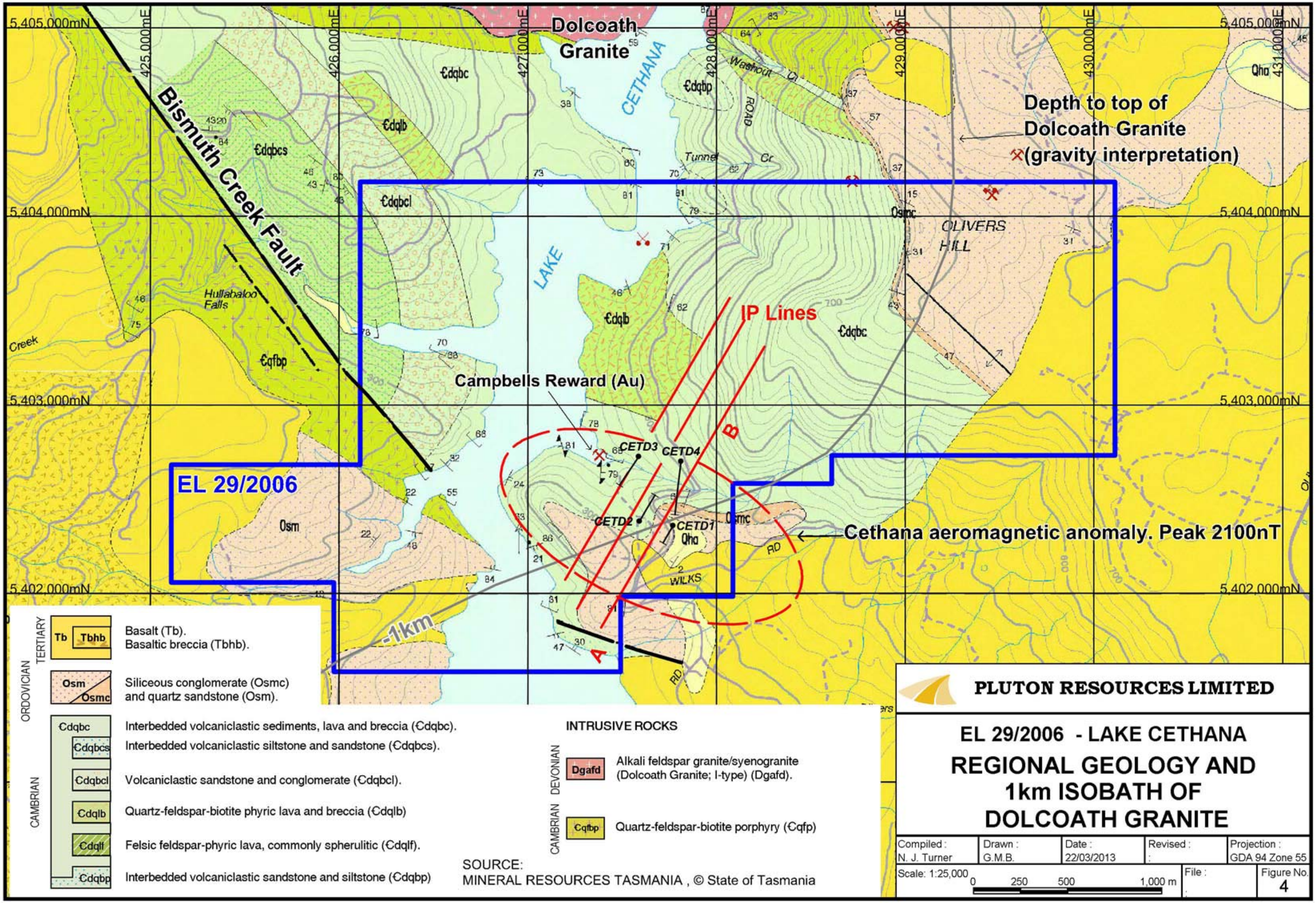
## EL 26/2009 - LAKE CETHANA

## SETTING RELATIVE TO DEVONIAN GRANITES AND THEIR GRAVITY-DERIVED ISOBATHS

| Compiled : | Drawn : | Date : | Revised : | Projection : |
|---|---|---|---|---|
| N. J. Turner | G.M.B. | 22/03/2013 | : | GDA 94 Zone 55 |

| Scale: 1:200,000 | 0 2 4 8 km | File : | Figure No. 3 |
|---|---|---|---|



Dolcoath Granite
Bismuth Creek Fault
CETHANA
LAKE
Washout Cr
ROAD
Tunnel Cr
Depth to top of
Dolcoath Granite
(gravity interpretation)
OLIVERS HILL
Hullabaloo Falls
Creek
IP Lines
Campbells Reward (Au)
CETD1
CETD2
CETD3
CETD4
A
B
EL 29/2006
Cethana aeromagnetic anomaly. Peak 2100nT
WILKS
RD
-1km
5,405,000mN
5,404,000mN
5,403,000mN
5,402,000mN
425,000mE
426,000mE
427,000mE
428,000mE
429,000mE
430,000mE
431,000mE
TERTIARY
Tb Tbhb
Basalt (Tb).
Basaltic breccia (Tbhb).
ORDOVICIAN
Osm Osmc
Siliceous conglomerate (Osmc) and quartz sandstone (Osm).
CAMBRIAN
Ꞓdqbc
Interbedded volcaniclastic sediments, lava and breccia (Ꞓdqbc).
Ꞓdqbcs
Interbedded volcaniclastic siltstone and sandstone (Ꞓdqbcs).
Ꞓdqbcl
Volcaniclastic sandstone and conglomerate (Ꞓdqbcl).
Ꞓdqlb
Quartz-feldspar-biotite phyric lava and breccia (Ꞓdqlb)
Ꞓdqlf
Felsic feldspar-phyric lava, commonly spherulitic (Ꞓdqlf).
Ꞓdqbp
Interbedded volcaniclastic sandstone and siltstone (Ꞓdqbp)
INTRUSIVE ROCKS
DEVONIAN
Dgafd
Alkali feldspar granite/syenogranite (Dolcoath Granite; I-type) (Dgafd).
CAMBRIAN
Ꞓqfbp
Quartz-feldspar-biotite porphyry (Ꞓqfp)
SOURCE:
MINERAL RESOURCES TASMANIA , © State of Tasmania
PLUTON RESOURCES LIMITED
EL 29/2006 - LAKE CETHANA
REGIONAL GEOLOGY AND
1km ISOBATH OF
DOLCOATH GRANITE
Compiled : N. J. Turner
Drawn : G.M.B.
Date : 22/03/2013
Revised :
Projection : GDA 94 Zone 55
Scale: 1:25,000
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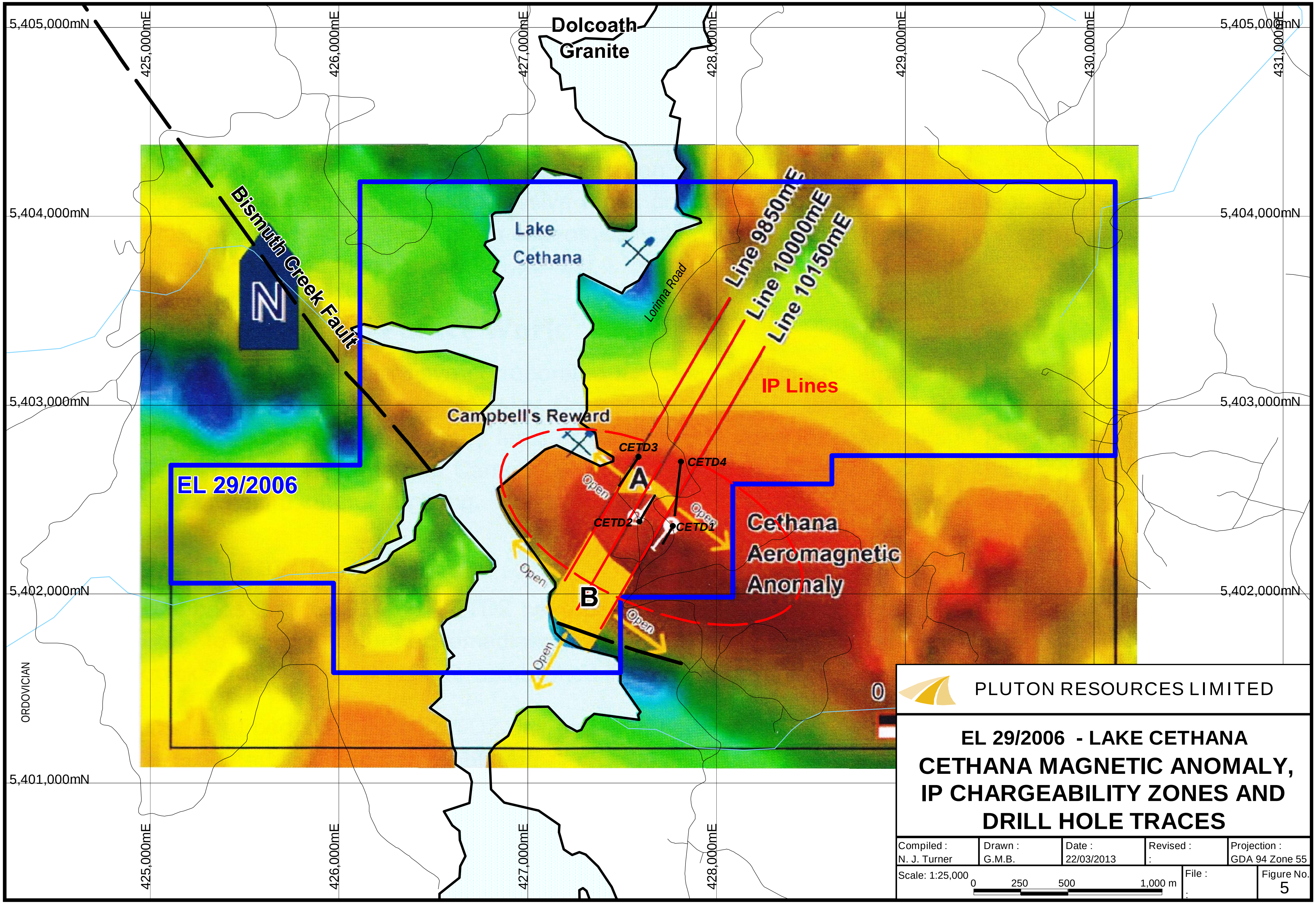
File :
Figure No. 4

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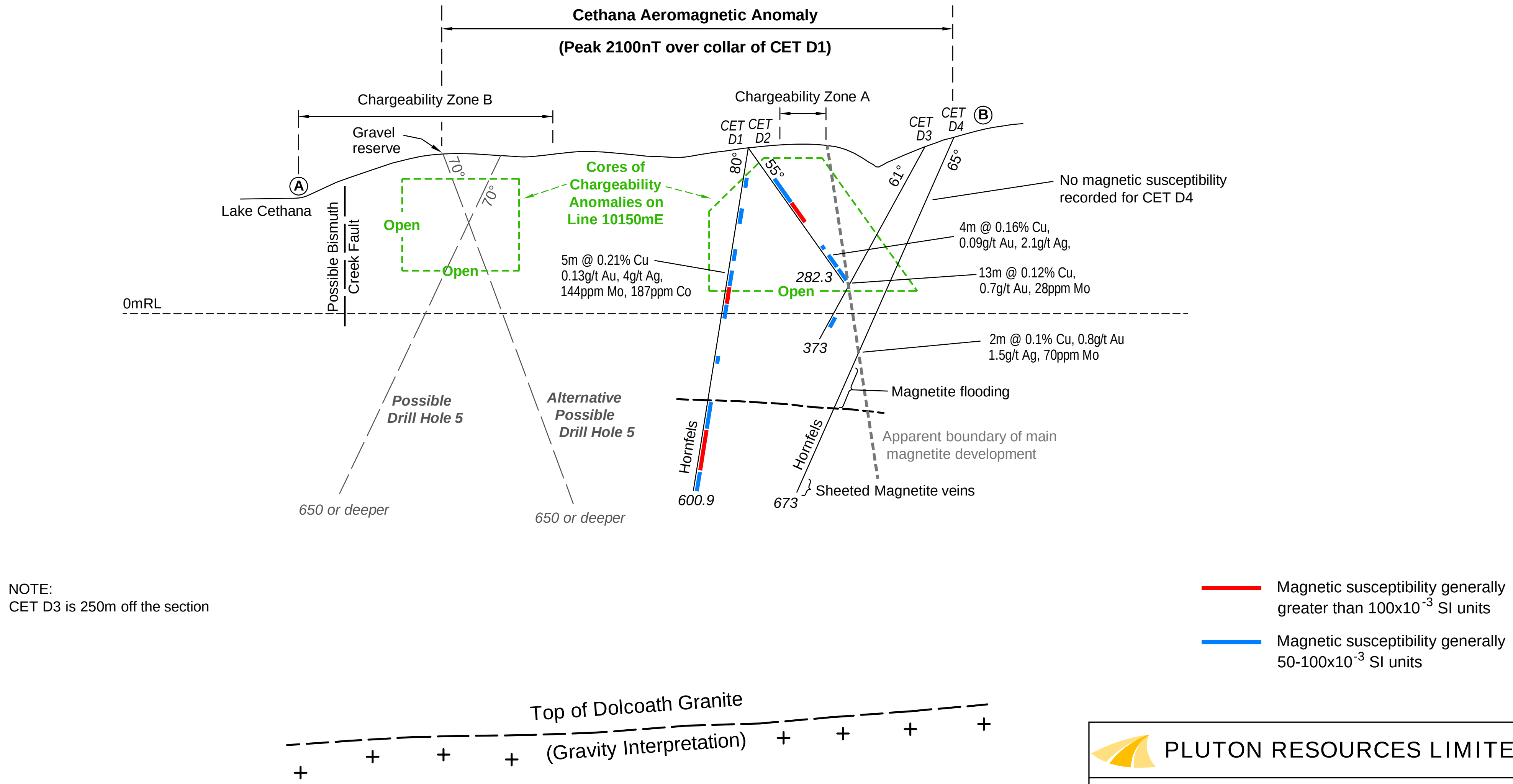
**EL 29/2006 - LAKE CETHANA**
**CETHANA MAGNETIC ANOMALY, IP CHARGEABILITY ZONES AND DRILL HOLE TRACES**

| Compiled : | Drawn : | Date : | Revised : | Projection : |
|---|---|---|---|---|
| N. J. Turner | G.M.B. | 22/03/2013 | : | GDA 94 Zone 55 |

Scale: 1:25,000 — 0 250 500 1,000 m | File : | Figure No. 5

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**EL29/2006 - LAKE CETHANA**

# CROSS SECTION A - B
# ALONG LINE 10150mE. V=H

| Compiled: N. J. Turner | Drawn : G.M.B. | Date : 23/03/2013 | Revised : : | Projection : . |
|---|---|---|---|---|
| Scale: 1:10,000 | 0 100 200 300m | | File : . | Figure No 6 |