# REYNOLDS RANGE REPORT EL 26071, EL 28077

## 22ND FEBRUARY TO 27TH FEBRUARY 2012

Linda Glass – March 2012

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**SUMMARY**

Outcropping hematite, goethite and manganese mineralisation occurs within the Reynolds Range region, northwest of Alice Springs. Mineralisation styles include magnetite-hematite replacement of conglomerate, goethite replacement of metasedimentary strata, Fe-breccia and quartz-hematite breccia, goethite-manganese replacement of dolostone and hematite (Fe-enriched) quartzite. The Reynolds Range has undergone multiple episodes of deformation and has a complex tectonic history such that iron and manganese mineralisation is strongly structurally controlled. Mineralisation occurs primarily at fault bounded lithological contacts or shear zones localised between the Mount Thomas Quartzite with the Lander Rock and Pine Hill Formations and areas of intense brecciation.

The highest grade for assayed rocks returned was just under 60% Fe and in general, phosphorus values are high (>> 0.1% P). Mineralisation at surface, appears to occur as laterally discontinuous pods. A short field program to follow up and further investigate areas which yielded the highest iron and manganese values is recommended.

**OBJECTIVE**

In February 2012, a team of four geologists, three from Territory Resources Ltd (Linda Glass, Catherine Breheny and Michael Binns) and private consultant R Russell undertook a helicopter-based reconnaissance survey over Territory Resources tenements EL26071 and EL28077 located with the Reynolds Range, ~200 km NW of Alice Springs, Figure 1.


**Figure 1**: Google earth imagery showing location of Reynolds Range tenements EL26071 and EL28077 ~150 km northeast of Alice Springs. Diagram supplied by Andy Burgess

The objective was to locate known historical hematite and manganese occurrences (as documented in MODAT; NTGS 2011), locate and map out as of yet undocumented occurrences of mineralisation as determined by field mapping with a view to evaluating the exploration potential for this region, Figure 2.

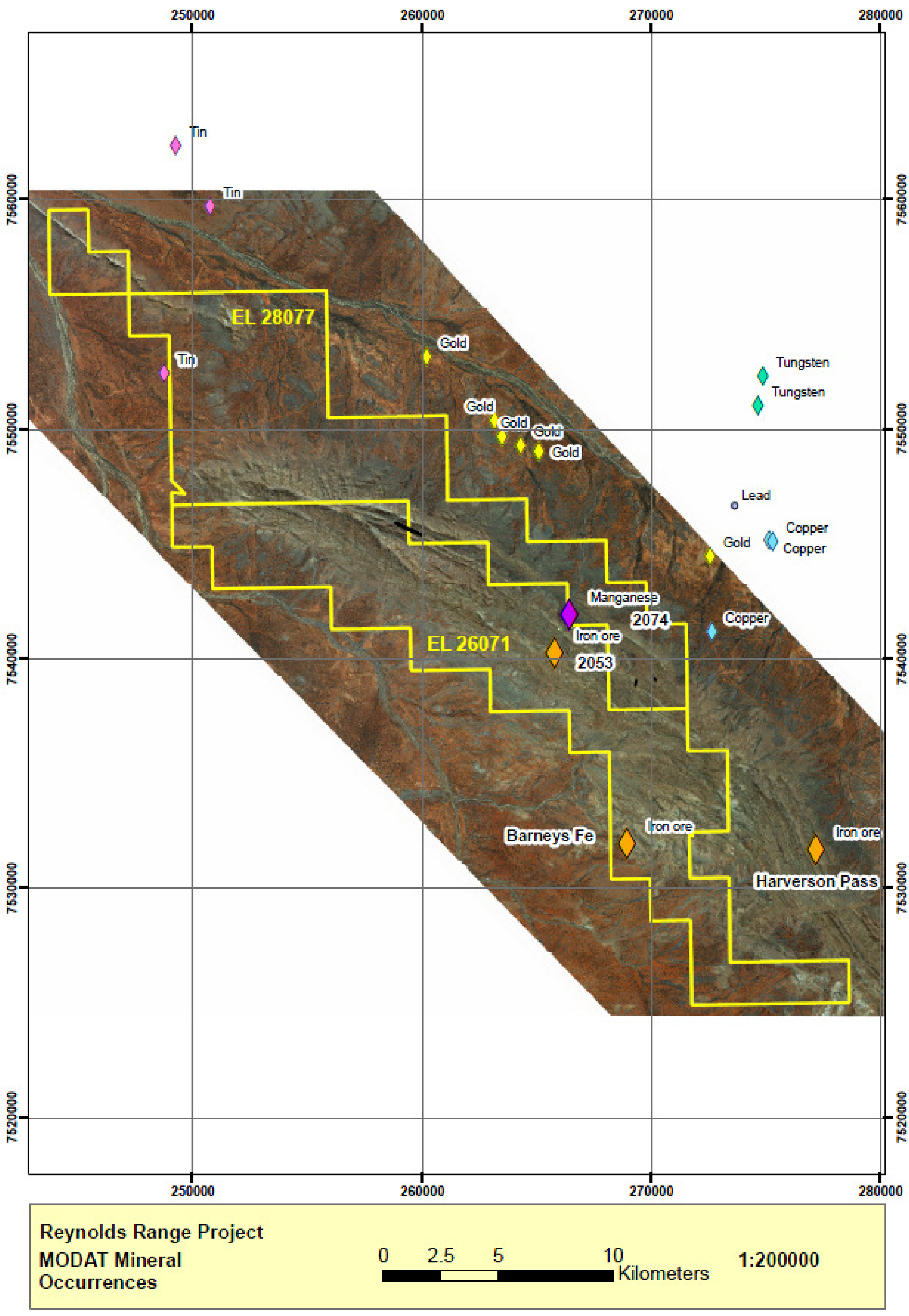


**Figure 2**: MODAT mineral occurrence localities for Reynolds Range tenements EL 28077 and EL 26071

Given the rugged and steep nature of the terrain, Figure 3, the area was explored by helicopter (due to the limited vehicular access). Alice Springs Helicopters was hired to provide a Bell Jetranger for the exploration fieldwork.

**Figure 3**: View to southwest showing rugged topography of Reynolds Range

## INTRODUCTION

EL26071 and EL28077 are tenements in the Reynolds Range area where the exploration rights are currently held by Territory Resources. The Reynolds Range region is prospective for a range of commodities, including Fe, Au, Mn, Pb, Zn, Sb, Cu, U, Sn, Ta, W, rare earth elements (REE), Ag, Ni and P (Hussey, 2010). Of these, Territory Resources is primarily interested in exploring for economic Fe and Mn. These commodities and other styles of mineral occurrences are recorded in MODAT (2011). Documented mineral occurrences within the tenements and surrounding area are presented in Table 1, Figure 2. Historically, abundant disseminated hematite has been documented within the upper unit of the Mount Thomas Quartzite and manganese occurrences within the Algamba Dolomite Member (Stewart, 1981a).

## GEOLOGY

The Reynolds Range is located within the Arunta Region, which extends over an area of ~200,000 $km^3$ in the Northern Territory. The Arunta Region has undergone multiple episodes of tectonothermal events which span the late Palaeoproterozoic to the Palaeozoic and are subdivided into three distinct provinces; the Palaeoproterozoic 1860-1700 Ma Aileron Province (in which tenements EL26071 and EL28077 are located), the 1690-1600 Ma Warumpi Province and the Neoproterozoic to Cambrian Irindina Province, (Beyer *et al* 2010). The Arunta Region is dominated by med-high grade Palaeo- to Mesoproterozoic metamorphic rocks and is unconformably overlain by Neoproterozoic to mid-Palaeozoic sedimentary strata.

The Aileron Province is located within the North Australian Craton (NAC) and comprises greenschist to granulite facies metamorphic rocks, which are broadly divided into three stratigraphic divisions, later intruded by granites (Stewart, 1981b). The Aileron Province has temporally equivalent stratigraphic successions to the gold-bearing Tanami and Tennant Creek Provinces. In addition, regional aeromagnetic data indicate that these areas may be laterally contiguous under cover, however, facies variations and differences exist within the sedimentary environments of both regions (Hussey 210). Structural corridors hosting quartz veins, lie parallel to the highly prospective (Au) Trans-Tanami corridor (Rohde, 2005). These late-stage fluids may be analogous to quartz veins that host mineralisation in the Tanami region.

Based on geochemical and isotopic studies, the depositional and tectonic setting for the Aileron Province is thought to involve rifting of continental crust or an evolving back-arc basin (Hussey, 2010).

## STRATIGRAPHY

The oldest rocks in the area of interest, are the Lander Rock Formation, which comprises interbedded pelitic to psammitic metasedimentary assemblages in the northwest, increasing in grade southeast to intercalating metapelite and quartzite assemblages. The sedimentary protolith is thought to be dominantly of turbiditic origin (Beyer *et al* 2010) and have maximum depositional ages ranging from 1860-1830 Ma (Scrimgeour *in press*). The Wickstead Creek Beds are strongly folded calc-silicate rocks interbedded within the Lander Rock Formation. A generalised view of the geology is shown in Figure 4.

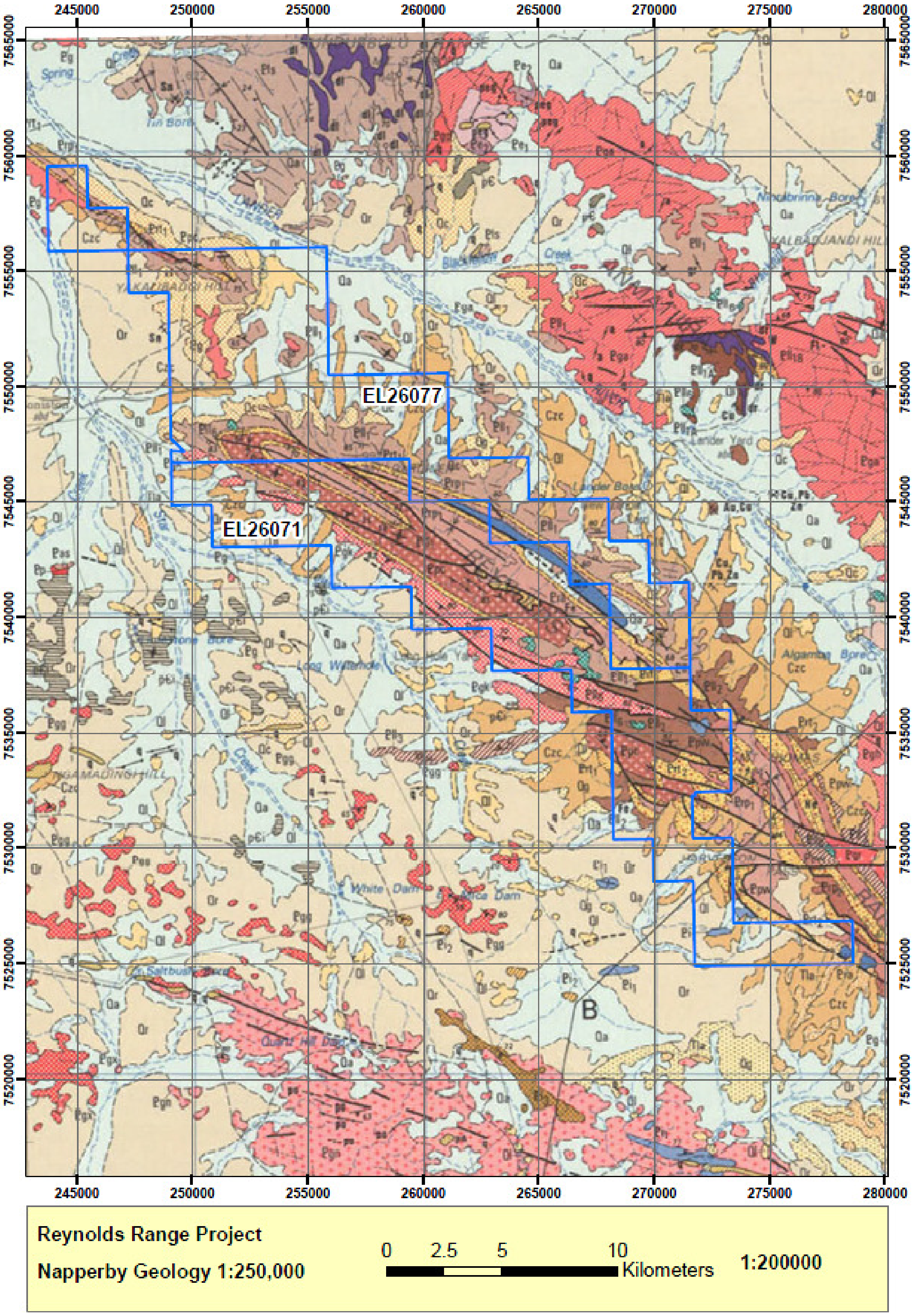


**Figure 4**: Napperby 1:250,000 geological map overlain by Reynolds Range tenements

The Reynolds Range Group overlies the Lander Rock Formation with angular unconformity and includes in ascending order, the Mount Thomas Quartzite, Pine Hill Formation (including Algamba Dolostone Member) and the Woodforde River Beds. The sedimentary sequence is thought to have formed during a marine transgression.

The Mount Thomas Quartzite varies in thickness from ~200 m to the northwest of the Reynolds Range, to ~500 m in the southeast (GA Stratigraphic Units Database). It consists of silicified sandstone, (including a basal conglomerate or pebbly arkosic unit) overlain by white to pink orthoquartzite (~100m) then blue quartzite (~125 m), the blue colour thought to be due to hematite (GA Stratigraphic Units Database). An alternative explanation for the blue colouration may be due to radiation damage, i.e. metamict zircon. A sample of blue quartzite will be submitted for geochemical analysis and a thin section prepared, so this information will be beneficial. The Mount Thomas Quartzite is overlain and interfingers with the Pine Hill Formation and is intruded by the Coniston and Warimbi Schists. Abundant disseminated hematite is documented as being associated with the upper unit of the Mount Thomas Quartzite (Stewart, 1981b).

The Pine Hill Formation overlies the Mount Thomas Quartzite to the northeast of the region and overlies and interfingers the quartzite to the southeast. It consists of shale, siltstone and fine-grained silty sandstone in the northwest, increasing in metamorphic grade to the southeast to slate with porphyroblasts of andalusite. The rocks are weakly cleaved and preserve tight folding on the mesoscopic and macroscopic scale (Stewart, 1981b).

The Algamba Dolomite Member occurs as two conformable lenses (northwest and southeast) within the Pine Hill Formation with a maximum thickness of ~400 m. The lenses were probably one lens which has been separated by faulting. The Algamba Dolomite Member is composed of grey-brown laminated to thin-bedded fine-grained recrystallised dolomite and subordinate irregularly laminated fine-grained limestone. A manganese anomaly has been documented within this member. Exposure of the member is better to the northwest and is largely under surficial cover towards the southeast.

The Reynolds Range Group shows a lithological gradation resulting from a marine transgression, represented by a fining upwards sequence in the stratigraphy. At the base are coarse-grained feldspathic sand and pebble gravel, overlain by sand then fine-grained lithologies represented by mud and clay deposits with interspersed dolostone occurrences.

These metasedimentary sequences are intruded by the Palaeoproterozoic Yakalibadgi Microgranite and Coniston and Warimbi Schists. The Warimbi and Coniston Schists are ca 1780 Ma (Hussey, 2010). The Yakalibadgi Microgranite is thought to have been emplaced along the contact between the Lander Rock Formation and the overlying Mount Thomas Quartzite (Stewart, 1981b). The Coniston Schist, located to the north of the Reynolds Range, represents a ~500 m thick conformable layer of quartz-rich orthoschist (Rafferty, 2010) which lies between the basal conglomerate and overlying quartzite of the Mount Thomas Quartzite. It reaches 350 m at the type locality (GA Stratigraphic Units Database). The Warimbi Schist is located to the south of the Reynolds Range and occurs as a series of sills intruded into the Mount Thomas Quartzite and has a maximum thickness of ~1000 m. It is an intensely deformed quartz augen orthoschist where foliation is defined by clots of recrystallised biotite.

### STRUCTURE

The Arunta region has undergone two major episodes of tectonism and deformation. The first major tectonic event involved multiple episodes of metamorphic and magmatic activity in the Palaeo- to Mesoproterozoic. These include the low-pressure/high temperature 1810-1790 Ma Stafford Event, the 1780-1770 Ma Yambah Event, the 1735-1690 Ma Strangways Event and the 1590-1560 Ma Chewings Orogeny (Beyer *et al* 2010). The Chewings Orogeny was responsible for a northwest-southeast transition in metamorphic grade from greenschist to granulite facies along the length of the Reynolds Range and regional scale conjugate steeply-dipping shear and crenulation bands (kink bands) Hussey (2010). The second major tectonic event occurred in the Palaeozoic, where deformation was associated with the 490-300 Ma Alice Springs Orogeny. This event was responsible for southeast and east trending shear zones.

On a regional scale, the Reynolds Range is characterised by northwest-trending faults which control the surface expression of metasedimentary strata and granitic sills, and large-scale folds which are observed at the kilometre scale on satellite imagery for the region. Deformation was accompanied by metamorphism, with lower-grade metamorphic assemblages to the northwest and increasing in metamorphic grade to the southeast. Stewart (1981b) summarises the structural evolution in the Reynolds Range as follows. Large-scale folding associated with the formation of antiforms and synforms and mesoscopic flexural-slip folds with sub-horizontal axes. This was followed by a second episode of folding related to granite intrusion of the Mount Airy Orthogneiss. The first episode of faulting caused repetition of the northern limbs of major synforms followed by the formation of vertical plunging folds. An episode of wrench-faulting followed.

### GEOPHYSICS

Figure 5 shows a radiometric image (total count) over the Reynolds Range tenements. A uranium channel radiometric anomaly centred on the northern and central part of EL 26071, is related to the Coniston Schist (Rafferty, 2010).

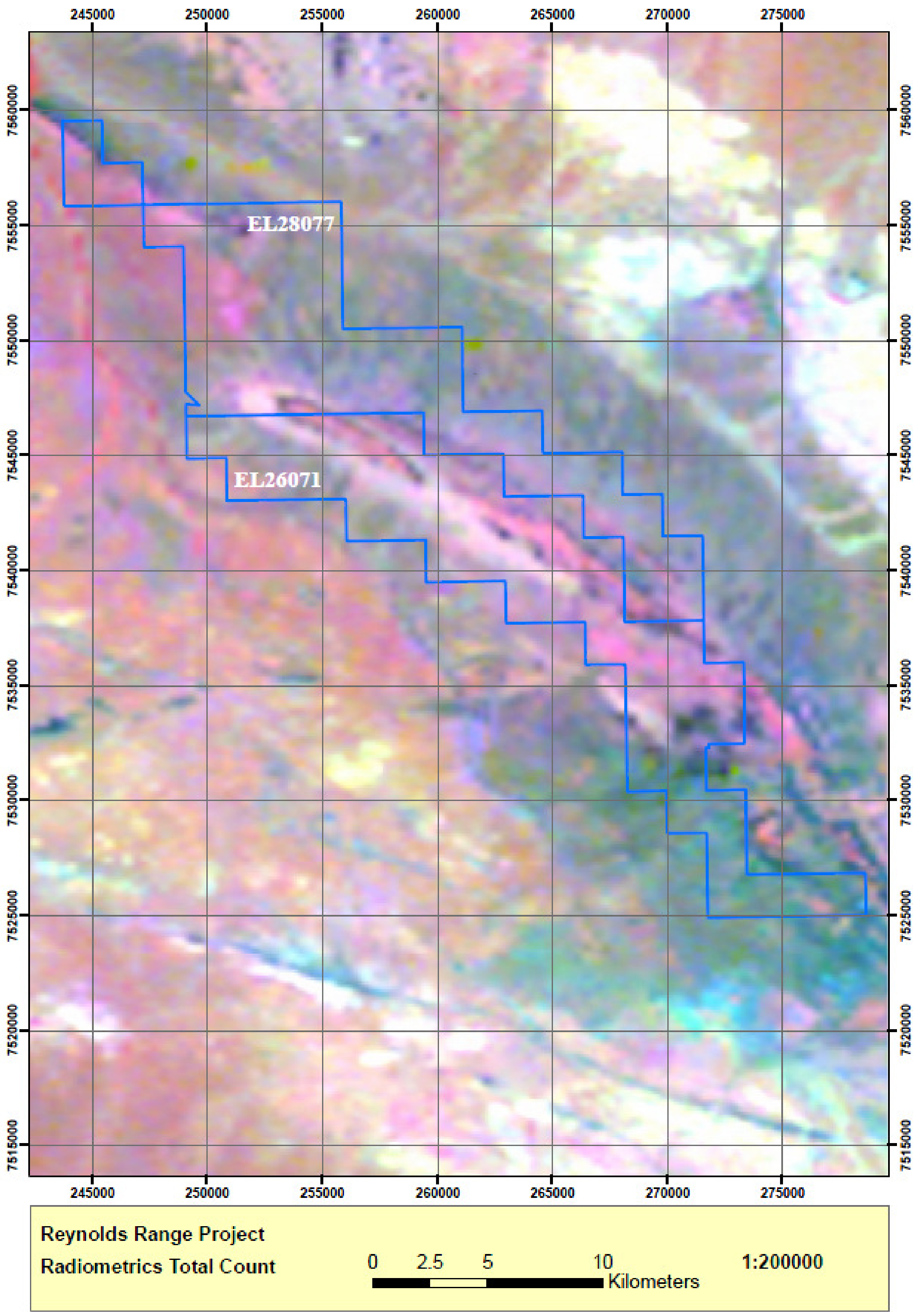


**Figure 5**: Radiometrics (total count) for Reynolds Range region

Figure 6 shows the Total Magnetic Intensity (TMI) over the tenements. To the southeast, northwest-trending magnetic highs are associated with the Pine Hill Formation. Further north, two linear northwest-trending magnetic highs appear to be related to the upper unit of the Mount Thomas Quartzite, within the Pine Hill Formation.

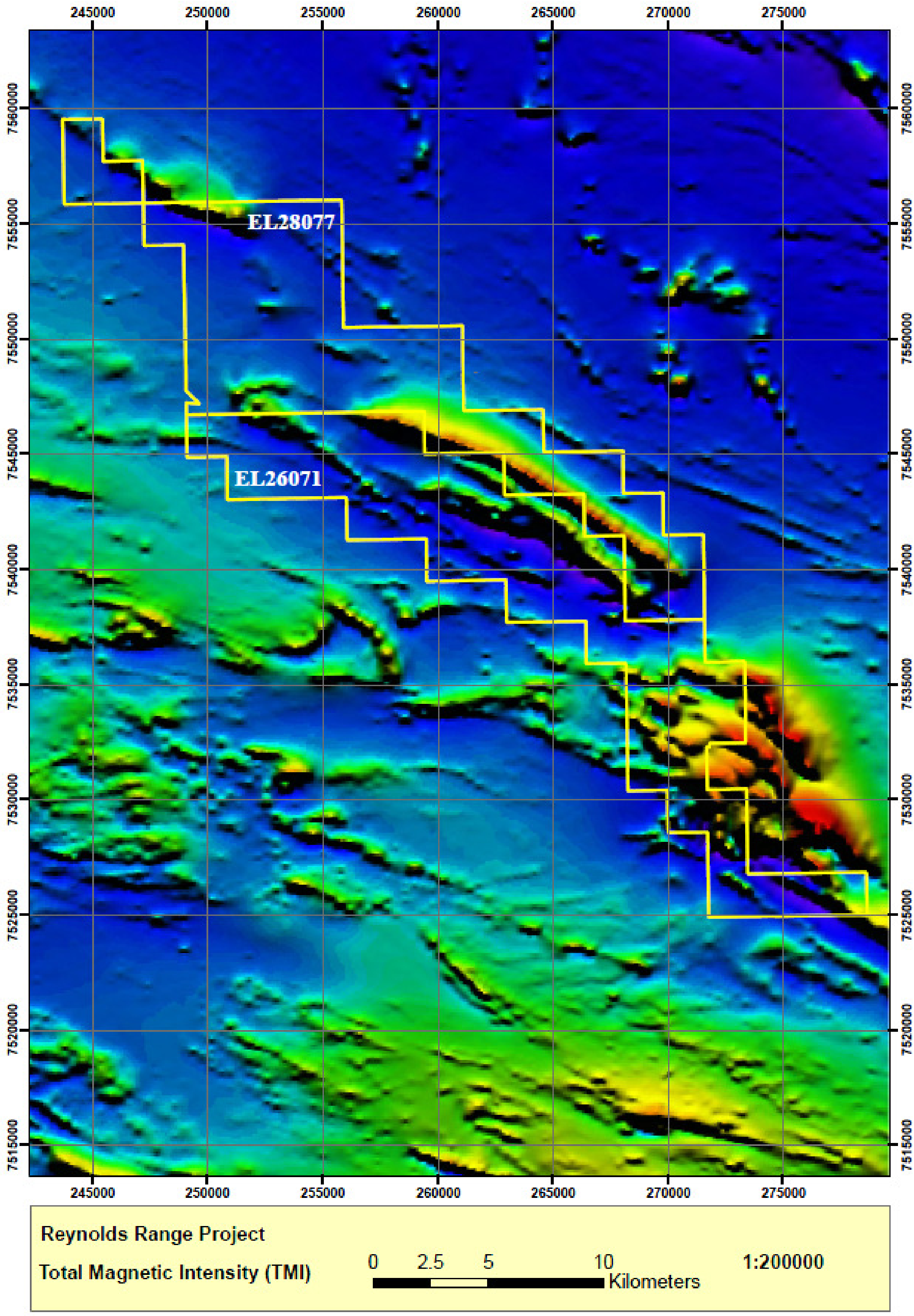


**Figure 6**: Total Magnetic Intensity (TMI) for Reynolds Range region

## FIELD PROGRAMME

A six-day helicopter-based reconnaissance survey was conducted over tenements EL26071 and EL28077 in the Reynolds Range, Napperby mapsheet 1:250,000 and Reynolds Range mapsheet 1:100,000. The area has been previously explored for gold, base metals, REE and uranium. The general region is particularly prospective for REE occurrences with the recent discovery of the Nolans Bore REE deposit (Arafura Resources) approximately 50 km to the southeast. Moreover, given the temporal stratigraphic similarity to the Tanami and Tennant Creek regions and the structural contiguous corridor mentioned earlier, the area is also highly prospective for gold.

A review of the NT heritage site data indicates that there are no sites recorded on tenements EL26071 and EL28077 in the Reynolds Range

The first priority for this reconnaissance field trip, was to investigate historical documented hematite and manganese occurrences within the tenement area and adjacent regions within the Reynolds Range (Stewart, 1981a; MODAT, 2011). The documented hematite and manganese localities obtained from MODAT (2011) are as follows:

| Locality Name | Commodity | Map100K | GDA Easting | GDA Northing | Zone | Datum |
|---|---|---|---|---|---|---|
| Barneys Fe | Iron ore | Reynolds Range | 268929 | 7531970 | 53 | GDA94 |
| Unnamed 02053 | Iron ore | Reynolds Range | 265780 | 7540264 | 53 | GDA94 |
| Unnamed 02074 | Manganese | Reynolds Range | 266422 | 7541922 | 53 | GDA94 |
| Harverson Pass | Iron ore | Reynolds Range | 277129 | 7531670 | 53 | GDA94 |

Table 1: Historical hematite and manganese localities in the Reynolds Range region, (MODAT, 2011).

In addition, areas of dark, anomalous outcrop (to the surrounding country rock as revealed by satellite imagery, Figure 7) were targeted and designated as areas of interest for potential iron mineralisation.

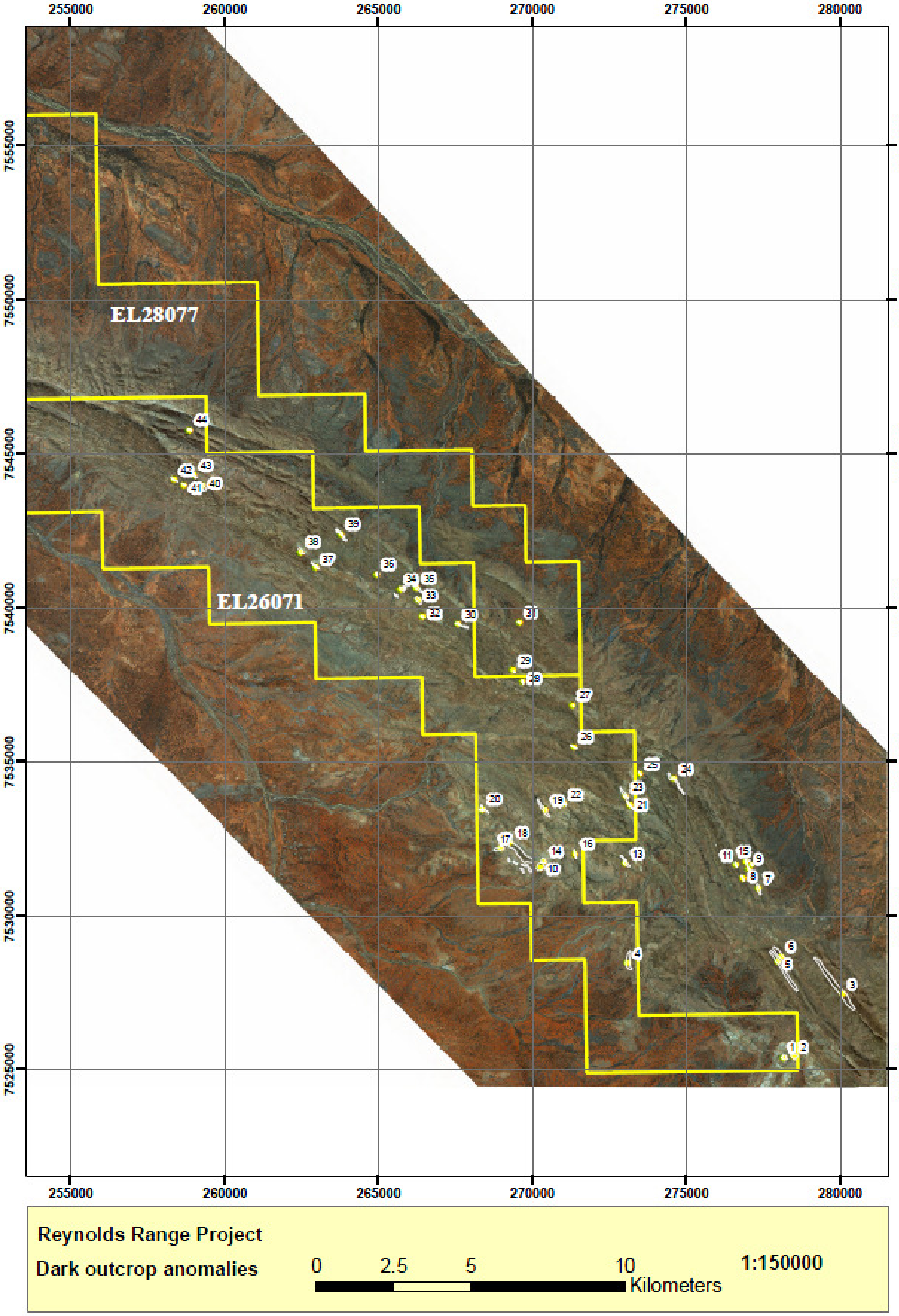


**Figure 7**: Satellite image dark outcrop anomalies identified for Reynolds Range

These areas were numbered and highlighted as sites to visit. Andy Burgess (Territory Resources) also identified areas of potential manganese interest, Figure 8.

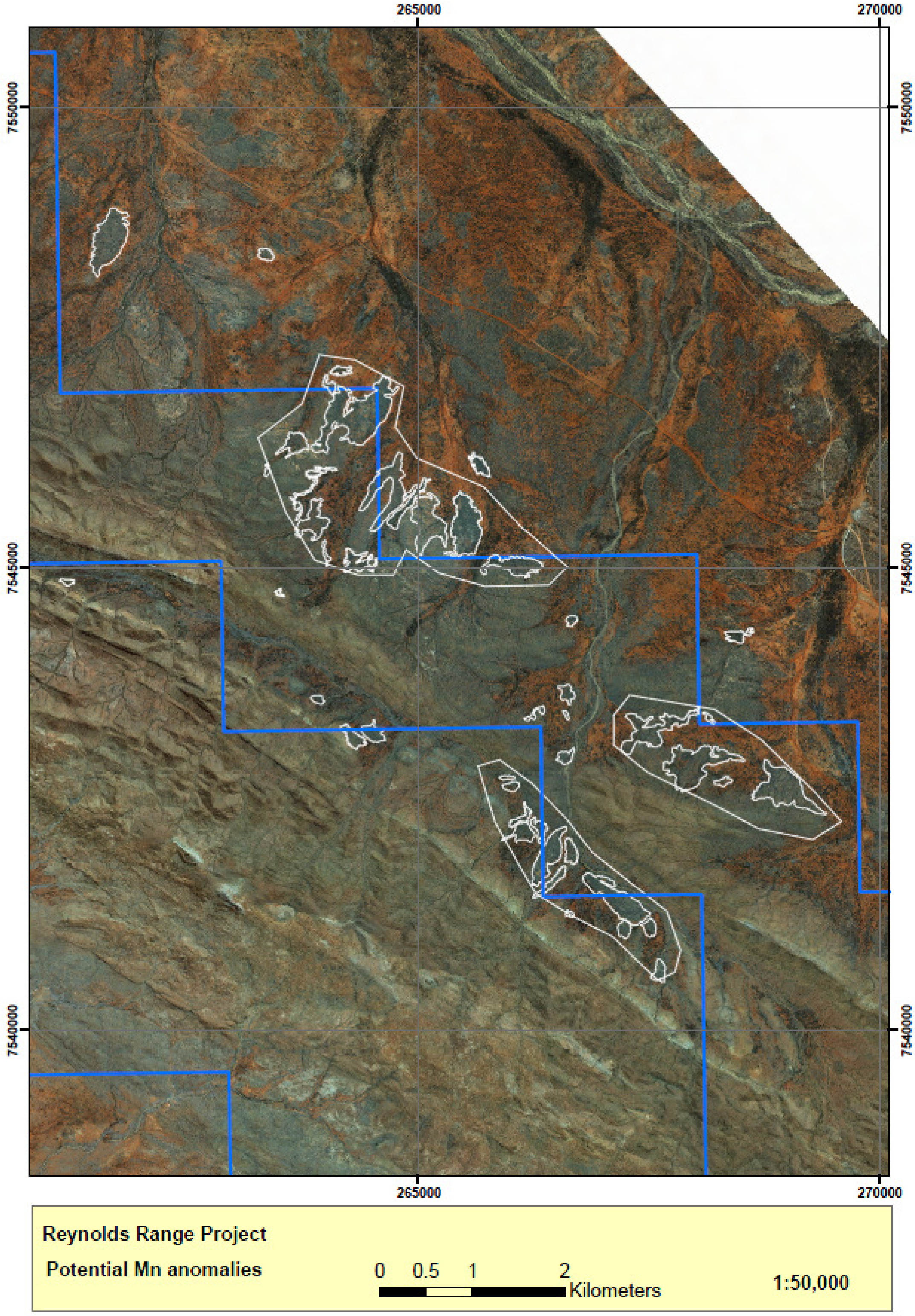

**Figure 8**: Google earth imagery showing potential manganese anomalies identified by Andy Burgess (Territory Resources)

To the northeast of the tenements, a line of four drill pads, aligned in a northeast configuration, are readily observable in satellite imagery. These areas were visited to check the drill spoils and evaluate the potential for iron mineralisation. All locality data and geochemical data are detailed in Table 2.

### HARVERSON PASS FE ANOMALY - MODAT

Of the Fe and Mn anomalies documented in MODAT (2011), the hematite occurrence at Harverson Pass (outside the tenement area) Figure 2, was unable to be located (allowing for discrepancies with the location, given that it is historical data prior to global positioning systems, GPS). However, elongate, parallel, northwest-striking highlighted dark ridge anomalies observed in satellite imagery (Figure 9) are steeply dipping quartzite ridges of the Mount Thomas Quartzite. The ridges are flanked by intrusive sills of the Warimbi Schist, the stratigraphy denoting a northwest-striking anticlinal structure.

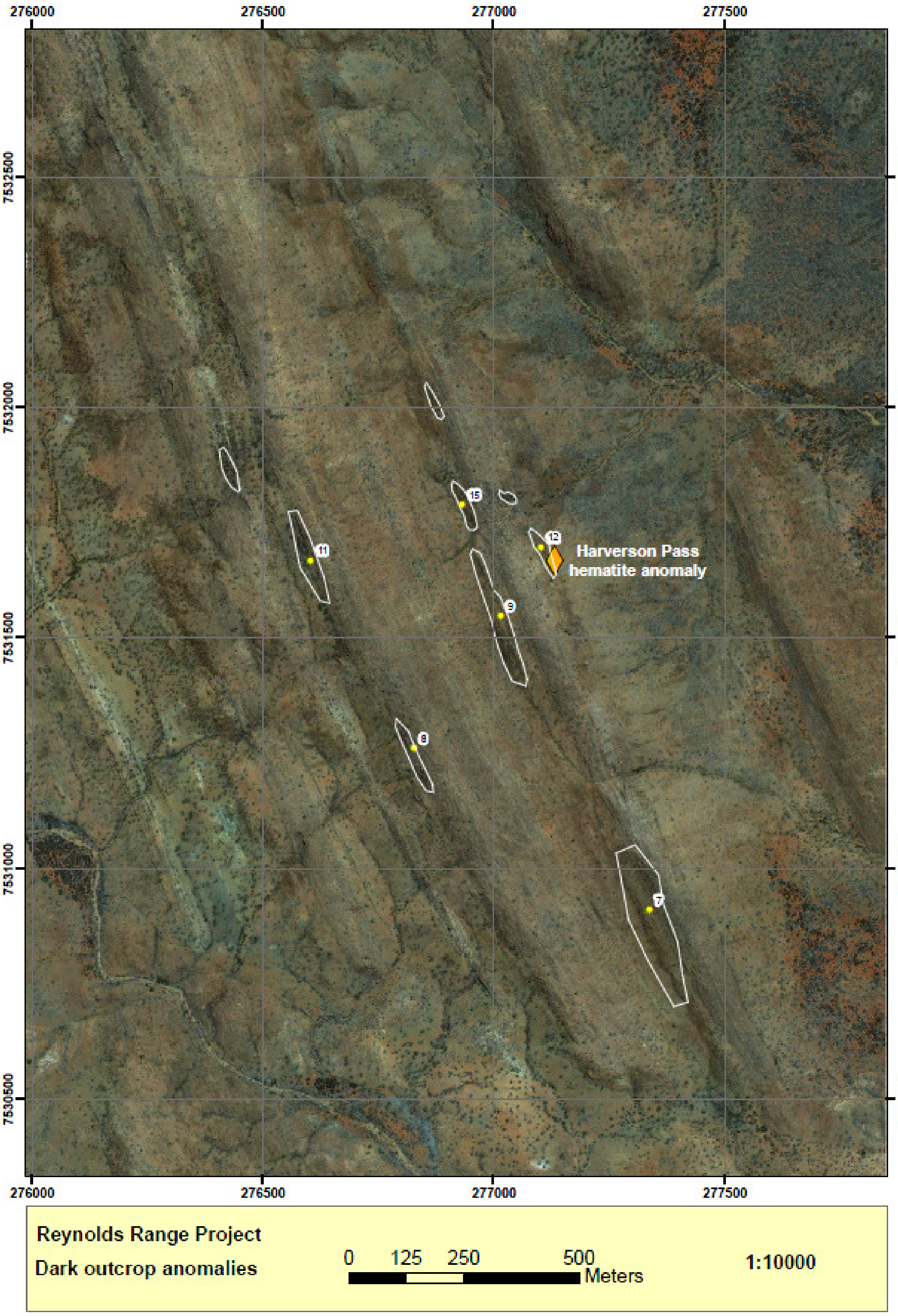


**Figure 9**: Satellite image dark outcrop (potential Fe anomalies) near Harverson Pass hematite anomaly (MODAT)

An isolated, subcropping exposure of vitreous yellow, ochreous goethite (sample TRK541 - 57% Fe) was found about a kilometre to the west of the documented Harverson Pass hematite location, situated within the Pine Hill Formation. Quartz-breccias occur at the contact to the Warimbi Schist and the Mt

Thomas Quartzite. Although no obvious signs of mineralisation were detected, an unusual green mineral/colouration was discovered in the Mount Thomas Quartzite, sample TRK548. The chemistry of this mineral is dominated by $SiO_2$, however, additional trace element analysis may have yielded additional valuable information, e.g. Cr (?fuchsite).

### BARNEYS FE ANOMALY - MODAT

Sample TRK554 was collected close to the documented Barneys Fe anomaly, Figure 2. The goethite sample yielded 50% Fe, 0.8% P and ~10% LOI (Loss on Ignition). A dark, linear feature identified in satellite imagery, ~500 m north of Barneys anomaly, was identified as a 150 m long x 10 m wide, north-striking (350°) ridge of goethitic quartz-mica schist (Lander Rock Formation). Near the concealed contact of the Mount Thomas Quartzite to the northeast, the quartz-mica schist is strongly sheared. Two samples (TRK542, TRK543) collected from this locality, yielded 44-46% Fe, however, they also yielded relatively high phosphorus, 0.9-1.0% P.

**Figure 10**: Outcropping ridge of goethite-quartz-mica schist

### UNNAMED 2053 FE ANOMALY - MODAT

Approximately 180 m north-northeast of the documented occurrence of Fe anomaly 2053, Figure 2, sample TRK544 was taken from a ~25 m x 10 cm wide pod of Fe-rich quartzite (Mt Thomas Quartzite) Figure 2. The quartzite forms part of a long, linear ridge which strikes 310°, and dips ~50° to the east. The sample yielded 52% Fe and 0.19% P.

### UNNAMED 2074 MN ANOMALY - MODAT

Manganese anomaly 2074 (EL 28077) Figure 2, is located within the Algamba Dolomite Member, which forms a northwest-trending topographic low (valley) within the Pine Hill Formation, bounded by ridges of the Mount Thomas Quartzite. Isolated sub-cropping goethite/manganese occurrences (around 10 m x 10 m) occur within colluvial cover and sub-cropping dolostone within a 300 m radius of Mn anomaly 2074. They consist of low-lying botryoidal manganese and yellow ochreous goethite (TRK545) and pods of rubbly Fe-rich metasedimentary rock (TRK547). The overall strike is ~300° towards the southwest. Samples TRK545 and TRK547 returned 48.1% and 25.8% Fe, 0.82% and 0.08% Mn and 9.9% and 6.2% LOI.

### AERIAL PHOTO ANOMALIES AND SAMPLE OBSERVATIONS

#### GOETHITE MINERALISATION

Although just off tenement (~1 km to the southeast of EL26071), satellite image anomaly 13 (Figure 7) is a northwest-striking series of dark, linear features within the upper Mount Thomas Quartzite. The linear features are goethitic lenses within massive quartzite ridges. Based on aerial photography, the ridges look to be ~2.5 km long by ~30 m wide, however, the width is variable on the outcrop scale.

The goethite ridges are adjacent to a west-northwest-trending fault which cross-cuts the Mount Thomas Quartzite, Pine Hill Formation and Coniston Schist. Northeast-trending faults offset the strata from the major fault. A ~1.5 km northwest plunging fold structure within the Mount Thomas Quartzite (observable in aerial photography, Figure 11) lies directly to the south of the fault.

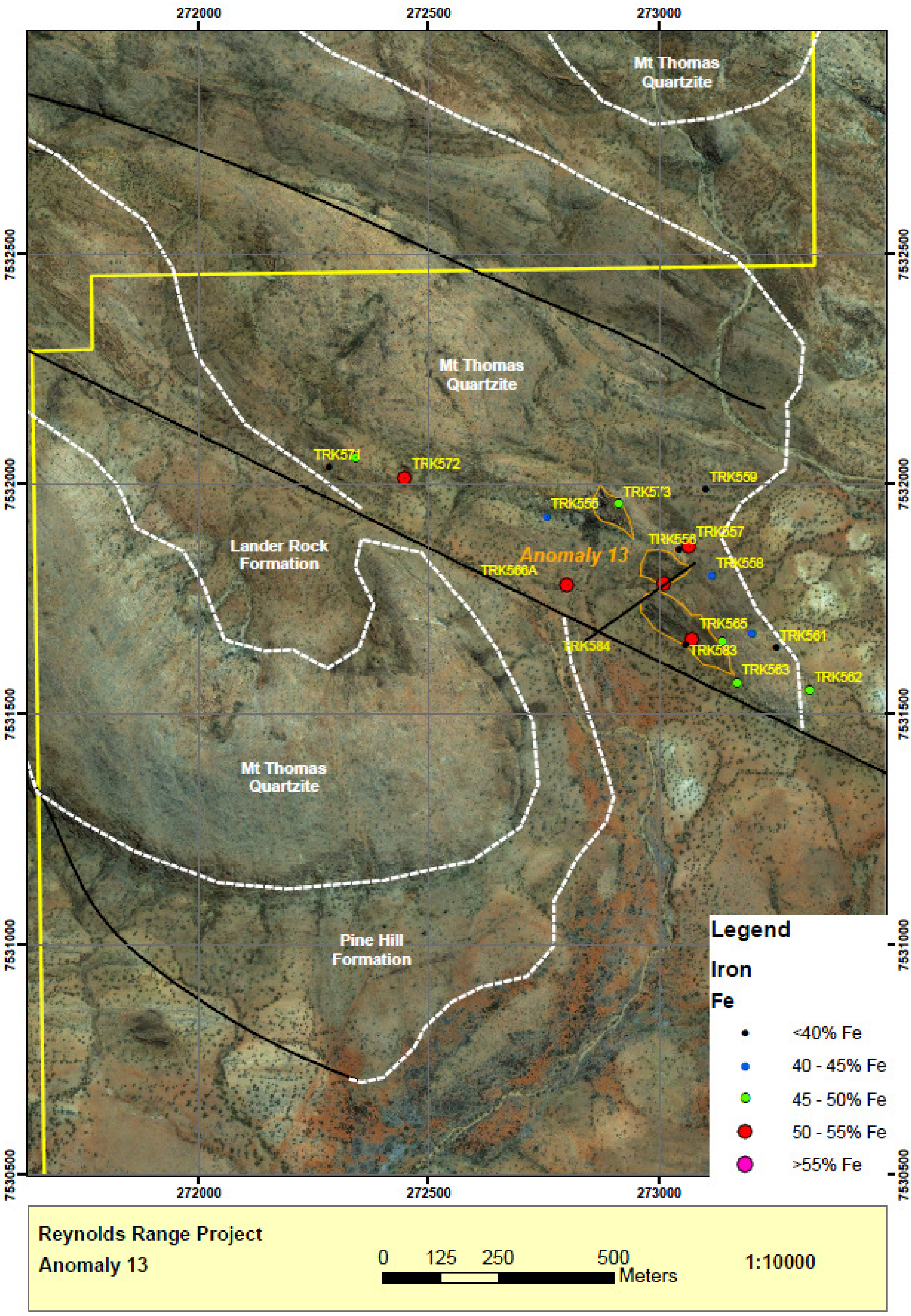


**Figure 11**: Satellite image showing lithological boundaries (dashed white lines) and structure for satellite image anomaly 13

The highest grade samples appear to be close to the sheared contact of the quartzitic Pine Hill Formation and the Mount Thomas Quartzite, suggesting that this may have been a major pathway for Fe-rich fluids responsible for the mineralisation. Field observations (increasing thickness of goethite mineralisation and offset) suggest a dilational jog in the fault system, which would further enhance the migration (and trap) metalliferous fluids (Figure 12). Quartz-hematite brecciation is observed at the contact zone.

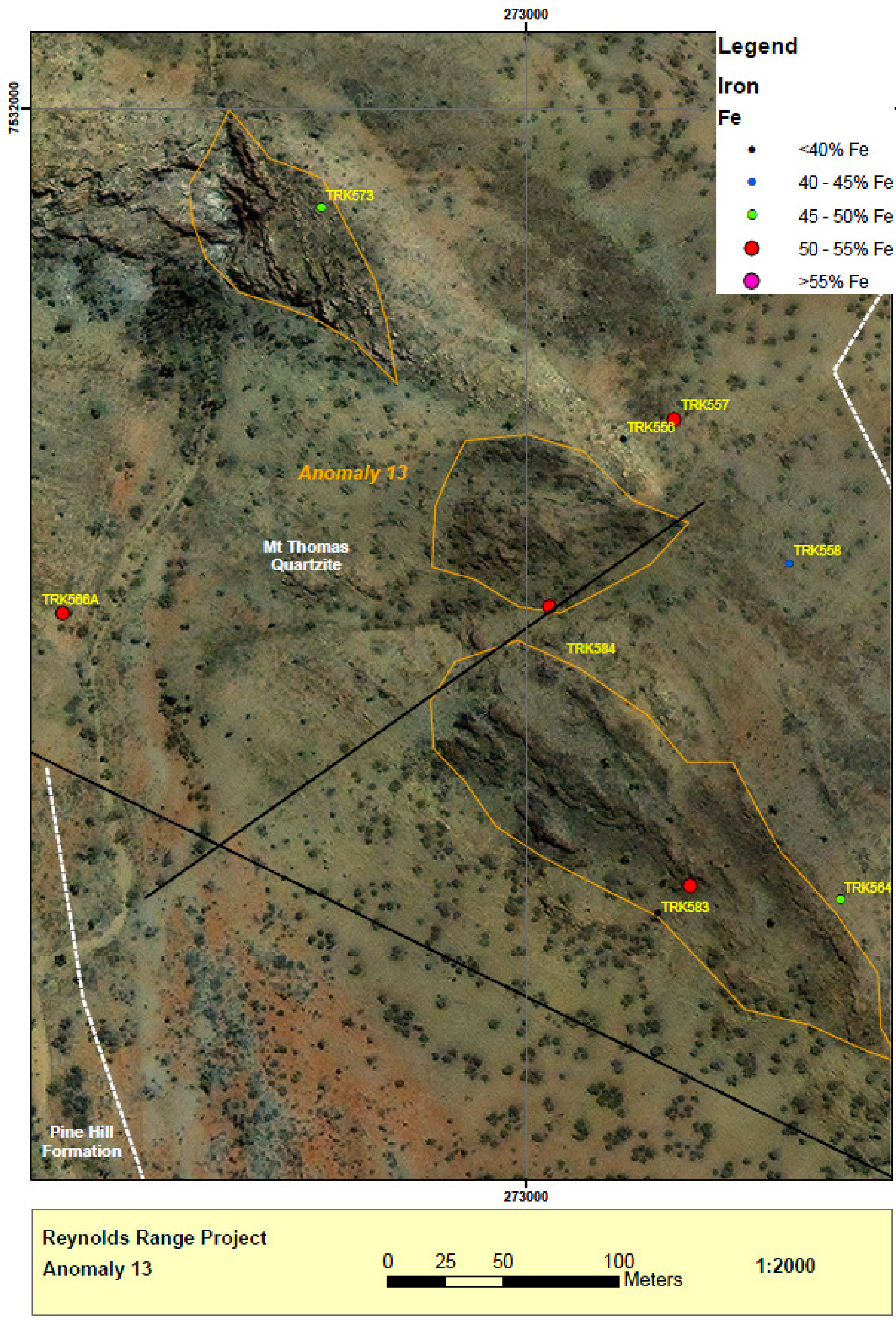


**Figure 12**: Detail of anomaly 13 showing offset of strata along a fault

Out of 21 samples collected for assay, 5 samples returned grades higher than 50% Fe, however, P values are higher than 0.1% P. All samples appear to be dominated by goethite.

### MAGNETITE/HEMATITE MINERALISATION

Magnetite/hematite mineralisation (the magnetite weakly magnetic) occurs as a series of northwest striking ridges, total length ~140 m and ~10 m wide, ~500 m south of satellite anomaly 31 (discussed in next section, Figure 7. The Fe mineralisation occurs at the faulted contact of the Mount Thomas Quartzite with the Lander Rock Formation (Figure 13) where an orthogonal south-trending fault offsets the quartzite. This area may also represent a zone of dilation i.e. a dilational jog along the northeast-striking fault. The host rock for the Fe mineralisation is a conglomeratic sandstone/siltstone of the upper Mount Thomas Quartzite. The magnetite-hematite mineralisation is located on the southwestern limb, close to the hinge zone of a syncline, Figure 13.

Hematite sample TRK574 yielded 56% Fe, 0.04% P and LOI 0.68% and sample TRK578 yielded 47% Fe, 0.05% P and LOI 0.9%. Other samples assayed in the region returned >40% Fe. Proximal to the mineralised area (~50 east) an outcropping quartz-hematite breccia is exposed in a creek system. Sample TRK570A yielded 15% Mn, 66% $SiO_2$. This area was mapped by Richard Russell and Michael Binns and the reader is advised to seek further detail in a report currently being prepared by Richard Russell for the Reynolds Range.

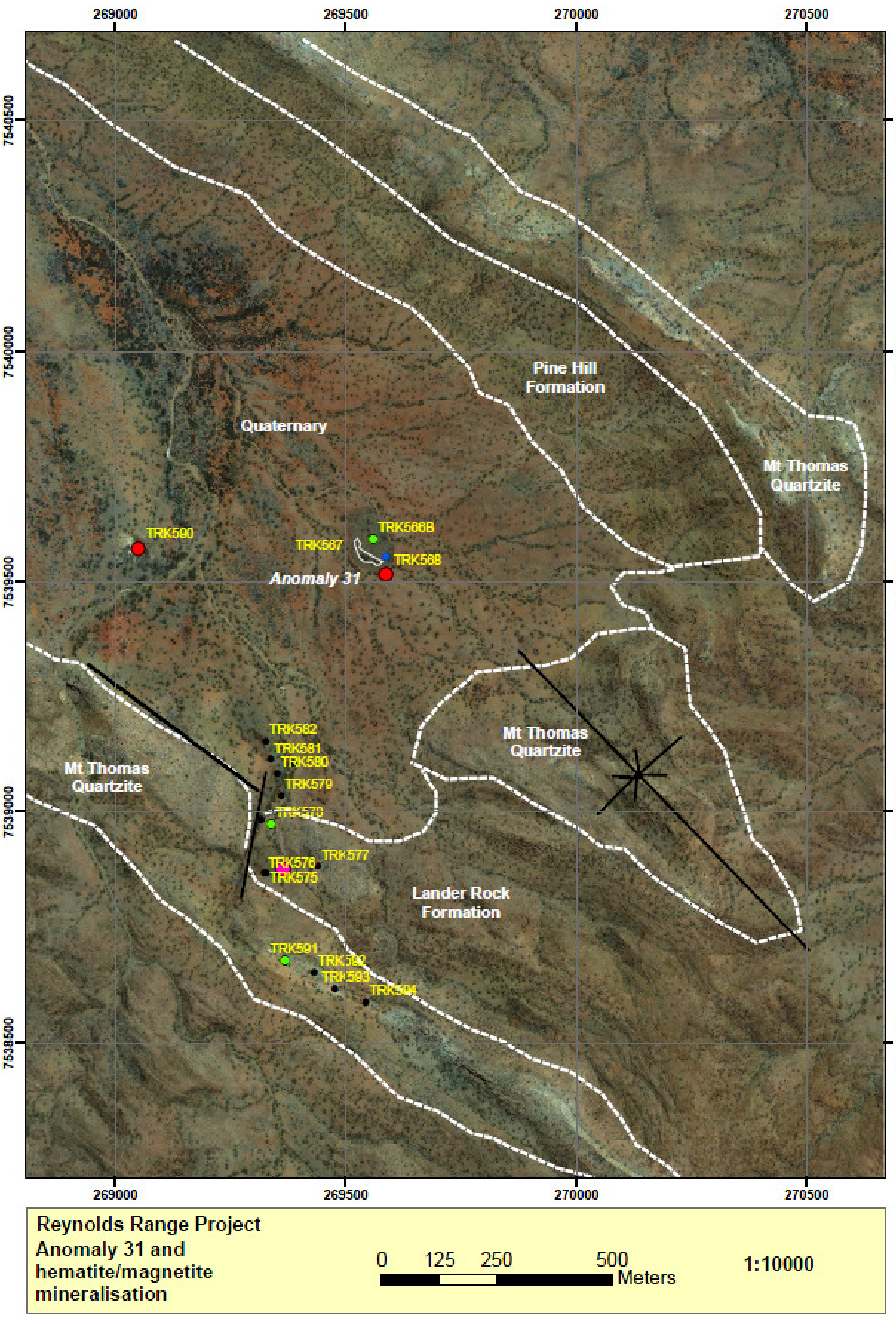


**Figure 13**: Satellite image showing lithological boundaries (dashed white lines) and structure for anomaly 31. Detail of hinge zone of syncline

#### GOETHITE/MANGANESE MINERALISATION

Satellite image anomaly 31 is a dark feature observed in the aerial photography, located in the southern portion of EL28077, Figure7, 13. It is surrounded by a noticeable vegetation anomaly, ~140 m x 80 m. The anomaly lies at the headwaters of a northwest-trending river system, within the fold hinge of a syncline of the Mount Thomas Quartzite and overlying Pine Hill Formation. Mineralisation consists of goethite and manganese, both locally botryoidal, Figure 14.

**Figure 14**: Photo showing detail of botyroidal iron and manganese mineralisation

Samples TRK566B and 568 yielded 49% Fe (0.42% P) and 53% Fe (0.21% P). Subcropping, botryoidal manganiferous goethite, sample TRK567 (44% Fe; 0.21% P) yielded 6.85% Mn. The outcrop is intensely brecciated with massive vugular textures and is locally glassy/vitreous in appearance. The mineralisation appears to be concentrated in the hinge and limbs of a syncline, Figure 13. Approximately 500 m to the west, sample TRK590 yielded 52% Fe and 0.37% P.

The Algamba Dolomite Member is exposed as low-lying outcrop in a valley flanked by the upper Mount Thomas Quartzite and the Pine Hill Formation. Although outcropping lithologies are minor, there are areas (small volume) where dolostone has been replaced by goethite and manganese, Figure 15.

**Figure 15**: Detail of outcrop showing iron replacement of dolostone

These occurrences tend to be associated with shear zones and fault zones. North of the Algamba Dolomite Member, Figure 16, samples of goethite and manganese-rich rocks were collected in the northwest valley extension. The samples were collected along the fault-bounded contact (shown in black in Figure 15) between the Mount Thomas Quartzite against the Pine Hill Formation and the Algamba Dolomite Member. Sample TRK598 yielded very high manganese (45.9% Mn, 5.9% Fe). Less than 20 m from sample TRK598, TRK597 returned 6.9% Mn and 37.6% Fe. Further information for these samples will be documented in the report by Richard Russell.

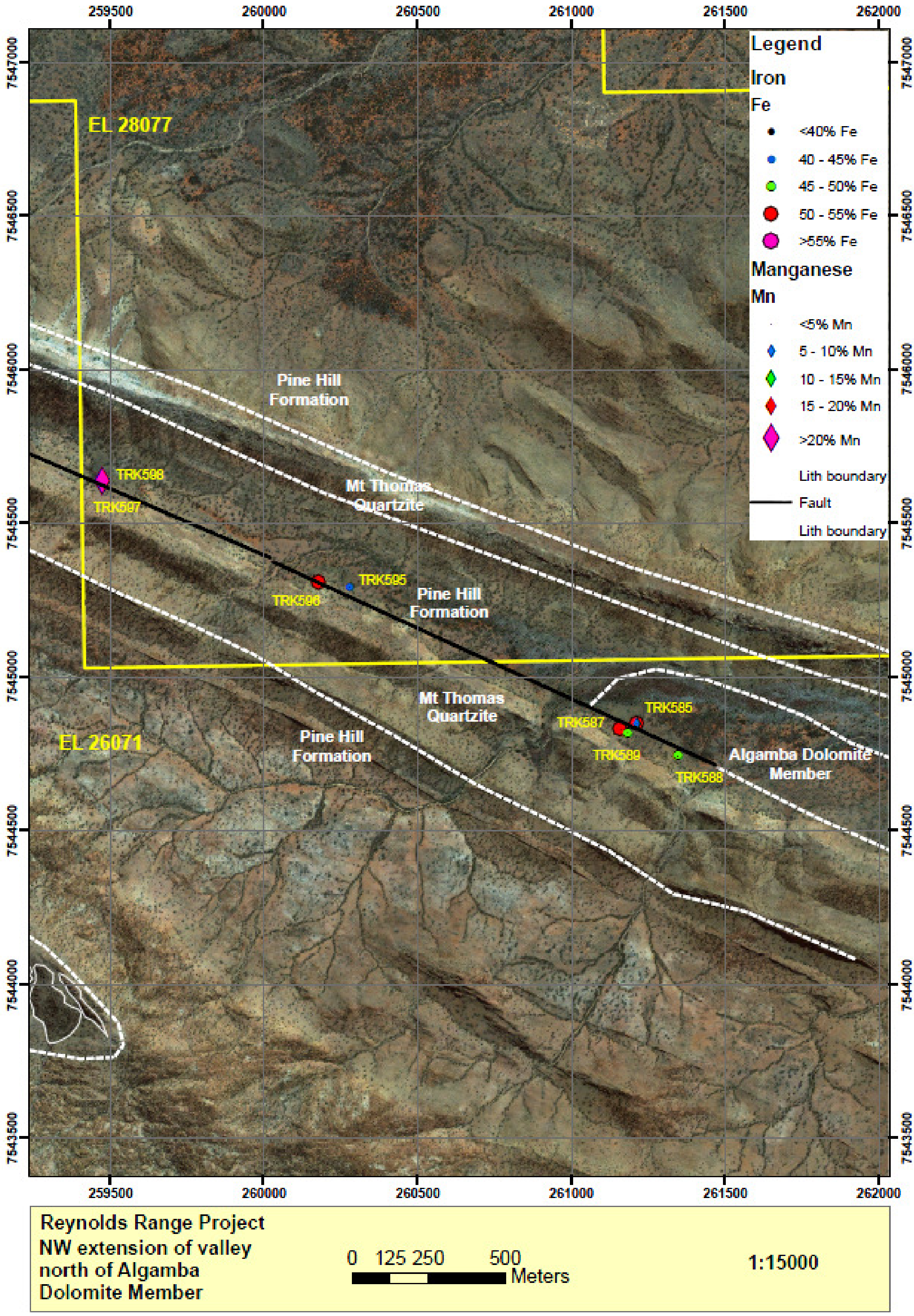


**Figure 16**: Satellite image showing northwest extension of valley north of Algamba Dolomite Member. Dashed white lines delineate lithological boundaries

Along strike of the fault to the southwest, three samples (TRK586-589) returned iron values >50% Fe. Figure 17 shows a large black coloured outcrop of botyroidal goethitic iron-oxide replacing a sedimentary precursor, ~30 x 10 x 5 m in size. The rock is very weathered, altered, vugular (porous), brecciated and with abundant orange-yellow goethitic clay as a surface coating in joints and fractures. Original bedding in the precursor rock is locally preserved, the overall strike 285°, dipping 70° towards the southwest.

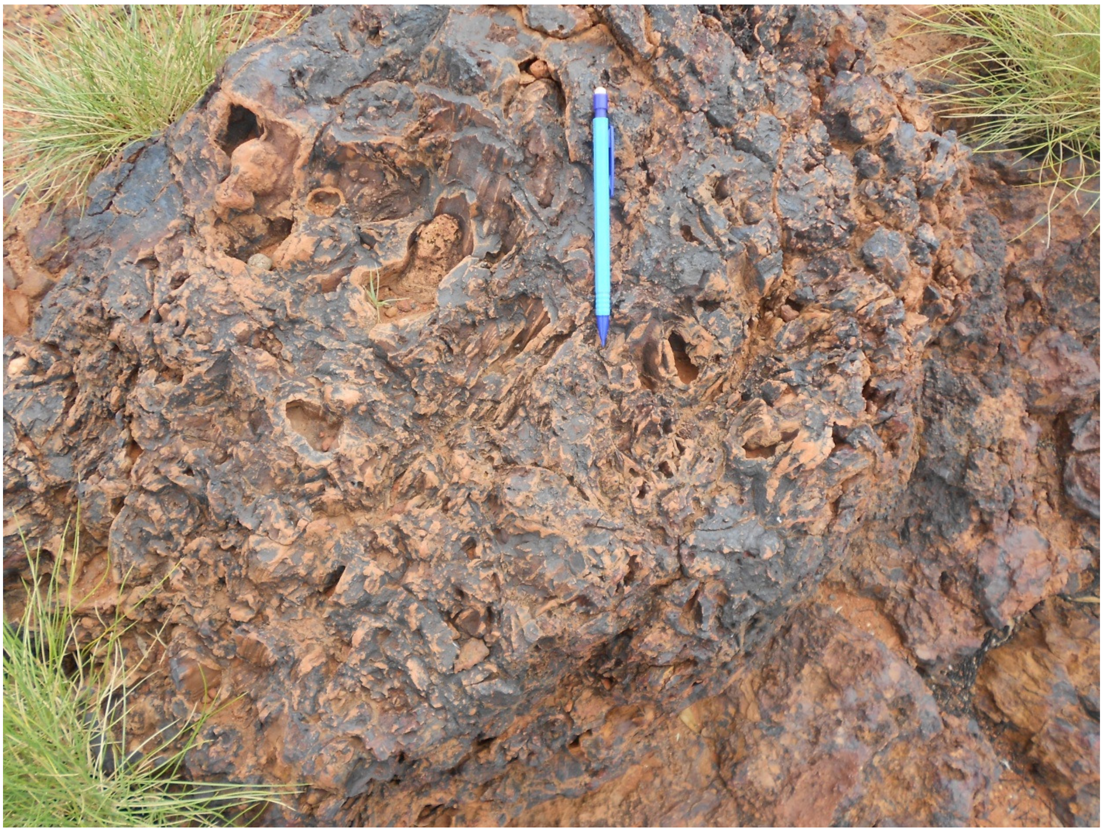

**Figure 17**: Large, dark coloured outcrop of botyroidal goethitic iron-oxide

Proximal to this outcrop, a small area of very weathered low-lying black manganese-coated subcrop returned 37% Fe and 5.8% Mn.

To the extreme southeast of EL26071, satellite image anomalies 1 and 2 are low-lying areas of subcropping goethite and manganese altered rocks within mapped Algamba Dolomite Member, Figure 18. The outcrop is black, to dark-brown, in places honeycomb-textured (possibly replacing dolostone) and botryoidal, with ochreous yellow clay in joints. A rare oolitic-textured sample was found. TRK600 returned 53.9% Fe and black, manganese float (TRK602) returned 36.7% Fe and 19.5% Mn.

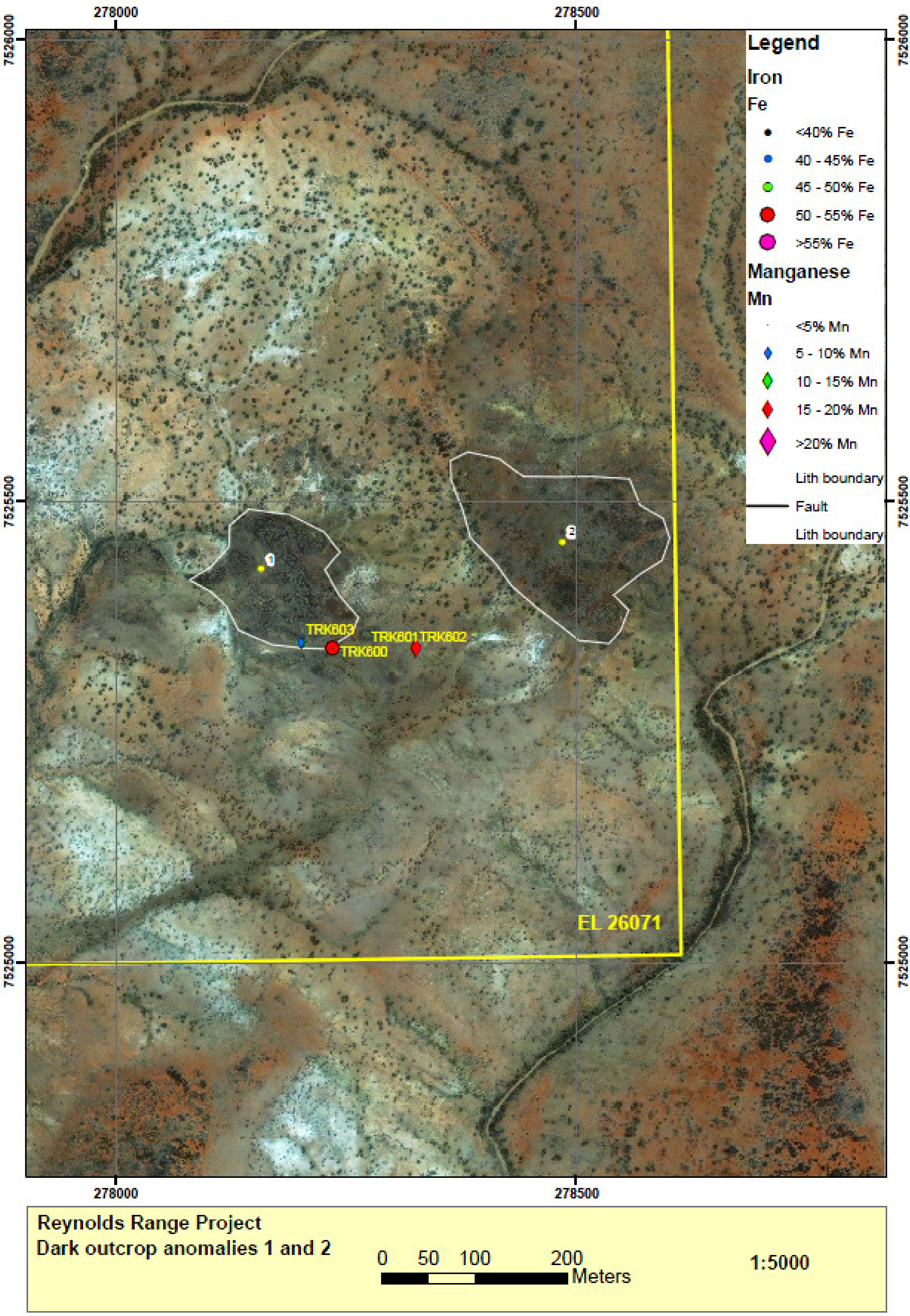


**Figure 18**: Satellite image showing outcrop anomalies 1 and 2 in EL 26071

### HEMATITE (Fe-ENRICHED) QUARTZITE

Quartzites in the Reynolds Range (Mount Thomas Quartzite) are variable in colour (white and unusual dark blue-grey lithologies are present) and possess varying degrees of iron enrichment, Figure 19.

**Figure 19**: Detail of blue quartzite outcrop

This has led to five broad categories of quartzite:

(i) hematite quartzite
(ii) quartzite with Fe-enrichment
(iii) Fe-stained quartzite
(iv) blue-grey quartzite
(v) white quartzite

Hematite quartzite appears to be volumetrically insignificant in the Reynolds Range (however, this is based on limited field observation). Sample TRK544 is a Fe-rich (hematite) quartzite located on the faulted contact to the Coniston Schist to the Pine Hill Formation. It has a linear surface exposure of ~25 m x 10 cm, striking 300° (50→090°). This sample returned 52.2% Fe, 0.19% P and 3.3% LOI.

Subcropping quartzite at satellite image anomaly 13 (discussed earlier), is enriched in iron (TRK556). This sample still retains original relict cross-bedding, Figure 20 and returned 24.7% Fe, 0.22% P and 4.4% LOI).

**Figure 20**: Detail of quartzite showing relict cross-bedding

Fe-stained quartzites are observed at the Harverson Pass hematite anomaly (see earlier) at the brecciated contact between the quartzite and the Warimbi Schist, however, iron abundance is low (TRK549 = 11.2% Fe).

Unusual blue-grey quartzite forms distinctive kilometre-scale, linear northwest-trending ridges in the Reynolds Range, Figure 21.

**Figure 21**: View to north-northwest, showing blue quartzite ridge in foreground and continuation of ridge along strike 300°

Iron content for TRK608 and TRK609 is 8.8% and 18.8% Fe respectively. At this stage, the process responsible for the distinctive blue-grey colouration is unclear. The white quartzites appear unmineralised.

### Fe-BRECCIA AND QUARTZ-HEMATITE BRECCIA

Iron-rich breccia and abundant quartz-hematite breccia units have been identified throughout the Reynolds Range. Fe-rich breccia sample TRK568, Figure 20, located close to the magnetite/hematite mineralised samples discussed earlier, yielded 52.6% Fe, 0.2% P, 12.9% $SiO_2$ and 8.1% LOI. This sample is iron-rich, silica poor and extremely brecciated with abundant vugular structures, Figure 21.

It is possible that this outcrop may be a vent system for volatile-rich fluid transfer responsible for magnetite/hematite mineralisation of the host conglomerate. Quartz-hematite breccia outcrops in a creek proximal to the above units (TRK570A). This sample returned low iron abundances, but high manganese values (3.4% Fe, 14.7% Mn, 66.8% $SiO_2$ and 4.4% LOI. These samples are positioned on a faulted contact between the Lander Rock Formation and the Mount Thomas Quartzite and are most likely the product of cataclastic deformation. This brittle deformation resulting in concomitant brecciation, would have provided a suitable porous host and structural corridor for Fe-rich fluids to migrate. Other quartz-hematite breccia locations are documented in Table 2. Along with shear zones at lithological boundaries, these breccias may have potential for gold mineralisation.

**Figure 21**: Detail of quartz-hematite breccia exposed in river system

**DRILL PADS IDENTIFIED FROM SATELLITE IMAGERY**

Straddling the north boundary of EL 28077, a southwest-trending drill pattern is observable in satellite imagery. The drill lines are spaced 400 m apart, and coordinates for the drill pads are in Table 3. Grey-green quartz-mica-sericite schist (no observable Fe-enrichment) drill chips were found at the centre two drill pads and drill spoils from the drill hole located to the extreme northeast were cream-coloured clay with quartzite chips.

| Name | Lithology | Datum | Zone | GDA Easting | GDA Northing |
|---|---|---|---|---|---|
| Drill pad 1 | Unknown | GDA94 | 52L | 263797 | 7546615 |
| Drill pad 2 | Grey-green quartz-mica-sericite schist | GDA94 | 52L | 263976 | 7546806 |
| Drill pad 3 | Grey-green quartz-mica-sericite schist | GDA94 | 52L | 264260 | 7547095 |
| Drill pad 4 | Cream clay, quartzite chips | GDA94 | 52L | 264534 | 7547369 |

**Table 3**: Location details for drill pads identified from satellite imagery

### OFF-TENEMENT SAMPLES TOWARDS AILERON ROADHOUSE

During the routine flight back to Aileron Roadhouse from the tenement area, dark-brown ridges were observed from the helicopter. Two samples (TRK610 and TRK611) were collected ~14.5 km southeast of anomalies 1 and 2, where long, discontinuous ridges have a strike length of ~100m by 45 m. The area is an old Tertiary land surface with rounded bounders of hematitic gritty sandstone typical of detrital iron deposits. Sample TRK610 returned 25.6 % Fe and 0.07% P. The second area investigated, is a ferruginous sandstone (hematite replacement), where remnants of original bedding are preserved, Figure 22. TRK611 returned 15.9% Fe and 0.08% P.

**Figure 22**: Hematite-replaced ferruginous sandstone outcrop

### DISCUSSION

Iron and manganese mineralisation is strongly structurally controlled, either by fault bounded contacts between metasedimentary units or shear zones localised at lithological contacts. The Reynolds Range has undergone multiple episodes of deformation and has a structurally complex tectonic history. Repeated episodes of folding produced large-scale anticlinal and synclinal structures followed by granitoid intrusion and repeated episodes of late-stage faulting, which tectonically juxtaposed and offset the metasedimentary strata. This deformation resulted in steeply dipping successions along limbs and hinge zones of large scale fold structures.

Iron and manganese mineralisation is present in the Reynolds Range, however, the highest grade for the assayed rocks returned was less than 60% Fe. There are small occurrences of hematite/magnetite replacing conglomerates of the Mount Thomas Quartzite, goethite replacing metasedimentary lithologies, e.g. quartz mica schist of the Lander Rock Formation and Mount Thomas Quartzite, goethite and/or manganese possibly replacing dolostone (Algamba Dolomite Member), Fe-enriched quartzites, Fe-rich breccias and quartz-hematite breccias. Apart from one localised area with hematite/magnetite, most of the mineralisation appears to be goethitic and/or manganiferous.

The main controls on mineralisation are sheared or faulted lithological contact zones between the Mount Thomas Quartzite with the Lander Rock and Pine Hill Formations and in areas of intense brecciation, all of which provide favourable sites for mineralisation. Flexural slip along strike between metasedimentary strata in synclines and anticlines has provided favourable pathways for fluid transport, with hinge zones and limbs of synclines most likely concentrating mineralising fluids. Quartz-hematite and Fe-rich breccias provided a favourable host medium for the mineralising fluids. In addition, satellite image anomalies 13 and 31, which have iron mineralisation, are centred and located near magnetic highs, Figure 23.

Late-stage intrusion of granitoids may have provided a heat source (?remobilisation of Fe and Mn-rich fluids) and large-scale faults may have provided zones of accommodation (dilation zones) favourable for mineralising fluid transport.

Goethite mineralisation is associated with metasedimentary strata of the Lander Rock Formation, Pine Hill Formation and Mount Thomas Quartzite, while goethite/manganese mineralisation is associated with the Algamba Dolomite Member, which is mainly restricted to a northwest-trending valley flanked by the Pine Hill Formation and Mount Thomas Quartzite. This area is a large syncline. Fe-rich breccias in this region suggest that this is a source/vent area for this style of mineralisation.

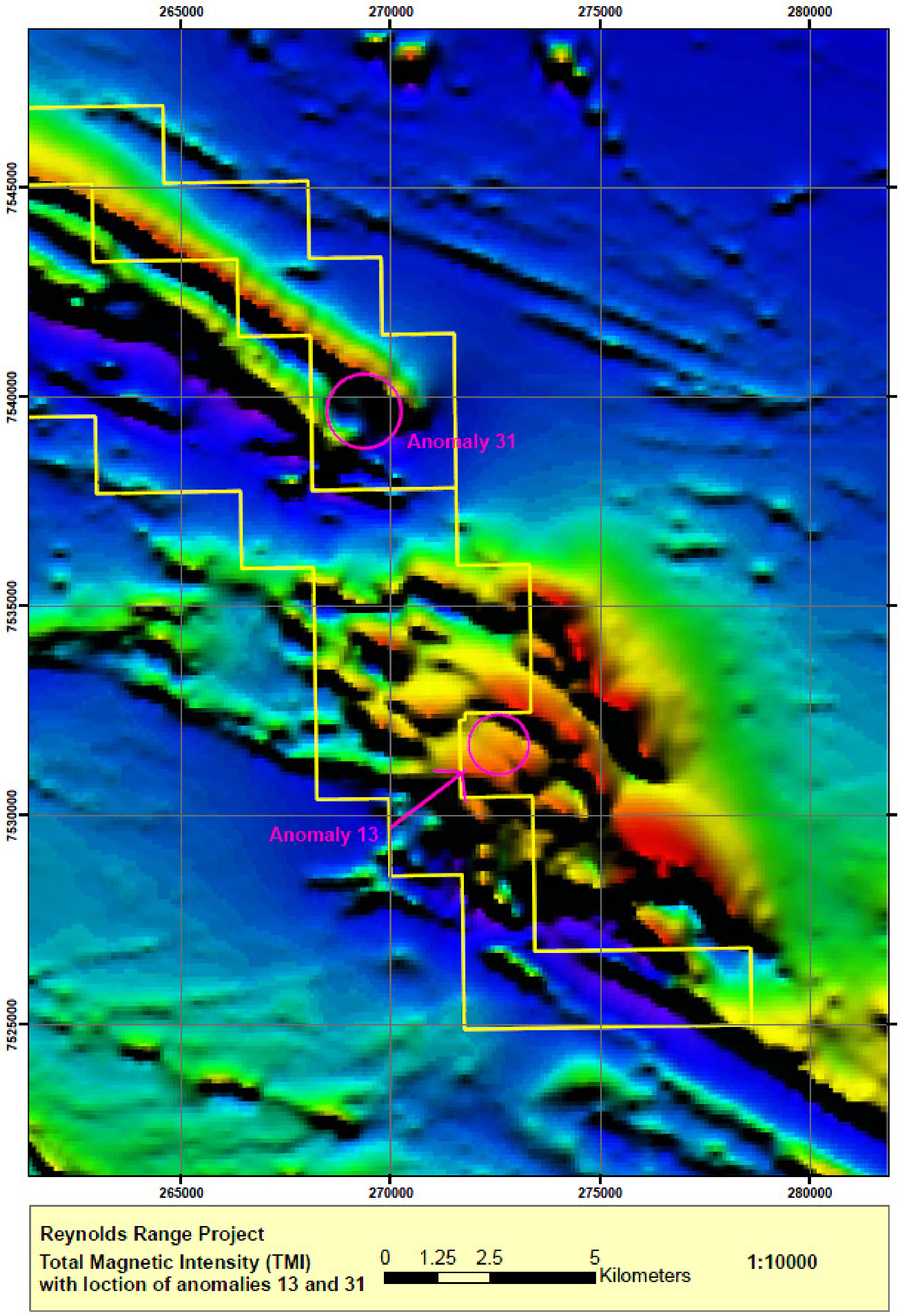


**Figure 23**: TMI image showing location of anomalies 13 and 31

Due to time constraints, only a small number of the identified satellite image anomalies were investigated. Figure 24 shows a synclinal structure with three dark rocky outcrops (anomalies 40, 41 and 43) that are, as of yet, unvisited.


**Figure 24**: Satellite imagery showing dark outcrop anomalies located in the hinge and limbs of a syncline (unvisited). Dashed white lines delineate lithological boundaries

Tertiary land surface, detrital iron deposit (sandstone replacement) is the mineralisation style between Aileron Roadhouse and the tenement area. Assay results for iron are typically low.

## CONCLUSIONS AND RECOMMENDATIONS

Reynolds Range is host to surface iron and manganese mineralisation, however, the highest grade for assayed outcropping rocks is 57% Fe and in most cases, phosphorus values are high (>> 0.1% P).

Given the time constraints, it was not possible to visit all the satellite image dark anomalies shown in Figure 7. An area of potential interest is the site of satellite image anomalies 40-43, in the northwest of the tenement area, Figure 7, 24. These dark photo anomalies are located within the hinge and axis of a syncline of the Pine Hill Formation, surrounded by a thin ridge of the Mount Thomas Quartzite, flanked by the Coniston Schist and may be a structurally favourable area for iron mineralisation. A short field program to follow up and further investigate areas which yielded the highest Fe and Mn values is recommended.

Regional aeromagnetic data reveal structural corridors that indicate the Aileron Province and the Tanami and Tennant Creek Provinces are possibly laterally contiguous under cover, which highlights the potential for Au mineralisation in the Reynolds Range. The complex structural history and abundant shear zones further enhance the prospectivity for this element. Potential exists for Au and base metals (Cu, Pb, Zn, REE etc). A program involving a stream sediment sampling program, (overbank and stream sediment trap sites) can be undertaken to determine if these elements are present in anomalous abundances.

Based on field observations, the area to the extreme northwest of the tenements are not deemed prospective for Fe mineralisation.

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