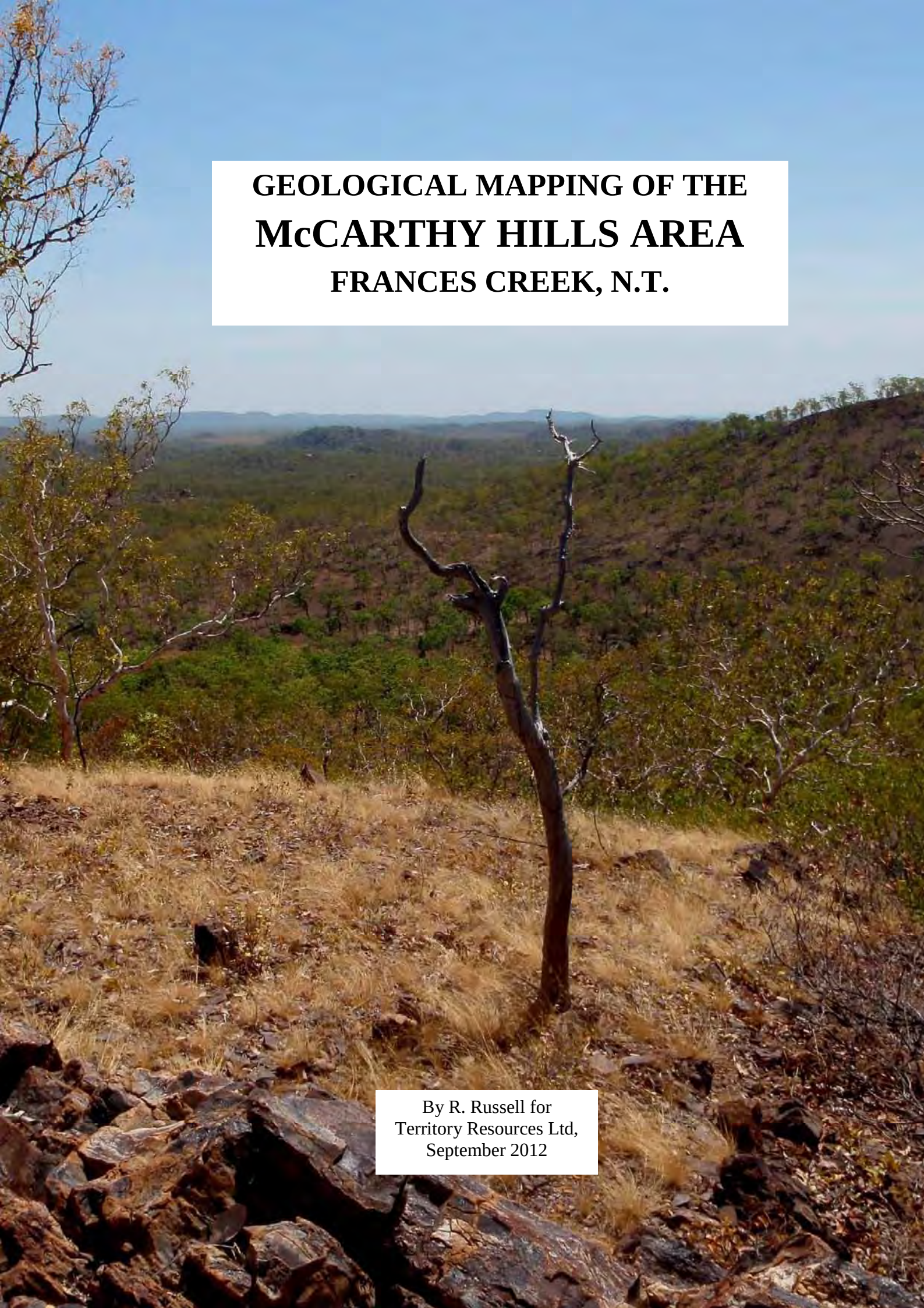


GEOLOGICAL MAPPING OF THE
McCARTHY HILLS AREA
FRANCES CREEK, N.T.

By R. Russell for
Territory Resources Ltd,
September 2012

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PHOTOGRAPHS

(Abridged Captions)

LIST OF ENCLOSURES

Enclosure No. (1:5,000 maps)

1 INTRODUCTION

1.1 Summary

Regional mapping of the McCarthy Hills project area has been carried out in two field trips from the 25th June to 5th July and 14th to 23rd August 2012. This work follows the detailed mapping at 1:1,000 of the 'Drillout' area in the central part of the project area (Russell, 2010a). This area was drilled in November/December 2010. The present mapping covers the central, and most prospective, part of the project area where Wildman and Koolpin Formation siltstones outcrop in a series of open folds. The mapped area (Figure 1) is located about 30km due east of the main Frances Creek mine workings.

The mapped area covers some 20.5 km^2 (Figure 1). The sedimentary units in the area comprise:

- Mundogie Sandstone,
- Upper and Lower Wildman siltstones and shales with a thick sill of Zamu dolerite and
- Koolpin Formation siltstones and tuff.

The units are open-folded with axes trending west-northwest (about 320^O) and plunging gently to the south-southeast. The major Allamber Springs Granite intrusion terminates the sedimentary sequence to the south and west.

The mapping was done by collecting geological data on walking traverses in the field followed by photo-interpretation of the available 'Quickbird' space imagery. The maps are at a scale of 1:5,000. Rock chip samples were taken of the mineralised outcrops (Tables 1 and 2).

Three maps were produced in the present work programme. They are numbered Enclosures 1 to 3 and they cover the following areas:

- ***Enclosure 1*** covers the western part of the project area from the Mundogie Sandstone ridges in the north to the granite outcrops in the south. The area includes the western part of the informally named 'Linear Valley' and the 'Kp Ridge'.
- ***Enclosure 2*** is located in the central part of the project area and is centred on the broad Central Valley. It includes the 'TTY 2010 Drillout Area' and extends from the Mundogie Sandstone outcrops in the north to the granites in the south.
- ***Enclosure 3*** covers the eastern part of the project area and includes structurally controlled valleys informally named 'Cone Valley', 'Hidden Valley' and the eastern part of 'Linear Valley'.

1.2 Conclusions

Iron mineralisation occurs primarily in the Lower Wildman Formation and secondarily in the Upper Wildman and Koolpin formations. The styles of mineralisation are as follows in approximate order of perceived importance:

1. Frances Creek-style multi-phase enrichment of siltstone breccias in the **Lower Wildman Formation.** Outcrops are at the 'Drillout', 'East-west' and 'Buggy' on the eastern side of 'North Valley'.
2. Enrichment in the **Zamu Dolerite** on the northwestern side of 'Cone Valley'.
3. Goethite in the matrix of **Koolpin chert-nodule siltstone** on the southwest flank of 'Butterfly Ridge' in the extreme southeast of the mapped area.
4. Enrichment in the **Cretaceous sandstone** cap at the south end of 'Butterfly Ridge'.
5. Goethite in **fault breccias in Koolpin and Lower Wildman** siltstones in the western part of 'Linear Valley'.
6. Enrichment in siltstone units of the **Upper Wildman** in 'North Valley'.

The approximate size of each of the mineralisation types are listed on Table 3.

1.3 Recommendations

Exploration aircore drilling is recommended at the 'East-west', 'Fedol' and 'Butterfly Ridge' prospects. The details are as follows:

1.3.1 East-west prospect:

- Ten north-south drill traverses are recommended spaced 100m or 200m apart in relation to the best outcrops of the iron breccia.
- Each traverse contains 1 to 3 holes spaced 40m apart. The total number of drillholes is 24 and recommended drill depth is 80m.
- Drilling should be orientated at 60^{O} below horizontal towards the north.
- Total metres drilled will be 1,920m

1.3.2 Fedol prospect

- Three east-west trending drill traverses are recommended 40m apart.
- Each traverse has 4 holes spaced 20m apart to a depth of 60m.
- Drilling should be orientated at 60^{O} from horizontal towards the west.
- Total metres drilled will be 720m.

1.3.3 Butterfly Ridge prospect

- Six east-west trending drill traverses are recommended 100m apart.
- Each traverse has 3 holes spaced 40m apart to a depth of 80m.
- Drilling should be orientated at 60^{O} from the horizontal towards the west.
- Total metres drilled will be 1,440m.

2 INTRODUCTION

2.1 Map Area and Programme

Mapping of the McCarthy Hills area has been carried out in two field trips from the 25th June to 5th July and 14th to 23rd August 2012. This work follows the detailed mapping at 1:1,000 of the 'Drillout' area in the central part of the project area which was completed in December 2010 (Russell, 2010a). This area was drilled in November/December 2010. The present mapping covers the whole of the prospective part of the project area where Wildman and Koolpin Formation siltstones outcrop in a series of open folds. The mapped area (Figure 1) is located about 30km due east of the main Frances Creek mine workings.

The mapping was done by collecting geological data on walking traverses in the field followed by photo-interpretation of the available orthophoto. The maps are at a scale of 1:5,000. Rock chip samples were taken of the mineralised outcrops (Tables 1 and 2).

This **report** is intended to provide some background geological information, outline the rationale of the work programme and annotate the maps.

The **maps** are presented at the rear of the report and are listed as Enclosures 1 to 3. The location of the maps is shown on Figure 1.

2.2 Conclusions

Iron mineralisation occurs primarily in the Lower Wildman formation and secondarily in the Upper Wildman and Koolpin formations.

2.2.1 Mineralisation styles

The styles of mineralisation are as follows in approximate order of perceived importance:

- Frances Creek-style multi-phase enrichment of siltstone breccias in the Lower Wildman Formation. Outcrops are at the 'Drillout', 'East-west Reef' and the eastern side of 'North Valley'.
    - The mineralisation is located about 100 to 200 metres from the Mundogie Sandstone outcrop.
    - Mineralisation is relatively narrow: about 2 to 10 metres thick and it generally thickens in minor fold closures and in close proximity to faults.
    - Grades are generally high.

- Enrichment in the Zamu Dolerite on the northwestern side of 'Cone Valley'.
    - Located on the south side of a NE trending cross fault.
    - Outcrop extends for 150 metres along strike. Width estimated to be about 5m.
    - Outcrop is poor (like Zamu dolerite), grades appear to be high.

- Goethite in the matrix of Koolpin chert-nodule siltstone in the southeast at 'Butterfly Ridge'.
    - Low grade but extensive (unit is about 600m long and 20m wide).
    - High silica content due to un-enriched chert nodules but could be beneficiated.
    - Enrichment is only on the southwest side of the unit.
- Enrichment in the Cretaceous sandstone cap on the south end of 'Butterfly Ridge'.
    - High silica content due to the quartz sandstone protolith.
    - Iron is derived from the goethite in the underlying mineralised Koolpin chert-nodule breccias.
    - About 300m long by 50m wide and about 5m thick.

- Goethite in fault breccias in Koolpin and Lower Wildman siltstones in the western part of 'Linear Valley'.
    - Matrix of breccias is enriched with goethite
    - Low grade but could be beneficiated
    - Relatively small volumes
- Enrichment in siltstone units of the Upper Wildman in 'North Valley'.
    - Goethite dominant, lower grade, lensoid, narrow.
    - Probably close to cross-cutting and thrust faults.
    - Relatively small volumes.

The approximate size of each of the mineralisation types are listed on Table 3.

2.2.2 General

The following are general observations made in the mapped area:

- The highest grade of iron mineralisation occurs in enriched dolerite on the northern side of 'Cone Valley' the ('Fedol' Prospect). Grades exceed 63% Fe. The mineralisation here may occupy a fold nose. Outcrop is poor and the maximum volumes of iron are likely to be about 0.2 Mt (Table 3).
- A series of iron breccia outcrops occur on an east-west trend in Lower Wildman siltstone immediately to the northeast of the TTY drillout area. The outcrops are informally named the 'East-west' prospect. Iron grades are patchy. The high grades are estimated to exceed 60% Fe. Total tonnage in the prospect is thought to be about 1.2 Mt in the top 30m (Table 3).
- Large tonnages are likely in enriched Koolpin chert-nodule siltstone at 'Butterfly Ridge' in the southeast. Although grades are low due to the chert nodules, it appears that beneficiation may be possible. The deposit may exceed 1.3 Mt (Table 3).
- Other mineralised zones are small or contain low grade goethitic material.

3 GENERAL MAPPING

3.1 Construction of the Maps

3.1.1 Technique

The maps of the area were constructed from field traversing supported by photo-interpretation. Field conditions were generally good with moderate temperatures and humidity. Most of the grass had been burned off which assisted the mapping considerably. An 'All Terrain Vehicle' (ATV, Photograph 5) was available during the second part of the work programme and the vehicle proved valuable in accessing the more remote parts of the project area.

The present interpretation is made from the field traversing and photo-interpretation. The maps are presented here as Enclosures 1 to 3. They are neat pencil-drawn working drafts.

The maps are essentially fact-maps of outcrop. North-south trending traverses were completed in the field at 250-metre and 500-metre intervals. Geological and geomorphological features were noted along each traverse and the northings of the features recorded. This information was then transferred onto transparent overlays. The maps were completed by photo-interpretation between these 'field-truth' lines. In addition to the traversing, the outcrop boundaries of the main mineralised units were located in the field and transferred to the map.

3.1.2 General features of the maps

The mapping is focussed on iron outcrops. These were generally located in the field by directly identifying outcrops or finding and following-up iron-rich float on hillslopes and in creek beds. It is thought that all the main iron-bearing units in the area have been successfully identified and outlined.

Less attention has been given to the other non-iron-bearing units in the area. Although the area is quite hilly, outcrop is surprisingly poor due to a thin blanket of colluvium. Many of the outcrops encountered in the valleys are essentially small 'windows' showing through the colluvium due to hillslope and creek erosion or slumps. The maps therefore show many small outcrops without boundaries. Rock type and dip/strike are shown on the maps but they are disconnected from each other due to the colluviual cover.

3.2 Geology and Geomorphology

3.2.1 Outcrop

3.2.1a Mundogie Sandstone

Outcrop in the mapped area comprises **Mundogie Sandstone** in the high ridges in the north (Photograph 1). The sandstones are the oldest rocks in the area and occupy the cores of the two main ESE-plunging anticlines. The sandstone is light grey, medium grained, fairly immature and contains characteristic quartz veins. The high ridges are

out of bounds to TTY personnel for heritage reasons so all the details on the maps are from air photo interpretation.

3.2.1b Wildman Formation and Zamu dolerite

Wildman Formation carbonaceous siltstones and shales occupy the main valleys in the mapped area. A major sill of **Zamu dolerite** intrudes the upper part of the Wildman Formation. Outcrop width varies considerably but 150m appears to be a common average. Real width of the sill is therefore about 100m to 120m. The Wildman siltstones outcrop poorly. The most prominent outcrops are the main iron breccias (Photographs 6 and 7). These are located in the Lower Wildman siltstones usually about 100m to 200m above the Mundogie Sandstone. The iron formations are essentially the same as those at Frances Creek although probably somewhat narrower. In the East-west prospect, the iron unit is duplicated in places possibly due to thrust faulting. In the 'Drillout', the iron unit contains numerous small tight parasitic folds. The Upper Wildman siltstones are more resistant than the lower part of the formation and are darker (pyritic?) and weather with a white kaolinised skin.

3.2.1c Koolpin Formation

Koolpin Formation siltstones occupy the structural lows in the mapped areas. The most resistant unit is a distinctive dark grey pyritic siltstone near the base of the formation (Photographs 1 and 2). It forms the prominent ridges on the axis of the central syncline and on the flanks of the northern and southern anticlines. Immediately below this unit and above the Upper Wildman siltstones and Zamu dolerite is a chert-nodule siltstone that can be traced through most of the map area. The northeastern ridge of Koolpin Siltstone is out-of-bounds for heritage reasons.

3.2.1d Gerowie Tuff

Above the prominent Koolpin siltstone unit is the Gerowie Tuff. This sequence at McCarthy's appears to comprise a basal grey siltstone overlain by a thickly bedded black cherty siltstone (probably the main tuff unit) followed by a sequence of fine to moderately- bedded quartzites. These rocks outcrop between the high 'Kp Ridge' and the granite in the southwest of the mapped area and in the out-of-bounds zone to the northeast. In spite of the cherty nature of the tuff, they do not form prominent outcrops.

3.2.1e Allamber Springs Granite

Allamber Springs Granite (Photograph 3) has intruded this part of the Pine Creek Geosyncline and terminates the metasedimentary package in the McCarthy Hills to the south and west (Photographs 19 and 20). The granite is generally porphyritic and contains xenoliths and veins of dark hornfelsic material (Photograph 22). Grain size varies considerably over short distances suggesting that several late-phase partial melts of the granite occurred.

3.2.1f Cretaceous sandstone

Cretaceous sandstone caps the southern end of 'Butterfly Ridge'. The sandstone is about 5 metres thick (Photograph 17) and rests on a flat erosional platform cut across the Koolpin chert-nodule siltstone. This platform has survived erosion in much of the project area but the sandstone cover has been removed by erosion. The sandstone (Photograph 18) is quartzitic, coarse grained, immature and contains pebble layers. It is highly ferruginous on 'Butterfly Ridge' due to the iron-rich Koolpin unit on which

it rests. The sandstone grades between 45% and 50% Fe (TRK 680 and 681; Table 2) and total tonnage is estimated at about 0.15 Mt (Table 3). The iron (goethite) is held in the matrix of the quartz grains so it could be amenable to beneficiation.

3.2.2 Geomorphology

The geomorphology of the area is largely controlled by structure and stratigraphy. The prominent ridges are the resistant Mundogie and Koolpin units (Photograph 1) and their overall shape reflects the anticline/syncline/anticline structural pattern. The broad valleys are underlain by shales and softer siltstones of the Wildman and Gerowie formations. Within the valleys, river terraces have developed probably in response to cyclical rejuvenation of the drainage due to knick-point splitting. This is particularly noticeable in 'Cone' Valley and in the 'Central' Valley.

3.2.3 Structure

All the sedimentary formations in the area have been open-folded into a sequence of anticline/syncline/anticline folds with axes trending at about 300^{O} plunging at a shallow angle to the ESE. On a broad scale, the folding is structurally simple. However, on a local scale, several significant structural features become apparent:

- 'Linear Valley' appears to be controlled by WNW trending thrust faults. In the west, these faults are associated with goethite breccia (Photographs 11 and 12).
- The southeastern end of the Linear Valley anticline and the central syncline are thrust faulted. This has produced repeated fault slices and a considerable thickening of the Wildman siltstone in Linear Valley.
- A prominent NE trending right lateral strike-slip fault extends through the centre of the mapped area. It runs through the access track pass in the Kp Ridge in the south and across the nose of the Mundogie Sandstone outcrop on the anticline in the north.

4 MAP DESCRIPTIONS

4.1 Introduction

Three maps were produced in the present work programme. They are numbered Enclosures 1 to 3 (Figure 1). The areas covered are as follows:

- ***Enclosure 1*** covers the western part of the project area from the Mundogie Sandstone ridges in the north to the granite outcrops in the south. The area includes the western part of the informally named 'Linear Valley' and the 'Kp Ridge'.
- ***Enclosure 2*** is located in the central part of the project area and is centred on the broad Central Valley. It includes the 'TTY 2010 Drillout Area' and extends from the Mundogie Sandstone outcrops in the north to the granites in the south.
- ***Enclosure 3*** covers the eastern part of the project area and includes structurally controlled valleys informally named 'Cone Valley', 'Hidden Valley' and the eastern part of 'Linear Valley'.

4.2 Enclosure 1; West

4.2.1 Location and access

Enclosure 1 covers the western part of 'Linear Valley' and extends from the high Mundogie Sandstone cliffs in the north to the Allamber Springs granite in the south. The 'Kp Ridge' roughly bisects the area. The granites in the south form low plains interrupted by tors and bornhardt domes (Photograph 3).

There are no active tracks in the area. The southern flank of the Kp Ridge is accessible by ATV. The rest of the area is accessed by hiking.

4.2.2 Structure and outcrop

The sedimentary sequence is younging from the Mundogie outcrops in the north to the granites in the south. The structuring appears to be simple and it is expected that dips should be consistently toward the south. However, this is not the case and the structural pattern is rather more complex:

- Folding occurs in the Gerowie Tuffs to the south of Kp Ridge. A syncline rests against the granite in the south. Other folds are obscured by colluvium shedding southward from Kp Ridge.
- A large anticline forms a major outlier of grey siltstone in the southwest ('Kp Outlier').
- The southern flank of Linear Valley consists of Zamu Dolerite.
- A thrust fault trending 290^{O} runs along the northern flank of Linear Valley and is associated with major goethitic breccias.
- A major fault trends NE at about 050^{O} across the western part of the area. The faulting is associated with goethite breccias where it crosses Kp Ridge.

4.2.3 Iron outcrops

The significant iron mineralisation in the map area are located in goethite breccias in the two main faults; the 290^{O} thrust and the 050^{O} cross fault. The goethite is mainly in the matrix of the breccias and the clasts are not generally enriched. The prospects are informally named 'Goethite' on the Kp Ridge (Photographs 13 and 14) and 'Breccia' in the valley (Photographs 10, 11 and 12). Iron grades at 'Breccia' are moderate at about 50% (TRK 644 to 649; Table 1) while at 'Goethite' grades are better at 54% to 58% (TRK 682 and 683; Table 2). Total tonnage in the top 30m of all the deposits here is thought to be about 0.4 Mt.

4.3 Enclosure 2; Central

4.3.1 Location and access

Enclosure 2 covers the central part of the project area extending from the high Mundogie Sandstone outcrops in the north across the low-lying silty flats of the 'Central Valley', 'Linear Valley' and the 'Kp Ridge' to the granites in the south.

Access is relatively good in this part of the project area. The main access track enters the area from the south and crosses the 'pass' through the Kp Ridge into the Central Valley. The track was upgraded for the 2010 drilling but the extension to the northeast was not used at this time. This part of the track was re-opened using the ATV in the present work programme.

4.3.2 Structure and outcrop

The map covers the central syncline where the 2010 drilling was carried out and the anticline to the south that controls Linear Valley. The fold axes are orientated west-northwest at about 300^{O} and plunge gently to the east-southeast. The southern flank of the anticline that forms Linear Valley appears to be thrust faulted. It is this structure that gives the valley its linear form.

A major fault crosses the fold structures in the centre of the map trending northeast at 055^{O}. The fault appears to be a right lateral strike slip fault but it does not significantly displace the sedimentary units. All the main iron formations in the Lower Wildman Formation are to the west of this fault.

4.3.3 Iron outcrops

The main iron outcrops in the McCarthy area are located on this map sheet. The 'Drillout' and 'East-west' prospects follow the strike of the Lower Wildman units in the western closure of the central syncline. Iron grades are high to moderate and the units are relatively narrow, seldom exceeding 5m in width (Photographs 6, 7 and 8). Total tonnage to 30m depth at 'Drillout' is estimated to be 0.76 Mt (Table 3). Tonnage at 'East-west' is likely to be larger at 1.21 Mt (Table 3). It is recommended that aircore drilling should be carried out over the 'East-west' prospect

The iron formations at 'Drillout' are tightly folded by parasitic structures and faulted by NE faults. An east-west thrust fault zone displaces the iron formations in the north.

The ‘East-west’ prospect is a continuation of the ‘Drillout’ outcrops to the northeast. The iron units are duplicated in places suggesting that they could be fault-repeated.

Iron mineralisation occurs in a fault zone in the northeast of the map area at the ‘Buggy’ prospect (Photograph 9). The iron is associated with major shearing and brecciation along a fault in the Lower Wildman Formation (Photograph 4). Iron grades are moderate (52% to 58%; TRK 666 to 669; Table 2) but tonnage for ‘Buggy’ and associated mineralised outcrops to the southeast is likely to be small (0.25 Mt; Table 3).

4.4 Enclosure 3; East

4.4.1 Location and access

Enclosure 3 covers the eastern part of the project area. The southeastward plunging noses of the two anticlines and the central syncline are on this map sheet. High ridges of Koolpin and Wildman siltstone form high ridges trending ESE while the valleys are underlain by less competent siltstone, shale and Zamu dolerite.

Access is into the valleys by ATV and hiking on the ridges.

4.4.2 Structure and outcrop

The major ridges mark the outline of the ESE plunging fold structures in the area. The culmination of the northern anticline is located in the east. The central syncline opens to the SE and the southern anticline terminates against the granites in the southeast of the map area. The axes of both the central syncline and the southern anticline contain thrust faults. The faulting is thought to be NE-block-over.

Northeast trending faults and shears displace the sedimentary units in places. A horst block is formed by two NE trending faults in the Central Syncline at the northern end of Butterfly Ridge. These faults continue across the Northern Anticline and are on-trend with the shearing at the silver/lead mine to the south (Photograph 21). Numerous smaller NE trending faults form minor displacements in the sedimentary units and are interpreted to be extension faults.

4.4.3 Iron outcrops

Minor iron breccias outcrop in the Wildman siltstones in North Valley at Josh’s Pod. A sample taken here graded 57% Fe (TRK 663, Table 2) but volumes are small.

Minor goethite breccias are located between the top of the Zamu Dolerite and the bottom of the Koolpin sequence. These have been sampled in places (TRK 671 and 673; Table 2) returning Fe grades of 55% and 61% respectively. Tonnage is thought to be small.

Enriched dolerite outcrops where Cone Valley joins North Valley at the ‘Fedol’ prospect (Photograph 16). Although outcrop is poor, it is possible to infer a ‘U’ shape to the mineralisation which suggests that it may be located in a narrow anticlinal fold nose plunging to the southeast. Iron grades are high, averaging over 65% (TRK 672,

675 and 676; Table 2). The tonnage is estimated to be 0.2Mt to a depth of 30m. It is recommended that aircore drilling should be carried out over this prospect.

The Koolpin Formation chert-nodule siltstone has been enriched on the southwest face of 'Butterfly Ridge' in the southeast of the map sheet (Photograph 15). The siltstone matrix has been enriched by goethite. However, the nodules are not enriched so the silica content is relatively high. *In situ* iron grades are between 45% and 55% Fe (TRK 677, 678 and 679; Table 2). It is thought that crushing and removal of the chert could up-grade the material to about 60% Fe. Tonnage is relatively high and a conservative estimate of the size of the deposit is 1.3 Mt (Table 3). Aircore drilling is recommended here.

5 RECOMMENDATIONS

It is recommended that aircore drilling be carried out as an initial phase of further exploration over three of the prospects in the McCarthy Hills area. They are the 'East-west', 'Fedol' and 'Butterfly Ridge' prospects.

5.1 'East-west' Prospect

This is the major untested zone of mineralisation at McCarthy Hills. It is likely to contain in excess of 1 Mt of mineable high to moderate-grade iron ore. The geometry of the deposit is relatively simple: it appears to be planar and dips to the south. Some thrust faulting is possible as the mineralised unit is repeated in places. In other places the outcrops pinch out so the geometry is probably also lensoid along strike. The southward dip means that the Mundogie Ridge to the north, which is a culturally sensitive area, will not need not be disturbed by exploration and mining activities.

Access is easy; the main access track at one time extended into the Central Valley and this could be re-opened. The mineralised outcrops occur low on the southern flank of the Mundogie Ridge so the topography is amenable for earthworks.

Ten north-south drill traverses are recommended spaced 100m or 200m apart in relation to the best outcrops of the iron breccia (Figure 2). Each traverse contains 1 to 3 holes spaced 40m apart. The total number of drillholes is 24 and recommended drill depth is 80m. Drilling should be at 60^{O} from horizontal towards the north. On this basis, total metres will be 1,920m

5.2 'Fedol' Prospect

This is a relatively poorly understood type of mineralisation in the Frances Creek area. Although the deposit is likely to be small, the iron grades are high, phosphorus is low and Al_2O_3 and SiO_2 are acceptable. If 'Fedol' is a plunging anticline, the mineralisation could thicken to the southeast on the nose of the structure.

The main track into the Central Valley could easily be extended across the silty valley flats to the prospect. It is located on low rolling slopes of the main ridge which lies to the northeast.

Three east-west trending drill traverses are recommended 40m apart (Figure 3). Each traverse has 4 holes spaced 20m apart to a depth of 60m. Drilling should be at 60^{O} toward the west. Total metres will be 720m.

5.3 'Butterfly Ridge' Prospect

This is a new type of iron play in the Frances Creek area. The chert-nodule siltstone is enriched by goethite to a width of about 20m over a strike length of about 600m. The deposit has the potential to be relatively large and it is recommended that further exploration be carried out here.

- The area needs to be mapped in more detail as the writer did not traverse the whole of the mineralised zone due to time constraints.

- The mineralised siltstone needs to be examined with a view to beneficiation. Perhaps a small bulk sample could be run through the bene' plant to check whether it is worth persevering with the prospect.
- Exploration aircore drilling is then recommended.

Access is not easy. An old track exists through Hidden Valley running from Central Valley to the old silver/lead mine in the far southeast. This track could be opened again and a new section of track constructed over the dolerite ridge between the mine and Butterfly Ridge. The dip of the siltstone is to the northeast so drill pads will need to be located on top of the ridge and drilling angled toward the west. The topography is steep.

Six east-west trending drill traverses are recommended 100m apart (Figure 4). Each traverse has 3 holes spaced 40m apart to a depth of 80m. Drilling should be at 60^{O} toward the west. Total meters will be 1,440m.

6 REFERENCES:

Ferenczi, P.A., 2001 Iron Ore, Manganese and Bauxite Deposits of the Northern Territory. *N.T. Geological Survey*, Report 13. Darwin, December 2001, 113pp.

Russell, R. 2010a *Geological mapping in the McCarthy Hills prospect, Frances Creek area, N.T.* Unpub. Int. Rept. for Territory Resources Pty Ltd., Dec 2010, 10pp.

" 2010b *Geological mapping between Helene 9 and Helene 5 Pits, Frances Creek, N.T.* Unpub. Int. Rept. for Territory Resources Pty Ltd., Dec 2010, 9pp.

" 2011a *Geological mapping of the Koolpin prospects, Frances Creek, N.T.* Unpub. Int. Rept. for Territory Resources Pty Ltd., Feb 2011, 19pp.

" 2011b *Geological mapping of the Rosemary-Jasmine-Beryl area, Frances Creek, N.T.* Unpub. Int. Rept. for Territory Resources Pty Ltd., Apr. 2011, 18pp.

" 2011c *Geological mapping of the H11 to H10 Corridor, Frances Creek, N.T.* Unpub. Int. Rept. for Territory Resources Pty Ltd., Apr. 2011, 27pp.

" 2011d *Geological mapping of the Mount Masson Trend, Big Hill to K19, Frances Creek, N.T.* Unpub. Int. Rept. For Territory Resources Pty Ltd., Apr. 2011, 20pp.

" 2012a *Geological Mapping of Jessops to Mount Harris, Frances Creek, N.T.* Unpub. Int. Rept. for Territory Resources Pty Ltd. January 2012, 21pp

" 2012b *Geological mapping of the Mount Masson Trend, Jettners Gold Mine to Jessops, Frances Creek, N.T.* Unpub. Int. Rept. for Territory Resources Pty Ltd., May 2012, 20pp

" 2012c *Geological mapping of the Frances Creek East Area, Frances Creek, N.T.* Unpub. Int. Rept. for Territory Resources Pty Ltd., July 2012, 18pp

Sener, A.K. 2004 *Characteristics, distribution and timing of gold mineralisation in the Pine Creek Orogen, Northern Territory, Australia.* PhD Thesis, University of Western Australia, Perth, Unpublished.

Stuart-Smith, P.G., Needham, R.S., Bagas, L., and Wallace, D.A. 1987 1:100,000 Geological Map Commentary, Pine Creek, Northern

Territory. *BMR, Geol and Geophysics*, Aust. Gov. Pub. Service, Canberra.

SRK Consulting 2007 *Structural Mapping and Interpretation of the Frances Creek Iron Ore Project.* SRK Project No. TIL002, SRK Australia. Internal Report for Territory Resources Ltd. July 48pp.

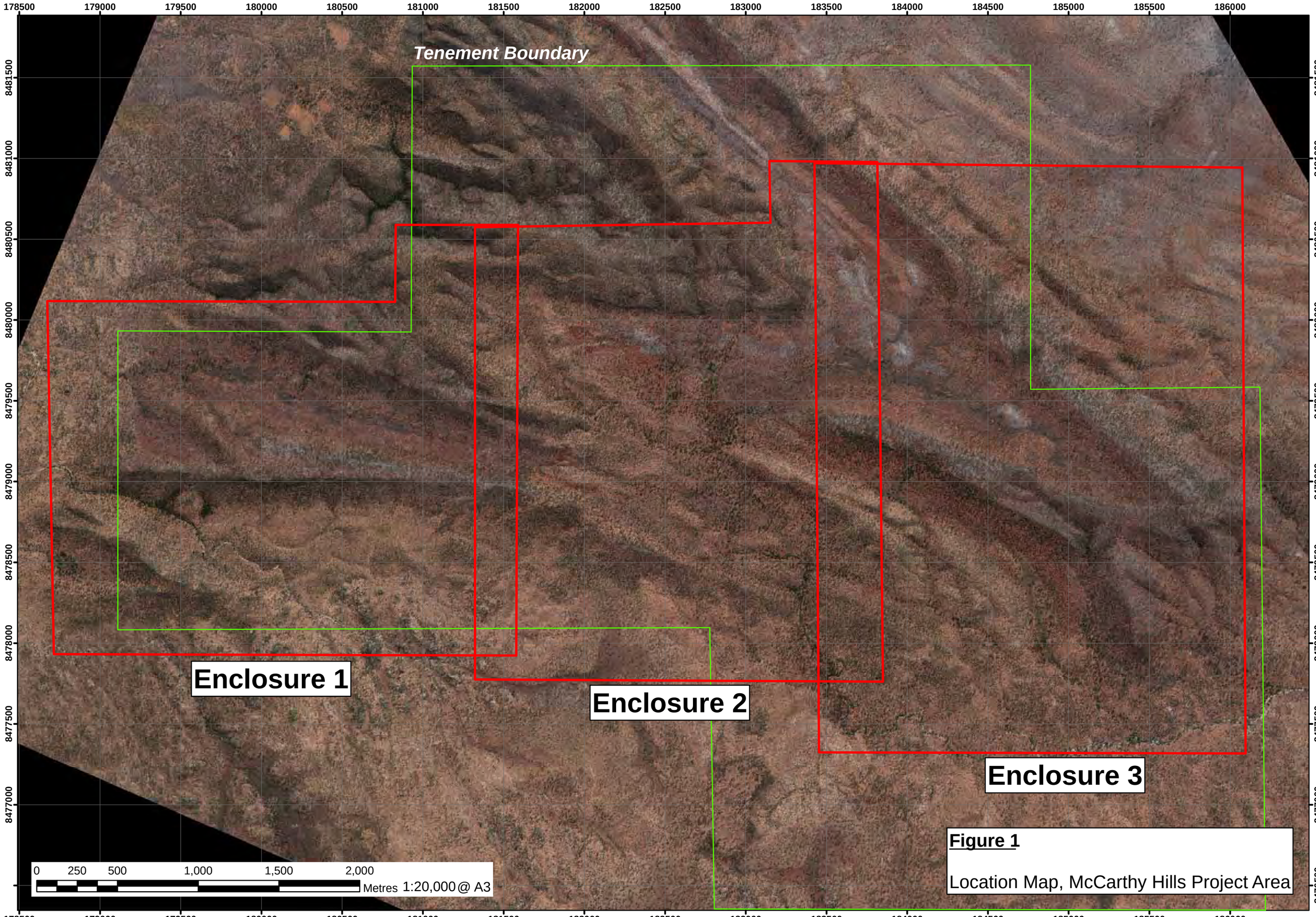


Figure 1

Location Map, McCarthy Hills Project Area

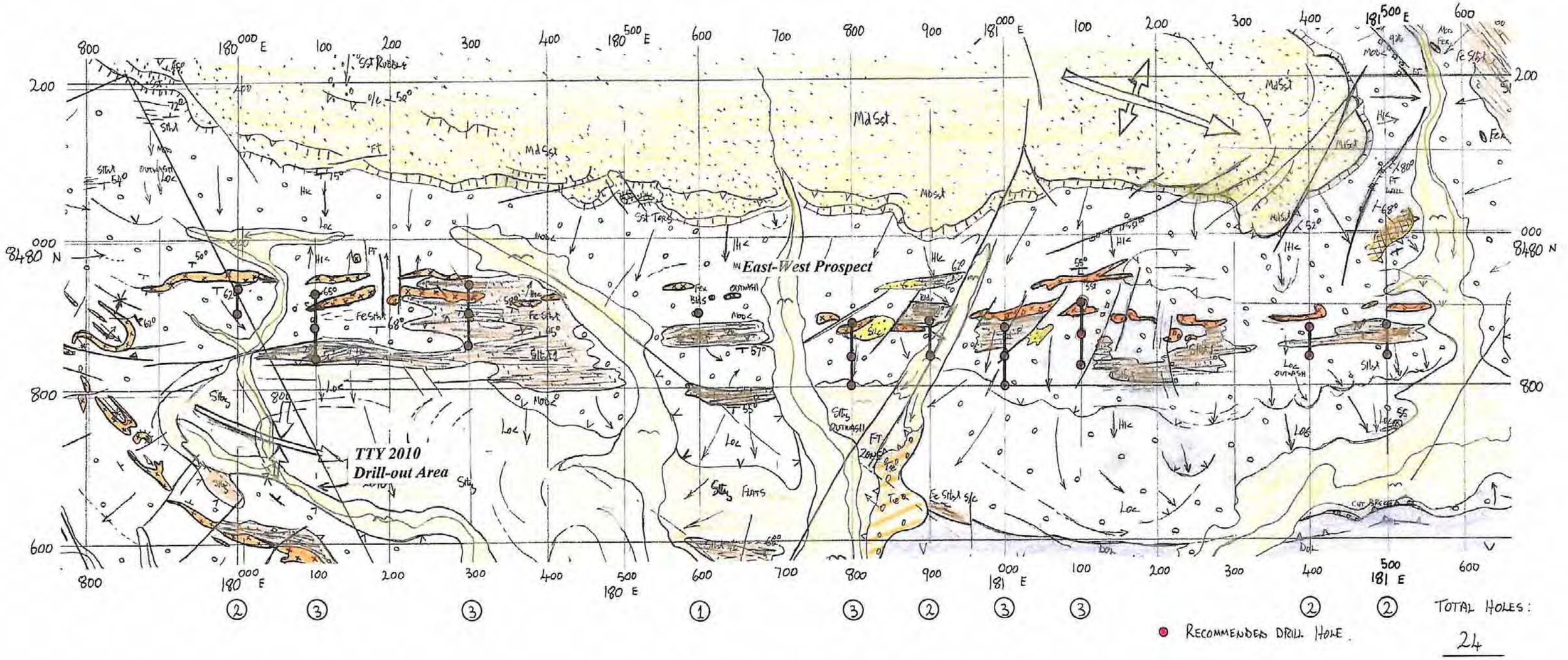


Figure 2 Recommended Drilling, 'East-west' Prospect

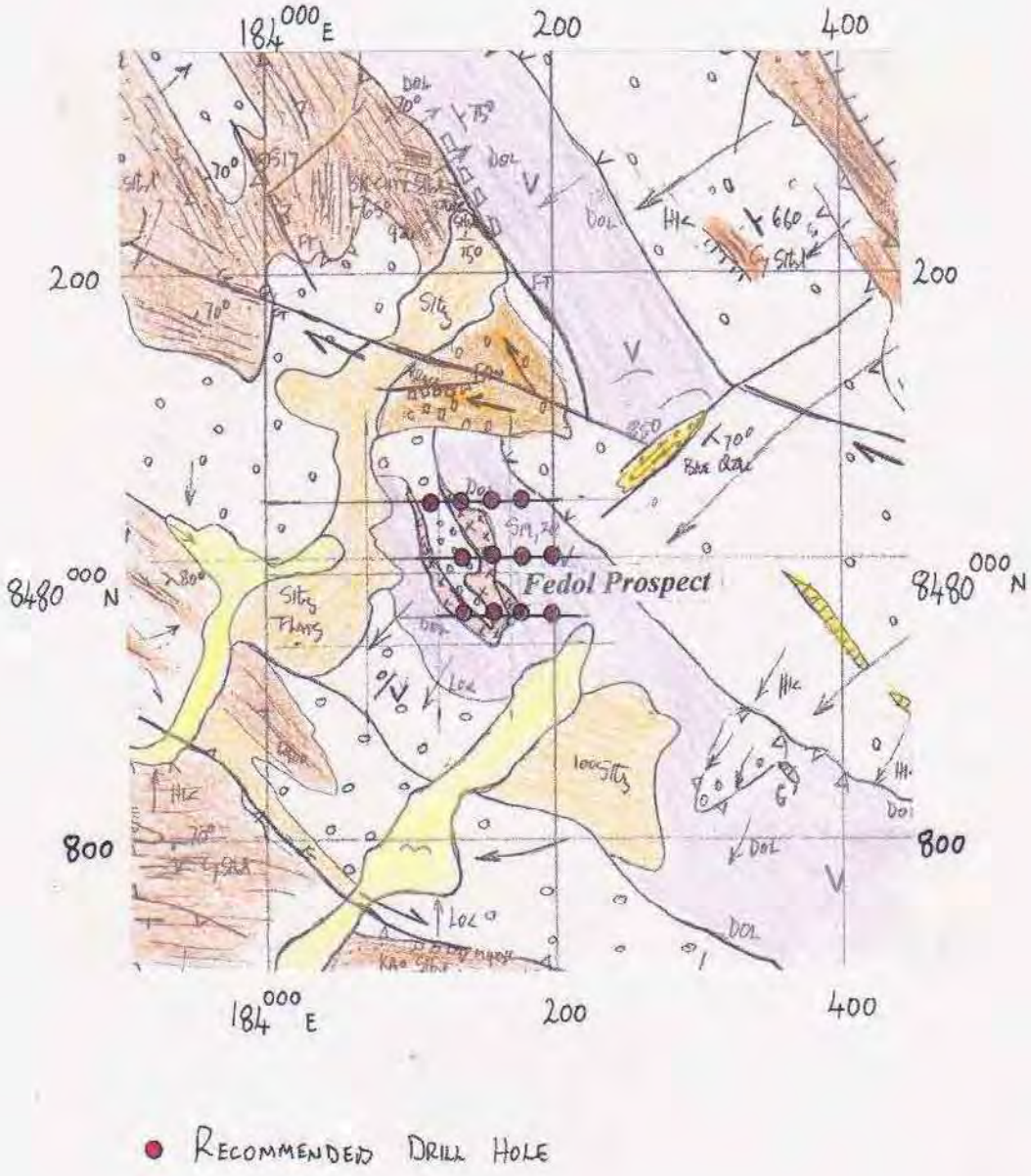


Figure 3 Recommended Drilling, 'Fedol' Prospect

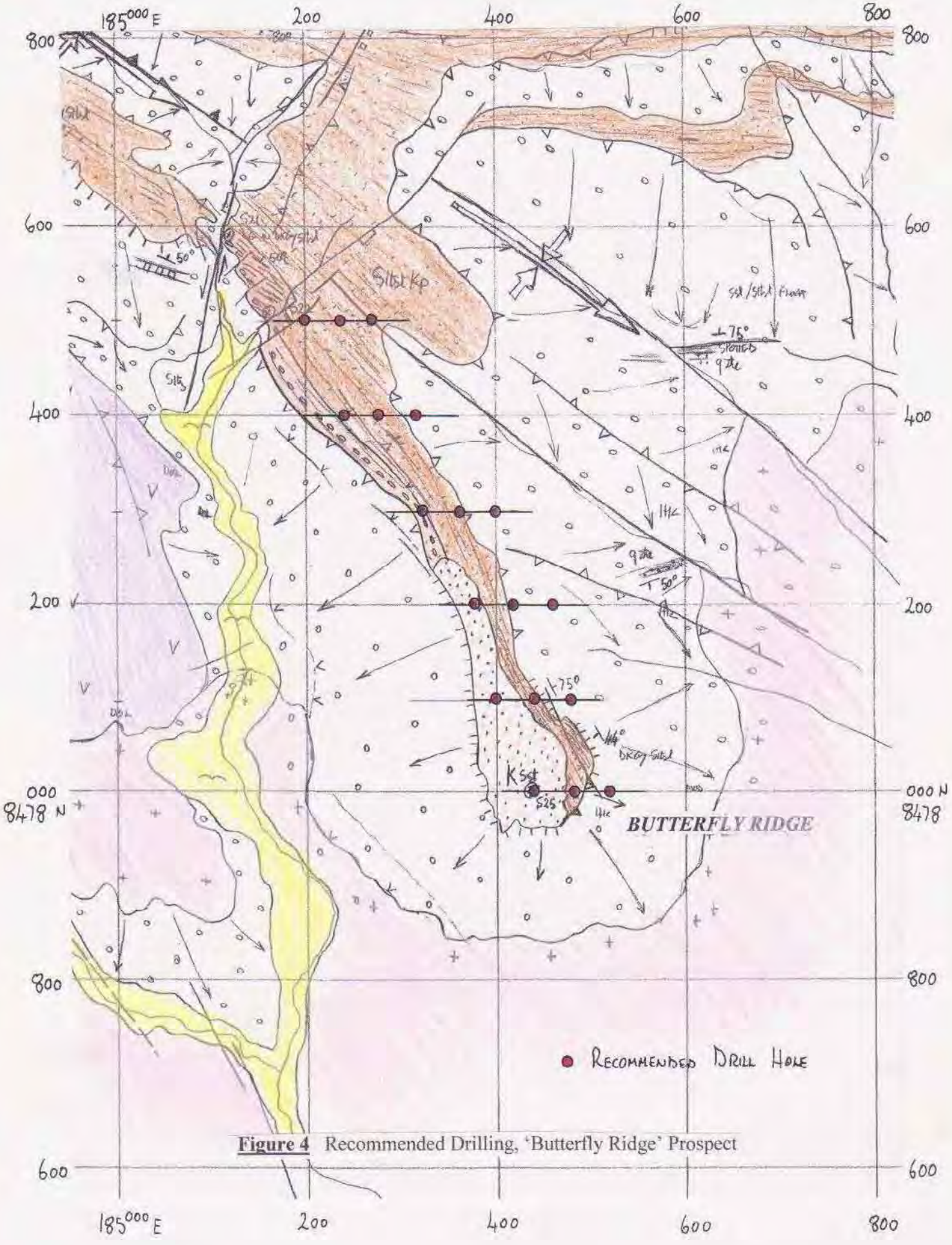


Figure 4 Recommended Drilling, 'Butterfly Ridge' Prospect

Table 1 Samples Collected by R. Russell, McCarthy Hills, 25th June to 5th July 2012. (All locations in GDA)

Sample No. TRK	Field No.	Position (Zone 53L) Easting	Northing	Rock Type	Fe	Al_2O_3	SiO_2	P	Mn	LOI	Prospect/Location	Comments
642	S1	181624	8479143	Goethite	58	1.97	3.5	0.424	0.02	10.2	Linear Valley central/west	Goethite in fault zone
	S2 (no Fe)	183370	8478273	Fe Sst breccia							Linear Valley east	Check for Pb, Ag. Very low iron
	S3 (no Fe)	183620	8478247									
643	S4	181131	8479329	Qtz Fe Breccia	32	2.26	42.9	0.145	1.14	6.47	Linear Valley west	Low grade goethite
644	S5	180678	8479543	Qtz Sltst Breccia	56.9	1.37	4.25	0.052	5.02	5.72		
645	S6	180700	8479499	Qtz/sltst Fe Breccia	52.1	2.22	12.6	0.361	0.17	8.85		Small breccia pod, very cherty
646	S7	180618	8479211		51.6	1.35	18.3	0.118	0.96	4.59		Narrow zone, goes under cover to west. Fault?
647	S8	180326	8479667		35.4	0.74	38.4	0.176	1.05	6.5		Breccias in major E-W trending fault zone intersected with N-S faults. Mainly goethite in matrix.
648	S9	180314	8479647		52.3	1.24	10.2	0.098	3.82	7.2		
649	S10	180463	8479585		51.1	0.66	8.6	0.177	6.21	8.33		
650	S11	179726	8479143		34.8	1.68	43.7	0.2	0.33	2.73	Kp Ridge west	Geothite in fine quartz breccia in dark grey siltstone.
651	S12	179600	8479025		45.8	1.51	27.1	0.152	0.32	3.8		
	S13 (no Fe)	184672	8477995	Fault gouge							Silver/lead mine, E McCarthy	Galena/argentite in NNE trending fault zone
652	S14	182122	8479305	Qz Fe Breccia	48.2	1.9	21.3	0.064	0.05	3.16	Central hills	Fault breccia on NW trending structure
653	S15	183115	8479523	Fe Sltst	49.6	2.06	22.5	0.146	0.17	2.88	Central valley	Goethite, high silica
654	S16	183860	8480267	Geothite in Siltstone	50.1	4.13	14.3	0.125	0.11	8.59	North Valley	High Fe in siltstone
655	S17	183999	8480307	Sltst breccia	46.5	2.13	22	0.082	0.52	7.81		Fault zone. Check for other minerals
656	S18	184127	8479975	Hematite	65.9	1.03	2.69	0.018	0.26	1.38		Mineralisation in enriched dolerite. High grade

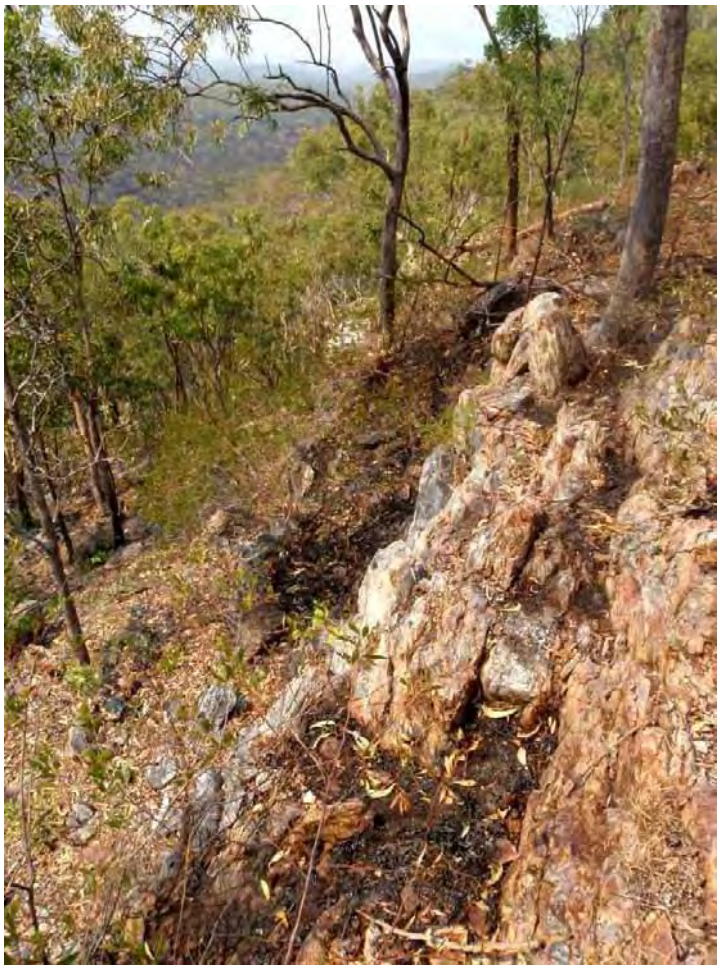
Table 2 Samples Collected by R. Russell, McCarthy Hills, 14th to 20th August 2012. (All locations in GDA)

Sample No. TRK	Field No.	Position (Zone 53L)		Rock Type	Fe	Al_2O_3	SiO_2	P	Mn	LOI	Prospect/Location	Comments
		Easting	Northing									
657	S1	183501	8479224	FeX Sltst Breccia	58.6	3	8.47	0.138	0	3.23	North Valley East. Small pods of enriched breccias in the Lower Wildman	Float
658	S2	183497	8480492		61.49	1.9	6.2	0.076	0	2.63		Outcrop on old track
659	S3	183496	8480544		64.47	1.23	2.09	0.054	0	3.51		Pod. Hi grade Fe in clasts
660	S4	183553	8480354		60.53	1.89	7.54	0.116	0	2.87		High grade lens on old track
661	S5	183509	8480702		54.54	3.27	11.5	0.242	0	5.38		South edge of outcrop, much siltstone
662	S6	183675	8480317	Fe Sltst	46.93	1.84	28.1	0.083	0	2.08	North Valley Central. Pods of mineralisation in the Upper Wildman in the central part of the valley. Mostly goethite-enriched siltstone	High iron content in siltstone
663	S7	183766	8480301	FeX Sltst Breccia	57.95	1.57	12.6	0.139	0	2.36		Josh's pod. High silica
664	S8	183695	8479901		55.48	1.32	5.12	0.413	0.1	11.1		Rich's Pod. Small lens in fault zone
665	S9	183746	8479839	Fe Qzte	31.82	0.45	52.1	0.053	0	1.52		Small outcrop on N edge of breccia
666	S10	183296	8480579	FeX Sltst Breccia	62.84	0.79	4.7	0.086	0	3.94	North Valley Northwest. 'Buggy' Prospect	Narrow outcrop adjacent to quartzite wall
667	S11	183332	8480649		51.76	1.76	20.4	0.072	0	3		Fold? In north of mineralised zone
668	S12	183372	8480581	Goethite/Mn in siltstone	57.63	1.72	11.1	0.052	0	4.03		South outcrop
669	S13	183312	8480597	FeX Sltst Breccia	55.83	2.72	13.3	0.07	0	3.36		Central outcrop, part of fold?
670	S14	183912	8479435	Goethite/Mn in siltstone	57.79	1.13	11.7	0.056	1.3	2.26	North Valley, south side	Unit on unconformity at base of Koolpin Fm.
671	S15	183919	8480453	Cherty goethite	54.61	3.54	10.8	0.308	0.1	5.63	Cone Valley, northwest corner. Fedol Prospect	Narrow unit close to dolerite
672	S16	184129	8480061	Fe Dolerite	62.27	0.7	7.9	0.022	0.2	1.47		Enriched dolerite. Pseudo bedding
673	S17	185378	8478891	Hematite/goethite	61.11	0.88	6.07	0.078	0	4.84	Cone Valley, south side	Narrow unit may be on fault zone
674	S18	184488	8479771	Fe Dolerite	56.4	1.57	6.64	0.48	0.3	8.6	Cone valley, northwest	Small lens near contact with Koolpin
675	S19	184158	8479999		65.53	0.67	3.84	0.019	0.2	1.21	Cone Valley, northwest corner. Fedol Prospect	Eastern end of enriched zone
676	S20	184133	8479971		67.35	0.31	2.27	0.016	0.1	0.89		Composite, central part of enriched zone
677	S21	185111	8478595	Goethite in Koolpin sltst	45.56	0.9	27.1	0.063	0	5.69	Butterfly Ridge. Far SE of project area	Enrichment in matrix of Koolpin 'chert nodule' siltstone
678	S22	185140	8478513		44.85	5.37	22.8	0.217	0	6.27		
679	S23	185236	8477988		54.99	2.13	12.8	0.203	0.1	4.87		As above, float to the SE
680	S24	185302	8477963	Cretaceous Fe Sandstone	44.86	4.17	27.9	0.105	0	2.63	Cap on SE end of Butterfly Ridge	Highly ferruginised coarse sandstone. Up to 5m thick
681	S25	185427	8478021		49.97	4.07	19.2	0.07	0	4.13		
682	S26	179838	8479195	Hematite/goethite in Koolpin sltst	58.66	2.95	6.47	0.173	0.1	5.54	Goethite Prospect, Kp Ridge	Enrichment in siltstone unit adjacent to main fault
683	S27	179825	8479273		54.36	2.73	10.9	0.188	0	7.33		Enriched unit adjacent to main fault, 3m wide
684	S28	182105	8478686	Goethite in Koolpin sltst breccia	47.9	4.07	20.7	0.161	0	4.84	Main Track Pass on Kp Ridge	10m to east of track
685	S29	182117	8478684		27.72	3.84	51.9	0.121	0.1	3.13		40m east of track. Low grade.
686	S30	182054	8478736	Goethite in cht-nod sltst	28.27	2.5	50.5	0.25	0	5.16		40m west of track.

Table 3 Possible Size of Deposits in the McCarthy Hills Project Area.

Prospect	Geology	Location	Outcrop Area (M^2)	Volume (30m thick; M^3)	Tonnage (SG 2.8; Mt)	Recommendations
Drillout Area	Enrichment in Lower Wildman siltstone breccia	Syncline closure, north-central part of project area	9,000	270,000	**0.77**	
East-west		South flank of the main Mundogie Sandstone Ridge	14,400	432,000	**1.21**	Aircore drilling
Buggy		Western side of North valley	3,200	96,000	**0.27**	
Fedol	Enrichment in Zamu dolerite	North edge of Cone Valley	2,400	201,600	**0.2**	Aircore drilling
Butterfly Ridge	Goethite in matrix of Koolpin chert-nodule siltstone	Butterfly Ridge, extreme southeast of the project area.	15,800	474,000	**1.33**	Detailed mapping, Aircore drilling
Cretaceous Sandstone	Enrichment in Cretaceous sandstones overlying Butterfly Ridge	Butterfly Ridge, extreme southeast of the project area	11,000	5m thick; 55,000	**0.15**	
Goethite' and 'Breccia'	Goethite in siltstone fault breccia	Western part of 'Linear valley'	4,800	144,000	**0.4**	
Josh's Pod and other mineralised zones	Goethite in siltstone and siltstone breccia	North Valley	1,400	42,000	**0.12**	

Photograph 1 Koolpin siltstone outcrops on the ridge in the foreground and Wildman shale and siltstone forms the valley below. The high ridge on the right skyline is Mundogie Sandstone while in the middle distance, all the units are removed by the intrusion of the Allamber Springs Granite which forms the low hills in the far distance. On the distant skyline are outcrops of the same Mundogie/Wildman/Koolpin sequence near the Frances Creek minesite.



Photograph 2 Grey cherty Koolpin siltstone forms much of the high ground in the project area. Here in the central part of the 'Kp Ridge', the unit dips steeply to the north.

Photograph 3 Tors in the Allamber Springs granite country in the south of the project area.

Photograph 4 A 'fault wall' of quartzite extends along a north-south trending fault zone in the Lower Wildman Formation in the north of the project area. ('Buggy' prospect).

Photograph 5 The 'All Terrain Vehicle' used in the second half of the field programme. The vehicle is a John Deere 'Gator' 855D XUV 4x4.

Photograph 6 Iron breccias near the east end of the 'East-west' prospect dip steeply to the south. The unit here is about 4 metres thick.

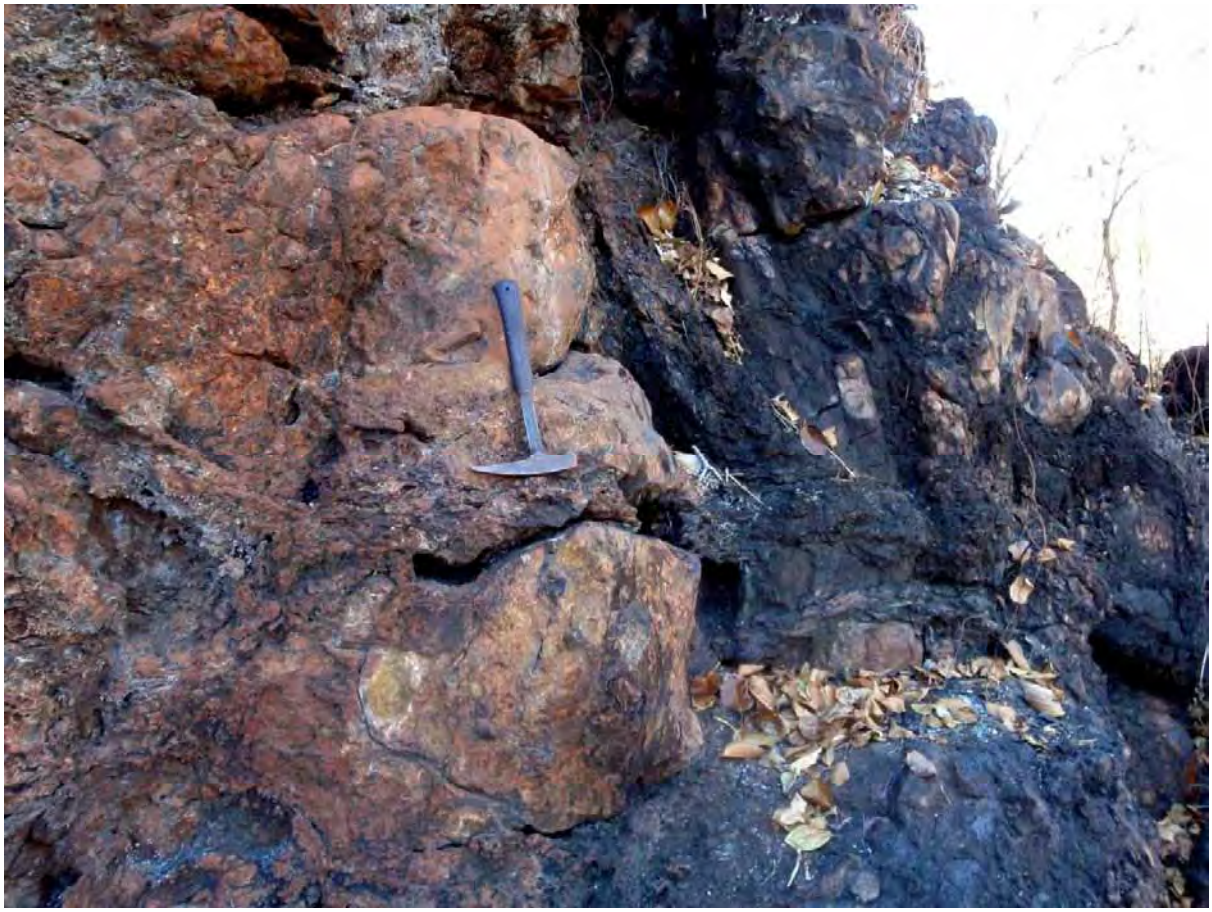
Photograph 7 Pseudo-karst hollow in high-grade iron breccia in the eastern part of the 'East-west' prospect. The hollow may have been formed by the leaching of silica.

Photograph 8 Selective enrichment of siltstone breccia in the 'East-west' prospect. Iron grade appears to be high.

Photograph 9 Mineralisation in Lower Wildman siltstone breccia adjacent to a major north-south fault in the north of the project area at the 'Buggy' prospect. The quartzite outcrop in the background marks the fault zone.

Photograph 10 Goethite breccia at the west end of 'Linear Valley' may be located on a large thrust fault trending about 290^{O}.

Photograph 11 Manganese in the cherty goethite breccias in the western part of 'Linear Valley'.



Photograph 12 The breccias in 'Linear Valley' are usually only partly enriched. These large blocks of siltstone remain un-altered by the goethite that forms the matrix of the breccia.

Photograph 13 Enrichment along a major northeast trending fault zone near the western end of Kp Ridge. The material is mainly goethite and the best mineralisation appears to be associated with the more brittle units of the Koolpin Formation.

Photograph 14 High-grade nodule of hematite in the goethites at the 'Goethite Prospect', western Kp Ridge.

Photograph 15 Goethite/hematite enrichment in the Koolpin chert-nodule siltstone. The enriched unit is located on the southwestern flank of 'Butterfly Ridge' in the southeast of the project area.

Photograph 16 Hematite enrichment in dolerite on the north side of 'Cone' valley. The outcrop here shows pseudo-bedding possibly related to variable levels of enrichment in the original sill. The enriched zone is about 150m long and an estimated 5m wide. Grades are over 65% Fe. ('Fedol' prospect).

Photograph 17 Breakaway formed by ferruginous Cretaceous sandstone on the southeast margin of Butterfly Ridge close to contact with the granites. Iron grades are about 45% to 50%.

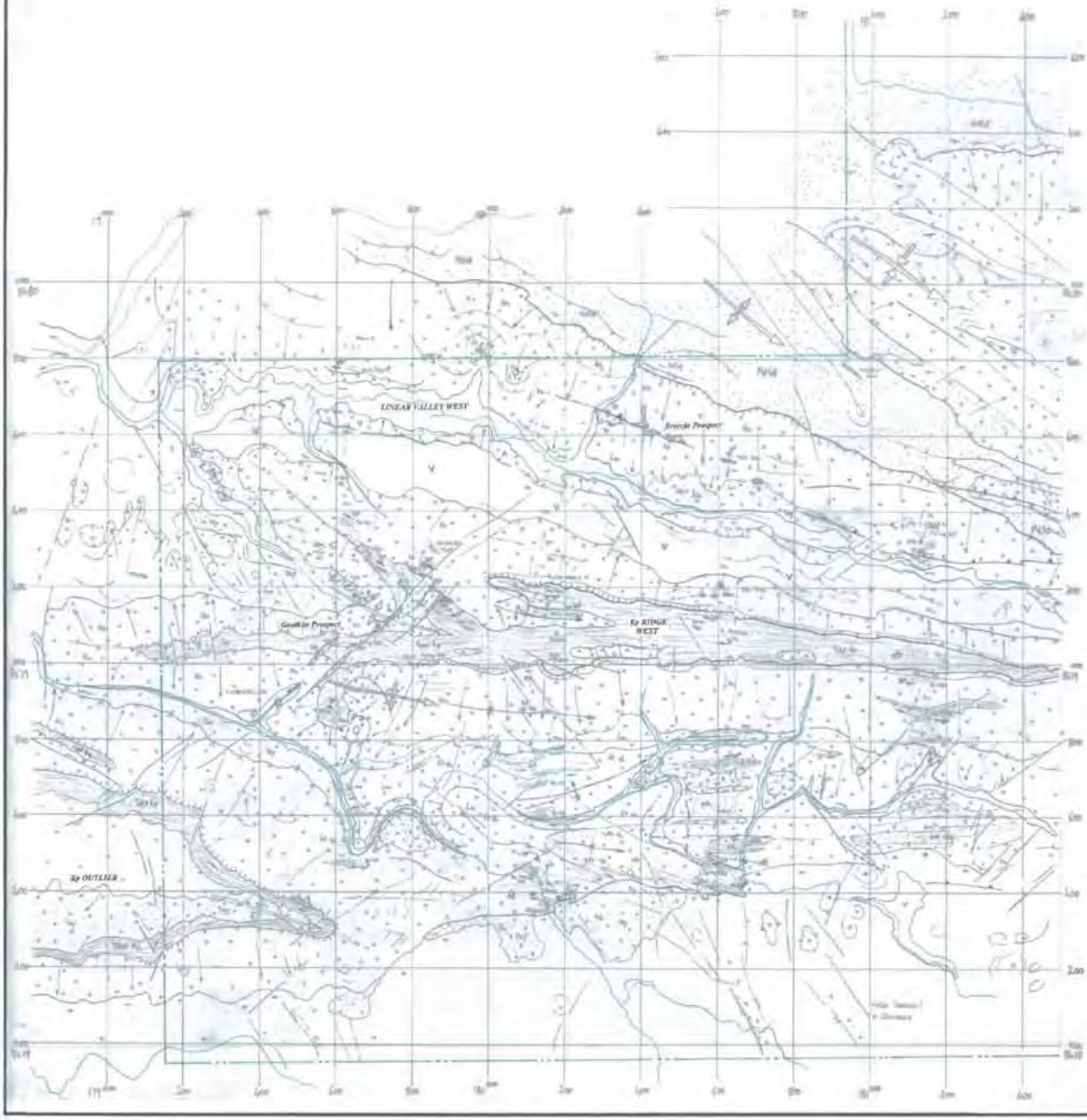
Photograph 18 The top of the Cretaceous sandstone unit on the summit of the ridge is flat, reflecting part of the Cretaceous/Tertiary palaeo-land surface.

Photograph 19 Josh Hunter is standing on the contact between sandstone of the Koolpin Formation (foreground) and the Allamber Springs Granite (rounded boulders in the background).

Photograph 20 Granite veins intrude folded sandstone of the Koolpin Formation about 5 metres north of the main granite outcrop edge.

Photograph 21 Old silver-lead mine workings in the southeast of the project area. The mineralisation follows a 010^{O} trending shear in siltstone of the Koolpin Formation close to the contact with the Allamber Springs Granite. The shear may have originated as an extension gash.

Photograph 22 Mafic xenoliths and late-phase mafic veining in porphyritic Allamber Springs Granite near the contact with the Koolpin Formation in the south of the project area.



KEY

STRUCTURE and MORPHOLOGY

OUTCROP

SUPERFICIAL DEPOSITS

OTHER

NOMENCLATURE

N

100 0 100 200 300 400 500 Metres

Scale 1:5,000

TERRITORY RESOURCES PTY LTD

GEOLOGICAL MAP OF THE

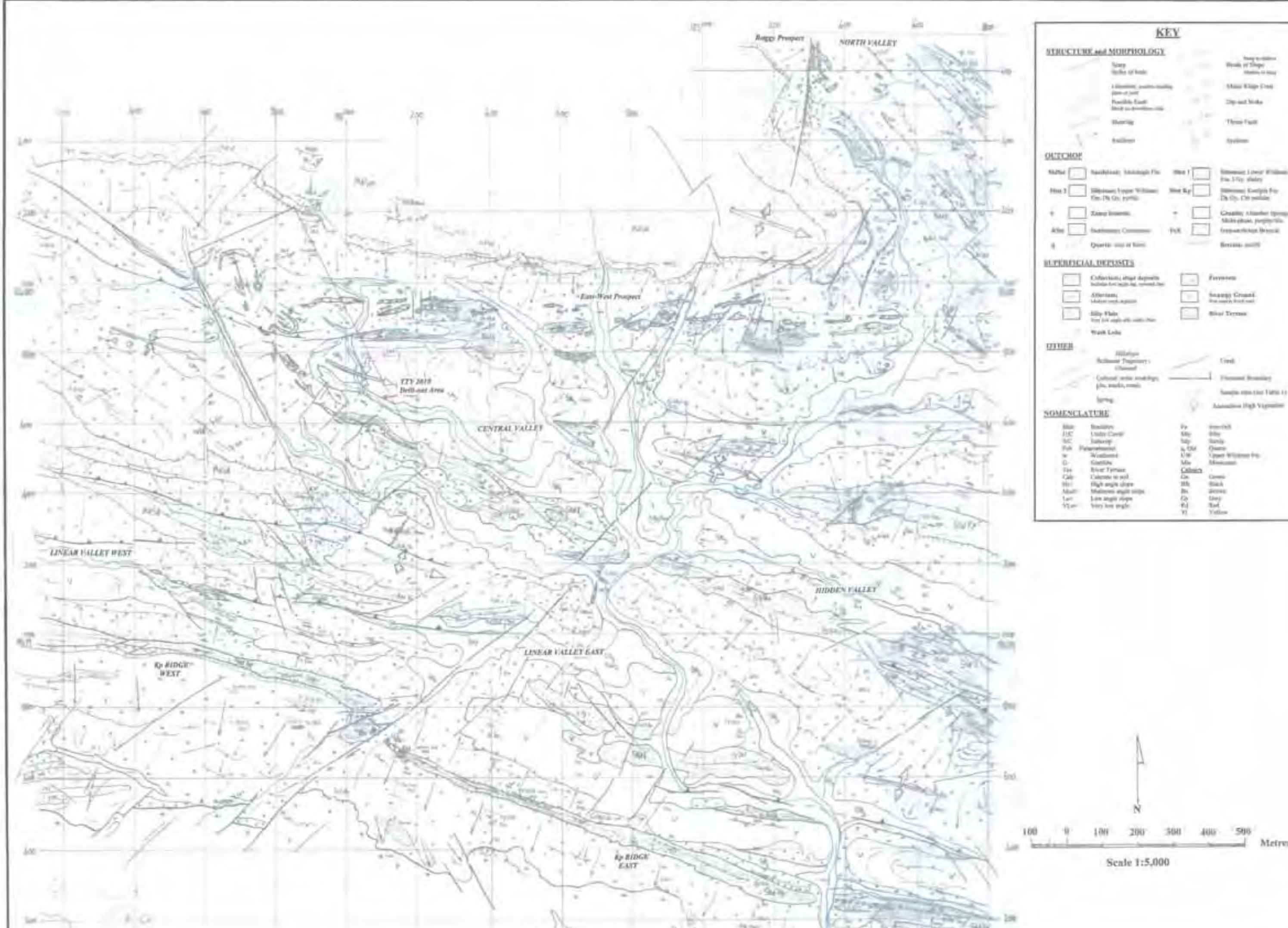
McCARTHY HILLS

PROJECT AREA

By R. Russell September 2012

Scale 1:5,000

ENCLOSURE 1: West



TERRITORY RESOURCES PTY LTD

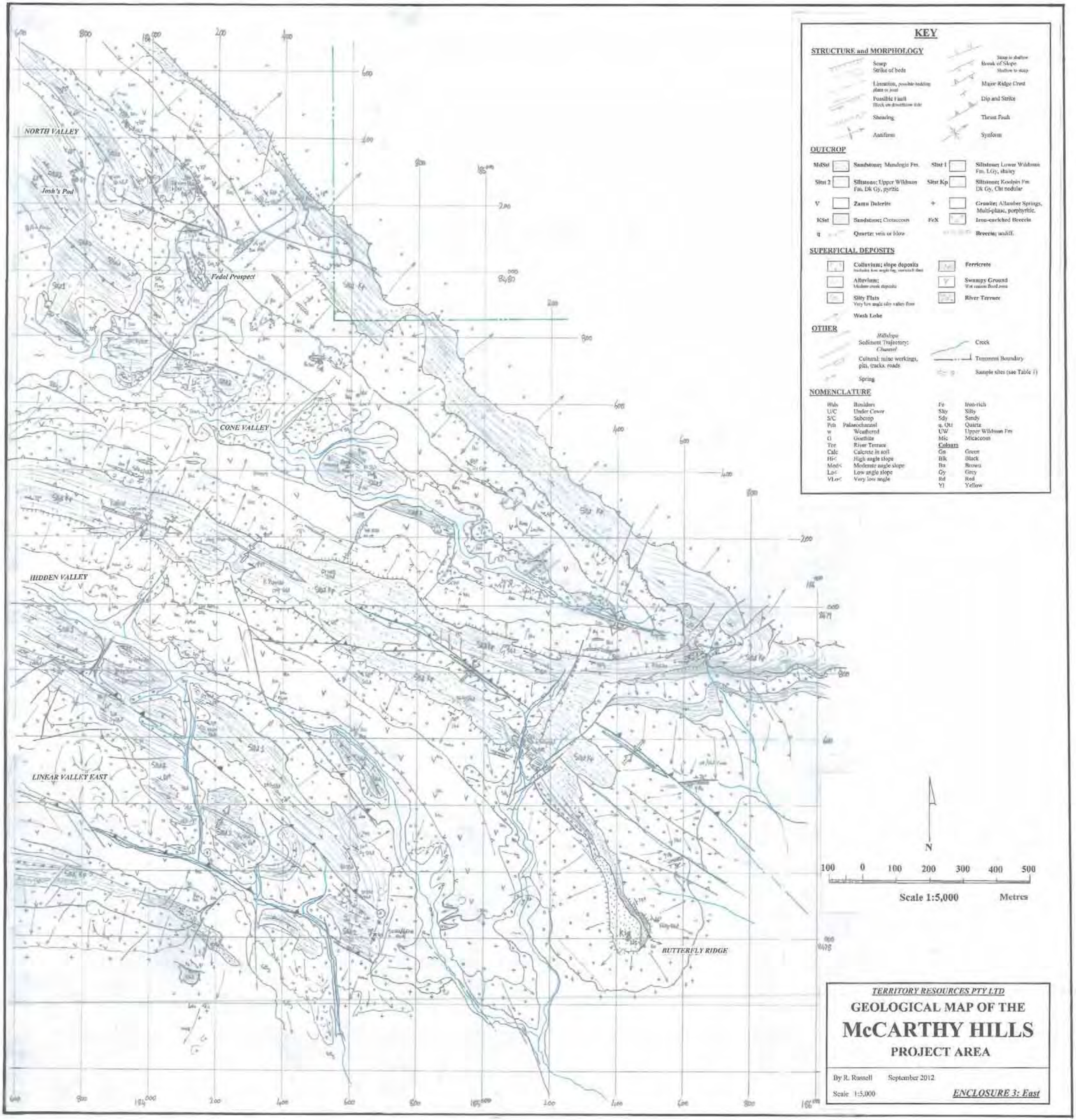
GEOLOGICAL MAP OF THE

McCARTHY HILLS

PROJECT AREA

September 2012

ENCLOSURE 2: Central


KEY
STRUCTURE and MORPHOLOGY
Scarp
Strike of beds
Lineation, possible bedding plane or joint
Possible Fault
Block on downthrow side
Shearing
Antiform
Steep to shallow
Break of Slope
Shallow to steep
Major Ridge Crest
Dip and Strike
Thrust Fault
Synform
OUTCROP
MdSst
Sandstone; Mundogie Fm.
Slst 1
Siltstone; Lower Wildman Fm. LGy, shaley
Slst 2
Siltstone; Upper Wildman Fm. Dk Gy, pyritic
Slst Kp
Siltstone; Koolpin Fm. Dk Gy, Cht nodular
V
Zamu Dolerite
+
Granite; Allamber Springs, Multi-phase, porphyritic.
KSst
Sandstone; Cretaceous
FeX
Iron-enriched Breccia
q
Quartz: vein or blow
Breccia; undiff.
SUPERFICIAL DEPOSITS
Colluvium; slope deposits
Alluvium;
Modern creek deposits
Silty Flats
Very low angle silty valley floor
Ferricrete
Swampy Ground
Wet season flood zone
River Terrace
Wash Lobe
OTHER
Hillslope
Sediment Trajectory:
Channel
Cultural: mine workings, pits, tracks, roads
Spring
Creek
Tenement Boundary
Sample sites (see Table 1)
NOMENCLATURE
Blds Boulders
U/C Under Cover
S/C Subcrop
Pch Palaeochannel
w Weathered
G Goethite
Tce River Terrace
Calc Calcrete in soil
Hi< High angle slope
Mod< Moderate angle slope
Lo< Low angle slope
VLo< Very low angle
Fe Iron-rich
Slty Silty
Sdy Sandy
q, Qtz Quartz
UW Upper Wildman Fm
Mic Micaceous
Colours
Gn Green
Blk Black
Bn Brown
Gy Grey
Rd Red
Yl Yellow
NORTH VALLEY
Josh's Pad
Fedol Prospect
CONE VALLEY
HIDDEN VALLEY
LINEAR VALLEY EAST
BUTTERFLY RIDGE
N
100 0 100 200 300 400 500
Scale 1:5,000
Metres
TERRITORY RESOURCES PTY LTD
GEOLOGICAL MAP OF THE
McCARTHY HILLS
PROJECT AREA
By R. Russell
September 2012
Scale 1:5,000
ENCLOSURE 3: East