GEOLOGICAL MAPPING OF THE

OCHRE HILL SOUTH, SADDLES AND LEWIS PROSPECTS

FRANCES CREEK, N.T.

by R. Russell for
Territory Resources Ltd
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CONTENTS

LIST OF PHOTOGRAPHS

(Abridged captions)

LIST OF ENCLOSURES

1 INTRODUCTION

1.1 Mapped Areas

This report describes mapping that has been carried out from the 14th to the 28th July 2014 over three areas to the north and northwest of the Francis Creek mining operation. They are:

- The valley extending southeast from Ochre Hill,
- the Saddles area between Ochre Hill and Saddles Extended and
- the Lewis prospect about 15km to the northwest near the old Touhys gold mine.

The present work programme is part of a sequence of mapping programmes that have been carried out by the writer in the Frances Creek area. The intention is to produce geological fact-maps of the designated areas.

1.2 Technique

In each of the mapped areas, geological and geomorphological features were noted along east-west hiking traverses and the eastings of the features recorded. This information was then transferred onto transparent overlays. The maps were then completed by photo-interpretation between these 'field-truth' lines. In addition to the traversing, important iron outcrop boundaries of the main mineralised units were accurately located in the field with waypoints from the GPS and also transferred to the map.

2.3 Data

The mapping is based on field traversing to create east-west trending 'ground truth corridors' and photo-interpretation. The photography used was the standard colour aerial photography of the Frances Creek area. The imagery is in mono and is of excellent quality.

Programmed burning of the grass had been carried out over most of the mapped areas prior to the field visit. This assisted the work considerably.

2.4 The Maps

The maps are at three different scales selected in accordance with the purpose of the mapping. At Ochre Hill south, the map is at the 'regional' scale of 1:10,000, Saddles is at a scale of 1:5,000 while Lewis is at the 'prospect' scale of 1:2,000. The maps are in the form of neat pencil-drawn drafts. The three maps produced in this work programme are designated Enclosures 1 to 3. These are located in pockets at the rear of this report. Rock-chip sampling was not carried out in the present work programme as the outcrops have been adequately sampled already.

This report follows similar reports prepared by the writer on the mapping of other areas in the Frances Creek area for Territory Iron. The same format is used in this report as in the previous reports. The report is intended to:

- provide some background geological information,
- outline the rationale of the work programme and
- annotate the maps.

2 OCHRE HILL SOUTHEAST VALLEY

2.1 Location and Technique

The prospective Lower Wildman Formation extends for about 6km to the southeast of Ochre Hill. The softer siltstones along the axis of the syncline form a long narrow valley between topographically high Mundogie sandstone outcrops (Photograph 1). It is thought possible that mineralisation could occur in the Wildman units that may be obscured by Cretaceous sandstone or superficial cover.

The present map was constructed from three walking traverses into the area and from photo-interpretation of the aerial photography at a scale of 1:10,000. The valley is about 400m wide and the mapped area is about 5km long (Enclosure 1). Frances Creek cuts east-west approximately through the centre of the area.

2.3 Results

No iron breccias were seen in the area. A ferruginous siltstone unit was noted to the north of Frances Creek and considerable ferruginization occurs at the base of the Cretaceous sandstones in the south but no mineralisation approaching economic grade was noted.

The valley contains extensive river terraces from Frances Creek and the creek draining southeastward from Ochre Hill. These terraces contain numerous clasts (estimated up to 5% of the total terrace volume in some places) of high-grade hematite. These cobble-sized clasts were presumably washed out of the Ochre Hill deposit or washed down Frances Creek from the large orebodies in that catchment. The terraces are mainly on the western side of the valley.

A large outcrop of Cretaceous sandstone occupies the southeastern end of the valley. The sandstone covers the southern end of the Lower Wildman outcrop at the southern closure of the syncline. The sandstone is flat-lying, coarse-grained and iron-stained at the base. It forms a high flat-topped mesa. No Wildman Formation could be identified with confidence to the southeast of the Cretaceous outcrop and certainly no mineralisation could be found in the valleys between the Mundogie Sandstone ridges in this vicinity.

3 SADDLES

3.1 Location and Technique

The mapping at the Saddles prospect is at a scale of 1:5,000 (Enclosure 2). The mapping was carried out using east-west walking traverses at 400m interval. Detailed outlining of the mineralised zones was also done using GPS waypoints along the outcrop margins.

3.2 Mineralisation

The mineralisation appears to follow two distinct northwest trends. The western trend is the dominant one, extending along strike for about 2km and reaching about 20m thick in places. The eastern trend is about 1.2km long and has a maximum thickness of about 15m (Photographs 2 and 3).

The mineralised zones are broken into segments by northeast trending cross faulting. In the vicinity of the faults, small lateral displacements, rotation and drag folding has occurred in the mineralised unit. The fault zones are usually marked by the absence of mineralised outcrop.

Many zones of iron enrichment occur in the Lower Wildman siltstone that are not specifically associated with the highly enriched siltstone breccia. These zones of enrichment were not mapped in detail and are of two main types:

- **Ferruginous siltstone** units are common along strike from the iron breccias. While they are of sub-economic grade, they appear to be associated with economic ore suggesting that the mineralised zones at depth probably merged with ferruginous siltstone in all directions. In the writer's opinion, the units could be used as a kind of 'pathfinder' to locate possible buried orebodies. The Fe siltstones are more red in colour than the usual Lower Wildman units and may contain minor beds of siliceous hematite and goethite in vughs and along bedding planes.
- Narrow **quartz breccia zones** with a goethite matrix occur in close proximity to the contact between the Lower Wildman and the Mundogie Formations. This unit pinches and swells and is absent over small strike lengths. It has been mapped in the Saddles area but has also been noted for many kilometres along the contact zone from Frances Creek to Jessops. The goethite is cokey, botreoidal and occasionally massive but never reaches an economic grade due to the high frequency of quartz clasts.

4 LEWIS PROSPECT

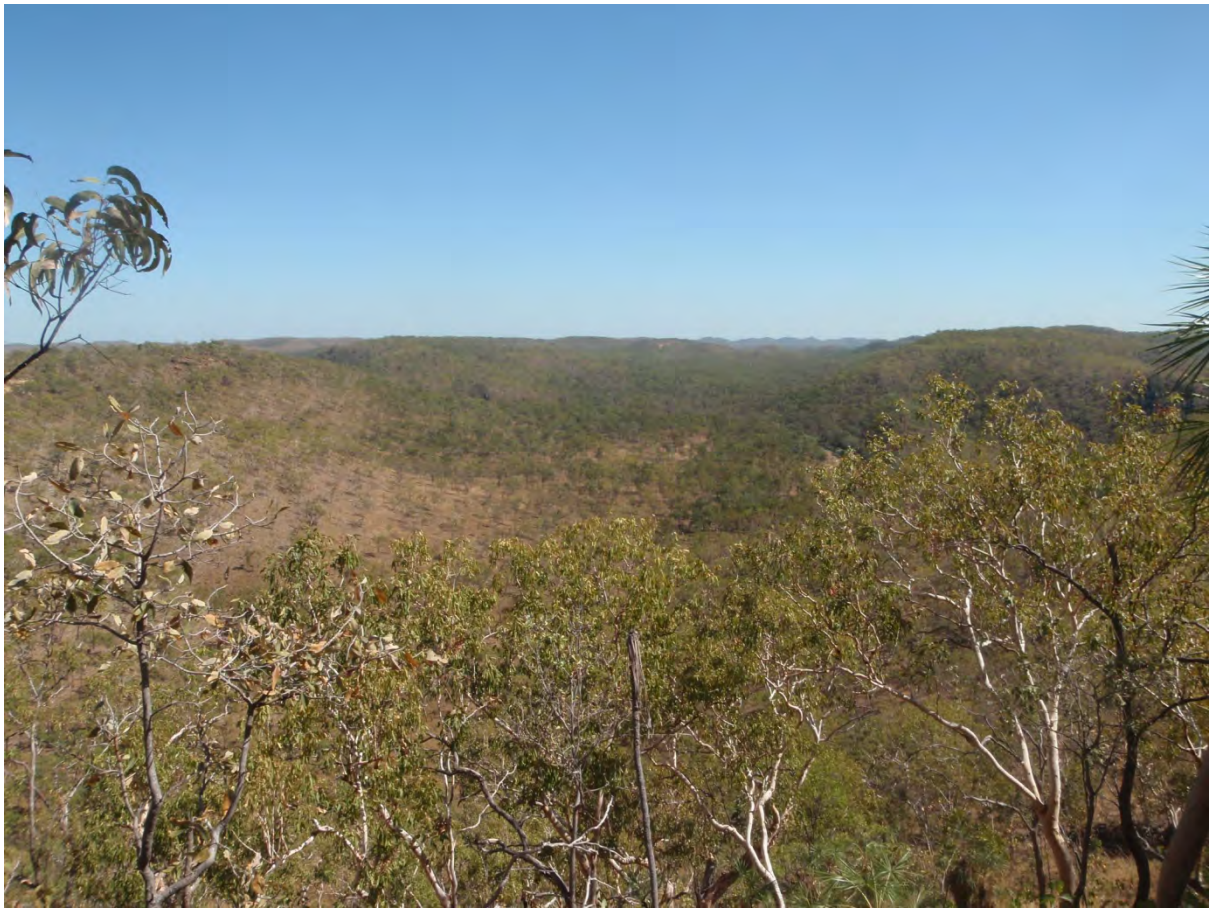
4.1 Location and Technique

The Lewis prospect is situated about 20km to the north-northwest of Frances Creek. It lies approximately 2km to the west of the old Touhys gold mine. The mineralisation is located in siltstones of the Koolpin Formation. The mapping was carried out by field traversing and air photograph interpretation at a scale of 1:2,000 (Enclosure 3).

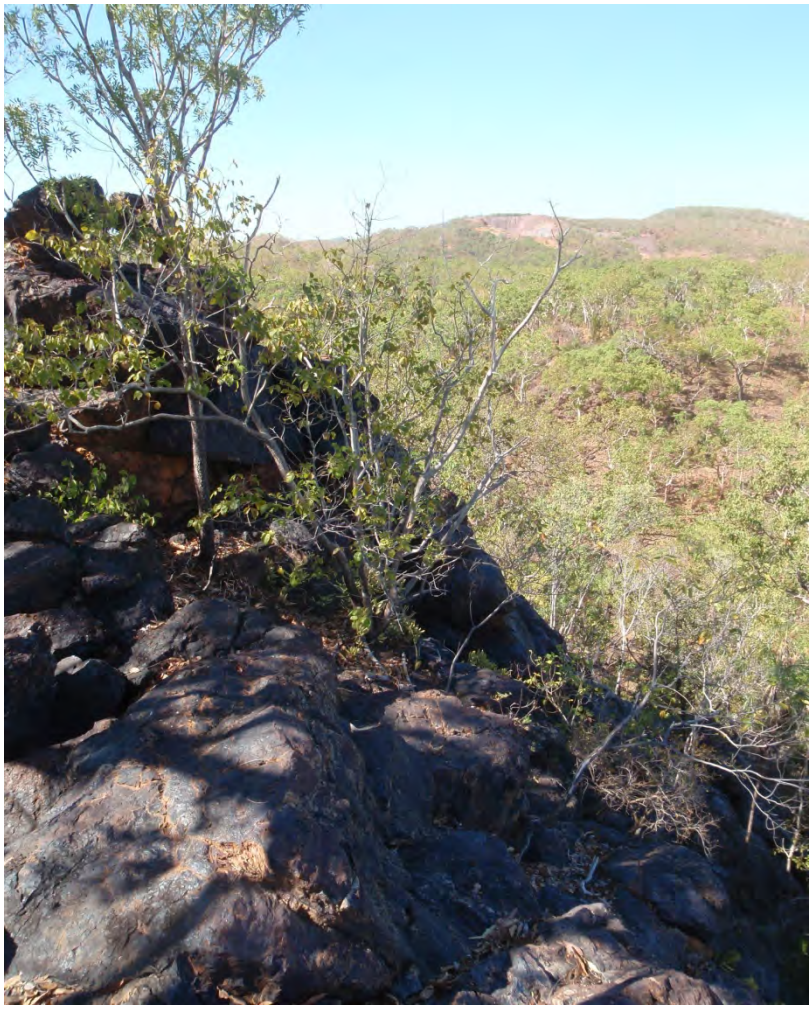
4.2 Mineralisation

The mineralised zone trends northwest at about 340^{O} and is situated on low to medium angle slopes on the western flank of a high sandstone ridge. To the west of the mineralised zone are extensive outcrops of Zamu dolerite which form a significant but slightly lower ridge. In the south, the mineralisation climbs a high northwest-trending chert ridge, outcropping on both flanks. Two styles of iron mineralisation are identified:

- The main iron mineralisation consists of narrow **goethite/siltstone breccia** zones with minor hematite (Photograph 4). The zone is discontinuous and is folded and offset by minor northeast trending brittle fractures.
- On the eastern flank of the goethite breccias is a zone of **ferruginous siltstone, sandstone and quartz breccias**. None of these units contain economic concentrations of iron. However, in small pockets, some high-grade hematite was observed (Photographs 5 and 6). This eastern zone possibly coincides with a major fault or unconformity.

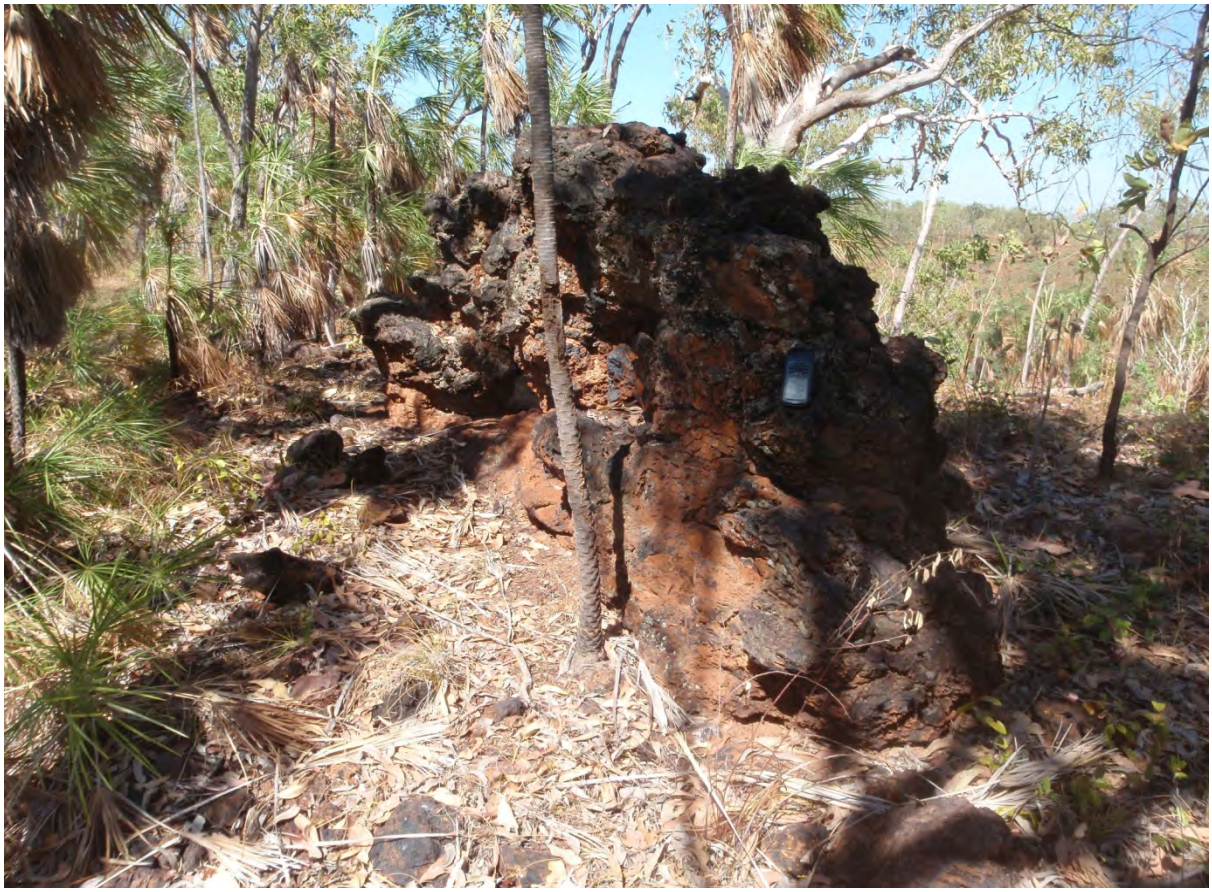


Photograph 1 Ochre Hill Southeast Valley viewed from the Cretaceous sandstone mesa in the south towards Ochre Hill in the middle distance.

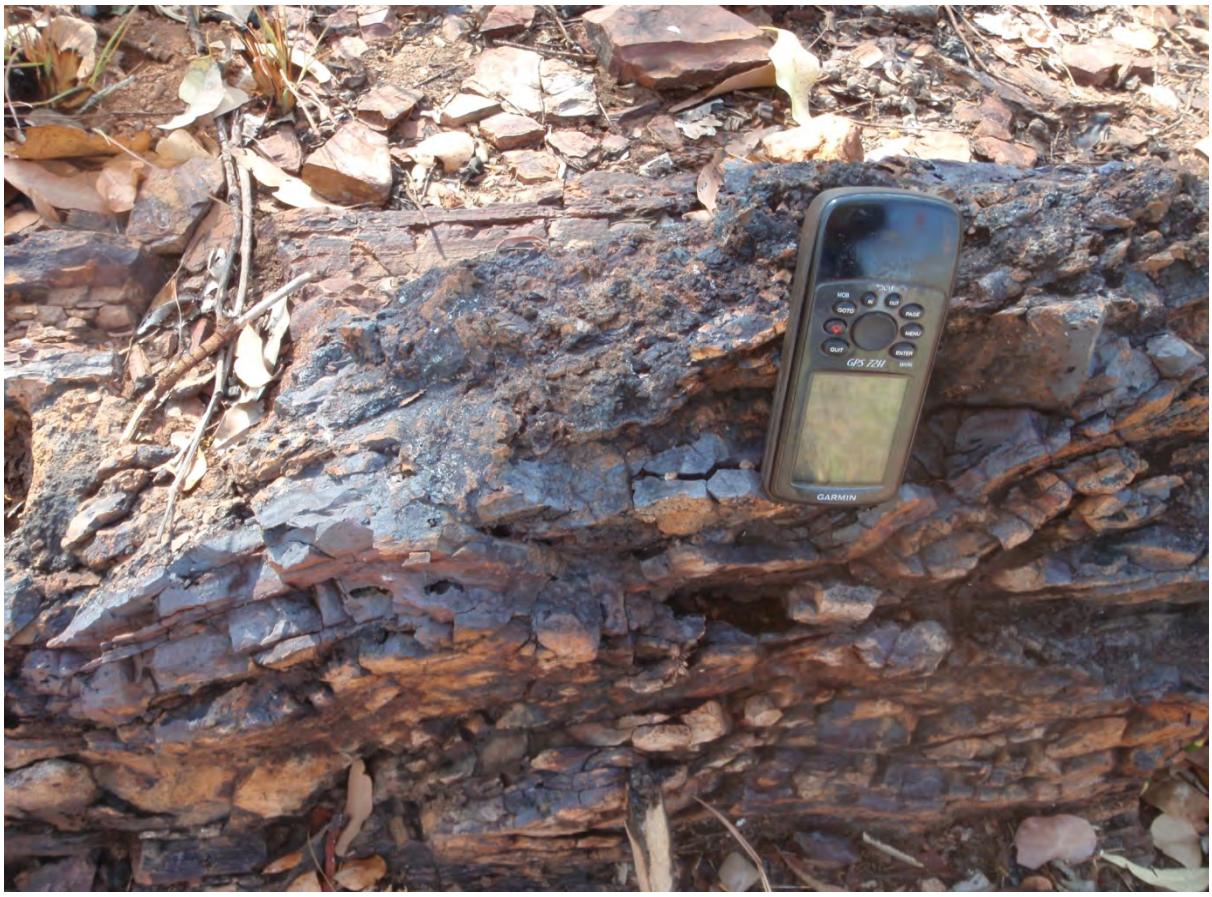


Photograph 2
Mineralised iron breccia outcropping in the central part of Saddles. The Ochre Hill pit is in the distance

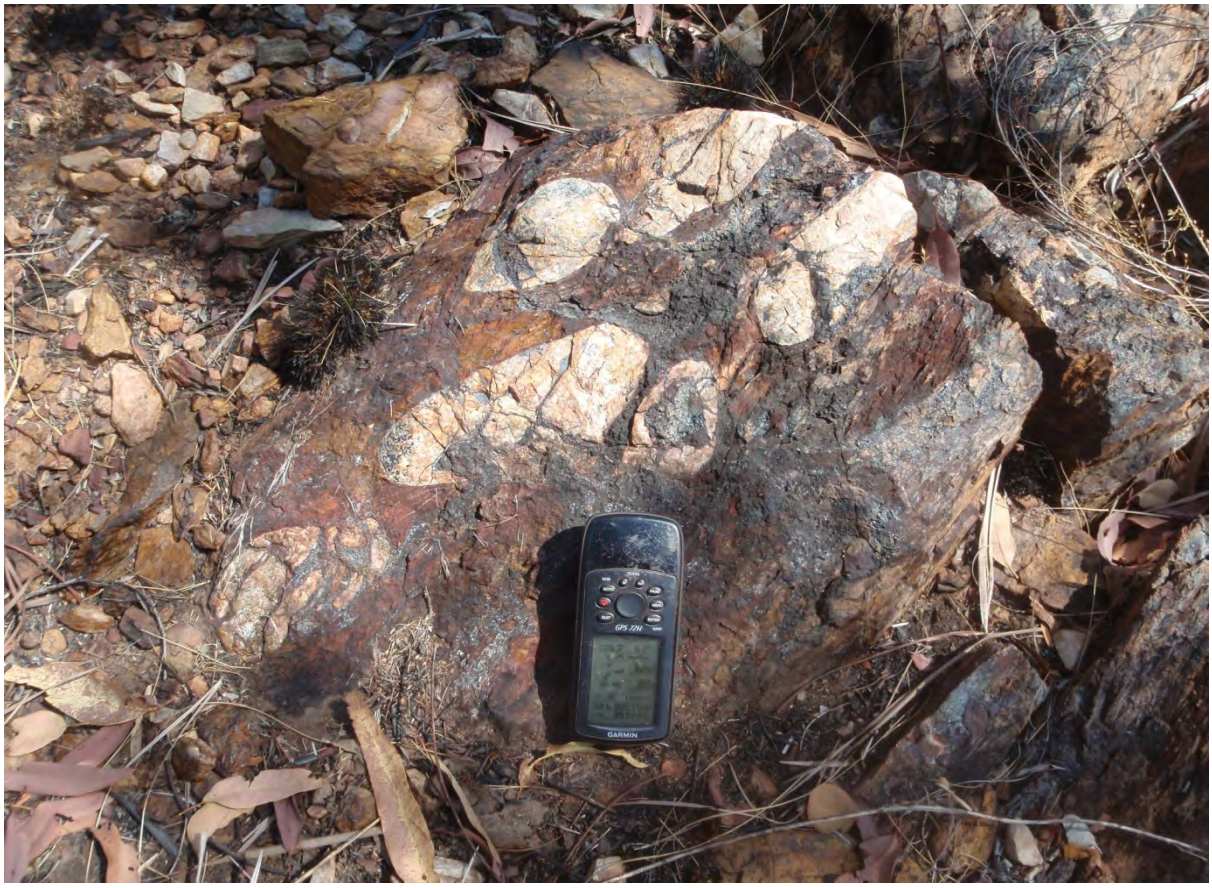
Photograph 3
Mineralised breccia resting in the axis of a small syncline. Located in the eastern mineralised trend at Saddles.



Photograph 4 Goethite-dominant siltstone breccia at Lewis. This material is typical of the mineralisation in the area.



Photograph 5 Hematite replacing siltstone at Lewis. The Koolpin siltstones here have only been partly brecciated.



Photograph 6 Chert nodules in ferruginous Koolpin siltstone at Lewis. The dark material is hematite which has invaded joints and vughs, including cracks in the chert nodules.

N

200 0 500 1,000

100

Metres

Scale 1:10,000

KEY

STRUCTURE and MORPHOLOGY

Scarp
Strike of beds

Possible Fault,
Minor lineation

Possible major Fault

Fold structure; syncline or anticline

Steep to shallow
Topographic Break of Slope
Shallow to steep

Major Topographic Ridge Crest

75° Dip and Strike

OUTCROP

Sltst	Lower Wildman Siltstone		Siltstone Undifferentiated
V	Zamu Dolerite	Md	Mundogie Fm. MainlySandstone
K	Cretaceous Sandstone	Q, q	Dyke, vein of Quartz
Brecc	Breccia, undifferentiated		

SUPERFICIAL DEPOSITS

	Colluvial sheet wash	Tce	River Terrace
	Swampy Ground		Alluvium

OTHER

Hillslope sediment trajectory

Creek

Pvt	Pavement
Tce	River Terrace
u /c	Under Cover
Hi<	High Angle Slopes
Mod <	Moderate Angle Slopes
Lo<	Low Angle Slopes

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GEOLOGICAL MAP OF

OCHRE HILL - SOUTHEAST VALLEY

By R. Russell July 2014

Scale 1:10,000

ENCLOSURE 1

N

100 0 100 200 300 400 500 Metres

Scale 1:5,000

KEY

STRUCTURE and MORPHOLOGY

- Scarp / Strike of beds
- Possible Fault, Minor lineation
- Possible major Fault
- Fold structure; syncline or anticline
- Steep to shallow Topographic Break of Slope Shallow to steep
- Major Topographic Ridge Crest
- 75° Dip and Strike

OUTCROP

- Sltst — Lower Wildman Siltstone
- Fe Sltst — Ferruginous Siltstone, Sub-economic iron grade
- V, Dol — Zamu Dolerite
- Q, q — Dyke, vein of Quartz
- Md — Mundogie Fm., MainlySandstone
- Fex — Mineralised iron breccia, Economic iron grade
- Brecc — Breccia, undifferentiated
- Cht — Cherty Breccia
- G - Goethite dominant; He - Hematite dominant
- Q/G Breccia — Quartz/Goethite breccia in close proximity to Mundogie contact

SUPERFICIAL DEPOSITS

- Colluvial sheet wash
- Tce — River Terrace
- Alluvium
- Swampy Ground
- Silty alluvial flats

OTHER

- Hillslope sediment trajectory
- Creek
- FP — Flood Plain
- Track, disturbed ground
- Hi< High Angle Slopes; Mod < Moderate Angle Slopes; Lo< Low Angle Slopes
- High Trees, dense vegetation

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GEOLOGICAL MAP OF THE

SADDLES AREA

By R. Russell July 2014

Scale 1:5,000

ENCLOSURE 2

KEY

STRUCTURE and MORPHOLOGY

- Scarp
- Strike of beds
- Possible Fault, Minor lineation
- Possible Major Fault
- Possible shear zone
- Steep to shallow Topographic Break of Slope Shallow to steep
- Topographic Ridge Crest
- 75° Dip and Strike
- Fold structure; syncline or anticline

OUTCROP

- Sltst — Koolpin Siltstone
- V — Zamu Dolerite
- Rd Sst — Sandstone, red ferruginous. Iron in joints and interstices
- Q, q — Dyke, vein of Quartz
- Brecc — Breccia, undifferentiated
- FeSltst — Ferruginous siltstone unit within the Koolpin Fm.
- Cht — Chert, Blue to black, weathering to cream. Banded to massive some brecciation. Gerowie Tuff?
- Sst — Sandstone, grey, fine to medium grained. Koolpin Fm?
- Fex — Mineralised Iron Breccia, usually a goethite matrix in Koolpin siltstone breccia.

SUPERFICIAL DEPOSITS

- Colluvial sheet wash
- Slty — Low angle silty river flats
- Swampy ground in the wet season
- Modern Alluvium
- Debris mass flow lobe

OTHER

- Hillslope sediment trajectory
- Channel/palaeochannel sediment trajectory
- Creek
- FP — Flood Plain
- u/c — Under Cover
- Hi< — High Angle Slopes
- Mod < — Moderate Angle Slopes
- Lo< — Low Angle Slopes
- High Trees, dense vegetation

N

100 80 60 40 20 0 100 200 Metres

Scale 1:2,000

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GEOLOGICAL MAP OF THE

LEWIS MINERALISED TREND

By R. Russell July 2014

Scale 1:2,000 ***ENCLOSURE 3***