



3 Kimberley Street, West Leederville, WA 6007  
PO BOX 1573 West Perth WA 6872  
Telephone 08 9381 7838 Facsimile 08 9381 5375  
Email: [info@emmersonresources.com.au](mailto:info@emmersonresources.com.au)  
Website: [www.emmersonresources.com.au](http://www.emmersonresources.com.au)  
ABN 53 117 086 745

---

## **Mulga Group**

*MLC's 38, 253 – 261, 376 – 387 & 432*

# **MINERAL TITLES ACT COMPLIANCE REPORT**

*LICENSEE:*

**SANTEXCO PTY LTD**

A.B.N.002 910 296

*(A wholly owned subsidiary of Emmerson Resources Ltd)*

AUTHOR: ADAM WALTERS  
SEPTEMBER 2013

### **DISTRIBUTION:**

Department of Mines & Energy  
Central Land Council  
Emmerson Resources Ltd

### **MAP SHEETS:**

|                          |               |           |
|--------------------------|---------------|-----------|
| <input type="checkbox"/> | TENNANT CREEK | SE53-14   |
| <input type="checkbox"/> |               |           |
| <input type="checkbox"/> | TENNANT CREEK | 5758      |
| <input type="checkbox"/> |               |           |
| <input type="checkbox"/> |               | 1:100 000 |

*Table of Contents*

**FIGURES ..... 3**

**TABLES ..... 3**

**1. SUMMARY ..... 1**

**2. INTRODUCTION..... 2**

**3. LOCATION..... 3**

**4. TENURE ..... 4**

**5. GEOLOGY ..... 6**

    5.1 REGIONAL GEOLOGY ..... 6

    5.2 LOCAL GEOLOGY ..... 7

    5.3 MINE GEOLOGY ..... 7

**6. EXPLORATION & RESOURCES ..... 8**

    6.1 EXPLORATION & RESOURCES..... 8

**7. CONCLUSIONS ..... 10**

**8. MTA COMPLIANCE RECOMMENDATION ..... 11**

**FIGURES**

- Figure 1. Mulga Group Location
- Figure 2. Mulga Group Tenure
- Figure 3. Mulga Group proposed ML's and subdivision of ML's
- Figure 4. AAPA and CLC Registered Sacred Sites and Exclusion Zones

**TABLES**

- Table 1. Mulga Group Tenure Details
- Table 2. Registered AAPA and CLC Sacred Sites and CLC Exclusion Zones
- Table 3. Historical Mines of the Mulga Group

## 1. SUMMARY

This report details the review of the Mulga Group of tenements MLC's 38, 253 – 261, 376 – 387 & 432 the titles cover the Golden Key, Valhalla, Aga Khan, Yellow Flame and Memsahib (the latter two are located just outside the western boundary of the group) historical mines. The aim of this report is to identify, reassess and review all historical work conducted of the titles to make a determination on the prospectivity of the title, identify the presence of any anomalous zones or deposits and then make a determination on the validity of the titles and then a recommendation to the Department of Mines and Energy (DME) on the transition of the titles to comply with the Mineral Titles Act.

It is recommended to amalgamate all Mulga group titles that fall on Perpetual Pastoral Lease (PPL) into one ML and all Mulga group titles that fall on Aboriginal Freehold Land (AFL) into one ML. MLC's 382, 386 & 387 fall on both PPL and AFL and therefore are the subject of a subdivision request that accompanies this report and recommendation. Figure 3 below clearly displays the proposed new ML's and the line for subdivision. Therefore the Proposed Mulga North ML will include MLC's 38, 253 – 261, 376 – 381, 383 – 385 & 432 and the subdivided portions of MLC's 382, 386 & 387 that fall on PPL. The proposed Mulga South ML will include the subdivided portion of MLC's 382, 386 & 387 that falls on AFL. The application for subdivision of MLC's 382, 386 & 387 will be submitted simultaneous with this submission and recommendation.

As described above it is clear that a anomalous zone defined by predominately gold mineralisation exists within the Mulga Group with potential for further discoveries and/or extensions to the known mineralisation at Memsahib and both Mulga Prospects;

Best mineralized intercepts at Mulga 1 include:

DDH-589 10m @ 6.92ppm Au from 524m, including 1m @ 48.83ppm Au from 527m

6m @ 12.73ppm Au from 554m, including 1m @ 67.65ppm Au from 557m

DDH-569 6m @ 6.17ppm Au, 0.12% Cu from 477m, including 1m @ 29.39ppm Au, 0.13% Cu

Resource estimate at Mulga 1 = 130,000 – 140,000t @ 8 g/t Au

Best mineralized intercepts at Mulga 2 include:

M2-002 8m @ 1.44ppm Au from 423.6m

DDH-580 8m @ 1.13ppm Au from 422m

M2-005 1m @ 11.6ppm Au from 419.3m

TCRC45 – 47 were drilled at the Memsahib with the best results returning, TCRC45 2m @ 24.8g/t Au from 79m, TCRC46 2m @ 1.10g/t Au from 34m with 16m of 0.28% Cu from 38m.

There are several minor magnetic anomalies within the dataset area that are associated with historic small-scale, high-grade gold prospects (Mint, Copper head, Memsahib, Yellow Flame). There does not appear to be any drilling over these prospects.

## 2. INTRODUCTION

This report details the review of the Mulga Group of tenements MLC's 38, 253 – 261, 376 – 387 & 432 the titles cover the Golden Key, Valhalla, Aga Khan, Yellow Flame and Memsahib (the latter two are located just outside the western boundary of the group) historical mines. The aim of this report is to identify, reassess and review all historical work conducted of the titles to make a determination on the prospectivity of the title, identify the presence of any anomalous zones or deposits and then make a determination on the validity of the titles and then a recommendation to the Department of Mines and Energy (DME) on the transition of the titles to comply with the Mineral Titles Act.

Figure 1 shows the location of the Mulga Group with respect to the Tennant Creek Township and figure 2 details the tenure of the Mulga Group.

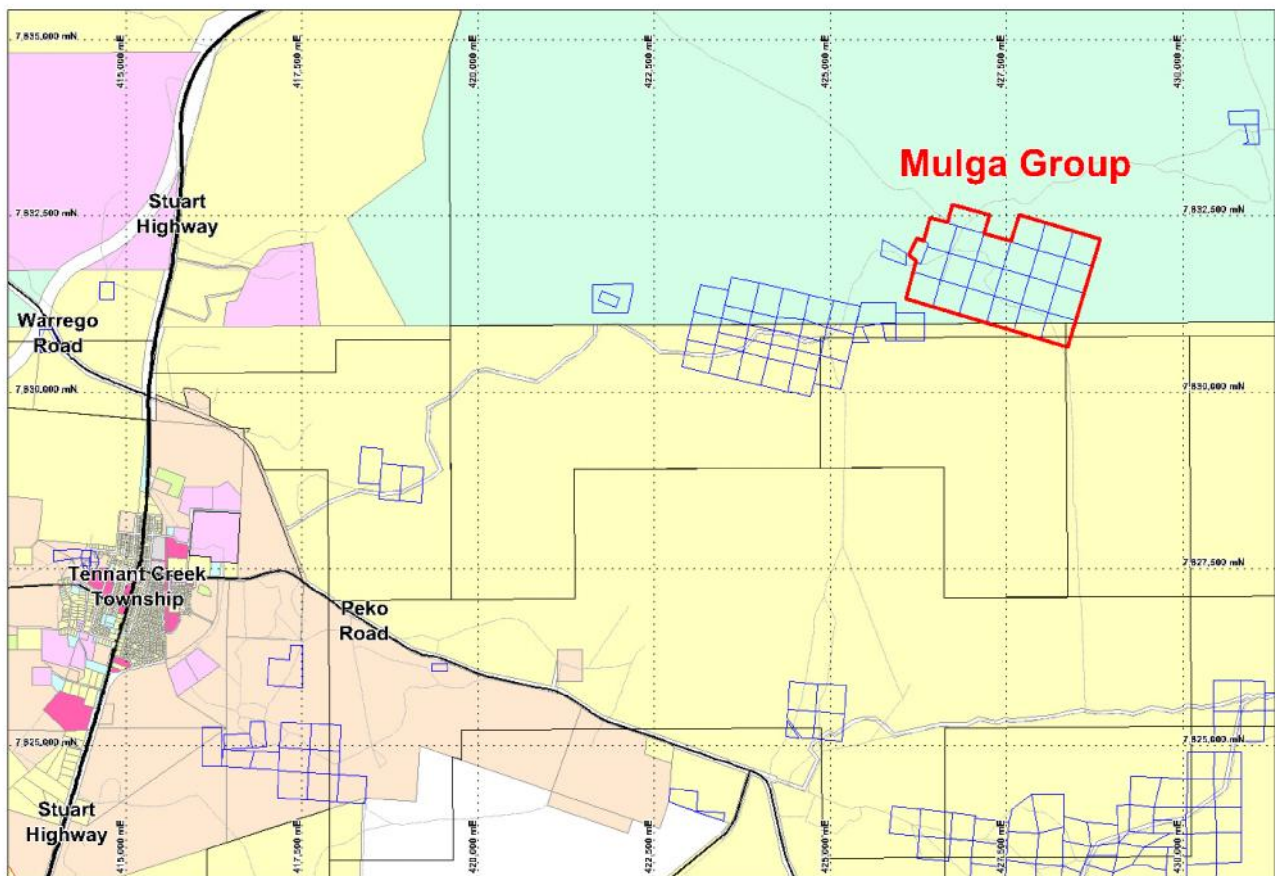
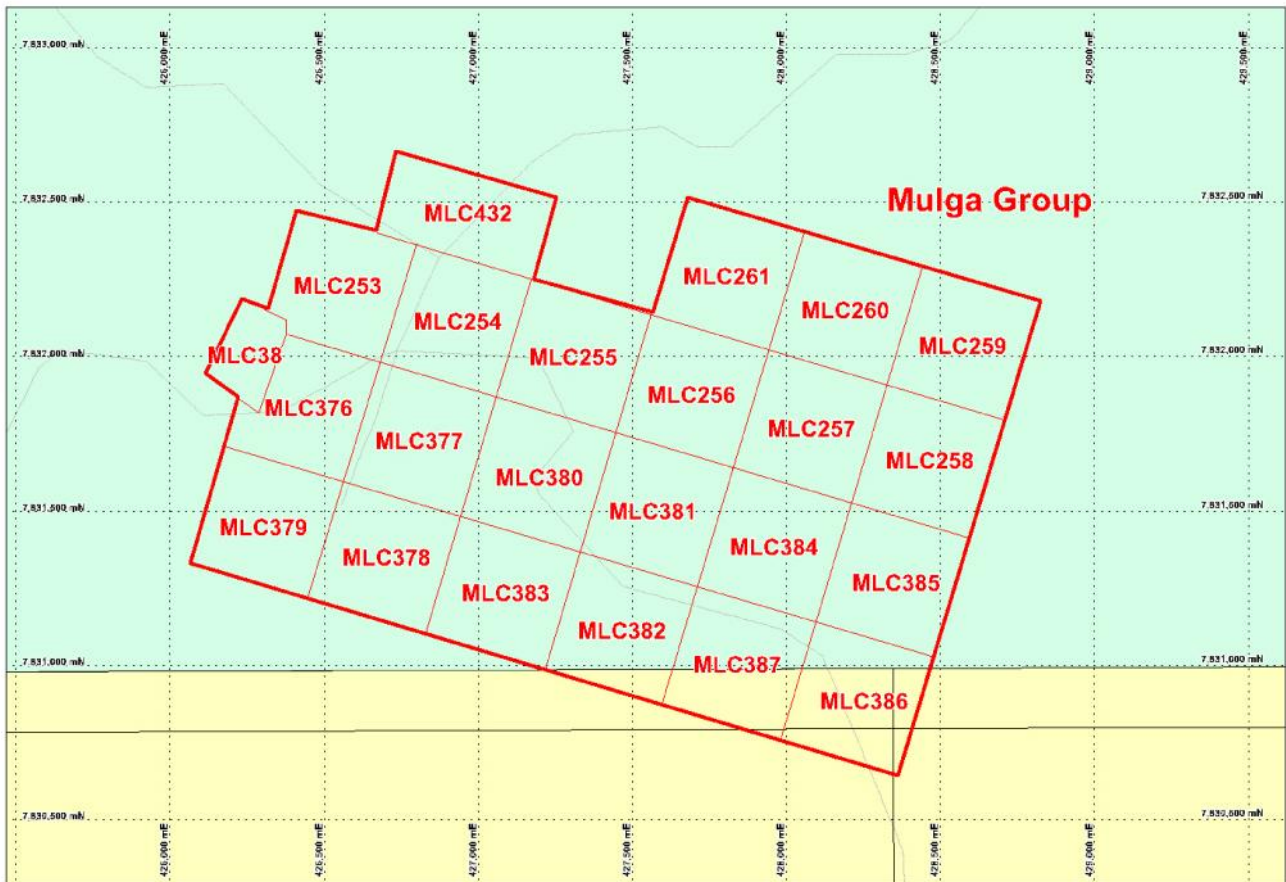


Figure 1: Location of Mulga Group with respect to the Tennant Creek Township



### 3. LOCATION

Access to the group area is east via the Stuart Highway, east via Peko Road then along the road to the Lone Star Mine, which lies to the south west of the group. Access to the group from the Lone Star Mine Road is via a series of unsealed tracks and fence line tracks, which during and immediately after rain generally become inaccessible.

Figures 1 and 2 further display access and location.

## 4. TENURE

The tenure details of the Mulga Group are detailed in the following table;

| Tenement ID | Tenement Name | Holder | Interest | Grant Date | Effective Date | Expiry Date | Area (Ha) |
|-------------|---------------|--------|----------|------------|----------------|-------------|-----------|
| MLC253      | Mulga 1       | San    | 100      | 15/12/1977 | 15/12/1977     | 31/12/2018  | 16        |
| MLC254      | Mulga 1       | San    | 100      | 15/12/1977 | 15/12/1977     | 31/12/2018  | 16        |
| MLC255      | Mulga 1       | San    | 100      | 15/12/1977 | 15/12/1977     | 31/12/2018  | 16        |
| MLC256      | Mulga 2       | San    | 100      | 15/12/1977 | 15/12/1977     | 31/12/2018  | 16        |
| MLC257      | Mulga 2       | San    | 100      | 15/12/1977 | 15/12/1977     | 31/12/2018  | 16        |
| MLC258      | Mulga 2       | San    | 100      | 15/12/1977 | 15/12/1977     | 31/12/2018  | 16        |
| MLC259      | Mulga 2       | San    | 100      | 15/12/1977 | 15/12/1977     | 31/12/2018  | 16        |
| MLC260      | Mulga 2       | San    | 100      | 2/09/1959  | 2/09/1959      | 31/12/2018  | 16        |
| MLC261      | Mulga 2       | San    | 100      | 15/12/1977 | 15/12/1977     | 31/12/2018  | 16        |
| MLC376      | Mulga 1       | San    | 100      | 20/12/1977 | 20/12/1977     | 31/12/2018  | 16        |
| MLC377      | Mulga 1       | San    | 100      | 20/12/1977 | 20/12/1977     | 31/12/2018  | 16        |
| MLC378      | Mulga 1       | San    | 100      | 20/12/1977 | 20/12/1977     | 31/12/2018  | 16        |
| MLC379      | Mulga 1       | San    | 100      | 20/12/1977 | 20/12/1977     | 31/12/2018  | 16        |
| MLC38       | Memsahib East | San    | 100      | 13/11/1961 | 13/11/1961     | 31/12/2023  | 9         |
| MLC380      | Mulga 1       | San    | 100      | 20/12/1977 | 20/12/1977     | 31/12/2018  | 16        |
| MLC381      | Mulga 1       | San    | 100      | 20/12/1977 | 20/12/1977     | 31/12/2018  | 16        |
| MLC382      | Mulga 1       | San    | 100      | 20/12/1977 | 20/12/1977     | 31/12/2018  | 16        |
| MLC383      | Mulga 1       | San    | 100      | 20/12/1977 | 20/12/1977     | 31/12/2018  | 16        |
| MLC384      | Mulga 2       | San    | 100      | 20/12/1977 | 20/12/1977     | 31/12/2018  | 16        |
| MLC385      | Mulga 2       | San    | 100      | 20/12/1977 | 20/12/1977     | 31/12/2018  | 16        |
| MLC386      | Mulga 2       | San    | 100      | 20/12/1977 | 20/12/1977     | 31/12/2018  | 16        |
| MLC387      | Mulga 2       | San    | 100      | 20/12/1977 | 20/12/1977     | 31/12/2018  | 16        |
| MLC432      | Mulga 1       | San    | 100      | 5/08/1981  | 5/08/1981      | 31/12/2022  | 15        |

Table 1: Mulga Group Tenure Details

The Mulga Group comprises 23 granted Mineral Leases, refer to figure 2 and table 1, covering an area of 360 hectares.

The leases are located on –



- NT Parcel 00494, Perpetual Pastoral Lease 1142, Tennant Creek Station
- NT Parcel 03735, Aboriginal Freehold Land held by the Warumungu Aboriginal Land Trust

Under the Mineral Titles Act Emmerson will be requesting to amalgamate all Mulga group titles that fall on Perpetual Pastoral Lease (PPL) into one ML and all Mulga group titles that fall on Aboriginal Freehold Land (AFL) into one ML. MLC's 382, 386 & 387 fall on both PPL and AFL and therefore are the subject of a subdivision request that accompanies this report and recommendation. Figure 3 below clearly displays the proposed new ML's and the line for subdivision. Therefore the Proposed Mulga North ML will include MLC's 38, 253 – 261, 376 – 381, 383 – 385 & 432 and the subdivided portions of MLC's 382, 386 & 387 that fall on PPL. The proposed Mulga South ML will include the subdivided portion of MLC's 382, 386 & 387 that falls on AFL. The application for subdivision of MLC's 382, 386 & 387 will be submitted simultaneous with this submission.

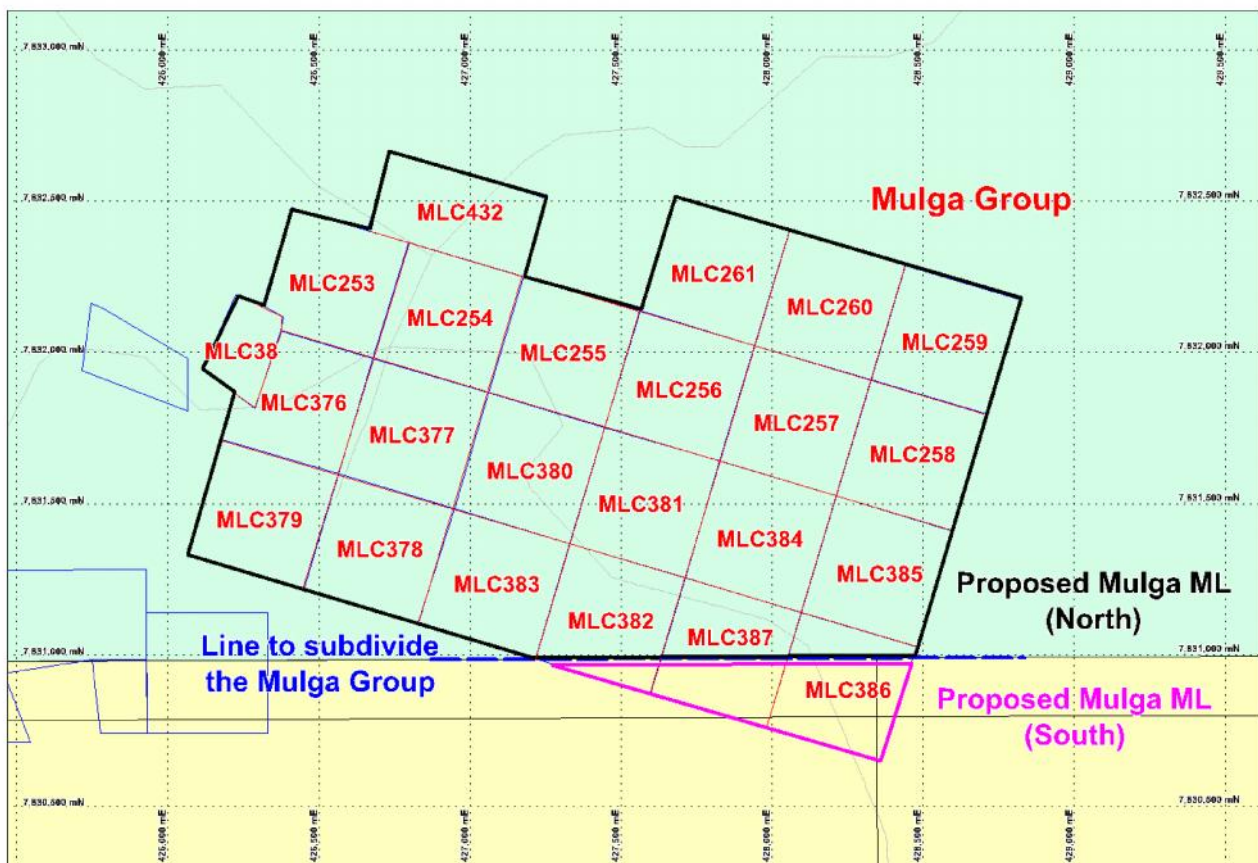


Figure 3: Mulga Group Proposed ML's and subdivision of ML's

The Mulga Group contains one AAPA registered sacred site and no CLC exclusion zones, as detailed in table 2 and figure 4 below;



| Registered Sacred Site | Comments  |
|------------------------|---|
| 5758-62                | <p>425 857E<br/>7 832 746N</p> <p>A large hill with several ironstone outcrops located about 1 km north of the road that runs west from Lone Star Hill.</p> |

Table 2: AAPA and CLC registered Sacred Sites and Exclusion Zones

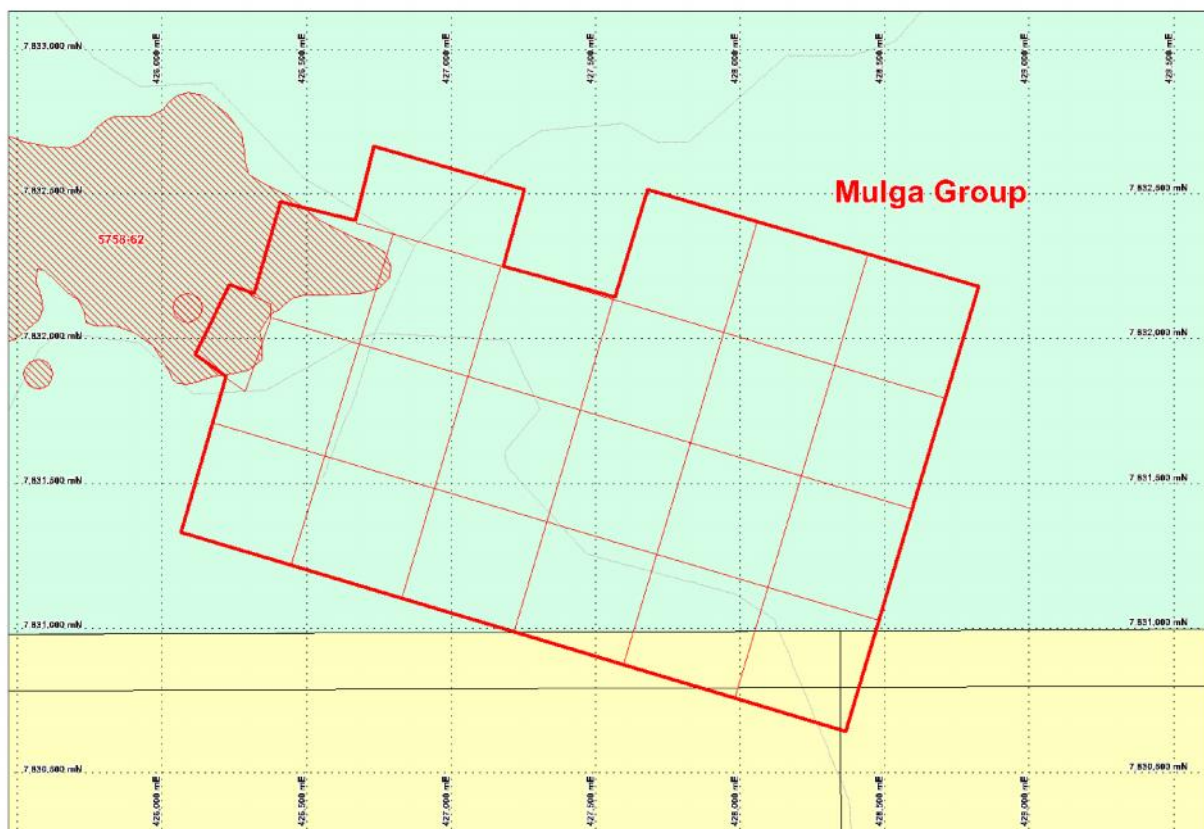


Figure 4: Registered AAPA and CLC sacred Sites and Exclusion Zones

## 5. GEOLOGY

### 5.1 Regional Geology

The reader is referred to AusIMM Monograph 14 (Geology of the Mineral Deposits of Australia and Papua New Guinea), Volume 1, pp. 829-861, to gain a good introduction to the regional geology and styles of gold-copper mineralisation of the area.

In 1995 the Northern Territory Geological Survey released a geological map and explanatory notes for the Flynn 1:100,000 sheet, which covers the area of the licenses.

The rocks of the Warramunga Formation host most of the orebodies in the region and underlie most of the Exploration Licenses.

## 5.2 Local Geology

The Mulga Group is located in the central east region of the Tennant Creek Province. Outcrops, which coincide with ridges and isolated hills, are dominate throughout the group, these ridges and isolated hills consist of weathered siltstone and greywacke of the Palaeoproterozoic Warramunga Formation and most likely underlie Cainozoic colluvium scree, alluvial red soil plains, quartz rich dissected colluvial fan deposits and less extensive alluvial deposits in active channels and on flood plains. The Quartz Hill Fault system dominates the structure of the licence, and is the major control on mineralisation and ironstone emplacement.

## 5.3 Mine Geology

The Mulga Group contains a number of historical mine workings with two also located on the boundary of the group, as detailed in the table below;

| <b>Mine Name</b> | <b>Operating Period/s</b> | <b>Production</b> | <b>Grade</b> | <b>Produced Metal</b> |
|------------------|---------------------------|-------------------|--------------|-----------------------|
| Golden Key       | 1939                      | 10.8t             | 44.4g/t Au   | 15.4oz Au             |
| Valhalla         | 1939                      | ?                 | ?            | ?                     |
| Aga Khan         | 1958 – 1959               | 11t               | 272.7g/t Au  | 96.5oz Au             |
| Memsahib         | 1937 – 49                 | 204.6t            | 26.3g/t Au   | 173.2oz Au            |

Table 3: Historical Mines of the Mulga Group

## 6. EXPLORATION & RESOURCES

### 6.1 Exploration & Resources

In 1988 Asarco Australia Limited conducted exploration work, which included: a detailed geological interpretation of the Mint area, identifying a significant alteration zone; Geochemical lag sampling over the Mint block of tenements. Line spacing was 100m with 25m sample spacing over the Mint alteration zone. Results confirmed the geological interpretation with a broad Au, Cu and Bi anomaly covering the west north-west trending shear zone, and continuing through to the Aga Khan workings further south; Detailed rock chip sampling was conducted, 90 samples were collected with assay results returning six samples >1.0ppm, the highest value being 3.22ppm Au. Numerous other samples returned better than 0.25ppm Au, with high Bi up to 3050ppm and Cu up to 6550ppm. The best results were generally from brecciated ironstone or hematitic sediments. Asarco also conducted drilling in April of 1988. Nine RC holes were drilled, totalling 532m, to test the strike extent of the Au, Cu and Bi anomalies defined by the soil and lag sampling. Two vertical, and the rest inclined at 60° to the north, holes were drilled over a strike of 80m. Seven of the holes intersected ironstone and/or alteration assemblages, the two that failed to intersect ironstone are believed to have been drilled below the plunging body. Best results returned were from TCRC19 1m @ 1.0g/t Au from 39m, this was from the furthest down plunge of all holes indicating the possibility of economic mineralization at greater depth. A detailed aeromagnetic and radiometric survey was flown by Aerodata Holdings Limited. The survey was flown on a line spacing of 200m, flight height of 60m.

Asarco continued exploration work in 1989, which included, 11.4 line km of infill gridding, together with 1:1000 geological mapping. A ground magnetic survey was completed, totalling 12 line km. Drilling of seven RC holes (TCRC27-30,36,37 & 42), totalling 626m, was conducted in October 1989. Drill holes TCRC29 and 30 tested the historically exploited Memsahib mine and its eastern extent. Results from TCRC29 support the observation that the Memsahib ironstone body and associated mineralisation have limited strike length. Intersections in TCRC30 support the observations that the ovoid bodies mineralisation developed in sheared kaolinised mudstone which bounded the ironstone body. Assays from TCRC42 showed 2m @ >1g/t Au mineralisation within sheared siltstones at the southern contact of the target ironstone.

Asarco continued exploration work in 1990 three holes (TCRC45 – 47) were drilled at the Memsahib workings, best results returned were, TCRC45 2m @ 24.8g/t Au from 79m, TCRC46 2m @ 1.10g/t Au from 34m with 16m of 0.28% Cu from 38m.

Asarco continued exploration work in 1991, which included work predominately at the Memsahib area. A detailed ground magnetic survey was conducted with the aim of locating other magnetic anomalies along the east south-easterly shear zone. The survey was conducted on a 25m line spacing with station spacing of 5m. The survey identified one distinct anomaly and several subtle anomalies. Two RC holes were drilled (TCRC60 & 61); best results returned were TCRC60 2m @ 0.161 g/t Au, 465ppm Cu and 118ppm Bi. TCRC61 2m @ 0.011g/t Au, 252ppm Cu, <1ppm Bi.

During 1994 rock chip sampling was undertaken, samples of the mullock dump at Memsahib were taken to ascertain if the dump contained a grade of mineralisation which might be recoverable. Samples MS1 – MS5 were collected but returned no favourable results.

During 1995 restoration of the Asarco grid was completed, three rock chip samples (113438 – 113440) were taken from outcrops around the Memsahib mine and two others (113441 & 113442) from crumbling ironstone wall-rock in a pit in the same area. Two diamond holes were drilled (MSD1 & MSD2), these holes were drilled to locate ore adjacent to, and below, the Memsahib mine workings, Au was found in both holes although not at ore grade.

During 1996 a detailed Airborne Geophysical Survey was engaged by World Science corporation, with specifications of north – south lines at 50m spacings, and flying height of 50m above mean terrain. The data showed a strong magnetic anomaly linking the Memsahib, Hilltop and Mint prospects.

Further rock chip sampling was undertaken in 1997, three sets of old workings were investigated and rock chip samples taken. Assay results for two sets of old workings were low. The third prospect, where Asarco had returned sample results of up to 3.2g/t Au, returned assays with only some >1g/t, and they were 1.94 and 1.84g/t Au, with low Cu and Bi.

Exploration of the Aga Khan area was conducted by National Gold NL has included: geological mapping, rock chip, dump sampling and an airborne magnetic survey. No prominent features were delineated by this survey, and only low Au values, the highest being 0.09 g/t Au, were returned.

During 1988 the area was mapped to 1:1000 scale to evaluate the prospect and also to determine the extent of any mineralisation and alteration. This mapping revealed an ironstone lode some 70m in length and trending north west lying within a sheared zone of Warramunga Group sediments, minor chlorite was recorded in the surrounding sediments. Geochemical lag and rock chip samples were taken over the area. These were analysed for Au, Cu and Bi. Although the lag results showed the area to be anomalous the rock chip samples taken around the workings have not supported the former. A large area has been flown by Aerodata for magnetics and radiometrics, of which the Aga Khan area made up an integral part.

The Mulga 1 prospect has a moderate-sized, moderate-intensity bullseye magnetic anomaly whereas much smaller and less intense magnetic anomalies exist at Mulga 2. Other prospects within the area are not associated with magnetic anomalies and lie in a 'sea' of low magnetic intensity.

The area lies within the structural wedge between the intersection of the Mary Lane Shear and the Quartz Hill Fault (both major D3 structures). The magnetic anomalies are interpreted to lie along a minor D1 structure which is also highlighted by magnetic data.

A small, moderate-intensity gravity ridge transects both the D1 and D3 structures between The Mint – TC38 – Mammoth prospects and a very weak high is coincident with the Mulga 2 magnetic anomaly. Deep gravity data reveals a large, high-intensity bullseye anomaly underlying the TC38 prospect; the Mulga 1 prospect sits on the southeast margin of the anomaly.

Vacuum drilling produced no Au anomalies except a single 400m long zone ~450m south of the Mulga 1 prospect that peaked at 685.5ppb Au. No copper anomalies were identified other than two spot highs of 100 and 90ppm. Virtually all other assays are <20ppm Cu. No coherent bismuth anomalies were identified but a sporadic cluster of elevated results to the west and southwest of the Mulga 1 magnetic anomaly (peak 4.8ppm)

The Mulga 1 and Mulga 2 prospects are by far the most extensively explored within the group with 19 diamond holes (including wedges) at Mulga 1 (8855m) and 13 diamond holes (including wedges) at Mulga 2 (6311m). Drilling has confirmed that the source of the magnetic anomalies are elongate vertical pipes of talc-chlorite-dolomite-magnetite with several lenses of quartz-magnetite. The Mulga 1 pipe occurs between 430 and 540m below surface and the Mulga 2 pipe is a further 100m below that. Both pipes have a strike of about 200m. Mineralization is deep and sporadic with high grades confined to narrow widths on contacts of the small ironstone lenses. At Mulga 1, DDH-594 intersected 75m of massive quartz-magnetite and DDH-552 and DDH-556 contain 35-40m of talc-magnetite which can certainly account for the observed magnetic anomaly.

Best mineralized intercepts at Mulga 1 include:

DDH-589 10m @ 6.92ppm Au from 524m, including 1m @ 48.83ppm Au from 527m

6m @ 12.73ppm Au from 554m, including 1m @ 67.65ppm Au from 557m

DDH-569 6m @ 6.17ppm Au, 0.12% Cu from 477m, including 1m @ 29.39ppm Au, 0.13% Cu

Resource estimate at Mulga 1 = 130,000 – 140,000t @ 8 g/t Au

Best mineralized intercepts at Mulga 2 include:

M2-002 8m @ 1.44ppm Au from 423.6m

DDH-580 8m @ 1.13ppm Au from 422m

M2-005 1m @ 11.6ppm Au from 419.3m

There are several minor magnetic anomalies within the dataset area that are associated with historic small-scale, high-grade gold prospects (Mint, Copper head, Memsahib, Yellow Flame). There does not appear to be any drilling over these prospects.

## 7. CONCLUSIONS

As described above it is clear that a anomalous zone defined by predominately gold mineralisation exists within the Mulga Group with potential for further discoveries and/or extensions to the known mineralisation at Memsahib and both Mulga Prospects.

## **8. MTA COMPLIANCE RECOMMENDATION**

It is recommended to amalgamate all Mulga group titles that fall on Perpetual Pastoral Lease (PPL) into one ML and all Mulga group titles that fall on Aboriginal Freehold Land (AFL) into one ML. MLC's 382, 386 & 387 fall on both PPL and AFL and therefore are the subject of a subdivision request that accompanies this report and recommendation. Figure 3 below clearly displays the proposed new ML's and the line for subdivision. Therefore the Proposed Mulga North ML will include MLC's 38, 253 – 261, 376 – 381, 383 – 385 & 432 and the subdivided portions of MLC's 382, 386 & 387 that fall on PPL. The proposed Mulga South ML will include the subdivided portion of MLC's 382, 386 & 387 that falls on AFL. The application for subdivision of MLC's 382, 386 & 387 will be submitted simultaneous with this submission.

