Appendix E:
Site Structural Geology
(Tedman-Jones 2017)
1. Introduction

The proposed mine infrastructure representing the Mount Dromedary Graphite Project is located approximately 135km north of Cloncurry in NW Queensland.

Field mapping was carried out from Tuesday 15th-Saturday 19th August 2017 to identify structure within those areas planned to be covered by infrastructure, including the Low-Grade Stockpile, and Plant and Administration areas in the northern sector and the Integrated Water/Tailings Landform, Raw and Mine Water Dam areas in the southern sector.

Maps based on field observations have been produced showing identified and interpreted lineaments including faults and jointing covering the northern and southern infrastructure covered sectors.

Field observations were made using 1:2500 scale A3 landscape colour registered and gridded (MGA-GDA94 zone 56) aerial images which allowed detailed in-field lineament and lithological identification and mapping.

As well as the basic requirement of structure-infrastructure maps, to better understand the relationship between structure and underlying bedrock geology which may assist with mine planning, maps of the interpreted geology and structure based on field mapping have also been produced.

2. Local Geology

Local lithologies consist of elements of the Proterozoic Corella Formation which locally in the Northern Sector have noticeably been tightly folded into steeply, mainly steeply west dipping metasediments. These folds trend essentially north-south with axial parallel structures, but the dominant structures trend northwest-southeast and northeast-southwest as a series of conjugate, brittle fractured, spaced joints and faults which often show local scale lateral displacement.

In the Southern Sector, apart from some of the eastern edge of the mapped area, most of the sector planned for dam infrastructure is covered by alluvium and colluvium masking large areas from structure observations. One prominent sheared fault structure indicating displacement of local lithology and aligned with a north-south trending creek bed, was mapped on the eastern side of the mapped area (“Creek Fault”).

The major north-south trending Coollulah Fault mapped on the regional 1:25000 “Dobbyn” Queensland Government geological map (Sheet-SE5414), also visible on regional magnetics, is situated on the western margin of the tenement and does not intersect any of the areas covered by planned infrastructure.

A second north-south structure visible on regional magnetics (“Middle Fault”) has been added to the structural mapping and is located just west of the Creek Fault. This was not identified in outcrop.

A series of prominent mainly north-south trending quartz blows represent quartz filled annealed shears. These are generally very pod-like and localised.

Most of the area west of the Creek Fault consists of steeply dipping and tightly folded (on north-south axes) quartzites with minor interbedded amphibolites. To the east of Creek Fault are a series of steeply dipping calcisilicate associated lithologies with minor interbedded metalimestones (dolomite?).

3. Structure and Lithology - Northern Sector

The area covered by the planned Low-Grade Stockpile consists of low relief terrain that rises to a low ridge of folded quartzite (metasandstone) at the northern end. Outcrop is common within areas bounded by thin, lightly lag covered, sandy, variably ferruginous colluvium (Figure 1).

Target resource graphitic schists are locally bounded to the west by dolerite. To the east, the graphitic schists are in contact with by micaceous schists and a broad zone of siliceous metaarenites interbedded with metalimestones (dolomite?), and occasional narrow ironstone lenses and beds. On the eastern side, a sequence of banded to laminated calcisilicates occur as ridges of prominent outcrop interbedded with low relief, variably red-rock altered felsic metacalcsilicates. Marginal to and within the calcisilicate zones are massive lenses of marble (coarsely crystalline white to pink weakly ferruginous calcite) (Figure 1).

Locally, these Corella Formation lithologies have been tightly folded by a series of tight vergence(?) folds into steeply, mainly steeply west dipping metasediments. These folds trend essentially north-south and north-northwest to east-southeast with minor axial parallel structure.

The dominant structural trends consist of brittle fracture, conjugate northwest-southeast and northeast-southwest spaced joints and minor faults which often show local scale lateral displacement (Figure 1).

The planned Plant and Administration area is planned on essentially low lying, mainly alluvial and colluvial covered areas with subcropping metacalcsilicates and carbonaceous metamudstones.

Within the northern area, no large regional scale faults were identified intersecting the proposed Low-Grade Stockpile area or the Plant and Administration areas (Figures 1, 2 and 5).

Apart from a meridional isoclinally(?) folded mainly steeply west dipping metamorphic sequence, most of the structure in the Northern Sector is represented by tectonic conjugate brittle fracturing as jointing and minor faults that display localised strike-slip displacement.

4. Structure and Lithology - Southern Sector

The area covered by the planned Integrated Water/Tailings Landform, Mine Water Dam and Raw Water Dam consists of low relief terrain that rises slowly to the east. Outcrop over most of this area is sparse and masked by large areas of alluvium with low relief rolling interfluves draped by thin
ferruginous sandy colluvials covered by a lag of quartz gravels. Within the Raw Water Dam area in the eastern portion of the area, the terrain rises beyond a prominent north-south creek where outcrop becomes more prominent (Figures 3 & 4).

The prominent north-south trending creek is host to a mappable north-south trending shear fault (Creek Fault) with lithologies to the east trending south-southeast and to the west of the creek, trending mainly north-south. The lithologies to the west of this creek are dominated by a wide sequence of north-south trending quartzite with minor interbedded amphibolites. To the east of the creek, quartzite sequences give way to prominent metacalsilicate outcrop (similar to the eastern corridor in the Northern Sector) with interbedded metalimestones (dolomite?) and felsic calcarenites with epidote propylitic alteration.

As most of this sector is masked by extensive alluvium (Figure 3) and lag covered ferruginous colluvials, limited structural trends were identified from mapped outcrop, but structural trends were visible on the imagery used in the field. From these observations, as in the Northern Sector, the interpreted structure consists of tectonic conjugate lineaments trending southwest-northeast and northwest-southeast. Mapped minor faults showed local lateral displacement.

A major regional fault, the Coollulah Fault (approx. 416150mE), that is identified on the 1:250,000 Dobbyn-Geology Map, is located to the west of the planned dam infrastructure (Figures 3, 4 & 5) and will not affect any infrastructure planning. Apart from the north-south trending Creek Fault (approx. 417400mE), a second north-south fault, the Middle Fault, as interpreted from regional magnetics (approx. 417250mE), has been included on the structural map, but was not obvious in the field. This interpreted structure bisects the planned Tailings Dam at its eastern margin.

5. Summary and Conclusions

a. Structure Northern Sector

Within the northern area, no large regional scale faults were identified intersecting the proposed Low-Grade Stockpile area or the Plant and Administration areas.

Apart from a meridional isoclinally(?) folded mainly steeply west dipping metamorphic sequence, most of the structure in the Northern Sector is represented by tectonic, conjugate, brittle fracturing as spaced jointing and minor faults that display localised strike-slip displacement.

The area covered by the planned Low-Grade Stockpile consists of low relief terrain that rises to a low ridge of folded quartzite (metasandstone?) at the northern end. Outcrop is common, with lower relief areas forming narrow corridors covered by lightly lag covered, sandy, variably ferruginous colluvium.

The proposed Low-Grade Stockpile area is underlain by a broad zone of metalimestones (including dolomite?) and calcsilicate associated lithologies.

As no regional scale faults occur within the planned Low-Grade Stockpile, this would make the selected area less prone to absorption of surface water, minimising ground water access and contamination.

The planned Plant and Administration area is planned on essentially low lying, mainly alluvial-colluvial areas with subcropping calcsilicates and carbonaceous mudstones. Within this area, no major regional structures of significance were identified, but a few lesser northeast southwest trending structures may exist below surface cover.
It is regarded that in general, the mapped structures in the Northern Sector represent relatively tight structural formation and as such should be minimally pervious.

b. Structure Southern Sector

Within the Southern Sector, three significant north-south trending structures (faults) were identified from previously published government mapping, geophysics and from the current field mapping project. The Coollulah Fault, a well-known major north-south regional fault, is interpreted from regional 1:250,000 geological maps to be to the west of all planned infrastructure, and as such should not pose a problem to the proposed dam infrastructure.

A second north-south fault termed the “Creek Fault” (Figures 3, 4, 5 and 6), was identified intersecting the proposed Raw Water Dam infrastructure. This fault structure is a shear zone that appears to be sub-vertical and is interpreted to show mappable displacement within local geology. The structure in part appears to follow the water course of a small north-south trending creek.

A third north-south structure identified from magnetics, termed the “Middle Fault” plots north-south across the eastern edge of the main Integrated Water/Tailings Landform outline. The actual existence of this structure is interpreted from magnetics and has not been located/confirmed in outcrop.

As in the Northern Sector, most identified structure in the Southern Sector is represented by southwest-north-east and northwest-southeast trending tectonic, conjugate, brittle fracturing as spaced jointing and minor faults that display limited localised strike-slip displacement.

As in the Northern Sector, it is regarded that in general, the mapped structures in the Southern Sector represent relatively tight structural formation and as such should be minimally pervious and not significantly impact infrastructure planning.

The only structures within the Southern Sector that may require consideration in terms of planning mine infrastructure are the interpreted faults described as the Middle Fault and Creek Fault. These are not considered to be regionally significant structures, but relatively limited scale local structures.

Figure 6 outlines the three main interpreted structures that may be significant with regard to mine planning within the proposed combined mining lease area.
Figure 1 Geology and Structure - Northern Sector
Figure 2 Structure and Infrastructure – Northern Sector
Figure 3 Geology and Structure - Southern Sector
Figure 4 Structure and Infrastructure – Southern Sector
Figure 5 Structure and Infrastructure – Combined Areas
Figure 6 Significant Interpreted Geological Structures Relevant to Mine Planning – Combined Areas