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Report prepared by

[International Geoscience](#)

On behalf of

UNIVERSAL SPLENDOUR INVESTMENTS PTY LTD
Final Report EL 27631
Relinquished Blocks

2 August 2012

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limitations of the data and information used in creating them. The conclusions and recommendations presented in this
document are the results of a comprehensive study and analysis of the available data and theory at the time of this document's
creation.
EXECUTIVE SUMMARY

Universal Splendour Investments (USI) was granted exploration license EL 27631 in June 2010, along with EL 27632 collectively referred to as the McArthur Project area. These tenements are located in the northern region of the Northern Territory, approximately 150km east of Katherine and 360km southeast of Darwin.

In May 2012, EL 27631 was reduced by 50% as requested by NTGS guidelines. This is the Final Report for those relinquished blocks, detailing all work completed by USI since June 2010.

In 2010, International Geoscience conducted a full background review for the McArthur Project. Stream sediment sample assays from the NTGS database within the exploration licence showed signs of high Mn values which appeared to be associated with Proterozoic rocks.

Evidence of Pb/Zn mineralisation, particularly the SEDEX style of the McArthur River type was found by reviewing the NT geochemical database. Three Pb/Zn mineral occurrences were identified within the McArthur project area.

Within the 2011 field season one field visit was undertaken in June to identify access to the tenements, collect rock samples and visit the Pb-Zn occurrence (Wongalara).

Unfortunately Wongalara was inaccessible by 4WD due to very wet conditions.

The area is considered prospective for manganese (Mn) and lead-zinc (Zn/Pb) mineralisation. Mn mineralisation and particularly Cretaceous sedimentary deposits of the style seen at Groote Eylandt are the main prospect within the project area.
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1 OVERVIEW

Universal Splendour Investments (USI) was granted exploration license EL 27631 in June 2010, along with EL 27632 collectively referred to as the McArthur Project area (Figure 1). These tenements are located in the northern region of the Northern Territory, approximately 150km east of Katherine and 360km southeast of Darwin.

The area is considered prospective for manganese (Mn) and lead-zinc (Zn/Pb) mineralisation. Mn mineralisation and particularly Cretaceous sedimentary deposits of the style seen at Groote Eylandt are the main prospect within the project area.

Evidence of Pb/Zn mineralisation, particularly the SEDEX style of the McArthur River type, is observed in the NT geochemical database. One Pb/Zn mineral occurrence lies within the tenement area (Wongalara).

Although the region surrounding the project area is currently being investigated for diamonds there is little information available with respect to previous exploration. There are indications of diamonds spread across most of northern Australia and there has been significant exploration expenditure to date with little success. Thus diamonds are a commodity of low priority at this stage.

1.1 RELINQUISHMENT

When granted in June 2010 the tenement consisted of 417 blocks (1390km²). In May 2012 USI applied to relinquish 50% of EL 27631 (a total of 208 blocks were retained) due to expenditure commitments not being reached during the 2011/2012 reporting period.

The area relinquished is shown in Figure 2.
Figure 1: Location of McArthur Project area (before relinquishment): EL 27631 & EL 27632. Base image from Bing Maps.
Figure 2: McArthur Project area: EL 27631 & EL 27632. Blocks relinquished in May 2012 are indicated by crosses.
2 GEOSPATIAL DATA COMPILATION

To compile all freely available geospatial data, the NT government was contacted and provided a large amount of data. In addition to the NT data, orthorectified images from Bing Maps (www.bing.com/maps/) were used. Below is a summary of the acquired geospatial data.

2.1 MAGNETICS

Several magnetic/radiometric airborne surveys cover the project area. These are comprised of the regional surveys obtained from the Geophysical Archived Data Delivery System (GADDS). All are in GRID format and were processed and imaged to produce the reduced-to-pole (RTP) total magnetic intensity (TMI) image (Figure 3) and the 1st vertical derivative (1VD) (Figure 4).
Figure 3: Regional airborne magnetic survey from GADDS. Reduced to Pole Total Magnetic Intensity (RTP TMI).
Figure 4: Regional airborne magnetic survey from GADDS. First Vertical Derivative of the Reduced to Pole Total Magnetic Intensity (RTP 1VD)
2.2 RADIOMETRICS

Radiometric data was freely available as grids of the potassium, thorium, uranium and total count. Figure 5 is a radiometric ternary image representing potassium, thorium and uranium as red, green blue respectively. Although the resolution of the data is not as good as the Landsat or Bing Maps, it is useful for mapping the outcrop and transported material. Higher resolution radiometric data may prove useful in later stages of exploration.
Figure 5: Compilation of airborne surveys (Urapunga and Marumba data). Radiometric ternary image representing Potassium, Thorium, Uranium as Red, Green, Blue.
2.3 LANDSAT

Various forms of Landsat data were downloaded from the NT Mines Department website including; merged grids, merged images, and individual tiles. In an effort to procure the best possible and freely available data, other sources of Landsat were acquired. The Landsat bands were imaged to produce various composite images (Figure 6, 742 represented by red, green and blue respectively). These composite images best enhance the geology of the area.
Figure 6: Landsat image representing bands 7, 4, 2 as Red, Green, and Blue.
2.4 ELEVATION

Due to the variable relief of the topography and the large amount of outcrop in the project area, elevation data is a valuable dataset to map the stratigraphy and terrain. The SRTM (Shuttle Radar Topography Mission) elevation data was purchased from Geolmage where it was re-gridded from 90m to 30m cell size (Figure 7). Subsequently the data was contoured at 5m intervals.
Figure 7: Regional SRTM elevation image
2.5 GEOGRAPHIC

All geographic data was provided by the NT government. Figure 8 shows the main and minor roads, tracks, main and minor watercourses, airstrips and main and minor localities. This information will be useful for field planning. Any additional information acquired during field visits will be added to this geographic database.
Figure 8: Geographic data for EL 27631 and surrounding area. Base image is an orthorectified image from Bing Maps.
2.6 GEOCHEMICAL

Geochemical data was available for EL 27631 from the NTGS (Figure 9). A large suite of elements was assayed and a preliminary assessment of the results has been included in Section 5 MINERALISATION AND PROSPECTIVITY of this report.

One Pb-Zn mineral occurrence is located within USI tenement 27631 (Wongalara) (Figure 9).

The Wongalara mineral occurrence was discovered by Australian Anglo American Prospecting during a stream sediment survey in 1983. This occurrence consists of a northern and southern anomaly. The northern is a 12m thick strata bound gossan that averaged 0.48% Pb and 0.13% Zn on the surface. The southern anomaly returned rock chip assays of up to 2.2% Pb and 0.46% Zn from a NNW trending fault zone. Follow-up over the gossan by Poseidon Exploration defined a NE striking Pb-Zn soil/rock anomaly returning chip samples up to 1.7% Pb and 2.3% Zn. The mineralization consisted of fine galena and sphalerite in ferruginous sandstone (Crawford Formation). Two of three diamond drill holes intersected weak Pb-Zn mineralisation in fine micaceous sandstone (Abbott, et. al., 2001).
Figure 9: Location of geochemical samples and mineral occurrences.
3 PREVIOUS EXPLORATION

Four exploration companies currently hold EL’s around the McArthur project area for mineral exploration (Figure 10, Australian Ilmenite Resources, Bulman Resources, G E Resources and North Australian Diamonds). A large portion of land surrounding USI’s tenements to the north and east are currently under application by various exploration companies.

3.1 AUSTRALIAN ILMENITE RESOURCES

Australian Ilmenite holds assets of ilmenite and magnetite as heavy mineral deposits within NT. Their ELs lie between and south of USI’s ELs and consist of three project areas (BUKA, BMC and SILL 80). The grade cut-off ranges from 2.5% to 6.5% ilmenite.

3.2 BULMAN RESOURCES

Bulman Resources is a subsidiary of Admiralty Resources NL and currently has a Pb/Zn project in the area. The project was estimated in the 1950’s to contain 375,000 tonnes at 15% Zn and 2% Pb but this estimate was later downgraded after drilling intersected a significant dolerite sill at depth.

3.3 G. E. RESOURCES

Unfortunately no information could be located regarding the exploration activity or prospects of G E Resources at this time.

3.4 NORTH AUSTRALIAN DIAMONDS

North Australian Diamonds have several granted tenements and several under application within the Arnhem Land region. The company has conducted a number of reconnaissance stream sampling programs on their Arnhem Land tenements. To date, 179 samples have been collected, half of which have been processed. Within these processed samples 5 have returned microdiamonds ~50km to the NNE of USI’s EL27632.
Figure 10: Location of EL’s of other exploration companies near USI’s McArthur project area.
4 REGIONAL GEOLOGY

4.1 OVERVIEW

The project area covers the north-western part of the mildly deformed McArthur Basin. The rock in this basin range in age from Palaeoproterozoic to Mesoproterozoic, and comprise sedimentary and interbedded volcanic rocks and associated high-level mafic and felsic intrusive. Based on the sequence stratigraphy and tectonic style, the McArthur Basin succession is subdivided into four ‘superbasin phases’. From earliest to youngest the superbasins are; Leichhardt, Calvert, Isa and Roper Superbasins (Abbott, et al., 2001). The earliest one (Leichhardt) is not observed within the project area. The overall McArthur succession within the project area has been divided into three lithostratigraphic groups – from oldest to youngest: the Katherine River, Mount Rigg and Roper Groups.

The Katherine River Group is part of the Calvert Superbasin and is confined to the western margin of the project area. This group consists of a mix of siliciclastics, carbonate, volcanic and high-level intrusive suite some 1700-1900 m thick. The McCaw Formation, the Gundl Sandstone and the West Branch Volcanics represent the upper portion of the group and contain thin basaltic layers. They indicate that igneous activity persisted over a long period during sedimentation (Sweet, et al., 1999).

The Mount Rigg Group is part of the Isa Superbasin and is described as a poorly exposed 600-800 m thick carbonate-dominated package, unconformably overlying the Katherine River Group. This group is only observed in the north-western portion of the project area (Sweet, et al., 1999).

The Roper Group makes up the Roper Superbasin and unconformably overlies the Mount Rigg Group. The Roper Group consists of a mudstone-sandstone succession with minor limestone and ironstone. It is extensively intruded by mafic sills and associated dykes of the Derim Derim Dolerite (Sweet, et al., 1999).

Rocks of Cretaceous age form an extensive flat-lying blanket on the Proterozoic units and are largely mapped as the Walker River Formation. This formation is a shallow-marine sandstone and local conglomerate grading up into marine mudstones. The rocks are strongly altered as a result of weathering during the later Cretaceous or Cainozoic (Sweet, et al., 1999). The Walker River Formation is host to Mn mineralisation at Groote Eylandt.

Cainozoic deposits include unconsolidated alluvial and colluvial sediment, extensive sand patches (possible in-situ degraded Cretaceous sandstone), ferricretes and other deeply weathered products (Sweet, et al., 1999).

4.2 DEFORMATION

The deformation history has been summarised from Abbott (2001) unless otherwise stated.

The major geological events within this region are relatively well constrained by isotopic geochronology on igneous rocks. However, the timing of all events after the intrusion of the Derim Derim Dolerite cannot be tightly constrained.

1820 – 1710 Ma: Deposition of earliest McArthur rocks (Leichhardt and Calvert Superbasins). The Katherine River Group was deposited in the Roper Region but was either eroded or never deposited to the northwest of the project area. The limited preservation of the Katherine River Group was probably due to the influence of the Urapunga Tectonic Ridge, which was either a basement high during deposition or a site of uplift and erosion after deposition. The West Branch Volcanics, extruded around 1710 Ma, provides an upper limit.
1620? – 1590? Ma: Local uplift and substantial erosion of the Vizard Group (not observed in the project area) before deposition of another carbonate-silic-clastic succession, Mount Rigg Group.

1590?-1500? Ma: A compressional event terminated sedimentation and caused gentle tilting, uplift and erosion of the Mount Rigg Group.

1500? – 1400? Ma: Development of the Roper Superbasin and deposition of the Roper Group. Crustal down-warping over a large area, to the south of the project area, resulted in broad subsidence and an incursion of the sea across the region. Sea-level changes, associated with episodic subsidence, led to a distinctive alternation of mudstone and quartz-rich shallow marine sandstones. Sedimentation was probably terminated by a waning of crustal movements to the south, leading to a reduction in subsidence and a parallel reduction in sediment supply.

1324 Ma: Extension in an approximately east-west direction led to the rise of mafic magma to high levels in the crust. Magma spread out as a series of extensive sills (Derim Derim Dolerite). Although north-trending dykes of identical composition appear to cut the sills, they are regarded as belonging to the same episode of magma generation.

1320? Ma or younger Proterozoic: A compressional event with shortening in an east-northeast – west-southwest to northeast-southwest direction, led to the development of the major folds and faults now visible in the Roper Group.

Neoproterozoic to Early Cambrian (513 Ma): Continued erosion of Proterozoic rock to a level not far above that of the present day.

Cambrian to Mid-Cretaceous: Erosion continued from Cambrian to mid-Cretaceous, when subsidence of the Carpentaria Basin and high global sea-levels resulted in deposition of a thin succession that began with non-marine sandstone, conglomerate and mudstone across a vast area of the north, including the project area.

Late Cretaceous to Cainozoic: Very stable crustal conditions permitted prolonged weathering and very little erosion of Cretaceous rocks, resulting in the formation of deep weathering profiles and associated ferricrete.

Middle? Cainozoic to present day: Gentle uplift and warping of Cretaceous rocks and their weathering of cap rock to ferricrete surface.
Figure 11: Regional geology from the McArthur project area based on the NTGS digital 2500K data. USI's tenements are outlined in red.
Figure 12: Geology map for ELs 27632 and 27631 derived from the NTGS 250K URAPUNGA and MT MARUMBA digital data
5  MINERALISATION AND PROSPECTIVITY

The McArthur project area is considered prospective for manganese mineralisation particularly Cretaceous sedimentary deposits of the style seen at Groote Eylandt and possibly older Proterozoic manganese mineralisation recorded throughout the McArthur Basin. However, significant Proterozoic manganese deposits have not been discovered to date in the McArthur Basin.

Also prospective within the McArthur project area is lead-zinc mineralisation of the SEDEX type (Sedimentary Exhalative) similar to the McArthur River Pb-Zn-Ag mine (~280km SE), and a low potential for diamonds similar to the Merlin project (south of Borroloola).

5.1  MANGANESE STYLE

Classification of the manganese deposits by Ferenczi (2001) in the Northern Territory can be divided into three types:

- Sedimentary (stratiform), e.g. Groote Eylandt;
- Hydrothermally concentrated (low temperature replacement), e.g. Bootu Creek; and
- Surficial, e.g. Calvert Hills-Robinson River area.

5.1.1 Sedimentary deposits

These are stratiform and are hosted in marine terrigenous-clastic sediments. The well documented world class Groote Eylandt deposit is the holotype. This deposit and several other prospects in the Carpentaria Basin are confined to shallow marine Cretaceous sediments, which are adjacent to Proterozoic terraces that define a Late Albian (ca 100 Ma) shoreline. Mineralisation ranges from disseminated Mn oxides in clayey quartz arenite to massive bedded pisolitic ore up to 11 m in thickness.

Proterozoic sedimentary basins in the NT lack significant BIF units and extensive Mn-rich carbonates, and this reduces the potential, respectively, for BIF related (Kalahari-type) and carbonate hosted (Molango-type) Mn deposits.

5.1.2 Hydrothermal deposits

These are low temperature epigenetic deposits that form strata bound massive Mn (± Fe) oxide lenses in shallow marine sediments. The Mucketty and Bootu Creek deposits, to the north of Tennant Creek, are examples of this style of Mn mineralisation. Cryptomelane is the dominant ore mineral; pyrolusite and minor hollandite are also present as are varying amounts of quartz and goethite. Minor barite, calcite and chalcedony occur in the gangue suite. Anomalous trace element levels (e.g. 1000 ppm Cu and 900 ppm Pb) are also characteristic. Mn (± Fe) oxides replace quartz arenite, siltstone and dolomite and form lenses up to 12 m in thickness. Massive ore is confined to replaced-siltstone and dolomite lithologies. These deposits are not proximal to volcanic or plutonic rock types like many of the deposits described in Roy (1981) and can be viewed as being distal. They are related to shallow regional hydrothermal activity that has remobilised Mn from sediments and volcanics elsewhere in the sequence.

5.1.3 Surficial deposits

Surficial deposits of Mn oxide are small in tonnage and are related to manganiferous carbonate sediments, unconformities, laterite development, or a combination of two or more of the above. Ore grades can be reasonable but are usually patchy in distribution. Occurrences in the Calvert Hills area (McArthur Basin) are examples of manganiferous carbonate-related deposits; occurrences in the McLeans-Green Ant Creek area (Pine Creek Orogen) are
examples of unconformity-related deposits; East Arnhem Land occurrences are examples of laterite-related Mn deposits.

5.2 MANGANESE DEPOSITS

Below is a summary of the deposits described in detail in the earlier repost on the Gulf Region. Figure 13 shows the location of the major Mn mineral occurrences, mines and prospects and the palaeo-shorelines for the Gulf and McArthur regions.

5.2.1 Groote Eylandt

Groote Eylandt lies on the eastern margin of the Proterozoic McArthur Basin and contains several Mn occurrences and operating mines (Figure 13).

The manganese sediments occur in a series of basins in the west and southwest of the Proterozoic quartzite island, which, during the Cretaceous period, were occupied by an epicontinental sea depositing sandy claystones and manganese carbonates (in a deeper water environment to the south termed the Southern Basin) and pisolithic manganese oxides (in a shallow water Northern Basin). The manganese sedimentation was restricted in time, and associated with a short, Cenomanian Age (95my) marine transgression and regression.

The northern basin contains un-fossiliferous quartz sandstones derived from the basement quartzite, overlain by a shallow marine glauconitic claystone, the top of which bears the primary pisolithic and oolitic manganese ores. This ore zone is followed by the secondary ores, concretionary manganese and weathering products of variable age. The oxides of the North Basin are either exposed or at shallow depths and are extensively mined.

The Southern Basin sequence is dominated by sandy siltstone which is calcareous in part and contains manganese carbonate oolites at a deeper stratigraphic level and minor manganese oxide cemented sandstones near surface.

The Groote Eylandt ore body occurs as an almost continuous layer some 22 km long, 6 km wide and up to 9 m, but averaging 3 m thick within the sandy layers of the Mullaman Formation. The manganese varies from massive oxides, through a mixture of oxides and kaolinitic clays and quartz sands to disseminated oxides in a sandy clay matrix. The major ores are found, either at a shallow depth or exposed in a series of WNW trending, joint controlled, partly infilled depressions between elongate inliers of basement quartzite, or they lie directly on broad terraces cut into the basement quartzite, or to the west as an almost continuous sheet that dips gently at 3° W.
Figure 13: Location Mn mineral occurrences, mines and prospects obtained from the NT database. Approximate location of the late Albian shore line and Kombolgie palaeo-high obtained from Munson et al., 2010. Location figure (Top Right) shows the major manganese resources in NT, the brown area indicates a region with 1-10 million tonnes of Mn, pink indicated 1000 tonnes of Mn.
5.2.2 Rosie Creek & Tawallah Deposits (Sandfire Resources)

The Rosie Creek deposit sits on the western side of a ridge of outcropping McArthur Basin quartzite. BHP explored along the west side of basement outcrops possibly seeking a replica of Groote Eylandt geological setting with mineralisation located in a basin west of an island. Re-analysis of the data from Rosie Creek suggests the mineralisation dips toward the east from a subsurface basement ridge detected by airborne EM surveys. A small basin lies between the subsurface rides and the present day outcropping basement ridge.

Nodular manganese mineralisation, interpreted to be at the base of the Cretaceous, was intersected at the Rosie Creek and Rosie SW Reconnaissance prospects where previous drilling by BHP had intersected manganese layers. In total 163 holes intersected Mn mineralisation at the base of the Cretaceous sedimentary sequence. The manganese intervals varied from 1 to 4 metres thick in loose manganiferous sandy and clayey sediments typically at shallow depths. The manganese rich horizon was intersected around 35 below surface.

![Nodules of Manganese oxides from Rosie Creek](image)

Figure 14: Nodules of Manganese oxides from Rosie Creek

West of Rosie Creek on the Tawallah prospects Sandfire drilled flat lying conductors detected by airborne electromagnetic surveys. Coarse pyritic horizons in clay were intersected and were considered to be the cause of the conductivity anomaly. The pyrite in clay possibly represents deposition from more anoxic conditions towards the centre of the basin. No manganese was indicated at Tawallah and no analysis of samples was carried out.

The AEM surveys did not directly detect manganese mineralisation but could be used to recreate the depositional environment by detecting the anoxic basin and concealed basement ridges.
The deposits around Rosie Creek appear to be similar geological setting to Groote Eylandt. A shallow basin probably cut off from the sea with anoxic conditions (west at Tawallah). Epeirogenic subsidence resulted in marine transgression, increasing oxygen particularly along the palaeo-shoreline where oxygenated, turbid conditions result in deposition of manganese oxides and carbonates.

5.2.3 Batten Creek Deposit (Brumby Resources)

Historical drilling by BHP during 1995 returned a best intersection of 6 metres at 15 per cent manganese from between 30 and 36 metres. The manganese mineralisation is hosted within the younger Cretaceous sedimentary rocks overlying the older Proterozoic rocks, which host the McArthur River Pb-Zn-Ag deposits.

Brumby Resources completed a VTEM survey over the Batten Creek Manganese Project in July 2008 to better delineate the extent of the manganese mineralisation. The survey detected 11 near surface sub-horizontal target zones between surface and 80 metres depth which are targets for manganese mineralisation. The historical BHP intersection from drill hole BCP010 was located in one of the VTEM conductors. Two other BHP holes, BCP009 and BCP011 did not intersect the currently defined VTEM anomaly and did not return any manganese intersections. The controls on the mineralisation at Batten are unclear.

The VTEM survey was undertaken to better define the extent of the known manganese mineralisation and also to identify any basement conductors that may be associated with base metal mineralisation. A total of eleven near surface sub-horizontal manganese-clay target zones (BCMN-01 to BCMN-11) between surface and 80 metres depth were delineated by the VTEM survey.

First pass Reverse Circulation (RC) drilling was undertaken in August 2009 on two of the eleven VTEM conductors. Fourteen vertical RC holes for 898 metres were drilled into the ‘Batten Creek’ prospect conductor and three vertical holes for 369 metres were drilled in to the ‘Three Brumbies’ prospect conductor.

A total of 12 drill holes out of 14 returned anomalous manganese intersections at the Batten Creek prospect. Drilling intersected multiple stacked sub-horizontal manganese lenses varying in thickness from 1 to 6 metres above 50 metres depth. The manganese lenses are hosted within Cretaceous manganiferous shales, siltstones and associated clays.

The anomalous manganese intersections were wet and associated with clay and are open in all directions, with only 1050 metres of the entire 4000 metre strike length of the conductor being drill tested to date.

5.2.4 Other Deposits

Surficial manganese deposits are present in the eastern McArthur (eg. Masterton No2) and northern Dunmarra (e.g. McLeans). These deposits are small in tonnage, but may contain patchy high-grade ore material.

5.3 DEPOSITIONAL ENVIRONMENT

The concentration of manganese in the region may have resulted from anoxic conditions in shallow seas surrounding the island during the Cretaceous Period (Frakes and Bolton, 1984). The oxide orebody consists essentially of flat-lying strata of primary sedimentary manganese oxide pisoliths and ooliths, up to 9m thick, in claystones and sandstones. A number of textural types exist including uncemented pisoliths and ooliths, (the primary
sediment), cemented pisoliths and ooliths (resulting from diagenesis) and textureless/concretionary ores (dominated by cryptomelane and essentially the results of secondary supergene processes).

Anoxic conditions in a shallow intra-cratonic basin, which is possibly closed to the main ocean leads to concentration of Mn and Fe in saline water. Towards the deeper parts of the basin Fe is precipitated as pyrite in carbonaceous mud. Opening of the basin to the sea results in increased oxidation particularly in more turbid conditions close to shorelines and development of manganese rich nodules.

At Groote Eylandt, the manganese mineralisation is on the western and south-western shore line. An embayment of the Carpentaria Basin is envisaged which at times may have been cut off from the ocean. The ore lies within the youngest strata of the Carpentaria Basin. The ore-zone sits at the top of a shallow-marine, glauconitic clay succession of Albian age. The primary ore is pisolithic and oolithic but secondary enrichment and weathering has occurred in later phases.

The time of formation of the Groote Eylandt manganese ore body was probably late Albian to early Cenomanian or around the boundary between Lower and Upper Cretaceous. The NTGS consider Groote Eylandt and Rosie Creek mineralisation to be contemporaneous.

An unpublished report by the NT geological survey (Munson et al., 2010) provides an up-to-date interpreted late Albian shoreline and Aptian to mid Albian shoreline (Figure 15).

<table>
<thead>
<tr>
<th>Epoch</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cenomanian</td>
<td>99.6 to 93.6 Ma</td>
</tr>
<tr>
<td>Albian</td>
<td>112 to 99.6 Ma</td>
</tr>
<tr>
<td>Aptian</td>
<td>125 to 112 Ma</td>
</tr>
</tbody>
</table>

Figure 15: Schematic map showing the extent of the Carpentaria Basin and sub-basins and the approximate late Albian regional shoreline (after Munson, et al., 2010).
5.4 MANGANESE PROSPECTIVITY

Within the McArthur project area several stream sediment sample assays show signs of elevated Mn values (Figure 17). In EL 27632 the elevated Mn assays appear to be dominantly related to Cretaceous outcrop which covers approximately 30 percent of the tenement. Therefore a large portion of this tenement is of interest to investigate for Mn potential during phase 2 (field investigation).

The source of Mn in EL27631, and a small portion of EL27632, appears to be from various Proterozoic rocks. Although a specific lithology cannot be identified these zones are recommended for follow-up in phase 2.
Figure 17: Mn stream sediment assays from the NT database throughout EL 27631. The area of interest has been outlined in black. Underlay is of 250K geology (see Figure 12 for legend).
5.5 SEDEX DEPOSITS (Pb-Zn)

SEDEX deposits can be hosted in a wide variety of rock types including shale, carbonate and organic-rich clastic rocks such as siltstone and less commonly sandstone and conglomerate rich sequences (Leach et. al., 2005).

The large deposits in northern Australia (Figure 18, McArthur River, Lady Loretta, Hilton and George Fisher) occur as a series of thin stacked sulphide-rich sheets with intervening and unaltered sedimentary rocks and are close to major faults, which are interpreted to be the conduits for ore fluids.

![Figure 18: Lead and Zinc resources within NT and northern Queensland (modified after Jairath et. al., 2010)](image_url)

5.5.5 McArthur River / HYC Mine

The largest SEDEX deposit in NT, approximately 280 km southeast of USI McArthur project area, is the McArthur River mine, also known as HYC (Here’s Your Chance). The
McArthur River deposit is one of the largest Pb/Zn deposits in the world with a current mineral resource of 157 Mt at 11.3% Zn, 4.9% Pb and 49 g/t Ag.

The deposit consists of fine-grained galena and sphalerite with pyrite and pyrrhotite. It has produced good geophysical targets using EM, IP and gravity. Generally this deposit has an iron-manganese or silicate alteration halo.

A model for the deposition of McArthur River involves a fault system tapping into source metals (Zn and Pb ions) at depth. The metal ions are circulated into a shallow (~600-800m) marine basin with restricted circulation (Figure 19). Precipitation of sulphide minerals (ZnS and PbS) occurs at a depth below the redox front.

In this deposit the highest grade mineralisation is at the bottom of the basin and is surrounded by a nodular carbonate zone (Figure 20).

![Figure 19: Cross-section of the McArthur River deposit showing the source of metal ions and the interpreted depth of sulphide precipitation (after Ireland et. al., 2004)](image)
Figure 20: Plan of McArthur River deposit model showing the central high grade laminated siltstone surrounded by the medium grade nodular carbonate zone (after Ireland et. al., 2004).

5.6 SEDEX (PB/ZN) PROSPECTIVITY

The ELs of the McArthur Project area lie within the McArthur Basin and along a trend of world class sedimentary type base metal deposits. In Queensland where there has been extensive exploration there are around six major base metal deposits with numerous smaller ones that are economic to sub-economic. In contrasts to the north-west in the Northern Territory there is only one major deposit, HYC, at McArthur River Mine with a possible further small economic resource currently being evaluated by Rox Resources to the west of McArthur River Mine.

In EL27631, and part of EL27632 higher Mn values were measured in rock samples probably from Proterozoic rocks. Pb/Zn deposits often have a halo of higher Mn and the presence of elevated Mn may be associated with base metal mineralisation.

CRA Exploration located a large gossan in the Blue Mud Bay area in the 70s and have held onto the area since but cannot obtain permission to explore and/or exploit the resource. In general, the area is under-explored for base metals in recent years and given the geology and location has high prospectivity for new Pb/Zn deposits.
Figure 21: Pb (Top) and Zn (Bottom) stream sediment assays from the NT database throughout EL 27631. The location of the three Pb/Zn mineral occurrences.
6 SUMMARY

Stream sediment sample assays within EL 27631 show signs of high Mn values (Figure 17).

The source of Mn in EL27631 appears to be from various Proterozoic rocks.

The Proterozoic rocks in the McArthur Basin have high prospectivity for Pb/Zn mineralisation. Such deposits often have a halo of higher Mn in surrounding rocks. The presence of higher Mn in rock analysis, the geological location and lack of detailed exploration make this a prospective area for Pb/Zn mineralisation.
7 REFERENCES


