Rio Tinto Exploration Pty Ltd

Marree Project

Combined Annual Report

for the period 21 August 2020 to 22 August 2021

EL 6388, EL 6389 and EL 6390

Report Type:	Combined Annual Report
Reporting Period:	21st August 2020 to 22nd August 2021
Tenement Numbers:	EL 6388, EL 6389 and EL 6390
Project:	Marree
Combined Reporting:	Granted 08 October, Anniversary 22 August
Tenement Holder:	Rio Tinto Exploration Pty Limited
Tenement Operator:	Rio Tinto Exploration Pty Limited
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Digital Files (name, file size, file type)

Non-applicable

1 Summary

This second combined annual report summarises the exploration activities undertaken by Rio Tinto Exploration (RTX) at the Marree Project for the period 21st August 2020 to 22nd August 2021. The Project consists of three granted tenements (EL 6388, EL 6389 and EL 6390) in three contiguous blocks.

The Project is located in South Australia approximately 280km north of Port Augusta and around 25 km northwest of the Farina township and is situated within two 1:250,000 Map Sheets: Curdimurka (SH5308) and Marree (SH5405).

RTX are targeting base metal mineralisation that may be associated with diapiric breccia bodies.

Owing to the global outbreak of the SARS-CoV-2 Coronavirus disease (COVID-19) and subsequent inter-state travel restrictions, technical work was limited to brief desktop reviews conducted during the reporting period. RTX have commenced negotiating a Native Title Mining Agreement (NTMA) with the Arabana Native Titleholders which covers the Project area. During the reporting period, RTX has met and presented the proposed workplan with the Arabana to conduct low impact surface sampling, however no agreement been reached or consent to access the land, therefore no field work was completed during the reporting period.

On the easing of COVID-19 associated restrictions that currently impede interstate travel between Queensland and South Australia, and upon reaching a NTMA with the Arabana future exploration will focus on field reconnaissance mapping and stream sediment sampling within the Tenements.

2 Exploration Index Map

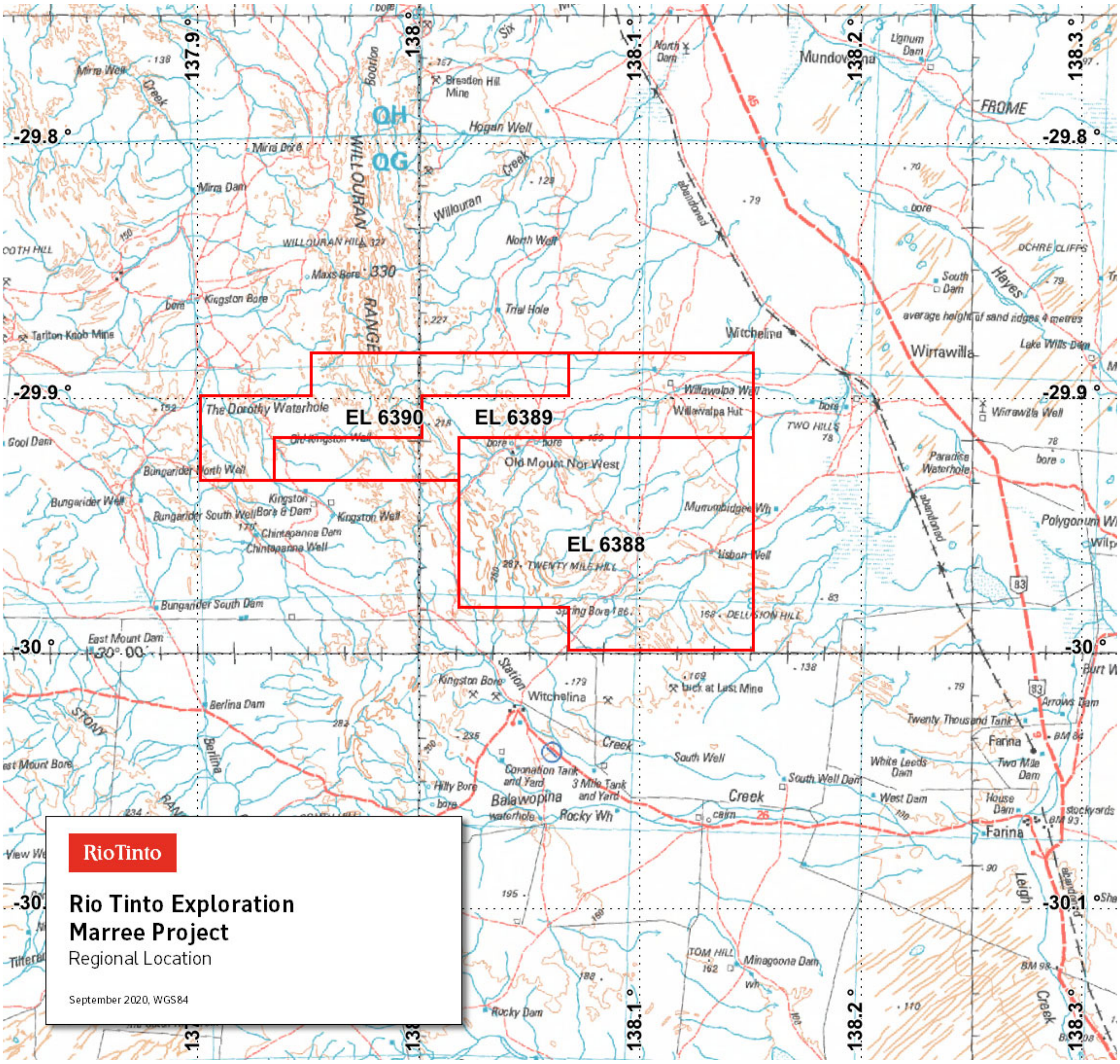


Figure 1: Marree Project Exploration Index Map

3 Keywords

1:250,000 Map Sheet Curdimurka (SH5308); 1:250,000 Map Sheet and Marree (SH5405)

Base Metals; Diapiric Breccia

Rio Tinto Exploration; Marree Project

4 Introduction, History and Exploration Rationale

4.1 Tenure

The project consists of three granted tenements (EL 6388, EL 6389 and EL 6390) in three contiguous blocks. The tenements were granted on the 22nd August 2019, for an initial period of two years. An application to renew the tenements for a further two-years through to August 2023 was submitted. Further details of the tenements are provided below in Table 1 and **Error! Reference source not found.**.

Tenement Number	Tenement Name	Tenement Status	Tenement Holder	Tenement Operator	Project
EL 6388	Marree 1	Granted	Rio Tinto Exploration Pty Ltd (100%)	Rio Tinto Exploration Pty Ltd	Marree Project
EL 6389	Marree 2	Granted			
EL 6390	Marree 3	Granted			

Table 1: Summary of Marree Project Tenure (part 1)

Tenement Number	Grant Date	Expiry Date	Area (km^2)	2019/2021 Required Expenditure	2020/2021 Actual Expenditure
EL 6388	22nd August 2019	21st August 2021	110	70,000*	9,911.83
EL 6389	22nd August 2019	21st August 2021	57	60,000*	9,500.83
EL 6390	22nd August 2019	21st August 2021	45	60,000*	9,622.83
TOTAL			**212**	190,000*	29,035.49

Table 2: Summary of Marree Project Tenure (part 2)

*On Thursday 2nd April 2020, Hon Dan van Holst Pellekaan MP, Minister for Energy and Mining, announced a “12-month waiver of committed expenditure for all mineral exploration licence holders” (van Holst Pellekaan MP, 2020).

4.2 Location

The project is located in South Australia approximately 280km north of Port Augusta and around 25 km northwest of the Farina township. Access to the Tenements are largely through pastoral station tracks that intermittently intersect the Project area.

4.3 Exploration Targets, Objectives and Rationale

RTX is exploring for base metal mineralisation associated with diapirism in the Willouran Ranges. Historic exploration activity in the region has previously identified base metal mineralisation along strike to the north in the Boorloo Mine (Rayner and Rowlands, 1980), where diapirism has been a driver of hypogene copper mineralisation (and subsequent weathering/oxidation to Cu-secondary minerals) hosted in adjacent wall rocks. Additional historic regional exploration such as at the Coplet Diapir, Northern Flinders Ranges, have also identified similar mineralisation associated with the episodic remobilisation of evaporitic sequences (Dewar and Hatched, 1975).

Recent global industry exploration is placing further attention on the potential for world class diapir-associated base metal deposits. Deposits such as Jinding (Zn-Pb), China, where the majority of mineralisation is hosted by evaporite diapir-related rocks (Leach et al., 2017 and Sing et al., 2020), and/or Kamoa (Cu-Co), Democratic Republic of Congo, where salt tectonics are a key structural prelude to extensive mineralising processes (Schmandt et al., 2013), are posing questions as to the potential for similar scale and grade deposits to be hosted within the Adelaide Fold Belt.

5 Geology

5.1 Regional Setting

The Marree Project is situated on the Curdimurka (SH5308) and Marree (SH5405) 1:250,000 map sheets, and is located in the Willouran Ranges, a northwest extension of the Flinders Ranges. The local geology is detailed in Hearon et al. 2004. An amended extract below summarises the salient context:

The Flinders Ranges, along with other nearby ranges such as the Willouran, Mount Lofty, Peake and Denison ranges, comprise a north–south trending tectonic province that constitutes the Adelaide Fold Belt (Scheibner, 1973; Jenkins, 1990), also referred to as the Adelaide Geosyncline (Sprigg, 1952) and the Adelaide Basin (e.g. Preiss, 2000). During the Neoproterozoic-Early Cambrian, the Adelaide Fold Belt is interpreted to have been a rift or aulacogen between the Gawler Craton and Curnamona Province (Sprigg, 1952; Scheibner, 1973; von der Borch, 1980; Preiss, 1987). Initial rifting in South Australia began between 1000 and 827 Ma and is thought to have occurred in five cycles throughout the Neoproterozoic as western Laurentia separated from Australia during the break-up of the Rodinian supercontinent (Moores, 1991; Preiss, 2000). Rift basins are thought to have been highly segmented and oriented northwest–southeast as a result of northeast–southwest extension (Rowlands et al., 1980; Preiss, 1987, 2000). An unknown original thickness of Callanna Group evaporites and interbedded facies were deposited in subsiding rift basins (Fig. 2). During later periods of rifting and thermal subsidence, a thick succession (ca. 9000 m) of nonmarine and marine strata accumulated (Coats, 1965; Forbes, 1990) in a series of partitioned basins (Murrell, 1977; Hearon et al., 2010a). Murrell (1977) suggested Burra Group rocks within the Willouran Ranges were deposited within a northwest–southeast trending trough <50 km wide. Continued rifting and thermal subsidence persisted until the Early Cambrian and was immediately followed by the Upper Cambrian–Ordovician (ca. 500 Ma) Delamerian Orogeny (Preiss, 2000).

The Delamerian Orogeny was a contractional event that consisted of complex deformation, metamorphism and crustal shortening of Neoproterozoic to Cambrian strata throughout the Flinders and associated ranges (Foden et al., 2006). Shortening orientation varies widely and has been interpreted as the result of two phases of deformation: (i) early north–northwest-directed shortening created folds which trend east–northeast; and (ii) later east– west-directed shortening created north–northwest trending folds (Preiss, 1987, 2000; Drexel & Preiss, 1995). In contrast, Rowan & Vendeville (2006) suggested the variety of structural trends, ranging from north–south to northwest– southeast to east–west to northeast–southwest, instead represent shortening of a complex 3D array of pre-existing salt diapirs and ridges. In addition to thin-skinned shortening detached at the autochthonous salt level the northern Flinders Ranges and the Willouran Ranges also had a component of thick-skinned deformation, with pre-existing extensional faults inverted during the Delamerian Orogeny (Preiss, 1993a, 2000; Paul et al., 1999).

Exposed strata in the Willouran Ranges are Neoproterozoic. Neoproterozoic rocks in the Adelaide Fold Belt are chronostratigraphically subdivided into four series (Willouran, Torrensian, Sturtian and Marinoan) and are lithostratigraphically divided into two supergroups: (i) the Warrina Supergroup contains the Callanna Group and the Burra Group; and (ii) the Heysen Supergroup includes glaciomarine strata of the Umberatana and Wilpena Groups (Mawson & Sprigg, 1950; Sprigg, 1952; Webb, 1960; Thomson et al., 1964; Rowlands et al., 1978; Preiss, 1982, 1987; Fig. 2). The younger Moralana Supergroup consists of Cambrian rocks. Pre-Adelaidean basement rocks in South Australia include Archean and Mesoproterozoic metamorphic complexes and igneous rocks (Preiss, 1987).

The Burra Group, which conformably overlies the Callanna Group, comprises the basal Emeroo Subgroup, the Mundallio Subgroup and the Bungarider Subgroup (e.g. Forbes, 1990; Parker et al., 1990; Fig. 3). Burra Group strata contain features that indicate deposition in a shelfal environment, primarily in a shallow-water, peritidal setting punctuated by brief episodes of deepening. The Emeroo Subgroup constitutes a succession of shallow marine and nonmarine sandstone with subordinate siltstone, dolostone and limestone. The Mundallio Subgroup is dominated by dolostone and shale with subordinate sandstone. The Bungarider Subgroup is mostly composed of shallow marine and nonmarine sandstone, dolostone and siltstone with polymict and monomict conglomerate. Polymict conglomerate beds containing clasts of diapiric breccia and dolomite dominate the lower portion of the Bungarider Subgroup (Fig. 4a). The youngest unit exposed in the eastern Willouran Ranges is the Lower Umberatana Group, which is composed mostly of nonmarine to marginal marine siltstone, sandstone and diamictite. Alternating beds of tillite and fine-grained, massive siltstone are interpreted as glacial outwash and loessite deposits, respectively (Preiss, 1987, 2006; Kendall et al., 2006). Facies and stratal thickness variations of the Burra and Umberatana groups in the eastern Willouran Ranges area were previously described by Belperio (1987, 1990), Preiss (1987) and Forbes (1990) and most recently described by Hearon (2008), Hannah (2009) and Hearon et al. (2010a). The principal units of interest include the Witchelina Quartzite, three members of the Skillogalee Dolomite (the lower Camel Flat Shale Member, the middle Twenty Mile Hill Member and the upper Old Mount North West Member) and the lower and upper members of the Myrtle Springs Formation (Fig. 3; see Hearon et al., 2010a; for full description). Forbes (1990) partially attributed lateral thickness changes in the Burra Group north and south of Willouran Hill to post-depositional erosion or tectonic disruption. Conversely, Hearon et al. (2010a) interpreted local variations in sedimentary units in the eastern Willouran Ranges as a result of rift-basin partitioning and the emplacement of a multi-level allochthonous salt canopy.

The Willouran-aged Callanna Group (ca. 850–800 Ma) is an assemblage of highly brecciated to commonly layered siliciclastic, carbonate and mafic intrusive to volcanic rocks originally interbedded with evaporites. Over time, the evaporites were either dissolved or altered so that they are now absent at the surface, however halite hoppers and pseudomorphed evaporite minerals such as displacive gypsum, scapolite and shortite are common (Rowlands et al., 1980; Preiss, 2000; Hearon, 2008; Fig. 4b, c). The presence of these minerals, which occur in hypersaline environments, and the mixed facies assemblage of the Callanna Group suggest a continental rifting environment recorded by two coeval depositional systems: (i) a continental shallow-water to sabkha environment; and (ii) widespread rift-related volcanism and extrusion of basic lavas (Forbes, 1980, 1990; Rowlands et al., 1980; Preiss, 1987, 1993b). The Callanna Group, which is divided into the Arkaroola and Curdimurka subgroups, represents the lowermost strata of the Adelaide Fold Belt sedimentary sequence and nonconformably overlies Archean and Mesoproterozoic crystalline basement (Forbes, 1990). Presently, most of the Callanna Group in the Flinders and Willouran ranges crops out as breccia, now leached of the former evaporite, containing clasts ranging in size from pebbles to clasts several kilometres long and several hundred metres thick that are nearly intact and upright to wholly disarticulated and overturned. The precise timing of evaporite dissolution is unknown. Bodies of Callanna Group breccia, herein termed diapiric breccia (br3), crosscut and are intercalated with post-Callanna Group stratigraphy throughout the Willouran and Flinders ranges (e.g. Webb, 1960; Coats, 1964; Forbes, 1990). In similar fashion to the Roan Group breccia of the Central African Copperbelt, the origin of diapiric breccia in South Australia has been the subject of much debate for over six decades. Both the Roan Group (e.g. Cailteux & Kampunzu, 1995) and the Callanna Group (Sprigg, 1949; Howard, 1951; Spry, 1952; Reyner, 1955; Reyner & Pitman, 1955) were originally interpreted as breccias that were a product of thrust faults and thrust-fault complexes. Burns et al. (1977) interpreted the formation of these breccias as a result of tectonic d'ecollements. In contrast, Webb (1960) suggested the breccia was emplaced diapirically due to a density contrast between mobile breccia and the overlying stratigraphy, and Mount (1975) argued for emplacement of diapiric breccia during the Delamerian Orogeny. Brittle deformation was also suggested as an origin for the Callanna Group breccia by Preiss (1987), Krieg et al. (1991) and Mendis (2002). Murrell (1977) recognized syndepositional folds and unconformities in the Willouran Ranges, but argued against diapiric intrusion in favour of synsedimentary slumping as the mechanism of breccia formation. Throughout the Flinders and Willouran ranges, the presence of growth geometries, unconformities, diapirderived detritus and pseudomorphs after evaporite minerals in strata adjacent to diapiric breccia bodies demonstrates the origin of the Callanna Group breccia as evaporite diapirs in which salt is no longer exposed at the surface (e.g. Webb, 1960; Dalgarno & Johnson, 1968; Mount, 1975; Lemon, 1985; Dyson, 1996; Mackay, 2011). The breccia represents a former layered evaporite sequence, with clasts of insoluble lithologies in a matrix of anhydrite and gypsum that has since been altered to nodular dolomite in a silty carbonate matrix (e.g. Rowlands et al., 1980; Preiss, 1987; Hearon, 2008; Hannah, 2009; Fig. 4f). Similar lithologies and textures within the Roan Group breccia of the Central Aftrican Copperbelt also suggest an origin as a former layered evaporite sequence (e.g. Jackson et al., 2003; Selley et al., 2005; Bull et al., 2011). Currently, there is a consensus among investigators that most of the diapiric breccia throughout the Flinders Ranges represents passive diapirs that grew at or just beneath the ground surface or sea floor due to an intricate balance between salt-supply rates and sediment-accumulation rates (e.g. Coats, 1964; Dalgarno & Johnson, 1968; Lemon, 1985; Dyson, 1998, 2004; Rowan & Vendeville, 2006; Hearon et al., 2010a,b; Kernen et al., 2012). More than 100 diapiric structures are exposed in the Flinders Ranges (Fig. 5). Similarly, cross-cutting diapiric breccia bodies and surfaces containing diapiric breccia exist in the eastern Willouran Ranges (Coats & Preiss, 1987; Forbes, 1990;

Drexel et al., 1993; Dyson, 2004; Hearon et al., 2010a). Salt diapirs and remnant allochthonous salt canopies are delineated based on the presence of blocks of Callanna Group non-evaporite lithologies now in contact with younger strata. Thus, the Callanna Group breccia is informally referred to here as a mobile substrate (i.e. 'salt') with similar properties as mobile evaporite (e.g. Jurassic Louann salt, Gulf of Mexico).

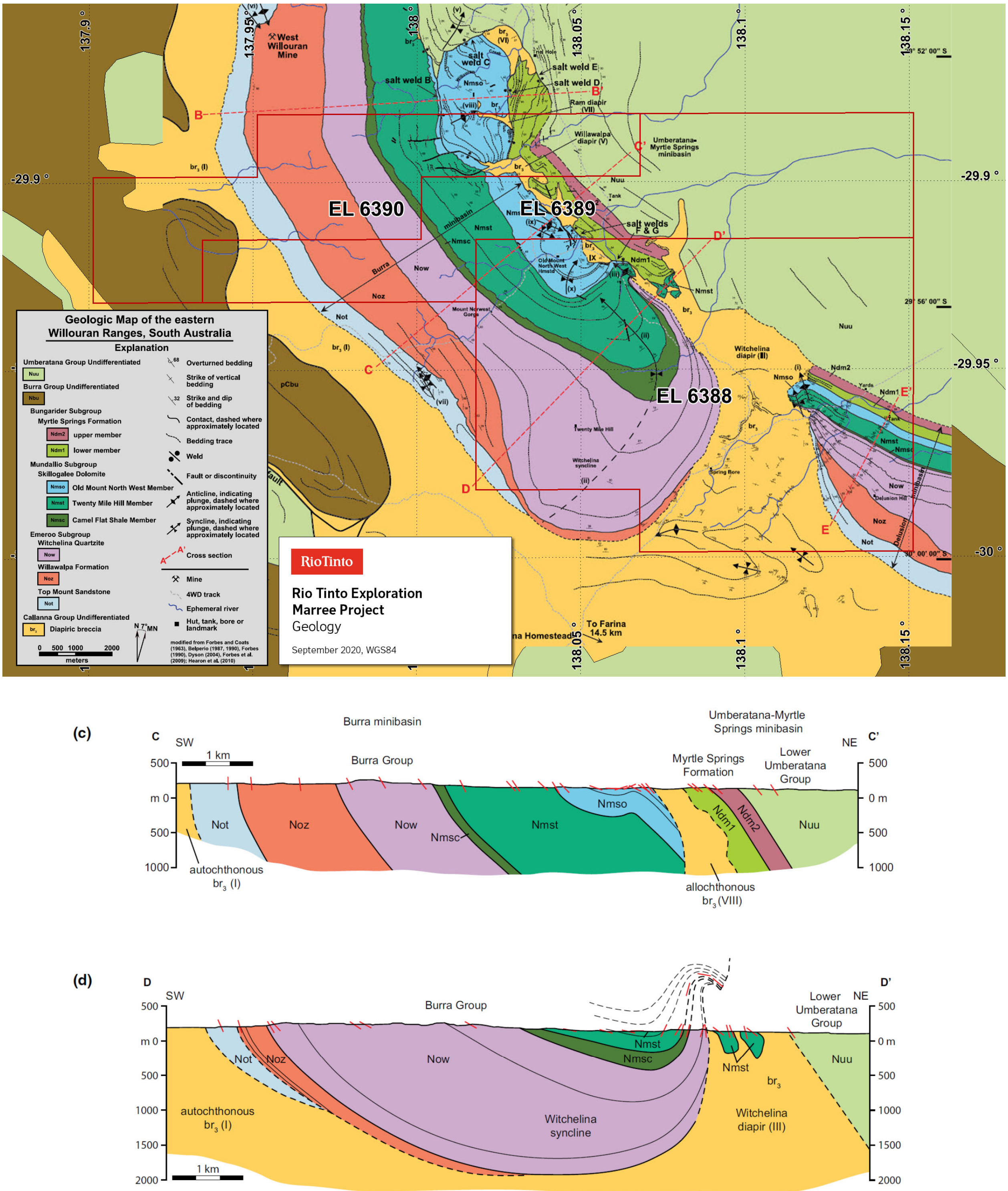
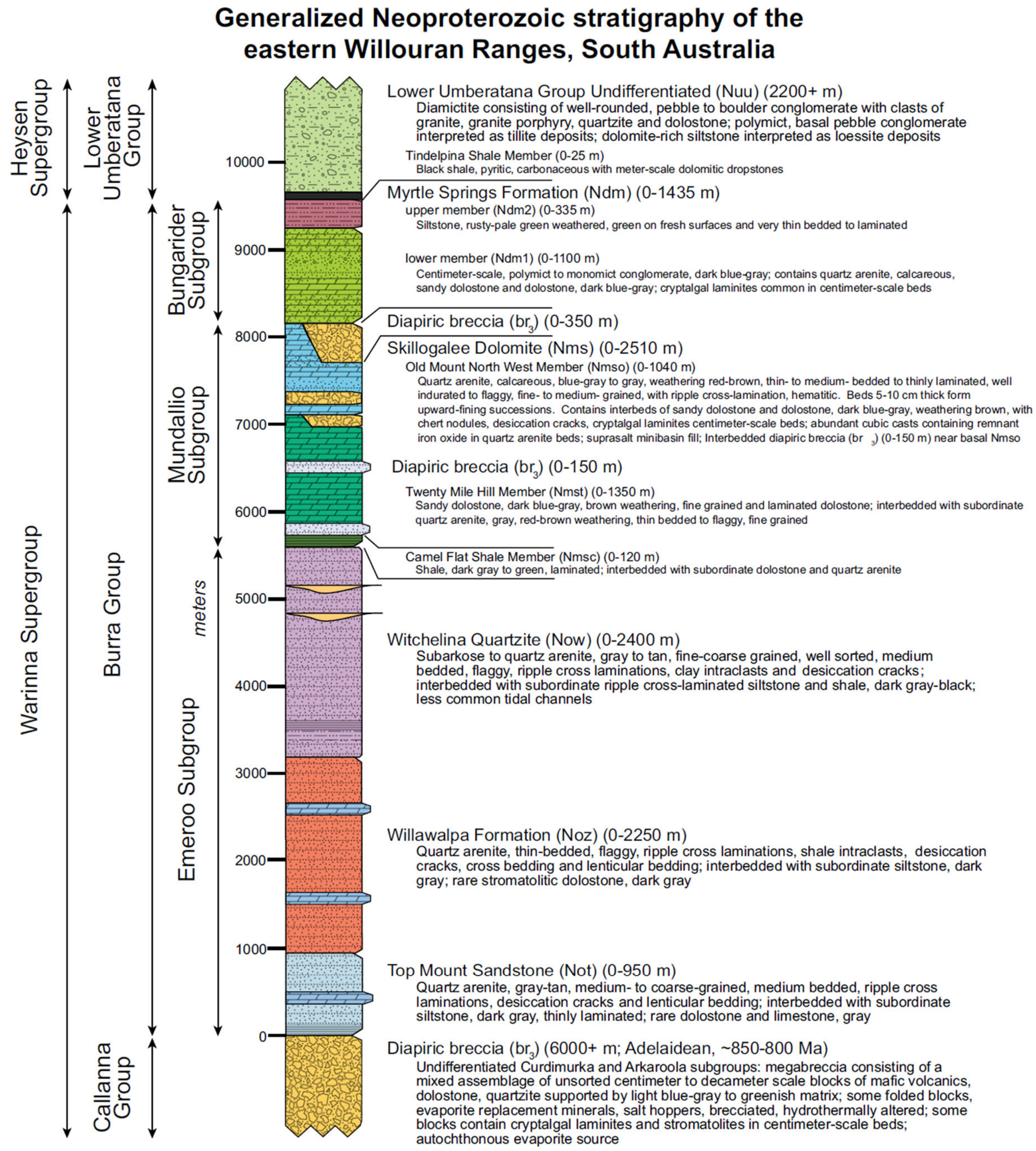


Figure 2: Marree Geological Map and Cross Sections. From Hearon et al 2004.



Generalized Neoproterozoic stratigraphy of the eastern Willouran Ranges, South Australia (modified from Belperio, 1986; Preiss, 1987; Forbes, 1990; Drexel *et al.*, 1993; Hearon *et al.*, 2010a).

Figure 3: Generalised Neoproterozoic stratigraphy of the eastern Willouran Ranges. From Hearon et al 2004.

6 Project Activity

6.1 Desktop Review

A high-level desktop review was completed during the reporting period. This was limited to establishing the key stakeholders (e.g. Traditional Owners, landholders) located within the project area, and researching open file scientific geological publications covering the Project area.

A remote sensing geological and structural interpretation was completed covering the tenement package to identify locations of salt welds and diapiric megabreccias.

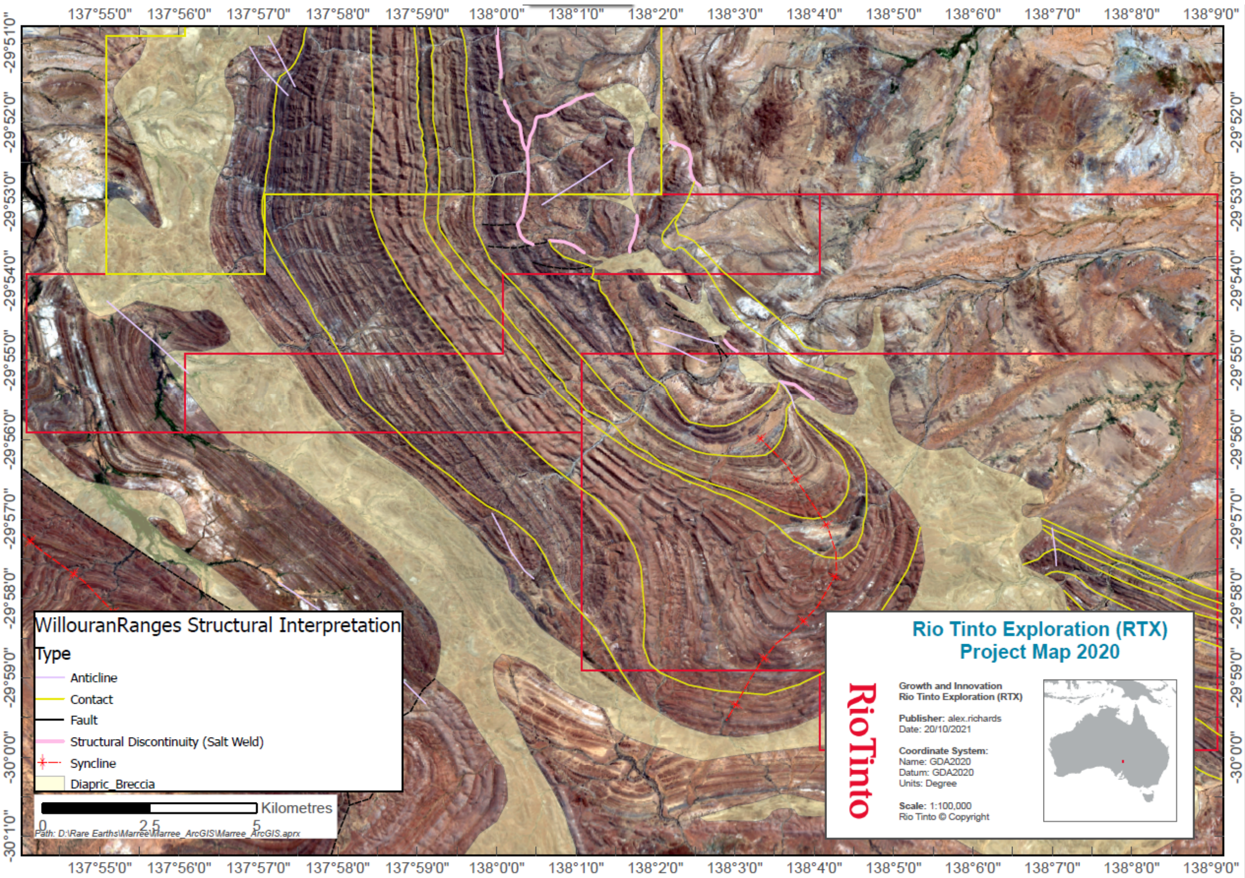


Figure 4: Marree Project geological satellite interpretation

6.2 Heritage

The Marree project covers a number of Traditional Owner Determinations and Claims (Table 3).

RTX have received a draft agreement from the Arabana Determination and Arabana Claim which, at conclusion of this reporting period, is still in negotiation. Engagement with the Adnyamathanha People has commenced, RTX are awaiting receival of a draft agreement. Discussions are ongoing although in person meetings with the respective Traditional Owner groups has been impeded due to COVID-19 related travel restrictions.

Tenement	Respective Native Title Groups
EL 6388	- Adnyamathanha People No. 1 Determined (non-exclusive) (Tribunal no SCD2009/003)
EL 6389	- Arabana No 2, Claim (Tribunal no SC2013/001) - Adnyamathanha People No. 1 Determined (non-exclusive) (Tribunal no SCD2009/003)
EL 6390	- Arabana People Determined (non-exclusive) (Tribunal no SCD2012/002) - Arabana No 2, Claim (Tribunal no SC2013/001)

Table 3: Summary of Marree Project Native Title Groups

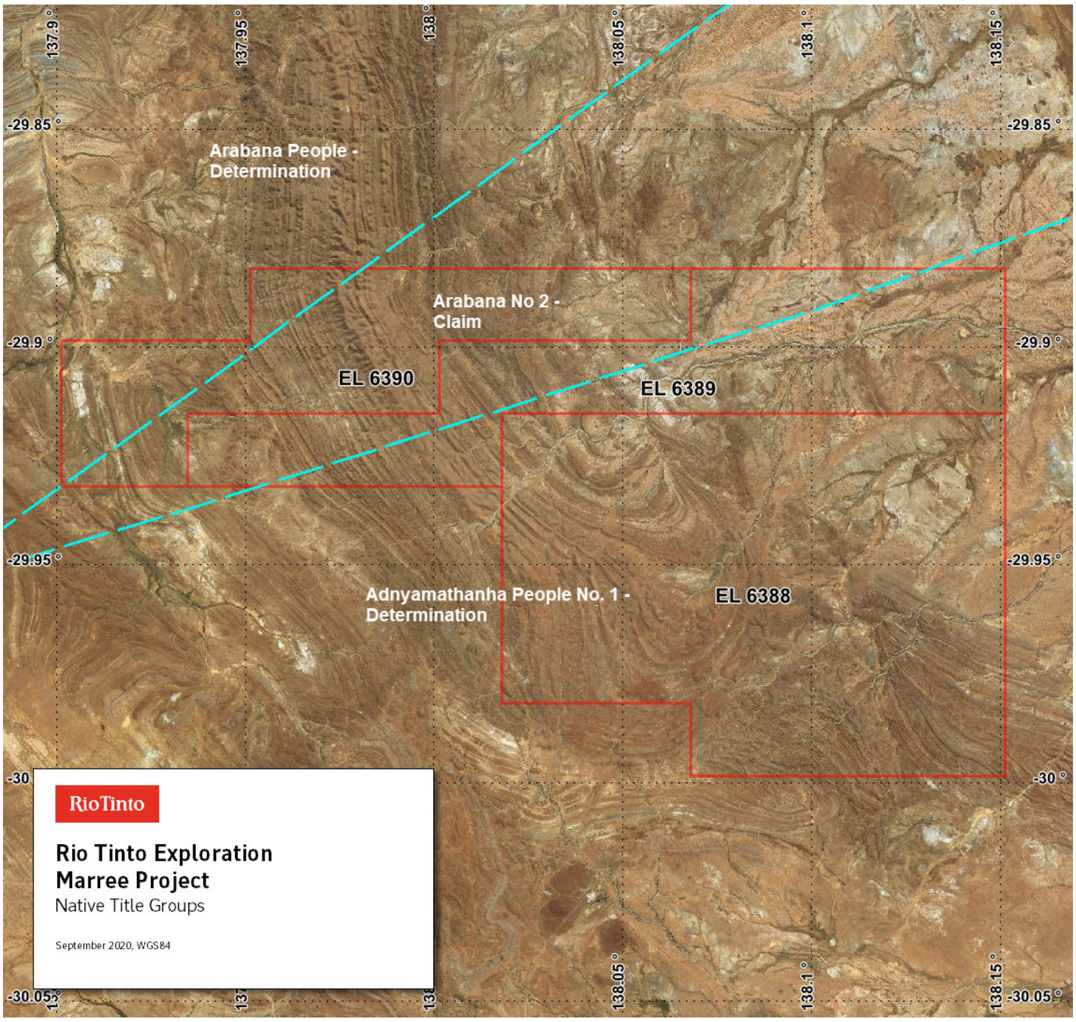


Figure 5: Marree Project Native Title Groups Map

7 Expenditure Statement

Limited expenditure on the Project Tenements is reflective of the effects of the global COVID-19 disease outbreak and the respective state and federal imposed travel restrictions. Opportunity to A breakdown of the first-year expenditure for each tenement is shown on the table below:

		Activity				
Tenement Number	**Tenement Name**	**Land Title Rentals**	**Rates & Taxes, Licenses**	**Desktop Review**	**Meetings & Staff Costs**	**Total**
EL6388	Marree 1	1,496.00	178.00	1,000.00	857	3,531.00
EL6389	Marree 2	775.20	178.00	1,000.00	857	2,810.20
EL6390	Marree 3	1,030.50	178.00	1,000.00	857	3,065.50
				Total Expenditure:		9,406.70

Table 4: Marree Project Tenement Expenditure Summary

8 Conclusions

The Marree Project area is prospective for diapir associated base metal mineralisation based on the presence of mineralisation detected during historic exploration to the north of the Project area, and the precedent of world class deposits such as Jinding and Kamoa.

Activities during the current reporting period have been heavily curtailed due to the global outbreak of the COVID-19 disease and ongoing NTMA negotiations with the Native Titleholders.

On the easing of COVID-19 associated restrictions that currently impede interstate travel between Queensland - South Australia and landholder approval to access the Land, future exploration will focus on field reconnaissance and stream sediment sampling within the Tenements.

9 References

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