



SANDFIRE RESOURCES NL

NORTH BATTEN AMALGAMATED GROUP REPORTING GR504

REPORTING PERIOD 30/09/2018 – 29/09/2019

Tenement Holder: Sandfire Resources NL

Tenement Operator: MMG Exploration Pty Ltd and Sandfire Resources NL

Target Commodities: Copper, Lead, Zinc

1:250,000 map sheet: Mount Young SD53-15, Bauhinia Downs SE53-03

1:100,000 map sheet: Mount Young 6067, Rosie Creek 6167, Tawallah Range 6066, Batten 6065, Borroloola 6165, and Mallapunyah 6064

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**BIBLIOGRAPHIC DATA SHEET**

Project Name	North Batten
Group Reporting No.	GR504
Tenement Numbers	EL26831, EL26833, EL26835, EL26836, EL28656, EL29022, EL30048, EL30137, EL30152, EL30156, EL30158
Tenement Operator	MMG Exploration Pty Ltd / Sandfire Resources NL
Tenement Holder	Sandfire Resources NL
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Authors	Wallace, H., Wynne, A, and Collier, L.
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Tenement Manager	Cristel Woelful Senior Tenement Consultant Australian Mining & Exploration Title Services PO Box 2495 PARAP NT 0804 T: 08 8984 4615 F: 08 8984 4085 M: 0429 574 379
Contacts Technical:	Allan Wynne, Compliance Officer, Sandfire Resources NL Hannah Wallace, Administration Geologist, Sandfire Resources NL
Emails:	Allan.Wynne@sandfire.com.au Hannah.Wallace@sandfire.com.au
Contact Expenditure:	Adam Groeneveld, Land Principal, Sandfire Resources NL Louise Collier, Land Administration Officer, Sandfire Resources NL
Email:	Adam.Groeneveld@sandfire.com.au Louise.Collier@sandfire.com.au

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ABSTRACT

On 29 May 2013, MMG Exploration Pty Ltd (MMG) executed a Joint Venture Agreement (JV) with Sandfire Resources NL (Sandfire). A total of 11 granted and 2 application exploration licenses, referred to as the North Batten Combined Reporting GR321, are held in the McArthur region of the Northern Territory. On 21 April 2019 MMG left the JV, returning the 11 exploration licences and 2 applications, referred to now as the North Batten Combined Reporting GR504, to Sandfire. Partial surrenders from seven tenements within the group, EL26833, EL26835, EL26836, EL30137, EL30152, EL30156 and EL30158, were lodged during May, effective from 9 June, 2019.

The North Batten Project Area is situated within the highly prospective Batten Fault Zone of the McArthur Basin. The primary exploration target in the reporting period was zinc-lead deposits in black shales of the McArthur Group. During the JV period, MMG has conducted a systematic desktop review of past exploration and existing interpretations based on structure, stratigraphy and geochemistry.

Following several years of surface sampling, geophysical surveys and diamond drilling, 2018 saw a large-scale IP program across the North Batten project area and several follow-up diamond drillholes. The 2018 – 2019 reporting period saw the drilling of 6 diamond drillholes totalling 2672.9 m. This report presents the findings for the 2018 holes NB17DD054, NB18DD056 – NB18DD060. These holes were drilled in the Rosie Creek, Berjaya and Rosie East areas. Most of these holes were IP chargeability anomaly targets however the holes east of the Emu Fault (NB18DD056 and NB18DD060) were conceptual structural/geochemistry targets. The holes in the Greater Rosie Creek area sought to intersect or test for extensions to the pyritic shale envelope that was found within the Barney Creek Fm at Rosie Creek in 2016. Drilling at Berjaya sought to follow up low-grade Zn mineralisation in MMG drillhole NB16DD018 drilled in 2016.

For the current reporting period, a total of \$4,550,988 was spent on the North Batten Combined Reporting GR504 tenements.



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1. INTRODUCTION

This annual report for the reporting period 30/09/2018 to 29/09/2019, is for Exploration Licences 28656, 29022, 26831, 26833, 26835, 26836, 30048, 30137, 30152, 30156 & 30158, which form part of the North Batten Combined Reporting GR504. Between 29 May 2013 and the 21 April 2019, the North Batten Tenements were operated by MMG Exploration Pty Ltd (MMG) in joint venture with Sandfire Resources NL (Sandfire).

2. LOCATION

The North Batten tenements are located about 660 km southeast of Darwin and approximately 400 km east south-east of Katherine in the “Gulf Country” of the Northern Territory, Australia. On the eastern boundary are the township of Borroloola, the McArthur River (HYC) Mine, and its loading facility at Bing Bong on the Gulf of Carpentaria. To the south is Cape Crawford and to the northwest is Roper Bar (Figure 2.1). The tenements are located on the Mount Young (SD53-15) and Bauhinia Downs (SE53-03) 1:250 000 scale map sheets and the Mount Young (6067), Rosie Creek (6167), Tawallah Range (6066), Bing Bong (6166), Batten (6065), Borroloola (6165) and Mallapunyah (6064) 1:100,000 scale map sheets.

Access to the project area is via the Stuart, Carpentaria and Tablelands highways and a network of station tracks. Access deteriorates significantly on unsealed roads in the north where multiple creek crossings need to be negotiated. Each wet season results in substantial damage to most creek crossings which need to be re- established.

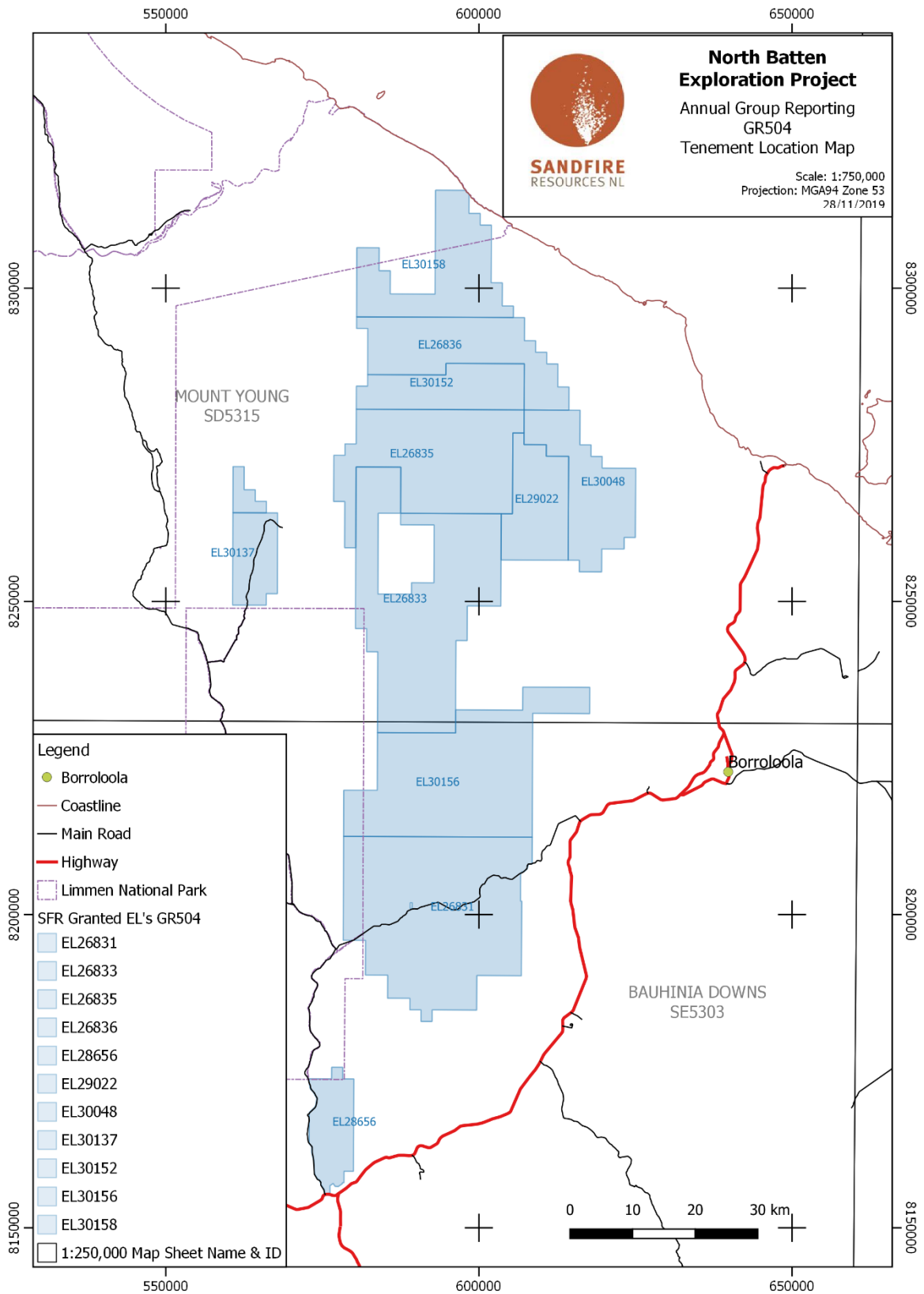


Figure 2.1 North Batten GR504 Tenement Location Map



3. TITLES

3.1 Tenements

On 29 May 2013, MMG Exploration Pty Ltd (MMG) executed a Joint Venture Agreement with Sandfire Resources NL (Sandfire). A total of 11 granted and two application exploration licences were held and referred to as the North Batten Combined Reporting GR321, in the southern McArthur region, Northern Territory, as detailed in Table 3.1.

Previously Sandfire had requested that EL24401 be divided into two portions, one to retain the existing title and the other under a new title number. This division request was to allow more effective management of this area which has potential for both HYC-type Pb-Zn SEDEX deposits within the Proterozoic geology of the Batten Trough, and manganese accumulations analogous to Groote Eylandt within the overlying Cretaceous sediments. Subsequently, application for EL30048 over 90 graticule blocks was submitted on 5 July 2013, reducing the area of EL24401 to 87 blocks.

Tenement renewals were lodged on 31 May 2013 for EL26831, EL26833, EL26835, and EL26836, and were granted until 8 June 2015. Sandfire received a request on 25 July 2013 to split each of the tenements that exceeded the maximum allowable 250 blocks under the Mineral Titles Act 2010. The nominated areas for compulsory division of EL26831, EL26833, EL26835 and EL26836 were lodged with DME on 26 August 2013. Tenement numbers allocated were EL30156, EL30137 EL30152, and EL30158 respectively, as detailed in Table 3-1.

Eleven granted tenements made up the Group Report Number GR321-13: EL28656, EL29022, EL26831, EL26833, EL26835, EL26836, EL30048, EL30137, EL30152, EL30156 & EL30158, which was approved on 18 September 2013, with annual reporting required each year to 29 September. Applications for Exploration Licences EL25501 and EL26299 over Aboriginal Freehold Land are the subject of continuing negotiations and are not reported upon in this annual report.

Further renewals for EL26831, EL30156, EL26833, EL30137, EL26835, EL30152, EL26836 and EL30158 were submitted on 29th May 2015 and were granted in January 2016. The tenements were renewed for two years and each tenement retained their entire area.

MMG withdrew from the Joint Venture Agreement with Sandfire effective of 21 April 2019. MMG withdrew all rights and obligations under the Agreement and the Joint Venture and ceases to have any further interest in the tenements. Sandfire is now the sole beneficial holder of Exploration Licences 26831, 26833, 26835, 26836, 28656, 29022, 30048, 30137, 30152, 30156 and 30158.

Approved amalgamated reporting GR321 was in the name of Sandfire Resources NL and MMG Exploration Pty Ltd. DPIR replaced GR321 with GR504 in the name of Sandfire Resources NL on 5 June 2019, with the reporting period for this title group remaining the same, 30 September to 29 September.

Partial surrenders from seven tenements within the group, EL26833, EL26835, EL26836, EL30048, EL30137, EL30152, and EL30158, were lodged during May, effective from 9 June, 2019.

Table 3.1 North Batten Project GR504 – Tenement Details

Lease	Holder(s)	Status	Application Date	Grant Date	Expiry Date	Area Graticule	Commitment
EL25501	Sandfire Resources NL	Application	24-Jul-06	-	-	37 Sub-blocks	\$0.00
EL26299	Sandfire Resources NL	Application	17-Jul-07	-	-	52 Sub-blocks	\$0.00
EL26831	Sandfire Resources NL	Granted	24-Jun-08	09-Jun-09	08-Jun-19	212 Sub-blocks	\$328,000.00
EL26833	Sandfire Resources NL	Granted	24-Jun-08	09-Jun-09	08-Jun-19	176 Sub-blocks	\$284,500.00



EL26835	Sandfire Resources NL	Granted	24-Jun-08	09-Jun-09	08-Jun-19	132 Sub-blocks	\$322,000.00
EL26836	Sandfire Resources NL	Granted	24-Jun-08	09-Jun-09	08-Jun-19	81 Sub-blocks	\$277,000.00
EL28656	Sandfire Resources NL	Granted	08-Mar-11	27-Oct-11	26-Oct-19	39 Sub-blocks	\$49,000.00
EL29022	Sandfire Resources NL	Granted	19-Sep-11	25-Jul-12	24-Jul-20	53 Sub-blocks	\$49,750.00
EL30048	Sandfire Resources NL	Granted	21-Sep-04	03-Jun-05	02-Jun-19	68 Sub-blocks	\$213,000.00
EL30137	Sandfire Resources NL	Granted	24-Jun-08	09-Jun-09	08-Jun-19	31 Sub-blocks	\$158,500.00
EL30152	Sandfire Resources NL	Granted	24-Jun-08	09-Jun-09	08-Jun-19	51 Sub-blocks	\$248,500.00
EL30156	Sandfire Resources NL	Granted	24-Jun-08	09-Jun-09	08-Jun-19	169 Sub-blocks	\$263,500.00
EL30158	Sandfire Resources NL	Granted	24-Oct-08	09-Jun-09	08-Jun-19	78 Sub-blocks	\$251,500.00

3.1.1 Landholders

Landowners over which the granted exploration licences lie, either partially or wholly are:

- PPL1069 Billengarra NT Por. 1323
- CLP429 Wurrunburru (Bing Bong) NT Por. 2432
- PL757 Lorella Springs NT Por. 1333
- PPL1051 McArthur River NT Por. 4319
- PL756 Nathan River NT Por. 1334
- Freehold Leila Creek NT Por. 3333

3.1.2 Native Title

The North Batten project area tenements are subject to several undetermined Native Title Claims that have been registered with the Federal Court. In each case the representative for the Native Title Groups is the Northern Land Council (NLC):

- NTD6031/02 DC02/30 Lorella-Nathan River
- NTD6016/00 DC02/15 Lorella Downs
- NTD6030/00 DC02/29 Billengarra
- NTD6031/00 DC02/27 McArthur River

Two applications for Exploration Licences ELA25501 and ELA26299 are subject to Native Title free-hold land, administered by the NLC under the Aboriginal Land Rights (Northern Territory) Act 1976 (ALRA) on behalf of the respective Native Title Groups, and require agreement with all parties prior to grant and exploration. Both ELA25501 and ELA26299, lie over the Narwinbi Aboriginal Trust Land Portion 2087 west of Borroloola, and are subject to negotiation periods of two year's duration by Mutual Consent. Initial Community Consultation meetings held in 2017 failed to gain Community consent and as a result these two ELAs have entered a 5 year moratorium period from 14 December 2017 to 14 December 2022.

Registered and recorded heritage sites on all granted exploration licences have been identified on plans sourced yearly from the Aboriginal Areas Protection Authority (AAPA).

3.1.3 National Parks and Reserves

During 2013, the Limmen Nation Park (LNP) was formalised and impacts on EL26831, EL26833, EL28656, EL30156 and EL30158.



4. GEOLOGY AND MINERALISATION

The McArthur Basin is a large sedimentary basin with an exposed area of about 180,000 km². Most of it lies within the north-eastern Northern Territory, and it extends over the border into the state of Queensland. Thick marine and non-marine sedimentary rocks were deposited from the late Palaeoproterozoic to the early Mesoproterozoic (1800–1430 Ma). The North Batten Project area lies within the Batten Fault Zone (BFZ) where sediments of the Tawallah, McArthur and Roper Groups rest unconformably on the Scrutton Volcanics, and are partially concealed by Cretaceous and Tertiary sediments.

As a base metals target, the McArthur Basin contains volcanic rocks and related intrusive igneous rocks and is a prime target area for SEDEX type economic sulphide deposits. This type of deposit holds 50% of the world's zinc and lead reserves, and make up around 25% of world zinc and lead production. In particular the McArthur Basin hosts the world-class McArthur River (HYC) zinc-lead-silver deposits in close proximity to the northerly trending Emu Fault Zone along the eastern margin of the Project area.

The Batten Fault Zone setting may also be considered prospective for red-beds and Mississippi Valley-type (MVT) styles of base metal mineralisation. Around the margins of the Lorella Pocket, the Mallapunyah Fm/Masterton Fm contact may host red-beds style mineralisation within the Masterton Sandstone. There are some subtle EM features which probably correspond with black shales and may or may not have relevance to the conceptual target horizon. Within the McArthur Basin stratigraphic sequence, siltstone and dolomite lithologies may have provided hosts for replacement lead-zinc mineralisation analogous to the MVT deposition style.

In the north of the North Batten Project tenements, a potential uranium target exists where the McArthur Basin basal sediments overlie, in part, coeval sequences of acid volcanics and granites, analogous to the host settings for major unconformity-related uranium deposits, e.g. Westmoreland, Queensland.

In the northwest part of the North Batten Project, a sedimentary iron formation, the Sherwin Ironstone Member, occurs within the McMinn Formation of the Mesoproterozoic Roper Group. The Sherwin Ironstone Member contains massive oolitic to pisolitic ironstone within interbedded medium to very coarse ferruginous sandstone, mudstone and shale. A resource has been identified along strike at the Roper Bar Iron Ore Project where the haematitic sandstone ironstones have been locally enriched by the addition of microcrystalline specular hematite.

Diamonds have been the target of previous exploration over the area covered by the southern part of the North Batten Project where multiple macro-diamonds, micro-diamonds and kimberlitic indicator minerals have been recovered from alluvial samples. The diamonds and indicators were recovered from creeks surrounding a remnant Cretaceous plateau within surrounding McArthur Group sediments. This situation is analogous to the Merlin Kimberlite cluster where Devonian-aged kimberlite pipes may occur beneath Cretaceous cover rocks.

During the Cretaceous Period, around 90 to 100 million years ago, the coastal areas along the Gulf of Carpentaria were inundated by a shallow sea. Manganese accumulations were formed in embayments close to the shoreline of this sea in a series of depositional episodes. The largest of these is on Groote Eylandt, a large island located within the Gulf of Carpentaria. The northern part of the North Batten Project area is prospective for this style of manganese occurrence.

4.1 Geology, Mineralisation and Exploration Rationale

The exploration targets for MMG were lead-zinc HYC-style or Century replacement deposits in carbonaceous shales and carbonates of the McArthur Group. Copper potential is considered to be low, as the McArthur Basin has only undergone minor basin inversion.

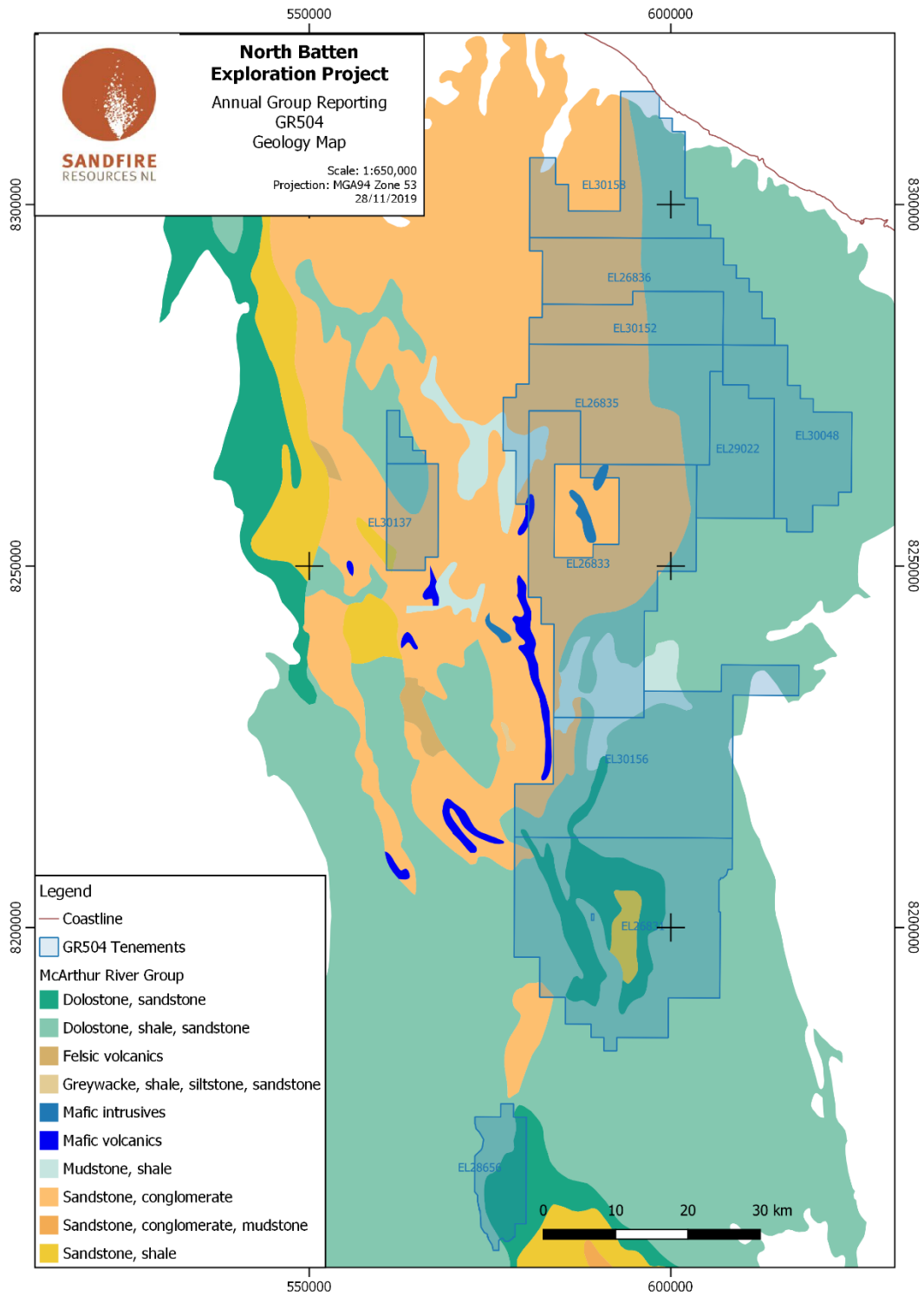


Figure 4.1 North Batten GR504 Geology Map (McArthur River Group).



5. HISTORICAL EXPLORATION

5.1 Exploration – Sandfire Resources

From 2006 to 2007, the interpretation of a ground IP pole-dipole Survey conducted in 2004 led to the siting of the initial diamond drill holes BRCD001-007 along the Coppermine Creek Fault Zone.

Ground IP surveys in 2006 and 2007 in-filled and extend the coverage along the Coppermine Creek Fault Zone confirmed the continuation of the chargeability anomaly and resulted in the siting of drill holes BRCD008-011 and BD012- 013 respectively. At Apollo, interpretation of profiles from the 2007 pole-dipole survey, which were stronger than those along the Coppermine Creek Fault Zone, was used to locate the site of BRCD014.

Fugro Airborne Surveys (FAS) carried out re-processing of historical data from QUESTEM and GEOTEM Airborne surveys.

From 2007 to 2008, open-file data were reviewed and in some cases reprocessed. Specifically, open-file Airborne Electro-magnetic (AEM) data and Airborne Magnetic data were reprocessed and a “worming” study of the reprocessed airborne magnetic and NTGS open-file gravity data sets was carried out by CSIRO. Areas within the project were re-flown with over 4176.5 line-km of AEM using the TEMPEST system by FAS. Further re-processing of the historical QUESTEM and GEOTEM Airborne surveys and re-interpretation of parts of the TEMPEST Survey by FAS resulted in CDI images which were used to define drillhole targets in 2007 and 2008.

Southern Geoscience Consultants merged data of the NTGS with historical Mag-Rad surveys of the Batten Trough then re-interpreted as TMI and 1VDTMI contours and profiles. Baigent Geosciences then reprocessed the compiled historical Mag-Rad surveys, and presented as TMI and 1VD magnetic and radiometric images.

Additional Induced Polarisation (IP) surveys and processing were conducted with approximately 12 line-km at the Copper Mine Creek prospect and 12 line-km at the Apollo prospect.

Brief helicopter reconnaissance was conducted during which eight rock chip samples were collected. Four samples returned weakly anomalous zinc values up to 255 ppm and one of these also assayed 292 ppm Cu. Thirteen additional samples were collected on various other occasions. Of these, seven samples from a gossanous horizon at West Yalco returned assays up to 409 ppm Pb, 3220 ppm Zn, 41.2% Fe and 7.26% Mn. The horizon was traced for 2.5 km of strike.

Colin Nash & Associates Pty Ltd carried out a regional scale structural and geological interpretation of the Batten Fault Zone suitable for use at scales 1:100,000 and smaller using ALOS-AVINIR imagery (10 m resolution) and ASTER satellite image data. Summary geology, structure and lithology plans were prepared from photo- geological interpretation of the 1:50,000 scale stereo ALOS/ASTER stereo pair images. The study advanced new concepts in regard to structures with the Batten Fault Zone of the McArthur Basin generated from a 2002 seismic survey. As of May 2009, orthophotographs and hill-shaded landform maps have been produced for up to 60% of the Borroloola Project tenement areas.

Prospect diamond drilling comprised 3 holes (BD12, 13 and 14) at Copper Mine Creek, 1 hole (BD15) at Apollo and 6 holes (BD16 to BD 21) at Yalco; a total of 10 holes for 3196.9 metres. All holes were testing either IP or AEM geophysical targets. 886 drill core intervals were submitted for Cu, Pb, Zn, Au, Ag, Ni, Co, Cr, As, Fe, Mn, Ba and Sb analyses. The only significant geochemically anomalous result was from Copper



Mine Creek hole BD-13 which intersected three intervals with Pb values up to 1.14%, weak Cu up to 780 ppm, and intermittent Ba up to 1672 ppm, within hydrothermal fault breccia. Five of the holes at Yalco intersected favourable Barney Creek Formation, adjacent stratigraphy and debris breccias; akin to ore hosting stratigraphy at the McArthur River (HYC) deposit.

Holes BD-17, 18, 19, 20 and 21 tested roughly 4 km along strike of a northeast trending AEM feature, exhibiting similarities to one encompassing the “HYC” deposit to the southeast. While no obvious occurrences of bedded Pb-Zn mineralization were observed, the program successfully intersected the favoured Barney Creek horizon and adjacent stratigraphic units in all the holes. Hole BD-19 had the most complete representation of all units, including >50 metres of the black pyritic Barney Creek Fm horizon. Petrology was completed on 11 drill core samples and 3 rock samples. Down-hole conductivity and gamma surveys were conducted at five drill sites and petrophysical work on three Yalco drill core samples showed that hydrothermally altered zones have a higher porosity and thus an elevated EM response when saturated with groundwater.

Detailed geological mapping was carried out at Coppermine Creek Fault Zone, Cam’s Gossan and Yalco Prospect.

Soil and ant-hill sampling were used as exploration tools. The soil orientation survey compared results of 2 mm screened samples with -80# screened samples. The results indicated a Pb soil anomaly. This was in-filled along 1.2 km of strike with an additional 120 sample sites at 50 m spacing along lines 100 m apart. Zn coincides locally with Pb. Ranges of anomalous values are 31–514 ppm for Pb and 21–145 ppm for Zn.

From 2008 to 2009, Haines Surveys completed detailed ground gravity at two prospects, Yalco and Warramana. At Yalco, the initial stage consisted of 236 detail gravity stations along six West–East trending lines at spacing of 1600 metres and station intervals of 200 m. The lines of irregular length ranged from 6400 m in the south increasing to 9000 m in the north. A further 556 stations on 17 lines at a 400 m, 800 m and 1600 m line spacing and at 100 m and 200 m station spacings completed the second stage which also included a traverse along a portion of the Ryan’s Bend road. The total survey entailed gravity readings at 729 stations along 23 lines.

At Warramana the initial survey consisted of 376 detailed gravity stations on a grid comprising 13 West–East trending lines all 5.4 km long, and 2 South–North trending lines straddling a discrete magnetic high feature. Line spacings were 800 m, locally closed down to 200 m, and station intervals were 200 m. A further 46 stations along 5 lines at 400 m and 800 m line spacing and at 100 m or 200 m station spacing were in-filled in the North–East of the original survey.

Geotech Airborne Limited carried out a total of approximately 1235 line-km helicopter borne VTEM survey over eight locations, including in-fills.

Drilling for base metals entailed five new holes and extending BD-16, for a combined total of 1894.3 m, including 241.8 m of pre-collaring, 352.9 m of HQ and 1299.6 m of NQ. Of these holes BD-16ext, BD-22, BD- 23 and BD-24 were drilled in the Yalco Area and BD-25, BD-26 were drilled in the Warramana Area, roughly 30 km further north of Yalco along the Emu Fault Zone.

From 2009 to 2010, reconnaissance mapping and sampling (i.e. rock chip and stream sediment) were carried out at the Hells Gate Iron Ore Prospect and at Nathan River and Butterfly Springs Stations for diamonds. Database entry of down hole geology logs, sampling and analyses from the 2008 manganese drilling was completed, and the final CSIRO interpretation of the 2008 Airborne VTEM surveys was received.



From 2010 to 2011, Sandfire targeted five prospect areas. These were the northern Emu Fault Zone for HYC- SEDEX-style lead-zinc hosted within the Barney Creek Formation, Tawallah T1 and T2 in the Lorella Pocket also for base metal SEDEX style deposits; Yiyinti, a conceptual unconformity-related uranium target, the Hells Gate Hingeline for iron ore, and the Alice Prospect for epigenetic lead-zinc.

Encouraging results at Tawallah T1 entailed significant copper mineralisation intersections over a 2.5 km by 1 km area, with a smaller enriched area concentrated around an interpreted feeder structure. This resulted in an extended drilling programme and coupled with difficult drilling conditions within the Emu Fault Zone holes, proposed drilling at Alice Prospect and Hells Gate was not conducted and only part of the proposed drilling at Yiyinti was completed. One RC drill rig and one diamond drill rig were used. In total RC drilling included 108 holes for 14,610.1 m and 907.7 m of diamond drilling was completed over 4 holes. 9435 RC samples and 161 drill core samples were submitted for Aqua Regia/AAS analysis.

From 2011 to 2012, exploration work conducted included;

- Geological mapping.
- Airborne magnetic-radiometric survey – over the Bing Bong and Yiyinti East & West Prospect areas for a total coverage of 3966.3 line-kilometres from September to October 2011.
- Airborne HeliTEM survey – over the Yiyinti East and West Prospect areas for a total coverage of 327 line-km from October to November 2011, to determine the existence and locations of bedrock conductors and for a better understanding of the subsurface geology within the surveyed areas.
- A ground radiometric survey – carried out in conjunction with mapping at Yiyinti East Prospect.
- RC and diamond drilling – From July to November 2011, eleven diamond drill holes and sixty-six RC holes were drilled for a total of 13,459 m.
- Grid soil sampling for copper, lead-zinc and uranium targets – three targets for red-beds style of base metals mineralisation were selected for 400 m x 100 m soil sampling from the Lorella Prospect. A total of 348 samples were collected across stratigraphy encompassing the Mallapunyah Formation and Masterton Sandstone contact zone.

The Rosie Prospect along the northern Emu Fault Zone was targeted for HYC-SEDEX-style lead-zinc hosted within the Barney Creek Formation. The Tawallah T1 T2, Lorella and South Lorella Prospects in the Lorella Pocket, and the North Costello Range Prospect were also targeted for base metal SEDEX style deposits. The Alice Prospect was targeted for replacement lead-zinc mineralisation, and Yiyinti, a conceptual unconformity- related uranium target.

Exploration work undertaken by Sandfire between April and September 2013 included rehabilitation work by the field supervisor and contractors of drillholes collars, pads, and sumps, and access roads left over from exploration between 2004 and 2012 on the farm-in JV tenements and prior tenements. The drillhole collars which had been kept open were capped after drilling as possible sources of water for follow-up drilling. Also, sites prepared at Yalco Prospect on EL26831 in 2008 but not used, had been located.



The exploration base camp and water bore at Lorella Springs Station used during 2010, 2011 and 2012 was re-established from July through to October 2013 during which time the rehabilitation work was completed. Drillhole sites and access were rehabilitated in accordance with NT government, and Sandfire internal Digirock Field Manual, guidelines.

Between 16 and 20 September, 2013, a field audit of rehabilitation of yearly exploration by Sandfire on its Borroloola Project tenements between 2004 and 2012 was conducted by three officers of the DME Mining Environment Compliance Group with the Sandfire Field Supervisor and Senior Project Geologist NT. It was agreed that three exploration RC drill hole collar sites on EL26835 would be remain capped following a request from the manager of Lorella Springs Station to use these as water sources for cattle during the dry season.

5.2 Exploration - MMG

2013

On 29 May 2013, MMG Exploration Pty Ltd (MMG) executed a Joint Venture Agreement (JV) with Sandfire Resources NL (Sandfire) for a total of 11 exploration licences and 2 applications referred to as the North Batten Combined Reporting Area. The primary exploration target for MMG is zinc-lead deposits in black shales of the McArthur Group. Since commencement of the JV, MMG has conducted a systematic desktop review of past exploration and existing interpretations based on structure, stratigraphy and geochemistry. Initial field reconnaissance was conducted to assess access into areas for proposed drilling, and program logistics.

2014

A mapping program of historical mineral occurrences was completed in 2014 and a total of 26 rock chip samples were collected. Some of the mineral occurrences were confirmed while others could not be located.

On the basis of the review work, eight diamond holes (NBDD001 – NBDD008) were completed at the Leila Creek, Yalco East, Sawtooth, Rosie Creek and Mt Young prospects. A number of shale units were intersected but none were significantly mineralised.

Following a review of historical surface geochemistry datasets that were deemed to be unreliable, a total of 1085 stream sediment samples were collected, aiming for a 5 km² catchment size. Both coarse (-2 mm to +425 µm) and fine fractions (-185µm) were analysed to assess for proximity and homogeneity indicators.

2015

In June 2015, a further 403 stream sediment samples were collected over the tenement package aiming to infill the 2014 survey to an optimal stream catchment area of 3.5 km². A break of slope soil sampling program was carried out in parallel to the stream sediment survey and totalled 91 samples.

Target areas of interest within the Project area were generated using historical exploration data and sedimentary facies analysis. Geological mapping to better constrain the stratigraphy and structural architecture in the target areas commenced in June 2015. Geological cross sections were produced for the target areas which allowed for optimised drill designs.

Between August and November 2015, nine diamond drillholes (NBDD009-NBDD017) were completed in the Rosie Creek, Sawtooth and Yalco West areas. A number of holes intersected carbonaceous shales of the Barney Creek Formation and Caranbirini Member but none were significantly mineralised. Two water bores



(NBWB001 and NBWB002) were also drilled in the Sawtooth prospect area in mid-July 2015 to provide water for proposed diamond drilling.

A natural-source audio-frequency magnetotelluric (NSAMT) survey co-funded by the NT 2015 Round 8 CORE Geophysics and Drilling Collaboration Program was completed over the Rosie Creek and Mt Young areas with the aim of imaging the broad scale basin architecture. Tensor (four-channel) AMT data were recorded at 288 sites throughout the survey over eight lines. Long period MT data were collected on 46 of these 288 sites. Station spacing varied between 500 metres for AMT and approximately 2-3 km for MT acquisition. The data allowed for the identification of conductive basins and interpreted basement highs.

2016

A Falcon® Airborne Gravity Gradiometry (AGG) plus aeromagnetic survey over the Greater Rosie Creek prospect was completed on April 4th 2016. The survey included a total of 5330 line-km oriented along east-west lines at a spacing of 250 m. The survey aimed primarily to map local basement and sub-basin architecture, including identifying faults that control the syn-tectonic changes in stratigraphic thickness of the prospective shale lithologies. The high resolution of the survey was such that direct detection of a large sediment-hosted Zn deposit similar to HYC should also be possible assuming a sufficient density contrast with host rocks. The resulting gravity and magnetic images have been the basis for the targeting of all 2016 and 2017 drillholes in the surveyed area.

Following the airborne geophysical survey, the drilling campaign consisted of 1 hole in the Berjaya prospect and 10 in the Rosie Creek prospect.

2017

A total of 21 holes were completed in the Rosie Creek, Mt Young, Yalco and Nhumbly Nhumbly areas. Follow up drilling in the Rosie Creek area focussed on the strongly pyritic unit intersected in holes NB16DD020, 25 & 27 in 2016. 2017 drilling delineated a widespread zone of pyrite mineralisation with low Zn anomalism in the northeast and defined the boundaries of the Rosie Creek sub-basin. The Mt Young holes encountered Lower McArthur group sediments and thinned Barney-Lynott sediments closing out the basin to the north while drillholes NB17DD044 and NB17DD045 collared at the southern extent of the Mt Young prospect intersected Nathan Group sediments and may sample Barney-Lynott cycle sediments.

The final 8 holes of 2016 and the first 15 of 2017 were reported in the previous Annual Report while the final 6 holes of 2017 and the first 6 holes of 2018 are reported herein.

2018

A total of 11 holes were completed in the Rosie Creek, Cow Lagoon, Berjaya and Rosie East areas. Holes NB18DD050 – NB18DD053 and NB18DD055 were reported in the previous Annual Report, while the final 6 holes (NB18D054 and NB18DD055 – NB18DD060) are reported herein.

An extensive time domain Induced Polarisation (IP) survey was conducted over various prospects in the North Batten area between 11th July and 3rd October 2018. 21 Induced Polarisation lines were surveyed; 13 at Rosie Creek Prospect, 3 at Sawtooth Prospect, 2 at Berjaya Prospect and 3 at Cow Lagoon Prospect for a total of 882 stations (76.9 line km).

The IP survey was discussed in the 2017 – 2018 annual report alongside the preliminary data. The final data has since been received and is provided with this report.



6. CURRENT EXPLORATION ACTIVITIES

The Exploration Index map for the reporting period is included as Figure 6.1. All work was undertaken by JV operator MMG.

6.1 Diamond Drilling

Eleven drillholes (NB18DD050 – NB18DD060) were drilled during 2018. NB18DD050 – NB18DD053 and NB18DD055 were reported in the 2018 annual report, NB18DD054, NB18DD056 – NB18DD060 are reported herein. Table 6.1 and 6.2 give the target rationale and collar details for drilling completed during the reporting period.

Table 6.1 Target Rationale for North Batten drillholes 30/9/2018 – 29/09/2019.

Hole ID	Target rationale
NB18DD054	Designed to drill into the most intense chargeability anomaly of the Rosie Creek IP program (Line IP17) which lies along the interpreted Emu Fault.
NB18DD056	Designed to test prospectivity of the area east of the Emu Fault (historical MMG drilling vectors toward this area). Collared on a magnetic depression interpreted as a possible graben setting.
NB18DD057	Redrill of the IP chargeability anomaly on IP34 that NB18DD052 failed to reach.
NB18DD058	Designed to test a chargeability anomaly on IP22 with a resistivity response interpreted as a basin at depth abutting a west dipping fault (interpreted HYC equivalent position).
NB18DD059	Targeted on the highest chargeability anomaly of the 2018 IP program (~16 mV/V) coincident with the hinge of a mapped syncline. Interpretation of the IP section suggested a core of Lynott formation carbonates overlying a 200 m-thick package of highly chargeable, pyritic Barney Creek Formation shales.
NB18DD060	Targeted based on geochemical fertility indicators vectoring east of the Rosie Creek sub-basin. Collared on a dense-centred triangular feature in the Falcon gD imagery.

Table 6.2 Drill collar details 30/09/2018 – 29/09/2019.

Hole ID	Tenement	Easting	Northing (mN)	Azimuth (°)	Dip (°)	Depth (m)
NB18DD054	EL26835	605653	8280407	90	-80	414.8
NB18DD056	EL30048	607664	8279770	300	-80	417.9
NB18DD057	EL26835	604189	8272302	90	-70	296.9
NB18DD058	EL26835	603704	8275625	90	-80	522.9
NB18DD059	EL26831	594350	8186110	90	-80	569.4
NB18DD060	EL30048	611760	8276398	195	-80	451.0

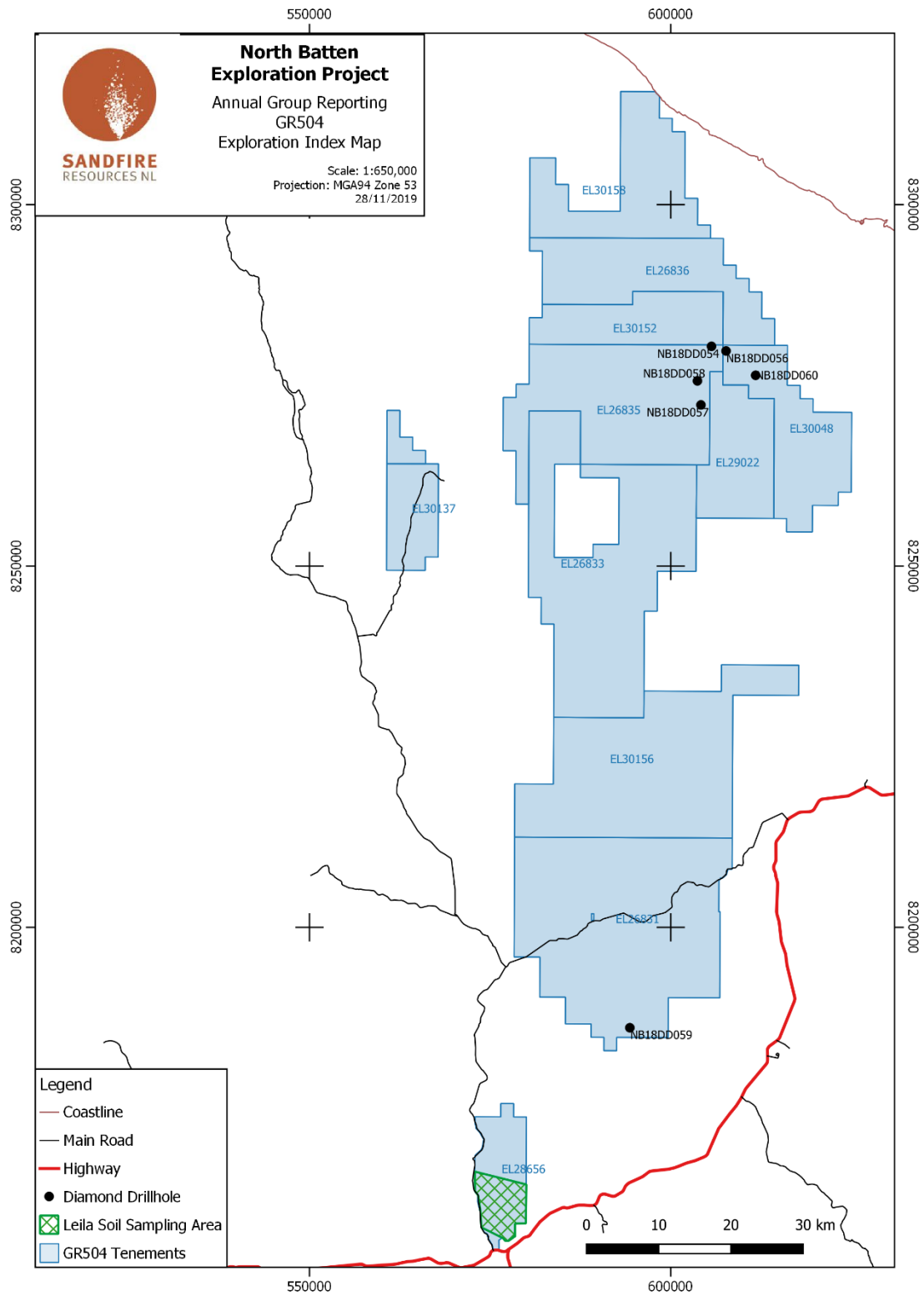


Figure 6.1 Exploration Index 30/09/2019 – 29/09/2019.

6.1.1 Drill and Logging Methodology

The 2018 drilling was carried out by Titeline Drilling using two UDR200 drill rigs. Holes were drilled with PCD from surface until refusal then diamond drilled to end-of-hole. Core diameter was PQ, HQ and NQ with depth of casing off to a narrower method determined by ground conditions.

Drill collars were surveyed using a handheld GPS-enabled GalaxyTab 2 tablet. Downhole surveys were completed using a Reflex digital single-shot tool approximately every 30 m. Core was orientated using an ACE digital ori tool.

All drill core was logged in the field by MMG geologists. A bottom-of-drillhole orientation (ori) line was marked along the core. A solid red paint-marker line was drawn on the core where three or more ori marks line up, while a dashed line is used when only one or two ori marks is available. Measurements of alpha and beta angles were taken using a kenometer.

All drilling data are provided in Appendix 1.

6.1.2 Assaying

In 2018 samples were typically taken continuously across Caranbirini Mb, Reward Dolomite and Barney Creek Fm. Samples were generally one metre long. Less prospective units were sampled every four to ten metres. Intervals of continuous sampling were favoured to allow the comparison of any elemental trends or ratios that can potentially be correlated across holes. The core was cut in half, with one half bagged and sent to the lab while other remained in the core tray to be stacked and stored in the Leila Creek core yard. The number of samples taken per drillhole is listed in Table 4.

Table 6.3 Sample Summary 30/09/2018 – 29/09/2019 (excl. QAQC)

Hole ID	No. of samples
NB18DD054	48
NB18DD056	89
NB18DD057	137
NB18DD058	207
NB18DD059	207
NB18DD060	84

Samples were despatched with standards, blanks and duplicates to ALS Geochemistry in Townsville. All samples were crushed to 70% passing 6 mm (CRU-21) and pulverised to 85% passing 85 µm.

Routine assays were analysed for 48 elements by four-acid digestion and ICP finish. Pulps and residues are currently held in storage by ALS.

Assays for 2018 drilling covered in this report were received in this reporting period. All available assay results are provided in Appendix 1.

6.1.3 Drilling Results

NB18DD054 - Rosie Creek

NB18DD054 was commenced on 21 September 2018 and completed on 1 October 2018 at a depth of 414.8 m in Tawallah Group volcanics.

NB18DD054 was designed to drill into the most intense chargeability anomaly (Figure 6.2) of the Rosie Creek IP program (Line IP17) which lies along the interpreted Emu Fault.

The hole intersected a cover sequence of pisolitic clays and sand to 36.3 m, the underlying units are interpreted as Tawallah Group sediments and volcanics. The sediments are predominantly hematitic sandstones to occasional pebble conglomerates with occasional interbeds of mudstone (Warramana Sandstone?). Volcanics are hematitic, fine grained and highly altered (Gold Creek Volcanics?). It is interpreted that the IP chargeability anomaly is due to disseminated hematite in Tawallah Group rocks. Plan18_29 was designed to the east of NB18DD054 along IP17 (Figure 6.2) but was not drilled based on the results of NB18DD054.

For a summary log of NB18DD054 see Table 6.4 below.

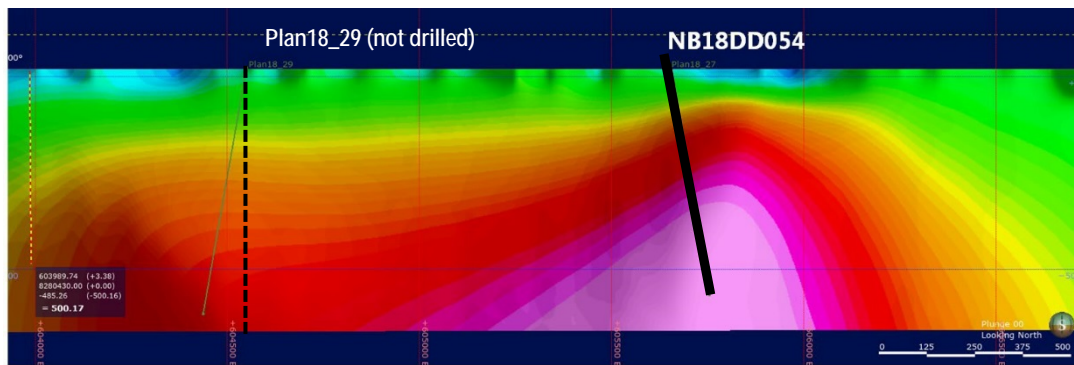


Figure 6.2 Chargeability results for IP17 with NB18DD054 at right. Plan 18-29 (left) was not drilled as it was expected to also intersect the Tawallah Group.

Table 6.4 NB18DD054 summary log.

Depth from (m)	Depth to (m)	Strat (<i>interp</i>)	Summary Log
0	24.7	Cov	PCD Pisolitic yellow clay.
24.7	36.3	Cov	PCD Quartz sand.
36.3	65.8	<i>Ptn</i>	Massive fine to medium-grained sandstone becoming hematitic below 52.7 m.
65.8	149.98	<i>Ptn</i>	Massive hematitic sandstone with rare well-rounded granule to cobble sized clasts of silicified sandstone. Basal conglomerate containing rounded pebbles composed of highly altered igneous protolith.
149.98	151.75	<i>Pte</i>	Altered and recrystallised rock (interpreted volcanic protolith) with rounded quartz crystals.
151.75	152.65	<i>Ptn</i>	Very coarse grained sandstone to pebble conglomerate containing clasts (<1 cm) of interpreted volcanogenic material as described in overlying and underlying intervals.
152.65	154.6	<i>Pte</i>	Altered and recrystallised undifferentiated volcanic/volcanic protolith with significant concentrations of rounded quartz crystals.
154.6	185.25	<i>Pte</i>	Strongly altered recrystallised fine grained hematitic volcanic. Hematite occurs as small blebs and fracture fill. Hematite stained silica/potassic alteration throughout. Chlorite filled fractures common and often associated with zones of broken core. Intensely altered fissile very fine grained rock with interpreted volcanogenic protolith at top 2 m and bottom 1 m of interval.
185.25	256	<i>Ptn</i>	Fine to coarse grained hematitic sandstone with zones of pebble conglomerate and interbeds (up to 1.3 m thick) of patchily altered fine grained red brown mudstone. Sandstone exhibits patchy potassic alteration and variable silicification increasing with depth.
256	260.82	<i>Pte</i>	Intensely altered fissile fine grained rock with interpreted volcanogenic protolith.
260.82	310.65	<i>Ptn</i>	Fine to medium-grained silicified sandstone with patchy potassic alteration. Abundant silica veining throughout interval.
310.65	414.8	<i>Ptn</i>	Intensely silica flooded sandstone. Rare chlorite infilling irregular fractures. EOH

NB18DD056 - Rosie Creek

NB18DD056 was commenced on 28 September 2018 and completed on 6 October 2018 at a depth of 417.9 m in Teena Dolomite.

Positioned east of the Emu fault and northeast of the Rosie pyrite envelope, NB18DD056 was designed to target a magnetic depression interpreted as a possible graben setting. MMG drilling in the Rosie Creek area suggests that zinc and pyrite content vector towards the northeast. NB18DD056 was collared in the unknown area east of the Emu Fault in the hope that a structural step-down accommodated deeper water facies rocks.

NB18DD056 intersected a thick package of carbonate interbedded with lesser siltstone and shale (Caranbirini Member?) overlying a thick coarse-grained silicified dolomitic unit (Reward Dolomite?). Below these units a sequence of pale dolosiltstones containing a 5 m interval of black shale was intersected (Barney Creek Formation). Crystalline Teena Dolomite containing neptunian dykes was intersected at 390 m.

The facies intersected in NB18DD056 are interpreted to represent a platform depositional setting and are not considered prospective.

For a summary log of NB18DD056 see Table 6.5 below.

Table 6.5 NB18DD056 summary log.

Depth from (m)	Depth to (m)	Strat	Summary Log
0	23.9	Cov	PCD Clays and sands with occasional rock fragments.
23.9	49.8	Cov	Fine grained tan sandstone and clayey highly weathered laminated siltstone.
49.8	79	Cov	Weathered conglomerate. Angular clasts.
79	131.3	Pmn	Pink to grey crypt-algal dolosiltstone with occasional plate breccia beds and patches of siliceous nodules/evaporite pseudomorphs.
131.3	191.4	Pmn	Dolomite/dolosiltstone dominated unit with bands of massive crypt-algal and gritty dolostone. Interbeds of shale up to 40 cm thick.
191.4	208.7	Pmn	Massive dolostone with common stylolites. Lesser shale interbeds (up to 10 cm thick).
208.7	279.5	Pmn	Nodular dolostone with common grit and pebble conglomerates/ plate breccias and rare shale interbeds. Siliceous nodules and lenses. Rare sulphides
279.5	302.6	Pmn	Dolosiltstone and dolarenite with common silicification. Rare interbeds of carbonaceous shale.
302.6	325	Pmn	Variably silicified algal dolostone and dolomitic breccia with dolosiltstone interbeds. Common secondary pyrite blebs with rare chalcopyrite. Common stylolites.
341.5	369	Pmn	Pale laminated dolosiltstone with rare interbeds of silicified shale and a gradational contact at base.
369	374	Pmq	Pyritic carbonaceous shale.
374	390	Pmq	Dolomitic siltstone. Thinly laminated with cb-sil veins.
390	417.9	Pmp	Pink and grey crystalline Teena Dolostone with fibrous cement-filled fractures and neptunian dykes. EOH

NB18DD057 - Rosie Creek

NB18DD057 was commenced on 3 October 2018 and completed on 11 October 2018 at a depth of 296.9 m. This hole was a redrill of the chargeability anomaly on IP34 that NB18DD052 failed to reach. It was designed at 70 degrees to avoid the deeply weathered brecciated zone intersected by NB18DD052. NB18DD057 was abandoned due to drilling difficulties.

The drill hole planned depth was 500 m with the chargeability anomaly expected to be intersected at approximately 300 m depth (Figure 6.3). Below 245 m the hole intersected sedimentary breccias comprising angular dolostone clasts in shale matrix interspersed with carbonaceous pyritic black shale intervals. These lithologies may represent talus slope breccia relating to movement along a growth fault that was possibly intersected by NB18DD052. Unfortunately, rods became stuck around 295m depth and NB18DD057 was reluctantly abandoned before intersection of the peak chargeability response. The hole was terminated in a breccia zone containing galena blebs up to 5mm within the breccia matrix.

For a summary log of NB18DD057 see Table 6.6 below.

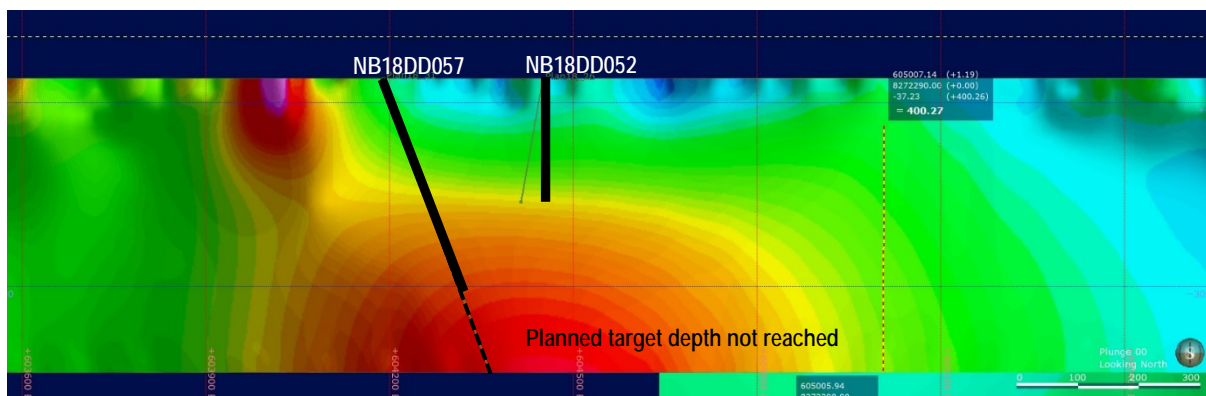


Figure 6.3 Preliminary chargeability results for IP line 34 with drill holes NB18DD055 (295.75 m; left) and NB18DD052 (202.3 m; right).

Table 6.6 NB18DD057 summary log.

Depth from (m)	Depth to (m)	Strat	Summary Log
0	10.9	Cov	PCD. Surficial sands and clays with siliceous rock fragments
10.9	14	Pmnc	PCD. Pulverised highly weathered siltstone.
14	49.6	Pmnc	Bleached highly weathered laminated siltstone with distinctive liesegang banding.
49.6	84.5	Pmnc	Pyritic carbonaceous shale with thin dolosiltstone interbeds and dewatering structures. Moderately weathered with trace oxidation especially exploiting fractures.
84.5	196	Pmx	Bleached siltstone and intensely clay altered siltstone with lesser variably bleached shale (some zone of fresh carbonaceous shale/siltstone at top of interval). Zones of matrix-supported breccia comprising sub-angular to angular clasts towards base. Basal silicified conglomerate
196	245	Pmq	Strongly carbonaceous shale with weak disseminated pyrite. Zones of thick pyrite stringers (up to 5 cm) in basal 5 m of interval.
245	253	Pmq	Matrix-supported breccia with angular clasts of dolomite in shale matrix. Possible talus breccia?
253	278	Pmq	Carbonaceous pyritic black shale with occasional matrix-supported dolostone breccia intervals.
278	295.75 EOH	Pmp	Silicified brecciated laminated dolomitic siltstone with possible cryptalgal textures. Matrix- and clast-supported breccia comprising jig-saw fit angular clasts within micritic matrix. Late pyrite blebs within breccia matrix and micrite-filled stylolites. Galena blebs (up to 5 mm) within breccia matrix between 280.3 – 280.9m. EOH

NB18DD058 - Rosie Creek

NB18DD058 was commenced on 9 October 2018 and completed on 23 October 2018 at a depth of 522.9 m in Teena Dolomite.

This hole was designed to target a chargeability anomaly on IP22 with a resistivity response interpreted as a basin at depth abutting a west dipping fault (interpreted HYC equivalent position).

NB18DD058 intersected Caranbirini Member and Reward Formation before intersecting Barney Creek Formation from 235 m. Barney Creek Formation consisted of variably bleached and clay altered siltstones and shales. Pyritic black shale was intersected from 242 – 351 m. Between 260 – 300 m occasional 1 to 6 cm horizons of graded coarser clastic sediments hosted sub-mm blebs of sphalerite. The best intercept in this zone was 9 m at 1250 ppm Zn from 288 m with a highest Zn assay of 3610 ppm in a 1m sample from 287 – 298 m. Transitional W-Fold Member was intersected from 462.2 m onwards and Teena Dolomite was intersected at 510 m.

The intense clay alteration in this hole is interpreted to have caused the chargeability response observed in the IP survey. The presence of a transitional Barney to W-Fold Member contact suggests that the base of Barney has been intersected however the lack of prospective deep water facies in the Barney Creek Formation suggests that the deepest part of the basin has not been tested.

For a summary log of NB18DD058 see Table 6.7 below.

Table 6.7 NB18DD058 summary log.

Depth from (m)	Depth to (m)	Strat	Summary Log
0	47.5	Cov	PCD. Surficial yellow clays, brown pisolitic gravels and medium-grained cream sand below 17 m.
47.5	176	Pmnc	Variably weathered, bleached and clay-altered laminated siltstone and shale. Occasional zones of hematite staining and limonite selvages on fracture surfaces.
176	196	Pmx	Intensely clay-altered and bleached green shale and siltstone. Primary bedding features obscured.
196	235	Pmx	Oxidised and strongly clay-altered laminated shales and lesser siltstones, possible relict pyritic shales. Patches of green alteration. Occasional sandy horizons of silicified rounded and platy clasts in basal 20 m of interval.
235	242	Pmq	Green altered and partially oxidised laminated shale and lesser siltstone
242	351	Pmq	Carbonaceous and dolomitic pyritic black shale. Banded disseminated to massive pyrite. Between 260 – 300 m depth occasional 1 to 6 cm horizons of graded coarser clastic sediments host sub-mm blebs of sphalerite.
351	482.5	Pmq	Variably clay altered and bleached carbonaceous shale. Clay-alteration varies from intense pervasive to weak fracture selvages. Occasional broken dolosiltstone interbeds.
482.5	499	PmqW	Pervasive teal-green clay alteration of laminated siltstone with rare patches of red clayey alteration. Some breccia zones. Occasional iron staining along coarser beds and some fractures.
499	504.8	PmqW	Limonitic clay with entrained clasts and fragments of siltstone.
504.8	510	PmqW	Siltstone breccia with angular bleached partially silicified siltstone clasts within a green clay matrix. Dolostone clasts towards base.
510	522.9	Pmc	Laminated dolosiltstone and crypt-algal dolostone. Possible Coxco needles. Broken beds and sedimentary pebble conglomerates/plate breccias. Occasional fibrous cement-filled fractures. EOH

NB18DD059 – Berjaya

NB18DD059 was commenced on 15 October 2018 and completed on 1 November 2018 at a depth of 569.4 m in Teena Dolomite.

NB18DD059 was drilled west of known low grade mineralisation at Berjaya along the Bald Hills trend from HYC. Past MMG drilling (NB16DD018) in the Berjaya area intersected Barney-Lynott cycle sediments with low grade Zn (20.8 m at 0.29% Zn, max result 0.81% Zn) with mineralisation resembling that of Ridge deposit, east adjacent to HYC.

NB18DD059 was targeted on the highest chargeability anomaly of the 2018 IP program (~16 mV/V) coincident with the hinge of a mapped syncline. Interpretation of the IP section suggested a core of Lynott formation carbonates overlying a 200 m-thick package of highly chargeable, pyritic Barney Creek Formation shales.

NB18DD059 intersected deeply weathered and variably clay altered Lynott Formation and Barney Creek shales. The intense IP chargeability anomaly was coincident with and interpreted to be due to clayey Lynott Formation sediments rather than pyritic Barney Creek Formation. Barney Creek Formation in this hole was only weakly pyritic and exhibited platform rather than deep water facies associations.

For a summary log of NB18DD059 see Table 6.8 below.

Table 6.8 NB18DD059 summary log.

Depth from (m)	Depth to (m)	Strat	Summary Log
0	191.7	Pmnd	Weathered and variably oxidised algal and stromatolitic dolostone and lesser dolomitic siltstone with rare sandstone interbeds.
191.7	205.4	Pmnh	Finely laminated dolomitic siltstone with fine shale interbeds and rare grit beds (debris flows) with shale rip up clasts. Patchy clay alteration.
205.4	212.5	Pmnh	Brecciated dolomitic siltstone with minor shale and minor grit beds. Breccia is composed of sub angular to angular clasts and is generally clast-supported.
212.5	217	Pmnh	Banded siltstone with minor shale interbeds. Brecciated weakly pyritic shales and minor clayey dolostone from 215 - 217 m. Broken throughout interval.
217	326.7	Pmnh	Variably weathered and bleached clayey dolostone and dolosiltstone with lesser shale and occasional grit (?dolarenite) interbeds. Limonitic throughout with some goethite. Broken and rubbly throughout interval. Manganese oxide dendrites.
326.7	354	Pmnc	Interbedded, variably altered siltstone and dolosiltstone with rare patches of carbonaceous shale and gritty interbeds containing quartz lithoclasts. Dewatering structures cross-cutting bedding.
354	363	Pmnc	Recrystallised dolostone with quartz-rich medium-grained sandstone interbeds.
363	381.6	Pmnc	Carbonaceous shale and siltstone with silicified siltstone interbeds. 20 cm of pyritic shale at ~367 m with disseminated pyrite in bands. Basal 3 m consists of brecciated and silicified dolosiltstone and arenite.
381.6	408	Pmx	Variably bleached and weathered siltstone and arenite.
408	460	Pmx	Interbedded laminated siltstone and sandstone. Variably bleached and clay-altered. Carbonaceous pyritic shale from ~410 – 411 m and ~421 – 422 m. Common spherical to lensoidal siliceous nodules throughout interval.
460	514	Pmq	Interbedded dolosiltstone and carbonaceous siltstone with lesser shale. Rare small (<1mm) blebs of sp-ga-cp. Broad zones of clay alteration throughout.
514	554.9	Pmq	Brecciated black shale and dolomitic siltstone with patchy bleaching. Dominantly angular clasts with clayey matrix fill. Becoming sideritic towards base; dolostone clasts and ferruginous matrix fill become dominant towards contact with underlying dolostone.
554.9	569.4	Pmc	Crystalline dolostone. Stylolitic. Brecciated zones becoming more common towards base. Some Coxco needles. EOH



NB18DD060 – Rosie Creek East

NB18DD060 was commenced on 25 October 2018 and completed on 2 November 2018 at a depth of 451m in Tawallah Group volcanics.

NB18DD060 was targeted based on geochemical fertility indicators vectoring east of the Rosie Creek sub-basin. East of the Rosie Creek sub-basin and the Emu Fault historical MMG drill holes NBDD010, NB16DD019 & NB16DD024 express barren, non-sub-basinal Pmq shale. Continuing further east, NB16DD023 expresses thickened Pmq shale, extended transitional W-Fold Member and carbonate debris flows in basal Pmq; all indicative of facies deepening. NB18DD060 was designed to test the area further east and was collared on a dense-centred triangular feature in the Falcon gD imagery.

NB18DD060 intersected interbedded dolosiltstone, dolarenites and limited carbonaceous shales. From 410 m to base of hole NB18DD060 intersected massive sandstone and fissile altered volcanic lithologies of the Tawallah Group. The overlying units are interpreted as belonging to the lower McArthur Group. The dense Falcon gD anomaly is interpreted to correspond to the thick carbonate package above 410m and the triangular feature likely represents a pop-up basement block. For a summary log of NB18DD060 see Table 6.9 below.

Table 6.9 NB18DD060 summary log.

Depth from (m)	Depth to (m)	Strat (<i>interp</i>)	Summary log
0	53.6	Cov	PCD. Surficial pisolitic gravel, medium-grained sand and clays below 14 m.
53.6	76.6	<i>Pma</i>	Variably altered and bleached laminated dolosiltstone and stromatolitic dolostone with 4 m thick clay matrix supported dolostone/dolosiltstone breccia at base of interval. Mm-scale pyrite blebs associated with stylolites and hairline fractures at 64m.
80	139	<i>Pma</i>	Silicified crypt-algal dolostone and laminated dolosiltstone with frequent horizons of plate breccia and pebble conglomerates.
139	292	<i>Pma</i>	Interbedded dolosiltstone and carbonaceous shale with occasional grit-granule conglomeratic layers, crypt algal dolostone and dolarenites. Carbonaceous shale contains rare disseminated pyrite. < 1cm sphalerite blebs and lesser mm-size chalcopyrite associated with gritty siliceous bed in laminated shales. Arenites becoming more common in second half of interval, occasionally conglomeratic with poorly-sorted granule size clasts of quartz and dolosiltstone.
292	303	<i>Pma</i>	Massive chaotic grit to cobble pink polymict conglomerates, poorly sorted with sub-rounded silicic clasts.
303	348	<i>Pto</i>	Pink laminated crypt-algal dolosiltstone and stromatolitic dolostone with quartz dolarenite interbeds. Occasional altered shale interbeds and normally graded grit-granule conglomerates. Patchily silicified and recrystallised throughout interval.
348	370	<i>Pto</i>	Dark pink/red intensely altered and silicified conglomeratic dolostone with sub-angular to rounded clasts. Interval crosscut by late silica quartz vein breccia (+ late pyrite replacing clasts within qtz veins and stylolites). Laminated pink crypt-algal dolostone in basal 10m of interval.
370	396	<i>Pto</i>	Dark green and brown altered dolarenite and dolosiltstone.
396	410	<i>Pto</i>	Silicified pink dolarenite with lesser dolosiltstone interbeds and occasional granule conglomerates. Below 400 m vuggy silica vein breccias host coarse pyrite and occasional chalcopyrite.
410	429	<i>Ptn</i>	Massive quartz sandstone. Pyrite infilling crosscutting fractures throughout interval.
429	434	<i>Ptg</i>	Chloritic fissile fine-grained amygdaloidal horizon within altered sandstone. Volcanic protolith?
434	450	<i>Ptn</i>	Massive quartz sandstone. Pyrite infilling fractures crosscutting bedding throughout.
450	451-EOH	<i>Ptg</i>	Highly altered chloritic fine grained fissile rock - volcanic protolith? EOH



6.2 Soil Sampling

6.2.1 Introduction

A soil sampling program was designed at the Leila Prospect (EL28656) to test the fertility of interpreted thickened Balbirini Formation (alternative stratigraphy target type). 62 soil samples were collected on a 1 km x 500 m grid in July 2018 (Figure 6.4).

6.2.2 Methodology

Samples were sent to ALS Townsville for 48-element assay by four-acid ICPMS (ME-MS41). Assays for the 2018 Leila Prospect soil sampling program were returned during the reporting period and are reported herein. For full assay results see Appendix 5. QAQC results are included as Appendix 6.

6.2.3 Results

The highest Zn assay was 154 ppm near the southern boundary of EL28656, all other samples returned Zn assays below 30 ppm (Figure 6.4).

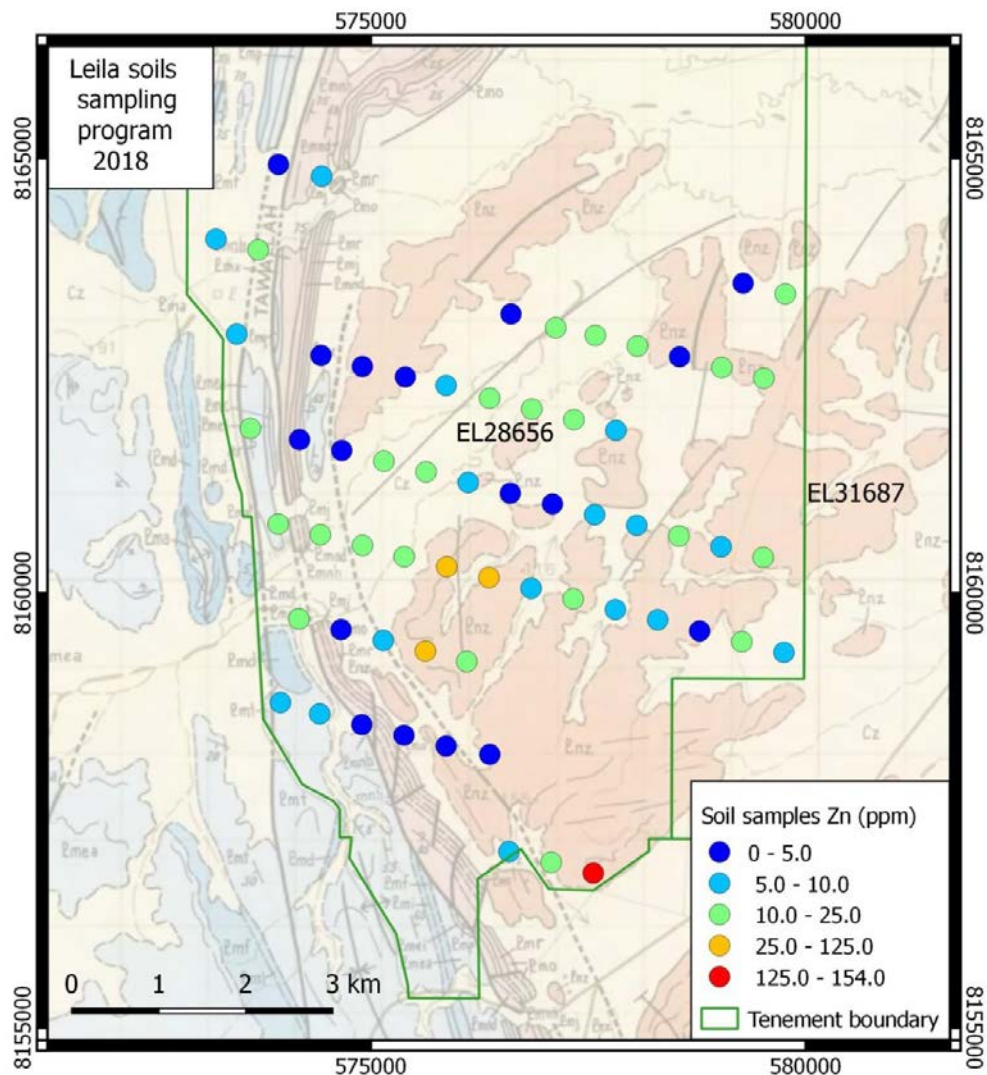


Figure 6.4 Leila Prospect soils sampling program coloured by Zn assay shown over NTGS 100K mapping.



6.3 Induced Polarisation Survey

An extensive time domain Induced Polarisation survey was conducted in the North Batten area between 11 July and 3 October. A total of 882 stations were read along 76.9 link km at the Rosie Creek, Cow Lagoon, Sawtooth and Berjaya prospect areas.

Methodology and results of this survey are discussed in the 2018 annual report (reporting Period 30/09/2018 – 29/09/2019).

Only preliminary results had been received by the submission deadline of the 2018 annual report. Final results have since been received and are included as an appendix.

6.4 Conclusions and Recommendations

The 2018 diamond holes NB17DD054, NB18DD056 – NB18DD060 were drilled in the Rosie Creek, Berjaya and Rosie East areas. Most of these holes were IP chargeability anomaly targets however the holes east of the Emu Fault (NB18DD056 and NB18DD060) were conceptual structural/geochemistry targets. The holes in the Greater Rosie Creek area sought to intersect or test for extensions to the pyritic shale envelope that was found within the Barney Creek Fm at Rosie Creek in 2016. Drilling at Berjaya sought to follow up low-grade Zn mineralisation in MMG drillhole NB16DD018 drilled in 2016. In summary:

- NB18DD054 - It is interpreted that the IP chargeability anomaly is due to disseminated hematite in Tawallah Group rocks.
- NB18DD056 - The facies intersected are interpreted to represent a platform depositional setting and are not considered prospective.
- NB18DD057 was abandoned due to drilling difficulties before reaching the chargeability anomaly, expected to be intersected at approximately 300 m depth.
- NB18DD058 - The intense clay alteration in this hole is interpreted to have caused the chargeability response observed in the IP survey.
- NB18DD059 - The intense IP chargeability anomaly was coincident with and interpreted to be due to clayey Lynott Formation sediments rather than pyritic Barney Creek Formation.
- NB18DD060 - The dense Falcon gD anomaly is interpreted to correspond to the thick carbonate package above 410m and the triangular feature likely represents a pop-up basement block.

The soil sampling at Leila prospect on EL28656 returned average results.

A detailed review of previous exploration results in order to assess the prospectivity of the area is planned for the next reporting period.

7. PLANNED EXPLORATION WORK

Sandfire is currently evaluating their exploration strategy in the Northern Territory at the time of writing.

8. EXPENDITURE

For the annual reporting period, a total of \$4,550,987.86 was spent on the North Batten Tenements. A breakdown of expenditure costs for the projects is given in Table 8.1.

Table 8.1 Exploration expenditure for the North Batten group reporting tenements for the period 30/09/2018 – 29/09/2019.

EL	Year	Blocks	Expenditure
EL26831	10	212	\$ 1,071,416.01
EL26833	10	183	\$ 0
EL26835	10	208	\$ 1,302,963.25
EL26836	10	178	\$ 384,580.43
EL28656	8	39	\$ 234,208.87
EL29022	7	53	\$ 92,455.14
EL30048	14	90	\$ 568,789.84
EL30137	10	99	\$ 9,827.63
EL30152	10	159	\$ 622,244.25
EL30156	10	169	\$ 199,124.19
EL30158	10	161	\$ 65,378.25

9. REFERENCES

Broadbent, G. C., Myers, R. E., & Wright, J. V. (1998). Geology and origin of shale-hosted Zn-Pb-Ag mineralization at the Century deposit, northwest Queensland, Australia. *Economic Geology*, 93(8), 1264-1294.

Jones D., Roberts, R., Ahmat, A., Wynne A. 2010. Group annual mineral exploration report Borroloola Project, Group Reporting number: GR121-09. Sandfire Resources NL, Report no 2011NT03.

Lauricella, P., Hawke, M., Evans, W., McKenzie, M., Schreck, T., Roberts, R., Wynne A. 2011. Group annual mineral exploration report Borroloola Project, Group Reporting number: GR121-09. Sandfire Resources NL, Report no 2010NT03.

Lauricella, P., Kiernan, P., Wynne A., Hansen, A. 2012. Group annual mineral exploration report Borroloola Project, Group Reporting number: GR121-09. Sandfire Resources NL, Report no NTX_SAN00039864.

Spelbrink L., Lester K. 2019. Group annual report for North Batten Amalgamated Group Reporting GR321. MMG Exploration PTY LTD, Report no MMR 7720

G.Street, P. Lauricella, C. Algie. 2008. Group annual mineral exploration report Borroloola Project, Sandfire Resources NL, Report no 2008/NT/02.

Wynne, A., Hansen, A., Hawke, M., Jones, D., Lauricella, P., Evans, J., Lewis, T., Marshall, T. 2009. Group annual mineral exploration report Borroloola Project, Group Reporting number: GR068-09. Sandfire Resources NL, Report no 2009NT03.



10. APPENDICES

Appendix 1. Group Annual Report MMG 2019

GR504_2019_A_02_appendix1.pdf

11. DIGITAL DATA

GR504_2019_A_01_report.pdf

GR504_2019_A_02_appendix1.pdf

GR504_2019_A_03_IPData.zip

GR504_2019_A_04_DrillCollars.txt

GR504_2019_A_05_Geot.txt

GR504_2019_A_06_Assay.txt

GR504_2019_A_07_Geol.txt

GR504_2019_A_08_Survey.txt

GR504_2019_A_09_QAQCD.txt

GR504_2019_A_10_QAQCS.txt

GR504_2019_A_11_Surface.txt

GR504_2019_A_12_LithCodes.csv