MMG Exploration Pty Ltd
Level 23, 28 Freshwater Place,
Southbank Victoria 3006
Australia Telephone: +61 3 9288 0888
Facsimile: +61 3 9288 0800
www.mmg.com

ABN 23 004 074 962

MMG Exploration Pty Ltd

ACN 119 136 659

CORE Geophysics and Drilling Collaborations Round 9 2016

Berjaya NW
EL26831

Project Title Holder: Sandfire Resources NL
Project Operator: MMG Exploration Pty Ltd

Map sheets
1:250 000 Bauhinia Downs SE5303
1:100 000 Batten 6065

Distribution:

1. Department of Primary Industries and Resources, NT.
2. MMG Exploration Pty Ltd.

Report Number: MMR 6754
Authors: Louis Cohalan
Angela O'Rourke
Date: December 5th 2016

SUMMARY

Drillhole NB16DD018 was drilled between September 1st and September 6th by MMG Ltd as part of Round 9 of the Northern Territory Geophysics and Drilling Collaborations program. The target rationale was to test an untested area on the northern fringe of the "HYC camp" along strike from sub-economic Zn mineralisation drilled historically within the Barney Creek Formation at the Berjaya Prospect located 16km west of the McArthur River Mine. The hole aimed to ascertain the style of mineralisation (as historical drill core cannot be located) and to test if the mineralised system improves northward which has the potential to open up a prospective exploration area. The 404.4 m deep diamond drillhole was collared in the Hot Springs Member of the Lynott Formation, intersected the entire thickness of the target stratigraphy, i.e. the Caranbirini Member of the Lynott Formation, the Reward Dolomite and the Barney Creek Formation, and was terminated in the Teena Dolomite (including the Coxco Dolomite Member). A 33.2 m thick interval of weak zinc mineralisation averaging 2359 ppm Zn was intersected from 180 m depth and can be correlated with mineralisation intersected in historical holes at the Berjaya Prospect further south. The mineralisation was dominantly sphalerite and pyrite with traces of galena and occurred as disseminations, aggregates, thin deformed bands and as breccia infill. The mineralised interval included a 5.9 m thick interval assaying at 0.47 % Zn. Lithological logging, downhole assays and subsequent 3D modelling from NB16DD018 indicate that the thickness and grade of the weakly mineralised interval both decrease to the north when compared to historical drilling at the Berjaya prospect. This finding, in conjunction with the target horizon becoming gradually deeper to the north downgrades the prospectivity of the area to the north.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF DOCUMENTS

INTRODUCTION

MMG's North Batten joint venture with Sandfire Resources comprises 11 granted exploration licences totalling an area of 3164 km^2 (Figure 1).

The Berjaya NW drillhole, NB16DD018, is located in the south of tenement EL26831 which is overlaid by the McArthur River Station pastoral property. The drillhole is located 19 km west of McArthur River Mine and accessible from the Carpentaria Highway by well-kept dirt track along a fenceline (Figure 2). The turn-off to the fenceline is 3.1 km to the southwest of the McArthur River Mine turn-off. A new 1.7 km-long dirt track leads from the fenceline to the drill site in a wooded area with low dolostone ridges.

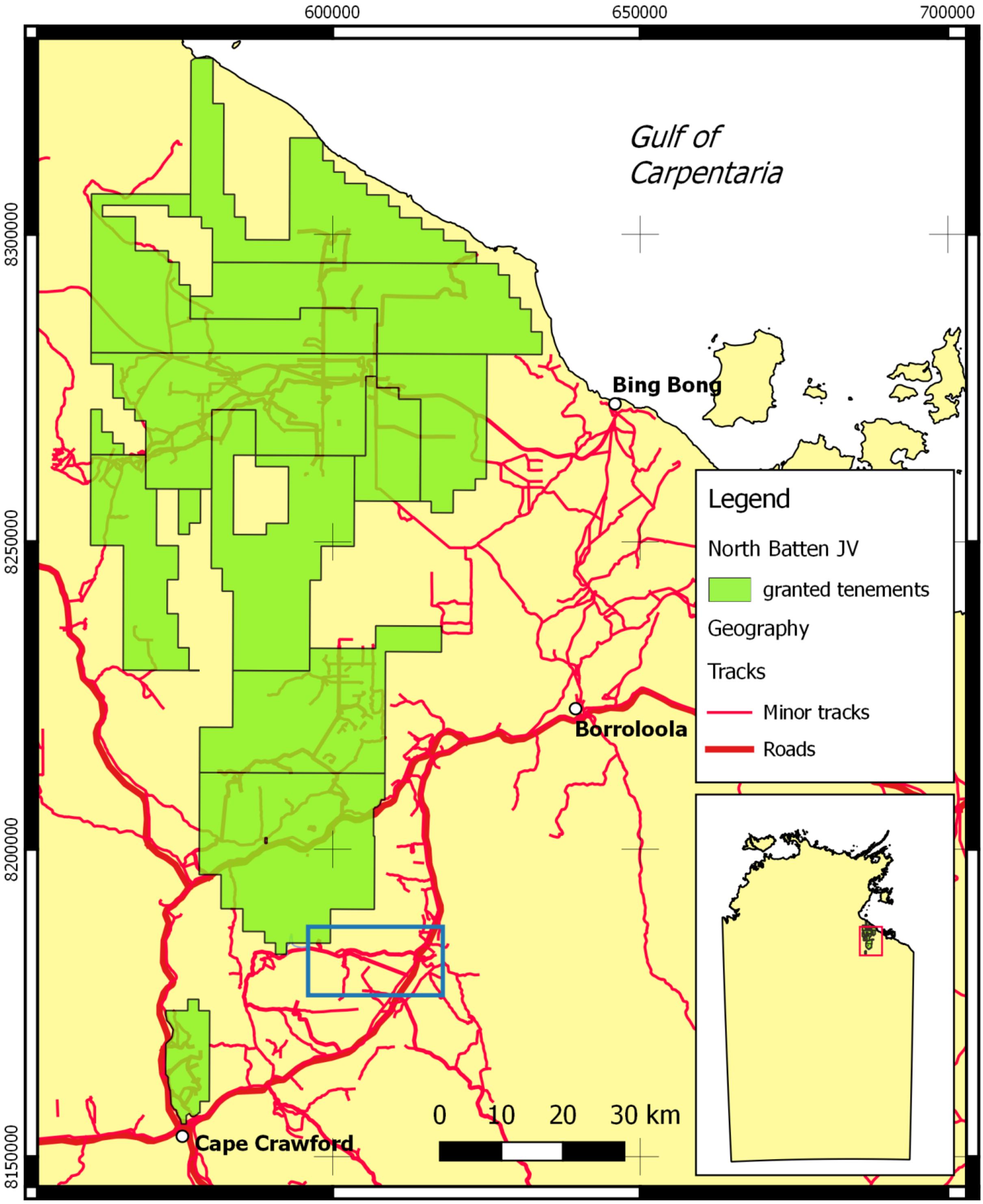

Figure 1. Location of the North Batten JV Tenements (green outline) in the Northern Territory. Area outlined by blue rectangle corresponds to figure 2a below.

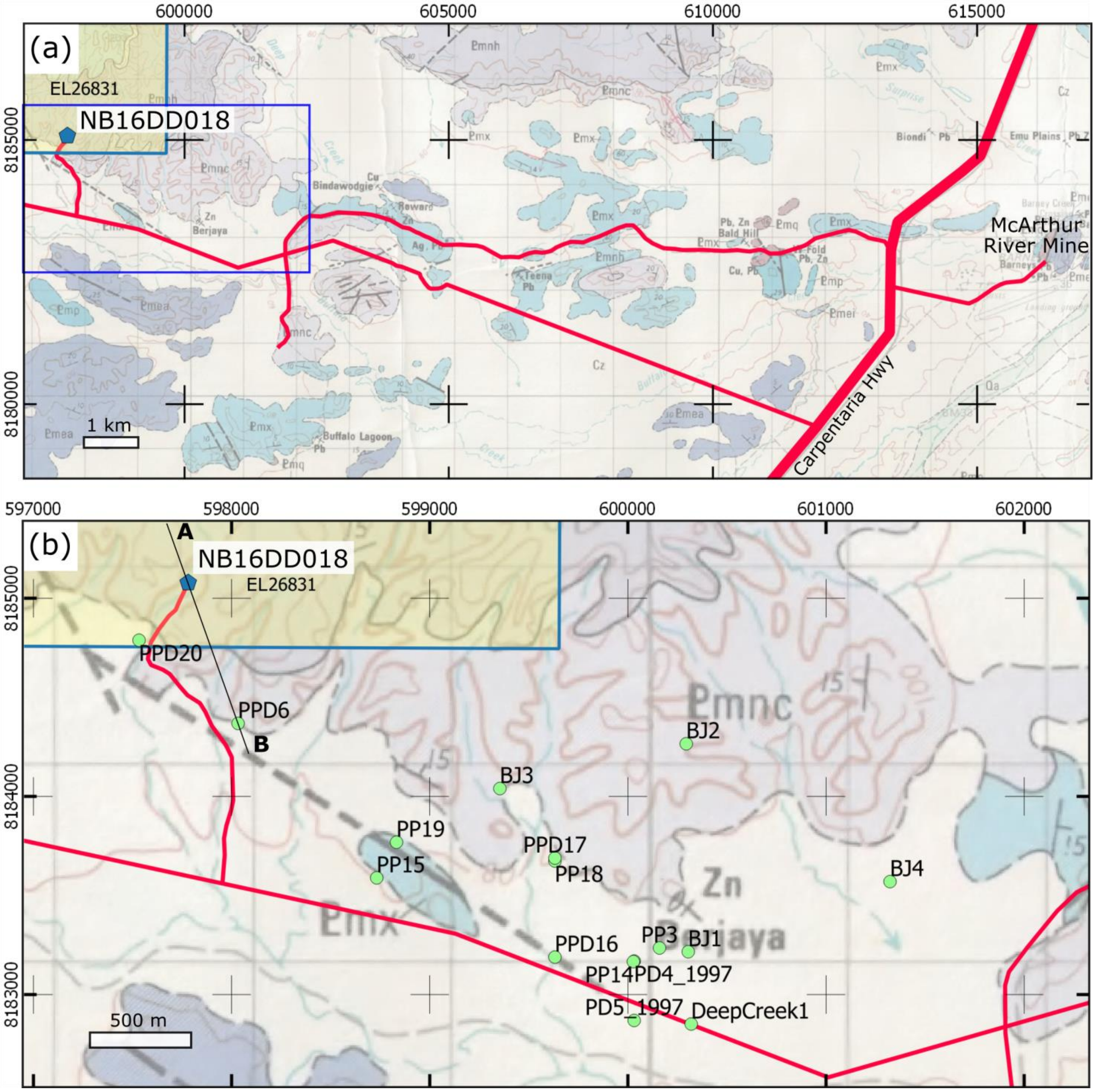

Figure 2. (a) NB16DD018 is located 19 km west of McArthur River Mine and accessed from the Carpentaria Highway along a west-northwest fence line and a roughly N-S section of new track; (b) Zoom into area shown by blue frame in (a). Location of historical drill collars plotted over NTGS 100K Geology. The MMG North Batten JV tenement is outlined in teal and shaded yellow. Cross-section A-B is shown later in Figure 15.

REGIONAL CONTEXT

The McArthur Basin (c.1860-c.1500 Ma) is exposed over an area of approximately 180,000 km^2 in the north-eastern Northern Territory (Ahmad et al. 2010). MMG's ground holding covers a large portion of the north-south trending Batten Fault Zone in the south-eastern section of the wider McArthur Basin. Mid-Proterozoic intracratonic basin fill of up to ~10 km of exposed thickness is comprised of rift-phase Tawallah Group and sag-phase McArthur Group rocks, with additional later 'stacked' basins of mid- to late-Proterozoic Nathan and Roper groups. The Batten Fault Zone is bound by mid-Proterozoic platform benches of the Wearyan Shelf to the east and Bauhinia Shelf to the west and is onlapped by the Cambrian Georgina and Carpentaria Basins. It unconformably overlies Palaeoproterozoic metamorphosed and deformed rocks of the Pine Creek Orogen to the west, Murphy Inlier to the south and Arnhem Inlier to the northeast (Ahmad et al. 2010).

McArthur River Mine has a total resource of 144 Mt at 11.2% Zn, 4.8% Pb and 48 g/t Ag (Ahmad *et al.* 2010). It is hosted in a pyritic carbonaceous shale sub-basin accommodated at the intersection between the basin-scale north-northwest-striking Emu Fault Zone which lies at (but does not necessarily define) the eastern edge of the Batten Fault Zone and the less pronounced east-west striking Bald Hills Fault. The gently-dipping stratiform ore body occurs as eight separate lenses at the base of the McArthur Group Barney Creek Formation.

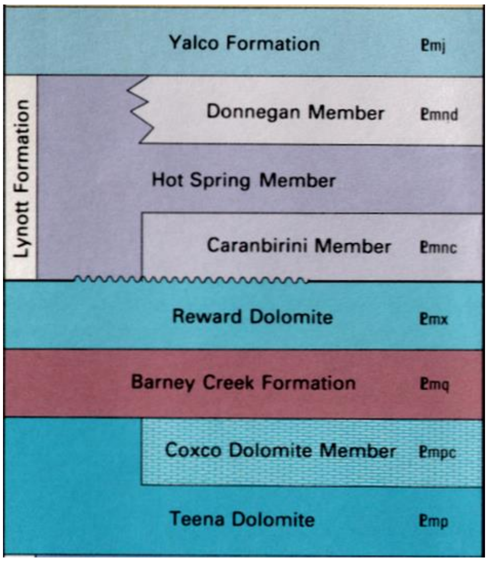

Figure 3. An excerpt of the NTGS stratigraphic column for the area of interest (McArthur River Region 6065-6165 (100k), 1991). The Barney Creek Formation and the Caranbirini Member of the Lynott Formation are the two deep water shaley units considered prospective for stratiform Zn-Pb deposits while the Reward Dolomite represents a shallowing event between the two.

According to NTGS 100k geological mapping, the Berjaya prospect area comprises a gently northwest-dipping sequence of mid-McArthur Group units including the Reward Dolomite at the base overlain by the Caranbirini and Hot Springs members of the Lynott Formation and the Yalco Formation to the northwest (Figure 3). The interpretation of drilling by previous explorers and researchers has varied and does not always correspond to the NTGS mapping. Drillholes PPD20 and PPD6 (MIM 1994 – 1995) terminate below the siltstone/shale unit interpreted as Caranbirini Member into a coxco needle-bearing dolostone unit interpreted to be the Coxco Dolomite Member of the Teena Dolomite. This suggests that the mapped Reward Dolomite may be Teena Dolomite and that the recessive unit is Barney Creek Fm rather than Caranbirini Member. Steve King, who did a re-interpretation of the McArthur Basin geology for MMG interprets what the NTGS mapped as Reward Dolomite as a siliciclastic and resistant sub-member of the Caranbirini Member.

The Berjaya Prospect is located at the edge of what we informally term the 'HYC camp' comprising the exposed middle McArthur Group stratigraphy to the west of McArthur River Mine which hosts the Teena and Myrtle deposits (Figure 4). The eastern extent of the area is not sharply defined and corresponds broadly to where higher levels of the stratigraphy are exposed (i.e. Yalco Fm and above).

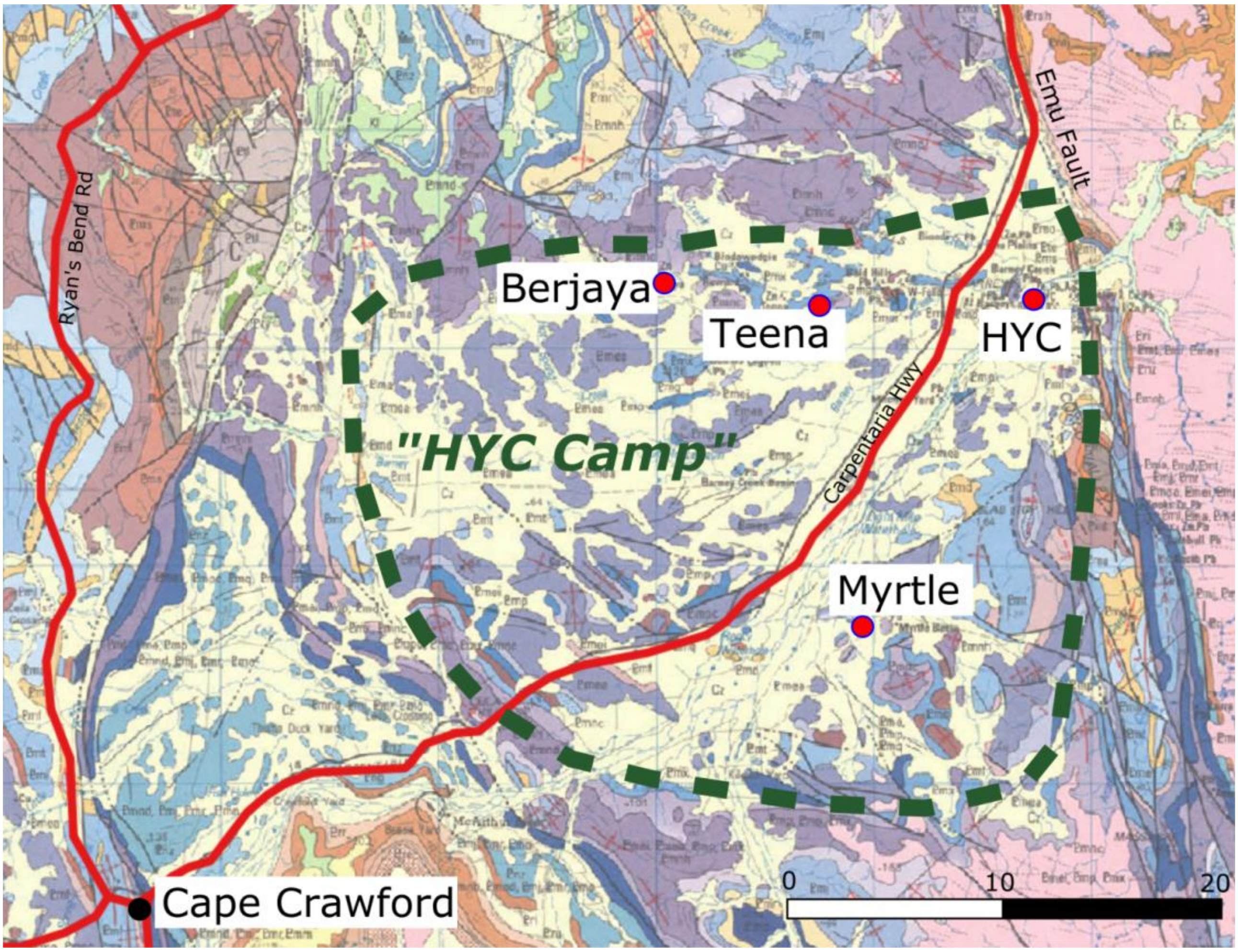

Figure 4. Location of the Berjaya prospect in relation to the 'HYC camp' (dashed green outline) and known key zinc deposits and prospects.

PREVIOUS EXPLORATION

The Berjaya Prospect was first located by A.O. Pty with an INPUT survey in 1976 (CR1979-0008).

The early EM anomalism was followed up by field reconnaissance, soil and rock chip sampling, IP and gravity surveys and four diamond drillholes (BJ1-BJ4) by the Bauhinia Joint Venture (BHP, AO, Shell, CR1983-0018). EM and IP anomalism were targeted as possible pyritic shales which are positively correlated with Zn+Pb at HYC. The soil sampling program produced anomalous Pb (≤1800 ppm) and Zn (≤5500 ppm) coincident with the minimum depth of the conductive body determined by the IP survey. Geophysical anomalies were attributed to pyritic black shale and discrete pyrite bands in the Lower Lynott Formation (Caranbirini Member). Rock chip samples had concentrations of up to 4100 ppm Pb and 3100 ppm Zn. Gossan samples contained up to 0.68% Zn.

Drillholes also intersected four 1 m intervals at >1% Zn including 1 m @ 4.63% Zn (DDH BJ1 at 54m depth at the top of Teena Dolomite) in a dolomitic slump breccia with dolarenite, dololutite and dolomitic shale with large vugs or veins filled with coarse dolomite, sphalerite, pyrite, pyrolusite and trace chalcopyrite.

In 1993, 1994, and 1995, following stream sediment and SIROTEM surveys, MIM drilled 20 holes including percussion and diamond holes between the Berjaya Prospect and the Hot Springs Anticline to the west. The significant Zn intercepts include:

- 5m @ 3.3% Zn (PPD16 from 106 m depth) in pyritic siltstones and shales interbedded with fine arenites, brecciated and cross-cut by steep dolomite veins containing sphalerite and rare fine galena.

- 2.8 m @ 2.35% & 4 m @ 2.26% Zn (PPD20 at 207.5 m & 211 m depth) in dolomitic siltstone with albitic alteration and bedding-parallel and cross-cutting sphalerite.
- 5.7m @ 1.16% Zn (hole PD4 at 17.5m depth) in thinly bedded dolomitic and pyritic siltstone with goethite and haematitic limonite lining cavities.
- 6 m @ 0.95% Zn from 86 m in hole PPD6 which is most proximal to the collaboration drillhole NB16DD018 (and recent mapping indicates is in the same fault block).

Several other intervals had results of 0.4 – 0.8% Zn including some in siliceous siltstone with manganese dendrites and others in carbonaceous pyritic black dolosiltstone with 30-60% disseminated or laminated pyrite (CR1997-0061).

Details of historical drillholes at the Berjaya prospect are listed in Table 1.

Table 1. Summary of historical drillholes at the Berjaya prospect.

Hole_ID	Type	Company	Year	Easting	Northing	Depth (m)	Dip	Azi	Report
BJ1	DD	Shell	1978	600305	8183215	101	-90	0	CR1983-0018
BJ2	DD	Shell	1978	600295	8184265	154.7	-90	0	CR1983-0019
BJ3	DD	Shell	1978	599354	8184039	76.7	-90	0	CR1983-0020
BJ4	DD	Shell	1978	601324	8183569	151.5	-90	0	CR1983-0021
DeepCreek1	UNK	unk	unk	600320	8182850	93	-90	0	unk
PP3	RC	MIM	1993	600160	8183234	102	-90	0	CR1997-0061
PD4	DD	MIM	1994	600032	8183168	66	-90	0	CR1997-0061
PD5	DD	MIM	1994	600032	8182868	54.3	-90	0	CR1997-0061
PPD6	RC/DD	MIM	1994	598032	8184368	178	-90	0	CR1997-0061
PP14	RC	MIM	1994	600028	8183165	48	-90	0	CR1997-0061
PP15	RC	MIM	1994	598732	8183588	66	-90	0	CR1997-0062
PPD16	RC/DD	MIM	1995	599632	8183188	168	-75	180	CR1997-0063
PPD17	RC/DD	MIM	1995	599632	8183688	114	-75	180	CR1997-0064
PP18	RC	MIM	1995	599632	8183673	102	-75	180	CR1997-0065
PP19	RC	MIM	1995	598832	8183768	174	-90	0	CR1997-0066
PPD20	RC/DD	MIM	1995	597532	8184788	276	-60	180	CR1997-0067

A petrography report (CR1997-0061_SECT04) was compiled by Rocko Pty. Ltd. for three mineralised samples (>1% Zn) from hole PPD20 at depth 194 m, 212.90 m and 220.10m. It was concluded that mineralisation is more like MVT style than stratiform-style (HYC) as iron sulphides and sphalerite appear to be younger than the stratiform micro-crystalline pyrite regarded as syngenetic. MIM concluded that Zn mineralisation occurs at Berjaya over a strike length of nearly 2.5 km but at sub-economic grades.

EXPLORATION CONCEPT

Sediment-hosted zinc sulphide deposits across the North Australia Zinc Belt, including McArthur River Mine, MMG's Century Mine, Lady Loretta and George Fisher-Hilton, all have key differences that distinguish them compositionally, lithologically, genetically and temporally from one another. The next world class Zn deposit is therefore likely to look different again and, as such, MMG prefers an open and empirically-driven approach over a focus on traditional ore genesis models. MMG's Geoscience team believe there is still potential to generate new exploration target areas within existing 'mature' terranes that previous exploration models have not considered. The recent discovery of the Teena deposit is proof that the "HYC camp" hosts more than one world class zinc deposit and there is no reason to doubt there could be more.

MMG is employing a multifaceted approach to exploration in the McArthur Basin with a focus on geochemistry; particularly litho-geochemical characterisation, Pb isotope work, lithofacies recognition and mapping, and generation of improved models of basin architecture in 3D space.

At the Berjaya prospect, results of historical exploration were not adequately followed-up and it is possible that the "HYC Camp" is not closed off the north-west. Historical EM and IP surveys have identified a conductive horizon bound to the southwest by a northwest-trending structure informally referred to as the 'Berjaya Fault'. Historical drilling has confirmed that the conductive unit is a pyritic shale/siltstone unit. This unit is considered prospective for Zn-Pb mineralisation based on the empirical correlation at HYC and on the model that stratiform Zn-Pb mineralisation occurs in deep basinal settings of reduced shales in association with pyrite accumulation. The presence of weak Zn-Pb mineralisation in some of the historical drilling is further encouragement of the suitability of the horizon to host significant mineralisation.

The target unit at this prospect is the carbonaceous shale of the Caranbirini Member or Barney Creek Formation. As the target stratigraphy is exposed at Berjaya NW and eroded at the surface, it is difficult to ascertain from historical data whether it is thinning or thickening to the north. However, the thickness of mineralisation in historical holes increases to the north from 22.7 m thick with greater than 1000 ppm Zn in PPD6 to 50.4 m thick in PPD20. Our co-funded drillhole was designed to test if this horizon became more prospective (thicker or higher grade) to the north.

DETAILS OF THE COLLABORATIVE PROGRAM

Drilling

Hole NB16DD018 was drilled by DDH1 Drilling between September 1st and September 6th and terminated at 404.4 m depth. The drilling methods used are summarised in Table 2 below.

Table 2. Coordinates, total depth, core type, pre-collar depth and dip and azimuth of NB16DD018.

Hole ID	**NB16DD018**	Rig Type	**Sandvik DE840**
Azimuth	**160^0**	Dip	**80^0**
Easting (GDA94)	**597771**	Northing (GDA94)	**8185065**
From (m)	To (m)	Hole Type	Hole Diameter
0.0	5.7	Mud	HWT-PCD
5.7	110.6	DD	HQ
110.6	404.4	DD	NQ2

Sampling

Three types of samples were taken from NB16DD018: routine assays (48 elements + Spectroscopy), lithogeochemistry assays (whole rock characterisation, 65 elements) and petrographic samples (Table 3). 144 intervals of a nominal length of 1 m (minimum 0.73 m, maximum 1.25 m) were analysed for routine assays and ASD focussing on the silty units of the Caranbirini Member and Barney Creek Formation. Fifteen QA/QC samples were inserted (approximately one in every ten samples) including four standards, five field duplicates, three pulp blanks and three coarse blanks. The lithogeochemistry samples have a nominal length of about 15 cm. Fifteen such samples as well as one coarse blank, one standard and one field duplicate were analysed for whole rock characterisation. Analysis was completed at ALS in Townsville. Seven 10 cm quarter core intervals were sent to Prof. Tony Crawford for petrographic analysis. The petrographic report has been submitted as an appendix to this report (Appendix 9). Spectroscopy results have been submitted as Appendix 10 but no analysis or interpretation has been done yet on these results yet.

Table 3. Summary of sampling methodology from NB16DD018.

Sample type	ALS method	Number of samples	Certified reference materials	Field duplicates
Routine	ME-MS61; TRSPEC 20	144	10	5
Lithogeochemistry	ME-XRF26; ME-MS81; ME-4ACD81; ME-MS42; ME-IR08	15	2	1
Petrography	NA	7	NA	NA

RESULTS AND INTERPRETATION

Complete drillhole logging, surveying, spectroscopy and assay data are included in Appendices 1 – 8 and 10. This section summarises the important results in terms of lithology, mineralisation, assays, petrography and interpretation.

Lithology

The lithology and stratigraphy intersected in NB16DD018 is logged in detail in Appendix 6 and summarised in Table 4 below. A graphic sedimentary log of NB16DD018 is provided in Figure 8.

Table 4. Summary log of NB16DD018.

From	To	Lithology
0.0 m	5.6 m	**Cover:** Residual soil and weathered rock
5.6 m	90.6 m	**Hot Springs Formation**: Interbedded algal dolostone, dolomitic sandstone and dolomitic siltstone
90.6 m	126.4 m	**Caranbirini Member**: Dolomitic siltstone and shale
126.4 m	129.8 m	**Reward Dolomite:** Sandy dolarenite unit
129.8 m	285.6 m	**Barney Creek Fm**: Dolomitic siltstone and pyritic shales (weakly mineralised from 187-213 m)
285.6 m	290.6 m	**W-fold Member** : Interbedded dolomitic siltstone and algal dolostone, partially silicified; transitional unit between Barney Creek Fm and Coxco Dolomite Member
290.6 m	347.0 m	**Coxco Dolomite Member**: Crystalline and brecciated dolostone with Coxco needles and neptunian dykes
347.0 m	404.4 m	**Teena Dolostone**: Algal laminated dolostone

Summary

A number of transgressive (upward-coarsening) cycles are evident within the Pmnc/Pmq interval. A particularly coarse interval of sandy dolomite was assigned to the Reward Dolomite and separates the interpreted Caranbirini Member from the Barney Creek Fm. The coxco needles in the dolostone unit that starts at 290.6 m are a useful stratigraphic marker, giving confidence that this unit is the Coxco Dolomite Member of the Teena Dolomite and that the unit above is the Barney Creek Fm. The contact between the Barney Creek Fm and the Coxco Dolomite Member is transitional and consists of interbedded siltstone and dolostone. This interbedded interval has been attributed to the W-Fold Member. Both the Caranbirini Member and the Barney Creek Fm consist of turbiditic siltstone rather than black shales. This suggests that Berjaya is a shelf environment, perhaps on the fringe of the deep basinal environment encountered at HYC.

Hot Springs Member

The Hot Springs Member of the Lynott Fm is represented in NB16DD018 by 85.2 m (from surface) of interbedded dolomitic siltstone, dolomitic sandstone, algal laminated dolostone and minor carbonaceous dolomitic siltstone.

Caranbirini Member

The Caranbirini Member of the Lynott Fm is represented in NB16DD018 by 35.5 m upward fining turbiditic sequences dominated by dolomitic siltstone with minor soft sediment deformation. The sequences are upward-fining both on the scale of individual turbidite beds and on the 10 m-scale where we see a maximum flooding surface of very fine material (dolomitic shale or micrite) grading upward to silty and fine sand material. Pyrite occurs as fine laminations and in discordant micro-veins interpreted to have formed from dewatering pathways.

Reward Dolomite

The Reward Dolomite is represented in hole NB16DD018 by a 3.4 m thick sandy grey and white dolomitic unit containing a minor interval of shale flakes at 129.5 m interpreted to be rip-up clasts from the Barney Creek Fm below.

Barney Creek Fm

The Barney Creek Fm is represented in hole NB16DD018 by a 155.8 m thick sequence dominated by turbiditic dolomitic siltstone with only thin black shale intervals. Siltstone sequences range from mass flow units 10 – 50 cm thick to thinly interlaminated turbidites. Dewatering structures, minor brecciated intervals and convoluted bedding can be found throughout the unit. A pyrite-rich nodular interval from 177.6 m to 180.0 m occurs 7 m above the top of the mineralised interval (Figure 5). This is similar to HYC where a nodular interval is present above the top ore lens. All mineralisation in this core occurs in the Barney Creek Fm and is described in the next section. The absence of thick carbonaceous shales suggests that this is not a deep basinal environment but rather a shelf environment.

Figure 5. Nodular interval at 178.1 m. Core diameter is 5 cm.

W-fold Member

The W-fold Member of the Barney Creek Fm is represented in NB16DD018 by a 5.0 m thick transitional interval between the siltstones of the Barney Creek Fm and the dolostone of the Coxco Dolomite Member of the Teena Dolomite. It consists of interbedded laminated siltstone with variably silicified algal dolostone and broken dolostone clasts.

Coxco Dolomite Member

The Coxco Dolomite Member of the Teena Dolomite is represented in NB16DD018 by 62.6 m of light grey dolostone comprising massive dololutite sometimes with crypt-algal laminations, algal-laminated dolostone, minor brecciated intervals, occasional neptunian dykes infilled with dolomitic siltstone and intervals of abundant upward radiating coxco needles (Figure 6).

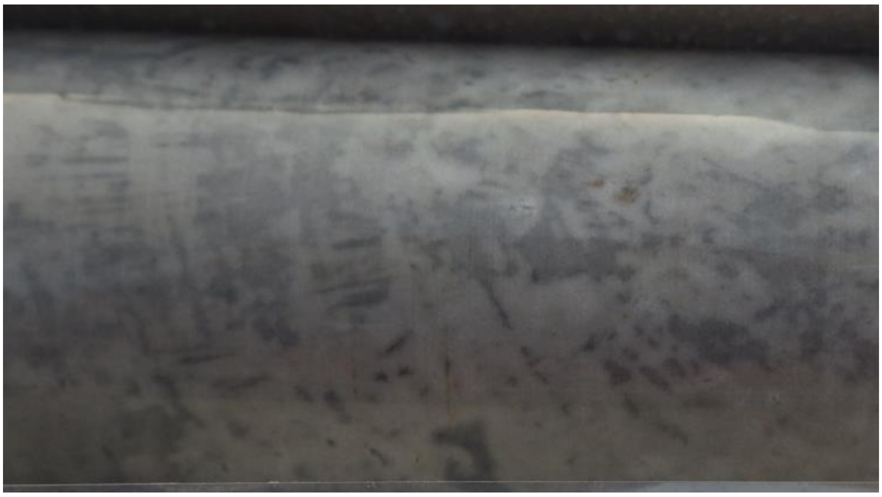

Figure 6. Discontinuous coxco needles can be distinguished in dark grey radiating uphole (left). Height of photo is 5 cm.

Teena Dolomite

The Teena Dolomite is represented in NB16DD018 by 51.2 m of dark grey algal laminated dolostone, massive brecciated intervals with crypt-algal laminations, occasional neptunian dykes (Figure 7) and pale grey massive recrystallised dolostone.

Figure 7. Neptunian dyke at 360.4 m in Teena Dolostone. The core diameter is 5 cm.

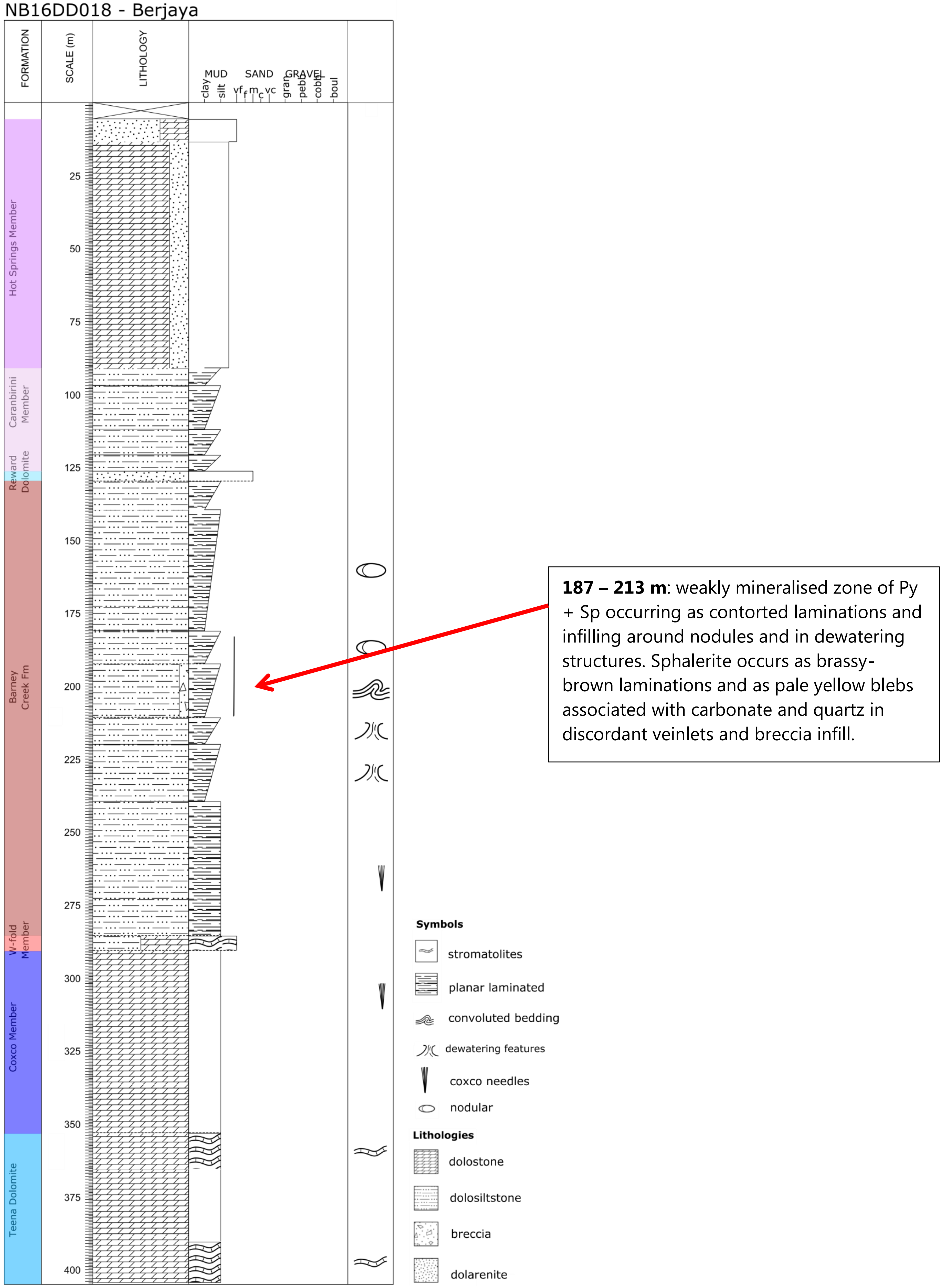

Figure 8. NB16DD018 (Berjaya NW) sedimentary graphic log

Mineralisation & Assays

Weak sphalerite mineralisation was encountered in dolomitic siltstone with light brown siderite/ankerite bands within the Pmq from 187.3 to 213.6m. The mineralisation is strongest within, and proximal to, narrow brecciated intervals. Two phases of sphalerite mineralisation were identified at the macro-scale: an early brassy-brown sphalerite that occurs as contorted bands associated with similar bands of pyrite and sometimes as rims to pyrite aggregates (Figure 9); and a later light honey-brown to yellow remobilised sphalerite occurring with carbonate and quartz in cross cutting micro-veins and as breccia infill (Figure 10).

Assays were taken at 1 m intervals and targeted the more carbonaceous parts of the siltstone. Three long intervals of core were selected for continuous sampling: 88 – 124 m, 164.6 – 244.5 m and 268 – 296 m. A downhole log of selected assays is plotted in Figure 11. The full assay results are reported in Appendix 5. The single highest Zn assay was 8090 ppm Zn at 197.3 m. The best Zn grades are summarised in Table 5.

Table 5. Zn highlights (NB16DD018).

Depth	Zn assay intersection
177.6 – 210.8 m	33.2 m @ 2359 ppm
190 – 210.8 m	20.8 m @ 2952 ppm
195.1 – 201 m	5.9 m @ 4780 ppm (0.48 % Zn)
197.3 – 198.1 m	0.8 m @ 8090 ppm (maximum Zn assay)

Figure 9. NB16DD018 @ 195.7 m: Left: light reddish brown sphalerite occurs as a rim surrounding a large pyrite aggregate; Right: sphalerite occurs as contorted bands parallel to hydrothermal pyrite bands; (NQ core 5 cm diameter).

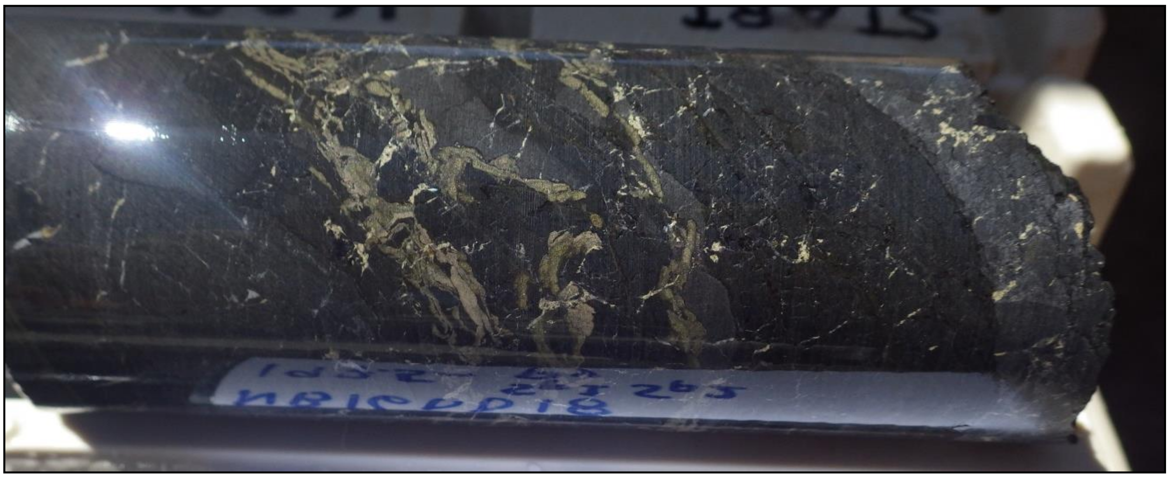

Figure 10. NB16DD018 @ 197.5 m: Convoluted laminations of Py and brassy-brown “Sp1” with pale yellow “Sp2” and carbonate in cross-cutting micro-veinlets.

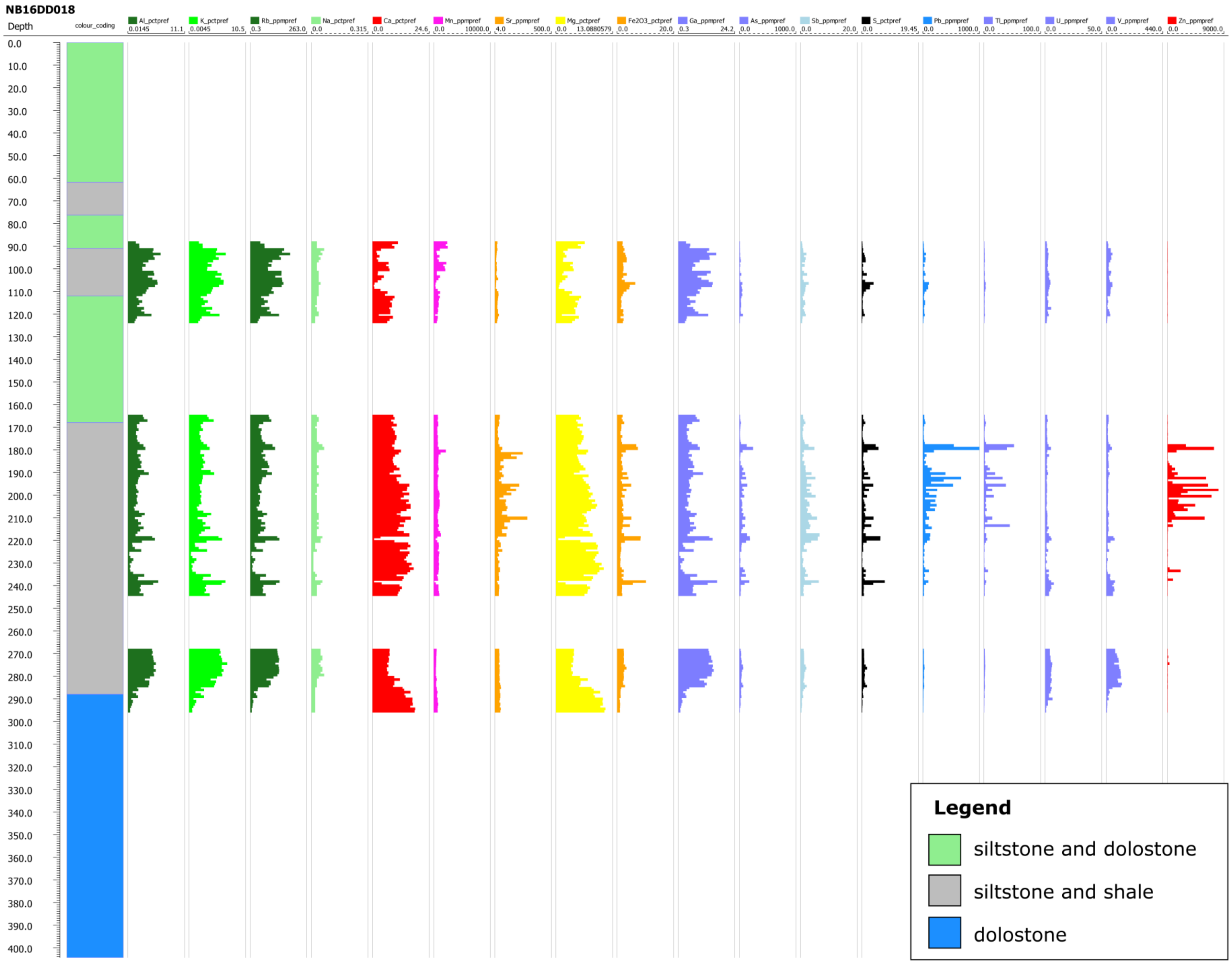

Figure 11. Downhole assays of selected elements in NB16DD018.

Petrography

Six thin sections were submitted to Prof. Tony Crawford from the University of Tasmania for petrographic analysis (Table 6). See the attached petrographic report for further detail (Appendix 9).

Table 6. Petrographic descriptions.

Sample_ID	Depth	Description
D1897062	178.3	laminated Py1 and Py2 associated to nodules in shale
D1897064	195.65	dolomitic shale with Py + Sp
D1897065	197.6	dolomitic shale/siltstone with concordant Sp1 (brassy) and discordant Sp2 (yellow)
D1897067	198.25	sedimentary breccia with Sp + Py basal contact scour
D1897070	210.6	dolomitic siltstone with honey brown Sp with carbonate
D1897071	219.1	pyritic shale (Pmq)

The petrographic analysis distinguished further phases of pyrite and sphalerite beyond the two discernable on the macro-scale (Figure 12, Figure 13). A summary of his findings on the paragenesis of the two main sulphide phases is presented in Table 7 below.

Table 7. Paragenesis of main sulphide phases.

Pyrite paragenesis	
Py1	Tiny euhedral bedding parallel (recrystallised from sedimentary Py during diagenesis)
Py2	Discontinuous bands, fragments and patches of Py up to several mm thick (most common in breccia intervals)
Py3	Small Py crystals in late quartz-carbonate veins and breccia cement/matrix; uncommon.
Sphalerite paragenesis	
Sp1	Bedding-parallel narrow bands usually immediately marginal to tan apatite beds, uncommon; most likely synchronous with Py1 as it is included in Py2 porphyroblasts forming from dissolution-recrystallization of Py1.
Sp2	Robust, narrow bands overgrowing masses of Py2
Sp3	Aggregates of small grains often localized around the broken margins of Py2 fragments, and therefore must post-date the brecciation-fragmentation event.
Sp4	Includes small Sp crystals and occasional larger seams in late qz + cb veins and breccia cement/matrix

Petrography showed that sphalerite was most common in samples showing the most brecciation and fabric disruption. A somewhat surprising finding was the presence of tan amorphous microcrystalline apatite (fluorapatite) beds and their spatial association to the sphalerite. Disruption of bedding was identified in all mineralised samples and was found to be due both to soft-sediment deformation and brittle post-lithification deformation.

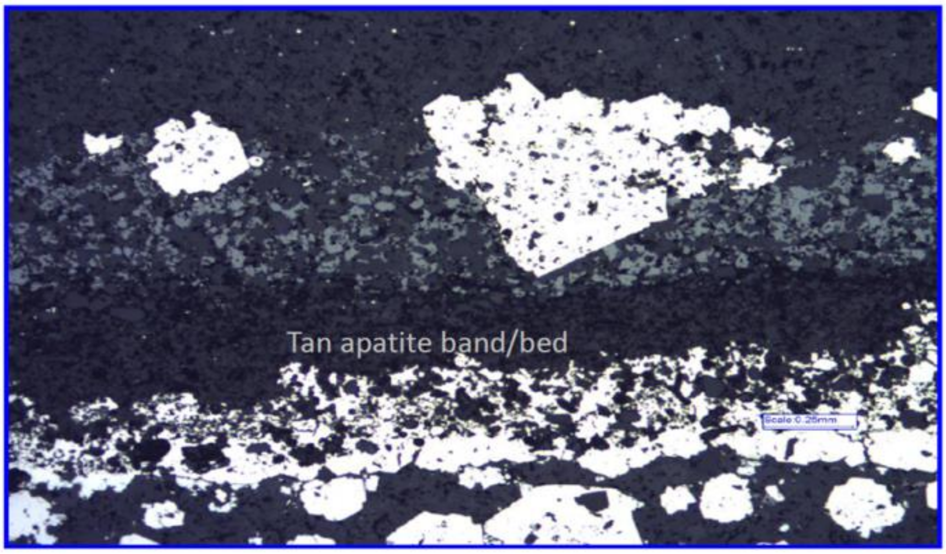

Figure 12. Typical grey Sp1 as bedding-parallel band adjacent to a thin bed of tan apatite in D1897065 (197.6 m). It occurs as inclusions in coarser porphyroblastic Py2 crystals and aggregates and thus pre-dates these.

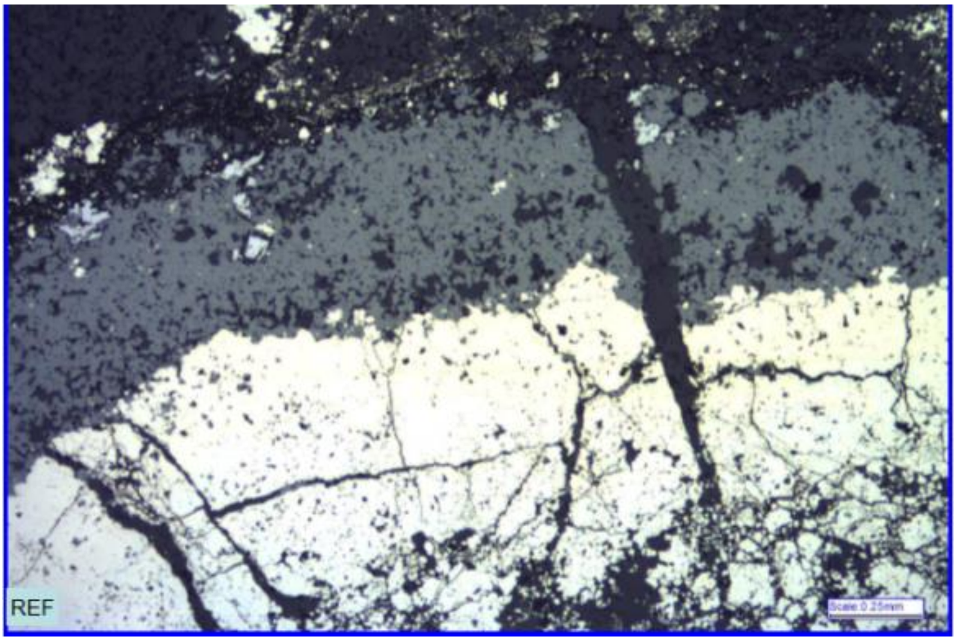

Figure 13. D1897064 (195.7 m): Sp2 overgrowing Py2. This thin section is of the rim of the large pyrite aggregate shown in Figure 6.

Interpretation and Comparison

Although data from a number of drillholes were examined to assist with interpreting the results of NB16DD018, the most instructive was PPD6 as it is the closest one and mapping indicates it lies within the same fault block. Surface mapping prior to drilling revealed the presence of a fault separating PPD20 from NB16DD018 and PPD6. This fault was inferred by a drastic change in bedding orientation (Figure 14). A northwest-southeast cross section between historical drillhole PPD6 and NB16DD018 is included as Figure 15. Simplified stratigraphy (excluding the Reward Dolostone) is plotted downhole with Caranbirini Member and Barney Creek Fm merged into a single unit.

The best mineralised interval in PPD6 was 6 m at 0.95% Zn from 86 m (including a maximum assay of 1m @ 1.3% Zn). In comparison, the best mineralised interval in NB16DD018 is 5.9 m @ 0.48% Zn from 195.1 m (including a maximum assay of 0.8 m @ 0.8% Zn). Thus, the best mineralised intervals in the two holes are of similar thickness but the grade in NB16DD018, 750 m to the north, is half that encountered in PPD6.

PPD6 also has a thicker zone of elevated Zn with over 32.5 m running > 1000 ppm Zn (over a true width of 31 m) whilst NB16DD018 intersected a 22.2 m thick interval (true width) running > 1000 ppm Zn. A further 1 km to the southeast, drillhole PP19 has similar Zn assay results to PPD6 with 6m @ 0.94% Zn from 100 m depth (consisting of three 2 m wide assay intervals) including a maximum of a 2m @ 1.2% Zn. Hence, it can be concluded that the mineralisation in NB16DD018 is decreasing in thickness and grade compared to PPD6 and PP19 to the south. The >500 ppm Zn and >1000 ppm Zn grade shells are plotted in the geological cross section in Figure 15 and illustrates that the mineralised interval thins to the north-northwest.

The relative thinning from southeast to northwest of the basinal and shelf facies observed between PPD6 and NB16DD018 seems to be mirrored regionally as well. Indeed, previous work done on the Berjaya and adjacent prospects suggests that the Barney Creek Fm and Reward Dolomite thicken to the east between BJ1, BJ4 and Boko3 (Winefield, *et al.* 1998)

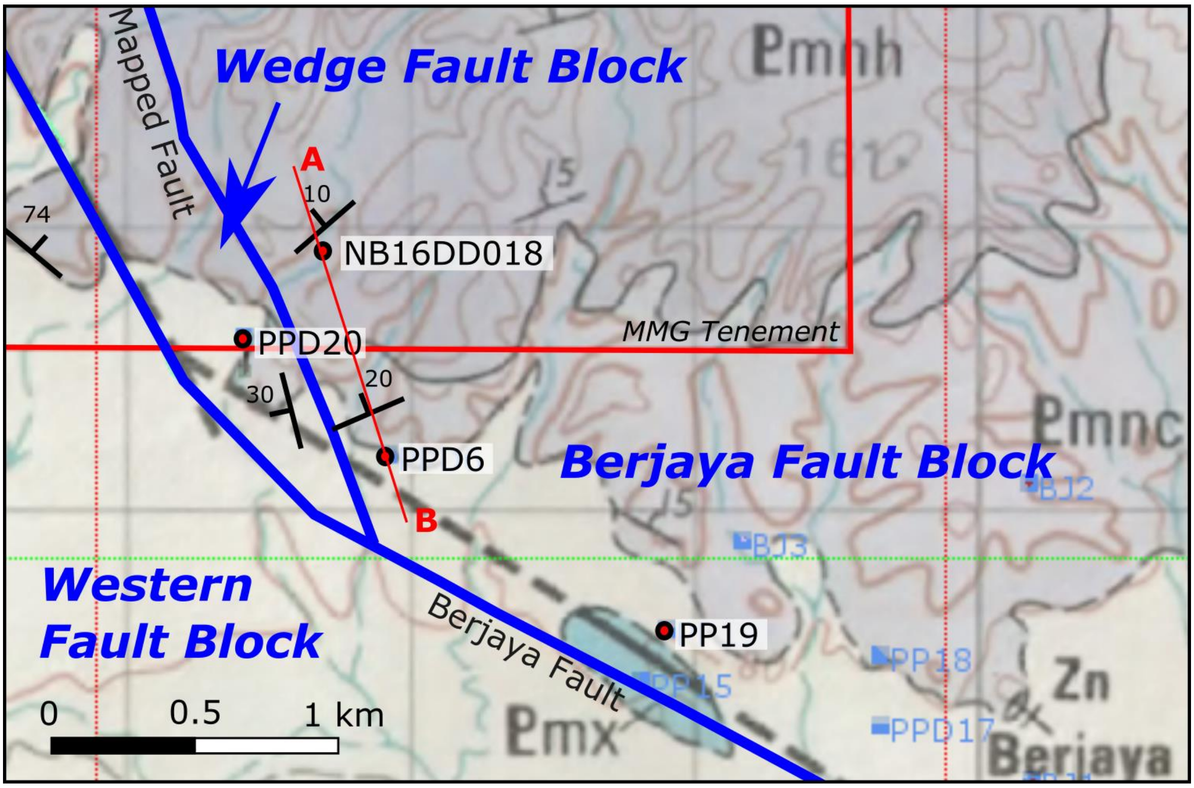

Figure 14. Fault-block model of Berjaya NW area based on field mapping.

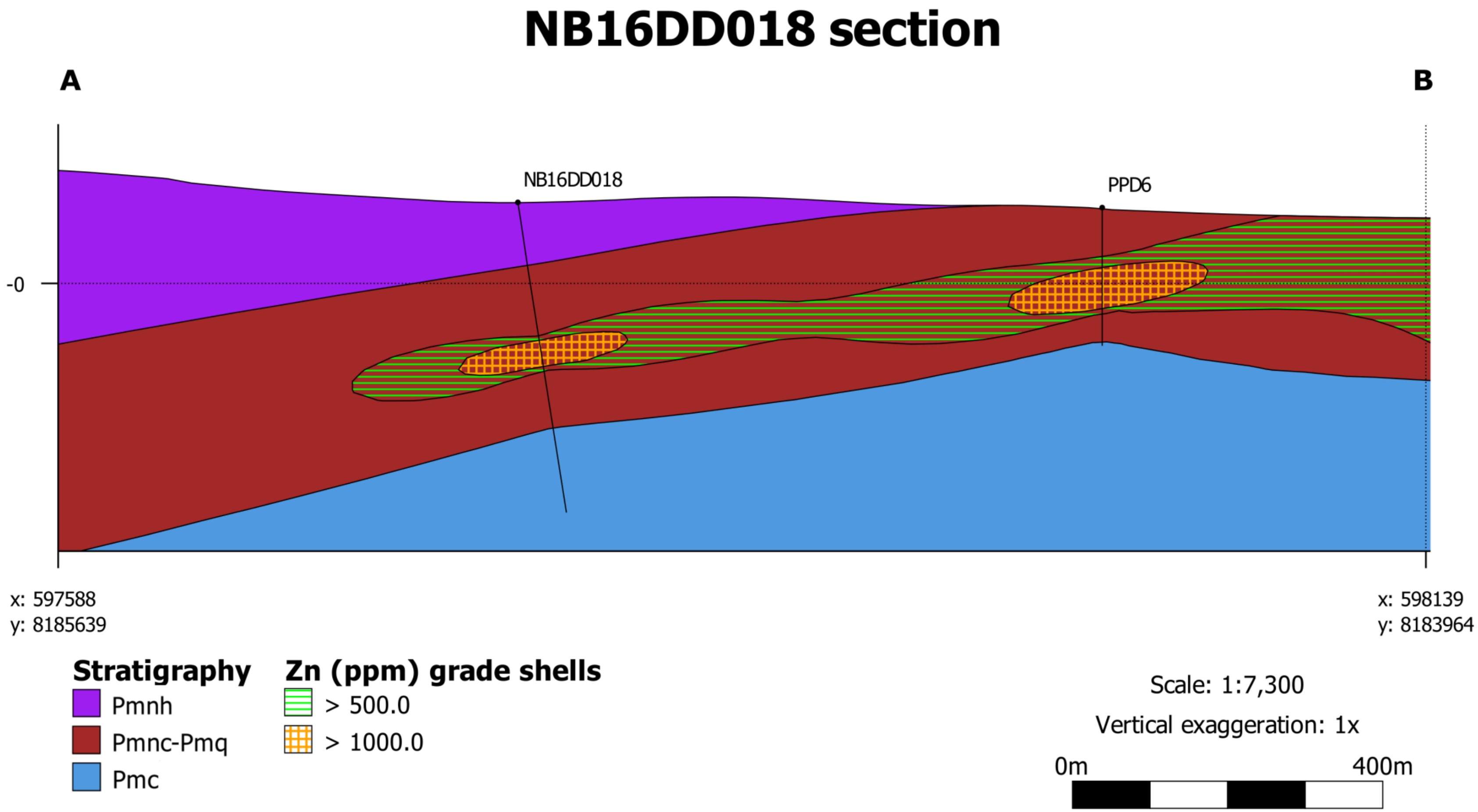

Figure 15. Geological cross section looking to the east-northeast (north is to the left). The cross-section trace A-B is plotted on Figure 2b and . The >500ppm Zn and >1000ppm Zn grade shells were created using Leapfrog Geo and were given a strong bedding-parallel bias by the modeller. Although their extents are very poorly constrained, they indicate the downhole Zn mineralised interval is thinning to the north-northwest.

CONCLUSION

NB16DD018 was drilled in September 2016 in the Berjaya Prospect on the northern extent of the "HYC camp" to test the open-ended northern extent of a known sub-economic mineralised trend in the Barney Creek Fm. The hole intersected the full sequence of the expected stratigraphy, i.e. the Hot Springs and Caranbirini members of the Lynott Fm, the Reward Dolomite, the Barney Creek Fm and the Teena Dolomite. Weak Zn mineralisation was intersected in the Barney Creek Fm between 187.3 and 213.6 m including 5.9 m @ 0.48 % Zn from 195.1 m. 3-D modelling that incorporates assays and lithology logs from historical drilling indicates that grades decrease to the north. It also shows that the thickness of the elevated Zn interval and the thickness of the prospective levels of stratigraphy (namely the Barney Creek Fm) both thin to the north relative to historical drilling. Furthermore, the facies encountered in the hole were turbiditic siltstone shelf facies rather than the basinal black shales that host mineralisation at HYC. On this basis, it is unlikely that MMG will plan further drilling to follow-up this prospect in North Batten JV tenements.

REFERENCES

Ahmad, M., Dunster, J. N. & Munson, T. J. 2010. 'Chapter 10: McArthur Basin' in *Geology and mineral resources of the Northern Territory*, Special Publication 5, NTGS 2013, pp.15:1-15:71

Pietsch, B. A., Wyche, S., Rawlings, D. J., Creaser, P M., Findhammer T. L. R. 1991. *'McArthur River Region, 1: 100 000 geological special'*

Winefield, Cooke, Bull & McGoldrick (1998) "Geology and geochemistry of the Berjaya Pb-Zn prospect, McArthur River region, NT" AMIRA/ARC Project P384A_07_Vol_1_December, pp.45-53

CR1997-0061. MIM Exploration Pty Ltd Technical Report No. 2567. Eighth Annual Report for Year Ended July 12, 1996

CR1983-0018. The Shell Company of Australia Ltd, Metals Division. Final Report EL 1203, Leila Yard, Northern Territory