



# ESSENTIAL METALS

for a sustainable future

## ASX Code: ESS

### Corporate Profile

Shares on issue: 200,817,300  
Cash: \$5.5m (30 Jun 2021)  
Debt: Nil

### KEY PROJECTS

**LITHIUM** Pioneer Dome

**GOLD** Golden Ridge

**GOLD** Juglah Dome

### Joint Ventures (ESS %)

1 x lithium project (51%)  
2 x nickel projects (20-25%)\*  
4 x gold projects (25-30%)\*  
\* Free carried to a decision to mine

### Corporate Directory

**Non-Executive Chairman**  
Craig McGown

**Non-Executive Directors**  
Paul Payne  
Warren Hallam

**Managing Director**  
Timothy Spencer

**CFO & Company Secretary**  
Carl Travaglini

**Exploration Manager**  
Andrew Dunn

### Investor Relations

Nicholas Read  
Read Corporate  
t: +61 8 9388 1474  
e: nicholas@readcorporate.com.au

ABN: 44 103 423 981

t: +61 8 9322 6974  
e: info@essmetals.com.au  
w: essmetals.com.au

Level 3, 46 Ord St,  
West Perth, WA 6005  
Australia  
PO Box 1787,  
West Perth, WA 6872  
Australia

21 July 2021

## JUNE 2021 QUARTERLY ACTIVITIES REPORT

Activities were focussed on completing drilling programmes at Golden Ridge and Juglah Dome and selecting Dome North lithium targets for a drill programme that commenced in July.

### HIGHLIGHTS

- **Pioneer Dome Lithium Project:** Geophysics reprocessing and assessment, target review and field checking, and drill target selection at Dome North were undertaken during the Quarter.
  - **Post-Quarter:** The drill programme commenced 19 July<sup>(1)</sup>.
- **Golden Ridge Gold Project:** First pass shallow air-core drilling at the AC75, Scandia and Maximus prospects was completed in May with assay results received in late June<sup>(2)</sup>. Best results included:
  - **Skandia:** 8m @ 1.01 g/t Au from 96m including 3m @ 2.45g/t Au (hole GRA0454); and
  - **Maximus:** 3m @ 3.0 g/t Au from 30m including 1m @ 6.07g/t Au (hole GRA0375); and
  - **AC75:** 12m @ 0.49 g/t Au from 51m including 3m @ 1.01 g/t Au (hole GRA0415)
- **Juglah Dome Gold Project:** Assay results from the March air-core drill programme were received. A further 700m of strike was added to the gold mineralised Gards porphyry into an area with thin alluvial cover and it remains open to the south. This is in addition to the 475m long zone of gold mineralisation defined during the December 2020 drill programme.<sup>(3)</sup>
- **Corporate:** Closing cash on hand as at 30 June: \$5.5 million.

(1) Refer ASX announcement "Dome North lithium drilling commences" dated 19 July 2021

(2) Refer ASX announcement "New gold zones at Golden Ridge" dated 8 July 2021

(3) Refer ASX announcement "Juglah Dome drilling outlines 1km strike at Gards" dated 17 May 2021

## PIONEER DOME LITHIUM PROJECT

The Pioneer Dome Project (ESS: 100%) is located in the core of Western Australia's lithium belt in the Eastern Goldfields, approximately 130km south of Kalgoorlie and 275km north of the Port of Esperance. A Mineral Resource of 11.2Mt @ 1.21% Li<sub>2</sub>O has been defined at Dome North in the northern area of the Project.

The southern Yilgarn area is recognised as well endowed with spodumene deposits, including the Bald Hill Mine, the Mt Marion Mine and the Buldania Project. The world-class Earl Grey deposit and the Mt Cattlin Mine are located further west and south, respectively.

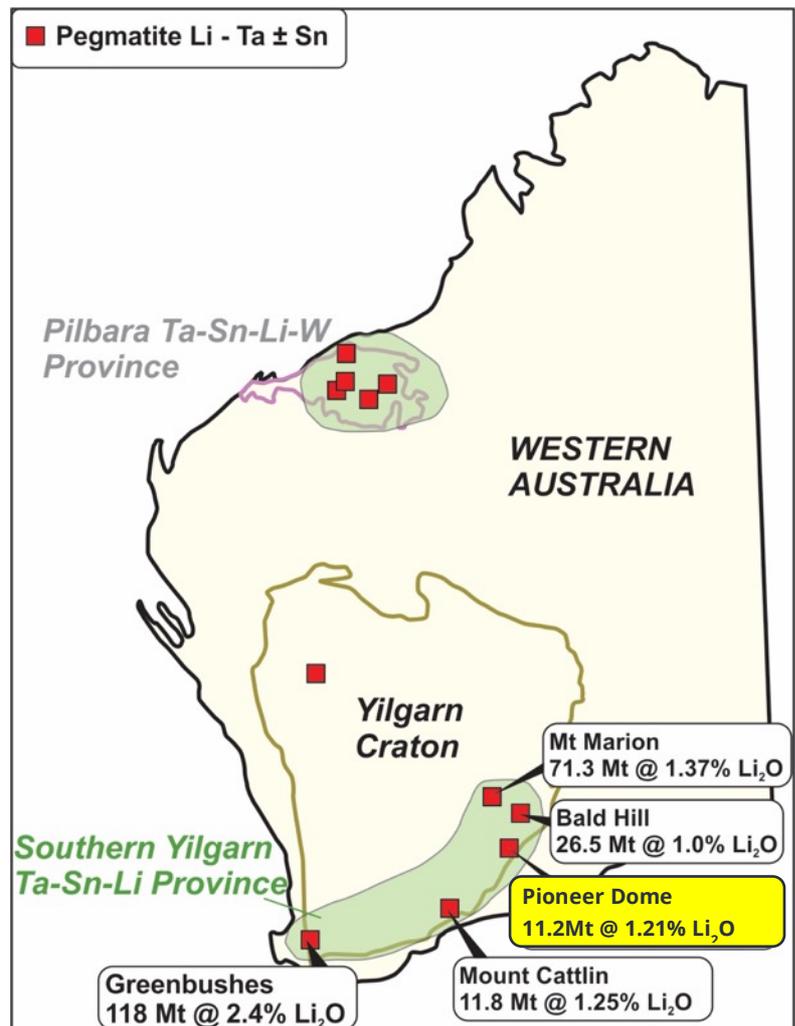


Figure 1 - The lithium deposits of the Southern Yilgarn Ta-Sn-Li Province in the context of pegmatite Li-Ta deposits of Western Australia. Modified from Skirrow et al, 2013. Mineral Resources quoted are sourced from Champion, 2018 (Mt Marion, Bald Hill, Mount Cattlin and Greenbushes).

Work undertaken during the Quarter focussed on increasing the understanding of the regional setting surrounding the Pioneer Dome Project. A deeper analysis of litho-geochemical classifications was undertaken to better constrain the geological interpretation to assist in identifying potential fertile intrusions and in planning an air-core drill programme targeting pegmatites in the vicinity of the Dome North Mineral Resource of 11Mt @ 1.21% lithium (Li<sub>2</sub>O).

### Reprocessing of Geophysical Surveys

Southern Geoscience Consultants (SGC) were engaged to reprocess the available government aerial magnetic and radiometric surveys covering from south of the Pioneer Dome Lithium Project to north of the Golden Ridge Gold Project (Figure 2). This was carried out to obtain a set of consistent images to help understand the response from the major Lithium projects within the area, namely Bald Hill, Buldania and Mt. Marion. This is assisting with the interpretation of the geology and structure within and surrounding the Pioneer Dome Project. A review of available geophysical



techniques to explore for obscured pegmatites was also conducted to ascertain which geophysical techniques could be suitable for use on the Project.

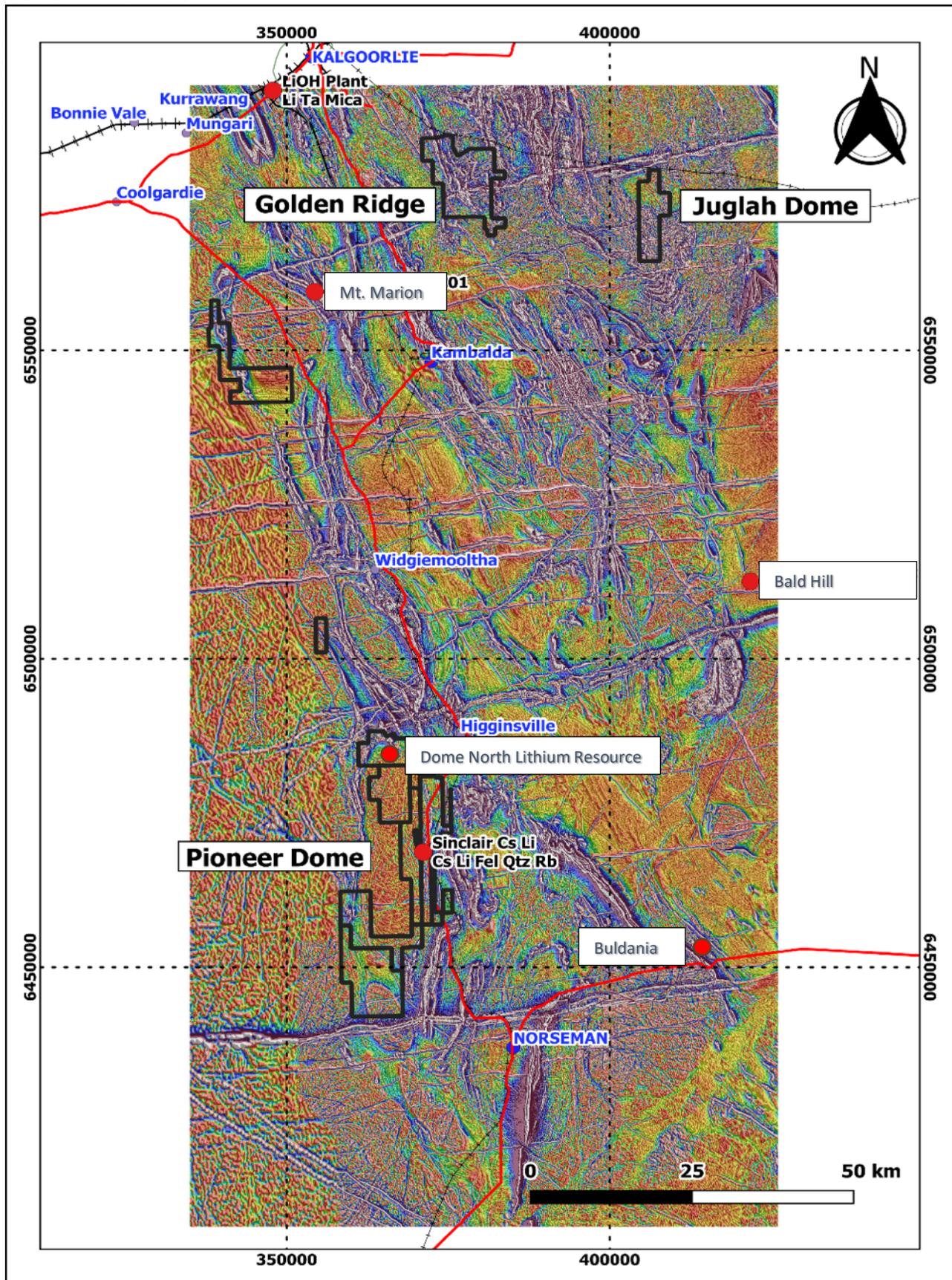


Figure 2 - Regional RTP 1VD with Speciality Metals type from Major Resource Projects layer.



## Lithochemical Classification

An extensive analysis was undertaken to distinguish lithologies within the Pioneer Dome Project based upon their geochemical signatures. Various immobile (e.g., Th, Cr) elements were used to define the population clusters whilst mobile elements (e.g., K, Rb, Li) were used to help understand fractionation on the defined intrusion populations.

Applied to the pegmatites identified at the Project thus far, this will provide a better understanding of which elements and element ratios are best suited to assess fractionation zonation and fertility in different sized pegmatite bodies.

It was also observed that a significant portion of the gneiss on the eastern side of the Pioneer Dome (Figure 3) lacks pXRF soil coverage.

This area is likely to be at higher metamorphic facies than the previously explored PEG001 to PEG009 pegmatite targets, located further to the east, where lithium minerals are dominated by petalite and lepidolite, indicating lower temperatures and pressures. The higher metamorphic grade of the gneiss may favour the formation of spodumene mineralisation.

Although the gneiss at Dome North as was previously considered a low priority area, it is noted that the Greenbushes pegmatites intrude in structures near the contact of the granofels (quartz-feldspar-biotite gneiss) and amphibolite. Consequently, the northern end of the gneiss at Dome North will now be tested, starting with a pXRF soil sampling programme that commenced towards the end of June.

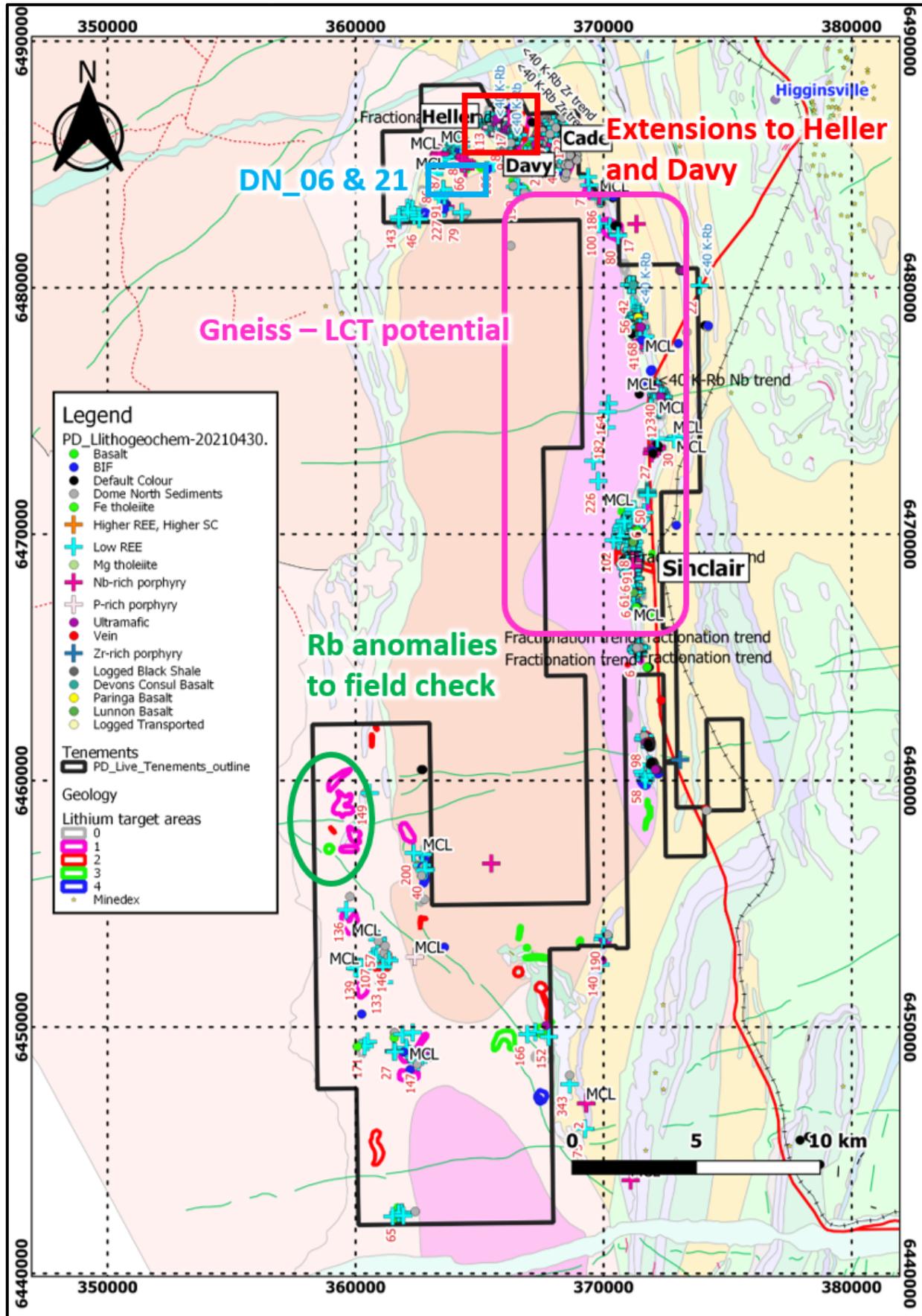


Figure 3 - LCT targets (coloured polygons as per legend), lithochemical classification (see legend), 100k interpreted geology and lesser explorer gneiss (magenta polygon).

## Dome North drill programme

During the Quarter, field and desktop work was completed to define areas with potential for the discovery of additional spodumene bearing pegmatites which could add to the currently defined Mineral Resource at Dome North.

A 5,000m drill programme, now using a slimline Reverse Circulation (RC) drill rig, has been designed to test those areas.

The drilling programme (that commenced on 19 July) will focus on the structural targets as well as follow up anomalism generated from previous exploration programmes. This includes drilling two poorly exposed targets (DN\_6 and DN\_21) south-west of the Heller Deposit (Figure 4).

Refer to ASX announcement "Dome North lithium drilling commences" dated 19 July 2021 for detailed information on the drilling programme.

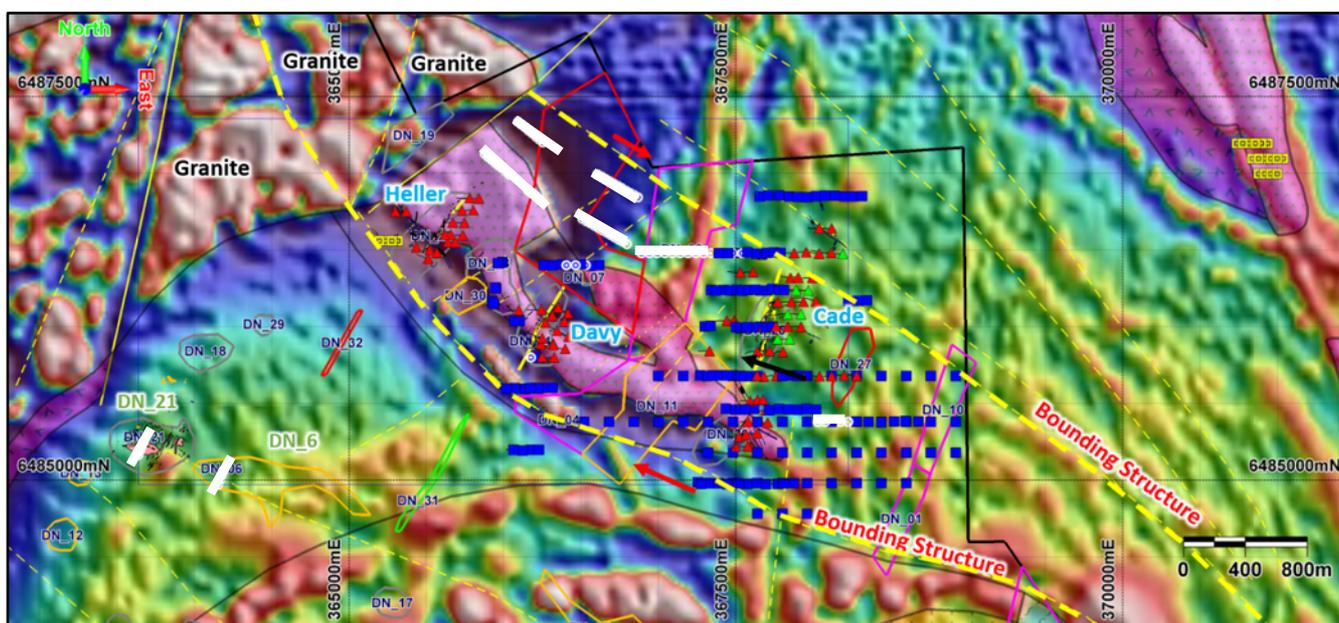


Figure 4 - Proposed drilling (white lines), RTP magnetic image, tenement outline (black polygon), interpreted structures (yellow lines), previous drilling and LCT targets (coloured and labelled polygons).

## Next Steps

- Drilling programme: Site preparation commenced on 19 July with the programme expected to complete by mid-August and assays are anticipated by end-September.
- Continuation of target generation and assessment.



## GOLDEN RIDGE GOLD PROJECT

### GOLDEN RIDGE GOLD PROJECT (ESS: 100% Au)

The Golden Ridge Project is located 20km southeast of Kalgoorlie and is highly prospective for gold and nickel mineralisation. The project lies within the well-endowed Menzies-Boorara Shear Zone that hosts the New Boddington, Paddington, Boorara and Golden Ridge Deposits (the latter two are owned by Horizon Minerals Limited – ASX:HRZ). Exploration at the Project by previous owners had identified multiple highly prospective gold and nickel targets.

During the Quarter, a first pass Air-Core (AC) drill programme was carried out to test three gold targets, Skandia, Maximus and AC75.

The three gold targets were identified to have coincident magnetic breaks, dislocations of lithological units and medium to large scale soil anomalies with potential to host >100koz. gold deposits. These targets were either previously not tested or were poorly tested.

Drilling was designed to determine the source of the soil anomalism to gain a greater understanding of the geology and to identify favourable features to support the presence of significant gold mineralisation.

The AC drill programme was completed in May with 92 holes drilled for a total of 6,080m. A breakdown of number of holes and metres drilled by prospect is shown in Table 1.

Summary results of the programme are included in following sections of this release. A more detailed description of the drill programme and results are contained the ASX announcement titled “New Gold Zones at Golden Ridge” dated 8 July 2021.

**Table 1 – Number of holes and total metres drilled by prospect**

<b>Prospect</b>	<b>No. holes drilled</b>	<b>Drill metres</b>
Skandia	25	1,712
Maximus	26	1,853
AC75	41	2,515
<b>Total</b>	<b>92</b>	<b>6,080</b>

## SKANDIA PROSPECT

AC drilling at the Skandia Prospect tested a 600m strike length of gold, arsenic and molybdenum in-soil anomalism that is coincident with favourable aeromagnetic features and minor outcropping feldspar-phyrlic porphyry lithologies.

Gold mineralisation was intersected and significant results from this drilling are listed below and shown in Figure 5:

- **8m @ 1.01 g/t Au** from 96m including 3m @ 2.45g/t Au (hole GRA0454); and
- **12m @ 0.50 g/t Au** from 60m (hole GRA0388)

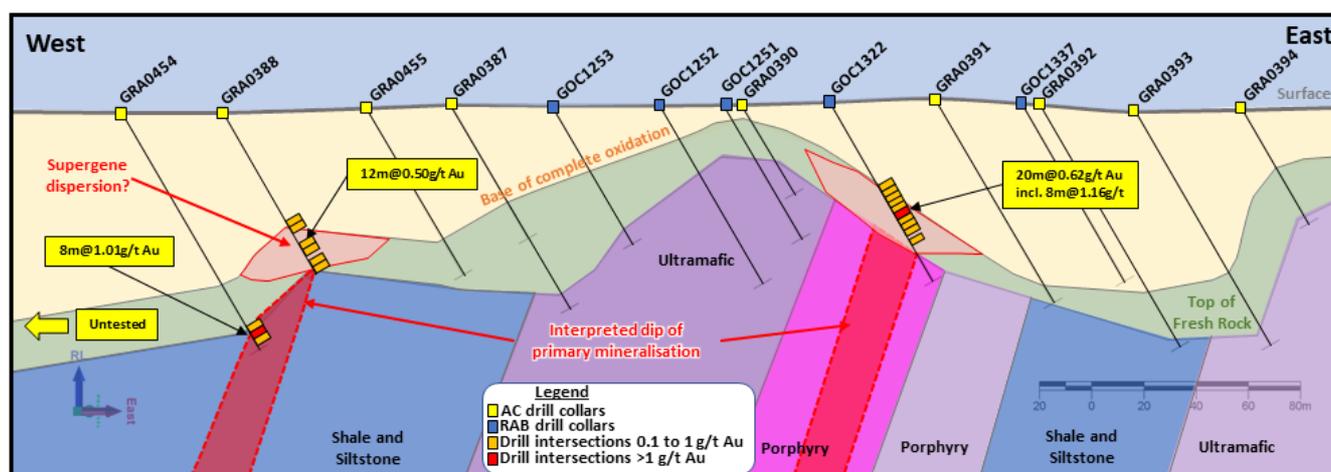


Figure 5 – Cross-section through the middle line of Skandia AC drilling with the interpreted mineralised primary structures, supergene dispersion and bedrock lithologies. Note: west of section are prospective untested sediments.

While the drilling did not intersect significant porphyry lithologies it highlighted a thick shale/siltstone sediment unit in between two ultramafic units with moderate quartz brecciation and sulphidation observed in EOH chips.

## MAXIMUS PROSPECT

AC drilling at the Maximus prospect tested a 600m strike length of interpreted north-west south-east trending structures in an area of coincident >20ppb Au-in-soils anomalism. Samples taken from mullock heaps of the old Maximus workings that are in the vicinity of GRA0369 returned gold values up to 14.89g/t Au (13 mullock samples returned an average of 1.68g/t Au). This mineralised zone is interpreted to be parallel to the Flying Ant trend.

The best AC drill results returned are as follows:

- **3m @ 3.0 g/t Au** from 30m including 1m @ 6.07g/t Au (hole GRA0375); and
- **5m @ 0.75 g/t Au** from 57m (hole GRA0369); and
- **3m @ 0.89 g/t Au** from 24m and 6m @ 0.17g/t Au (hole GRA0368)

## AC75 PROSPECT

AC drilling at the AC75 prospect tested a 650m long zone of north-south oriented, medium to large scale >20ppb Au gold-in-soil anomalism, in an area of minimal previous exploration activities.

Drilling intersected basalt and ultramafic lithologies with minor bands of chert and shale and the mineralisation intersected correlates with a roughly north-south oriented band of weakly brecciated shale and chert.

The best results of the program are as follows:

- **12m @ 0.49 g/t Au from 51m** including **3m @ 1.01 g/t Au** (hole GRA0415); and
- **9m @ 0.26 g/t Au** from 54m (hole GRA0451); and
- **6m @ 0.32 g/t Au** from 33m (hole GRA0449); and
- **6m @ 0.24 g/t Au** from 39m (hole GRA0413)

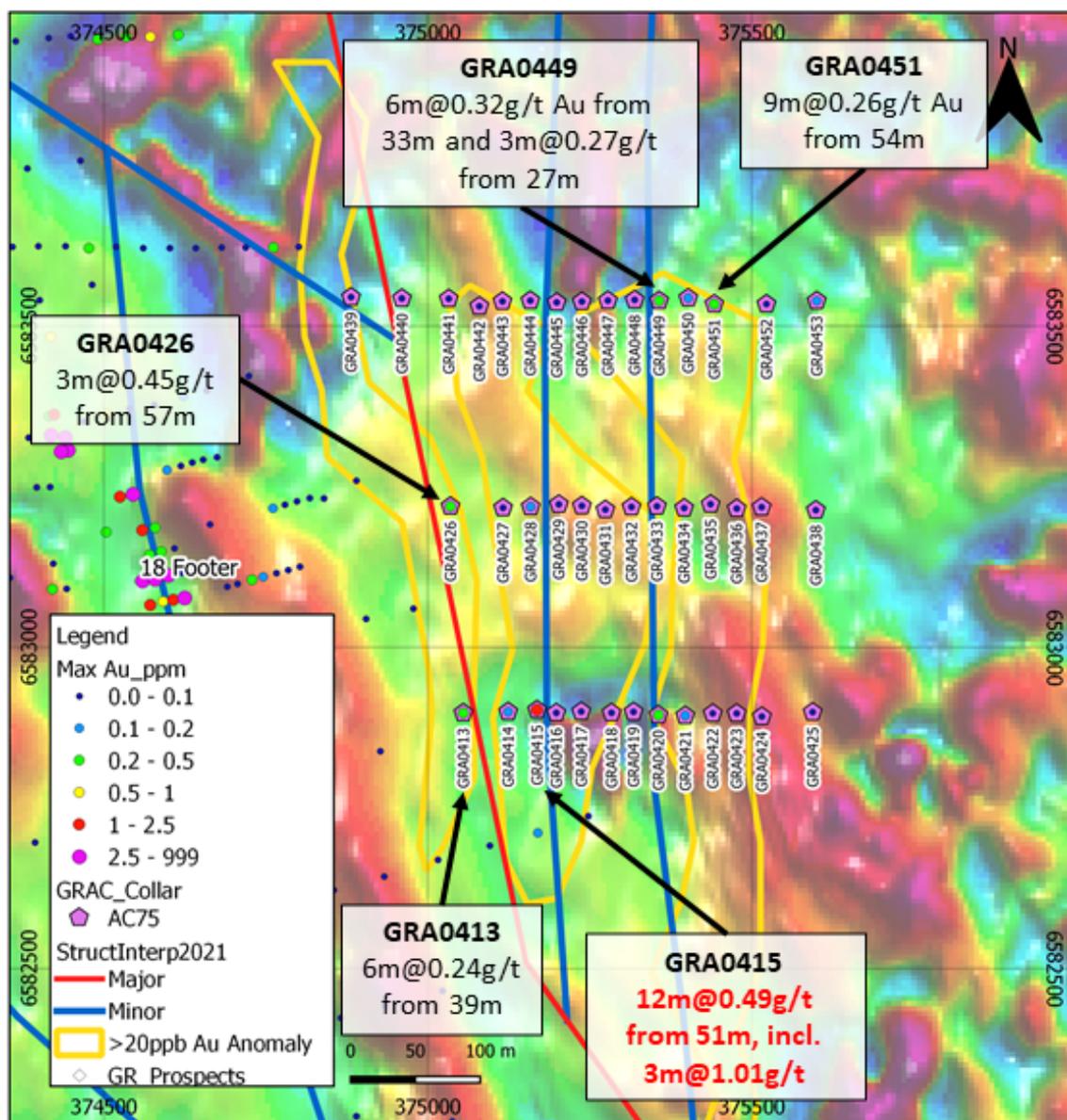


Figure 6 - Location of the AC75 AC drilling (pink pentagons), maximum Au (ppm) in drilling, area of >20ppb Au soil anomalism (yellow polygons) and interpreted structures from aeromagnetic (blue lines).



## NEXT STEPS

During the September Quarter the following steps will be undertaken with follow up and infill drilling expected to take place in the December quarter:

- Resample composite samples >0.1g/t Au for individual metre samples.
- Complete a detailed interpretation of the results and formulate the next phase of exploration.
- Infill soil programme over priority targets.
- Field checking and geological mapping of remaining priority gold targets.

## JUGLAH DOME GOLD PROJECT

The Juglah Dome Project (ESS: 100%) is located ~60km east-southeast of Kalgoorlie and is highly prospective for gold mineralisation. Exploration by previous owners identified multiple gold targets using soil geochemistry and drilling. The Project lies in a similar geological setting to the Majestic and Imperial Deposits, located 10km to the north-west, and the Daisy Complex to the west, which forms part of Silver Lake Resources Limited's Mt Monger Operations.

## GARDS PROSPECT

A total of 24 air-core (AC) holes totalling 420m were drilled to the south-east of the Gards gold strike (Figure 7). The aim of this drilling was to define the location of the felsic porphyry and extend the known mineralisation to the south-east of southern-most RC intersection of 8m @ 2.18g/t Au (20GDRC034) into an area of thin alluvial cover. The drilling successfully expanded the known extent of felsic porphyry that hosts the gold mineralisation at Gards by over 700m, and it remains open to the south-east.

Due to the hardness of the porphyry unit, the air-core holes could not penetrate more than 1 or 2m into the potentially mineralised zone. Assays at or close to bottom of hole have confirmed that the felsic porphyry is mineralised for at least 700m to the south-east of the previous RC drilling.

Results included:

- **4m @ 0.29g/t Au** from 17m (to EOH) in 21GSAC003
- **4m @ 0.22g/t Au** from 12m (to EOH) in 21GSAC004
- **2m @ 0.18g/t Au** from 15m (to EOH) in 21GSAC016
- **1m @ 0.15g/t Au** from 17m in 21GSAC024

With the trend of the mineralised porphyry now defined, follow-up RC drilling can now be planned to test the entire thickness of the intrusion. It is anticipated that thicker and potentially higher grade intersections will be returned from testing the full thickness of the porphyry unit.



### Next Steps

Interpretation and modelling of the results will be carried out. This will assist in determining the scope of future drill programmes, including Reverse Circulation (RC) drilling into the porphyry unit to determine the tenor and thickness of gold mineralisation as well as further testing of the strike potential where the mineralisation remains open and untested to the south.

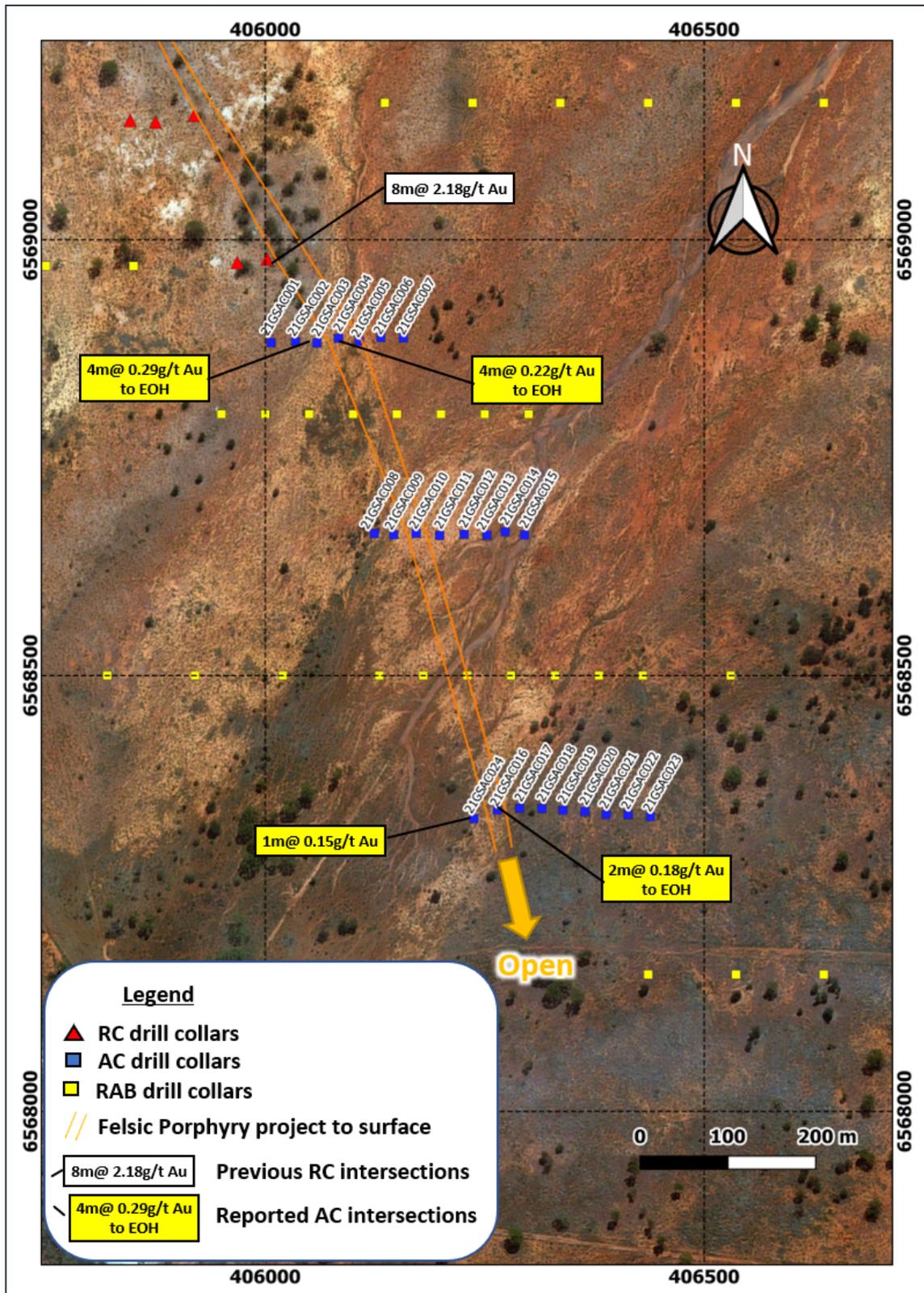


Figure 7 - Location of Gards South AC drilling with the interpreted mineralised felsic porphyry.



## JOINT VENTURE INTERESTS

Essential Metals has a portfolio of minority (20%-30%) free-carried interests in four gold and two nickel joint ventures located in Western Australia and holds a 51% interest in a lithium joint venture in Ontario, Canada.

The following notable activities were reported by the joint venture partners during the Quarter.

### Balagundi Gold/Base Metals Joint Venture Eastern Goldfields WA

**ESS 100% reducing to 25% - Black Cat Syndicate Limited (ASX: BC8) earning 75% (farm-in stage)**

Assays for the 3,600 auger samples collected in the March Quarter for multi-element analysis (aqua regia and pXRF) were received and reviewed.

Planning for an electromagnetic (EM) survey included refining the survey area to include prospective folded stratigraphy that has elevated copper (Cu) and lead (Pb) values from the soil sampling, as well as mapped gossans in proximity. The survey method selected is Moving Loop EM on 400m lines. This work is scheduled for the September Quarter.

### Acra Gold Joint Venture Eastern Goldfields WA

**ESS 25% - Northern Star Resources Limited (ASX:NST) 75%**

Activities were focussed on drilling at three prospects: Jubilee Gift, North Brilliant and Kalpini South.

Two diamond drill holes totalling 828m were drilled at Jubilee Gift with results as follows:

**Table 1 – Significant intercepts for Jubilee Gift prospect**

Hole ID	East (MGA)	North (MGA)	RL (MGA)	Dip (deg)	Azi (MGA)	Hole Depth (m)	From (m)	To (m)	DTH Width (m)	Grade g/t Au
JBDD21016	410918	6622228	338	-60	215	408	279.0	279.9	0.9	3.9
JBDD21017	410578	6622421	342	-60	215	420				NSI

At the North Brilliant prospect, 13 reverse circulation (RC) drill holes totalling 2,016m were drilled while at the Kalpini South prospect, six RC holes totalling 948m were drilled. All RC drilling assays are pending.

Drill hole information is included in Appendix 1 at the end of this Report.



**Wattle Dam Nickel Joint Venture (WDNJV)** Eastern Goldfields WA (nickel rights only)

***ESS 20% - Maximus Resources Limited (ASX: MXR) 80%***

JV Operator, Maximus Resources Limited (MXR), identified four high-priority Kambalda style komatiite-hosted nickel sulphide exploration targets through ongoing geological reviews. Three of the four targets, namely Highway, Central and Andrews Shaft West, are located on WDNJV ground with the fourth target, Hilditch, located a few hundred metres south but with the prospective geology striking into a WDNJV tenement (M15/1770).

MXR planned a Fixed Loop Electromagnetic Survey to be conducted at the Hilditch target, including onto WDNJV tenement M15/1770, which commenced in July.

Please refer to various ASX announcements released by Maximus Resources (ASX:MXR) during the Quarter for more detailed information on the above activities.

**Larkinville East Gold Joint Venture (ELGJV)** Eastern Goldfields WA

***ESS 25% - Maximus Resources Limited (ASX: MXR) 75%***

During the Quarter, JV Operator, Maximus Resources Limited (MXR) conducted a 1500m RC drill programme to test potential down-plunge extensions of previously reported thick high-grade gold intersections as part of the resource extension and infill programme to improve confidence of the mineral resource and to test areas of open mineralisation along strike and down-dip.

As at the date of this Quarterly Report, the results of the programme have not been released.

Please refer to various ASX announcements released by Maximus Resources (ASX:MXR) during the Quarter for more detailed information on the above activities.



## CORPORATE

As at 30 June 2021, the Company held **\$5.5 million in cash reserves** and had no debt.

No securities were issued during the Quarter.

The Company received 785,695 ordinary fully paid shares in Medallion Metals Limited (ASX:MM8) in June as consideration for termination of a gold royalty held by Essential Metals over several tenements held by Medallion Metals. On 30 June 2021, the share price of Medallion Metals closed at \$0.245 per share, valuing the issued shares at \$192,495.

During the quarter, the Company paid a total of A\$112,000 to related parties, comprising all directors of the Company (Managing Director salary, non-executive director fees and superannuation). (Appendix 5B, Item 6).

---

*This ASX release has been approved by the Board of Directors*

**For further information:**

Tim Spencer, Managing Director  
Essential Metals Limited  
T: +61 8 9322 6974  
E: tims@essmetals.com.au

**Investor Relations**

Nicholas Read  
Read Corporate  
T: +61 8 9388 1474  
E: nicholas@readcorporate.com.au

---

**References to ASX announcements:**

- 19 July 2021 - Dome North lithium drilling commences
- 8 July 2021 - New gold zones at Golden Ridge
- 17 May 2021 - Juglah Dome drilling outlines 1km strike at Gards
- 1 April 2021 - Gold focussed drilling commences
- 10 February 2021 - Encouraging drill results at Juglah Dome
- 9 February 2021 - Farmin-JV with nickel specialists at Blair – Golden Ridge
- 1 February 2021 – Pioneer Dome lithium update
- 6 July 2020 - Golden Ridge compelling gold targets

The Company confirms that it is not aware of any new information or data that materially affects the information included in the previous market announcements and that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed.



## ABOUT ESSENTIAL METALS LIMITED

Essential Metals is a well-funded and active explorer focused on key global demand-driven commodities, focussed on the creation of shareholder wealth through exploration and project development. The Company operates **three strategically located lithium and gold projects** in Western Australia.

### 100% OWNED AND MANAGED PROJECTS:

- **LITHIUM:** The **Pioneer Dome LCT Project** is highly prospective for lithium-caesium-tantalum (LCT) mineral systems and includes the **Dome North Lithium Mineral Resource** of 11.2 million tonnes @ 1.21% Li<sub>2</sub>O.
- **GOLD:** The **Juglah Dome Project** is located 60km east-southeast of Kalgoorlie and is considered to be highly prospective for gold and has potential for VHMS style polymetallic deposits.
- **GOLD:** The **Golden Ridge Project** is located ~20km SSE of Kalgoorlie, WA. Our activities are focussed on reappraising known prospects as well as identifying new areas within the large land tenure.

### JOINT VENTURE INTERESTS:

- **LITHIUM:** The Company holds a 51% Project interest in the **Mavis Lake** Project, Ontario, Canada where drilling has intersected spodumene.
- **GOLD:** The **Acra** Project is near Kalgoorlie. Northern Star Resources Limited (ASX:NST) has earned a 75% Project Interest and continues to fully fund exploration programmes until approval of a Mining Proposal by DMIRS is received with Essential Metals holding a 25% interest.
- **GOLD:** The **Kangan** Project is in the West Pilbara and part of a joint venture with Novo Resources Corp (TSXV:NVO) and Sumitomo Corporation (TYO:8053), who will jointly fund 100% of gold exploration programmes until a decision to mine is made, with Essential Metals holding a 30% interest.
- **GOLD:** The **Balagundi** Project is subject to a farmin & JV agreement where Black Cat Syndicate Limited (ASX:BC8) is earning a 75% interest in the Project located at Bulong, near Kalgoorlie. Black Cat will then fully fund gold exploration programmes until a decision to mine is made, with Essential Metals retaining a 25% interest.
- **GOLD:** The Company holds a 25% free-carried interest (gold only) in the **Larkinville** Project near Kambalda, WA, with Maximus Resources Ltd (ASX:MXR).
- **NICKEL:** The nickel mineral rights on the **Blair-Golden Ridge** Project, which includes the suspended Blair Nickel Sulphide Mine. are subject to a Farmin/Joint Venture with Crest Investment Group, a nickel exploration specialist which is earning up to a 75% interest. The Company will retain a 25% free-carried interest up to a decision to mine.
- **NICKEL:** The Company holds a 20% free-carried interest (nickel only) in the **Wattle Dam** project near Kambalda, WA, with Maximus Resources Ltd (ASX:MXR).



## **Forward Looking Statements**

This document may contain forward-looking statements which involve a number of risks and uncertainties. These forward looking statements are expressed in good faith and believed to have a reasonable basis. These statements reflect current expectations, intentions or strategies regarding the future and assumptions based on currently available information. Should one or more of the risks or uncertainties materialise, or should underlying assumptions prove incorrect, actual results may vary from the expectations, intentions and strategies described in this announcement. No obligation is assumed to update forward looking statements if these beliefs, opinions, and estimates should change or to reflect other future developments.

## **Exploration Work - Competent Person Statement**

Mr Andrew Dunn (MAIG), Exploration Manager who is employed full-time by Essential Metals Limited, compiled the technical aspects of this Report, other than pertaining to the Acra Gold Project Joint Venture. Mr Dunn is eligible to receive equity-based securities in Essential Metals Limited under the Company's employee incentive schemes. Mr Dunn is a member of the Australian Institute of Geoscientists and has sufficient experience that is relevant to this style of mineralization and type of deposit under consideration and to the activity that is being reported on to qualify as a Competent Person as defined in the 2012 edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves". Mr Dunn consents to the inclusion in the report of the matters in the form and context in which it appears.

## **Acra Gold Project Joint Venture - Exploration Work - Competent Person Statement**

The information in this announcement that relates to exploration results for the Acra Project Joint Venture is based on information compiled by Michael Mulroney, a Competent Person who is a Member of the Australasian Institute of Mining and Metallurgy and a full-time employee of Northern Star Resources Limited. Mr Mulroney has sufficient experience that is relevant to the styles of mineralisation and type of deposits under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves" for the Company's Acra Project Joint Venture. Mr Mulroney consents to the inclusion in this announcement of the matters based on this information in the form and context in which it appears.



## Appendix 1 – Acra Gold Project Joint Venture

The information in this Appendix 1 has been provided by Northern Star Resources Limited.

**Table 2 – DD drill hole information – Jubilee Gift prospect**

Hole ID	Tenement	East (MGA)	North (MGA)	RL (MGA)	Hole Type	Dip (deg)	Azimuth (MGA)	Depth (m)
JBDD21016	E28/1746	410917	6622227	338	DD	-60	215	408
JBDD21017	E28/1746	410578	6622421	342	DD	-60	215	420

**Table 3 – RC drill hole information – North Brilliant prospect**

Hole ID	Tenement	East (Local)	North (Local)	RL (Local)	Hole Type	Azimuth (Local)	Dip	Depth
NBRC20013	E27/438	398552	6637333	388	RC	205	60	198
NBRC20014	E27/438	398569	6637372	388	RC	205	60	204
NBRC20015	E27/438	398431	6637294	388	RC	205	60	120
NBRC20016	E27/438	398460	6637354	388	RC	205	60	150
NBRC20017	E27/438	398488	6637411	388	RC	205	60	174
NBRC20018	E27/438	398616	6637250	390	RC	205	60	114
NBRC20019	E27/438	398648	6637325	388	RC	205	60	156
NBRC20020	E27/438	398590	6637188	390	RC	205	60	90
NBRC20021	E27/438	398330	6637365	388	RC	205	60	120
NBRC20022	E27/438	398359	6637423	388	RC	205	60	90
NBRC20023	E27/438	398692	6637430	387	RC	205	60	210
NBRC20024	E27/438	398519	6637473	387	RC	205	60	180
NBRC20025	E27/438	398641	6637493	386	RC	205	60	210

**Table 4 – RC drill hole information – Kalpini South prospect**

Hole ID	Tenement	East (Local)	North (Local)	RL (Local)	Hole Type	Azimuth (Local)	Dip (deg)	Depth (m)
KSRC20016	E27/438	399163	6634912	368	RC	35	-60	240
KSRC20017	E27/438	399091	6635127	372	RC	215	-60	180
KSRC20018	E27/438	399056	6635076	371	RC	215	-60	126
KSRC20019	E27/438	399162	6635118	372	RC	215	-60	216
KSRC20020	E27/438	399021	6635138	372	RC	215	-60	90
KSRC20021	E27/438	398991	6635097	372	RC	215	-60	96



## JORC Table 1 (references to all NST drilling to date including AC, RC and diamond drilling are retained)

### Section 1: Sampling Techniques and Data

Criteria	JORC Code explanation	Commentary
Sampling Techniques	Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as downhole gamma sondes, or handheld XRF instruments, etc.). These examples should not be taken as limiting the broad meaning of sampling.	Sampling was completed using a combination of Aircore (AC), Reverse circulation (RC) and HQ Diamond Drilling (DD).
	Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.	RC samples were split using a rig-mounted cone splitter on 1m intervals to obtain a sample for assay. These 1m samples were submitted for assay within 24 hours.  AC samples were obtained using 4m scoop composites from piles of samples arranged in tens or twenties (metre by metre) on the drill site floor and homogenised, forming a single sample. Multi-element (ME) samples were also taken at end of hole and presented for ME analysis.
	Aspects of the determination of mineralisation that are Material to the Public Report. In cases where 'industry standard' work has been done this would be relatively simple (e.g. 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases, more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.	Diamond core was transferred to core trays for logging and sampling. Half core samples were nominated by the geologist from the HQ diamond core, generally being around one metre in length, but with a sample width ranging between approximately 30cm and 120cm as dictated by the geology. Sample lengths varied because drill core samples were allocated so as not to cross significant geological boundaries.  Samples were taken to Kalgoorlie laboratories for preparation by drying, crushing to <3mm, and pulverising the entire sample to <75µm. 300g Pulps splits were then dispatched to Perth laboratories for 50g Fire assay charge and AAS analysis.
Drilling techniques	Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc.).	Core was orientated using the Reflex ACT Core orientation system.  RC Drilling was completed using a 5.75" drill bit, downsized to 5.25" at depth.  AC drilling was completed using a blade bit and drilled to blade refusal where possible.
Drill sample recovery	Method of recording and assessing core and chip sample recoveries and results assessed.	Moisture content and sample recovery are recorded for each AC/RC sample.
	Measures were taken to maximise sample recovery and ensure representative nature of the samples.	For diamond drilling, the contractors adjust their rate of drilling and method if recovery issues arise. All recovery is recorded by the drillers on core blocks. This is checked and compared to the measurements of the core by the geological team. Any issues are communicated back to the drilling contractor.  RC drilling contractors adjust their drilling approach to specific conditions to maximise sample recovery. Moisture content and sample recovery are recorded for each RC sample. No recovery issues were identified during 2021 RC drilling.



Criteria	JORC Code explanation	Commentary
		<p>Recovery was poor at the very beginning of each hole, as is normal for this type of drilling in overburden.</p> <p>AC drilling contractors adjust their drilling approach to specific condition to maximise sample recovery. Moisture content and sample recovery are recorded for each 4m composite sample. No recovery issues were identified during the 2020 Exodus drilling, although some holes were abandoned before reaching blade refusal due to paleochannel sediment impeding penetration of the drill string.</p>
	Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.	No relationship has been observed between recovery and grade.
Logging	Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.	<p>All diamond core is logged for regolith, lithology, veining, alteration, mineralisation and structure. Structural measurements of specific features are also taken through oriented zones.</p> <p>RC sample chips are logged in 1m intervals. For the entire length of each hole. Regolith, Primary lithology, alteration, veining and mineralisation are all recorded.</p> <p>AC sample chips are logged in 1m intervals. For the entire length of each hole. Regolith, Primary lithology, alteration, veining and mineralisation are all recorded.</p>
	Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.	All logging is quantitative where possible and qualitative elsewhere.
	The total length and percentage of the relevant intersections logged.	In all instances, the entire drill hole is logged.
Sub-sampling techniques and sample preparation	If core, whether cut or sawn and whether quarter, half or all core taken.	All regolith diamond core is fully sampled down to a depth where the core has been deemed competent enough to be sawn. All fresh Diamond core is cut, and half the core is taken for sampling. The remaining half is stored for later use.
	If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry.	<p>All RC samples are split using a rig-mounted cone splitter to collect a 1m sample 3-4kg in size. Moisture content of the sample is recorded and noted if wet samples are obtained.</p> <p>All AC samples are hand-scooped 4m composite sample 3-4kg in size. Moisture content of the sample is recorded and noted if wet samples are obtained.</p>
	For all sample types, the nature, quality and appropriateness of the sample preparation technique.	<p>Samples submitted for analysis to Genalysis or MinAnalytical laboratories for sample preparation in Kalgoorlie and analysis in Perth.</p> <p>Sample preparation commences with sorting, checking and drying at less than 110°C to prevent sulphide breakdown. Samples are jaw crushed to a nominal 15mm particle size or smaller. If the sample is greater than 3kg a Boyd crusher with rotary splitter is used to reduce the sample size to less than 3kg (typically 1.5kg) at a nominal &lt;3mm particle size. The</p>



Criteria	JORC Code explanation	Commentary
		entire crushed sample (if less than 3kg) or sub-sample is then pulverised to 90% passing 75µm, using a bowl pulveriser. 300g Pulp subsamples are then taken with an aluminium scoop and stored in labelled pulp packets.
	Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.	Grind checks are performed at both the crushing stage(3mm) and pulverising stage (75µm), requiring 90% of material to pass through the relevant size.
	Measures were taken to ensure that the sampling is representative of the in-situ material collected, including for instance results for field duplicate/second-half sampling.	Field duplicates were taken for AC/RC samples at a rate of 1 in 50
	Whether sample sizes are appropriate to the grain size of the material being sampled.	Sample sizes are considered appropriate.
Quality of assay data and laboratory tests	The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.	A 50g Fire assay charge is used with a lead flux, dissolved in the furnace. The pill is totally digested by HCl and HNO <sub>3</sub> acids before Atomic absorption spectroscopy (AAS) determination for gold analysis.
	For geophysical tools, spectrometers, handheld XRF instruments, etc., the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.	No geophysical tools were used to determine any element concentrations.
	Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.	<p>Certified reference materials (CRMs) are inserted into the sample sequence randomly at a rate of 1 per 20 samples to ensure correct calibration. Any values outside of 3 standard deviations are re-assayed with a new CRM.</p> <p>Blanks are inserted into the sample sequence at a rate of 1 per 20 samples, this is random, except where high-grade mineralisation is expected. Here, a blank is inserted after the high-grade sample to test for contamination. Failures above 0.2g/t are followed up, and re-assayed. New pulps are prepared if failures remain.</p> <p>Field duplicates are taken for all AC/RC samples (1 in 50 samples). No Field duplicates are submitted for diamond core.</p>
Verification of sampling and assaying	The verification of significant intersections by either independent or alternative company personnel.	All significant intersections are verified by another Northern Star geologist during the drill hole validation process, and later by a Competent Person to be signed off.
	The use of twinned holes.	No twinned holes were drilled for this dataset.
	Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.	Geological logging is directly entered into an Acquire database. Assay files are received in CSV format and loaded directly into the database by the project's responsible geologist with an Acquire importer object.



Criteria	JORC Code explanation	Commentary
	Discuss any adjustment to assay data.	No adjustments are made to this assay data.
Location of data points	Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.	<p>A planned hole is pegged using a hand-held GPS by the geologist.</p> <p>The final collar is picked up after hole completion by Differential GPS in the MGA 94 Zone 51 grid.</p> <p>During drilling, single-shot surveys are taken every 30m as a minimum standard to ensure the hole remains close to design with a further survey taken at the end of hole. A continuous north-seeking gyro tool is used. A more detailed survey (i.e. more survey stations) is generally conducted upon completion of the hole. Results are uploaded to an online server, where they can be downloaded and imported into Northern Star's Acquire database. Downhole surveys are not taken for <b>aircore</b> drilling.</p>
	Specification of the grid system used.	Collar coordinates are recorded in MGA94 Zone 51.
	Quality and adequacy of topographic control.	The Differential GPS returns reliable elevation data with an appropriate level of precision for resource drilling.
Data spacing and distribution	Data spacing for reporting of Exploration Results.	Drillhole spacing is variable and dependent on the interpreted geometries of geology and mineralisation at individual prospects.
	Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.	Only exploration results are being reported.
	Whether sample compositing has been applied.	No compositing has been applied to these exploration results (accept AC samples that are already in 4m composites), although composite intersections are reported.
Orientation of data in relation to geological structure	Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.	<p>All drilling was oriented as close to perpendicular as practicable to the interpretation of mineralisation orientation.</p> <p>Aircore drilling is vertical in most cases but inclined in areas where the orientation of mineralisation can reliably be predicted (inclined aircore drilling has not yet been used on the Acra JV ground).</p>
	If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.	No sampling bias is considered to have been introduced by the drilling orientation.
Sample security	The measures taken to ensure sample security.	Prior to laboratory submission samples are stored by Northern Star Resources in a secure yard or in a locked and enclosed trailer on site. Samples are transported to the laboratory within 24 hours where they are stored in a secure



Criteria	JORC Code explanation	Commentary
		fenced compound and tracked through their chain of custody and via audit trails.
Audits or reviews	The results of any audits or reviews of sampling techniques and data.	No such exercise has been undertaken for the drilling at this stage.

## Section 2: Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.	All drill holes mentioned in this report are located within tenements E27/579 & E28/1746. These tenements are part of a joint venture between Pioneer Resources ASX: PIO (80%) and Northern Star Resources ASX: NST (20%). Northern Star Resources have the option of earning a further 55% interest (total 75% interest) in the project by sole funding \$3 million of exploration expenditure within 3 years. On the 21st of February 2019, notice was sent to Pioneer that the expenditure threshold has been reached to complete the earning of an additional 55% interest in the Acra JV Tenements, with new JV tenement equity of NST (75%) and PIO (25%). Following the formation of the Joint Venture (JV) Pioneer will continue to be free carried up until the JV secures a DMP approval for a future Mining Proposal. When a Mining Proposal is approved, Pioneer may either contribute pro-rata to future expenditure or sell its 25% JV interest at a fair market value to Northern Star Resources for cash or NST shares at Pioneer's election. The tenements are located approximately 60km NE of Kalgoorlie WA.
	The security of the tenure held at the time of reporting along with any known impediments to obtaining a license to operate in the area.	No known impediments exist, and the tenements are in good standing
Exploration done by other parties	Acknowledgement and appraisal of exploration by other parties.	The prospects referred to in this report are targets generated by NSR based on work previously undertaken by Pioneer Resources from geological field mapping coincident with historic workings that have hardly been tested in this area of drilling by Pioneer Resources.
Geology	Deposit type, geological setting and style of mineralisation.	Mineralisation styles at Acra are typical of Eastern Goldfields-style shear hosted gold deposits. Mineralisation at all three prospects is believed to be associated with the crustal-scale structural corridor – the Emu Fault. The bulk of gold mineralisation occurring along the Emu Fault typically occurs



Criteria	JORC Code explanation	Commentary
		as brecciated, coarse crystalline vein containing quartz-carbonate ± pyrite ± pyrrhotite ± arsenopyrite ± gold.
Drill hole information	<p>A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:</p> <ul style="list-style-type: none"> <li>○ easting and northing of the drill hole collar</li> <li>○ elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar</li> <li>○ dip and azimuth of the hole</li> <li>○ downhole length and interception depth               <ul style="list-style-type: none"> <li>▪ hole length.</li> </ul> </li> </ul>	All holes in this programme are tabulated in the main body of the report.
	<p>If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.</p>	<p>All drill holes are reported in the body of this reported regardless of the results returned.</p> <p>Exclusion of the drill information will not detract from the understanding of the report.</p>
Data aggregation methods	<p>In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.</p>	<p>All reported assay results have been length weighted to provide an intersection width. Barren material between mineralised samples has been permitted in the calculation of these widths where the resultant average composite grade of samples beyond (and not including) the core mineralised zone exceeds the cut-off grade used for intercept calculation.</p>
	<p>Where aggregate intercepts incorporate short lengths of high-grade results and longer lengths of low-grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.</p>	<p>No assay results have been top cut for the purpose of this report. Unless otherwise stated, a lower cut-off of 1g/t has been used to identify significant results. Where the target zone does not exceed the 1 g/t cut-off the intercept has been calculated across the target structure with no cut-off grade applied. For early-stage exploration drilling (e.g. regional aircore), lower cut off grades are appropriate in reporting significant results and the cut off grades used are stated in these cases.</p>
	<p>The assumptions used for any reporting of metal equivalent values should be clearly stated.</p>	<p>No metal equivalent values have been used for the reporting of these exploration results</p>
Relationship between mineralisation widths and intercept lengths	<p>These relationships are particularly important in the reporting of Exploration Results.</p>	
	<p>If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.</p>	<p>Downhole lengths have been reported and are not an indication of true width.</p>
	<p>If it is not known and only the downhole lengths are reported, there should be a clear statement to this effect (e.g. 'downhole length, true width not known').</p>	<p>Downhole widths have been clearly specified when used. True widths have not been used.</p>



Criteria	JORC Code explanation	Commentary
Diagrams	Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported. These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.	Appropriate plans and/or sections have been included in the body of this report.
Balanced reporting	Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practised to avoid misleading reporting of Exploration Results.	Both high and low grades have been reported accurately, clearly identified with the drill hole attributes and 'From' and 'To' depths.
Other substantive exploration data	Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.	All material exploration data has been reported within the report body.
Further work	The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling).	Further planned work is referenced in the report body.
	Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	Appropriate diagrams are included in the body of this report.