BlackEarth Minerals NL
ASX:BEM

17 July 2019

ASX Announcement

Maniry Graphite Project Development Update

- **Madagascan department of mines (BCMM) offers support to BEM to fast track Maniry following a meeting in June 2019 with the Minister of Mines and Strategic Resources**
- **Optimisation work on spheroidization by Dorfner ANZAPLAN on Maniry graphite concentrate due to be completed by early August**
- **Metallurgical tests undertaken by BGRIMM (China) independently confirm ALS (Perth) pilot results**
- **Positive preliminary offtake discussions held with major Chinese buyers**

BlackEarth Minerals NL (**ASX: BEM**) ("**BlackEarth**", the "**Company**") is pleased to announce a feasibility study update, in relation to the development of its Maniry Graphite Project located in southern Madagascar (the "**Project**").

The Company recently had the opportunity to hold strategic discussions with the [Madagascan] Minister of Mines and Strategic Resources, Mr Fidiniavo Ravokatra. Discussions centred around a number of key elements including:

- The Company's current development schedule and expenditures incurred to date on the Project;
- Estimated personnel needs both during construction and in operations;
- BlackEarth's social and community activities to date, including its assistance in furnishing a number of classrooms in the immediate area and financial support, together with Australian Doctors for Africa (ADFA), for the development of a specialised medical clinic in the region;
- Environmental management plans; and
- BEM's plans for the development of the Project.

Understanding the Company's plans, the Minister has offered his full support given the strategic value that the project holds in one of the poorest parts of the country.

Minister, Mr Fidiniavo Ravokatra meets with BEM Managing Director, Tom Revy

Dorfner ANZAPLAN (Germany) recently commenced a detailed program for product (concentrate) battery testing. The test work will target the optimised conditions for producing a spherical graphite product from a flake graphite flotation concentrate, for use in the battery industry. The comprehensive program will determine optimum conditions for the:

- Spheroidization of flake graphite concentrate
- Purification of spherical graphite
- Production of pouch cells and electrochemical characterization

The program is expected to take a number of months with phase 1 results, spheroidization of BEM concentrate, to be completed in early August 2019. Results will be released to the market once and are seen as critical, in terms of BEM's current off-take discussions. This test work follows the recently completed successful expandability program completed and announced to the market last month (refer to ASX release 4 June 2019 "Test results deliver high value expandable graphite specification").

Metallurgical results have been received from Beijing General Research Institute for Mining and Metallurgy (BGRIMM) who undertook metallurgical test work on a sample of Maniry ore. The ore sample was part of ore feed to the Company's soon to be completed second pilot run being undertaken at ALS (Perth), details of which are set out in table 1 appended to this announcement. The results from the high-level test work undertaken by BGRIMM confirmed the detailed metallurgical work undertaken by ALS (Perth) and Battery Limits Pty Ltd in the first pilot run and first reported in the announcement entitled "Definitive Metallurgical Test Work Confirms High Grade, Large Flake Concentrate" dated 10 December 2018. Key statements by BGRIMM included:

- "The graphite ore owned by BlackEarth Minerals NL contains a high distribution ratio of large flakes";

- "We obtained a very high concentrate yield of large graphite flakes and a high recovery of graphite from the tests"; and

- "The fixed carbon content has already reached a high level, and it can even be further improved through optimizing processing and technical parameters".

BEM jumbo flake produced by BGRIMM (China)

Flake Size	(microns)	Mesh	Composite	
			Mass (%)	TGC (%)
Large - Super Jumbo	180-500+	80-38	41.5	92
Medium	150-180	100-80	14.2	94
Small	75-150	200-100	28.5	94
Fine	<75	-100	15.8	93

BGRIMM preliminary graphite flake grade and distribution results

The Company has recently met with a number of potential off-take parties. BEM has, since listing the Company, ensured that it has pursued a rigorous and auditable qualification plan as part of its fast track strategy. Thorough technical investigations undertaken by suitably qualified personnel who understand the needs of prospective buyers prepared the Company for positive initial meetings with potential end-users held last month. As part of the current pilot work, screened concentrate samples will be sent to interested parties by late August 2019 for testing. These include those directly operating in the battery, refractory and expandable markets.

CONTACTS

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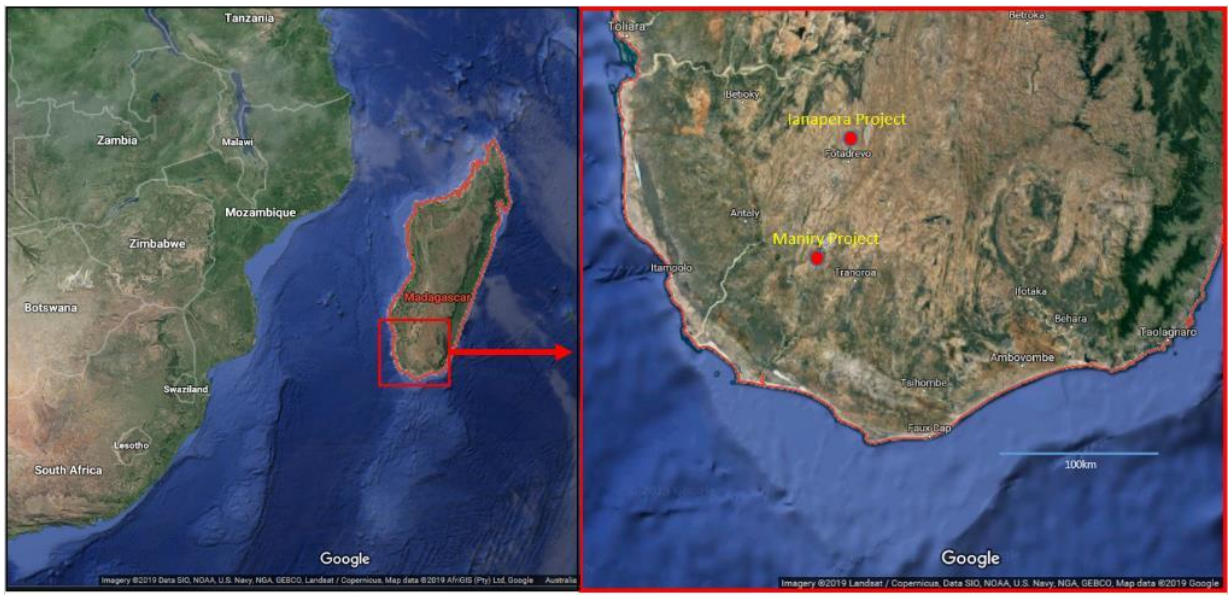
BlackEarth encourages investors to update their contact details to stay up to date with Company news and announcements here: http://www.blackearthminerals.com.au/update-details/

Competent Persons Statement

The information in this document that relates to metallurgical test work results derived from the Company's second pilot program and reported by BGRIMM is based on information reviewed by Mr David Pass, who is a Member of the Australasian Institute of Mining and Metallurgy. Mr Pass is an employee of BatteryLimits. Mr Pass has sufficient experience relevant to the mineralogy and type of deposit under consideration and the typical beneficiation thereof to qualify as a Competent Person as defined by the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC Code, 2012 Edition). Mr Pass consents to the inclusion in the report of the matters based on the reviewed information in the form and context in which it appears.

About BlackEarth Minerals NL

BlackEarth Minerals NL (ASX:BEM) is an ASX listed company focussed primarily on the development of its 100% owned Madagascan Maniry and Ianapera graphite projects.



The location of the Company's primary graphite projects: Madagascar (Maniry & Ianapera - above)

The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement for the scoping study results (ASX Announcement dated 30th January 2019 – "Positive Scoping Study Results for the Maniry Graphite Project"; and that all material assumptions and technical parameters underpinning the estimates of forecast financial information derived from a production target as outlined below continue to apply and have not materially changed.

Project Life	10 Years
NPV @ 10% pre-tax	US$ 103M
IRR pre-tax	42%
Project CAPEX Stage 1	US$ 41M (500ktpa ore)
Project CAPEX Stage 2	US$ 29M (1Mtpa ore)
Payback for Stages 1 & 2	3.7 years (Stage 1 - Only 2.7 years)
Annual graphite production	Av 30ktpa (Stage 1 – Years 1-3) Av 60ktpa (Stage 2 – Years 4+)

Project	Deposit	Tonnes (Mt)	TGC Grade (%)	Contained Tonnes (t)
Maniry	Razafy - Indicated	8	7.22	677,600
	Razafy - Inferred	3.2	6.8	217,600
	Razafy -Total	**11.2**	**7.1**	**795,200**
	Haja - Inferred	9	5.79	521,100
	Haja Total	**9**	**5.79**	**521,100**
	Total Resources	**20.2**	**6.51**	**1,316,300**

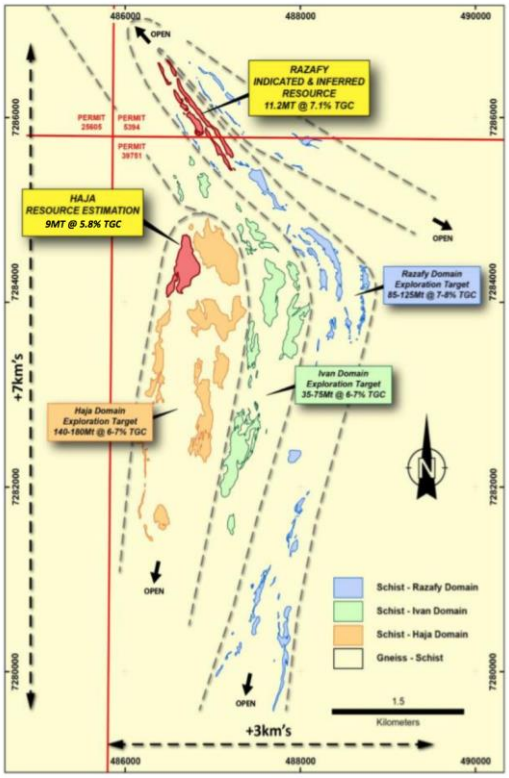
Razafy – Resources reported at 6% TGC with cut off constraining wireframe solids defined at a nominal 3% cut off grade

Haja – Resources reported at 5% TGC cut off with cut off constraining wireframe solids defined at a nominal 1.5% cut off grade

For Razafy CP statement refer to ASX release 14 August 2018 – "Update to Razafy Resources Estimation"

For Haja CP statement refer to ASX release 27th December 2018 – "Maiden Resource " Estimation for Haja"

For Maniry Exploration Target refer to ASX release 14 August 2018 – "Update Maniry Exploration Target"



Maniry Graphite Project – Overview
For Maniry exploration target refer to ASX release 14 August 2018 "Update Maniry Exploration Target"

JORC Code, 2012 Edition – Table 1

Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	Commentary
Sampling techniques	**Drilling** • the drillhole database only consist of diamond drillholes • sampling consists of 2m composite samples of quarter core with breaks at lithological discontinuities - typical 3-5Kg • samples are cut using a diamond blade core saw • duplicate samples are collected every 20th sample for QAQC purposes • standards (CRMs) are inserted every 20th sample for QAQC purposes • sampling is considered to be comprehensive and representative • quarter cores are sent for analysis, the remaining core material is retained and stored in BEM's secure coreshed • metallurgical samples were obtained from diamond drilling using ½ cores. A split of crushed sample was used for metallurgical test work **Trenching** • trenches are dug perpendicular to the strike of mineralised units with a JCB backhoe loader • trained geologists log and systematically sample the trenches using a rock hammer at 2m intervals • CRMs are inserted ~every 20th samples for QAQC purposes •
Drilling techniques	• diamond drilling only • core size is HQ and NQ typically in 0.5-1.5m runs • core from a select number of drillholes are orientated
Drill sample recovery	• core recovery is routinely recorded every metre by trained geologists • no bias or relationship has been observed between recovery and grade • recovery is typically +80% within weathered rock, and +95% in fresh rock
Logging	**Drilling** • all drillholes are logged by qualified and experienced geologists • logging includes descriptions of geotechnical, mineralisation, structural and lithological aspects of the core and is digitally recorded using an industry standard code system • cores are systematically photographed • the data collected offers sufficient detail for the purpose of interpretation and further studies **Trenching** • all trenches are logged by qualified and experienced geologists • logging includes descriptions of mineralisation, structural and lithological aspects of the encountered rocks and is digitally recorded using an industry standard code system • the data collected offers sufficient detail for the purpose of interpretation and further studies
Sub-sampling techniques and sample preparation	**Drilling** • quarter cores are cut using a diamond core saw and collected for assay • 2 metre composite sampling is deemed to be comprehensive and representative for the style/type of mineralisation under investigation • duplicate samples are taken (remaining quarter core) every 20th sample • sample preparation from quarter core to pulp is undertaken at BEM's sample preparation facility in Antananarivo (former Intertek-Genalysis facility)

Criteria	Commentary
	Trenching • the base of the trench is chipped to obtain a representative sample over 2m intervals. Although the sampling technique is not ideal, the technique is deemed satisfactory for this exploratory phase of work • QAQC measured are deemed satisfactory for this type of sampling and exploratory phase of work • the sample size (3kg) is deemed satisfactory to the grain size of the material being sampled • sample preparation from 3Kg chip sample to pulp is undertaken at BEM's sample preparation facility in Antananarivo
Quality of assay data and laboratory tests	• assaying is undertaken by Intertek Genalysis in Perth (Aus) • samples are pulverised to 75 microns, roasted to 420^{o}C and digested with a weak acid. Final analysis is undertaken by CS analyser (Code: C73/CSA) • standards and duplicates (duplicates only for core, not for trench samples) are inserted every 20th sample by the BEM technical team in addition to the internal QAQC from the laboratory. No issues been observed with QAQC • metallurgical work was undertaken by BGRIMM technology group China managed by BatteryLimits Pty Ltd
Verification of sampling and assaying	• significant intersections have been verified by alternative company personnel • no twin holes have been completed • all data is recorded digitally using a standard logging system and files are stored in an industry standard database
Location of data points	**Drilling** • Razafy: all collars have been located using a DGPS (accurate to 1cm) Projection and grid systems used: UTM (WGS84 Z38S). The down hole azimuth and dip is recorded using a Magshot down hole instrument (accurate to 1deg) • Haja: topography and collar survey data is based on measurements taken on GPS handheld device **Trenching** • all XYZ surveying is collected using a handheld Garmin GPS accurate to ±4m • Projection and Grid system used: UTM (WGS84) Z38S
Data spacing and distribution	**Drilling** • the drillhole grid spacing is 100m along strike by 30m across strike at Razafy, and 50m across strike at Haja • the drillhole spacing allowed to follow the graphitic mineralisation outlines from section to section and down dip • samples have been composited to 2m length within the mineralised lenses interpreted to complete the statistical analysis, variography and estimation **Trenching** • the geologist in charge of the program systematically samples all visible mineralised units as well as the lithologies either side of these • this data is not thought to be appropriate for resource estimation purposes • no sample compositing has been applied.
Orientation of data in relation to geological structure	**Drilling** • the drilling grid matches the strike of the orebody • the orientation of the drilling is not expected to introduce sampling bias as drillholes intersect the mineralisation at a sufficient angle to the dip of the orebody, in addition, the mineralisation envelopes are interpreted in three-dimensions

Criteria	Commentary
	Trenching • the trenches are oriented perpendicular to the perceived orientation of the outcropping mineralisation, but since sampling is two-dimensional and not perpendicular to the dip of mineralisation, reported intercepts will be wider than the true width of the mineralised unit
Sample security	**Drilling** • samples are cut and sampled on site before being transported to BEM's sample preparation facility in Antananarivo • sample pulps are freighted by plane to Intertek Genalysis in Perth (Aus) for assaying • the remaining core samples are kept in a secure facility adjacent to BEM's offices in Antananarivo **Trenching** • samples are packaged and stored in secure storage from time of gathering to sample preparation
Audits or reviews	• sampling procedures has been reviewed by external auditors Sigma Blue Pty. Ltd. and OMNI GeoX Pty. Ltd, with site visits at the beginning of the programmes

Section 2 Reporting of Exploration Results

(Criteria listed in section 1 also apply to this section.)

Criteria	Commentary
Mineral tenement and land tenure status	• work was undertaken upon permits 5391, 5393, 5394, 25094, 25605, 39751 • the tenements are located within the inland South West of Madagascar • tenements are held 100% by BlackEarth Madagascar SARL, a wholly owned subsidiary of BlackEarth Minerals NL through Madagascar Graphite Ltd • no overriding royalties are in place • there is no native title agreement required • tenure does not coincide with any historical sites or national parkland • tenements are currently secure and in good standing
Exploration done by other parties	• regional mapping by BRGM • historical diamond drilling and trenching by Malagasy Minerals. Ltd. (2014-2016)
Geology	The project overlies a prominent 20km wide zone consisting of a folded assemblage of graphite and quartz-feldspar schists, quartzite and marble units, with lesser intercalated amphibolite and leucogneiss. This zone, termed the Ampanihy Belt is a core component of the Neoproterozoic Graphite System. The belt is interpreted as a ductile shear zone accreted from rocks of volcanic and sedimentary origins
Drillhole Information	refer to Section 1
Data aggregation methods	• cut offs of 5%, 10% 15% and 20% graphitic carbon have been used for aggregated reported intercepts • no cutting of high grades is applied • all trench samples represent a 2m interval length

Criteria	Commentary
Relationship between mineralisation widths and intercept lengths	• sampling does not occur perpendicular to the dip of mineralisation and therefore is not truly representative of the true width of the mineralised unit • the dip of the mineralised units is known from previous drilling and/or the trenching logging • the dip of the mineralised unit is shown within the diagrams
Diagrams	refer to body of text above for diagrams and tabulated intercepts when applicable
Balanced reporting	• all significant results that are material to the project have been reported • any data that has not been released has been deemed insignificant
Other substantive exploration data	no other exploration related data has been collected that requires reporting
Further work	future exploration work at Maniry is likely to include further mapping, trenching and drilling

Section 3 Estimation and Reporting of Mineral Resources

(Criteria listed in section 1, and where relevant in section 2, also apply to this section.)

Criteria	Commentary
Database integrity	• the drillhole database has been loaded in an industry standard database • validation for duplicates, missing data, outliers, erroneous intervals is completed before proceeding to the interpretation and analysis
Site visits	• Annick Manfrino, Competent Person for the resource estimate visited the site during the drilling programme in March-April 2018 • drilling, sampling and sample preparation procedures were reviewed and are considered of industry standard
Geological interpretation	**Razafy** • the confidence in the geological interpretation of the graphitic lenses is considered robust for the purpose of estimating and reporting Indicated and Inferred resource • graphite mineralisation hosted within graphitic schists and gneiss, visibly recognizable from the background rock • the complete extent of the two main lenses outcrop and can be followed by surface mapping • trenches have been used with success in early exploration stages to confirm the strike continuity • no major faulting or other structural disruption has been mapped in the deposit area and the location of the drilling intercepts of the graphitic mineralisation confirms the position of the lenses anticipated from the trenches observations • the boundary between graphitic schists and gneiss and the surrounding material is usually sharp with TGC below 0.5% in the background material changing to +3% grades in the graphitic lenses, leaving few options to shift the boundaries position when interpreting the mineralised body • mineralisation envelopes were interpreted at a nominal +3% TGC cut-off grade • only rare occurrences of non-mineralised material are included in the two main lenses • logged graphitic rich zones correspond extremely well with TGC assay results • no alternative interpretation has been considered at present • the weathered horizon (oxide) can easily be interpreted from the sulphur depression observed in the assay data. The oxide horizon is approximately 20m thick. The transition zone is usually of very limited thickness when present **Haja** • the confidence in the geological interpretation of the graphitic lenses at Haja is considered robust for the purpose of estimating and reporting a resource of the Inferred category • graphite mineralisation hosted within graphitic schists and gneiss, visibly recognizable

Criteria	Commentary
	from the background rock • the complete extent of the Haja lenses outcrop and can be followed by surface mapping • trenches have been used with success in early exploration stages to confirm the strike continuity • no major faulting or other structural disruption has been mapped in the deposit area and the location of the drilling intercepts of the graphitic mineralisation confirms the position of the lenses anticipated from the trenches observations • the boundary between graphitic schists and gneiss and the surrounding material is usually sharp with TGC below 0.5% in the background material changing to +1.5% grades in the graphitic lenses, leaving few options to shift the boundaries position when interpreting the mineralised body • mineralisation envelopes were interpreted at a nominal +1.5% TGC cut-off grade • the Haja orebody is composed of three adjacent parallel lenses dipping 25º to the east which often coalesce into a single body • logged graphitic rich zones correspond extremely well with TGC assay results • no alternative interpretation has been considered at present • the base of the weathered horizons- oxide & transition- can be interpreted from the sharp change in sulphur grades
Dimensions	**Razafy** • the Mineral Resource encompasses the Razafy deposit and a new prospect named Razafy East • the Razafy deposit comprises two major lenses – East Main d West Main lenses-, and four minor lenses adjacent to the main zone • the solids interpreting the two main zones are 1450m long with a maximum plan width of 65m for the East main lens, and 60m for the West main lens in the south part of the deposit • the two main lenses extend 155m depth below surface and define the lowest depth below surface at which a resource has been estimated • the Razafy block model extents 1625m along strike, 900m across strike and 200m depth to cover the East Razafy prospect area **Haja** • the resource model is based on six fences of drillholes 100m apart with drillholes separated by 50m on section • the Haja resource model cover the volume occupied by the Haja orebody and extents 725m north-south, 550m east-west and 210m at depth • the solids interpreting the Haja graphitic orebody extents 630m north-south, 500m east-west and 170m vertically
Estimation and modelling techniques	**Razafy** • TGC and sulphur have been estimated by ordinary kriging using 140m along strike by 50m down dip by 12m across strike search ellipse which defines the outmost distances to which blocks can be extrapolated from drillholes • drill sections are spaced regularly at a 100m (with the exception of the first northern section which is 200m away from the second section), with drillholes spaced at 30m across sections • kriging parameters for both TGC and sulphur were obtained from modelling the directional variograms (normal variograms) for the two main lenses • nugget values are 20% of the total sill for both elements • the grade estimation was completed using Geovia GEMS mining software with partial blocks to honour the volume of the grade envelope solids • the block model is based on 25m along strike by 5m across strike by 5m Z, which is considered adequate given the current drill spacing of 100m section lines by 30m spacing • mineralised envelopes were used as hard boundaries during interpolation • the base of oxide was used as a hard boundary for the sulphur estimation but as a soft boundary for the TGC estimation

Criteria	Commentary
	• no top-cut measure was used as there is no evidence of outliers. The maximum TGC value for the 2m sample assays is 15% • the grade estimates -TGC & sulphur- were validated visually and statistically and honour spatially and statistically the input data • no previous estimate exists for this deposit **Haja** • TGC and sulphur have been estimated by ordinary kriging using Geovia GEMS mining software • mineralised envelopes were used as hard boundaries for the TGC during the interpolation • oxidation zones were used as hard boundaries for the interpolation of Sulphur • no top-cut was used for TGC but the influence of grades above 6.5% TGC was limited to 70mx70mx6m during interpolation. The 6.5% TGC grade corresponds to a statistical change in the data distribution. The maximum TGC value is 11.45% • no top-cut measure was used for sulphur • the grade estimates -TGC & sulphur- were validated visually and statistically and honour spatially and statistically the input data • no previous estimate exists for this deposit
Moisture	• the resource is reported for Razafy and Haja on a dry tonnage basis
Cut-off parameters	• the resource is reported for Razafy at a 6% TGC cut-off grade and a 5% TGC cut-off grade for Haja. These cutoff grades are in line with other reported Mineral Resources in East Africa • a Scoping Study has been completed on Razafy – refer to this study for cut-off grade calculations • no mining studies have been completed to date for Haja and cut-off grade calculations are not available
Mining factors or assumptions	• based on the orientation, thickness and depth to which the graphitic lenses have been modeled and their estimated TGC, the potential mining method is considered to be open pit mining for both deposits

Metallurgical factors or assumptions	**Razafy**
	• metallurgical testwork program has been undertaken on drill core samples taken from a drill program completed in 2018. A total of 20 diamond drill holes were sampled, to create representative composite samples
	• sample preparation was undertaken by ALS Metallurgy in Perth WA , managed by BatteryLimits
	• sub samples (2x 1 kg) were issued to BGRIMM technology group for initial confirmatory flotation testwork. The samples were stage ground in a rod mill to 100% passing 1mm. The samples underwent rougher flotation and up to 6 stages of regrind polishing and 9 stages of cleaner flotation. multiple stages of cleaning (up to 6), with recleaning The results indicated that high grade (94% TGC) concentrates can be produced at a recovery of 87% in open circuit
	
	Haja
	• in accordance with Clause 49 of the JORC code (2012), the product specifications and general product marketability were considered to support the Mineral Resource Estimate for Industrial Minerals
	• independent preliminary flotation testwork completed by ALS Global Laboratory (Perth,WA) on three composites are reported in previous announcements and show that:
	  ○ 16% to 37% in overall weight of concentrate is of large or greater flake size category (+ 180 micron) at a concentrate grade above 97% TGC
	  ○ overall concentrate grades range from 93.6% to 95.6% TGC

Criteria	Commentary
Environmental factors or assumptions	• it is assumed that the processing of ore will have minimal environmental impact. This is based upon other graphite processing operations and basic assumptions on how graphite ore will be processed at Maniry
Bulk density	**Razafy** • the bulk density used to report the Razafy Mineral Resource is based on 19 measurements made by the water displacement method by the Intertek Perth laboratory • a 2.07t/m^3 value was used for the oxide material and 2.17t/m^3 for the fresh material **Haja** • the bulk density data used to report the resource comprises 56 measurements made by caliper method on competent fresh core drilled during the 2018 BEM's drilling campaign which cover the depth and extent of the deposit. The data has been averaged in 20m vertical slices, and corresponding values assigned to the block model range from 2.05 m/t^3 in the weathered material to a maximum of 2.69 m/t^3 at the lowest depth. The average density of the resource reported is 2.20m/t^3
Classification	**Razafy** • the two main lenses are continuous over the strike of the deposit. They can be followed on surface by mapping without interruption and are not disrupted by faulting • trenching completed during the early exploration stages, but not used in the resource estimate, confirm the location at surface of the thickness of the mineralisation estimated by the model • with a 100m drill section spacing and search ellipse of 140mx50mx12m, extrapolation of blocks is limited • all minor lenses, including the East Razafy prospect have been classified as Inferred material • for the East and West main lenses, the kriging slope of regression obtained for the TGC estimate was used to separate Indicated from Inferred resource at depth. Blocks with a slope of regression greater than 0.5 were classified as Indicated, the other blocks were classified as Inferred • the classification is based on a high degree of geological understanding of the mineralisation occurrence and spatial distribution, correlated by systematic drilling information with limited extrapolation • the Mineral Resource estimate appropriately reflects the view of the Competent Person **Haja** • the Haja lenses are continuous over the length of the deposit drilled • the mineralisation can be followed at surface from mapping and with the trenches available. Graphitic mineralisation is easily visually distinguished from the surrounding background rock from its colour and the presence of visible graphitic flakes • the trenches completed during the early exploration stages, but not used in the resource estimate, confirm the location at surface of the thickness of the mineralisation estimated by the model • at either strike end of the deposit, extrapolation has been limited by the wireframed envelopes which were extended 50m from the first and last drillhole fences • downdip, the mineralisation was extrapolated no more than 70m from the last drillhole intercepts on which the wireframes are based • all material inside the wireframe envelopes within the ranges detailed above has been classified as inferred material • the classification of the resource estimate appropriately reflects the view of the Competent Person

Criteria	Commentary
Audits or reviews	• no audit nor review were undertaken for the Razafy and Haja Mineral Resource estimates
Discussion of relative accuracy/ confidence	• the relative accuracy of the Mineral Resource estimates is reflected in the reporting of the resources as per the guidelines of the JORC Code 2012 edition • no other estimation method or geostatistical assessment has been performed • the Mineral Resource estimates of the Razafy and Haja deposits are global estimates of tonnes and grades • tonnages and grades above the nominated cut-off grades applied on TGC are provided in the body of the announcement • the contained graphite values were calculated by multiplying the TGC grades (%) by the estimated tonnage on a block by block basis • no production data is available to reconcile results with