ASX Announcement **29 April, 2019**

Excellent Technical Outcomes to Underpin a Standalone Downstream Graphite Processing Business

HIGHLIGHTS

Testwork Outcomes

- Update on further major testwork programs focussed on particle milling and micronisation technologies and the production of ultra-fine materials, as well as the assessment of those milled products to be utilised in batteries.
- Milling trials show rapid particle size reductions to nominated median (D50) size specification inferring industry sector's leading milling costs.
- Milling cost advantages of McIntosh flake compared to typical African or Chinese sourced flakes demonstrated to be 2-3 times lower for hammer milling and approximately 2 times lower for air milling.
- The various size classifications of the micronised products have wide application in a wide range of battery chemistries as conductivity enhancement materials and the ultra-fine, high purity materials at sub 5 µm sizings as coatings and dispersions in battery and industrial applications which is a very high-value market, served by a very limited number of manufacturers.
- Test outcomes include ability to produce synthetic diamonds from McIntosh flake – currently technical grade, potentially also gem-stone quality, subject to the highest purity precursor material. There is a significant market for quality synthetic diamond precursor to underpin industrial applications for technical grade diamonds.

Downstream Scoping Study

- The above testwork outcomes feed into a scoping level study examining the viability of a stand-alone downstream graphite products manufacturing business. The scoping study is in progress.
- Market investigations were undertaken for the various planned graphite products focussing on specifications, utilisation, market depth and pricing. A conservative pricing matrix has been compiled for the purposes of the scoping study.
- The scoping level assessment of the downstream business assumed is regarded as a fully autonomous, long-term industrial business. Hexagon plans to utilise its current reported graphite concentrate feedstock price of US$1,504/t highlighting the Company's goal that this would be a standalone business, securing feedstock at arm's length commercial rates – notwithstanding that is not Hexagon's primary objective.

- The Company expects to release the outcomes of the downstream scoping study shortly and subject to completion of ASX review.

1. OVERVIEW & COMMENTARY

The purpose of this report is to provide an update on a significant body of testwork programs recently completed which feed into the scoping level study currently underway examining Hexagon's downstream graphite processing business case. Also, the Company would like to provide some preliminary insights of the commercial implications of these test outcomes ahead of the release of the Downstream Scoping Study (**DSS**) findings.

In sections 2 and 3 below, Hexagon has reported a range of important and in some cases, industry-leading technical results. These outcomes, along with previous results such as for thermal purification, underpin the Company's strategy of manufacturing and selling a diverse range of graphite materials into several different market segments including batteries and various industrial applications. As part of the DSS, Hexagon has undertaken investigations into downstream market opportunities both internally and through appropriate industry experts. The objective is to understand the end users' specific requirements, the potential market depth and possible pricing in different locations – which is an iterative process with the product development testwork, such as is reported herein.

This is also a prelude to the full DSS findings expected to be released soon and introduces key concepts related to this and previous testwork programs. The DSS is to be a +/-30% accuracy assessment of Hexagon's planned standalone graphite manufacturing business relying on a high-quality graphite feedstock, likely to be from its 49% interest in the McIntosh Joint Venture (**MJV**) (subject to a positive Feasibility Study being undertaken by 51% MJV partner, Mineral Resources Limited) or other long-term commercial sources able to meet the same technical specifications.

Therefore, the concentrate purchase price utilised in the DSS will be based on an open-market, commercial feedstock price such as Hexagon's own assessment of the McIntosh concentrate sale price estimated to average US$1,504/t. This basis for the feedstock input price, makes it independent and distinct from a cost input based on any site operating cost but consistent with potential sales prices ranges reported for McIntosh concentrates such as in the Prefeasibility Study (ASX Report, 31 May 2017) and in a business strategy update (ASX Report, 28 August 2018). For the DSS financial assessment the upstream and downstream are not inter-dependent and the Company would have access to other commercially priced sources – notwithstanding that is not Hexagon's primary objective.

The product marketing assumptions in the DSS will be based on a vast body of technical work commissioned by Hexagon, which has highlighted distinct market opportunities in the USA, Europe and also Japan, Korea and China – this work is ongoing. It is a highly concentrated market space with many of the premium end sectors supplied by just a handful of manufacturers which creates entry opportunities but also means it is prudent to keep some of the following details at a generalised level.

Testwork programs such as the ones reported herein provide the basis for the product and pricing matrix in Table 1 which comprises:

i. *Expandable Line* – products derived from larger sized purified flake material and being sold as an expandable precursor either as a standard purity grade for fire retardants, foams, lubricants, and conductive additives or as a higher purity material, suitable for high-tech foils, gaskets and seals e.g. for nuclear industry or fuel cell applications.

ii. *Industrial Line* – products derived from mid-sized purified flake into 3 product segments; synthetic diamond precursor, conductivity enhancement material (**CEM**) for batteries and electrodes and ultra - fine grained material for specialised coatings and mould release agent for foundries.

iii. *Battery Anode Line* – products derived from mainly finer-sized purified flake as well as "undersize" from the above lines consisting mainly of standard uncoated spherical graphite (**USG**) and some speciality spherical and ultra-fine materials for industrial uses.

Table 1: Downstream Products and Pricing

Product	ID	Product Price US$/t			Conviction Rating
		Low	High	Modelled	
Expandable					
Std. +80#X	E1_Z3	4,500	7,500	5,000	4
	E1_Z4	3,000	3,500	3,500	5
Prem +80#X	E2_Z6	6,000	11,000	7,500	3
	E2_Z9	3,500	4,000	4,000	4
Industrial					
Std. Diamond Precursor	I1_P4	4,200	5,000	5,000	4
	I1_P6	4,200	4,200	4,200	5
Prem. Diamond Precursor	I2_P1	8,000	10,000	10,000	3
Std. CEM	I3_E3	6,000	9,000	6,500	4
	I3_E6	3,000	4,000	3,500	3
UHP-E CEM	I4_E8	4,000	14,000	5,000	5
Prem. CEM	I4_E9	9,000	19,000	9,000	3
Coating Precursor	I4_E12	15,000	22,000	18,215	4
BAM					
USG - 23	B1_L3	3,200	3,800	3,600	4
USG - 16	B1_L6	3,200	3,800	3,600	4
SG-SSP	B3_L12	15,000	18,034	15,329	4
G-SSF	B3_L13	3,000	7,000	3,250	4

The product sale prices assumed in the DSS, will utilise those "modelled" in Table 1 and can be broadly characterised as representing a "basket price" for product sold. Generally the modelled prices are conservative compared to the price ranges generated from Hexagon's market studies reflecting several factors, namely; Hexagon needs to achieve market penetration into a well-established, conservative market, also in several cases it is introducing new products into that market which have the same specifications as established products but through a different treatment route e.g. thermal purification-which can create a marketing inertia and finally, in some cases the Hexagon products are unknown due to their very high specifications and customers may need- some convincing of the merits of these enhanced products. These factors are reflected in the pricing selected for any modelling and also into the Conviction Rating (where 5 is the strongest) which also reflects some of these uncertainties including in some cases the need for more detailed market investigations, notwithstanding that a modelled price has been proposed.

In conclusion, the testwork results support Hexagon's plans to manufacture a range of high-end graphite products into a diverse group of value-added industry segments, subject to ongoing positive testwork and Feasibility Study. The DSS plans to assess the financial viability of this proposed long-term industrial business based on procuring graphite concentrate feedstock on independent commercial terms at full market prices breaking the nexus with its McIntosh Project, but obviously hopeful of utilising at least its own attributable joint venture concentrate allocation. The testwork has highlighted sought-after technical attributes which are incorporated into the processing flow sheets and marketing strategy to capture that additional value included in the DSS. Notwithstanding that the initial price assumptions are prudent, recognising the marketing challenges ahead the product prices to be modelled are well skewed toward the lower half of the estimated product price range.

2. TECHNICAL OUTLINE

Hexagon's US technology partner, NAmLab is undertaking a series of test work programs designed to demonstrate the suitability of refined, McIntosh flake graphite for a diverse range of premium end use applications, including:

a. Expandable graphite precursor for high end Conductivity Enhancement Materials (**CEM**) and "nuclear" quality foils and seals;
b. Industrial applications comprising finished products including, CEM additive for electric arc furnace (EAF) electrodes, synthetic diamond precursor, specialty lubricants and ultra-fine materials utilised in a range of applications including mould release / forging lubricant, obscuration materials and other specialty ultra-fine materials; and
c. Battery materials including various d50 sizes of uncoated purified spherical graphite for battery anode materials (BAM) in rechargeable lithium-ion batteries and several grades of ultra-fine CEM and coating materials in battery applications.

The outcomes of this work are important inputs into the marketing and product pricing strategy and the assumptions that will flow through to the DSS.

An updated technical summary of work outcomes related to the Industrial and Battery Materials lines are presented below as a follow-up to the ASX report dated 18 December, 2018 with further updated details in Attachment 1: JORC Table 1.

A summary overview is provided in Table 2 highlighting sectors and applications for both natural flake and synthetic graphite at various size specifications and at minimum high purity levels which are generally referred to herein as "3-Nines Plus".

Table 2: Applications for different grades of sized/ground graphite, having purity of 99.9+ wt. %C.

Size Specification	Primary End Use Application(s)
> 425 µm (+40 mesh)	EAF electrodes conductivity enhancement additives; nuclear graphite; precursor for making high purity expandable and expanded delaminated graphite for CEM uses in batteries, and other Fuel Cell and chemical applications.
> 250 µm (from -40 to +60 mesh)	Precursors for synthesis of high purity expandable and expanded delaminated graphite for CEM uses in batteries; EAF electrodes

	conductivity enhancement additives, CEM additives into thermally conductive applications (such as resistively heated asphalt, etc.).
> 150 µm (from -60 to +100 mesh)	CEM-type conductivity enhancement additives for lantern (carbon-zinc) and traction Ni-Fe, Ni-Cd batteries; precursors for making synthetic diamonds and specialty refractories for magnesia carbon bricks.
150 to 45 µm	Food grade plastics; precursors for making synthetic diamonds, food and industrial grade grease/lubricants and specialty brake-pad linings.
< 45 µm	lead acid battery negative electrodes (expander), 'C'/'D'/'F' alkaline battery cathode CEMs; CEM additives to: conductive graphite bars, sheets and rods.
25 to 40 µm	Milled precursor for spheroidization and classification into lithium-ion battery anode material (**BAM**).
< 25 µm	Standard performance 'AA'/'AAA'/9V alkaline battery cathode CEM; precursors for nickel coating (EMI shielding, etc.).
12-18 µm	Premium grade 'AA'/'AAA'/9V alkaline battery cathode CEM, some lithium primary batteries; zinc air (hearing aid) battery CEMs.
< 8 µm	Lithium primary battery CEMs; CEM additives to: ultra-fine-grain conductive graphite sheets and rods. Specialised mould release agent for foundry forging and forming applications.
~ 5 µm	Lithium-ion battery cathode CEM.
~ 3 µm	Infrared obscuration materials, components of conductive inks and coatings.
< 2 µm	Pigments for premium performance conductive paints and coatings.

The main focus of the various test regimes is on milling and classification for certain specific end use target markets in the Industrial and Battery Lines of planned products:

- Industrial Line
  These products are planned to be produced from a refined flake concentrate with a flake size distribution between 250 to 150 µm. A variety of tests were conducted mainly aimed at examining micronising to very fine size specifications for a range of industrial and energy storage-related applications. Testwork was also undertaken to establish the suitability of McIntosh graphite for manufacturing synthetic diamonds.
- Battery Line
  Test work on Battery anode materials has been reported previously (17 July & 21 June 2018) with further work planned. This current test work relates to battery materials utilised in a wide range of battery chemistries as conductivity enhancement materials (CEM) and coating products. Note, CEMs in the finer sized categories in Table 1 could be made out of natural crystalline flake or delaminated expanded graphite – two distinct processes.

3. TESTWORK PROGRAMS

The following section describes the individual test programs.

3.1 Milling Test work

This work consisted of tests examining traditional impact hammer mills and air jet mills to determine the ability to achieve the size specifications set out in Table 2 for various premium priced materials. A side-by-side comparison with "Typical" flake from China and Africa was also undertaken to examine potential advantages of utilising the McIntosh flake.

The tests were performed on concentrate sample (HXGCon2). It was decided to work with the original non-purified concentrate, having purity of 97.55 wt. %C. This material was chosen in favour of using a 99.998 wt. %C precursor, which was saved for other value-added processing test work.

Hexagon also undertook test work to examine the feasibility of producing high-purity 1 to 3 µm graphite materials used in specialised electrical applications. The technology developed by NAmLab is proprietary.

3.1.1 Hammer Mills

To assess the potential of Hexagon's McIntosh graphite for the end uses listed in Table 2, a series of sequential hammer milling passes were performed.

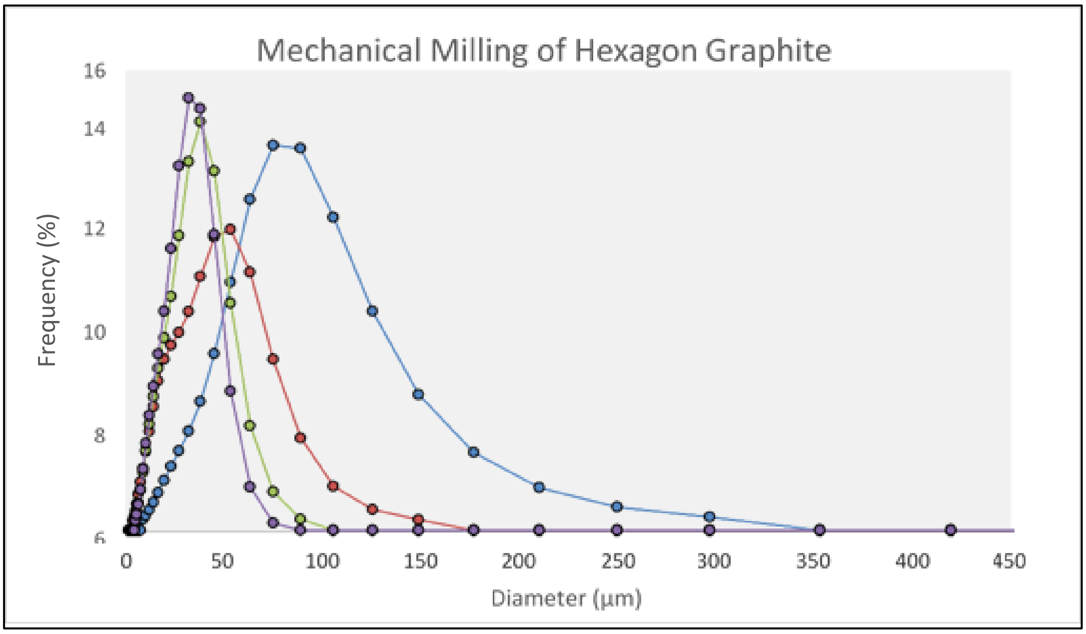
Screened Sample - For the initial milling trials, a lab-scale hammer mill was used to grind Hexagon's McIntosh graphite samples that were pre-screened to a minus 125 µm and plus 45 µm particle size. Hammer milling was chosen for the initial milling because it represents the most established and economical milling method in a scaled up mode, based on its higher throughput (2,200 lbs/hr) relative to air-milling (200 lbs/hr). To grind the material, the mill uses four steel hammers, attached to a base plate, which in turn is secured to a horizontal rotor. Rotor speed was kept constant at either 16,000 RPM or 14,000 RPM for all the hammer experiments. Graphite powders were fed into the mill via a funnel while a rotor inside the body was energised to spin counter-clockwise. The hammers impacted the graphite material, reducing it to fine particles. These, in turn, passed through a screen into a transfer pipe, and into the end-product tank. Compressed air, coming from an external source, was used as an airlock; it also assisted with moving the powder and collecting it in the end-product tank and in a filter bag. Once all the material has been milled, the product tank was removed from the mill, and the material was retrieved and analysed.

In order to compare three very different graphites (China, Africa and McIntosh materials) as reported in the following section, required pre-screening to generate a feed of between minus 125 µm and plus 45 µm, though unscreened material was also tested. In order to prepare a pre-screened sample, NAmLab used the Ro-tap RX-29 Tap Test Sieve Shaker machine.

The McIntosh screened sample was passed through the hammer mill at 16,000 rpm and an average milling time of six and a half minutes per pass to ensure that all the material was completely milled. As presented in Figure 1, the milled sample underwent significant reductions in median particle size following each pass through the hammer mill. However, the rate of particle size reduction per pass significantly abates as the D_{50} particle size approaches 25 µm as shown in Table 3.

The hammer-milled graphite material was able to achieve the particle size specifications, <45 µm, required for use in lead acid battery anode and large (i.e. 'C'/'D'/'F') alkaline battery cathodes. Positively, Hexagon's "thin" flake graphite only required a single hammer mill pass to meet the prerequisite <45 µm size limit. Operationally, this suggests a low energy input required to meet the specifications.

Figure 1: Particle size distributions of mechanically milled Hexagon's McIntosh graphite.



Pass 1 (blue), Pass 2 (red), Pass 3 (green) & Pass 4 (purple)

Table 3. Particle size characterization of mechanically milled Hexagon's McIntosh graphite.

Mill Pass	D_{10} (µm)	D_{50} µm)	D_{90} (µm)	Std. Dev (µm)
0	25.27	66.73	125.1	37.29
1	9.18	31.2	64.93	22.39
2	10.07	27.21	46.73	14.67
3	10	25.03	41.13	12.46

Ultimately, electrochemical testing will show how effective these particles are for application in CEM markets.

Unscreened - grinding of the un-screened bulk concentrate material from McIntosh using hammer mill was undertaken to demonstrate that unscreened concentrate could also be processed through the hammer mill to produce materials of interest to CEM applications, as well as the precursors for BAM, as per guiding specifications presented in Table 2.

Table 4. Size reduction of un-screened bulk McIntosh graphite GN180319001 in the hammer mill as a function of pass.

Pass	0	1	2
%Tile	Size (um)		
10	26.22	6.27	6.48
20	37.17	9.53	8.83
30	47	12.91	11.33
40	56.93	16.56	14.4
50	67.7	20.59	17.88
60	79.72	25.05	21.15
70	93.34	30.27	24.07
80	109.5	36.81	26.98
90	132.1	46.98	30.44
95	151.7	56.69	33.17

Two passes through the hammer mill have been conducted. A D50=20.6 µm and a D50=17.9 µm have been registered after the first and the second pass, respectively as presented in Table 4.

This grinding campaign has established the feasibility of McIntosh flake being able to cater to:

- Standard performance 'AA'/'AAA'/9V alkaline battery cathode CEM; precursors for nickel coating (EMI shielding, etc.)
- Premium grade 'AA'/'AAA'/9V alkaline battery cathode CEM, some lithium primary batteries; zinc air (hearing aid) battery CEM applications.

3.1.2 Air Milling

To assess the potential of Hexagon's McIntosh graphite for the end uses listed in Table 2, a series of sequential air milling passes was performed.

For the air jet milling test work, NAmLab utilised a 4" air Impact Pulveriser mill which is equipped with counter-opposed nozzles. The air mill forces directly opposing jet streams (incoming from an adjacent air compressor) to cause particle-to-particle, head-on impact, typically four times the impact power of a single force against a stationary object. The mill utilises fluid energy - compressed air, typically at 30 – 80 psi - to produce impact. It has shown to be effective in grinding graphite precursors used in this project; pulverizing and sizing to the desired particle dimension in a matter of minutes.

As seen in Table 5, after nine passes through the 4" air mill, the median particle size (D50) of the precursor graphite was found to have decreased to 5.11 µm from an initial size of 67.7 µm. This result suggests that, except for conductive paints and coatings, air milling of Hexagon graphite from the McIntosh resource can achieve particle sizes required for most high value graphite end uses identified in Table 2.

Table 5. Air mill parameter and particle size characterization of milled Hexagon graphite samples2.

Air Mill Pass	Mill Pressure (PSI)	D_{10} (µm)	D_{50} (µm)	D_{90} (µm)	St Dev (µm)
0	0	26.22	67.7	132.1	42.11
1	30	10.55	26.62	55.98	17.24
2	35	6.11	15.13	34.35	10.19
3	80	5.93	11.08	16.32	4.18
4	80	5.25	9.97	14.87	3.91
5	80	4.78	8.95	13.85	3.62
6	80	3.2	7.23	13.62	4.05
7	80	3.13	6.36	11.1	3.12
8	80	3.01	6.13	10.5	2.92
9	80	2.303	5.11	9.28	2.694

This significant reduction in particle size is illustrated in scanning electron microscope (SEM) images of the pre- and post-air milled materials, as seen in Figure 2, in which the initial flake graphite is converted into fine fragments having irregular shapes and sizes.

Moreover, as can be seen in Table 6 and consistent with the large reduction in particle size, the smaller particle size materials have both substantially increased BET surface area and significantly decreased tap densities and Scott volumes relative to the starting graphite materials – sought after attributes for CEM.

Figure 2. SEM images of McIntosh graphite before milling (left, see pass "0", above) and after air milling passes (right, see pass 9, above).

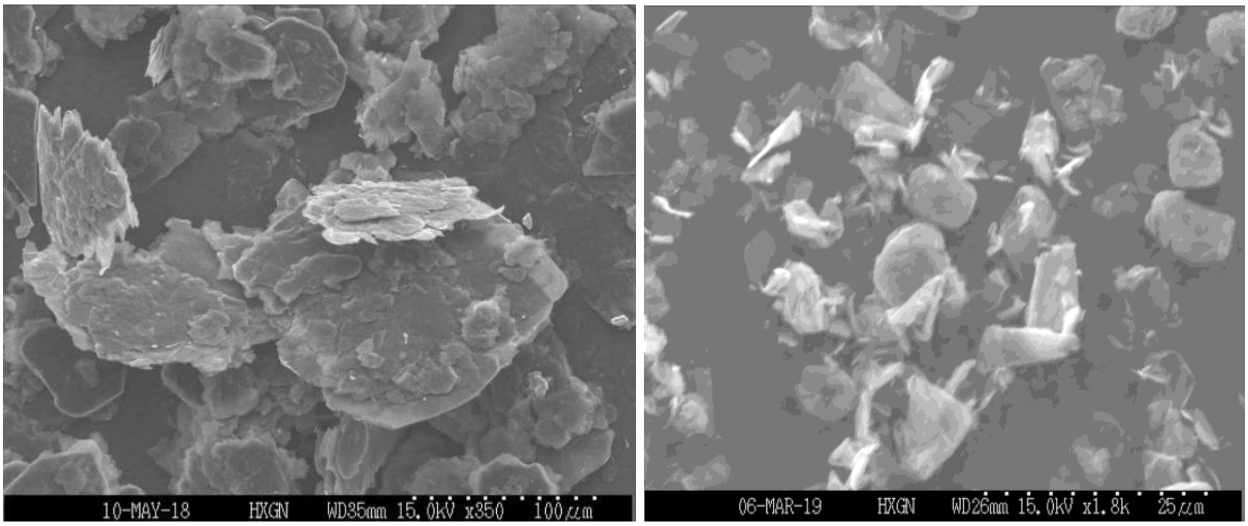


Table 6. Surface area and density of pre- and post-air milled McIntosh graphite material.

Sample ID	BET (m^2/g)	Tapped Density (g/cm^3)	Scott Volume (g/cm^3)
GN180319001	5.803	0.38	0.2
GN180419001, after 4 mill passes (D_{50} <10 µm)	41.209	0.166	0.077
GN180419001, after 9 mill passes (D_{50} <5 µm)	46.121	0.166	0.066

The BET surface area of McIntosh graphite went up significantly as presented in Table 6. Results greater than 40 m^2/g are highly encouraging for CEM applications. Most conductive materials on the market are below 15 m^2/g at these sizes, while expanded delaminated graphites reach 30 m^2/g.

Materials with surface area of greater than 30 m^2/g could be of premium value to battery designers.

3.1.3 Comparative Milling Tests with African and Chinese Flake

A comparative study into hammer and air milling of McIntosh flake versus African and Chinese flake was undertaken in order to bench mark possible comparative advantages for downstream processing – such as the energy intensive milling process.

Due to McIntosh flake being significantly thinner than "typical" counter-part it was concluded that across a range of product sizes that McIntosh materials should offer a significant operating cost advantage due to lower energy inputs to achieve the minus 45 µm specifications for CEM materials and BAM precursor also.

NAmLab provided some comparative data on grinding of McIntosh, Chinese, and African flakes using new dry mechanical milling / built-in classifier technology, noting the time and energy input it takes to reduce the size to D50~3.5 µm, D50=10 µm; D50=15 µm and D50=25 µm. Using the same US$0.05/kWh power costs:

- *Hammer mill* grinding costs were estimated at c. $790/t to generate a <45 µm product for both Chinese and African flake. This compares to estimates on the same basis of McIntosh flake at $265/t. This presents a significant cost advantage for Hexagon in the CEM and BAM precursor markets; and

- *Air milling*, McIntosh's thin flakes, relative to those from Africa and China, the operating cost estimate was $485/t and $970/t for the <8 µm and <5 µm air milled CEM products respectively. NAmLab reported that estimates are half the costs to achieve the same size grading for Chinese flake, Hexagon's closest competitor by these standards. This is likely attributed to the thin nature of the McIntosh flake, which is therefore more friable on grinding compared to the others.

Hexagon's downstream operating costs are being finalised and will be reported in the scoping level study of the downstream business case.

3.1.4 Superfine Grinding

In order to prepare ultra-fine, c. 2 µm sized graphite particles for use in coatings and pigment s NAmLab utilised a pilot-scale Super Fine Grinding Mill (SFGM). The SFGM mill is used for reducing the particle size of graphite when size specifications exceed those which can be achieved with air milling. A major challenge is retaining high purity level at the stated size.

Initial tests involved a 48 hour milling campaign with results summarised in Tables 7 & 8. The test results conclusively confirmed that McIntosh graphite can be reduced in size through this proprietary milling technology to meet the product specifications of < 2 µm materials for use in lithium battery cathodes as well as conductive paints, coatings and mould release agents.

Table 7. Particle size comparison of McIntosh graphite before and after [wet] milling.

Sample ID	D_{10} (µm)	D_{50} µm)	D_{90} (µm)	Std. Dev (µm)
GN181105001	26.22	67.7	132.1	42.11
GN190219001	1.0	1.264	3.27	0.678

Table 8. Surface area and packing density characteristics of Hexagon's McIntosh graphite before (GN181105001) and after (GN190219001) wet milling.

Sample ID	BET (m^2/g)	Tapped Density (g/cm^3)	Scott Volume (g/cm^3)
GN181105001	6.515	0.966	0.428
GN180419001	161.182	0.488	0.264

3.1.5 Conclusions of Milling Test work

NAmLab has provided guidance on the size of milled flake as a function of its possible end-use/market segment (Table 1). Test work was undertaking examining hammer and air mills into size reduction of Hexagon's McIntosh graphite to demonstrate which of these markets to target.

The test work on hammer milling has established the feasibility of grinding un-screened bulk concentrate material from McIntosh using hammer mills. A D50 particle size of 20.6 µm and a D50=17.9 µm have been achieved after the first and the second pass, respectively. These results open an entryway for McIntosh graphite into the base performance 'AA'/'AAA'/9V alkaline battery cathode CEM; precursors for nickel coating (EMI shielding, etc.), as well as into the premium grade 'AA'/'AAA'/9V alkaline battery cathode CEM, some lithium primary batteries; zinc air (hearing aid) battery CEM applications.

Similarly, air milling, showed that bulk McIntosh concentrate can be reduced in a 4" jet pulveriser down to D_{50} = 5 µm. It took several passes through the air mill to achieve this particle size but, according to NAmLab, at least a factor of 3x fewer passes will be needed to achieve the same result in production-scale 24" to 42" air jet mills.

McIntosh flake is clearly amenable to standard hammer milling but also to air milling to achieve even finer D50 specifications as are increasingly sought particularly applied to a range of specialised battery applications (refer to section 3.2.3 below).

A comparative study into hammer and air milling of McIntosh flake, Chinese flake and African was also undertaken. NAmLab concluded significant, order of magnitude, cost advantages due to lower energy inputs to achieve the required size specifications due to McIntosh flake being thinner and more friable.

Test work also demonstrated the feasibility of Hexagon producing ultra-fine, high purity materials at sub 5 um sizing's for a range of specialised battery and industrial applications to fill a high-value market with less than a handful of manufacturers.

3.2 Conductivity Enhancement Material (CEM) Testwork

Following the milling testwork described above additional testwork was carried out to evaluate McIntosh flake graphite as electrically conductive materials in the cathodes of alkaline zinc/manganese dioxide primary batteries, lithium/carbon monofluoride primary batteries, and lithium-ion rechargeable batteries. A key technical parameter is the particle size distribution (**PSD**) referred to as the median D50 value. Some typical D50 parameters are listed in Table 9 for typical CEM applications.

Table 9. Applications for different grades of CEMs in batteries.

Particle Size D_{50} Value	Primary End Use Application(s)
< 45 µm	Lead acid battery negative plates, 'C'/'D'/'F' alkaline battery cathode CEMs
< 25 µm	Standard grade 'AA'/'AAA'/9V alkaline battery cathode CEM
< 15 µm	Premium grade 'AA'/'AAA'/9V alkaline battery cathode CEM
< 8 µm	Lithium primary battery anodes
< 5 µm	Lithium-ion battery cathode CEM
< 2 µm	Pigments of conductive paints and coatings, to include battery can coatings

3.2.1 Background

Unlike graphite utilised as anode active materials in lithium-ion batteries, graphite used for CEMs should not be spheroidal. Spheroidal graphite has strict "low surface area" requirements whereas the best CEM tend to have high-surface area attributes such as being composed of thin, sheet-like particles, featuring low packing density and numerous breaks on the surfaces of individual particles. The greater the number of breaks, results in better electrical contact with active cathode material, which in turn allows building better conductive networks in the electrodes. This enables improved active material utilisation coefficients.

In making the CEM grades, powder engineers select intricate technologies for creating near contaminant-free particles of graphite. These particles of graphite feature engineered surfaces to created tailored BET values (surface areas), size distribution and powder density characteristics. Where possible, hammer milling is employed which offers the most economical size reduction solution down to a certain size but for batteries which use ultra-fine CEM, air milling technologies are applied.

3.2.2 Testwork Methods

The samples employed had nominal sizings of; 5 µm, 10 µm, 15 µm and 25 µm. The three finer sizes were produced in the air mill and the 25 µm sample was produced in the hammer mill from the milling test work described above. Prior to proceeding each of the samples were characterised for size distribution, BET (surface area) and then compared to two control samples of premium quality synthetic graphites, grades: SFG 6L and KS-15, as applicable. Particle size distributions (PSD) were also determined for the cathode material e.g. the electrolytic manganese dioxide, (**γ-MnO_2** (**EMD**)) for the alkaline batteries.

In this testwork NAmLab utilised a standard 4-point electrical resistivity jig a well-established method of “preliminary” qualification of graphite for applications in alkaline and lithium-ion batteries.

Grouped for each of the battery chemistries listed above, the results are graphed and tabulated for each of the CEM sizes and for the control sample. Each graph represents the dependence of electrical resistivity of a cathode pellet (measured in Ω·inch) on the weight percent of CEM addition to the cathode mix as a function of compaction pressure (metric tonnes); the higher the compaction pressure the lower the resistance as greater compaction brings particles closer together and facilitates their physical contact.

For the lithium-ion chemistries test cells were manufactured by NAmLab to undertake tests for Galvanostatic cycling to further assess the CEM performance.

3.2.3 Testwork Results

A vast amount of data is collected for each of the 4 nominal CEM sizes and the control samples; below, summary excerpts are presented grouped by battery chemistry.

a. *Primary Alkaline Zinc/Manganese Dioxide Batteries*

   Comparing Figures 3 and 4; starting from the lowest pressure setting (0.5t), it becomes obvious that performance of premium quality synthetic graphite closely trails that of HXG’s 5 μm product, while the coarser grades of McIntosh flake deliver significantly better performance. At first glance, this is a counter-intuitive conclusion: it would seem that the finer the conductive diluent, the higher its in-matrix conductivity should be. However, it does not work this way in alkaline battery cathodes.

   The best performance is typically brought about by a grade of graphite whose particle size distribution dovetails that of the EMD. To this point, the most obvious leader of performance in the reported test series is a 15 μm CEM from McIntosh flake. From the PSD characterisation work the 15 μm CEM almost mirrors the size distribution of the EMD. In doing so, the 15 μm CEM provides sufficient amounts of coarse, medium and fine particles to enhance conductivity of the broadly distributed matrix material.

   Concurrently, other size grades of CEM graphite including the control sample of KS-15 had tighter size distributions; meaning that they are lacking either the ultra-fine or coarse size particles that would be needed to match up certain parts of the distribution of the EMD matrix material.

   The second best material in the test series is the 25 μm graphite. Similarly, to the leading 15 μm grade, this graphite also provides a broad size distribution. However, this grade is coarser than the matrix MnO2 which explains why it scored in second place. Nevertheless, the 25 μm grade is the lowest cost conductivity enhancement graphite in this test series due to it being the coarsest and mechanically milled. It therefore remains a very strong candidate for C, D, and F type alkaline cells, which employ coarser grades of EMD in their cathode matrixes.

Figure 3: 4-Pt Electrical resistivity of ɣ-MnO_2 (EMD) cathode as a function of graphite type and its concentration in electrode matrix at pellet pressure of 0.5 tons.

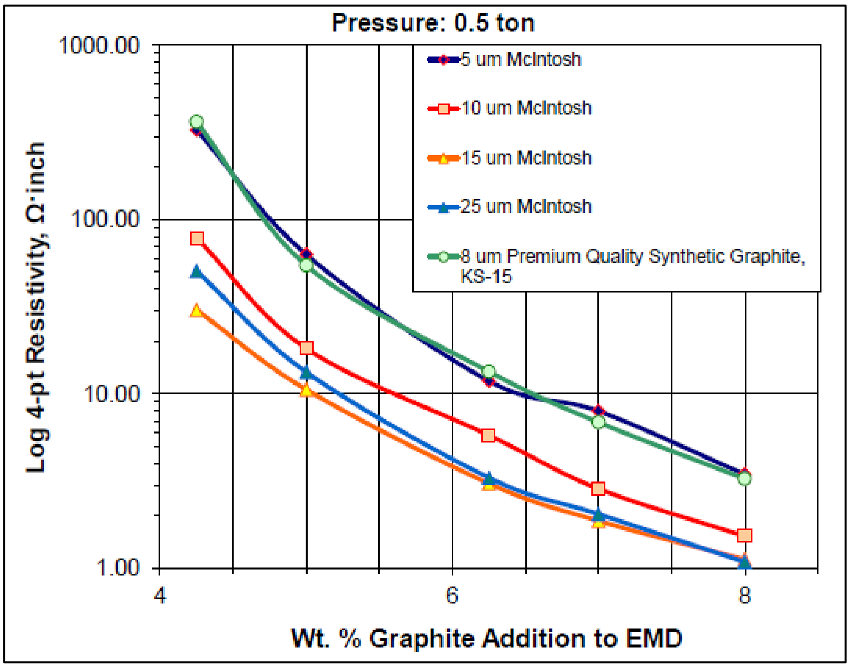
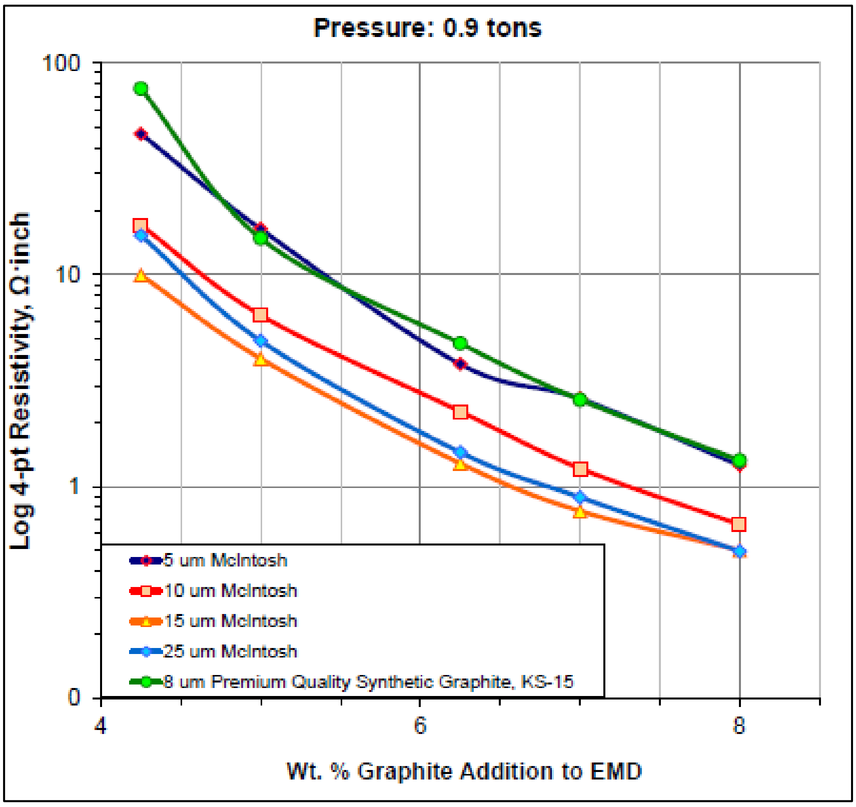


Figure 4: 4-Pt Electrical resistivity of ɣ-MnO2 (EMD) cathode as a function of graphite type and its concentration in electrode matrix at pellet pressure of 0.9 ton



b. *Rechargeable Lithium-Ion Batteries*

Extensive tests were undertaken to evaluate the potential for McIntosh flake CEM to act as a conductive diluent in the cathode of rechargeable lithium-ion batteries. For the host matrix, NAmLab employed battery grade lithium nickel manganese cobalt dioxide powder, denoted as NMC 5:3:2 (or NMC). NMC has a tight size distribution with a particle size of D50=13.1 µm and finer grades of CEM are expected to work best with this active material. As a control, NAmLab selected a top quality synthetic graphite grade SFG-6L made by Imerys.

i. Resistivity tests

The same procedure as reported above was undertaken for each of the 5 µm 10 µm and 15 µm grade CEM samples.

Figure 5: Comparison of electrical resistivity of natural crystalline flake graphite of McIntosh resource with resistivity of premium quality synthetic graphite SFG 6L at pressure of 0.5 ton.

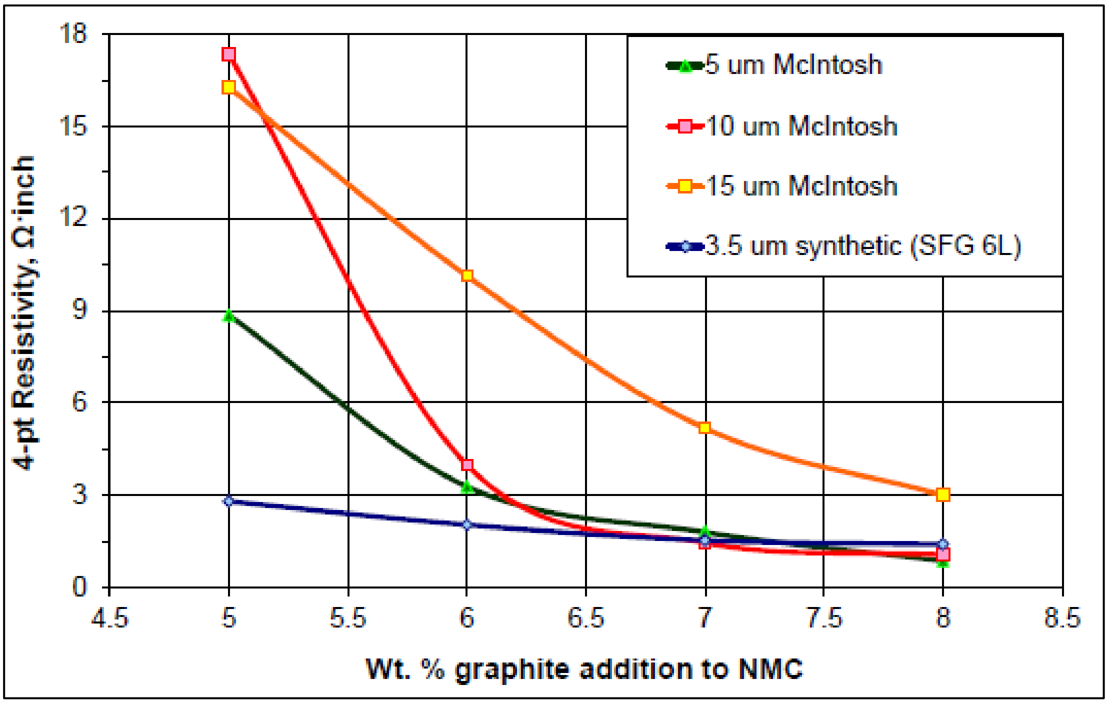


Figure 5 presents a comparison of resistivity of NMC pellets at the low pressure of 500 kg for the 5 µm 10 µm and 15 µm McIntosh graphite samples versus the control (SFG 6L). Unfortunately, there was only sufficient NMC remaining to perform the one comparative test at the low pressure setting. Notwithstanding, SFG 6L is a market leading material and whilst at this low pressure it clearly outperforms the McIntosh CEM at the lower addition rate (i.e. 5 wt. % and 6 wt. % loadings to NMC), at plus 6.5 wt. % addition to NMC, the McIntosh 10 µm matches the SFG-6L control and the 5 µm sample meets or marginally outperforms the control. Both the McIntosh 10 µm and 5 µm samples demonstrated lower pellet resistivity (better performance) than that of the control synthetic graphite at 7.5 wt. % and 8 wt. % additions to NMC.

ii. Cycling Tests

A series of coin cells (CR2016) were produced by NAmLab for electrochemical testing of the lithium-ion battery CEM materials-grade materials. Specifically, lithium nickel manganese cobalt dioxide powder, further denoted as NMC 5:3:2, or NMC/graphite slurries for each of the size grades and the control, were coated on aluminium foil and paired against a Li anode.

Figure 6: Galvanostatic discharge curves for NMC/McIntosh graphite and NMC/synthetic graphite vs. Li/Li⁺ counter electrode. C/20 rate. The initial discharge cycles are shown

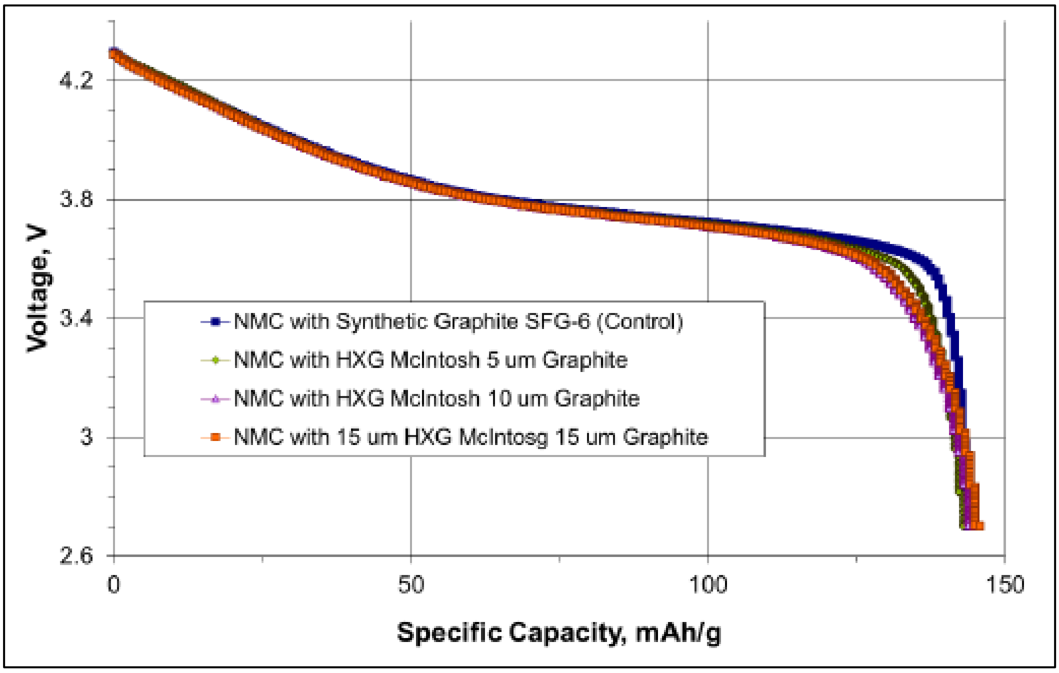


Figure 6 is an overlay of the initial discharge capacities of all four samples and shows that the overall shape of the discharge curves closely tracks that of the SFG-6 control for almost the entire duration of discharge, except for the tail end, starting to diverge at 120 mAh/g. The capacity achieved by the control formulation is 143.2 mAh/g, which is lower than that achieved by NMC/HXG McIntosh 15 μm and NMC/HXG McIntosh 10 μm at 145.8 mAh/g and 143.8 mAh/g, respectively. NMC/HXG McIntosh 5 μm formulation came closest to repeating the shape of the control formulation. While the average discharge voltage of the McIntosh 5 μm cathode was the highest for all McIntosh-containing formulations, the actual end-of-life capacity of a cell containing the 5 μm graphite came in the lowest in this test series (i.e.143.01 mAh/g).

Therefore, this electrochemical testwork closely supports the preliminary 4-point resistivity study described above (in section b (i) above with a higher, say 8 wt. % graphite addition to NMC, comparable to better reversible capacities for all three McIntosh CEM size grades compared to the industry's best-performing control (based on premium quality synthetic graphite grade SFG-6L).

c. *Lithium Primary Batteries*

Lithium primary cells represent a large segment of the battery industry which is populated by many battery chemistries, each suited for its unique application niche. Examples of lithium primary battery chemistries which use graphite and other carbonaceous materials as conductive diluents include, but are not limited to; lithium/Sulphur dioxide, lithium/thionyl chloride, lithium/sulphuryl chloride, lithium/oxychloride, lithium/manganese dioxide, lithium/iron disulphide, lithium/copper oxide, lithium/copper oxyphosphate and lithium/carbon monofluoride (Li/CFx). The Li/CFx battery chemistry is used in military, mining, and medical applications and represents the highest specific energy chemistry among all rechargeable and non-rechargeable battery systems. On this basis it was decided to validate the performance of McIntosh graphite as conductivity enhancement additives in 32650- Li/CFx cells.

Full-scale electrodes and batteries were made with McIntosh 15 μm CEM material. Graphite was added in the amount of 7 wt. % of electrode composition and employed as CEM in CFx cathode active material. For the control material, NAmLab used an in-house expanded delaminated graphite EG-10. CEM made from delaminated expanded graphite is known for having superior electrical conductivity in the electrode matrices to any natural flake graphite, mainly due to higher BET surface area and thinner particles.

Figure 7 presents the on-set of discharge of two 32650LJ cells, recorded at 0.1A of continuous current draw. The McIntosh flake CEM formulation performs significantly better than the control formulation based on EG-10, the control. This manifests as greater average discharge voltage for the McIntosh cells (2.67 VDC for McIntosh vs. 2.6 VDC for control formulation). Another feature of the diagram is that a known weakness of the Li/CFx battery chemistry is its initial voltage dip. Whilst the NAmLab designed EG-10 has been able to greatly minimise this industry-standard voltage drop, the McIntosh graphite has nearly eliminated this negative phenomenon completely, which is very promising.

Figure 8 shows the continued discharge profiles of the same cells referenced above. It is evident that the McIntosh formulation ultimately loses to the performance of the expanded graphite-based control. At a cell capacity of 3.75 Ah, the expanded graphite-containing cell retains stability of the output voltage, while HXG material-rich cell undergoes a decay, at the 6 Ah threshold of established nominal capacity for this cell size. The control cell reaches a 7 Ah capacity before reaching its cut-off voltage. Despite the control cell's longer performance, the McIntosh graphite-containing formulation has delivered a very solid performance, according to NAmLab.

Due to this unexpected results NAmLab ran 2 additional tests to determine performance at higher drain rates:

- 500 mA – Figure 8 shows a galvanostatic discharge curve of the McIntosh 15 μm cell at 5x the current density reported in the previous test (figure 7). At 500 mA continuous current the initial voltage drop is not apparent and the overall shape of discharge curve is excellent. This cell reached 5.52 Ah before cut-off, which indicates a solid level of electrochemical performance. This attests to the ability of the refined McIntosh flake to act as conductivity enhancement additive in CFx.
- 1,000 mA – Figure 9 presents the discharge curve at high drain rate of 1,000 mA continuous current. It was expected that the control formulation would exceed the McIntosh 15 μm CEM, however the McIntosh material delivered a very solid level of electrochemical performance – with a lower initial voltage drop than the control formulation and during the initial segment of discharge, it delivered higher average discharge voltage than the control cell.

This attests to the ability of the refined McIntosh flake to act as conductivity enhancement additive in CFx and potentially other lithium primary batteries.

Figure 7: Full discharge of AETC's Li/CFx 32650LJ cells at 100 mA current drain.

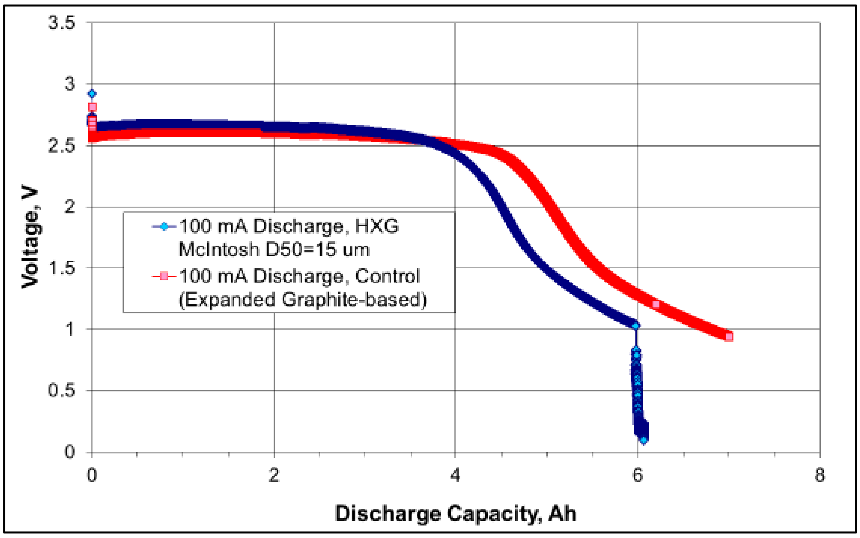


Figure 8: Full discharge of AETC's Li/CFx 32650LJ cells at 500 mA current drain.

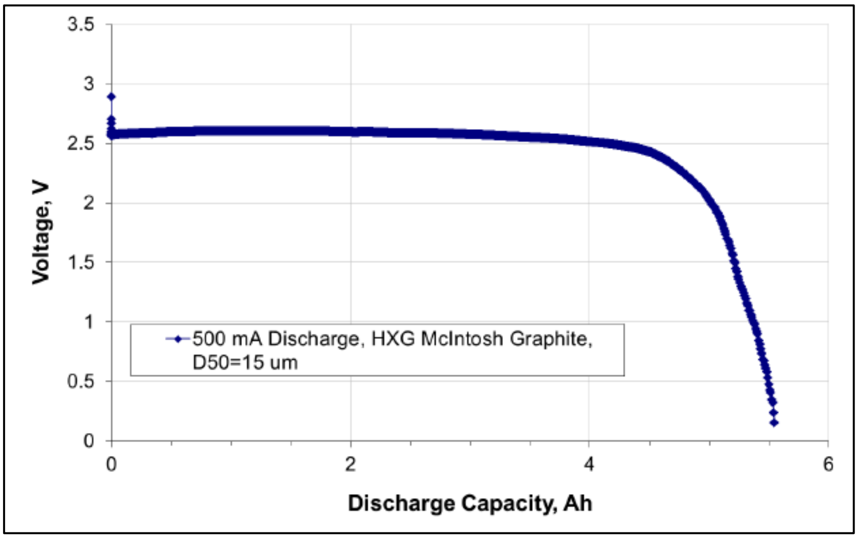
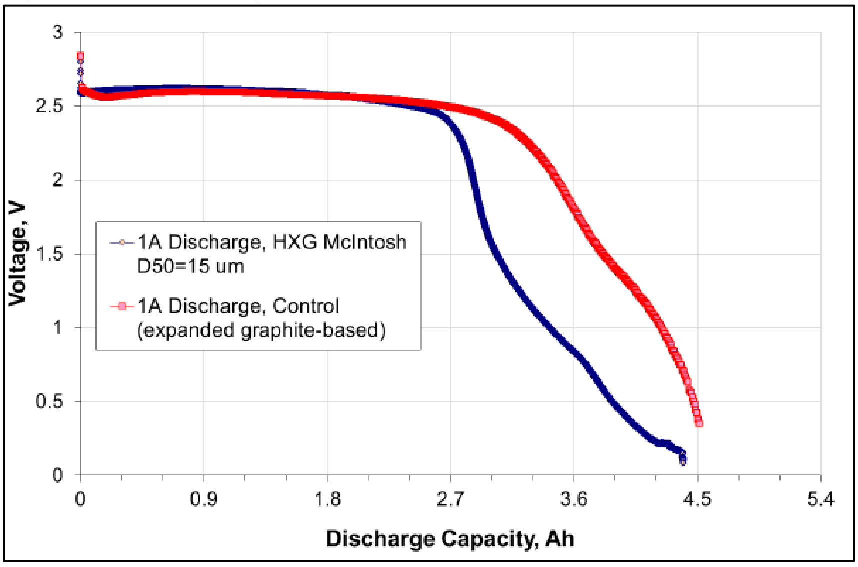


Figure 9. Full discharge of AETC's Li/CFx 32650LJ cells at 1,000 mA current drain



3.2.4 Conclusions of CEM Testwork

The extensive 4-point electrical resistivity testwork has established the feasibility for application of milled forms of Hexagon's McIntosh graphite as conductivity enhancement additives in cathodes of alkaline zinc/manganese dioxide primary batteries, lithium-ion batteries and lithium primary battery systems.

3.3 Synthetic Diamonds

Not all natural graphite precursors form diamonds and there was significant uncertainty with entering this testwork; the first time ever that McIntosh graphite was undergoing reactive synthesis to form a cultured diamond. Hexagon considers that there is significant market potential to initially produce a high-quality diamond precursor material to produce technical grade diamonds. An independent market study currently in progress indicates that in 2015 global demand for technical grade synthetic diamonds was c. 4 billion carats (c. 10,000 tonnes) which would require approximately 20,000-25,000 tonnes of precursor material. This was across a range of industries with specific requirements generally ranging from 100 μm down to 0.5 μm. As raw unprocessed stones, these diamonds sell for US $0.05 per carat (c.2.5 grams).

3.3.1 Background

Technical-grade diamonds are produced out of graphite by simultaneous application of pressure on the order of 50,000 kg/cm2 and temperature of approximately 1,500°C in specialized presses. Under these conditions, graphite, in the presence of a molten catalyst, turns into liquid phase, and then re-crystalises from saturated solution in the form of diamond. NAmLab used a high pressure high temperature (HPHT) press utilising established diamond-making technology known as "anvil-and-lentil-shaped cavity" made from specialised, hard, resistant materials. Using pistons to apply working pressure, resistive heat is added emanating from DC current flowing through graphite elements into a pellet composed of the working graphite precursor mixture. The heat and electricity work in conjunction to create a pressure and temperature environment allowing for the formation of the diamonds.

The recovery yield of diamonds is on the order of 50%, but it varies based on the attributes of the precursor graphite.

3.3.2 Testwork – synthetic diamonds

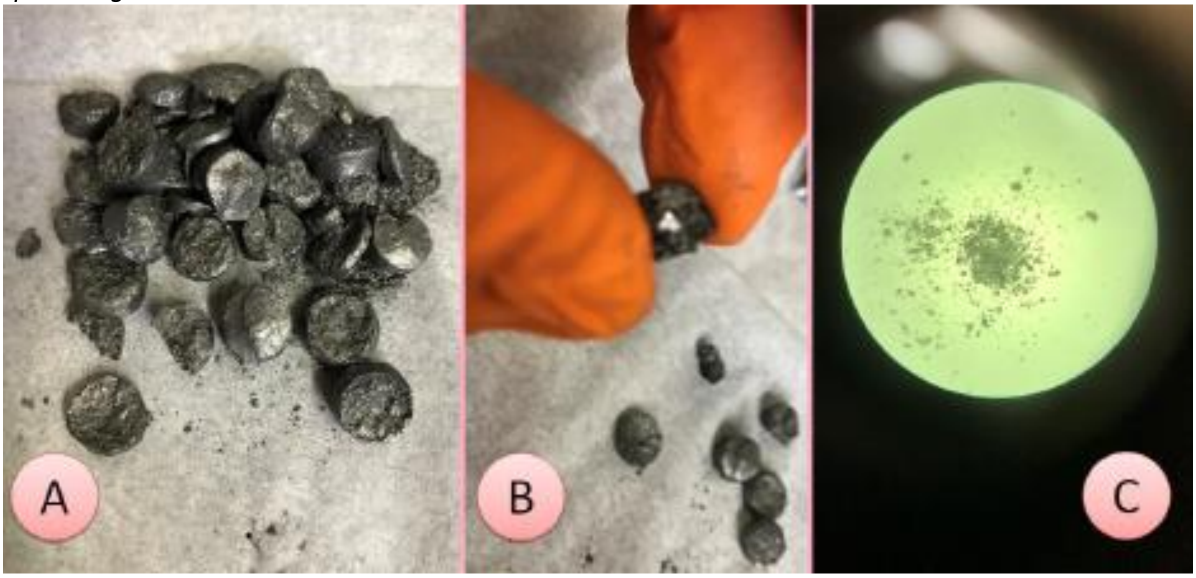
The sample material utilised for this testwork was the purified concentrate produced from a 20kg sample of thermally purified McIntosh concentrate as reported on 18 December 2018. This material achieved purity levels of "plus-4-nines" i.e. 2 subsamples yielding 99.998 wt. %C and 99.9991 wt. %C.

Plus "3-Nines"%C is the generally accepted minimum purity levels for synthetic diamond production. A review of crystallinity was also undertaken by examining XRD curves generated by Argonne National Laboratory's Advanced Photon Source which found the crystallinity to be very lucrative for subsequent diamond synthesis test work. Finally, it is worth noting, NAmLab and its associated diamond experts would not accept any graphite purified through acid leaching. Acid residue is considered unfavourable and potentially explosive in HPHT reactions. The fact that the McIntosh graphite precursor was thermally purified was viewed as a significant advantage by the diamond makers.

Conversion of the precursor material into cultured diamond was conducted at the experimentally determined "preliminarily optimal" pressure of 5.5 GPa (54,281 atmospheres or 56,084.4 kg/cm^2), while simultaneously maintaining a working temperature of 1,400°C via resistive heating. The synthesis time was 50 seconds per batch of graphite. The reaction was conducted using a homogeneous mixture of graphite with a Ni-Mn alloy, loaded at a ratio of 1:1, which acts as catalyst for graphite solubility at the given pressure and temperature.

After completion of the reaction the sample was removed from the press (see Figure 10 (a)), broken up and the contents of the sample containing the synthetic diamond, Ni-Mn alloy and unreacted graphite (see Figure 10 (b)) were broken into free flowing powder (see Figure 10 (c)), deposited on a sample holder, sputtered with a nano-thick gold coating and subsequently imaged by SEM.

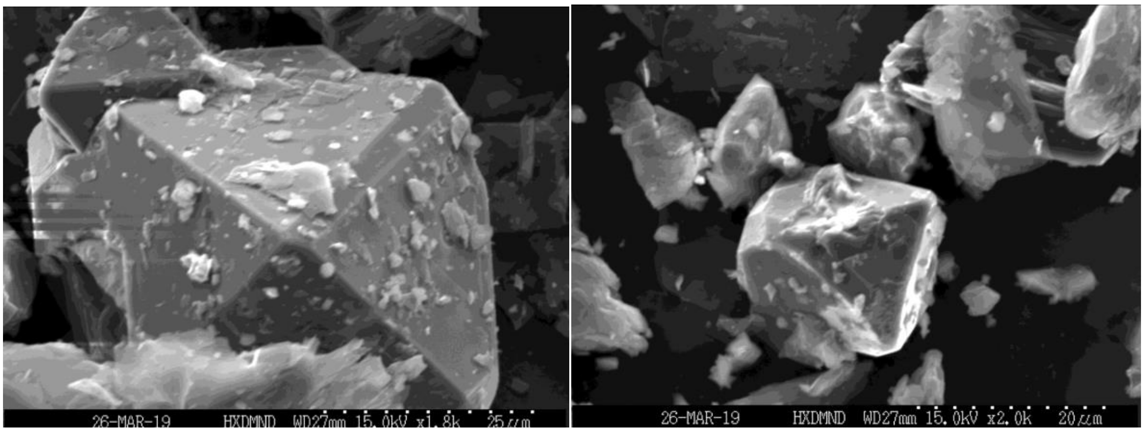
Figure10. Appearance of synthetic diamonds after synthesis:
(a) billets of graphite, unreacted catalyst and diamond (note shiny crystals); (b) large crystals of cultured diamond embedded into the middle of the billet; (c) synthetic diamond dust before gold sputtering.



Following synthesis, testwork focused on the crystal morphology of the synthetic diamonds produced from McIntosh flake graphite, as well as purity aspects of the precursor material. To undertake this work a variety of analytical techniques were employed, including:

- *Scanning Electron Microscopy (SEM).*
  A Hitachi S-3200N High Resolution SEM was employed to produce images of selected samples of cultured diamonds.
- *Optical microscopy.*
  NAmLab utilised its Dino-Lite handheld, test stand-mounted digital microscope with a MicroTouch snapshot feature to image the individual particles in magnification ranges: from 50x to 300x, and 500x for the finest products.
- *Analysis of elemental impurities in graphite using the Solid ICP method.*
  Testing of deleterious elements in graphite for diamond-making was performed through the solid- ICP method (Inductively Coupled Plasma on Solids technology). NAmLab tested dry mineral samples by disintegrating it in a high-temperature furnace in the presence of activating chemicals. All impurities are transferred into a torch to generate the intensity signal tied to their concentration. The ultimate purity is thus detected in a superior manner than the Glow Discharge Mass Spectrometry methods traditionally employed.

Figure 11. Synthetic Diamonds from McIntosh Precursor: (Left) Twinned octahedral (Right) simple Octahedral



The most prevalent crystal morphology observed in synthetic diamonds by SEM is octahedron with a variety of crystal growth habit modifications (e.g. flattened, twinned, truncated) with only a few cubic crystal morphologies being observable. As demonstrated by the SEM images (Figure 11) of the synthetic diamonds the particle size of the diamonds ranges from 20-90 µm with the majority of them having particle sizes of 40-70 µm.

3.3.3 Commercial Implications -synthetic diamonds

The diamond sizes produced from this initial testwork is very commercially attractive. The microscopic diamonds, which go into lapping compounds, are those that fall in the range of < 44 µm and go down to <0.5 µm. While there are many 25-45 µm crystals, in these experiments we have seen next to none that would be less than 15 µm with McIntosh feed. Such diamonds have lower value and typically are part of fine metal finishing dispersions.

Concurrently, diamonds, which are coarser than 45 µm carry greater commercial value, and belong to a class of "micronised crystals". Applications for these materials are drill bits and other cutting tools, diamond-filled pastes, specialty abrasives such as engineered sand papers, etc.

To this effect, Hexagon will undertake follow-up work to whereby two distinct sub-product streams are screened out; a microscopic and a micronized stream. Importantly, this same McIntosh graphite will make larger size diamonds if compressed on larger diamond press machines. Indeed, given the high purity of the purified McIntosh flake graphite (> 99.995 % carbon) one market that Hexagon could also include is the current growing market of gemstone quality synthetic diamonds.

4. COMPETENT PERSONS' ATTRIBUTIONS

Exploration Results and Mineral Resource Estimates

The information within this report that relates to exploration results, Exploration Target estimates, geological data and Mineral Resources at the McIntosh and Halls Creek Projects is based on information compiled by Mr. Mike Rosenstreich who is an employee of the Company. Mr. Rosenstreich is a Fellow of The Australasian Institute of Mining and Metallurgy and has sufficient experience relevant to the styles of mineralisation and types of deposits under consideration and to the activities currently being undertaken to qualify as a Competent Person(s) as defined in the 2012 edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves and he consents to the inclusion of this information in the form and context in which it appears in this report.

Metallurgical Test Work Outcomes

The information within this report that relates to metallurgical test work outcomes and processing of the McIntosh material is based on information provided by a series of independent laboratories. Mr. Rosenstreich (referred to above) managed and compiled the test work outcomes reported in this announcement. A highly qualified and experienced researcher at NAmLab planned, supervised and interpreted the results of the NAmLab test work. Mr. Michael Chan, a full time employee of Hexagon Resources, Ltd, also reviewed the metallurgical test work outcomes. Mr. Chan is a Metallurgical Engineer and a Member of the Australasian Institute of Mining and Metallurgy. Mr. Chan and the NAmLab principals have sufficient relevant experience relevant to the style of mineralisation and types of test-work under consideration and to the activities currently being undertaken to qualify as a Competent Person(s) as defined in the 2012 edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves and have consented to the inclusion of this information in the form and context in which it appears in this report.

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ATTACHMENT 1: JORC TABLE 1.

JORC Table 1 Summary

- Geology – interpretation was undertaken based on a combination of geological logging data from drill holes, surface mapping and modelled conductive plates from the VTEM survey of 2014.
- Drilling method – the drilling method used is a combination of reverse circulation "RC" and diamond. The mineralisation for Emperor is defined by 9 RC drill holes for a total of 1,134 m, 21 diamond drill holes for a total of 2,940.5 m and 9 RC precollar / diamond tail holes for 1,369.3 m. The mineralisation for Longtom is defined by 37 RC drill holes for a total of 4,146 m, 1 diamond drill hole for a total of 54.9 m and 4 RC precollar / diamond tail holes for 620.6 m. The mineralisation for Wahoo is defined by 26 RC drill holes for a total of 2,023 m and 11 diamond drill holes for a total of 1,257.8 m. The mineralisation for Barracuda is defined by 35 RC drill holes for a total of 2,883m and 3 diamond drill holes for a total of 294.0m. Additional RC and diamond tail drilling was undertaken from mid-August to end of October, 2018 at the Emperor, Wahoo mineral resource areas and several prospects, namely Threadfin and Mahi Mahi. This data is still to be compiled and all assays are pending.
- Sampling – one-metre drill chip samples were collected throughout the RC drill programme in sequentially numbered bags. Core samples from diamond drill holes were collected based on geology and a minimum interval of 1m and a maximum of 2m.
- Sub-sampling - analysis was undertaken at ALS laboratory where samples initially undergo a coarse crush using a jaw crusher to better than 70% passing 6mm. Samples exceeding 3 kg were spilt using a Jones Riffle Splitter 50:50. Pulverising was completed to 85% passing 75µm in preparation for analysis.
- Sample analysis method – all samples were sent to ALS for preparation and for Total Graphitic Carbon (TGC), Total Carbon and Total Sulphur (S) analyses. A 0.1 g sample is leached with dilute hydrochloric acid to remove inorganic carbon. After filtering, washing and drying the remaining sample is roasted at 425°C to remove organic carbon. The roasted residue is analysed for carbon using a high temperature LECO furnace with infrared detection for percentage units.
- Duplicate analysis and analysis of Certified Reference Material (standards) and blanks was completed and no issues identified with sampling reliability or contamination.
- Estimation methodology – grade estimation was undertaken using Surpac software to model graphitic mineralisation using a nominal 3% TGC cut-off grade and to estimate TGC by ordinary kriging at Emperor, Longtom and Wahoo and inverse distance (cubed) at Barracuda.
- Resource Classification – classification is based on confidence in geological and grade continuity using the drilling density, geological model, modelled grade continuity and conditional bias measures (slope of the regression and kriging efficiency) as criteria. Indicated Mineral Resources are defined where the drill spacing is sufficient to assume geological and grade continuity and where diamond drill samples have been assessed for graphite quality. As a general rule, drill spacing of 40 m by 40 m or less resulted in an Indicated classification for Emperor and Wahoo and areas with broader spacing are classified as Inferred. For Longtom drill spacing of approximately 25 m by 100 m or less resulted in an Indicated classification and areas with a broader spacing are classified as Inferred. The results from metallurgical test work at the McIntosh project have been considered for Mineral Resource classification. The likelihood of eventual economic extraction was considered in terms of possible open pit mining, likely product specifications, possible product marketability and potentially favourable logistics to port and it is concluded that graphite at the McIntosh Project is an Industrial Resource in terms of JORC Code Clause 49.
- Cut-off parameters – the Mineral Resource is reported above a 3% TGC cut-off grade.
- Mining modifying parameters – planned extraction is by open pit mining and mining factors such as dilution and ore loss have not been applied.

- Metallurgical methods - no metallurgical assumptions have been built into the resource model. Data from mineralogy and preliminary metallurgical test work has been considered for Mineral Resource classification.
- In June, 2017, ALS completed pilot processing program of a 2.4 tonne bulk composite sample collected from diamond core drilling at Emperor and generated 100kg of concentrate to provide samples for potential offtake companies. This material achieved a high graphite grade of 97.6% TGC but because it was targeting a flake size of c. 106 microns, this sample was not representative of the potential recoverable flake size distribution. This is because at that time the Company's marketing focus was solely on a product for the lithium ion battery anode market and the perceived optimum feed size for those plants of c. 106 microns.

  The 445 drill core samples utilised for the ALS bulk sample which were processed into graphite concentrate were each weighed (total weight was 2,383.8kg). Head grade was calculated on a weighted average basis as well as assayed from the 2.4t composite sample (4.77% TGC).

  The 20kg of concentrate that was purified was a subsample of the 100kg generated by the ALS Piloting process obtained by splitting.

  Following purification a spinning riffle splitter was utilised to extract two 15g samples which were then assayed.

  The latest mineralogical examination of drill samples indicates that graphite occurs across a range of sizes from fine to very large flake. Additional test work with a larger data set is currently underway examining the flake size distribution and the flow sheet requirements to preserve larger flake.

  The concentrate assaying and sizing work was undertaken at an ISO 9001:2008 compliant laboratory in the US, highly experienced in graphite applications and test work, utilising conventional assaying and sizing techniques. This same facility has completed two rounds of refining test work; the first on five – sub samples of the concentrate generated at ALS (see above) and the second on a bulk 19.6 kg sample from the same source. Both results indicated the ability to achieve graphite purity of greater than 99.95 wt. % graphitic carbon.

  There is a large body of test work, in progress from sample sources from the Emperor Resource, this comprises two distinct programs:

  a. What is referred to as the "Upstream" test work which is aimed at refining and optimising g the upstream flotation concentration of the ore to a range of graphite concentrate products with specific size specifications;

  b. What is referred to as the "Downstream" test work is to examine and verify the downstream or secondary processing flowsheet parameters and responses to develop a marketing strategy based on the technical attributes of the material and to match it with end-users requirements.

  The following Appendices relate to the bulk sample which was the subject of the downstream testwork being reported. The sample composited in late 2016, and processing as described above was completed in June 2017. Therefore, the main updates are in Section 2 "Other Substantive Exploration Data" which focusses on the methods employed for these tests.

Appendix 1: JORC Table 1 Emperor Resource

Section 1 Sampling Techniques and Data

Criteria	JORC Code Explanation	Commentary
Sampling techniques	• *Nature and quality of sampling* • *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.*	**1. Reverse Circulation** • RC drilling used high pressure air and a cyclone with a rotary splitter. • Samples were collected at one-metre intervals. • Approximately 50% of samples were not submitted for assay due to the visual non-mineralised nature of the material collected. All graphitic intervals were submitted for analyses. • Duplicate and standards analysis were completed and no issues identified with sampling reliability. • Samples were sent to the ALS laboratory in Perth for assay preparation and then sent to ALS in Brisbane for Total Graphitic Carbon (TGC) analyses. • All samples were pulverised to better than 85% passing 75µm with a 10 g aliquot taken for assay. • Sampling was guided by Hexagon's protocols and QA/QC procedures. • RC drilling samples of 3 to 5 kg weight were shipped to the laboratory in plastic bags; samples were pulverised and milled for assay. **2. Diamond Drilling** • Drill samples in this program were collected based on geology, varying in thickness from 0.1 m to 2 m intervals. Sampling was completed so samples could be composited to one metre intervals within the geological units. • Core samples were quarter split HQ3 core using a diamond bladed saw and sent to the ALS laboratory in Perth for assay preparation and then sent to ALS in Brisbane for Total Graphitic Carbon (TGC) analyses. • All samples were pulverised to better than 85% passing 75µm with a 10 g aliquot taken for assay. • Duplicate samples, CRM standards and blank material were used during the drill programs. Duplicates collected after each 50 samples. Standards were inserted for samples ending in *00,*20,*40,*60 and *80 and blanks for samples ending in *01,*21,*41,*61 and *81.Sampling was guided by Hexagon's protocols and QA/QC procedures.
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).*	**1. Reverse Circulation** • RC drill holes (total of 2,154 m from 18 holes) – completed with face sampling hammers and collected through a cyclone. Sample recovery was estimated at a percentage of the expected sample, sample state recorded (dry, moist or wet), samples tested with 10:1 HCl acid for carbonates and graphite surface float. • RC drilling was completed by Egan drilling using an X400 drill rig and United Drilling Services using a DE840 drill rig. **2. Diamond Drilling** • Diamond drill holes (total of 2,940.5 m for 21 holes) – collected HQ_3 core using a 3m core barrel and drilled by Terra Drilling using a Hanjin Powerstar 7000 track mounted rig. Core orientation was recorded using a Reflex EZ Shot instrument. • RC pre-collars were drilled with HQ_3 diamond tails for a total of 1,369.3 m from 9 holes.
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *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.*	**1. RC Drilling** • A face sampling hammer was used to reduce contamination at the face. • 1 m drill chip samples, weighing approximately 2 kg were collected throughout the drill programme in sequentially numbered bags. • Split samples were recovered from a cyclone and rig-mounted cone splitter. The sample recovery and physical state were recorded. • Every interval drilled is represented in an industry standard chip tray that provides a check for sample continuity down hole. **2. Diamond drilling**

		• Core recovery was excellent. Recoveries were measured for each run between core blocks and measurements recorded. Core was photographed and logged for RQD and geology. • Analysis from one pair of twin holes drilled at Hexagon's Longtom resource (an adjacent and similar style graphite deposit) noted a lower graphite content in the RC samples when compared with diamond core. Insufficient work has been completed on comparing RC and diamond methods to rule out drilling by RC.
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.* • *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.* • *The total length and percentage of the relevant intersections logged.*	• All RC and diamond drilling (100%) was logged for geology in the field by qualified geologists. Lithological and mineralogical data was recorded for all drill holes using a coding system developed specifically for the Project. Primary and secondary lithologies are recorded in addition to texture, structure, colour, grain size, alteration type and intensity, estimates of mineral quantities, graphite intensity and sample recovery. The oxidation zone is also recorded. • No adjustments have been made to any assay data • Geological logging is qualitative in nature. • Diamond drilling logging also recorded recovery, structure and geotechnical data. • Diamond core was orientated using the Reflex orientation tool. • Core was photographed both dry and wet.
Sub-sample techniques and sample preparation	• *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.* • *Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.* • *Whether sample sizes are appropriate to the grain size of the material being sampled.*	**1. RC Drilling** • All samples marked with unique sequential sample number • RC drilling samples were bagged at the drill site in calico bags with a second outer plastic bag to prevent loss of fines. The sample sizes are considered to be appropriate to the grain size of the material being sampled. • 1m RC drilling samples were submitted to either Actlabs Canada or ALS laboratories in Perth. The samples were riffle split on a 50:50 basis, with one split pulverised and analysed for Total Graphitic Carbon (TGC), Total Carbon (TC) and Total Sulphur (TS) using a LECO Furnace, and the other split held in storage. • For RC samples, standards and field duplicates were inserted at an approximate rate of 1 in every 20 samples collected. Duplicate assay results exhibit good correlation with the original assays and no consistent bias is evident. • Sample preparation: 1. Coarse crush using a jaw crushed to better than 70% passing 6mm. 2. For samples exceeding 3kg received mass, riffle split using a Jones Riffle Splitter 50:50 3. Pulverise up to 3kg of coarse crushed material to better than 85% passing 75µm particle size 4. Small aliquot (~10g) taken for assay. **2. Diamond Drilling** • Diamond drill core was cut into half core (used for metallurgical testing) and the remaining half sawn into quarter core using diamond blade core-saw. Quarter core was used for samples and duplicates. Core cutting was carried out under consignment at Westernex in Perth. • Duplicate assay results exhibit good correlation with the original assays and no consistent bias is evident. • Sample preparation: 1. Coarse crush using a jaw crushed to better than 70% passing 6mm. 2. For samples exceeding 3 kg received mass, riffle split using a Jones Riffle Splitter 50:50 3. Pulverise up to 3 kg of coarse crushed material to better than 85% passing 75µm particle size 4. Small aliquot (~10 g) taken for assay. • Sampling procedures and sample preparation represent industry good practice:
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.* • *Nature of quality control procedures*	• The assaying and laboratory procedures used are industry standard and are appropriate for the material tested. • Sampling was guided by Hexagon's protocols and QA/QC 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.	• For RC samples, standards and field duplicates were inserted at an approximate rate of 1 in every 20 samples collected. • Field duplicates were inserted into diamond core samples at a rate of 4 every 100 samples, standards at a rate of 4 every 100 samples and blanks at 2 every 100 samples. • Statistical analysis of standards, blanks and duplicates during the QAQC process showed that the data was satisfactory. • No issues were identified with sampling reliability
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* • *Discuss any adjustment to assay data.*	• Hexagon QA/QC checks show that all samples are within acceptable limits. No adjustments to assay data have been made based on the analysis of duplicates, standards and blanks. • Standards from ALS laboratory were found to be acceptable. • Duplicate analysis was completed and no sampling issues were identified. • CSA verified several graphite intersections in core and RC chip samples during a visit to Hexagon's warehouse during January 2015. • During a site visit in October 2015, a geological consultant from CSA verified that the diamond drilling, geological logging and sampling practices were of industry standard. The consultant also verified graphite intersections in core samples. • Analysis from one pair of twin holes drilled at Hexagon's Longtom resource noted a lower graphite content in the RC samples when compared with diamond core. It is suggested that RC samples are biased due to the loss of fine material. The majority of samples used in the estimation for Emperor are diamond core. • The Hexagon database is hosted in a SQL backend database, ensuring that data is validated as it is captured and exports are produced regularly. Assay results are merged into the database from the lab certificates limiting transcription or mapping errors from occurring. • No adjustments have been made to the results.
Location of Data points	• *Accuracy and quality of surveys used to locate drillholes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	• 11 diamond core drill holes were sampled using ⅓, ½ and ¾ drill core to achieve a composite sample considered representative of the Emperor deposit. • These are a subset of a total 48 drill holes. • 45 drill hole collars, including all of the 11 sampled holes, were surveyed using Differential GPS by a surveyor from Savannah Nickel mines for the 2015 program and a contract surveyor (MNG survey) from Broome. The degree of accuracy of drill hole collar location and RL is estimated to be within 0.1 m for DGPS. 3 collars were surveyed using a handheld Garmin 62S and Garmin 76c Global Positioning System (GPS) with a typical ±5 m accuracy. Topography from contours generated from a LiDAR survey was used to validate collar points and assign RL values to the 3 holes surveyed by GPS that had an RL >2 m different to the topography. • Downhole surveys completed for all holes where possible (48 holes). EZshot survey data was used where downhole surveys were not successful. All holes used in the resource have been downhole surveyed using a gyro by ABIM Solutions. • Topographic control was adequate for the purposes of Mineral Resource estimation. • The map projection used is the Australia Geodetic MGA 94 Zone 52.
Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *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.*	• Drill spacing on an approximate 40 m by 40 m grid throughout the majority of the deposit, dropping to 40 m across strike by 80 m along strike to the south of the deposit. • Geological interpretation and mineralisation continuity analysis indicates that data spacing is sufficient for definition of a Mineral Resource.

	• *Whether sample compositing has been applied.*	
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.* • *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.*	• Holes generally drilled dipping at -60° targeting the fold hinge and limbs. • Diamond drill core has been orientated using a Reflex ACE tool 9Act II), with α and β angles measured and positioned using a Kenometer. MapInfo software was used to calculate dip and dip direction for each structure. • The relationship between the drilling orientation and the orientation of key mineralised structures is not considered to have introduced a sampling bias.
Sample Security	• *The measures taken to ensure sample security.*	• Unique sample number was retained during the whole process • RC and diamond samples were placed into calico bags and then into self-sealing plastic bags prior to being put into bulka bags. The bulka bags were then transported by road. RC samples were sent to the ALS laboratory in Brisbane for preparation and analysis and diamond core samples were sent to ALS in Perth for preparation and then to ALS in Brisbane for analysis. A small amount of core samples were sent to Actlabs. • Drill core transported to Westernex was secured on pallets with metal strapping and transported to Perth by road train. • The sample security is considered to be adequate.
Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	• Sampling techniques and data collected methods have been audited by CSA during a site visit in October 2015 • Field data is managed by an independent data management consultancy Rocksolid Solutions. • All data collected was subject to internal review

Section 2 Reporting of Exploration Results

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.* *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.*	• Drilling was recently completed at the Emperor deposit, on exploration leases E80/3864 and E80/4841, Mahi Mahi on exploration lease, E80/4825 and Threadfin, exploration leases, E80/4739 and E80/4931. These tenements are held by McIntosh Resources Pty Ltd, a wholly owned subsidiary of Hexagon Resources. Mineral Resources Limited is managing the current exploration on the project under the Joint Venture Agreement signed 7 November, 2018. Mineral Resources has subsequently earned its 51% interest and is continuing the Feasibility Study work.
Exploration done by other parties	• *Acknowledgment and appraisal of exploration by other parties.*	• The East Kimberley has been largely explored for base metals and diamonds with no active previous exploration for graphite. Graphite had been noted by Gemutz during regional mapping in the Mabel Downs area for the BMR in 1967, by Rugless mapping and RAB drilling in the vicinity of Melon Patch bore, to the east of the Great Northern Highway in 1993 and has been located during nickel exploration by Australian Anglo American Ltd, Panoramic Resources Ltd and Thundelarra Resources Ltd over the last 20 years.
Geology	• *Deposit type, geological setting and style of mineralisation.*	• The McIntosh Project graphite schist horizons occur in the high grade terrain of the Halls Creek Mobile Zone of Western Australia. The host stratigraphy is the Tickalara Metamorphic which extend for approximately 130 km along the western side of the major Halls Creek Fault. The metamorphic rocks reach granulite metamorphic facies under conditions of high-temperature and high pressure although the metamorphic grade in the McIntosh Project area appears to be largely upper amphibolite facies with the presence of key minerals such as sillimanite and evidence of original cordierite. • Hexagon has identified potential graphite schist horizons based on GSWA mapping and EM anomalism over a strike length in excess of 15 km within the project area, with potential for an additional 35 km strike length of graphite bearing material from lower order EM anomalism.

Drill hole Information	• *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:* • *easting and northing of the drill hole collar* • *elevation or RL (elevation above sea level in metres) of the drill hole collar* • *dip and azimuth of the hole* • *down hole length and interception depth* • *hole length.*	• 21 diamond drill holes for 2,940.5 m and 18 RC drill holes for 2,154 m and 9 RC precollar diamond tail (RD) holes for 1,369.3 m completed at the Emperor deposit. • The location of the 11 diamond drill core holes sampled to provide samples for the 2.4t bulk sample utilised by ALS to generate c. 100kg of graphite concentrate is provided in Table 1 below. • Additional drilling was undertaken in July-August 2017, and between August and October 2018, however these samples were not available at the time the bulk sample was composited.
Data aggregation methods	• *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.*	• Data compiled in Excel and validated in Datashed by an external data management consultancy. • RC samples were all 1 m in length, diamond core samples vary between 1m and 2 m samples. • Metal equivalents are not reported as this is an industrial mineral project where the mineral properties define grade (e.g. flake size and purity). • A nominal 3% Total Graphitic Carbon cut-off has been applied in the determination of significant intercepts. • The 445 core samples utilised for the ALS bulk sample which was processed into graphite concentrates were each weighed (total weight was 2,383.8kg). Head grade was calculated on a weighted average basis as well as assayed from the 2.4t composite sample (4.77% TGC). • The 20kg of concentrate was a subsample of the 100kg generated by the ALS Piloting process obtained by splitting. • Following purification a spinning riffle splitter was utilised to extract two 15g samples which were then assayed.
Relationship between mineralisation widths and intercept lengths	• *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* • *If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect.*	• Mineralised widths at Emperor are estimated to be typically between 5 m and 70 m, compared with RC samples of 1m width. There is a very close relationship between the graphitic schist unit and Total Graphitic Carbon (TGC%) assays. The presence of graphitic schist is clearly evident in both the RC chips and diamond drill core so that the assay widths can be clearly related to the geological logs. • The graphitic schist horizon has been interpreted as an anticlinal fold. Angled drill holes (generally 60º) have targeted the mineralised unit with the priority to intersect the limbs perpendicular to the strike of the graphitic schist horizon, although in some areas this was not possible and holes were drilled down dip. However interpreted EM data and the width of intersections where holes were drilled perpendicular to the unit have allowed for a good indication of unit thickness to be made and applied in areas where the information is not available.
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.*	• Not Relevant as metallurgical test work results are being reported. However Figure 1 illustrates where a purification furnace fits in to the downstream flow sheet.
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 practiced to avoid misleading reporting of Exploration Results.*	• Metallurgical results for a bulk 19.5kg sample of concentrate are being reported. Two sub samples were analysed and both results reported. As well, all battery critical deleterious elements are reported.
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,*	*Sample origin for test work reported – 29 April, 2019* • Relevant to the test work being reported – the 2,383kg Emperor bulk sample was selected on the basis of being representative of the Emperor deposit. This material was subsequently crushed, milled and concentrated at a pilot scale to produce 100kg of graphite concentrate grading 97.6% TGC. The purification test results relate to a random, 20kg sub-sample of this concentrate.

	groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.	• Metallurgical test work is underway and being reported progressively on McIntosh concentrate material produced from previous test work. The results reported herein are derived from such a sample. *Background to current testwork report* • Earlier work was focused on purification of the graphite concentrate as part of a downstream processing route as well as suitability for it to form certain battery materials such as spherical graphite in lithium-ion batteries. This report provides information on several test work programs examining: - Size reduction through various milling and micronising technologies; - The effectiveness of the ground material to be utilised as conductivity enhancement material in a various battery chemistries; - The suitability of the purified material to be utilised to manufacture technical grade synthetic diamonds. - The suitability of micronised material to be used as mould release agent for foundry application, brake pad/lining and specialty grease/lubricant. This recent work is being managed and undertaken by a well credentialed and experienced private company in the US and Hexagon staff have inspected these facilities. Hexagon has a confidentiality obligation not to disclose the entities name and hence refers to it as NAmLab. The test work completed by NAmLab, was done so in accordance with a detailed scope of work and target size specifications for different planned products compiled by Hexagon. *Milling Testwork* • For the comparative milling tests, unpurified concentrate (as described above) was utilised to preserve the “valuable” high purity sample for other testwork. • *Impact Hammer mills* are effective for size reduction to approximately 10 to 30 µm. For further size reductions Hexagon tested air jet mills and also a proprietary superfine grinding technology being developed by NAmLab. • To assess the potential of Hexagon’s McIntosh graphite for the end uses listed in Table 2, a series of sequential hammer milling passes were performed. • *Screened Sample* - For the initial milling trials, a lab-scale hammer mill was used to grind Hexagon’s McIntosh graphite samples that were pre-screened to a minus 125 µm and plus 45 µm particle size. Hammer milling was chosen for the initial milling because it represents the most established and economical milling method in a scaled up mode, based on its higher throughput (2,200 lbs/hr) relative to air jet milling (200 lbs/hr). To grind the material, the mill uses four steel hammers, attached to a base plate, which in turn is secured to a horizontal rotor. Rotor speed was kept constant at either 16,000 RPM or 14,000 RPM for all the hammer experiments. Graphite powders were fed into the mill via a funnel while a rotor inside the body was energised to spin counter-clockwise. The hammers impacted the graphite material, reducing it to fine particles. These, in turn, passed through a 325 mesh screen into a transfer pipe, and into the end-product tank. Compressed air, coming from an external source, was used as an airlock; it also assisted with moving the powder and collecting it in the end-product tank and in a filter bag. Once all the material has been milled, the product tank was removed from the mill, and the material was retrieved and analysed. • In order to prepare a pre-screened sample, NAmLab used the Ro-tap RX-29 Tap Test Sieve Shaker machine. • *Air jet milling* test work, NAmLab utilised a 4” air Impact Pulveriser mill which is equipped with counter-opposed nozzles. The air mill forces directly opposing jet streams (incoming from an adjacent air compressor) to cause particle-to-particle, head-on impact, typically four times the impact power of a single force against a stationary object. The mill utilises fluid energy - compressed air, typically at 30 – 80 psi

		- to produce impact. It has shown to be effective in grinding graphite precursors used in this project; pulverising and sizing to the desired particle dimension in a matter of minutes. • Superfine grinding - In order to superfine materials, NAmLab employed its pilot-scale Super Fine Grinding Mill (SFGM), The SFGM mill is used for reducing the particle size of graphite when size specifications exceed those which can be achieved with standard jet milling. The mill has three modes of operation. In the first mode, a set batch of raw material is fed into the size reduction chamber and discharged. In the second, material is continuously pumped through the machine and fed out into a product tank. In the third, raw material is pumped into the machine, discharged back into the feed tank, and processed repeatedly. In the mill, a shaft rotates within the vessel as several spinning blades grind down the particles until they reach a super fine size, which meets the desired end-product specification. After all particles have been ground, the vessel may be removed and the particles emptied into a receiver tank. A supply of water constantly flows through the mill to cool it, and compressed air is used for the discharge process. *CEM Testwork* • The ability of alkaline batteries to operate at high drain currents is limited by the electrical conductivity of the cathode. The higher the cathode conductivity, the better battery performance one should expect. Conductivity is a reverse value of electrical resistance, which can be determined by the 4-point resistivity method. The values of electrical resistivity were determined for EMD/graphite blends using a 4-point resistivity apparatus. Inside a 4-point resistivity jig the powder is confined under a pre-set pressure between four electrically conductive metal surfaces that are electrically insulated from each other by Teflon spacers. The OD of a piston matches the ID of an AA size alkaline battery can, while the OD of an opening in the centre of the piston matches the ID of a typical cathode ring. These parts allow making compressed shapes near identical in size to the dimensions of the cathode rings employed in the actual alkaline cells of AA form factor. The compaction of powdered blends was undertaken in a Carver semi-automatic hydraulic press to the following pre-programmed settings for this test series: 500 kg, 600 kg, 700 kg, 800 kg, 900 kg, and 1,000 kg. While under pressure, the value of electrical resistance for the EMD/graphite matrix was measured by the 4-wire digital Kelvin Bridge. In contrast to classic unidirectional resistivity probes used for measuring conductivity of materials, the operation of the Kelvin Bridge is facilitated by two additional fixed Ohm- value resistors and a circuit of variable resistors. This arrangement is advantageous for the tests conducted under the umbrella of this project, since it minimised the wasteful resistance of the electrical circuit of unidirectional resistor probes. The parasitic resistances are not included in the measurement in the 4-point method. Therefore, the latter provides increased accuracy of measurements in the desired range of measured data points. NAmLab has the following design constants: the diameter of the test specimen (compressed electrode pellet) is 0.4915 inch, radius (r): 0.24575 inch; height L: 0.7210 inches (defined as the distance from the top of upper screw to the bottom of the moulded pellet). The Surface area (A) of the relevant portion of the vertical compression die is calculated as (1): $A = \pi \cdot r^2 = 0.1896\ inch^2$. (1) The value of resistance (R) is registered by the Ohm meter and converted into resistivity (ρ) by (2): $\rho = R*A/L = 0.263\ R$,(2)

		where ρ is expressed in Ohm·inch. The result can optionally be converted into SI units (i.e. Ohm·cm). *Synthetic Diamonds* Technical-grade diamonds are produced out of graphite by simultaneous application of pressure on the order of 50,000 kg/cm^2 and temperature of approximately 1,500°C in specialised presses. NAmLab utilised a high pressure high temperature (HPHT) press which incorporates a highly specialised mould as part of its design. Specifically, the graphite/catalyst mixture is pressed into a pellet which is inserted into a sacrificial ceramic shell. The reactive mixture is outfitted with graphite heating elements to improve thermal conductivity of the composite. Unidirectional pressure is applied by conformal pistons which consolidate sacrificial ceramics, which, in turn, apply pressure to the reactive mixture. The pistons are made out of an ultra-hard alloy press-fitted into an outer pressure ring. The outer ring reinforces the inner piston and prevents its breakage. After having applied working pressure, the operator supplies resistive heat emanating from DC current flowing through graphite elements into a pellet composed of a working mixture. The heat and electricity work in conjunction to create a pressure and temperature environment allowing for the formation of the diamonds. While in the press, the graphite melts into a liquid, and, after approximately sixty seconds, the press is turned off, discontinuing the flow of electrical current and allowing the liquefied graphite to cool. During this cooling process, the graphite begins to recrystallise out of a saturated solution of graphite and catalyst, forming the synthetic diamonds. The recovery yield of diamonds is on the order of 50%, but it varies based on the type of graphite. The mixture has to undergo mechanical and chemical separations to segregate diamonds from unreacted graphite. *Analytical Methods* - Following synthesis, testwork focused on the crystal morphology of the synthetic diamonds produced from McIntosh flake graphite, as well as purity aspects of the precursor material. To undertake this work a variety of analytical techniques were employed, including: • *Scanning Electron Microscopy (SEM).* A Hitachi S-3200N High Resolution SEM was employed to produce images of selected samples of cultured diamonds. • *Optical microscopy.* NAmLab utilised its Dino-Lite handheld, test stand-mounted digital microscope with a MicroTouch snapshot feature to image the individual particles in magnification ranges: from 50x to 300x, and 500x for the finest products. • *Analysis of elemental impurities in graphite using the Solid ICP method.* Testing of deleterious elements in graphite for diamond-making was performed through the solid- ICP method (Inductively Coupled Plasma on Solids technology). NAmLab tested dry mineral samples by disintegrating it in a high-temperature furnace in the presence of activating chemicals. All impurities are transferred into a torch to generate the intensity signal tied to their concentration. The ultimate purity is thus detected in a superior manner than the Glow Discharge Mass Spectrometry methods traditionally employed.
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).*	*Upstream Flow Sheet* • Continuation of the test work programs gathering mineralogical data, primary processing test work including optimisation of comminution and flotation to improve the Stage 1 process flow sheet. *Downstream Testwork*

		• Electrical testwork specifically on CEM in EAF-Electrodes and alkaline/primary batteries, lithium-ion battery charge/discharge performance test. BAM spheroidisation and classifying testwork. Also pilot scale thermal purification and downstream production.

Table 1: Location & Drill hole Parameters for Diamond Core Holes sampled for the Pilot Test work undertaken by ALS in 2017.

Hole ID	Hole Type	Grid_ID	East	North	RL	Max Depth
T6GDD164	DD	MGA94_52	389967	8052593	406.0	130.7
T6GDD165	DD	MGA94_52	389908	8052581	408.5	138.24
T6GDD167	DD	MGA94_52	389994	8052435	410.3	183.25
T6GDD168	DD	MGA94_52	390118	8052458	415.2	155.53
T6GDD171	DD	MGA94_52	389954	8052668	399.9	95.05
T6GDD173	DD	MGA94_52	389881	8052655	405.1	141.2
T6GDD176	DD	MGA94_52	389949	8052509	411.8	171.2
T6GDD192	DD	MGA94_52	390004	8052642	405.0	99.2
T6GDD193	DD	MGA94_52	389940	8052547	411.1	201.3
T6GDD194	DD	MGA94_52	389977	8052476	412.6	179
T6GDD195	DD	MGA94_52	389908	8052709	400.3	102.3