HEXAGON resources limited
High Purity Flake Graphite for New Technologies

ASX ANNOUNCEMENT

29 July 2016

QUARTERLY ACTIVITIES REPORT

PERIOD ENDING 30 JUNE 2016

HIGHLIGHTS:

McIntosh Flake Graphite Project:

Graphene:

- **Graphene produced from Hexagon's ultra-high purity graphite (+99.9%TC) was successfully demonstrated using all three exfoliation methods**
- **High yield of graphene from graphite at approximately >90%**
- **High quality graphene with single to a few layers from Hexagon's graphite samples is confirmed by Raman, TEM and TGA analysis**
- **Graphene produced via several methods including a 'green method' without the use of hazardous chemicals**
- **Graphene produced from Hexagon's high-purity graphite samples have comparable quality to graphene currently available on the market**
- **These graphene test work results have been sent to currently engaged commercial graphene groups**

Graphite:

- **Elemental composition after combustion of Hexagon's bulk scale flake graphite sample confirms ultra-high purity material grading +99.9 %TC**
- **X-Ray Diffraction (XRD) has confirmed that the carbon in the representative bulk scale graphite concentrate is crystalline and no amorphous material**
- **Results from this study indicate that Hexagon's ultra-high purity graphite has the potential to be used for large scale graphene production**

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High Purity Flake Graphite for New Technologies

Pre-feasibility:

- **Open pit mining optimisation results demonstrate the potential for multiple low strip ratio, open pit operations across a range of production scenarios**
- **Environmental surveys for the mining proposal are well advanced with baseline flora and fauna surveys completed**
- **Hexagon in advanced discussions with key potential end users in the US, Europe and Asia**
- **Drilling program planned to upgrade further resources into the indicated and measured categories in preparation for commencement of mining**
- **Superior metallurgy +99% TC ultra-high purity graphite concentrate can be achieved from conventional crush, grind and flotation without the use of chemicals**
- **Hexagon is well positioned to take advantage of the unprecedented demand from the lithium ion battery market, and the rapidly emerging graphene market, by producing premium quality graphite and graphene**

South Korean Flake Graphite Projects:

- **Detailed assessment by Hexagon's new management team has highlighted significant upside at its South Korean projects**
- **Flake size distribution in graphite concentrate from historical mining at Geumam indicates >30% to be in the large to extra-large 'jumbo' category and >30% in the medium category making it well suited for production of spherical graphite for use in lithium-ion batteries**
- **Outcropping regional scale fold hinge at Geumam has the potential to produce large to jumbo flake at high grades along with good recoveries**
- **Review of historical mine data from Geumam has highlighted that the open pit operation targeted the synformal structure and confirmed the high quality of the Geumam flake graphite product**
- **Significant potential to grow current JORC resources**

MCINTOSH FLAKE GRAPHITE PROJECT

PRODUCTION OF GRAPHENE

Physical and microscopic examination of the representative, bulk scale graphite concentrate based on conductive and gravimetric tests confirm a highly concentrated flake graphite concentrate.

Preparation of both graphene oxide (GO) and graphene from the Hexagon graphite samples was successfully demonstrated using three exfoliation methods:

- **Liquid exfoliation based on acid chemical oxidation with a GO reduction step**
- **Direct thermal / mechanical exfoliation**
- **Electrochemical exfoliation (both without the need for intermediary GO steps)**

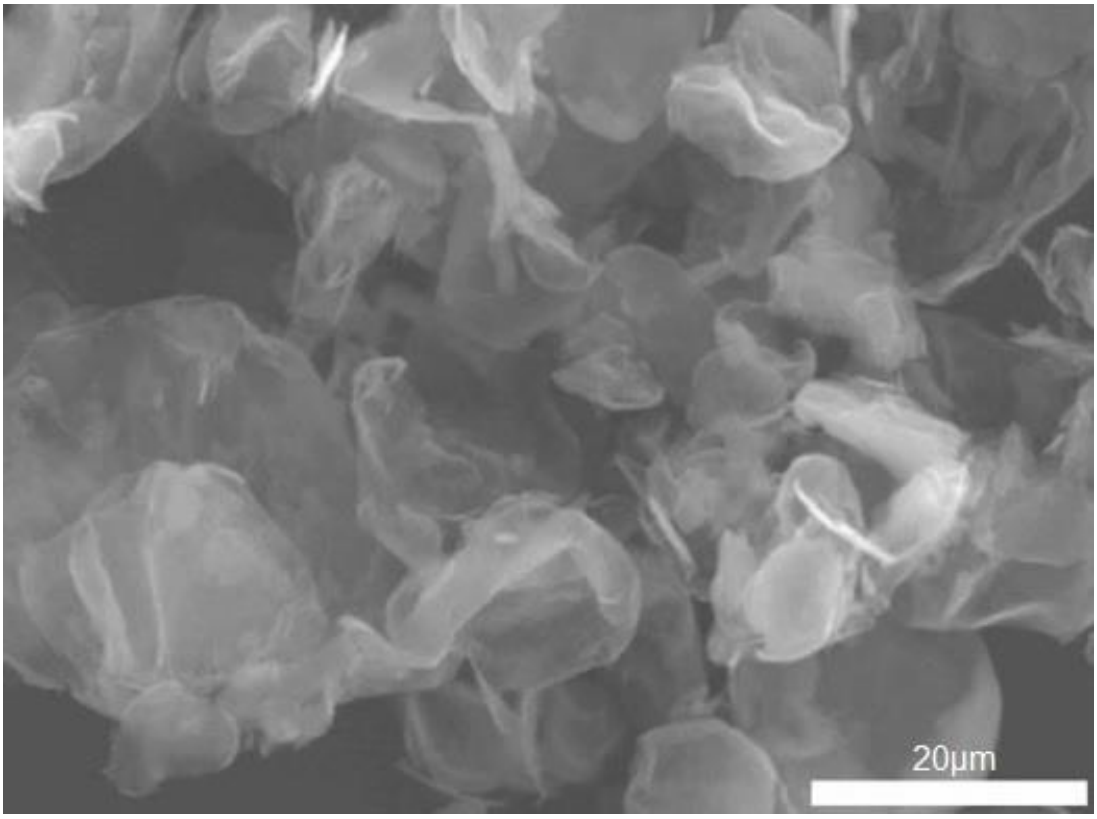

Figure 1: Scanning Electroscope Microscopy (SEM) image showing the typical morphology of dispersed graphene prepared from Hexagon's graphite

PREPARATION OF GRAPHENE USING A 'GREEN METHOD'

To confirm the preparation of reduced graphene from Hexagon's graphite, a 'green method' for the reduction of GO based on non-hazardous amino acids for the replacement of hazardous hydrazine hydrate was used. This method offers the potential to be used for scalable and environmentally friendly production of reduced graphene and avoids the use of any toxic materials.

This method was applied in performing the services and showed similar results but greater reduction efficiency (~10x) when compared with the common hydrazine method. Characterization results of the reduced graphene oxide (rGO) produced in the reduction process from GO from Hexagon ultra-high purity graphite using amino acids are shown in Figure 2.

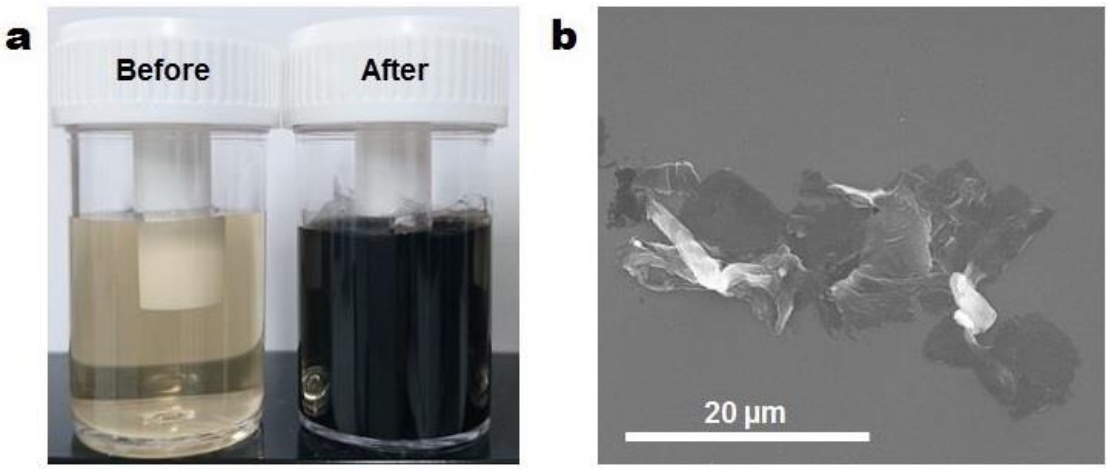

Figure 2: (a) Digital photographs of produced GO from Hexagon graphite before and after the reduction and graphene conversion process (b) SEM image of produced reduced graphene oxide (rGO) sheets

Figure 2(a) shows the change in the solution colour from a light brown (GO solution) to black (rGO solution) after the reduction process confirmed successful transformation. The conversion yield is not measured as it is based on the initial material, but approximately > 90 % of carbon is converted to graphene (rGO). Figure 2(b) shows a scanning electron microscope image of the reduced graphene oxide sheets produced.

CHARACTERISATION AND GRAPHENE EXFOLIATION METHODS

Results from this study indicate that Hexagon's graphite has potential to be used for the increased scale of graphene production. Typically, the greater the purity of graphite, the more efficient graphene isolation and yield will be.

Raman spectroscopy is recognised as the most powerful and accurate method used to infer the graphene quality. The properties of obtained graphene were assessed based on the shape and shift of the 2D bands compared with graphite used as a control. These parameters were used to indicate thickness of graphene and graphene electrical properties relevant for applications, where high quality graphene is required, such as supercapacitors, sensors or batteries. Figure 3 shows the Raman graphs of graphene and GO prepared by all three methods confirming the quality and integrity of its structure extracted from Hexagon's graphite.

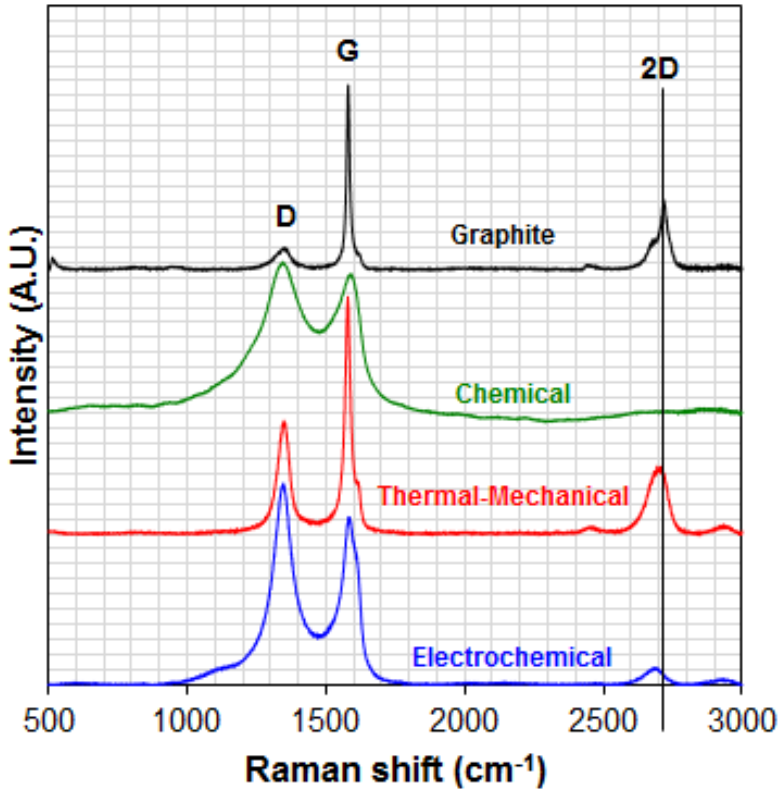

Figure 3. Comparative Raman graphs of graphene prepared by the three methods confirming the quality and integrity of its structure extracted from Hexagon graphite

MINE ENGINEERING AND OPEN PIT OPTIMISATION

Stage 1 of the McIntosh PFS focused on the project mine engineering design to determine the parameters under which a future mining operation could be established. Pit optimisations across a range of production scenarios, consistent with the previously announced conceptual study (see ASX:HXG announcement, McIntosh – Significant Added Potential Demonstrated - 23 February 2015) of 1.2Mtpa and 2.4Mtpa throughput have both shown favourable results.

Open pit optimisation work conducted by Hexagon's independent Mine Engineering consultant has shown favourable waste to ore ratio's across the range of potential production profiles (see Figures 4, 5, 6 & 7).

Stage 1 of the McIntosh PFS also determined that the most cost effective method of transport would be via the deep water Port of Wyndham using the sealed Great Northern Highway and existing all weather haul road running through the McIntosh project area.

Key components:

- ***Conventional truck and shovel mining methods***
- ***Low average strip ratio for projected life of mine***
- ***Simple processing using proven technology consisting of crushing, grinding, flotation, filtration, drying and bagging***
- ***Further technical studies being conducted to assess the viability of producing spherical graphite and graphene***

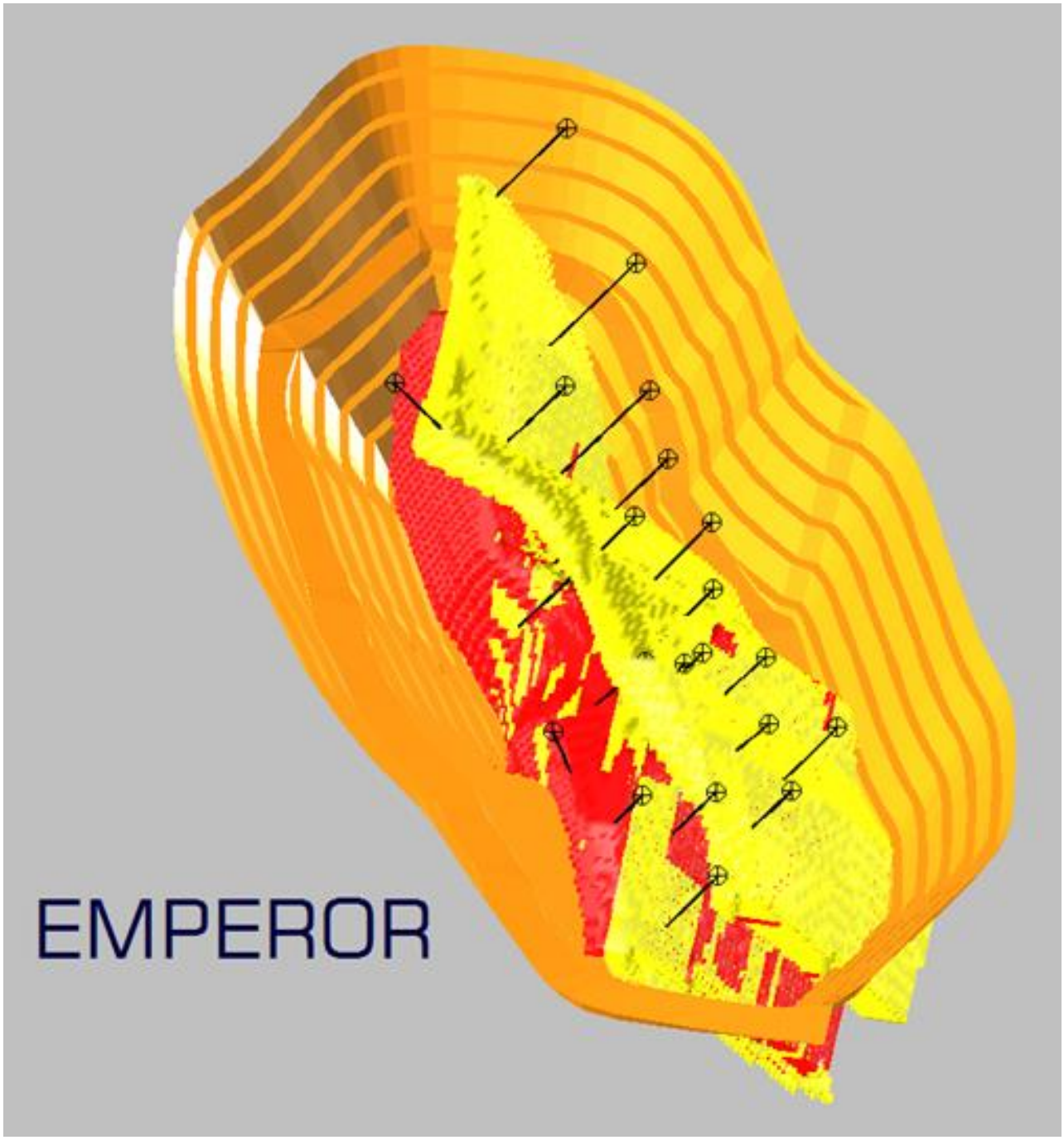

Figure 4: Emperor resource block model 8.4Mt @ 4.6% TGC (red > 4% TGC; yellow < 4% TGC) with drill hole traces and 2.4Mtpa conceptual open pit design

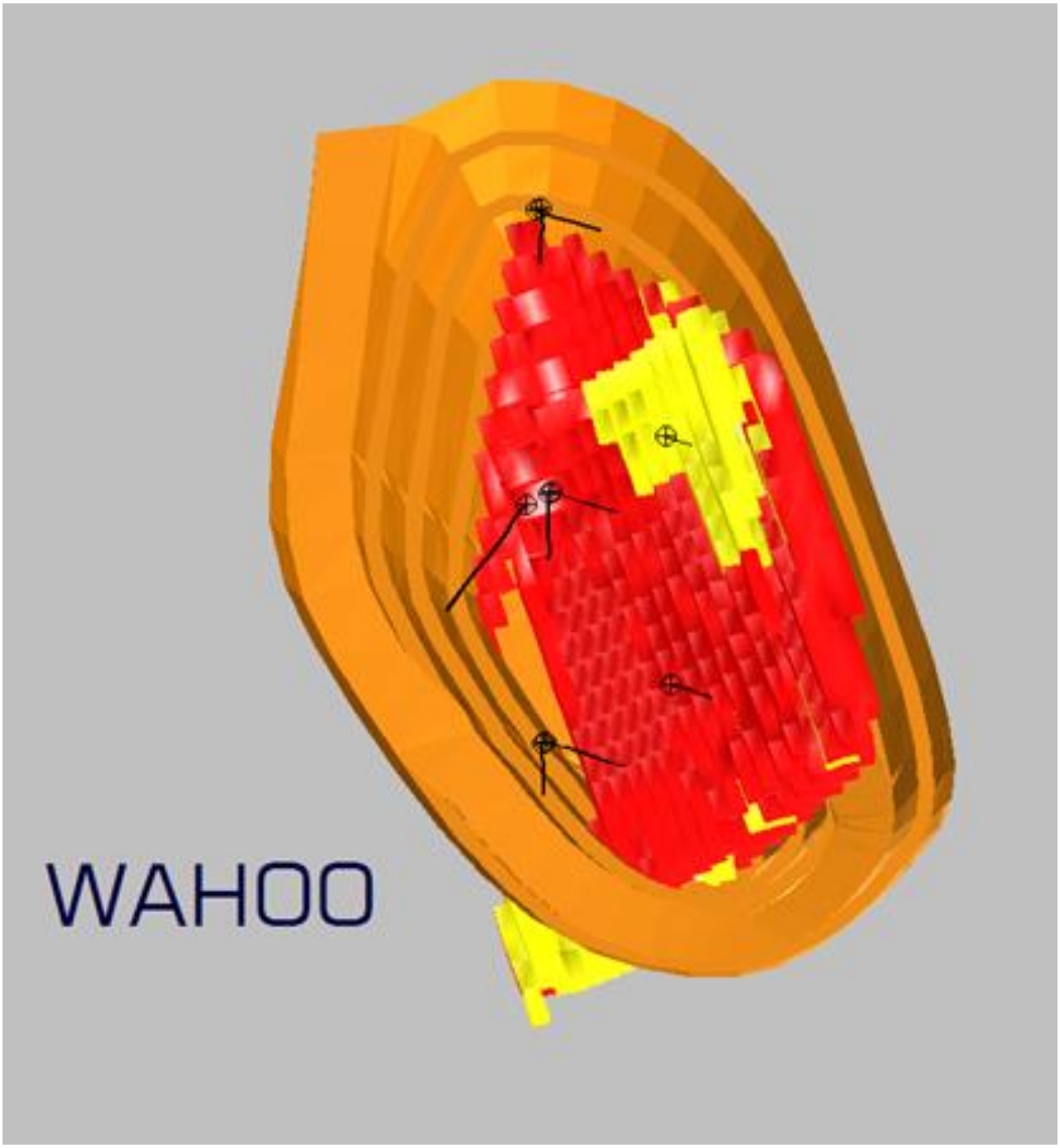

Figure 5: Wahoo resource block model 0.9Mt @ 4.4% TGC (red > 4% TGC; yellow < 4% TGC) with drill hole traces and 2.4Mtpa conceptual open pit design

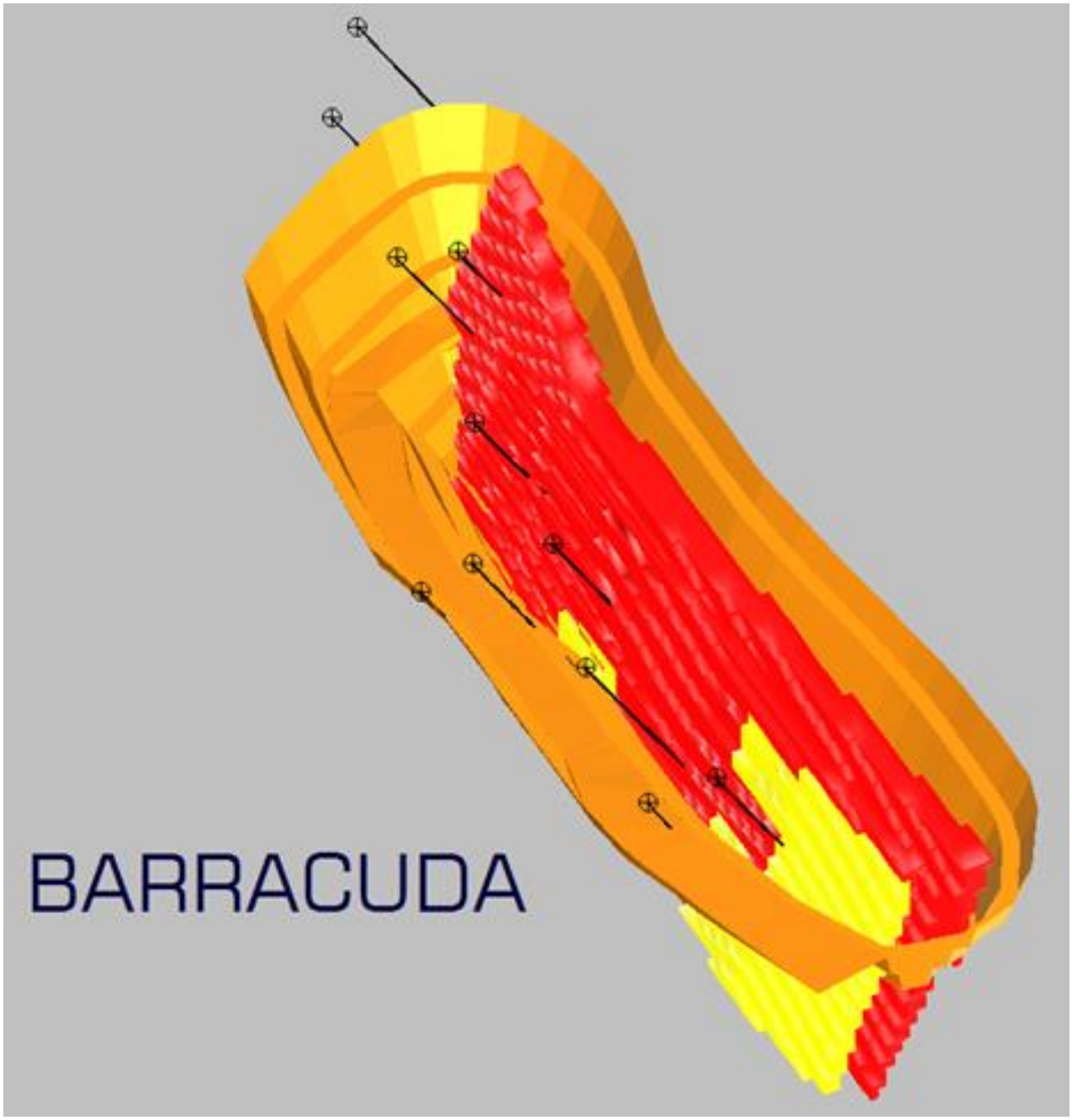

Figure 6: Barracuda resource block model 0.7Mt @ 4.4% TGC (red > 4% TGC; yellow < 4% TGC) with drill hole traces and 2.4Mtpa conceptual open pit design

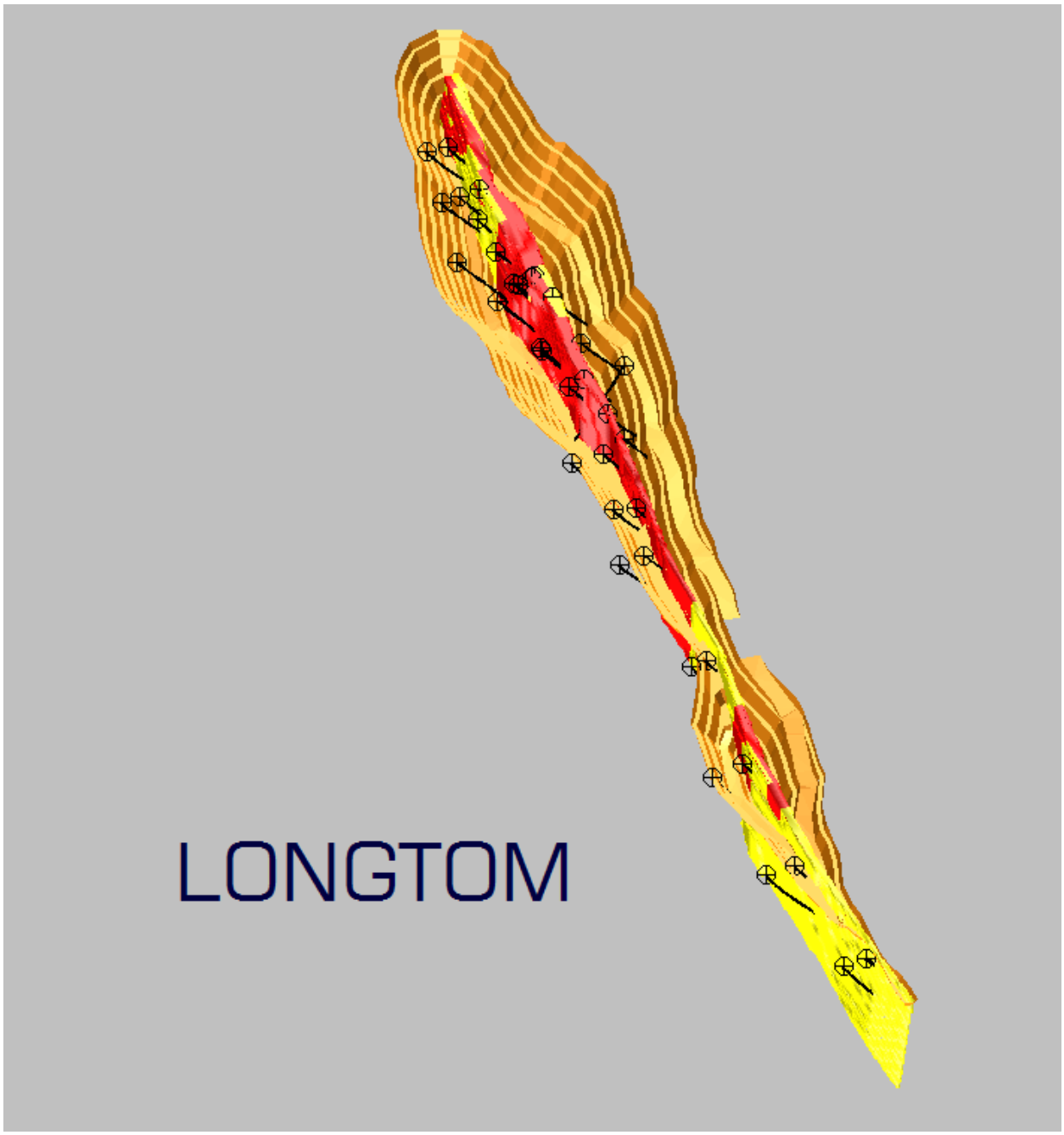

Figure 7: Longtom resource block model 7.1Mt @ 4.7% TGC (red > 4% TGC; yellow < 4% TGC) with drill hole traces and 2.4Mtpa conceptual open pit design

MCINTOSH RESOURCE

The Stage 1 open pit optimisation results are based on the Global Resource Estimate of 17.2Mt @ 4.63% TGC (see Table 1) as announced on the 27 January 2016 (see ASX:HXG announcement, Australia's Largest Flake Graphite Resource).

A total of 7.8 million tonnes at 4.55% TGC, being 45% of the total McIntosh resource, is within the indicated category, representing a high degree of geological confidence allowing for conversion into mineable ore reserves.

Table 1: McIntosh Flake Graphite Project Global Mineral Resource Estimate – 27 January 2016

Deposit	JORC Classification	Material Type	Tonnes (Mt)	TGC (%)	Contained Graphite (Tonnes)
EMPEROR	*Indicated*	*Oxide*	-	-	-
		Primary	*3.4*	*4.32*	*145,250*
	Inferred	*Oxide*	-	-	-
		Primary	*5.1*	*4.79*	*240,900*
	Indicated + Inferred	**Oxide + Primary**	**8.4**	**4.61**	**386,150**
LONGTOM	*Indicated*	*Oxide*	-	-	-
		Primary	*4.5*	*4.71*	*210,350*
	Inferred	*Oxide*	*0.5*	*4.51*	*24,350*
		Primary	*2.1*	*4.84*	*103,000*
	Indicated + Inferred	**Oxide + Primary**	**7.1**	**4.73**	**337,700**
WAHOO	*Inferred*	*Oxide*	*0.1*	*4.16*	*3,550*
		Primary	*0.8*	*4.43*	*37,000*
	Inferred	**Oxide + Primary**	**0.9**	**4.40**	**40,550**
BARRACUDA	*Inferred*	*Oxide*	*0.3*	*4.49*	*11,350*
		Primary	*0.5*	*4.37*	*21,450*
	Inferred	**Oxide + Primary**	**0.7**	**4.41**	**32,800**
Total Resource	**Indicated + Inferred**	**Oxide + Primary**	**17.2**	**4.63**	**797,200**

Notes: 1. Longtom (Target 1) has a 2% TGC lower cut-off grade. Emperor (Target 6), Wahoo (Target 4) and Barracuda (Target 5) have a 3% TGC lower cut-off grade
2. Rounding may result in differences in total and average grades

The mineral Resource classification criteria is based on the drill spacing, diamond core logging, geological mapping and 3 dimensionally modelled VTEM geophysical survey data which together confirm the grade and geological continuity of the graphitic schist mineralisation. All four deposits are hosted in a graphitic schist in a strongly metamorphosed meta-sedimentary sequence with flake graphite at surface.

MCINTOSH GROWTH POTENTIAL

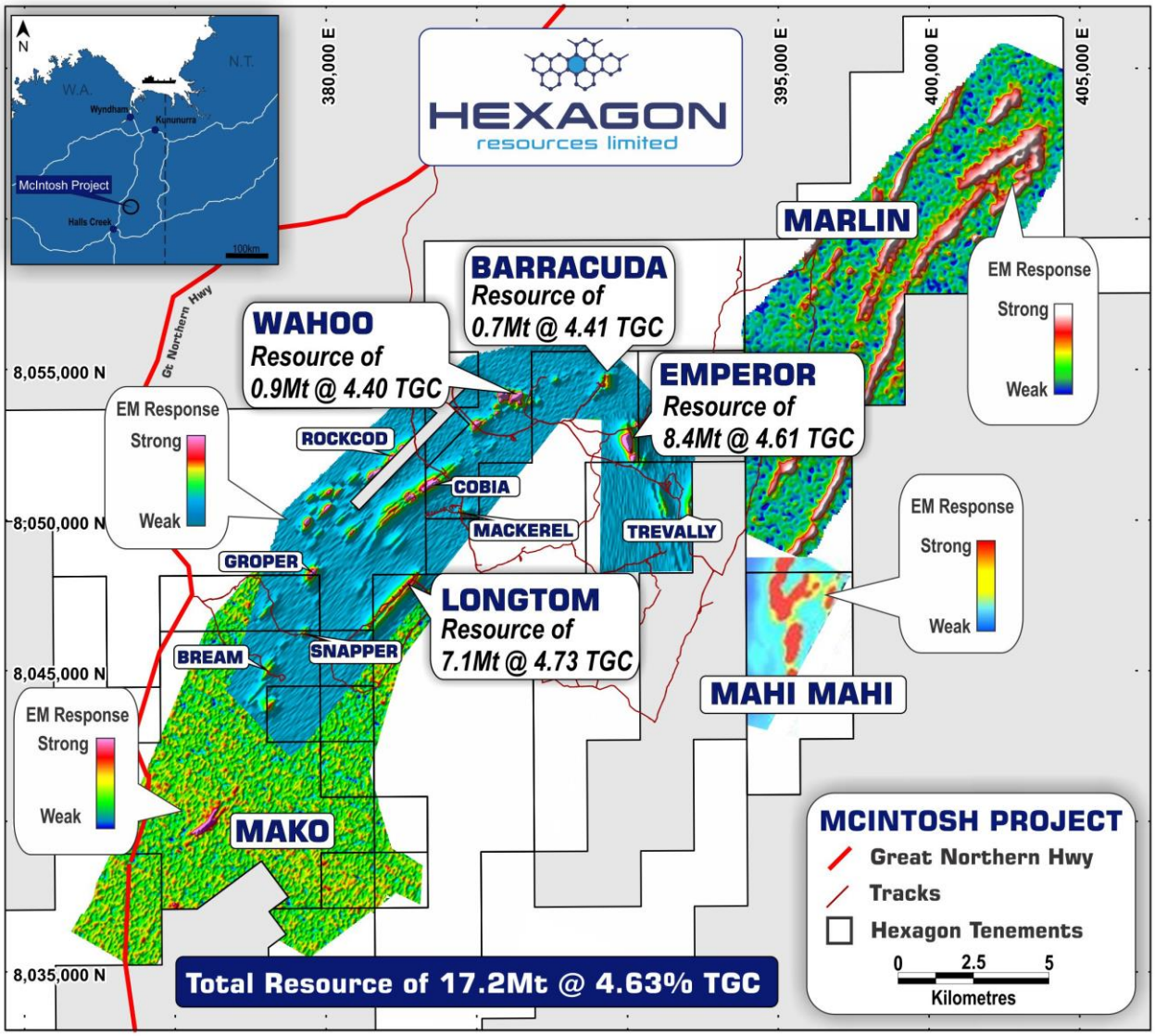

Figure 8: McIntosh Flake Graphite Project – Current resource base of 17.2Mt @ 4.63% TGC with significant potential to expand the resource base further

"The greater McIntosh tenement package contains significant electromagnetic anomalies confirmed to be associated with the presence of flake graphite, of particular significance are the Marlin, Mahi Mahi and Mako prospects (see Figure 8). These exciting prospects, along with the significant potential identified at Cobia, Rockcod and Groper has the company well positioned to become a significant, long term producer of high quality / high purity flake graphite" commented Hexagon's CEO / Head of Operations, Tony Cormack.

ENVIRONMENTAL APPROVALS

Stage 1 of the PFS also focussed on biological and social requirements to allow for compliance with regulatory assessment. Hexagon's environmental consultants have completed:

- Desktop review of previous flora and fauna surveys
- Database search and review of identified flora and fauna
- Level 2 Flora and Vegetation Survey (dry season)
- Level 2 Flora and Vegetation Survey (wet season)
- Vertebrate & Invertebrate Fauna Dry Season Survey (dry season)
- Level 2 Vertebrate Fauna Survey
- Short Range Endemic Invertebrate Fauna Survey

TRANSPORT / LOGISTICS

The McIntosh Project is located on an existing haul road and is approximately 20 kilometres from the sealed Great Northern Highway. The deep water Port of Wyndham is located approximately 240 kilometres to the north of the project area having excellent ship loading infrastructure, numerous bulk storage options along with sufficient capacity to accommodate any production profile from the McIntosh project.

Figure 9: Aerial view of the deep water Port of Wyndham, located approximately 240km north of the McIntosh project area

HEXAGON TENEMENT HOLDINGS - AUSTRALIA

Project	Tenement	Type	Number	Ownership Status at end of Quarter	Acquired/Disposed
McIntosh, WA	Melon Patch	E	E80/3864	100% Hexagon	
	McIntosh Hills	E	E80/3928	100% Hexagon	
	Melon North	E	E80/3906	100% Hexagon	
	Melon South	E	E80/3907	100% Hexagon	
	Black Granite	E	E80/4396	0% Hexagon	Tenement surrendered
	White Rock South	E	E80/4688	100% Hexagon	
	Panton West	E	E80/4734	100% Hexagon	
	Black Rock Creek	E	E80/4739	100% Hexagon	
	Togo	E	E80/4732	100% Hexagon	
	Edle Creek	E	E80/4825	100% Hexagon	
	Alice Downs	E	E80/4842	100% Hexagon	
	White Rock	E	E80/4841	100% Hexagon	
	Carolyn Hills South	P	P80/1821	100% Hexagon	
	Panton North	E	E80/4733	100% Hexagon	
	Mabel Hill	E	E80/4879	100% Hexagon	
	Wills Creek	E	E80/4931	100% Hexagon	
Mabel, WA	Mabel Downs	E	E80/4385	100% Hexagon	
	Spring Creek	E	E80/4797	100% Hexagon	
	Six Mile Bore	E	E80/4814	100% Hexagon	
Halls Creek, WA	Golden Crown South	E	E80/4794	100% Hexagon	
	Highway	E	E80/4793	100% Hexagon	
	Granite	E	E80/4795	100% Hexagon	
	Granite	P	P80/1816	100% Hexagon	
	Granite	P	P80/1817	100% Hexagon	
	Granite	P	P80/1815	100% Hexagon	
	Granite	P	P80/1818	100% Hexagon	
	Granite	P	P80/1414	100% Hexagon	
	Granite	P	P80/1799	100% Hexagon	
	Granite	P	P80/1801	100% Hexagon	
	Granite	P	P80/1800	100% Hexagon	
Valla, NSW	Valla	EL	EL6702	100% Hexagon	Relinquishment application lodged

SOUTH KOREAN FLAKE GRAPHITE PROJECTS

During the quarter a detailed review of the South Korean projects by the company's new management team identified significant upside by targeting specific geological structures. The review, which focussed primarily on the Geumam project, being the most advanced of the South Korean projects, was based on lessons learnt from the ongoing development of the company's flagship flake graphite project at McIntosh in Western Australia. A detailed review of historical mine data from Geumam was also completed.

GEUMAM FLAKE GRAPHITE PROJECT

The Geumam Flake Graphite project is an advanced project located in a semi-rural setting surrounded by world class infrastructure. The project currently has a JORC 2012 compliant resource of 5.5Mt @ 5.4% Cg at Area B (See Table 2 and Figure 10) completed by independent consultant RungePincockMinarco (RPM). The mineral resource estimate is limited to only a portion of the Area B prospect with significant potential for resource upgrade based on the exploration potential identified across another six prospects.

Table 2: JORC 2012 Mineral Resource Estimate for Area B, Geumam

Geumam Area B Deposit Mineral Resource Estimate (1% C graphite Cut-off)					
Indicated Mineral Resource					
Type	**Tonnes (Mt)**	**C graphite %**	**C total %**	**S total %**	**Contained Graphite (t)**
Oxide	0.5	7.2	8.8	0.8	36,000
Fresh	1.0	6.3	8.9	1.0	65,000
Total	**1.5**	**6.6**	**8.9**	**0.9**	**101,000**
Inferred Mineral Resource					
Type	**Tonnes (Mt)**	**C graphite %**	**C total %**	**S total %**	**Contained Graphite (t)**
Oxide	0.1	7.8	9.5	0.8	11,000
Fresh	3.8	4.8	8.4	0.9	183,000
Total	**4.0**	**4.9**	**8.4**	**0.9**	**195,000**
Total Mineral Resource					
Type	**Tonnes (Mt)**	**C graphite %**	**C total %**	**S total %**	**Contained Graphite (t)**
Oxide	0.6	7.3	9.0	0.8	47,000
Fresh	4.9	5.1	8.5	0.9	249,000
Total	**5.5**	**5.4**	**8.6**	**0.9**	**296,000**

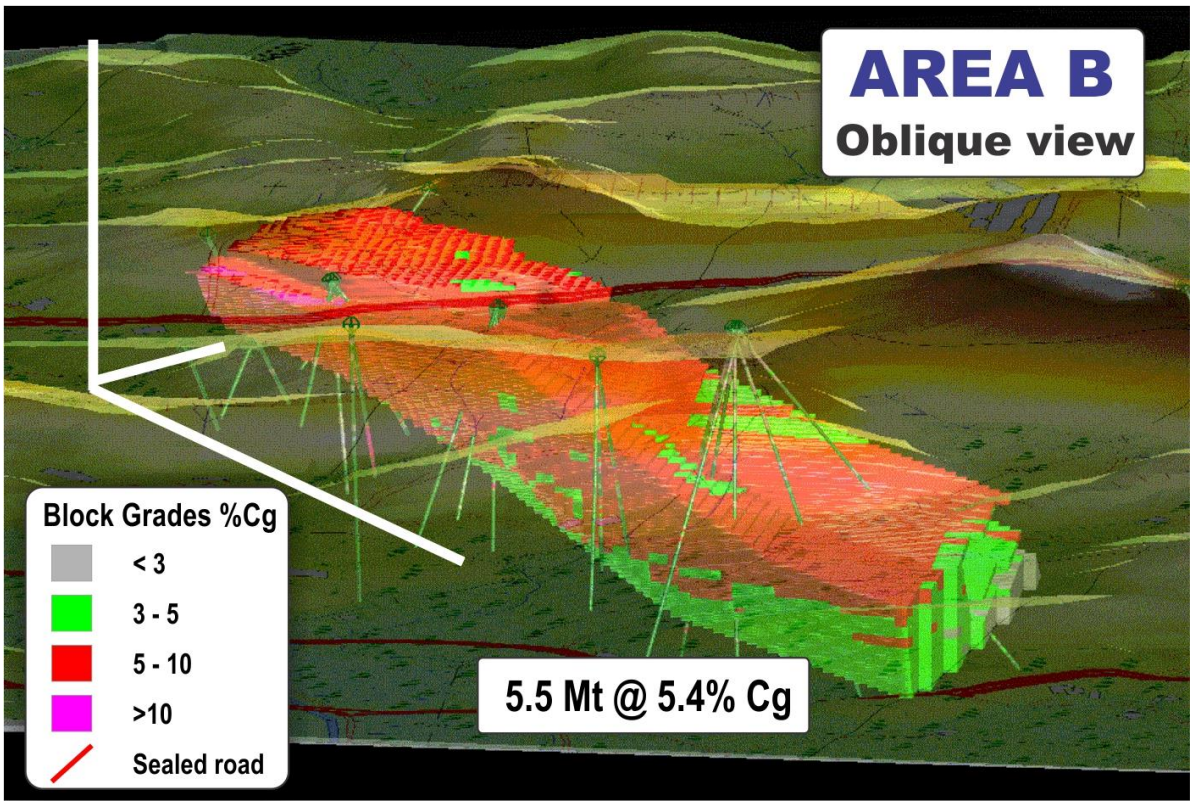

Figure 10: Geumam Area B resource block model coloured by Cg grade and showing diamond drill hole traces

Historical metallurgical reports from KMPC indicate from a ROM head grade of 7.5% Cg, a flotation concentrate grading 87.6% Cg was produced with only 2 cleaner flotation cycles, with a recovery of 79.2%. Recovered graphite flake distribution is tabulated below (See Table 3), indicating 30% of the flake is high value large and coarse 'Jumbo' flake product. Table 3 below shows flake size distribution of the historic concentrate which demonstrate that through simple flotation good recovery's of large to extra-large 'jumbo' flake graphite, suitable for spherical feed, can be obtained.

Table 3: Flake size distribution in concentrate from historical mining at Geumam

Classification	Microns (µm)	Mesh Size (#)	% in interval
Very fine	<75	-200	15.9
Fine	75-106	-150 to +200	16.8
Small	106-150	-100 to +150	15.6
Medium	150-180	-65 to +100	30.7
Large	180-300	-48 to +65	21.6
Extra Large 'Jumbo'	>300	+48	9.4

Comminution studies have concluded that the ore types ranged from soft to moderate hardness and would present no difficulties in milling. Separation test work has finalised the optimum grinding and flotation roughing conditions with optimum grind size is moderately coarse at 80% passing 212µm for the Area B deposit and slightly finer at 80% passing 180µm for Area C (similar to historic KMPC results, 1983).

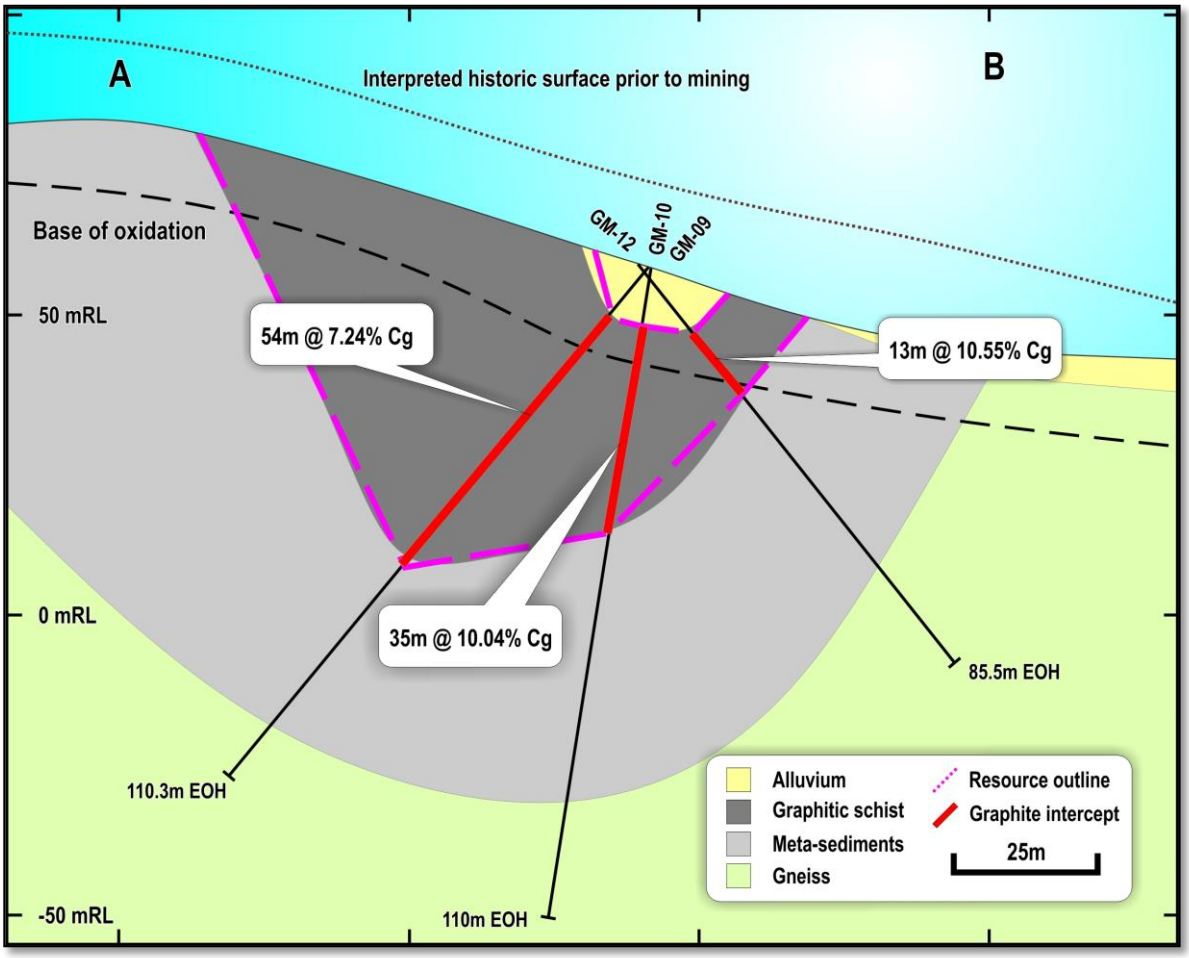

Figure 11: Cross-section A – B at the Guemam Flake Graphite project showing synformal structure of the deposit along with diamond drill holes and the historic surface

The geological structure of the Geumam project is a regional scale fold hinge (syncline), similar to the structure found at Hexagon's Wahoo deposit in Western Australia (See Figure 11 and 12). These fold hinge areas due to the high levels of stress on the lithology have an increased metamorphic grade, which test work has highlighted also correlates with an increased flake graphite grade as well as superior flake size.

Graphite occurs mainly as individual flakes concentrated in different layers with variable concentrations, or as small, loosely clustered acicular aggregates weakly parallel to the layering. Individual graphite flakes display curved or crumpled shapes and the size distribution of graphite flakes was calculated at 99.75µm by the *Equivalent Circle* method and 191.60µm using the *Maximum Diameter* method.

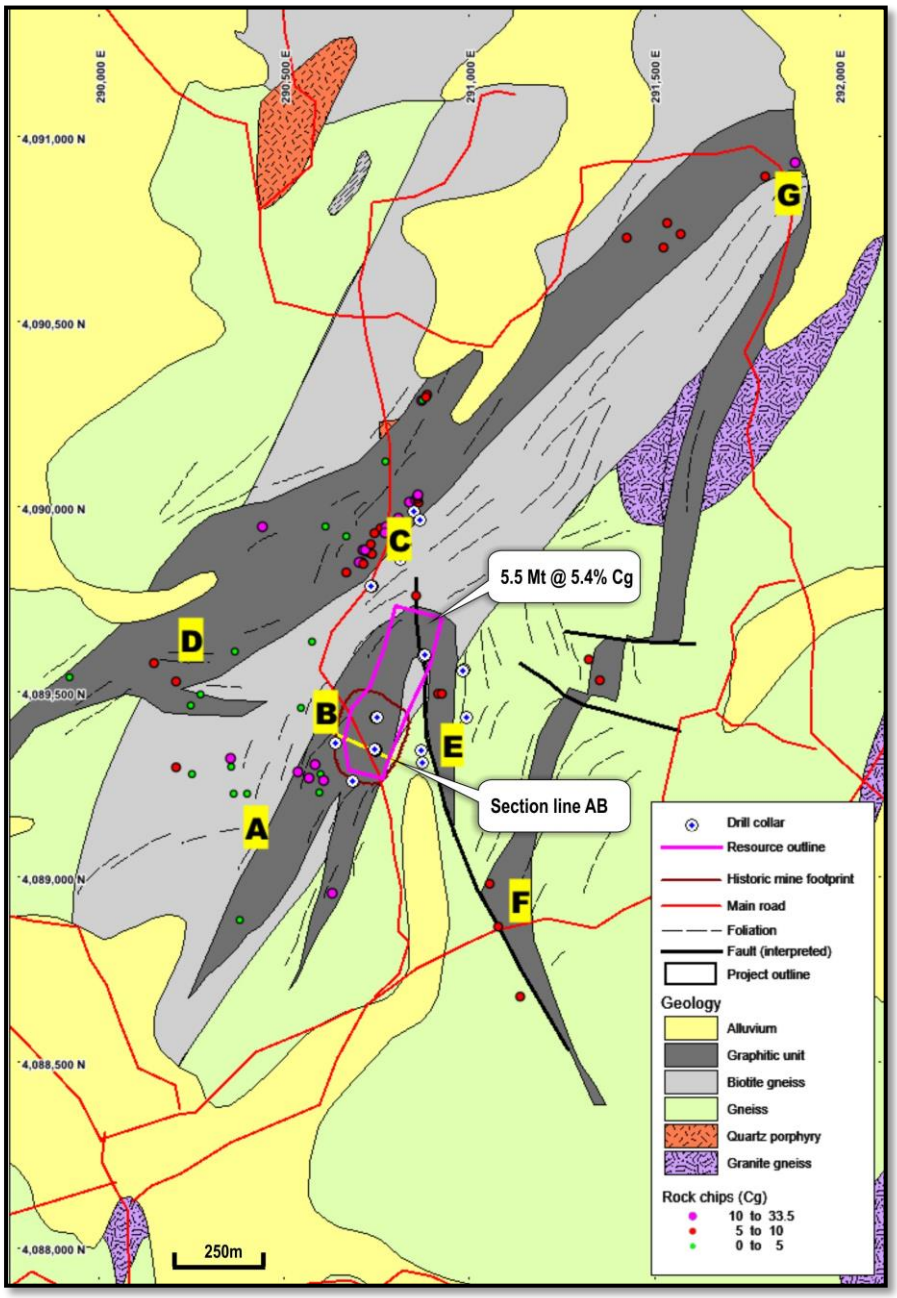

Figure 12: Geology of the Geumam Flake Graphite project with resource outline projected to the surface

Geological mapping, sampling and a review of all the historical exploration data reported by the KMPC has identified zones of graphite of significant size and grade at prospect Areas A, B, C, D, E, F and G. These zones outcrop from surface and the moderately-dipping graphite mineralisation is considered amenable to open pit mining methods.

TAEWHA FLAKE GRAPHITE PROJECT

According to the KMPC (1984), mining operations commenced about 1979 at the Taehwa graphite mine with trial flotation mill operations were undertaken in about 1982. The plant consisted of a jaw crusher, ball mill, spiral classifier, flotation cells, and a regrind rod mill. High-grade flake graphite was extracted from adits and an open pit.

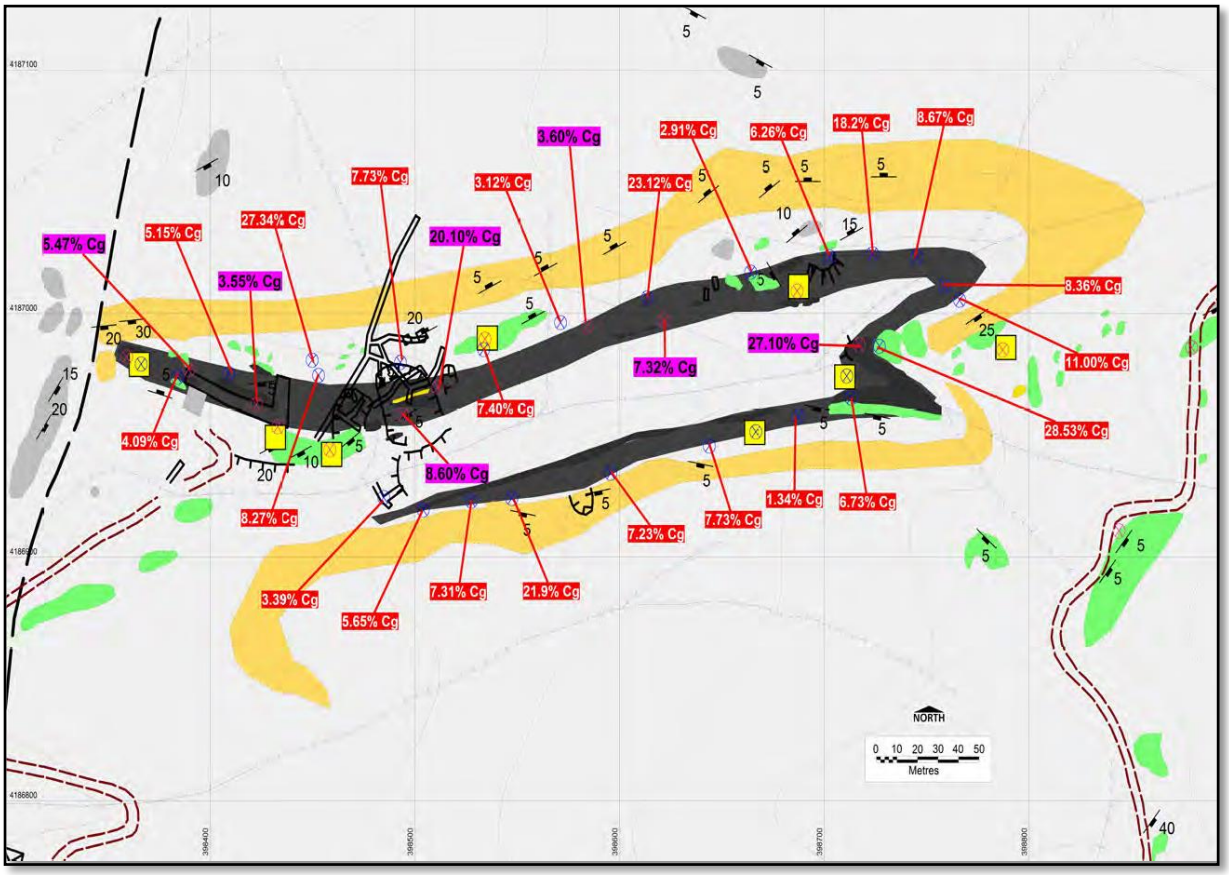

Figure 13: Hexagon assay results are highlighted in purple (>1% Cg) and yellow (0.1-1% Cg) boxes. Historical rock chip assays from the KMPC (1984) sampling are indicated in red boxes

The Taewha project contains high-grade, medium to jumbo size flake graphite as confirmed by petrographic studies with >30% of graphite considered to be large to extra-large 'jumbo' flake.

Flake graphite occurs with other wispy fibrous minerals (sericite, sillimanite and biotite). Surface rock chip sample assays up to 27.10% Cg (See Figure 13) have been recorded with individual graphite flakes displaying curved, wavy or crumpled shapes, ranging from 50µm up to 1500µm in length, averaging about 250µm and confirmed by MLA as 224.77µm (*Equivalent Circle*) or 416.67µm (*Maximum Diameter*).

The Taewha project contains an Inferred resource of 170,000 t @ 7% Cg estimated by an independent geologist (2012) (ASX: 16 May 2013). The limbs of the graphite unit are open and inferred to extend further to the north and south. Although limited by topographic constraints, the graphitic gneiss unit could also extend along strike to the east.

Historic metallurgical test work was undertaken by KMPC (1980) on two bulk samples and produced an excellent medium to extra-large 'jumbo' flake graphite concentrate with a grade of >90% Cg, at a high recovery of 89%.

Test work involved comminution and flotation studies, using a variety of "collector" types and concentrations, regrinding, followed by further flotation to determine an optimum yield flotation concentrate with >30% of graphite considered to be large to extra-large 'jumbo' flake.

SAMCHEOK FLAKE GRAPHITE PROJECT

The Samcheok Flake Graphite project is situated on the eastern seaboard of South Korea in Donghae County of Gangwon-Do. The project has a JORC compliant inferred resource of 200,000 tonnes at 5% Cg which was completed by an independent consultant. There is a historical open cut mine at Samcheok with associated mine buildings in various conditions along with old mining stockpiles and waste dumps.

The graphitic unit is hosted within biotite schist of the Yongnam Gneiss Complex, near the schist's basal contact with gneiss. Foliation in the schist strikes north-northwest, dipping steeply to the east. Graphitic schist approximately 60-80m thick and can is clearly evident in limonite-hematite stained outcrops in road cuts and open pit exposures over a strike length of at least 700m

Flake graphite grades of 4-5% Cg were recorded in sampling of the graphitic unit by the KMPC (1977). The strike potential of Samcheok project is considered to be significant, the graphitic unit can possibly be traced for approximately 4,000m (See Figure 14).

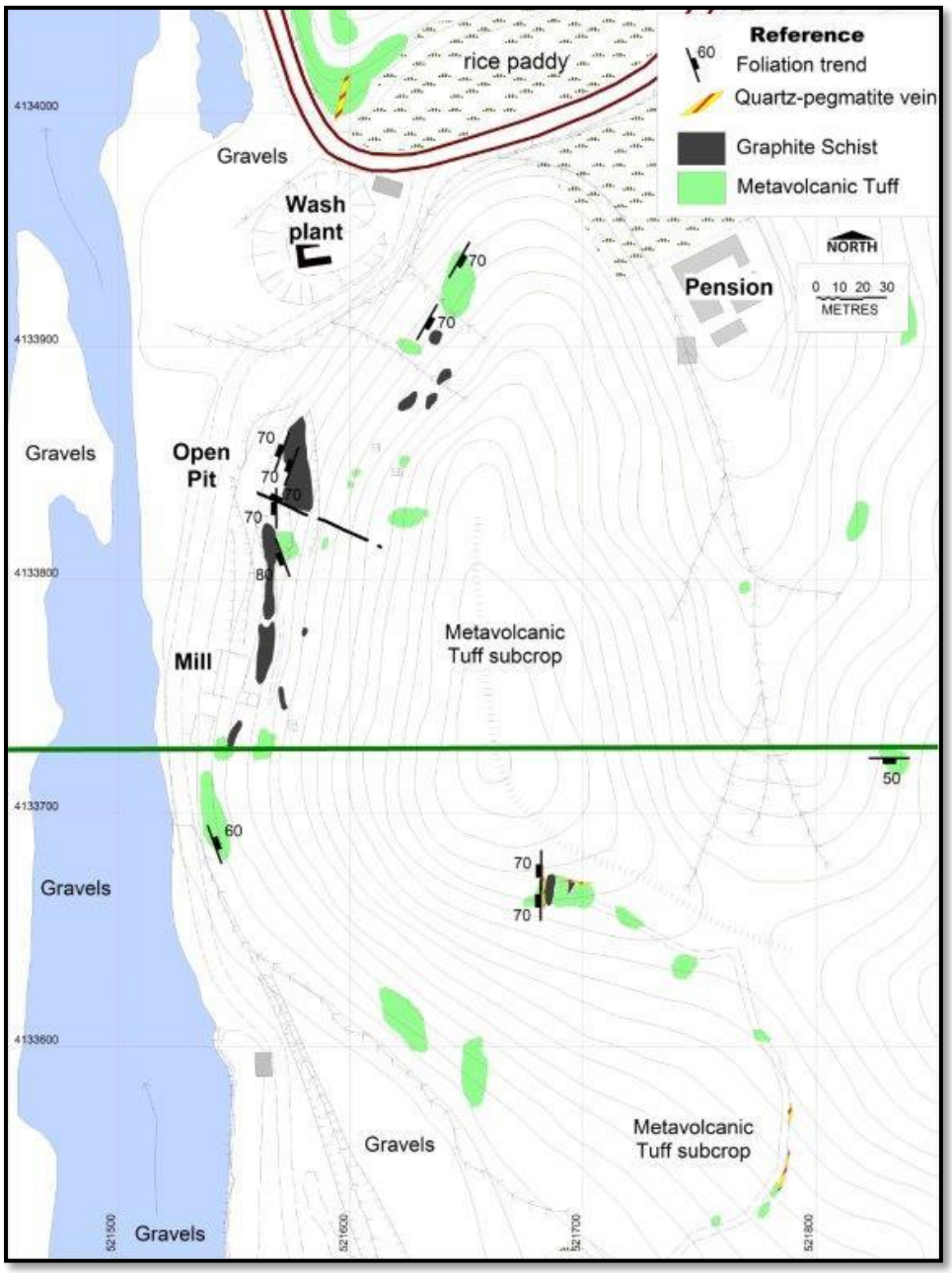

Figure 14: Geology of Samcheok Flake Graphite project showing prospect locations and mapping of the flake graphite schist

SOUTH KOREA

- Premier region for mineral exploration with potential for world-class high grade deposits
- Extensive history of mining and processing - historical mining data accessible
- Numerous high grade mines not yet subjected to modern exploration methods
- Foreign investment welcome
    - Established statutory approvals systems reflective of world industry standards
    - Established financial and legal system
    - Security of exploration and mining titles guaranteed by law
    - No government mining royalties
    - Corporate tax rate of 22%
- Excellent high quality road, rail and power infrastructure

HEXAGON TENEMENT HOLDINGS - SOUTH KOREA

Geumam Flake Graphite Project

Tenement Number	Registration Number	Area (ha)	Registered Holder	Grant Date	Expiry Date
Dangjin 54-4	200432	44	*Won Kwang Mines Inc*	30 July 2014	31 July 2021
Dangjin 56-3	200433	68	*Won Kwang Mines Inc*	30 July 2014	31 July 2021
Dangjin 66-1	200434	68	*Won Kwang Mines Inc*	30 July 2014	31 July 2021
Dangjin 55-3	80077	68	*Won Kwang Mines Inc*	7 February 2012	6 February 2032
Dangjin 65-1	80014	68	*Won Kwang Mines Inc*	8 December 2011	7 December 2031
Dangjin 65-2	78355	68	*Won Kwang Mines Inc*	17 December 2009	16 December 2029
Dangjin-54-2	200258	135	*Won Kwang Mines Inc*	23 May 2013	22 May 2020
Dangjin-55-4	200259	64	*Won Kwang Mines Inc*	23 May 2013	22 May 2020

Taehwa Flake Graphite Project

Tenement Number	Registration Number	Area (ha)	Registered Holder	Grant Date	Expiration Date
Hongcheon 91-2	079948	68	*Won Kwang Mines Inc*	15 November 2011	14 November 2031

Samcheok Flake Graphite Project

Tenement Number	Registration Number	Area (ha)	Registered Holder	Grant Date	Expiration Date
Samcheok 09-2	**200216**	68	*Won Kwang Mines Inc*	10 January 2013	9 January 2020

HEXAGON resources limited
High Purity Flake Graphite for New Technologies

Further information:

Tony Cormack
CEO / Head of Operations
tonyc@hexagonresources.com
0427 349 451

Ken Banks
Investor Relations
kenb@hexagonresources.com
0402 079 999

Competent Persons Statement

The information in this report relating to Mineral Resource Estimates, Exploration Target Estimates, Exploration Drilling, Assay Results and Geological Data is based on information previously compiled and / or reviewed by Mr. Tony Cormack, Member of the Australasian Institute of Mining and Metallurgy and a full-time employee of Hexagon Resources Limited. Mr. Cormack has sufficient experience which is relevant to the activity being undertaken to qualify as a Competent Person as defined in the 2012 edition of the 'Australasian Code of Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Mr Cormack consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.