

# QUARTERLY ACTIVITIES REVIEW FOR THE PERIOD ENDING 31 DECEMBER 2018

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**Corporate Information**  
ASX Codes **TLG**  
Shares on issue **218.2m**  
Options (unlisted) **17.9m**

**Company Directors**  
**Terry Stinson**  
Non-Executive Chairman

**Mark Thompson**  
Managing Director

**Grant Mooney**  
Non-Executive Director

**Stephen Lowe**  
Non-Executive Director

**Ola Mørkved Rinnan**  
Non-Executive Director

Australian advanced material technology company, Talga Resources Ltd (**ASX:TLG**) (“**Talga**” or “**the Company**”) is pleased to report its activities for the quarter ending 31 December 2018.

Talga is building a vertically integrated business with wholly owned, world class mineral resources, processing innovations and technologies to produce advanced materials and products that are stronger, lighter, multi-functional and environmentally positive in their applications.

Highlights of the December quarter include:

## COMMERCIAL AND PRODUCT DEVELOPMENT

- Battery anode initial testing delivers outstanding performance results from range of trademarked Lithium-ion battery products
- Talga’s graphene silicon battery anode product, Talnode™-Si, shows 50% higher energy density over commercial graphite
- Talga’s ultra-fast charge battery anode product, Talnode™-X, retains capacity over 300mAh/gm at 20C charge rate (equivalent of charging a battery from 0-100% in 3 minutes)
- Talphene®-enhanced lightweight epoxy composites show high conductivity test results for lightning strike protection and anti-icing in aircraft and wind turbine applications
- Letter of Intent signed subsequent to the period with global carbon and technology giant Schunk Group, to explore incorporation of Talphene® into automotive application

## MINERAL PROJECT DEVELOPMENT AND EXPLORATION

- Activities at the Company’s four north Sweden cobalt-copper-gold projects recommenced with encouraging results reported and resource drilling and on-going exploration planned
- Identification of significant vanadium prospect on the Company’s Vittangi project

## CORPORATE AND INVESTOR RELATIONS

- Appointment of key European management personnel for Swedish operations and expansion of Talga’s commercial team based in UK
- Successful product roadshows completed in Asia and US
- Cash on hand of A\$13.8 million at 31 December 2018



**Managing Director, Mark Thompson:** *“The December quarter capped a year of intense engagement with and expansion of the Company’s alliances, growing portfolio of commercial agreements and R&D initiatives with major European, UK and global conglomerates.*

*The test results of several battery products during the quarter were outstanding, and opened many doors during a successful product roadshow in Japan, South Korea and the USA. Feedback received at the meetings confirms we are on the right track with this product range and samples for commercial trials have since been delivered to a range of customers including some of the largest battery and electronic companies in the world.*

*These deliveries take place under a progression of steps including confidentiality agreements, non-disclosure agreements, material transfer agreements, letter of intents, memorandum of understandings and joint development agreements that are ordinarily in commercial confidence. These agreements are entered into with the customer towards mutual commercial outcomes, and to control and protect each company’s competitive advantages, intellectual property and other aspects of industrial or consumer product commerciality. This is the normal process to develop industrial products to market ready status, based on on-going test results, performance, safety and deliverability.*

*The calibre, scope and market penetration of the industrial conglomerates with Talga products now under test or development moving into 2019, bodes well for the Company’s upcoming feasibility study that will detail our commercial pathway for our exciting materials going into production.”*

## **COMMERCIAL AND PRODUCT DEVELOPMENT**

During the quarter, Talga continued strong progress in the development of its Lithium-ion (“Li-ion”) battery anode products and trademarked these as Talnode™. Each Talnode product will have a unique suffix designation based on formation and application. Current Talnode products include:

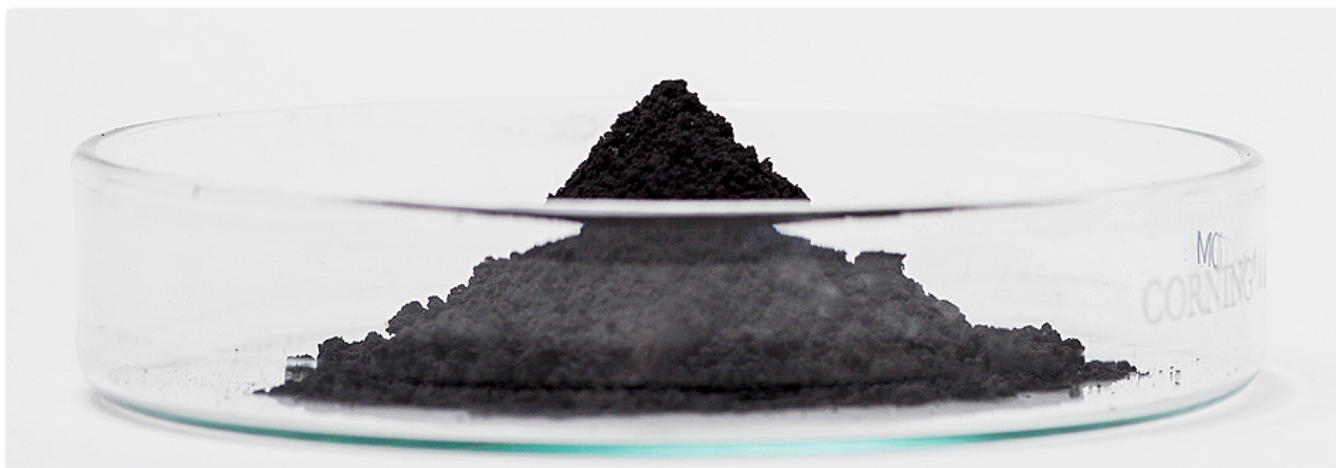
- **Talnode - C** Engineered graphite anode for super stable lifetime +20% higher capacity retention at higher charge/discharge rates
- **Talnode - X** Formulated graphite anode for ultra-fast charge (0-100% in 3 minutes)
- **Talnode - Si** Graphene Silicon-anode for +50% higher energy density

Talnode products are in addition to Talga’s other previously trademarked graphene and graphite product lines, Talphene® and Talphite®.

### **Talnode-C scales up**

During the period under review, a batch run of pouch battery cells using Talnode-C was constructed at a European pilot line facility and were being independently tested for use in electric vehicles. Approximately 50kg of Talnode-C was prepared at the end of the quarter to be coated and distributed to customers. Considerable interest from battery and electronics manufacturers for Talnode-C, primarily from Asia, is driving preparation for increased sample production, testing and product development next quarter.

**Figure 1.** Talga’s Lithium-ion anode product Talnode-C under development.



### **Ultra-fast charge breakthrough**

Successful initial test results announced during the quarter show Talnode-X outperformed the commercial benchmark and achieved very high charge capacity of >300mAh/g, at an ultra-fast charge rate of 20C, whilst not negatively impacting battery life.

In general terms, this anode performance allows for a Li-ion battery to be charged from 0% to 100% in 3 minutes without losing its capacity. The commercial goal of this product is to recharge an electric car in a similar time it takes to currently fill a fuel tank of today's combustion engine vehicles.

These new test results, conducted at a leading independent European battery test facility, followed Talga's breakthrough test results of its engineered active Li-ion anode product, coined Talnode-C, announced on 15 May 2018. Since then, commercial enquiries have increased and the Company has been providing technical information, test results and product samples to some of the world's largest battery manufacturers and electronic companies.

### **Silicon anode for extended capacity**

The Talga-developed graphene silicon lithium-ion anode product, Talnode-Si, achieved highly positive initial test results during the quarter towards extending the capacity of lithium-ion battery anodes. Highlights of the results include:

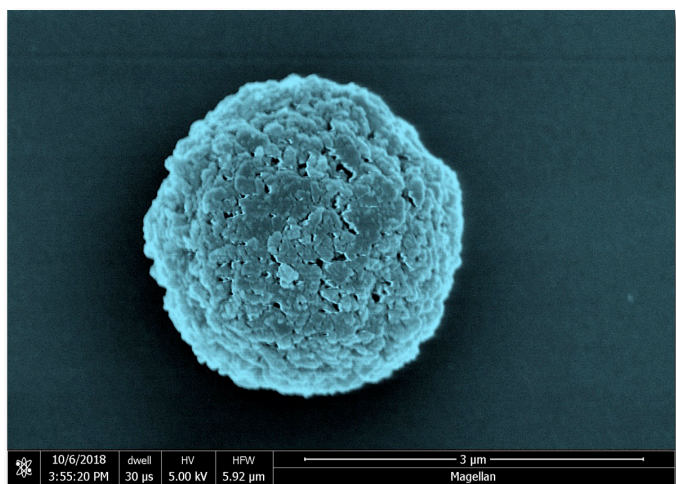
- ~50% higher reversible capacity (~550mAh/g) than commercial graphite (~350mAh/g)
- Coloumbic efficiency of 99.3% - 99.8%
- 95% reversible capacity (@45 cycles - tests ongoing)

The results are the first achieved under Talga's UK Government funded "Safevolt" project (ASX: TLG 26 Mar 2018) - a Talga-led program run in conjunction with consortia partners, Johnson Matthey, the University of Cambridge and manufacturing research group, TWI.

Major Li-ion battery manufacturers are increasingly looking for higher energy density by using greater amounts of silicon in graphite anodes. However, silicon use is hindered by a range of battery life and stability problems. The Talga test results show graphene based Talnode-Si is effective in stabilising the silicon as it expands, resulting in maintaining battery life while enabling much higher energy density.

Following the announcement of the Talnode-Si test results the company has received numerous commercial enquiries and is now preparing test sample production to satisfy customer requests. Although the product is still at laboratory scale, the significant level of interest points to the market potential for Talnode-Si and is a very encouraging starting point for commercial partnerships, joint development programs and the potential scale up of this product.

**Figure 2.** Scanning electron microscope image of graphene based Talnode-Si particle.



**Figure 3.** Lithium-ion battery pouch cell prepared with Talnode-C anode product for testing.



### **Talphene lightweight epoxy composite**

Conductivity tests undertaken at UK-based TWI during the period demonstrated potential for carbon fibre reinforced polymer (CFRP) panels, constructed with Talphene-enhanced epoxy resin, to replace copper in composite aircraft and wind turbine applications.

A range of conductivity tests relevant to aircraft applications were performed. Results (ASX:TLG 28 Nov 2018) showed the Talphene-enhanced panel provides similar lightning strike protection as copper mesh panels currently used in composite aircraft - but with 75% less weight.

The results also demonstrated Talphene's significant conductivity properties, including up to a 500% increase in dielectric constant, a 100% increase in resin thermal conductivity as well as achieving temperatures well over 100 degrees Celsius in anti-icing trials. As CFRP resins are normally non-conductive these results are highly positive.

The ability to improve the weight, electrical and thermal conductivity of CFRP composites has significant benefits for many market applications including aircraft lightning strike protection and wing anti-icing, both of which currently use heavier copper mesh.

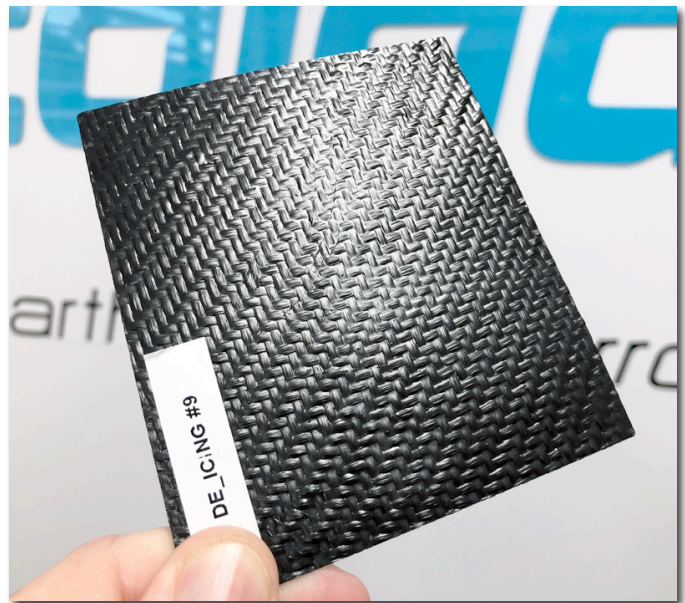
The same technology could also be of similar benefit to wind turbine blades that require costly manual or chemical de-icing in winter.

### **Letter of Intent signed with global carbon and technology giant**

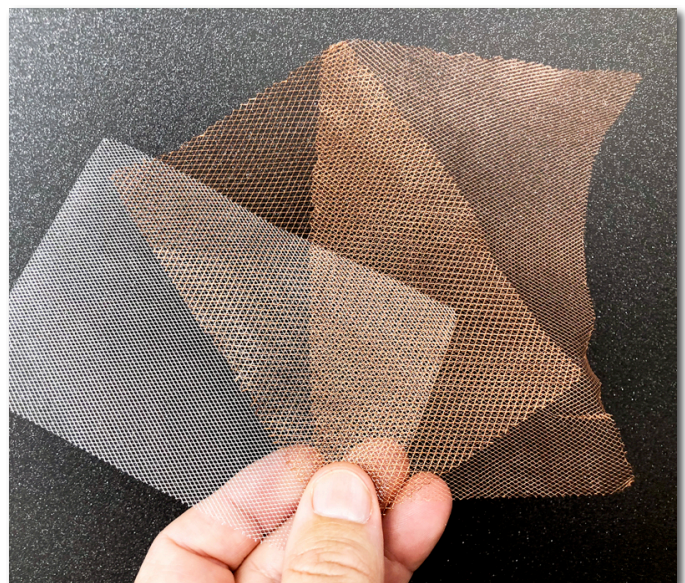
Subsequent to the quarter, Schunk Carbon Technology GmbH, a subsidiary of globally operating Schunk Group signed a Letter of Intent (LOI) with Talga under which both companies agree to co-operate on the development and incorporation of Talphene into an application in the automotive sector (details are commercially confidential).

The LOI follows a period of engagement and testing that further validates Talga's deepening base of quality customers with billion dollar plus annual sales and market leading high volume products.

The Schunk Group is a globally operating technology company with more than 8,200 employees in 29 countries. The Schunk Group offers a broad range of products and services in the fields of carbon technology and ceramics, environmental simulation and air conditioning, sintered metal and ultrasonic welding. In 2017, the Schunk Group achieved a turnover of about EU1.2 billion.



**Figure 4.** Carbon fibre reinforced polymer panel constructed with Talphene-enhanced epoxy resin for enhanced electrical and thermal conductivity.



**Figure 5.** Metal mesh currently for lightning strike protection in composite aircrafts.

### ***Strong progress of Talphene product developments***

Talga continues to progress development of its Talphene products through joint development and collaboration programs, as well as in-house product development efforts.

During the quarter, close to 200 Talphene coated panels were prepared using varying commercial coating products and supplied to joint development partners, including large industrial and consumer coating suppliers, for independent testing in industrial salt water spray systems under signed collaboration agreements. The Company has moved to trademark its range of Talphene-enhanced coatings as it continues to define and develop its graphene product range.

A variety of graphene-enhanced resin samples were also prepared for delivery to a range of EU locations under executed agreements, for testing in customer specific applications with increased strength and conductivity being the main benefits sought.

Furthermore, during the quarter Talga received minor income from Talphene-enhanced materials delivered for composite application testing outside of our standard joint collaboration agreements. Income from all sales was invoiced at year end with payment received in January 2019.

### ***New metallurgical work underway***

Due to the outlook for a significant increase in Li-ion battery demand globally, Talga has commenced a series of new metallurgical tests on the Company's Jalkunen and Raitajärvi graphite resource projects. Core samples from these projects, including Vittangi ore as benchmark material, were sent for metallurgical testing of the flake for flotation and purification in battery applications with results due in February 2019.

## **MINERAL PROJECT DEVELOPMENT AND EXPLORATION**

Main activities completed during the quarter included progress on the pre-feasibility study and mine permitting of the Vittangi graphite-graphene project. Results from exploration activities on the Company's 100%-owned cobalt-copper-gold projects were also reported during the period (ASX:TLG 11 Oct 2018).

### ***Update on the Company's Vittangi Pre-Feasibility Study***

The Company's Pre-Feasibility Study ("PFS") activities continued during the quarter focusing on planning for downstream value adding processes for the graphite and functionalised graphene product streams. Mine optimisations were also completed with preliminary mine planning now having commenced. The PFS remains on track for delivery end of Q1 2019.

Environmental study activities concluded in the quarter included completion of social and reindeer herding studies, hydrology, tails and waste testing as well as mine effluent process design. Consultation meetings with key government and stakeholder groups as a precedent to permit applications also commenced in December.

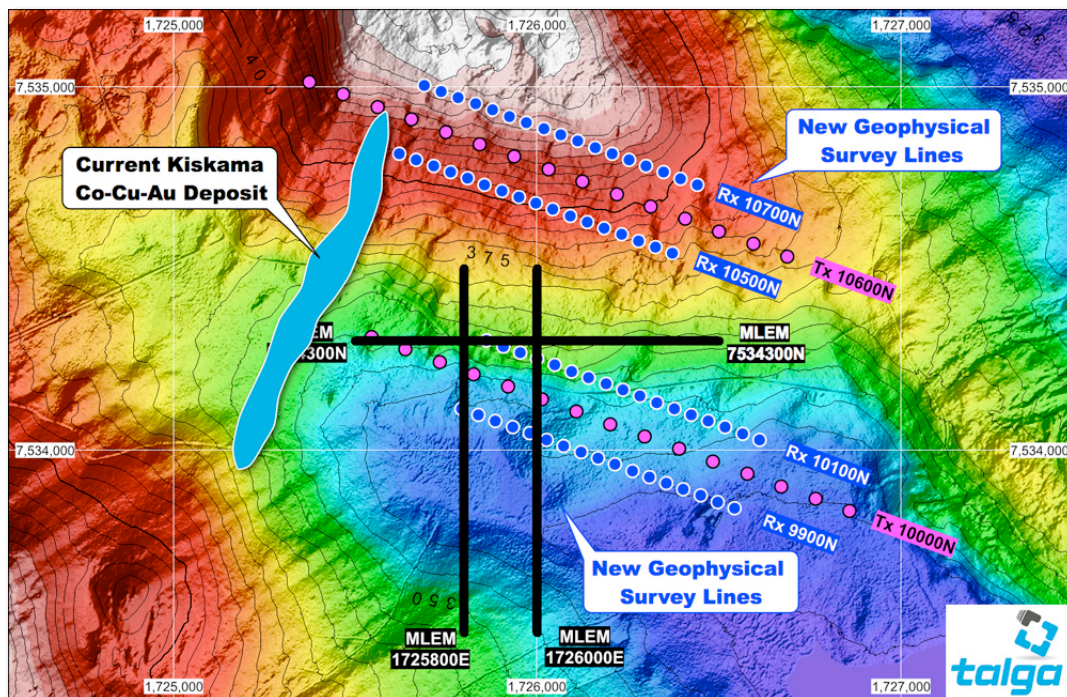


**Figure 6.** Talga technician performing corrosion testing of Talphene coatings at Talga Advanced Materials GmbH facility in Rudolstadt, Germany.

## Kiskama Project

During the quarter a geophysical campaign was completed at Kiskama, consisting of Induced Polarisation (IP) and Moving Loop Electromagnetic (MLEM) with the aim of identifying conductors and potentially finding new mineralised zones missed by historical work on the project. During the surveys, several anomalous zones were noted in field data and surveys were extended to cover the new anomalies more thoroughly, delaying the start of drilling at the project. The extensive geophysical data is currently being analysed and will assist better targeting of the proposed diamond drilling program, which is now scheduled to commence in February as part of completing the maiden JORC compliant cobalt-copper-gold resource at Kiskama.

**Figure 7.** Topographic image map of Kiskama Project showing new IP and MLEM geophysical survey lines adjacent and east of the current Kiskama cobalt deposit.



Talga moved to secure new exploration permits over significant surface copper, cobalt and gold mineralisation found in historical exploration data on several prospects near Kiskama. At the Airivaara prospect, historic rock samples returned up to 0.27% Co, 0.9% Cu and 0.12g/t Au from a diopside-biotite rich unit within quartz-rich gneiss. Talga also reported on the Äijäjärvi permit where the geological survey of Sweden drilled over 12 diamond core holes between 1967-1969. Intercepts included 7.5m @ 1.57% Cu from 57.3m (67001) and 5.6m @ 1.06% Cu from 44.3m (67005) (ASX:TLG 11 Oct 2018) using a 0.7% Cu cut-off. The new prospects add further size and scale potential to the Kiskama copper-cobalt project.

## Lautakoski Project

During the quarter, Talga reported drill core sampling results from the Lautakoski Project, located approximately 40km northwest of the town of Pajala in northeastern Sweden (ASX:TLG 11 Oct 2018). At Lautakoski, Talga's follow-up drilling of a 'wildcat' electromagnetic conductor intersected broad and consistent zones of copper and cobalt mineralisation with significant alteration (carbonate-K-feldspar-biotite-scapolite) and structural deformation (intense brecciation). Intercepts included 91.8m @ 0.18% copper and 147ppm cobalt from 14m, including 21m @ 0.34% copper and 182ppm cobalt (LAU16001R). Reviews of geophysical data are underway to determine vectors for further work.

## Aitik East Project

During the quarter, Talga reported first-pass reconnaissance rock sampling results from its three wholly owned exploration permits located 25km east of Boliden's Aitik Cu-Au mine, Europe's largest base metal mine (36Mt ore per annum). Samples returned up to 4.8% copper, 1.2g/t gold, 66g/t silver, 0.6% molybdenum, plus anomalous levels of tellurium and bismuth (ASX:TLG 11 Oct 2018).

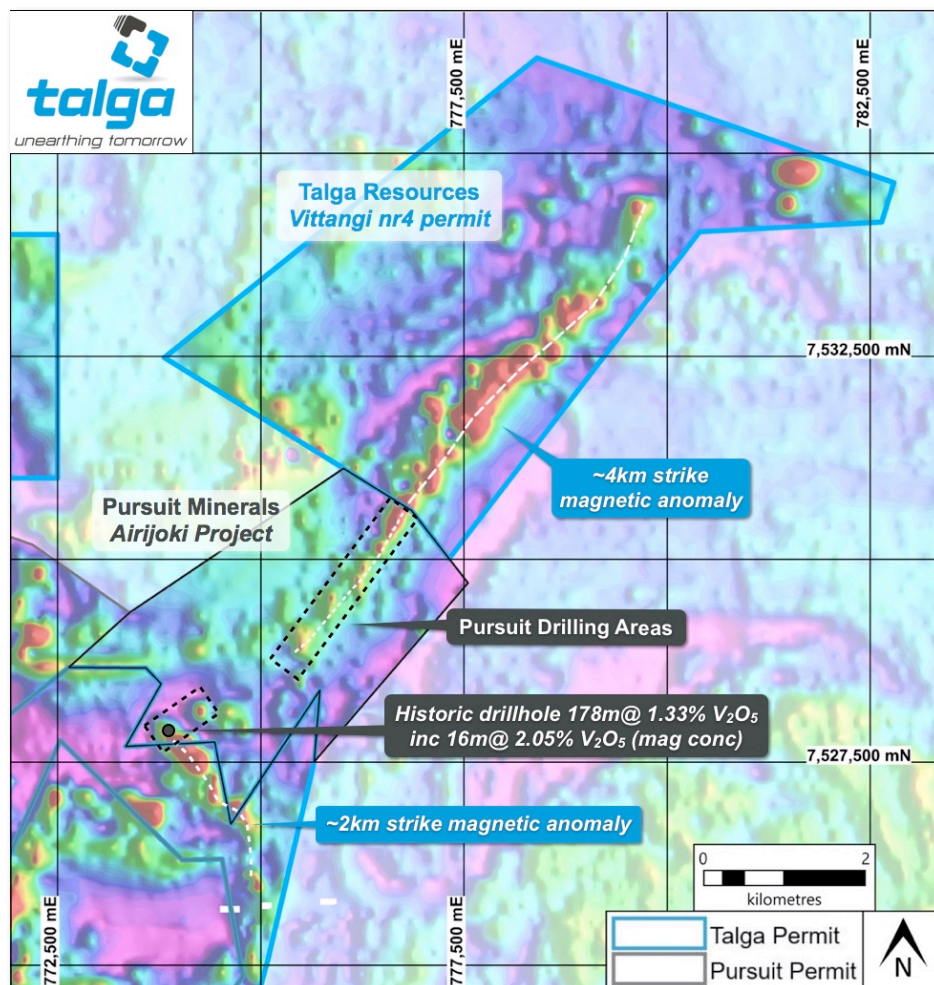
The high grades, disseminated nature of some of the mineralisation and the suite of ore minerals (which are similar to the ore mined and processed at the Aitik mine) are encouraging and further exploration activities are planned for mid-2019.

## Vanadium prospect identified in Talga permits

In response to the strong increase in the demand and price for vanadium, Talga completed an internal review to assess the vanadium potential across its projects. As reported during the quarter, this review identified a significant vanadium prospect located in the northeast corner of the Company's Vittangi Project (ASX:TLG 19 Dec 2018). The vanadium target is identified by high magnetic susceptibility rock units striking for a total of over 6km through Talga's 100% owned tenements.

Directly along this trend and adjacent to Talga's permits, ASX-listed Pursuit Minerals Ltd (ASX: PUR) has recently conducted exploration drilling and metallurgy test work on its Airijoki project with the aim of defining an initial vanadium JORC compliant resource. Talga's project boundary comes within 200m of some of Pursuit's drill holes. Talga is monitoring Pursuit's activities and depending on the on-going results obtained by Pursuit, will develop and undertake an initial exploration program as appropriate.

**Figure 8.** Location map showing vanadium exploration activities on airborne magnetic imagery in the north east part of Talga's Vittangi project.



## CORPORATE AND INVESTOR RELATIONS

### ***Bolstering of European management team amid rapid operational progress***

During the quarter, further key European based management personnel were appointed.

Dr Stephen Hutchins has been appointed Technical Sales Director to head-up the Company's Sales and Marketing department at its UK subsidiary, Talga Technologies Limited. Dr Hutchins has a PhD in Surface Physics and was previously Chief Operating Officer for coatings technology company, Keronite.

His other previous roles include Head of Sales at Lotus Engineering, an internationally recognised automotive engineering consultancy providing services to many of the world's top automakers and Scientist at Topexpress Ltd, where he provided engineering consultancy to aerospace, automotive, maritime and industrial clients.

Talga has also appointed Ms Anna Utsi, as General Manager for its Swedish subsidiary, Talga Graphene AB. Ms Utsi is an experienced strategic planning and public affairs professional and will lead the public process for mineral project permitting approvals and manage the Company's environmental and stakeholder engagement team.

Ms Utsi holds a Master of Science in Environmental Engineering and most recently served as the Director of Strategic Innovation Program for the Swedish Mining and Metal Producing Industry (STRIM). Her other previous roles include Head of Business Development at Swerea MEFOS, Regional Manager at SSAB Merox (a subsidiary of Sweden's largest steel producer SSAB), and Environmental Manager for the Swedish Steel Producer association.

### ***Outreach***

During the quarter, senior Talga staff completed successful commercial roadshows in South Korea, Japan, Germany and the US, focusing on business development and marketing the Company's advanced graphene and graphite products. Meetings were taken with some of the world's largest corporations, who subsequently are receiving samples of Talga products for commercial evaluation.

While on the roadshow, Talga's Managing Director, Mark Thompson, and staff delivered presentations at the influential Advanced Automotive Battery Conference in Japan and Benchmark Minerals Graphite + Anodes 2018 event in USA. The Benchmark presentation is available on Talga's website. Mr Thompson also provided a product update video, the link of which can be found on Talga's website.



**Figure 9.** Anna Utsi, General Manager of Talga Graphene AB and based in Luleå, Sweden.



**Figure 10.** MD, Mark Thompson, presenting at the AABC event in Osaka, Japan.



**Figure 11.** Talga's Battery Product Manager, Dr Sai Shivareddy, and MD, Mark Thompson, with Simon Moores from Benchmark Minerals.



### **Tenement Interests**

As required by ASX listing rule 5.3.3, refer to Appendix 1 for details of Talga's interests in mining tenements held by the Company. No new joint ventures or farm-in/farm-out activity occurred during the quarter.

### **Financial**

Talga closed out the 2018 December quarter with A\$13.8 million cash-in-bank. Following the expiry of listed options in December, the Company currently has 218,192,650 quoted ordinary shares on issue and at the close of the ASX on 30 January 2019, was capitalised at A\$75.3 million.

For further information, visit [www.talgaresources.com](http://www.talgaresources.com) or contact:

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### **About Talga**

Talga Resources Ltd ("Talga") (ASX: TLG) is an advanced material technology company enabling stronger, lighter and more functional graphene- and graphite-enhanced products for the multi-billion dollar global coatings, battery, construction and carbon composites markets. Talga has significant advantages owing to its 100%-owned unique high grade conductive graphite deposits in north Sweden, a Research and Development test processing facility in Germany and in-house product development and technology. Joint development agreements are underway with a range of international corporations.

### **No New Information**

To the extent that announcement contains references to prior technical information, exploration results and mineral resources; these have been cross referenced to previous market announcements made by the Company. These had been disclosed to JORC 2012 standard. Unless explicitly stated, no new information is contained. The Company confirms that it is not aware of any new information or data that materially affects the information included in the relevant market announcements that assumptions and technical parameters underpinning the relevant market announcement continue to apply and have not materially changed.

## APPENDIX 1

### Tenement Holdings

Project/Location	Tenements	Interest at end of quarter	Acquired during quarter	Disposed during quarter
<b>Ahmavuoma Project</b> Norrbotten County, Sweden	Ahmavuoma nr 3 Ahmavuoma nr 4 Ahmavuoma nr 5	100% 100% 100%		
<b>Aitik East Project</b> Norrbotten County, Sweden	Suorravaara 2 Suorravaara 3 Suorravaara 4	100% 100% 100%		
<b>Jalkunen Project</b> Norrbotten County, Sweden	Jalkunen nr 1 Kursuvaara Nybrännan nr 2	100% 100% 100%		
<b>Kiskama Project</b> Norrbotten County, Sweden	Kiskama nr 1 Airivaara nr 100	100% 100%		
<b>Lautakoski Project</b> Norrbotten County, Sweden	Jukkasvaara nr 2 Lautakoski nr 2 Lautakoski nr 4 Piipiönjoki nr 1 Suinavaara nr 2 Suinavaara nr 3 Suinavaara nr 4	100% 100% 100% 100% 100% 100% 100%		
<b>Masugnsbyn Project</b> Norrbotten County, Sweden	Masugnsbyn nr 101	100%		
<b>Piteå Project</b> Norrbotten County, Sweden	Gräliden nr 2 Önusträsket nr 2	100% 100%		
<b>Raitajärvi Project</b> Norrbotten County, Sweden	Raitajärvi nr 5	100%		
<b>Vittangi Project</b> Norrbotten County, Sweden	Maltosrova nr 3 Nunasvaara nr 2 Vathanvaara nr 101 Vittangi nr 2 Vittangi nr 3 Vittangi nr 4	100% 100% 100% 100% 100% 100%		