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**TALGA**  
RESOURCES

# Talga Resources Ltd Investor Presentation

**Shaw Stockbroking  
Graphite Conference**



ASX: TLG

## Cover; Nunasvaara graphene sample and graphene schematic.

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# Executive Summary



- ▶ Talga Resources Ltd (“Talga”) ASX:TLG is developing multiple graphite deposits in Sweden including the **world’s highest grade graphite mineral resource**<sup>1</sup>.
- ▶ In recent tests Talga has demonstrated a **world-first ability** to produce **high quality graphene** direct from its **raw** (uncrushed/unpurified) **graphite ore** which provides Talga with **unique economic advantages** compared to global graphene peers.
- ▶ This new **low cost** and **abundant** supply potential is a paradigm shift in the production outlook for bulk graphene, a new material with huge growth potential.
- ▶ Talga has defined **two** JORC<sup>1</sup>resources to date and is ramping up its low-cost development to focus on becoming a global **graphite** and **graphene** supplier with industry leading **margins**.
- ▶ The Company is currently **drilling** potential extensions of it’s flagship Nunasvaara deposit, **scoping study** utilising dual graphite/graphene production expected by months end, moving towards further **commercial/sales** agreements and **bulk sample/pilot plant** processing in 2015.

<sup>1</sup> See appendices for details of JORC (2004) resources and [www.techmetalsresearch.com](http://www.techmetalsresearch.com) for world graphite resources grade comparison.

# Talga Resources Corporate Overview

## Board of Directors

<b>Keith Coughlan</b>	Non-executive Chairman
<b>Mark Thompson</b>	Managing Director
<b>Grant Mooney</b>	Non-executive Director

## Capitalisation Summary at 30 June 2014

ASX:TLG Ordinary Shares	<b>124.6M</b>
ASX:TLGO Options ( <i>exp 30 Nov 2015 at 35c</i> )	<b>7.75M</b>
Unlisted Options <sup>1</sup>	<b>7.85M</b>
Cash \$AUD	<b>\$4.3M</b>
Market Capitalisation ( <i>undiluted @ \$0.45</i> )	<b>\$56.1M</b>

## Share Price last 12 months ASX:TLG



## Top Shareholders (+3%) at 29 August 2014

Lateral Minerals Pty Ltd ( <i>Mark Thompson</i> )	<b>11.4%</b>
Gregorach Pty Ltd	<b>6.3%</b>
Two Tops Pty Ltd	<b>3.8%</b>
UBS Nominees	<b>3.2%</b>
Yandal Investments Pty Ltd	<b>3.1%</b>

<sup>1</sup> As at 29 August 2014

# Talga's Graphite Project Pipeline

100% ownership of five graphite projects in Sweden with multiple deposits offering the full range of market size specifications. Two advanced stage projects in the development pipeline. These are drilled to JORC<sup>1</sup> Indicated status and preliminary economic studies are underway on one of the deposits.



## Vittangi

JORC<sup>1</sup> Indicated and Inferred 7.6Mt @ 24.4% Cg containing 1.85Mt graphite, flake size <75µm and graphene nanosheets, suit powder and graphene/tech market. Scoping study u/way.

## Raitajärvi

JORC<sup>1</sup> Indicated and Inferred 4.3Mt @ 7.1% Cg containing 0.35Mt graphite, 87% coarse flake size (49% >200µm), suit refractory and spherical market.

## Jalkunen

First pass drilling highlights include 45m @ 19.4% Cg, 9m @ 35.0% Cg, 51m @ 15.4% Cg and 26m @ 27.7% Cg. Flake size <75µm to >200µm. Graphene. Drilling planned.

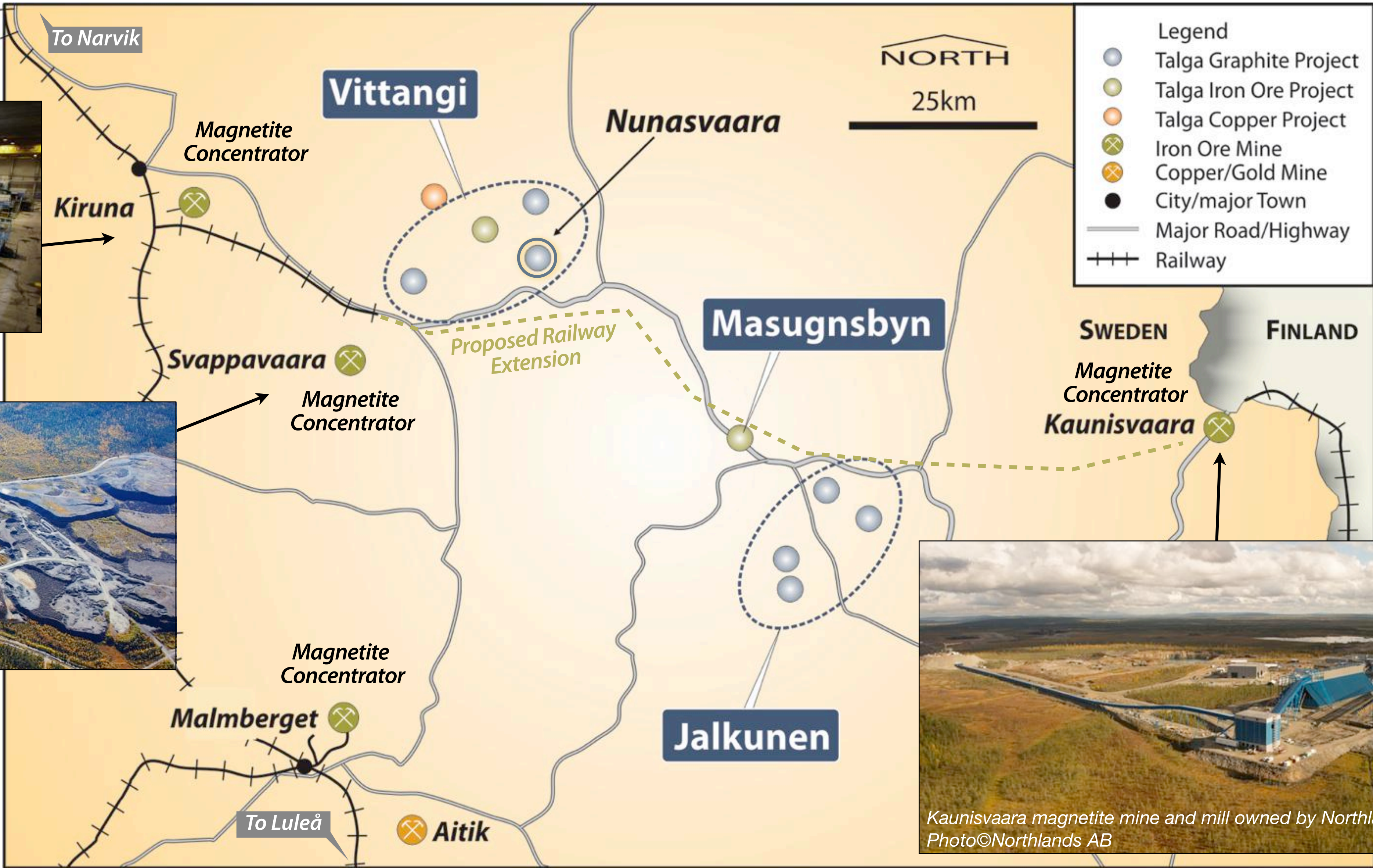
## Pajala

First pass drilling highlights include 8m @ 30.2% Cg, 20m @ 7.5% Cg, 5m @ 39.9% Cg. Flake size <75µm to >400µm Jumbo. Graphene and spherical market.

## Piteå

First pass drilling highlights grade 2.7-8.9% Cg. Flake size 80% >300µm Jumbo. Suit spherical market. New tenements pegged over extensions.

# Established mining district with extensive milling and transport infrastructure



Kiruna magnetite mine and mill owned by LKAB. Photo©Fredric Alm/LKAB



Svappavaara magnetite mine and mill owned by LKAB. Photo©Fredric Alm/LKAB



Kaunisvaara magnetite mine and mill owned by Northlands AB. Photo©Northlands AB



# Advantages of Sweden for Mining

- ▶ Ranked **No.1 mining jurisdiction in world** by Fraser Institute 2013-14
- ▶ Corporate tax rate **22%**, Mineral Production tax **0.2%**
- ▶ **Established** bulk commodity **infrastructure** with open access rail, road and ports
- ▶ **Low cost power** from hydroelectricity and nuclear grid
- ▶ Well established **mining province** with **highly skilled** workforce and **support industries**
- ▶ Hosts **world-class mineral deposits** but remains under-explored relative to peers as foreign mineral ownership only allowed since 1992

The 'Aitik' Cu-Au mine, northern Sweden. Owner; Boliden. Milling 36Mt annum ore.

# Logistics Advantages

- ▶ EU consumes **20%** of global natural graphite and **imports 95%** of its needs (vast majority from China). Graphite is EU classified “critical raw material”.
- ▶ Talga’s projects located **proximal** to high quality sealed roads and open-access heavy haulage railway with **direct link to Europe markets**. No shipping required.
- ▶ Major **cost advantage** on delivery compared to shipments from other jurisdictions.



Road through Nunasvaara project



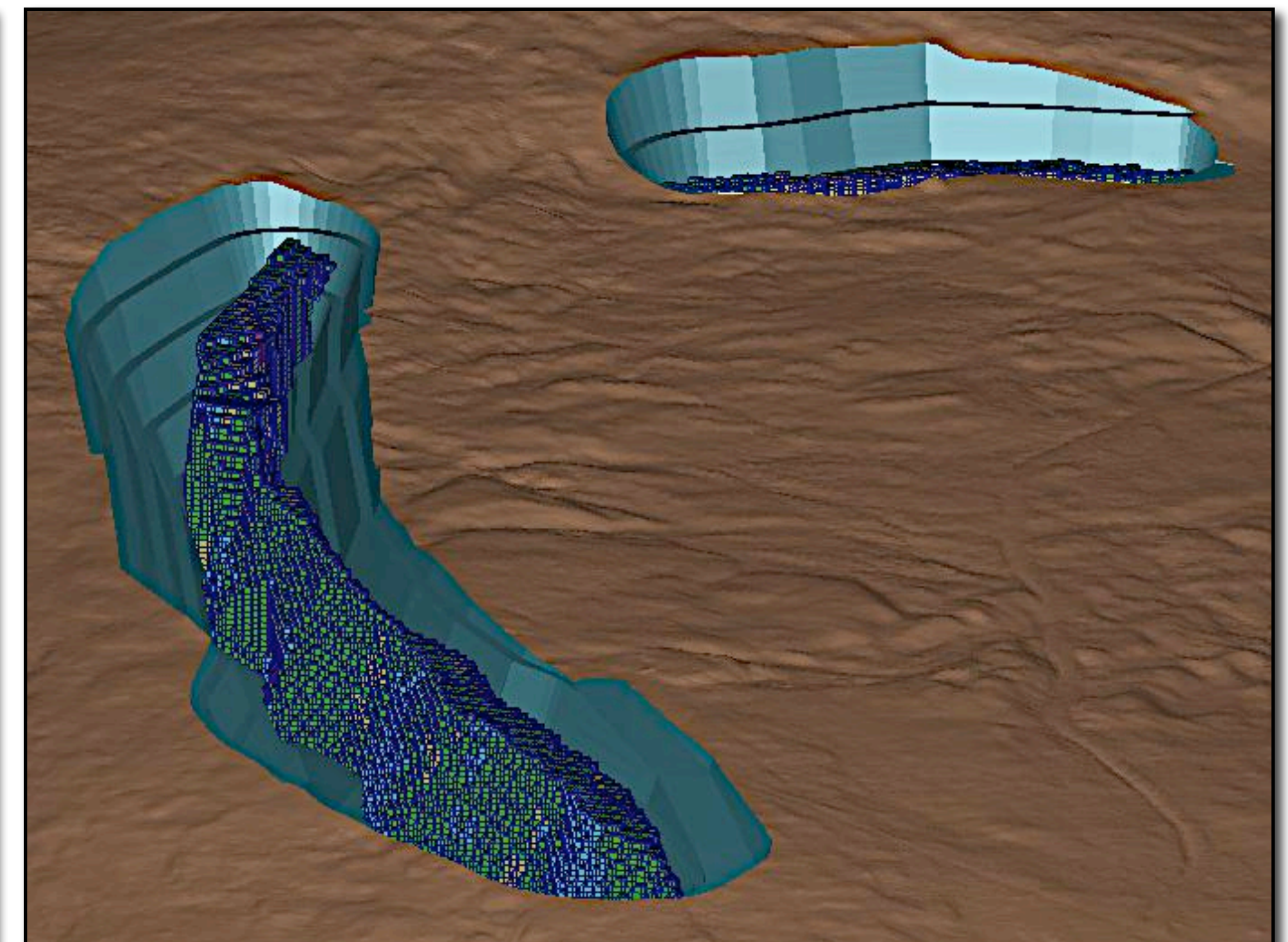
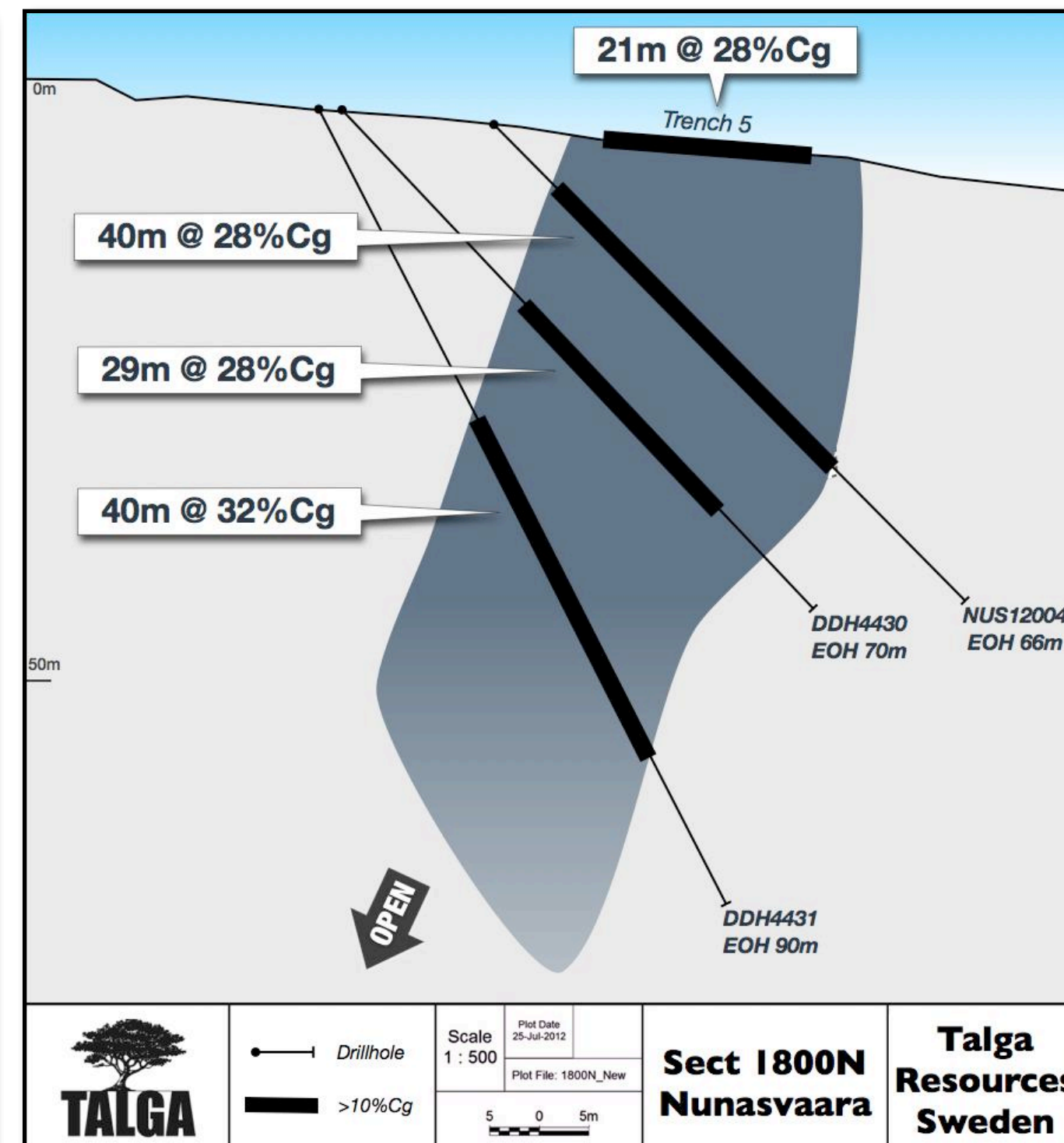
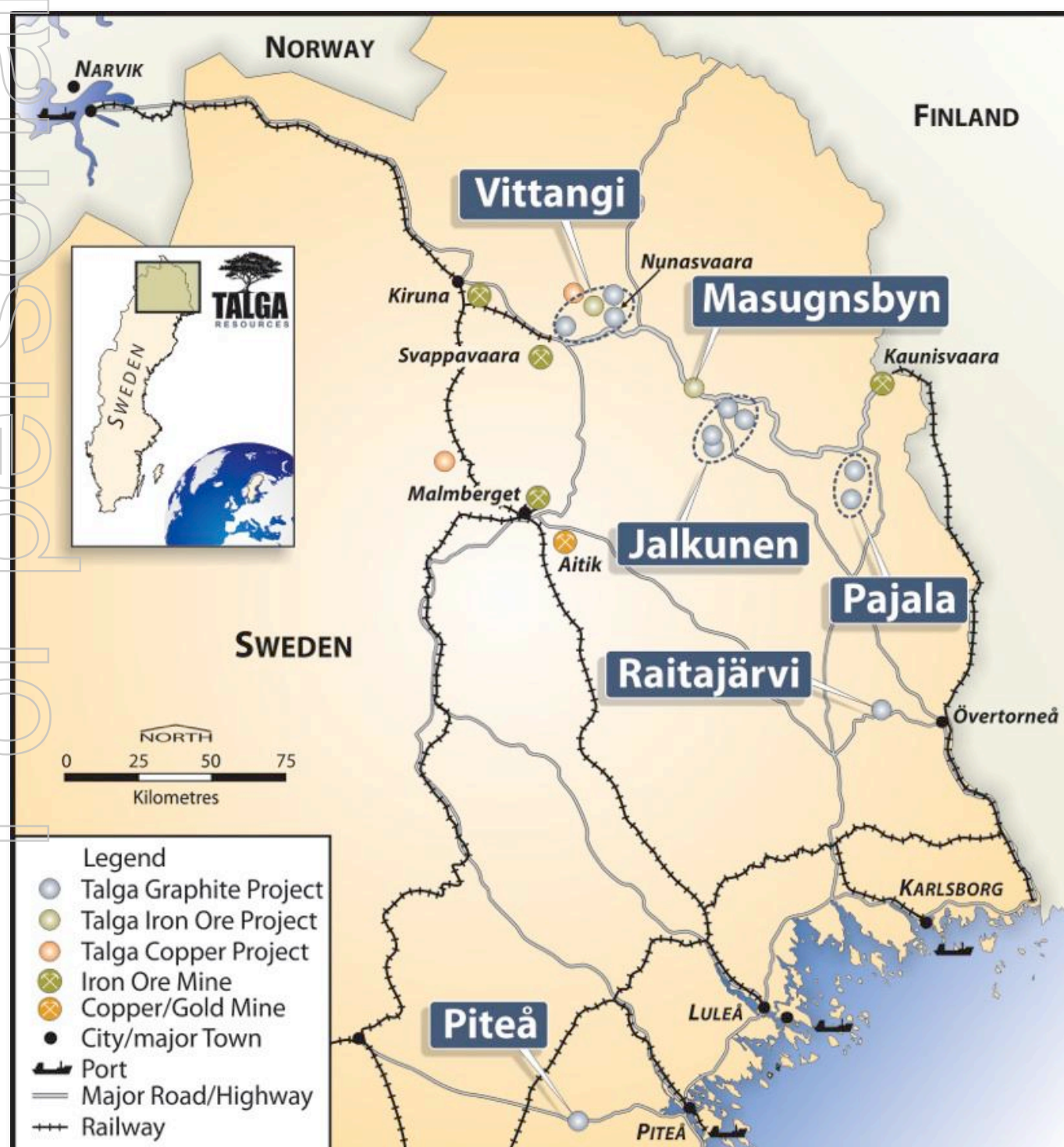
Öresund Bridge road/rail tunnel linking Sweden to mainland Europe

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# Vittangi Project - Nunasvaara Graphite Deposit

- ▶ World's highest grade JORC/NI43-101 resource<sup>1</sup> of (ASX:TLG 8 Nov 2012) 7.6Mt @ 24.4% graphite ("Cg") (see appendix).
- ▶ Mineralisation from surface to 165m depth and remains open. Average true width 20m over 1.2km strike and remains open at depth and strike. Graphite unit hosted within volcanic greenstone belt. Robust outcropping high grade resource makes low-cost potential in both ultrafine to fine graphite and bulk graphene market.
- ▶ Mineralogy supports demonstrated one stage dual graphite / graphene processing method

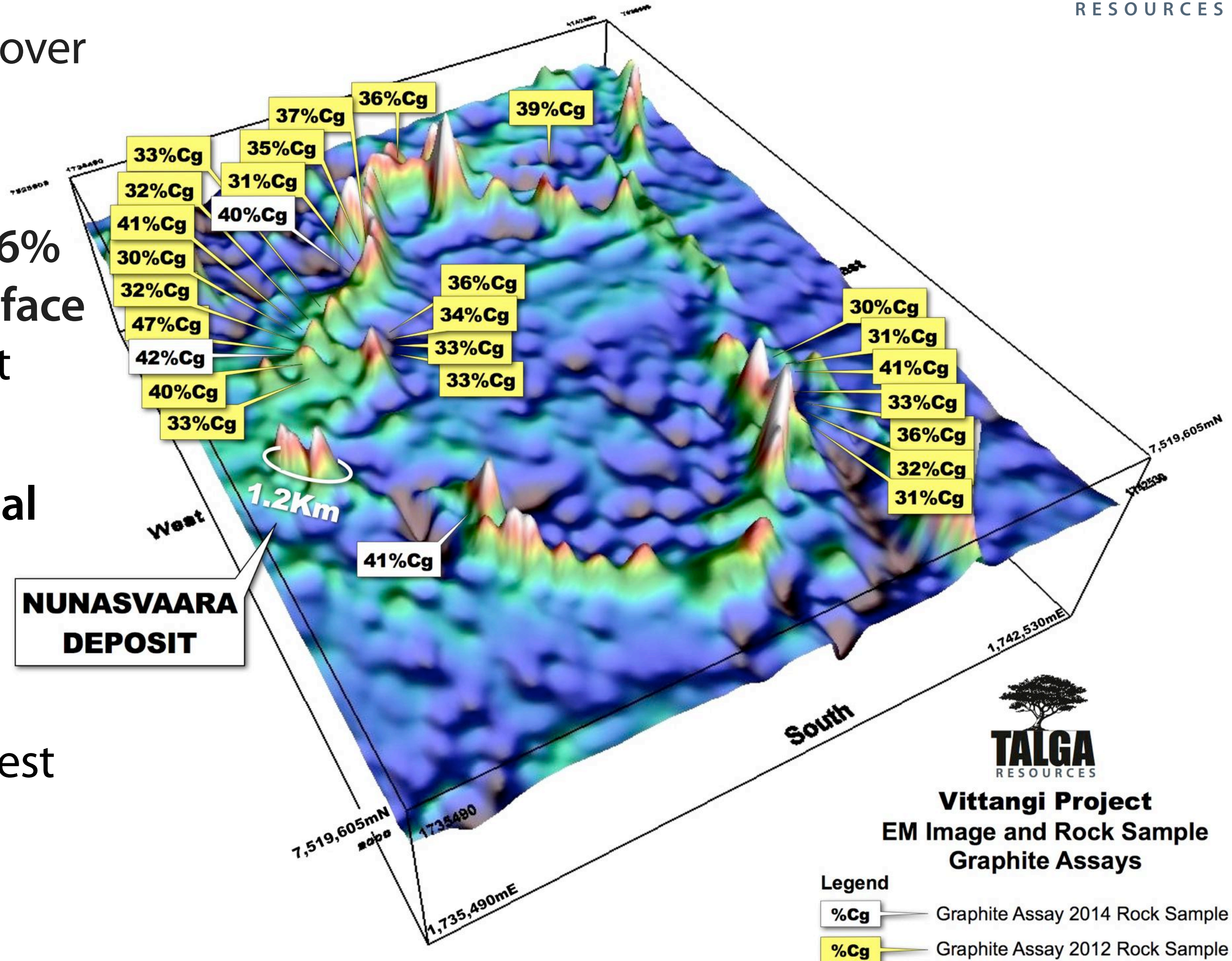


# Nunasvaara strike potential and logistics advantages



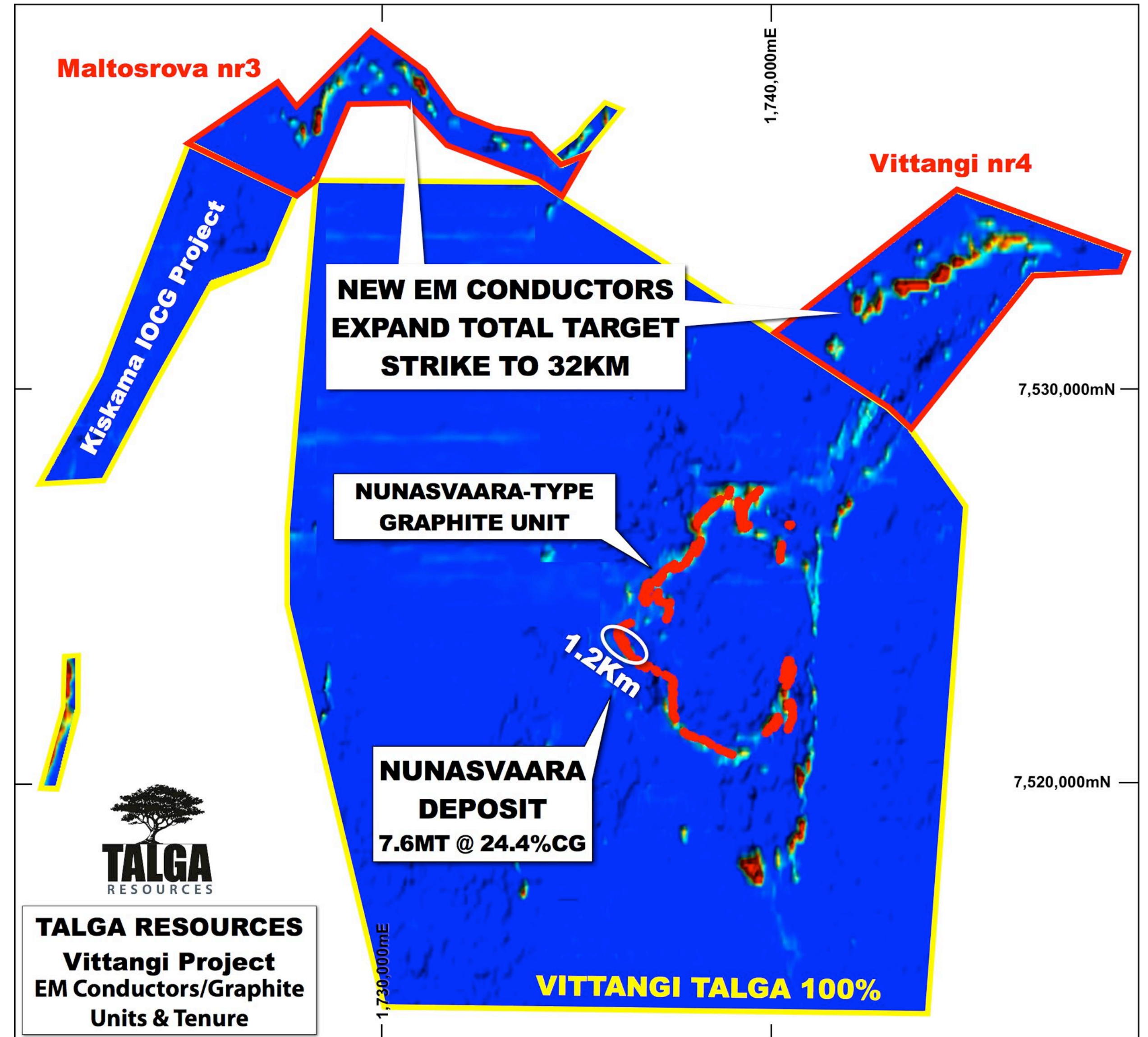
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- ▶ Graphite is mapped in outcrop and EM over at least 15km strike. 100% owned TLG.
- ▶ EM conductors sampled by Talga along strike of Nunasvaara deposit average 26% Cg with grades up to 47% Cg from surface sampling. Less than 8% of graphite unit drill tested to date.
- ▶ Development advantages of exceptional grade, open-pit mining, low-cost grid power and nearby transport options (3km to road, 25km to rail).
- ▶ Drilling commenced in September to test five sites over 7km of strike around Nunasvaara deposit (see ASX:TLG 4 September 2014).



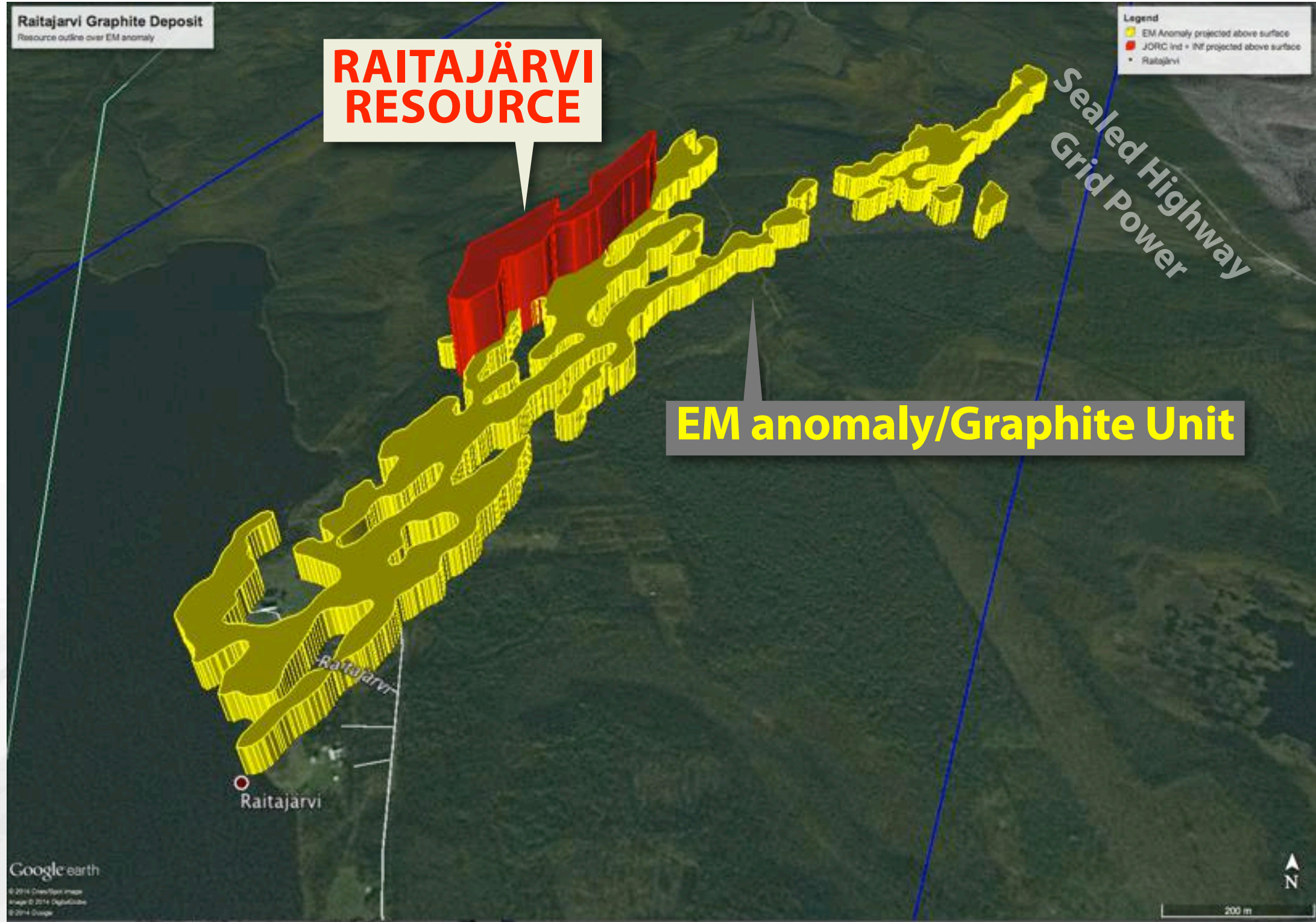
# Vittangi Project - New Tenements Extend Strike

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- ▶ Further EM conductors (interpreted to be similar to Nunasvaara-type graphite) identified extending outside the previous project area.
  - ▶ Talga's tenement applications over these conductors have now been granted which doubles the total strike of graphite targets in the Vittangi project from approximately 15km to 32km strike.
  - ▶ The Vittangi graphite project area now totals 347km<sup>2</sup>.
  - ▶ Fieldwork and geophysical results support confidence in the overall large scale and high grade tenor of the greater Vittangi project. Estimation of JORC compliant exploration targets over whole project underway.



# Other Graphite Projects - Raitajärvi

- ▶ Indicated and Inferred **4.3 Million tonnes @ 7.1% Cg**, JORC 2004 resource<sup>1</sup> open at depth and along strike.
- ▶ Near-surface deposit contains **87%** coarse crystalline flake graphite with previous metallurgical work demonstrating up to 99.0%C purity concentrate.
- ▶ Significant portion 'large' and 'jumbo' size flake graphite in favor for production of lithium-ion battery electrodes.
- ▶ **Advantageously** located 2km from the Övertorneå - Övertorneå Highway and grid power, 25km to town and railway.
- ▶ Capable of being 10-20,000t/annum output as second producer for Talga but excellent potential for size increase as remains open in all directions and less than 25% of the deposit's electromagnetic signature drill tested to date.



Raitajärvi Mineral Resource<sup>1</sup> (5% Cg lower cut-off)

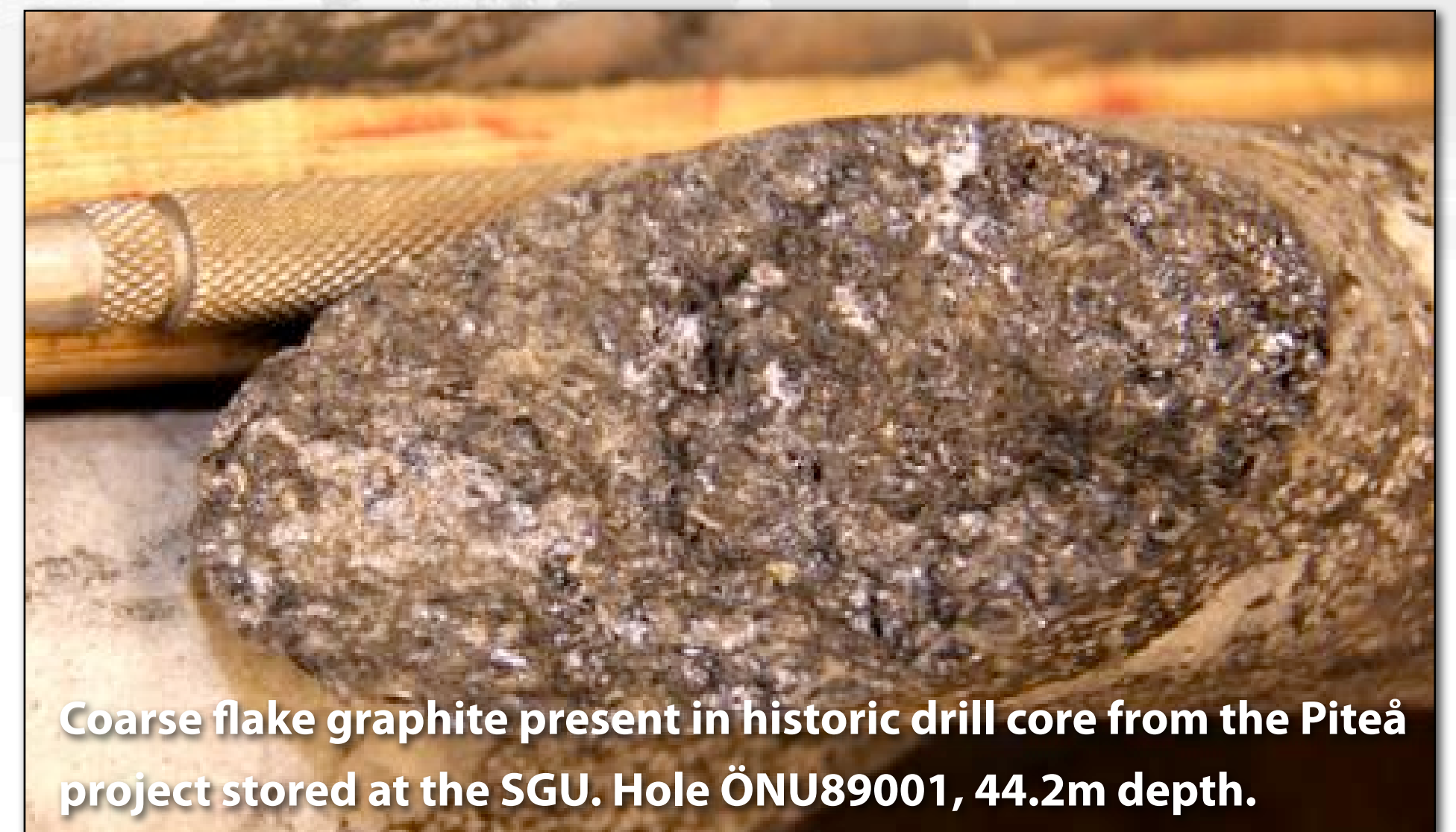
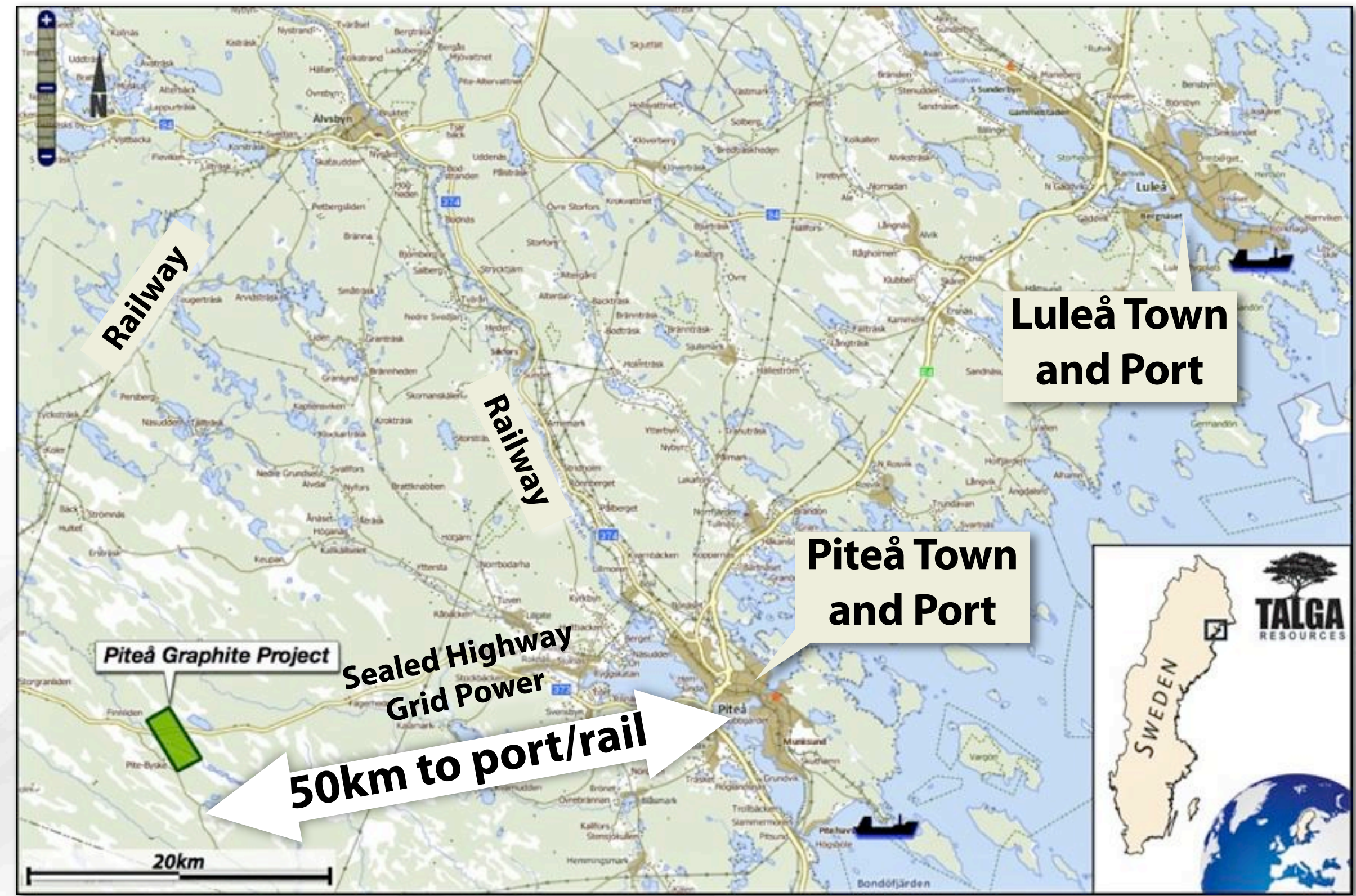
JORC 2004 Classification	Tonnes (Mt)	Grade (%Cg)
Indicated	3.4	7.3
Inferred	0.9	6.4
<b>Total</b>	<b>4.3</b>	<b>7.1</b>

Raitajärvi graphite flake size

< 100µm	100-200µm	200-400µm	>400µm
13%	38%	38%	11%

# Piteå Project

- ▶ **Coarse flake graphite** within a 4 x 1km EM anomaly intercepted to date by 3 historic drillholes.
- ▶ **Very large average flake size; >80% reported as 'jumbo' 300 µm (+50 mesh).**
- ▶ Such large flake graphite is **premium product** for spherical graphite production and commands **higher prices.**
- ▶ Located on sealed road **50km from port** of Piteå and adjacent to grid power.
- ▶ Adjacent EM anomalies pegged. Fieldwork to expand target zone and confirm drill targets after grant in 2015 for stage 2 drill testing .



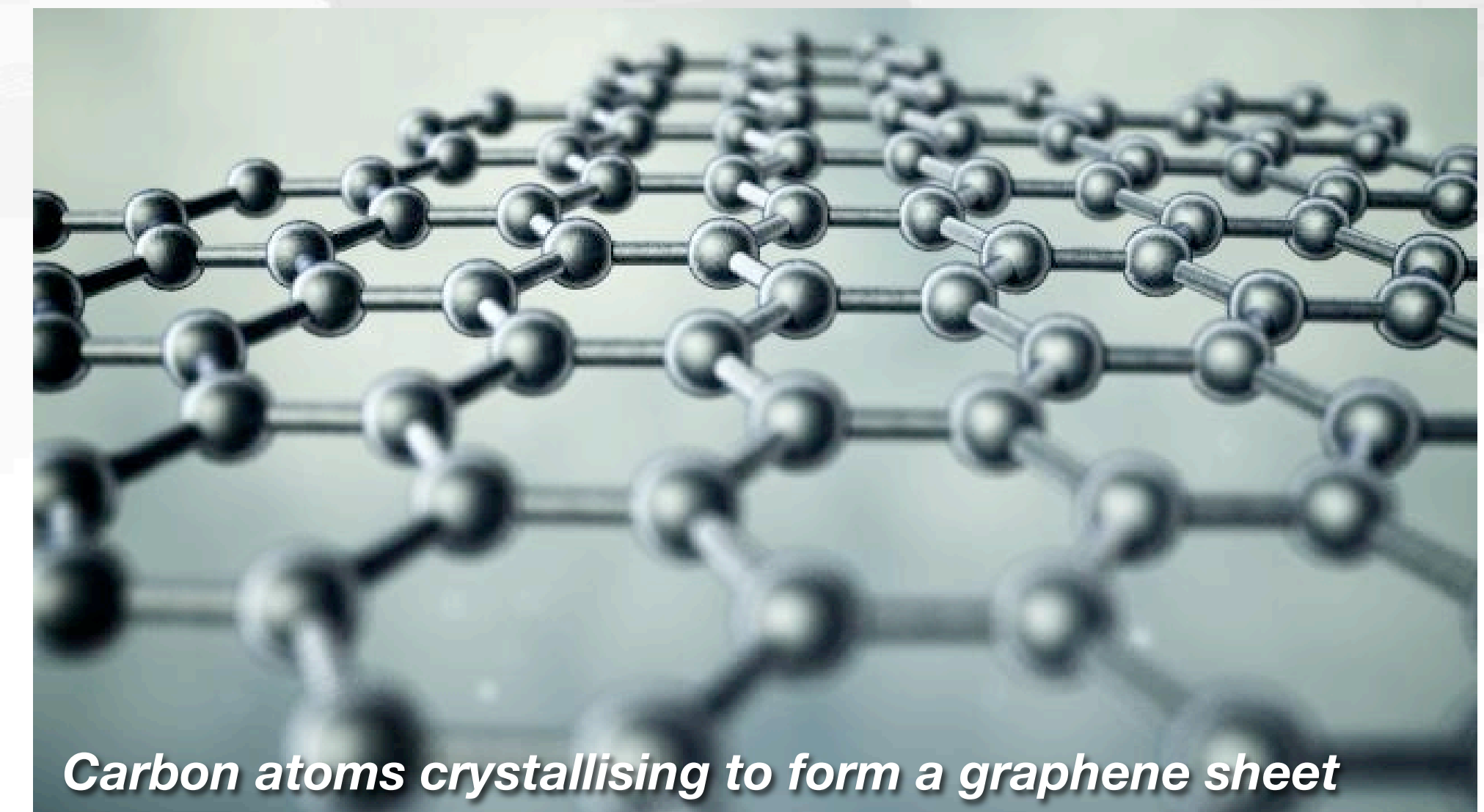
Coarse flake graphite present in historic drill core from the Piteå project stored at the SGU. Hole ÖNU89001, 44.2m depth.

*Piteå average graphite flake size*

< 100µm	100-300µm	300-600µm	>600µm
0%	45%	64%	18%

# Graphite versus Graphene?

- ▶ Graphite (the mineral) consists of parallel sheets of carbon atoms in a hexagonal lattice, which when one or few atoms in thickness, are called **graphene**.
- ▶ Graphite therefore **IS** made from graphene sheets. There are about 3 million layers of graphene in 1mm of graphite.
- ▶ Graphene is everywhere you find graphite. But separating graphite to a few atoms thick is expensive and hard to scale up.
- ▶ Main factors delaying uptake include:
  - production methods are not scalable enough supply large quantities for commercial uptake
  - graphene production is prohibitively expensive
  - lower cost scalable production exists however quality limits applications/markets.
- ▶ Oil is a good analogy to graphene - omnipresent however fundamentals required for commercial success.



# Graphene - Disruptive Potential Across Multiple Markets

“Graphene, which is composed of one-atom-thick sheets of carbon hexagons, is being produced today, but only in limited quantities and at high cost.

***When this material can be mass-produced cost-effectively, its impact could be quite disruptive.”***

**McKinsey Global Institute, May 2013**

**“Disruptive Technologies: Advances that will transform life, business and the global economy.”**

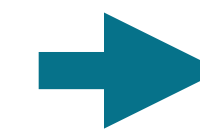
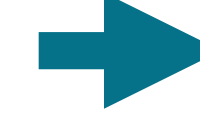
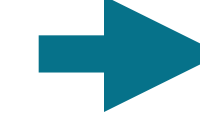
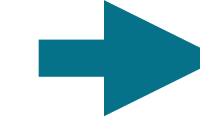
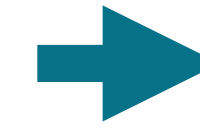
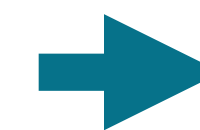
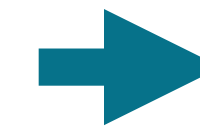
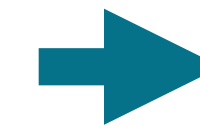


Exhibit E1

Twelve potentially economically disruptive technologies



Mobile Internet



Automation of knowledge work



The Internet of Things



Cloud technology



Advanced robotics



Autonomous and near-autonomous vehicles



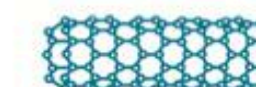
Next-generation genomics



Energy storage



3D printing



Advanced materials



Advanced oil and gas exploration and recovery

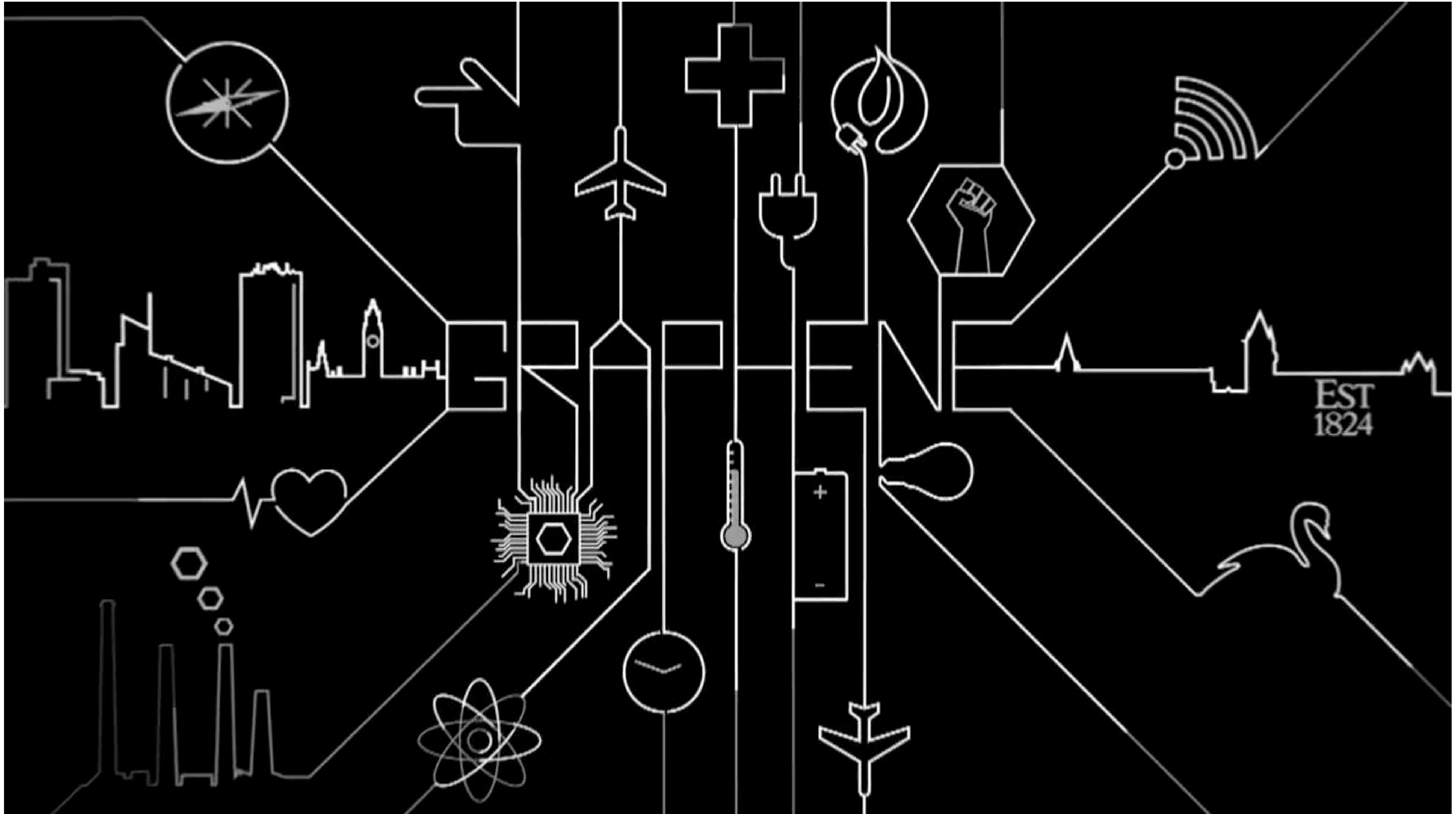


Renewable energy

SOURCE: McKinsey Global Institute analysis

# Graphene; What is it & the buzz out of Manchester

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**Video:** Courtesy The University of Manchester



# Graphene Market

Commercialisation is here

Global consumption of potential  
graphene additive materials

- ▶ While the media is excited by future 'hi-tech' applications, and graphene-enhanced products are becoming available (tennis racquets, riding helmets) the main driver of near term graphene commoditisation may well be **additives**.
- ▶ Small amounts of graphene platelets (**0.05-2%**) added to common bulk materials<sup>2</sup> can impart **exponential** increases in strength e.g. **cement** (global consumption 3,300Mt/ann), and **aluminium** allowing less material/lighter builds. Similar additions of graphene to **steel** coatings can impart anti-corrosion properties and conductive properties to **plastics**. Conductive and 3-D printing inks are commercialising rapidly.
- ▶ **Talga can sell graphene it produces during development phases;** metallurgical to pilot plant, from processing drillcores. First sale of graphene completed July 2014 to German group Microdrop Technologies.



# Graphene from Graphite

Graphite ore-to-graphene requires multi-stage expensive processes

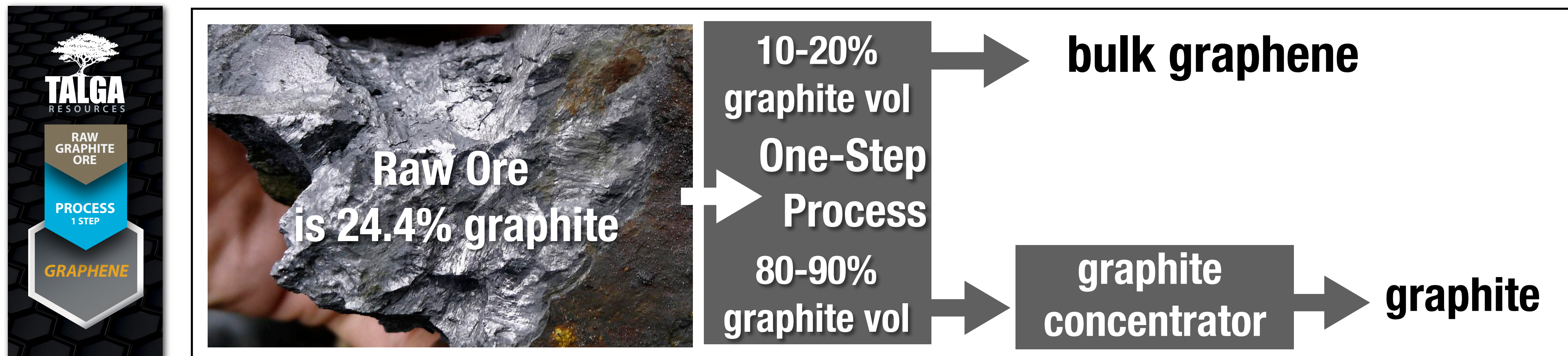
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- ▶ The problem with scalable natural graphite sources though is they require **multiple stages** of crushing, milling and flotation to form a **concentrate** for **further stages** of **purification** commonly involving oxidation and reduction, sonication, electrode forming etc to reach graphene stage. The **multiple stages** increase **costs** and can decrease **quality** of the graphene.
- ▶ Other simple processes have either such **low yields** (eg, 'Blender' method) or require **high purity** (expensive) **source material** they are **not commercial** or **cannot** generate significantly **lower cost** of graphene supply.
- ▶ *As graphite ores already contain 'natural graphene' an ultra-low cost path considering energy and commerciality is a single stage process where raw graphite ore can be processed to graphene without multiple steps.*



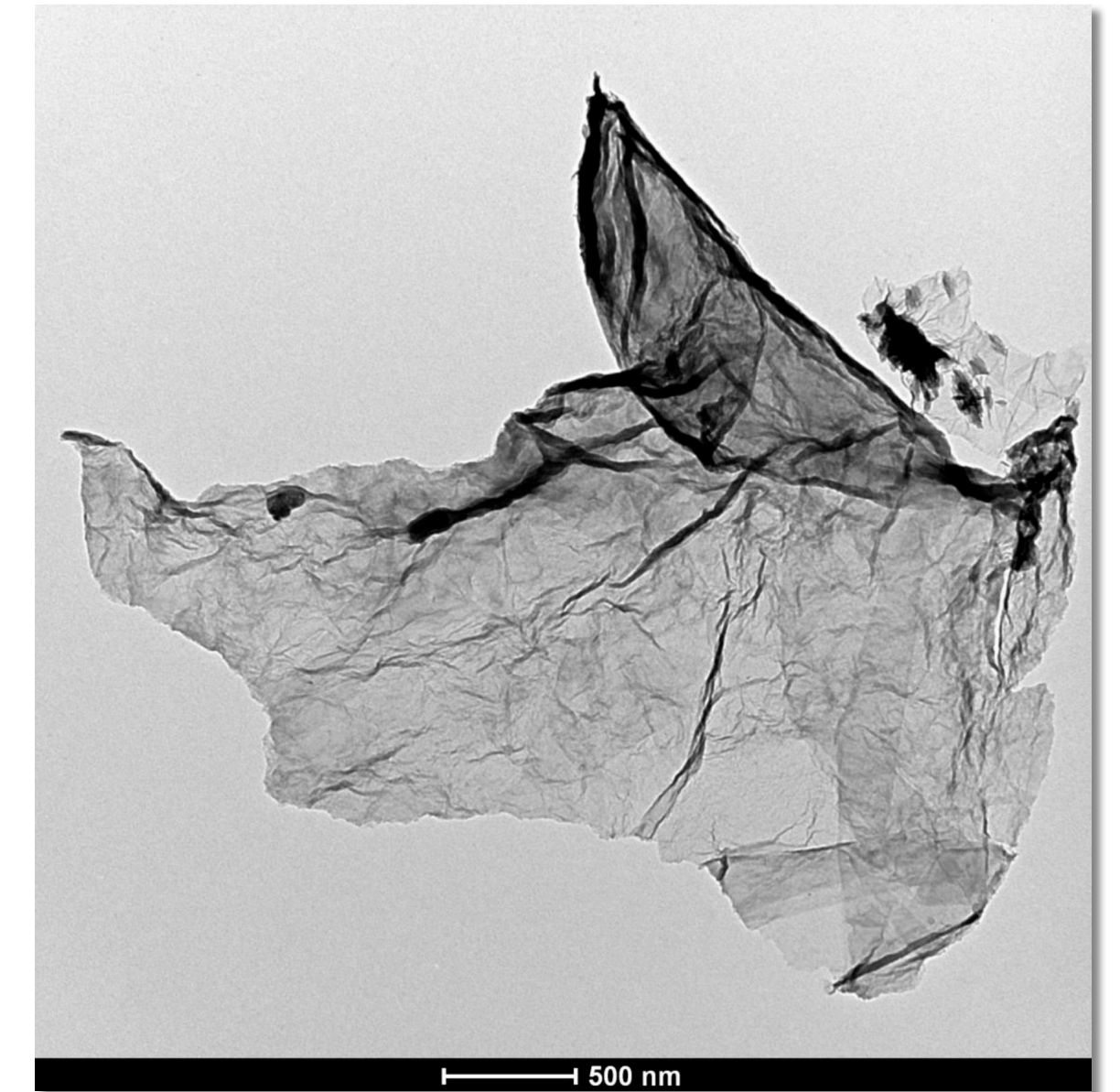
# Talga one-step processing

- ▶ Because of the **unique characteristics** of Nunasvaara, both graphite and graphene can be liberated from the deposit in a **single step** process. This means no expensive **multiple stage processing** or purification that imparts complexity and costs.
- ▶ The deposit is unique, not the process.
- ▶ Graphene is a **byproduct** of the graphite processing. This shows strong potential for Talga to enjoy a **vastly different production and capital cost structure compared to other** producers globally, and represents a paradigm shift in the production outlook for **bulk graphene cost and scale**.



# Talga's Graphene Status

- ▶ The highly homogenous nature of the raw ore has enabled production of consistent quality 1-5 layer graphene. High potential for further optimisation and additional functionalisation.
- ▶ CSIRO is co-funding a research program on Talga's graphite ore and graphene.
- ▶ An initial sale of graphene has been made to a German 3-D printer manufacturer
- ▶ Process pathway has been demonstrated at benchtop scale and upscaling tests are underway to design a 5 tonne/hr pilot plant to be operational in north Sweden mid 2015. The pilot plant will be designed to supply 100-200 tonnes graphene samples over few year test period.
- ▶ A scoping study underway will include potential for production scenarios 10x this level.



# Milestones on path to production



- ▶ Scoping study expected end of September with dual graphene/graphite production.
- ▶ Permitting underway for bulk sample and pilot plant to be built for operation mid-2015. Bulk sample permit application for 2,000m<sup>3</sup> test mining.
- ▶ Metallurgical testwork in Australia produces graphene products for analyses and commercial purposes, until Pilot plant to be developed for installation near Nunasvaara.
- ▶ Exploitation permit applications will follow scoping study with fullscale production targeting circa 2016.
- ▶ Bulk sample program can be duplicated annually to continue producing test graphene and graphite products prior to full scale development.

# Investment Highlights



- ▶ **Highest grade** JORC/NI43-101 graphite resource in world.
- ▶ Demonstrated ability to produce high quality graphene direct from its raw ore provides robust margin potential compared to peers.
- ▶ **Low cost** capex and bottom of production cost curve expected.
- ▶ **Advanced** down the **path to production**.
- ▶ Massive resource **growth profile**; dominant land position on drilled EU graphite deposits.
- ▶ Exposure to high growth materials and energy markets - CAGR75% to 2025
- ▶ **Located** on road and rail routes to major markets, in highly ranked **low-risk** mining and corporate jurisdiction, Sweden.

***To get further information or register interest contact:***

**Mark Thompson - Managing Director**

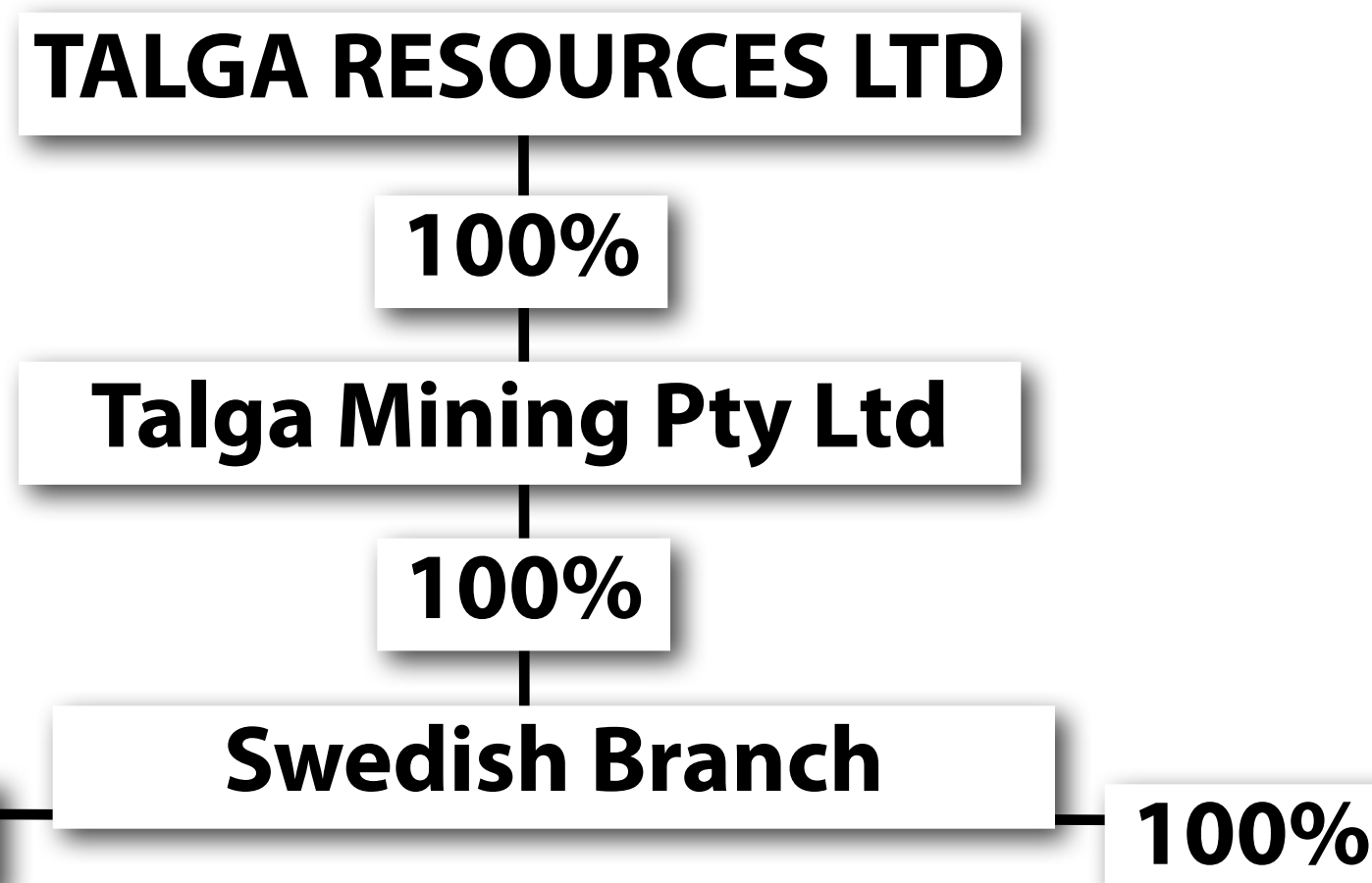
1st Floor, 2 Richardson St West Perth WA 6005 Australia

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# Appendices

## Talga Asset Structure and JORC (2004) Resources\*

*1 Note: This information was prepared and first disclosed under the JORC code 2004. It has not been updated since to comply with the JORC code 2012 on the basis that the information has not materially changed since it was last reported. The Company is not aware of any new information or data that materially affects the information included in the previous announcement and that all of the previous assumptions and technical parameters underpinning the estimates in the previous announcement have not materially changed.*



### GRAPHITE

*Nunasvaara Graphite Mineral Resource @ 10% Cg lower cut-off Nov 2012*

Classification	Tonnes (Mt)	Graphite (%Cg)
Indicated	5.6	24.6
Inferred	2.0	24.0
<b>Total</b>	<b>7.6</b>	<b>24.4</b>

*Raitajärvi Graphite Mineral Resource @ 5% Cg lower cut-off Aug 2013*

Classification	Tonnes (Mt)	Graphite (%Cg)
Indicated	3.4	7.3
Inferred	0.9	6.4
<b>Total</b>	<b>4.3</b>	<b>7.1</b>

### IRON

*Iron Mineral Resources @ 20% Fe lower cut-off July 2013*

Deposit	Tonnes (Mt)	Grade %Fe	JORC Category
Vathanvaara	51.2	36.0	Inferred Resource
Kuusi Nunasvaara	46.1	28.7	Inferred Resource
Mänty Vathanvaara	16.3	31.0	Inferred Resource
Sorvivuoma	5.5	38.3	Inferred Resource
Jänkkä	4.5	33.0	Inferred Resource
Masugnsbyn	87.0	28.3	Indicated Resource
Masugnsbyn	25.0	29.5	Inferred Resource
<b>Total</b>	<b>235.6</b>	<b>30.7</b>	

# References & Qualified Persons

**1 Resource Note:** All Talga owned resources referred to in this report are based on information prepared and first disclosed under the JORC code 2004. They have not been updated since to comply with the JORC code 2012 on the basis that the information has not materially changed since it was last reported. The Company is not aware of any new information or data that materially affects the information included in the previous announcement and that all of the previous assumptions and technical parameters underpinning the estimates in the previous announcement have not materially changed.

## 2 Research references

**Graphene in concrete** "Materials Genome for Graphene-Cement Nanocomposites for Infrastructure Applications"; Hunain Alkhateb et al Department of Civil Engineering, University of Mississippi USA plus see <http://www.monash.edu.au/assets/pdf/industry/graphene-oxide-reinforced-concrete.pdf>

**Graphene in aluminium** "Reinforcement with graphene nanosheets in aluminum matrix composites". Wang, J et al (2012). Scripta Materialia, 66 (8).

**Graphene in plastics** "Graphene Nanoplatelets: A Multi-functional Nanomaterial Additive for Polymers and Composites" (2013) Lawrence T. Drzal, Chief Scientist XG Sciences, Inc. Professor, Chem Engin and Materials Science Michigan State University

**Graphene on iron/steel** "Hybrid nanocomposite coatings for corrosion protection of low carbon steel: A substrate-integrated and scalable active-passive approach," (2011) G.K. Rout et al, J. Mater. Res., 26, 837–44 and see <http://www.steeltimesint.com/news/view/tata-partners-with-epsrc-to-develop-graphene-coated-steels>.

## Competent Person's Statement

The information in this report that relates to Exploration Results is based on information compiled and reviewed by Mr Mark Thompson, who is a member of the Australian Institute of Geoscientists. Mr Thompson, an employee of the Company, has sufficient experience which is relevant to the activity which is being undertaken to qualify as a "Competent Person" as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves" ("JORC Code"). Mr Thompson consents to the inclusion in the report of the matters based on this information in the form and context in which it appears.

The information in this report that relates to Resource Estimation is based on information compiled and reviewed by Mr Simon Coxhell of CoxsRocks Pty Ltd. Mr Coxhell is a consultant to the Company and a member of the Australian Institute of Mining and Metallurgy. Mr Coxhell has sufficient experience relevant to the styles of mineralisation and types of deposits which are covered in this document and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves" ("JORC Code"). Mr Coxhell consents to the inclusion in this report of the matters based on this information in the form and context in which it appears.