



# Leading the Charge in the Vanadium Industry

Rapidly progressing the DFS for the development of a globally significant, high grade, vanadium project

**Investor Presentation December 2018**



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## Competent Person’s Statement

The information in this presentation that relates to Exploration Results are based on information compiled by Mr Ian Prentice. Mr Prentice is Managing Director of the Company and a member of the Australian Institute of Mining and Metallurgy. Mr Prentice has sufficient experience relevant to the styles of mineralisation and types of deposits which are covered in this presentation and to the activity which they are 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 Prentice consents to the inclusion in this presentation of the matters based on his information in the form and context in which it appears.

The information in this report that relates to Mineral Resource estimates is based on information compiled by Mr Aaron Meakin. Mr Meakin is a Principal Consultant with CSA Global and a Member of the Australian Institute of Mining and Metallurgy. Mr Meakin has sufficient experience relevant to the styles of mineralisation and types of deposits which are covered in this report 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 Meakin consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.

The information that relates to Ore Reserves is based on information compiled by Mr Daniel Grosso and reviewed by Mr Karl van Olden, both employees of CSA Global Pty Ltd. Mr van Olden takes overall responsibility for the Report as Competent Person. Mr van Olden is a Fellow of The Australasian Institute of Mining and Metallurgy and has sufficient experience, which is relevant to the style of mineralisation and type of deposit under consideration, and to the activity he is undertaking, to qualify as Competent Person in terms of the JORC (2012 Edition). The Competent Person, Karl van Olden has reviewed the Ore Reserve statement and given permission for the publication of this information in the form and context within which it appears.

The information in this report that relates to the Processing and Metallurgy for the Gabanintha project is based on and fairly represents, information and supporting documentation compiled by Damian Connelly who is a Fellow of The Australasian Institute of Mining and Metallurgy and a full time employee of METS. Damian Connelly has sufficient experience relevant to the style of mineralisation and type of deposit under consideration 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”). Damian Connelly consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

All currency amounts are in AUD\$ unless stated otherwise.



# Invest in a World-Class Vanadium Development Project



- **Vanadium – stand out commodity over past 18 months**
  - Structural change in industry resulting in global deficit
  - Price increased 5 fold in past 18 months from US\$5/lb to >US\$25/lb  $V_2O_5$
- **Gabanintha – a globally significant vanadium deposit**
  - Large high grade resource in Murchison region of Western Australia
  - Initial Probable Reserve of 16.7Mt at 0.96%  $V_2O_5$
- **Robust Pre-Feasibility Study\* delivered June 2018**
  - Industry competitive US\$4.27/lb  $V_2O_5$  operating cash cost
  - Production rate of up to 13,000tpa of high purity  $V_2O_5$
- **Progressing Definitive Feasibility Study for June quarter 2019 delivery**
  - Industry leading consultants with considerable expertise in their fields
  - Focused on delivering a high quality outcome in a competitive time frame
- **Global Peer**
  - Largo Resources, Inc. (TSX:LGO CN\$1.7bn) operating Maracas Menchen Mine, Brazil, upgrading from ~10,000tpa to ~12,000tpa  $V_2O_5$



\*Refer TMT ASX announcement dated 21 June 2018 for full details of the pre-feasibility study

# Corporate Overview

## Company Snapshot

ASX Codes	TMT, TMT0
Proforma cash as at 30 Sept 2018*	~\$7.3m
Market Cap (as at 7 Dec 2018)	~\$30.0m
Tradeable Shares on Issue	47.5m
Escrowed Shares on Issue**	22.5m
Total Shares on Issue	70.0m
Unlisted Options (various)***	20.61m
Listed Options - (\$0.40 – 24/05/20)	6.13m

\* \$6M Placement & 12,000,000 fully paid shares issued – Refer ASX Announcement 5 October 2018

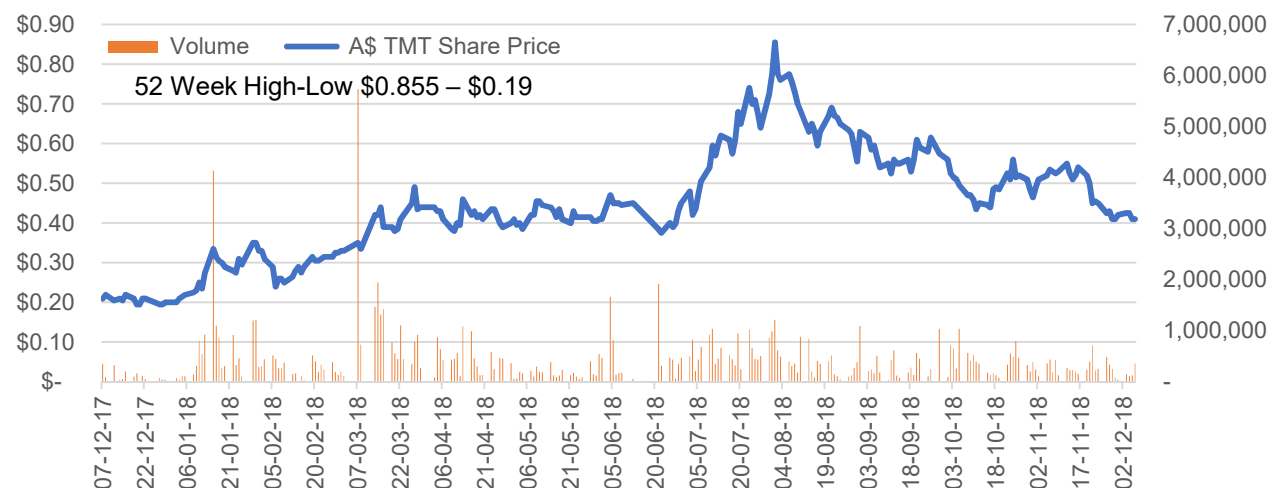
\*\* 22.5m shares, 13.7m \$0.25 options subject to restriction until 21 December 2018,

\*\*\* 14.6m \$0.25, 31/12/19 expiry; 2.75m \$0.35 12/01/21 expiry; 3.26m \$0.40, 24/05/20 expiry

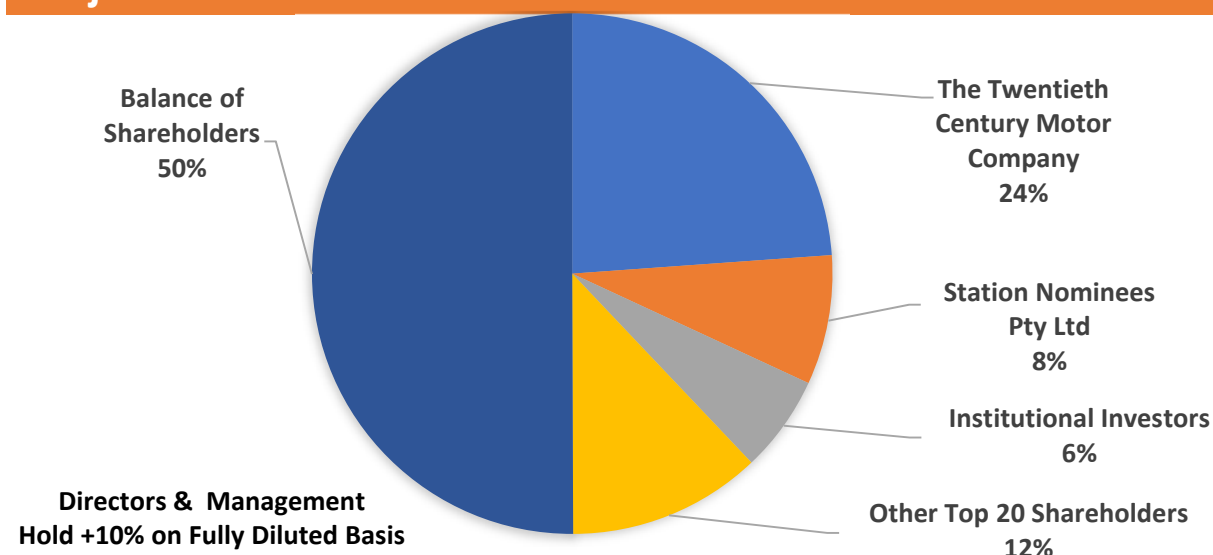
"We think there's a revolution coming in vanadium redox flow batteries. You'll have to get into the mining business and produce ultra-pure vanadium electrolyte for those batteries on a massive scale"

- Robert Friedland, May 2017

## 12 Month Share Price Performance



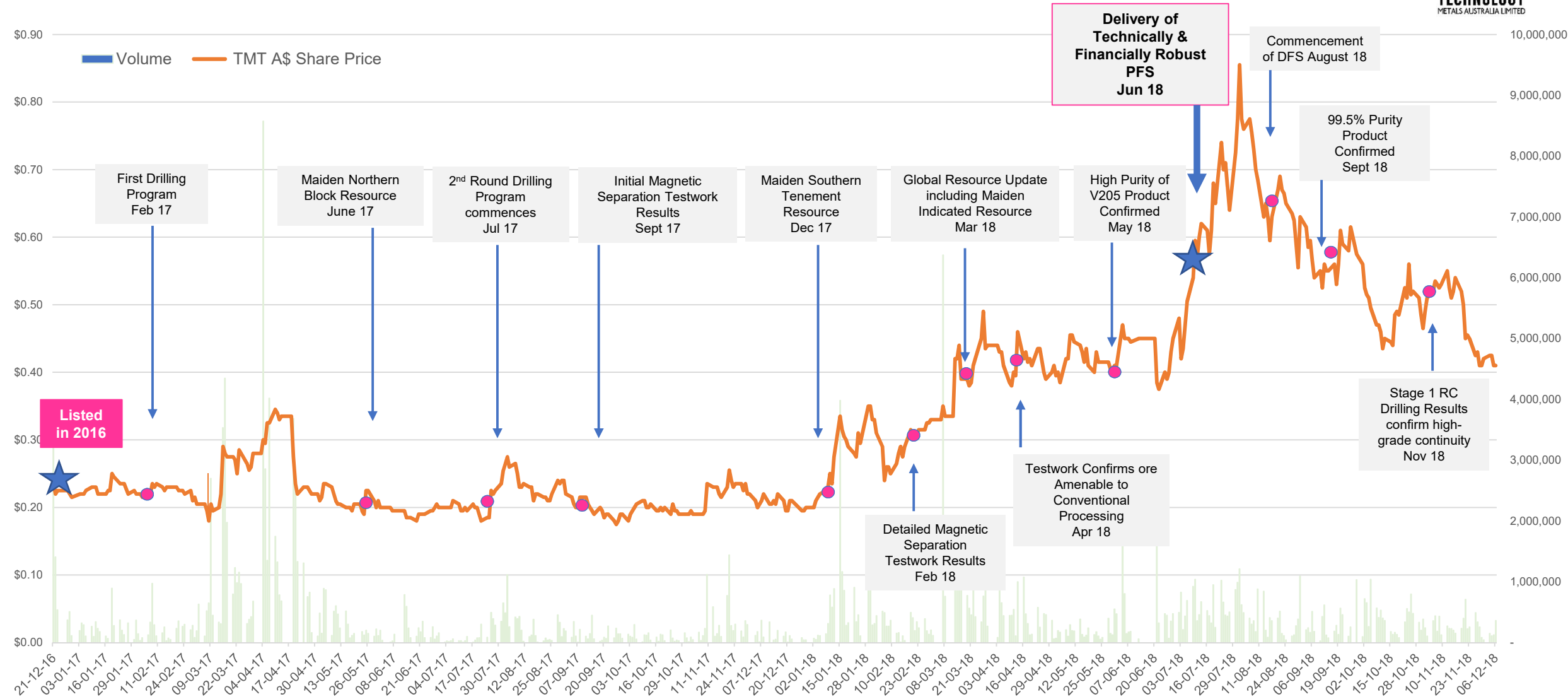
## Major Shareholders







# Key Milestones



# Experienced Board and Development Team



## **Michael Fry** **Non-Executive Chairman**

Michael Fry holds a Bachelor of Commerce degree from the University of Western Australia, is a Fellow of the Financial Services Institute of Australasia, and is a past member of the Australian Stock Exchange.

Mr Fry has extensive corporate and commercial experience, financial and capital market knowledge and a background in corporate treasury management.



## **Ian Prentice** **Managing Director**

Mr Prentice is a Member of the Australasian Institute of Mining and Metallurgy and holds a Bachelor of Science (Geology) from the University of Western Australia.

Mr Prentice has served as a Director for a number of ASX-listed resource companies, with activities ranging from exploration and project acquisition in Asia and Africa through to project development and production in Australia.



## **Sonu Cheema** **Non-Executive Director and Company Secretary**

Mr Cheema has completed a Bachelor of Commerce majoring in Accounting at Curtin University and is a member of CPA Australia.

Mr Cheema holds the position of Accountant and Company Secretary for Cicero Corporate Services and has over 10 years' experience working with public and private companies in Australia and abroad.





Vanadium Markets

**Outlook**

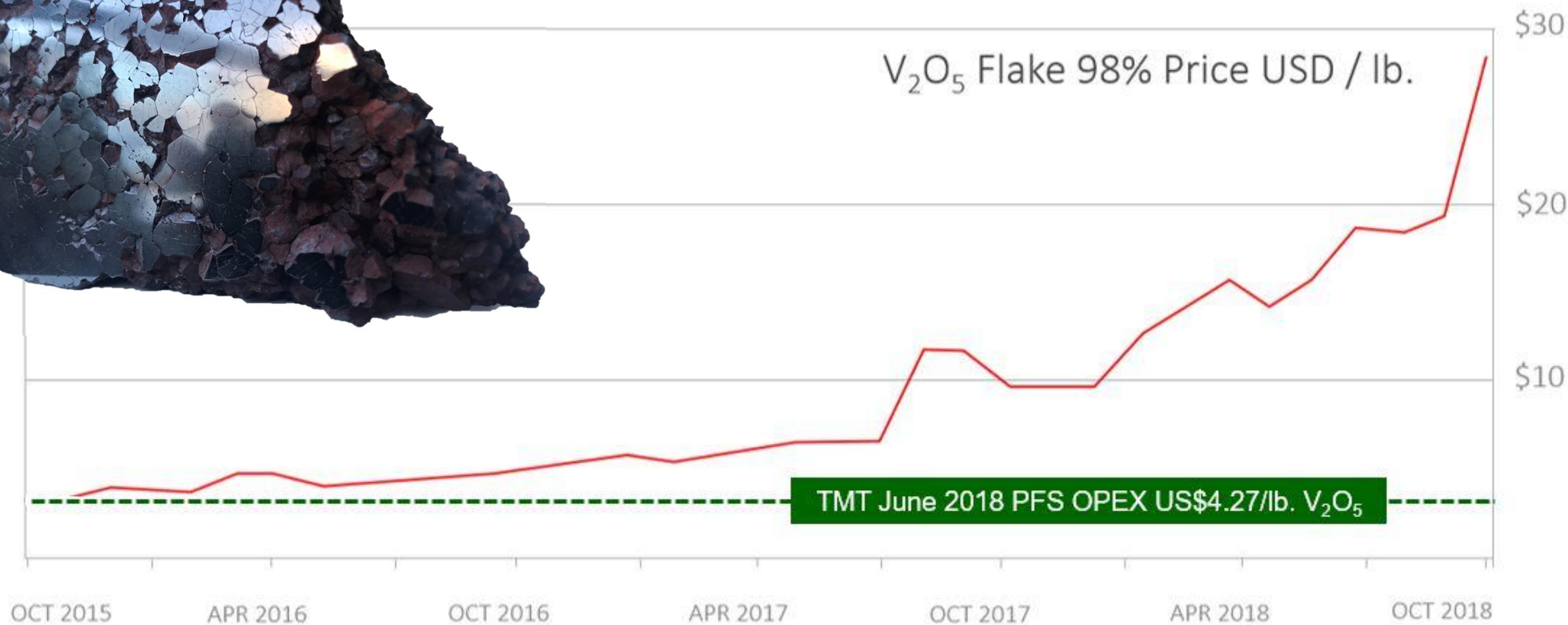
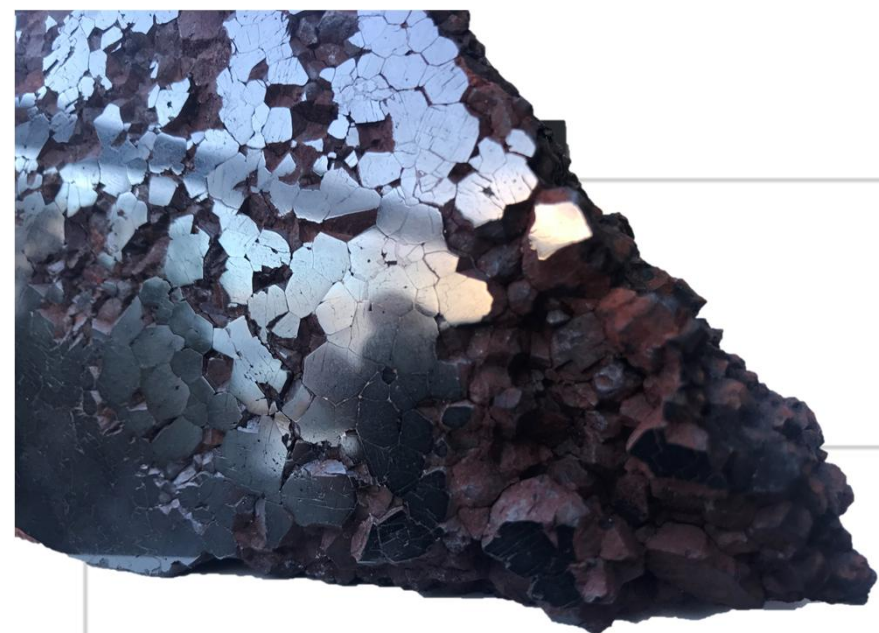
**Supply/Demand**

**VRB's**





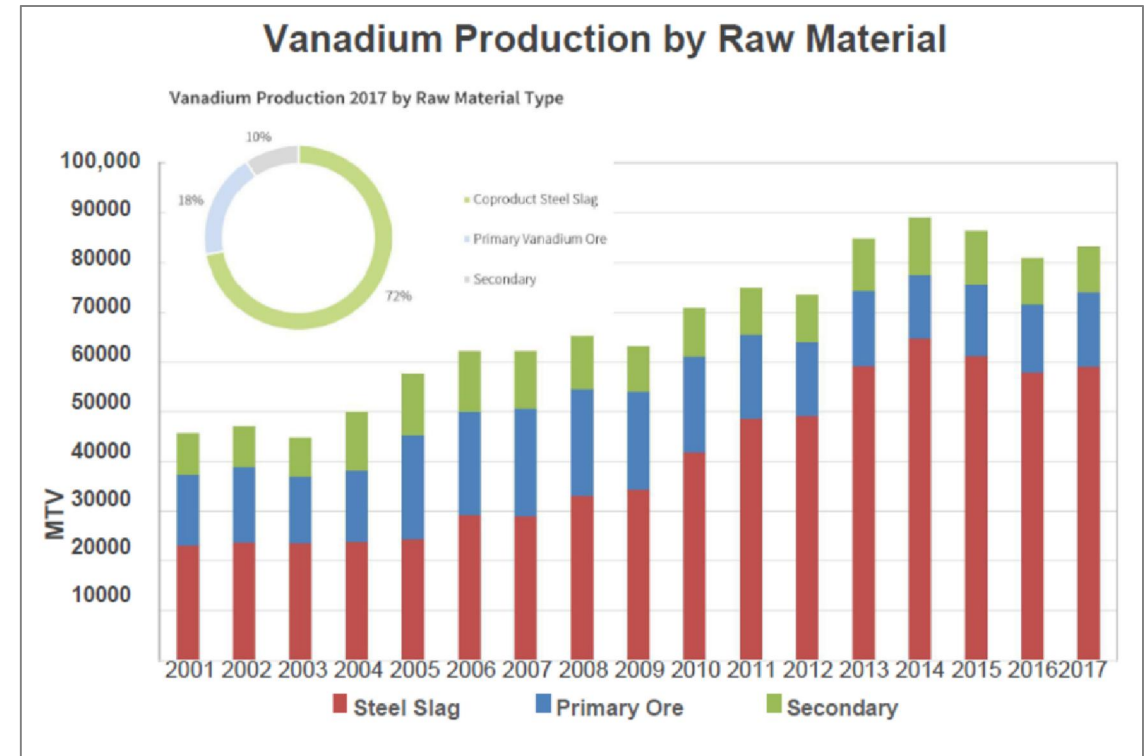
# Vanadium Shines





# Vanadium Supply Constraints

- Structural change in industry has seen consumption outstrip supply since 2010.
- Global industry rationalisation, strict environmental regulations in China and limited new supply resulting in a production decline.
- Ban on slag imports to China implemented 1 January 2018 amidst shutdowns of Chinese plants.
- Annual global production in 2017 (~83,200t V metal) made up of steel slag co-product (72%), primary ores (18%) and 10% from secondary.
- China was largest producer at 57% of supply, followed by Russia and South Africa.
- Production from existing sources forecast to reach ~111,900t V metal by 2025 (source: TTP Squared).



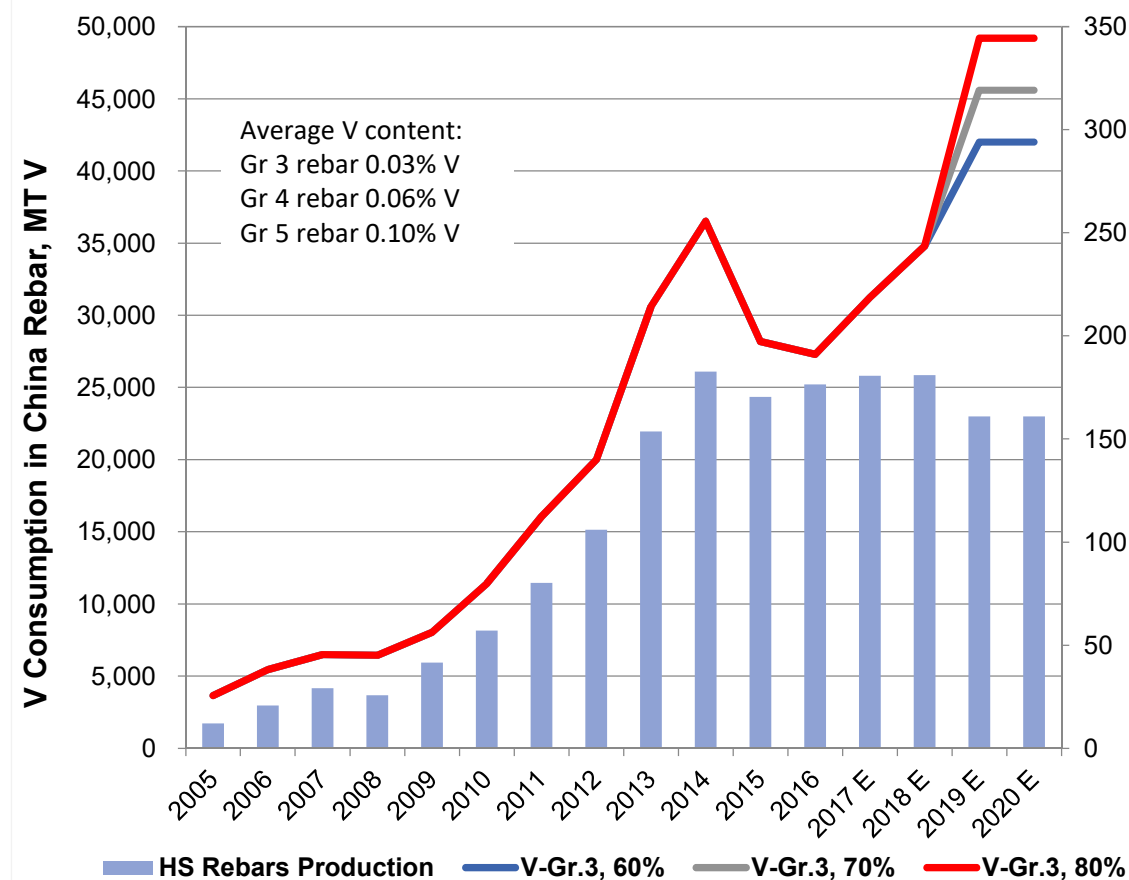
Source: Vanitec

# Vanadium Consumption Increasing



- Consumption in 2017 (~85,800t V metal) dominated by steel alloys (86%) with chemical industry and energy storage at 9% and aeronautical at 5%.
- Global consumption dominated by China at 44%, Europe at 18% and North America at 12%.
- Growth of intensity of use of vanadium in steel is the main driver of increasing consumption.
- New Chinese Rebar standards will see intensity of use in China increase from 0.048kg/T steel towards European / USA levels of 0.078 – 0.097kg/T steel.
- Global consumption forecast to increase to 133,200t V metal by 2025 (source: TTP Squared).

## Vanadium Consumption in Chinese Rebar



Source: China Iron & Steel Research Institute (CISRI)

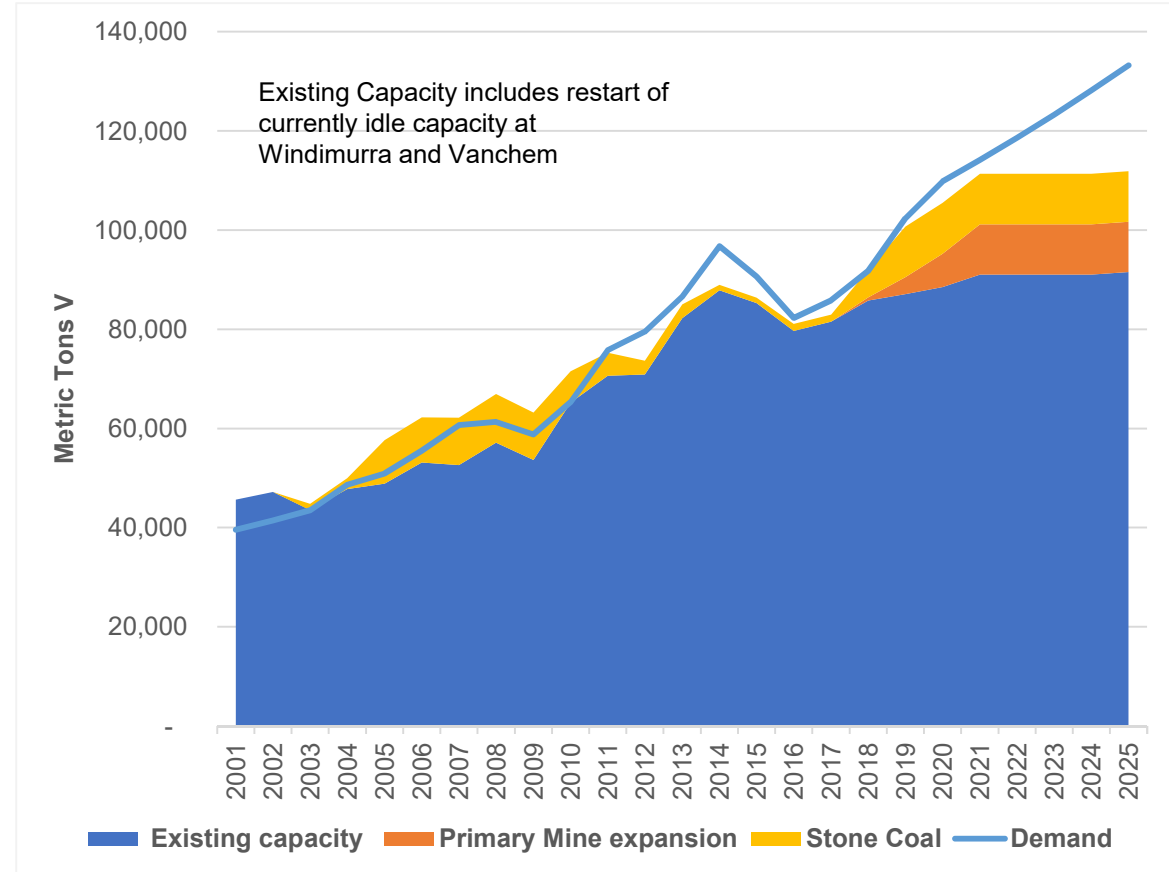


# Vanadium Market in Deficit

- Shortfall of ~2,600t V metal in 2017, with World (ex China) consumption outstripping supply since 2006.
- Chinese market dynamics impacting on ability to fill global supply gap.
- Current  $V_2O_5$  pricing<sup>1</sup> reflects surging Chinese demand and limited readily available supply:
  - **CHINA** US\$27.00 – 27.70/lb
  - **EUROPE** US\$28.50 – 28.90/lb
- Global deficit forecast to increase to ~21,300t V (~37,900t  $V_2O_5$ ) in 2025 (Source: TTP Squared).
- Emerging primary producers vital to meeting the increasing demand.

1 – Source: FerroAlloyNet, 7 December 2018.

## Vanadium Supply and Demand



Source: TTP Squared

# Market Disrupter – VRB's

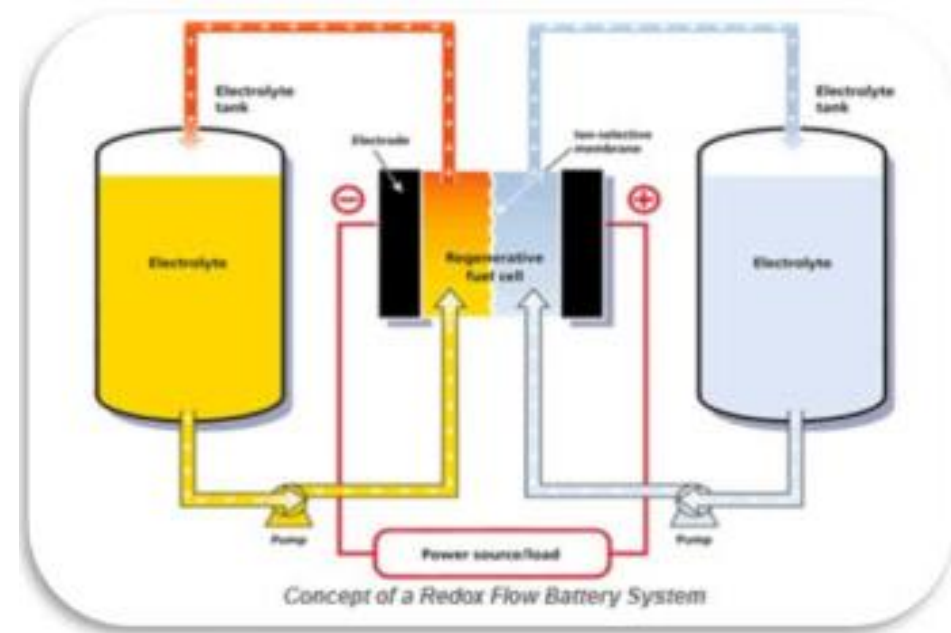
- Vanadium Redox Batteries (VRB's) provide an efficient storage and re-supply solution for renewable energy, suitable for large-scale applications.
- VRB's are able to time-shift large amounts of previously generated energy for later use – balancing solar and wind intermittency.
- Vanadium ions in different oxidation states are used to store energy; battery capacity expandable by adding more storage tanks.
- VRB and chemical industry vanadium demand set to climb to 23,730t V metal by 2020.
- Rongke Power developing a 200MW/ 800MWh battery in Dalian, China, using ~6,960 tonnes  $V_2O_5$ .





# Advantages of VRB's

- Lifespan of +20 years with very high cycle life (up to 20,000 cycles) and no capacity loss.
- Rapid recharge and discharge, with very fast response time (<70ms).
- Can discharge to 100% with no performance degradation with excellent long term charge retention.
- Only one battery element – vanadium is anode and cathode – unique among flow batteries.
- Easily scalable into large MW applications; provide a grid scale solution – peak shaving, regulating load frequency, driving grid efficiency.
- Suitable for micro grids for remote communities, mine sites, islands etc.
- Improved safety (non-flammable) compared to Li-ion batteries.





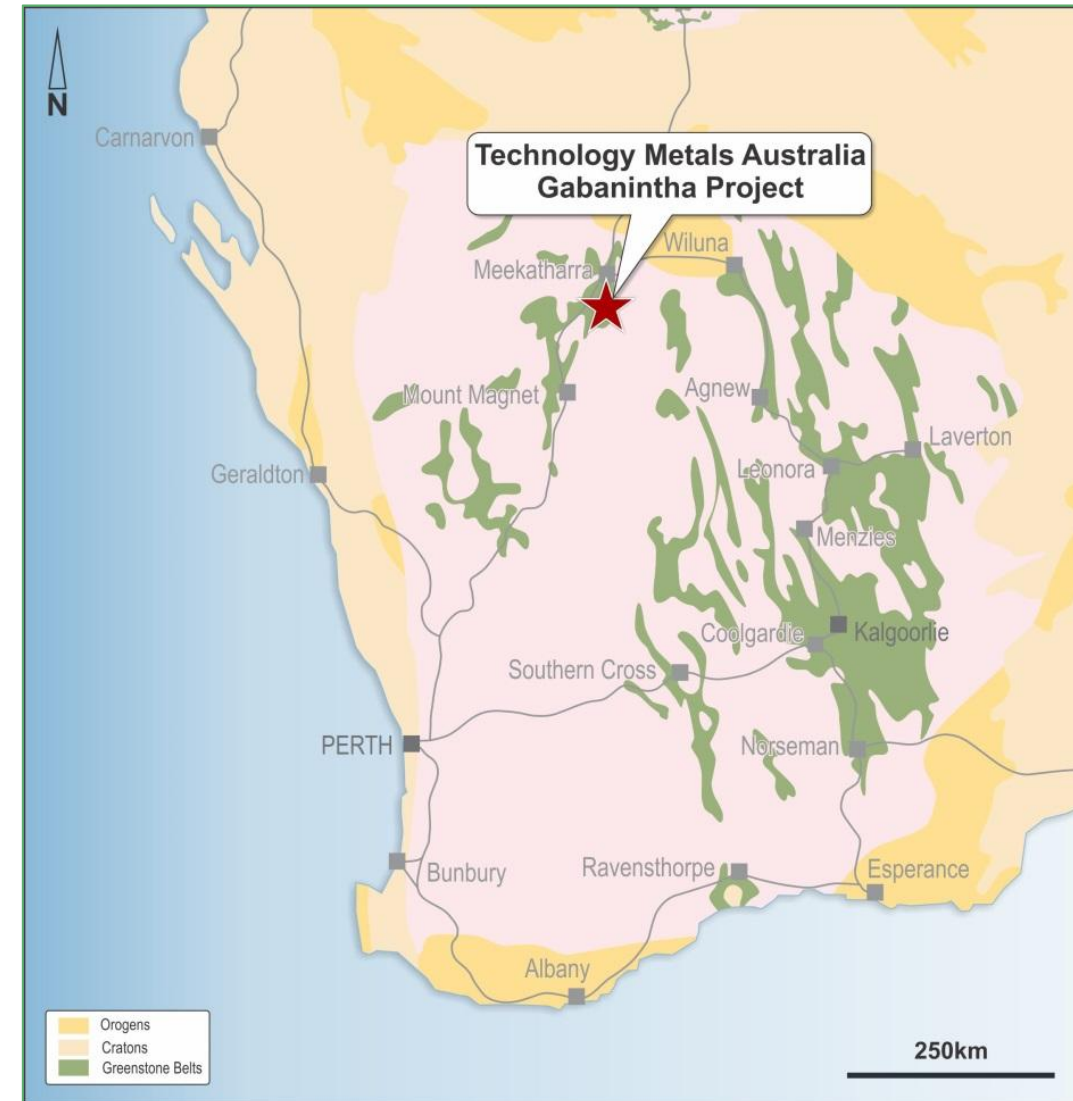
# Gabanintha Vanadium Project





# Project Overview

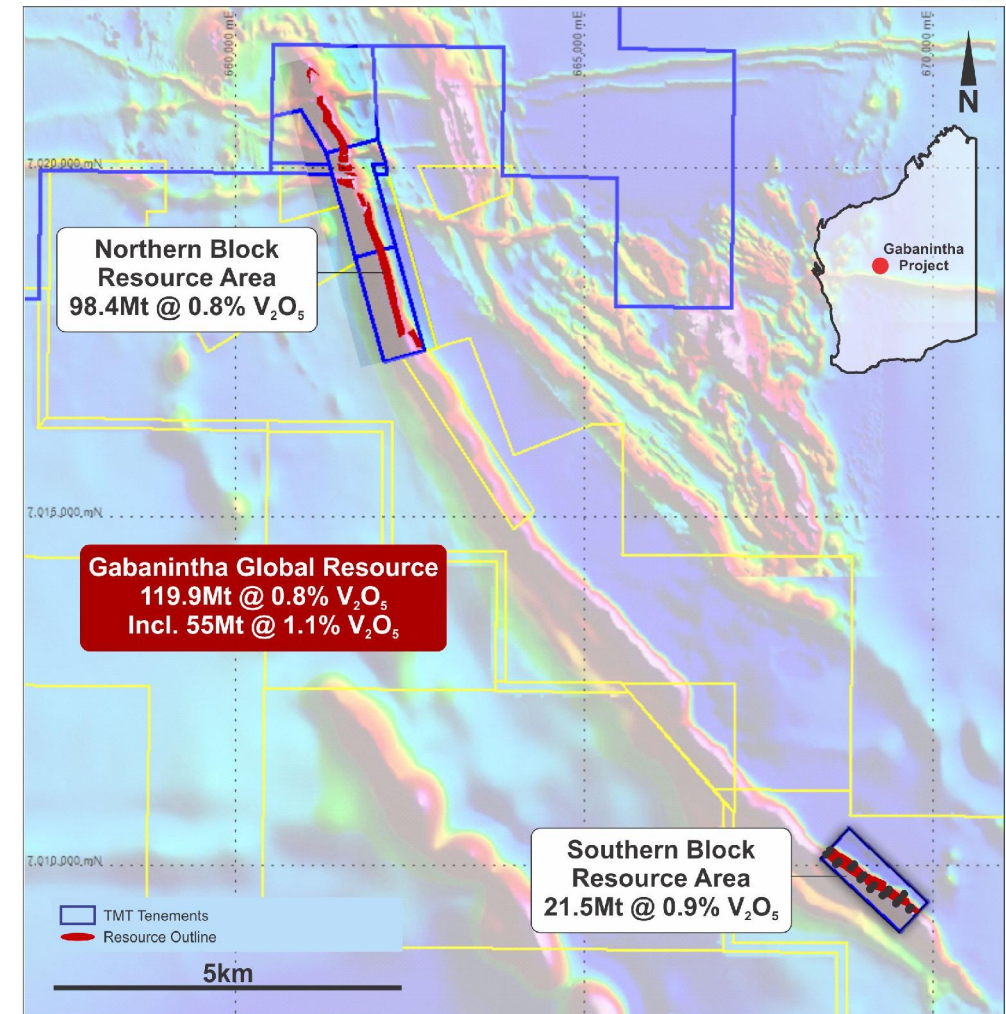
- 40km South East of Meekatharra in Western Australia.
- Excellent infrastructure – sealed Highway from Perth passes within 30km of the project.
- Port of Geraldton 500km to the south west accessible via sealed highway.
- Gas pipeline within 160km.
- Granted tenure with Mining Lease applications in place.
- Global resource of 119.9Mt at 0.8%  $V_2O_5$  including exceptional high grade component of 55.0Mt at 1.1%  $V_2O_5$ .
- Maiden reserve of 16.7Mt at 0.96%  $V_2O_5$  contained within initial Indicated resource of 21.6 Mt at 0.9%  $V_2O_5$ .





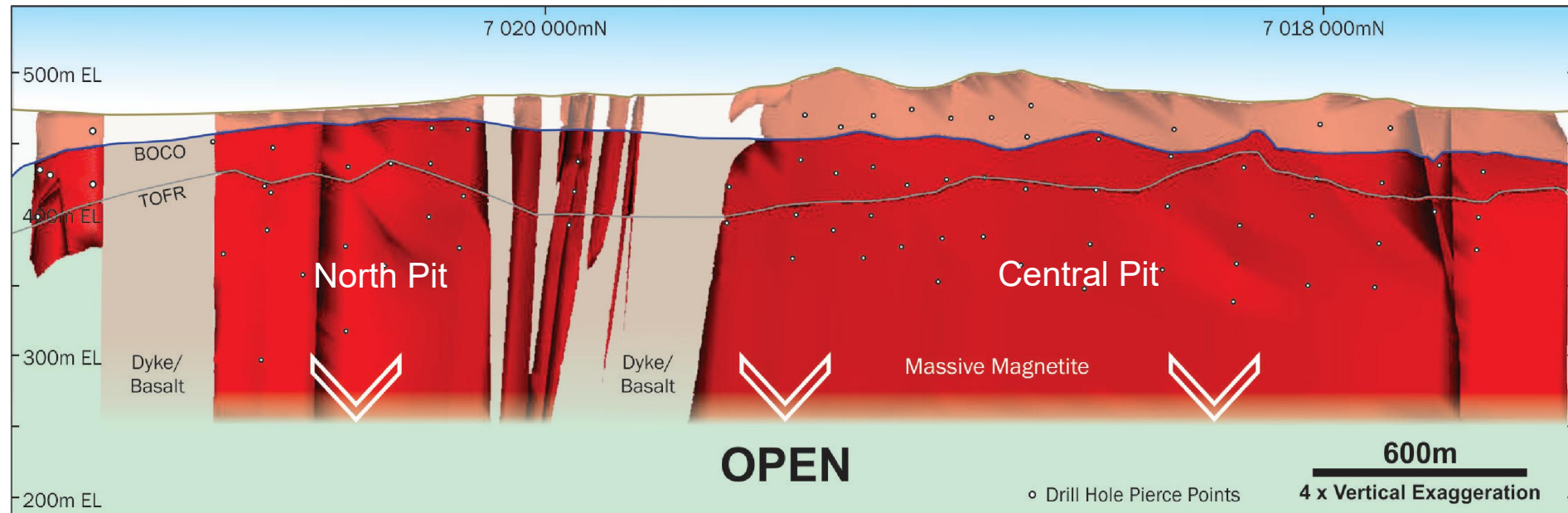
# Geological Setting

- Mineralisation hosted by a layered mafic igneous unit – magnetite layers host high grade vanadium and titanium.
- Project contains over 5.5km strike length of the mineralised unit – divided in to Northern Block and Southern Tenement.
- Outstanding consistency of grade and continuity of mineralisation within broad high grade basal massive magnetite zone.
- Mineralisation outcrops along majority of strike length and dips to the west / south west at 55° to 60°.
- High grade basal massive magnetite zone overlain by multiple medium grade zones.
- Mineralisation remains open at depth with high grade zone intersected at in excess of 190m vertical.



# Geological Control

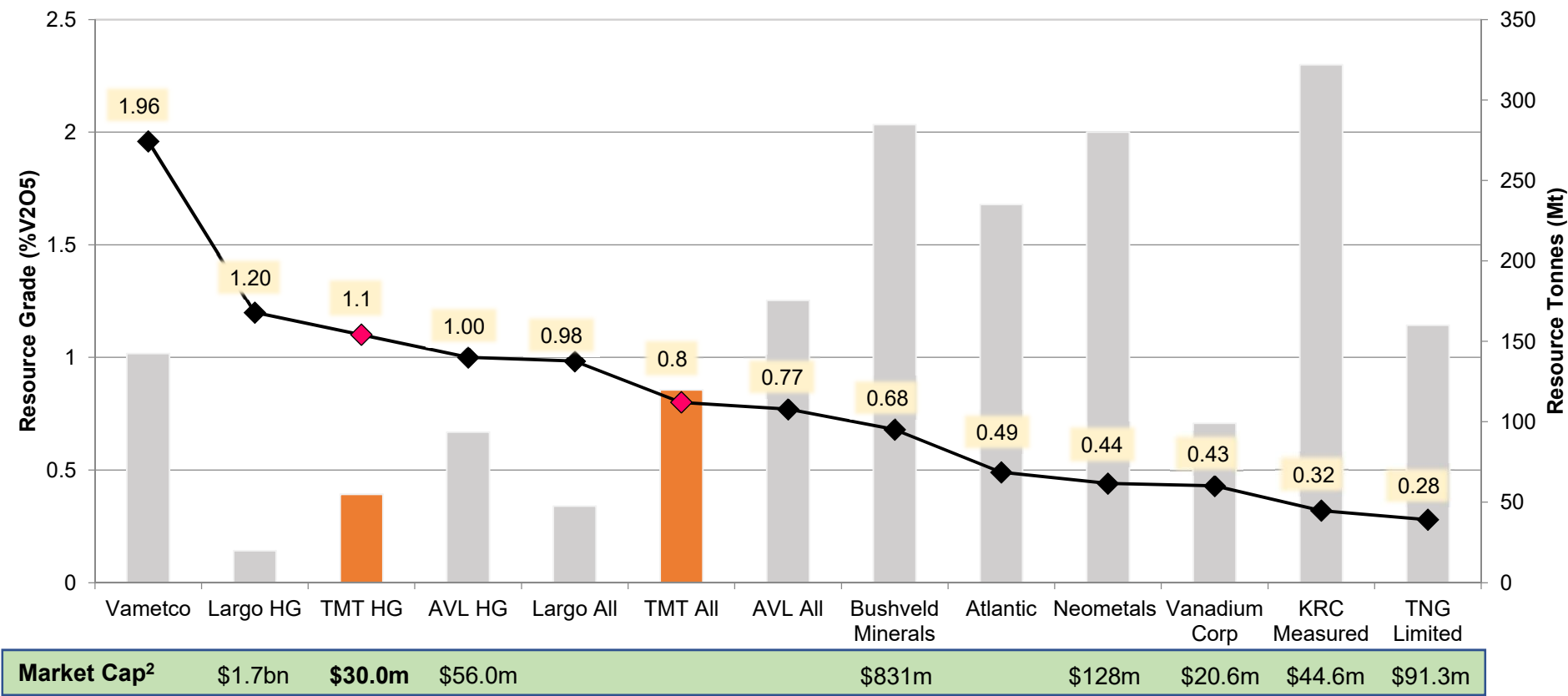
- Northern Block divided into two main zones – North and Central.
- Thickening of high grade mineralisation evident in +700m long North Zone along with a significantly shallower oxidation profile.
- Very shallow oxidation profile in North Zone enables early access to transitional and fresh material – priority for initial open pit development.
- Southern Tenement has similar very shallow oxidation profile.



# Global Vanadium Projects (ex China)



## TMT at the Right End of the Chart



2 – Market capitalisation of listed entities as at 7 December 2018. Bushveld Minerals and Neometals hold other significant resource assets. Vametco 75% owned by Bushveld Minerals. Atlantic Limited not listed.



June 2018

# Pre-Feasibility Study





# Pre-feasibility Study Delivers<sup>3</sup>

## Key Metrics

Probable Reserve	16.7Mt at 0.96% V <sub>2</sub> O <sub>5</sub>
Processing Schedule	19.2Mt at 0.96% V <sub>2</sub> O <sub>5</sub> (includes 13% Inferred Mineral Resource)
Processing Route	Conventional salt roast / water leach
Initial Mine Life	13 years
Production LOM	~129,000 tonnes V <sub>2</sub> O <sub>5</sub>
Annual Output	~11,700 to 13,100 tonnes V <sub>2</sub> O <sub>5</sub> from years 2 to 10
LOM Strip Ratio	5.6:1 across two open pits; North Pit and Main Pit
Production Commencement	Targeting 2021



<sup>3</sup> – Refer TMT ASX announcement dated 21 June 2018 for full details of the pre-feasibility study.

# Pre-feasibility Financial Results<sup>3</sup>

## Financial Metrics

CAPEX	~A\$380M (US\$284)
Operating costs	US\$4.27/lb V <sub>2</sub> O <sub>5</sub>
LOM Revenue	A\$4,935m
LOM EBITDA	A\$3,070
Pre-tax NPV (10% discount rate)	A\$1.3bn (US\$958m)
IRR	55%
Post-tax NPV (10% discount rate)	A\$850m (US\$637m)
IRR	43%
Payback on capital	<2.5 years including 6 months ramp up
US\$:A\$ FX Assumption	0.75
Vanadium Price Assumption*	US\$13/lb V <sub>2</sub> O <sub>5</sub>

\* – Source: Merchant Research & Consulting

3 – Refer TMT ASX announcement dated 21 June 2018 for full details of the pre-feasibility study.





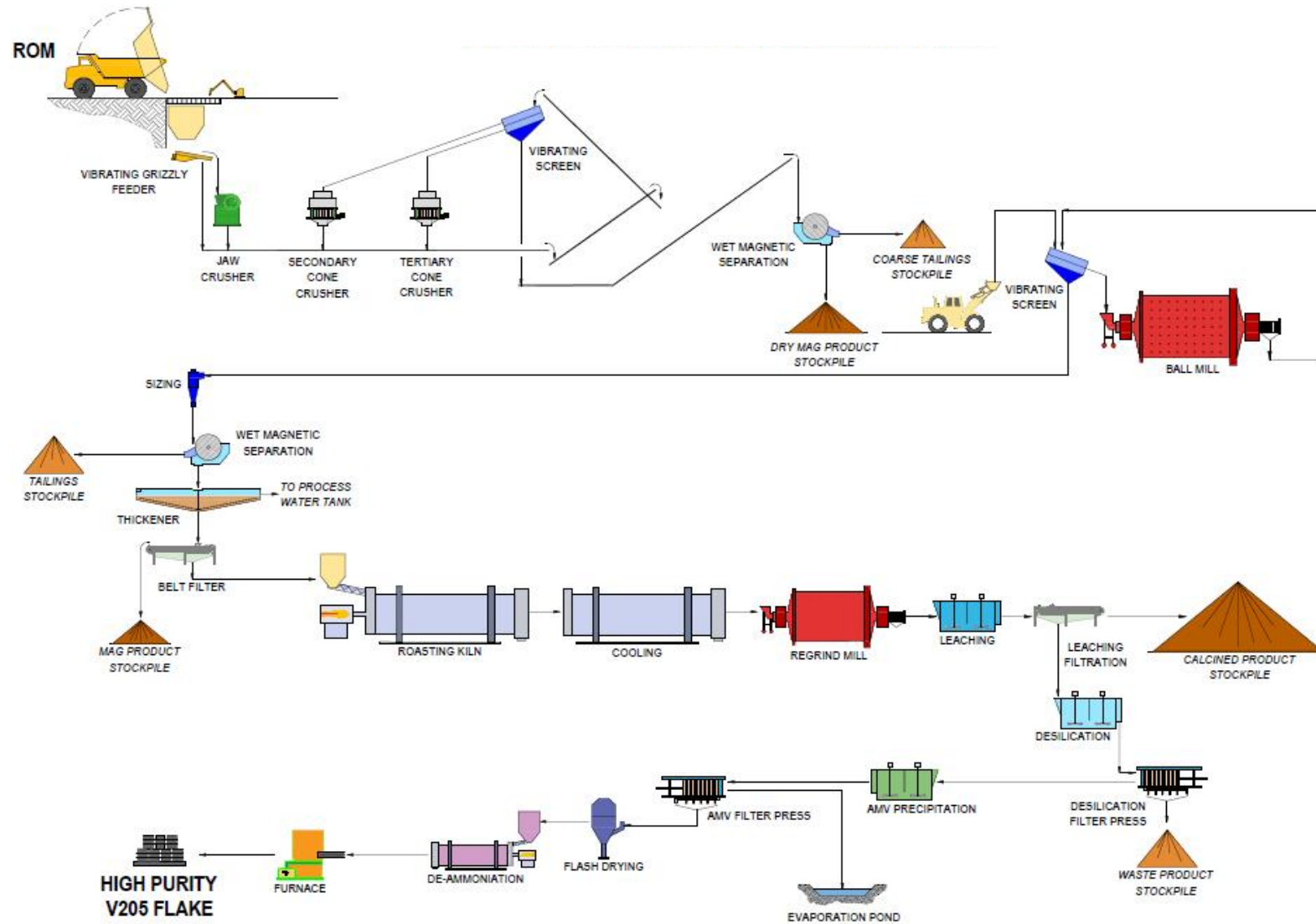
# Metallurgical Bench Scale Testwork<sup>4</sup>

- Testwork completed on diamond drilling samples; six initial composites with weights ranging from 29kg to 49kg.
- Recoveries of up to 97.8% V in to magnetic concentrate with very high weight recoveries of up to 85.6%.
- Concentrate grades of +1.3%  $V_2O_5$  for transitional and fresh high grade massive magnetite zone.
- Exceptional rejection of deleterious elements Si and Al results in very high quality magnetic concentrate.
- Downstream test work confirms conventional salt roast / water leach processing with low reagent consumption.
- Final product grades of +99.5%  $V_2O_5$  achieved.
- Product expected to be suited to both steel and chemical / VRB industries.



<sup>4</sup> – Refer TMT ASX announcement dated 12 September 2018 for full details of latest product generation testwork.

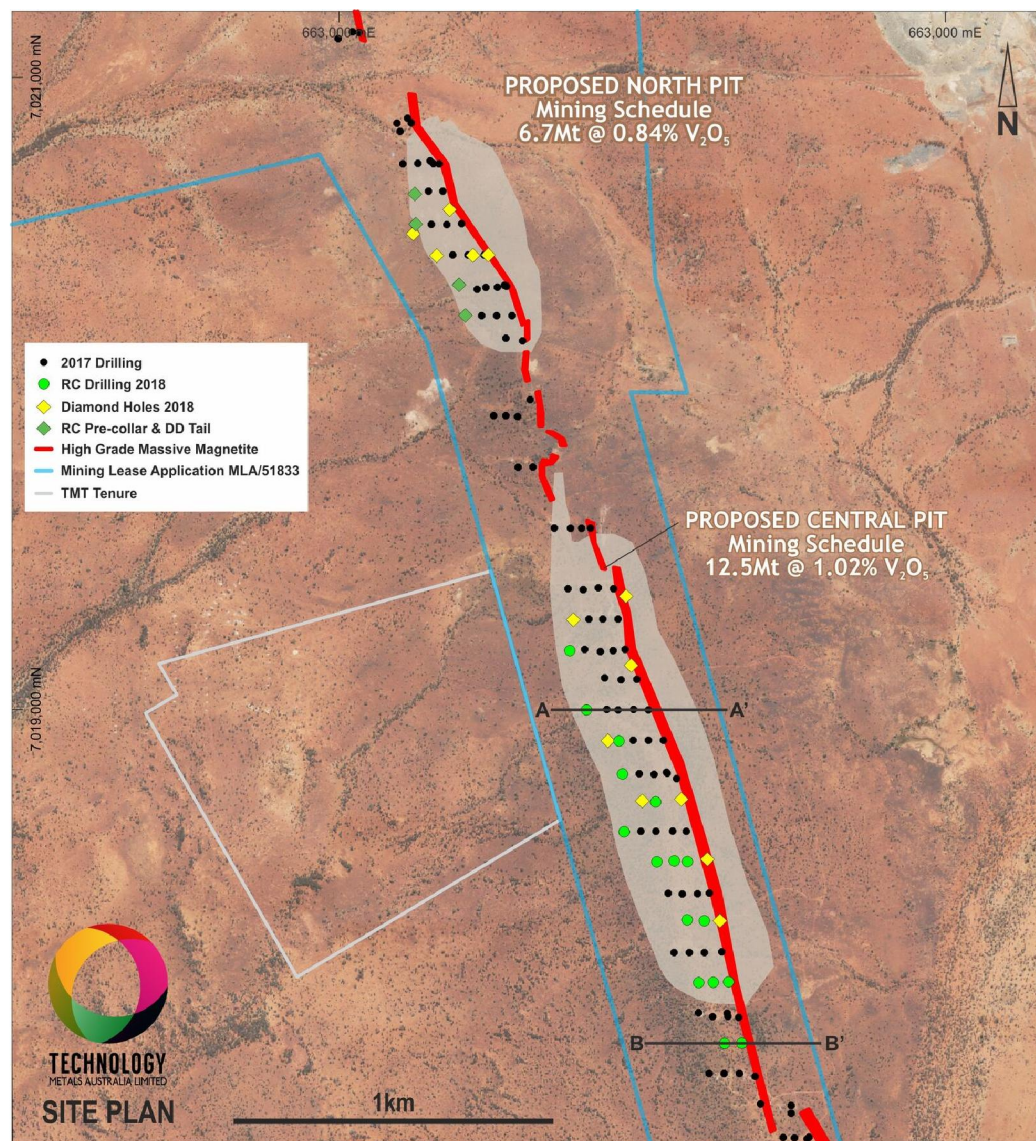
# Proposed Processing Flow Sheet





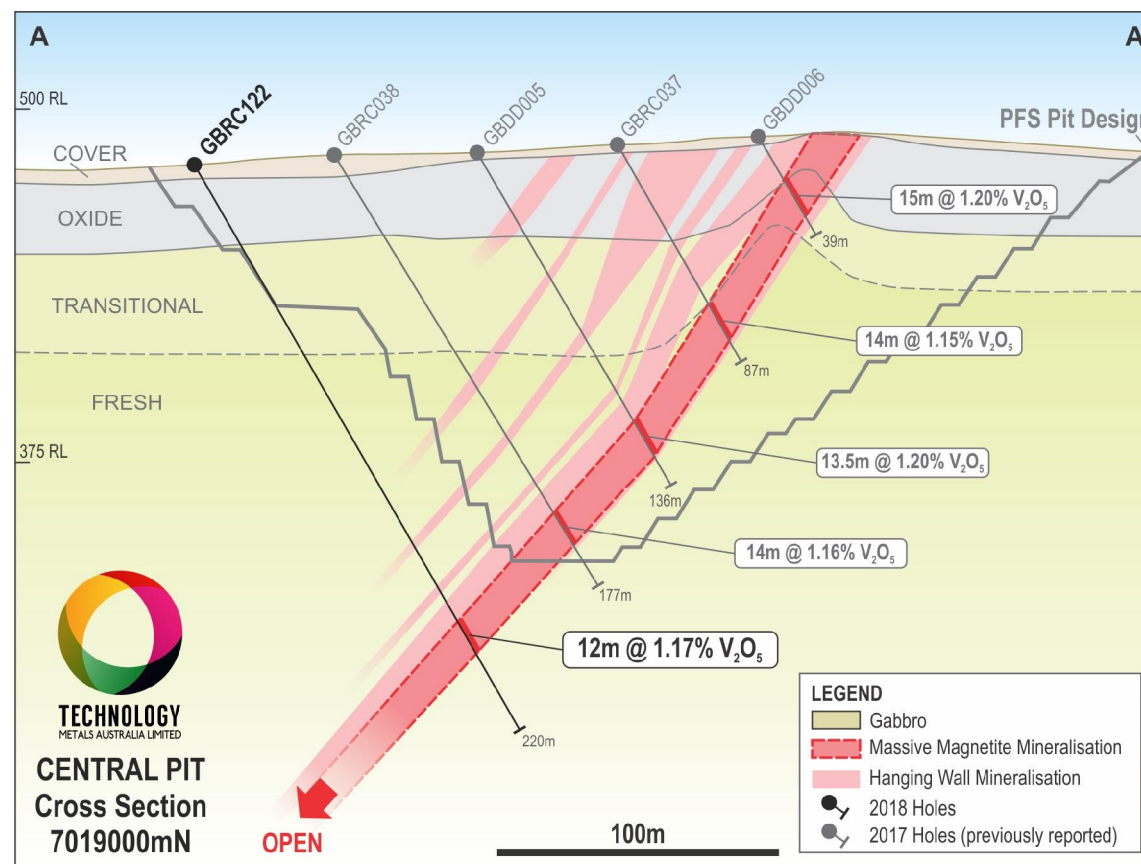
# Project Enhancement Opportunities

- PFS identified significant enhancement opportunities, including:
  - Open pit designs limited by drilling depth/Indicated Resource.
  - Conversion from Inferred to Indicated Resources to materially increase mine life.
  - Detailed geotechnical data to enable steeper open pit walls, thereby reducing strip ratio.
- Project enhancement drilling of 6,730m of RC and Diamond drilling (45 holes) across Northern Block and Southern Tenement.
- Drilling confirmed extension of massive magnetite mineralisation and competency of host rocks.
- Extension of Indicated Resource and steeper open pit walls will enable open pits to be deepened, thereby increasing mine life.



# Project Enhancement Drilling Program<sup>5</sup>

- Resource infill and extension holes intersected broad massive magnetite mineralisation.
- Results from RC drilling (3,741m across 28 holes) confirm success in infilling and extending high grade mineralisation.
- Massive magnetite mineralisation intersected 25 to 50m down dip of Indicated Resource; vertical depths of up to 190m.
  - 14m at 1.17%  $V_2O_5$  from 208m
  - 12m at 1.17%  $V_2O_5$  from 192m
- Infill holes expected to extend Central Pit Indicated Resource by +300m to south.
  - 16m at 1.26%  $V_2O_5$  from 28m
  - 14m at 1.14%  $V_2O_5$  from 90m
- Diamond drilling (2,989m across 21 holes) results expected in coming weeks.

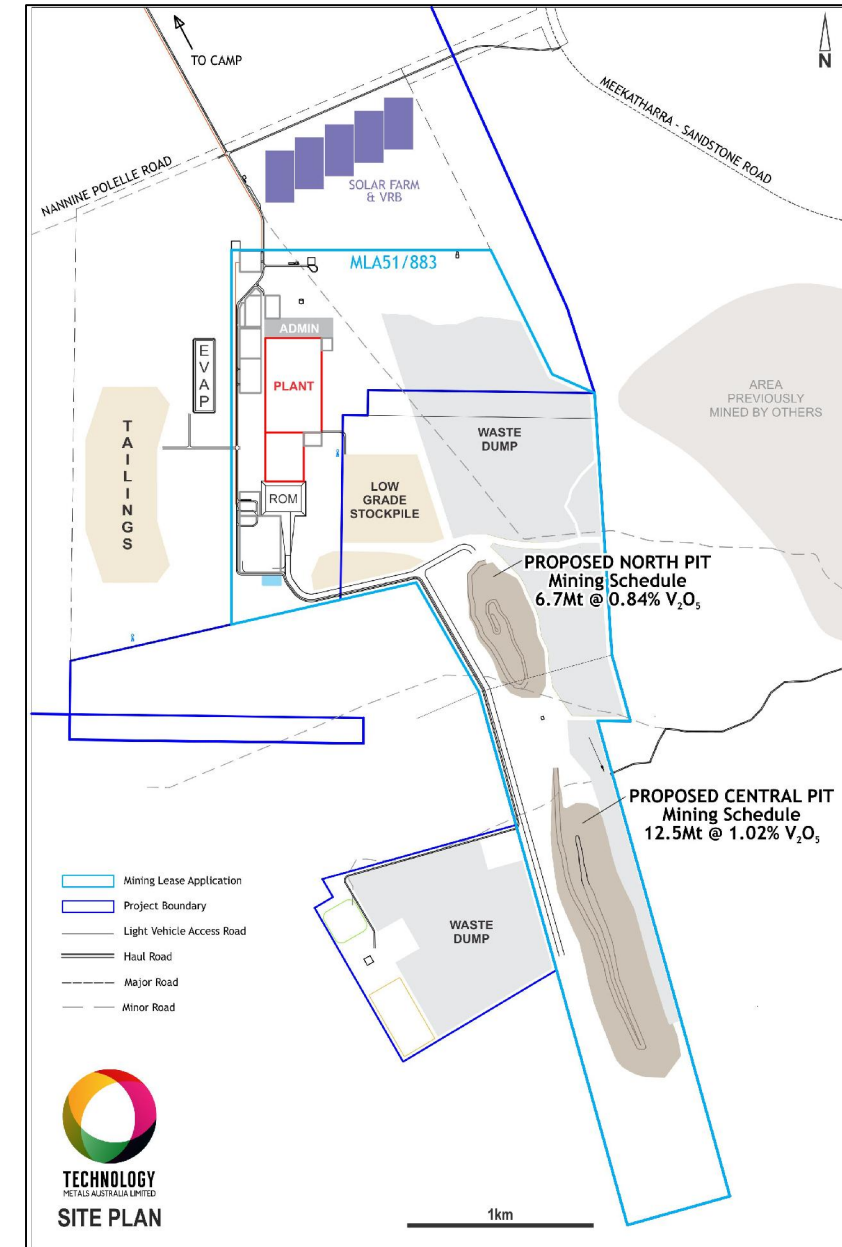


5 – Refer TMT ASX announcement dated 8 November 2018 for full details of project enhancement RC drilling results.



# Study Team Rapidly Progressing DFS

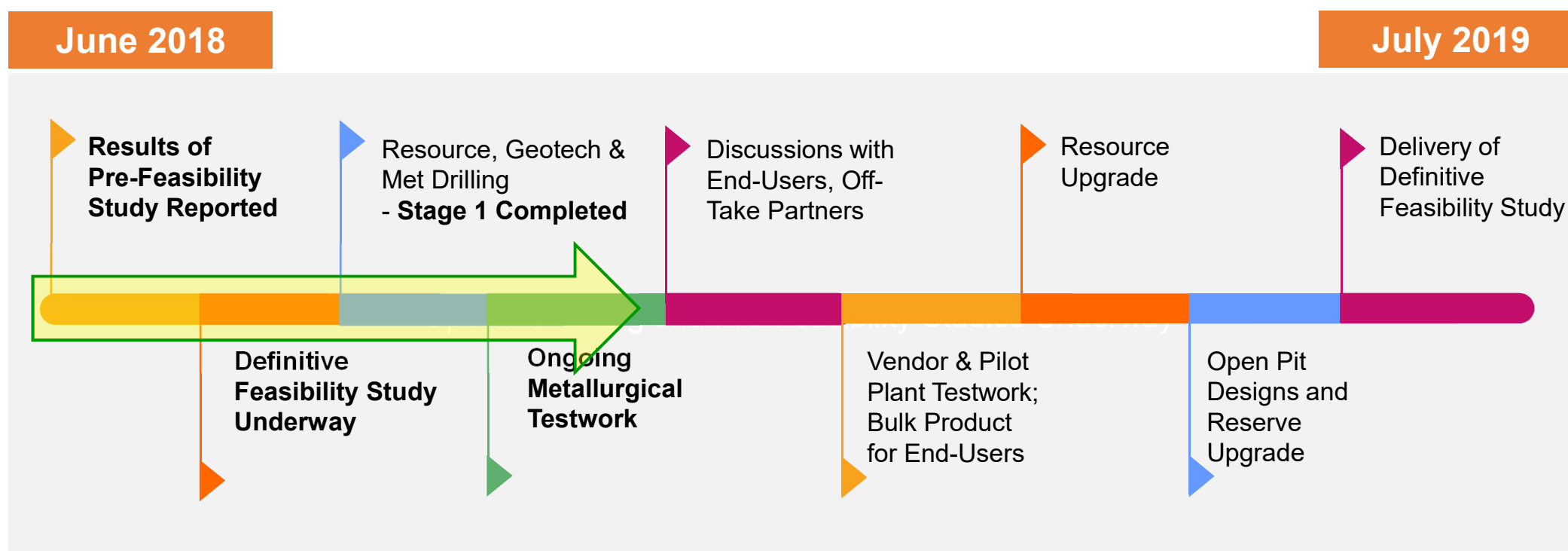
- DFS being executed by Wave International, managed and assisted by TMT geological and processing personnel, with contribution from a range of industry leading consultants.
- Bulk sample collection drilling program completed along the strike of the proposed North Pit.
- Product generation testwork has progressed to scaled-up kiln testwork – pilot plant scale testwork planned for early 2019.
- Detailed process plant design and engineering completed with packages sent to prospective vendors for quotation.
- Environmental and heritage studies progressing in support of advancing mining lease grant and statutory approvals.
- On track to deliver high quality DFS results June quarter 2019.



# Gabanintha Development Strategy



***"Aggressive development timeline maintained"***





# Investment in Technology Metals

- **Leveraged to structural change in vanadium industry** with positive outlook for commodity pricing driven by demand growth in steel and VRB's.
- **Exposure to a globally significant** high grade, large scale and long life vanadium development project.
- **PFS confirms conventional** processing and open pit mining resulting in a lower risk development scenario.
- **Rapidly progressing the DFS** supported by a team of industry experts to execute the significant project enhancements identified in the PFS.
- **Stable well resourced mining environment** with excellent infrastructure and access to services.
- **Experienced Board and management** team focused on rapidly progressing the project to maximise shareholder value.



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# Global Mineral Resource<sup>6</sup>



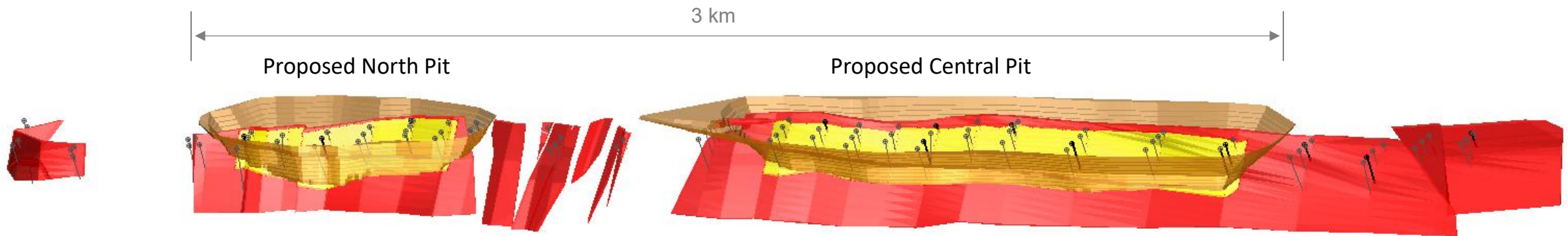
- Overall Global Resource of **119.9Mt at 0.8% V<sub>2</sub>O<sub>5</sub>** split between **98.4Mt at 0.8% V<sub>2</sub>O<sub>5</sub>** in the Northern Block and **21.5Mt at 0.9% V<sub>2</sub>O<sub>5</sub>** in the Southern Tenement.
- One of the highest grade deposits in the World, with exceptional high grade resources of **55.0Mt at 1.1% V<sub>2</sub>O<sub>5</sub>** within consistent basal massive magnetite.
- Probable Reserve of 16.7Mt at 0.96% V<sub>2</sub>O<sub>5</sub>** contained within **Indicated Resource of 21.6Mt at 0.9% V<sub>2</sub>O<sub>5</sub>** (Northern Block only – includes a high grade component of 14.5Mt at 1.1% V<sub>2</sub>O<sub>5</sub>).
- Scope identified to materially increase the Indicated Resource within an expanded global resource.

Technology Metals Gabanintha Vanadium Project - Global Mineral Resources as at March 2018										
Material	Classification	Tonnage (Mt)	V2O5%	Fe%	Al2O3%	SiO2%	TiO2%	LOI%	P%	S%
Massive magnetite	Indicated	14.5	1.1	49.2	5.1	5.8	12.8	-0.2	0.007	0.2
	Inferred	40.5	1.1	48.3	5.5	6.5	12.7	0.2	0.007	0.2
	<b>Indicated + Inferred</b>	<b>55.0</b>	<b>1.1</b>	<b>48.5</b>	<b>5.4</b>	<b>6.3</b>	<b>12.7</b>	<b>0.1</b>	<b>0.007</b>	<b>0.2</b>
Disseminated magnetite	Indicated	7.1	0.6	29.9	12.6	24.4	7.8	2.9	0.032	0.1
	Inferred	57.7	0.6	27.2	13.7	26.7	7.2	4.0	0.024	0.2
	<b>Indicated + Inferred</b>	<b>64.9</b>	<b>0.6</b>	<b>27.5</b>	<b>13.5</b>	<b>26.4</b>	<b>7.2</b>	<b>3.9</b>	<b>0.025</b>	<b>0.2</b>
<b>Combined</b>	<b>Indicated + Inferred</b>	<b>119.9</b>	<b>0.8</b>	<b>37.1</b>	<b>9.8</b>	<b>17.2</b>	<b>9.7</b>	<b>2.1</b>	<b>0.016</b>	<b>0.2</b>

\* Note: The Mineral Resource was estimated within constraining wireframe solids using a nominal 0.9% V2O5 lower cut-off for the Massive magnetite zone and using a nominal 0.4% V2O5 lower cut-off for the banded and disseminated mineralisation zones. The Mineral Resource is quoted from all classified blocks within these wireframe solids above a lower cut-off grade of 0.4% V2O5. Differences may occur due to rounding.

6 – Refer TMT ASX announcements dated 13 June 2017, 18 December 2017 and 6 March 2018 for full details of the mineral resource estimation.

# Northern Block Resource Classification

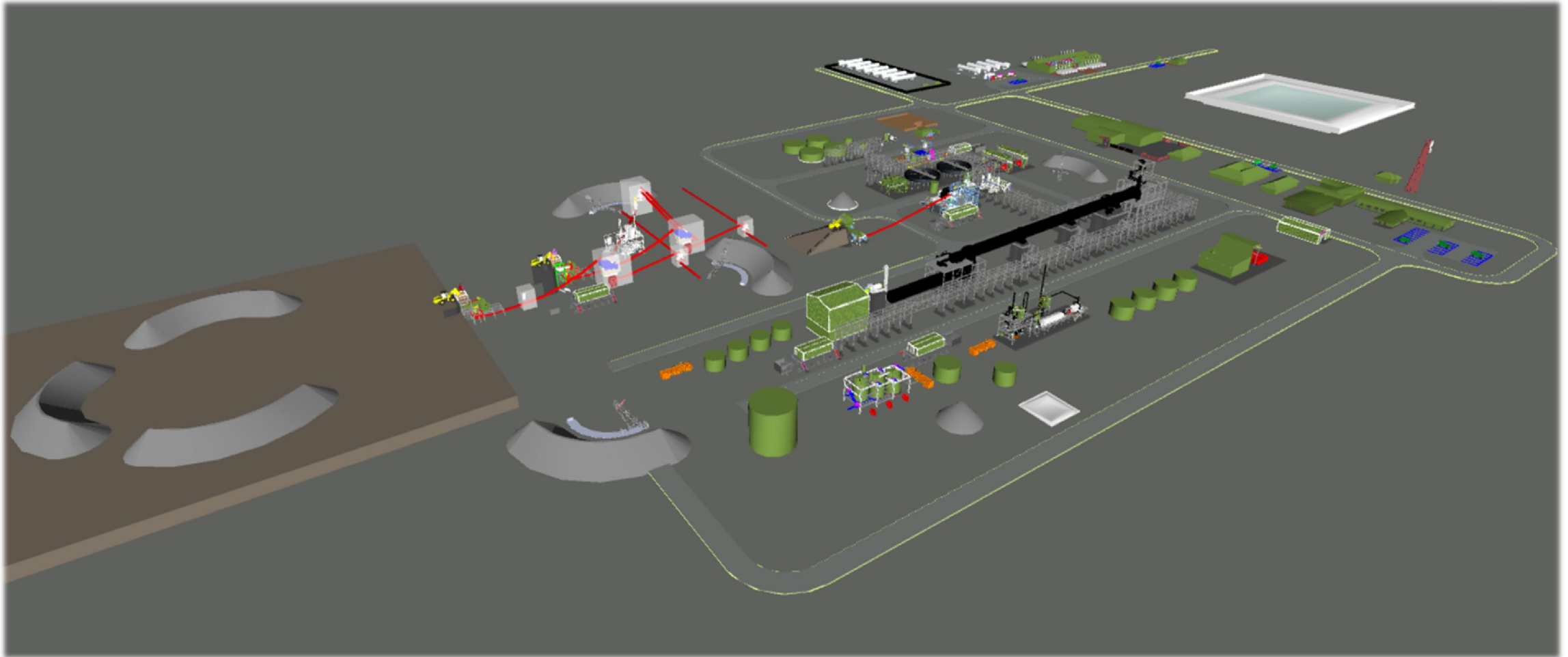


Long section view towards the east (090°) of classified model (Indicated – yellow, Inferred – red)

- PFS open pit designs for North Pit (mining schedule of 6.7Mt at 0.84%  $V_2O_5$ ) and Central Pit (mining schedule of 6.7Mt at 0.84%  $V_2O_5$ ).
- Highlights that pit designs capture the majority of the Indicated Resource (yellow), the lack of drilling beneath the pit designs and the broad spacing of drilling at the southern end of the Central Pit.
- Clear scope to materially increase the Indicated Resource within an expanded Global Resource.
- Drilling has now been completed to depth below the pit designs and infilled to minimum 100m line spacing.
- Bulk sample drilling in North Pit expected to upgrade a portion of the resource to Measured Category.



# Processing Facility Schematic



Gabanintha Project – Schematic Processing Plant Layout