



METALLICA MINERALS

The Multi-Commodity Resource Development Company



NORNICO: Nickel-Cobalt & Scandium “Tri-Metal” Project

SydneyResources
Round-up

ASX:MLM

10-13 May 2011



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The NORNICO and Lucky Break Nickel Projects and the Weipa Heavy Mineral Sands projects are at the evaluation and feasibility stage and although reasonable care has been taken to ensure that the facts stated in this presentation are accurate and or that the opinions expressed are fair and reasonable, no reliance can be placed for any purpose whatsoever on the information contained in this document or on its completeness.

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At the date of this presentation Metallica Minerals holds approximately 45% of MetroCoal Limited which listed on the ASX on 4 December 2009, further information can be sourced from metrocoal.com.au

At the date of this presentation Metallica Minerals holds approximately 30% of Cape Alumina Ltd which listed on the ASX on 29 January 2009 and latest and more detailed information can be sourced from Cape Alumina and capealumina.com.au

At the date of this presentation Metallica Minerals holds approximately 15% of Orion Metals Limited, further information can be sourced from orionmetals.com.au

At the date of this presentation Metallica Minerals holds approximately 76% of Planet Metals Limited, further information can be sourced from planetmetals.com.au

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This material is used for a company summary presentation only, for more detailed information the reviewer should seek company information as provided in Metallica's ASX releases, Annual and Quarterly Reports.

Technical information contained in this report has been compiled by Metallica Minerals Managing Director Mr Andrew Gillies B.Sc. M. AUSIMM and Metallica Minerals Ltd, who is a **competent person** and a member of the Australasian Institute of Mining and Metallurgy and have relevant experience to the mineralisation being reported on to qualify as Competent Persons as defined by the Australasian Code for Reporting of Minerals Resources and Reserves. Mr Gillies consents to the inclusion in this presentation of the matters based on the information in the form and context in which it appears.



Metallica Minerals Limited

ABN: 45 076 696 092

ASX Code: MLM

www.metallicaminerals.com.au

Share price (10 May 2011)	29c
Shares on Issue	117.3M
Market Cap	\$34M
Cash (31 March 2011)	\$4.31M
Investments (ASX Listed, see Table back slide)	~\$50M

Largest Shareholders:

- Jien Mining Pty Ltd 18.9%
- Golden Breed Pty Ltd 7.5%
- RCF (Funds III LP & IV LP) 6.1%



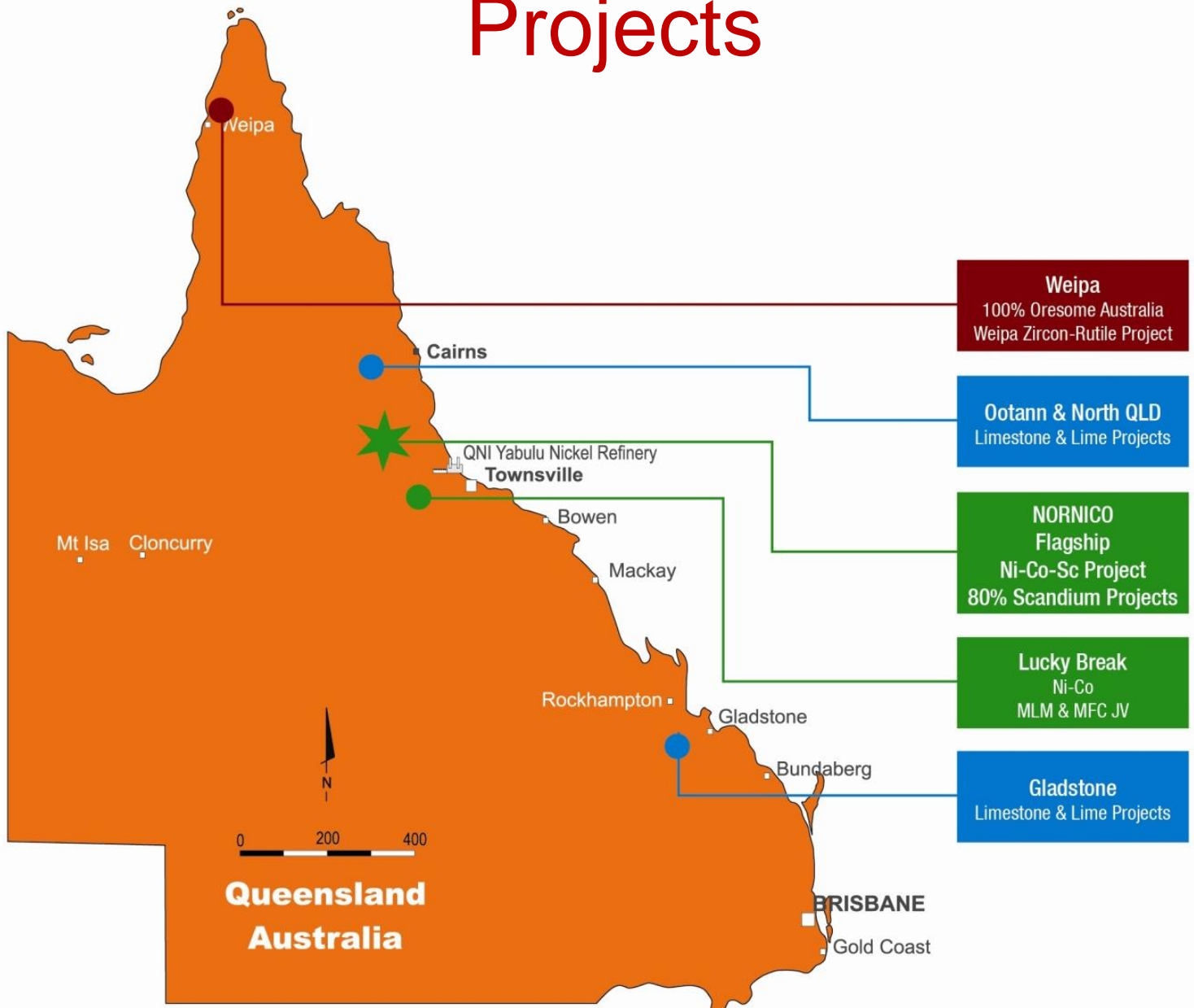
Drilling Greenvale Resources

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Metallica QLD Resource Development Projects



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MLM Share Price

12 month | 117.3M shares on issue | Current Market Cap ~ \$34M

4/05/11

EMA (25)

MLM Daily



Substantial Shareholders

	% Ownership
Jien Mining Pty Ltd (Subsidiary of Jilin HOROC Nonferrous Metal Group)	18.9%
Golden Breed Pty Ltd	7.5%
Resource Capital Funds	6.1%

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Metallica Board of Directors (5)

Experienced | Talented | Dedicated

- David Barwick | Non-Executive Chairman
- Andrew Gillies | Managing Director/CEO
- John Haley | CFO Director/Company Sec
- Barry Casson | Non-Executive Director
- Wu Shu | Non-Executive Director (Tao Li | Alternate Director)

Executives

- Andrew Gillies | MD/CEO – Geological/Mining background
- John Haley | CFO – Accounting/Financial background



Corporate Strategy

Mission & Vision

- Become a highly profitable long term diversified resource developer & producer – **flagship NORNICO**
- NORNICO Ni-Co-Sc “Tri-Metal” **production targeted early 2014**
- **Zircon-Rutile** production targeted **early 2013**
- Limestone/Lime projects ready for development awaiting market off-take
- High social, environmental and safety standards
- Deliver high returns for shareholders



Strategic Objectives

- **Generate Cashflow Business** (NORNICO, Weipa HMS, Limestone)
- Become **Ni-Co-Sc metal producer** & world’s major Sc supplier
- Maximise our (4) ASX listed Investment holdings (MTE, CBX, PMQ, ORM)
- Maintain adequate funding and high quality staff

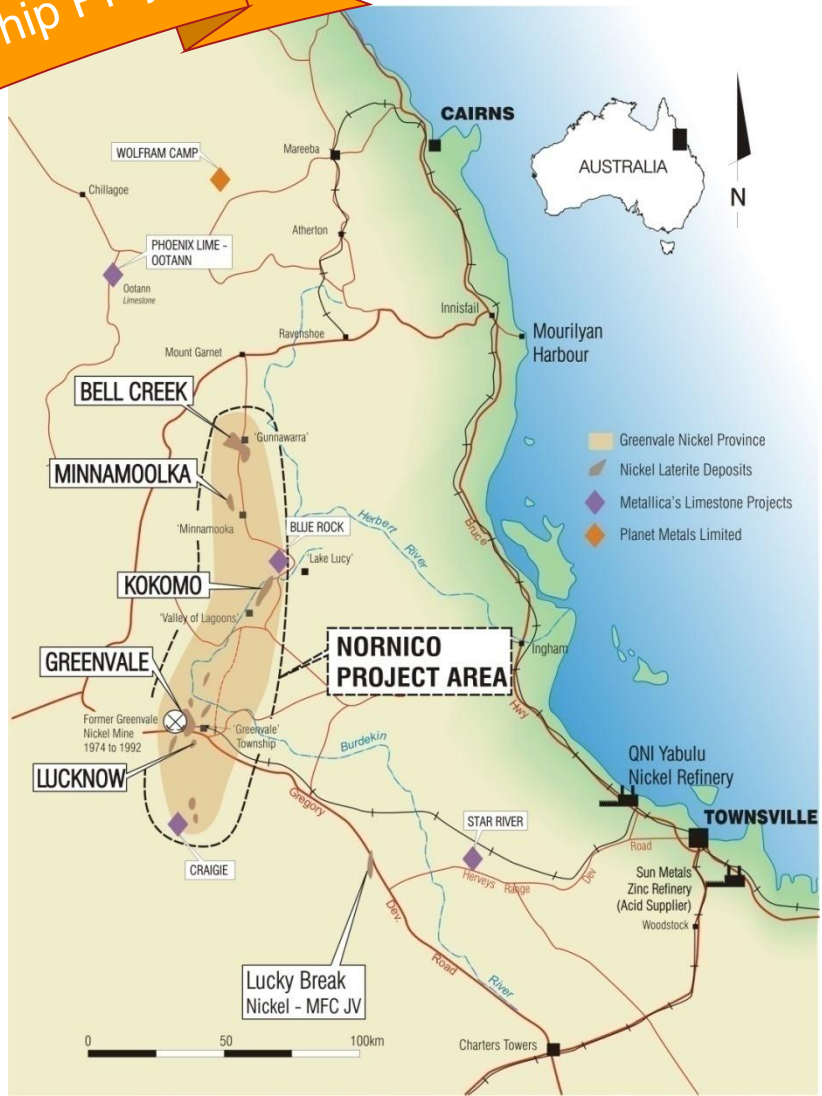


NORNICO Ni-Co-Sc Project | MLM 100% Excellent Location

Flagship Project

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Greenvale Township



Table 1

NORNICO Ni-Co Resource Base

Containing approx **400,000t Nickel & 42,000t Cobalt**

Approximately 90% in Measured & Indicated

Nickel-Cobalt Deposit	Million Tonnes (Mt)	Ni (%)	Co (%)	Insitu Contained Ni Metal	Insitu Contained Co Metal
Bell Creek S	9.12	0.97	0.07	88,086	6,040
Bell Creek N	2.30	0.83	0.03	19,090	621
Bell Creek NW	3.07	0.77	0.05	23,639	1,443
The Neck	0.84	0.84	0.03	7,056	218
Minnamoolka	7.08	0.80	0.04	56,408	2,872
Kokomo	16.20	0.67	0.12	107,910	19,450
Greenvale Mine Site	8.00	1.04	0.08	50,510	3,730
Lucknow	2.43	0.58	0.20	13,810	4,800
TOTAL	49.04	0.81	0.09	399,534	41,990

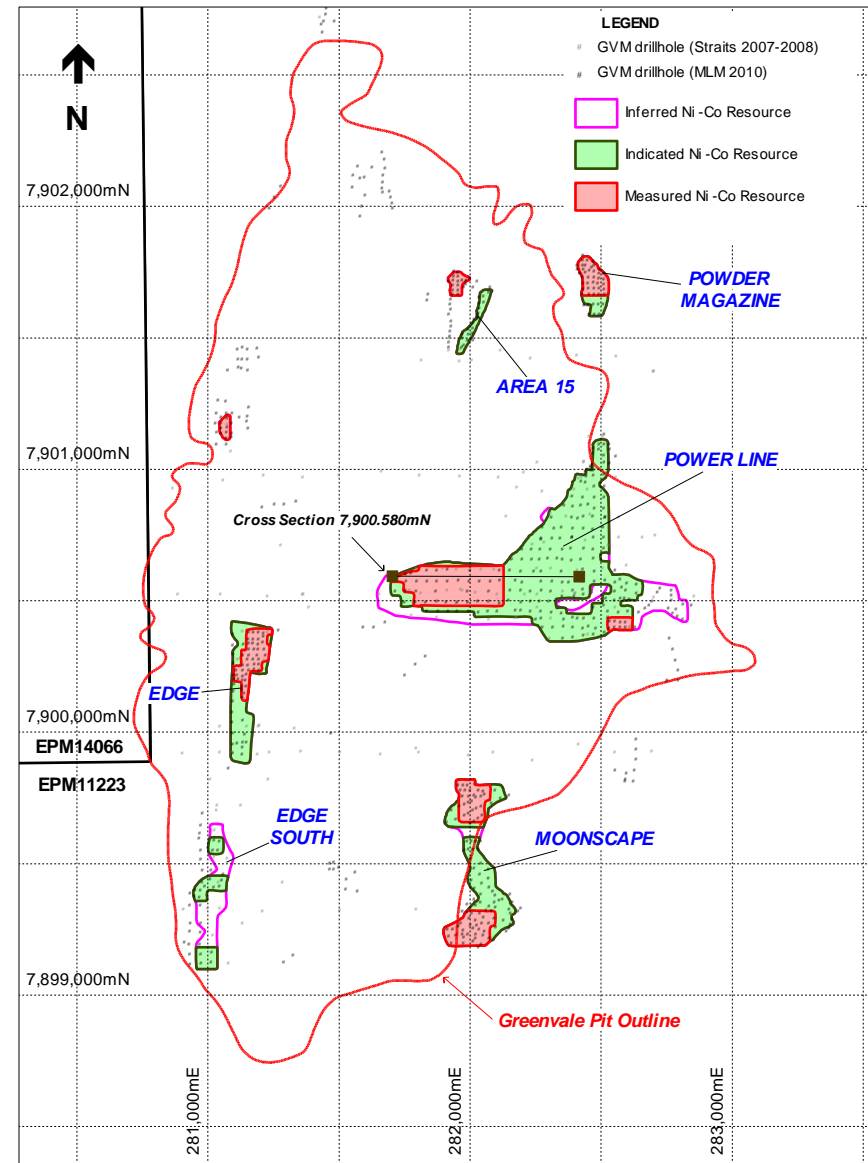
Note – using 0.7% NiEq (Ni+2Co) COG

See Table at end of this presentation providing individual breakdown of Measured, Indicated and Inferred resource categories.



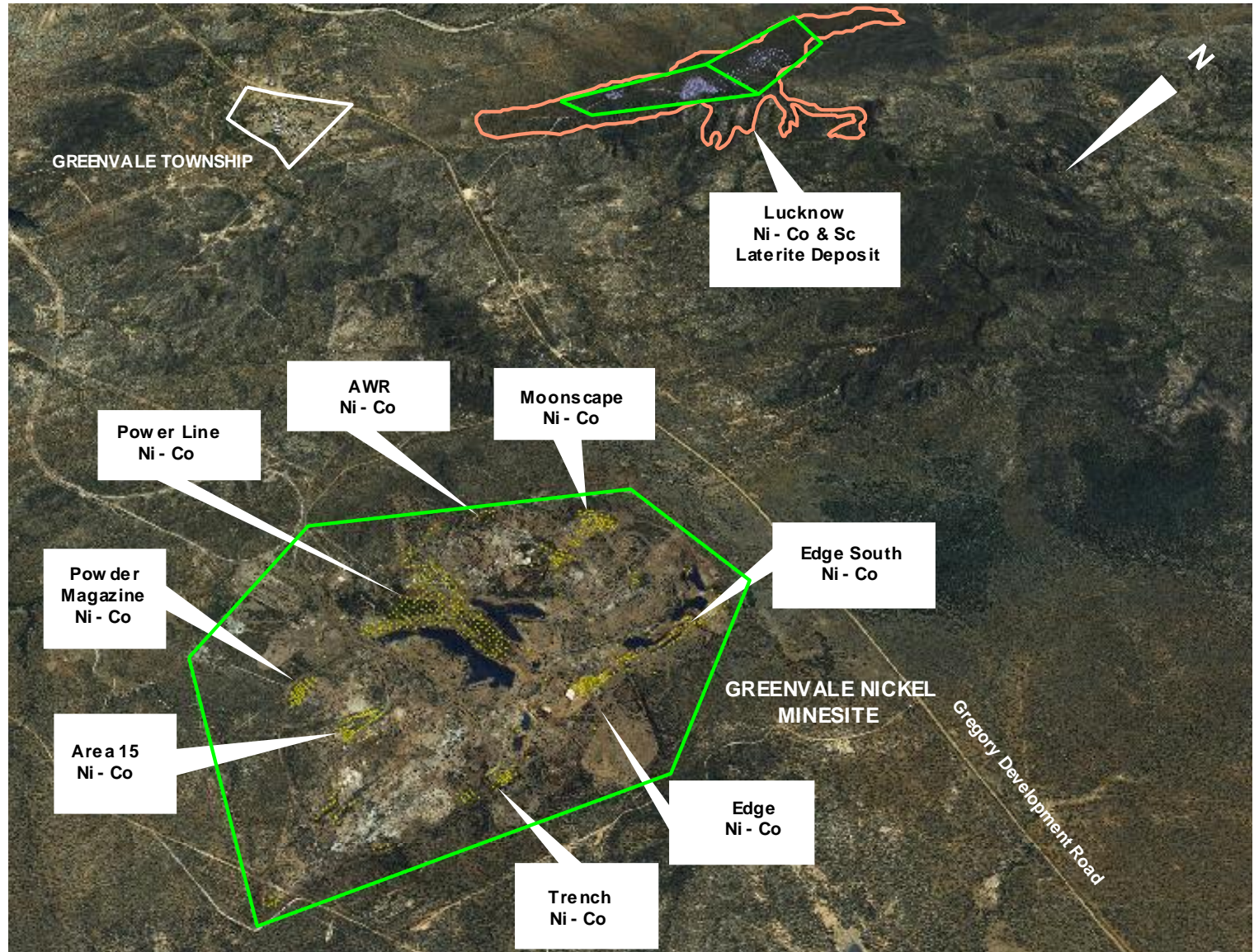
Proposed NORNICO – Ni-Co & Sc Greenvale Mine & Processing Site

- ✓ Remnant >1.2% NiEq (Ni+2Co) ores (> 30g/tSc)
- ✓ Excellent processing site
- ✓ Established infrastructure
- ✓ Greenvale township 3km
- ✓ High cobalt & scandium nickel ores Lucknow (8km) & Kokomo (55km) > 200g/tSc
- ✓ 3 metals recovered (Ni plus Co & Sc) using same HPAL process & plant





NORNICO – Greenvale Nickel Minesite looking ESE towards Greenvale township and the Lucknow deposit

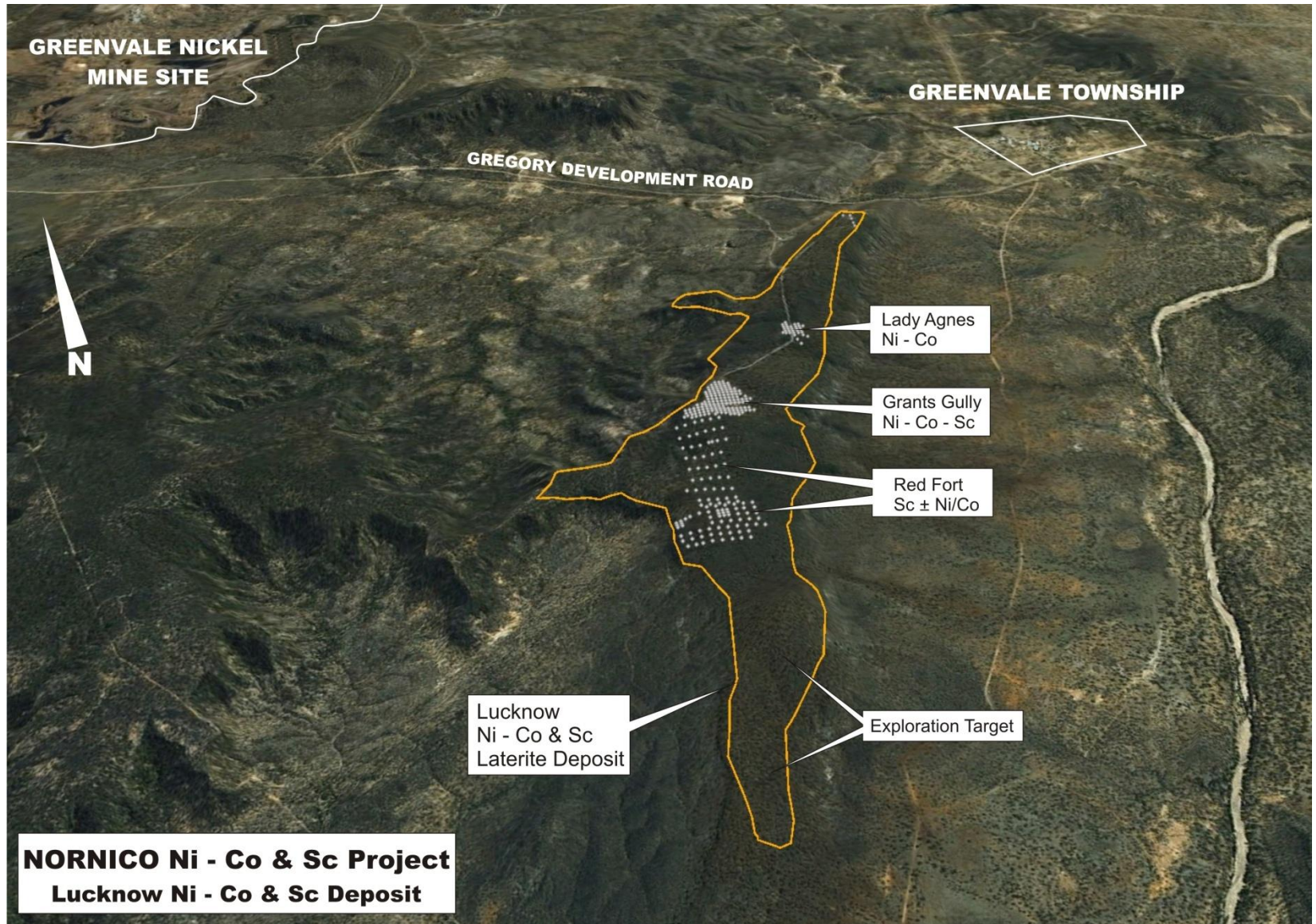


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NORNICO — looking N from Lucknow Ni-Co-Sc deposit to Greenvale Mine Site ~8km road distance



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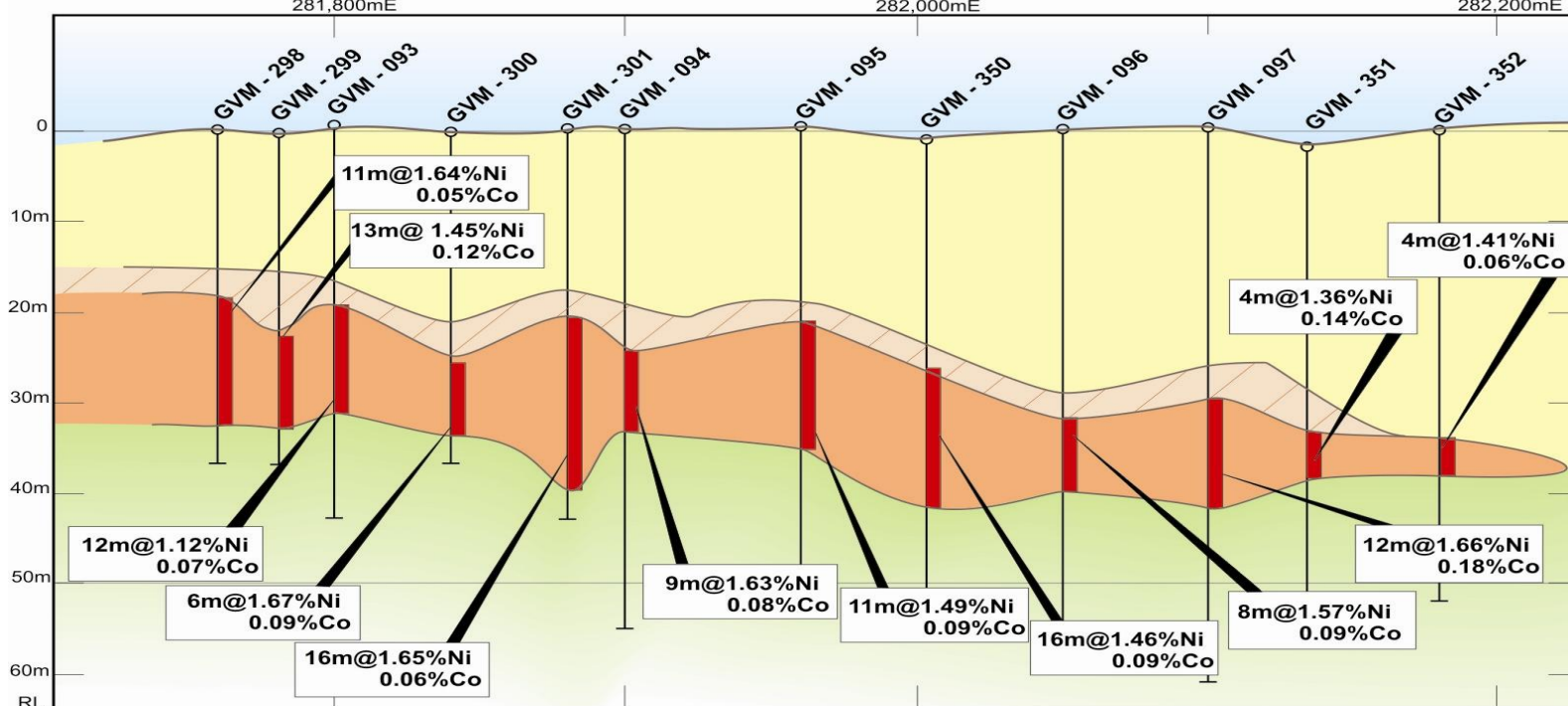
NORNICO Ni-Co & Sc “Tri-Metal Project”

Change in development strategy (April 2011)

- **Increased plant size** from ~200ktpa → ~500ktpa & increased Ni-Co & Sc production (economies of scale)
- AAL processing → **HPAL processing** (more efficient, proven bankable technology)
- Previously buy acid, LNG (heat) & electricity → Now have **acid-power plant** to provide acid, heat & electricity (cost benefits/lower op costs)



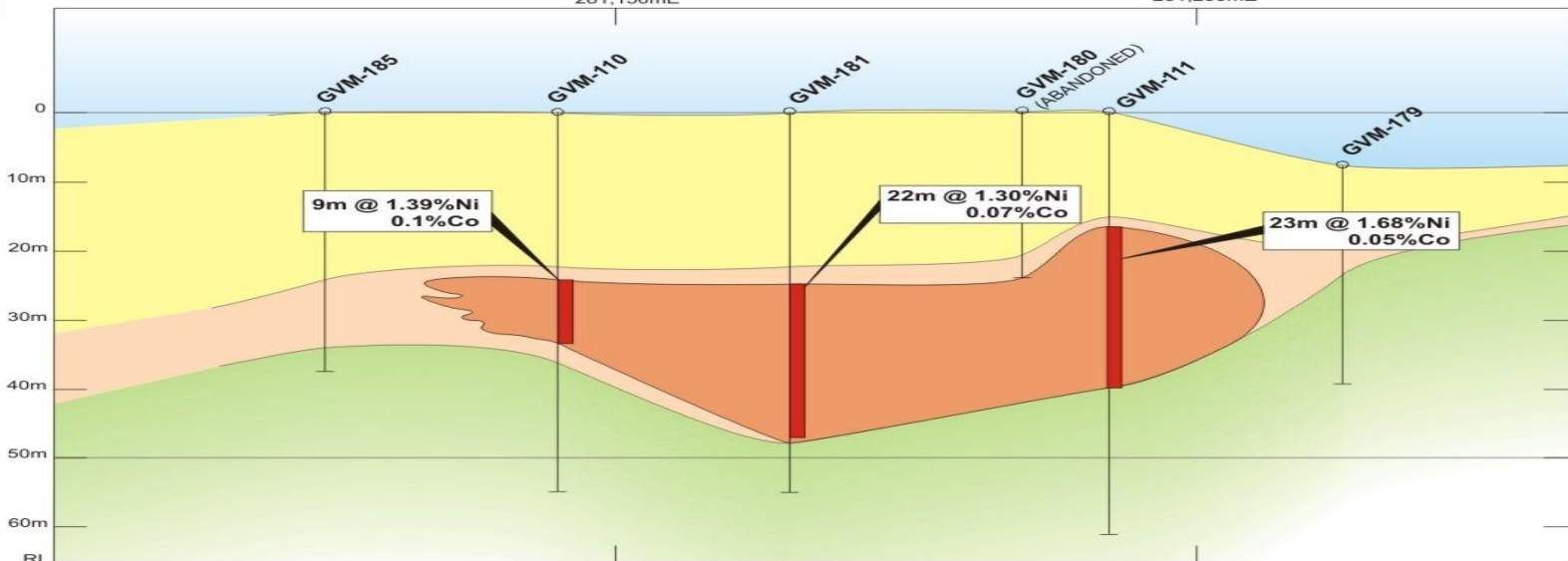
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Power Line - Cross Section
GREENVALE 7.900.620mN



- Hematite Zone (depleted in Nickel)
- Silica Box Zone (Low - Medium Ni)
- Strongly Ni - Co Mineralised Laterite



The Edge - Cross Section
GREENVALE 7,900,380mN



- Hematite Zone (depleted in Nickel)
- Weakly Ni - Co Mineralised Laterite
- Strongly Ni - Co Mineralised Laterite
- Weathered Ultra-Mafic Basement

Lucknow Ni-Co & Scandium (Sc) Project



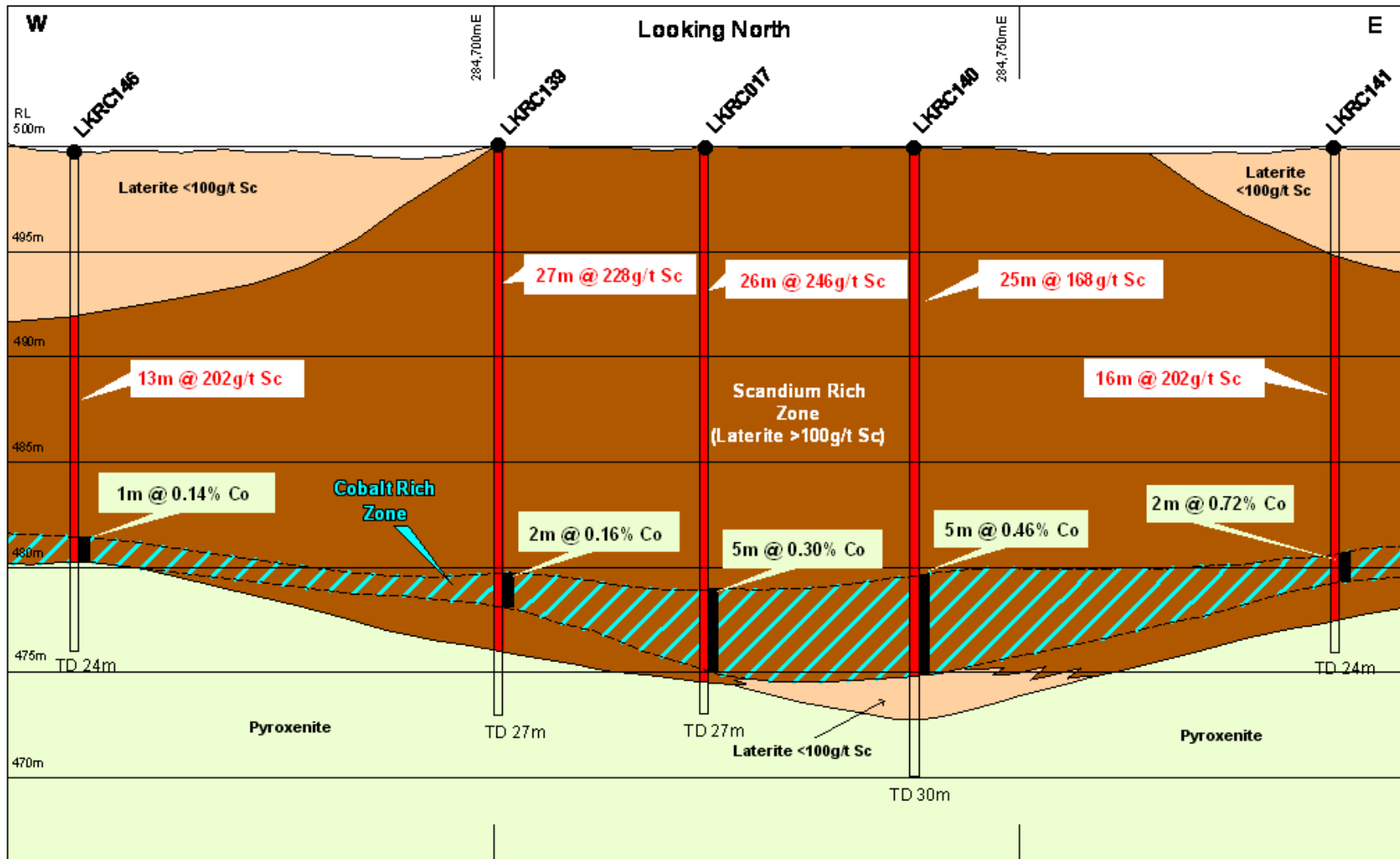
■ Major Scandium Discovery Bonanza intercept 27m @ 882 g/t Sc (April 2010)

■ High grade scandium resource 4.12Mt @ 206g/t Sc

> 1.2 million kg Sc oxide (Red Fort zone) see *following slides*



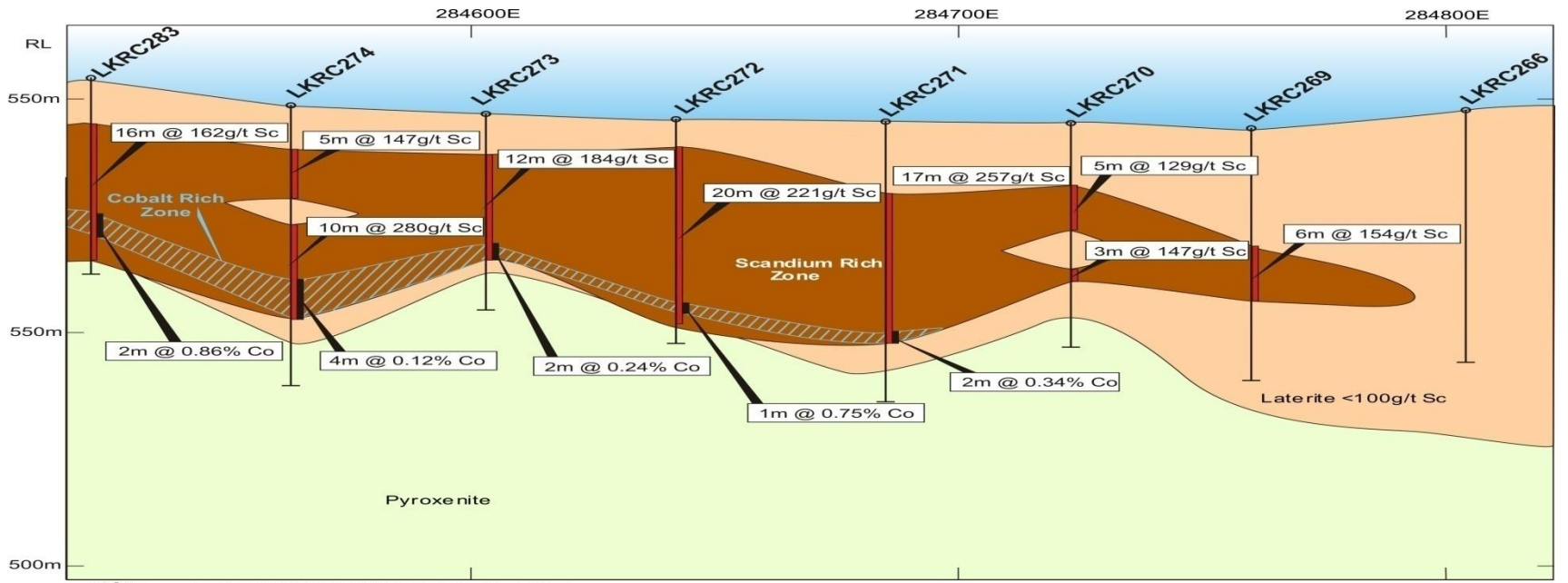
Scandium Cross Sections



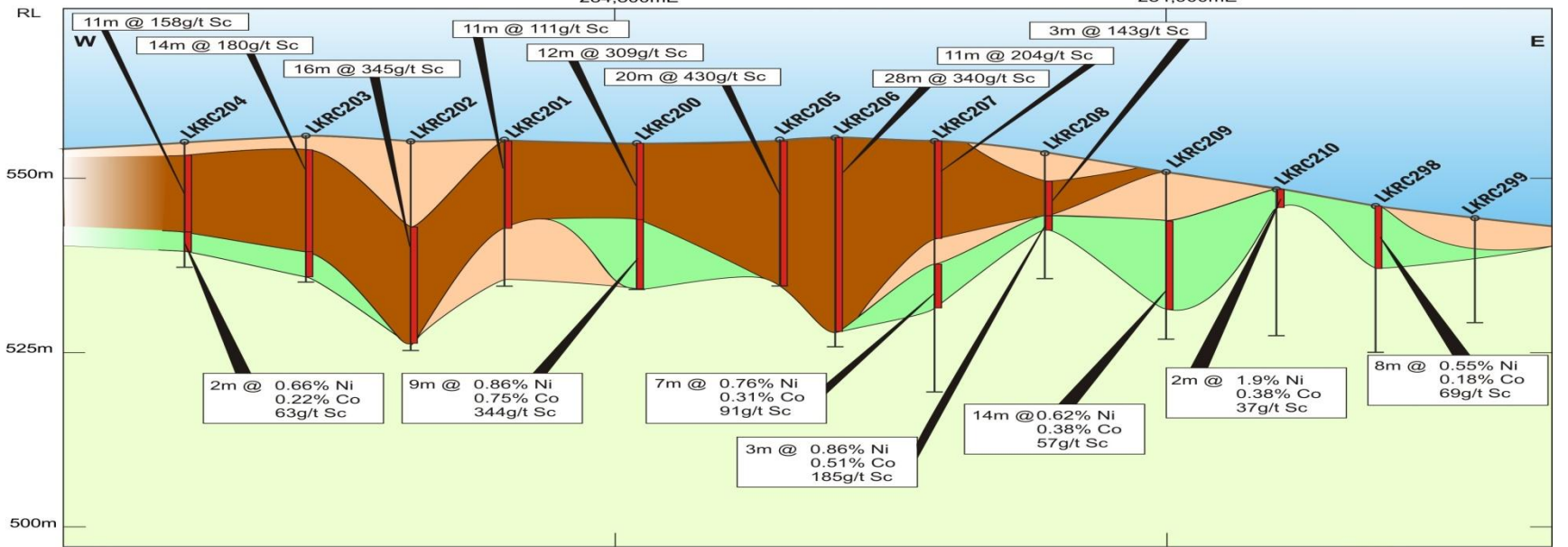
**RED FORT SCANDIUM (Sc) ZONE
CROSS SECTION THROUGH HIGH GRADE SCANDIUM ZONE**

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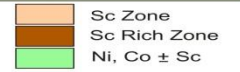
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**LUCKNOW PROJECT
RED FORT
CROSS SECTION 7.894.080mN**



**LUCKNOW PROJECT
GRANTS GULLY
CROSS SECTION 7.894.900mN**



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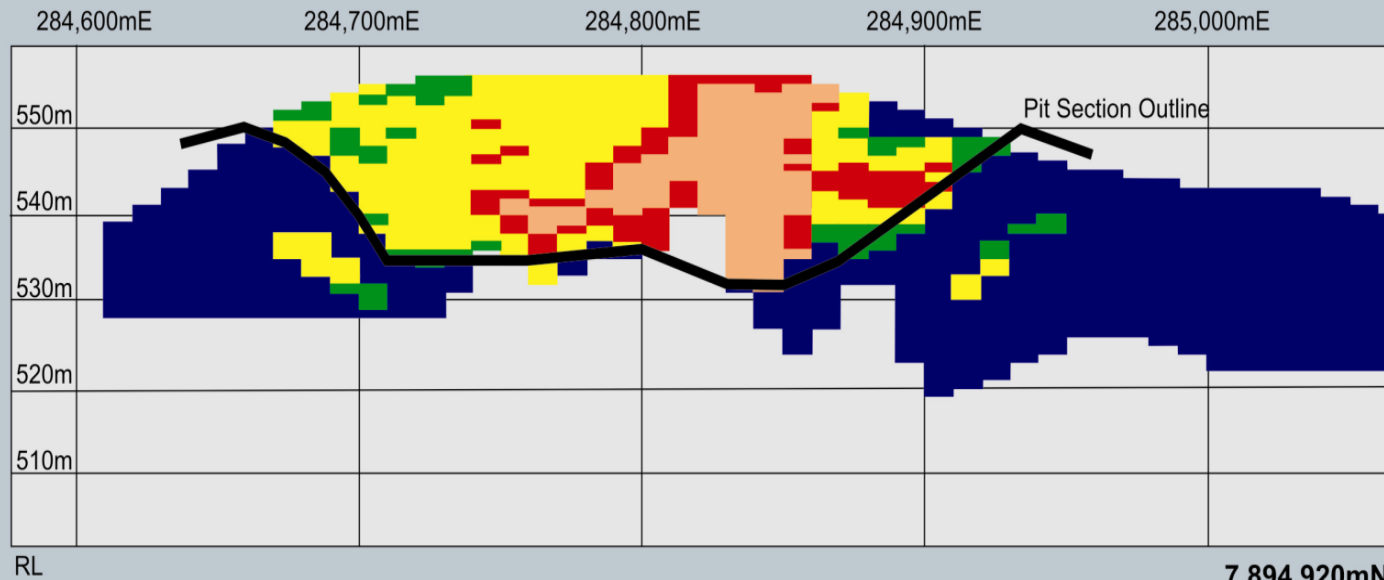
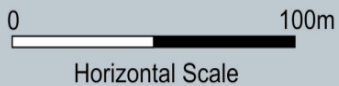
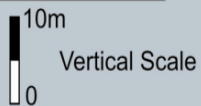
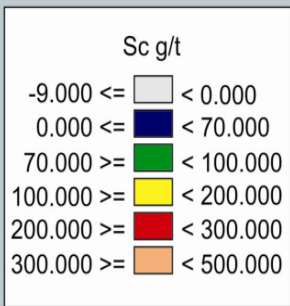
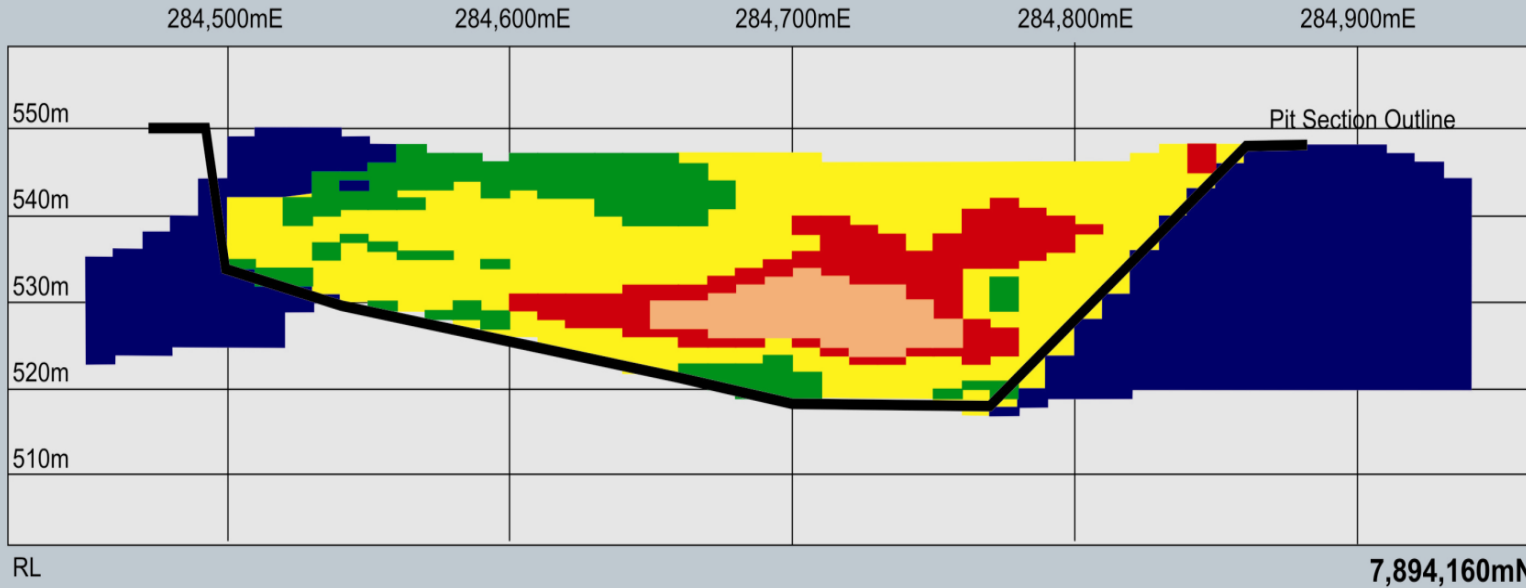


NORNICO – Scandium Resource base

- Metallica holds **2 of the 3 worlds only defined Sc Resources** (other in NSW)
- 1. **Lucknow** 6.24Mt @ 169 g/t Sc for 1,580 tonnes Sc_2O_3 (70 g/t Sc cog) including 4.12Mt @ 206g/t Sc (120 g/t Sc cog) - resource open to south (Measured 0.51 Mt @ 239 g/t Sc, Indicated 1.77 Mt @ 209 g/t Sc, Inferred 1.84 Mt @ 194 g/t Sc)
- 2. **Kokomo** 9.0Mt @ 109g/t Sc for 1,500 tonnes Sc_2O_3 (70 g/t Sc cog) (Measured 0.7Mt @ 154g/t Sc, Indicated 3.8Mt @ 121g/t Sc, Inferred 4.4Mt @ 91g/t Sc)
- **Combined Sc resource 15.1Mt @ 133g/t Sc** (70g/t Sc cog)
- Bonanza grade zones can be targeted early **0-27m @ 882 g/t Sc**
- > 2,000 t Sc metal or > **3,000 t Sc_2O_3** to a maximum of 50m depth
- Sc associated with hydrated iron oxide in laterite **highly amenable to acid leach extraction**
- Assuming **US\$1,500/kg Sc oxide** & 85% recovery the potential revenue from Scandium alone is **A\$4.5 Billion**



NORNICO - Lucknow - Scandium Rich Block Model Ore Cross Sections

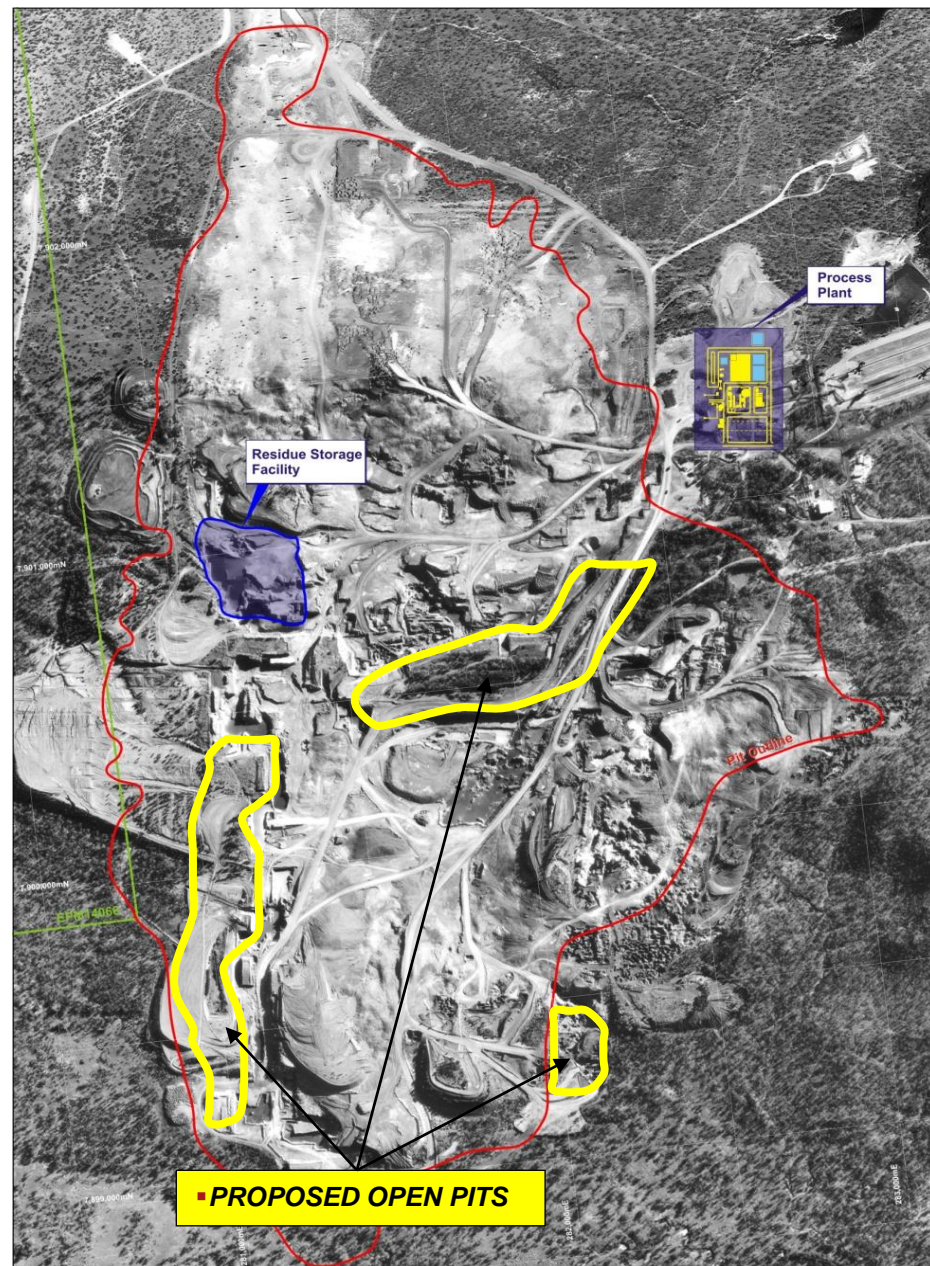


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NORNICO Project Site

- Greenvale Ni mine site ~1992 photo
- Proposed HPAL & acid + power plant site
- Residue Storage
- Initial open pits on remnant Ni-Co resources < 55M depth
- Easy access to Ni-Co & Ni-Co-Sc & nearby Sc ores
- Good potential for high blended Ni-Co & Sc grades in early years
Max revenue for early capital pay back



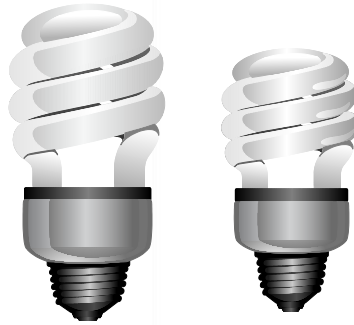


Scandium – Element 21

(80% MLM/20% SRL)



Fuel Cells



Lighting



Scandia stabilised Zirconia



Al – Sc Alloys

- **Scandium (Sc)** the scarce & valuable Rare Earth Element (REE)
- Metallica discovered **2 large high grade Sc Deposits** (Lucknow & Kokomo)
- Major Capex and Opex cost benefits of **Sc recovered together with Ni & Co**
- **Substantial market potential** & enquiry for Sc oxide
- **Potential to become the worlds major supplier Sc Oxide & Sc products**

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Scandium – Element 21

“Green Economy Tech Metal”

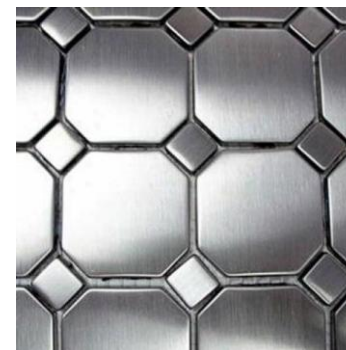


Scandium has unique properties that will enhance our future

- 1. High strength/lighter Sc-Aluminium alloy frames** = better transport frames eg. cars, bikes, commercial & military aircraft etc provides more efficiency & means less energy/fuel & better reliability
- 2. Natural Gas & H₂ SOFC** = more efficient electricity + heating & less CO₂ than conventional fossil fuel electricity
- 3. Better lighting** by creating artificial natural sunlight = brighter for less electricity

Sc has similar properties to other important commonly used strategic tech metals such as Titanium, Zircon & Yttrium

“Opportunity to develop a whole new strategic technology metal market – that’s waiting for reliable Sc delivery”



Tech Metal



Scandium Oxide (Sc_2O_3) Applications & Market

(1) Solid Oxide Fuel Cells (SOFC)

- Natural Gas or H_2 fuel source & air are chemically converted into electricity, heat, water & CO_2
- Scandium Stabilized Zirconia (SSZ) most efficient SOFC & at lower temperature (performance gains) & extended life for SOFC's
- SOFC electric transportation as well as fixed electricity generators in home, business or town (gas connected) & selling excess electricity to grid
- Home size SOFC approx size of dishwasher



Bank of fuel cells for business



Inside fuel cell



Scandium Oxide (Sc_2O_3) Applications & Market

(2) Sc-Al Alloys

- Even small quantities ($<1\% \text{Sc}$) significantly increases strength of aluminium alloys (Al-Sc-Zr)
- Improves weldability & reduces heat cracking
- Allows for stronger, lighter frames/structures
- Improved corrosion resistance



Al-Sc alloys are light & stronger

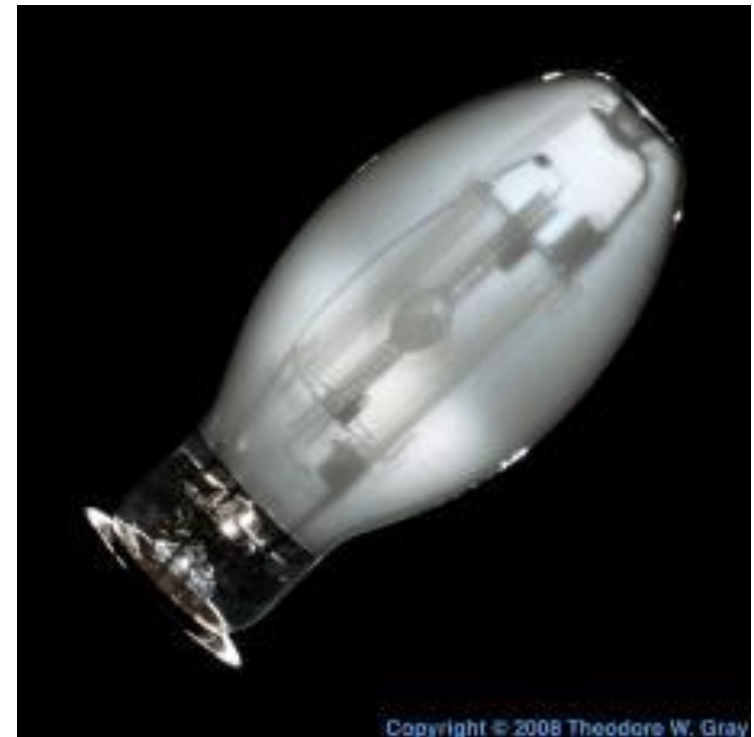
- Sc is a potent grain refiner 0.3% Sc plus Zirconium (3Sc:1Zr) considerably improves strength, durability, plasticity, weldability & corrosion resistance
- Soviet Military (70-80's) used Sc-Al alloys – Ballistic Missiles & MIG jets
- Major benefits for transportation industries (automotive, aircraft, aerospace, marine), sporting & structural industries



Scandium Oxide (Sc_2O_3) Applications & Market

(3) Lighting

- Sc is more prevalent on the sun than earth
- Responsible for broad spectrum of White Light
- Artificial-natural sunlight – Sc bearing metal halide lamps (commonly used on film sets)
- Energy saving: More lumens/AMP or same lumen's for less electricity
- A 65 year old person requires 10 x more light to read same text as a 10 year old <http://www.microsun.com>



> Lumens for < Electricity



Scandium Oxide (Sc_2O_3) Applications & Market

(4) Supply & Demand

- Current market from Soviet stockpiles (1980's) ~3 to 5tpa Sc_2O_3 , plus small scale Sc production from Russia, Ukraine & China ~ 2 to 5 tpa Sc_2O_3
- Currently no mining or primary scandium supply. (solely from stockpiles and some by-product U, W, production) prices > US\$ 1,500/ Kg Sc_2O_3 (99.9% purity)
- Current Scandium use is severely restricted by its scarcity & lack of reliable supply
- Current primary uses of scandium today is high-end sporting goods (e.g. Bicycles), aerospace, hand guns, specialised lighting and fuel cell development

“Metallica is in a unique position to develop a high grade Scandium resource with good acid leaching characteristics to produce a long term reliable supply of Sc_2O_3 (99.9% purity) in significant qualities > 40 tpa – 150 tpa.”

- Excellent opportunity to create a whole new strategic metal market, waiting to happen for highly efficient SOFC, Sc-Al alloys & metal halide lighting applications
- Demand expected to grow dramatically once long term reliable supply established, particularly SOFC & Sc-Al alloys for high value, price inelastic applications (*)
- Due to scarcity, high potency, small quantities used in valuable applications, the price is likely to remain high

Hence the opportunity!

(*) Where high performance characteristics far outweigh price considerations



NORNICO – Importance of Scandium

Higher Returns

- **3 Metals:** Ni + Co + Sc making NORNICO unique
- Having Sc as a co-product is potential nickel laterite game changer **with expected ~30-40% additional revenue income** coming from Sc co-production
- **Higher revenues / Tonne ore**

Example of average Ni-Co-Sc ore	1.0 % Ni	0.1% Co	67g/t Sc (100g/t Sc ₂ O ₃)	Combined Ni + Co + Sc VALUE
Contained value \$/t ore	\$220	\$33	\$178	\$430/t ore

- 3 Metal bearing Ni, Ni-Co, Ni-Co-Sc, Sc-Co & Sc (ie >200 g/t Sc) ores can be easily **blended to further maximise revenues**

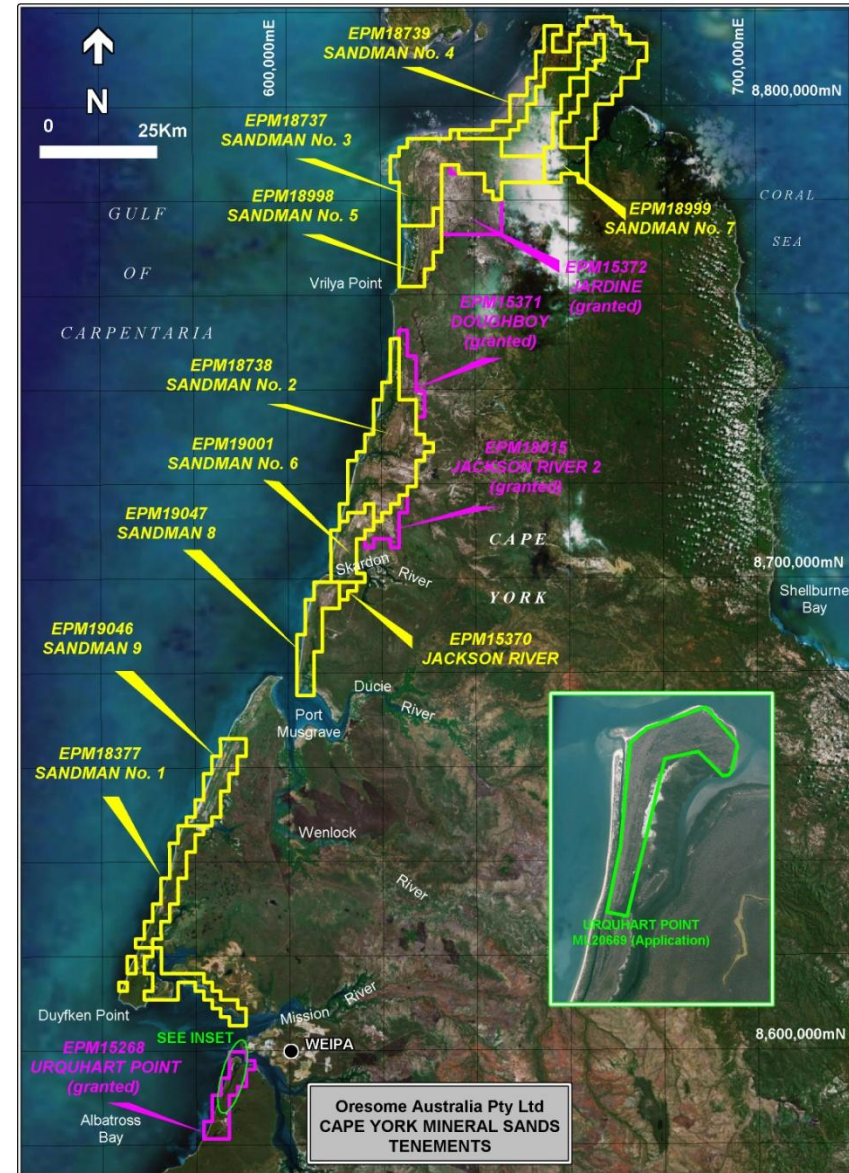
Calculation assumes: US\$10/lb Ni, US\$20/lb Co, US\$1,600/kg Sc Oxide, US\$/AUD\$ 90c, 90% recovery Ni & Co, 85 % recovery Sc

Ni & Sc 100% price paid, Co 75% price paid (Cobalt Sulphide)



Oresome Australia (MLM 100%)

- 100% owned Cape York Heavy Mineral Sands (HMS) – Zircon & Rutile Project
- Urquhart Point Mining Lease applied for over shallow high grade Zircon-Rutile deposit
- Over 2,000km² of EPM's/EPMA's
- Feasibility & EIS process started
- Zircon-Rutile production targeted early 2013





Metallica's 3 Project Assets

1. **NORNICO Ni-Co & Sc** (Flagship) – 100%MLM

Ni-Co Resource 49Mt @ 0.81% Ni, 0.09% Co
containing approx. 400,000 Ni & 42,000 Co metal

PLUS

Scandium Resource 15Mt @ 133g/t Sc (Lucknow & Kokomo)
containing 3,000 t Sc oxide

- All shallow resources <55m depth
- Mining studies to focus on higher grade Ni-Co & Sc zones to establish >15 year life at 500ktpa (ie best >7.5Mt Ni, Co & Sc ores)
- Design provide an average metal production of ~5,000 Ni pa, 600 Co tpa & 50,000 kgpa Sc oxide
- If 100% Sc ore, then up to 150,000kg pa Sc oxide production



2. Weipa Zircon + Rutile HMS project - 100% MLM

- High grade, coarse grained, very low slimes & shallow (0-3m)
- Targeting Zircon-Rutile production start early 2013
- Potential for new HMS province in Western Cape York

3. Limestone – Lime Projects – 100% MLM

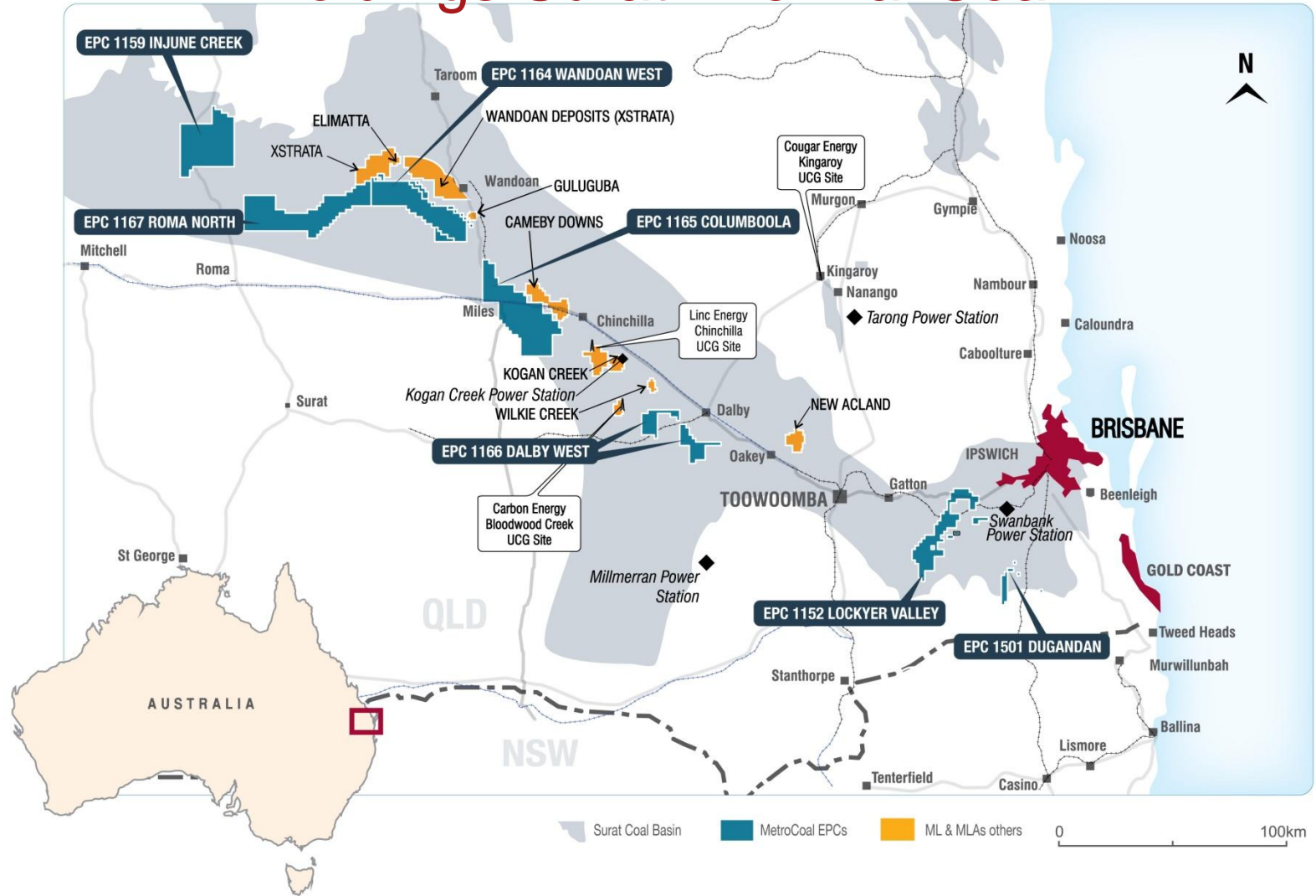
- Ootann/North Queensland & Gladstone Lime projects
- Close to markets, awaiting market off-take



MetroCoal – MTE (MLM 45%) Tenement

MLM holds 80,000,000 MTE shares

Holdings Surat Thermal Coal



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~4,000km tenements covering coal bearing strata



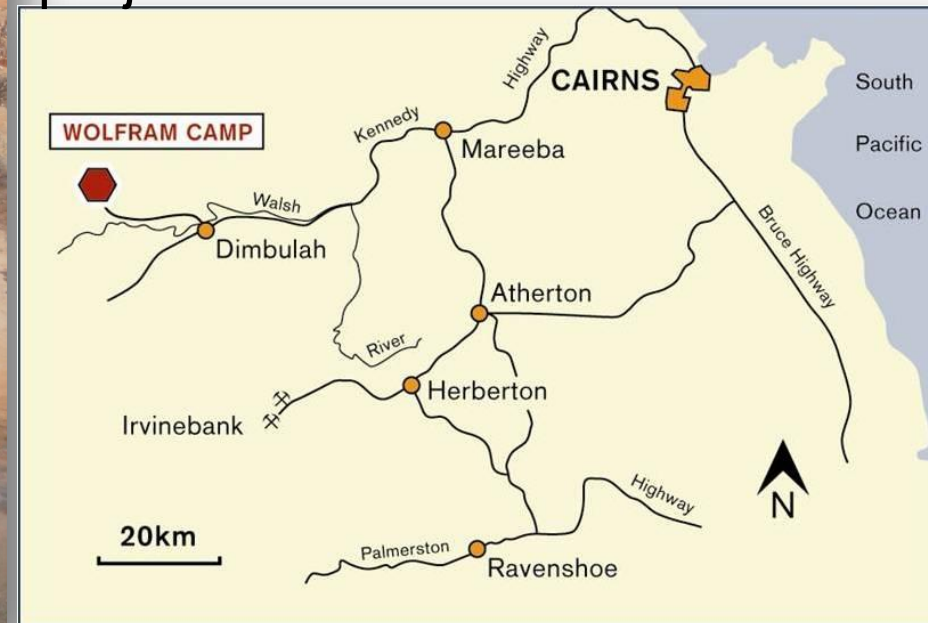
Planet Metals Ltd - PMQ (MLM 76%)

MLM holds 45,500,000 PMQ shares



- Completion of Sale of Wolfram Camp Project - \$7M (\$3.5M cash & 3.5M Deutsche Rohstoff Shares (see ASX release 11 May 2011))

- Focus on Mt Cannindah Cu-Au project and the Cu & Au sector



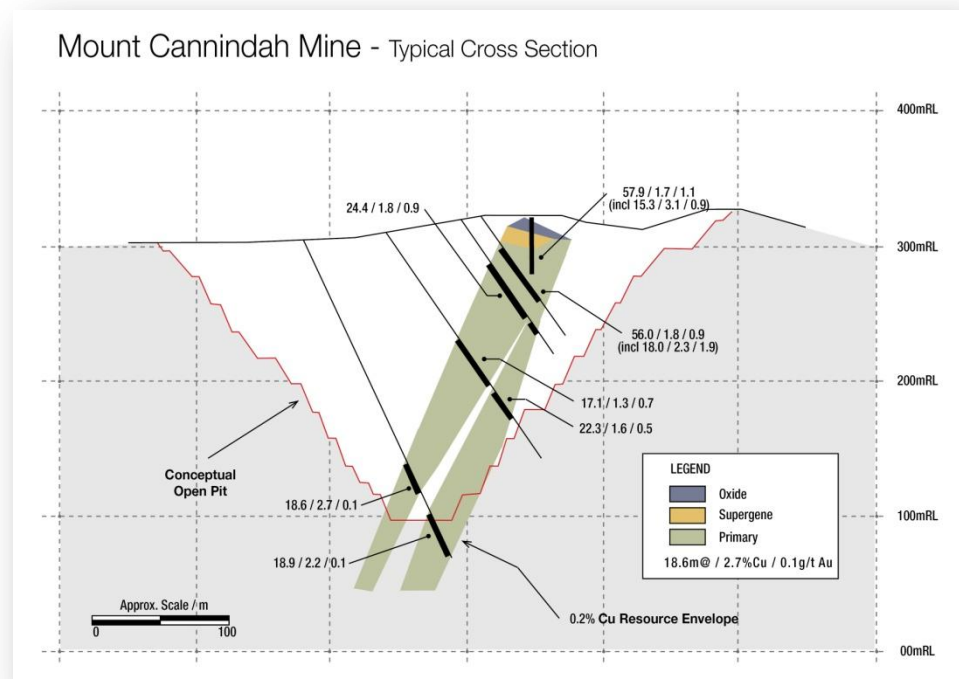
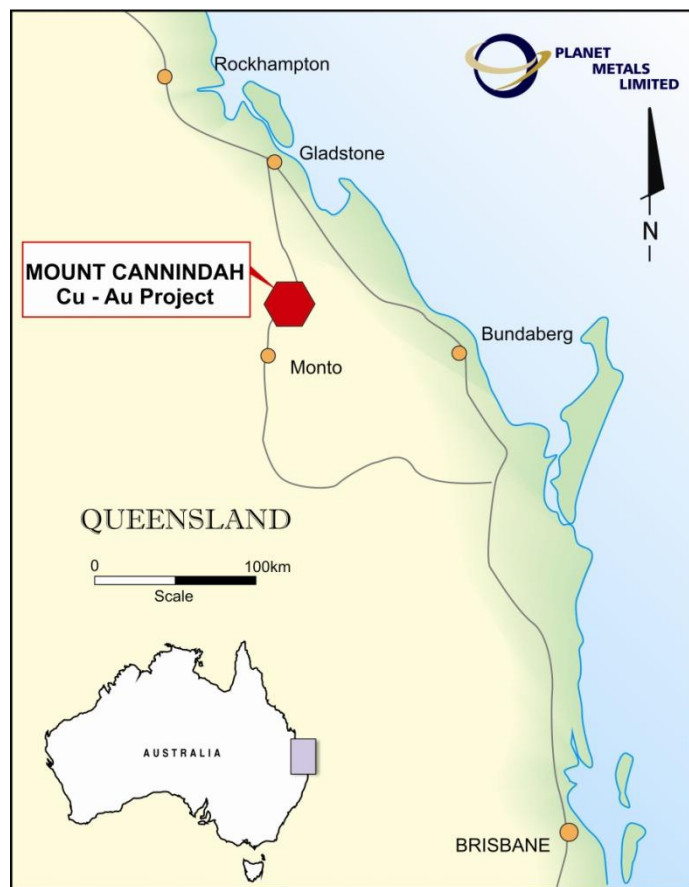
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Planet Metals Limited (MLM 76%)

MLM holds 45,500,000 PMQ shares

- 100% Mt Cannindah Cu-Au
- Large porphyry Cu-Au system
- Excellent exploration upside
- Nine granted mining leases covering 6km²
- JV with Drummond Gold (ASX:DGO) earning up to 75%
- Drilling commenced

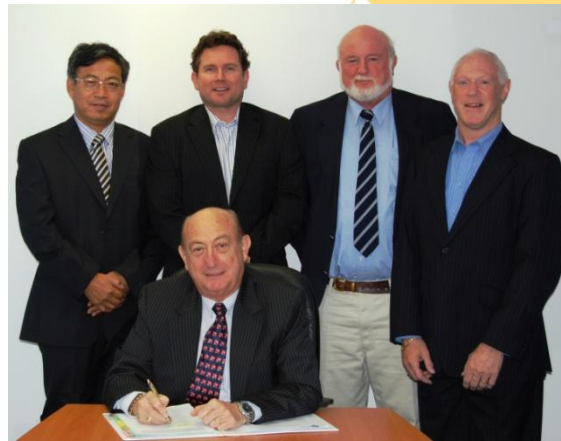
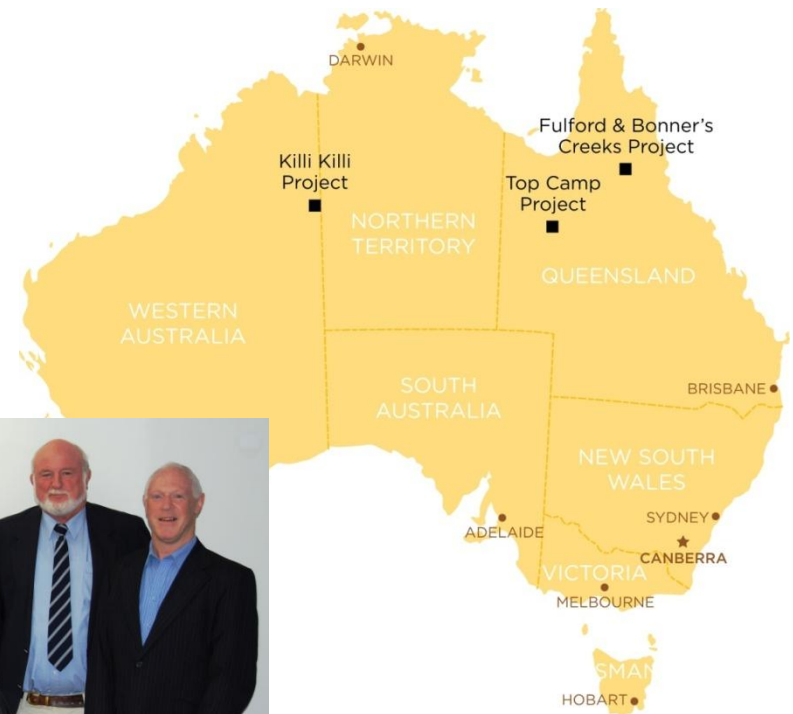




Orion Metals LTD - ORM (MLM 15%)

MLM holds 11,866,658 ORM shares
Gold & Rare Earth Metals Explorer

- 30 hole RC drilling program completed in December 2010 confirming high REE and Gold mineralisation at Killi Killi Hills discovery
- Killi Killi has high proportion of Heavy REE (HREE) making highly attractive exploration project
- REE & Au Tenement acquisition program continues in WA
- Current cash ~\$4.3M (28/02/2011)
- 79.6 M shares on issue
- Mcap – ~19M (24c)

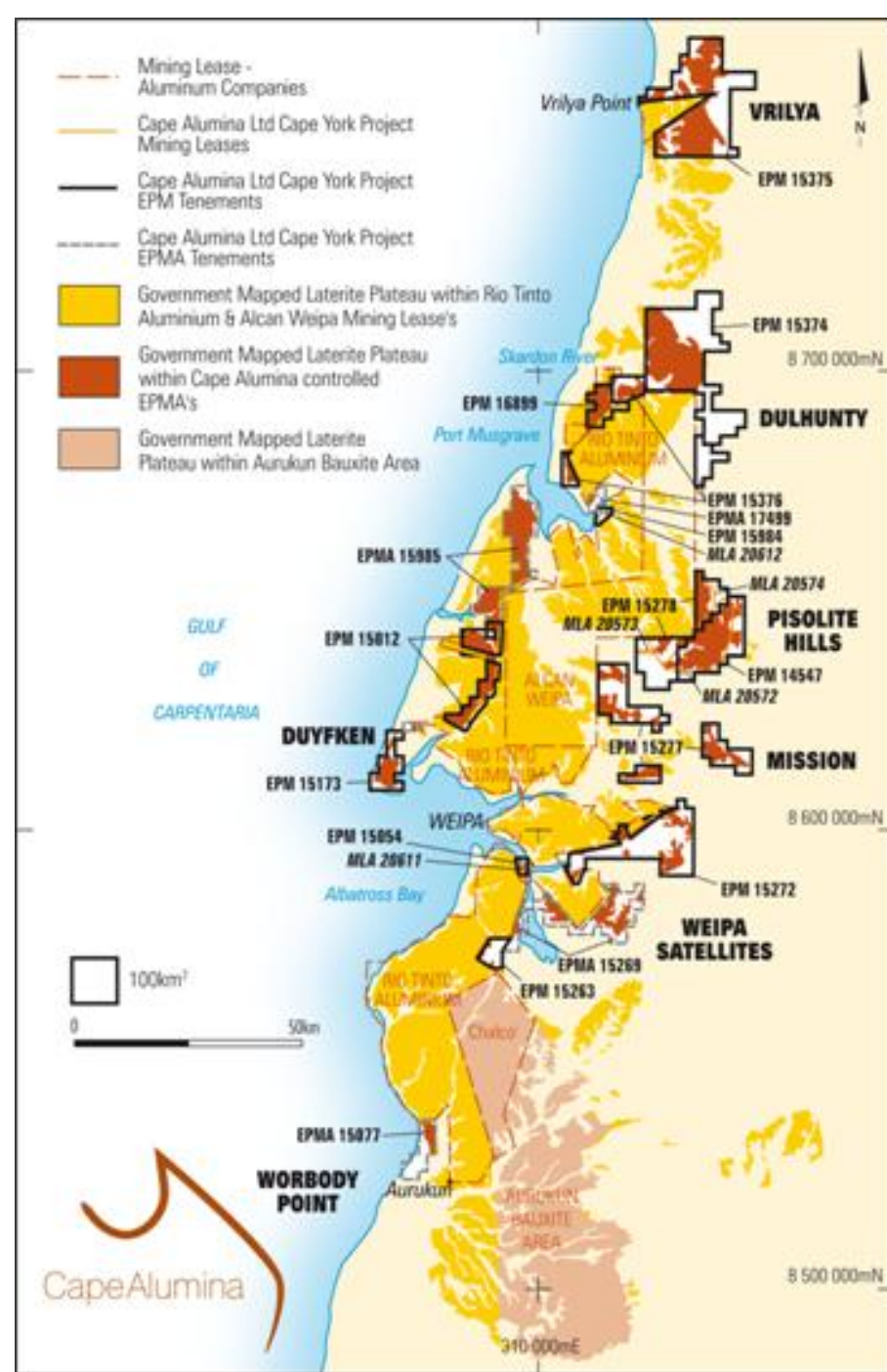




Cape Alumina - CBX

MLM holds 38,600,000 CBX shares
(MLM ~30%)

- 100% owned Weipa Bauxite Project
- New focus on Bauxite Hills deposits
- Pisolite Hills Project on hold





Metallica's Strategic Value ASX Investments



ASX Code	Commodity	Company	MLM %	No. Shares MLM hold	Share Price	Market Value
MTE	Coal	MetroCoal 176,683,663	45.3%	80,000,000	37.5c	\$30.0
CBX	Bauxite	Cape Alumina 129,050,803	29.9%	38,600,000	35c	\$13.5
PMQ	Tungsten & Copper Gold	Planet Metals 59,717,114	76.2%	45,500,000	9.5c	\$4.3
ORM	Gold & REE's	Orion Metals 79,597,443	14.9%	11,866,658	24c	\$2.8
Total Listed Investments						\$50.6M
Cash at Bank (28/04/2011)						\$4.1
Cash & Total Listed Investments						\$54.7
Shares on Issue (MLM)						117.3
MLM Cash & Listed Investments/share						\$0.47

\$54.7M value **before**

+ NORNICO Ni-Co-Sc

+ Zircon-Rutile

+ Limestone

Discover the 'Hidden Value' in Metallica Minerals

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METALLICA MINERALS

A Multi-Commodity Resource Development Company

Discover the 'Hidden Value' in Metallica Minerals

METALLICA SUBSIDIARIES

NORNICO PTY LTD | 100% MLM

GREENVALE OPERATIONS PTY LTD | MLM 100%

LUCKY BREAK OPERATIONS PTY LTD | MLM 100%

SCANDIUM PTY LTD | MLM 100%

PHOENIX LIME PTY LTD | MLM 100%

ORESOME AUSTRALIA PTY LTD | MLM 100%

THANK
YOU

ASX:MLM

NICKEL-COBALT-SCANDIUM + COAL + BAUXITE + COPPER-GOLD + TUNGSTEN



NORNICO Ni-Co Resource Base

Nickel Deposit	Million Tonnes (Mt)	Ni (%)	Co (%)	Fe (%)	Mg (%)	In situ contained Ni metal	In situ contained Co metal
Bell Creek South							
Measured	8.85	0.97	0.07	11.70	7.50	85,845	5,930
Indicated	0.27	0.83	0.04	8.50	9.10	2,241	111
Inferred							
Totals	9.12	0.97	0.07	11.61	7.55	88,086	6,040
Bell Creek North							
Measured							
Indicated	2.3	0.83	0.03	8.60	7.70	19,090	621
Inferred							
Totals	2.3	0.83	0.03	8.60	7.70	19,090	621
Bell Creek Northwest							
Measured							
Indicated	3.07	0.77	0.047	15.70	5.20	23,639	1,443
Inferred							
Totals	3.07	0.77	0.05	15.70	5.20	23,639	1,443
The Neck							
Measured							
Indicated	0.84	0.84	0.026	8.80	6.50	7,056	218
Inferred							
Totals	0.84	0.84	0.03	8.80	6.50	7,056	218
Minnamoolka							
Measured							
Indicated	5.92	0.8	0.044	11.30	10.60	47,360	2,605
Inferred	1.16	0.78	0.023	8.90	10.20	9,048	267
Totals	7.08	0.80	0.04	10.91	10.53	56,408	2,872

THE MULTI COMMODITY
RESOURCE COMPANY



Nickel Deposit	Million Tonnes (Mt)	Ni (%)	Co (%)	Fe (%)	Mg (%)	In situ contained Ni metal	In situ contained Co metal
Kokomo							
Measured	1.3	0.81	0.17	20.40	4.60	10,530	2,210
Indicated	11.7	0.66	0.12	21.90	3.20	77,220	14,040
Inferred	3.2	0.63	0.1	19.10	3.00	20,160	3,200
Totals	16.2	0.67	0.12	21.23	3.27	107,910	19,450
Greenvale Mine Site							
Measured	2.63	1.08	0.09	22.00	3.90	28,404	2,367
Indicated	4.47	1.03	0.08	21.00	4.50	46,041	3,576
Inferred	0.90	0.99	0.07	19.00	5.50	8,910	630
Totals	8.0	1.04	0.08	21.10	4.42	83,355	6,573
Lucknow							
Measured	0.86	0.66	0.17	24.30	2.20	5,676	1,462
Indicated	0.82	0.52	0.23	22.50	2.10	4,264	1,886
Inferred	0.75	0.54	0.19	23.10	2.10	4,050	1,425
Totals	2.43	0.58	0.20	23.32	2.14	13,990	4,773
Combined NORNICO Resource							
Measured	13.64	0.96	0.09	15.31	6.20	130,455	11,969
Indicated	29.39	0.77	0.08	17.46	5.57	226,911	24,500
Inferred	6.01	0.70	0.09	17.62	4.65	42,168	5,522
Totals	49.04	0.81	0.09	16.88	5.63	399,534	41,990

• Notes:

[See next slide for competent persons statement](#)

1. Above categories all calculated using a 0.70% NiEq (Ni+2Co) cut-off grade.

2. Block models for the above resources estimates were constructed by filling wire frame surfaces representing nickel laterite mineralisation boundary with 10m by 10m by 1m blocks. Nickel (Ni) grades were estimated by ordinary kriging using various search radius, depending on the drill spacing of the deposit. A minimum of 4 and a maximum of 15 composites were used to estimate each block, with a maximum of 3 composites from any 1 drill hole. Therefore, at least 3 drill holes were used to estimate block grade values. At Bell Creek South, Minnamoolka and Kokomo a nominal 0.3% Ni mineralised envelope was used as a hard boundary for Ni and Co block grade estimation. Hard boundaries were also used between the laterite and basement zones.

3. Variations due to rounding factors.

4. Iron (Fe) and magnesium (Mg) are included to indicate the overall ore quality, as both metals influence acid consumption as well as dissolved Fe, Mg and other metals, which are contaminants to nickel loaded pregnant solution which is treated to produce a marketable nickel and cobalt intermediate product. As a rule, the lower the Fe and Mg in the laterite ore the better metallurgy and the ore is more suited to heap leach processing.



Competent Person Statement

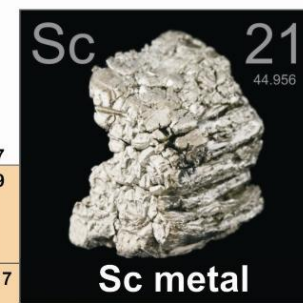
- **Technical information and exploration results** contained in this report has been compiled by Metallica Minerals Ltd full time employees Andrew Gillies in the position of Managing Director and previous Metallica Minerals Ltd Exploration Manager, Mr Pat Smith MSc. B.Sc (Hons). Mr Gillies and Mr Smith are members of the Australasian Institute of Mining and Metallurgy and have relevant experience to the mineralisation being reported on to qualify as Competent Persons as defined by the Australasian Code for Reporting of Minerals Resources and Reserves. Mr Gillies and Mr Smith consent to the inclusion in this report of the matters based on the information in the form and context in which it appears
- The **NORNICO project Mineral Resource estimate(s)** is based upon and accurately reflects data compiled, validated or supervised by Mr John Horton, Principal Geologist, who is a Member of the Australasian Institute of Mining and Metallurgy and a full time employee of Golder Associates Pty Ltd. Mr Horton has sufficient experience that is relevant to the style of mineralisation and the type of deposit under consideration and to the activity which he has undertaken to qualify as a Competent Person as defined in the 2004 edition of the 'Australasian Code for the Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Mr. Horton consents to the inclusion of this information in the form and context in which it appears in this document.



17 RARE EARTH ELEMENTS (REE)

Sc + Y + 15 Lanthanides - Periodic Table

ELEMENT 21 : SCANDIUM



Sc, Y, Ti, Zr
have similar properties
(Y, Ti, Zr Established Deposits/Markets)

												13	14	15	16	17																			
												5	10.811	6	12.011	7	14.007	8	15.999	9															
												B	C	N	O																				
												13	26.982	14	28.086	15	30.974	16	32.065	17															
												Al	Si	P	S	Cl	Ar																		
Na	Mg	21	44.956	22	47.867	23	50.942	24	51.996	25	54.938	26	55.845	27	58.933	28	58.693	29	63.546	30	65.39	31	69.723	32	72.64	33	74.922	34	78.96	35	79.904	36	83.80		
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr																		
37	85.468	38	87.62	39	88.906	40	91.224	41	92.906	42	95.94	43	(98)	44	101.07	45	102.91	46	106.42	47	107.87	48	112.41	49	114.82	50	118.71	51	121.76	52	127.60	53	126.90	54	131.29
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe																		
55	132.91	56	137.33			72	178.49	73	180.95	74	183.84	75	186.21	76	190.23	77	192.22	78	195.08	79	196.97	80	200.59	81	204.38	82	207.2	83	208.98	84	(209)	85	(210)	86	(222)
Cs	Ba			Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn																	
87	(223)	88	(226)			104	(261)	105	(262)	106	(266)	107	(264)	108	(277)	109	(268)	110	(281)	111	(272)	112	(285)	113	114	(209)	115	116	117	118					
Fr	Ra			Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub	Uut	Uuq																					

Light REE

Heavy REE

		57	138.91	58	140.12	59	140.91	60	144.24	61	(145)	62	150.36	63	151.96	64	157.25	65	158.93	66	162.50	67	164.93	68	167.26	69	168.93	70	173.04	71	174.97
LANTHANIDE SERIES		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu															
ACTINIDE SERIES		89	(227)	90	232.04	91	(231)	92	(238)	93	(237)	94	(244)	95	(243)	96	(247)	97	(247)	98	(251)	99	(252)	100	(257)	101	(258)	102	(259)	103	(262)
		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr															

- ✓ Scandium Deposits / Resources are one of the most scarce REE
- ✓ Scandium is one of the most valuable ~ US \$1,500/kg Sc oxide
- ✓ Major uses: Aluminium alloys, Solid Oxide Fuel Cells & Artificial Sunlight Lighting
- ✓ New Metal (Sc) Market waiting to happen once a reliable supply is established
- ✓ Sc is a “Strategic Technology Metal” (STM)
- ✓ China (95% Worlds REE supply) has no known Sc Primary Deposits (>100g/t Sc)



NORNICO Ni-Co-Sc Project video

*Nickel laterite exposure
Greenvale Nickel mine site*