



PRE FEASIBILITY STUDY

THUNDERBIRD

World's Best Undeveloped Mineral Sands Project



ASX : SFX | NOVEMBER | 2015

www.sheffieldresources.com.au



SheffieldResources
LIMITED



DISCLAIMER

PREVIOUSLY REPORTED INFORMATION

This report includes information that relates to Exploration Results which were prepared and first disclosed under the JORC Code 2012. The information was extracted from the Company's previous ASX announcements as follows:

"PRE-FEASIBILITY STUDY UPDATE CONFIRMS THUNDERBIRD AS THE WORLD'S BEST UNDEVELOPED MINERAL SANDS PROJECT", 14 October 2015

"OUTSTANDING RESULTS FROM ILMENITE UPGRADE TESTWORK", 9 September 2015

"CONVENTIONAL DOZER TRAP MINING CONFIRMED AS PREFERRED MINING METHOD AT THUNDERBIRD", 17 September 2015

"THUNDERBIRD HIGH GRADE RESOURCE UPDATE", 31 July 2015

"QUARTERLY REPORT FOR PERIOD ENDING 30 JUNE 2015", 27 July 2015

"PRE-FEASIBILITY STUDY CONFIRMS THUNDERBIRD AS NEXT MAJOR MINERAL SANDS PROJECT IN GLOBAL DEVELOPMENT PIPELINE", 14 May 2015

"LARGE Ni-Cu-Co ANOMALIES IDENTIFIED IN THE FRASER RANGE", 11 February, 2014

"COMPELLING NEW DRILL TARGET IDENTIFIED FROM GROUND EM SURVEY AT RED BULL NICKEL PROJECT", 23 June 2015

"TWELVE NEW NICKEL AND GOLD TARGETS OUTLINED IN FRASER RANGE", 3 July 2015

These announcements are available to view on Sheffield Resources Ltd's website www.sheffieldresources.com.au

The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcements and, in the case of estimates of Mineral Resources, and Pre-feasibility studies, that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement

FORWARD LOOKING STATEMENTS

Some statements in this report regarding estimates or future events are forward-looking statements. They include indications of, and guidance on, future earnings, cash flow, costs and financial performance. Forward-looking statements include, but are not limited to, statements preceded by words such as "planned", "expected", "projected" "estimated" "may", "scheduled", "intends", "potential", "could" "nominal" "conceptual" and similar expressions. Forward looking statements, opinions and estimates included in this announcement are based on assumptions and contingencies which are subject to change without notice, as are statements about market and industry trends, which are based on interpretations of current market conditions. Forward looking statements are provided as a general guide only and should not be relied on as a guarantee of future performance. Forward looking statements may be affected by a range of variables that could cause actual results to differ from estimated results.

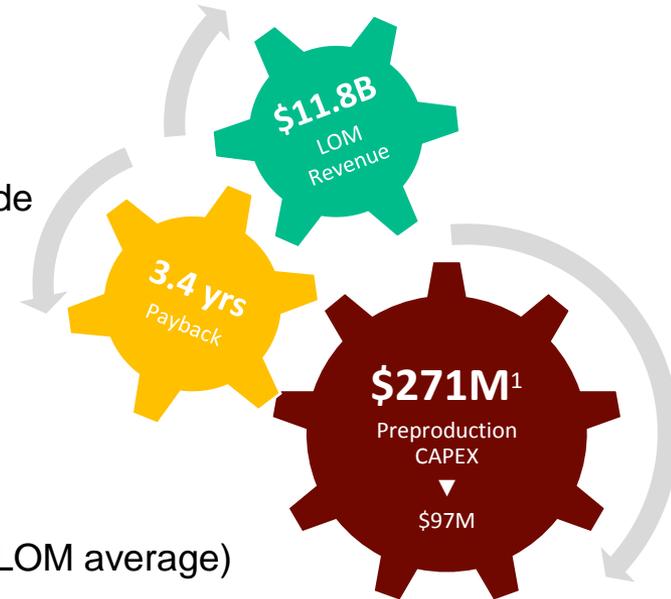
MINING INVENTORY

In this report the term "mining inventory" is used to report that part of the Mineral Resource that has been considered in the Pre-feasibility Study. The mining inventory does not meet the requirements of an Ore Reserve as defined under the 2012 edition of the JORC Code and should not be considered an Ore Reserve. There is no certainty that all or any part of the mining inventory will be converted into Ore Reserves.

WORLD'S BEST UNDEVELOPED MINERAL SANDS PROJECT

KEY POINTS - THUNDERBIRD

- PFS confirms low risk, high margin, long life mining project
- Pre-production capital reduced by 26% to A\$271 million¹
- Capital payback period reduced to 3.4 years
- Mine life extended to 40 years, with considerable exploration upside
- Revenue A\$11.8 billion over Life of Mine (“LOM”)
- Operating cash flow of A\$6.0 billion LOM²
- Annual EBITDA of A\$135 million (LOM average)
- Revenue to cash cost ratio of 2.02:1 (LOM)
- 100ktpa zircon, 382ktpa high grade sulphate ilmenite production (LOM average)
- Primary zircon is premium grade and suited to the ceramics sector
- Upgraded ilmenite has superior qualities which will assist in displacing others in the market
- Targeting commissioning in 2018, to coincide with expected global supply gap
- Amongst the World’s largest and highest grade deposits
- 100% owned project located in one of the world’s best mining jurisdictions



¹Excludes contingency.

²Before taxes and royalties.

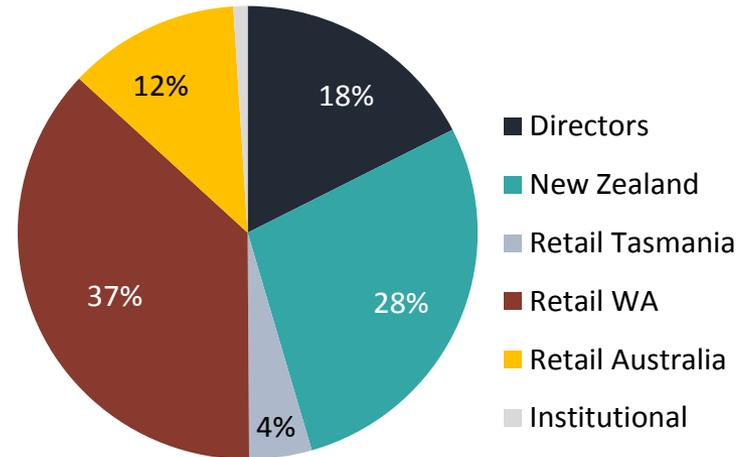
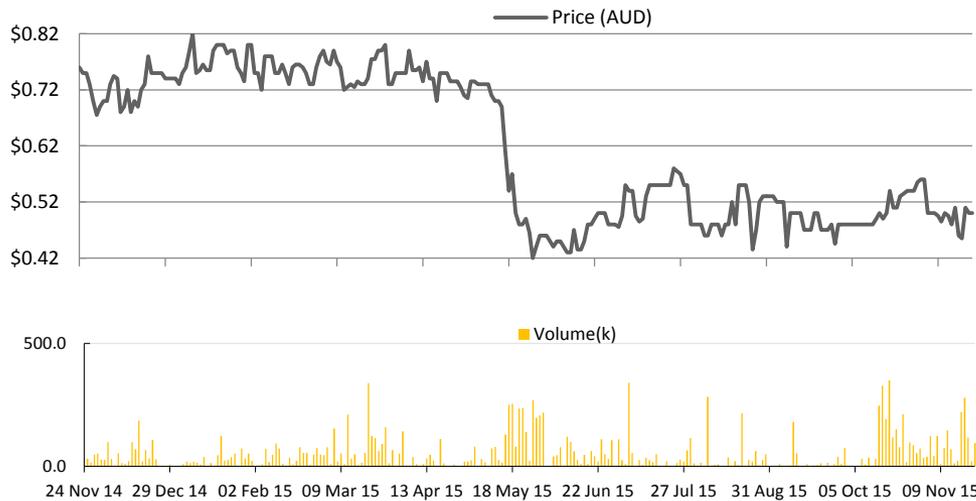
CORPORATE SUMMARY

CORPORATE SNAPSHOT

ASX Code	SFX
Issued Shares ¹	150.3M
Employee Options (Ave. Ex Price 68c)	7.4M
Share Price (24 Nov 2015)	A\$0.46
Market Cap	A\$69.1M
Cash (Unaudited) ¹	A\$10.2M
Enterprise Value	A\$58.9M
Top twenty shareholders ²	43%

DIRECTORS & MANAGEMENT

Will Burbury	Non-executive Chairman
Bruce McFadzean	Managing Director
David Archer	Technical Director
Bruce McQuitty	Non-executive Director
Jim Netterfield	BFS Manager
Mark Teakle	Development Manager
David Boyd	Exploration Manager
Wayne Groeneveld	Sustainability Manager

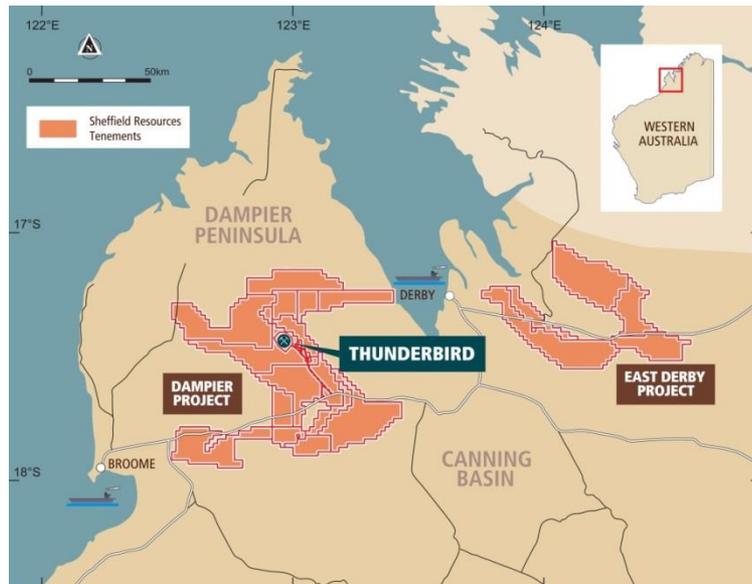


¹Assumes settlement of \$5m placement and \$2m SPP as announced 27 Nov 2015

²Top twenty shareholders and share register pie chart are pre placement

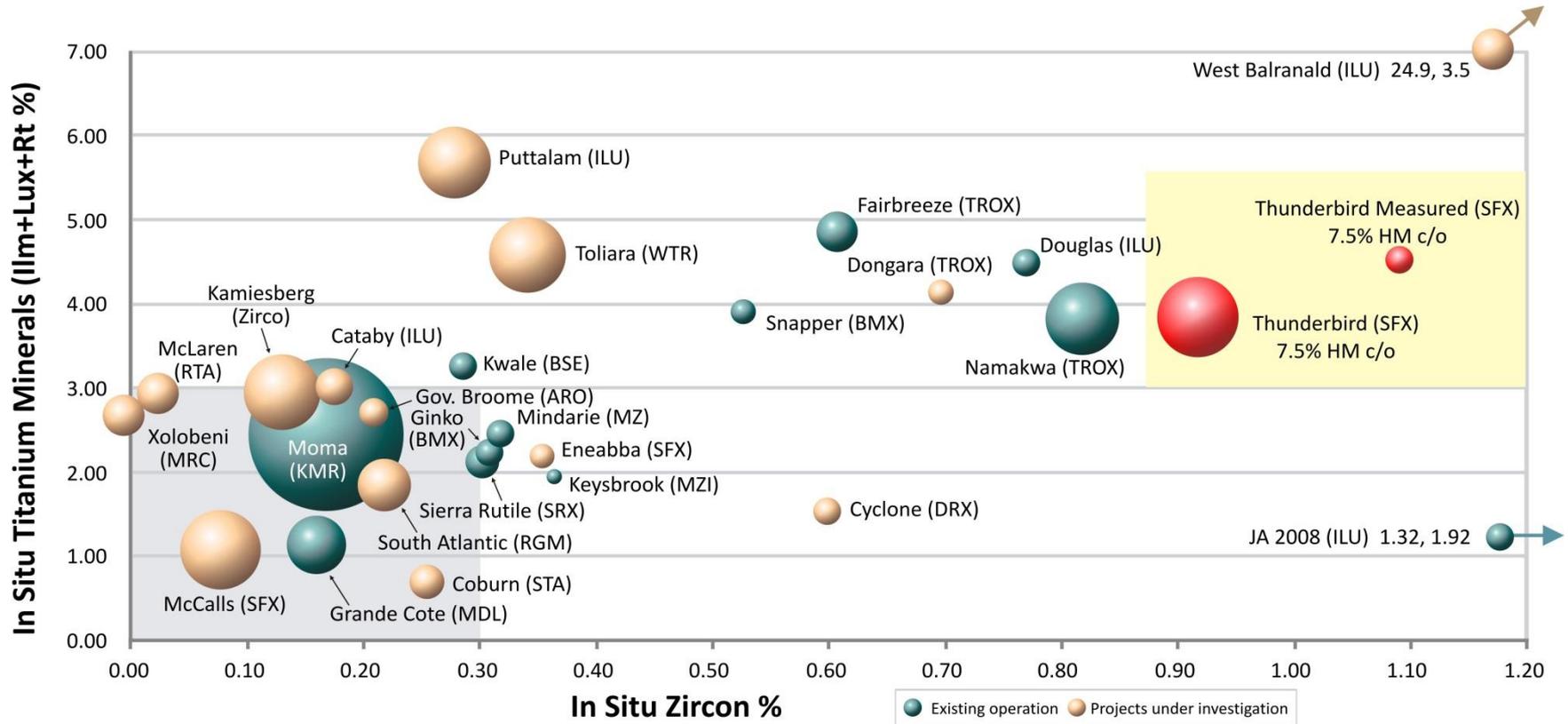
SHEFFIELD RESOURCES

- Listed on ASX December 2010
- Flagship: Thunderbird Mineral Sands – a Tier 1 project
- From initial drill hole to PFS in 3 Years
- Targeting first production from Thunderbird early 2019
- First mover status in Canning Basin mineral sands province
- Drill-ready nickel targets in Fraser Range



THUNDERBIRD – TIER 1 PROJECT

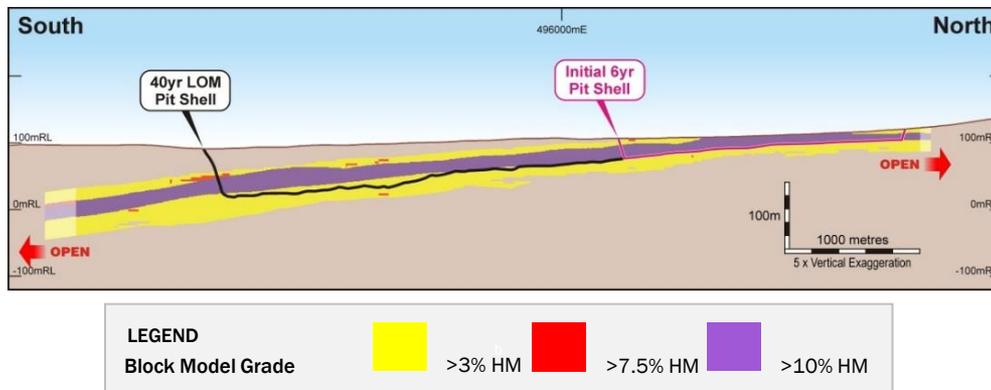
- Amongst the world's largest and highest grade deposits
- Thunderbird's high zircon and titanium mineral grades set it apart from others globally



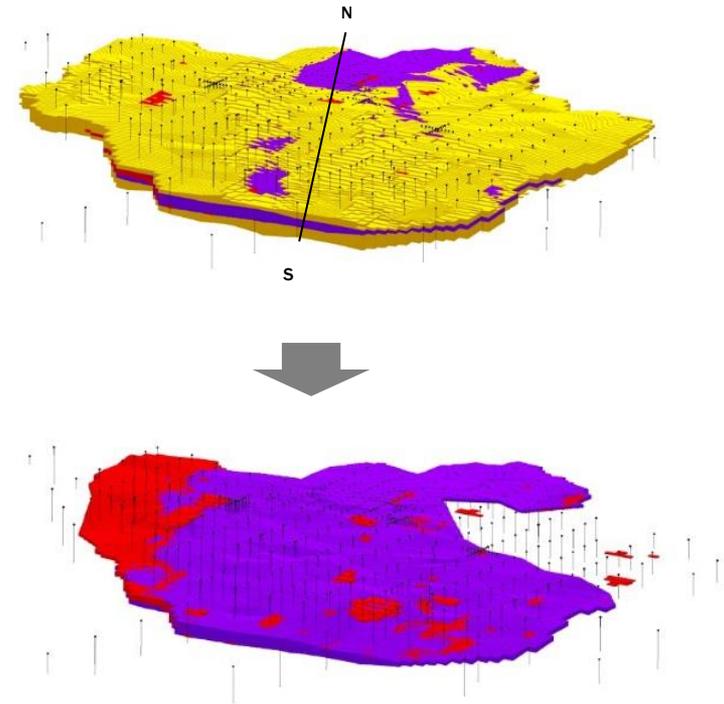
Thunderbird Mineral Resource ranked against current mineral sands operations and projects under investigation globally. Data compiled by Sheffield from open file sources.

THUNDERBIRD MINERAL SANDS DEPOSIT

- Key to Thunderbird is the thick, continuous High Grade Zone
- This zone occurs at surface in the northern part of the deposit
- Deposit geometry favours large scale mining



Total Resource at 3% HM cut-off



High Grade Zone at 7.5% HM cut-off

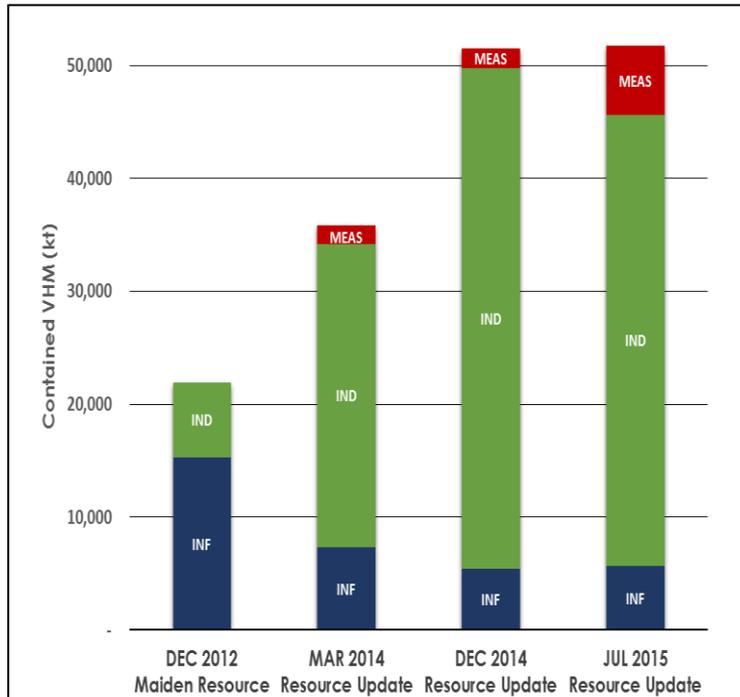
THUNDERBIRD RESOURCE

Thunderbird High Grade Mineral Resource at 7.5% HM cut-off 31 July 2015

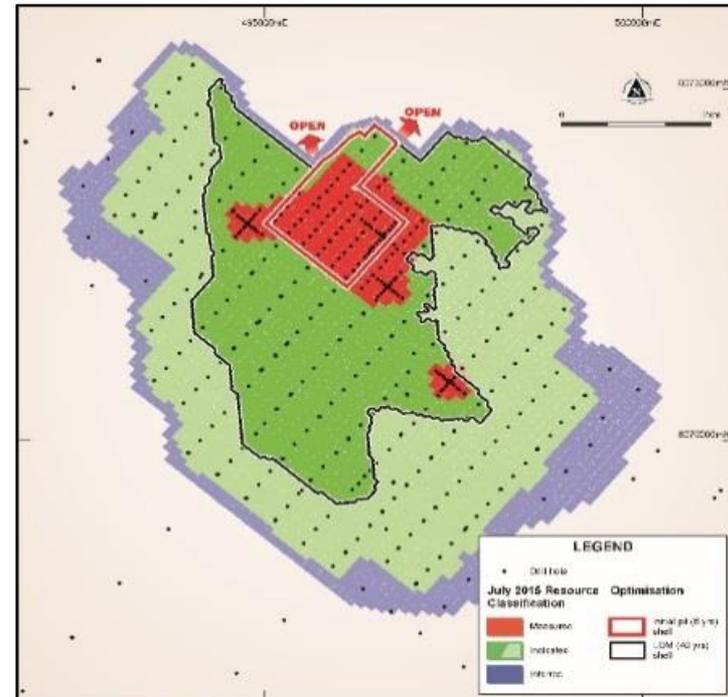
- **Globally Significant >1Bt at 11.9% HM**
- **Measured + Indicated > 85% of Resource**

Resource	Mineral Resources ¹		Valuable HM Grade (in situ) ²			
	Material Mt	HM %	Zircon %	HiTi Leuc %	Leucoxene %	Ilmenite %
Measured	110	14.9	1.09	0.31	0.28	4.0
Indicated	850	11.8	0.90	0.28	0.25	3.3
Inferred	130	10.7	0.82	0.25	0.23	3.0
Total	1,090	11.9	0.91	0.28	0.25	3.3

Refer to Appendices 1 for full Resources Tabulation. Tonnes have been rounded to reflect the relative uncertainty of the estimate. The in situ grade is determined by multiplying the percentage of HM by the percentage of each valuable heavy mineral within the heavy mineral assemblage.



High Grade Resource Growth



Resource Classification Plan

MINING INVENTORY AND PHYSICALS

- **Mining Inventory** used for the PFS Update comprises **685Mt at 11.3% HM¹**
- With in-situ grades of **0.87% zircon, 0.27% HiTi leucoxene, 0.28% leucoxene and 3.13% ilmenite¹**
- This equates to 40 years of scheduled production with initial production at a 12Mtpa mining rate, ramping up to 18Mtpa from Year 8 for the remainder of the mine life
- **Mining inventory** for the **six year starter pit** comprises **68Mt at 15.7% HM¹**
- With high in-situ grades of **1.12% zircon, 0.32% HiTi leucoxene, 0.31% leucoxene and 4.18% ilmenite¹**

PHYSICALS	YEARS 1-7	LOM
Average ore mined (Mtpa)	12.2	17.1
Average head grade (%HM)	15.4	11.5
Strip ratio (waste:ore)	0.20:1	0.66:1
HMC PRODUCED (MT)	13.2	52.0
PRODUCTION	YEARS 1-7	LOM
Zircon (tpa)	88,000	100,000
HiTi88 (tpa)	21,000	26,000
LTR Ilmenite (tpa)	311,000	382,000
Primary Ilmenite (tpa)	58,000	14,000
Total Products	478,000	522,000

¹From Measured and Indicated Resources only

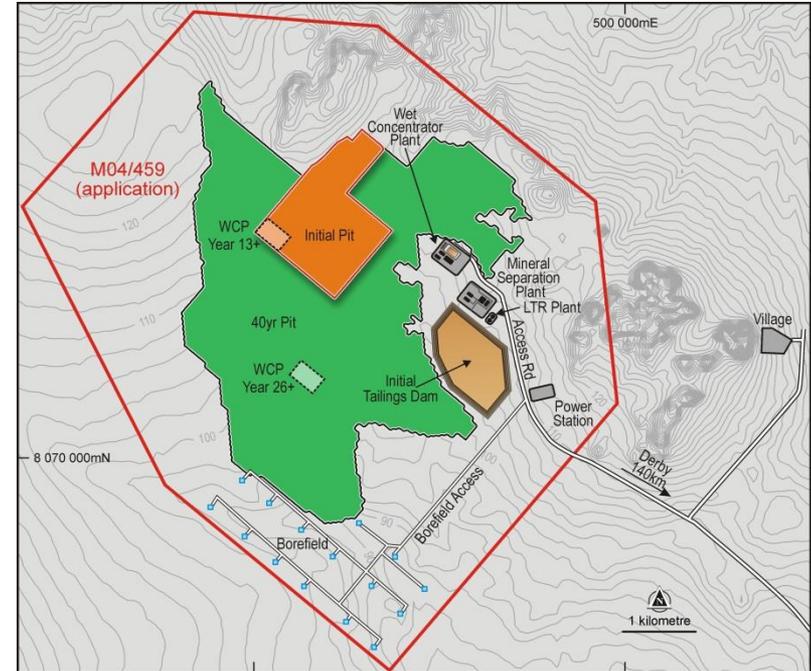
INFRASTRUCTURE AND LOGISTICS

Mining & Site Infrastructure

- Dry mining rate of 12mtpa, ramping up to 18Mtpa by Year 8
- Conventional dozer trap mining
- Mining commences in shallow northern sector of deposit
- WCP, MSP, & initial tailings dam adjacent to deposit
- Only 2 WCP moves in 40 year LOM
- BOO camp and power station

Product Handling & Export

- Products trucked 150km from mine to Derby
- Access agreement over bulk handling facility at Derby
- Product storage & loading at Derby Port
- Barging & transhipment of bulk products
- Close proximity to potential markets



Thunderbird Site Layout Plan



Mine To Port Logistics Chain

CAPITAL COSTS

- Total pre-production capital required to develop the project is estimated to be A\$296.6 million



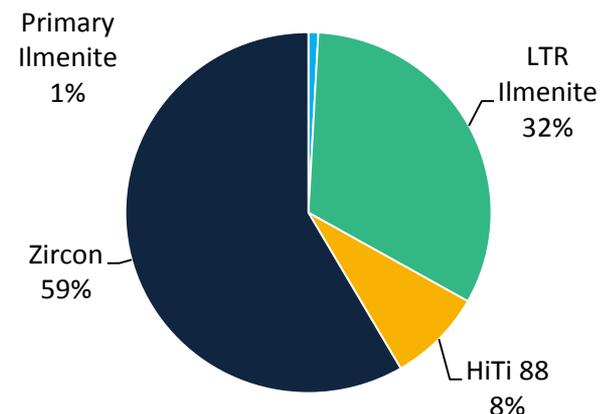
COST AREA	A\$M
Pre-production owners cost	
Sub-total pre-production owners cost	19.7
Project direct costs	
Mining ¹	6.8
Process Water System	9.0
Wet Concentrator Plant	42.0
Mineral Separation Plant	93.0
LTR Plant	27.7
Site Infrastructure ²	16.6
Power Infrastructure ²	6.0
Roads	10.1
Borefield	6.5
Port	9.4
Sub-total direct costs	227.1
Project indirect costs	
EPCM	24.5
Contingency 10%	25.3
Sub-total indirect costs	49.8
GRAND TOTAL	296.6

¹MUPs, mobile equipment, lease-purchased over 5 years. ²Camp and power station are build own operate (BOO). Numbers have been rounded to one decimal place.

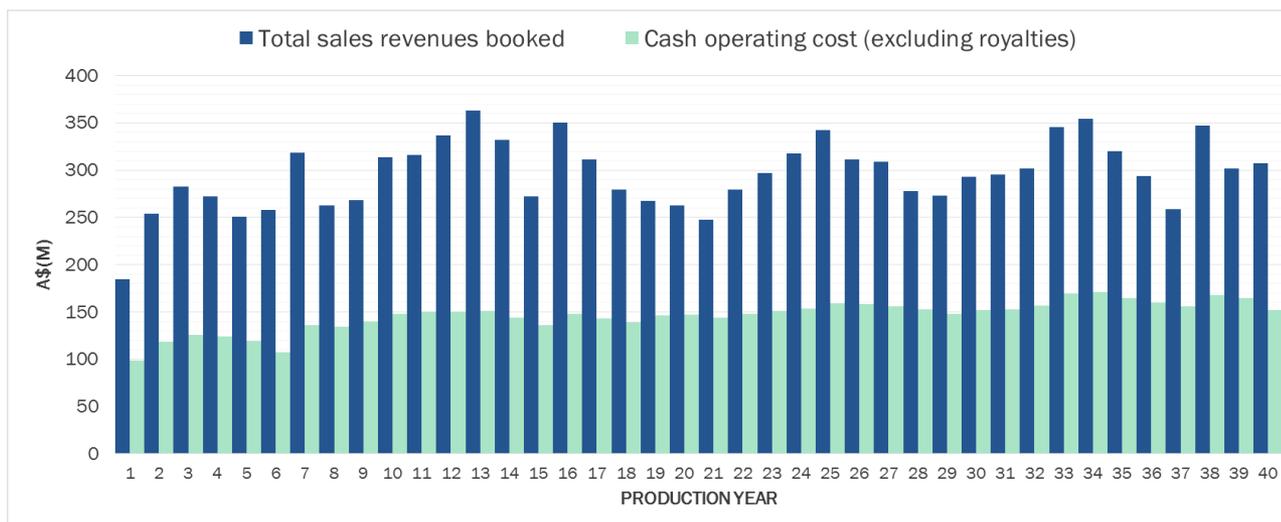
REVENUES

PRODUCT	LOM TONNES	LOM REVENUE (A\$M)
Zircon	4,006,000	6,910
HiTi88	1,052,000	995
LTR Ilmenite	15,283,000	3,821
Primary Ilmenite	559,000	103
TOTAL PRODUCTS	20,900,000	11,829

Production and Revenue Totals LOM



LOM Revenue Distribution



Forecast Annual Revenues and Costs

KEY FINANCIAL OUTCOMES AND ASSUMPTIONS

FINANCIALS		
Key Item	A\$M	LOM
Revenue (LOM total)	A\$M	11,829
Operating Cash Flow (LOM Average)	A\$M pa	149
EBITDA (LOM Average)	A\$M pa	135
EBIT (LOM Average)	A\$M pa	122
Key Item	A\$/tonne of	LOM
Unit Revenue	product	566
Unit Revenue	MUP feed	17.32
Cash operating costs (C1 costs)	product	280
Cash operating costs (C1 costs)	MUP feed	8.57
Royalties	product	28.30
Revenue:Cost ratio (excluding royalties)		2.02
Key Assumptions	US\$ (FOB bulk)	LOM
A\$:US\$ Exchange rate		0.74
Zircon Price	US\$/tonne	1,371
LTR Ilmenite Price	US\$/tonne	185
Primary Ilmenite Price	US\$/tonne	136
HiTi88 leucoxene Price	US\$/tonne	700

MARKETING STUDY – PRODUCT ASSESSMENT BY TZMI

Zircon (59% of revenue)

- Primary zircon product meets the requirements for premium classification for use in the ceramic sector

LTR Ilmenite (32% of revenue)

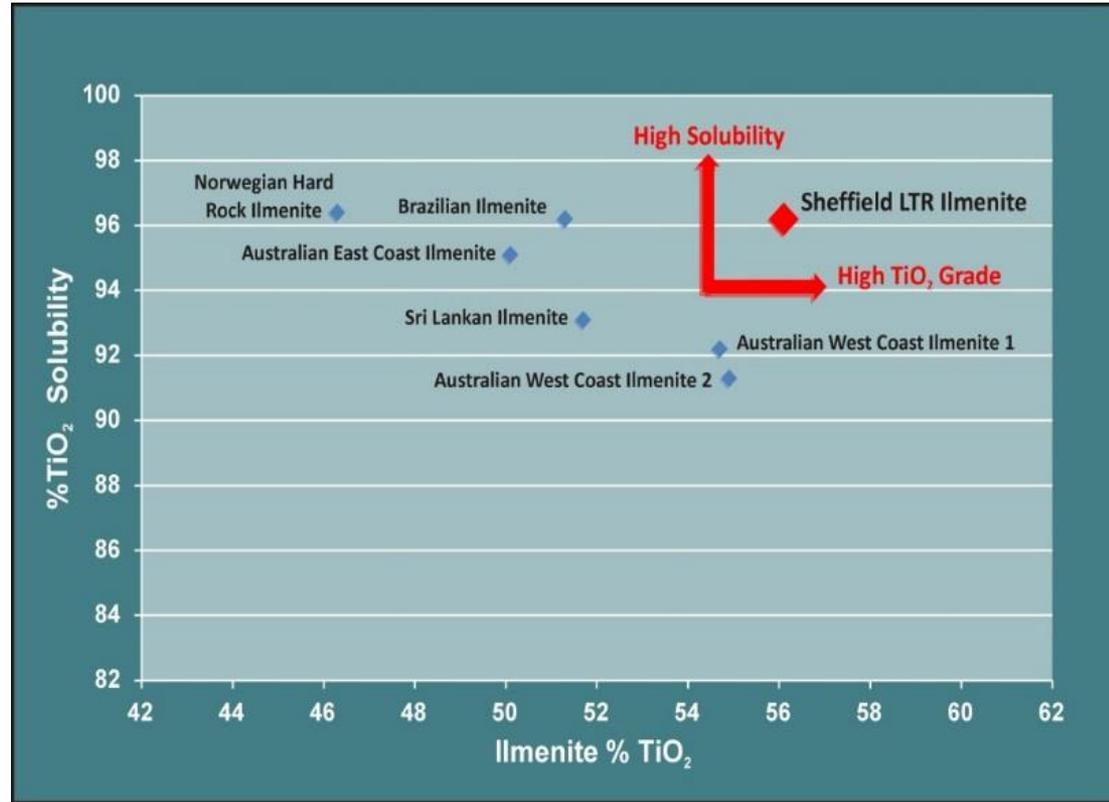
- LTR ilmenite (56.1% TiO_2) is suitable feedstock for sulphate pigment manufacture and, due to low impurities, could be a preferential blend feed
- Smelter modelling showed TiO_2 content of the simulated slag product exceeded levels of typical chloride grade slags available from western ilmenite smelters

HiTi88 (8% of revenue)

- HiTi88 product (87.7% TiO_2 content) is suitable for welding electrode application, particularly for flux core wires

Primary Ilmenite (1% of revenue)

- Primary ilmenite (45.8% TiO_2) is a suitable feedstock for the sulphate-route TiO_2 pigment process



THUNDERBIRD ANALOGY

TRONOX'S NAMAKWA PROJECT¹

- Commenced mining in 1994 (+30 year life)
- Reserves (2012) 432Mt @ 8.8% HM
- In situ grades: 0.80% zircon, 0.22% rutile, 0.48% leucoxene, 3.09% ilmenite
- 21Mtpa mining rate (truck & shovel)
- Annual production approximately 125kt zircon, 300kt ilmenite, 27kt rutile
- Ilmenite production feeds a large titanium smelter (250ktpa Ti slag, 120ktpa pig iron)

THUNDERBIRD PFS METRICS

- +40 year mine life
- Mining Inventory² 685Mt @ 11.3% HM
- In situ grades: 0.87% zircon, 0.55% HiTi+leucoxene, 3.13% ilmenite
- 12-18Mtpa mining rate (dozer trap)
- Forecast annual production approximately 100kt zircon, 396kt ilmenite, 26kt HiTi88
- Ilmenite production could underpin a large titanium smelter or pigment plant



1. Source Exxaro Resources Ltd 2012 Annual Report

2. The term "mining inventory" is used to report that part of the Mineral Resource that has been considered in the Thunderbird Pre-feasibility Study. The mining inventory does not meet the requirements of an Ore Reserve as defined under the 2012 edition of the JORC Code and should not be considered an Ore Reserve. There is no certainty that all or any part of the mining inventory will be converted into Ore Reserves.

KEY POINTS – THUNDERBIRD MINERAL SANDS PROJECT

NEXT STEPS

- Secure exclusive port access - *completed*
- Appointment of BFS Study Manager - *completed*
- BFS to be tendered
- 20t bulk sample met testwork and flow sheet optimisation commencing Q4 2015
- Engineering review and de-bottlenecking studies Q1 2016
- Port lease agreement
- Native Title agreement and Permitting

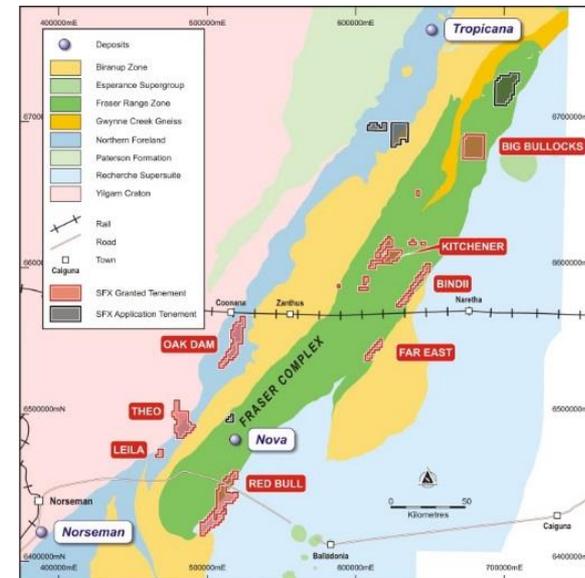
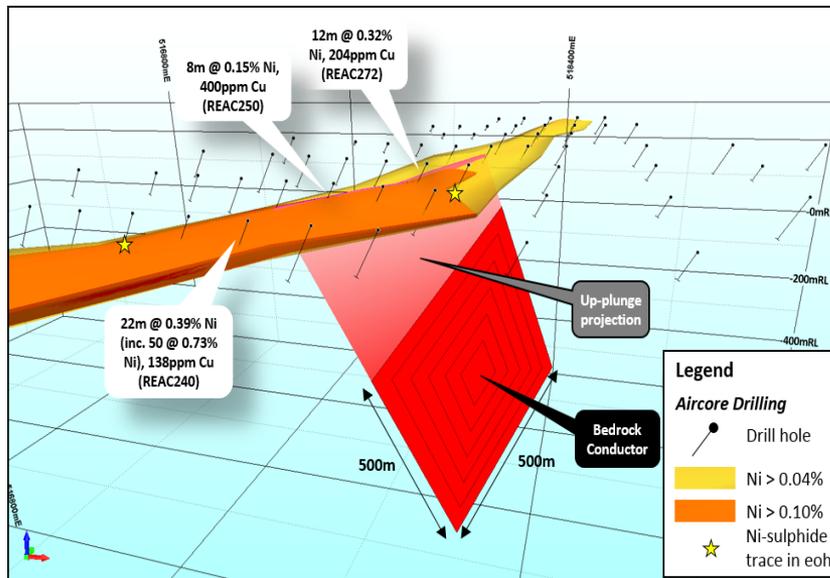
UPSIDE POTENTIAL

- Potential CAPEX and OPEX savings in lower cost environment
- Optimisation of process design, increasing efficiency and recoveries
- Product optimisation work targeting customer requirements
- Develop marketable titanomagnetite product from LTR magnetic fraction
- Customer testing of LTR ilmenite, targeting a potential 5-10% premium
- Assess more efficient mining configurations to reduce mining costs
- Exploration upside - shallow, high grade deposits

ACTIVITY	2015				2016				2017				2018				2019	
	Q1	Q2	Q3	Q4	Q1	Q2												
PFS update	█	█	█	█														
Permitting	█	█	█	█	█	█	█	█										
Bankable Feasibility Study				█	█	█	█	█										
Environmental Approvals				█	█	█	█	█										
Infrastructure	█	█	█	█	█	█	█	█	█	█	█	█						
Engineering Construction									█	█	█	█	█	█	█	█	█	█
Commissioning																	█	█
First Products																		█

FRASER RANGE - RED BULL : HIGH PRIORITY TARGET TO BE DRILLED IN COMING MONTHS

- Red Bull project is within 20km of the Nova Ni-Cu deposit
- Coincident bedrock conductor and nickel geochemical target identified at Stud prospect
- Modelled bedrock conductor of 500m x 500m, depth to top 150-200m
- Anomalous nickel in shallow aircore drill holes up-dip from conductor: e.g. 12m @ 0.32% Ni from 37m (REAC272)
- 1km trend of IP anomalism (possible disseminated sulphide source) extends south from conductor and coincides with >0.1% Ni anomalism in aircore drill holes, e.g. 5m @ 0.73% Ni from 33m (REAC240)
- Traces of nickel and copper sulphides in end-of-hole aircore samples
- Drilling Q4 2015
- Many more targets on 1,900km² of 100% owned tenure in the Fraser Range region



Appendix 1: Thunderbird Deposit Mineral Resource 31 July 2015

Thunderbird Deposit Mineral Resource¹

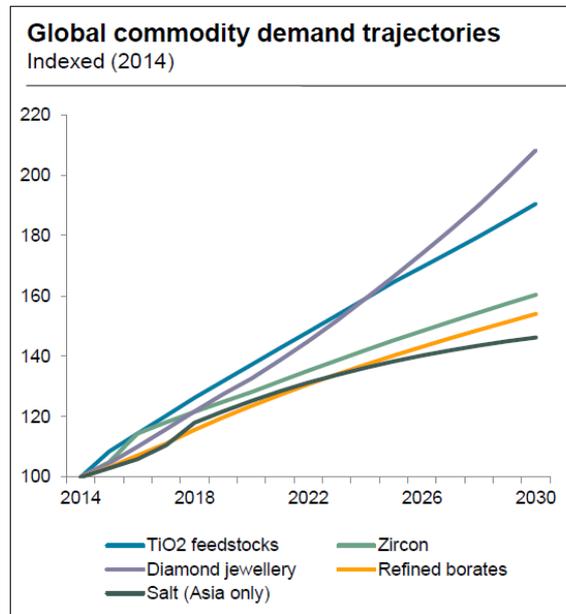
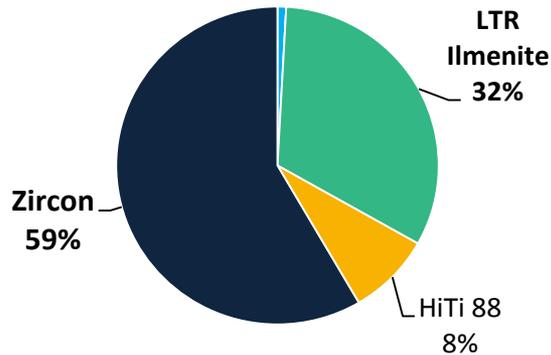
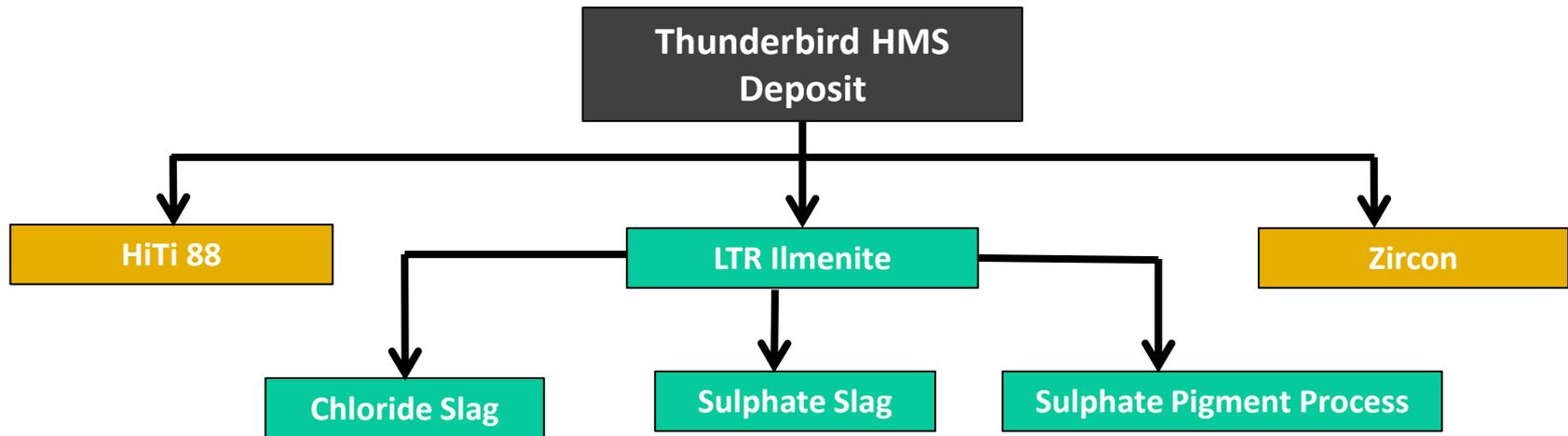
Resource Category	Cut off (HM%)	Zircon (kt)	HiTi Leucoxene (kt)	Leucoxene (kt)	Ilmenite (kt)	Total VHM (kt)
Measured	3.0	1,700	500	500	5,800	8,400
Indicated	3.0	14,000	4,500	5,300	46,700	70,500
Inferred	3.0	2,800	900	1,200	9,300	14,200
Total	3.0	18,500	5,900	6,900	61,800	93,100
Measured	7.5	1,200	300	300	4,300	6,100
Indicated	7.5	7,700	2,400	2,200	27,800	40,000
Inferred	7.5	1,100	300	300	3,900	5,700
Total	7.5	9,900	3,000	2,800	36,000	51,700

Thunderbird Deposit contained Valuable HM (VHM) Resource Inventory¹

Resource Category	Cut off (HM%)	Mineral Resources					In-situ HM (Mt)	Mineral Assemblage ²			
		Material (Mt)	Bulk Density	HM %	Slimes %	Osize %		Zircon %	HiTi Leuc %	Leuc %	Ilmenite %
Measured	3.0	230	2.1	9.4	19	10	21	7.9	2.2	2.1	27
Indicated	3.0	2,410	2.0	6.9	16	8	167	8.4	2.7	3.1	28
Inferred	3.0	600	2.0	5.6	16	9	33	8.4	2.8	3.5	28
Total	3.0	3,240	2.1	6.9	16	9	222	8.3	2.7	3.1	28
Measured	7.5	110	2.2	14.9	17	13	16	7.3	2.1	1.9	27
Indicated	7.5	850	2.1	11.8	15	10	100	7.6	2.4	2.2	28
Inferred	7.5	130	2.0	10.7	14	9	14	7.6	2.3	2.2	28
Total	7.5	1,090	2.1	11.9	15	10	131	7.6	2.3	2.1	28

¹ All tonnages and grades have been rounded to reflect the relative uncertainty of the estimate, thus sum of columns may not equal. ² Estimates of Mineral Assemblage are presented as percentages of the Heavy Mineral (HM) component of the deposit, as determined by magnetic separation, QEMSCAN and XRF. Magnetic fractions were analysed by QEMSCAN for mineral determination as follows: Ilmenite: 40-70% TiO₂ >90% Liberation; Leucoxene: 70-94% TiO₂ >90% Liberation; High Titanium Leucoxene (HiTi Leucoxene): >94% TiO₂ >90% Liberation; and Zircon: 66.7% ZrO₂+HfO₂ >90% Liberation. The non-magnetic fraction was submitted for XRF analysis and minerals determined as follows: Zircon: ZrO₂+HfO₂/0.667 and High Titanium Leucoxene (HiTi Leucoxene): TiO₂/0.94.

Appendix 2: THUNDERBIRD – ZIRCON AND TITANIUM PRODUCT STREAM



Source: Rio Tinto analysis

