Thunderbird Mineral Sands Project

Bankable Feasibility Study Update

Summary Outcomes

31 July 2019

Notice and Disclaimer

IMPORTANT: You must read the following in conjunction with this Bankable Feasibility Study Update (BFSU).

Summary information in relation to Sheffield

This BFSU contains summary information about Sheffield Resources Limited (ACN 125 811 083) (Company or Sheffield), its subsidiaries and their activities which is current as at the date of this BFSU, unless otherwise indicated. The information in this BFSU remains subject to change without notice, and Sheffield is not responsible for updating, nor does it undertake to update, it. This BFSU should be read in conjunction with Sheffield's periodic and continuous disclosure announcements lodged with the Australian Securities Exchange (ASX), which are available at http://www.sheffieldresources.com.au/irm/content/asx-announcements1.aspx?RID=398 or www.asx.com.au.

This BFSU should also be read in conjunction with the risks disclosed in Sheffield's ASX announcement released on 10 December 2018.

Industry data

Certain market and industry data used in connection with or referenced in this BFSU, including in relation to other companies in Sheffield's peer group, may have been obtained from public filings, research, surveys or studies made or conducted by third parties, including as published in industry-specific or general publications. Neither Sheffield or their respective representatives have independently verified any such market or industry data.

Compliance Statements

Information and documentation which forms the basis of the Thunderbird BFS and BFSU in relation to Mineral Resources, Ore Reserves and metallurgy and process design has previously been reported as detailed below. The Company confirms that it is not aware of any new information or data that materially affects the information included in the relevant market announcements and, in the case of the July 2016 Thunderbird Mineral Resources and the July 2019 Thunderbird Ore Reserve, that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. In the case of the announcement entitled "BFS Update Materially Improves Project Economics" dated 31 July 2019, the Company confirms that all material assumptions underpinning any production target and any forecast financial information derived from any production target that is disclosed in this announcement continue to apply and have not materially changed. The Company confirms that the form and context of the Competent Person's findings are presented and have not been materially modified from the original market announcements.

Estimates of Mineral Resources and Ore Reserves and exploration results

This BFSU contains estimates of Sheffield's Ore Reserve and Mineral Resources and information that relates to exploration results.

The Mineral Resources and Ore Reserves of Sheffield have been extracted from Sheffield's ASX releases;

"BFS UPDATE MATERIALLY IMPROVES PROJECT ECONOMICS" 31 July 2019

"THUNDERBIRD ORE RESERVE UPDATE" 31 July 2019

"HIGH GRADE MAIDEN MINERAL RESOURCE AT NIGHT TRAIN" 31 January 2019

"MINERAL RESOURCE AND ORE RESERVE STATEMENT" 3 October 2018

"THUNDERBIRD ORE RESERVE UPDATE" 16 March 2017

"SHEFFIELD DOUBLES MEASURED MINERAL RESOURCE AT THUNDERBIRD" 5 July 2016

The exploration results have been extracted from Sheffield's ASX releases;

"NEW LARGE HIGH GRADE DISCOVERY SOUTH OF THUNDERBIRD" 13 November 2018

"EXCEPTIONAL RESULTS CONFIRM MAJOR DISCOVERY AT NIGHT TRAIN" 9 October 2018

A copy of these announcements is available at http://www.sheffieldresources.com.au/irm/content/asx-announcements1.aspx?RID=398 or www.asx.com.au.

Bankable Feasibility Study ("BFS")

This BFSU contains information that relates to a Bankable Feasibility Study. This information was extracted from the following ASX releases by Sheffield:

THUNDERBIRD BFS DELIVERS OUTSTANDING RESULTS" 24 March, 2017

Other Extracted Information

In addition to those ASX releases referred to above, this BFSU contains information extracted from the following ASX releases:

"SHEFFIELD SIGNS BINDING PRIMARY ILMENITE OFFTAKE AGREEMENT" 1 July 2019

"ADDITIONAL BINDING ZIRCON CONCENTRATE OFFTAKE AGREEMENT SIGNED" 22 July 2019"

"SHEFFIELD SECURES THUNDERBIRD LNG SUPPLY AGREEMENT" 22 January 2019

"SHEFFIELD SIGNS TAURUS DEBT FACILITY AND EPC CONTRACT" 12 November 2018

"FEDERAL ENVIRONMENTAL APPROVAL GRANTED FOR THUNDERBIRD" 28 September 2018

"NAIF APPROVES LOAN FACILITIES TOTALLING A$95M" 19 September 2018

"FAVOURABLE NATIONAL NATIVE TITLE TRIBUNAL OUTCOME" 28 August 2018

"GRANT OF MISCELLANEOUS LICENCES" 27 June 2018

"ADDITIONAL BINDING OFFTAKE SIGNED" 1 February 2018

"BINDING ZIRCON CONCENTRATE OFFTAKE AGREEMENT SIGNED" 12 December 2017

"SHEFFIELD ANNOUNCES EPC PREFERRED CONTRACTOR" 19 October 2017

"EPA RECOMMENDS APPROVAL OF THUNDERBIRD" 9 October 2017

"SHEFFIELD SIGNS MAIDEN BINDING OFFTAKE AGREEMENT" 12 September 2017

"SHEFFIELD SIGNS CORNERSTONE ILMENITE MOU" 29 May 2017

"ADDITIONAL ZIRCON OFFTAKE MOU SIGNED" 10 April, 2017

"QUARTERLY ACTIVITIES REPORT" and "QUARTERLY CASHFLOW REPORT" 30 April 2019

"QUARTERLY ACTIVITIES REPORT" and "QUARTERLY CASHFLOW REPORT" 31 July 2019

"NATIVE TITLE AGREEMENT SIGNED BY TRADITIONAL OWNERS" 1 November 2018

"MINING LEASE GRANTED OVER THUNDERBIRD MINERAL SANDS PROJECT" 26 September 2018

"NATIVE TITLE UPDATE: SHEFFIELD SIGNS CO-EXISTENCE AGREEMENT" 10 September 2018

"STATE MINISTER FOR ENVIRONMENT APPROVES THUNDERBIRD MINERAL SANDS PROJECT" 13 August 2018

"MAIDEN BINDING ILMENITE OFFTAKE AGREEMENT" 21 June 2018

"BINDING OFFTAKE AGREEMENTS EXCEED 50% OF STG 1 REVENUE" 22 December 2017

"COMMENCEMENT OF EARLY WORKS AND TRAINING PROGRAM" 4 December 2017

"SHEFFIELD MANDATES TAURUS FOR US$200M DEBT FACILITY' 18 October 2017

"SHEFFIELD SECURES SECOND BINDING OFFTAKE AGREEMENT" 25 September 2017

"SHEFFIELD LAUNCHES ABORIGINAL EMPLOYMENT PROGRAM" 17 August 2017

"SHEFFIELD SECURES FURTHER ZIRCON OFFTAKE MOUs" 26 April 2017

"THUNDERBIRD ILMENITE EXCEEDS PREMIUM SPECIFICATION" 13 March 2017

The Company confirms that it is not aware of any new information or data that materially affects the information included in the relevant market announcements and, in the case of estimates of Mineral Resources and Ore Reserves, 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 announcements.

Notice and Disclaimer

Not financial product advice

This Bankable Feasibility Study Update (BFSU), and the information provided in it, does not constitute, and is not intended to constitute, investment or financial product advice (nor tax, accounting or legal advice). This BFSU should not be relied upon as advice to investors or potential investors and has been prepared without taking account of any person's individual investment objectives, financial situation or particular needs. Any investment decision should be made based solely upon appropriate due diligence. Before making an investment decision, prospective investors should consider the appropriateness of the information having regard to their own investment objectives, financial situation and needs and seek legal, accounting and taxation advice appropriate to their jurisdiction. Recipients of this BFSU are advised to consult their own professional advisers. An investment in any listed company, including Sheffield, is subject to significant risks, both known and unknown and including (without limitation) risks of loss of income and capital. A number of risks are beyond the control of Sheffield.

Effect of rounding

A number of figures, amounts, percentages, estimates, calculations of value and fractions in this BFSU are subject to the effect of rounding. Accordingly, the actual calculation of these figures may differ from the figures set out in this BFSU.

Financial data

All currency amounts are in Australian Dollars ($ or A$) unless otherwise stated.

Future performance, forward-looking statements and key risks

This document is to be read in conjunction with the information contained in Appendices and the the BFSU announcement and the Ore Reserve announcement of 31 July 2019.

This BFSU contains certain "forward-looking statements". Forward-looking statements can generally be identified by the use of forward looking words such as "forecast", "likely", "believe", "future", "project", "opinion", "guidance", "should", "could", "target", "propose", "to be", "foresee", "aim", "may", "will", "expect", "intend", "plan", "estimate", "anticipate", "continue", “indicative" and "guidance", and other similar words and expressions, which may include, without limitation, statements regarding plans, strategies and objectives of management, anticipated production dates, expected costs or production outputs for the Company, based on (among other things) its estimates of future production of the Thunderbird Project and the future operation of Sheffield and the Thunderbird Project.

To the extent that this BFSU contains forward-looking information (including forward-looking statements, opinions or estimates), the forward-looking information is subject to a number of risk factors, including those generally associated with the mineral sands industry. Any such forward-looking statement also inherently involves known and unknown risks, uncertainties and other factors that may cause actual results, performance and achievements to be materially greater or less than estimated. These factors may include, but are not limited to, changes in commodity prices, foreign exchange fluctuations, general economic and share market conditions, increased costs and demand for production inputs, the speculative nature of exploration and project development (including the risks of obtaining necessary licenses and permits and diminishing quantities or grades of reserves), changes to the regulatory framework within which the Company operates or may in the future operate, environmental conditions including extreme weather conditions, geological and geotechnical events, and environmental issues, and the recruitment and retention of key personnel.

Any forward-looking statements are also based on assumptions and contingencies which are subject to change without notice and which may ultimately prove to be materially incorrect, as are statements about market and industry trends, which are based on interpretations of current market conditions. Investors should consider the forward-looking statements contained in this BFSU in light of those disclosures and not place reliance on such statements. The forward-looking statements in this BFSU are not guarantees or predictions of future performance and may involve significant elements of subjective judgment, assumptions as to future events that may not be correct, known and unknown risks, uncertainties and other factors, many of which are outside the control of Sheffield. As a result, there can be no assurance that actual outcomes will not materially differ from these forward-looking statements. The forward-looking statements are based on information available to Sheffield as at the date of this BFSU. Except as required by law or regulation, Sheffield undertakes no obligation to provide any additional or updated information or update any forward-looking statements, whether as a result of new information, future events or results or otherwise.

Indications of, and guidance on, future performance are also forward-looking statements, and include statements in this BFSU regarding anticipated mine life, expected or indicative costs, indicative revenues, indicative production outputs and anticipated production dates. To the maximum extent permitted by law, Sheffield, and its respective directors, officers, employees, advisers, agents and intermediaries (together, "Relevant Parties") disclaim any obligation or undertaking to release any updates or revisions to the information to reflect any change in expectations or assumptions, or any change in events, conditions or circumstances on which any such information or statement is based. Nothing in this BFSU will, under any circumstances (including by reason of this BFSU remaining available and not being superseded or replaced by any other BFSU or publication with respect to Sheffield or the subject matter of this BFSU), create an implication that there has been no change in the affairs of Sheffield since the date of this BFSU.

To the maximum extent permitted by law, the Relevant Parties make no representation or warranty (express or implied) as to the fairness, accuracy, reliability, currency, reasonableness or completeness of the contents of this BFSU or any other information (whether written or verbal) that the Relevant Parties otherwise provide to the recipient. The recipient may not rely on the contents of the BFSU or any information in it in making any decision to invest or acquire an interest in the Thunderbird Project. To the maximum extent permitted by law, the Relevant Parties are not liable for any direct, indirect or consequential loss or damage suffered (whether foreseeable or not) by any person (whether arising from negligence or otherwise) as a result of relying on this BFSU or the information in it, any errors therein or omissions therefrom, or any other written or oral communications transmitted to the recipient in the course of its evaluation of the Thunderbird Project, or otherwise in connection with this BFSU or the information in it.

Investment risk

As noted above, an investment in Sheffield securities is subject to investment and other known and unknown risks, a number of which are beyond the control of Sheffield. Sheffield (nor its related bodies corporate) does not guarantee any particular rate of return or the performance of the Company or the Thunderbird Project, nor does it guarantee the repayment of capital from Sheffield or any particular tax treatment. Prospective investors should make their own enquiries and investigations regarding all information in this BFSU, including but not limited to the assumptions, uncertainties and contingencies which may affect future operations of Sheffield and the Thunderbird Project and the impact that different future outcomes may have on Sheffield and the Thunderbird Project.

Not an Offer

This BFSU is for information purposes only and does not constitute or form any part of any offer or invitation to sell or issue, or any solicitation of any offer to purchase or subscribe for, any securities in the Company in any jurisdiction. This BFSU and its contents must not be distributed, transmitted or viewed by any person in any jurisdiction where the distribution, transmission or viewing of this document would be unlawful under the securities or other laws of that or any other jurisdiction.

SECTION I

Summary Key BFS Update Outcomes

Thunderbird Bankable Feasibility Study Update

Clear set of objectives - zircon focus, reduce capital, increase production and revenue to deliver meaningful improvements to project financial metrics with reduced risk

Bankable Feasibility Study Update (BFSU) Objectives	• Reduce Stage 1 capital costs • Reduce equity funding gap and maintain approved project debt • Enhance revenue through increased zircon production and binding offtake for 100% of product volume • Deliver meaningful improvement in Project NPV and IRR • Inform operating and financial assumptions with executed and negotiated agreements • Significantly reduce execution risk of construction, commissioning and ramp up • Maintain shovel ready approval status • Engage with key project Stakeholders
Project Shovel Ready Status Since January 2019	• Mining Lease granted and Native Title Agreement executed • State and Federal Environmental Approvals granted • Works Approval received • Executed gas supply agreement with Woodside and EDL • Negotiated key agreements for Catering and Mining Services • Early work completed initial Village accommodation, site communications and access road from highway well advanced • Tier 1 mining jurisdiction

BFS Update Partners.

GR	• Process and non process infrastructure design CAPEX and OPEX cost
Optiro	• Resource Estimation
entech.	• Mining Studies, Mining Cost Estimates and JORC Ore Reserve
ATC Williams	• Tailings Management
IMC ROBBINS	• Bulk Metallurgical test work and analysis
MBS ENVIRONMENTAL	• Environmental Approval and assessments

Thunderbird Bankable Feasibility Study Update

Comparative analysis - BFSU outcomes compared to prior assumptions

Metric	2019 BFSU	Previous Disclosures	Change
Total Funding Requirement	**A$478m**	A$579m[1]	▼ A$101m (17%)
Equity Requirement	**A$143m**	A$251m[1]	▼ A$108m (43%)
Project Capital	**A$392m**	A$463m[1]	▼ A$71m (15%)
Project Revenue	**A$15.1B**	A$13.6B[2]	▲ A$1.57B (11%)
Project operating costs	**A$7.21B**	A$7.63B[2]	▼ A$0.42B (6%)
NPV_{10} pre-tax	**A$1.13B**	A$0.67B[2]	▲ A$0.46B (69%)
NPV_8 post-tax	**A$0.98B**	A$0.62B[2]	▲ A$0.36B (58%)
IRR pre-tax %	**30.1%**	24.9%[2]	▲ 5.2% (21%)
Zircon production (average '000tpa)	**202**	145[2]	▲ 57 (39%)
Offtake	**~100%**	>75%	▲ Full
LTR & Ilmenite Process Circuit	**Not Required**	Included in Stage 1[2]	Removed
Process Rate (t/hr)	**1,085**	788[2]	▲ 297 (38%)
Mine Life	**37 years**	42 years[2]	▼ 5 years (12%)
Long Term Average FX Rate (A$/US$)	**0.75**	0.75[2]	No change
Long Term Zircon Price - FOB (TZMI)	**US$1,469**	US$1,387[2]	▲ US$82 (6%)

- Reduced Stage 1 capital costs
- Reduced remaining equity requirement
- Strong cashflows targeting similar debt capacity
- Roasting and ilmenite circuit removed
- 38% increase to plant capacity and throughput
- 10% increase in Ore Reserve
- Lower unit costs from increased plant throughput
- Shorter mine life & reduced gas consumption from LTR removal
- Offtake secured for ~100% of product revenue Stage 1
- Robust pricing - structural supply shortage for zircon and TiO_2 feedstocks

Reference:
1. ASX Announcement "*Joint Kimberley-Pilbara Regional Forum*" 11 June 2019
2. ASX Announcement "*Thunderbird BFS Delivers Outstanding Results*" *24 March 2017*

Staged Approach to Project Development

Staged development to minimise initial capital costs and delivery risk

- The large scale of Thunderbird's ore body allows for multiple stages of development, with shared infrastructure from Stage 1
- As a result, the current execution strategy is planned in two stages of development with the purpose of minimising up front capital and delivery risk whilst still ensuring material scale in Stage 1
- Stage 1 – Single line mining, concentrator and zircon processing process plant and all associated site and port infrastructure
- Stage 2 – Scaled down version of Stage 1 with incremental increase in associated site infrastructure

	Stage 1	Stage 2 (year 5 of operations)
Timing	• Construction ready • First production expected in H2 2021	• Following full ramp up of Stage 1 • First production expected in year 5
Scope	• Mining Unit Plant (MUP), Wet Concentrator Plant (WCP), Zircon Processing Plant (ZPP) • Power, gas storage, port, road and non-process related infrastructure • Accommodation village • All other logistics systems and infrastructure necessary	• Duplication of Stage 1 Mining and Processing Scope • Power station and gas storage increase • Accommodation increase
Total development capital	**A$392m**[1] • Stage 1 direct capital expenditure • Includes long tenor infrastructure and improvement capex supported by NAIF funding	**A$237m** • Sheffield's estimate based on BFS Stage 1 To be confirmed prior to Stage 2 investment decision and implementation • May be funded from internal cash flow and/or refinancing of Stage 1 debt

1. Excludes project finance related funding requirements (cost overrun provision, interest charges during construction and financing fees) of A$86m and corporate overhead costs of $13m during construction

Thunderbird Bankable Feasibility Study Update

Zircon focus, reduce capital, increased revenue and reduced risk

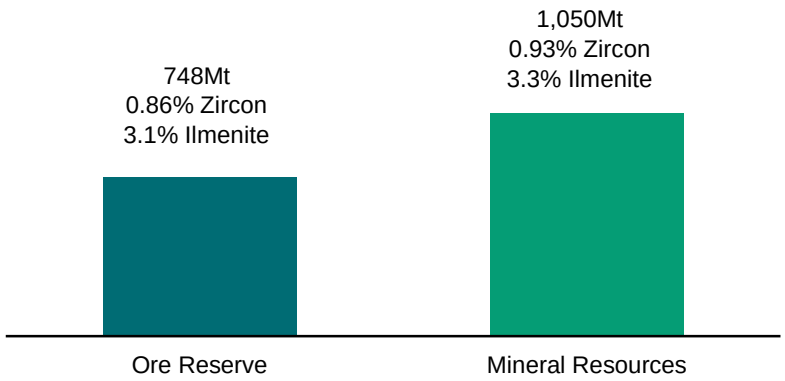
World Class, High Grade Mineral Sands Deposit

- Ore Reserve[1] of 748Mt @ 11.2% HM and >1,050Mt Mineral Resources[1] (>80% in the Measured & Indicated category)
- **Conservative** revenue factor of 0.70 applied to guide the Ore Reserve economic boundary, drives high revenue to cost ratio
- **Among the world's largest and highest grade, zircon rich mineral sand deposits**
- 97% of the first 8 years mining is sourced from the high confidence **Proved** Ore Reserve category
- Mineralisation extends from surface to a maximum known depth of 155m over an area at least 11km by 7km, open at depth

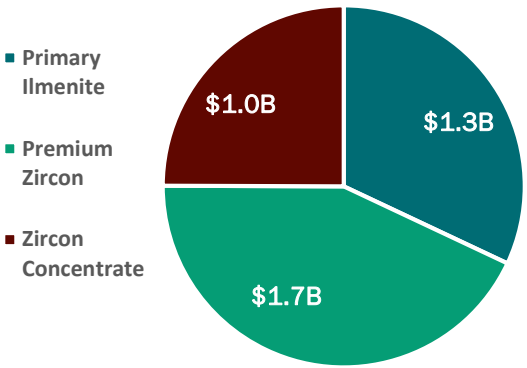
Strong Project Economics and Ratios

- Pre-tax NPV_{10} A$1.13B[2] and IRR 30.1%[2]
- Post-tax NPV_8 A$0.98B[4] and IRR 24.0%[4]
- Stage 1 CAPEX[3] of A$392m
- Stage 2 CAPEX of A$237m
- Strong forecast annual average EBITDA
  - Stage 1 (Year 1 – 4): A$131m
  - Stage 1 and 2 (Year 5 – 10): A$250m
- High confidence average revenue to cost ratio
  - Stage 1 (Year 1 – 4): 2.2:1
  - Stage 1 and 2 (Year 5 – 10): 2.4:1
- Life of Mine forecast revenue = $15.1B
- Assumed Long Term FX Rate (USD:AUD) = 0.75

Thunderbird Ore Reserve and Mineral Resources[1]



Estimated A$ Revenue by Product Stage 1 and 2 (Years 1 – 10)



Commodity Prices ($US FOB)	Stage 1 FY 2022 – 2025	Stage 1 and 2 FY 2026 – 2031	LOM
Premium Zircon	1,520	1,469	1,472
Zircon Concentrate	689	718	723
Primary Ilmenite	102	94	95

1. ASX Announcement dated 31 July 2019 titled *"Thunderbird Ore Reserve Update"* and 5 July 2016 titled *"Sheffield doubles measured Mineral Resource at Thunderbird"*
2. Pre-tax & pre-finance NPV based on 10% WACC. NPV and IRR based project cashflows only (i.e. excludes Sheffield's other project finance related funding requirements)
3. Capex depicts direct capital expenditure only. Excludes other project financing related costs of $86m
4. Post-tax & pre-finance NPV based on 8% WACC. NPV and IRR based project cashflows only (i.e. excludes Sheffield's other project finance related funding requirements)

Thunderbird Bankable Feasibility Study Update

Zircon focus, reduce capital, increased revenue and reduced risk

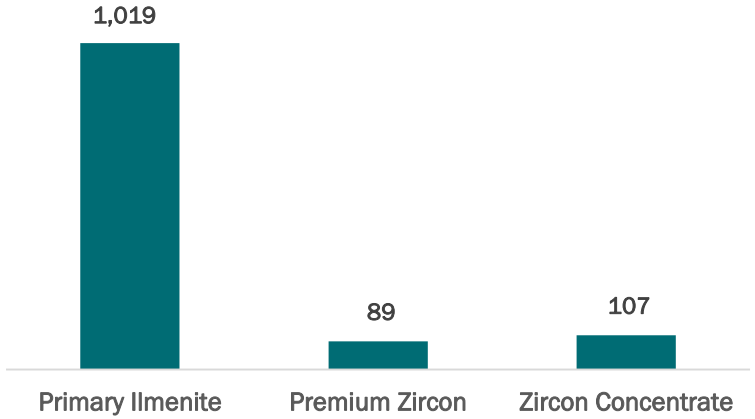
Globally significant Outputs and Project Physicals

- Sheffield aims to be a globally significant **zircon** producer with estimated average production of:
  - Stage 1 (Year 1- 4): 132ktpa
  - Stage 2 (Year 5- 10) 238ktpa
  - LOM Average: 202ktpa
- Dry ore mining and WCP capacity
  - Stage 1 MUP @ 10.4Mtpa and WCP @ 1,085 dry tph
  - Stage 2 MUP @ 20.8Mtpa and WCP @ 2,170 dry tph
- Very low Waste : Ore strip ratio of 0.85:1.0
- Topsoil, waste, over size rehandle and in pit tailing construction by truck and excavator. Total estimated average annual movement:
  - Year 1 – 4 = 7.9Mt waste materials
  - Year 5 - 10 = 21.6Mt waste materials

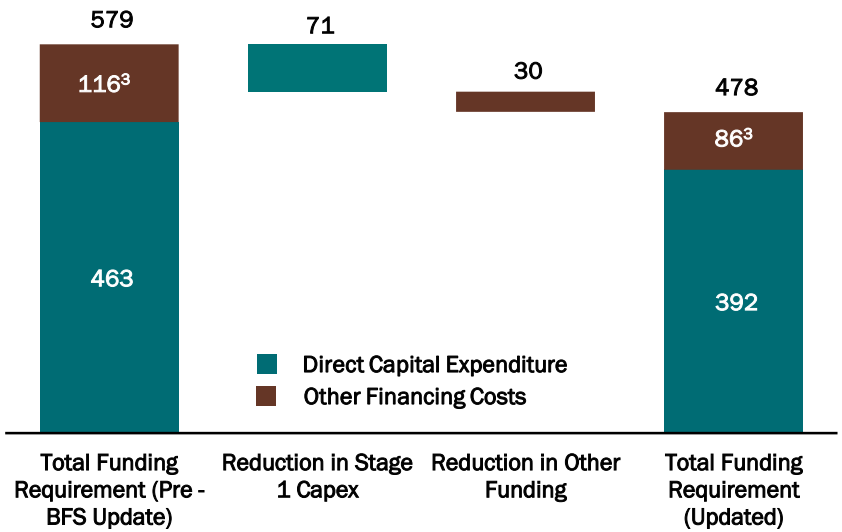
Funding and Pathway to Production

- Total funding requirement reduced by A$101m
- Stage 1 direct project Capex cost of A$392m
- Available debt facilties[1] of US$175m (A$240m[2]) and NAIF facility A$95m
- Estimated remaining equity requirement of A$143m
- Strategic Partner Process continues
- Lender due diligence scheduled for Q3/Q4 2019
- Construction Schedule – 21 months from notice to proceed
- Commissioning – single processing stream, 3 products only, reduced risk
- Targeted First Products – H2 2021

Thunderbird Annual Average Production Years 1 to 10 (ktpa)[2]



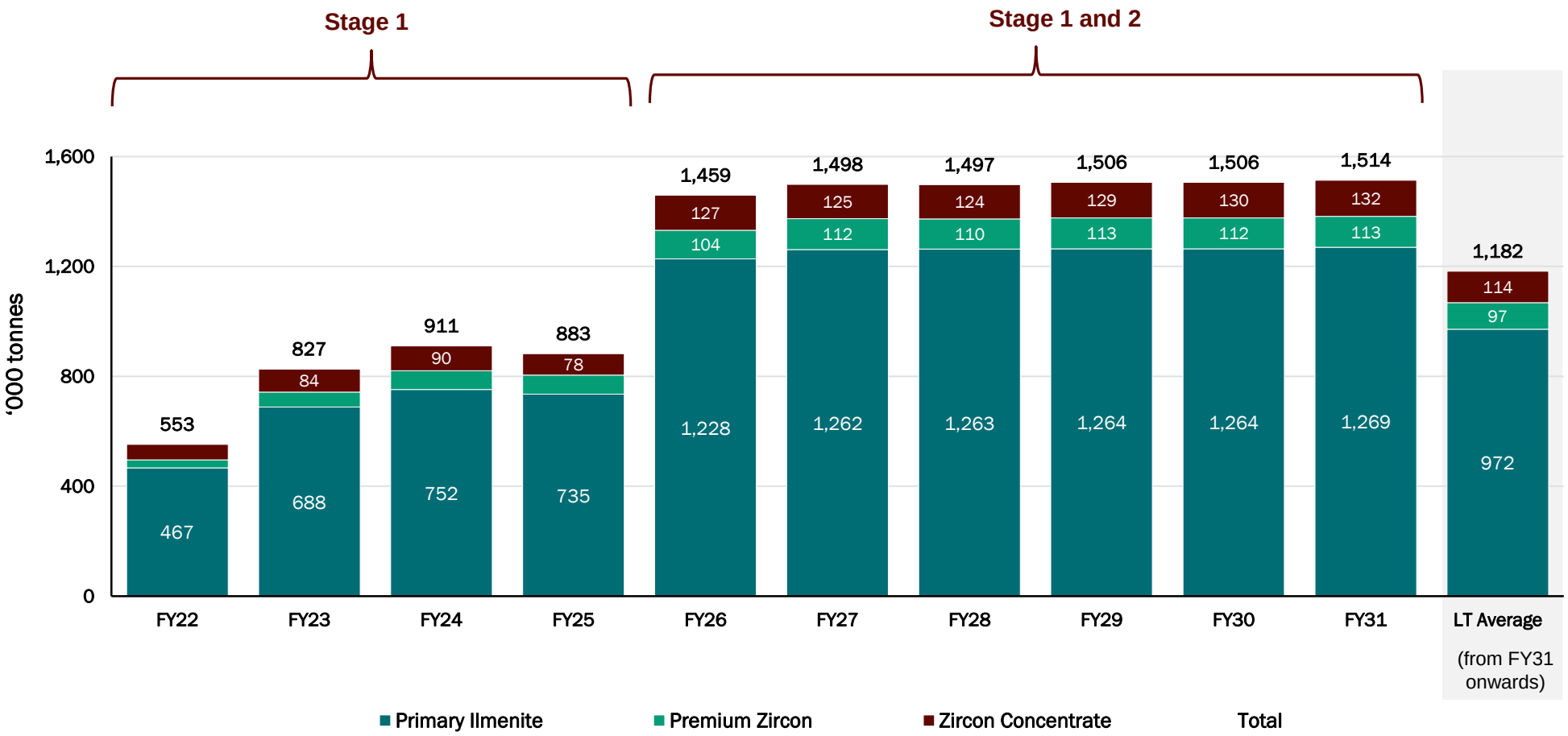
Funding Requirement A$m



1. Subject to financing completion
2. USD:AUD average exchange rate of 0.73
3. Includes cost overrun, interest, working capital, fees, etc

Indicative Mine Schedule

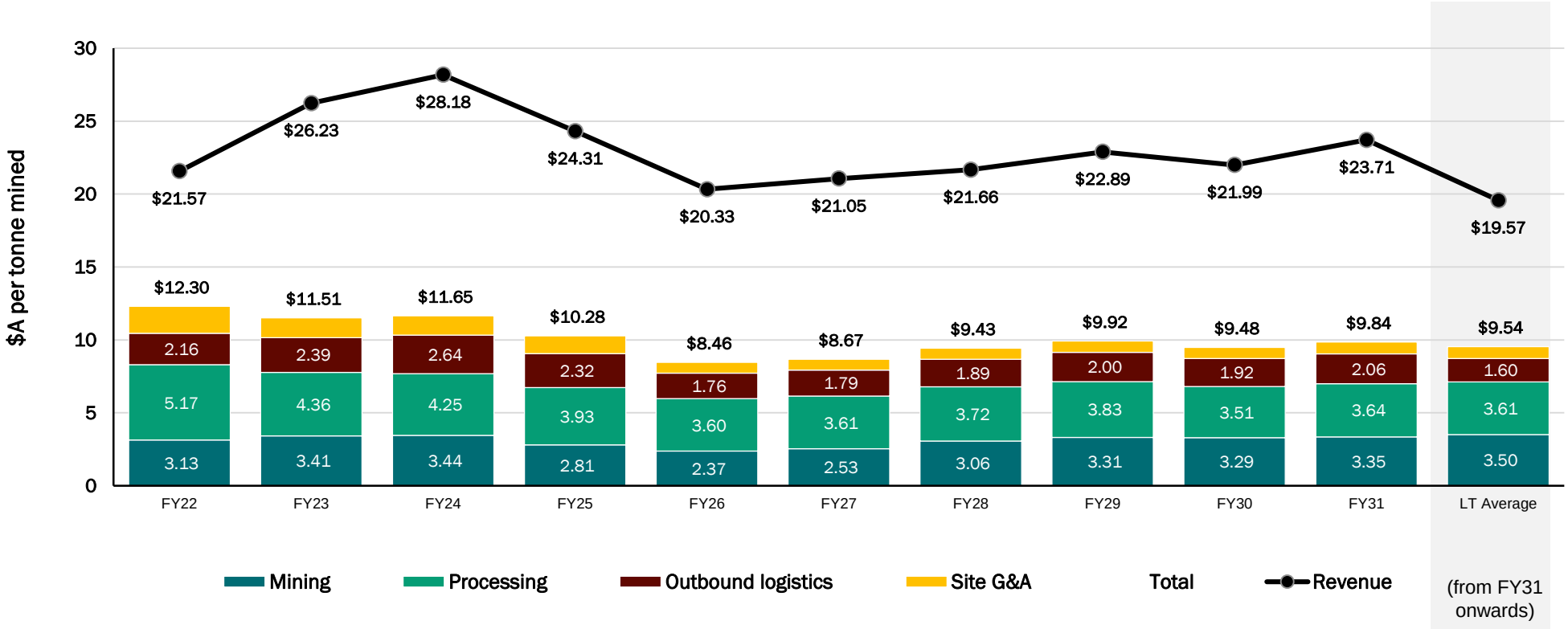
LOM plan to deliver 202ktpa zircon and 961ktpa ilmenite on average over a 37 year mine life



Note:
This page sets out production profile information for Stage 1 and Stage 2 of the Thunderbird Project. Such information is derived from the financial model prepared by Sheffield for Stage 1 and Stage 2 of the Thunderbird Project. The financial model for Stage 2 is based on current Sheffield management estimates, which will be confirmed prior to a Stage 2 investment decision and its implementation. Such estimates are based on, among other things, a detailed mine plan prepared as part of the BFS Update for the life of mine (including Stage 2) and other BFS Update assumptions for Stage 2, which, where relevant, have been adjusted to reflect contractual outcomes and the results of due diligence on Stage 1. Actual volumes produced will be subject to a number of risks and uncertainties and therefore may vary from this current, indicative profile

A Strong Cash Operating Margin

Revenue and Site Cash Costs A$ per tonne of Ore Mined (Production Years)



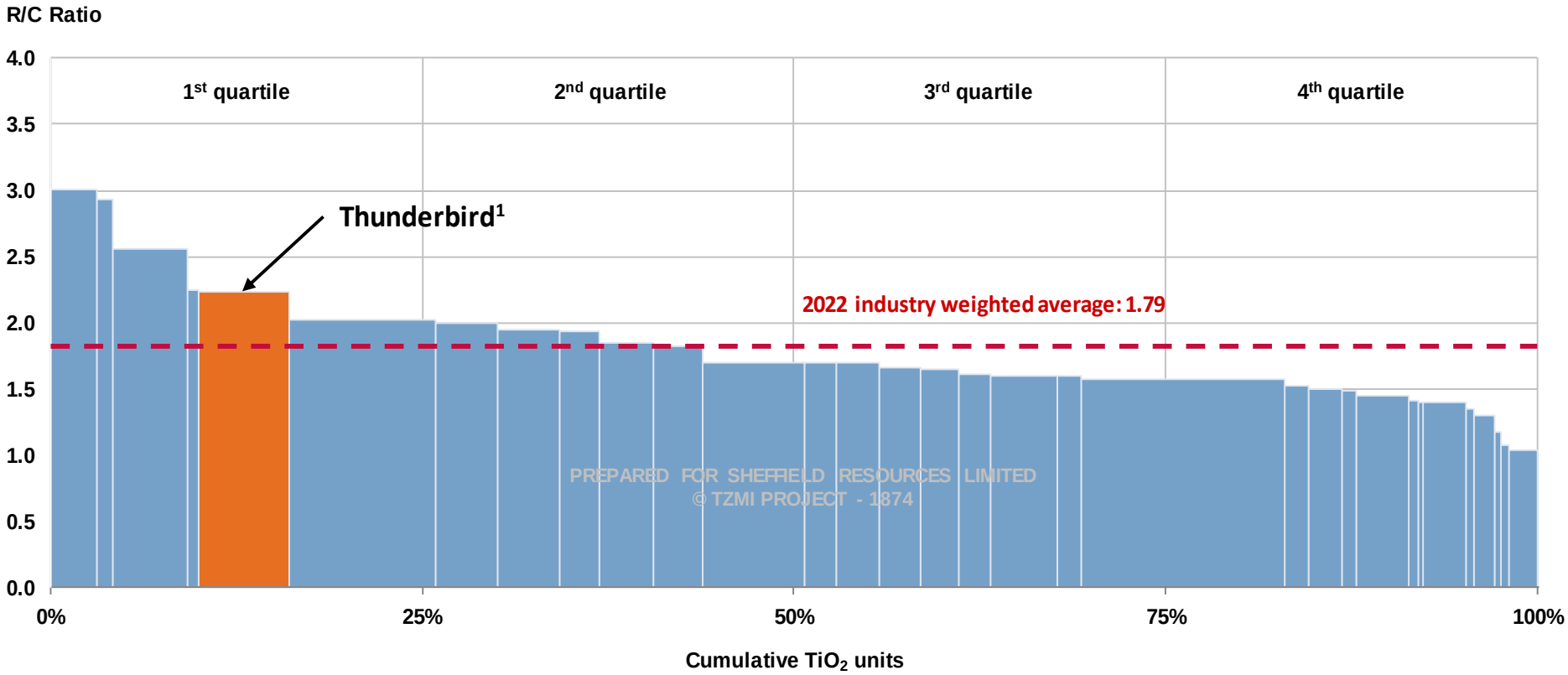
- Very strong cash margin with revenue to cost ratio well above 2:1
- Strongly leveraged to zircon production
- Stage 2 expected to deliver significantly reduced unit costs

Note:
This page sets out the unit cash operating costs and revenues for the first 10 years of the Thunderbird Project. Such information is derived from the financial model prepared by Sheffield. Such estimates are based on, among other things, a detailed mine plan, negotiated contracts with key suppliers. Actual outcomes will be subject to a number of risks and uncertainties and therefore may vary from this current, indicative profile

One of the Highest Margin Projects Globally

Thunderbird is in the first quartile - one of the highest margin projects globally

Independent TZMI Feedstock Cost Study for CY 2022 (Published 2018)

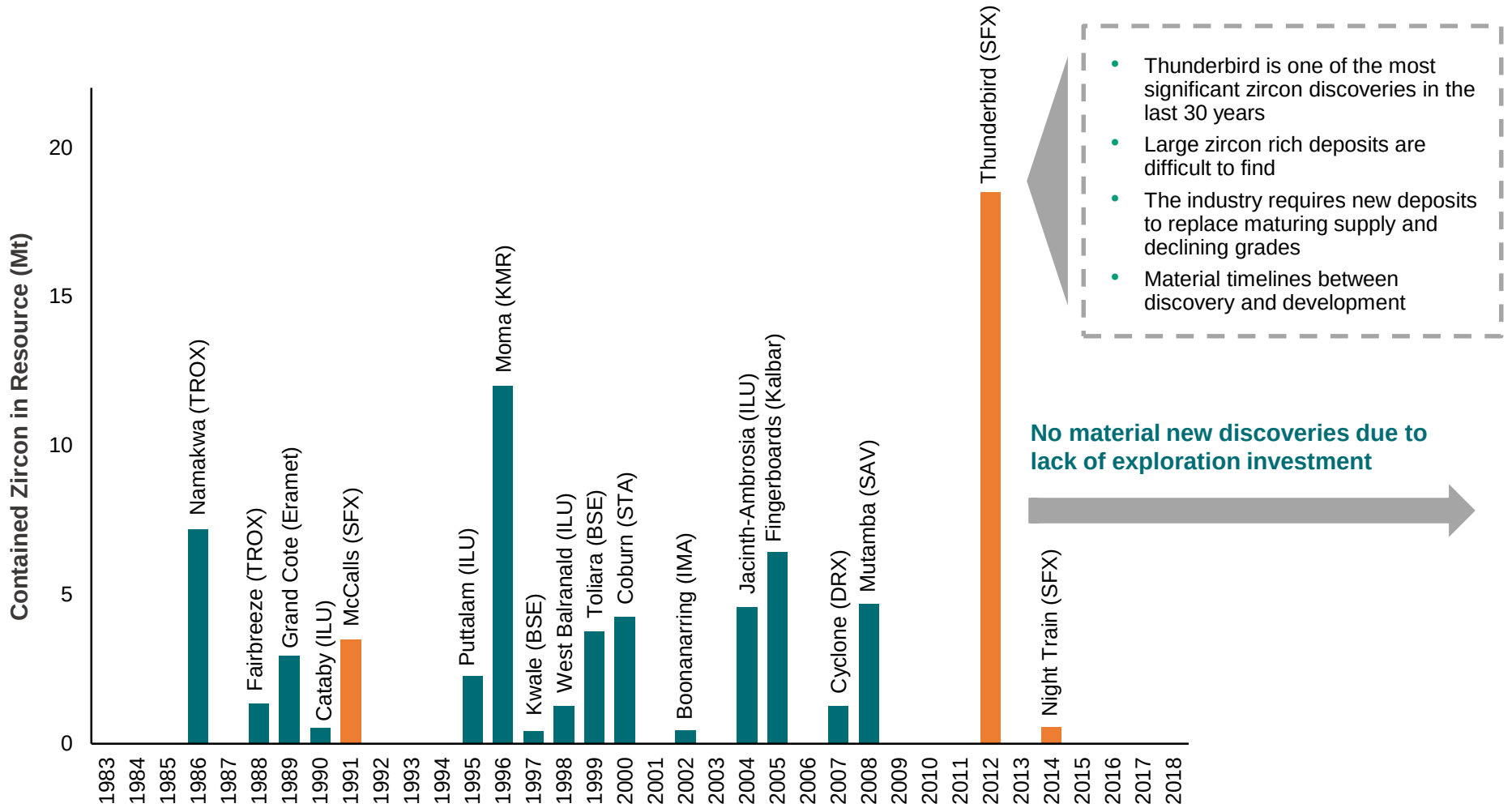


Note:
1. Period represented for Thunderbird is the 4 year period post ramp up, equalling CY 2024 to 2027 inclusive. RC ratio is based on the TZMI 2018 feedstock cost study using long-term pricing and forecast exchange rate. The R/C ratio for Thunderbird has was determined using standard TZMI methodology with production, cost and product pricing assumptions provided by Sheffield Resources. The industry curve was determined by TZMI using TZMI estimates. Accordingly, the information set out on this page is not and should not be interpreted as a forecast. Sheffield does not have sufficient certainty (and therefore does not yet have a reasonable basis) in order to issue any cost or revenue forecasts.

A Globally Significant Zircon Discovery

Only opportunity to secure a large scale greenfield zircon project

Globally significant zircon discoveries over the past 30 years based on published pre-production resources[1]



Note:

1. Thunderbird Mineral Resource as published on the ASX on 5 July 2016. Thunderbird Mineral Resource ranked against published pre-production Mineral Resources of current mineral sands operations and projects > 2M tonnes contained zircon plus selected deposits < 2Mt contained zircon under investigation globally. Data compiled by Sheffield from public sources

SECTION II

Thunderbird Project Overview

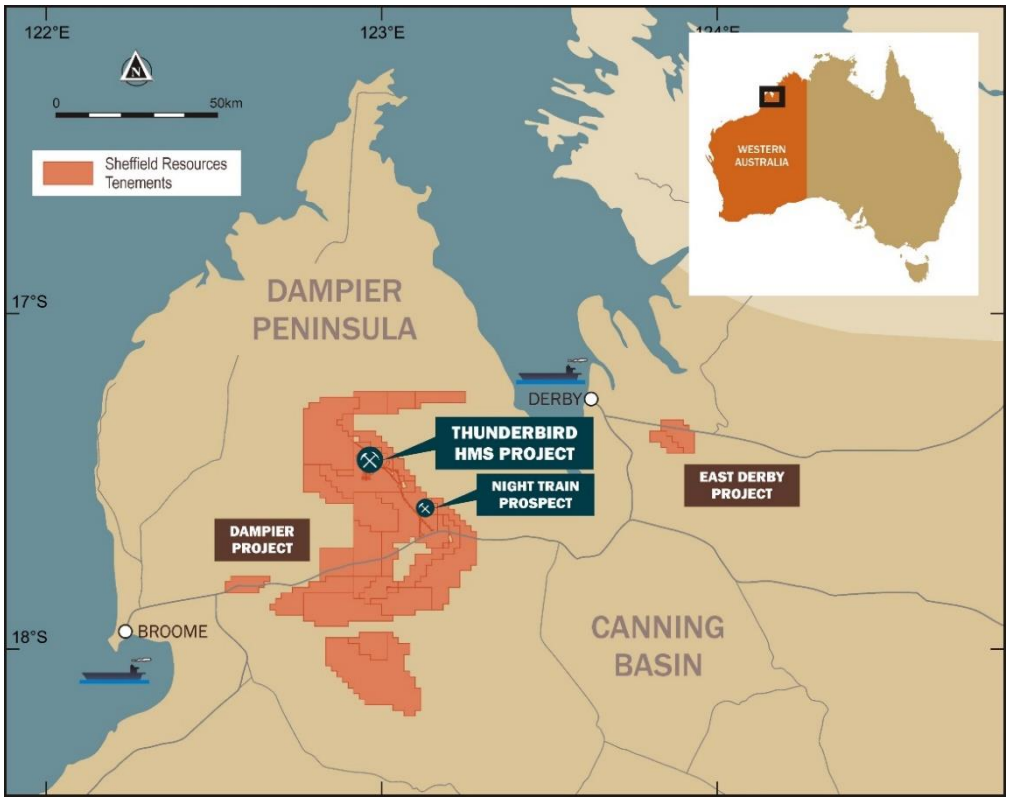
Thunderbird Location Jurisdiction Overview

Thunderbird is a large scale, high grade zircon focused project in a Tier 1 mining jurisdiction

Western Australia is a Tier 1 Jurisdiction

- Located on the Dampier Peninsula in northern Western Australia
- Environmental low risk location on existing pastoral property and away from river water sheds
- Large-scale, high grade, zircon focused mineral sands project
- New underexplored Mineral Sand Provence in which Sheffield has large dominant land tenure positioned along 160km highly mineralised trend[1]
- One of the best mining jurisdictions in the world with a history of mining and existing skilled workforce[2]
- Existing infrastructure supporting Project development
  - 148km from Broome, international airport, Port facilities and support services
  - 146km from Derby, domestic airport, Port facilities with existing ship loader and mining industry support services
- Thunderbird is connected to both ports via the sealed major national highway
- Close proximity to offtake partners provides competitive shipping costs

Location



1. Refer to ASX announcement 31 January 2019 titled *"High Grade Maiden Mineral Resource at Night Train"*
2. *Fraser Institute Survey of Mining Companies, 2016*

History of Thunderbird

A greenfield project rapidly progressed by Sheffield from the grassroots exploration stage in 8.5 years

Key milestones pre BFS release

Dec 2010: Exploration Licence application

Applied for Exploration Licence E04/2083, covering the Thunderbird deposit

Sep 2011: Tenement Grant

For the area surrounding and including Thunderbird

2012: Maiden Resource

Commenced first drilling program and released maiden Mineral Resource for Thunderbird

2013: Industry recognition

Awarded the "Digger and Dealers Mining Forum Best Emerging Company Award" and the "Australian Mining Prospect Awards Explorer of the Year"

2014: Resource expansion, Scoping Study

Significant increase in total Mineral Resources and released scoping study results

Mar 2015: Coordinated project

Thunderbird designated a Level 2 Lead Agency Project Proposal by the Western Australia Department of Mines and Petroleum

Oct 2015: Increase in scale

Released an update to the PFS modelling indicating a substantial increase to scale

Mar 2017: BFS release

Released BFS study

Mar 2017: Thunderbird Ore Reserve Update

Ore Reserve of 680.5Mt at 11.3% HM

Key milestones post 2017 BFS release

May 2018: Port

Signed 20 year Derby Port Access Agreement for long term access to an existing bulk handling facility and associated infrastructure

Oct 2017: Taurus debt

Mandated Taurus as lead arrangers and underwriters for a US$175m debt finance facility

Sep 2018: Permits

Mining Lease, State and Federal environmental approvals granted, finalising key permits for development

Sep 2018: NAIF debt

NAIF approves loan facilities totalling A$95m

Nov 2018: EPC contract

Signed fixed price, lump sum, EPC contract with GR Engineering Services

Nov 2018: Native Title

Native Title Agreement signed with Traditional Owners

BFSU release

Jul 2019: Bankable Feasibility Study Update

BFSU release with reduced capital, updated Ore Reserve and significantly improved Project returns

Jan 2019: Strategic Partner Process

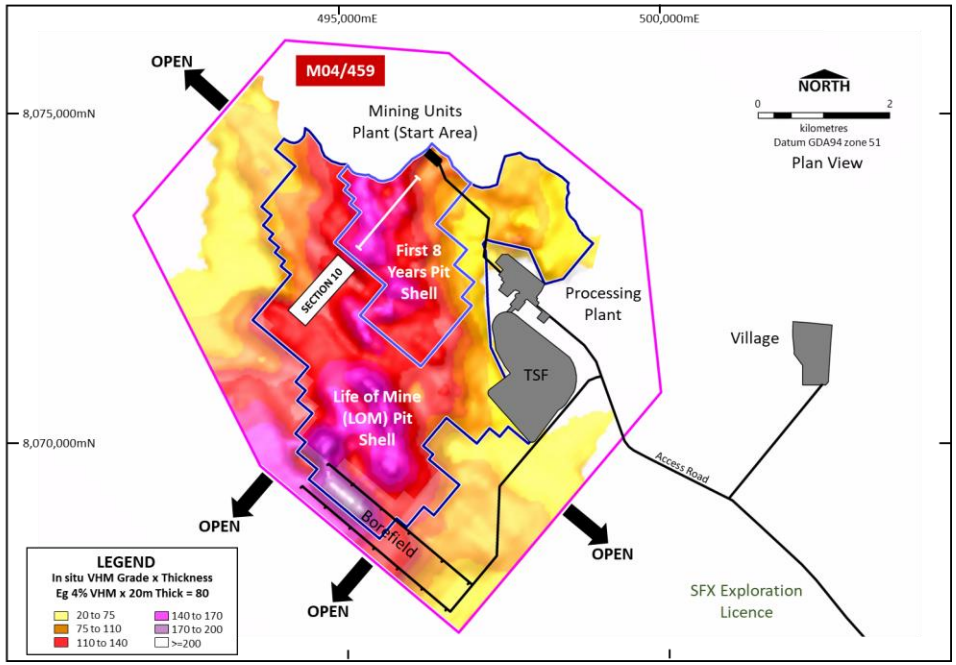
UBS led process to assess opportunities to introduce strategic partner to advance Project

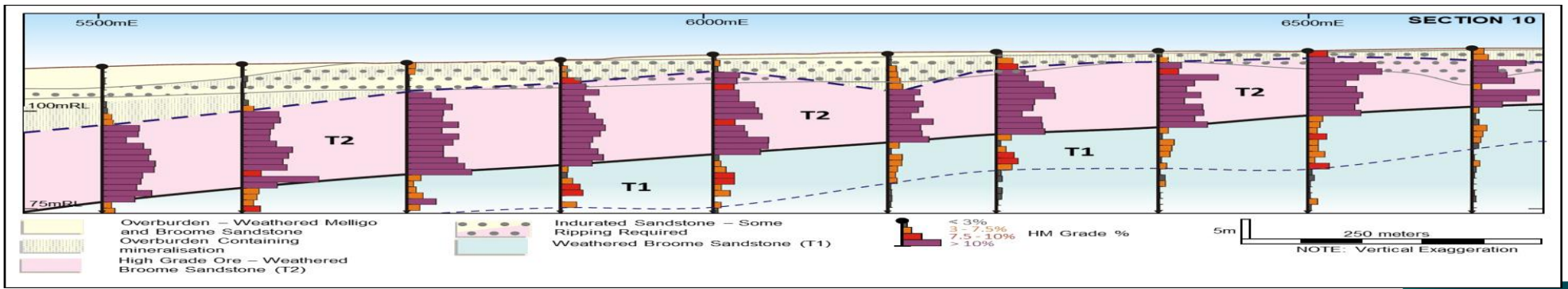
Thunderbird is a High Grade, Thick Deposit

Deposit exhibits strong continuity and high Valuable Heavy Mineral ("VHM") grades

- Thunderbird is the first significant mineral sand deposit to be discovered in the Canning Basin and is typical of an off-shore, sub-wave base style deposit
- Valuable heavy minerals ("VHM") contained within the deposit include ilmenite, zircon, leucoxene and rutile
- Mineralisation occurs as a flat, thick, broad sheet-like body striking northwest and dipping shallowly under cover at c. 4 degrees to the SW
  - Contains a continuous high grade zone up to 43m in thickness
  - Extends from surface to a maximum known depth of 155m over an area at least 11km by 7km
- The Mineral Resource estimate of **1,050Mt at 12.2% HM, 0.93% zircon and 3.3% Ilmenite**[1] is based on drill hole data collected by Sheffield from 2012 to 2015 comprising:
  - 670 holes drilled for a total of 37,076m with 24,388 samples assayed for HM, slimes and oversize
  - 20 sonic core holes and 5 Bauer bulk sample holes
  - The heavy mineral is fine to medium grained with a zircon D_{50} of 57 microns and titanium minerals D_{50} of 67 microns
- High grade zone remains open in multiple directions

Thunderbird Site Layout Over Image of VHM Grade x Thickness (>7.5% HM)





1. ASX Announcement dated 5 July 2016 titled *"Sheffield doubles measured Mineral Resource at Thunderbird"*

Thunderbird JORC Compliant Ore Reserve

Greater than 70% conversion of Mineral Resource in Ore Reserve demonstrates high quality of Thunderbird Deposit

- Ore Reserve[1] estimate was prepared by Entech Pty Ltd, an experienced and prominent mining engineering consultancy with appropriate mineral sands experience and industry knowledge. Based on the 5 July 2016 Thunderbird Mineral Resource estimate[2]

- Modifying factors applied to convert to Proved and Probable Ore Reserve including:
  - Price based on TMZI long term forecast
  - 98% mining recovery, no additional dilution or minimum mining widths due to the bulk nature of the deposit
  - Cut off strategy being applied for first 10 years of open pit design
  - Bulk mining techniques, including dozer trap mining and waste mining via truck and excavator
  - Geotechnical analysis form basis of pit designs including:
  - Excavatability and trafficability inform 3 x Dozer Test Costeans
  - 40 deg pit slope wall angles including batter and berm
  - Mineral processing based on well understood and conventional mineral sands processing techniques

Thunderbird Deposit Ore Reserves[1]

Pit Stage		Ore							
		Tonnes (Mt)	HM %	OS %	SL %	In-situ ZIR %	In-situ HITI %	In-situ LEU %	In-situ ILM %
Starter Void	Proved	0.2	11.7	17.6	19.9	1.08	0.30	0.25	3.56
	Probable	-	-	-	-	-	-	-	-
	Inferred	-	-	-	-	-	-	-	-
	Total	*0.2*	*11.7*	*17.6*	*19.9*	*1.08*	*0.30*	*0.25*	*3.56*
Interim Pit	Proved	128.1	15.4	13.8	16.1	1.12	0.32	0.29	4.15
	Probable	3.8	14.7	11.2	14.8	1.09	0.31	0.30	4.07
	Inferred	-	-	-	-	-	-	-	-
	Total	*131.9*	*15.4*	*13.8*	*16.0*	*1.12*	*0.32*	*0.29*	*4.14*
Rest-of-Mine Pit	Proved	91.2	11.4	14.3	16.3	0.89	0.27	0.26	3.02
	Probable	524.8	10.1	10.5	14.5	0.78	0.26	0.27	2.86
	Inferred	0.2	12.8	21.0	14.2	0.86	0.27	0.26	3.19
	Total	*616.2*	*10.2*	*11.1*	*14.8*	*0.80*	*0.26*	*0.27*	*2.88*
Grand Total	**Total**	**748.3**	**11.2**	**11.6**	**15.0**	**0.86**	**0.27**	**0.27**	**3.11**

  - CAPEX and OPEX cost informed on executed or negotiated final agreements, industry sources or in-house estimation and expertise

- Open pit optimisation using CAE NPV Scheduler software to generate Lerch-Grossman shells and a 70% revenue factor pit shell was selected based on mine life and cost revenue. Strategic scheduling zones were defined by Whittle Consulting optimisation software

- A detailed scheduling of land clearing, ore mining, waste mining, tailings storage and other ancillary activities on 200m by 100m ore blocks were completed over the first 8 years of the schedule; after which larger scheduling blocks have been utilized

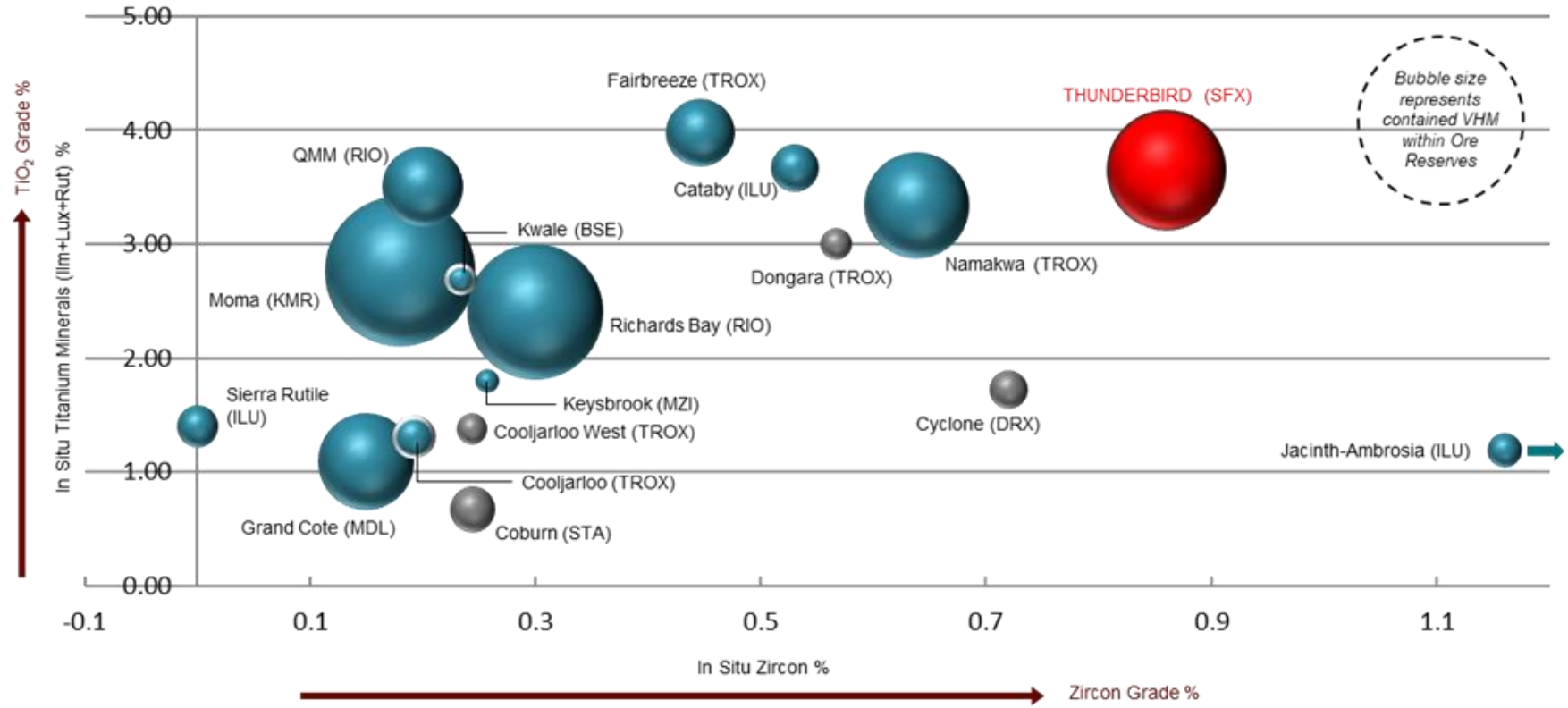
- Life-of-mine average strip ratio (waste: ore) of 0.85 : 1.00

1. ASX Announcement dated 31 July 2019 titled *"Thunderbird Ore Reserve Update"*
2. ASX Announcement dated 5 July 2016 titled *"Sheffield doubles measured Mineral Resource at Thunderbird"*

One of the Largest, Highest Grade Ore Reserves Globally

Comparison of Ore Reserves and grade between the key large mineral sands deposits globally[1,2,3]

- Large, mature mineral sands deposits globally are typically showing a strong trend of accelerating grade depletion with each new published Ore Reserve update
- The highest grade and most significant zircon producing mine, Jacinth-Ambrosia is now entering the back end of its mine life
- Increasing throughput and production rates at mature operations are accelerating the depletion of Ore Reserves and mine life



Notes:
1. Thunderbird Ore Reserve as published on the ASX on 31 July 2019. Thunderbird Ore Reserves ranked against latest published Ore Reserves of current mineral sands operations and projects under investigation globally. Accordingly, for the operating projects, no account is made for any volumes of product already produced
2. Blue bubbles are operating mines, grey bubbles are Ore Reserves reported but the project is not operating. Only Ore Reserves > 1.2Mt contained VHM shown
3. Data compiled by Sheffield from public sources. This analysis does not illustrate the variance in product value between rutile, leucoxene and ilmenite

Conventional and Well Tested Mining Techniques

Thunderbird will use conventional and well tested dry mining techniques and equipment currently employed in existing and similar mineral sands operations globally

Mining method

- Dry mining via conventional dozer trap mineral sand mining using bulk mining techniques and in-pit feed preparation units
- Topsoil and overburden excavated and transported using truck and excavators
- Oversize material rejected from in-pit Mine Unit Plant ("MUP") will be rehandled by loader to mine void
- Ore will be slurried and pumped to a nearby Wet Concentration Plant ("WCP")
- Mine production rates vary to provide constant target feed rates to the WCP after removal of oversize and slimes
- Sheffield may engage contractors for mining operations and equipment maintenance
- Entech Pty Ltd completed all mine design and scheduling
- Pit design is based on the geotechnical analysis undertaken by independent consultants
- The dozer trap mining method and costs have been applied to the whole LOM schedule

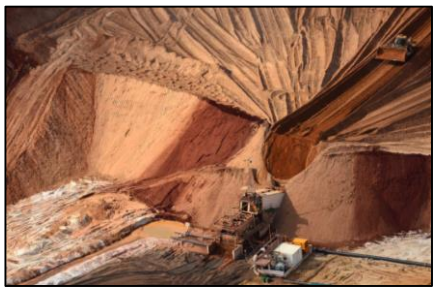
Summary of LOM material type by Pit Stage[1]

	Ore (Mt)	Waste (Mt)	
Pit Stage	Material	Topsoil	Waste
Starter Void	0.2	0.1	0.0
10 Year Pit	131.9	1.64	61.0
Rest of Mine Pit	616.2	5.38	577.0
Total	**748.3**	**7.04**	**638.0**

Vegetation and Topsoil Removal

Removal of Overburden

Dozer Push Mining Unit Plant - Ore



1. Sourced from the Bankable Feasibility Study Update 31 July 2019

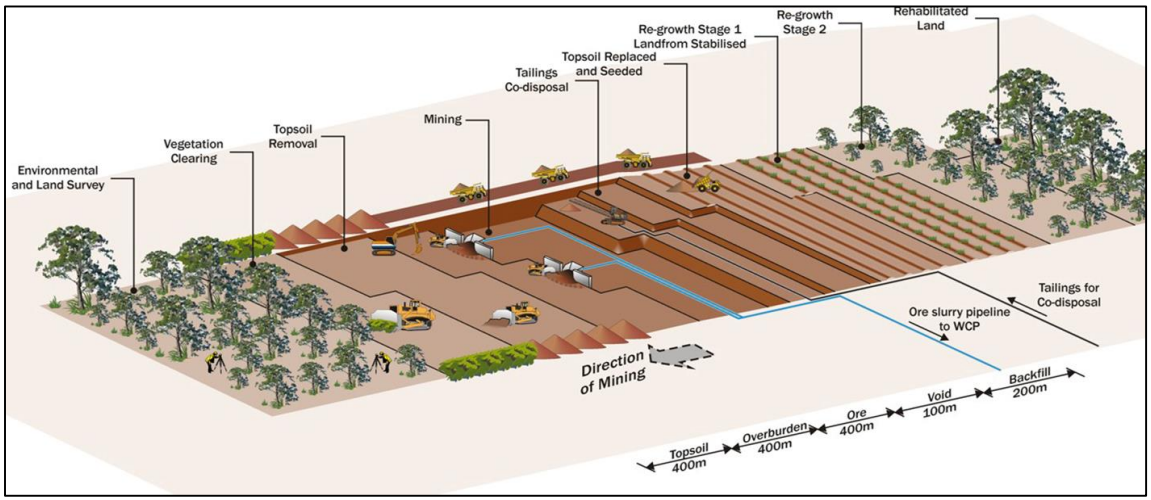
Conventional and Well Tested Mining Techniques

Thunderbird will use conventional and well tested dry mining techniques and equipment currently employed in existing and similar mineral sands operations globally

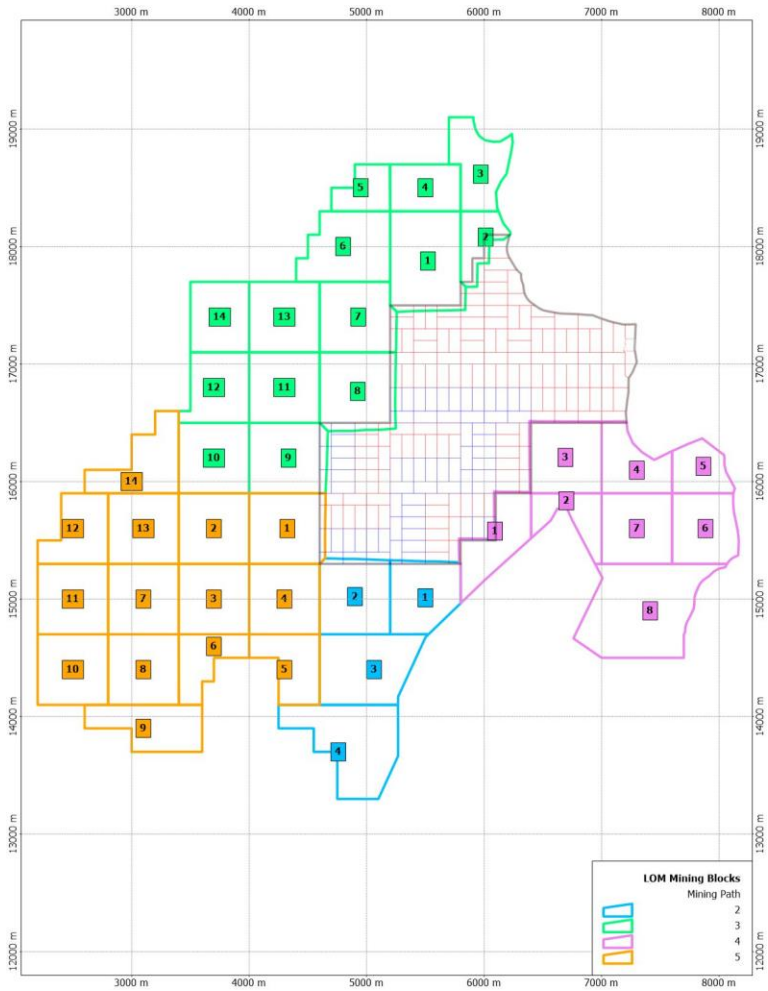
Major mining equipment to be utilised[1]

Class	Description	Max utilisation (hrs/month)	Equipment utilised (#) Year 1 – 4	Year 5 – 10	Year 11 - 43
70t Excavator	Hitachi ZX690LC-5	500	1	1	1
120t Excavator	Komatsu PC1250SP-8R	500	1	1	1
200t Excavator	Komatsu PC2000-8	500	0	3	3
100t Loader	CAT 992k	500	1	1	1
100t Truck	CAT 777G	500	4	7	13
100t Bulldozer	CAT D11T CD	450	3	6	6
65t Bulldozer	CAT D10T	500	2	3	4
Grader	CAT 16M	500	1	2	2
Water Cart	CAT 745	500	1	2	3
Service Truck	CAT 745	500	1	1	1

Schematic diagram showing mining method



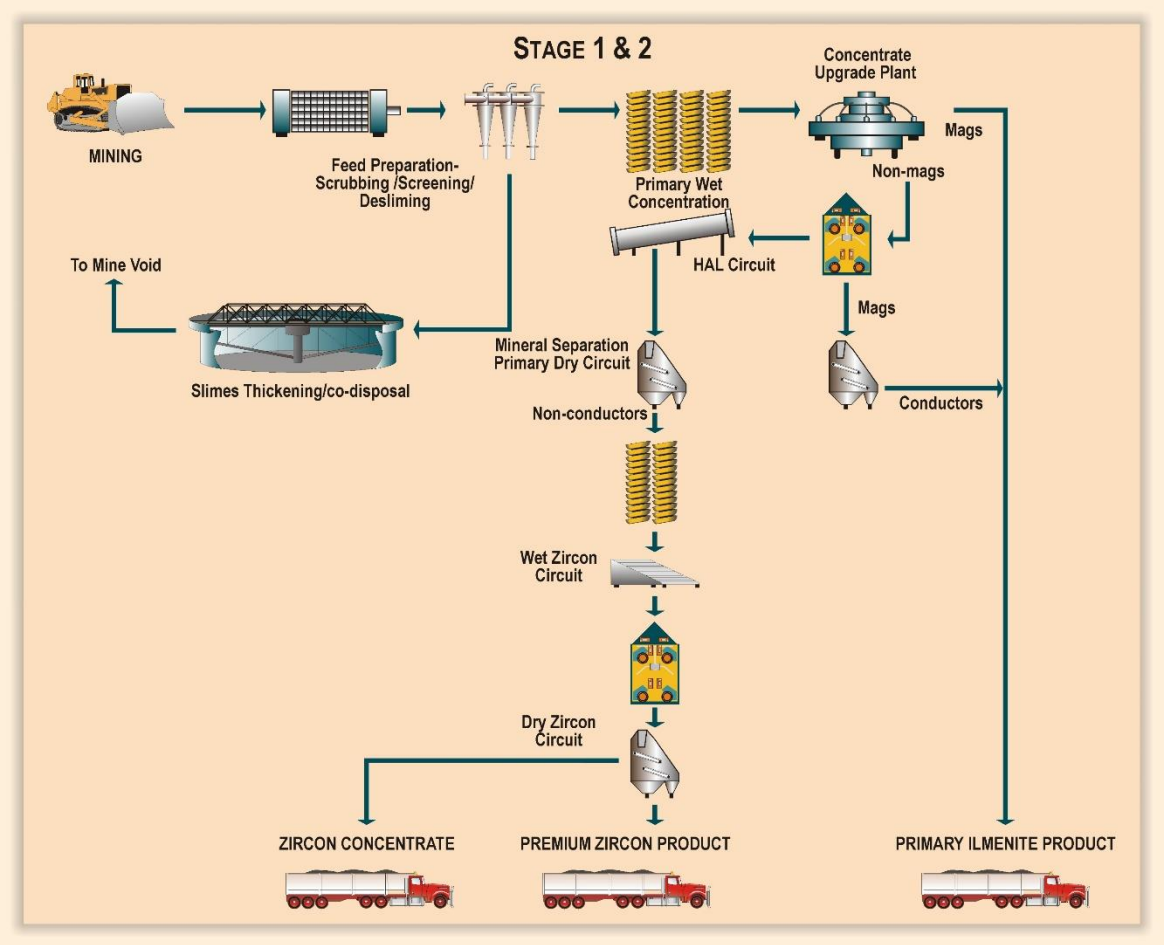
LOM mining blocks[1]



1. Sourced from the Bankable Feasibility Study Update 31 July 2019

Simple and Conventional Processing Circuit

Simplified conventional flowsheet producing three quality products for LOM



Stages 1 & 2

- Same flow sheet as 2017 BFS with removal of LTR
- Stage 2 is a simple duplication of Stage 1 mining and processing
- Dry mining via conventional dozer trap mineral sand mining
- Simple and well tested conventional mineral separation flowsheet
- Only three finished products
- Premium zircon, zircon concentrate and Primary Ilmenite

Recovery (%)[1]	Stage 1	Stage 2	LOM
Zircon to Premium Zircon	43.9	53.0	53.3
Zircon to Zircon Concentrate	36.0	33.3	33.6
Ilmenite to Ilmenite Products	76.7	77.7	78.7

Notes:
1. Based on metallurgical test work carried out on a 40t bulk sample using full scale & scalable equipment and sourced from the BFSU Financial Model

Well Positioned Near Existing Port Infrastructure

Thunderbird is conveniently located between two existing ports

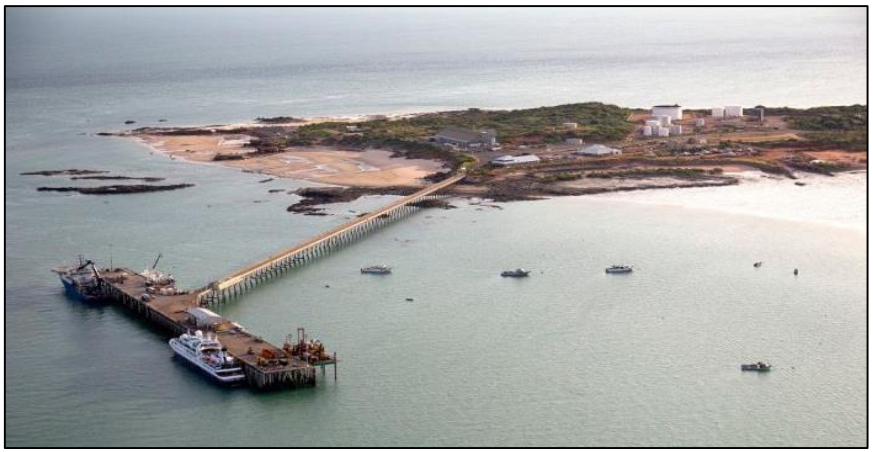
- Thunderbird is located in close proximity to two existing ports
  - Port of Broome is 148km away, including 115km of major national highway
  - Port of Derby is 146km away, including 113km of major national highway
- Products proposed to be trucked from mine to port
- Port of Derby has been selected for exporting bulk products
  - Has existing bulk loading facilities (conveyor and shiploader)
  - Existing shiploader and conveyor requires minimal commissioning costs
  - Access agreement in place for port storage, wharf and bulk handling facility
  - Bulk products stored in a purpose-built 100kt facility (Stage 1) at the port and loaded by conveyor onto barges, increased to 150kt (Stage 2)
  - transhipped 20-30kms to meet a moored ocean-going vessel where products will be transferred
  - Barging & transhipment of bulk products has been successfully operated by previous users at 500ktpa
- Port of Broome is more suitable for packaged products due to availability of warehousing and existing stevedoring services
- Both ports offer the potential for packaged and bulk shipment, thus minimising shipping risk

Product Shipment Details

Product	Port	Method	Sale basis
Premium zircon	Broome	FIBC[1] Bulk Bags	CIF
Primary ilmenite	Derby	Bulk Shipment	CIF
Zircon concentrate	Derby	Bulk Shipment	CIF

1. Flexible Intermediate Bulk Container

Port of Broome



Port of Derby

Supporting Site Infrastructure

Construction of accommodation village, road access, energy and water facilities underway

Significant progress to date:

- Main access road to Thunderbird established off the Great Northern Highway mid-way between the towns of Broome and Derby
- 328 person accommodation village procured
- Site facilities operational - 52 rooms, large-scale kitchen/dining, potable water supply, waste water treatment plant, communications

Final infrastructure typical of mineral industry to be established:

- Internal roads to the mine pit area, increased village accommodation
- Mine and process plant workshops, offices and warehouse buildings
- 18MW gas-fired power station
- LNG storage infrastructure storage for 10 days operation
- Initial surface Tailings Storage Facility (TSF) for process tailings until year 3; then tailings to pit void
- Process water from bore field adjacent to mining void for first 15 years
- Mine dewatering bore field required after approximately year 15
- Expected dewatering volumes exceed process water needs from approximately year 30 onwards with excess water discharged via aquifer injection

Accommodation village at Thunderbird

Aerial photo of Thunderbird accommodation village

SECTION III

Financial Information

Each of the slides in Section IX should be read together with, and are subject to, each of the assumptions contained in the Company's Thunderbird Financial Model.

Stage 1 Total Funding Requirement

The total Stage 1 funding requirement is estimated at approximately A$478 million

Stage 1 upfront capex

Description	Amount (A$m)
Wet Concentrator Plant	52.9
Concentrate Upgrade Plant	22.0
Hot Acid Leaching Plant	36.3
Zircon Processing Plant	52.3
Process Water Systems	11.4
Processing	**174.9**
Engineering & Project Management	22.8
Site Construction, Commissioning, Mobilisation	70.2
Power Reticulation & Other Non-Process Infrastructure	24.4
Infrastructure	**117.4**
Power Station & Storage, Village & Port Facilities	66.5
Ops Readiness, Tailings Dams, Bore Field & Other	32.9
Owners Costs	**99.4**
Stage 1 Upfront Capex	**391.7**

Total funding requirement

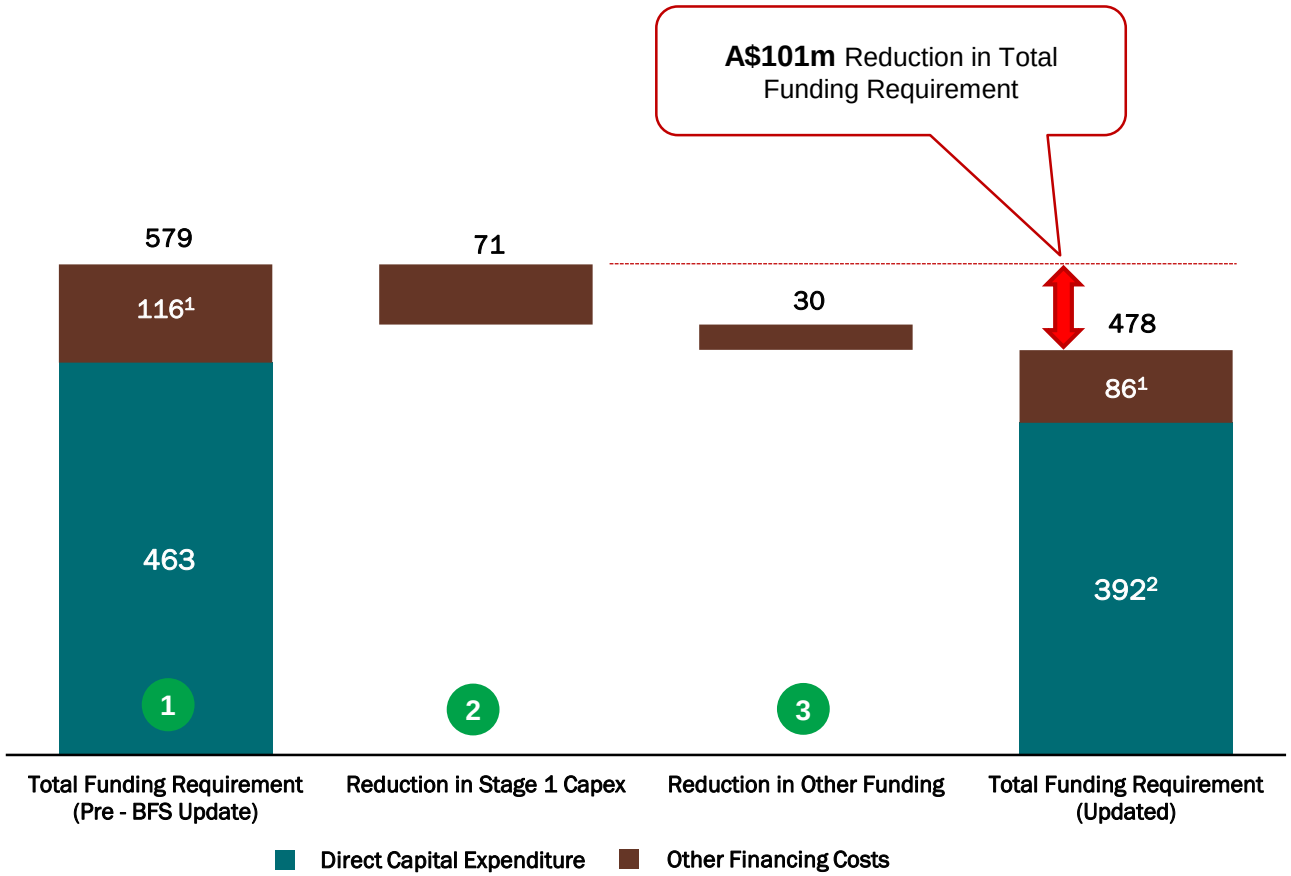
Description	Amount (A$m)	Comments
Processing	174.9	
Infrastructure	117.4	
Owners Costs	99.4	• Power and gas EPC contract (funded by NAIF) • Roads, village, port, other
Stage 1 Upfront Capex	**391.7**	• Includes contingencies of 7.5%
Pre-operations Net Working Capital	1.5	• Net operating cash flows during construction period
Financing Costs	17.3	• Includes debt commitment, upfront fees, debt services reserve accounts, advisory & legal fees, independent technical expert costs
Cost Overrun Facility	40.0	• c. 10% provision on Stage 1 upfront capex (as required by lenders)
Interest During Construction	26.9	• LIBOR + facility margin (over construction period)
Total Other Funding Requirements	**85.7**	
Total Uses	**477.4**	

Note:
1. GRES EPC scope encapsulates the A$174.9m of processing costs and A$117.4m of infrastructure costs
2. Total uses excludes Sheffield's corporate overheads estimated to be $13m over the pre-production period.
3. Totals may not add to the rows above due to rounding

Revised Stage 1 Capital Expenditure

c. 80% of the revised Stage 1 upfront capex is subject to a fixed price EPC contracts with GRES & others

Bridge From BFS Stage 1 Upfront Capex to Revised Funding Requirement (A$m)



1. Original BFS Stage 1 upfront capex of A$348m, with Sheffield opting to invest a further A$115m in Infrastructure and Improvement Capex to lower the operating cost base. In addition to Stage 1 upfront capex, c. A$116m in other project finance related funding required to commence operations at Thunderbird (see previous page for detail)

2. Removal of LTR and related ilmenite circuit capital, offset by a 38% increase in WCP capacity and other downstream equipment

3. Proportionate reduction in other financing costs relative to direct capital expenditure (e.g. cost overrun facility, fees and reduced working capital due to schedule improvement)

Note:
This page sets out the change in project funding requirements for Stage 1 of the Thunderbird Project. Such information is derived from the financial model prepared by Sheffield for Stage 1 of the Thunderbird Project. Such estimates are based on, among other things, a detailed mine plan, negotiated contracts with EPC contractors and project financiers. Actual outcomes will be subject to a number of risks and uncertainties and therefore may vary from this current, indicative profile

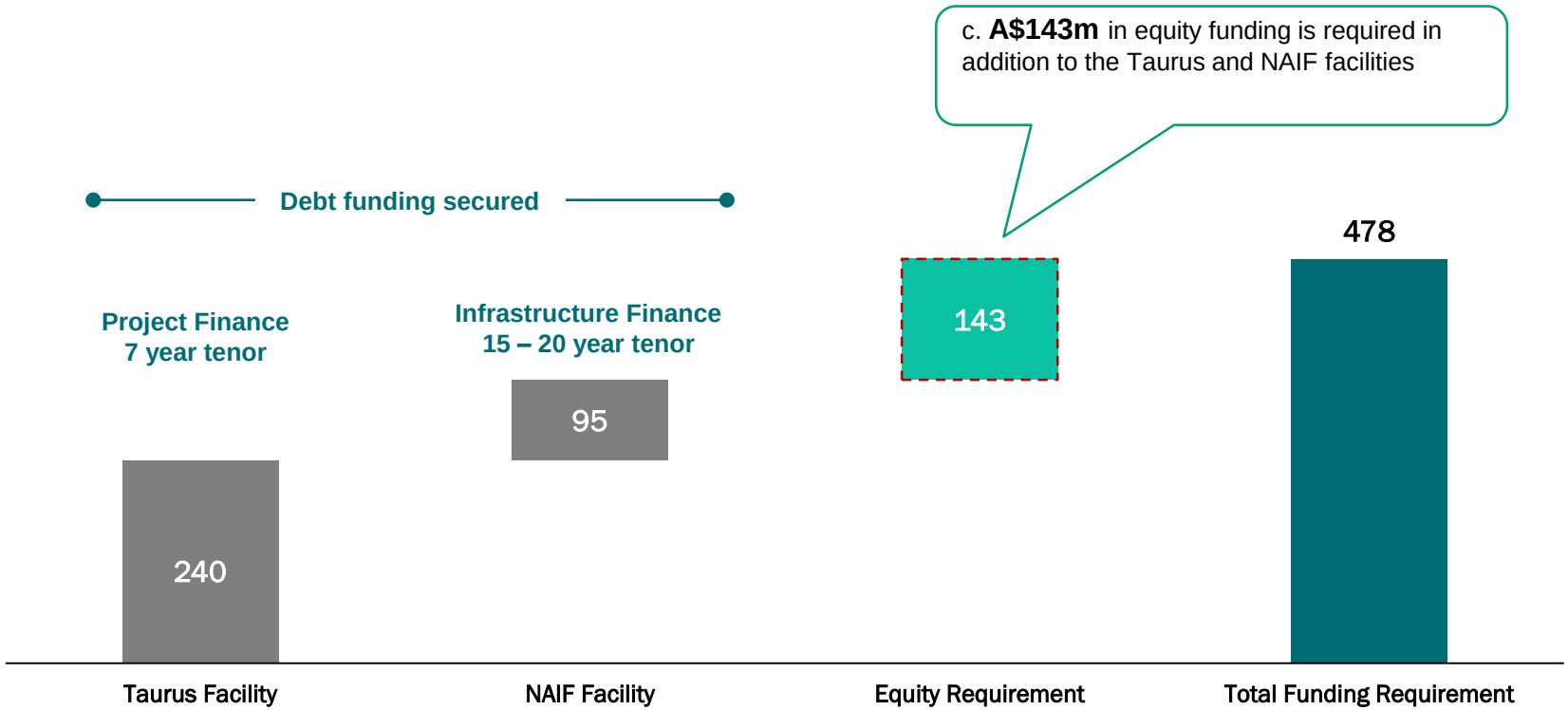
1 Includes cost overrun, interest, working capital, fees, etc

2 Project capital for process plant and infrastructure

Stage 1 Funding Sources

With c. A$335m of debt funding secured through the Taurus and NAIF facilities.
A$143m of equity funding is required to commence construction of Thunderbird Stage 1

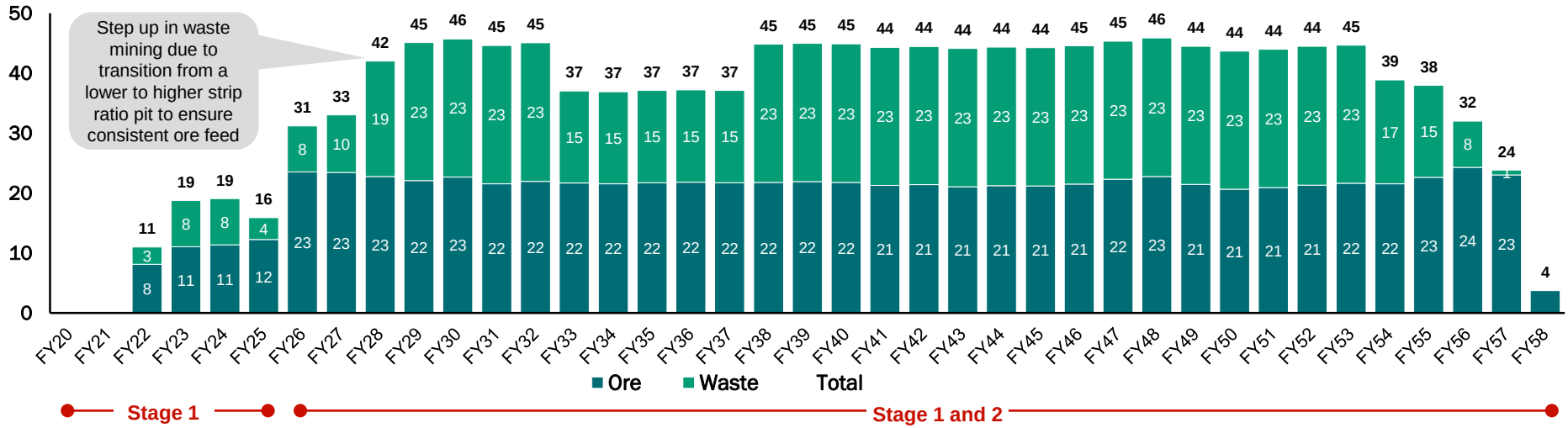
Stage 1 Funding (A$m)[1]



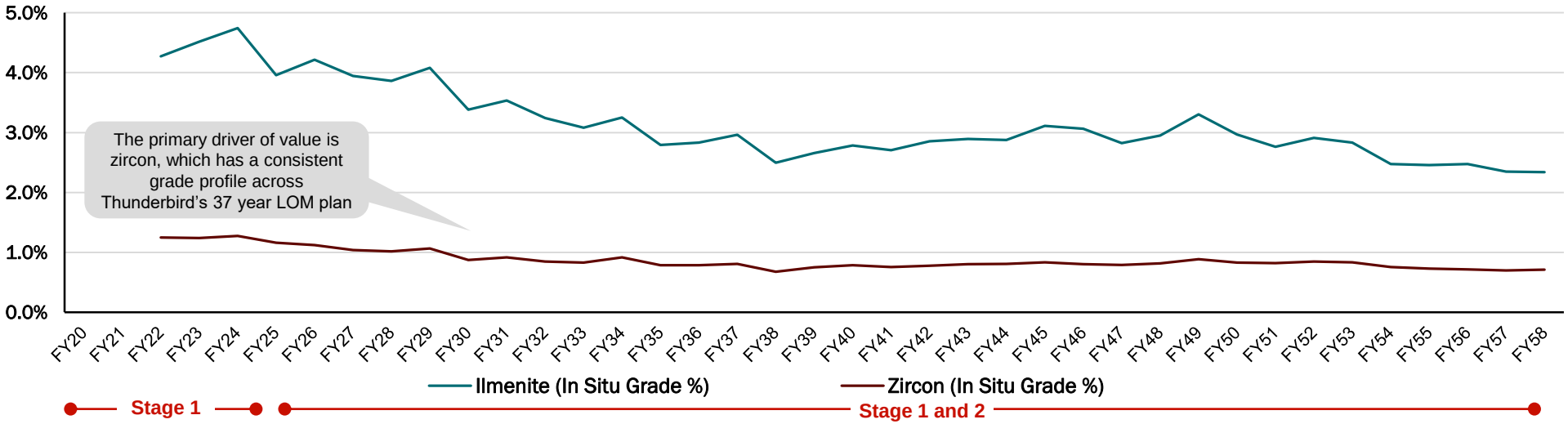
Note:
1. Tenor and other terms for the NAIF facilities are non-binding and subject to definitive documentation. Assumes the US$175m Taurus debt facility is converted to A$ using an A$/US$ exchange ratio of 0.73 during the expected drawdown period
2. Includes A$86m of Sheffield's other project finance related funding requirements. Excludes Sheffield's corporate overheads estimated to be A$13m

Material Mined and Grade Profile

Material Mined – Ore & Waste (Mt)



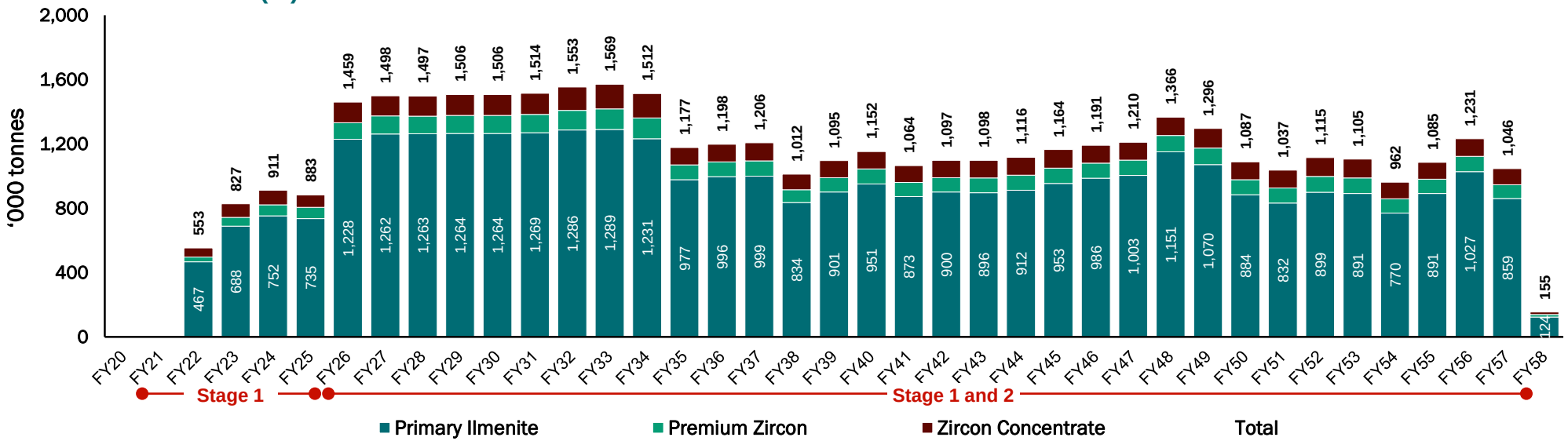
Insitu Grade (as % of Ore Mined)[1]



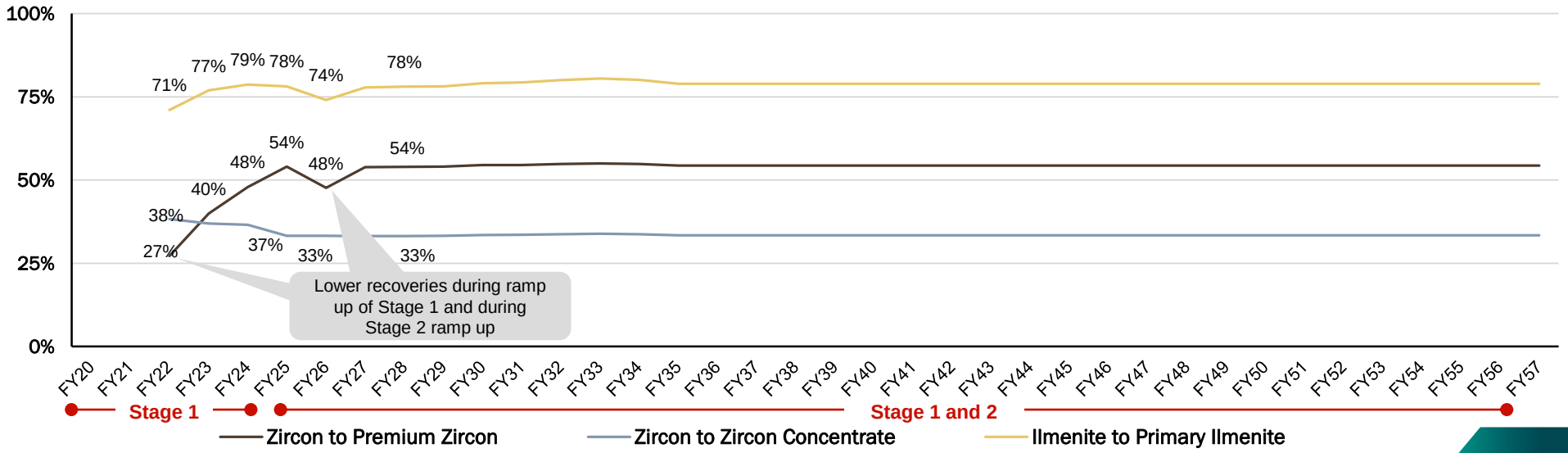
Note:
1. Insitu grade is calculated as the product of HM grade and the percentage of ilmenite, zircon or leucoxene contained within the HM

Production and Recoveries

Final Products (kt)

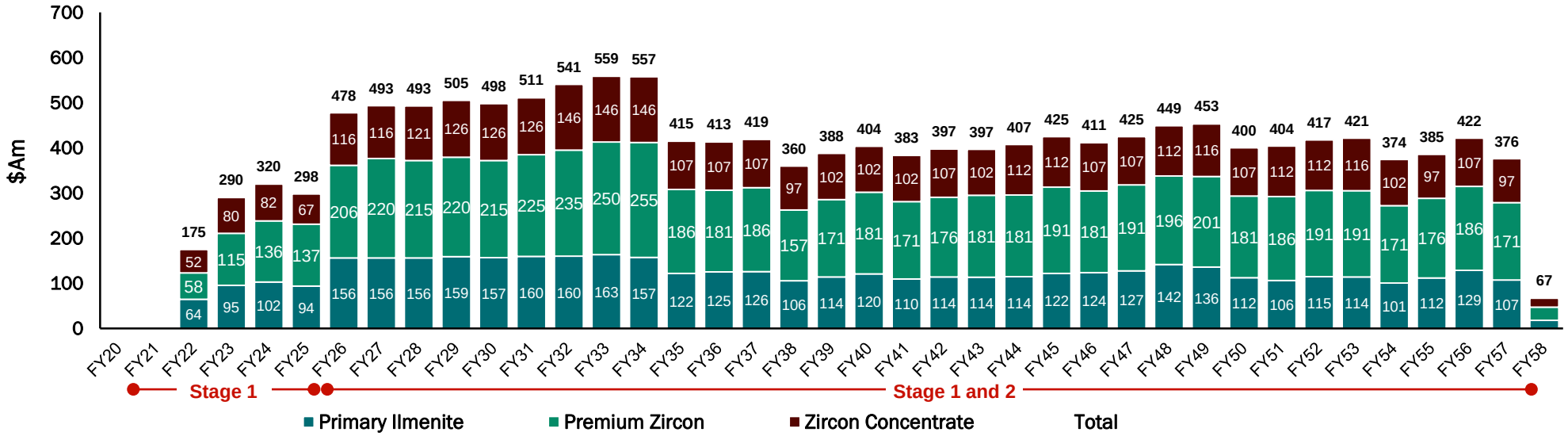


Overall Recoveries (%)

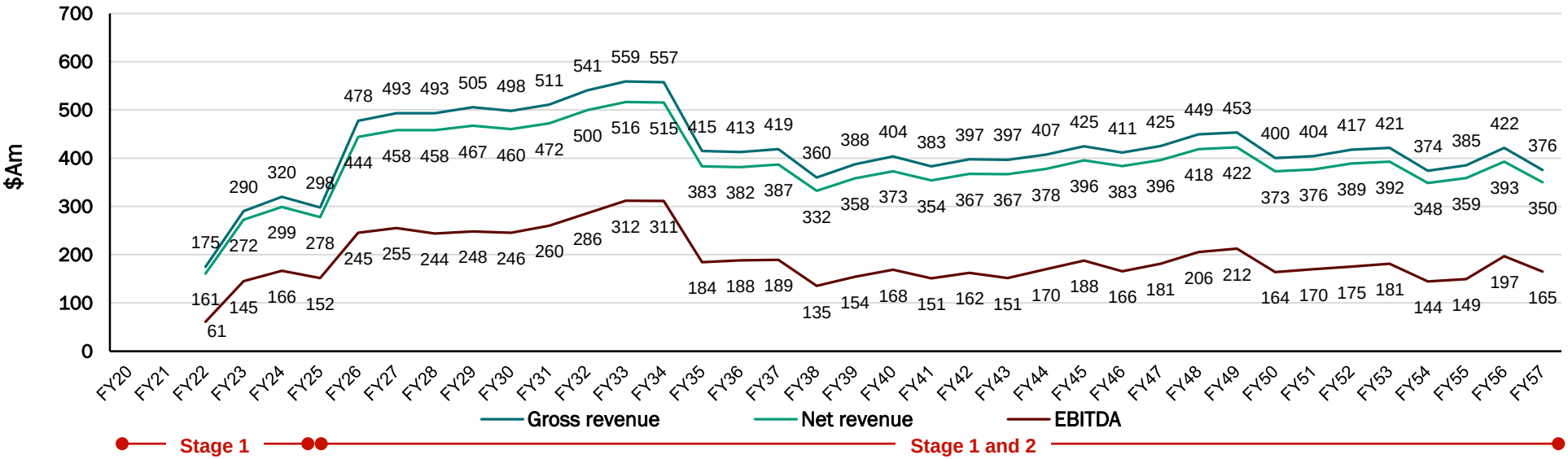


Revenue and EBITDA

Total Gross Revenue by Product (A$m)



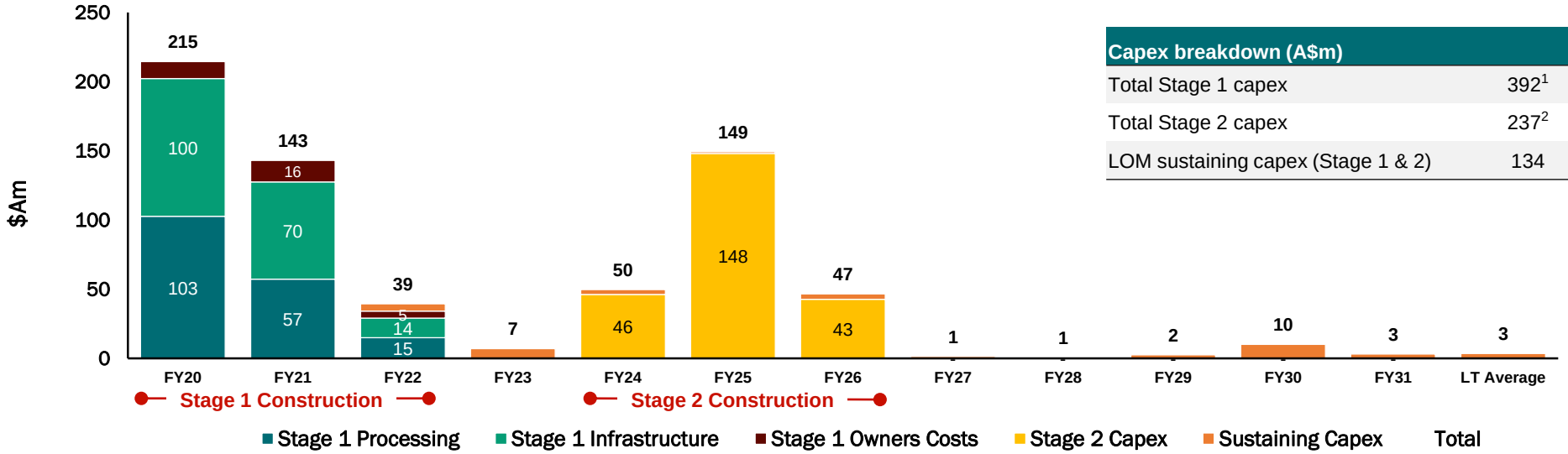
Revenue and EBITDA (A$m)[1,2]



Notes:
1. Net revenue calculated as gross revenue less royalties
2. EBITDA does not include corporate overheads

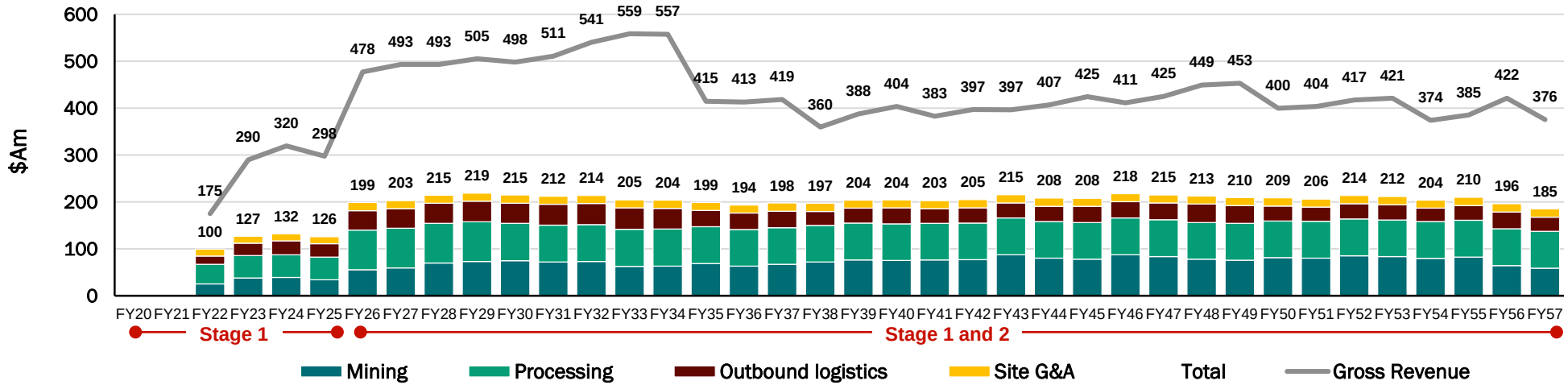
Capex and Operating Margins

Capex by category (A$m)



Capex breakdown (A$m)	
Total Stage 1 capex	392[1]
Total Stage 2 capex	237[2]
LOM sustaining capex (Stage 1 & 2)	134

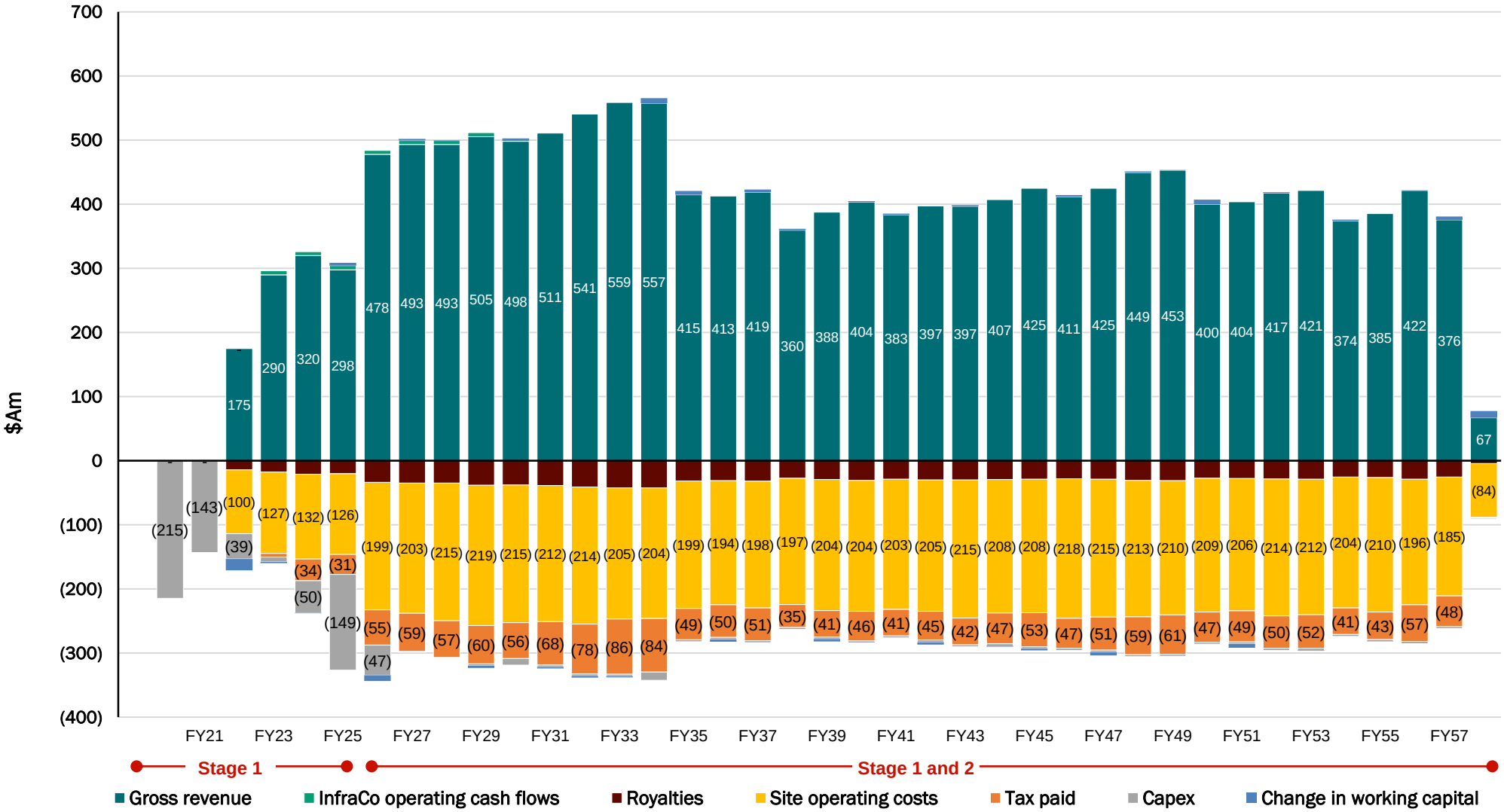
Site Operating Costs & Revenues ($Am)



Note:
1. Excludes Sheffield's other project finance related funding requirements of A$86m
2. Based on management estimate using BFS Stage 1 capex

Free Cash Flow

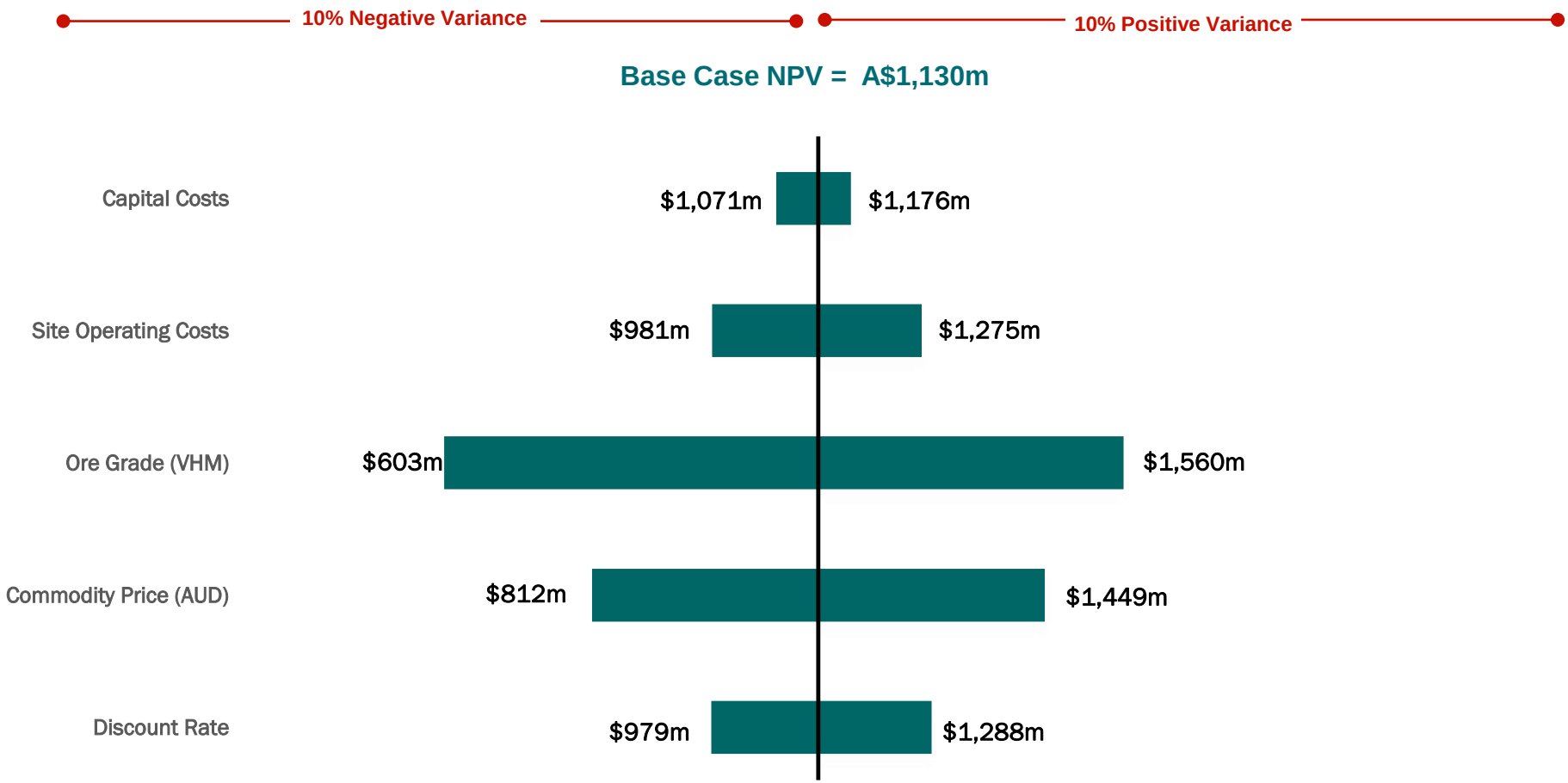
Post-Tax Cash Flow (excluding Corporate Overheads)[1] (A$m)



Note:
1. Free cash flow calculated as gross revenue plus InfraCo operating cash flows, less royalties, site operating costs, tax paid, capex, change in working capital & other working capital related items. Excludes corporate overheads

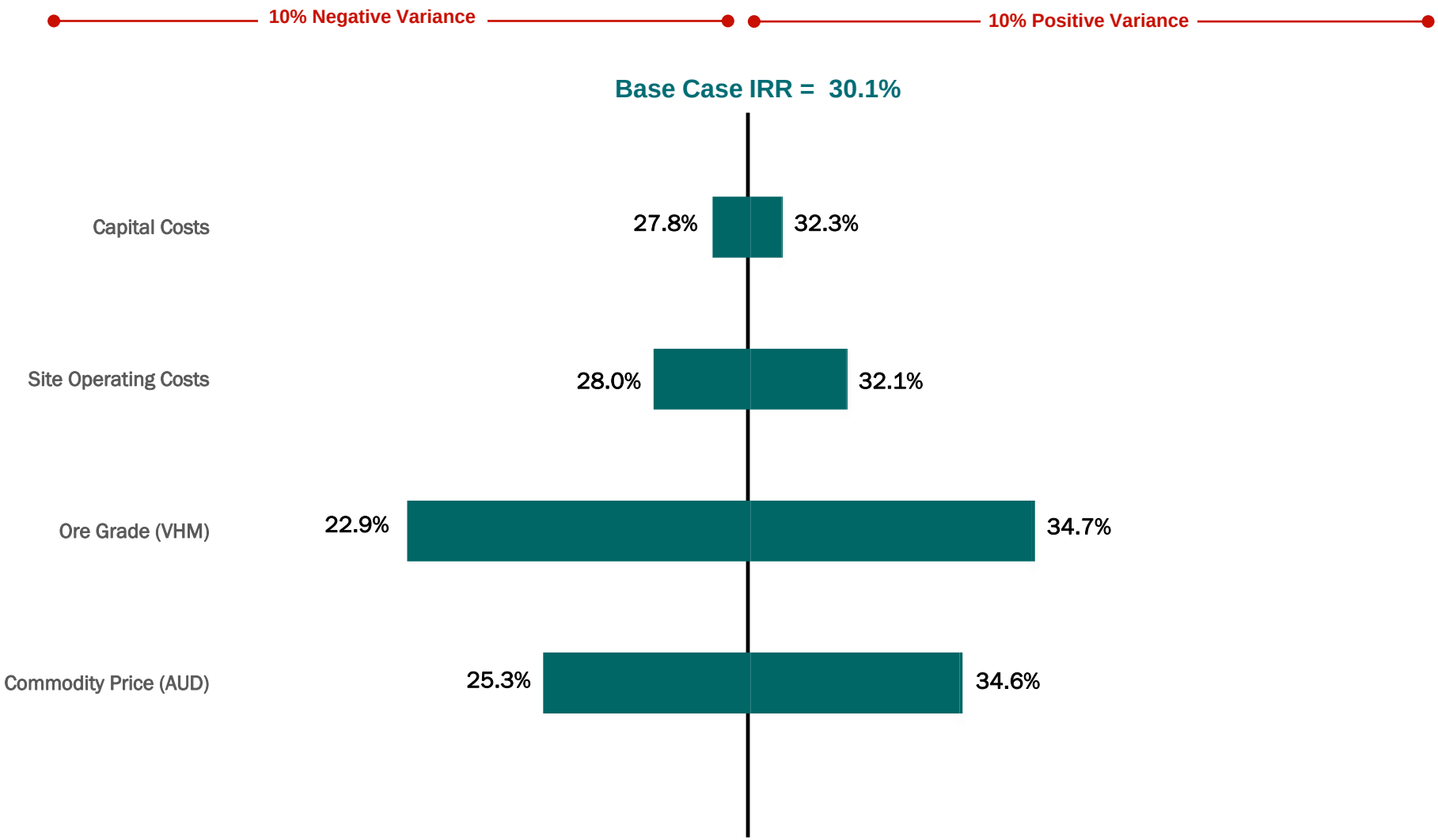
Sensitivity Analysis – NPV Outcomes (A$m)

Base Case Pre-finance, pre-tax NPV_{10} of A$1.13B compared to 10% shifts in commodity price, discount rate, costs and ore grade



Sensitivity Analysis – IRR Outcomes (%)

Base Case Pre-finance, pre-tax IRR of 30.1% compared to 10% shifts in commodity price, costs and ore grade



Operating Assumptions

Key physical and cost assumptions which underpin the BFSU Financial Model

Physical assumptions overview

	Stage 1[1]	Stage 2[2]	LOM[3]
Volume			
Ore Mined (Mt)	42.8	136	748
Strip Ratio (W:O)	0.51	0.78	0.85
Mine life (years)		37	
Grade (% of ore mined)			
HM	15.6	14.5	11.2
Ilmenite	4.4	3.8	3.11
HiTi Leucoxene	0.35	0.30	0.27
Zircon	1.23	1.01	0.86
Leucoxene	0.32	0.27	0.27
Recovery (%)			
Zircon to Premium Zircon	43.9	53.0	53.3
Zircon to Zircon Concentrate	36.0	33.3	33.6
Ilmenite to Ilmenite Products	76.7	77.7	78.7

Operating cost breakdown

A$/t ore mined	Stage 1[1]	Stage 2[2]	LOM[3]
Mining	3.19	2.98	3.37
Processing	4.36	3.65	3.69
Outbound logistics	2.39	1.90	1.69
Site G&A	1.40	0.76	0.83
Total	**11.34**	**9.28**	**9.58**

Capex breakdown

	A$m
Stage 1	
Processing	175
Non-Processing & Infrastructure	117
Owner Costs	99
Total Stage 1 development capex	**392[4]**
Stage 2	
Total Stage 2 development capex	**237[5]**
Sustaining capex	
Stage 1 (Year 0 - 4)	17
Stage 1 & 2 (Year 5+)	114
Total LOM sustaining capex	**131**

Source: BFSU Financial Model

Notes:
1. Refers to the financial year from 1 July 2021 to 30 June 2025
2. Refers to the period from 1 July 2025 to 30 June 2031
3. LOM (Life of Mine) refers to the period from year 0 to year 37
4. Excludes Sheffield's other project finance related funding requirements of A$86m
5. Based on management estimate using BFS Update Stage 2 capex

Royalty Regime and Fiscal Assumptions

Key royalty and fiscal arrangements are outlined below

	Arrangement or Calculation
State government royalty	• WA State government royalty of **5% of Total Sales Revenue**
Taurus royalty	• Royalty for years 1 to 4, starting on first sale, of **0.5% of Total Sales Revenue** on FOB basis or equivalent • Royalty for year 5 onwards, for a period of 22.5 years, of **0.75% of Total Sales Revenue** on FOB basis or equivalent
Native title royalty & Miscellaneous Licence Access	• Calculated as a percentage of Total Sales Revenue (**confidential terms – in line with market standard range**)
Company tax	• Australian corporate tax rate of 30% applies • Sheffield has a future tax benefit of approximately A$20m as at 30 June 2019 arising from available tax losses

US$175m Taurus facility summary

Sheffield expects to conclude similar debt package with an experienced metals & mining specialist private equity fund

Taurus Overview

- Experienced specialist global investor based in Australia, targeting small to mid-sized metals & mining companies
- Provides bespoke financing across the capital structure including project and acquisition finance debt, equity and convertible notes
- Experienced in providing project finance facilities to fund project developments
- Previous mining investments include:
  - Base Resources, Heemskirk Consolidated (equity and loan)
  - Teranga Gold, Talisman Mining, Toro Gold (project finance facility)
  - Stanmore Coal (acquisition finance and brownfields mine development)
  - Whitehaven Coal, Asanko Gold, Hot Chili, Aquila Resources, AMC (equity)

Debt Facility Overview – Tranches A and B

- Lender: Taurus Mining Finance Fund and Taurus Mining Finance Annex Fund
- Syndicated facility agreement has been executed, with the debt facility to be underwritten by Taurus, and subsequently expected to be syndicated
- Revenue royalty of 0.50% (Years 1 – 4) and 0.75% (Years 5 – 22.5)
- Upfront fee is customary for a facility of this nature (50% due upon signing and the balance due on satisfaction of certain conditions precedent to drawdown of the facility)
- Sheffield will agree a minimum equity requirement with lenders as a conditions precedent to drawdown
- Conditions precedent to drawdown are customary for a facility of this nature including (but not limited to) final due diligence

Tranche A Key Terms

Facility type	Senior secured[1]
Borrower	Thunderbird Operations Pty Ltd (“TOPL”)
Amount	US$75m
Interest rate	USD LIBOR + 4.5% p.a.
Commitment fees	2.0% p.a. (on undrawn amount)
Tenor	7 years
Repayable	Between Year 3.5 and Year 7

Tranche B Key Terms

Facility type	Senior secured[1]
Borrower	TOPL
Amount	US$100m
Interest rate	8.5% p.a.
Commitment fees	2.0% p.a. (on undrawn amount)
Tenor	7 years
Repayable	End of Year 7

Note:
1. Tranches A, B and C are senior secured over TOPL assets and rank pari passu between themselves. They have a second ranking security over InfraCo assets. Tranche D is senior secured over InfraCo assets and has second ranking over TOPL assets. See next page for information on Tranches C and D

A$95m NAIF Loan Facility Summary

Sheffield expects to conclude debt financing with Government support to provide very long tenor financing demonstrates conviction and support for Thunderbird

NAIF Overview

- Northern Australia Infrastructure Fund ("NAIF") is a corporate Commonwealth entity that was established under the NAIF Act 2016 to provide assistance for the construction of infrastructure to benefit Northern Australia
- NAIF and Sheffield have agreed non-binding term sheets for the NAIF facilities
- Subject to definitive documentation being entered into and customary conditions precedent (including State of WA approval), the NAIF facilities will include:
  - A$30m Project Development Facility (“Tranche C”)
  - A$65m Infrastructure Development Facility (“Tranche D”)
- Commercial terms confidential, but based on customary market rates
- Represents the single largest NAIF investment decision to date
- Federal Minister consent obtained. Sheffield is now working through the State of WA approval process – Sheffield expects to complete definitive documentation in relation to the NAIF facility in H2 2019

Purpose of the NAIF Facilities

- The NAIF facility enables Sheffield to build and own key infrastructure (power generation, gas storage, road, port storage facilities and accommodation), rather than having a third party build, own and operate (BOO) the infrastructure and lease it to Sheffield. This will have the effect of reducing operating costs.

Tranche C Key Terms[2]

Facility type	Senior secured (project development facility)[2]
Borrower	TOPL
Amount	A$30m
Interest rate	Commences at 3.5% p.a. and increases over time
Tenor	15 years
Amortisation	Straight line between Years 9-15

Tranche D Key Terms[2]

Facility type	Senior secured (infrastructure development facility)[2]
Borrower	Thunderbird InfraCo Pty Ltd
Amount	A$65m
Interest rate	Commences at 3.5% p.a. and increases over time
Tenor	20 years
Amortisation	Credit foncier repayment profile, payable semi-annually
Purpose	To be used for constructing on-site infrastructure, upgrading mine site roads, etc.

Notes:
1. Tenor and other terms for the NAIF facilities are subject to completion of definitive documentation, which Sheffield expects to complete in H2 2019. The key terms summarised above are non-binding. As such, any legally binding terms that may ultimately be agreed between Sheffield and NAIF in respect of the NAIF facilities may be different to the terms summarised above
2. Tranches A, B and C are senior secured over TOPL assets and rank pari passu between themselves. They have a second ranking security over InfraCo assets. Tranche D is senior secured over InfraCo assets and has second ranking over TOPL assets. See previous page for information on Tranches A and B

SECTION IV

Thunderbird Development Strategy

Stage 1 Execution Strategy

Sheffield expects to convert BFSU cost estimate into an EPC contract[1] with GRES that will deliver the process plant and associated infrastructure on a fixed price, turnkey basis

1 Owners Works (A$99m)

- Sheffield to manage various contracts via a combination of **EPC, fixed price or unit price works** to deliver non process plant project infrastructure and associated works
  - **Approximately 50% of owners works capital will be executed under EPC contracts**
  - Mine access road – construction commenced
  - Village – purchased and installation commenced
  - Power, gas, mining & village services contracts
  - Mine plan updated
  - Customer off-take
  - Other (Derby storage shed, bore field, trial mining pits, communications, etc.)

2 EPC Design and Engineering

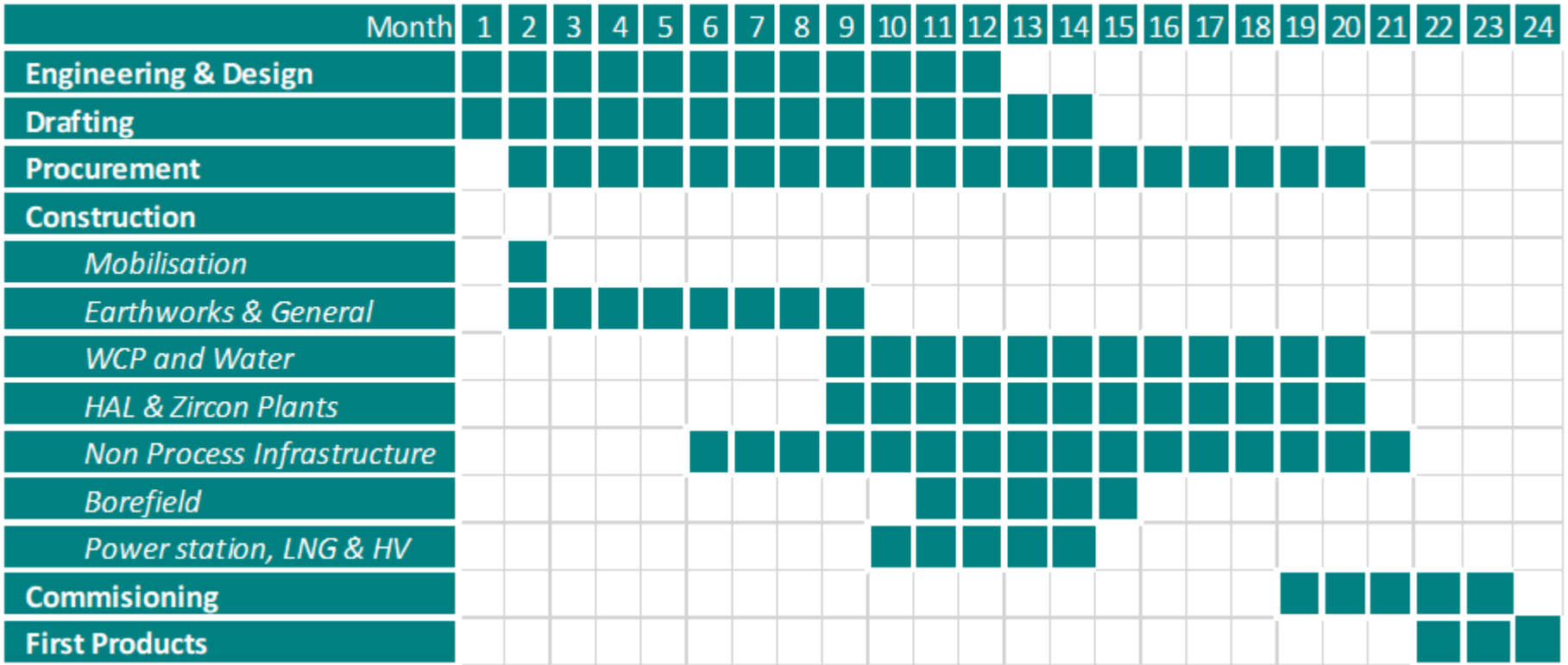
- GR Engineering Services ("GRES"), an ASX listed specialist contractor, to deliver a process plant and associated infrastructure on a fixed price, **turnkey basis**
  - GRES has extensive experience in successfully delivering mineral sands projects and has relevant Australian and global industry experience
  - Due-Diligence process with debt providers completed late 2018 examining technical, commercial and contractual arrangements
  - Fixed price lump sum EPC contract executed with GRES (November 2018)
  - EPC contract covers approximately 75% of Stage 1 upfront capital expenditure, with significant performance responsibility assumed by GRES, including:
    - **Individual 72-hour throughput tests for sections of the plant**
    - **Full plant 7-day throughput test**
    - **Metallurgical test for zircon recovery**
    - **Metallurgical test for ilmenite recovery**
    - **Metallurgical and technical support for performance testing and ramp up for 6 months after practical completion**

3 Construction (A$293m)

Notes:
1. The Company entered into an EPC contract with GR Engineering in November 2018 and expects to review terms and conditions to enable consistency with this BFS Update.

Stage 1 Development & Commissioning Timeline

The proposed timetable takes into account all foreseeable seasonal events, such as the wet season. Early works have already commenced



Source: Stage 1 development schedule based on Sheffield's current development plan as per GRES as at July 2019

Note: This timetable is subject to obtaining FID. Continuing further construction on early works is also subject to FID

SECTION V

Products, Offtake and Markets

Premium Quality Products

Production of high quality zircon products and ilmenite suited to chloride slag production

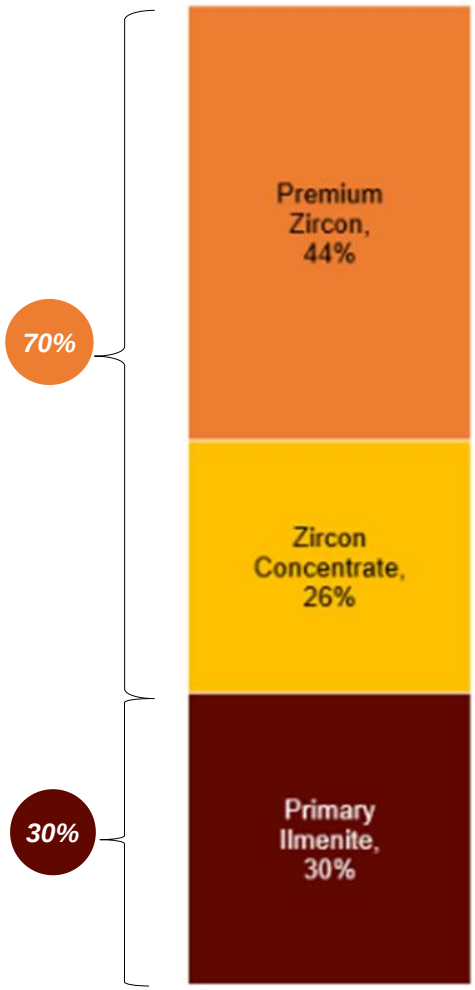
Thunderbird produces three high quality finished products comprising:

- **Premium Zircon**
  - Product has high ZrO_2 (> 66% ZrO_2 + HfO_2) and very low contaminant trace elements (low in TiO_2, Fe_2O_3, Al_2O_3), making it suitable for all zircon applications
  - Suited to ceramics, zirconium chemicals and fused products industry, foundry, investment castings and other specialty markets
- **Zircon Concentrate**
  - Zircon concentrate provides value through high levels of contained valuable minerals.
  - Material to offer a ZrO_2 rich (c. 35% ZrO_2) and TiO_2 rich (c. 34% TiO_2) concentrate to customers for further process upgrading
  - Suited to ceramics (as a blended product), zirconium chemicals industry, foundry and investment castings
- **Primary Ilmenite**
  - Material suited for upgrading as feedstock for TiO_2 slag production (both chloride and sulfate slag)
  - Low in key contaminants
  - Option to produce LTR ilmenite later in the mine life if market dynamics are favourable. The LTR process can produce a premium high-grade product that is capable of feeding both the chloride slag market (53.0% TiO_2) and the sulfate pigment market (57.0% TiO_2)

Stage 1 offtake summary

Product	Binding Agreement (% of Stage 1)	Offtake Parties
Premium zircon	**100%**	Sukaso, Ruby Ceramics, RZI, Qingyuan Jinsheng, Minchem, CFM, Others
Zircon Concentrate	**100%**	Hainan Wensheng, RZI
Primary Ilmenite[2]	**~100%**	Bengbu

% Revenue[1] over Stage1&2



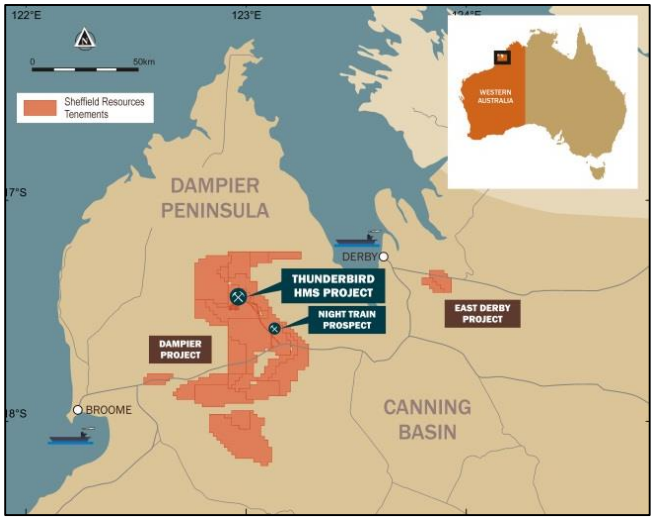
Note:
1. Based on the Thunderbird Financial Model
2. Based on Primary Ilmenite (CUP Mags only) volumes for Stage 1

Optimally Positioned to Supply Key End Markets

Sheffield has a clear competitive advantage in supplying the Asian markets

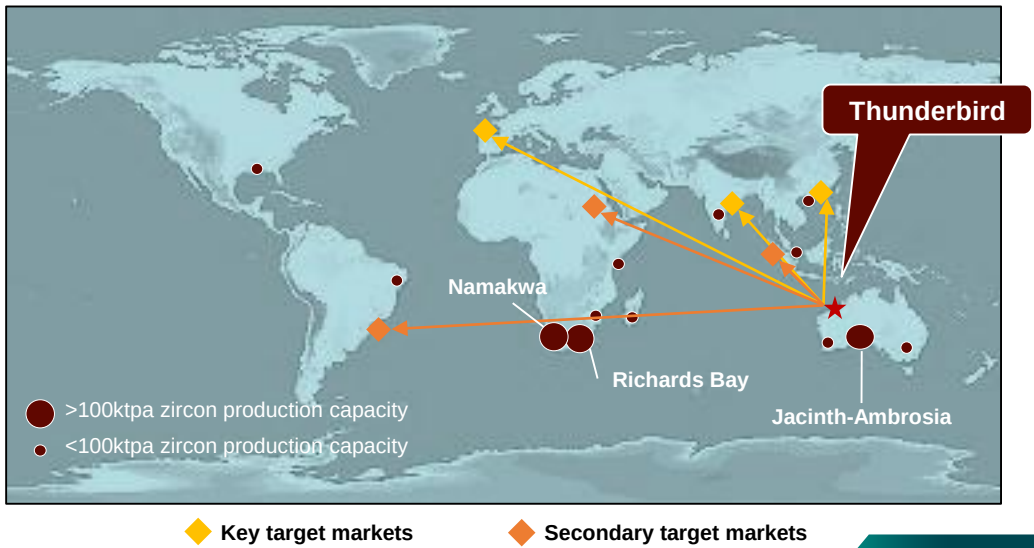
Close proximity to port and other key infrastructure

- Thunderbird is located in a low risk jurisdiction with minimal chance of supply disruption
- Simple mine to market logistics with two ports in close proximity of Thunderbird. Connected to both ports via the major highway in the region
  - Seaport and airports including Broome international airport, Curtin domestic airport, Derby Airport, Port of Broome and Port of Derby
  - Significant physical assets at the ports including storage sheds, transport and lifting equipment and lay down areas
  - Access to industrial services such as mechanical, electrical, civil and building, road construction and earthwork
  - Civil/community resources including hospitals, medical centres, housing and recreation facilities



Strategically positioned for the high growth Asian markets

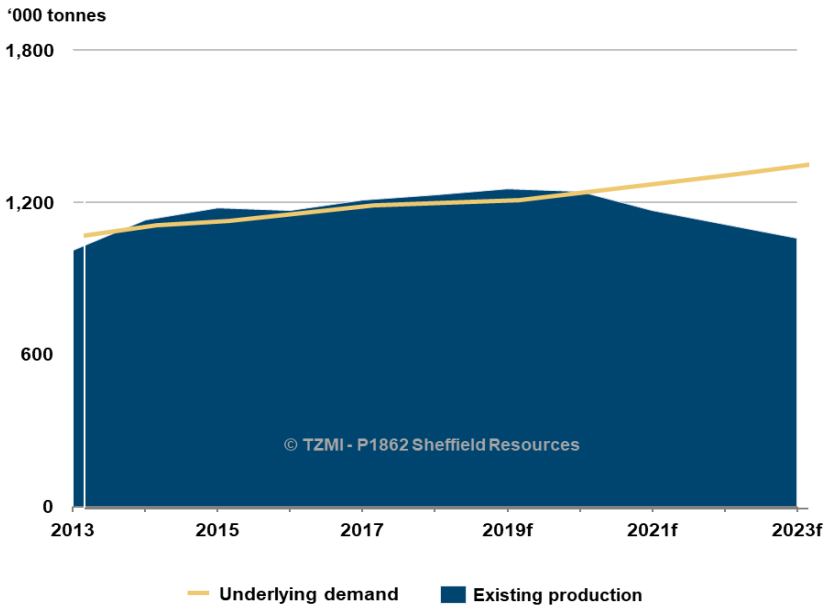
- Thunderbird is significantly closer in proximity to the Asian markets compared to other mineral sands producers
  - Key market given China consumes c. 50% of global zircon and ilmenite feedstocks
- The majority of global zircon production is sourced from mature operations in South Africa (Richards Bay, Fairbreeze, Namakwa) and Southern Australia (Jacinth-Ambrosia)
  - Other minor production predominantly from Australia, South Africa, Mozambique, Kenya, Madagascar, Asia, USA and Brazil
- Thunderbird has a competitive advantage given it is located c. 4,500km from China, compared to c. 6,500km for Jacinth-Ambrosia and >10,000km for Richards Bay



A Substantial Supply Gap in the Zircon Market is Emerging

Thunderbird ideally positioned to help bridge the expected supply gap

Significant zircon supply gap expected[1]



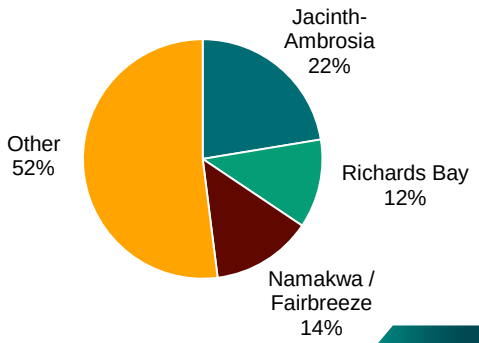
Key observations

- Supply decline of 2.9% p.a. expected up to 2023
  - Supply is dominated by Australia and Sub-Saharan Africa – material supply deficit expected to emerge from 2019 due to Ore Reserve depletion, jurisdictional risks and limited exploration success
  - Ore Reserves expected to diminish at the mature, larger scale assets such as Jacinth-Ambrosia and Richards Bay
  - Zircon supply deficit to increase from 2022 as demand outpaces supply growth (even with the onset of new projects)
  - Mine closures at North Stradbroke Island (Australia) in 2019 and Mataraca (Brazil) due in 2020
- **Supply gap is primarily driven by an expected decline in supply, rather than a forecast increase in demand**
- Thrifting and substitution have reached logical limits
- Reserve depletion of existing projects and jurisdictional risks associated with new projects are expected to tighten supply, supporting zircon's robust price outlook

Zircon supply at risk with c. 50% of global zircon production concentrated in three mature assets

- c. 50% of global zircon production sourced from 3 mature operations:
  - Jacinth-Ambrosia (c. 280ktpa, 10+ years old, Australia)
  - Richards Bay (c. 150ktpa, 40+ years old, South Africa)
  - Namakwa / Fairbreeze (c. 170ktpa, 30+ years old, South Africa)
- Declining grade and ore reserves at these 3 operations will exacerbate the supply deficit
- Additional jurisdictional and geopolitical risk given 2 of the assets are located in South Africa
- Australia's overall zircon output from existing operations is expected to decline substantially to c. 200ktpa by 2026

Split of Global Zircon Production[2]



Note:
1. Sourced from TZMI
2. Sourced published Company reports and total from TZMI

Steady Zircon Demand Growth With Supply Deficit Pending

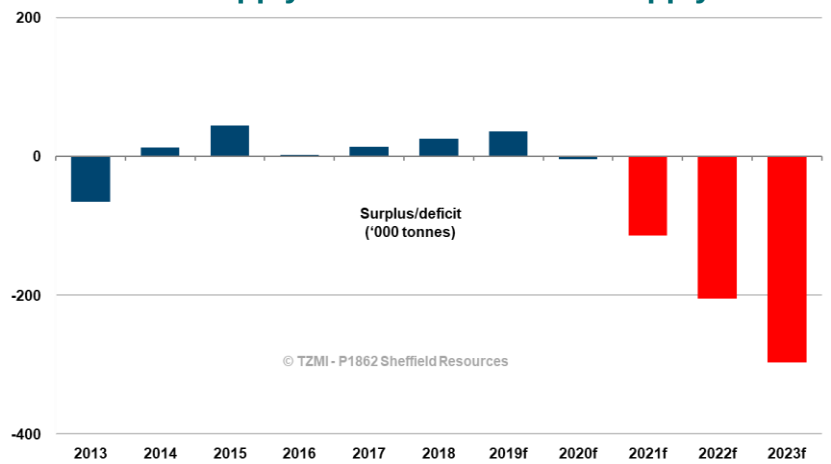
A strong baseline of demand growth coupled with a substantial supply gap supports a robust price outlook for zircon

- Global demand expected to grow at 2.3% p.a. to 2023, in line with global GDP growth
- Significant demand growth from India expected due to mass urbanization
- Stable ceramics growth of 2.6% p.a. through to 2023
- Ceramics industry to dominate growth market in terms of volume accounting for 54% of total growth through to 2023
- Zirconia and zirconium chemicals expected to be the highest growth sector at 2.9% p.a.
- Foundry and refractories both forecast to grow at a conservative 1.8% p.a. by 2023

Key observations

- 1.2Mtpa global market, expected to grow at 2.4% p.a. to 2023, in line with global GDP growth – primarily driven by demand for ceramics
  - Underpinned by improved offtake in China after some capacity rationalisation and drawdown of excess finished product inventory
  - Expanding markets in India putting pressure on supply with India expected to be 10% of total demand by 2023
- China and Europe represent 47% and 21% of global demand, respectively, driven by urbanisation, industrialisation and demand for ceramics
- Demand for ceramics represents c. 50% of end-market usage, driven by demand for floor tiles in developing economies (which have the highest proportionate use of floor tiling and sanitary products)

Zircon supply deficit without new supply[1]

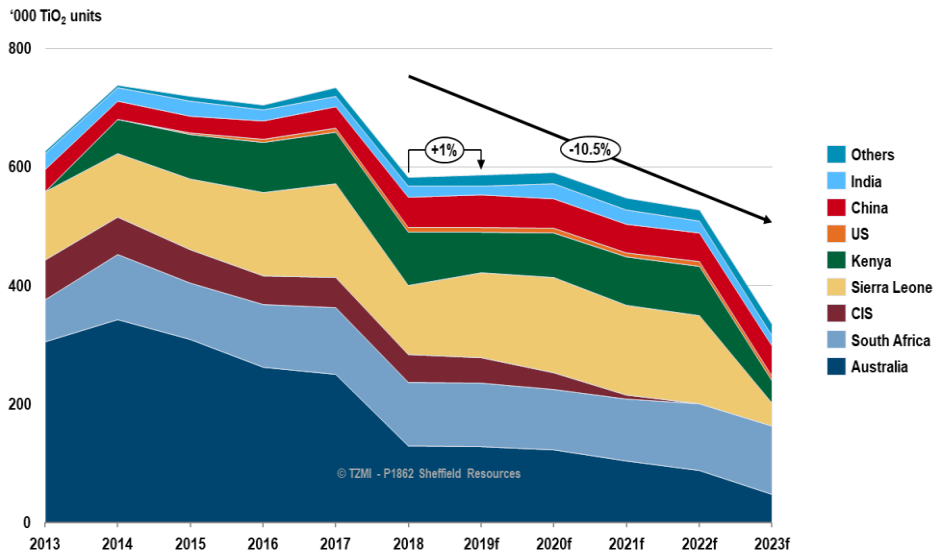


Note:
1. Sourced from TZMI

Substantial Supply Gap in the Titanium Market is Emerging

Thunderbird ideally positioned to help bridge the expected supply gap

Significant supply gap for high TiO_2 feedstocks on the horizon[1]



Key observations

Rutile supply decline of **10.5%** p.a. expected up to 2023

- Supply volume declines by 330,000 TiO_2 units by 2023
- Steep decline in supply due mainly to depletion of existing resources.
- Demand continuing to exceed supply
- Alternative feedstocks required to fill demand void.

Opportunities

Production of Chloride Slag to fill void

- Demand for TiO_2 feedstocks globally predicted to reach 8.49 million TiO_2 units by 2023 (Currently 7.5 million TiO_2 units).
- Major growth area to meet demand identified as Chloride Slag.
- Chinese processors developing chloride slag technology to fill supply void.
- Sheffield has binding offtake agreement for 100% of available primary ilmenite with Chinese Chloride Slag producer

Pigment production continues to be dominant consumption of TiO_2 feedstocks

Approximately 90% of global demand for TiO_2 feedstocks is for production of pigments with other key markets being titanium metal and welding rod production

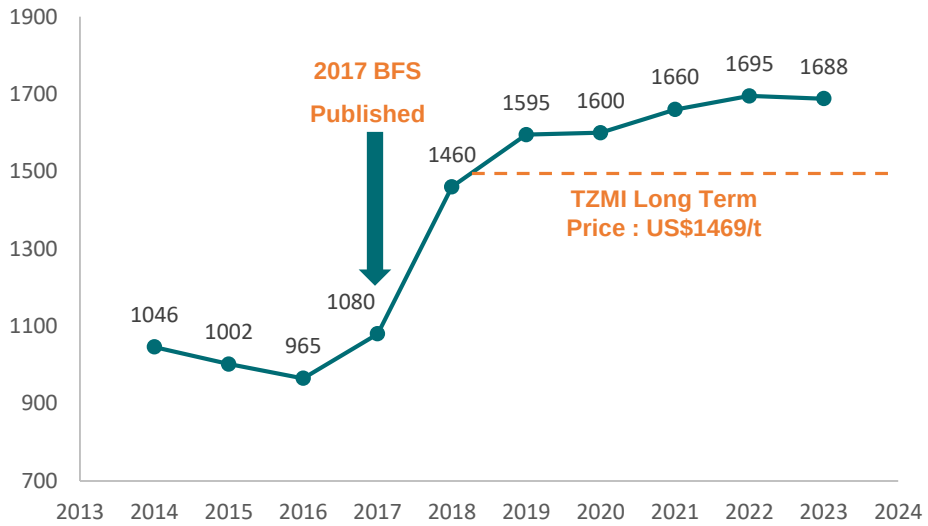
- High grade TiO_2 feedstocks in tight supply (rutile, synthetic rutile, chloride ilmenite, leucoxene) putting pressure on pigment producers.
- Sulfate and Chloride Pigment production evenly split at 50/50 of the total pigment sector.
- Unless new supply is brought on line current projections indicate growth in underlying demand to significantly outpace supply
- Without new supply the annual deficit position is predicted to be 1.2 million TiO_2 units by 2023

Note:
1. Sourced from TZMI

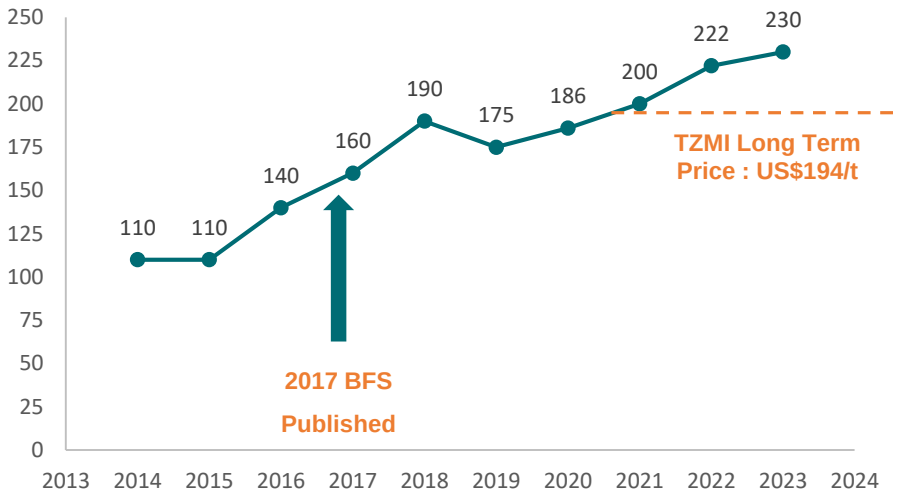
Expected Improvement in Zircon and Ilmenite Prices

Robust price outlook for both zircon and ilmenite going forward

TZMI Historical and Forecast Zircon Prices (US$/t FOB)[1]



TZMI Historical and Forecast Sulfate Ilmenite Prices (US$/t FOB)[1,2]



- Zircon prices have significantly increased over the past 24 months and are expected to show steady incremental growth over the next 3-4 years
  - Driven by the larger, more sophisticated producers
- Forecast pricing underpinned by a significant supply gap expected to emerge for zircon (see next page)
- The consensus view supports the need for additional supply from 2020 onwards

- Ilmenite prices started to increase from Q4 2016 and continued to rise throughout 2017 and 2018
  - Pigment demand expected to increase during 2019 as de-stocking nears completion
  - Chloride slag market identified as a major growth sector in coming years
- Long-term consensus forecasts anticipate a supply deficit from 2020
- Ilmenite pricing varies greatly based on different feed stocks and product quality

Notes:
1. Forecasts based on the June 2019 TZMI Market Study Report. Historical data based on TZMI and Sheffield estimates
2. Ilmenite pricing varies based on the feedstock quality. As a result, the historical pricing in this chart is based on an average of several different feed stocks, and has been sourced from TZMI

SECTION VI

Legal, Commercial and Social Licence to Operate

Primary Approvals, Leases & Agreements in Place

Thunderbird is fully permitted and construction ready

Party	Topic	Scope	Date Complete	In Place
Dept of Environment & Energy (Cwth)	*Environmental Approval*	Federal Government environmental approval for project	Sep 2018	☑
Department of Water & Environmental Regulation (WA)	*Environmental Approval*	State Government environmental approval for project	Aug 2018	☑
	Works Approvals	Minor or preliminary works (MoPW) – trial mining pits	Sep 2017	☑
		Approval for mining, processing, sewage facility and waste	Aug 2018	☑
	Licence to Take Water	Groundwater licence for project construction and operations	Oct 2018	☑
Department of Mines, Industrial Regulation & Safety (WA)	*Mining Lease*	• Mining Proposal (Village and Road) • Tenure for mining and processing • Mining Proposal Stage 1 – submitted and under assessment	Sep 2017 Sept 2018 Expect Aug 2019	☑ ☑
	Miscellaneous Licences	Tenure for infrastructure, roads and accommodation	Jun 2018	☑
Shire of Derby & West Kimberley	*Port of Derby Lease*	Tenure for facilities at Port of Derby	May 2018	☑
Native Title Claimants	*Aboriginal Heritage Agreements*	Heritage protocols for exploration tenure	Nov 2015	☑
	Native Title Agreements	Agreed terms and conditions for project operations	Oct 2018	☑

Environment

All necessary State and Federal environmental approvals received

- Sheffield's strong social licence to operate is supported by full State and Federal environmental approvals following a 3 year Public Environmental Review ("PER")
- The PER process required Sheffield to assess the environmental impact of the project development and included detailed public consultation and identification of key environmental concerns for the community. The key issues identified by the PER process were:
  - Impact on the Greater Bilby
  - Impact on ground water resources
  - Haulage of mineral sands products through Derby
  - Impact of ocean going vessels on marine animals
- The Environmental Protection Authority ("EPA") conducted a detailed review, including a site visit by the EPA Board and 2 periods of public comment
- All environmental approvals were received with the following conclusions and/or conditions:
  - PER concluded all risks can be adequately managed
  - Approvals contain standard industry conditions and controls
  - Specific Greater Bilby management plans in place
  - Environmental offset fund established
  - Restrictions on speeds and travel times for haulage of products to Port of Derby

Thunderbird personnel receive training in Bilby management as part of our Bilby Management Program (2018)

Native Title Agreement

Native Title agreement signed and is irrevocably binding on both Sheffield and the Traditional Owners

- Sheffield signed the Co-existence Agreement (Native Title Agreement) for Thunderbird on 31 October 2018
- The Traditional Owners for the Mt Jowlaenga Polygon #2 Native Title Claimant Application authorised the Named Applicants to sign the Co-existence Agreement for Thunderbird, making it binding on both Sheffield and the Traditional Owners
- Details of the Co-existence Agreement are confidential, however the final agreement is in line with Sheffield's pledge to the community and contains:
  - Royalty payments to the Traditional Owners
  - Local and Aboriginal employment and business commitments
  - Protection for Aboriginal heritage and the environment
- The Co-existence Agreement establishes the framework by which the Company can work with the Traditional Owners to protect Aboriginal heritage and the environment while delivering sustainable employment and business outcomes for Traditional Owners and the wider Aboriginal community

Sheffield, Arma Legal and Traditional Owner representatives with signed Co-Existence Agreement (October 2018)

Sheffield's Aboriginal Employment Strategy

- Sheffield has been successful in building a strong locally based workforce particularly in the area of Aboriginal employment (10 out of its current 13 Kimberley based personnel are Aboriginal people)
- Strong commitment to training and development which results in ongoing employment
- In addition, Sheffield has pledged:
  - To achieve 40% Aboriginal employment by year 8 of operations
  - To commit to Aboriginal businesses during construction and operations

APPENDIX A

Ore Reserves, Mineral Resources and Exploration

Thunderbird Ore Reserves

Thunderbird Ore Reserves: Valuable Heavy Mineral in-situ grade[1]

Ore Reserve Category	Ore Tonnes (Mt)	In-situ HM Tonnes (Mt)	HM Grade (%)	Valuable Heavy Mineral Grade (In-situ)[2]				Oversize (%)	Slimes (%)
				Zircon (%)	HiTi Leucoxene (%)	Leucoxene (%)	Ilmenite (%)		
Proved	219	30.0	13.7	1.02	0.30	0.28	3.68	14.0	16.1
Probable	529	53.4	10.1	0.79	0.27	0.27	2.87	10.5	14.5
Total	**748**	**83.8**	**11.2**	**0.86**	**0.27**	**0.27**	**3.11**	**11.6**	**15.0**

Thunderbird Ore Reserves: Mineral assemblage as percentage of HM grade[1]

Ore Reserve Category	Ore Tonnes (Mt)	In-situ HM Tonnes (Mt)	HM Grade (%)	Mineral Assemblage[3]				Oversize (%)	Slimes (%)
				Zircon (%)	HiTi Leucoxene (%)	Leucoxene (%)	Ilmenite (%)		
Proved	219	30.0	13.7	7.4	2.2	2.0	26.9	14.0	16.1
Probable	529	53.4	10.1	7.8	2.6	2.7	28.4	10.5	14.5
Total	**748**	**83.8**	**11.2**	**7.7**	**2.4**	**2.4**	**27.8**	**11.6**	**15.0**

Notes:

1. Ore Reserves are presented both in terms of in-situ VHM grade, and HM mineral assemblage. Tonnes and grades have been rounded to reflect the relative accuracy and confidence level of the estimate, thus the sum of columns may not equal. Ore Reserves reported for the Dampier Project were prepared and first disclosed under the JORC Code (2012). Refer to Sheffield's ASX Announcement dated 31 July 2019 titled "Thunderbird Ore Reserve Update" for further detail. Ore Reserve is reported to a design overburden surface with appropriate consideration for modifying factors, costs, mineral assemblage, process recoveries and product pricing
2. The in-situ grade is determined by multiplying the HM Grade by the percentage of each valuable heavy mineral within the heavy mineral assemblage
3. Mineral Assemblage is reported as a percentage of HM Grade. It is derived by dividing the in-situ grade by the HM grade

Thunderbird Mineral Resources

Thunderbird Mineral Resources: Valuable Heavy Mineral in-situ grade[1]

Cut-off (HM%)	Mineral Resource Category	Ore Tonnes (Mt)	In-situ HM Tonnes (Mt)	HM Grade[2] (%)	Valuable Heavy Mineral Grade (In-situ)[3]				Slimes (%)	Oversize (%)
					Zircon (%)	HiTi Leucoxene (%)	Leucoxene (%)	Ilmenite (%)		
> 3% HM	Measured	510	45	8.9	0.71	0.20	0.19	2.4	18	12
	Indicated	2,120	140	6.6	0.55	0.18	0.20	1.8	16	9
	Inferred	600	38	6.3	0.53	0.17	0.20	1.7	15	8
	Total	**3,230**	**223**	**6.9**	**0.57**	**0.18**	**0.20**	**1.9**	**16**	**9**
>7.5% HM	Measured	220	32	14.5	1.07	0.31	0.27	3.9	16	15
	Indicated	640	76	11.8	0.90	0.28	0.25	3.3	14	11
	Inferred	180	20	10.8	0.87	0.27	0.26	3.0	13	9
	Total	**1,050**	**127**	**12.2**	**0.93**	**0.28**	**0.26**	**3.3**	**15**	**11**

Thunderbird Mineral Resources: Mineral assemblage as percentage of HM grade[1]

Cut-off (HM%)	Mineral Resource Category	Ore Tonnes (Mt)	In-situ HM Tonnes (Mt)	HM Grade[2] (%)	Mineral Assemblage[4]				Slimes (%)	Oversize (%)
					Zircon (%)	HiTi Leucoxene (%)	Leucoxene (%)	Ilmenite (%)		
> 3% HM	Measured	510	45	8.9	8.0	2.3	2.2	27	18	12
	Indicated	2,120	140	6.6	8.4	2.7	3.1	28	16	9
	Inferred	600	38	6.3	8.4	2.6	3.2	28	15	8
	Total	**3,230**	**223**	**6.9**	**8.3**	**2.6**	**2.9**	**28**	**16**	**9**
>7.5% HM	Measured	220	32	14.5	7.4	2.1	1.9	27	16	15
	Indicated	640	76	11.8	7.6	2.4	2.1	28	14	11
	Inferred	180	20	10.8	8.0	2.5	2.4	28	13	9
	Total	**1,050**	**127**	**12.2**	**7.6**	**2.3**	**2.1**	**27**	**15**	**11**

Notes:

1. The Thunderbird Mineral Resources are reported inclusive of (not additional to) Ore Reserves. The Mineral Resource reported above 3% HM cut-off is inclusive of (not additional to) the Mineral Resource reported above 7.5% HM cut-off. All tonnages and grades have been rounded to reflect the relative accuracy and confidence level of the estimate and to maintain consistency throughout the table, therefore the sum of columns may not equal. The Mineral Resource estimate was prepared and first disclosed under the JORC Code (2012). Refer to Sheffield's ASX announcement dated 5 July 2016 titled *"Sheffield Doubles Thunderbird Measured Mineral Resource"* for further detail
2. Total heavy minerals (HM) is within the 38µm to 1mm size fraction and has been reported as a percentage of the total material quantity
3. The Valuable HM in-situ grade is reported as a percentage of the total material quantity and is determined by multiplying the percentage of total HM by the percentage of each valuable heavy mineral within the HM assemblage at the resource block model scale
4. The Mineral Assemblage is represented as the percentage of HM grade. Estimates of mineral assemblage are determined by screening and magnetic separation. Magnetic fractions were analysed by QEMSCAN for mineral determination as follows: >90% liberation; ilmenite 40-70% TiO_2; leucoxene 70-94% TiO_2; high titanium leucoxene (HiTi Leucoxene) >94% TiO_2 and zircon 66.7% ZrO_2+HfO_2. The non-magnetic fraction was analysed by XRF and minerals determined as follows: Zircon ZrO_2+HfO_2/0.667 and HiTi Leucoxene TiO_2/0.94

Night Train Mineral Resources

Night Train Mineral Resources: Valuable Heavy Mineral in-situ grade[1]

Mineral Resource Category	Cut off (HM%)	Ore Tonnes (Mt)	HM Grade (%)	Valuable Heavy Mineral Grade (In-situ)[2,3]					
				Zircon (%)	HiTi Leucoxene & Rutile (%)	Leucoxene (%)	Ilmenite (%)	Slimes (%)	Oversize (%)
Inferred	1.2	130	3.3	0.45	0.18	1.5	0.71	8.7	2.2
Inferred	2.0	50	5.9	0.82	0.33	2.9	1.06	10.2	2.2

Night Train Mineral Resources: In-Situ Tonnes[1]

Mineral Resource Category	Cut off (HM%)	HM Tonnes (Mt)	In-situ Tonnes[4]				
			Zircon (kt)	HiTi Leucoxene & Rutile (kt)	Leucoxene (kt)	Ilmenite (kt)	Total VHM (kt)
Inferred	1.2	4.2	560	220	1,900	900	3,590
Inferred	2.0	3.0	420	170	1,500	540	2,600

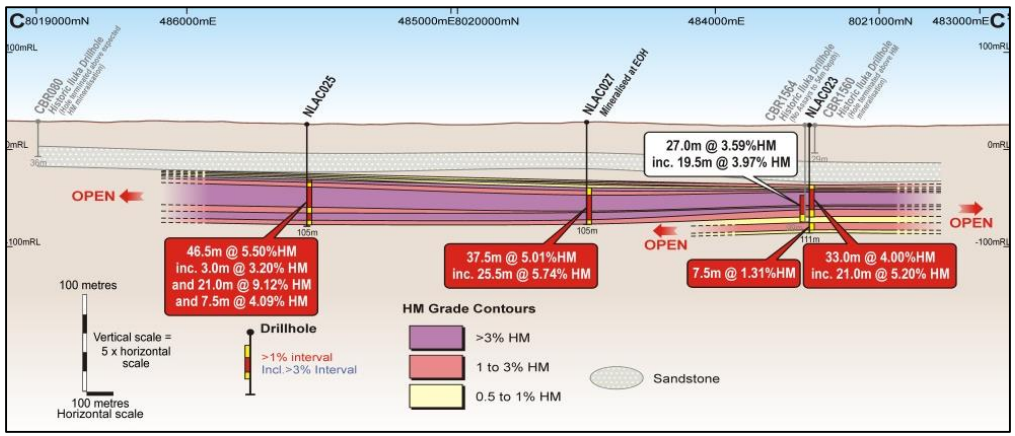
Notes:
1. Refer to ASX Announcement on 31 January 2019 titled *"High Grade Maiden Mineral Resource at Night Train"* for further information, explanations and qualifications. The Mineral Resource estimate was prepared by Optiro Pty Ltd and disclosed under the JORC Code (2012). Total HM is within the 38µm to 1mm size fraction and reported as a percentage of the total material, slimes is the -38µm fraction and oversize is the +1mm fraction. Tonnes and grades have been rounded to reflect the relative accuracy and confidence level of the estimate, thus the sum of columns may not equal
2. In-situ assemblage grade is determined by multiplying the percentage of total HM by the percentage of each valuable heavy mineral within the heavy mineral assemblage at the resource block model scale
3. Estimates of Mineral Assemblage are presented as percentages of the Total Heavy Mineral (THM) component of the deposit, as determined by magnetic separation, QEMSCANTM and XRF for one of 12 composite samples. Magnetic fractions were analysed by QEMSCANTM for mineral determination as follows: ilmenite: 40-70% TiO_2 >90% liberation; leucoxene: 70-90% TiO_2 >90% liberation; high titanium leucoxene (HiTi leucoxene) and rutile combined > 90% TiO_2 liberation, and zircon: 66.7% ZrO_2+HfO_2 >90% liberation. The non-magnetic fraction was submitted for XRF analysis and minerals determined as follows: zircon: ZrO_2+HfO_2/0.667 and high titanium leucoxene (HiTi leucoxene): TiO_2/0.94. HM assemblage determination was by the QEMSCANTM process for 11 of 12 composite samples which uses observed mass and chemistry to classify particles according to their average chemistry, and then report mineral abundance by dominant % mass in particle. For the TiO_2 minerals the following breakpoints were used to distinguish between ilmenite 40% to 70% TiO_2, leucoxene 70% to 90% TiO_2, high TiO_2 leucoxene and rutile > 90%
4. The contained in-situ tonnes for the valuable heavy minerals were derived from information from the in-situ grades and tonnes of the Mineral Resource

Significant Regional Exploration Upside

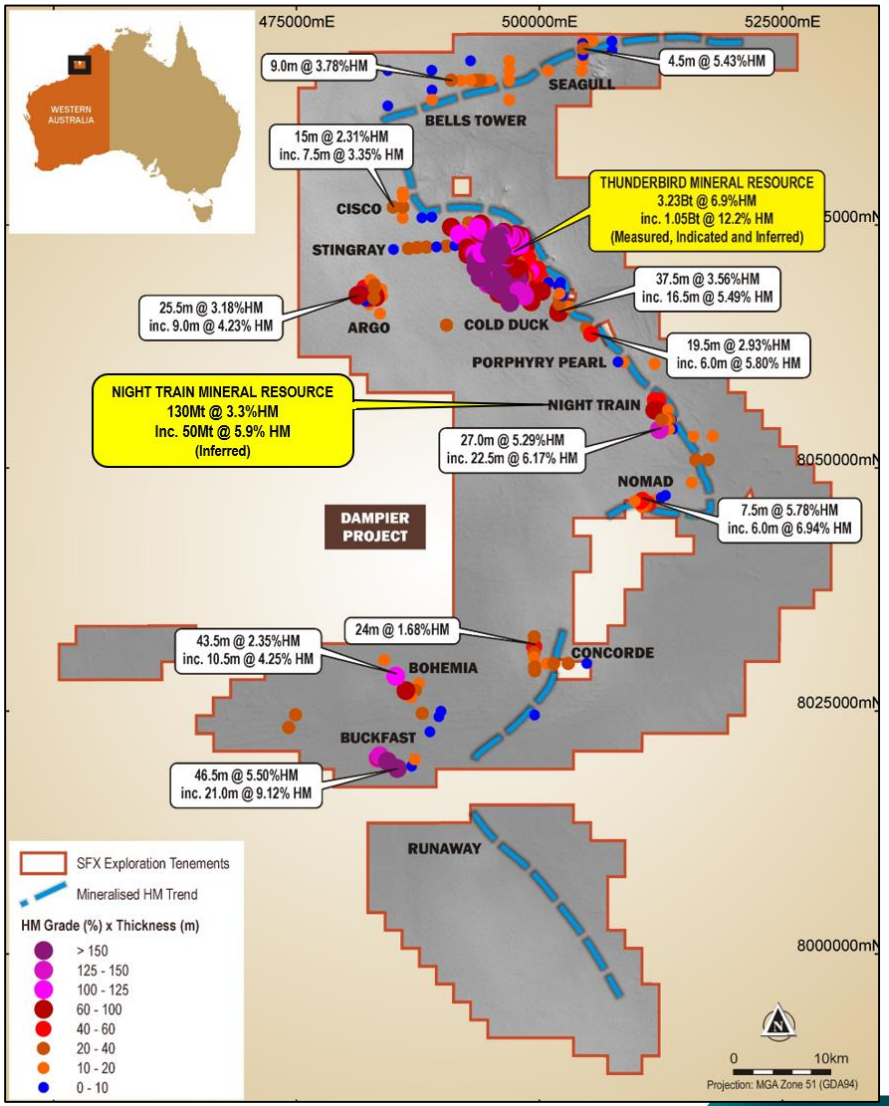
Strategic value demonstrated through multiple discoveries made along a 160km long trend

- Exploration has delineated 14 zones of significant mineralisation along a 160km long highly mineralised trend which extends from Seagull in the north to Runaway in the south[1]
- Maiden high grade Mineral Resource[1] outlined at Night Train
- Three substantial new mineral sands discoveries have been outlined at Buckfast, Bohemia and Concorde
  - Characterised by broad sheet-like geometries, thick intersections
  - Mineral assemblages with high proportions of VHM dominated by leucoxene, altered ilmenite and zircon with low to moderate levels of trash
- Opens up a new 60km long highly prospective corridor south of Thunderbird
- Thick high grade intervals[2] have been intersected, including;
  - 46.5m @ 5.50% HM from 57.0m (NLAC025), including 21.0m @ 9.12% HM from 64.5m (Buckfast)
  - 37.5m @ 5.01% HM from 67.5m (NLAC027), including 25.5m @ 5.74% HM from 75m (Buckfast)
- **Numerous zircon-rich targets identified for follow-up drilling**

Buckfast – Cross Section[2]



Dampier Project – Regional Plan[1]



Notes:
1. Refer to ASX announcement 31 January 2019 titled *"High Grade Maiden Mineral Resource at Night Train"*
2. Refer to ASX announcement 13 November 2018 titled *"New Large High Grade Discovery South of Thunderbird"*

APPENDIX B

Product Specifications

Product quality

Premium quality zircon, zircon concentrate and primary ilmenite products with extensive testing conducted by offtake partners

Zircon Product Properties[1]

- Meets premium classification for use in the ceramics sector
- Approved globally after extensive testing by offtake partners and other consumer groups
- Approved for investment casting applications
- Low levels of impurities (particularly Al_2O_3)

Composition	Premium Zircon (%)	Typical (%)
$ZrO_2 + HfO_2$	66.2 – 66.6	66.30
TiO_2	0.09 – 0.20	0.14
Fe_2O_3	0.06 – 0.10	0.08
SiO_2	32.5 – 33.5	32.5
Al_2O_3	0.10 - 0.15	0.15

- 100% Binding Offtake in Place
- Offtake partners in key locations and regions in Europe, India and China
- Material suited to all zircon applications

Zircon Concentrate Product Properties

- Highly sought after concentrate material
- High ZrO_2 and TiO_2 grade
- (c. 35% ZrO_2, & 34% TiO_2)
- Value for both the ZrO_2 and TiO_2 units

Composition	Zircon Concentrate (%)	Typical (%)
$ZrO_2 + HfO_2$	32.0 – 37.0	35.20
TiO_2	32.0 – 37.0	34.40
Fe_2O_3	1.00 – 1.50	1.30
SiO_2	18.0 – 22.0	19.2
Al_2O_3	1.00 - 1.50	1.30

- 100% Binding Offtake in Place
- Offtake partners in key locations within China
- Material well suited to processing and upgrading

Primary Ilmenite Product Properties[2]

- Low technical risk
- Suitable for chloride slag production
- Produces valuable co-product in High Purity Pig Iron (HPPI)
- Low levels of Cr_2O_3, very low CaO and MgO
- Fine to medium grained.

Composition	Primary Ilmenite (%)	Typical (%)
TiO_2	35.0 – 45.0	38.5
$TiO_2 + Fe_2O_3 + FeO$	92.5	91.0 – 95.0
Cr_2O_3	0.05	0.04 - 0.06
CaO	0.02	<0.01 – 0.03
MgO	0.20	0.15 – 0.25

- 100% Binding Offtake in Place
- Offtake partner to be integrated
- Will produce chloride slag and chloride pigment

Notes:
1. Based on the ASX announcement released on 12 October 2016 *"Thunderbird BFS Delivers Outstanding Product Improvements"*
2. Based on the ASX announcement released on 1 July 2019 titled *"Sheffield Signs Binding Primary Ilmenite Offtake Agreement"*

APPENDIX C

Corporate Overview, Board and Senior Management

Sheffield Resources Corporate Overview

Sheffield Resources is an ASX listed mineral sands developer which owns 100% of the large scale shovel ready Thunderbird Mineral Sands Project

- Sheffield Resources Limited ("Sheffield" or the "Company") is an ASX listed mineral sands developer and explorer based in Perth, Western Australia (ASX:SFX)
- Sheffield is focused on the development of the 100% owned Thunderbird Mineral Sands Project ("Thunderbird" or the "Project") located on the Dampier Peninsula in Northern Western Australia.
- Thunderbird has been developed as a greenfield project by Sheffield since discovery in 2012 and is one of the largest and highest grade zircon rich discoveries in the last 30 years and is one of a few greenfield mineral sands deposits globally in a secure jurisdiction
- Experienced and skilled Board and management (>150 years' collective experience) with strong in-house intellectual property and knowledge and capable of developing, delivering and operating Thunderbird
- Sheffield has a portfolio of mineral sands assets in Australia with a focus on zircon rich assemblages which includes:
  - Thunderbird with Ore Reserve of 748Mt @11.2%HM[2]
  - Night Train deposit, 20km to the east of Thunderbird and with an Inferred Mineral Resource[3] of 130Mt @ 3.3% HM, containing 3.6Mt of VHM
  - Dampier Project has delineated 14 zones of significant mineralisation along a 160km long highly mineralised trend[4]

Capital structure[1]

Item	Unit	Value
Ordinary Shares Outstanding (as at 30 July 2019)	*#m*	261
Share Price (as at 29 July 2019)[1]	*A$/sh*	0.73
Market Capitalisation	***A$m***	**190.5**
Cash Balance (30 June 2019)	*A$m*	2.7
Debt Balance (30 June 2019)	*A$m*	-
Enterprise Value	***A$m***	**187.8**

Share price chart – Since BFS release[1]

1. Market data as at 29 July 2019 and sourced from ASX market based data and reports published by Sheffield Resources
2. Refer to ASX announcement 31 July 2019 titled "Thunderbird Ore Reserve Update"
3. Refer to ASX announcement 31 January 2019 titled *"High Grade Maiden Mineral Resource at Night Train"*
4. Refer to ASX announcement 13 November 2018 titled *"New Large High Grade Discovery South of Thunderbird*

Board of Directors

Will Burbury — *Non-Executive Chairman*

- Practised as a corporate lawyer with a leading Australian law firm prior to entering the mining and exploration industry in 2003
- Actively involved in the identification and financing of many Australian and African resources projects
- Held senior management positions and served on the boards of several private and publicly listed companies
- Previously Chairman of Warwick Resources Limited prior to its merger with Atlas Iron Limited in 2009. Formerly a director of Lonrho Mining Limited (ASX: LOM) and an executive of Nkwe Platinum Ltd (ASX: NKP)

David Archer — *Technical Director*

- Geologist with over 30 years' experience in exploration and mining in Australia
- Held senior positions with major Australian mining companies, including Renison Goldfields Consolidated Limited and 10 years as a director of Archer Geological Consulting
- Consultant to Atlas Iron Limited and Warwick Resources Limited and was responsible for significant iron ore discoveries for both companies in the Pilbara region
- Other major West Australian discoveries include the Raleigh and Paradigm gold mines and the Magellan lead mine

Bruce McFadzean — *Managing Director*

- Over 40 years' mining experience leading financing, development and operation of several new mines in the global resources industry
- Professional career includes 15 years with BHP Billiton and Rio Tinto in a variety of positions globally and 4 years as Managing Director of successful Western Australia gold miner Catalpa Resources Limited (ASX:CAH) which he subsequently merged into Evolution Mining (ASX:EVN)
- Raised in excess of A$700 million in debt and equity from Australian and overseas markets and has built and operated mines globally
- Initiated and completed several successful merger transactions

Bruce McQuitty — *Non-Executive Director*

- 35 years' experience in the mining and civil construction industries
- Managing Director of Warwick Resources Limited prior to its merger with Atlas Iron Limited in 2009
- Held senior positions with Consolidated Minerals Limited, Renison Goldfields Consolidated Limited and Gympie Gold Limited
- Significant technical expertise in exploration, project generation, feasibility, underground mining and engineering geology and has managed exploration teams in Australia and overseas

Executive Management Team

Stuart Pether — *Chief Operating Officer*

- Mining professional with over 25 years' experience in the resources industry
- Experience includes project development, technical studies, mine operations and corporate management
- Most recently, CEO of Kula Gold Limited, and previously was the Vice President, Project Development for Evolution Mining and Chief Operating Officer for Catalpa Resources
- Holds a Bachelor of Engineering (Mining) from the Western Australian School of Mines and is a member of the Australasian Institute of Mining and Metallurgy

Mark Di Silvio — *CFO / Company Secretary*

- CPA and MBA qualified finance professional with over 25 years' resources industry experience
- Professional career includes gold operations and project development experience in both Australia and overseas, senior finance roles with Woodside Petroleum Limited in Australia and Africa
- Most recently CFO for TSX listed Mawson West Limited, and was also previously CFO of Centamin Plc (TSX, LSE listed)
- Significant experience in financial management, debt and offtake funding and product offtake agreements

Jim Netterfield — *General Manager, Process & Engineering*

- More than 20 years' experience in the resources industry with a proven track record in successfully managing mineral development projects through to production
- Professional career includes 11 years with BHP Billiton and Rio Tinto in a variety of senior operations roles, including Vice President – Railway & Ports, Vice President, Operations - Dampier
- Served as acting CEO and Operations Director at Oakajee Port & Rail Pty Ltd for 4 years, where Jim led the feasibility studies for Mitsubishi's $10 billion magnetite iron ore project

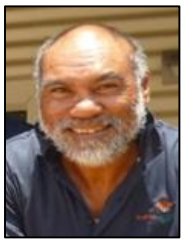
Neil Patten-Williams — *General Manager, Marketing*

- Over 18 years' experience in the resources industry, including 5 years as Sales and Marketing Manager for established mineral sands producer Doral Group, where Neil was responsible for marketing, logistics and sales globally
- Prior to his appointment as Sales and Marketing Manager at Doral, Neil was Operations Manager of the Doral Fused Materials Plant in WA for 5 years, where he was responsible for all aspects of safety, operations and maintenance. He was also the company's Zirconia Operations Manager for 5 years
- Strong background in both zircon and titanium mineral products

Executive Management Team & Key Personnel

Geoff Williams — *General Manager, Thunderbird Operations*

- Mining engineer with over 25 years' mining experience and more than 15 years' in senior operational and corporate executive roles
- Previously COO at Kimberley Diamond Company, General Manager at Consolidated Minerals and Mining Manager at Wiluna Gold Operations
- Track record of delivering agreed outcomes and maximising business capability, profit and efficiency
- Based in Broome



Justin King — *Community Relations Superintendent*

- A trusted community leader in the Kimberley region with experience as Aboriginal Liaison Officer within the mining sector and an abiding commitment to Aboriginal people
- Based in Broome

Sebastian Grey — *Principal Exploration Geologist*

- Over 15 years' resources experience with a BSc(Hons) Geology
- Well versed in Sheffield's projects after joining the Company in March 2013

Vanessa Hughes — *General Manager, People & Community*

- Qualified human resources executive with more than 25 years' experience, 15 years of which have been in senior management roles
- Prior appointments have included General Manager People, Culture and Information at Resolute Mining, General Manager People and Culture at Millennium Minerals and HR Manager at Integra Mining
- Demonstrated expertise in employee relations, indigenous engagement, people development, optimising workplace cultures and corporate social responsibility

Mark Teakle — *Technical Manager*

- Over 35 years' experience with a BSc(Hons) Geology
- Mineral sands technical expert
- Joined Sheffield in April 2012

Brad Horsman — *Contracts and Commercial Superintendent*

- Over 10 years' experience in commercial construction and contract administration
- Based in Broome

APPENDIX D

Glossary

Glossary

Term	Definition
2015 PFS	Thunderbird Pre-Feasibility Study released on 14 May 2015
A$/t	Australian dollars per metric tonne
A$m	Australian million dollars
Al_2O_3	Aluminium oxide
ASX: CAH	Catalpa Resources Limited
ASX: EVN	Evolution Mining Limited
ASX: LOM	Lonrho Mining Limited
ASX: NKP	Nkwe Platinum Limited
AUD	Australian dollars
Bankable Feasibility Study or BFS	Thunderbird Bankable Feasibility Study released on 24 March 2017
BBSY	Bank Bill Swap Bid Rate
BOO	Build, Own and Operate
BSE	Base Resources Limited
c.	Circa
CAGR	Compound annual growth rate
CaO	Calcium oxide
Capex	Capital expenditure
CFM	CFM Minerals company
CIF/FOB	Cost insurance freight / free on board
Company	Sheffield Resources Limited
CPI	Consumer price index
Cr_2O_3	Chromium(III) oxide
CUP	Concentrate upgrade plant
Cwth	Commonwealth
CY	Calendar year
Derby Port Access Agreement	Agreement with Sheffield for minimum 20 year exclusive access to the Derby Port
DMIRS	Department of Mines, Industrial Regulation and Safety
DRX	Diatreme
E04/2083	Exploration licence covering the Thunderbird deposit
EBITDA	Earnings before interest, tax, depreciation and amortisation
EDL	Energy Developments
EPA	Environmental Protection Authority

Term	Definition
EPC	Engineering, procurement and construction
EPC Contract	Engineering, procurement and construction contract
eq	Equivalent
Fe_2O_3	Iron(III) oxide or ferric oxide
FeO	Iron(II) oxide or ferrous oxide
FIBC	Flexible intermediate bulk container
FID	Final investment decision
FY	Financial year
G&A	General and administrative
GDP	Gross domestic product
GRES, GR Engineering or GR Engineering Services	GR Engineering Services Limited
HAL	Hot acid leach
HfO_2	Hafnium oxide
Hi-Ti	High titanium leucoxene
Hi-Ti88	High titanium leucoxene (88%)
HM	Heavy minerals
HMC	Heavy mineral concentrate
HMS	Heavy mineral sand
IDP	Ilmenite dry plant
ILU	Iluka Resources Limited
IMA	Image Resources, Inc.
In-situ grade	Grade determined by multiplying the percentage of the total HM by the percentage of each valuable heavy mineral assemblage at the resource block model scale
IRR	Internal rate of return
JORC Code (2012)	The Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, 2012
JSA	Job safety analysis
JV	Joint venture
kL	Kilolitre
km	Kilometre
KMR	Kenmare Resources plc
kt	Thousand tonnes

Glossary

Term	Definition
ktpa	Thousand tonnes per annum
LIBOR	London Inter-bank Offered Rate
LIMS	Low intensity magnetic separation
LNG	Liquified natural gas
LOM	Life of mine
LTR	Low temperature roast
LTR Ilmenite	Low temperature roast ilmenite
MFU	Mining feed unit
MgO	Magnesium oxide
Mineral Resources	Mineral resources deemed to be in compliance with the JORC Code (2012)
Mining Lease	Approval to mine and process minerals granted by the Department of Mines
MoPW	Minor or preliminary works
MSP	Mineral separation plant
Mt	Million tonnes
Mtpa	Million tonners per annum
MUP	Mining unit plant
MVA	Mega volt amp
MW	Megawatt
MZI	MZI Resources Limited
NAIF	Northern Australia Infrastructure Fund
Native Title	Native Title agreement
NPV	Net present value
Opex	Operating expenses
Ore Reserve	Ore reserves deemed to be in compliance with the JORC Code (2012)
p.a.	Per annum
PER	Public environmental review
PFS	Thunderbird Pre-feasibility Study released on 14 October 2015
PP&E or PPE	Property, plant and equipment
QEMSCAN	Quantitative evaluation of materials by scanning electron microscopy

Term	Definition
QMM	QIT Madagascar Minerals
RIO	Rio Tinto
ROM	Run of mine
SAV	Savannah Resources plc
Sheffield or SFX	Sheffield Resources Limited
SiO_2	Silicon dioxide
SLTO	Social license to operate
SPP	Share purchase plan
SR	Synthetic rutile
STA	Strandline Resources Limited
t	Metric tonne
Thunderbird	Thunderbird Mineral Sands Project
TiO_2	Titanium dioxide
TJ	Terajoule
TOPL	Thunderbird Operations Pty Ltd
tph	Metric tonnes per hour
Traditional Owners	The Traditional Owners for the Mt Jowlaenga Polygon #2 Native Title Claimant Application
TROX	Tronox Limited
TZMI	TZ Minerals International Pty Ltd
UBS	UBS AG, Australia branch
US$/t	U.S. dollars per metric tonne
US$m	U.S. million dollars
VDR	Virtual data room
VHM	Valuable heavy minerals
W:O	Ratio of waste to ore
WA	Western Australia
WACC	Weighted average cost of capital
WCP	Wet concentration plant
WHIMS	Wet high intensity magnetic separation
WWTP	Wastewater treatment plant
ZrO_2	Zirconium dioxide
ZSP	Zirconium sponge plant