

Due Diligence and Valuation Report

Arrowhead Code:	30-02-01
Coverage initiated:	September 14, 2023
This document:	September 14, 2023
Fair share value bracket:	AUD 2.4 to AUD 2.7
Share price (September 14, 2023):	AUD 0.46

Analysts

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Market Data

52-Week Range:	AUD 0.40 – AUD 0.68 ⁱ
Average Daily Volume (3M Avg.):	180,452 ⁱⁱ
Market Cap (September 14, 2023):	AUD 180.7 million (mn) ⁱⁱⁱ

Company Overview: Sheffield Resources Limited (Sheffield or SFX) is a well-established Australian mineral exploration and development company founded in 2007. The company aims to create a diverse portfolio of mineral sand assets globally to enhance stakeholder wealth. The company's primary focus is its flagship project – the Thunderbird Mineral Sands Project.

The Thunderbird Mineral Sands Project, located near Derby in Western Australia's Canning Basin region, stands out as one of the largest and most valuable mineral sand deposits globally, due to its vast size and exceptional high-grade quality. It aims to become the leading source of Zircon for global markets for the next few decades. Kimberley Mineral Sands Pty Ltd. (KMS), which oversees the development and construction activities of the Thunderbird Project, is SFX's 50:50 Joint Venture (JV) with YGH Australia Investment Pty Ltd (Yansteel), a subsidiary of Tangshan Yanshan Iron & Steel Co. Ltd.

As part of the JV, SFX raised c. AUD 130.1 mn in project equity funding from Yansteel for subscribing c. 50% in KMS. The project is being developed in stages – Stages 1 and 2, to decrease upfront capital requirements, minimize construction risk, and streamline operational risk. The initial phase (Stage 1) of the Thunderbird Project will entail the construction of a plant with a capacity to produce c. 1,100 Kilotonnes per annum (ktpa) of Zircon and Ilmenite concentrates.

In addition to Thunderbird, SFX has invested USD 1mn out of a maximum USD 2.5 mn to acquire and option on the South Atlantic Project in Brazil. This project comprises four deposits: Retiro, Estreito, Capao do Meio, and Bujuru. Of these, the Retiro and Bujuru deposits are the primary targets. SFX has the option to increase its stake to 20%, which would entail an additional investment of c. USD 12.5 mn (USD 15 mn in all).



Company:	Sheffield Resources Limited
Ticker:	ASX: SFX
Headquarters:	West Perth, Australia
Executive Chairman:	Bruce Griffin
CFO:	Mark Di Silvio
Website:	www.sheffieldresources.com.au



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Key Highlights: (1) KMS has completed its Bankable Feasibility Study (BFS) for the Thunderbird Project, estimating the post-tax net present value (NPV) of Stage 1 at AUD 842.0 mn (100% basis), an Internal Rate of Return (IRR) of 26.6% and Life-of-Mine (LOM) of 33 years. Stage 2 should double the mining capacity with a 50% increase in final products. The post-tax NPV is estimated at c. AUD 548.0 mn (100% basis), with an IRR of 27% and LOM increased to 36 years; **(2)** Construction of Thunderbird project is c. 95% completed and commissioning has commenced, with production on schedule to commence in 4Q 2023, and first customer delivery planned in 1Q 2024; **(3)** The company has secured 80% of the Stage 1 revenue in binding take or pay-offtake agreements for the first five years of production; **(4)** The estimated investment for the Thunderbird Project stands at c. AUD 483.7 mn, which is being fully funded by JV equity and debt facilities; **(5)** The Ore Reserve stands at 754 Mn tonnes (Mt), which is sufficient to support a > 35-year mine life for Stage 1 & 2; **(6)** A drilling program of up to 10,000m at the South Atlantic project is planned to commence in Q4 2023;

Key Risks: (a) Thunderbird Project's profitability depends mainly on the mineral sand price. Any prolonged and unfavorable price movements of mineral sands (particularly Zircon & Ilmenite) could materially reduce the cash generation at the Thunderbird Project and therefore its value to SFX; **(b)** The mineral sand industry is highly concentrated as it has experienced prolonged curtailment of supply. However, there is no certainty that such supply shortages will exist in the future, potentially adversely affecting market pricing for mineral sands.

Valuation and Assumptions: Based on our due diligence and valuation estimates, Arrowhead believes that SFX's fair market value per share lies between AUD 2.4 and AUD 2.7, derived using blended valuation. As per the DCF method, the fair market value ranges from AUD 2.5 to AUD 2.8, while as per Relative Valuation (EV/CFO), the Low and High bracket estimates stood at AUD 1.8 and AUD 2.0, respectively. The Relative Valuation (EV/ORE) ranges from AUD 2.7 to AUD 2.8.

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1. Investment Thesis

Arrowhead is initiating coverage on Sheffield Resources Limited (SFX) with a fair value of AUD 2.4 per share in the low-bracket scenario and AUD 2.7 per share in the high-bracket scenario, derived using blended valuation.

SFX is primed to capitalize on the significant opportunity in the global mineral sand industry, underpinned by the world-class Thunderbird Mineral Sands Project, located near Derby in Western Australia's Canning Basin region. The project stands out as one of the largest and most valuable mineral sand deposits globally, because of its vast size and exceptional high-grade quality. The project is nearing completion and is fully funded, resulting in minimal execution risk. SFX's goal is to establish a multi-asset mineral sands company that generates wealth for all stakeholders, and Thunderbird is a major step toward achieving this aim.

Thunderbird – the largest mineral sand production project in the making

Thunderbird is a major mineral sand discovery and is the largest and highest-grade find of the last 30 years. It is located in a highly attractive mining investment jurisdiction, and is well-positioned to provide a secure, long-term supply of high-quality products to a variety of customers. This low-risk, low-cost project has the potential to generate strong cash margins from globally significant production levels, with more than 35 years of mine life. It is a 50:50 JV between KMS and Yansteel, and is set to produce a high-quality suite of mineral sand concentrate products, including Zircon concentrate and magnetic concentrate containing high-quality Ilmenite. The project is following a two-stage development strategy designed to de-risk it, reduce upfront capital requirements, minimize construction risk and streamline operational risk. KMS has secured financing of AUD 483.7 mn to fund its planned capex, including AUD 311.5 mn in debt financing and AUD 172.2 mn in equity, predominantly contributed by SFX's JV partner Yansteel. Thunderbird's construction is ~95% complete and remains within the planned funding envelope. Commissioning has commenced and production set to begin in the Q4 2023, with the first product delivery to customers scheduled for the first quarter of 2024.

Strong Stage 1 and 2 economics instill confidence in stakeholders

The Thunderbird Project's BFS analysis reveals impressive economic performance with low risk and strong cash margins from substantial production levels over a long mine life. The project requires relatively low capital investment and offers high value. The study estimates a post-tax NPV of around AUD 1.39 bn (with an 8.0% discount rate) and an IRR of 26.6%. Total Stage 1 NPV is at AUD 842.0 mn (100% basis), with an IRR of 26.6% and LOM of 33 years. Stage 2 should double mining capacity, with a 50% increase in final products, resulting in a post-tax NPV of about AUD 548 mn (100% basis) with an IRR of 27%. The LOM increases to 36 years. KMS has modified the costs and other factors applied to the estimation process, leading to a positive outcome with the BFS testing. The Thunderbird Project has the potential to produce up to 1.8 mn tonnes per year of mineral sand concentrate. The 754 mn tonnes of Ore Reserve, with a 36-year mine life. At the planned production levels Thunderbird could supply 6.5% of the world's Zircon needs and 3.5% of titanium feedstock requirements, potentially making Thunderbird a leader in the global Zircon market.

80% of Stage-1 revenue has binding take or pay-offtake agreements

KMS is currently in the pre-revenue stage, but it has secured a binding agreement with Yansteel for 100% of its Ilmenite containing Magnetic Concentrate (MC) production from Stage 1. Additionally, KMS has secured binding agreements with three major customer groups for their Non-Magnetic Concentrates (NMC), specifically their Zircon product, with each group representing around 25% of the volume. This means that around 75% of the volume is under binding agreements. These agreements cover a significant portion of the volume, indicating a promising start for the company. With the assurance of almost 80% of revenue coming through take or pay-offtake agreements, we believe KMS is poised for steady growth in the coming years.

The South Atlantic Project - an invaluable second asset for the future

SFX's aims to assemble a portfolio of global mineral sand development and production assets and has recently acquired an option over the South Atlantic Project. This project is situated in Rio Grande do Sul, the southernmost state of Brazil. Retiro and Bujuru are the most advanced deposits within the tenements, with estimated exploration targets of 250-380 Mt @ 3-3.9% of Heavy Minerals (HM) for 10-12 Mt for Retiro and 250-340 Mt @ 3.3-4.0% of HM for 10-11 Mt for Bujuru. With USD 1mn of an option investment of USD 2.5 mn already paid, SFX has acquired the option to acquire a 20%

stake in the South Atlantic Project by investing a further USD 12.5 mn with total investment of USD 15.0 mn if the option is exercised. The company can also opt to increase its stake in RGM to 80% and ultimately 100%. By making this move, SFX reduces concentration risk and aligns with its growth strategy of building a portfolio of assets in the future.

However, certain risks could impede growth plans

Adverse commodity price movement could negatively affect the project's economics

The Thunderbird Project's profitability will mainly depend on the mineral sand price. Mineral sand prices may fluctuate because of several factors beyond the company's control, including changes in global supply, demand, currency exchange rates, general economic conditions and other factors. Although the price for MC has been fixed for the next 5 years, the NMC prices get fixed either by negotiations or through independent expert determination (based upon market price data). As a result, KMS's revenues (majorly the NMC segment) are directly affected by fluctuations in price. Any unfavorable and prolonged price movements of mineral sands (particularly Zircon and Ilmenite) could hurt SFX, thereby posing a threat to better cash flow generation, longer period of repaying debt and reduced dividend payout to SFX, resulting in delayed returns to the stakeholders.

A stringent regulatory environment could adversely impact the project's expansion

The Thunderbird Project is at the pre-revenue stage (95% complete) and the commissioning has already started. Although the required permits have all been granted, there is a possibility that the project might still need a few minor approvals (if any) to commence operations. These approvals are subject to various federal, state and local laws and regulations. Any amendments to existing laws or the imposition of new laws may have a material adverse effect on the project operations or the Stage 2 expansion.

Investment thesis conclusion

Through its world-class Thunderbird Project, SFX plans to strategically position itself to cater to the vast demand for mineral sands worldwide. With the largest Zircon mine, Jacinth-Ambrosia, operated by Iluka, approaching the end of its mine life (by 2030) supply side constraints are expected to increase. Low inventory levels and superior project economics, combined with full offtake agreements, could make Thunderbird a core source of Zircon production for the global market for the next 3-4 decades. To reduce concentration risk, SFX has diversified into other geographies and assets, like the South Atlantic Project, which has the potential to become the company's second most significant asset. However, in the process of becoming one of the world's largest mineral sand producers, the company must overcome several hurdles, including threats arising from commodity price fluctuations and adverse regulatory environments.

2. Business Overview

2.1 Introduction^{iv}

Founded in 2007, Sheffield Resources Limited (Sheffield or SFX) is an Australia-based mineral exploration and development company focused on creating a global portfolio of mineral sand assets that can generate cash returns and capital growth for its stakeholders. It is focused on developing its flagship Thunderbird Mineral Sands Project, which is one of the world’s largest undeveloped Zircon-rich mineral sand deposits.

The Thunderbird Mineral Sands Project is located near Broome in the Canning Basin region of Western Australia. It is one of the largest and highest-grade mineral sand discoveries of the last 30 years.

To develop the Thunderbird Project, SFX entered into a 50:50 JV with YGH Australia Investment Pty Ltd (Yansteel), a wholly owned subsidiary of Tangshan Yanshan Iron & Steel Co. Ltd, in 2021. As a result, Kimberley Mineral Sands Pty Ltd. (KMS) was formed, and development and construction commenced activities at the Thunderbird Project. Construction is now c. 95% complete and commissioning has commenced. The project is on track for first production in Q4 2023, with the first product deliveries to customers scheduled for Q1 2024. Thunderbird could thereby become one of the primary sources of Zircon production for global markets over the next several decades.

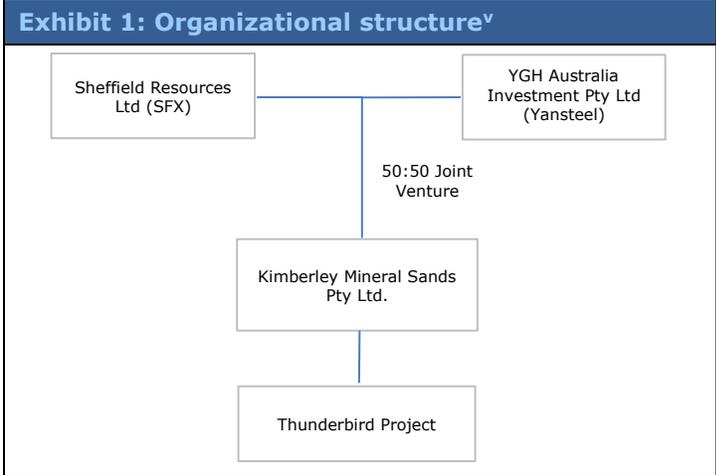
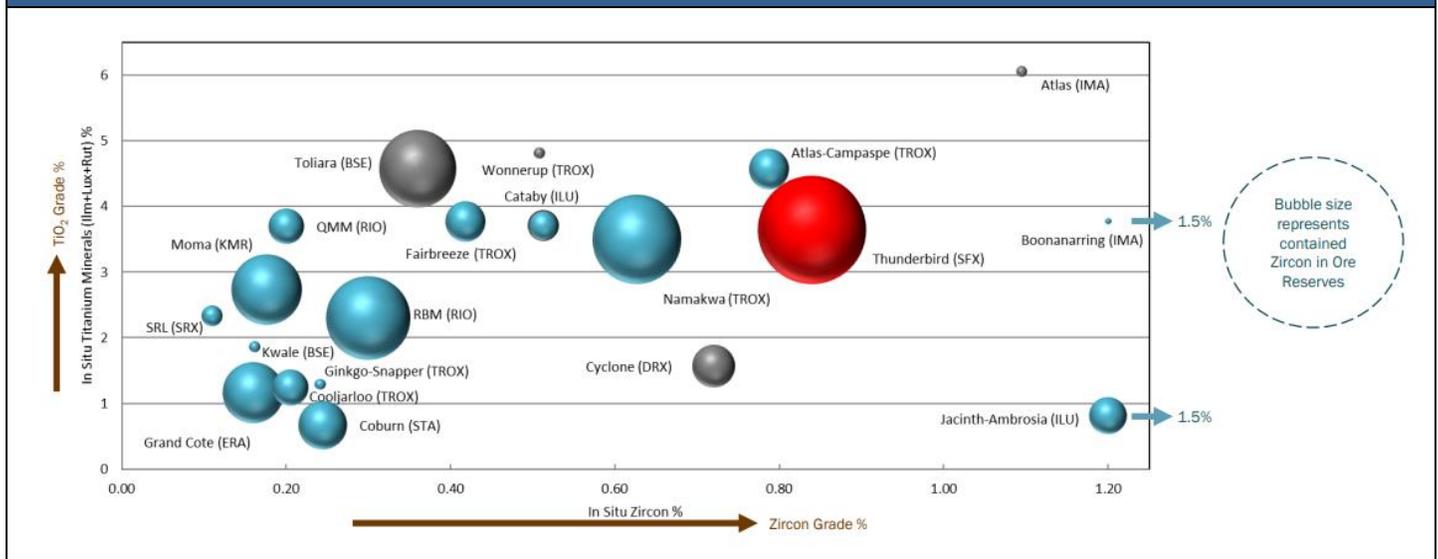


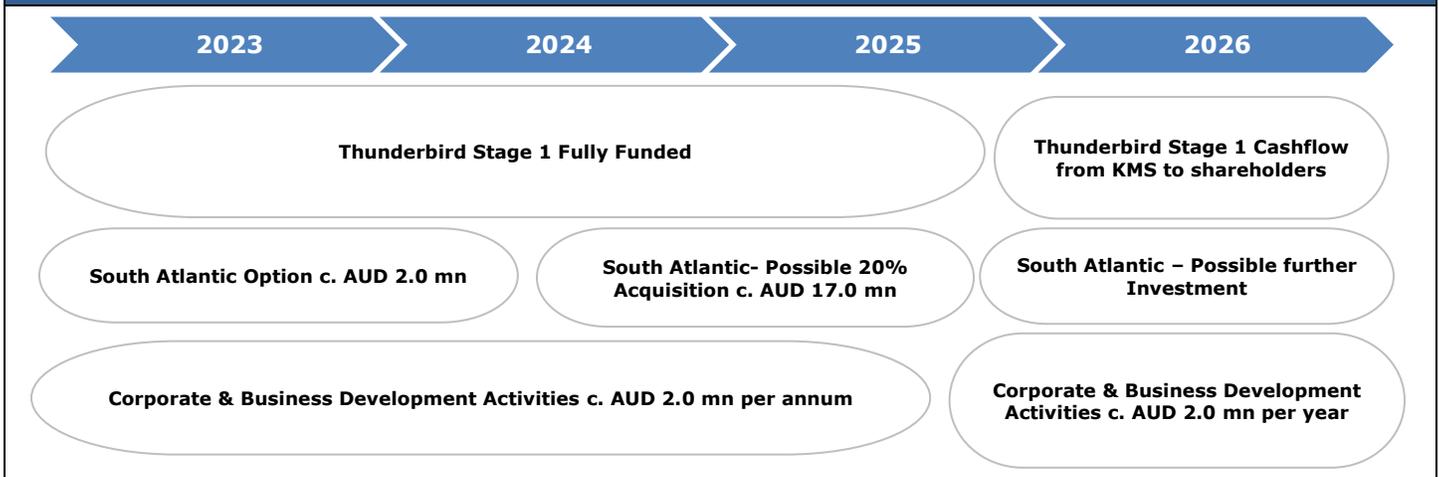
Exhibit 2: Thunderbird: The World’s Largest Zircon Reserves



The company continues to assess and consider growth opportunities within the mineral sands sector. SFX has already invested USD 1 mn of 2.5 mn to acquire an option on the South Atlantic Project in Brazil. The option is to increase its stake to 20% by investing a further USD 12.5 mn (USD 15.0 mn in all) for 20% with further an option to increase its interest to 80% and ultimately 100% of the project.

This places Sheffield in a bright spot to pursue its long-term objective to become a leading global mineral sand producer and developer, with the Thunderbird project being fully funded with Stage 1 Cashflow to benefit shareholders by 2026. The Company also aims to expand its stake in the South Atlantic Project to 20% by 2025 with an option of further investing in the following years.

Exhibit 3: Fully funded to execute proposed work program^{vi}



2.2 Projects

2.2.1 Thunderbird^{viii}

Overview and Geographic Presence

Thunderbird is one of the world’s largest undeveloped Zircon-rich mineral sand deposits, located in the Kimberley region in northern Western Australia on the Dampier Peninsula. It lies 70 km west of Derby and 30 km north of the sealed Great Northern Highway (GNH) joining Derby and Broome. The Dampier region is a low-risk jurisdiction, and its strategic location near Asian markets should add impetus to the project aimed at delivering a long-term supply of high-quality feedstock to a wide variety of end-user industries.

Mineralization

The Thunderbird deposit, hosted by highly weathered Broome Sandstone, contains a number of valuable heavy minerals including Zircon, Ilmenite, Monazite, Leucoxene and Rutile.

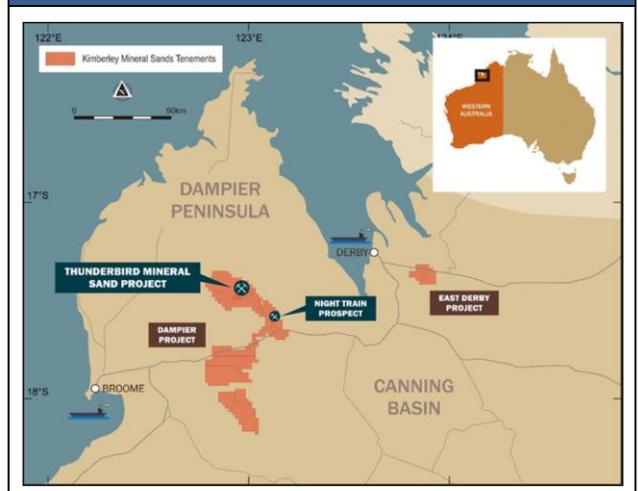
The mineralization is in a thick, broad anticlinal sheet-like body striking northwest, folded from a flat dip to a dip of about four degrees, extending under cover to the southwest. The areal extent, width, grade, geological continuity and grainsize of the Thunderbird mineralization are interpreted to indicate an offshore, sub-wave base depositional environment, similar to the interpreted depositional environment of the WIM 150 deposit of the Murray Basin in southeastern Australia.

JV With Yansteel

Yansteel, a wholly owned subsidiary of Tangshan Yanshan Iron & Steel Co. Ltd, is a privately owned steel manufacturer headquartered in Hebei, China. Yansteel has a production capacity of c. 10 mtpa of steel products, with annual revenue of c. AUD 6.0 bn.

In 2020, SFX entered a 50:50 JV with YGH Australia Investment Pty Ltd (Yansteel) for the development of the Thunderbird Project. Previously, ownership of the Thunderbird Project was held by Sheffield through its 100%-owned subsidiary KMS. However, on March 12, 2021, Yansteel invested c. AUD 130.1 mn in project equity funding into KMS and subscribed for c. 50% of KMS shares. The purpose of the JV is to develop Stage 1 of the Thunderbird Project, leveraging Yansteel’s downstream capabilities through the construction of a 500 ktpa integrated TiO₂ processing facility. This plant will consume the magnetic concentrate (containing Ilmenite) offtake from Thunderbird Stage 1.

Exhibit 4: Location of Thunderbird Mineral Sands Project^{vii}



KMS is governed by a four-person board of directors with two directors each from Sheffield and Yansteel. The key JV decisions must be executed with unanimous approval from both shareholders. However, KMS operates as a separate entity with its own management and employees.

Expansion Potential

The Thunderbird project is divided into the following stages:

- **Stage 1:** Involves one Mining Unit Plant (MUP) supporting a 10.4 mtpa mining operation, a Wet Concentration Plant (WCP) with a rougher feed rate processing capacity of 1,085 dry tonnes per hour (tph) to produce Heavy Mineral Concentrate (HMC), and a Concentrate Upgrading Plant (CUP) to split the HMC into products comprising 690 ktpa of MC, 190 ktpa of NMC and 75 ktpa of Paramagnetic Concentrate (PMC).
- **Stage 2:** Assumed to start from Year 5, the mining and wet concentration capacity will double Stage 1 capacity to a 20.8 mtpa mining operation with a WCP rougher feed rate processing capacity of 2,170 dry tph. The CUP and final product volumes will increase by 50%.

The company estimates that Stage 1 and 2 operations will together produce c. 1.4 mtpa of Zircon and Ilmenite concentrates over a forecasted 36-year mine life.

Stage 1 demonstrates the strong project economics. Stage 2 fully utilizes the reserves and represents a valuable growth option. The Company deliberately focuses on producing concentrates, rather than Zircon and Ilmenite, as this reduces the capital by c. 33%, and simplifies the project ramp up as it relaxes the need to achieve the tight quality requirements of final products.

Mineral Resource Estimate (MRE)

KMS, on September 24, 2019, announced an updated MRE for its Thunderbird Project, with the Mineral Resource unchanged at 3,023 mt @ 6.9% HM at 3.0% HM cut-off, containing 93.0 mt of Valuable HM (VHM). However, at the 7.5% HM cut-off, the Mineral Resource stood at 1,050 mt @ 12.2% HM, having 50.0 mt of VHM.

Exhibit 5: Thunderbird MRE ^{ix}										
(In-situ assemblage at both low and high grade)										
Mineral Resource	Cut off	Material	In-situ Total HM	Total HM Grade	Zircon	High Titanium Leucoxene	Leucoxene	Ilmenite	Over size	Slimes/VHM
Category	(Total HM%)	(mt)	(mt)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Measured	3.0	510	45	8.9	0.71	0.20	0.19	2.4	12	18
Indicated	3.0	2,120	140	6.6	0.55	0.18	0.20	1.8	9	16
Inferred	3.0	600	38	6.3	0.53	0.17	0.20	1.7	8	15
Total	3.0	3,230	223	6.9	0.57	0.18	0.20	1.9	9	16
Measured	7.5	220	32	14.5	1.07	0.31	0.27	3.9	15	16
Indicated	7.5	640	76	11.8	0.90	0.28	0.25	3.3	11	14
Inferred	7.5	180	20	10.8	0.87	0.27	0.26	3.0	9	13
Total	7.5	1,050	127	12.2	0.93	0.28	0.26	3.3	11	15
(HM assemblage at both low and high grade)										
Measured	3.0	510	45	8.9	8.0	2.3	2.2	27	12	18
Indicated	3.0	2,120	140	6.6	8.4	2.7	3.1	28	9	16
Inferred	3.0	600	38	6.3	8.4	2.6	3.2	28	8	15
Total	3.0	3,230	223	6.9	8.3	2.6	2.9	28	9	16
Measured	7.5	220	32	14.5	7.4	2.1	1.9	27	15	16
Indicated	7.5	640	76	11.8	7.6	2.4	2.1	28	11	14

Inferred	7.5	180	20	10.8	8.0	2.5	2.4	28	9	13
Total	7.5	1,050	127	12.2	7.6	2.3	2.1	27	11	15
(In-situ tonnes at both low and high grade)										
Measured	3.0	510	45	-	3,600	1,000	1,000	12,000	17,700	3,600*
Indicated	3.0	2,120	140	-	11,800	3,800	4,300	39,100	59,000	11,800*
Inferred	3.0	600	38	-	3,200	1,000	1,200	10,500	15,900	3,200*
Total	3.0	3,230	223	-	18,600	5,900	6,500	61,700	92,600	18,600*
Measured	7.5	220	32	-	2,300	700	600	8,400	12,000	2,300*
Indicated	7.5	640	76	-	5,800	1,800	1,600	21,000	30,200	5,800*
Inferred	7.5	180	20	-	1,600	500	500	5,600	8,200	1,600*
Total	7.5	1,050	127	-	9,700	3,000	2,700	35,000	50,400	9,700*

*Represents VHM

Ore Reserve Estimates (ORE)

According to the updated ORE (on March 24, 2022), the total Ore Reserve of SFX stood at 754.0 mt @ 11.0% HM containing 83.0 mt of HM, compared to the previous Ore Reserve of 748.0 mt @ 11.2% HM containing 84.0 mt of HM.

Exhibit 6: Thunderbird ORE ^x									
Ore Reserve				VHM Grade (In-Situ)					
Reserve Category	Material (Mt)	HM (Mt)	HM (%)	Zircon (%)	High Titanium Leucoxene (%)	Leucoxene (%)	Ilmenite (%)	Oversize (%)	Slimes (%)
Proved	239	-	12.9	0.96	0.29	0.28	3.4	14	16
Probable	514	-	10.1	0.79	0.26	0.27	2.9	11	15
Total	754	-	11.0	0.84	0.27	0.27	3.1	12	15
Ore Reserve				Mineral Assemblage					
Proved	239	31	12.9	7.5	2.2	2.2	27	14	16
Probable	514	52	10.1	7.8	2.6	2.6	28	11	15
Total	754	83	11.0	7.7	2.4	2.5	28	12	15

Bankable Feasibility Study (BFS)

KMS completed the BFS for its Thunderbird Project in March 2022. The study shows robust and attractive economics with low risk, generating strong cash margins from globally significant production levels over a decades-long mine life, with a high-value proposition and a relatively low level of capital investment.

The updated Final Investment Decision (FID) document released on October 07, 2022, highlighted a total funding requirement of c. AUD 484.0 mn. The study estimates a project post-tax net present value of c. AUD 1.39 bn (discount rate of 8.0%), with an estimated IRR of 26.6%, with a payback period of c. 5.0 years (capex payback including Stages 1 & 2).

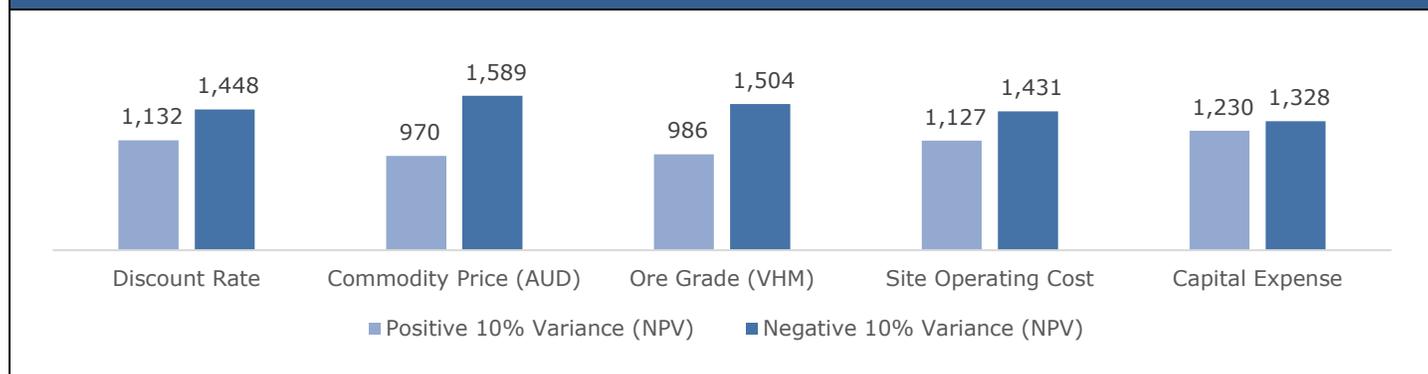
The total annual production is estimated at AUD 1,424 ktpa, with an average EBITDA per annum of AUD 121.0 mn. The estimated LOM is 36 years.

Total Stage 1 NPV is AUD 842.0 mn (100% basis), with an IRR of 26.6% and LOM of 33 years. The project capital outlay for Stage 1 is estimated at AUD 379.0 mn, while the production capacity for Stage 1 is 913 ktpa. Stage 2 doubles the mining capacity with a 50% increase in final products. The post-tax NPV is estimated at c. AUD 548 mn (100% basis) with an IRR of 27.0%. The total capital outlay is expected to remain at c. AUD 258.0 mn, with LOM increased from 33 years to 36 years.

The BFS has also been tested by modifying the costs and other factors applied to the estimation process. The completed BFS has been tested with a $\pm 10\%$ interval level, which is shown in the exhibit below.

Post-tax NPV	AUD 1.39 bn
Discount rate	8.0%
Internal rate of return (IRR)	26.6%
Total funding requirement (Stage 1)	AUD 484.0 mn
Average EBITDA per annum	AUD 121.0 mn
Payback period (Stages 1 & 2)	5.0 Years
Total Production (avg. ktpa)	1,424
Mine life	36 Years
Long-term average foreign exchange rate (AUD/USD)	0.75
Long-term zircon price – FOB	USD 1,516

Exhibit 8: BFS Sensitivity Chart Showing NPV Sensitivity to Different Drivers (AUD mn)^{xii}



The key financial and operating costs metrics on a staged development basis are as follows:

Particulars	Stage 1: Years 1- 4	Stage 1 & 2: Years 5 - 10	LOM
Revenue	1,338	3,521	16,811
Royalties	(77)	(205)	(1,098)
Net Revenue	1,261	3,316	15,713
Opex: Mining	(275)	(481)	(3,267)
Opex: Processing	(148)	(410)	(2,287)

Opex: Logistics	(177)	(314)	(1,198)
Opex: Site G&A	(97)	(156)	(907)
Total	(697)	(1,361)	(7,659)
EBITDA	564	1,954	8,054
Revenue-to-Cost Ratio	1.92	2.59	2.20

Types of Products

The BFS flowsheet forecasts the production of the following products:

- **NMC (c. 60% of revenue)**: Contains Zircon and titanium minerals (used predominantly to produce titanium dioxide pigment) and monazite (43% ZrO₂, 16% TiO₂). Approximately 40% of recoverable zircon will be premium-grade.
- **MC (c. 30% of revenue)**: This product contains high-grade Ilmenite (c. 55% TiO₂), but is mixed with an iron oxide mineral that can be readily removed by roasting and magnetic separation.
- **PMC (c. 10% of revenue)**: It is a co-product containing Zircon and titanium minerals and monazite (10% ZrO₂, 28% TiO₂, 33% Fe₂O₃, 2% CeO₂).

The product pricing assumptions for Stages 1 & 2 are presented in the table below.

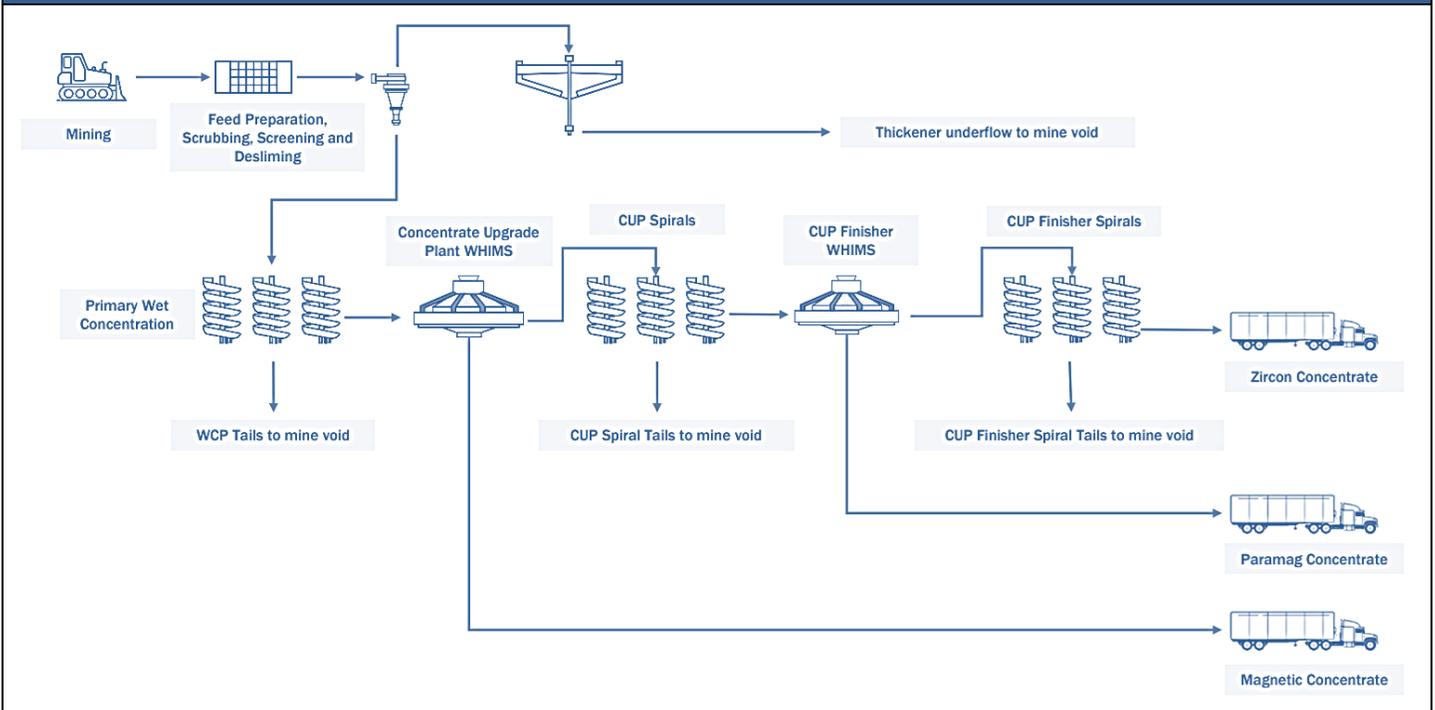
Exhibit 10: Thunderbird Project: Price Assumptions (USD per tonne)^{xiv}			
Commodity Prices	Stage 1: Years 1- 4	Stage 1 & 2: Years 5 - 10	LOM
NMC	806	705	745
MC	130	120	130
PMC (diluted)	112	105	107

Processing Method

KMS appointed GR Engineering Services Limited (GRES) to engineer, procure and construct (EPC) the Stage 1 processing plant for the production of concentrates. The MUP, WCP and Concentrate Upgrade Plant (CUP) are the key process steps in the flowsheet for production of concentrate. The process for producing the three concentrates includes:

- First, the mined materials are prepared for processing in a Feed Preparation Plant using scrubbing, screening and desliming, with the slimes fed to a Thickener prior to disposal.
- Slurried ore is then fed into the primary WCP, where the heavy minerals are separated from the lighter sand by gravity in spiral separators. The resulting Heavy Mineral Concentrate is fed into the CUP where magnetic separators (Wet High-Intensity Magnetic Separators or WHIMS) are used to split the HMC into magnetic and non-magnetic concentrate.
- The magnetic concentrate is sold without further processing. The non-magnetic concentrate is further processed by removing additional light material in spirals and by magnetic separation in the CUP Finisher WHIMS to remove the Paramagnetic Concentrate to produce Zircon Concentrate

Exhibit 11: Flowsheet for Producing Concentrates^{xv}



Work-in-Progress: 95% Complete

As per the management, the Thunderbird Project is on schedule with c. 95% of construction completed, and the capex remains within the planned funding envelope of AUD 484.0 mn. We believe this places KMS in a good position to start commissioning in H2 2023, with the first shipment of product expected in Q1 2024.

The project is now nearing completion and commissioning of service areas has commenced. Plant commissioning is scheduled to commence during the current September quarter. Construction of the WCP and CUP is almost complete, while commissioning of the bore fields, water and flocculant services, in conjunction with commissioning of air services, is underway. Tailings storage facility earthworks are also complete, and water is successfully being pumped from the bore fields to the stormwater storage pond. Waste mining activities are also progressing well. Construction of the Dry Mining Unit (DMU) is well advanced, with mobilization and site assembly scheduled later this quarter. The commencement of ore mining and sequential commissioning of the DMU and process plant is expected to occur during the December quarter.

Exhibit 12: Thunderbird WCP & CUP Overview^{xvi}



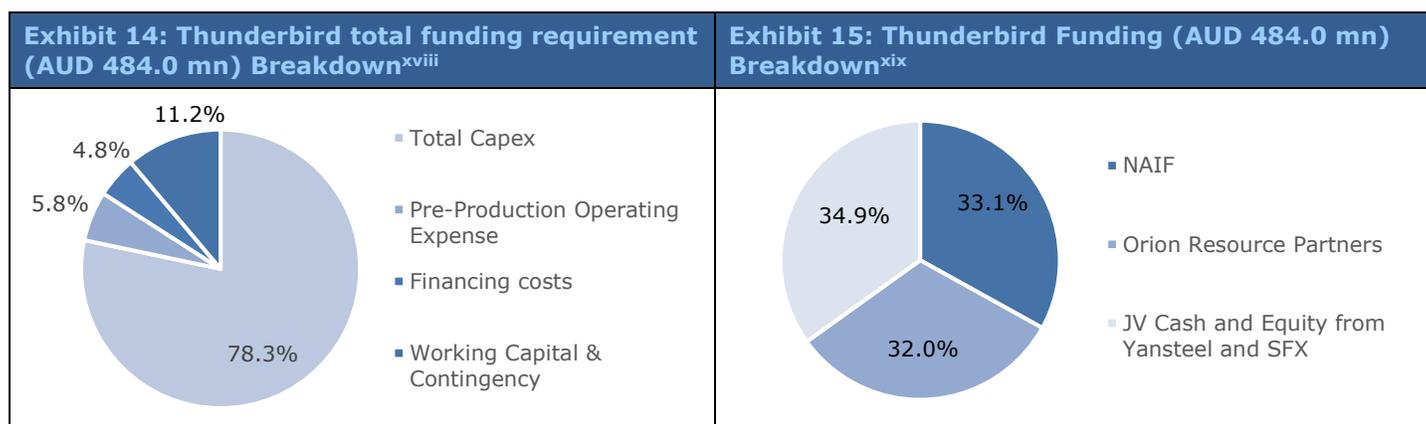
Exhibit 13: Dry Mining Unit Screen Assembly^{xvii}



Cost and Funding

According to the BFS, estimated total investment for Stage 1 is AUD 483.7 mn, with capex at c. AUD 379.0 mn, including contingency. To maximize operational readiness once construction is complete, KMS focusses on the pre-production activities and planned expenditures, which will be c. AUD 28.0 mn. The expected on-budget completion of construction activities means that the overall funding envelope allows increased commitment of funds toward pre-production activities. This has resulted in a total direct expenditure of c. AUD 407.0 mn, with c. AUD 23.0 mn assigned for project financing costs and the rest allocated toward contingency and working capital provisions.

The company has already secured funding similar to the estimated capex amount. Of the total financing, the company has two debt facilities of AUD 160.0 mn and USD 110.0 mn (AUD 155.0 mn at forward Forex when committed) from Northern Australia Infrastructure Facility (NAIF) and Orion Resource Partners, respectively. The remaining funding of AUD 169.0 mn at FID comprised JV cash reserves (AUD 111.0 mn) and equity financing from Yansteel (AUD 24.0 mn) and SFX (AUD 34.0 mn).



Sales Volume and Offtake Agreements

The targeted production volumes for Stage 1 (years 1-4), the combined stages 1 & 2 (years 5-10), and the LOM average for the project, differentiated on a product basis, are as follows:

Exhibit 16: Thunderbird Project: Production Assumptions (Avg. tpa) ^{xx}			
Commodity Prices	Stage 1: Years 1- 4	Stages 1 & 2: Years 5 - 10	LOM
NMC	190,000	373,000	285,000
MC	690,000	1,330,000	1,017,000
PMC (diluted)	75,000	160,000	122,000
Total	955,000	1,863,000	1,424,000

KMS has a binding offtake agreement with Yansteel for 100% of its Ilmenite (magnetic concentrate) product from Stage 1. It also has binding offtake agreements for its non-magnetic concentrate (Zircon product) with three prominent customer groups at c. 25% each, resulting in c. 75% of the volume under binding offtake agreements. In all, c. 80% of Stage 1 revenue has binding take or pay-offtake agreements for the first five years of production. The PMC segment has a commercially marketable level of Zircon, Titanium and Monazite, KMS has not yet committed to an offtake agreement for the stream. It has been approached by a number of potential offtake groups and is working to determine the best potential opportunity to supply this PMC to the market.

2.3.2 Night Train Prospect^{xxii}

Overview and Geographical Presence

Located on the Dampier Peninsula in the northern Canning Basin, 20km south of the world-class Thunderbird Mineral Sands deposit, the Night Train Prospect area is rich in Zircon and Titanium however mineral grades are lower than the Thunderbird deposit.

MRE

The Inferred MRE was undertaken by Optiro Pty Ltd, consisting of 130 Mt @ 3.3% HM containing 3.6Mt of VHM with a 1.2% cut-off and is inclusive of 50 Mt @ 5.9% HM having 2.6Mt of VHM with 2.0% cut-off. This high-grade component of the Inferred Resource has high in-situ grades of 0.82% Zircon, 0.33% High Titanium (HiTi) Leucoxene & Rutile, 2.9% Leucoxene, and 1.06% Ilmenite for a total of 5.11% VHM.



Exhibit 18: Night Train MRE ^{xxiii}										
(In-situ assemblage at both low and high grade)										
Mineral Resource	Cut off	Material	In-situ Total HM	Total HM Grade	Zircon	High Titanium Leucoxene	Leucoxene	Ilmenite	Over size	Slimes
Category	(Total HM%)	(mt)	(mt)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Inferred	1.2	130	3.3	-	0.45	0.18	1.5	0.71	2.2	8.7
Inferred	2.0	50	5.9	-	0.82	0.33	2.9	1.06	2.2	10.2
(HM assemblage at both low and high grade)										
Inferred	1.2	130	3.3	-	14	5.4	46	22	2.2	8.7
Inferred	2.0	50	5.9	-	14	5.6	49	18	2.2	10.2

Mineralization and Metallurgical Test Work

The mineralization is hosted by a deeply weathered sandstone unit located near the base of Cretaceous Broome Sandstone, where the host sands are clean, fine to medium-grained, well-sorted and comprise predominantly quartz sand with high-grade VHM. The host sands are compact and soft with low levels of slimes (8.7%) and oversize (2.2%), along with some isolated bands of coarser sand and grit present within the mineralized horizon.

In 2016, SFX completed initial metallurgical test work, which confirmed the production possibilities of high-quality Zircon meeting ceramic-grade specifications, where both primary and secondary Zircon products contain low levels of Iron Oxide (Fe₂O₃). The primary product is premium ceramic-grade Zircon comprising c. 78% of the total Zircon produced, while the secondary Zircon product has a high ZrO₂ grade and contains relatively low levels of contaminants.

The high VHM mineral assemblage, low slimes and oversize support a different HM provenance, depositional and regolith environment to that of Thunderbird, thereby suggesting that Thunderbird and Night Train may be among several stacked mineralized sequences in the region with the potential for a variety of mineralization styles. The high-quality, coarser-grained mineral assemblage with a high proportion of premium ceramic-grade Zircon confirms the Canning Basin as an emerging Zircon-rich mineral sand province with significant exploration potential.

Upside Potential^{xxiv}

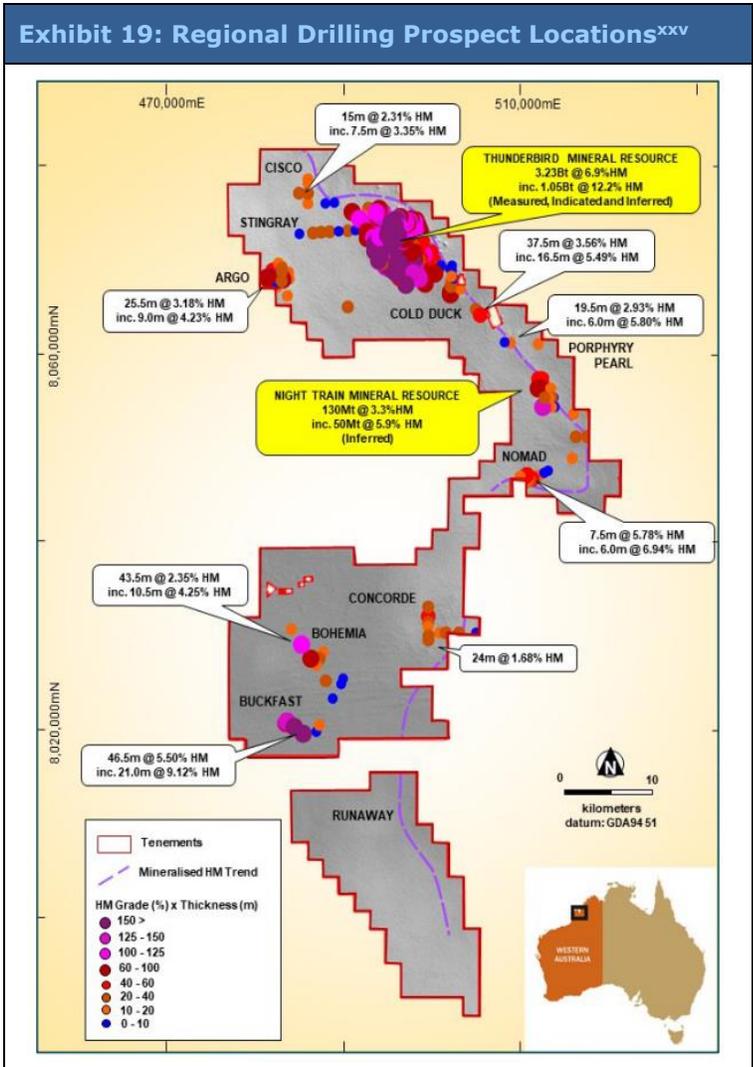
Stretching 120 km of the long, highly mineralized trend extending from Cisco in the north to Runaway in the south, exploration activities have identified 14 significant mineralization zones, inclusive of the Thunderbird and the Night Train deposits.

The company has seen success with continued exploration activities in the area with three new mineral sand prospects discovered. High proportions of VHM dominated by leucoxene, altered ilmenite and zircon with low to moderate levels of trash have been observed, thereby providing an attractive exploration target while confirming the great potential of this emerging mineral sands district and further opening up an incremental new prospective corridor (60km south of the Thunderbird project).

Drilling has intersected high-potential prospects, which include the following:

- **Drill hole NLAC025:** 46.5m @ 5.50% HM from 57.0m, including 21.0m @ 9.12% HM from 64.5m (Buckfast)
- **Drill hole NLAC027:** 37.5m @ 5.01% HM from 67.5m, including 25.5m @ 5.74% HM from 75m (Buckfast)

Metallurgical test work suggests that Zircon meeting ceramic specifications are possible and numerous zircon-rich targets identified for follow-up drilling.

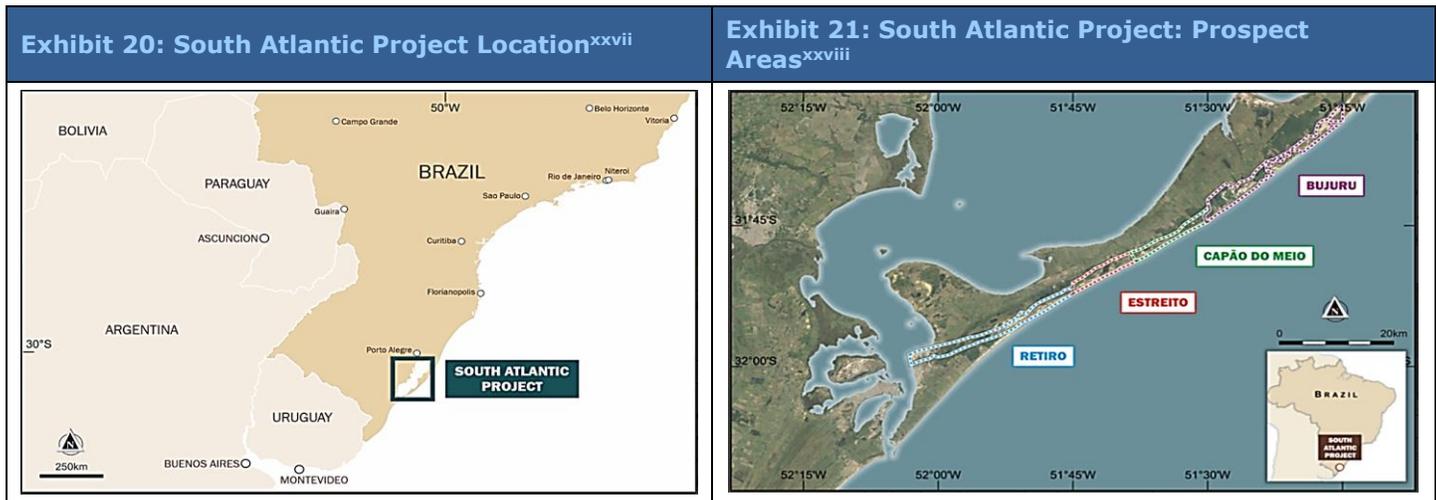


2.3.3 South Atlantic Project^{xxvi}

Overview, Geographical Presence and Prospect Areas

To reduce concentration risk and pursue its stated mineral sands growth strategy, SFX has decided to invest in the South Atlantic Project, which it expects to be a significant second asset in the future.

The South Atlantic Project is located within the southernmost state of Brazil, Rio Grande do Sul, along the coast of the Atlantic Ocean. The coastal plain is a relatively flat and low-lying area stretching over c. 620km from the border with Uruguay in the south to the city of Osório in the north. The tenements are held by Rio Grande Mineração S/A (RGM), where Mineração Santa Elina Indústria e Comércio S/A and Kromus Xi Fundo De Investimento Em Participações are the owners. There are four main deposits within the tenements: Retiro, Estreito, Capao do Meio and Bujuru, with exploration targets developed for the Retiro and Bujuru deposits.



History and Exploration Activities

In 1958, HM were first discovered within the project area. Nearly 30 years later, RTZ Mineracao Ltda (RTZM) discovered Retiro and Estreito. A year later, a pilot plant trial was carried out to produce one tonne of HM concentrate, which was subjected to further mineral separation processing test work. Paranapanema SA, in the early 1990s, conducted an exploration program in Bujuru, leading to bulk sampling programs conducted in 1992 and 1999. Later, RGM acquired the tenements previously held by Rio Tinto and Paranapanema and undertook numerous environmental, technical and economic studies. In 2014, bulk sample test programs were carried out with the help of extensive reverse circulation air core (RCAC) drilling. In 2022, sonic drilling was carried out by RGM over Retiro and Bujuru, and test pitting was conducted at Bujuru to compare the grade discrepancies of historical drilling before 2014, the 2014 RCAC drilling and bulk test work programs.

Exploration Targets: Retiro

Retiro Deposit’s exploration target is estimated at 250-380 Mt @ 3-3.9% of HM for 10-12 Mt of total contained estimate of HM tonnes with a cut-off grade between 1-2% HM.

Exhibit 22: Retiro Deposit's Exploration Target^{xxix}

(HM assemblage)										
Classification	Cut off	Material	In Situ HM	Total HM	Ilmenite	Altered Ilmenite	Zircon	HiTi/Rutile	Leucoxene	Non-Valuable HM
Category	(Total HM%)	(mt)	(mt)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Exploration Target	2.0	250	10	3.9	49	5	5	3	0	38
	1.0	380	12	3.0	49	5	5	3	0	38

Exploration Targets: Bujuru

Bujuru Deposit's exploration target is estimated at 250-340 Mt @ 3.3-4.0% of HM for 10-11 Mt of total contained estimate of HM tonnes with a cut-off grade between 1-2% HM.

Exhibit 23: Bujuru Deposit's Exploration Target^{xxx}

(HM assemblage)										
Classification	Cut off	Material	In Situ HM	Total HM	Ilmenite	Altered Ilmenite	Zircon	HiTi/Rutile	Leucoxene	Non-Valuable HM
Category	(Total HM%)	(mt)	(mt)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Exploration Target	2.0	250	10	4.0	53	6	6	3	0	32
	1.0	340	11	3.3	53	6	6	3	0	32

Exhibit 24: Retiro Exploration Target^{xxxi}

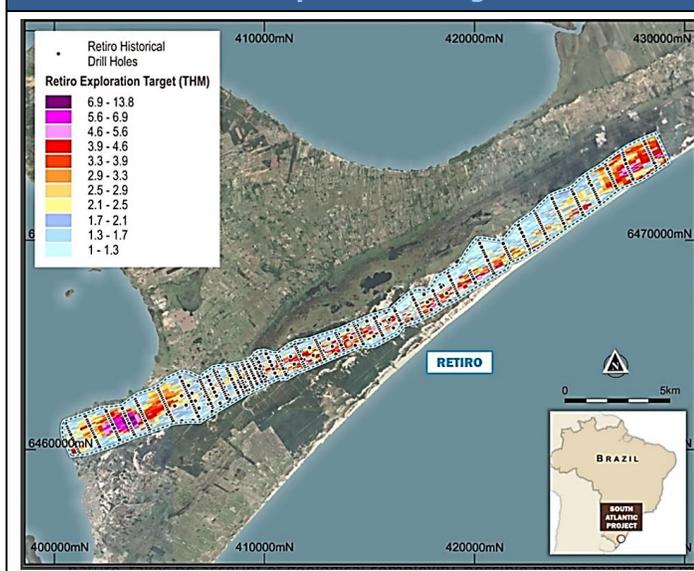
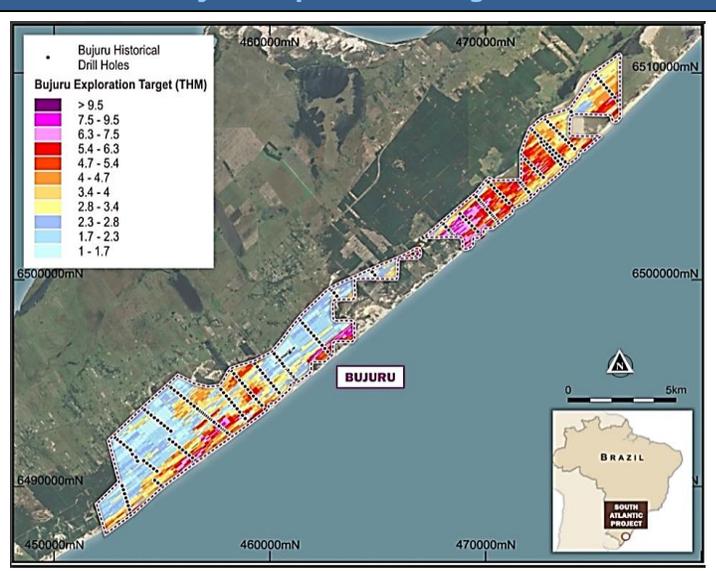


Exhibit 25: Bujuru Exploration Target^{xxxii}



RGM Option Agreement

Under this agreement, SFX provided RGM with an unsecured loan of USD 2.5 mn of which USD 1 mn has been paid to date. The proceeds from the agreement were intended to fund project-related activities and assist SFX with further project-related due diligence.

After completion of work program activities such as regulatory approvals, drilling, resource definition and a definitive feasibility study (DFS), as per the option agreement, SFX has the right to increase its stake up to 20% in RGM. The incremental proceeds for the additional stake are c. USD 12.5 mn (USD 15.0 mn in all). The timeframe for the option exercise is within 18 months of the date of the agreement. However, the option exercise is subject to the satisfaction

or waiver of various conditions under certain circumstances, including the execution of a formal shareholders agreement and framework agreement for the resultant JV. The company may exercise a further option to increase its stake in RGM up to 80%.

2.4 ESG: Roadmap toward a Sustainable Future^{xxxiii}

2.4.1 Environmental

The Company has received the following approvals:

- Strong social license to operate is supported by full State and Federal environmental approvals, following an extensive Public Environmental Review ("PER"), which involves full environmental impact assessment, with detailed public consultation and identification of key environmental concerns for the community;
- The Environmental Protection Authority ("EPA") conducted a detailed review, including a site visit by the EPA Board and two periods of public comment and consultation. As a result, SFX has been granted all environmental approvals based on PER standard industry conditions and controls, and adequately managed risks. Approvals contain the Greater Bilby management plans, Establishment of an Environmental offset fund, etc.

Addressing the Climate Change challenge

- CO₂ baseline Scope 1 emissions estimated in BFS 2017 at 11mt CO₂e (c.40-year life of project);
- A significant reduction expected following the removal of Low-Temperature Roaster;
- Independent third-party validation of emissions commissioned for 2022 BFS;

To reduce the CO₂ emissions across a 36-year mine life, the company foresees taking the following steps:

- Introduction of renewable electricity to complement LNG gas generation;
- Innovation within the process plant value chain;
- Logistics at the mine site and to port (e.g., electric fleet solutions);
- Targeting net-zero emission by 2050;

Exhibit 26: Goals For a Sustainable Future^{xxxiv}

Acceptance	Seek Low Carbon Technology	Invest in Climate Safe Practices	Promote Climate Policy
<ul style="list-style-type: none"> • Accept Climate change science • Support net zero global ambitions • Support community's goals 	<ul style="list-style-type: none"> • Renewables for power generation • Diesel substitution • Partner with innovative suppliers 	<ul style="list-style-type: none"> • Measure climate performance • Consider carbon offsets • Climate Risk Assessments • Low carbon inputs 	<ul style="list-style-type: none"> • Partner with the local community • Determine net zero emissions pathway • Engage with the peers, suppliers, and customers

2.4.2 Social

Some of the strategies adopted by the Company for the fulfillment of its social commitment:

- Signed Co-existence Agreement (Native Title Agreement) for Thunderbird on October 31, 2018, which is irrevocably binding on both SFX and the Traditional Owner. The agreement involves commitment toward:
 - Royalty payments to the Traditional Owners across the mine life;
 - Local and Aboriginal employment and business commitments;

- Protection for Aboriginal heritage and the environment;

The above framework establishes that 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. In the process, the Company has developed a strategy called “Aboriginal Employment Strategy” to build a strong locally based workforce. The strategy encompasses the following:

- The Company’s strong commitment toward training and development, which results in ongoing employment. As a result, Aboriginal Training Fund & Business Support programs have been developed;
- The Company targets c. 40% Aboriginal Employment by year 8 of operations;
- Commitment toward high standards in safeguarding the environment, water, diversity, Aboriginal businesses and Aboriginal heritage during construction and operations;
- Specific focus on Local Employment with c. 300 jobs created on a ‘Drive In, Drive out’ basis;

This is expected to generate more than AUD 1.0 bn as State and Federal Tax Contribution over a 36-year mine life (100% share).

Additionally, Sheffield welcomed Ms. Vanessa Kickett to the Board as an independent Non-Executive Director. With extensive experience and involvement with aboriginal engagement, native title and heritage matters throughout Western Australia, she will assist in shaping the Thunderbird Mineral Sands Project and Sheffield’s commitment to the indigenous community in the Kimberley region of Western Australia.

2.4.3 Governance

The Governance strategy that the Company has adopted is as follows:

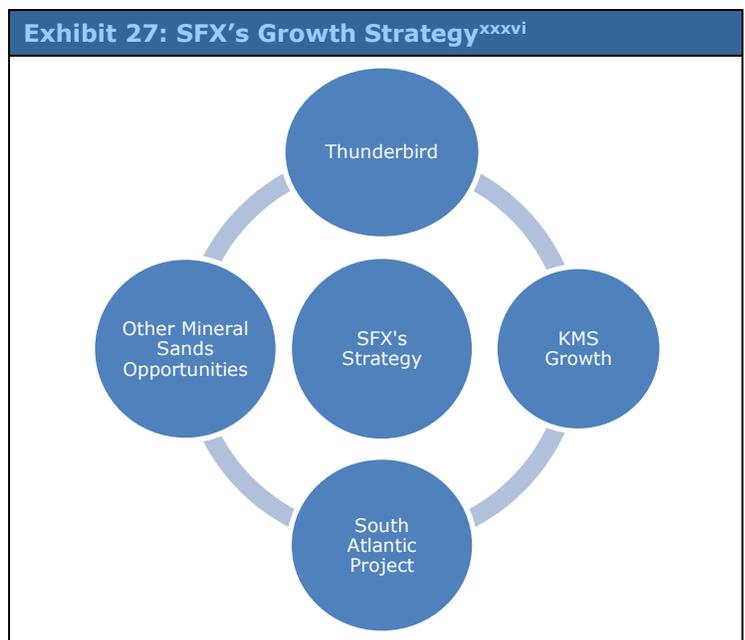
SFX follows the ASX Corporate Governance Council's Corporate Governance Principles and Recommendations (4th Edition). These are non-prescriptive, flexible and fundamentally anchored in an ‘if not, why not’ disclosure approach^{xxxv}, which a listed entity wishes to adopt for its governing body.

SFX is also committed to increasing the diversity in its Board and management.

2.5 Business Strategy and Outlook

To assemble a portfolio of global mineral sands through the development and production of various assets, SFX’s growth strategy focuses on the following:

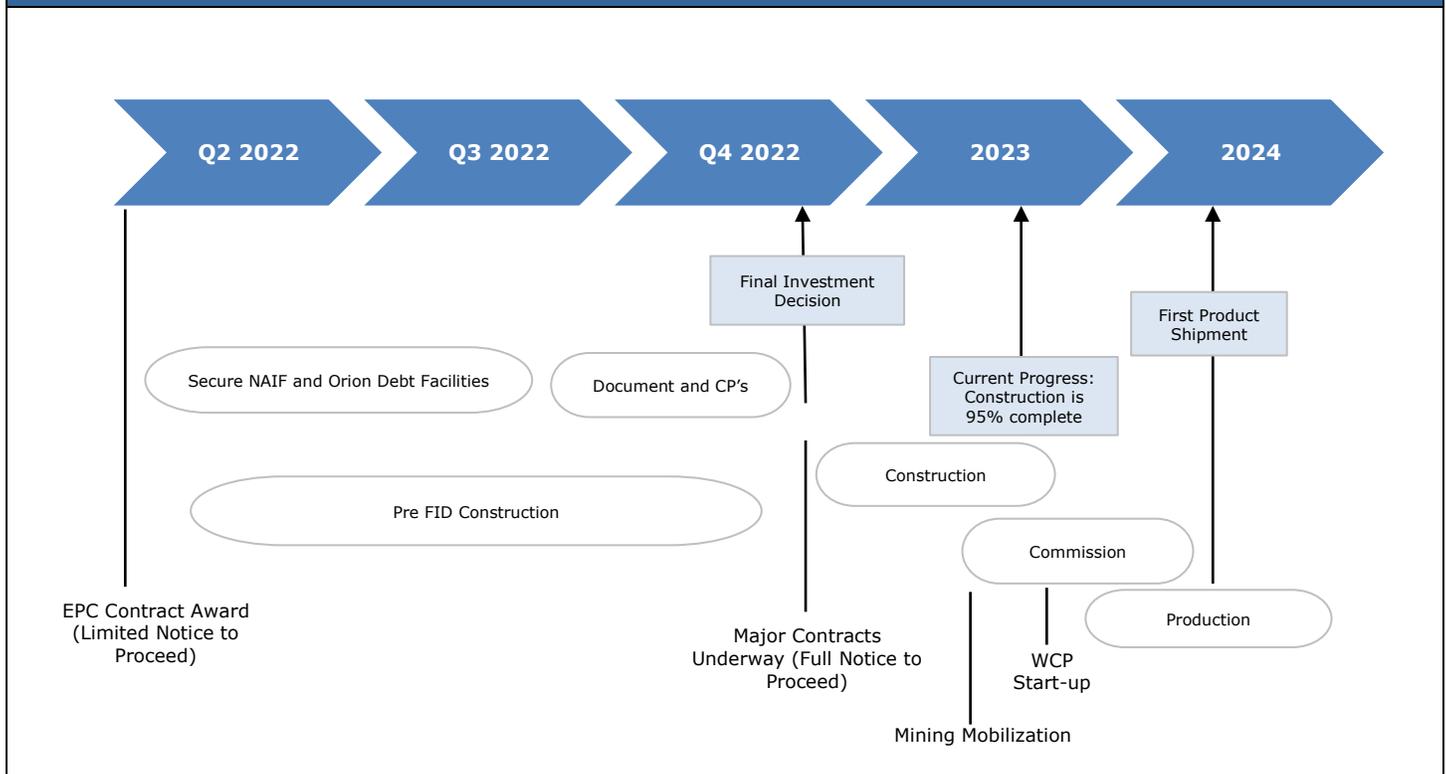
- **Thunderbird Project and Its Development:** SFX’s flagship project, operated as a JV with Yansteel, has completed its BFS, demonstrating strong economics. The project has been designed strategically in a phased manner: Stage 1 has a post-tax NPV of AUD 842 mn, generating c. AUD 120.0 mn per year of cash to Sheffield, following debt repayment. The construction of the project is 95% complete and commissioning has commenced. Production is scheduled to commence in Q4 2023 and with the first customer shipments in Q1 2024. In total, 80% of Stage 1 revenue has binding take or pay-offtake agreements for the first five years of production.
- **KMS and Its Growth Strategy:** Stage 2 of the Thunderbird Project should add significant value to KMS. According to the BFS, Stage 2 is designed to build on the capabilities of Stage 1, generating a 50% increase in final products scheduled for production in 2028.



The post-tax NPV is AUD 548.0 mn (100% basis), with IRR at 27%. The LOM has increased from 33 years to 36 years. The company also sees significant exploration potential in its 120-km-long, highly mineralized trend extending from Cisco in the north to Runaway in the south. Fourteen significant mineralization zones have been identified. The company has identified three new mineral sands discoveries in the area. High proportions of VHM, dominated by leucoxene, altered ilmenite and zircon, with low to moderate levels of trash, have been observed, thereby providing attractive exploration targets while confirming the great potential of this emerging mineral sands district and further opening up an incremental new prospective corridor (60km south of Thunderbird project). Recent drilling has resulted in high-quality intersections with metallurgical test work suggesting that high-quality Zircon meeting ceramic specifications can be produced. The company has identified numerous zircon-rich targets for follow-up drilling.

- **South Atlantic Project:** SFX recently acquired an option on this project, which it believes has excellent potential. Located within the southernmost state of Brazil, Rio Grande do Sul, along the coast of the Atlantic Ocean, the South Atlantic Project already hosts four main deposits: Retiro, Estreito, Capao do Meio and Bujuru, with significant exploration targets developed for the Retiro and Bujuru deposits. SFX has an option agreement under which it has provided RGM with an unsecured loan of USD 2.5 mn with an option to acquire a 30% stake. The company believes that this project has the potential to be a significant second asset in the future.
- **Future Growth:** SFX constantly pursues growth by reviewing other quality mineral sand opportunities. The company targets advanced projects with the potential to unlock value by applying Sheffield’s mineral sands and funding experience.

Exhibit 28: SFX’s Pathway to Production^{xxxvii}



With the attractive economics shown in BFS, we believe the Thunderbird Project is well-placed to become one of the largest and highest-grade mineral sands operations worldwide, potentially producing up to 1.8 mtpa of mineral sand concentrate. The 754 Mt of Ore Reserve can support production equivalent to 6.5% of the world’s Zircon needs and 3.5% of Titanium feedstock requirements over a 36-year mine life, with attractive economics. The project is low risk, low cost and has the potential to generate strong cash margins from globally significant production levels, indicating the project's impressive outlook.

2.6 Company Milestones

Exhibit 29: Sheffield Resources' Milestone Timeline	
Year/Period	Event
2010	<ul style="list-style-type: none"> Listed on ASX on December 15, 2010 Five tenements granted of Iron Ore and HM Sands (HMS)
2011	<ul style="list-style-type: none"> Acquired McCalls HMS project in North Perth Basin Acquired 3 mining leases and a retention license from Iluka Resources Drilling started at the advanced Yandanooka HMS exploration project
2012	<ul style="list-style-type: none"> Discovered 4.4-bn-tonne maiden resource at McCall HMS Project Commenced drilling at the Dampier HMS project near Derby in Western Australia's Kimberley region Discovered nickel-copper at the Fraser Range Project in Western Australia Found Zircon-rich mineral at the Thunderbird deposit Commenced airborne electromagnetic survey at the Red Bull Project; found four high-order anomalies
2013	<ul style="list-style-type: none"> Discovered high-quality Zircon, Ilmenite, Rutile and Leucoxene products at Thunderbird Initiated diamond drilling of three strong bedrock conductors at the Red Bull Nickel-Copper Project Identified three substantial nickel-copper-cobalt anomalies from regional Aircore drilling completed at the Red Bull Nickel-Copper Project Discovered high-grade iron results from rock chip sampling at the North Pilbara Iron Project in the Pilbara region of Western Australia
2014	<ul style="list-style-type: none"> Doubled total mineral resources at the Thunderbird HMS deposit Identified large bedrock conductor at the Red Bull Ni-Cu project, Fraser range
2015	<ul style="list-style-type: none"> High-grade results from infill drilling at the 100%-owned Thunderbird Mineral Sands Project Outlined three new mineral sand discoveries to the north and south of Thunderbird through regional exploration drilling Identified a new, high-priority Ni-Cu drill target following completion of high-powered, moving loop EM surveys at the 100%-owned Red Bull Nickel Project Discovered high-grade results from infill drilling at the Thunderbird Mineral Sands Project, located near Derby in northwest Western Australia
2016	<ul style="list-style-type: none"> Appointed leading engineering group, Hatch Ltd., to deliver the BFS for the Thunderbird Mineral Sands Project Signed a JV agreement with Independence Group NL (IGO) in the Fraser Range region of Western Australia
2017	<ul style="list-style-type: none"> Secured offtake agreement for premium Zircon of Thunderbird Mineral Sands Project
2018	<ul style="list-style-type: none"> Secured State and Federal environmental approvals for the Thunderbird Project Secured Native Title Agreement & Grant of Thunderbird Mining Lease.
2019	<ul style="list-style-type: none"> Secured an agreement with Woodside Energy Limited (Woodside) and Energy Developments Pty Ltd (EDL) for the supply and delivery of Liquefied Natural Gas (LNG) for Thunderbird
2020	<ul style="list-style-type: none"> Formed a 50:50 JV on the Thunderbird Mineral Sands Project with Yansteel Yansteel invested AUD 130.0 mn to acquire 50% of the project
2022	<ul style="list-style-type: none"> Received AUD 24.0 mn in cash consideration from Image Resources NL after divestment of Eneabba Project exploration tenements

	<ul style="list-style-type: none"> Received AUD 12.0 mn cash consideration from Image Resources NL for the McCalls Project Agreed on a USD 110.0 mn loan from Orion Resource Partners Agreed on AUD 160.0 mn project finance from NAIF Made Final Investment Decision (FID) for Stage 1 development of Thunderbird Mineral Sands Project
2023	<ul style="list-style-type: none"> Completed 95% of Thunderbird construction Commenced Thunderbird commissioning

2.7 Company Premium

- a) One of the Largest Mineral Sand Operations in the Making:** Thunderbird, one of the largest and highest-grade mineral sand discoveries of the last three decades, is located in one of the world’s most attractive mining investment jurisdictions. We believe it is well-placed to deliver a long-term, secure supply of high-quality products to a range of customers. The project is low-risk, low-cost (the revenue-to-cost ratio is over 2x) and has the potential to generate strong cash margins from globally significant production levels with over 35 years of mine life. It is a 50:50 JV between KMS and Yansteel and looks poised to generate a high-quality suite of mineral sand concentrate products, such as Zircon concentrate and MC containing high-quality Ilmenite, suitable for market requirements. To scale up the project in line with the market requirements, Thunderbird was split into two stages. Stage 1 demonstrates the strong projects. Stage 2 fully utilizes the reserves and represents a valuable growth option. The Company deliberately focuses on producing concentrates, rather than Zircon and Ilmenite, as this reduces the capital by c. 33%, and simplifies the project ramp up as it relaxes the need to achieve the tight quality requirements of final products. Currently, the construction is 95% complete, commissioning has commenced, and the project is on track to start production in Q4 2023, with the first customer deliveries scheduled for Q1 2024.
- b) Strong Economics for Stages 1 and 2:** The BFS of the Thunderbird Project has shown robust and attractive economics with low risk, generating strong cash margins from globally significant production levels over a decades-long mine life, and with a high-value proposition and a relatively low level of capital investment. The study estimates a strong post-tax NPV of c. AUD 1.39 bn (discount rate of 8.0%), with an estimated internal rate of return of 26.6%. Total Stage 1 NPV is AUD 842.0 mn (100% basis), with an IRR of 26.6% and LOM of 33 years, while Stage 2 doubles the mining capacity with a 50% increase in final products, resulting in a post-tax NPV of c. AUD 548 mn (100% basis) with an IRR of 27%. Total LOM was increased from 33 years to 36 years fully utilizing the 754 Mt of Ore Reserve. KMS has seen a strong positive outcome with the BFS testing by modifying the costs and other factors applied to the estimation process. Apart from the attractive economics shown in the BFS, the Thunderbird Project has the potential to produce up to 1.8 mtpa of mineral sand concentrate. Stage 1 has the capability to produce 6.5% of the world’s Zircon needs and 3.5% of Titanium feedstock requirements, showcasing Thunderbird’s potential as an emerging worldwide leader with attractive economics.
- c) Fully Funded and Within Budget:** KMS has secured AUD 483.7 mn in financing to fund the Stage1 investment. This includes AUD 315 mn of debt financing and AUD 169 mn of equity, primarily from Yansteel. The company has announced that Thunderbird’s construction is 95% complete commissioning has commenced, and project expenditures remain within the planned funding envelope.
- d) Offtake Agreements:** KMS is further bolstered by the binding offtake agreement with Yansteel for 100% of its Ilmenite product (MC) from Stage 1. Also, KMS has binding offtake agreements for its NMC (Zircon product) with three prominent customer groups, with each taking c. 25%, resulting in c. 75% of volumes under binding offtake agreements. In all, c. 80% of the Stage 1 revenue is under to binding take or pay-offtake agreements for the first five years of production, suggesting that KMS should have strong, stable topline growth in the future.
- e) South Atlantic Project:** This has recently been added to SFX’s asset portfolio, in line with its strategy to assemble a set of global mineral sand development and production assets. The project is located within the southernmost state of Brazil, Rio Grande do Sul. Out of the four main deposits within the tenements, Retiro and Bujuru are the most advanced. Exploration targets are estimated at 250-380 Mt @ 3-3.9% of HM for 10-12 Mt for Retiro, and 250-340 Mt @ 3.3-4.0% of HM for 10-11 Mt at Bujuru. Under the option agreement, SFX has the right to acquire it’s a 20% stake in RGM. The company has paid USD 1mn of up to USD 2,5mn to acquire

the option and a payments of a further USD 12.5 mn are required to secure 20% if the option is exercised. The company may exercise a further options to increase its stake in RGM up to 80%. This reduces concentration risk and helps the company pursue its growth strategy to build a significant second asset in the future.

2.8 Company Risk^{xxxviii}

- a) Commodity Price Volatility:** The Thunderbird Project’s profitability will mainly depend on the mineral sand price. Mineral sand prices can fluctuate because of several factors beyond the company’s control, including changes to global supply, demand, currency exchange rates, general economic conditions and other factors. The price KMS receives for mineral sand products under its existing offtake agreements will mainly be determined through periodic pricing negotiations. The offtake agreements have a fallback position of expert price determination if the parties cannot agree on a negotiated price. As a result, KMS's revenues are directly linked to fluctuations in price and its ability to maintain its pricing position through those negotiations. Any unfavorable and prolonged price movements of mineral sands (particularly Zircon and Ilmenite) could hurt SFX, thereby posing a risk to the cash flow generation.
- b) Exchange Rate Fluctuations:** KMS is exposed to the fluctuations and volatility of the exchange rate between the USD and the AUD as determined in international markets. Currency exchange rates play an important role in the profitability of KMS, as mineral sand prices are denominated in USD, while the company’s expenditures are predominantly in AUD. Any appreciation in AUD might create short-term headwinds for KMS.
- c) Competition Risk:** The mineral sand industry is highly concentrated, with a relatively small number of major producers leading the market, coupled with a variety of much smaller companies. The mineral sands industry is currently poised for a sustained curtailment in supply, particularly within the Zircon sector, for the foreseeable future, according to some industry experts^{xxxix}. However, there is no certainty that supply shortages will exist forever. Any major discovery of large mineral sand deposits could create a material increase or even oversupply in the market, adversely affecting market pricing for mineral sands.
- d) Key Personnel Risk:** KMS is dependent on the experience, skills and knowledge of its senior management and key employees for the implementation of its growth strategy. The loss of any of them, or the inability to recruit relevant staff, could lead to disruption and adversely affect the business, cash flows, financial condition and results of the Thunderbird Project.

2.9 Shareholding Pattern

The company had 392,825,669 shares of common stock issued and outstanding on September 14, 2023. The shareholding pattern is as follows:

Exhibit 30: Shareholding Pattern (on September 14, 2023)		Exhibit 31: Top Shareholding Pattern	
		Shareholders	Shares outstanding
<p>0.3% 5.5% 8.0% 8.7% 77.6%</p> <ul style="list-style-type: none"> ■ YGH Australia Inv Pty Ltd (Yansteel) ■ Yovich & Co ■ BlackRock Inc ■ Management ■ Others 	YGH Australia Inv Pty Ltd (Yansteel)	34,259,421	
	Yovich & Co	31,319,960	
	BlackRock Inc	21,456,836	
	Management	1,021,700	
	Others	304,767,752	
	Total	392,825,669	

2.10 Listing and Contact Details

Company Contacts

Home Office

Address: Sheffield Resources Ltd, Level 2, 41 - 47 Colin Street, West Perth, WA 6005

Contact No: 086-555-8777

Website: www.sheffieldresources.com.au

Email Id: info@sheffieldresources.com.au

3. News^{x1}

- **Announced Status Update for Thunderbird Construction:** On August 14, 2023, the company announced that its Thunderbird Construction activities were nearing completion, commissioning of key service areas had commenced, waste mining was in progress and recruitment of operations personnel was on track. The company was targeting the commencement of ore mining and sequential commissioning of the DMU and process plant during the December quarter with first customer shipment remaining on track for Q1 2024.
- **Announced Status Update for Thunderbird Construction:** On June 19, 2023, the company announced that its Thunderbird Construction activities were about 90% complete within the original planned budget. The project was expected to be commissioned in H2 2023. The company targeted its first delivery of mineral sand products to customers by Q1 2024.
- **Announced Status Update for Thunderbird Construction:** On February 14, 2023, the company announced that its 50%-owned Thunderbird Mineral Sands Project's construction was on track and was more than 75% complete. Management reviewed its cost forecast and expected to complete the project with the available funding of AUD 484 mn. The CUP's construction had commenced, and steel structure installation was in progress. The WCP's construction was continuing, and installation of pipework and hoppers was on track. The site's electrical works and overall materials delivery was also on track.
- **Announced Status Update for Thunderbird Construction:** On December 15, 2022, the company announced that its 50%-owned Thunderbird Mineral Sands Project was more than 60% complete as of November 30, 2022. More than 400,000 hours of work had been done at the site without any lost-time injuries. The steel structures were well underway, with process tanks and associated equipment progressively installed. Installation of power generation facilities was in progress. The lining of the stormwater storage pond had commenced, and the tailing
- **Announced Final Investment Decision for Thunderbird:** On October 07, 2023, the company announced its final investment decision for constructing and developing the world-class Thunderbird Mineral Sands Project in northern Western Australia. The site construction activities were more than 40% complete. The Thunderbird Mineral Sands Project was funded through debt of AUD 315 mn and equity investment of AUD 169 mn.
- **Execution of Binding LNG Supply Agreement:** On September 26, 2022, the company announced that KMS had executed a 5-year agreement (which could be extended) with Woodside Energy Pty Ltd for the supply and delivery of c. 650 terajoules per year of LNG to the Thunderbird Mineral Sands Project.
- **Execution of Power Generation Agreement:** On September 16, 2022, the company announced that KMS had executed a 15-year agreement with Pacific Energy Pty Ltd for electricity supply to Thunderbird. Pacific Energy would build, own and operate a 16-megawatt power station for supplying electricity to the Thunderbird Mineral Sands Project.
- **Announced Status Update for Thunderbird Construction:** On September 12, 2022, the company announced that its 50%-owned Thunderbird Mineral Sands Project was over 38% complete on August 31, 2022. Construction activities at the site were well within expectations. No lost-time injuries were reported, and more than 250,000 hours of work were completed. Construction of the Thunderbird Project was on track, enabling occupancy for a growing workforce exceeding 160 Kimberley-based employees and contractors. The company targeted its first delivery of mineral sand products to customers by Q1 2024.

4. Management and Governance^{xli}

Exhibit 32: Management and Governance		
Name	Position	Experience
Bruce Griffin	Executive Chair	<ul style="list-style-type: none"> Executive Chair at Sheffield Resources Previously Senior Vice President of Strategic Development of LB Group and Vice president for BHP Served as Chief Executive Officer (CEO) of TZ Minerals International Pty Ltd Non-Executive Director of CVW CleanTech Inc and Mawson Gold Limited
Mark Di Silvio	CFO & Company Secretary	<ul style="list-style-type: none"> CFO & Company Secretary at Sheffield Resources Has more than 30 years of experience in the resources industry Served in a senior finance role for Woodside Petroleum Limited CFO of Central Petroleum Ltd., Centamin Plc, Ausgold Ltd. and Mawson West Limited Certified Public Accountant (CPA) with an MBA degree
John Richards	Lead Independent Non-Executive Director	<ul style="list-style-type: none"> Lead Independent Non-Executive Director at Sheffield Resources More than 35 years of experience in the resources industry Non-Executive Director of Northern Star Resources Limited and Sandfire Resources Limited Worked at Normandy Mining Ltd, Standard Bank, Buka Minerals and Global Natural Resources Investments
Ian Macliver	Non-Executive Director	<ul style="list-style-type: none"> Non-Executive Director at Sheffield Resources Chairman of Grange Consulting Group Pty Ltd & Grange Capital Partners and Non-Executive Chairman of MMA Offshore Limited Worked in various listed and corporate advisory companies Experience in corporate activities, including capital raisings, acquisitions, divestments, takeovers, business and strategic planning, debt and equity reconstructions, operating projects and financial review and valuations
Gordon Cowe	Non-Executive Director	<ul style="list-style-type: none"> Non-Executive Director at Sheffield Resources Has worked with leading business start-ups, including planning and delivering multiple complex projects; over 30 years of experience Qualified mechanical engineer
Vanessa Kickett	Non-Executive Director	<ul style="list-style-type: none"> Non-Executive Director at Sheffield Resources Deputy Chief Executive Officer of the Southwest Aboriginal Land and Sea Council Experienced in Aboriginal engagement, native title and heritage matters throughout Western Australia

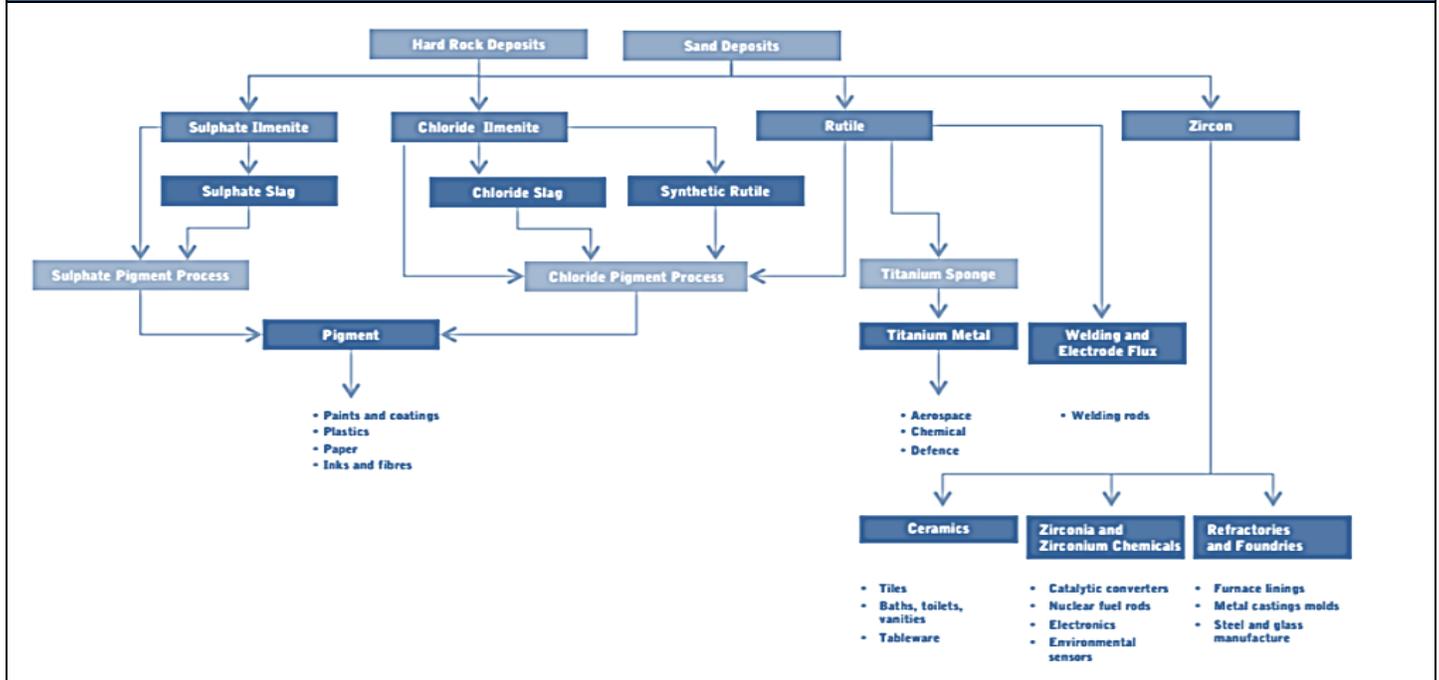
5. Industry Overview

5.1 Mineral Sands

5.1.1 Definition and Market Size^{xlii}

Mineral sands are deposits that contain a concentrated amount of economically important minerals known as 'HMS', which are much heavier than common sand minerals such as quartz (SiO₂). These 'HMS' have a relative density of c. 4 - 5.5 g/cm³ as compared to common sand minerals such as quartz with a relative density of c. 2.65 g/cm³.

Exhibit 33: Mineral Sand Industry Overview^{xliii}



Mineral sand deposits typically contain the following minerals:

- Zircon
- Rutile
- Leucoxene
- Ilmenite
- Monazite
- Xenotime

These deposits are characterized by grade (defined as the percentage of HM found in a deposit) and assemblage (defined as the relative proportion of VHM components of Ilmenite, Rutile and Zircon). Typically, a mineral sand deposit has an HM grade ranging from 0.5 – 20%.

The Global Mineral Sand Market is projected to expand to USD 53.7 bn by 2029 from USD 43.8 bn in 2021, at a CAGR of 2.6% during the forecast period^{xliiv}.

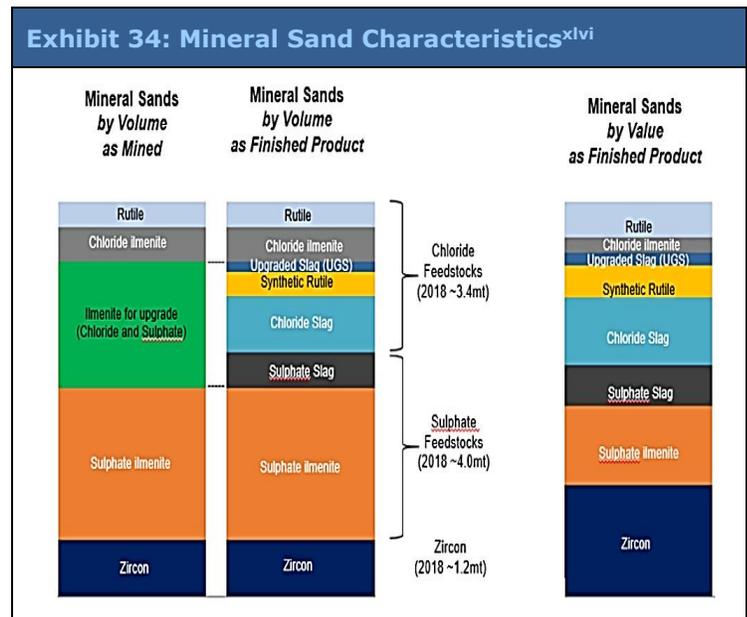
5.1.2 Deposits^{xlv}

Most mineral sand deposits were formed thousands of years ago. During this period, immense changes in sea levels resulted in repeated reworking of sediments deposited by rivers on coastal shorelines. The composition of mineral sand deposits reflects the type of rocks from which the sands containing the HMs have been derived. These deposits are typically formed as a result of coastal marine sedimentary processes and are found in unconsolidated fossil shorelines. A link exists between marine erosion and mineral sand deposits, where wave and current action creates conditions in which lighter sand particles are transported more readily than heavier mineral sand particles, creating a build-up of mineral sands. Mineral sands are supplied to the coast through rivers draining the hard-rock hinterland. Typically, the size of mineral sand deposits varies between 100 - 200 m wide, 5 - 20 m thick and 2 - 20 km long.

5.1.3 Mineral Sands Characteristics^{xlvii}

The mineral sand market is divided mainly based on three ways of measuring the types of mineral sands:

- **By Volume as Mined:** In 2018, c. 1.2 Mt of Zircon was produced globally. Typically, in mineral sand deposits, Zircon is produced in lower quantities than TiO₂. The global historical average ratio between the two mined product streams ranges from 1:4 to 1:5, i.e., total Zircon production by volume is c. 20-25%.
 - Chloride feedstocks: Used in chloride pigment plants
 - Sulphate feedstocks: Used in sulfate plants



- **By Value as Finished Products:** Feedstocks are either sold as raw minerals (rutile and chloride or sulfate Ilmenite) or as upgraded feedstocks. Upgraded feedstocks are synthetic rutile, chloride and sulfate slag and upgraded slag. Although Zircon accounts for c. 20-25% by volume, it stands as the most valuable product of mineral sand, followed by Sulfate Ilmenite and Chloride Slag.

5.1.4 Different types of Mineral Sands Processing Methods^{xlviii}

Some of the processing methods of Mineral sands include gravity separation, magnetic separation, electrostatic separation and flotation.

- **Gravity Separation:** Used in the initial stage of enrichment to separate HM from gangue (quartz, feldspar, biotite) and other HM.
- **Magnetic Separation:** Magnetic separation is of two types: wet and dry. Wet magnetic separation is typically used to separate mineral sands concentrate into magnetic (typically containing Ilmenite) and non-magnetic (typically containing Zircon and Rutile) streams. Dry magnetic separation is typically used to upgrade magnetic concentrates into final products (e.g., Ilmenite).
- **Electrostatic Separation:** Electrostatic Separation utilizes the difference in conductivity of minerals to upgrade nonmagnetic concentrate into separate mineral products (e.g., Zircon and Rutile).

Because there are many associated minerals in mineral sands, it is necessary to combine gravity separation, magnetic separation, and electrostatic separation to produce separate mineral products (e.g., Ilmenite, Zircon and Rutile).

5.1.5 Major Producers^{xlix}

Australia, India, southern Africa and the southern USA are among the main producers of mineral sand. Most mineral sands occur in sand-style deposits. However, the Titanium-bearing mineral, i.e., Ilmenite, is also mined from hard rock deposits found in Canada, China and Norway. Australia's mineral sand deposits occur along the coast of eastern Australia, from Victoria to Northern Queensland, in South Australia, and in Western Australia.

5.2 Titanium

5.2.1 Titanium – The Elementⁱ

Titanium – a chemical element with the symbol 'Ti', is found in nature only as an oxide. Ti can be processed to and from a lustrous transition metal with a silver color, low density and high strength, resistant to corrosion in sea water, aqua regia and chlorine. Ti is the ninth-most abundant element and the seventh-most abundant metal found on earth. Some of the Titanium-containing minerals are Anatase, Brookite, Ilmenite, Perovskite, Rutile and Titanite (sphene). Of these, only Rutile and Ilmenite have economic importance.

TiO₂ is the oxide of Titanium metal. It is a white, inorganic compound, which has been used for c. 100 years in a vast number of diverse products. With characteristics such as being odorless and absorbent, TiO₂ has a high refractive index, thereby giving it an excellent light scattering capability. Ideal for inclusion in a variety of consumer and industrial products, TiO₂ is particularly well-suited to applications that need to deliver high levels of opacity, brightness and ultraviolet (UV) protection. It also has a number of lesser-known qualities that make it an extremely useful and important ingredient in the battle to fight climate change and prevent skin cancer. It is used in a plethora of products such as paints, catalytic coatings, plastics, paper and packaging and commercial printing inks. TiO₂ can also be found in cosmetics, toothpaste and food. TiO₂ is a popular ingredient appearing in hundreds of everyday products, bringing significant benefits to the economy and overall quality of life.

5.2.1.1 Rutileⁱⁱ

Rutile is an oxide mineral composed of TiO₂ and is the most common natural form of TiO₂.

Rutile forms an important constituent of HM ore deposits. Rutile is mainly used for the manufacture of refractory ceramics, as a pigment, and for the production of Titanium metal. Rutile is widely used as a welding electrode covering.

5.2.1.2 Ilmeniteⁱⁱⁱ

Ilmenite is a Titanium-iron oxide mineral that is weakly magnetic and black or steel-gray in color. It is a heavy, moderately hard, opaque, black mineral with a submetallic luster and the most important ore of Titanium and the main source of TiO₂.

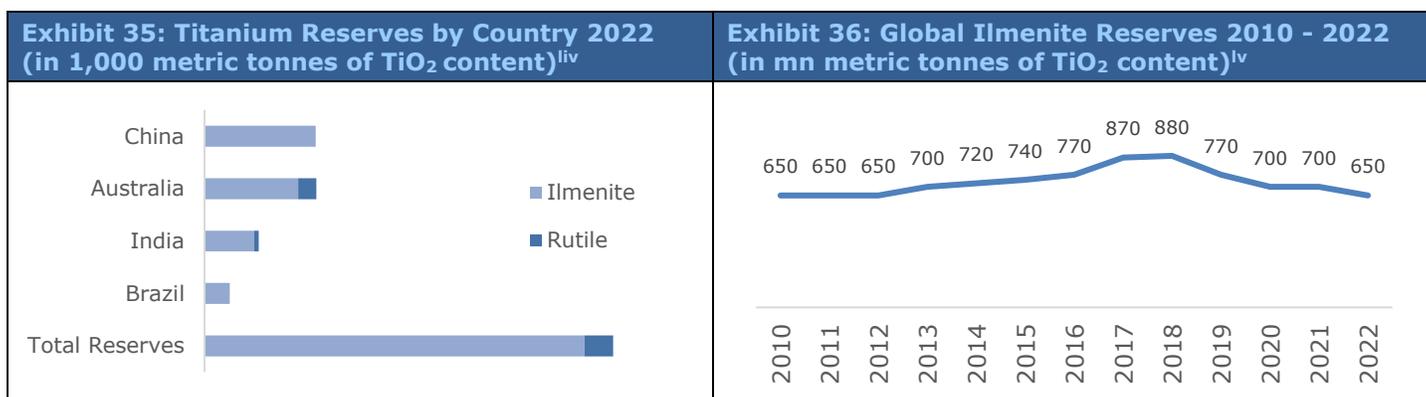
Pure Ilmenite is paramagnetic, i.e., it shows weak attraction to a magnet, but Ilmenite forms solid solutions with hematite that are weakly ferromagnetic and so are noticeably attracted to a magnet. Natural deposits of Ilmenite usually contain intergrown or exsolved magnetite that also contributes to its ferromagnetism. Ilmenite is distinguished from hematite by its less intensely black color and duller appearance and its black streak, and from magnetite by its weaker magnetism.

Synthetic rutile (SR) or upgraded Ilmenite (UGI) is a chemically modified Ilmenite, which has had most of the non-Titanium components removed. Its composition is between 88 - 95% TiO₂. This is similar to the naturally formed rutile mineral from which it derives its name. Synthetic rutile is used for coating welding electrodes and for the manufacture of Titanium tetrachloride, which is majorly used in making Titanium sponges.

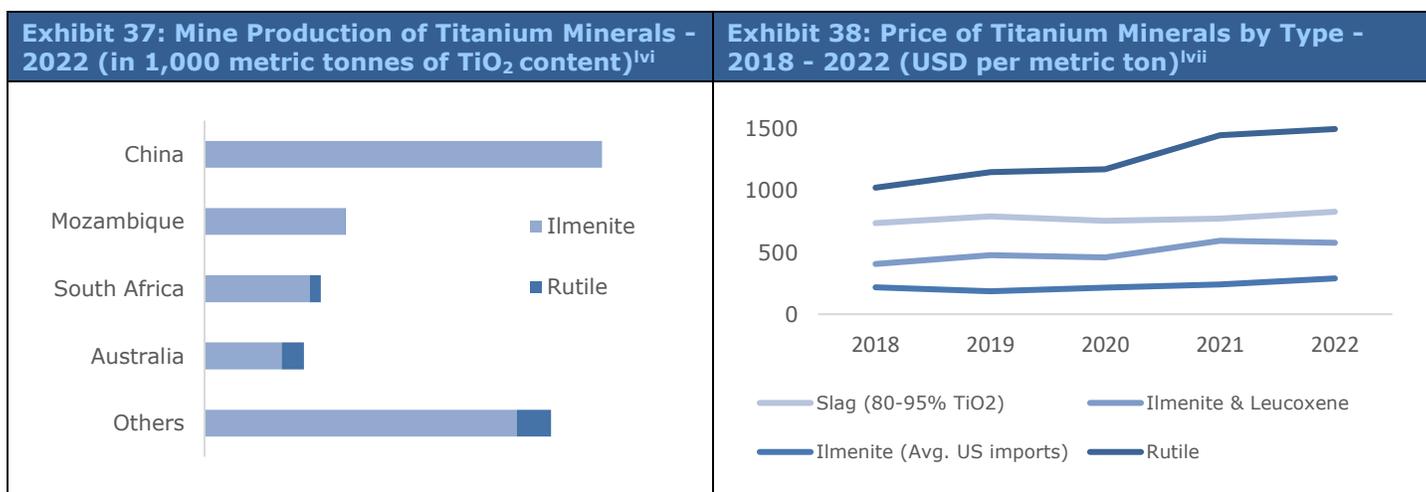
Slag is one of the most common methods of upgrading ilmenite, where ilmenite is added to an electric arc smelting furnace (using a reducing agent such as anthracite) to separate molten iron and titanium from impurities. This process results in the creation of Titanium Slag with higher TiO₂ content (between 72-91% of TiO₂). Typically, Chloride Slag contains coarser size fraction up to 95% TiO₂, while Sulfate Slag has 80% of TiO₂ content.

5.2.2 Market Size, Total Reserve, Total Mine Production and Prices

It is estimated that the global Titanium market will grow significantly, reaching USD 33.5 bn by 2026 from USD 24.7 bn in 2021, with a CAGR of 6.3% in 2021 - 2026^{liii}.



Global reserves of ilmenite are estimated at around 650 mn metric tons (MMT). The top-three countries with significant reserves are China, Australia and India. China has the largest share of about 29.2%, followed by Australia with 24.6% and India with 13.1%.



The world's total mine production of 9.4 MMT is primarily made up of Ilmenite, accounting for c. 94%, with Rutile making up the remaining percentage. China leads the way in Ilmenite mine production, accounting for 38.5%. Mozambique and South Africa follow closely, producing 13.6% and 10.2% of the world's Ilmenite, respectively.

5.2.3 Key Market Trends^{lviii}

The following are the key trends visible in the Titanium market today:

Titanium Metal – the Fastest-Growing Product Type of Titanium

Titanium metal finds application in numerous industries, including aerospace and defense, the chemical and process industries, energy and power and desalination. Expanding demand from these diverse end-users is expected to propel the Titanium market in the future.

Paints & Coatings the Fastest-Growing User of TiO₂

TiO₂ is an essential component in paints and coatings, enhancing their coverage, brightness, whiteness, opacity and durability. Its use spans a broad range of coatings, including those employed in architecture, automobiles, industry, powder coatings, water-based paints, wood finishes and others. The market for paints and coatings is experiencing an upsurge, driven primarily by significant growth of the housing and construction industry, rising gross domestic product, ongoing urbanization and increased disposable incomes. Technological advancements in industrial sectors, such as automotive and wood, are contributing to the market's expansion.

Aerospace & Defense the Fastest-Growing Industry Application of Titanium Metal

Titanium plays a crucial role in the production of turbine engines, airframes and other aerospace components. It accounts for c. 25% of the overall weight in turbine engines and is employed for fasteners, landing-gear supports and other internal components.

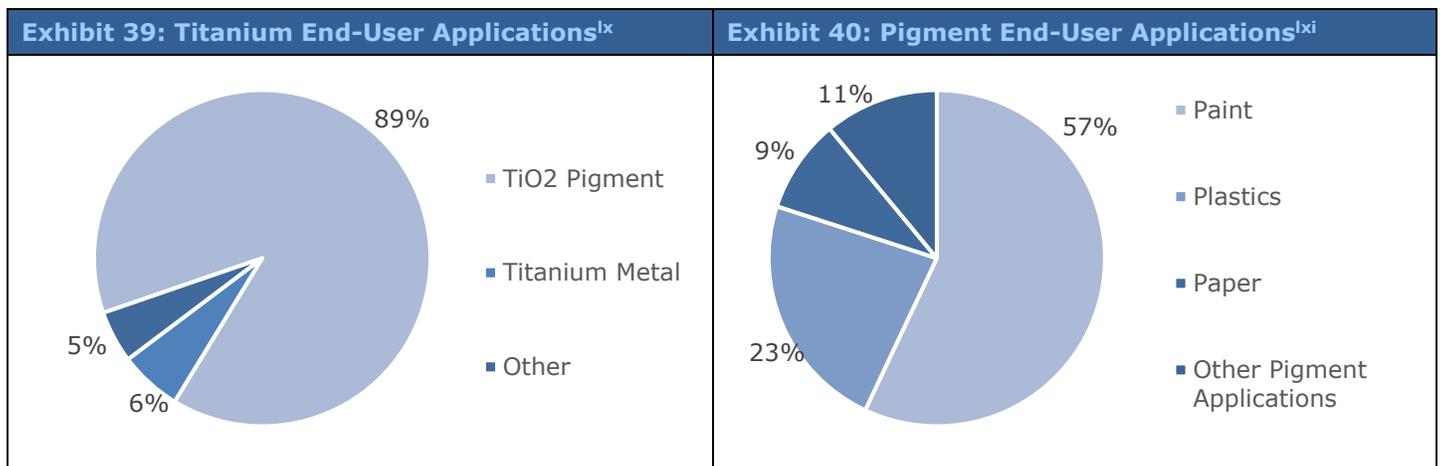
Asia Pacific (APAC) is the Fastest-Growing Titanium Market

The APAC region is poised to lead the global Titanium market with the highest CAGR growth, primarily attributable due to the resurgence of end-use industries. The COVID-19 pandemic caused several Titanium producers and companies to halt their production at sites in different countries, and demand for TiO₂ and Titanium metal in APAC countries decreased. However, the demand for Titanium is expected to surge as end-use industries bounce back and the supply chain is re-established.

5.2.4 End-User Applications^{lix}

Despite its versatile applications in various industries, the majority of Titanium minerals are used in pigment manufacturing, accounting for c. 89%. The remaining 11% is used for producing Titanium metal and other materials.

TiO₂ pigment products are primarily made from Ilmenite, Slag, Rutile, Synthetic Rutile and Leucoxene. These products are widely used in various applications including paints, coatings, plastics, inks, fibers, rubber, food, cosmetics and pharmaceuticals. Titanium minerals are also employed in specialized applications such as welding electrodes and in the production of Titanium metal, which is extensively used in the commercial aerospace, military and industrial sectors. The exhibit below shows the diverse range of applications.

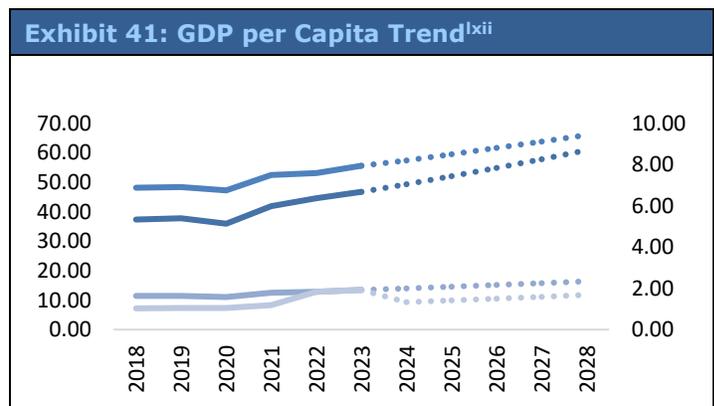


5.2.5 Demand Drivers

5.2.5.1 GDP per Capita

GDP per capita is a widely used measure to evaluate a country's economic performance by calculating the economic output per individual. It enables economists to judge the prosperity of countries based on their economic growth. Typically, higher GDP per capita is associated with industrialized and developed nations.

According to the latest report from the International Monetary Fund (IMF), the GDP per person in the world averages USD 13.44 thousand for 2023. This figure has been steadily increasing at a CAGR of 3.3% since 2018 and is projected to reach USD 16.38 thousand with a CAGR of 4.0% over the next five years.



The GDP per person in advanced economies is presently much higher, with the current rate at USD 55.54 thousand for 2023. This number has been steadily increasing at an annual growth rate of 2.9% since 2018 and is projected to rise to USD 65.97 thousand at a CAGR of 3.5% over the next five years.

Meanwhile, the GDP per person in emerging markets and developing economies has also shown a steady increase, reaching USD 6.67 thousand for 2023 with an annual growth rate of 4.6%. It is expected to continue growing and reach USD 8.69 thousand with an estimated CAGR of 5.4% by 2028.

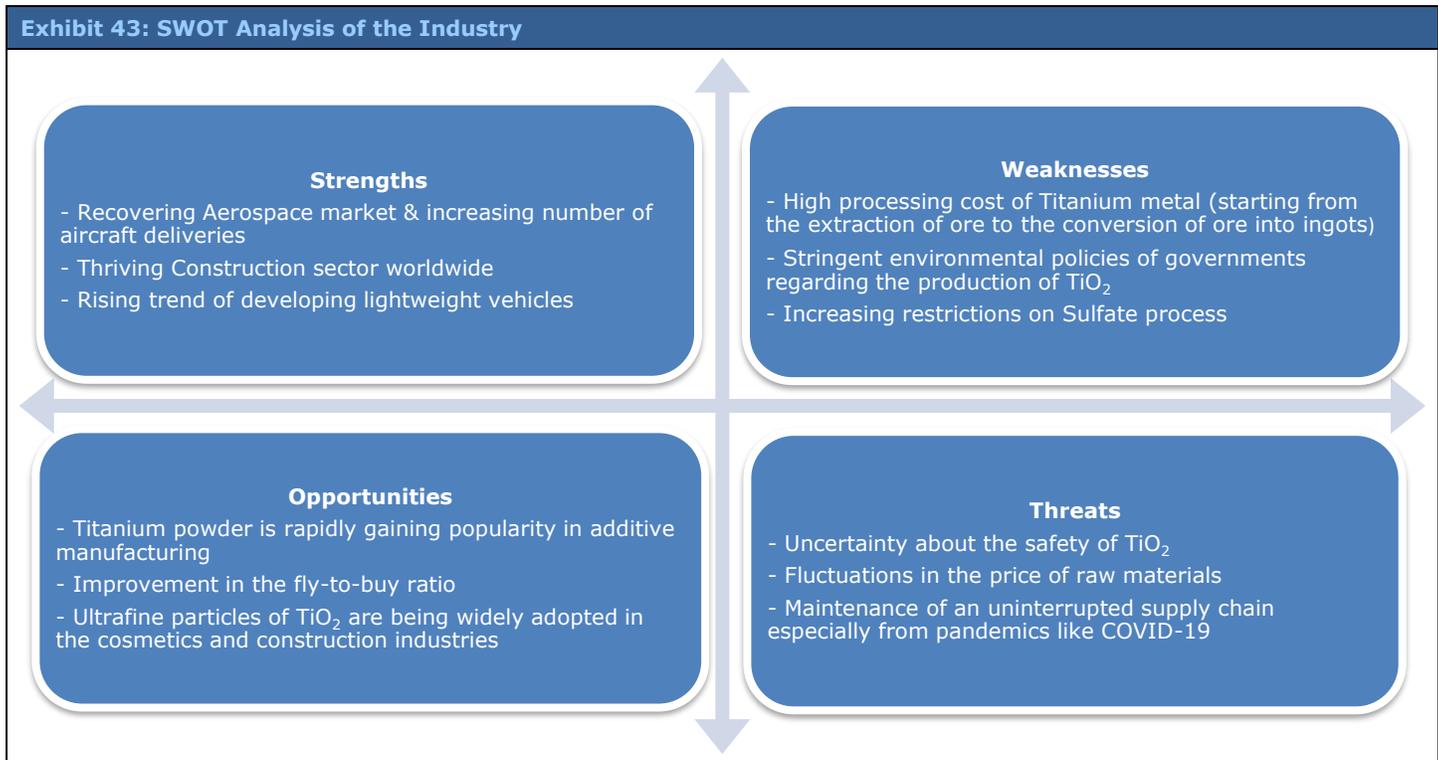
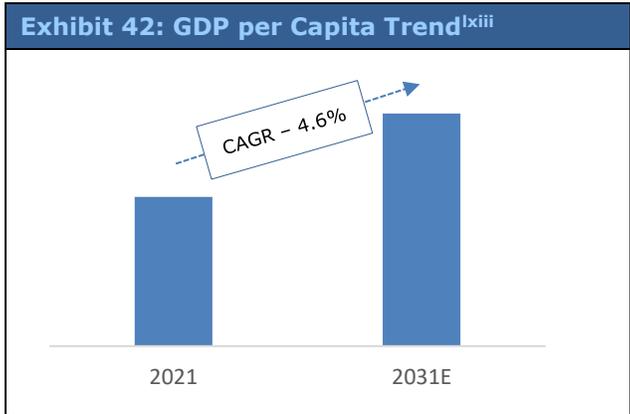
Lastly, the Asia Pacific region has experienced a CAGR of 4.0%, which brought its GDP per person to USD 8.79 thousand for 2023. It is expected to continue growing at a rate of 6.0% over the next five years to reach to 11.79 thousand.

5.2.5.2 Pigment Market Outlook

Rapid urbanization and subsequent growth in the construction sector are augmenting the global pigments market, which is poised to increase at a CAGR of 4.6% to USD 53.8 bn by the end of 2031 from USD 34.5 bn in 2021^{lxiv}.

Infrastructure development across the globe is expected to boost demand for paints and coatings in the construction sector. An increase in automobile production should further drive demand for industrial paints. Also, the surge in global production and consumption of plastics is expected to fuel the pigment market in the future.

5.2.6 SWOT Analysis



5.3 Zircon

5.3.1 Zirconium – The Element^{lxv}

Zirconium is a lustrous, grey, soft and ductile metal that has derived its name from the mineral 'Zircon'. Zircon is the oldest mineral on the earth's crust and the 12th most abundant element in terrestrial rocks. It is the most important source of Zirconium. Zirconium is not found in nature as a native metal but is found as Zirconium silicate (ZrSiO₄).

Application Areas

Zircon is mainly consumed as an opacifier, with the key application area being the decorative ceramics industry. It is also used as an important refractory oxide metal. Other applications include its use in refractories and foundry casting and a growing array of specialty applications as Zirconia and Zirconium chemicals, including in nuclear fuel rods, catalytic fuel converters and in water and air purification systems.

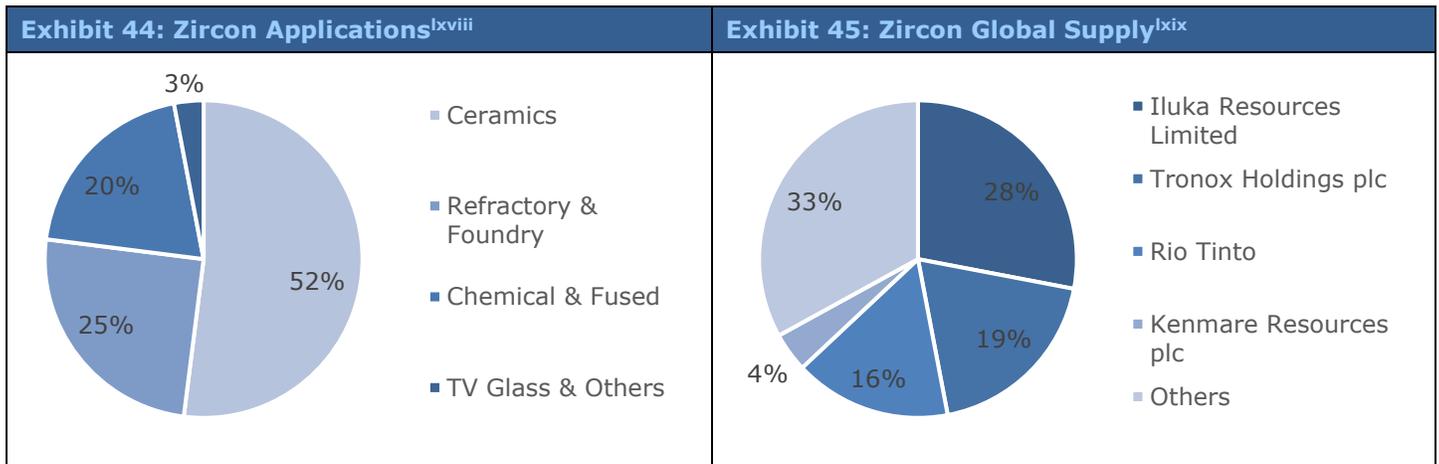
5.3.2 Global Demand and Supply^{lxvi}

The global demand for Zircon stood at 1.0 Mtpa in 2019, which rose to 1.2 Mtpa in 2022. This demand is forecasted to increase by c. 2.7% in 2023.

The demand for Zircon faced short-term headwinds at the start of 2020 due to global economic uncertainty and the destocking of downstream supply chains. However, long-term fundamentals, such as the increase in Asian and African middle classes and continued urbanization, are expected to drive future demand. Strong demand from end-user industries, such as ceramics (particularly in the tiles, sanitary ware and tableware segments), is expected to increase. At present, ceramics account for more than 50% of Zircon sand consumption.

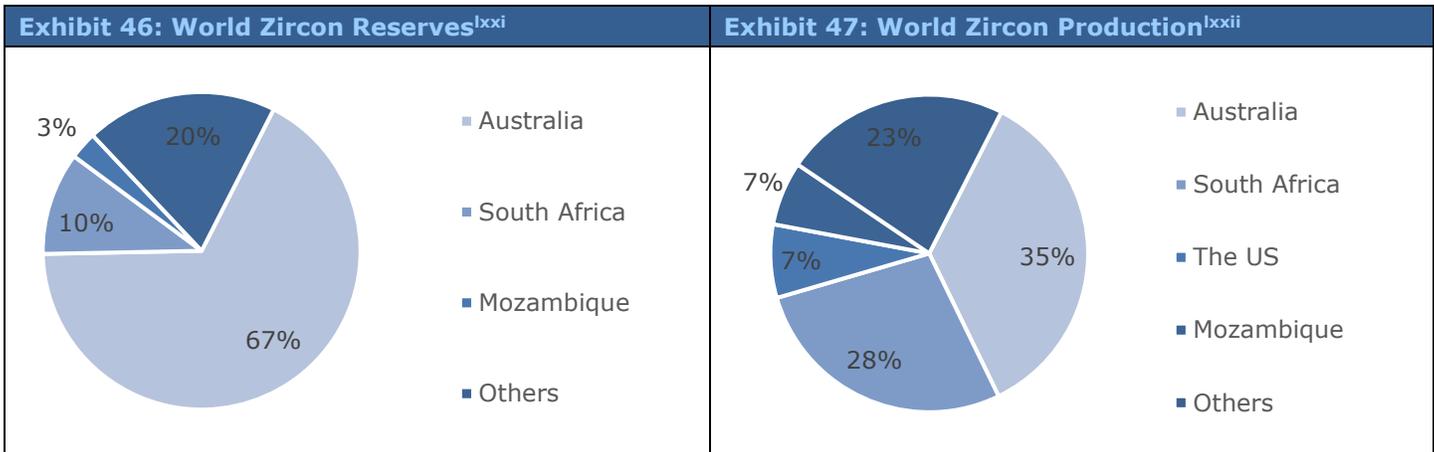
The global Zirconium market reached USD 1.8 bn in 2022, while it is expected to rise to USD 2.9 bn by 2028, exhibiting a CAGR of 7.8% in 2023 - 2028. Rising demand for nuclear power generation, in the production of catalytic converters in automobiles, and considerable growth in the aerospace industry, along with rising per capita incomes, are some of the key factors driving the market^{lxvii}.

The global supply of Zircon is controlled by a few companies such as Iluka Resources Ltd, Tronox Holdings Plc and Rio Tinto. These three main producers control c. 63% of the global Zircon supply. Iluka's Zircon production is mainly from its Jacinth-Ambrosia mine in South Australia, while Rio Tinto owns Richards Bay Minerals in South Africa and Tronox/Cristal owns mines in both South Africa and Australia.



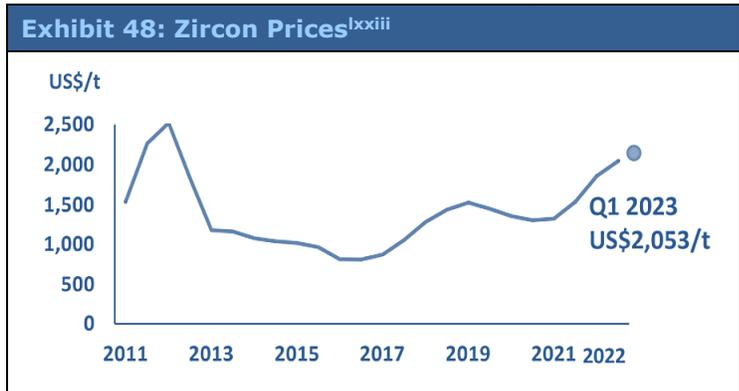
5.3.3 Leading Zircon Reserves and Producers^{lxx}

The world's reserves of Zirconium stood at c. 64 Mt, with Australia holding the world's largest reserves, followed by South Africa and Mozambique. In 2022, global production of Zirconium minerals was estimated at 1.2 Mt, with Australia as the front-runner, followed by South Africa, the US and Mozambique.



5.3.4 Market Update and Prices^{lxxiv}

In the last 13 years, the price of Zircon sand touched a peak of USD 2,700/t in 2012, after which it experienced a drop. This was driven mainly by falling demand as end-users looked to substitute Zircon with competing minerals or eliminate it from their product formulations. Annual demand also tumbled from 1,300/t in 2011 to 1,000/t in 2013, leading to a pile-up of unsold inventories, which took a number of years to clear. As a result, prices for the next two years dropped back to USD 1,000-1,200/t. However, steady growth in demand and reduced inventory levels led to an increase in prices, which rose to USD 1,500-1,600/t from 2016 to 2019.



Strong demand, coupled with high freight rates, stimulated the Zircon price, as it started 2022 at USD 2,000/t and finished the year at USD 2,300/t. Currently, in 2023, the price is trending lower^{lxxv}, but remains at an elevated level as compared with the price in Q1 2023. The strong demand scenario is expected to continue in the latter half of 2023 and might result in an increase in Zircon price by an estimated 10% over the year. Price support is accentuated by the limited supply coming from a number of aging mines that are transitioning to lower-grade ore bodies, and therefore reducing output. A case in point is Jacinth-Ambrosia, operated by Iluka, which is approaching the end of its mine life and is expected to close by 2030. Emerging supply gaps are evident, and inventories are low, helping maintain the Zircon price at USD 2,000/t.

5.3.5 Key Market Trends^{lxxvi}

Widespread Use Led to Increasing Demand

Zircon is mainly used in ceramics and foundry, in the form of sand and flour (milled sand), as it offers a variety of valuable properties.

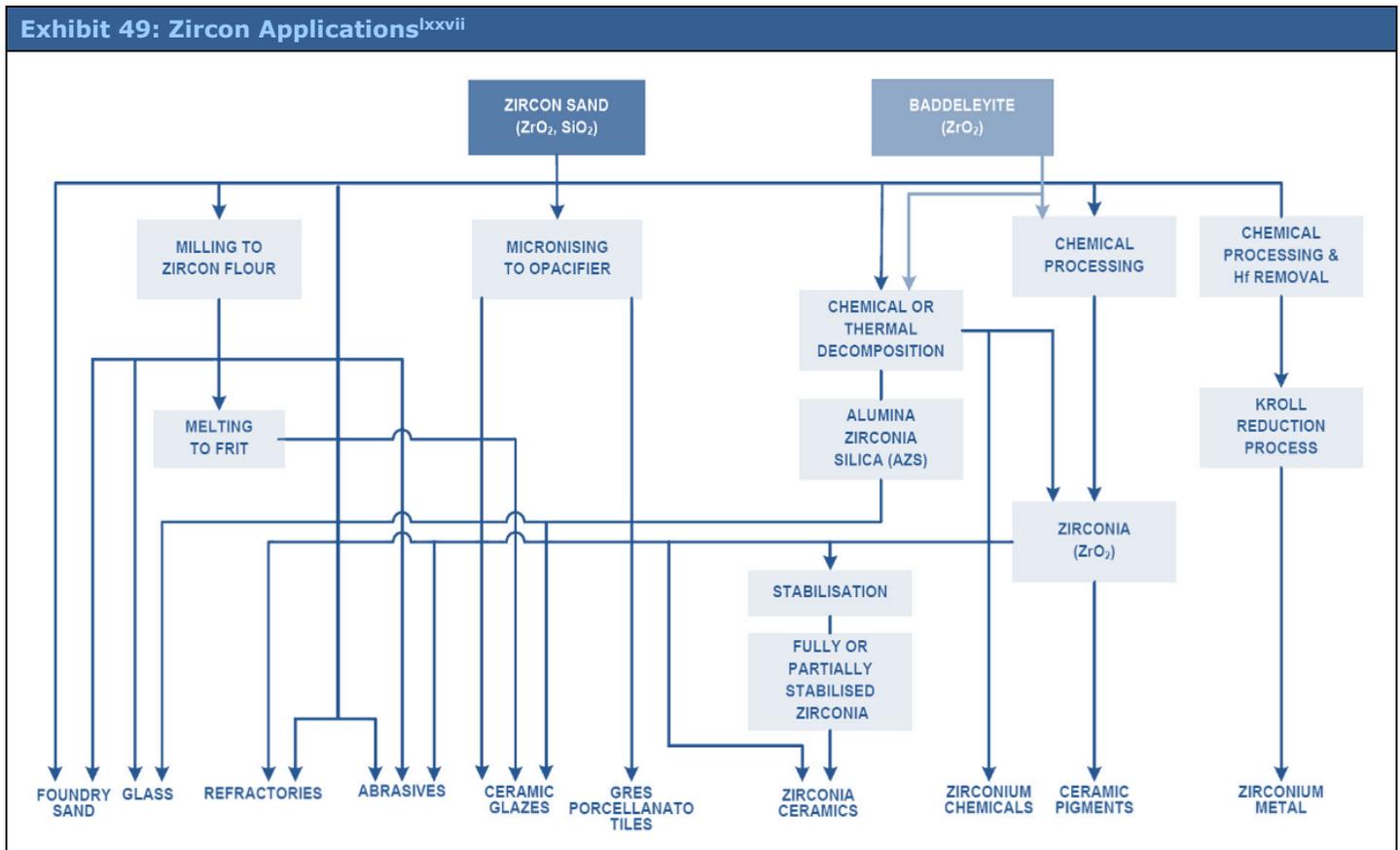
- It provides a high refractive index for opacification and inducing white color, coupled with ancillary benefits, such as the ability to impart greater mechanical strength, toughness and durability to ceramic bodies and glass matrices. These attributes are highly valued by specific segments of the ceramics industry.
- The most used form of Zircon is 'Flour'. It is combined with frit compositions, or micronized Zircon, to produce glazes, engobes and ceramic body compositions. Zircon sand is also employed to improve the abrasion resistance of glazed surfaces, particularly for floor tiles.
- Zircon is used in foundry applications as a molding base for a variety of casting techniques. It is also used as a mold coating in die casting and in refractory paints and washes, due to its properties that reduce the wettability of other foundry sands. Usage of Zircon foundry sand imparts a better metal finish, a lesser likelihood of 'burn-on' and improved metal solidification.

China Set to Dominate the Market in the Long Run

- China’s interest in developing its nuclear energy could lead to a major increase in the demand for Zirconium.
- China is a major consumer and exporter of ceramics, with more than 1,450 ceramic tile manufacturers in the country. It currently accounts for more than 50% of total global consumption of ceramic tiles.
- China’s iron and steel industry is likely to provide further impetus to Zircon consumption, driven by the growth of the refractories market in recent years.

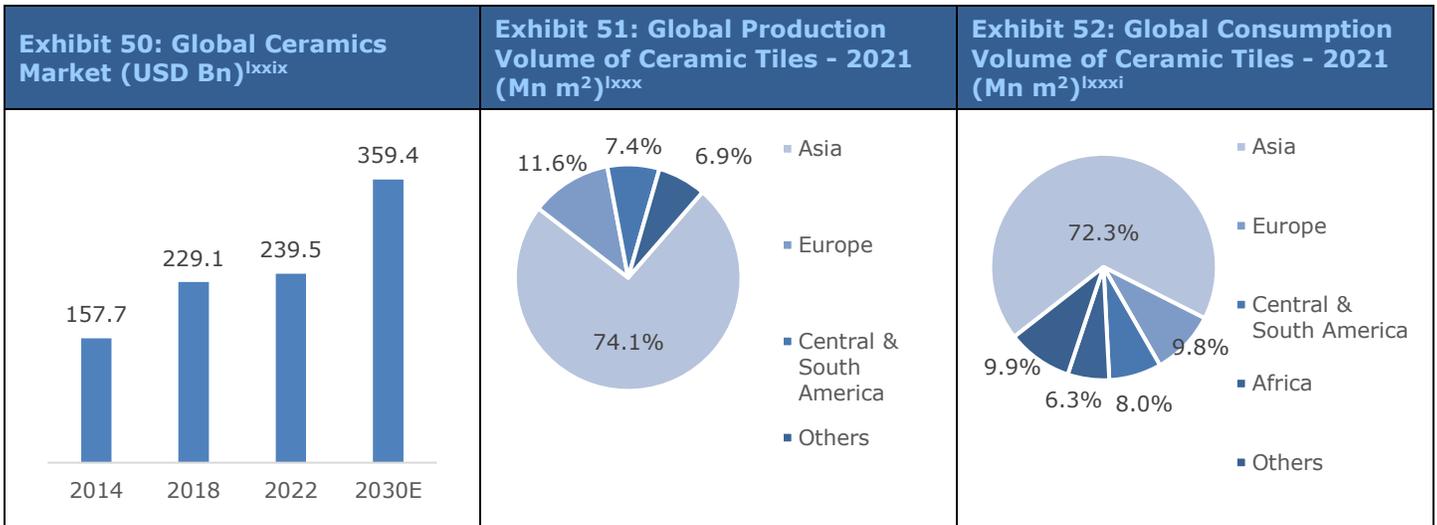
5.3.6 Zircon - Processes and Applications: A Brief Snapshot

Around 80% of mined Zircon is used either in its natural state or processed into a finer size for various applications in refractories, foundry, glass and ceramics. A summary of the process and the end-users' applications is given below:

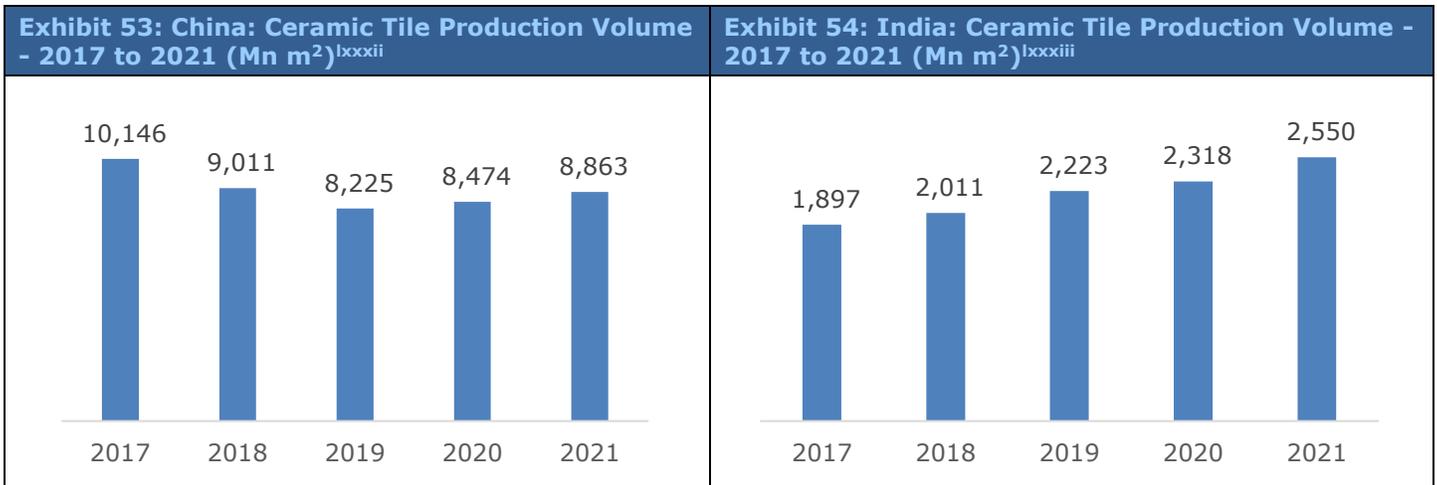


5.3.7 Ceramics: A Key Demand Driver of Zircon^{lxviii}

The ceramics market worldwide, which was valued at c. USD 240.0 bn in 2022, is expected to increase to USD 359.4 bn by 2030, with a CAGR of 5.2% in 2023 - 2030. This growth is largely attributable to the expansion of the building and construction industry, where ceramics are extensively used in tiles, sanitary ware and bricks. This industry is expected to push the ceramics market forward in the coming years. In 2021, global production and consumption of tiles has reached 18.3 bn m² and 18.2 bn m², respectively. Asia is the primary contributor in terms of both production and consumption, accounting for over 70% in both cases.



The ceramics and foundry industry in Asia has witnessed a considerable surge in demand, propelled mainly by emerging economies such as China and India. Consequently, the demand for Zircon flour and sand has also experienced an upswing. As the industry gradually moves past the COVID restrictions and the construction sector recuperates, the demand for these materials is expected to remain robust in China and India.



6. Valuation

The fair market value of the company's shares stood between AUD 949.6 mn and AUD 1057.6 mn on September 14, 2023. The fair market value for one of the company's publicly traded shares stood between AUD 2.4 and AUD 2.7 on September 14, 2023. The valuation approach followed is Blended Valuation.

6.1 DCF method

Valuation	
Risk free rate (Rf)	4.1% ^{lxxxiv}
Beta	0.51 ^{lxxxv}
Market return (Rm)	8.1% ^{lxxxvi}
Cost of equity	6.6%
Cost of debt (after tax)	0.0%
WACC (discount rate)	6.6%

Year ending – June (AUD 000's)	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E
FCFF (Low)										
Free cash flow to firm	(1,758.2)	(21,856.9)	7,267.9	(2,176.3)	(2,392.3)	82,841.8	35,559.9	84,590.3	83,423.6	119,859.5
Discount factor	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6
Present value of FCF	(1,734.8)	(20,224.8)	6,306.8	(1,771.0)	(1,825.7)	59,287.5	23,865.9	53,240.5	49,239.6	66,344.2
FCFF (High)										
Free cash flow to firm	(1,778.5)	(21,860.3)	8,885.2	(2,117.9)	(2,290.7)	91,812.8	38,322.3	90,456.2	88,439.0	128,419.6
Discount factor	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6
Present value of FCF	(1,754.9)	(20,227.9)	7,710.3	(1,723.5)	(1,748.1)	65,707.7	25,719.8	56,932.5	52,199.9	71,082.3

Arrowhead Fair Value Bracket	High	Low
Terminal Value (TV)	1,911,893.9	1,600,612.2
Present Value of TV	186,814.3	156,398.5
Present Value of FCF	860,262.8	770,295.1
Net Debt ^{lxxxvii}	(38,444.5)	(38,464.8)
Equity Value Bracket	1,085,521.6	965,158.4
Shares O/S ('000s)	392,825.7	392,825.7
Fair Share Value Bracket (AUD)	2.8	2.5
Current Market Price (AUD) ^{lxxxviii}	0.5	0.5
Upside/(Downside)	500.7%	434.1%
Current Market Cap. (AUD mn)	180,699.8	180,699.8
Target Market Cap. Bracket (AUD mn)	1,085,521.6	965,158.4

Sensitivity Analysis

Sensitivity Table - High		WACC (%)				
		6.1%	6.4%	6.6%	6.9%	7.1%
GROWTH RATE (%)	1.0%	2.95	2.80	2.68	2.56	2.45
	1.5%	3.00	2.85	2.71	2.59	2.47
	2.0%	3.07	2.91	2.76	2.63	2.51
	2.5%	3.16	2.98	2.82	2.68	2.55
	3.0%	3.28	3.08	2.90	2.74	2.60

Sensitivity Table - Low		WACC (%)				
		6.1%	6.4%	6.6%	6.9%	7.1%
GROWTH RATE (%)	1.0%	2.62	2.49	2.38	2.28	2.19
	1.5%	2.66	2.53	2.42	2.31	2.21
	2.0%	2.72	2.58	2.46	2.34	2.24
	2.5%	2.80	2.64	2.51	2.38	2.27
	3.0%	2.90	2.72	2.57	2.44	2.31

Approach for DCF Valuation

Time Horizon: The Arrowhead fair valuation for Sheffield Resources Ltd. is based on the DCF method. The time period chosen for the valuation is 108 months (2023E-2032E).

Terminal Value: This is estimated using a terminal growth rate of 2.0%.

Prudential nature of valuation: It should be noted that Arrowhead's fair value bracket estimate is a relatively prudent estimate, as it discounts the eventuality of any new products being launched in the market or any significant change in the strategy.

6.2 Relative Valuation

Exhibit 55: Peer Set ¹ xxxix									
Company Name	Ticker	Market Capitalization	Total Assets	EV*	EBITDA	CFO	EV/CF O	Ore Reserve Est. (Mt)	EV/Ore Reserve
Iluka Resources Limited	ASX: ILU	3,437.3	3,001.8	3,120.0	837.7	601.5	5.2	162.0	19.3
Kenmare Resources plc	LSE: KMR	814.5	1,837.4	747.7	437.0	308.1	2.4	1,507.0	0.5
Strandline Resources Limited	ASX: STA	212.1	378.8	400.2	(10.9)	(3.8)	NA	535.3	0.7
PYX Resources Limited	NSX: PYX	231.0	131.1	218.1	(9.6)	(5.8)	NA	263.5	0.8
Base Resources Limited	ASX: BSE	202.9	571.4	63.3	270.7	167.3	0.4	947.9	0.1
Image Resources NL	ASX: IMA	95.3	201.1	33.2	57.9	36.8	0.9	6.7	5.0
Sierra Rutile Holdings Limited	ASX: SRX	84.8	328.8	35.9	160.4	63.8	0.6	214.0	0.2
Mineral Commodities Ltd	ASX: MRC	32.5	115.6	31.5	(10.7)	1.9	16.8	21.8	1.4
Median							1.7		0.8

*Note: EV means Enterprise Value

**We have used MRE (Inferred) since Ore Reserve Estimates was not available.

Particulars	High	Low
Cash Flow from Operations (10-Yr Forward)	128,419.6	119,859.5
PEER EV/ CFO	1.7	1.7
Arrowhead Premium/(Discount)	50.0%	50.0%
Enterprise Value (Cal. Using EV/CFO)	320,630.1	299,257.7
Less: Net Debt	(458,510.8)	(425,582.4)
Implied Equity Value	779,140.9	724,840.1
Shares o/s ('000s)	392,825.7	392,825.7
Intrinsic Value per share (AUD)	2.0	1.8
Current market Price (AUD)	0.5	0.5
Upside / (Downside)	331.2%	301.1%

Particulars	High	Low
Ore Reserve Estimate (kt)	754,575.2	754,575.2
PEER EV/ Ore Reserve Estimate	0.8	0.8
Arrowhead Premium/(Discount)	10.0%	5.0%
Enterprise Value (Cal. Using EV/ORE)	653,784.4	624,066.9
Less: Net Debt	(458,510.8)	(425,582.4)
Implied Equity Value	1,112,295.2	1,049,649.4
Shares o/s ('000s)	392,825.7	392,825.7
Intrinsic Value per share (AUD)	2.8	2.7
Current market Price (AUD)	0.5	0.5
Upside / (Downside)	515.5%	480.9%

6.3 Blended Valuation

Blended Valuation	High	Low
DCF (AUD) Weightage- 80%	2.8	2.5
Relative Valuation: EV/CFO (AUD) Weightage- 10%	2.0	1.8
Relative Valuation: EV/ORE (AUD) Weightage- 10%	2.8	2.7
Blended Value (AUD)	2.7	2.4
Upside/(Downside)	585.3%	525.5%
Target Market Cap. Bracket (AUD '000s)	1,057,561	949,576

Approach for DCF Valuation

Time horizon: The period chosen for the valuation is 432 months (2023E-2059E).

Prudential nature of valuation: It should be noted that Arrowhead's fair value bracket estimate is relatively prudent, as it discounts the eventuality of any new products being launched in the market or any significant change in strategy.

Important information on Arrowhead methodology

The principles of the valuation methodology employed by Arrowhead BID are variable to a certain extent depending on the subsectors in which the research is conducted, but all Arrowhead valuation research possesses an underlying set of common principles and a generally common quantitative process.

With Arrowhead Commercial and Technical Due Diligence, Arrowhead extensively researches the fundamentals, assets and liabilities of a Company, and builds solid estimates for revenue and expenditure over a coherently determined forecast period. Elements of past performance, such as price/earnings ratios, indicated as applicable, are present mainly for reference purposes. Still, elements of real-world past performance enter the valuation through their impact on the commercial and technical due diligence.

Elements of comparison, such as multiple analyses may be to some limited extent integrated in the valuation on a project-by-project or asset-by-asset basis. In the case of this Sheffield Resources Limited report, there are no multiple analyses integrated in the valuation.

Arrowhead BID fair market value bracket

The Arrowhead Fair Market Value is given as a bracket. This is based on quantitative key variable analysis, such as key price analysis for revenue and cost drivers or analysis and discounts on revenue estimates for projects, especially relevant to those projects estimated to provide revenue near the end of the chosen forecast period. Low and high estimates for key variables are produced as a tool for valuation. The high-bracket DCF valuation is derived from the high-bracket key variables, while the low-bracket DCF valuation is based on the low-bracket key variables.

In principle, an investor who is comfortable with the high-brackets of our key variable analysis will align with the high-bracket in the Arrowhead Fair Value Bracket, and likewise in terms of low estimates. The investor will also take into account the Company intangibles – as presented in the first few pages of this document in the analysis of strengths and weaknesses and other essential Company information. These intangibles serve as supplementary decision factors for adding or subtracting a premium in the investor's own analysis. The bracket should be understood as a tool provided by Arrowhead BID for the reader of this report and the reader should not solely rely on this information to make his decision on any particular security. The reader must also understand that on one hand, global capital markets contain inefficiencies, especially in terms of information, and that on the other hand, corporations and their commercial and technical positions evolve rapidly: this present edition of the Arrowhead valuation is for a short to medium-term alignment analysis (one to twelve months). The reader should refer to important disclosures on page 42 of this report.

7. Appendix

7.1 Sheffield's Financial Summary

Exhibit 56: Financial Summary		<i>Low Bracket Estimates</i>							
<i>Year ending June</i>	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E
Revenue (AUD 000's)	95.0	101.7	108.8	116.4	124.6	133.3	142.6	152.6	163.3
Operating profit (AUD 000's)	(3,312.0)	(3,633.3)	(4,001.6)	(4,436.6)	(4,929.6)	(5,486.6)	(6,058.9)	(6,698.2)	(7,411.3)
Net income (AUD 000's)	(9,751.6)	34,055.8	44,369.6	32,578.1	50,578.1	84,006.6	97,208.3	98,006.7	97,392.1
EPS (AUD)	(2.48)	8.67	11.29	8.29	12.88	21.39	24.75	24.95	24.79
Growth rates (%)									
Revenue	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
Operating profit	NA	NA	NA	NA	NA	NA	NA	NA	NA
Net income	NA	NA	30.3%	(26.6%)	55.3%	66.1%	15.7%	0.8%	(0.6%)
EPS	NA	NA	30.3%	(26.6%)	55.3%	66.1%	15.7%	0.8%	(0.6%)
EBITDA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Margins (%)									
Gross margins	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Operating profit margin	-3485.3%	-3573.3%	-3678.1%	-3811.1%	-3957.6%	-4116.6%	-4248.6%	-4389.6%	-4539.2%
Net profit margin	-10261.9%	33493.6%	40782.4%	27985.2%	40605.2%	63030.2%	68164.0%	64227.9%	59649.6%
EBITDA margins	-3485.3%	-3573.3%	-3678.1%	-3811.1%	-3957.6%	-4116.6%	-4248.6%	-4389.6%	-4539.2%
Ratios									
ROA	(5.9%)	16.6%	18.0%	11.2%	14.1%	18.6%	17.6%	15.0%	12.9%
ROE	(6.5%)	20.7%	21.6%	13.3%	17.5%	23.4%	21.5%	17.7%	14.9%
Debt/equity	0.0x	0.0x	0.0x	0.0x	0.0x	0.0x	0.0x	0.0x	0.0x

Exhibit 57: Financial Summary		<i>High Bracket Estimates</i>							
<i>Year ending June</i>	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E
Revenue (AUD 000's)	100.4	110.5	121.5	133.7	147.0	161.7	177.9	195.7	215.3
Operating profit (AUD 000's)	(3,263.9)	(3,525.4)	(3,816.3)	(4,158.9)	(4,539.6)	(4,962.1)	(5,380.9)	(5,841.0)	(6,346.1)
Net income (AUD 000's)	(5,708.4)	40,648.0	51,546.0	37,602.3	56,692.5	90,442.1	104,443.3	104,453.9	105,312.4
EPS (AUD)	(1.45)	10.35	13.12	9.57	14.43	23.02	26.59	26.59	26.81
Growth rates (%)									
Revenue	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Operating profit	NA	NA	NA	NA	NA	NA	NA	NA	NA
Net income	NA	NA	26.8%	(27.1%)	50.8%	59.5%	15.5%	0.0%	0.8%
EPS	NA	NA	26.8%	(27.1%)	50.8%	59.5%	15.5%	0.0%	0.8%
EBITDA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Margins (%)									
Gross margins	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Operating profit margin	-3249.9%	-3191.2%	-3140.4%	-3111.2%	-3087.4%	-3067.9%	-3024.4%	-2984.5%	-2947.8%
Net profit margin	-3249.9%	-3191.2%	-3140.4%	-3111.2%	-3087.4%	-3067.9%	-3024.4%	-2984.5%	-2947.8%
EBITDA margins	-5683.9%	36794.5%	42417.6%	28130.2%	38555.9%	55917.0%	58703.1%	53371.9%	48918.6%
Ratios									
ROA	(3.3%)	18.5%	19.4%	11.9%	14.5%	18.4%	17.5%	14.8%	12.9%
ROE	(3.7%)	23.7%	23.5%	14.2%	18.0%	23.2%	21.3%	17.5%	14.9%
Debt/equity	0.0x	0.0x	0.0x	0.0x	0.0x	0.0x	0.0x	0.0x	0.0x

7.2 Sheffield Resources Ltd. Balance Sheet Forecast

Year Ending - June	All figures in AUD '000, unless stated differently								
	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E
Total current assets	16,649.9	23,917.9	21,741.6	19,349.3	102,191.1	137,751.0	222,341.3	305,765.0	425,624.4
Total non-current assets	130,056.9	158,474.4	206,845.6	243,860.3	213,886.2	264,897.3	280,387.4	298,187.2	279,322.6
TOTAL ASSETS	146,706.8	182,392.3	228,587.2	263,209.6	316,077.3	402,648.3	502,728.8	603,952.2	704,947.1
Total current liabilities	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0
Total non-current liabilities	-	-	-	-	-	-	-	-	-
TOTAL LIABILITIES	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0
Total shareholders' equity	146,532.8	182,218.3	228,413.2	263,035.6	315,903.3	402,474.3	502,554.8	603,778.2	704,773.1
TOTAL LIABILITIES & EQUITY	146,706.8	182,392.3	228,587.2	263,209.6	316,077.3	402,648.3	502,728.8	603,952.2	704,947.1

Low Bracket estimates

Year Ending - June	All figures in AUD '000, unless stated differently								
	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E
Total current assets	16,626.3	25,511.5	23,393.6	21,102.9	112,915.7	151,237.9	241,694.1	330,133.2	458,552.8
Total non-current assets	134,052.0	167,358.7	222,721.0	264,482.2	231,416.8	285,797.2	302,270.9	321,021.0	300,922.5
TOTAL ASSETS	150,678.2	192,870.2	246,114.5	285,585.1	344,332.5	437,035.2	543,965.0	651,154.2	759,475.3
Total current liabilities	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0
Total non-current liabilities	-	-	-	-	-	-	-	-	-
TOTAL LIABILITIES	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0
Total shareholders' equity	150,504.2	192,696.2	245,940.5	285,411.1	344,158.5	436,861.2	543,791.0	650,980.2	759,301.3
TOTAL LIABILITIES & EQUITY	150,678.2	192,870.2	246,114.5	285,585.1	344,332.5	437,035.2	543,965.0	651,154.2	759,475.3

High Bracket estimates

8. Analyst Certifications

I, Sumit Wadhwa, certify that all the views expressed in this research report accurately reflect my personal views about the subject security and the subject Company, based on the collection and analysis of public information and public Company disclosures.

I, Ayushi Saraswat, certify that all the views expressed in this research report accurately reflect my personal views about the subject security and the subject Company, based on the collection and analysis of public information and public Company disclosures.

Important disclosures

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Investors must make their own investment decisions based upon their specific investment objectives and financial situation utilizing their own financial advisors as they deem necessary.

Investors are advised to gather and consult multiple sources of information while preparing their investment decisions. Recipients of this report are strongly advised to read the Information on Arrowhead Methodology section of this report to understand if and how the Arrowhead Due Diligence and Arrowhead Fair Value Bracket integrates alongside the rest of their stream of information and within their decision-making process. Past performance of securities described directly or

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9. Notes and References

- ⁱ Source: Bloomberg as on September 14, 2023
ⁱⁱ Source: Bloomberg as on September 14, 2023
ⁱⁱⁱ Source: Bloomberg as on September 14, 2023
^{iv} Source: Annual Report 2022
^v Source: Annual Report 2022
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- xliii Source: Mineral Sands Industry Information By Iluka
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- xlv Source: Mineral Sands Industry Information By Iluka
- xlvi Source: Mineral Sands Industry Information By Iluka
- xlvii Source: Mineral Sands Industry Information By Iluka
- xlvi Source: Iluka Technical Information PDF
- xlviii Source: Iluka Technical Information PDF
- xlix Source: Iluka Technical Information PDF
- i Source: [Titanium - Wikipedia](#), [Titanium dioxide - Wikipedia](#), [Titanium dioxide - Venator \(venatorcorp.com\)](#), [What is titanium dioxide? \(tdma.info\)](#)
- ii Source: [Rutile - Wikipedia](#)
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- liv Source: Statista
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- lx Source: Investors Presentation by Iluka
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- lxii Source: [World Economic Outlook \(April 2023\) - GDP per capita, current prices \(imf.org\)](#)
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