# SHEFFIELD RESOURCES (SFX)

## INITIATION: A Best-in-Class Mineral Sands developer

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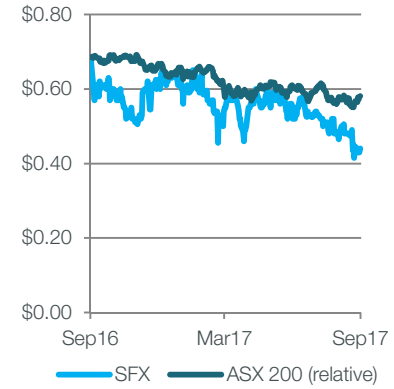
Date 11 September 2017

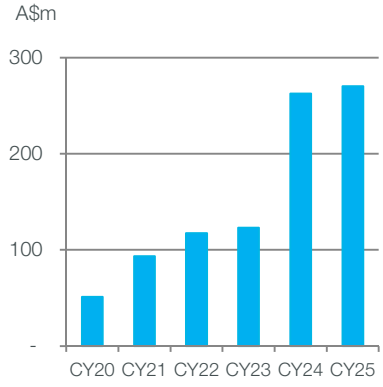
| We say | Price | Target | Strategic Target |
|---|---|---|---|
| **BUY** | **0.44** | **1.40** | **2.00** |

We believe Sheffield has all the right ingredients to be one of the best performing mining stocks over the next 6-12 months. Over the past year, mineral sands prices have staged a major recovery and the macro outlook appears compelling. In parallel, Sheffield has a host of de-risking milestone due near-term (see p20) which we believe could see the world class Thunderbird mineral sands project funded and in construction within months. We initiate coverage with a high conviction Buy.

### SHARE PRICE CHART




### FORECAST OPERATING CASHFLOW




### COMPANY DATA & RATIOS

| | |
|---|---|
| Enterprise value | $78m |
| Diluted market cap* | $86m |
| Diluted shares* | 196m |
| Free float | 100% |
| 12 month price range | $0.41-0.69 |
| GICS sector | Materials |

Board & Management hold ~15% (FD)
*Diluted for 14.6m options

### IMPLIED RETURN

| | |
|---|---|
| Implied all-in return | 218% |

## A COMPELLING MACRO OUTLOOK

Over the last 12 months mineral sands prices have staged a major recovery with ilmenite prices more than doubling to US$180-200/t and premium zircon prices rallying over 20% to ~US$1,100/t with more price rises expected shortly. The outlook for zircon is particularly compelling with mine closures pointing to a supply deficit from 2019. Zircon and ilmenite represent 62% & 29% of Sheffield's revenue respectively.

## THUNDERBIRD: A BEST-IN-CLASS PROJECT

In our view Thunderbird has the best combination of world-class scale (3.2bn tonnes), very high grades (0.9% zircon, 3.1% ilmenite) and low strip (0.78:1) that make it arguably one of the most compelling mineral sands projects in the world. When you add the projects proximity to port (140km) and low-risk jurisdiction, we believe it is probably best-in-class.

## IMPLIED RETURN OF OVER 200%

We adopt the company's BFS price assumptions (a discount to TZMI) and get an post-tax NPV of A$619m for Thunderbird. Our $1.40 price target is based on a heavy 50% discount to NPV to accommodate development risks and potential dilution. We believe SFX may sell a stake in the project to reduce the funding need, which could potentially lift our valuation to our Strategic Target of $2.00 (discussed on p23).

# CONTENTS

# INVESTMENT SNAPSHOT

## MACRO: WHY MINERAL SANDS?

After several years of subdued prices, over the last 12 months mineral sands prices have staged a material recovery (see price charts on p8). In addition, the outlook for both zircon and ilmenite is looking increasingly promising with a number of mines set to close over the next few years. Mineral sands industry expert TZMI expects zircon markets to be in a supply deficit from 2019 (see chart on p6).

The timing of this material improvement in mineral sands pricing is extremely fortuitous for Sheffield which expects Thunderbird to generate 62% of revenue from zircon and 29% from ilmenite (based on BFS price assumptions, see p7).

In addition to this strong macro outlook for both zircon and ilmenite products, we see potential for supply shocks from mines in Africa.

South Africa (the second biggest supplier of zircon) recently flagged an increase in the minimum black ownership requirement of local mines from 26% to 30% as well as a new 1% revenue royalty, which would have consumed 95% of total industry dividends in 2016 according to the South African Chamber of mines. For the existing mines in South Africa, we believe it is getting increasingly difficult to justify investing further capital, based on minimum return on capital hurdles.

While higher prices may delay mine closures, any unanticipated closures have the potential to exacerbate the forecast supply deficits and could lead to materially higher prices.

## STOCK SPECIFIC: WHY SHEFFIELD RESOURCES?

We believe Sheffield has all the right ingredients to be one of the best performing mining stocks on the ASX over the next 6-12 months:

- **World class scale**: Thunderbird is one of the largest and highest grade mineral sands deposits globally, including those currently in production. The Thunderbird resource is 3.2 billion tonnes @ 6.9% Heavy Minerals containing a high-grade zone of 1.05bt @ 12.2% HM.
- **Very high grade**: Thunderbird has very high reserve grades of 0.9% zircon and 3.63% titanium minerals – 3.1% ilmenite and 0.53% leucoxene. The chart on p5 highlights Thunderbird as one of the highest grade mineral sands deposits in the world.
- **Very low strip**: Thunderbird has a strip ratio of just 0.78:1 over its projected 42 year life and just 0.52:1 over the first 4 years.
- **Well positioned on the cost curve**: Thunderbird is well-positioned on the global revenue/cost curve sitting at around the 30$^{th}$ percentile (see the chart on p5)
- **Close proximity to ports, existing infrastructure in place**: Thunderbird is very fortunate to be located only ~140km from two underutilised ports, ~110km of which is a sealed road. Sheffield also stands to benefit from the unused shiploader and conveyor at the Derby port.
- **Safe jurisdiction**: Western Australia is widely regarded as one of the best jurisdictions in the world to develop mining projects. Many of Sheffield's producing peers are in much higher risk jurisdictions like South Africa (Rio Tinto), Mozambique (Kenmare) and Kenya (Base Resources).
- **Excellent management team with the right set of skills**: In our view, Sheffield is run by a very experienced team of mining executives and the Thunderbird project has been designed and reviewed by some of the worlds most experienced expert consultants (Hatch, SRK, etc).

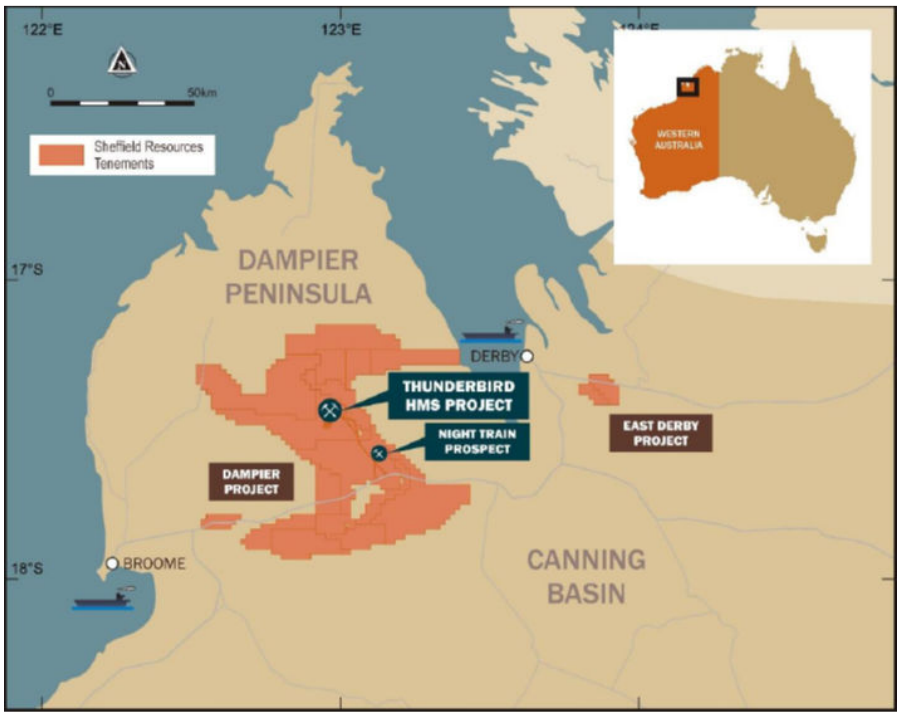
# COMPANY OVERVIEW

Sheffield Resources Limited is an ~A$85m market cap mineral sands developer through its 100%-owned Thunderbird project in Western Australia. We believe Thunderbird is probably the best undeveloped mineral sands project globally based on its combination of world-class scale, above-average grades and safe jurisdiction.

A Bankable Feasibility Study (BFS) for Thunderbird was completed in March 2017 and the company is rapidly moving towards a development decision.

Unlike many ASX companies, Sheffield has provided much greater transparency on its project assumptions by making its full ~650 page BFS available on its website[1].

Sheffield's tenement holdings in northern WA




Source: Company

Sheffield was listed on the ASX in December 2010 with plans to develop several early-stage mining projects in Western Australia, including projects in mineral sands, iron ore, talc and tungsten.

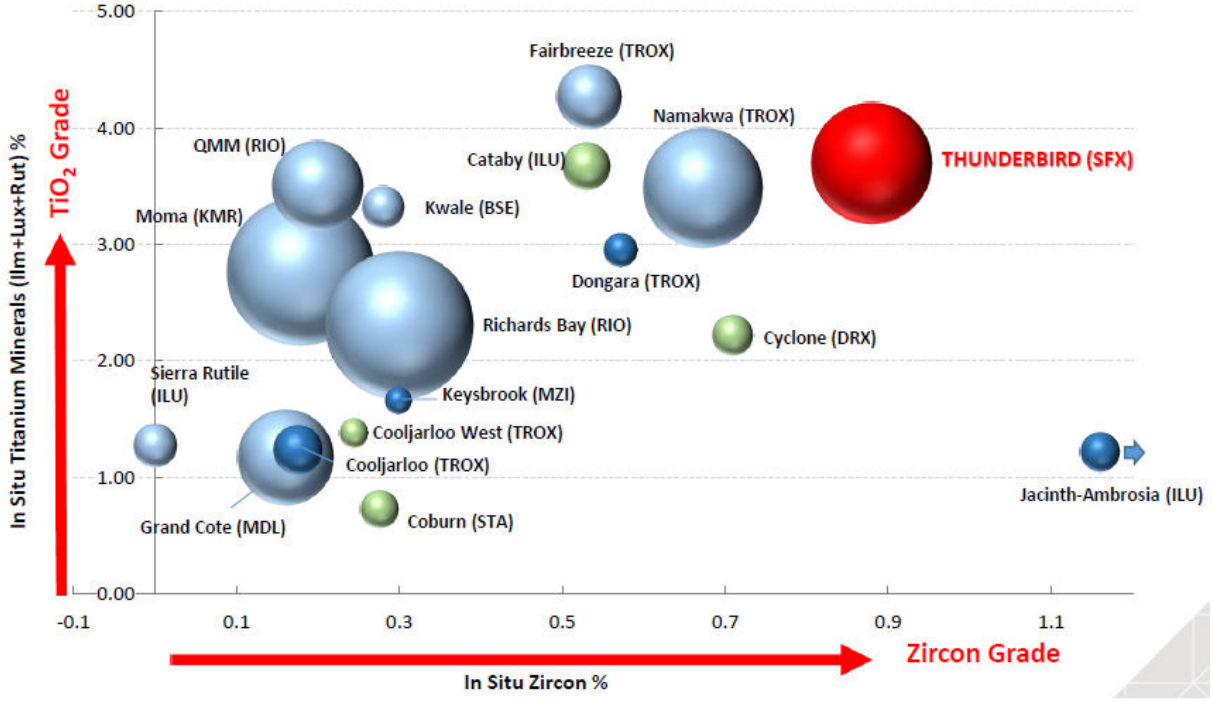
After the company's 2012 exploration program revealed the scale and quality of its Thunderbird minerals sands project, the company sold its iron-ore, talc and tungsten assets. The company also plans to spin out several early stage gold and base metals assets via an in-specie distribution in a wholly-owned subsidiary called Carawine Resources.

Sheffield's primary focus is mineral sands and bringing Thunderbird into production. At the end of June 2017, SFX had ~A$8m in cash.

[1] http://www.sheffieldresources.com.au/irm/content/bankable-feasibility-study1.aspx?RID=464

In our view, the two charts below highlight the key attributes of Sheffield's 100%-owned Thunderbird mineral sands project in WA:

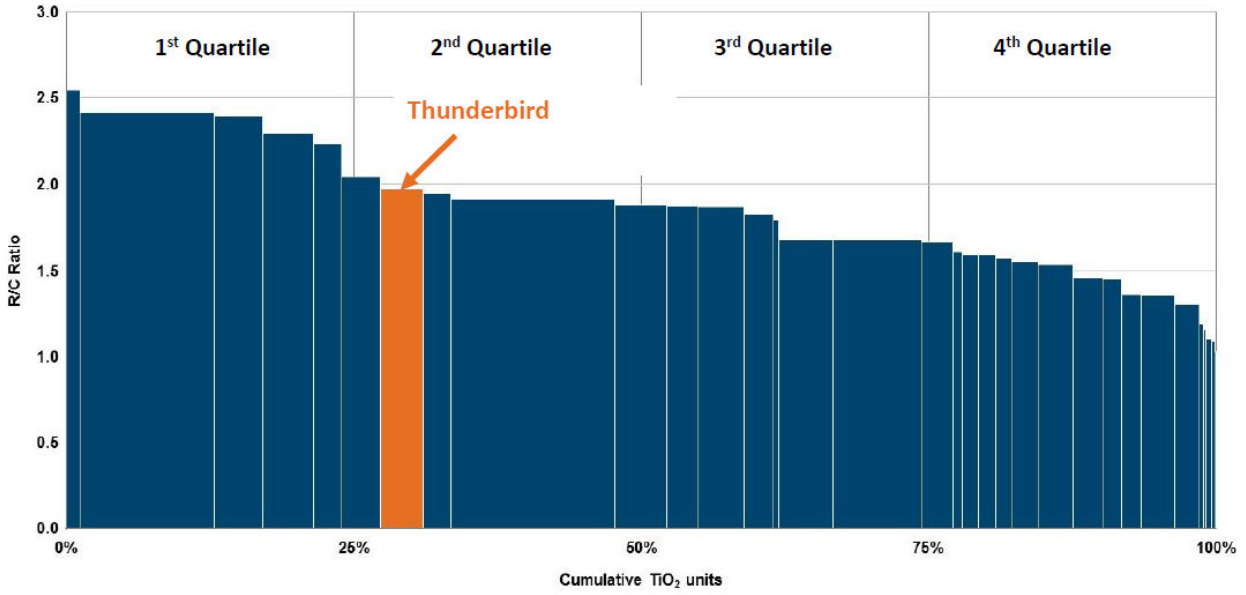
Best-in-class combination of high-grades, scale and safe jurisdiction




Note: Blue bubbles are operating mines, green bubbles are reported reserves but project is not operating
Light blue bubbles represent operating African mines' reserves
Bubble size proportional to tonnes of contained VHM. Only reserves > 1.2Mt contained VHM shown

Source: Company

Competitive Revenue To Cost Ratio (Margin Curve)




Source: Company, TZMI 2020 Cost Curve. Based on 4 years of production post ramp-up (years 3-7)

It's important to note that a number of the first quartile producers are vertically integrated… so of the world's stand-alone mineral sands mines, Thunderbird stands out as one of the highest margin globally.

# MINERAL SANDS – A STRONG OUTLOOK

The two key markets for Thunderbirds product are zircon (62% of revenue) and titanium feedstocks (35% of revenue). Underlying prices in both of these markets have improved materially over the last 12-months and the outlook appears increasingly promising as a result of mine closures, declining grades in existing mines and lack of new projects.

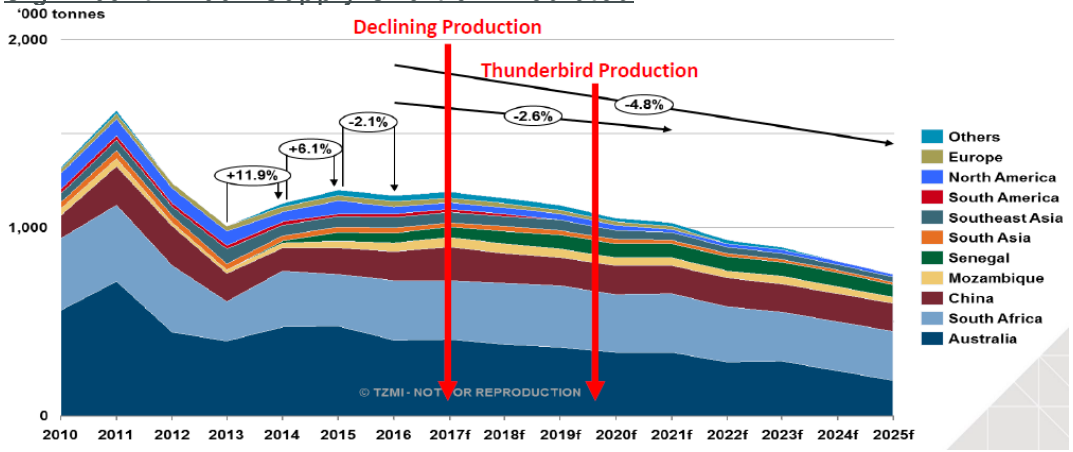
## ZIRCON MARKETS – A BRIEF SNAPSHOT

Over 50% of zircon is used as an opacifier in the ceramics industry with other end uses being foundry applications and specialty markets. Over the past few years (2014-2016) global zircon demand was relatively steady at 1.1mtpa, however demand is expected to grow over the next 5 years in line with global GDP at ~3% per annum.

Zircon demand is dominated by China (45%) and Europe (20%) with other key markets being India, South-east Asia and the Middle East.

Zircon supply is predominately provided by Australia (50%) and southern Africa. The three key zircon producers are Iluka (30%), Rio Tinto (18%) and Tronox (15%). Given its market share, Iluka tends to set zircon pricing. Global supply is expected to decline from 2018 due to a number of planned mine closures. Mineral sands industry experts TZMI expect a supply deficit from 2019.

Significant Zircon Supply Shortfall Predicted




Source: Company, TZMI

Without new projects, global zircon supply is expected to decline significantly over the coming years, 2017-2025, driven by:

- **Mine closures**: North Stradbroke, Mataraca, Murray Basin, Eneabba, Capel, Old Hickory
- **Declining grades**: Namakwa, ZultiNorth, Jacinth, Cooljarloo, Kwale
- **Supply levels expected to drop to 0.75mtpa by 2025** (from the current ~1.1mtpa)

One of the other key challenges for new projects is the declining investment appeal in some African jurisdictions. South Africa (the second biggest supplier of zircon) recently flagged an increase in the minimum black ownership requirement of local mines from 26% to 30% as well as a new 1% revenue royalty, which would have consumed 95% of total industry dividends in 2016 according to the South African Chamber of mines.

We believe it is likely getting harder and harder for mines in South Africa (light blue in the chart above) to justify further investment based on minimum return on capital hurdles.

## TITANIUM MARKETS – A BRIEF SNAPSHOT

Around 90% of titanium feedstocks are used to manufacture pigment to impart whiteness, brightness and opacity to paint, paper, plastics, sunscreen, etc. The key titanium feedstocks are ilmenite (52-58% $TiO_2$), rutile (95-97% $TiO_2$) and slag (85-95% $TiO_2$).

There are two main types of ilmenite feedstocks, sulphate and chloride, and each has specific processing feed requirements (Thunderbird will produce a high quality sulphate ilmenite).

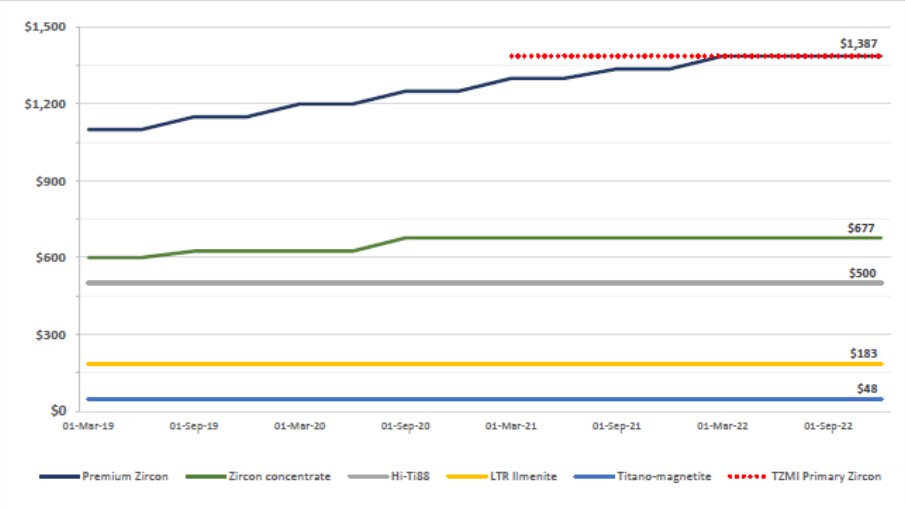
The global titanium feedstock market is 6.5-7mtpa ($TiO_2$ units) and demand is expected to grow in line with global GDP at ~3% per annum.

During 2016, much stronger than expect demand from China emerged for sulphate ilmenite and TZMI predicts the sulphate ilmenite market is in a strong deficit, which is what has driven the strong recovery in prices over the last ~12-months by over 100% to ~US$180-200/t.

## PRODUCT PRICING ASSUMPTIONS

In its BFS, Sheffield used mineral sands prices based on forecasts provided by industry expert TZMI. Sheffield discounted the TZMI price from 2019 to 2020, instead adopting a steady increase from spot prices to TZMI's long term forecasts, as set out in the picture below.

Thunderbird BFS price assumptions




Source: Company

**Thunderbird revenue split**
43% Premium zircon
19% Zircon concentrate
29% Sulphate ilmenite
4% Hi-Ti Leucoxene
5% Titano magnetite

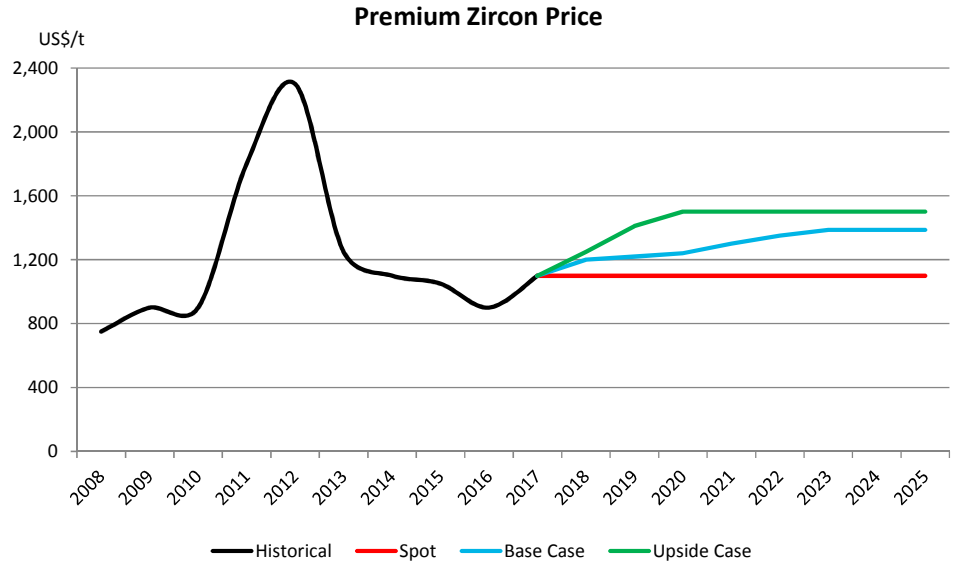
Zircon Prices (~62% of revenue on BFS prices)

It is worth highlighting that zircon prices have already improved faster than the above forecasts – Iluka recently announced a lift in its premium zircon reference price by US$130/t to US$1,100/t from Q3 CY17. Iluka speaks for ~30% of global zircon production and generally sets product pricing. We believe it is likely premium zircon prices will increase by at least ~US$100/t every year of the next 2-3 years, and we see potential for faster price increases.

TZMI expects a supply deficit by 2019 and expects premium zircon prices to improve to ~US$1,387/t over the next few years.

One major swiss-based investment bank is forecasting a much more bullish improvement in premium zircon prices to over US$1,500/t by 2020.

The chart below provides a summary of historical premium zircon prices, spot prices and our Base Case and Upside Case forecasts:




The premium zircon price has recovered materially from its lows and TZMI and most market participants expect higher prices over the next few years.

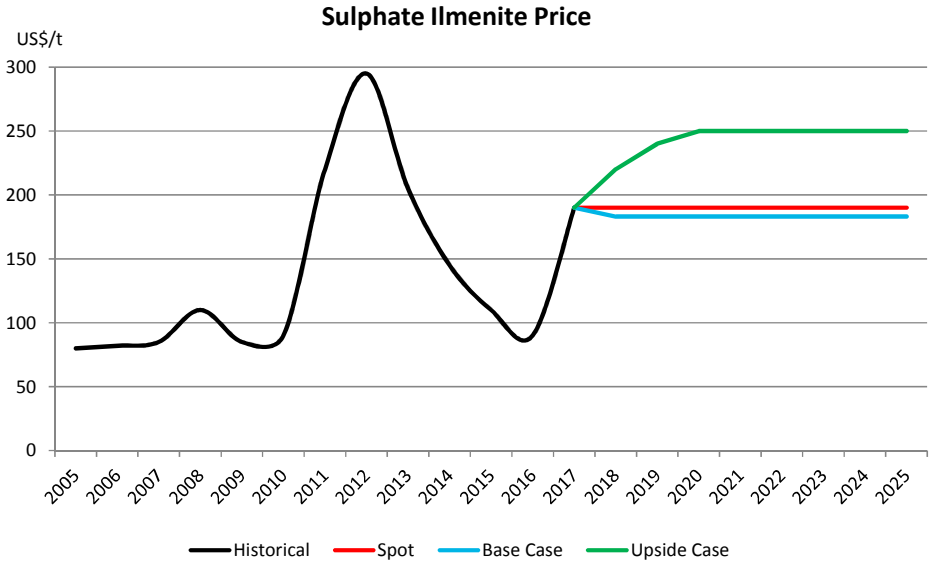
Current prices are ~US$1,100/t and could potentially move towards ~US$1,200/t from Q4 CY17.

Source: Company reports, Bloomberg, TZMI, Blue Ocean estimates

Sulphate Ilmenite Prices (29% of revenue on BFS prices)

Sulphate ilmenite prices have also improved by over 100% over the last 12 months to ~US$180-200/t. Given the high quality of SFX's ilmenite, we believe it's likely to sell towards the top end of this range (in time).

The chart below provides a summary of historical sulphate ilmenite prices, spot prices and our Base Case and Upside Case forecasts:




The recent major recovery in sulphate ilmenite prices has been driven by stronger than expect demand from China.

Current prices are ~US$180-200/t and are expected to remain at these levels for the foreseeable future.

Source: Company reports, Bloomberg, TZMI, Blue Ocean estimates

# THE THUNDERBIRD MINERAL SANDS PROJECT, WA

## BANKABLE FEASIBILITY STUDY

A Bankable Feasibility Study (BFS) for the world-class Thunderbird project was released in March 2017 and was managed by Hatch with a team of well-regarded industry experts. The full ~650 page BFS is also available on Sheffield's website[2].

The key outcomes of the Thunderbird BFS are outlined below:

| Thunderbird BFS | Stage 1 | Stage 2 |
|---|---|---|
| Period | years 1-4 | years 5-42 |
| **Capex** | **A$348m** | **A$195m** |
| Mining rate | 8.5mtpa | 17mtpa |
| Strip ratio | 0.52 | 0.78 life of mine |
| Wet Concentrate Plant rate | 788tph | 788tph x 2 |
| | | |
| Revenue ($/t ore)[1] | A$27.23/t | A$20.62/t |
| Opex incl royalties ($/t ore)[1] | A$15.62/t | A$12.25/t |
| **Operating cash margin**[1] | **43%** | **41%** |
| **Avg operating cash margin**[1] | **A$95m p.a.** | **A$142m p.a.** |

Source: Company, [1]Blue Ocean estimates on BFS price assumptions

The table below summarises the robust financial outcomes from BFS as well as our estimates at current prices and an upside price scenario.

| Financial Outcomes | | Current Prices | BFS | Upside Case |
|---|---|---|---|---|
| Premium Zircon Price* | US$/t | 1,100 | 1,282-1,387 | 1,500 |
| Ilmenite Price | US$/t | 190 | 183 | 250 |
| | | | | |
| Average cash margin (years 5-7) | A$m | 206 | 253 | 330 |
| Post-tax $NPV_{10\ nominal}$ | A$m | 380 | 620 | 1,026 |
| Post-tax IRR | % | 18% | 21% | 28% |

Source: Company, Blue Ocean. *We assume zircon concentrate prices are ~50% of premium zircon prices

The table below provides a summary of target product volumes at Thunderbird:

Thunderbird Target Production Volumes

| Product | Years 1 – 4 (Average tpa) | Years 5 – 10 (Average tpa) | Years 11 – 42 (Average tpa) | Life of Mine (Average tpa) |
|---|---|---|---|---|
| LTR Ilmenite | 264,500 | 515,800 | 371,800 | 387,800 |
| Hi-Ti88 | 12,800 | 23,000 | 20,300 | 20,300 |
| Premium Zircon | 51,500 | 95,000 | 75,100 | 76,100 |
| Zircon Concentrate | 49,100 | 86,200 | 67,200 | 68,500 |
| Titano-magnetite | 156,600 | 305,400 | 220,400 | 229,800 |
| Total Products | 534,500 | 1,025,400 | 754,800 | 782,500 |

Source: Company

At full production Thunderbird is expected to represent:

- **6-7% of global zircon market**
- **3% of global ilmenite market**

On BFS prices zircon products represent 62% of revenue and ilmenite represents 29% of revenue.

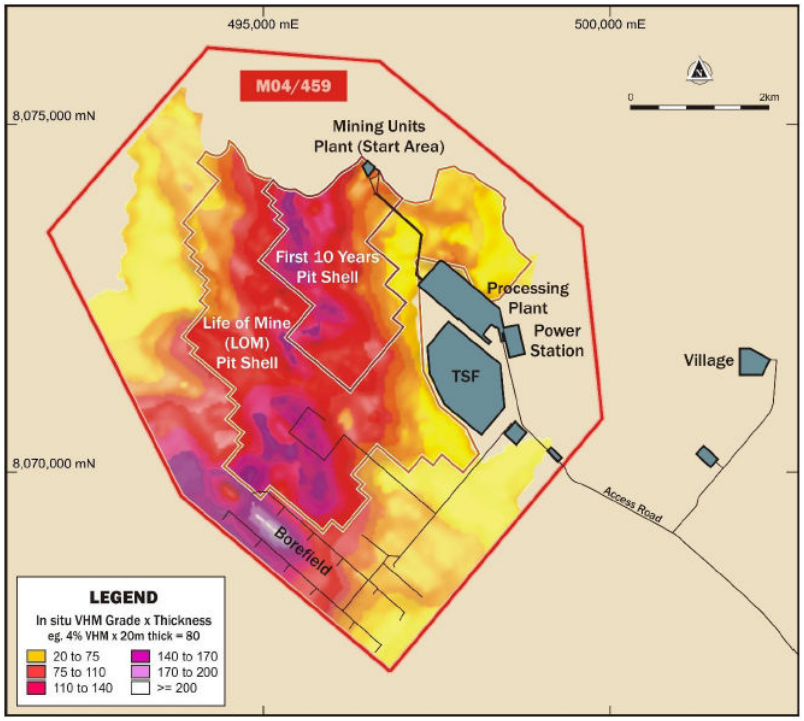
[2] http://www.sheffieldresources.com.au/irm/content/bankable-feasibility-study1.aspx?RID=464

## MINERALISATION

Thunderbird is one of the largest and highest grade mineral sands deposits globally, including those currently in production.

The Thunderbird deposit formed during an Early Cretaceous marine regression and is hosted by highly weathered Broome Sandstone.

The mineralisation at Thunderbird occurs in a ~45m thick, flat lying layer, at an average depth of 24m below surface. The ore body dips ~4% to the south. Known mineralisation covers a large area of at least 11km by 7km and remains open in several directions.




Source: Company

## RESOURCE

At a 3% HM cut-off the Thunderbird resource is a very substantial 3,230Mt @ 6.9% heavy mineral which is 8km long and 3-6.5km wide and is open in most directions. The mineral resource is based on 670 holes drilled for a total of 37,076m.

Using a higher cut-off 7.5% HM there is a coherent high-grade zone comprising 1,050Mt @ 12.2% heavy mineral.

Thunderbird Resource June 2016

| Resource Category | Cut-off HM (%) | Qty (Mt) | Bulk Density | HM (%) | Slimes (%) | Oversize (%) | Valuable HM Grade (In-Situ %) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Zircon | Hi-Ti88 Leucoxene | Leucoxene | Ilmenite | Total VHM |
| Measured | 3.0 | 510 | 2.1 | 8.9 | 18 | 12 | 0.71 | 0.20 | 0.19 | 2.4 | 3.5 |
| Indicated | 3.0 | 2,120 | 2.0 | 6.6 | 16 | 9 | 0.55 | 0.18 | 0.20 | 1.8 | 2.8 |
| Inferred | 3.0 | 600 | 2.0 | 6.3 | 15 | 8 | 0.53 | 0.17 | 0.20 | 1.7 | 2.6 |
| Total | 3.0 | 3,230 | 2.0 | 6.9 | 16 | 9 | 0.57 | 0.18 | 0.20 | 1.9 | 2.9 |
| Measured | 7.5 | 220 | 2.1 | 14.5 | 16 | 15 | 1.07 | 0.31 | 0.27 | 3.9 | 5.5 |
| Indicated | 7.5 | 640 | 2.1 | 11.8 | 14 | 11 | 0.90 | 0.28 | 0.25 | 3.3 | 4.7 |
| Inferred | 7.5 | 180 | 2.0 | 10.8 | 13 | 9 | 0.87 | 0.27 | 0.26 | 3.0 | 4.4 |
| Total | 7.5 | 1,050 | 2.1 | 12.2 | 15 | 11 | 0.93 | 0.28 | 0.26 | 3.3 | 4.8 |

Source: Company

## RESERVES

Sheffield released its updated reserve for Thunderbird with the BFS in March 2017.

The life of mine strip ratio at Thunderbird is estimated at a very low 0.78:1 and only 0.52:1 during the first 4 years of operation.

For the first 10 years of mining, a very impressive 97% of reserves sit in the proved category – the highest confidence category under the JORC code.

Thunderbird Reserve (March 2017)

| Ore Reserve | | | Valuable HM Grade (In-Situ) | | | | Other | |
|---|---|---|---|---|---|---|---|---|
| Reserve Category | Material (Mt) | HM (%) | Zircon (%) | Hi-Ti Leucoxene (%) | Leucoxene (%) | Ilmenite (%) | Oversize (%) | Slimes (%) |
| Proved | 235.8 | 13.3 | 1.00 | 0.29 | 0.26 | 3.55 | 13.7 | 16.5 |
| Probable | 444.8 | 10.2 | 0.80 | 0.26 | 0.26 | 2.85 | 11.0 | 15.2 |
| **Total** | **680.5** | **11.3** | **0.87** | **0.27** | **0.26** | **3.10** | **12.0** | **15.7** |

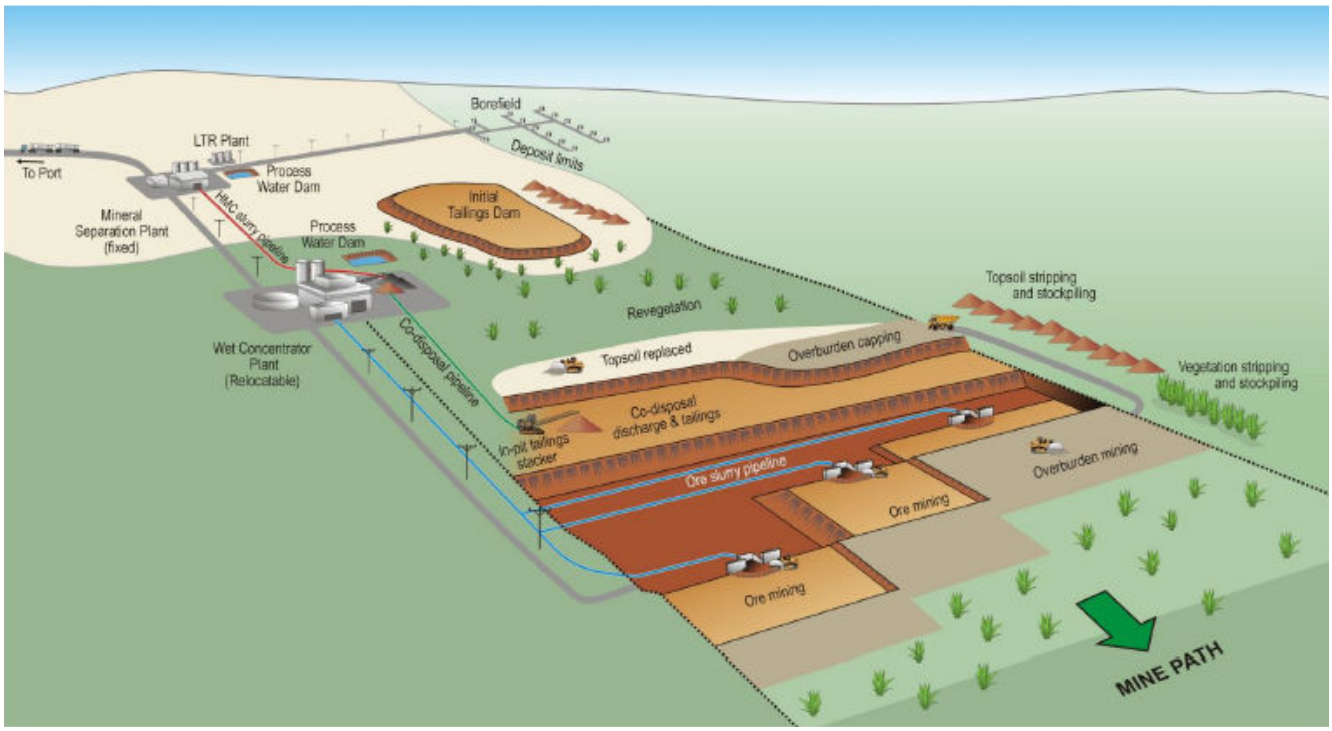
Source: Company

## MINING

The picture below provides an overview of the planned mining method at Thunderbird which comprises a few simple steps:

- Overburden removal – very modest in early years, average depth life of mine is only ~24m
- Ore mining via a simple dozer push operation into a mining unit plant (MUP)
- The MUP rejects any oversize material >2mm via a series of vibrating screens
- <2mm ore is then pumped via slurry pipeline to the Wet Concentrator Plant (WCP)

Schematic diagram showing the Mining Method




Source: Company

Sheffield plans to use contract mining and has already selected its preferred contractor – one of the most experienced contract miners in the mineral sands space.

Example of a dozer push mining operation into a mining unit plant (MUP)

Source: Company Reports

The mining unit plant (MUP) at Thunderbird will reject oversize material (>2mm) via a series of vibrating screens, and will be capable of processing up to 1,500tph.

The <2mm ore is then pumped via slurry pipeline to the Wet Concentrator Plant (WCP) which has a capacity of 788tph.

A second MUP will be added in Stage 2 from year 5.

One of the most important areas it is essential to get right in a dry-mining mineral sands operation like Thunderbird is understanding and catering for induration – harder zones where the material has been cemented together over time.

Sheffield has done extensive geotechnical testing to understand the extent of induration comprising geotechnical logging, sonic and large diameter Bauer drilling (700mm) as well as several test pits. The test work confirmed there is some induration in the top ~6 meters where a "weakly-indurated crust" occurs. Below depths of 12 meters there is increased weathering and the ore becomes increasingly softer where it is classified as a "tightly-packed sand", with variable degrees of induration.

In defining the block model for Thunderbird, each mining block has been assessed for "excavatability" on a scale of 1-5 based on drill hole geological observations, geotechnical studies and sample assays. The results are summarised below:

| MINDEX | Excavatability | % of Pit Inventory |
|---|---|---|
| <=1 | Easy Digging | 87 |
| 2 | Hard Digging | 4 |
| 3 | Easy Ripping | 5 |
| 4 | Easy – Hard Ripping | 2 |
| 5 | Hard Ripping | 2 |

Source: Company

Only 4% of the mine plan is classified as harder than "Easy Ripping".

Within ore, this percentage falls to 2.6% and essentially none of this material occurs in the first 5 years.

Based on the material movement required to fill the MUP during Stage 1, Sheffield estimates it would only need 1.6 D11 dozers. But to ensure there is more than sufficient equipment on hand if more induration than expected is encountered, the BFS has been costed to include 3 x D11 dozers, plus another D10 dozer, plus a 40t excavator, plus a 992 loader – in short, we are comfortable that Sheffield has allowed for significant additional equipment to mitigate risks in this area.

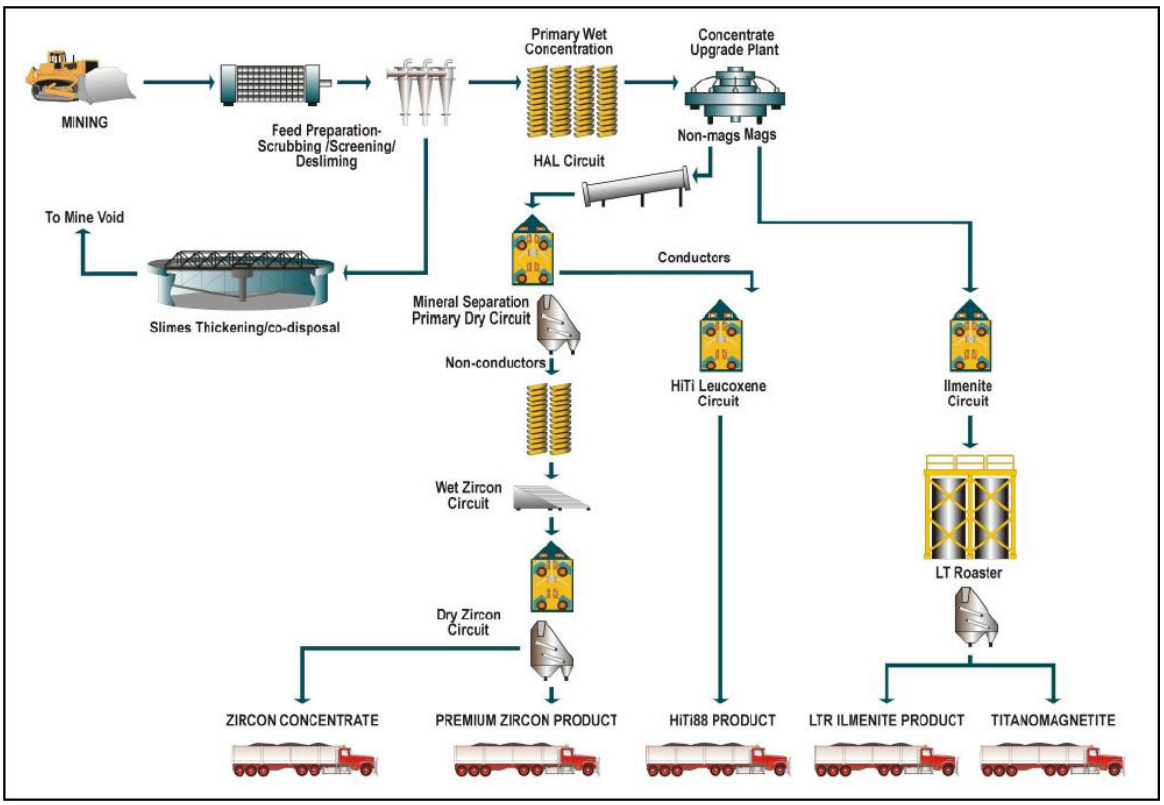
In actual fact, statistically the valuable heavy minerals tend not be associated with the indurated material. Given most indurated material will be rejected as oversize (>2mm), there is good chance of better head grades in the early years... however this upside potential is ignored in the BFS.

## PROCESSING

The proposed process flow sheet at Thunderbird employs conventional mineral sands processing technology almost across the board with the main exception being the low-temp roast circuit, which we discuss in detail below.

It is important to note that the flowsheet for Thunderbird has remained essentially unchanged since the PFS, during which 12.5t of material was tested. As a part of the BFS, Sheffield tested an additional 40t of material using full scale and scalable equipment (i.e. a full scale MG12 spirals).

Simplified Process Flow Sheet




Source: Company

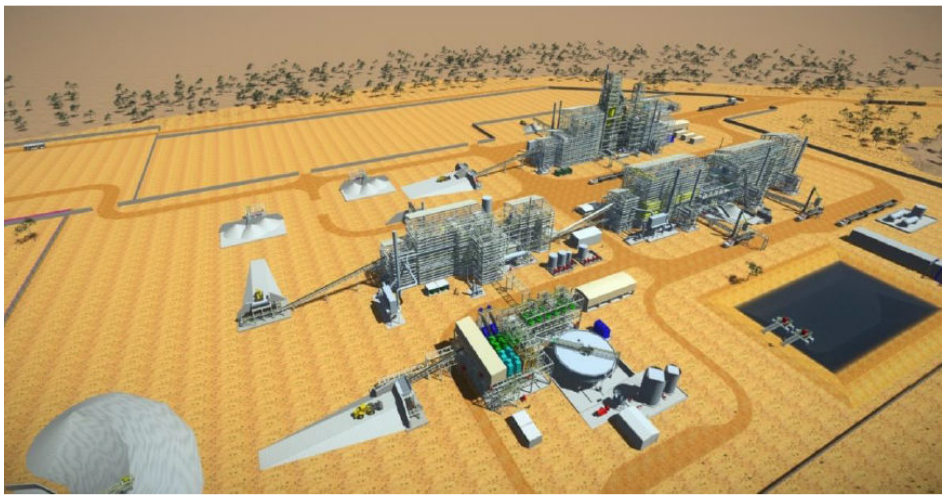
In the section below we discuss the key areas of Thunderbird's flowsheet:

**Desliming**: This step simply removes material finer than 38μm via standard cyclones. These slimes (<38μm) are then thickened for tailings disposal. Around 15% of the resource is classified as slimes, which is pretty typical for a deposit like this and much lower than some other mineral sands operations. We believe slimes are unlikely to be an issue at Thunderbird.

**Wet Concentrator Plant (WCP)**: The primary aim of this circuit is to produce a high grade heavy mineral concentrate (HMC) using spiral gravity concentrators. Thunderbird is more fine-grained than many other projects and has taller spirals (MG12s) and more banks of spirals (7 banks). While this approach improves recoveries, overall the recoveries at Thunderbird are probably still lower than a comparable coarse-grained project, however this is baked into the recoveries assumed in BFS. Again, the recoveries projected in the BFS are based on 40t of testwork using full scale equipment, so we have a high degree of confidence on this aspect of the flowsheet.

**Concentrate Upgrade Plant (CUP)**: This section of the plant separates the magnetic minerals (predominately ilmenite) from the non-magnetic minerals (predominately zircon) using high intensity magnetic separators and then a further upgrade of the non-magnetic fraction in spiral separators.

Schematic of the Thunderbird Process Plant Layout



Source: Company

**Hot Acid Leach (HAL)**: This circuit is designed to remove iron oxide coatings from the non-magnetics (predominately zircon) using dilute sulphuric acid which also breaks down mineral agglomerations.

**Primary Dry Circuit**: The main objective of the Primary Dry Circuit uses high-tension roll separators to separate conductive minerals (like Hi-Ti88 Leucoxene) from non-conductive minerals (like zircon).

**Wet Zircon Circuit**: This step removes significant impurities (like $Fe_2O_3$ and $SiO_2$) from the zircon concentrate using gravity concentrators comprising spirals and shaking tables.

**Dry Zircon Circuit**: The dry zircon circuit involves the final zircon refining where remaining impurities such as rutile and leucoxene are separated using high tension roll separators.

**Dry Ilmenite Circuit**: This is an electrostatic circuit where conductive material (ilmenite) and non-conductive materials (impurities) are separated via high tension roll separators.

**Low Temp Roast (LTR)**: The LTR is essentially the only processing step in the flowsheet which is unique to Thunderbird. The objective of the LTR is to roast the ilmenite under a reducing atmosphere, which converts the haematite gangue minerals to magnetite, which can then be removed via magnetic separation.

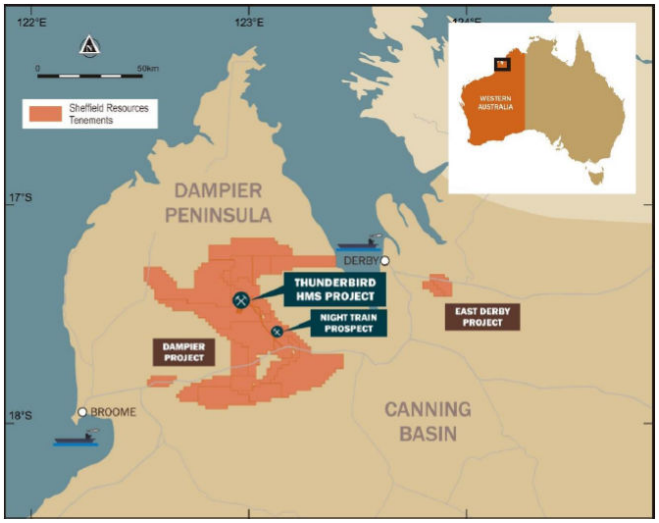
We spent considerable time researching and understanding this process and had a call with the company's external expert roasting consultant, Mr John Winter. Mr Winter is a very well regarded expert in his field and has spent ~20 years specialising in roasting applications, and has developed over 70 roasting circuits – around half of which for mineral sands applications.

On our call, Mr Winter made a number of observations which gave us considerable confidence that the LTR is a well-tested, well-understood and relatively low-risk element in the flow sheet. According to Mr Winter, the LTR at Thunderbird is:

- "exceptionally simple" and only requires a single stage roast at up to 550°C. By comparison, Richard's Bay, which has been operating since the late 60s, includes a much more complex dual stage roast at much higher temperatures of ~850-900°C.
- "actually very similar to a fluid bed dryer". There are hundreds of examples of fluid bed dryers in operating mines
- "much lower risk than many roasting circuits in other operations"

## INFRASTRUCTURE

Thunderbird is located in the Dampier Peninsula, less than 150km from two ports in Broome and Derby and is very fortunate to have good access to substantial existing infrastructure.




Source: Company

Thunderbird is located in a safe jurisdiction, close the coast, where much of the required infrastructure is already in place – sealed roads for most of the route to port, underutilised ports, an unused shiploader and conveyor at Derby, etc.

Thunderbird also has strong support from the local region and state of WA. The project has been awarded "Lead Agency Status" in recognition of its importance to WA.

**Access**: The Thunderbird site is readily accessible via a 30km unsealed road which meets the great northern highway. The road is sealed for the remaining ~110km to each of the two ports.

**Water**: Water access is good via borefield located just south of the proposed plant site. The initial borefield will comprise 17 boreholes. A potable water treatment plant will be located on site.

**Power**: Power will be provided via on-site liquefied natural gas fuelled Build-Own-Operate (BOO) power station, plus a backup diesel generator. Installed power will be 16MW for Stage 1 and 32MW for Stage 2. Power costs are expected to be ~A19c/kWh. There is also potential to lower power costs to ~A15-16c/kwh via a planned gas pipeline from Valhalla to Derby (ignored in BFS).

**Labour**: Thunderbird is located ~140km from the nearest town capable of supporting the required workforce. The company has estimated Thunderbird will provide ~300 jobs during construction, then up to 200 direct full time local jobs during its operation.

**Accommodation**: A dedicated accommodation village will be constructed ~8km from the plant site and will be able to accommodate 300 personnel during construction and ~200 once in operation.

**Ports**: Sheffield has assumed all shipments will be purchased on an FOB basis, so once the product is loaded onto a ship at the port, the customer will be responsible for shipping to its required destination. Sheffield plans to make use of both ports (which are currently underutilised) based on two shipment types:

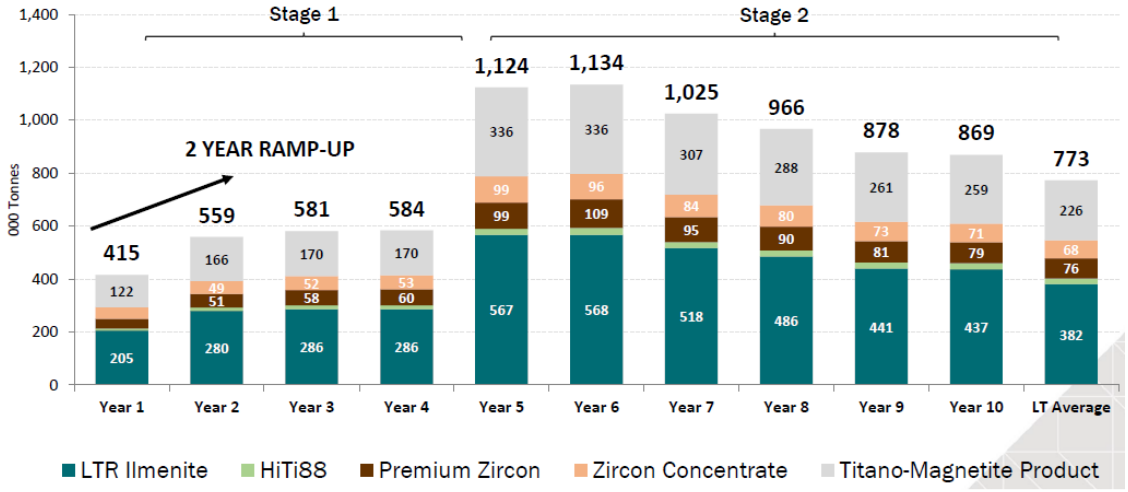
- **Bulk shipping**: Zircon concentrate, Ilmenite and Titano-magnetite product streams will be trucked to the port of Derby where there is an unused shiploader & conveyor (see p19). Products will be loaded via barge and transhipping (done successfully for 5-7 years).
- **Packaged shipping**: Premium zircon and Hi-Ti88 Leucoxene will be bagged on site into 2t flexible intermediate bulk container (FIBC) bags. Products will be trucked to Broome in flat bed trucks where they will be loaded directly to ships using existing infrastructure.

**Tailings**: There will be an initial Tailings Storage Facility (TSF) for the first 2.5-3 years tailings will be deposited in-pit to filling the mining void. Two tailings streams will be produced – a courser sandy fraction and a finer fraction referred to as 'slimes'.

## PRODUCTION VOLUMES & MARGINS

The picture below provides detailed summary of Thunderbird's forecast production volumes by product in the BFS. Over the first four years of the operation the mining rate is 8.5mtpa (Stage 1) which increases to 17mtpa in year 5 (Stage 2). The company plans to fund the A$195m in Stage 2 capex from cash flow and debt.

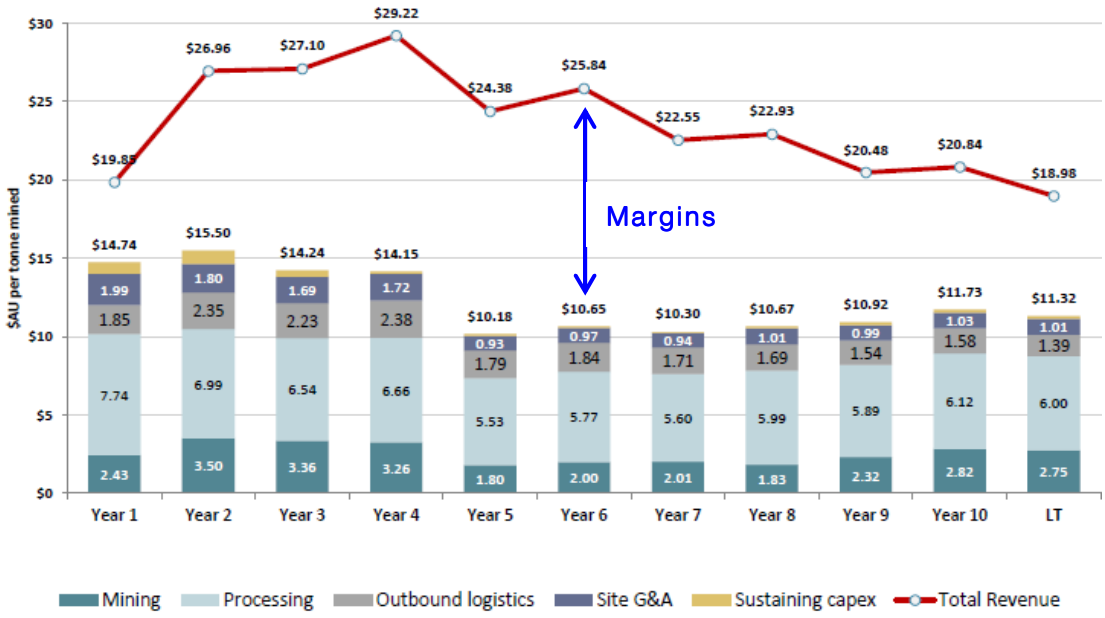
Production Volumes




Source: Company

The chart below provides a useful summary of the BFS projections of revenue and site operating costs per tonne of ore mined for the first 10 years of the mine life… with the difference between the two representing the company's healthy operating cash margins.

Revenue & Site Cash Costs per tonne of ore mined




Source: Company

This chart also highlights that the lion's share of the costs at Thunderbird are in Processing (53%), followed by Mining (23%) and Outbound logistics (13%). i.e. Any modest changes in the mining costs are unlikely to have a material impact on Thunderbird's overall cost structure.

## PRODUCT QUALITY

As part of the BFS, Sheffield has produced significant volumes of its high quality products for testing with potential customers and overall the feedback has been extremely positive.

As a result, a number of these potential customers have already expressed interest in buying products by signing non-binding Memorandums of Understandings (MOUs) to take certain volumes of product for Stage 1. These MOUs are summarised in detail in the next section.

Bottom line, Thunderbird's products meet the required product specifications and are low on deleterious elements. The company's ilmenite product is particularly high quality and may in time begin to attract a premium due to its low chome, and alkalis and market leading solubility (however the BFS assumes standard pricing).

Sheffield has included a product spec sheet for each of its 5 product on its website, available here: http://www.sheffieldresources.com.au/irm/content/our-products.aspx?RID=466

## OFFTAKE

Offtake discussions are well advanced with key groups in Europe, China and India and **Sheffield already has non-binding MOUs in place for offtake for over 50% of project revenue for Stage 1 of the project.**

The company has received indicative interest for considerably more and these discussions will be progressed into binding offtake agreements in parallel with debt finance.

| Offtake | % of revenue | MOUs | MOUs as % Rev | SFX target pre build |
|---|---|---|---|---|
| Premium Zircon | 43% | 70% | 30% | 100% |
| Zircon Concentrate | 19% | 47% | 9% | 100% |
| Ilmenite | 29% | 45% | 13% | 100% |
| Other products | 9% | - | - | - |
| **Total** | **100%** | | **52%** | **i.e. >90% of revenue** |

Source: Company

**Summary potential customers with MOUs in place**

Sheffield has non-binding MOUs in place for:

- 70% of Premium Zircon production for Stage 1, comprising:
  - 30% to Nanjing Rzisources International Trading Co (**China**) and Minchem HMP (**UK**)
  - 20% to Sukaso Ceracolours Pvt Ltd (**India**)
  - 20% to Ruby Ceramics Pvt Ltd (**India**) and to CFM Minerales SA (**Spain**)
- 47% or Zircon Concentrate production for Stage 1
  - 47% to Nanjing Rzisources International Trading Co (**China**) and Minchem HMP (**UK**)
- 45% of Ilmenite production for Stage 1
  - CNNC Huayuan Titanium Dioxide Co. Ltd (**China**)

## BREAKDOWN OF CAPEX & OPEX

The table below provide a breakdown of the capex for Thunderbird. The initial capex estimate of A$348m includes A$24m for contingency or 7.5%. Capital costs have been converted at an A$/US$ of 0.75.

Thunderbird Initial Capex

| Description | US$M | A$M |
|---|---|---|
| Processing – Stage 1 | | |
| Plant Area Civils & Process Water Systems | 19.0 | 25.3 |
| Wet Concentrator Plant | 43.5 | 58.0 |
| Concentrate Upgrade Plant | 25.7 | 34.3 |
| Zircon Processing Plant | 59.2 | 78.9 |
| Ilmenite Processing Plant | 22.7 | 30.2 |
| Low Temperature Roast | 32.6 | 43.4 |
| **Sub-Total** | **202.6** | **270.1** |
| Infrastructure / Owners – Stage 1 | | |
| Site Preparation, Roads & Access | 5.0 | 6.7 |
| Dams, Bore field & HV Infrastructure | 12.0 | 16.0 |
| Derby Port | 5.0 | 6.6 |
| Labour & Operational Readiness | 6.7 | 8.9 |
| Mining Services & Infrastructure | 4.6 | 6.1 |
| Accommodation Village | 3.9 | 5.2 |
| Administration & Services | 3.2 | 4.2 |
| **Sub-Total** | **40.3** | **53.7** |
| **Contingency** | **18.0** | **24.2** |
| Total Stage 1 Capital Cost | 260.9 | 347.9 |

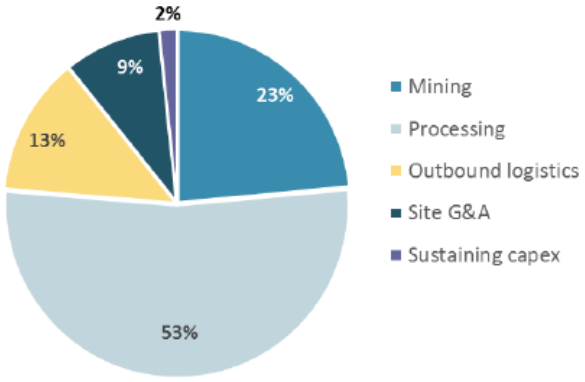
Source: Company

The two pie charts below show a breakdown of costs by major area (LHS) and a more detailed breakdown including power, labour etc (RHS). It is worth noting that power costs represent a material 34% of projected costs: 17% for electricity plus 17% for natural gas.

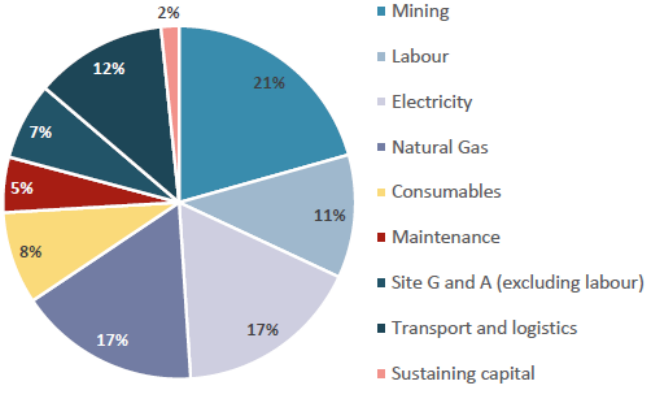
The BFS assumes power will be provided via on-site liquefied natural gas fuelled Build-Own-Operate (BOO) power station, plus a backup diesel generator. Installed power will be 16MW for Stage 1 and 32MW for Stage 2. Power costs under the BFS are projected to be ~A19c/kWh.

However, the company is also exploring the potential to lower power costs to ~A15-16c/kwh via a planned 450km gas pipeline from Valhalla to Derby. Given power represents ~34% of costs in the BFS, this option represents potential for a material cost saving for Sheffield.

Life of Mine Costs by Major Area




Detailed Life of Mine Costs




Source: Company

## SITE VISIT HIGHLIGHTS

The pictures below were taken during our site visit to Thunderbird and subsequent trip the port of Derby in late August 2017.

Above: Around 110km of the road to port is sealed and most of it looks like this.

Above: The ~30km unsealed Thunderbird access road is pretty well established. The first 19km will be used and a new ~11km dual lane unsealed road will be constructed, suitable for quad trailer road trains up to 53.5m long.

Above: Standing in one of the three test pits. This pit was excavated with a D10 dozer.

Above: An opportunity to stand in the Thunderbird orebody. It's unusual (but valuable) to be able to see and touch an orebody like this before the start of mining. The ore was surprising soft and easy to break with a hand pick.

Above: Demonstrating how easy it is to separate the heavy minerals with simple panning.

Above: The unused shiploader, warehouse and conveyor at the port of Derby. Sheffield has an access agreement in place for port storage and bulk handling.

## NEAR-TERM CATALYSTS

In our view the key near term de-risking milestones for Sheffield are:

- **Native Title Agreement**: We expect agreement on native title by end October 2017
- **Environmental Approval**: We expect this to be forthcoming by end November 2017
- **Credit-approved project debt**: Sheffield aims to have debt in place by end October 2017. This is an important de-risking milestone, because it means the project has been reviewed by an independent expert (SRK) on behalf of the bank lenders and the banks have confirmed they are comfortable lending to the project (subject to normal conditions precedent, like sufficient binding offtake agreements in place, permits in place, raising sufficient equity, etc).
- **Potential sale of stake in project to Partner (if required)**: We expect any deal with a potential partner to be finalised by end CY17 / early CY18. We include more detail and analysis on this option on p23.

## DEVELOPMENT TIMETABLE

In addition the milestones outlined above, our forecasts assume the following development timetable for Thunderbird:

- Finance in place by end CY17 / early CY18
- Construction begins early CY18 (24 month construction period)
- First production early CY20

## PERMITTING

Thunderbird has been awarded Lead Agency status by the West Australian government, recognising the importance of the project to the state and local regional.

The company expects its Minor and Preliminary Works (MPW) approval within the next week or so, which allows the company to begin construction of roads, camp, infrastructure, etc. The company also regards this approval as a strong indication other approvals will be forthcoming.

The West Australian Environmental Protection Authority's (EPA) Public Environmental Review (PER) process continues with the release of the EPA report and recommendations to the Minister for Environment anticipated in the near term. We expect Sheffield to receive the key Environmental and Social approvals by end November 2017.

## NATIVE TITLE

The Federal Court heard an appeal on 28 August 2017 in relation to decision made in favour of Sheffield by the National Native Title Tribunal on 22 May 2017. The Court is expected to hand down its decision within a few weeks. Sheffield remains confident of a positive outcome.

In the event a positive outcome is handed down, it is possible the matter could be appealed again in a higher court, however Sheffield believes this is unlikely.

In the event the Court hands down a positive determination and it is not appealed, Sheffield should be awarded its Mining Licence by the end of October 2017.

# INVESTMENT PROPOSITION

This section provides an in-depth look at our valuation assumptions for Sheffield Resources.

## VALUATION ASSUMPTIONS

The table below summarises our key valuation assumptions based on the Bankable Feasibility Study released for Thunderbird in March 2017. Bottom line, we endorse and adopt essentially all of the company's BFS assumptions.

| Project Metric | Stage 1 | Stage 2 | Commentary |
|---|---|---|---|
| Mine life | years 1-4 | years 5-42 | 42 year mine life as per BFS |
| Initial Capex | A$348m | A$195m | In line with the BFS |
| Strip ratio | 0.52:1 | 0.79:1 | 0.78:1 life of mine as per BFS |
| Mining rate | 8.5mtpa | 17mtpa | In line with the BFS |
| Production volumes | As per BFS | As per BFS | see p15 |
| Prices | As per BFS | As per BFS | see p7 |
| Revenue ($/t ore) | A$27.23/t | A$20.62/t | |
| Costs + royalties + sustaining | A$15.62/t | A$12.25/t | In line with the BFS |
| **Operating Cash Margin** | **43%** | **41%** | |
| Ave Operating Cash Margin | A$95m p.a. | A$142m p.a. | |
| Royalties | 5%+0.5% | 5%+0.75% | 5% WA state + native title |
| **Financial Metric** | **Blue Ocean estimates** | | **Commentary** |
| IRR Post Tax | 21% | | In line with the BFS |
| Discount Rate | 10% | | 10% nominal, 8% real |
| NPV Post Tax | A$619m | | BFS A$620m |

Source: Company data, Blue Ocean Equities.

Given the significant initial project capex of A$348m relative to the company's ~A$85m market cap, we have applied a heavy 50% discount to our DCF valuation to accommodate development risks and potential dilution. Despite this heavy discount, the implied return to our A$1.40 price target is still over 200%. We assign notional A$30m valuation for exploration and Sheffield's other early stage projects.

Near-term, we see potential for the company to sell a stake in the project as a process is underway to explore that option. We have analysed the valuation impact on a number of scenarios on the following page.

But bottom line, it's important to flag that we intend to reduce our discount to NPV to 20-30% if/when the company has a clearer path to funding – via the sale of a stake in the project, or if the share price rallies to materially higher levels.

## VALUATION SENSITIVITY

Based on the valuation assumptions outlined on the previous page, our NPV post-tax for Thunderbird is A$619m on essentially the same product pricing assumptions at the BFS (outlined on p7).

The sensitivity table below provides our estimate of NPV for Thunderbird on a range of premium zircon prices and discount rates. This analysis assumes zircon concentrate prices at a 50% discount to premium zircon. On BFS prices, zircon products represent ~62% of revenue.

| Post-Tax NPV (A$m) | | Premium Zircon Price (US$/t) | | | | |
|---|---|---|---|---|---|---|
| | | 1,100 | 1,200 | 1,300 | 1,400 | 1,500 |
| Discount | 6% | 889 | 1,074 | 1,259 | 1,443 | 1,628 |
| Rate | 8% | 561 | 694 | 827 | 960 | 1,093 |
| (nominal) | 10% | 352 | 452 | 552 | 653 | 753 |
| | 12% | 213 | 291 | 369 | 448 | 526 |

Source: Blue Ocean estimates

The sensitivity table below provides our estimate of IRR post-tax for Thunderbird at a range of premium zircon prices. Again, this analysis assumes zircon concentre prices at a 50% discount to premium zircon.

| Post-Tax IRR | Premium Zircon Price (US$/t) | | | | |
|---|---|---|---|---|---|
| | 1,100 | 1,200 | 1,300 | 1,400 | 1,500 |
| | 16% | 18% | 20% | 22% | 23% |

Source: Blue Ocean estimates

## FUNDING ASSUMPTIONS

We assume Sheffield develops Thunderbird via traditional project finance with 50/50 debt/equity:

| Funding Uses | A$m |
|---|---|
| Initial capex | 348 |
| Working capital + other costs | 52 |
| **Total** | **400** |

| Funding Sources | | A$m |
|---|---|---|
| Debt | 50% | 200 |
| Equity | 50% | 200 |
| **Total** | | **400** |

Source: Company, Blue Ocean estimates

Given Sheffield's market cap is currently ~A$85m, the potential ~A$200m equity need appears somewhat prohibitive at present, without material dilution for existing shareholders.

The Sheffield board and management team is acutely aware of this dynamic and has commissioned a process to potentially sell a stake in the project to a partner... we explore the potential valuation impact on the following page.

## POTENTIAL SALE OF PROJECT STAKE TO A PARTNER

In the table below, we outline three potential scenarios: A "Go-it-Alone" scenario where Sheffield does *not* sell a stake in the project, an extreme case where SFX sells 50% of the project at a huge (bordering on ridiculous) discount, and a scenario somewhere in between, where SFX sells a 25% stake in the project for a more modest discount (the most likely scenario in our view).

| Funding Scenarios | | Go-it-Alone | Sale of 25% | Sale of 50% |
|---|---|---|---|---|
| **Sale of Stake in Project** | | | | |
| Discount to NPV | % | - | 35% | 68% |
| Proceeds from sale of stake | A$m | - | 100 | 100 |
| | | | | |
| Partner Equity | A$m | - | 50 | 100 |
| SFX Equity* | A$m | 200 | 50 | - |
| Project Debt | A$m | 200 | 200 | 200 |
| **Total** | **A$m** | **400** | **400** | **400** |

| SFX share of value | | Go-it-Alone | Sale of 25% | Sale of 50% |
|---|---|---|---|---|
| Project post-tax $NPV_{10}$ (BFS) | A$m | 620 | 620 | 620 |
| SFX share of Thunderbird | % | 100% | 75% | 50% |
| SFX share of NPV + sale proceeds | A$m | 620 | 565 | 410 |

| SFX value per share | | Go-it-Alone | Sale of 25% | Sale of 50% |
|---|---|---|---|---|
| Current fully diluted SFX shares | m | 196 | 196 | 196 |
| | | | | |
| New SFX shares @ 40c | m | 500 | 125 | - |
| Fully diluted shares post funding | m | 696 | 321 | 196 |
| SFX share of NPV + sale proceeds | A$/sh | **0.89** | **1.76** | **2.09** |
| | | | | |
| New SFX shares @ 70c | m | 286 | 71 | - |
| Fully diluted shares post funding | m | 482 | 267 | 196 |
| SFX share of NPV + sale proceeds | A$/sh | **1.29** | **2.11** | **2.09** |
| | | | | |
| New SFX shares @ $1.00 | m | 200 | 50 | - |
| Fully diluted shares post funding | m | 396 | 246 | 196 |
| SFX share of NPV + sale proceeds | A$/sh | **1.57** | **2.30** | **2.09** |

Source: Company, Blue Ocean estimates. *SFX cash A$8.3m at end June, but we assume zero for this analysis

This analysis strongly supports Sheffield's strategy of selling a stake in the project – in our view it is very unlikely Sheffield will "Go-it-Alone" unless the share price is *much* higher.

In the extreme case, where SFX sells a 50% stake in Thunderbird for a 68% discount to NPV of A$100m... a scenario which would be accretive to the tune of ~A$210m for the incoming partner! Under this scenario, the purchase price would fully fund SFX's equity need and SFX's fully-funded share of NPV grows to $2.09 per share... more than 4x the share price of ~A44c!

In our view the red circled scenario is the most likely: i.e. SFX sells a modest stake, the stock rallies and SFX does a much more modest ~A$50m raising at materially higher levels.

## PRICE TARGET & RATING

Our $1.40 Price Target is for Sheffield Resources is based on:

- An NPV for Thunderbird using BFS mineral sands prices (as outlined on p7 of this report) and a 10% nominal discount rate
- A heavy 50% discount to NPV to accommodate development risks and potential dilution

It is important to flag that we intend to reduce our discount to NPV to 20-30% if/when the company has a clearer path to funding – via the sale of a stake in the project, or if the share price rallies to materially higher levels (resulting in a less dilutive major raising).

We rate Sheffield Resources a high conviction Buy and our $1.40 Price Target represents an implied return of over 200%.

We also believe that Sheffield is probably a takeover target given its relatively modest ~A$85m market cap, relative to the A$620m NPV for Thunderbird, as well as the project's combination of world-class scale, very high grades and safe jurisdiction.

## STRATEGIC TARGET

We derive our $2.00 Strategic Target for Sheffield Resources based on the potential partner funding scenarios outlined on the previous page. In more than half of these scenarios (5 out of 9) our valuation for SFX's share of Thunderbird is north of $2.00 per share.

Our $2.00 Strategic Target represents an implied return of ~350%. It is important to note that our Strategic Target does *not* account for upside mineral sands pricing scenarios *or* for further exploration success at the company's other mineral sands projects.

## KEY RISKS

Sheffield Resources is exposed to all the normal risks associated with developing and operating mining projects, including funding and construction risk.

Assuming Sheffield makes the transition into production, its revenues will be derived from the sale of premium zircon (43% of revenue on BFS assumptions), zircon concentrate (19% of revenue), sulphate ilmenite (29% of revenue), Hi-Ti88 leucoxene (4% of revenue) and titano-magnetite (5% of revenue). Fluctuations in the prices of these products as well as the Australian dollar could impact the company's reported cash flow (in A$), profitability and share price.

As Sheffield's Thunderbird project is based in Western Australia, an investment in Sheffield also carries Australian sovereign risk. However, it is worth noting that Australia is considered materially lower sovereign risk than many of the other jurisdictions which host mineral sands mines like South Africa (Rio Tinto), Mozambique (Kenmare) and Kenya (Base Resources).

# MODEL SUMMARY: FINANCIALS & VALUATION

| Stock Details | | | | | |
|---|---|---|---|---|---|
| Recommendation: | BUY | | | Enterprise Value | $78m |
| Target | $1.40 | Share Price | $0.44 | Diluted MCap | $86m |
| NAV | $1.40 | 52 Week High | $0.69 | Diluted Shares | 196m |
| Implied Return | 218% | 52 Week Low | $0.41 | Free Float | 100% |
| | | | | Avg Daily Value | $0.1m |

| Macro Assumptions | % of Rev | FY17E | FY18E | FY19E | FY20E | FY21E |
|---|---|---|---|---|---|---|
| Exchange Rate (A$/US$) | | 0.75 | 0.76 | 0.75 | 0.74 | 0.73 |
| Premium Zircon | 43% | 1,025 | 1,150 | 1,241 | 1,250 | 1,279 |
| Zircon Concentrate | 19% | 513 | 575 | 621 | 625 | 638 |
| Ilmenite | 29% | 135 | 180 | 180 | 183 | 183 |
| | **91%** | | | | | |
| **Profit & Loss (A$m)** | | **FY17E** | **FY18E** | **FY19E** | **FY20E** | **FY21E** |
| Revenue | | - | - | - | 82 | 195 |
| Operating Costs | | - | - | - | (56) | (123) |
| **Operating Profit** | | **-** | **-** | **-** | **26** | **72** |
| Corporate & Other | | (7) | (6) | (6) | (6) | (6) |
| Exploration Expense | | (1) | - | - | (0) | (1) |
| **EBITDA** | | **(8)** | **(6)** | **(6)** | **19** | **66** |
| D&A | | (0) | (0) | (0) | (4) | (8) |
| **EBIT** | | **(8)** | **(6)** | **(6)** | **15** | **57** |
| Net Interest Expense | | 0 | 2 | 2 | (9) | (19) |
| **Pre-Tax Profit** | | **(8)** | **(4)** | **(4)** | **6** | **39** |
| Tax Expense | | 1 | - | - | (3) | (12) |
| **Underlying Profit** | | **(6)** | **(4)** | **(4)** | **4** | **27** |
| Signficant Items (post tax) | | (2) | - | - | - | - |
| **Reported Profit** | | **(8)** | **(4)** | **(4)** | **4** | **27** |

| Cash Flow (A$m) | FY17E | FY18E | FY19E | FY20E | FY21E |
|---|---|---|---|---|---|
| Operating Cashflow | (5) | (6) | (6) | 20 | 66 |
| Tax | - | - | - | - | (5) |
| Net Interest | 0 | 2 | 2 | (9) | (19) |
| **Net Operating Cash Flow** | **(5)** | **(4)** | **(4)** | **11** | **42** |
| Exploration | (9) | - | - | (2) | (4) |
| Capex | (0) | (76) | (169) | (101) | (14) |
| Acquisitions / Disposals | 1 | - | - | - | - |
| Other | 0 | - | - | - | - |
| **Net Investing Cash Flow** | **(8)** | **(76)** | **(169)** | **(103)** | **(18)** |
| Equity Issue | 16 | 200 | 2 | 3 | 2 |
| Borrowing / Repayments | - | - | 100 | 100 | - |
| Dividends | - | - | - | - | - |
| Other | - | - | - | - | - |
| **Net Financing Cash Flow** | **16** | **200** | **102** | **103** | **2** |
| Change in Cash Position | 3 | 120 | (72) | 11 | 26 |
| FX Adjustments | - | - | - | - | - |
| **Cash Balance** | **8** | **129** | **57** | **68** | **94** |

| Balance Sheet (A$m) | FY17E | FY18E | FY19E | FY20E | FY21E |
|---|---|---|---|---|---|
| Cash | 8 | 129 | 57 | 68 | 94 |
| Other Current Assets | 5 | 5 | 5 | 5 | 5 |
| PP&E | 0 | 76 | 245 | 341 | 347 |
| Exploration & Development | 39 | 39 | 39 | 41 | 44 |
| Other Non Current Assets | (5) | (5) | (5) | (5) | (5) |
| **Total Assets** | **48** | **244** | **341** | **450** | **485** |
| Debt | - | - | 100 | 200 | 200 |
| Other Liabilities | 2 | 2 | 2 | 5 | 11 |
| **Net Assets** | **46** | **242** | **239** | **245** | **275** |

| Ratio Analysis | | FY17E | FY18E | FY19E | FY20E | FY21E |
|---|---|---|---|---|---|---|
| Diluted Shares | m | 188 | 521 | 523 | 531 | 536 |
| EPS - Diluted | Ac | (3.5) | (1.1) | (0.8) | 0.7 | 5.1 |
| **P/E** | x | **n.m.** | **n.m.** | **n.m.** | **64.8x** | **8.7x** |
| CFPS - Diluted | Ac | (2.4) | (1.0) | (0.8) | 2.0 | 7.9 |
| **P/CF** | x | **n.m.** | **n.m.** | **n.m.** | **21.6x** | **5.5x** |
| FCF - Diluted | Ac | (2.5) | (15.7) | (33.4) | (15.3) | 8.8 |
| **P/FCF** | x | **n.m.** | **n.m.** | **n.m.** | **n.m.** | **5.0x** |
| | | | | | | |
| Dividends | Ac | - | - | - | - | - |
| Dividend yield | % | - | - | - | - | - |
| Payout Ratio | % | - | - | - | - | - |
| Franking | % | - | - | - | - | - |
| | | | | | | |
| Enterprise Value | A$m | 78 | (42) | 129 | 218 | 192 |
| **EV/EBITDA** | x | **(10.1x)** | **7.0x** | **(21.6x)** | **11.3x** | **2.9x** |
| ROE | % | (14%) | (2%) | (2%) | 1% | 10% |
| ROA | % | (13%) | (2%) | (1%) | 1% | 6% |
| | | | | | | |
| Net Debt / (Cash) | | (8) | (129) | 43 | 132 | 106 |
| Gearing (ND/(ND+E)) | % | n.m. | (113%) | 15% | 35% | 28% |
| Gearing (ND/E) | % | n.m. | (53%) | 18% | 54% | 39% |

| Reserves & Resources | | | Valuable HM Grade | | | |
|---|---|---|---|---|---|---|
| | | **HM** | **Zircon** | **Ilmenite** | **Hi-Ti Lcx** | **Leucox** |
| | mt | % | % | % | % | % |
| Proved | 236 | 13.3 | 1.00 | 3.55 | 0.29 | 0.26 |
| Probable | 445 | 10.2 | 0.80 | 2.85 | 0.26 | 0.26 |
| **Reserve** | **681** | **11.3** | **0.87** | **3.10** | **0.27** | **0.26** |
| | | | | | | |
| Measured | 220 | 14.5 | 1.07 | 3.90 | 0.31 | 0.27 |
| Indicated | 640 | 11.8 | 0.90 | 3.30 | 0.28 | 0.25 |
| Inferred | 180 | 10.8 | 0.87 | 3.00 | 0.27 | 0.26 |
| **Resource** | **1,050** | **12.2** | **0.93** | **3.30** | **0.28** | **0.26** |

| Earnings Sensitivity | | | FY20E | FY21E | FY20E | FY21E |
|---|---|---|---|---|---|---|
| | | | A$m | A$m | % | % |
| Premium Zircon Price | US$/t | +10% | 3 | 8 | n.m. | 29% |
| Ilmenite Price | US$/t | +10% | 2 | 4 | n.m. | 15% |
| Exchange Rate | A$/US$ | -10% | 6 | 15 | n.m. | 57% |

| Valuation | Discount | Stake | A$m | A$/sh | |
|---|---|---|---|---|---|
| Thunderbird (unrisked) | | 100% | 619 | 3.16 | |
| | | | | | |
| Thunderbird (risk-adjusted) | 50% | 100% | 309 | 1.58 | |
| Exploration & Other Projects | | | 30 | 0.15 | |
| Corporate & Other | | | (74) | (0.38) | |
| Debt | | | - | - | |
| Cash | | | 8 | 0.04 | |
| Option Strikes | | | 0 | 0.00 | P/NAV |
| **Risk adjusted NAV** | | | **274** | **1.40** | 0.31 |

Source: Company data, Blue Ocean Equities

# MODEL SUMMARY: OPERATIONAL INPUTS & FREE CASH FLOW

| Macro Assumptions | | | FY18E | FY19E | FY20E | FY21E | FY22E |
|---|---|---|---|---|---|---|---|
| A$/US$ FX | | x | 0.76 | 0.75 | 0.74 | 0.73 | 0.73 |
| | % of revenue | | | | | | |
| Premium Zircon | 43% | US$/t | 1,150 | 1,241 | 1,250 | 1,279 | 1,327 |
| Zircon Concentrate | 19% | US$/t | 575 | 621 | 625 | 638 | 663 |
| LTR Ilmenite | 29% | US$/t | 180 | 180 | 183 | 183 | 183 |
| Hi-Ti88 | 4% | US$/t | 500 | 500 | 500 | 500 | 500 |
| Titano-Magnetite | 5% | US$/t | 58 | 58 | 48 | 48 | 48 |

| Operational Summary | | FY18E | FY19E | FY20E | FY21E | FY22E |
|---|---|---|---|---|---|---|
| **Thunderbird** | | | | | | |
| **Mining** | | | | | | |
| Ore Mined | mt | - | - | 3.7 | 7.8 | 8.4 |
| Strip Ratio | x | - | - | 0.52 | 0.52 | 0.52 |
| **Production** | | | | | | |
| Premium Zircon | kt | - | - | 18 | 44 | 54 |
| Zircon Concentrate | kt | - | - | 21 | 46 | 50 |
| LTR Ilmenite | kt | - | - | 102 | 242 | 283 |
| Hi-Ti88 Leucoxene | kt | - | - | 4 | 11 | 14 |
| Titano-Magnetite | kt | - | - | 61 | 144 | 168 |
| **Total Production Volume** | **kt** | **-** | **-** | **207** | **487** | **570** |
| **Costs** | | | | | | |
| Opex incl royalties | A$/t ore | - | - | 15.23 | 15.72 | 15.79 |
| Sustaining capex | A$/t ore | - | - | 0.73 | 0.80 | 0.64 |
| **Opex+Royalties+Sustaining** | **A$/t ore** | **-** | **-** | **15.96** | **16.51** | **16.42** |
| Operating Cash Margins | A$/t ore | - | - | 6.18 | 8.47 | 11.99 |
| *Operating Cash Margins* | *%* | - | - | *28%* | *34%* | *42%* |

| FCF Contribution | A$m | FY18E | FY19E | FY20E | FY21E | FY22E |
|---|---|---|---|---|---|---|
| **Revenue** | | | | | | |
| Premium Zircon | | - | - | 31 | 77 | 99 |
| Zircon Concentrate | | - | - | 18 | 40 | 46 |
| LTR Ilmenite | | - | - | 26 | 61 | 71 |
| Hi-Ti88 Leucoxene | | - | - | 3 | 7 | 10 |
| Titano-Magnetite | | - | - | 4 | 9 | 11 |
| **Total Revenue** | **A$m** | **-** | **-** | **82** | **195** | **237** |
| Revenue per tonne ore | A$/t | - | - | 22.14 | 24.99 | 28.41 |
| Opex incl royalties | | - | - | 56 | 123 | 132 |
| Sustaining Capex | | - | - | 3 | 6 | 5 |
| Opex+Royalties+Sustaining | A$m | - | - | 59 | 129 | 137 |
| **Operating Cash Margins** | **A$m** | **-** | **-** | **23** | **66** | **100** |
| *Operating Cash Margins* | | - | - | *28%* | *34%* | *42%* |
| Growth Capex | | 76 | 169 | 98 | 8 | 31 |
| Exploration | | - | - | 2 | 4 | 4 |
| Corporate Overheads | | 6 | 6 | 6 | 6 | 6 |
| **All-in Cash Margin** | **A$m** | **(82)** | **(175)** | **(83)** | **48** | **59** |
| *All-in Cash Margins* | | - | - | *n.m.* | *25%* | *25%* |

| Corporate | A$m | FY18E | FY19E | FY20E | FY21E | FY22E |
|---|---|---|---|---|---|---|
| Cash Tax | | - | - | - | 5 | 18 |
| Other Items | | - | - | - | - | - |
| **FCF pre Debt Service** | | (82) | (175) | (83) | 43 | 41 |
| Net Interest | | (2) | (2) | 9 | 19 | 17 |
| Debt Drawdown / (Repayment) | | - | 100 | 100 | - | (40) |
| **FCF post Debt Service** | | (80) | (73) | 8 | 24 | (16) |

| New Equity/Dividends | A$m | FY17E | FY18E | FY20E | FY21E | FY22E |
|---|---|---|---|---|---|---|
| Proceeds from Shares/Options | | 200 | 2 | 3 | 2 | - |
| Dividends Paid | | - | - | - | - | - |
| **Change in Cash** | | 120 | (72) | 11 | 26 | (16) |
| **Cash Balance** | | 129 | 57 | 68 | 94 | 78 |

Source: Company data, Blue Ocean Equities

# BOARD & MANAGEMENT

**Will Burbury, Non-exec Chairman**: Will Burbury practised as a corporate lawyer with a leading Australian law firm prior to entering the mining and exploration industry in 2003. During his career, he has been actively involved in the identification and financing of many Australian and African resources projects. He has held senior management positions and served on the boards of several private and publicly listed companies. Mr Burbury was previously Chairman of Warwick Resources Limited prior to its merger with Atlas Iron Limited in 2009. He was also formerly a director of Lonrho Mining Limited (ASX: LOM) and an executive of Nkwe Platinum Ltd (ASX: NKP).

**Bruce McFadzean, Managing Director**: A qualified mining engineer with more than 35 years' experience in the global resources industry, Mr McFadzean has led the financing, development and operation of several new mines around the world and his skills will drive progress of Sheffield's world-class Thunderbird minerals sands project through to production. Bruce McFadzean's professional career includes 15 years with BHP Billiton and Rio Tinto in a variety of positions and four years as Managing Director of successful Western Australia gold miner Catalpa Resources Limited (ASX:CAH). Under his management, Catalpa's market capitalisation grew from $10m to $1.2b following the Evolution merger. He has raised in excess of A$350m in debt and equity from Australian and overseas markets.

**David Archer, Technical Director**: David Archer is a geologist with 24 years experience in exploration and mining in Australia. He has held senior positions with major Australian mining companies, including Renison Goldfields Consolidated Limited, and has spent the last ten years as a director of Archer Geological Consulting specialising in project generation, geological mapping and project evaluation. Mr Archer was a consultant to Atlas Iron Limited (ASX: AGO) and Warwick Resources Limited and was responsible for significant iron ore discoveries for both companies in the Pilbara. He was also involved in the discovery of the Magellan lead mine and the Raleigh and Paradigm gold mines.

**Bruce McQuitty, Non-Exec Director**: Bruce McQuitty has 30 years experience in the mining and civil construction industries and was previously Managing Director of Warwick Resources Limited prior to its merger with Atlas Iron Limited in 2009. Prior to that he held senior positions with Consolidated Minerals Limited, Renison Goldfields Consolidated Limited and Gympie Gold Limited. Mr McQuitty has significant technical expertise in exploration, project generation, feasibility, underground mining and engineering geology and has managed exploration teams in Australia and overseas. Mr McQuitty holds a Masters of Economic Geology and a Bachelor of Science.

**Stuart Pether, Chief Operating Officer**: Mr Pether is a mining professional with over 25 years' experience in the resources industry. His experience includes project development, technical studies, mine operations and corporate management. Most recently Stuart was the CEO of Kula Gold Limited; previous to this the Vice President, Project Development for Evolution Mining and prior to that Chief Operating Officer for Catalpa Resources. Stuart holds a Bachelor of Engineering (Mining) from the Western Australian School of Mines, is a member of the Australasian Institute of Mining and Metallurgy and a committee member of WASM Alumni.

**Jim Netterfield, Project Manager**: Mr Netterfield brings more than 20 years' experience in the resources industry to the role and has a proven track record in successfully managing mineral development projects through to production. Mr Netterfield was responsible for delivering the DFS for Thunderbird. Mr Netterfield's professional career includes 11 years with BHP Billiton and Rio Tinto in a variety of senior operations roles. He recently served for four years as acting CEO and Operations Director at Oakajee Port & Rail Pty Ltd, leading the feasibility studies for Mitsubishi's $10 billion magnetite iron ore project. In addition, he has held senior operations roles with Minara Resources, Tomago Aluminium Company and Janus Consulting Australia.

**Mark Di Silvio, CFO and Company Secretary**: Mr Di Silvio is a CPA and MBA qualified finance professional with over 25 years' resources industry experience. Mr Di Silvio's professional career includes gold operations and project development experience in both Australia and overseas, senior finance roles with Woodside Petroleum Limited in Australia and Africa prior to joining Centamin Plc (TSX, LSE listed) as CFO. His most recent position was CFO for Toronto listed Mawson West Limited. Mr Di Silvio has significant experience in financial management, debt and offtake funding and product offtake agreements which is a key requirement for Sheffield as it advances the development of the world class Thunderbird mineral sands project.

**Neil Patten-Williams, Marketing Manager**: Mr Patten-Williams is a professional with over 18 years' experience in the resources industry, including five years as Sales and Marketing Manager for established mineral sands producer the Doral Group, where he was responsible for marketing, logistics and sales globally. Mr Patten-Williams has a strong background in both zircon and titanium mineral products. Prior to his appointment as Sales and Marketing Manager at Doral, he was Operations Manager of the Doral Fused Materials Plant in WA for five years responsible for all aspects of safety, operations and maintenance and also spent five years as the company's Zirconia Operations Manager. As a metallurgist with hands-on operational experience Mr Patten-Williams has a unique blend of commercial, global marketing and operational skills in the mineral sands industry.

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## DISCLAIMER



## DISCLOSURE

Blue Ocean Equities Pty Limited, its employees, consultants and its associates within the meaning of Chapter 7 of the Corporations Law may receive commissions, underwriting and management fees from transactions involving securities referred to in this document, and may from time to time hold interests in the securities referred to in this document.

Blue Ocean Equities Pty Limited and associates may hold shares in Sheffield Resources at the date of this report and this position may change at any time without notice.

Steuart McIntyre does not own shares in Sheffield Resources.