ASX AND MEDIA RELEASE
14 October 2015

PRE-FEASIBILITY STUDY UPDATE CONFIRMS THUNDERBIRD AS THE WORLD'S BEST UNDEVELOPED MINERAL SANDS PROJECT

KEY POINTS

- **Pre-feasibility Study Update confirms low risk, high margin, long life mining project**
- **Pre-production capital reduced by 26% to A$271 million[1]**
- **Capital payback period reduced to 3.4 years**
- **Mine life extended to 40 years, with considerable exploration upside**
- **Revenue A$11.8 billion over Life of Mine ("LOM")**
- **Operating cash flow A$6.0 billion (LOM), A$149 million (annual LOM average)[2]**
- **EBITDA A$5.4 billion (LOM), A$135 million (annual LOM average)**
- **Revenue to cash cost ratio 2.02:1 (LOM)**
- **100ktpa zircon, 382ktpa high grade sulphate ilmenite production (LOM average)**
- **Primary zircon is premium grade and suited to the ceramics sector**
- **Upgraded ilmenite has superior qualities which will assist in displacing others in the market**
- **Targeting commissioning in 2018, coinciding with an expected global supply gap**
- **DFS will be finalised in 2016, with a substantial field component already complete**
- **100% owned project located in one of the world's best mining jurisdictions**

Mineral sands developer Sheffield Resources Limited (ASX:SFX) ("Sheffield" or "the Company") is pleased to announce the results of the Pre-feasibility Update on its 100% owned Thunderbird mineral sands project, located near Derby in Western Australia (Figure 1).

Key outcomes of the PFS Update include a 26% reduction in pre-production capital expenditure to A$271 million[1], 13% increase in annual EBITDA to A$135 million[3], improvement of capital payback to 3.4 years and a 25% increase in mine life to 40 years.

The PFS Update is based on a conventional dozer trap mineral sand mining operation involving an initial 12Mtpa throughput, increasing to 18Mtpa in year eight, and a low risk, conventional processing flow sheet with all infrastructure located on site.

Sheffield's Managing Director Bruce McQuitty said Thunderbird now stood out as the world's best undeveloped mineral sands project.

"The PFS update has confirmed that the Thunderbird project is a strategic, high margin, zircon-rich asset located in one of the world's most stable mining jurisdictions," he said. "It is a project that requires modest capital expenditure yet generates strong EBITDA margins over a very long mine life.

"We have carefully developed the updated PFS using proven, cost-effective conventional mining and processing techniques.

"Importantly, we have shown that Thunderbird will generate a highly marketable suite of products. The primary zircon is of premium quality whilst the upgraded ilmenite demonstrates characteristics that are superior to other sulphate ilmenites in the market, meaning it should become a preferred feedstock.

"Whilst there has been strong interest in relation to Thunderbird's products, the Company has chosen not to commit to offtake agreements until after completion of the DFS.

"Thunderbird is an asset of strategic importance in the global mineral sands industry and of State significance in Western Australia."

[1]Excluding Contingency. [2]Excluding Royalties. [3]Annual LOM Average.

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PFS UPDATE HIGHLIGHTS

The Thunderbird PFS Update contains significant improvements to the previous PFS study, which have enhanced the Project's economics and technical feasibility.

PFS versus PFS Update

Pre-production capital costs have decreased by A$96.6M or 26% to A$271.3M[1]. The decrease is largely attributed to a reduction in initial mine throughput from 18Mtpa to 12Mtpa with a resultant decrease in capital expenditure associated with mining and processing.

The pre-production capital total includes A$27.7M for an ilmenite upgrade plant which will allow Sheffield to produce large quantities of consistently high quality, high grade sulphate ilmenite over the 40-year mine life.

The operation will be ramped up to a throughput of 18Mtpa in year eight, well past the initial capital payback period of 3.4 years. The ramp-up involves straightforward modular additions of plant and equipment which will be fully funded by operating cash flow. The shortened capital payback is due to lower pre-production capital and scheduling of high grade near-surface mineralisation in early production years (the initial six-year pit has an average grade of 15.7% heavy mineral).

In addition, further cost savings have been made to on-site and off-site infrastructure, including a Build Own Operate (BOO) arrangement for the accommodation camp and power station.

Figure 1: Location Plan

The mine life has increased substantially by 25% to 40 years, confirming the Project's capacity to supply globally significant quantities of high quality products to the market over a long period of time.

The processing flow sheet now includes an ilmenite upgrade step using a low temperature roast ("LTR") to upgrade the primary ilmenite by 22% to produce a high grade (56.1%) sulphate ilmenite. This will be one of the highest grade sulphate ilmenites in the global market. Smelter modelling test work also confirms the LTR ilmenite is suitable feed for producing high quality TiO_2 slag (89.8% TiO_2) and pig iron. Higher forecast pricing for the LTR ilmenite product is the principal driver of the 11% increase in unit revenue.

Table 1: Financial Highlights and Variance from PFS (All in AUD)

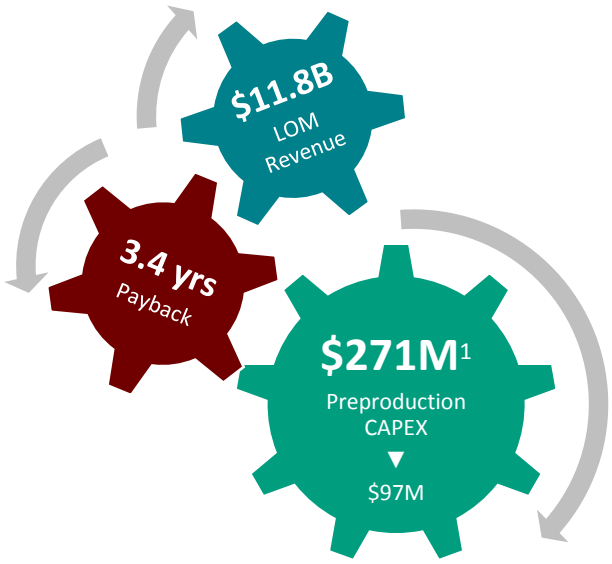
	PFS UPDATE OUTCOMES	CHANGE FROM PFS		
Pre-production Capital[1]	**$271.3M**	**$96.6M**	▼	**26%**
Mine Life	**40yrs**	**8yrs**	▲	**25%**
Revenue LOM	**$11.8B**	**$2.3B**	▲	**24%**
Annual Operating Cash Flow[2]	$149M	$15M	▲	11%
Annual EBITDA	$135M	$15M	▲	13%
Capital Payback	3.4yrs	0.2yrs	▼	6%
Unit Revenue LOM	$566	$58	▲	11%
Unit Cash Cost[2] LOM	$280	$1	▲	0.4%
Revenue to Cost[2] Ratio LOM	2.02	0.20	▲	11%

[1]Excluding Contingency. [2]Excluding Royalties.

Robust Financial Returns

Financial modelling shows that Thunderbird will deliver average annual EBITDA of A$135 million over LOM. The Project is expected to produce an annual operating cash flow of A$149 million[2]. The revenue to cost ratio has improved to 2.02:1 over the LOM. A revenue to cost ratio of 2.19:1 during the first seven years reflects high in-situ grades (>1% zircon) and a low strip ratio (0.20:1) during this period.

Operating costs have remained the same over LOM, despite a reduction in throughput and the introduction of an ilmenite upgrade step.



High Quality Products

Leading global mineral sands consulting group TZMI has confirmed that Sheffield's primary zircon and LTR ilmenite are high quality products that are likely to receive strong market support. Collectively these products represent 81% of the total projected revenue. Significant interest has been registered in these products by leading marketing specialists and industry groups.

Pathway to Production

Financial results delivered in the PFS Update confirm the technical viability and robust economics of the Thunderbird project, paving the way to Definitive Feasibility Study ("DFS") and potential development. Permitting is well advanced and a robust mine-to-market logistics chain has been demonstrated. The project is well located in a stable jurisdiction and proximal to major Asian and Middle Eastern markets.

Mine construction is scheduled to commence in 2017, followed by commissioning in 2018 and the first year of production in 2019 (see Table 2 below).

Table 2: Production Timeline

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

Next Steps

Sheffield will now commence the DFS, which will advance in parallel with the environmental approvals process and offtake negotiations during calendar 2016. During the DFS several identified opportunities to enhance the project economics will be examined, including optimising process design and tailoring product specifications to target further pricing premiums.

[1]Excluding Contingency. [2]Excluding Royalties.

THUNDERBIRD PROJECT
PRE-FEASIBILITY STUDY UPDATE

Sheffield Resources Limited **ASX : SFX**

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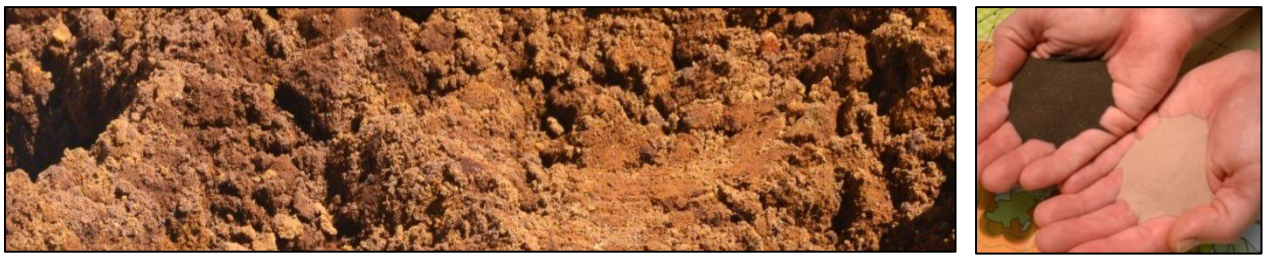

Figure 2: Thunderbird Mineralised Sand (left) and Products (right)

INTRODUCTION

The Thunderbird project is located on the Dampier Peninsula about 60km west of Derby, and 25km north of the sealed Great Northern Highway joining Derby and Broome (Figure 3). Thunderbird has the potential to become a globally significant mineral sands mining and processing operation. Zircon is the key value driver of the project making up 59% of forecast revenue, with the remainder generated from substantial amounts of high grade sulphate ilmenite and HiTi leucoxene.

Sheffield has completed a PFS Update for the Thunderbird project which follows the PFS previously announced to the ASX on 14 May 2015. The PFS Update includes a number of key developments and initiatives:

- 12Mtpa initial throughput ramping to 18Mtpa designed to significantly lower pre-production CAPEX;
- An updated Mineral Resource, including a large increase in the Measured Resource component;
- Detailed mine scheduling in early production years to incorporate high grade, shallow mineralisation;
- An upgraded LTR ilmenite product; and
- Review of CAPEX and operating costs.

Thunderbird is one of the largest mineral sands deposits to be discovered in the last 30 years. It has a total Mineral Resource of 3.2Bt @ 6.9% HM (Measured, Indicated and Inferred) (at 3% HM cut-off), containing 18.5Mt of zircon, 61.8Mt of ilmenite, 6.9Mt of leucoxene and 5.9Mt of HiTi leucoxene (Appendix 1). The Project's current Mineral Resource supports an initial 40 year mine life with significant scope to increase this in the future. After ramp-up to an 18Mtpa throughput, Thunderbird will be one of the world's largest dry mining mineral sands operations.

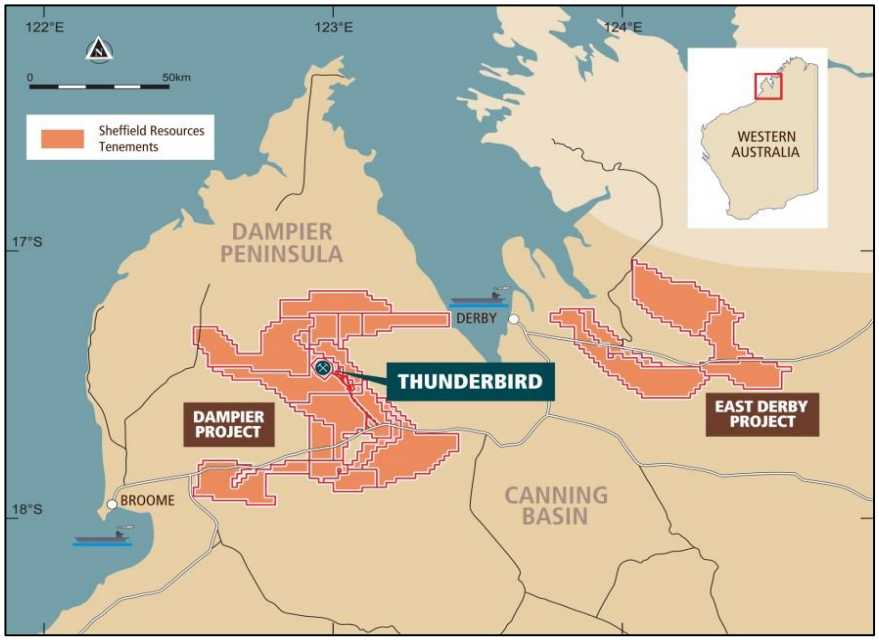

Figure 3: Location of Thunderbird Project

In addition to being located in the stable mining jurisdiction of Western Australia, other key advantages of the project are its proximity to Asian markets and robust mine to port logistics chain.

Thunderbird is a strategic asset with a production profile that includes globally significant amounts of zircon and ilmenite – the latter could underpin a large sulphate pigment plant or ilmenite smelter.

PFS UPDATE TEAM

Sheffield's Thunderbird project development and exploration teams have worked in conjunction with a number of highly specialised consultant companies to complete studies on all aspects of the PFS Update.

Table 3: Contributors to Thunderbird PFS & Update

CONSULTANT	SCOPE AREA
Robbins Metallurgical	Metallurgical testwork and process design
Robbins Project Engineering	Process Engineering
GR Engineering	Study Review
TZMI	Marketing studies
ATC Williams	Geotechnical investigations
RCR Mining Technologies	Bulk sample and mining review
EPMS	Engineering
Quantitative Group	Resource estimation
Resource Engineering and Design	Infrastructure studies
Wyntak	Logistic studies
Entech	Pit optimisation & mine scheduling
Northwind Resources	Financial modelling
Pennington Scott	Hydrogeological investigations
Ecologia	Environmental Consultants

TENURE

Sheffield's 100% owned Thunderbird project comprises mining lease application M04/459, which is underlain by active exploration licence E04/2083, plus 7 miscellaneous licences (L04/82-86,92,93) relating to off-site infrastructure. These tenements lie within the broader Dampier project which comprises the tenements set out in Table 4 and covers a total area of 3,952km^2.

Table 4: Tenements

TENEMENT NUMBER	STATUS	AREA KM^2 (HA)	TENEMENT NUMBER	STATUS	AREA KM^2 (HA)
M04/459	Application	45.3	E04/2386	Application	324.8
E04/2081	Granted	96.8	E04/2399	Application	529.9
E04/2083	Granted	465.1	E04/2400	Application	130.8
E04/2084	Granted	613.0	E04/2401	Application	447.9
E04/2159	Granted	127.8	L04/82	Application	633 Ha
E04/2171	Granted	510.6	L04/83	Application	219 Ha
E04/2192	Granted	26.2	L04/84	Granted	120 Ha
E04/2193	Granted	121.3	L04/85	Granted	237 Ha
E04/2194	Granted	95.1	L04/86	Granted	191 Ha
E04/2348	Application	206.6	L04/92	Granted	197 Ha
E04/2349	Application	144.0	L04/93	Granted	184 Ha
E04/2350	Application	114.5			

The Mining Lease application is subject to the Mount Jowlaenga Polygon #2 Native Title Claim (WC2014/005) and is located within the Mount Jowlaenga Pastoral Lease (N050161). The Mining Lease application is situated within the Shire of Broome and the proposed access road and bulk handling export facility is located within the Shire of Derby-West Kimberley.

GEOLOGY

The Thunderbird mineral sands deposit is hosted by sand formations deposited during the Cretaceous period. The main mineralised unit is locally named the “Thunderbird Formation”.

The Thunderbird Formation comprises medium to dark brown-orange, fine to very fine well-sorted sands. The Formation is up to 90m thick, however, in the up-dip region of the Thunderbird deposit, the upper part of the Formation has been eroded. The Formation dips at very shallow angles to the southwest and west, beneath unconsolidated Pliocene Pindan sand and Cretaceous cover sequences.

The Thunderbird deposit has a strong weathering overprint. This has resulted in the formation of patchy, weakly indurated sandstone and, in areas where the high grade mineralisation comes to surface, thin (typically 1cm to 10cm) discontinuous layers of hard, iron cemented sandstone. Together these material types are estimated to comprise no more than 10% of the deposit.

The deposit is interpreted to have formed in an off-shore sub wave base environment, with the high grade zone at its core thought to have formed within higher energy shoals. This interpretation is supported by the broad areal extent of the deposit, its thickness, relatively fine grainsize, high grade and strong geological continuity.

Thunderbird is the first major mineral sands discovery in the Canning Basin. Sheffield is well placed for further exploration success, having secured a large tenement holding totalling 5,800km^2 in the Canning Basin. The Company’s first reconnaissance drilling campaign resulted in three promising new discoveries: Night Train, Nomad and Seagull (see ASX release 22 September 2015).

The Night Train prospect has significant grades and widths of mineralisation, supported by a high value mineral assemblage with over 90% valuable heavy mineral. It occurs at a higher stratigraphic level than Thunderbird. This evidence of stacked mineralised sequences opens significant scope for further discoveries in the region.

Figure 4: Bulk sample collection with a Bauer rig

Figure 5: Raw (left) and Panned (right) Mineralisation from Thunderbird

MINERAL RESOURCE

Thunderbird's Mineral Resource is significant at the world scale. Its large size and high zircon and titanium mineral grades set it apart from others globally. The Measured Resource component alone is larger and higher grade than many entire deposits currently being mined, or under investigation (Figure 6).

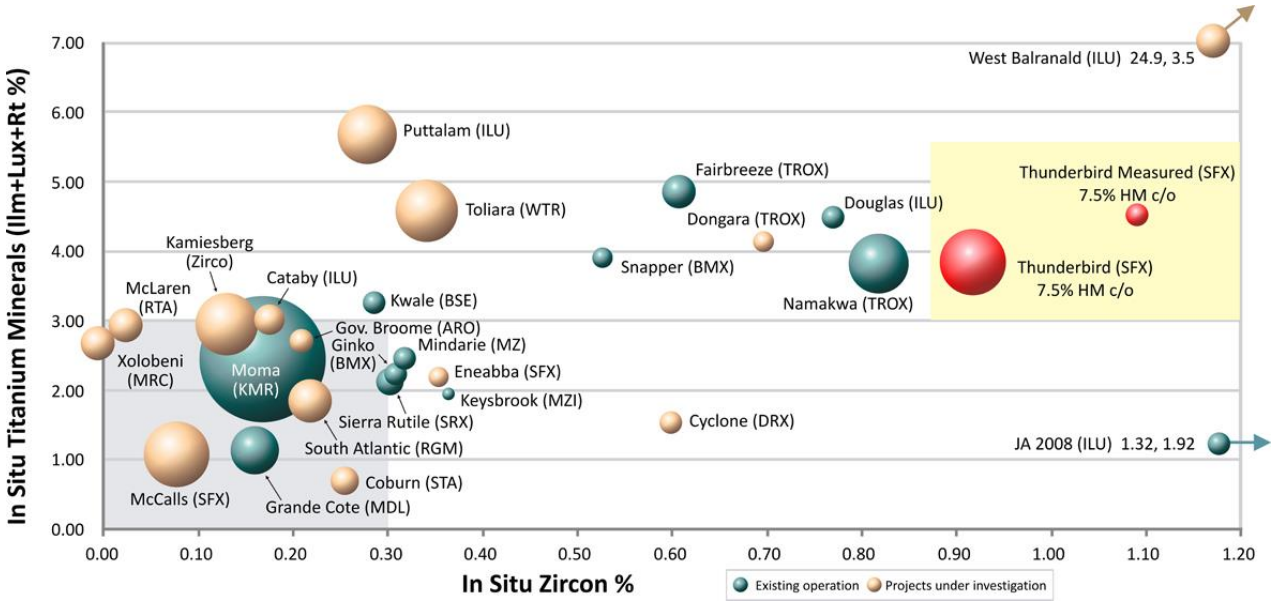

Figure 6: Thunderbird Mineral Resource Ranked Against Current Mineral Sands Operations and Projects under Investigation Globally (Data Compiled by Sheffield from Open File Sources)

This PFS Update is based on the Thunderbird Mineral Resource announced on 31 July 2015 (Table 5). It comprises 3.240Bt @ 6.9% HM (at 3% HM cut off), including a coherent high grade zone (at 7.5% cut off) of 1.09Bt @ 11.9% HM (Measured, Indicated and Inferred). This high grade component contains 9.9Mt of zircon, 3.0Mt of high-titanium leucoxene, 2.8Mt of leucoxene and 36Mt of ilmenite.

The Measured category comprises 110Mt @ 14.9% HM (at a 7.5% HM cut-off), with very high in-situ zircon and ilmenite grades of 1.09% and 4.0% respectively. Significantly, the majority of the Measured Resource occurs in the shallow up-dip portion of the deposit targeted for production in the early years of the operation (Figures 8 & 9).

Table 5: Thunderbird Deposit High Grade Mineral Resource Summary (at 7.5% HM cut-off) 31 July 2015

	MINERAL RESOURCES [1]		VALUABLE HM GRADE (in situ) [2]			
Resource	Material Mt	HM %	Zircon %	HiTi Leuc %	Leucoxene %	Ilmenite %
Measured	110	14.9	1.09	0.31	0.28	4.0
Indicated	850	11.8	0.90	0.28	0.25	3.3
Inferred	130	10.7	0.82	0.25	0.23	3.0
TOTAL	**1,090**	**11.9**	**0.91**	**0.28**	**0.25**	**3.3**

Refer to Appendices 1 & 2 for full Resources Tabulation

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

At 7.5% HM cut-off the resource covers an area 7.5km long by 2.5km to 6.5km wide. This higher grade mineralisation is encased within the 3% cut-off resource envelope, but has a north-south long axis orientation which is oblique to the northwest strike of the overall deposit and host formations. The high grade mineralisation displays strong lateral continuity, with sharp upper and lower boundaries distinguished by grade and colour changes.

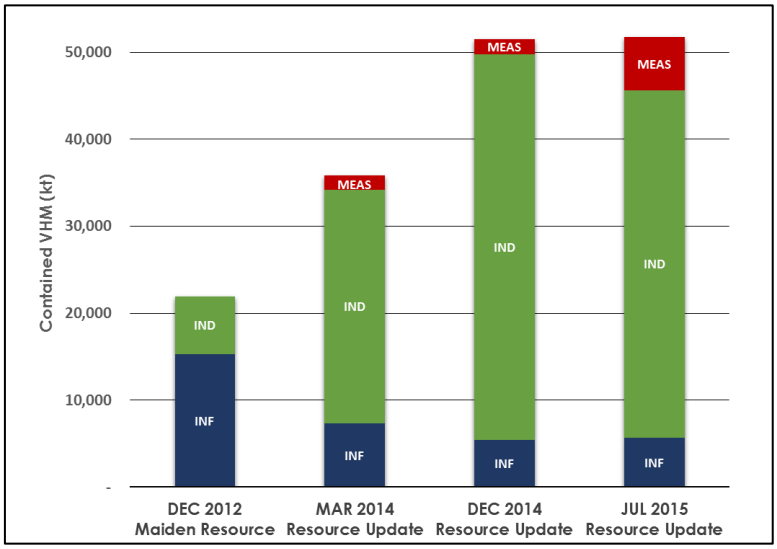

Figure 7: Thunderbird Resource Growth (Contained VHM @ 7.5% HM Cut-Off)

The high grade mineralisation extends from surface to a maximum modelled depth of 126m and remains open to the north and south. It averages 16m thickness but in places can be up to 43m thick (Figure 9). In the up-dip region, part of the deposit has been eroded, exposing high grade mineralisation at surface. This is the area from which production has been scheduled in the early operating years.

At a 3% HM cut-off, the heavy mineral assemblage of the total resource comprises 8.3% zircon, 2.7% high-titanium leucoxene, 3.1% leucoxene and 28% ilmenite for a total valuable heavy mineral component of 42%. Process test work has shown these valuable heavy minerals can be recovered using standard mineral sands processing techniques. The non-valuable heavy mineral ("trash") comprises fine to coarse sand sized iron oxide and iron-cemented quartz aggregates, with a very minor proportion of aluminosilicate and other minerals. The majority of trash minerals are readily removed during the primary concentration stage using conventional processing equipment.

The Thunderbird resource has a moderate slimes content, averaging 15% at the 7.5% HM cut-off. The slimes have favourable characteristics, including a low clay content, and exhibit high settling rates at low flocculant dosage rates. Oversize (+1mm) levels are low to moderate, averaging 9-10% of the total resource.

Further information relating to the Mineral Resource is included in Appendix 1 and 2 of this announcement.

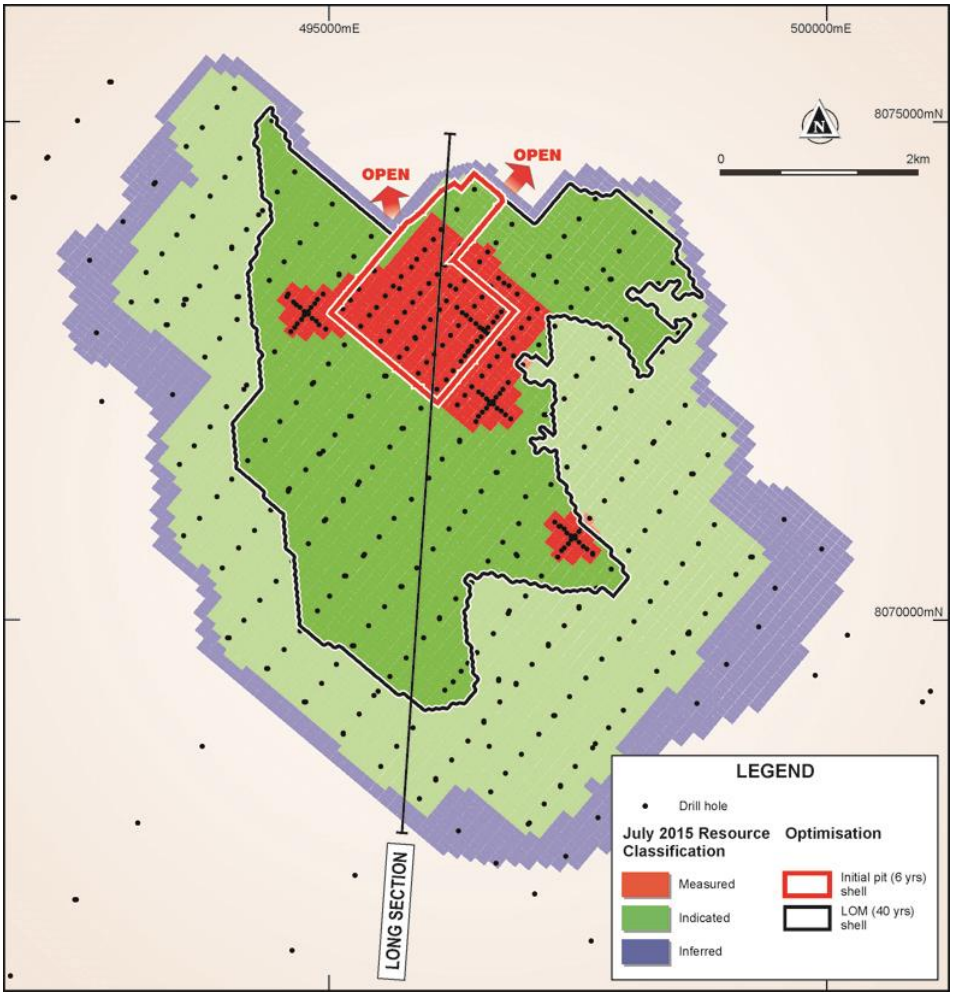

Figure 8: Thunderbird Resource Block Model Resource Category Plan and PFS Pit Shells

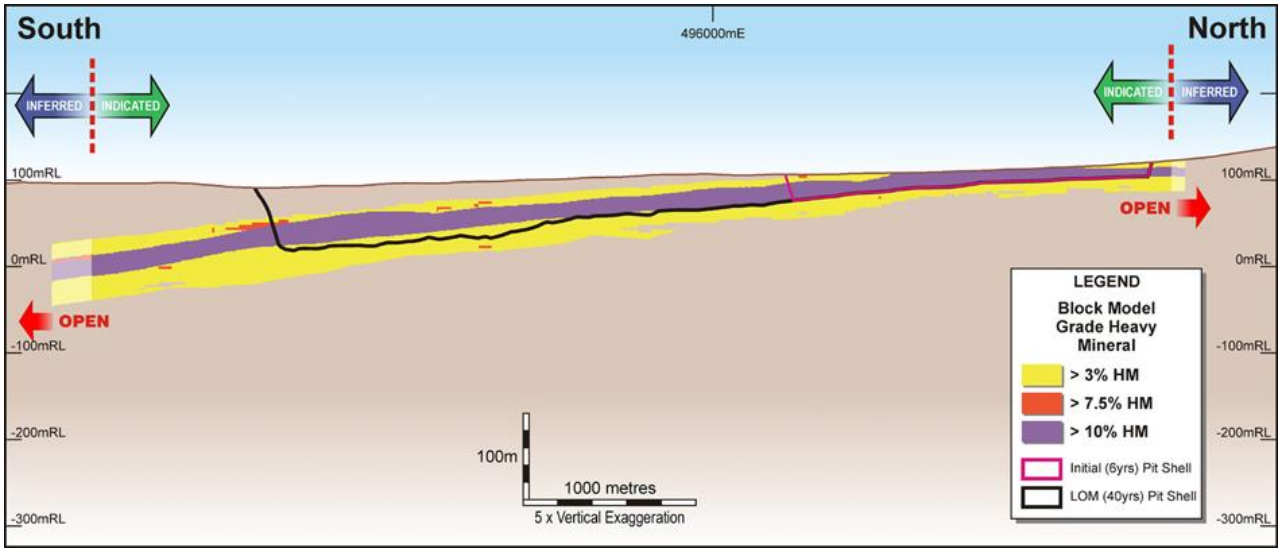

Figure 9: Cross-Section F-F' Through the Thunderbird Resource Block Model Showing the Current Resource HM Grade and PFS Pit Shell Outlines

GEOTECHNICAL

Sheffield has completed both quantitative and qualitative studies regarding the amenability of Thunderbird mineralisation to the proposed mining method, trafficability and pit slope stability assessment.

Geotechnical investigations, including the drilling and examination of 20 sonic core holes, were undertaken by ATC Williams in 2014. They confirmed the mineralised unit comprises 85-90% dense, fine to medium grained sand with occasional extremely weathered fine to medium grained sandstone. This material is expected to be readily excavatable using conventional mining equipment (see ASX release dated 17 March 2015).

Figure 10: Mineralised Sample Collection from THBA004 using the Bucket Tool (0.7m Diameter)

This assessment is supported by observations of a recently completed 100t bulk sampling program using a "Bauer" rig. This program comprised five 0.7m diameter holes at a spacing of about 1km x 500m within the area of the deposit targeted for the first 6 years of production (see ASX release dated 17 September 2015). The program was observed by engineering group RCR Mining Technologies who assessed the mining and material handling characteristics of the Thunderbird mineralisation. Based on their observations, RCR recommended dozer trap mining as the preferred mining method for the deposit.

Figure 11: Sequence (from L-R) of Shallow Mineralisation Being Lifted from Bauer Hole THBA005, August 2015.

An assessment of trafficability indicated that the residual sands are very dense and are expected to be readily trafficable in dry conditions. During the wet season 'good' to 'excellent' trafficability has been inferred with temporary interruption of mining likely only during extreme rainfall events.

Open pit stability studies indicate that overall design slopes between 40˚ and 60˚ should be feasible. Pit slope angles of 40˚ have been used in optimisation studies.

The water table is at approximately 35m depth, consequently the first 12 years of mining will be completely above the water table.

PIT OPTIMISATION AND MINE SCHEDULING

The **Mining Inventory** that forms the basis of the PFS Update is from the northern central portion of the Thunderbird Mineral Resource and comprises **685Mt at 11.3% HM,** with in-situ grades of **0.87% zircon, 0.27% HiTi leucoxene, 0.28% leucoxene and 3.13% ilmenite** (from Measured and Indicated Resources only).

This equates to 40 years of scheduled production with initial production at a 12Mtpa mining rate for eight years, ramping up to 18Mtpa for the remainder of the mine life. The waste-to-ore ratio averages 0.66:1 over the 40 year life of mine. Mineralisation remains open beyond the 40 year pit shell outline, mainly in the down-dip direction, with optimisation studies indicating production can extend well beyond 40 years (Figure 8).

The Mining Inventory is based on pit optimisation studies which take into account a range of modifying factors such as commodity prices, overburden, mining and processing costs, mineral recovery, realisation costs and pit wall slope.

Detailed mine planning and scheduling was completed for the first six years of mining. Rate of advance, mining unit plant (MUP) moves, maintenance of voids for in-pit tailings co-disposal and services infrastructure were accounted for in the schedule.

The schedule scenario comprises three MUPs, with two MUP operating at any on time and advancing in sequence on 200m x 100m mining areas. The size and continuity of the orebody allows the three-MUP scenario to be utilised, eliminating downtime between MUP moves and reducing operating risk.

Mining is scheduled to begin in the north-eastern part of the deposit, where high grade mineralisation is at surface, then progress down-dip to the southwest before turning southeast to exploit the bulk of the near-surface high grade resource in the early years of operation. The mining inventory for the initial six year pit comprises **68Mt at 15.7% HM,** with high in-situ grades of **1.12% zircon, 0.32% HiTi leucoxene, 0.31% leucoxene and 4.18% ilmenite** (of which 86% is from Measured Resources and 14% from Indicated Resources) and covers the capital payback period of 3.4 years.

Beyond the initial six year pit a less detailed schedule was developed within the 40 year optimised pit shell, with broad limitations placed on the mine path, including maximum pumping distance from the MUPs to the wet concentrator of 2,000m. This will require WCP moves in production years 13 and 26 (Figure 20).

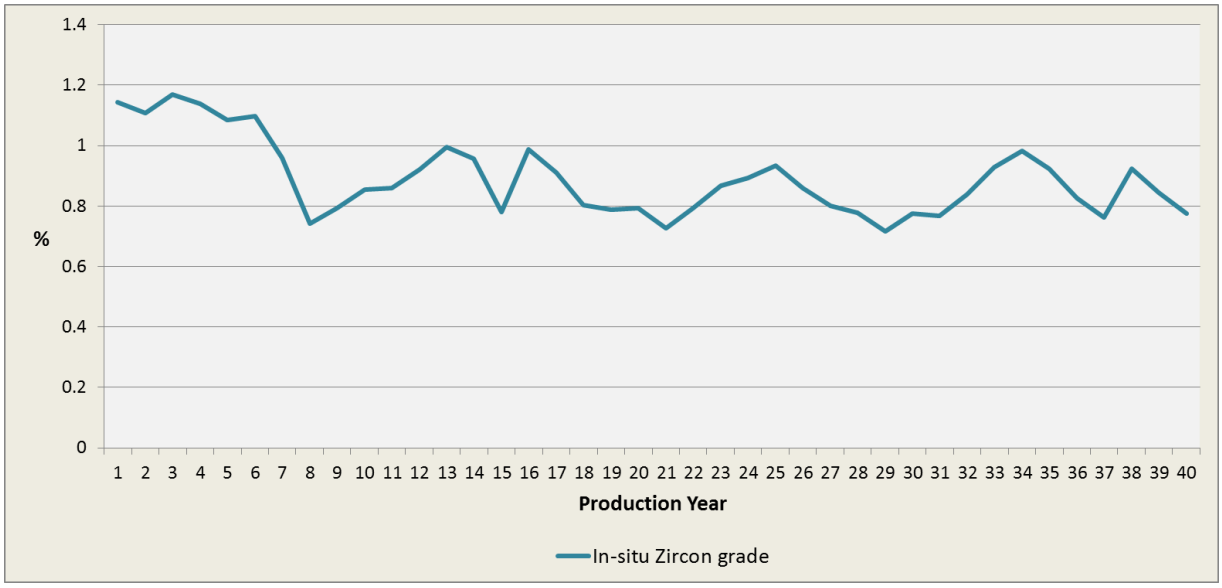

Figure 12: Annual In-Situ Zircon Grade Showing High Grades Scheduled in First Six Years of Production

MINING

The proposed mining technique is a strip mining and backfill method typically used in dry mining operations in the mineral sands industry. Mining commences with excavation of an initial pit to expose the ore. As the pit advances, waste overburden and tails are used to provide a dam wall within the mine void, which is then backfilled with tailings, then contoured and rehabilitated (Figure 13).

At the proposed 12Mtpa ROM feed rate of 1,620tph, 4 large dozers will deliver the ore to 2 x 810tph skid-mounted dozer trap MUPs. A third MUP will be available (on standby) to minimise downtime during mine face relocation and to maintain consistent throughput.

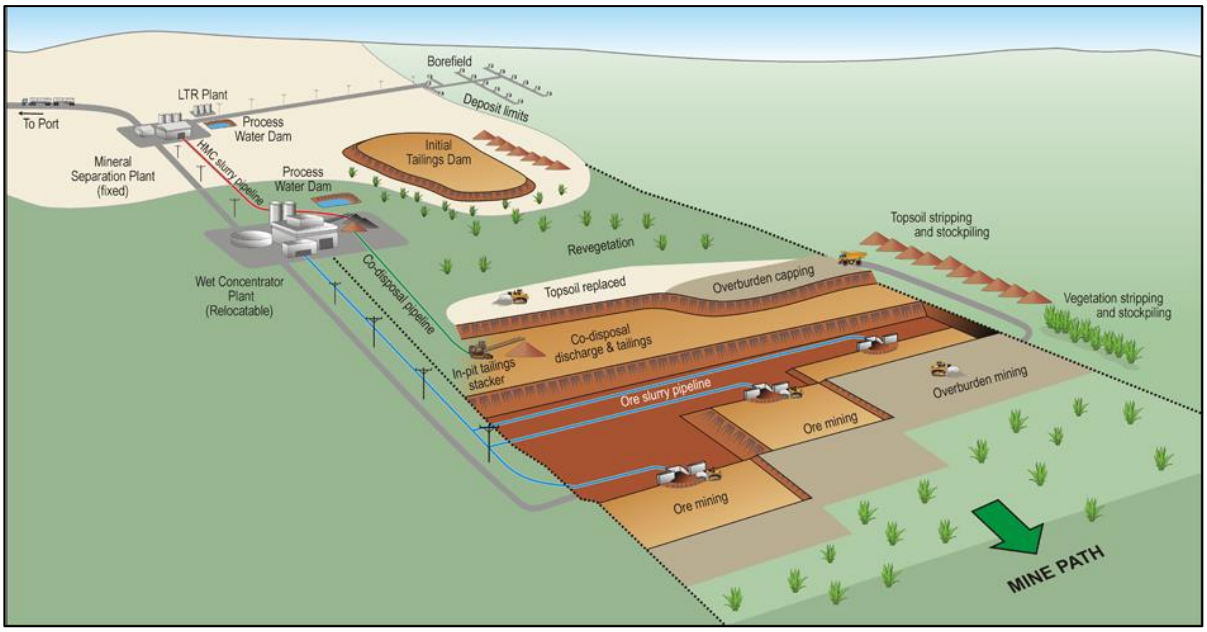

Figure 13: Schematic Mine Design

Figure 14: Dozer Trap Mining at Twin Hills, Western Australia

At year eight, the throughput will increase to 18Mt ROM feed rate of 2,430tph by deploying an additional MUP and supporting mobile equipment.

Ore mining will be supported by a fleet of loaders and 100 tonne trucks. Waste mining, oversize removal and dam wall construction and rehandling will be carried out with a fleet of loaders, trucks, excavators and scrapers. Low strip ratios in the early years will allow the ore mining fleet to also service the waste mining load.

The MUPs will screen coarse oversize, with undersize fed to a scrubber trommel. The undersize from the trommel is slurried and pumped to the Wet Concentrator Plant (WCP).

Table 6: Physicals Summary

PHYSICALS	YEARS 1-7	LOM
Average ore mined (Mtpa)	12.2	17.1
Average head grade (%HM)	15.4	11.5
Strip ratio (waste:ore)	0.20:1	0.66:1
HMC PRODUCED (MT)	8.8	52.0
PRODUCTION	**YEARS 1-7**	**LOM**
Zircon (tpa)	89,000	100,000
HiTi88 (tpa)	21,000	26,000
LTR Ilmenite (tpa)	311,000	382,000
Primary Ilmenite (tpa)	58,000	14,000
Total Products	**479,000**	**522,000**

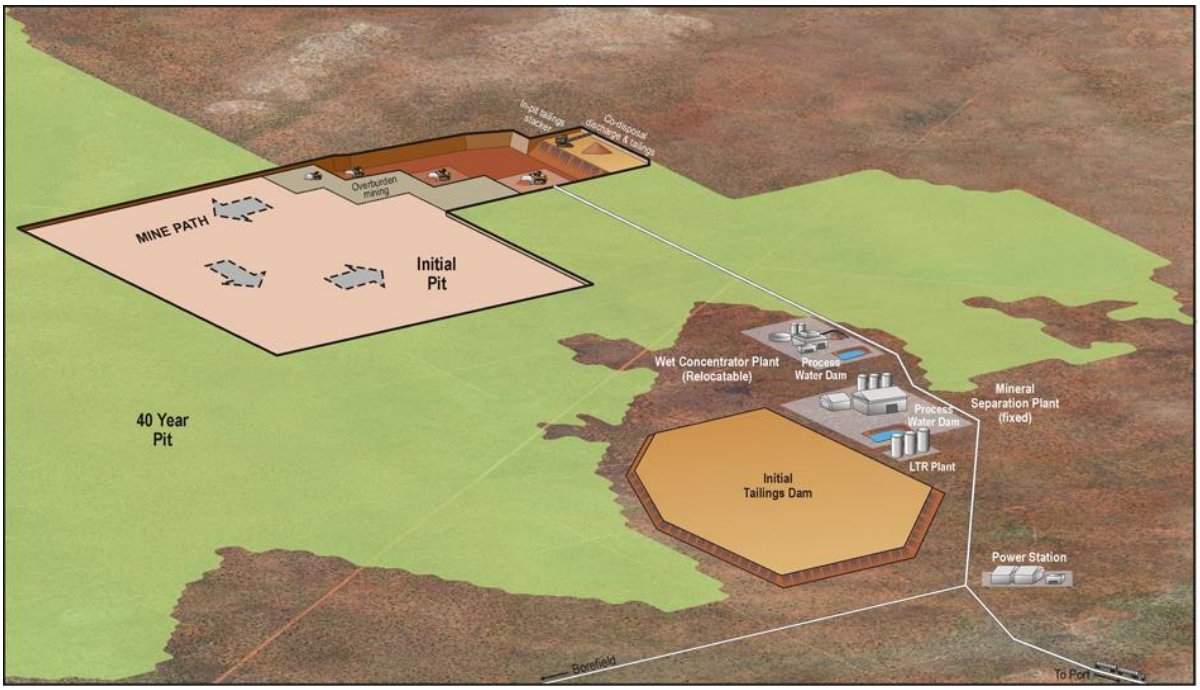

Figure 15: Schematic mine layout with initial pit and 40 year LOM pit shell superimposed (oblique view looking north)

PROCESSING

The Thunderbird mineralisation will be processed through a conventional heavy mineral sands processing circuit to deliver a suite of zircon, ilmenite, and HiTi88 products. The process includes an ilmenite upgrade step using a low temperature roast ("LTR") to upgrade the primary ilmenite by 22% to produce a high grade (56.1%) sulphate ilmenite.

The processing flowsheet has been developed by leading mineral sands specialists Robbins Metallurgical Pty Ltd on the basis of metallurgical process development testwork carried out during the PFS on a 12.5 tonne bulk sample using full-scale and scalable equipment. The product recoveries obtained from this work have been used in the PFS financial model.

Slurried ore from the MUPs will be combined at the WCP, screened at 2mm and the -2mm fraction then further slurried before being deslimed on dual cyclone clusters.

Cyclone underflow will report to two identical gravity circuits comprising eight stages of spiral separators, which will separate sand from the heavy minerals. Cyclone overflow will report to a deep cone thickener for recovery of process water. Thickened underflow (clay slimes) and sand tails will be pumped initially for co-disposal into a tails dam, and later into the mine void. Tailings co-disposal testwork indicates polymer-treated tails will achieve high consolidation rates, with high water recovery from tailings expected.

Processing water for slurrying and the WCP will be supplied by a process water dam near the WCP. A borefield will access the shallow aquifer adjacent to the deposit. Hydrogeological investigations have established adequate quantities of very low salinity water suitable for processing. The heavy minerals, contained in a concentrate (HMC) will be slurried and pumped to the Mineral Separation Plant (MSP).

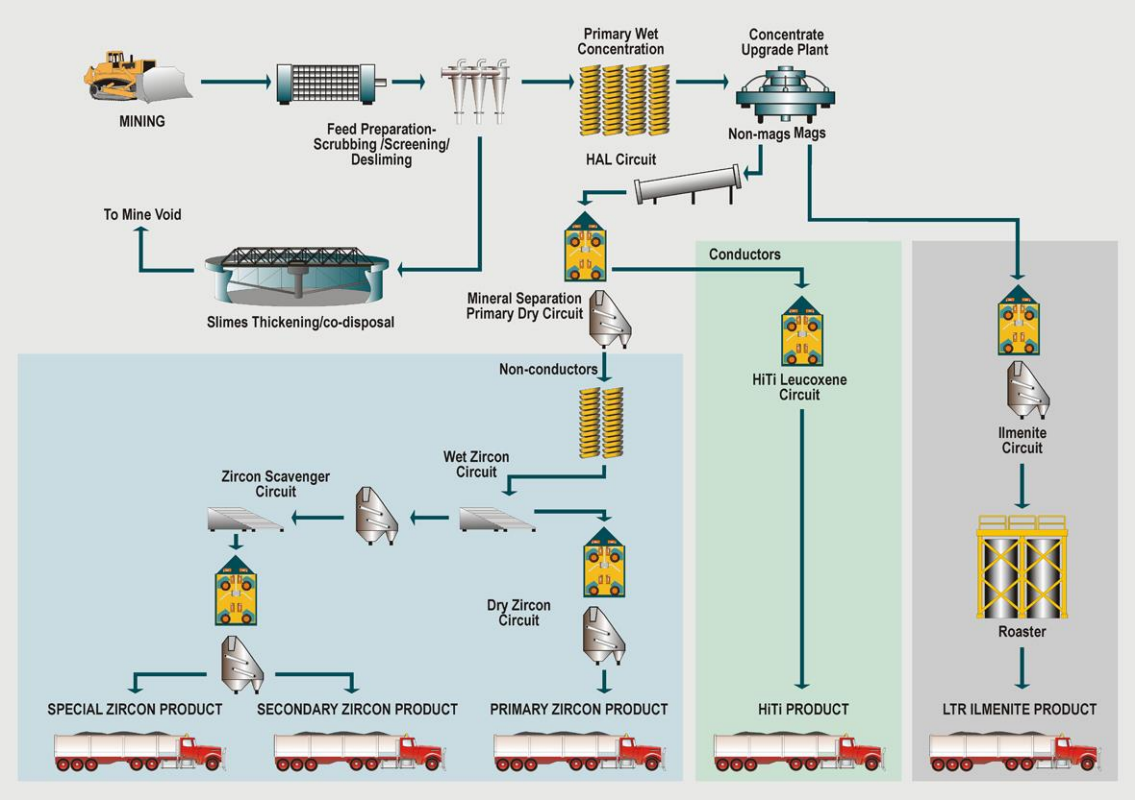

Figure 16: Thunderbird Schematic Process Flow Sheet

At the MSP, HMC from the WCP will be received at a Concentrate Upgrade Plant (CUP), where it is screened at 850 microns and then undersize separated using magnetic and gravity separation techniques to produce magnetic (ilmenite-bearing) and non-magnetic (HiTi88 and zircon-bearing) concentrates and tails.

Figure 17: FM 1 Spiral Separator Stage (Top, Middle, Bottom Splitter Left to Right)

Magnetic concentrate will be pumped to an attritioner to remove surface coatings and then pumped to an Ilmenite Dry Plant (IDP) for drying and further processing.

Non-magnetic concentrate at the CUP will be upgraded using spiral concentrators and then pumped to a Hot Acid Leach plant (HAL) for surface cleaning of the mineral grains. Leached non-magnetics report to an attritioner where dilute caustic soda is introduced to neutralise any residual acid, and then to a primary electrostatic circuit where it is further separated over several stages of electrostatic separators, and a magnetic separation stage to produce conductor (HiTi88-enriched) and non-conductor (zircon-enriched) concentrates. Non-conductor concentrate is further treated via magnetic, electrostatic and gravity circuits to produce a Primary Zircon product. Additional processing of magnetics streams from the Primary Zircon circuit, including batch feeding via a HAL stage will produce Secondary and Special Zircon products.

Figure 18: Laboratory Upcurrent Classifier

Conductors from the primary electrostatic circuit will be processed by a second stage of electrostatic separation to produce a HiTi88 (87.7% TiO_2) product.

The magnetic concentrate from the CUP will be pumped to the Ilmenite Dry Plant (IDP), dried, then further upgraded using screens and electrostatic separators to produce a primary ilmenite product.

The primary ilmenite will be upgraded using a low temperature roast to produce a high grade (56.1%) sulphate ilmenite product. The purpose of the LTR plant is to condition ilmenite and iron-bearing minerals by partial reduction to increase the magnetic susceptibility of iron oxides, while keeping the ilmenite in a temperature range that avoids the solubility of TiO_2 being affected by " rutilisation" (conversion to less soluble rutile). The LTR plant contains a fluid bed reactor where the ilmenite is treated by hot reducing gases generated by the gasification of coal. An indirect benefit of the process is that excess heat from the LTR plant can be used for drying in the IDP.

After the LTR step, cooled, partially reduced ilmenite is sent to an ilmenite magnetic separation plant (IMS) comprising a two stage circuit of low-intensity magnetic separators and a final Rare Earth Roll magnetics stage. The IMS plant removes magnetized iron-bearing material from the ilmenite and upgrades the TiO_2 in the final product from 45-47% to 56.1%.

Overall recovery of ilmenite to product (45-47% TiO_2) is 74%. The overall recovery of LTR ilmenite (56.1% TiO_2) is 68%.

Overall zircon recovery, excluding semi-processed and re-circulated streams, is calculated at 67%. The Primary (66.6% ZrO_2) Zircon is approximately 80% of the recovered zircon. A Secondary (65.1% ZrO_2) and a Special (62.8% ZrO_2) Zircon were also produced.

The HiTi88 (87.7% TiO_2) product recovery, excluding semi-processed or re-circulation streams is 40%.

Table 7: Recovery Summary

PRODUCT	RECOVERY TO PRODUCT
Zircon[1]	67%
LTR Ilmenite	68%
Primary Ilmenite	74%
HiTi88	40%

[1] The Primary (66.6% ZrO_2) Zircon comprises approximately 80% of the recovered zircon

Figure 19: Example Modular Wet Concentrator Plant Courtesy Robbins Project Engineering

ENVIRONMENT AND PERMITTING

Environment and permitting requirements are progressing in parallel with feasibility studies.

Sheffield commissioned environmental consultants *ecologia* to complete comprehensive flora and fauna surveys of the Thunderbird study area. These surveys will assist Sheffield to document the flora and fauna in the region and provide sufficient information to enable an assessment of the Project's impacts on the environment. Six comprehensive environmental surveys were completed over the Project area between June 2012 and June 2015. A number of additional surveys and studies are planned for the remainder of 2015 and early 2016, including a targeted fauna survey, overburden and tailings characterisation, soil assessments, a surface water study and dust and noise modelling.

Sheffield has received confirmation from the Department of Water that a section 5C application for a licence to take water, submitted earlier in the year, has been accepted and will be processed in due course.

The mining lease application lodged during the September 2014 quarter has initiated the native title negotiation process which will continue for the remainder of 2015. Miscellaneous licences for infrastructure including access roads and a camp were lodged in December 2014.

Stakeholder identification has commenced with significant engagement activity planned over the last quarter of 2015.

The Thunderbird mineral sands project has been assessed and designated as a Level 2 Lead Agency Project by the WA Department of Minerals and Petroleum ("DMP"). The DMP will advise and assist the Company with coordination of approvals across other WA government departments and agencies.

INFRASTRUCTURE AND LOGISTICS

Site Infrastructure

The Thunderbird Project has a compact site layout, providing significant operating cost advantages and minimising the environmental footprint. The permanent Mineral Separation Plant, the initial location of the movable Wet Concentrator Plant, and an initial Tailings Storage Facility will all be favourably located adjacent to the orebody within optimal pumping distances (Figure 20).

Infrastructure and buildings located around the WCP and MSP, including recycling and communications facilities, total $16.6M. Site buildings around the WCP include a mine administration office, contractor's office and workshop. Site buildings around the MSP include an administration office, medical facility, dry store, laboratory, communications building and an electrical and mechanical workshop.

A borefield totalling $6.5M will be located in the southern portion of the mining lease approximately 4.5km from the process water dam and 3.5km from the power station.

A Build Own Operate (BOO) 16MW LNG/diesel power station will be located close to the mine and processing facilities. The power station requires supporting infrastructure and a power distribution network to the plant and borefield totalling $6M.

New and upgraded roads totalling $10.1M will provide access to the mining operation, processing facilities, the accommodation camp, and all-weather access via the Mt Jowlaenga Road to the Great Northern Highway.

A BOO accommodation camp will be located approximately 5km east-southeast from the mine site. Initially this will be for 140 persons, expanding to 170 coinciding with the ramp up of throughput to 18Mtpa in Year 8.

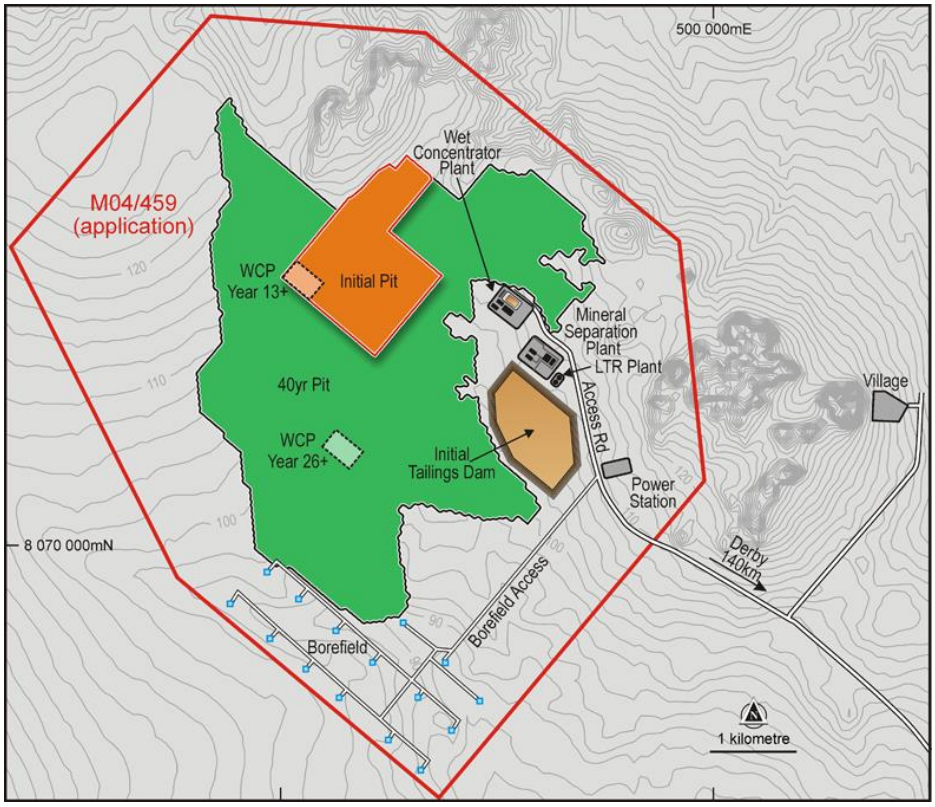

Figure 20: Thunderbird Site Layout Plan

Off-site Infrastructure

Final products will be transported in bulk form by a fleet of 4 quad road trains from the mine to the Derby Port for storage and export. A storage warehouse facility and administration office will be constructed adjacent to the Derby wharf. Bulk ilmenite, zircon and HiTi88 products will be off-loaded in the storage shed where they will be stacked separately in preparation for transhipment via barge. The products will be reclaimed from the stockpiles by front end loaders and transferred by conveyor to the ship loader (Figure 22).

Figure 21: Mine to Port Logistics Chain

Derby Port has previously been used for the export of up to 500,000tpa of base metal concentrates from Western Metal's Lennard Shelf operations and is well suited to the export of mineral sands products.

Sheffield is negotiating with the Shire of Derby/West Kimberley Council for exclusive use of the bulk commodity handling area at the Derby wharf (see ASX release dated 2 March 2015).

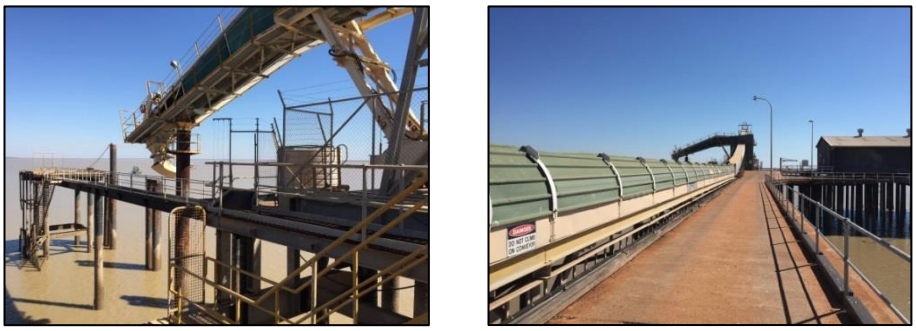

Figure 22: Ship Loader at the Derby Wharf

Figure 23: Derby Wharf

CAPITAL COSTS

The total pre-production capital required to build the Thunderbird Project has been estimated at A$271.3M[1]. The estimate of the total pre-production capital costs is summarised by area in Table 8 and Figure 24. The estimate covers the design and construction of the Project's mining and processing, supporting site infrastructure and off-site infrastructure such as an access road and port facilities at Derby.

Table 8: Capital Cost Estimates

COST AREA	A$M
Pre-Production Owners Cost	
Sub-Total Pre-Production Owners Cost	**19.7**
Project Direct Costs	
Mining[2]	6.8
Process Water System	9.0
Wet Concentrator Plant	42.0
Mineral Separation Plant	93.0
LTR Plant	27.7
Site Infrastructure[3]	16.6
Power Infrastructure[3]	6.0
Roads	10.1
Borefield	6.5
Port	9.4
Sub-Total Direct Costs	**227.1**
Project Indirect Costs	
EPCM	**24.5**
Contingency 10%	25.3
Sub-Total Indirect Costs	**49.8**
GRAND TOTAL	**296.6**

[2]MUPs, mobile equipment, lease-purchased over 5 years.[3]Excludes camp and power station which are build-own-operate (BOO). Excludes working capital and cost of DFS. Numbers have been rounded to one decimal place.

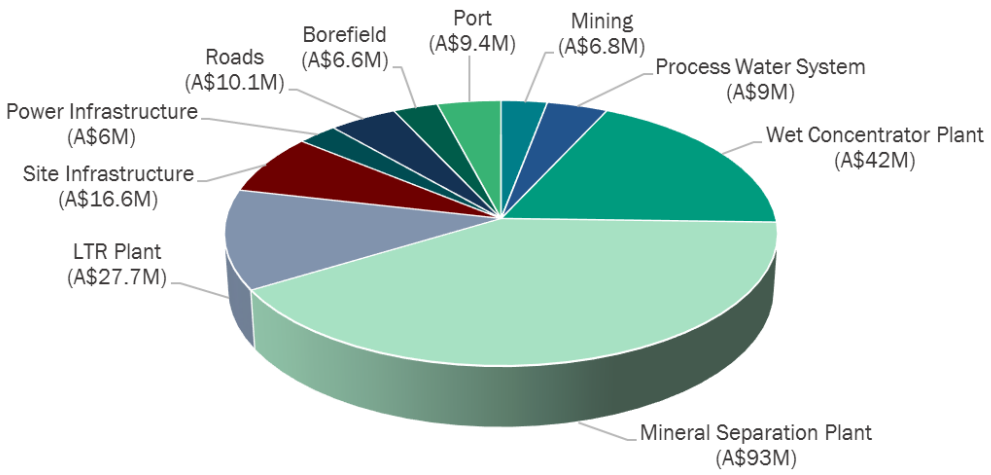

Figure 24: Distribution of Direct Capital Costs

[1]Excludes Contingency.

The capital cost of expansion from 12Mtpa to 18Mtpa throughput in Year 8 is A$63.9M and will be met from operating cash flow.

Based on maintenance schedules, there is very little sustaining capital required in the first 10 years of operations. Sustaining capital costs average A$3.97M per annum over the 40 year mine life and cover all costs required to sustain the operation over that period. This relates to the replacement of worn plant and equipment.

OPERATING COSTS

Total life of mine estimated operating costs for the Project are summarised in Table 9 and Figure 25. The estimate has a base date of Q2 2015 and is reported in A$. No escalation has been included in the estimate.

Table 9: Operating Cost Estimates

OPERATING COST	A$/t final products
Cost Centre	**LOM**
Direct mining	68.5
MUPs	29.7
WCP	38.8
MSP	75.4
LTR	12.3
Administration	7.3
Infrastructure & services	8.0
Realisation Expenses	28.2
Marketing	11.3
Royalty	28.3
TOTAL OPERATING COST A$ PER TONNE OF PRODUCT (AVERAGE LOM)	**307.8**

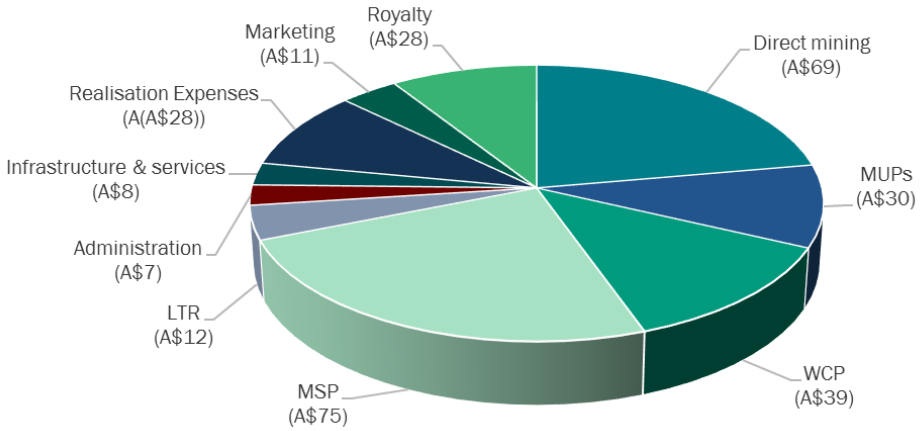

Figure 25: Distribution of Operating Costs

PRODUCT REVENUE AND VOLUMES

Production is scheduled to commence in 2019 with annual volumes over the 40 year LOM shown in Figure 26. Over the 40 year LOM, production volumes average 382.1kt for LTR ilmenite, 14.3kt ilmenite, 100.1kt for zircon and 26.2kt for HiTi88. Production and revenue totals over the LOM are shown in Table 10.

Table 10: Production and Revenue Totals LOM

PRODUCT	LOM TONNES	LOM REVENUE (A$M)
Zircon	4,006,000	6,910
LTR Ilmenite	15,285,000	3,821
HiTi88	1,052,000	995
Primary Ilmenite	559,000	103
TOTAL PRODUCTS	**20,902,000**	**11,829**

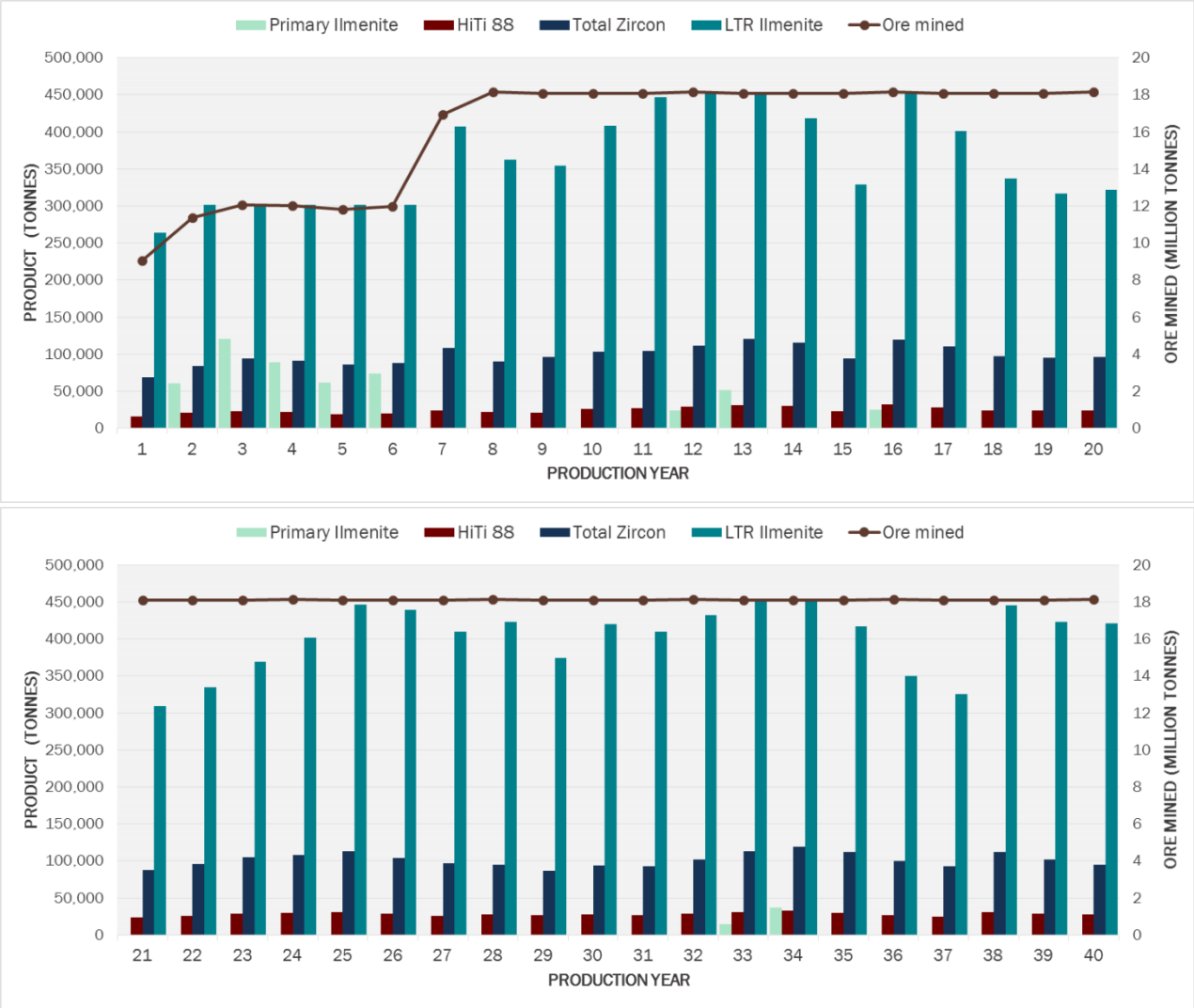

Figure 26: Annual Forecast Ore Tonnes Mined and Production Volumes for Thunderbird Products. Top: Production Years 1-20. Bottom: Production Years 21-40.

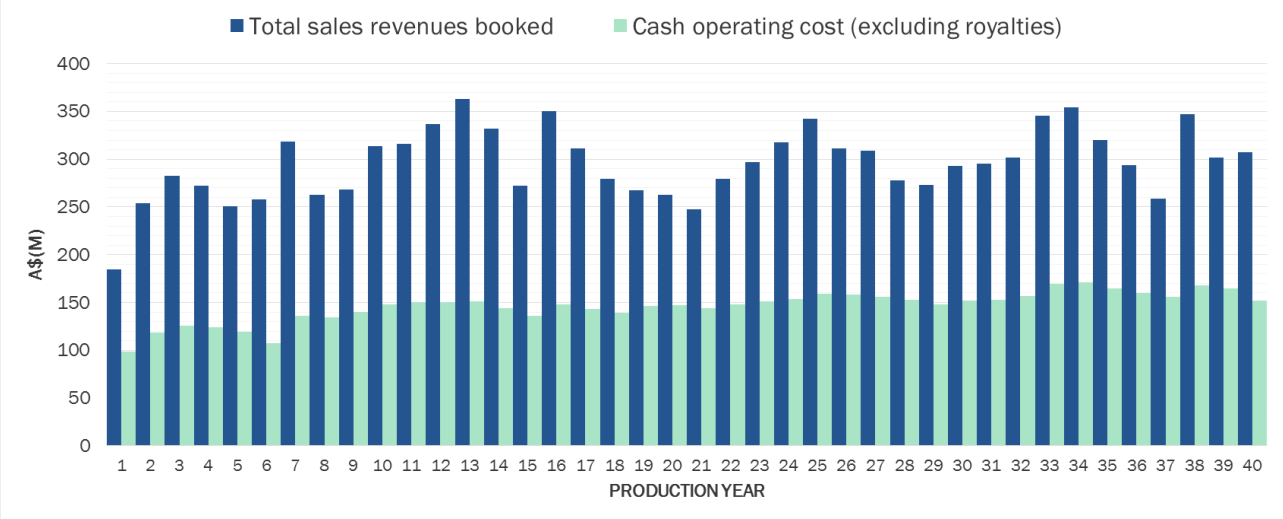

Figure 27: Annual Revenues and Costs

MARKETING

Industry experts TZMI completed an assessment of the marketability of final products obtained from the PFS 12.5t bulk sample metallurgical testwork, taking into account product quality and expected production volumes. The key outcomes are set out below.

Zircon (59% of revenue)

TZMI concluded that the primary zircon product meets the requirements for premium classification for use in the ceramic sector. The ceramics sector is the largest sector of the zircon market, with China being the largest importing country. TZMI do not see any issue with placing this material in the market due to the progressively growing supply gap beyond 2018, when production from several major global operations is expected to decline. The secondary and special zircon can be sold as high grade concentrates to the zircon chemicals sector or to zircon concentrate processors, most of which are located in China.

Figure 28: Zircon Used in Ceramics (tiles) and New Technologies such as Phone and Watch Cases

LTR Ilmenite (32% of revenue)

The LTR ilmenite product is produced by a simple, 15 minute ultra-low temperature (450^{0}C) reduction roast, and subsequent magnetic separation stage, which upgrades TiO_2 in the primary ilmenite by 22% to 56.1% TiO_2 and increased the FeO to Fe_2O_3 ratio.

The results of sulphuric acid solubility testwork show that the TiO_2 solubility for the LTR ilmenite product is very high at 96.2% using an acid-to-ore ratio of 1.67 (see ASX release 9 September 2015).

The TiO_2 solubility of the Thunderbird LTR ilmenite has been benchmarked against several known commercial ilmenites that are suitable for existing sulphate plants (Figure 28). The Thunderbird LTR ilmenite is in the highest bracket of solubility, and has a higher TiO_2 grade than all the ilmenites tested in the benchmarking exercise.

Figure 29: Primary Ilmenite Product (Left), LTR Ilmenite Product (Middle), Paint Pigment (Right)

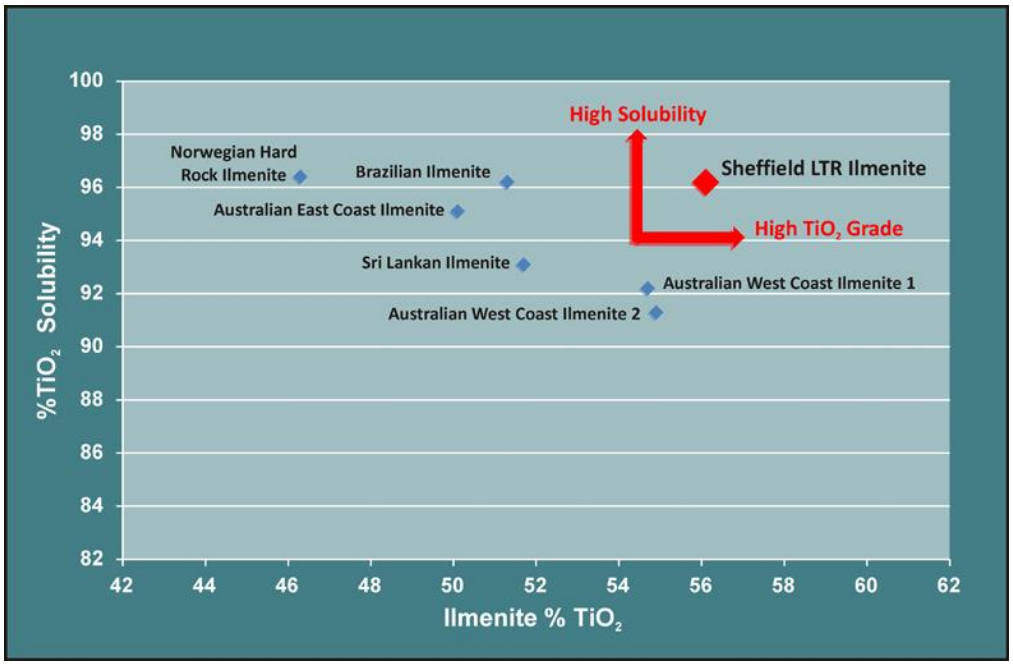

Figure 30: %TiO_2 Solubility vs Grade, Sheffield LTR Ilmenite Benchmarked against known Sulphate Ilmenites (Blue)

Testwork completed by Outotec on pre-reduced and primary ilmenite product derived from the PFS testwork, and modelling completed on LTR ilmenite, indicate that high grade TiO_2 slag and pig iron can be produced. The high grade slag product (89.8% TiO_2) compares well with competing slag products from Western and Asian smelters. The testwork showed that the LTR ilmenite is capable of producing both a high quality sulphate and chloride grade slag suitable for pigment plants, further broadening potential markets.

TZMI concluded that the LTR ilmenite would be a suitable feedstock for sulphate pigment manufacture and recommend further testing in commercial plants. TZMI also indicated that, due to low impurities, this product could be used as a preferential blend feed where other feedstocks have higher impurity levels.

TZMI's smelter simulation modelling using LTR ilmenite specifications showed that the elevated TiO_2 content of the ilmenite (56.1%) would be beneficial to the smelting operation (reducing specific energy consumption) and would allow targeting of a higher TiO_2 slag product. The TiO_2 content of the simulated slag product exceeded TiO_2 levels of typical chloride grade slags available from western ilmenite smelters.

Due to the high TiO_2 content and low Cr_2O_3 levels, TZMI indicates that a 5-10% premium to the recommended long term price of US$181/t for this product may be achievable, subject to customer testing.

TZMI indicate that there may be a market for the titanomagnetite product which is a co-product of the LTR magnetic separation stage. This product contains 22% TiO_2, 56.6% Fe_2O_3 and 11.9% FeO. The target market for this product is blast furnace protection in the steelmaking industry. This product has not been factored into the PFS, but will be investigated further during the DFS.

Primary Ilmenite (1% of revenue)

The primary ilmenite product (45.8% TiO_2) is a suitable feedstock for the sulphate-route TiO_2 pigment process. Despite elevated iron oxide levels, the low levels of alkalis and chromium make this ilmenite an attractive feedstock for blending with ilmenite from other sources with higher levels of these contaminants. TZMI recommend a long term price of US$135/t for this product.

HiTi88 (8% of revenue)

TZMI indicate that the likely end use market for the HiTi88 product (87.7% TiO_2 content) would be welding electrode application, particularly for flux core wires. Another alternative market would be the titanium sponge markets which are based on molten salt chlorination technology.

Figure 31: Titanium End Uses: Titanium Metal, Paints and Flux Cored Wires

FINANCIAL EVALUATION

A discounted cash flow ("DCF") analysis has been undertaken on the Thunderbird Project incorporating the estimated capital costs (including contingency), operating costs and revenue assumptions outlined above. The financial analysis uses TZMI's long term forecast prices specific to Thunderbird planned products. The key financial parameters for the project are set out in Table 11.

Table 11: Key Financial Outcomes and Assumptions

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

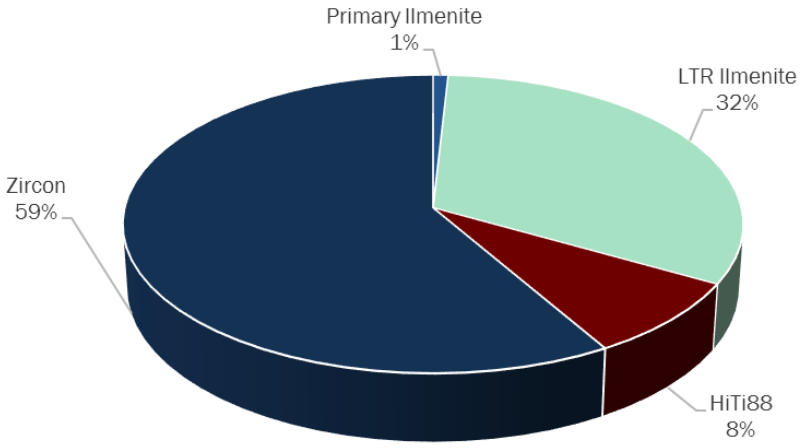

Figure 29: LOM revenue distribution

UPSIDE POTENTIAL

During the DFS, Sheffield will explore several opportunities to further improve the Project's strong financial returns, for example:

- CAPEX and OPEX savings in the lower cost, post mining boom pricing environment (Sheffield notes that quotes for various items were in decline up until completion of the PFS update, with more savings likely to come prior to completion of the DFS)
- Optimisation of process design, focused on increasing processing efficiency and product recoveries
- Further product optimisation work targeting customer requirements and extra revenues, such as:
  - Producing a marketable titanomagnetite product from the LTR process magnetic fraction
  - Customer testing of LTR ilmenite, targeting a 5-10% pricing premium indicated by TZMI
- Assess more efficient mining configurations to reduce mining costs
- Exploration upside, focused on shallow, high grade deposits

NEXT STEPS

Sheffield is well positioned to complete the Thunderbird DFS in 2016. A substantial proportion of the field component, including infill drilling and collection of a 100t of bulk sample, has already been completed. Next steps include:

- DFS Study Manager appointment
- DFS to be tendered
- 20t Bulk sample metallurgical test work and flow sheet optimisation to commence in Q4 2015
- Engineering review and de-bottlenecking studies scheduled for Q1 2016
- Port lease agreement
- Native title agreement and permitting

PROXIMAL TO MARKETS AND THE WORLD'S LARGEST ECONOMIES

THUNDERBIRD LINKED TO GROWTH IN GLOBAL CONSTRUCTION

Figure 30: Construction, Ceramics and Paints

ENDS

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COMPLIANCE STATEMENTS

PREVIOUSLY REPORTED INFORMATION

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

- Derby Port: *"SHEFFIELD GRANTED PREFERRED PROPONENT STATUS FOR DERBY WHARF BULK HANDLING FACILITY"* 2 March, 2015
- Geotechnical Investigations: *"THUNDERBIRD MINERAL SANDS PROJECT UPDATE"* 17 March, 2015
- Thunderbird Pre-feasibility study: *"PRE-FEASIBILITY STUDY CONFIRMS THUNDERBIRD AS NEXT MAJOR MINERAL SANDS PROJECT IN GLOBAL DEVELOPMENT PIPELINE"* 14 May 2015
- Thunderbird High Grade Resource Update: *"THUNDERBIRD HIGH GRADE RESOURCE UPDATE"* 31 July 2015
- Bulk Sample Collection: *"CONVENTIONAL DOZER TRAP MINING ASSESSED AS PREFERRED MINING METHOD AT THUNDERBIRD"* 17 September, 2015
- Night Train discovery: *"NEW MINERAL SANDS DISCOVERY AT NIGHT TRAIN"* 22 September, 2015

These announcements are available on Sheffield Resources Ltd's web site www.sheffieldresources.com.au.

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

FORWARD LOOKING AND CAUTIONARY STATEMENTS

Some statements in this report regarding estimates or future events are forward-looking statements. They involve risk and uncertainties that could cause actual results to differ from estimated results. Forward-looking statements include, but are not limited to, statements concerning the Company's exploration programme, outlook, target sizes and mineralised material estimates. They include statements preceded by words such as "anticipated", "expected", "targeting", "likely", "scheduled", "intends", "potential", "prospective" and similar expressions.

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

ABOUT SHEFFIELD RESOURCES

Sheffield Resources Limited (**Sheffield**) is focused on developing its 100% owned, world class Thunderbird Mineral Sands Project, located near Derby in Western Australia.

ASX Code:	SFX	Market Cap @ 48cps	$64.5m
Issued shares:	134.4m	Cash: $5.1m (at 30 June 2015)	

THUNDERBIRD MINERAL SANDS

Thunderbird is one of the largest and highest grade mineral sands discoveries in the last 30 years.

The deposit is rich in zircon, which sets it apart from many of the world's operating and undeveloped mineral sands projects which are dominated by lower value ilmenite.

Sheffield's Pre-feasibility study shows Thunderbird is a modest capex project that generates strong cash margins from globally significant levels of production over a 40 year mine life.

The Company is targeting project construction commencing 2017 and initial production in 2019. The initial planned production profile is aligned with expected emerging supply gaps in global mineral sands markets.

NICKEL-COPPER

Sheffield has over 2,000km^2 of 100% owned tenure in the Fraser Range region of Western Australia, including the Red Bull project which is within 20km of the Nova Ni-Cu deposit. The Company is exploring the region for magmatic nickel deposits similar to Nova.

Appendix 1: Thunderbird Deposit Mineral Resource 31 July 2015

Table 2: Thunderbird Deposit Mineral Resource[1]

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

Table 3: Thunderbird Deposit Contained Valuable HM (VHM) Resource Inventory[1]

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

[1] All tonnages and grades have been rounded to reflect the relative uncertainty of the estimate, thus sum of columns may not equal. [2] Estimates of Mineral Assemblage are presented as percentages of the Heavy Mineral (HM) component of the deposit, as determined by magnetic separation, QEMSCAN and XRF. Magnetic fractions were analysed by QEMSCAN for mineral determination as follows: Ilmenite: 40-70% TiO_2 >90% Liberation; Leucoxene: 70-94% TiO_2 >90% Liberation; High Titanium Leucoxene (HiTi Leucoxene): >94% TiO_2 >90% Liberation; and Zircon: 66.7% ZrO_2+HfO_2 >90% Liberation. The non-magnetic fraction was submitted for XRF analysis and minerals determined as follows: Zircon: ZrO_2+HfO_2/0.667 and High Titanium Leucoxene (HiTi Leucoxene): TiO_2/0.94.