



SheffieldResources  
LIMITED

ASX and Media Release

14 April, 2014

## SCOPING STUDY HIGHLIGHTS THUNDERBIRD'S EXCEPTIONAL FINANCIAL RETURNS

### KEY SCOPING STUDY OUTCOMES

- Scoping Study demonstrates Thunderbird is a world class, long life mineral sands project that is anticipated to provide exceptional financial returns with modest capital requirements.
- Projected and estimated production and financial parameters are as follows:
  - Initial mine life of 32 years, targeting first production in 2017
  - Life of mine (LOM) revenue of \$10.0 billion
  - LOM operating cash flow of \$5.0 billion\* (\$204 million per annum for first 10 years of production)
  - Average LOM annual EBITDA of \$140 million (\$187 million per annum for first 10 years of production)
  - Pre-production capital expenditure of \$257 million plus \$37 million of contingency, with identified opportunities that may reduce capital expenditure
  - Capital payback in 2.0 years
  - Average annual production of 118,200 tonnes zircon, 545,000 tonnes ilmenite, and 21,700 tonnes of HiTi80 leucoxene (circa 8% and 4% of global zircon and ilmenite markets respectively)
  - Very low LOM strip ratio of 0.6:1 (first 10 years 0.2:1)
- Scoping study incorporates only Indicated and Measured Mineral Resources
- Considerable upside potential – high grade Inferred Resources excluded from the current study and mineralisation remains open in several directions
- Pre-feasibility studies commenced with completion anticipated Q1 2015

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Mineral sands developer Sheffield Resources Limited (ASX:SFX) ("Sheffield" or the "Company") today announced the results of a comprehensive Scoping Study for its 100% owned Thunderbird deposit, located near Derby in northwest Western Australia (Figure 1).

This follows an updated mineral resource for Thunderbird of **2.62Bt @ 6.5% HM** (Measured, Indicated and Inferred) for **170Mt of contained HM**, including a high grade component of **740Mt @ 12.1% HM** (Table 1, Appendix 1), announced to the ASX on 19 March 2014.

Managing Director, Bruce McQuitty said the results of the Scoping Study demonstrate exceptional financial returns over a long mine life, underlining the Thunderbird project's world class status.

*"The Scoping Study has demonstrated Thunderbird has the potential to generate consistently strong cash margins from globally significant levels of production over a 32 year mine life."*

*"At the current modelled production rates, Thunderbird will supply approximately 8% and 4% of the global zircon and ilmenite markets respectively. Furthermore, the large scale and favourable geometry of the deposit are conducive to significant production expansions."*

\*Excluding taxes, royalties, closure costs, sale of capital equipment

"The strong LOM cash flows are supported by a 30% higher cash flow in the first 10 years of operations, advantaging estimated capital payback and project financing."

"We have commenced the Pre-feasibility Study, during which opportunities will be pursued to enhance the already outstanding margins and reduce the modest development capital requirement. We look forward to progressing towards the development of the project, targeting initial production in 2017."

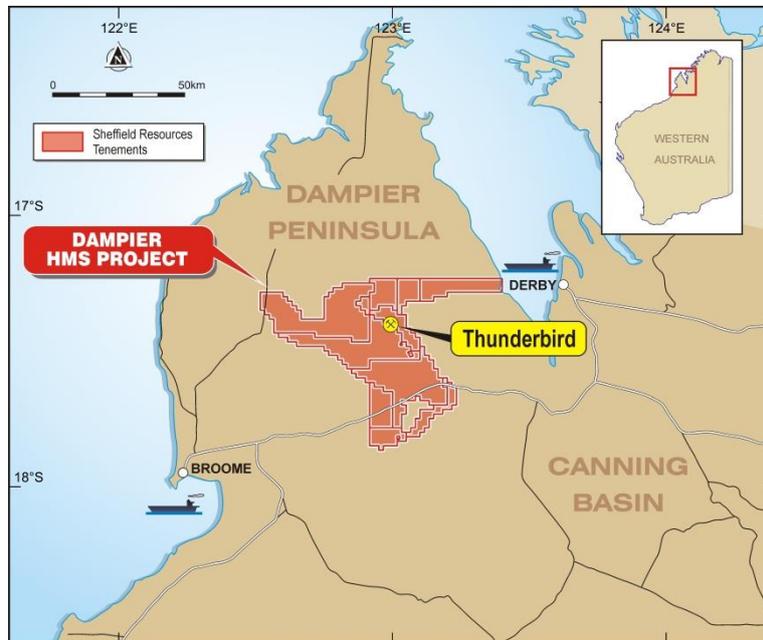


Figure 1: Location of Thunderbird deposit

## SUMMARY

The Scoping Study was compiled with the assistance of engineers RJ Robbins and Associates and Engineering and Project Management Services (EPMS), and metallurgical consultants Robbins Metallurgy Pty Ltd. Pit optimisation was undertaken by Creative Mined Pty Ltd and financial modelling was completed by Northwind Resources Pty Ltd. Mineral sands industry experts TZMI and Chinese group Ruidow were engaged to review the quality of the Thunderbird products and to provide advice on markets and prices.

The Scoping Study highlights the world class status of the Thunderbird deposit, which is characterised by:

- large scale;
- high grade;
- thick, sheet-like ore body geometry;
- low stripping ratio;
- conventional processing flowsheet;
- modest pre-production capital requirement;
- favourable location and logistics; and
- readily saleable products.

Average annual production following ramp-up to a 20.8 Mtpa mining rate is estimated to be **118,200t zircon**, **545,000t ilmenite** and **21,700t HiTi80** over an initial mine life of 32 years, which will position Sheffield as a globally significant mineral sands producer. During the first 10 years the projected annual zircon production averages **135,100tpa**.

The mining inventory that forms the basis of the Scoping Study was derived from an optimised pit shell giving a **32 year mine life** and comprises **669 million tonnes averaging 10.2% HM** (Measured and Indicated Resources).

At the assumed pricing of US\$1,475/t for zircon, US\$185/t for ilmenite and US\$870 for HiTi80 leucoxene over the life of the mine, and a A\$/US\$ exchange rate of US\$0.90, the project is anticipated to generate average operating cash flows of \$156 million per annum. The life of mine revenue is forecast to be \$10.0 billion and C1 cash operating costs over life of mine are \$5.0 billion\*.

## MINERAL RESOURCES AND MINING INVENTORY

The Scoping Study is based on the Thunderbird Mineral Resource announced on 19 March 2014 which was completed in accordance with the JORC Code (2012 edition) and is summarised in Table 1.

**Table 1: Thunderbird Deposit Mineral Resource<sup>1</sup> Summary**

Resource Category	Cut-off HM%	Mineral Resources		Valuable HM Grade (In-situ) <sup>2</sup>			
		Material Million Tonnes <sup>3</sup>	HM %	Zircon %	HiTi Leucoxene %	Leucoxene %	Ilmenite %
Measured	3.0	75	7.5	0.68	0.20	0.18	2.2
Indicated	3.0	1,805	6.8	0.56	0.19	0.20	1.9
Inferred	3.0	740	5.7	0.49	0.17	0.20	1.6
<b>Total</b>	<b>3.0</b>	<b>2,620</b>	<b>6.5</b>	<b>0.55</b>	<b>0.18</b>	<b>0.20</b>	<b>1.8</b>
Measured	7.5	30	12.2	1.1	0.32	0.26	3.6
Indicated	7.5	545	12.5	0.94	0.29	0.25	3.5
Inferred	7.5	165	10.9	0.84	0.27	0.24	3.2
<b>Total</b>	<b>7.5</b>	<b>740</b>	<b>12.1</b>	<b>0.92</b>	<b>0.29</b>	<b>0.25</b>	<b>3.4</b>

The mining inventory that forms the basis of the Scoping Study is from the northern central portion of the Thunderbird Mineral Resource and comprises **669Mt at 10.2% HM, with in-situ grades of 0.83% zircon, 0.27% HiTi leucoxene, 0.26% leucoxene and 2.9% ilmenite** (from Measured and Indicated Resources only).

The mining inventory is based on pit optimisation studies which took into account a range of modifying factors such as mining loss, mineral recovery and pit wall slope. No dilution factor was applied due to the thick, continuous nature of the mineralisation.

In the down-dip and up-dip directions the pit optimisation is limited to the extents of the Indicated Mineral Resource (Figures 2-6). Inferred Mineral Resources were excluded from the optimisation because they have a lower level of geological confidence. Due to the high rate of conversion of Mineral Resources from the Inferred to the Indicated categories at Thunderbird to-date, Sheffield believes there is potential to expand the mining inventory in the up-dip and down-dip directions, subject to further drilling and exploration success. There is, however, no certainty that further exploration work will result in the conversion of Inferred Mineral Resources to Indicated or Measured Mineral Resources.

<sup>1</sup> Data is sourced from detailed resource tabulation in Appendix 1.

<sup>2</sup> 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.

<sup>3</sup> Tonnes and grades have been rounded to reflect the relative uncertainty of the estimate.

\*Excluding taxes, royalties, closure costs, sale of capital equipment

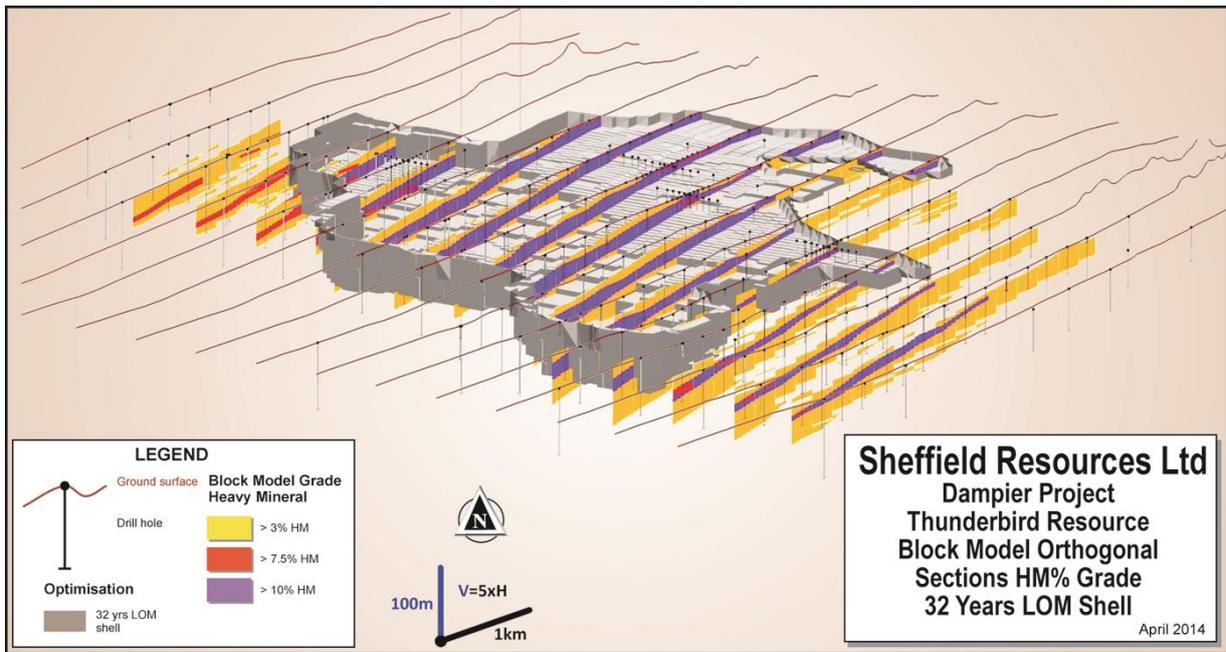


Figure 2: Oblique view of the Thunderbird Deposit 32 Year Pit Shell Outline on stacked sections

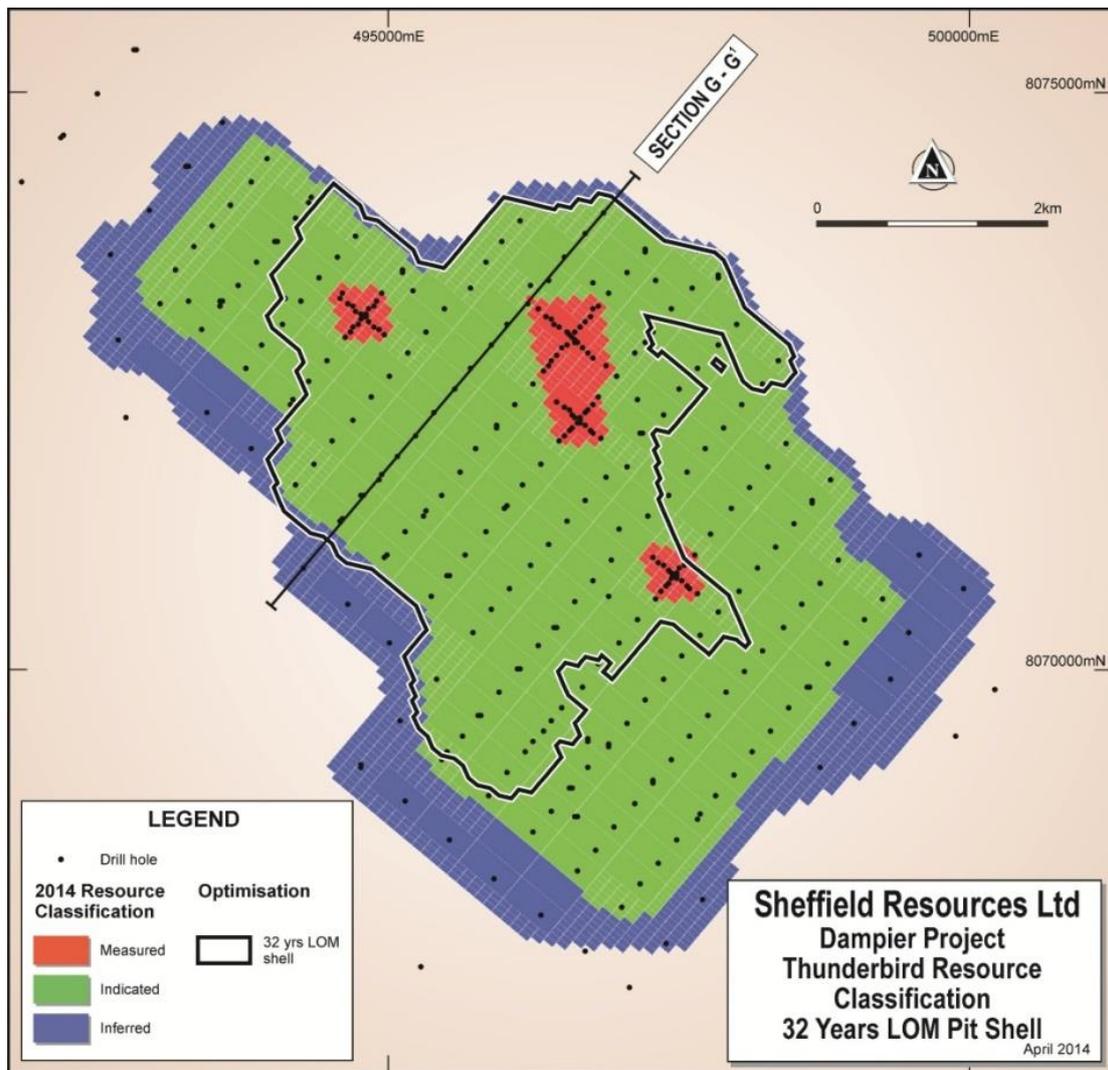


Figure 3: Thunderbird Deposit 32 Year Pit Shell Outline on Mineral Resource Classifications

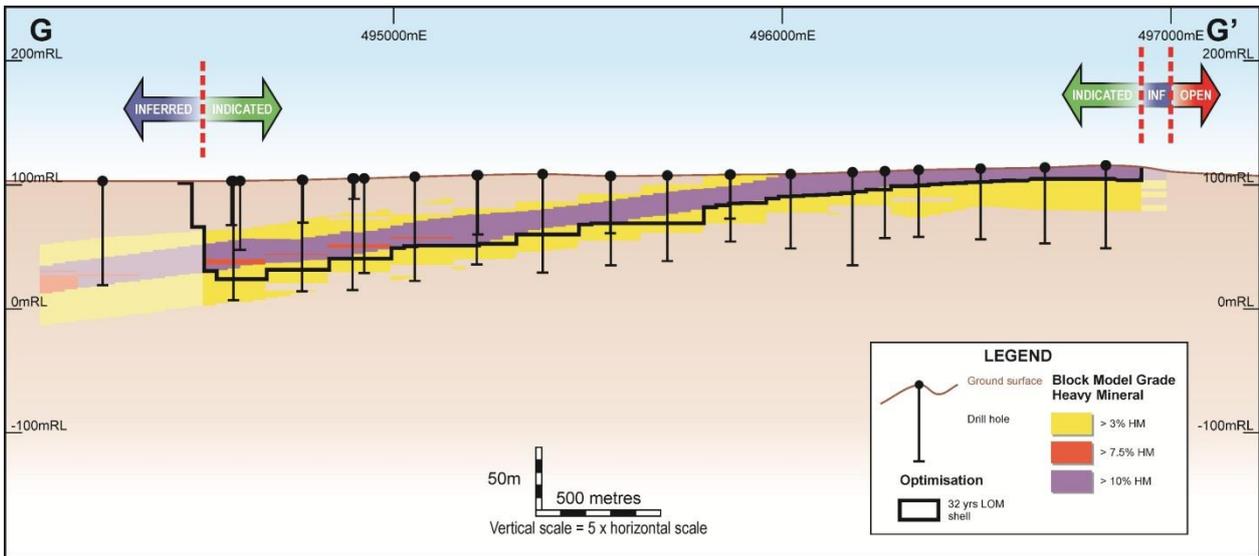


Figure 4: Cross-section G-G' through the Thunderbird resource block model showing the 32 Year Pit Shell Outline in relation to Mineral Resource Classifications

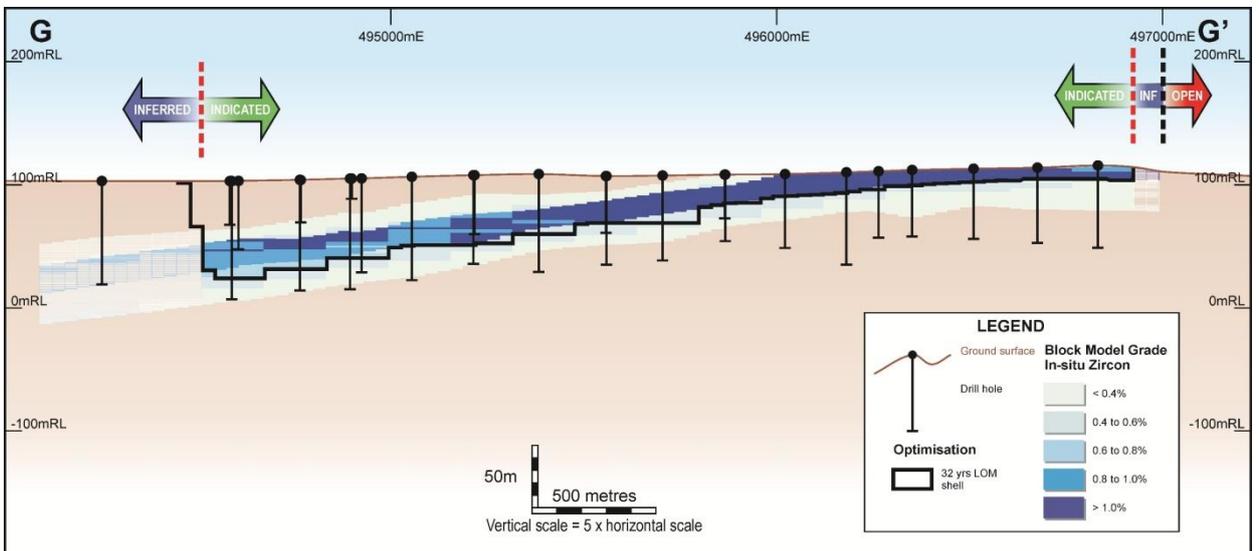


Figure 5: Cross-section G-G' through the Thunderbird deposit showing the 32 Year Pit Shell Outline and resource block model in situ zircon grades

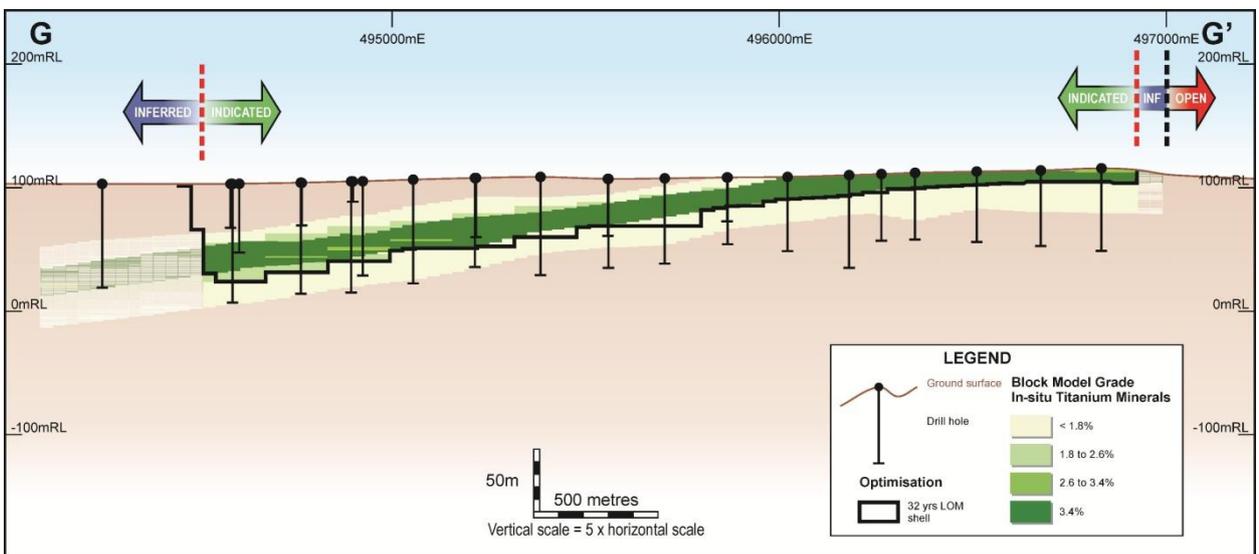


Figure 6: Cross-section G-G' through the Thunderbird deposit showing the 32 Year Pit Shell Outline and resource block model in situ titanium mineral grades

## **METALLURGY & PRODUCTS**

A processing flowsheet has been developed on the basis of metallurgical process flow diagrams produced by test programmes on two bulk samples totalling 11 tonnes, collected from drill samples. The test programmes were conducted by Robbins Metallurgical Pty Ltd and comprised feed preparation screening and scrubbing, wet concentrate spiral tests, concentrate upgrading and mineral separation testwork to design ilmenite, HiTi leucoxene and zircon circuits.

Engineers RJ Robbins and Associates developed engineering process flow diagrams from the metallurgical work to design conceptual mining, feed preparation, Wet Concentrate, Concentrate Upgrade and Mineral Separation Plants, a Process Water System and Product Loadout Plants.

From the metallurgical testwork, potential final products were obtained, the specifications of which are presented in Appendix 2. These products were assessed for their marketability by industry experts TZMI, and Chinese marketing group Ruidow Information Technology Co Ltd.

The primary zircon product meets the premium classification for the requirements of the ceramic zircon sector, and is considered readily saleable.

The primary ilmenite product is a suitable feedstock for the sulphate-route TiO<sub>2</sub> pigment process, or as a feed for either titanium sulphate- or chloride-slag manufacture. The low levels of alkalis and chromium also make this an attractive feedstock for blending with ilmenite from other deposits with higher levels of these contaminants.

Secondary ilmenite, high-TiO<sub>2</sub> leucoxene and rutile are likely to be produced in smaller volumes. These products can be combined into a HiTi80 product with specifications suited to the welding rod market. This has the advantage of simplifying the conductors circuit in the MSP.

## **MINING & PROCESSING**

The Scoping Study assumes dry mining of the Thunderbird deposit at a rate of 2,500tph using large dozers and scrapers. Ore will be screened and pumped as a slurry from relocatable skid-mounted Mining Unit Plants (MUP) for further screening, scrubbing and desliming at the Wet Concentrator Plant (WCP). Deslimed ore will be pumped to a 5-stage wet concentrator circuit.

Processing water for slurring and the WCP will be supplied by a borefield accessing the shallow fresh water aquifer underlying the deposit. Heavy mineral concentrate (HMC) from the WCP will be transported to a Concentrate Upgrade Plant (CUP), whilst thickened slimes, sand tails and oversize from the WCP will be co-disposed in the mine void.

At the CUP, magnetic and gravity circuits will separate magnetic (ilmenite-bearing) from non-magnetic (HiTi 80 and zircon-bearing) concentrates. Separate ilmenite and non-magnetic circuits within a conventional Mineral Separation Plant (MSP) will produce final products of ilmenite, zircon and HiTi 80 leucoxene for transport to port.

Inputs to the operation will comprise diesel fuel, gas for heating and drying, sulphuric acid for a hot acid leach stage in the non-magnetics circuit and lime for neutralising the acid leachate. All plant (WCP, CUP and MSP) will be located at the minesite. Power will be self-generated on site using gas or diesel fuel.

An accommodation camp for 145 personnel will be constructed at the minesite. Additional infrastructure will include an upgraded access road of approximately 35km to the Great Northern Highway.

Key project parameters are tabled below:

**Table 2: Thunderbird Scoping Study Key Project parameters**

<b>Average Mining Rate</b>	<b>mtpa</b>	<b>20.8</b>
<b>Mine Life</b>	<b>years</b>	<b>32</b>
<b>HMC Produced</b>	<b>ktpa</b>	<b>1,477</b>
<b>Production- Zircon</b>	<b>ktpa</b>	<b>118.2</b>
<b>Production-HiTi 80</b>	<b>ktpa</b>	<b>21.7</b>
<b>Production- Ilmenite</b>	<b>ktpa</b>	<b>545</b>
<b>LOM revenue</b>	<b>A\$m</b>	<b>10,010</b>
<b>Average Operating Cash Flow* (first 10 years)</b>	<b>A\$mpa</b>	<b>204</b>
<b>Average Operating Cash Flow* (LOM)</b>	<b>A\$mpa</b>	<b>156</b>
<b>EBITDA (first 10 years)</b>	<b>A\$mpa</b>	<b>187</b>
<b>EBITDA</b>	<b>A\$mpa</b>	<b>140</b>
<b>EBIT</b>	<b>A\$mpa</b>	<b>126.4</b>
<b>EBIT (first 10 years)</b>	<b>A\$mpa</b>	<b>179</b>
<b>EBIT Margin</b>	<b>A\$/tonne product</b>	<b>183</b>
<b>Unit Revenue (average LOM)</b>	<b>A\$/tonne product</b>	<b>457</b>
<b>Unit Cash Cost (exc. Royalties) (average LOM)</b>	<b>A\$/tonne product</b>	<b>230</b>
<b>Royalties (average LOM)</b>	<b>A\$/tonne product</b>	<b>22.8</b>
<b>Pre-production Capital</b>	<b>A\$m</b>	<b>257.3</b>
<b>Pre-production Capital Contingency</b>	<b>A\$m</b>	<b>36.9</b>
<b>Payback</b>	<b>Years</b>	<b>2.0</b>
<b>Strip Ratio (average LOM)</b>	<b>waste:ore</b>	<b>0.6:1</b>
<b>Strip Ratio (first 10 years)</b>	<b>waste:ore</b>	<b>0.2:1</b>

\*Excluding taxes, royalties, closure costs, sale of capital equipment

**Table 9: Thunderbird Scoping Study Key Assumptions**

<b>A\$:US\$ Exchange rate</b>		<b>0.90</b>
<b>Zircon Price</b>	<b>US\$/tonne</b>	<b>1,475</b>
<b>Ilmenite Price</b>	<b>US\$/tonne</b>	<b>185</b>
<b>HiTi 80 leucoxene Price</b>	<b>US\$/tonne</b>	<b>870</b>

Product prices used in the study were derived from a combination of price forecasts from industry sources.

Pre-production capital costs (including contingencies) are estimated at \$294m as summarised below:

**Table 10: Pre-production Capital Summary**

	<b>A\$M</b>
<b>Local site infrastructure</b>	<b>43.05</b>
<b>Mining Units</b>	<b>22.9</b>
<b>Wet Concentrator Plant</b>	<b>39.8</b>
<b>Concentrate Upgrade Plant</b>	<b>8.8</b>
<b>Mineral Separation Plant</b>	<b>47.6</b>
<b>Process Water System</b>	<b>22.9</b>
<b>Off-site Infrastructure</b>	<b>19.0</b>
<b>Labour Indirects</b>	<b>4.5</b>
<b>EPCM</b>	<b>37.8</b>
<b>Contingency (15%)</b>	<b>36.9</b>
<b>Other Costs</b>	<b>10.9</b>
<b>TOTAL</b>	<b>294.15</b>

The estimated Life of Mine sustaining capital is \$158m.

These capital expenditure estimates assume that all plant and equipment is purchased outright and new by Sheffield, except for the power plant which is leased. Options to reduce these capital costs such as the leasing of mining units, mobile plant and equipment will be considered during forthcoming feasibility studies.

Key Life of Mine operating cost parameters are tabled below:

**Table 11: Life of Mine Operating Cost Parameters**

<b>Mining</b>	<b>\$3.67/bcm</b>
<b>Mining Unit Plants</b>	<b>\$13.30/t HMC</b>
<b>Processing</b>	<b>\$72.36/t product</b>
<b>Transport, Storage, Shiploading</b>	<b>\$21.46/t product</b>
<b>Mine Administration</b>	<b>\$0.61/t MUP feed</b>

## **VALUE ENHANCEMENT OPPORTUNITIES**

Sheffield has identified a number of opportunities that could provide significant enhancement to the Thunderbird economics. These opportunities, to be evaluated during pre-feasibility, include:

- production of an ilmenite product and a non-magnetic concentrate to simplify processing, expected to lower capital costs by approximately \$60 million;
- incremental step changes in the mining rate;
- the leasing of mining units, mobile plant and equipment to lower capital costs;
- the potential for dredge mining which would significantly lower operating costs, but increase capital costs;
- using locally sourced gas from recently discovered nearby gas fields for power generation;
- using two smaller capacity WCPs to improve operational flexibility;
- further enhancement of recoveries from revised process flowsheet design;
- optimised mine scheduling based on the results of further infill drilling; and
- exploration for additional shallow high grade mineralisation.

## **NEXT STEPS**

The Company has commenced a Pre-Feasibility Study (PFS) which is expected to be completed during Q1 2015. Work conducted during the course of the PFS has the scope to further improve the already robust project economics by exploring the opportunities referred to above.

Sheffield intends to complete an infill and step-out drilling programme and a resource update by Q4 2014. Step-out drilling will target extensions of shallow, high grade mineralisation to the north and northeast of the deposit. The discovery of additional high grade mineralisation in this area is likely to further improve the project economics.

The PFS will include a hydrogeological study and a water drilling programme to model the impact of processing water abstraction and to obtain the relevant approvals. Port and infrastructure studies are planned, as is investigation of potential improvements to the processing flow sheet design.

Level 2 flora and vegetation and terrestrial and subterranean fauna assessments have already been completed over the project. Further baseline studies outside of the immediate project area are planned during 2014.

Geotechnical drilling and analysis is planned to assist with detailed mine planning studies.

Sheffield plans to complete a Definitive Feasibility Study during 2015, followed by mine construction in 2016, with first production targeted for 2017.

Throughout these processes and programmes, Sheffield will place a strong focus on increasing stakeholder engagement.

## **SCOPING STUDY PARAMETERS – CAUTIONARY STATEMENT**

The Scoping Study referred to in this report is based on low-level technical and economic assessments, and is insufficient to support estimation of Ore Reserves or to provide assurance of an economic development case at this stage, or to provide certainty that the conclusions of the Scoping Study will be realised.

Unless otherwise stated all cash flows are in Australian dollars, are undiscounted and are not subject to inflation/escalation factors and all years are calendar years. The Scoping Study financial analysis excludes the cost of pre-feasibility and bankable feasibility studies, estimated to be \$5M and \$10M, respectively.

The Company has concluded it has a reasonable basis for providing the forward looking statements included in this announcement. The detailed reasons for that conclusion are outlined throughout this announcement and in particular in the disclaimer entitled "Forward Looking and Cautionary Statements".

## **ABOUT THE THUNDERBIRD DEPOSIT**

The Thunderbird deposit occurs within Sheffield's Dampier Project, located on the Dampier Peninsula about 60km west of Derby, and 25km north of the sealed Great Northern Highway joining Derby and Broome (Figure 1).

Thunderbird is one of the largest mineral sands deposits to be discovered in the last 30 years. It has a total Mineral Resource of **2.62Bt @ 6.5% HM** (Measured, Indicated and Inferred) (at 3% HM cut-off), containing 14.3Mt of zircon, 47.9Mt of ilmenite, 5.2Mt of leucoxene and 4.7Mt of HiTi leucoxene. The resource has a coherent higher grade component of **740Mt @ 12.1% HM** (Measured, Indicated and Inferred) (at 7.5% HM cut-off) containing 6.8Mt of zircon, 2.1Mt of high-titanium leucoxene, 1.9Mt of leucoxene and 25Mt of ilmenite (Appendix 1).

The Mineral Resource is based on data from Sheffield's 2012 and 2013 aircore drilling programmes which together comprise 441 holes for 25,953m.

Mineralisation occurs as a thick, sheet-like body 8km long and between 2.5km and 5.5km wide and remains open in all directions. The mineralised horizon strikes northwest and dips very gently to the southwest, extending from surface to a maximum modelled depth of 153m. The average depth to the top of mineralisation is 21m and the average mineralised thickness is 47m. Around 32% of the total resource area occurs within 6m of surface.

Within the mineralised horizon is a thick, higher grade zone which has a north-south long axis orientation, oblique to the regional strike. The high grade mineralisation extends from 1m below surface to a maximum modelled depth of 112m.

The Thunderbird deposit is hosted by deeply weathered Cretaceous-aged formations. Its areal extent, thickness, grain size, excellent grade and geological continuity are thought to indicate an off-shore, sub-wave base depositional environment.

Sheffield geologists have defined five stratigraphic units within the deposit area, referred to locally as the Fraser Beds, Reeves, Melligo, Thunderbird and Jowlaenga Formations. Of these, the Thunderbird Formation is the main mineralised unit and comprises medium to dark brown/orange, fine to very fine well-sorted loose sands. It is over 90m thick and is very rich in heavy minerals (up to 40% HM).

Within the Thunderbird Formation are occasional layers of 20cm to 1m thick iron-cemented material interpreted to have formed by the leaching of iron oxides from iron-bearing minerals such as ilmenite. They are a minor component of the thick mineralised sequence and have a patchy distribution, rarely extending between drill holes (at 60m to 250m spacing).

Sizing analyses data indicate the heavy minerals to be fine to medium grained with a median diameter (d50) of 75-90 microns. Modern processing techniques can recover high density heavy minerals down to 38 microns.

Oversize (+1mm) levels are low to moderate, averaging 9% of the resource at the 3% cut-off grade, and 11% at the 7.5% cut-off grade. The oversize consists of granules, and quartz- and iron-cemented aggregates.

The Thunderbird resource has a moderate slimes content, averaging 17% at the 3% HM cutoff and 16% at the 7.5% HM cutoff. The slimes have favourable characteristics, including a low clay content, and exhibit high settling rates at low flocculant dosage rates of 20-30 grams per tonne.

Thunderbird is the first major mineral sands deposit to be discovered in the Canning Basin, which is rapidly emerging as an important new mineral sands province. Sheffield recently expanded its Dampier project tenure to 2,521km<sup>2</sup> and plans to explore the project area for more large scale mineral sands deposits.

ENDS

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## COMPLIANCE STATEMENTS

The information in this report that relates to results of Scoping Studies is based on information compiled by Mr Mark Teakle, a Competent Person who is a Member of the Australasian Institute of Geoscientists (AIG) and the Australasian Institute of Mining and Metallurgy (AusIMM). Mr Teakle is a full-time employee of Sheffield Resources Ltd and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Mr Teakle consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

## PREVIOUSLY REPORTED INFORMATION

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

- SHEFFIELD DOUBLES TOTAL MINERAL RESOURCES AT WORLD CLASS THUNDERBIRD HMS DEPOSIT, 19 March 2014

This report also includes information that relates to Exploration Results which were prepared and first disclosed under the JORC Code 2004. The information has not been updated since to comply with the JORC Code 2012 on the basis that the information has not materially changed since it was last reported. The information was extracted from the Company's previous ASX announcements as follows:

- Metallurgy: "WORLD CLASS STATUS OF THUNDERBIRD CONFIRMED BY METALLURGICAL TESTWORK", 25 March 2013.
- Product Quality: "THUNDERBIRD PRODUCTS CONFIRMED AS HIGHLY MARKETABLE", 1 August 2013.

These announcements are available on Sheffield Resources Ltd's web site [www.sheffieldresources.com.au](http://www.sheffieldresources.com.au).

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

## FORWARD LOOKING AND CAUTIONARY STATEMENTS

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

The Company believes it has a reasonable basis for making the forward looking statements in this announcement, including with respect to any production targets, based on the information contained in this announcement and in particular to the Mineral Resource for Thunderbird as at 19 March 2014, independently compiled by QG Pty Ltd, together with independent metallurgical, processing design, engineering, mining and marketing studies, product quality assessment, external commodity price and exchange rate forecasts and global operating cost data.

In this report the term "mining inventory" is used to report that part of the Mineral Resource that has been considered in the Scoping 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 a rapidly emerging heavy mineral sands (HMS) company.

ASX Code – SFX

Market Cap @ 70cps - \$83.7m

Issued shares – 119.6m

Cash - \$3.4m (at 31 December 2013)

Sheffield's projects are all situated within the state of Western Australia and are 100% owned by the Company.

### HEAVY MINERAL SANDS

The Dampier project, located near Derby in WA's northwest, contains the large, high grade zircon-rich Thunderbird HMS deposit. Sheffield is targeting first production from Thunderbird in 2017.

The Eneabba project comprises multiple HMS deposits and is located near Eneabba approximately 140km south of the port of Geraldton in WA's Mid-West region.

Sheffield is also evaluating the large McCalls chloride ilmenite project, located 110km to the north of Perth.

### NICKEL-COPPER

Sheffield's Red Bull project is located in the highly prospective Fraser Complex within 20km of Sirius Resources NL's (ASX:SIR) Nova Ni-Cu discovery.

### IRON

Sheffield holds four exploration licences prospective for iron in the North Pilbara region, all near existing iron ore mine sites or major development projects and within potential trucking distance of Port Hedland. The recently discovered Mt Vettel DSO deposit is the Company's current exploration focus in this region.

### POTASH

The Oxley potash project is located in the northern part of the Proterozoic Moora Basin, approximately 38km northeast of Three Springs. Sheffield is exploring the Oxley Potash project for unconventional hard rock potash mineralisation suitable for open pit mining.

**APPENDIX 1: THUNDERBIRD MINERAL RESOURCE 19 MARCH 2014**

**Table 1: Thunderbird deposit Mineral Resource<sup>1</sup>**

Resource Category	Cut off (HM%)	Mineral Resources					In-situ HM (Mt)	Mineral Assemblage <sup>2</sup>			
		Material (Mt)	Bulk Density	HM %	Slimes %	Osize %		Zircon %	HiTi Leuc %	Leuc %	Ilmenite %
Measured	3.0	75	2.1	7.5	19	11	6	9.1	2.7	2.4	30
Indicated	3.0	1,805	2.1	6.8	17	9	122	8.3	2.7	2.9	28
Inferred	3.0	740	2.0	5.7	15	9	42	8.5	2.9	3.5	29
<b>Total</b>	<b>3.0</b>	<b>2,620</b>	<b>2.1</b>	<b>6.5</b>	<b>17</b>	<b>9</b>	<b>170</b>	<b>8.4</b>	<b>2.8</b>	<b>3.0</b>	<b>28</b>
Measured	7.5	30	2.2	12.2	18	14	4	8.7	2.6	2.2	30
Indicated	7.5	545	2.1	12.5	16	11	68	7.5	2.3	2.0	28
Inferred	7.5	165	2.0	10.9	14	10	18	7.6	2.5	2.2	29
<b>Total</b>	<b>7.5</b>	<b>740</b>	<b>2.1</b>	<b>12.1</b>	<b>16</b>	<b>11</b>	<b>89</b>	<b>7.6</b>	<b>2.4</b>	<b>2.1</b>	<b>28</b>

**Table 2: Thunderbird deposit contained Valuable HM (VHM) Resource Inventory<sup>1</sup>**

Resource Category	Cut off (HM%)	Zircon (kt)	HiTi Leucoxene (kt)	Leucoxene (kt)	Ilmenite (kt)	Total VHM (kt)
Measured	3.0	510	150	140	1,660	2,450
Indicated	3.0	10,170	3,350	3,550	34,110	51,170
Inferred	3.0	3,600	1,230	1,470	12,110	18,420
<b>Total</b>	<b>3.0</b>	<b>14,280</b>	<b>4,730</b>	<b>5,150</b>	<b>47,880</b>	<b>72,040</b>
Measured	7.5	330	100	80	1,130	1,640
Indicated	7.5	5,090	1,590	1,380	18,790	26,850
Inferred	7.5	1,360	440	400	5,160	7,360
<b>Total</b>	<b>7.5</b>	<b>6,790</b>	<b>2,130</b>	<b>1,860</b>	<b>25,080</b>	<b>35,860</b>

<sup>1</sup> All tonnages and grades have been rounded to reflect the relative uncertainty of the estimate, thus sum of columns may not equal.

<sup>2</sup> Estimates of Mineral Assemblage are presented as percentages of the Heavy Mineral (HM) component of the deposit, as determined by screening, magnetic separation, QEMSCAN and XRF. Magnetic fractions were analysed by QEMSCAN for mineral determination as follows: Ilmenite: 40-70% TiO<sub>2</sub> >90% Liberation; Leucoxene: 70-94% TiO<sub>2</sub> >90% Liberation; High Titanium Leucoxene (HiTi Leucoxene): >94% TiO<sub>2</sub> >90% Liberation; and Zircon: 66.7% ZrO<sub>2</sub>+HfO<sub>2</sub> >90% Liberation. The non-magnetic fraction was submitted for XRF analysis and minerals determined as follows: Zircon: ZrO<sub>2</sub>+HfO<sub>2</sub>/0.667 and High Titanium Leucoxene (HiTi Leucoxene): TiO<sub>2</sub>/0.94.

**APPENDIX 2: PRODUCT SPECIFICATIONS**

**Table 1: Zircon Specifications**

ZrO <sub>2</sub> %	Fe <sub>2</sub> O <sub>3</sub> %	TiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	P <sub>2</sub> O <sub>5</sub> %
66.2	0.05	0.09	0.10	0.14

**Table 2: Primary Ilmenite Specifications**

TiO <sub>2</sub> %	FeO%	Fe <sub>2</sub> O <sub>3</sub> %	SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	Cr <sub>2</sub> O <sub>3</sub> %	MgO%	MnO%	ZrO <sub>2</sub> %	CaO%
50.1	8.0	36.4	1.6	0.3	0.05	0.2	1.5	<0.01	<0.01

**Table 3 Secondary Ilmenite Specifications**

TiO <sub>2</sub> %	FeO %	Fe <sub>2</sub> O <sub>3</sub> %	SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	Cr <sub>2</sub> O <sub>3</sub> %	MgO %	MnO %	ZrO <sub>2</sub> %	CaO %	P <sub>2</sub> O <sub>5</sub> %	SO <sub>3</sub> %
60.1	-	33.9	2.0	0.4	0.15	0.1	1.3	0.2	<0.01	0.06	0.07

**Table 4: Hi-TiO<sub>2</sub> Leucoxene Specifications**

TiO <sub>2</sub> %	Fe <sub>2</sub> O <sub>3</sub> %	SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	Cr <sub>2</sub> O <sub>3</sub> %	MgO %	MnO %	ZrO <sub>2</sub> %	CaO %	P <sub>2</sub> O <sub>5</sub> %	SnO <sub>2</sub> %	Nb <sub>2</sub> O <sub>5</sub> %	V <sub>2</sub> O <sub>5</sub> %
91.9	1.2	2.2	0.2	0.08	<0.01	0.03	2.5	0.03	0.09	0.17	0.6	0.2

**Table 5: Rutile Specifications**

TiO <sub>2</sub> %	Fe <sub>2</sub> O <sub>3</sub> %	SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	Cr <sub>2</sub> O <sub>3</sub> %	MgO %	MnO %	ZrO <sub>2</sub> %	CaO %	P <sub>2</sub> O <sub>5</sub> %	SnO <sub>2</sub> %	Nb <sub>2</sub> O <sub>5</sub> %	V <sub>2</sub> O <sub>5</sub> %
94.6	0.5	1.8	0.2	0.09	<0.01	<0.01	1.5	<0.01	0.03	0.26	0.37	0.3

**Table 6: HiTi80 Leucoxene Specifications**

TiO <sub>2</sub> %	Fe <sub>2</sub> O <sub>3</sub> %	SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	Cr <sub>2</sub> O <sub>3</sub> %	MgO %	MnO %	ZrO <sub>2</sub> %	CaO %	P <sub>2</sub> O <sub>5</sub> %	SnO <sub>2</sub> %	Nb <sub>2</sub> O <sub>5</sub> %	V <sub>2</sub> O <sub>5</sub> %
84.4	9.2	2.6	0.7	0.08	<0.01	0.3	0.6	0.03	0.06	0.1	0.4	0.2