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SHEFFIELD RESOURCES LTD (SFX AU, $0.47. Market cap A$162.9m)

BFS delivers a $1.3bn valuation with a simplified flowsheet for the world's largest zircon reserve. SFX NPV$_8$ now >$1.80/share

The long awaited final BFS for SFX's 50%-owned world class Thunderbird zircon/Ti feedstock project has been released. The results are significantly better than those flagged by the company, and certainly better than our now aged estimates. A revised EPC agreement has been signed with GRES which will be mobilising to site in April. Finalisation of debt funding is close. FID is scheduled for mid-year.

Commissioning remains scheduled for late next year with first sales due in early 2024.

The NPV$_8$ for the Stage 1+Stage 2 development of Thunderbird is now A$1.28bn with a long term US$1,516/t FOB zircon price and FX of 75c with an IRR of 27.5% (both post tax). We are currently working through our own valuation, but it will certainly be higher than the SFX valuation with our long term zircon price assumption at around US$1600/t. With the current spot price at over US$2000/t and the continuing tight market for the product, we believe these are both conservative forecasts.

Key to the changes to the project's scope is the production of 100% mineral sand concentrates rather than final end products. Already announced is the proposed production of a zircon concentrate to be sold to Asian concentrators. SFX will also produce an ilmenite concentrate, thereby removing the need for the low temperature roaster and an upgrading circuit. This not only has the impact of significantly simplifying the process flowsheet, but also reduces the headline capex by 8%.

As in previous iterations, the project will be developed in two stages (St2 from Year 5). The mine life is now 36 years in the current configuration. Cash costs have improved slightly, with an R/C ratio of 2.4 (Years 1-10). This is a very high margin, long mine life project.

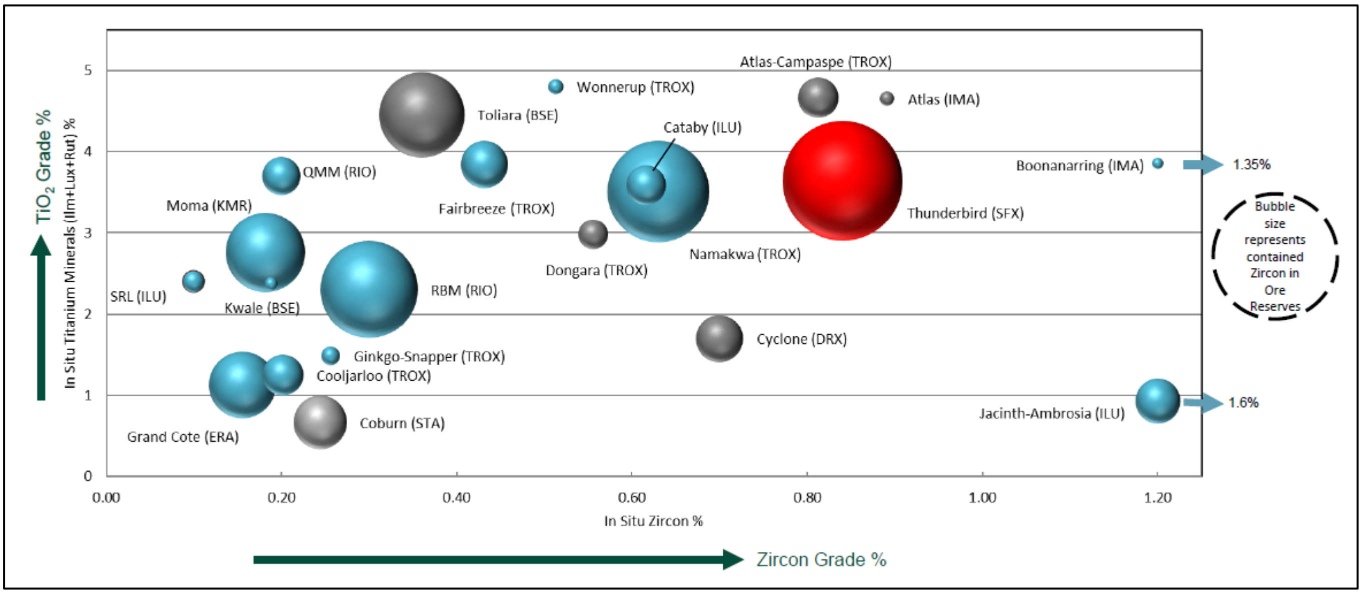
It is important to note that the combination of a lower capital requirement and the sale of non-core assets (which raised ca. $36m) appears to have removed a requirement for any further equity by SFX. (A modest equity raise had been flagged).

With minor adjustments to this valuation (netting out modest overheads) the base case valuation is estimated at A$1.80/share. With our higher zircon price assumptions (US$1600/t), this is likely to be higher again. Our previous valuation was $1.70/share, which adopted quite different project inputs and a modest equity raise.

Hats off to SFX management. The current proposal looks to be much more 'do-able' than options we've seen for Thunderbird in the past and with significantly lower start-up risk.

We anticipate continued rerating of SFX as the debt is finalised and as this Tier 1 project moves into production. At the current share price, SFX is trading at a significant discount to its underlying value.

Thunderbird is the world's largest reserve of zircon



Source: SFX presentation

As we discuss in the section on "Commodities" below, Thunderbird is now the most significant new source of zircon for the world's zircon industry for the next 3-4 decades at least.

The Thunderbird BFS – a simplified, lower capex project with robust returns

The following detail is important in understanding what is a significant improvement in project value (with only a modest increase in underlying commodity prices) and a decrease in pre-production capex. There is no doubt that the involvement of 50% partner Yansteel has been critical to this outcome.

New process flowsheet
See Appendix 1 for a graphical summary of the changes to the process flowsheet. In summary:

- A two stage development, initially mining at a 1250 tph rate and expanding to 1750tph from year 5 (largely unchanged).
- Processing rate of 1085tph (Stage 1), duplicated for Stage 2 (unchanged).
- Scrubbing, screening, desliming (unchanged)
- Primary wet concentration followed by concentrate upgrade plant (unchanged)
- Magnetic separation with non-magnetics (mainly zircon) to finisher spirals to produce a zircon-rich concentrate (significantly simplified, removing the hot acid leach circuit and final dry plant which produced a final pure zircon stream).
- Magnetic fraction reports straight to a TiO_2 rich (ilmenite) concentrate for sale to Yansteel as feedstock for a pigment plant, currently under construction (significantly simplified with the removal of the low temperature roast and ilmenite upgrading circuits).

This has resulted in a +8% reduction in capital for the project and a significant simplification of the process flowsheet.

Concentrate products

- **Zircon**: As already proposed by SFX, the bulk of the project's revenue, zircon, will be sold to Asian concentrators as a non-magnetic concentrate. Key elements are:
  - Around 200,000 tonnes per year (Stage 1)
  - Around 37% ZrO_2, 26% TiO_2, 1% monazite
  - Binding contracts with 3 customers, 5 years take or pay for 170,000 tonnes per year. Here the price is linked to the market price for contained valuable minerals.
  - Pricing between US$685 and 887/t.
  - Life of mine non-mag concentrate is estimated to make up around 59% of total revenue using TZMI's forecasts.
- **Ilmenite**: The current announcement highlights the removal of the low temperature roaster (LTR) from the circuit. This will result in a magnetic concentrate with the following key features:
  - The production of around 750,000 tonnes per year (Stage 1) expanding to over 1000ktpa in Stage 2.
  - Around 39% TiO_2 and >50% total iron.
  - Pricing between US$119 and 134/t
  - Life of mine mag concentrate is estimated to make up around 37% of total revenue.
  - A 100% binding offtake is in place with Yansteel for this material.
- **Other revenue**: Around 4% of revenue is estimated to come from a so-called paramagnetic concentrate (low Zr, low Ti, medium Fe).

Those with good memories will draw some parallels with a previous proposal, when SFX was in dialogue with zircon major Bengbu. As SFX highlight in this release, KMS will have a high degree of security of offtake with Yansteel as the company is already constructing a vertically integrated concentrator/smelter/pigment complex in China. The plant is designed to process ilmenite concentrates from a variety of sources, including from Thunderbird.

Capital, operating costs, mine life

- Simplification of the flowsheet had enabled the pre-production capex for Stage 1 of Thunderbird to be reduced from that estimated in the 2019 BFSU. As summarised in Appendix 1 of this note, pre-production capex is now estimated at A$361m (including $36m spent to March '22 on the BFS and early works). This is some 8.5% lower than the BFSU and has had to absorb quite significant cost inflation which is currently ravaging the WA mining industry.
- The operating costs on an R/C metric have improved slightly, from 2.3 to 2.4. This cements Thunderbird in the most attractive quartile of the global mineral sands cost curve.
- The mine life is now 36 years, down a year from the BFSU and 7 years from the original BFS. As we know the exploration potential to the south of Thunderbird is excellent. Mine life is the least of our concerns.

Funding Thunderbird

- This is clearly critical for KMS (and SFX), and it has been an issue which has dogged the project for several years.
- We believe debt funding is close to conclusion, with an amount of $300-320m targeted. This is forecast to cover around 65% of the total funding requirement for the project of $484m. This is expected to come from NAIF (>10 year tenor) and a source of commercial debt. We

would expect SFX to follow the lead set by Strandline (STA ASX) and use Nordic Bonds. NAIF approval is due in 2Q22.

- The following table summarises the sources and uses of funds:

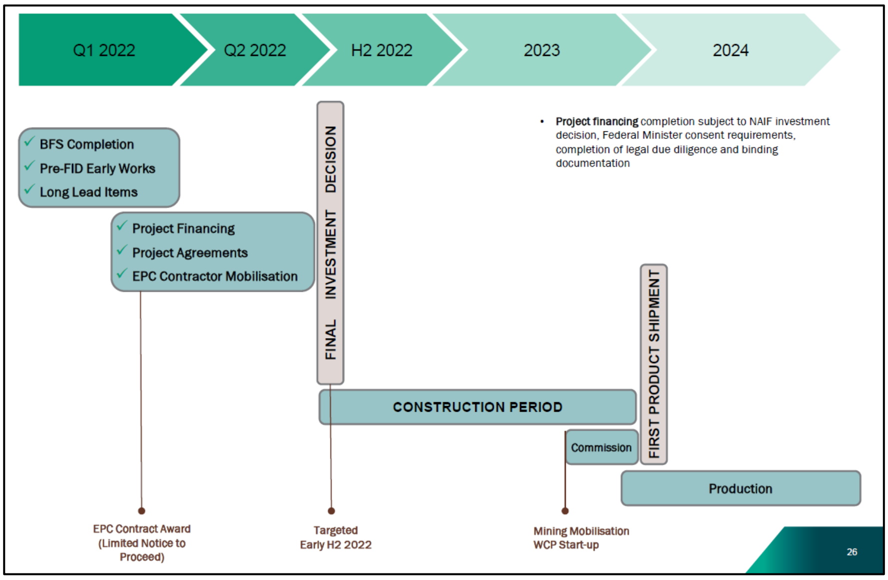
Thunderbird project, sources and uses of funds (KMS JV basis)	
Uses of funds	(m)
Pre-production capex	$361
Working capital	$20
Financing costs	$62
Cost overrun	$40
	$484
Sources of funds	
Senior debt (approx. Range $310-320m)	$317
JV cash on hand (approx)*	$105
Additional equity (approx)**	$62
	$484
*JV cash at 12/21 was $107m	
**Contribution from SFX	$36

Source: SFX presentation and 2022 interim report

- We estimate SFX's cash balance to be around $40m so sufficient to fund a $36m additional equity top-up for the JV. There seems to be no requirement for further equity from SFX, as had been flagged in previous releases.

Timetable

- No changes to earlier timetables, with FID early in the June half and with mobilisation to start immediately after the Northern Australian wet (April) with first shipments early 2024. This is summarised with the following chart.



Source: SFX presentation

Valuation
The following table presents our interim valuation for SFX of $1.80/share, after tax and fully funded, and is based on the company valuation of A$1.3Bn for 100% of the Thunderbird project.

We are currently working through the detail of the BFS release and will update our Thunderbird model accordingly. As we discuss above, we believe that using our long term zircon price of US$1600/t (FOB) will lead to a modest increase in our valuation.

Sum-of-the-Parts	A$m	Equity	Risk	A$m	A$/share
Thunderbird	1,279	50%	100%	640	1.81
Other Assets	-	100%	100%	-	-
Corporate Costs	(18)	100%	100%	(18)	(0.05)
Net Cash (Debt)	7	100%	100%	7	0.02
Cash from options & new equity		100%	100%	-	-
Total	**1,268**			**629**	**1.80**
WACC					**8.0%**
FPO Shares					347
Options					2
Performance Rights					5
Fully Diluted SOI					**354**

Source: BSCP estimates

Note the following:
- Debt will be held within the JV company Kimberley Mineral Sands.
- Project G&A is factored into KMS. The corporate costs are those associated with running SFX, who's sole asset is 50% of KMS.

Commodity outlook – zircon supply under extreme pressure

In our initiation report on SFX (November 2016) we summarised our outlook for the mineral sands industry as follows:

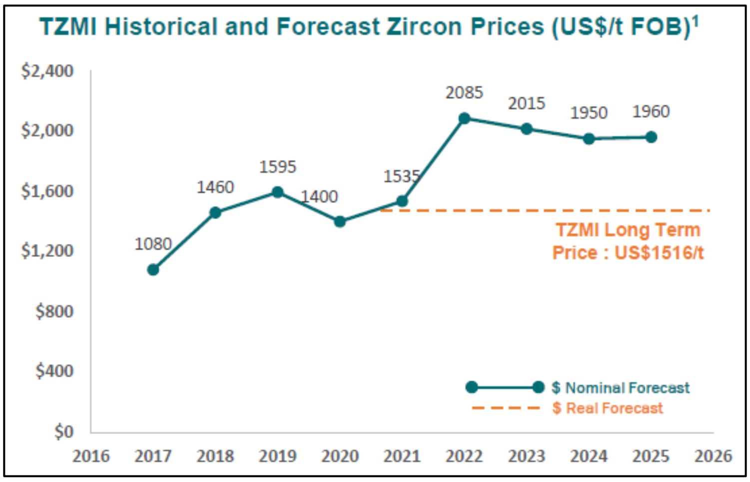
The mineral sands industry is broadly in decline, and significant additional capital will need to be spent to ensure future demand is met, particularly of TiO2 feedstock. With the maturity and slow and steady demise of the Tier 1 mineral sand deposits (in particular Southern Africa and the Perth and Murray Basins) the world is becoming overdue for a new long term source of stable supply, preferably in a geopolitically stable environment. The best new projects will be those that can supply both ilmenite (with or without rutile) and zircon, at low costs of production.

Roll on 5+ years and the supply side has played out far worse than we predicted. The once proud Richards Bay Minerals is a shambles, and has only just come out of force majeur declared last year. In our view, there is little chance that its replacement, Zulti South, will come into production. Major Australian zircon producers are mature, with one major source of supply, Iluka's Jacinth Ambrosia project, in decline with production to soon be supplemented with lower grade satellite orebodies. The number of greenfield projects ready for production we can count on the fingers of one hand. The industry is fraught with permitting delays.

We are expecting global zircon supply to peak in over the next 12 months and decline at perhaps 3-4% per year on average out to 2030. An expanding supply deficit appears certain to develop over the next 2-4 years. Over the past few years the deficit has been filled with swing production, mainly sourced by Iluka and the reprocessing of previously processed tailings. Asian suppliers (especially from the alluvial deposits of Indonesia) have been important, albeit small, swing producers.

How will the producers satisfy what is likely to be a 2-3% annual growth in zircon demand? Zircon supply is becoming critical in our view, and this has already seen zircon prices rally strongly with contract prices now around US$2000/t and spot prices out of Indonesia approaching US$2500/t.

The following chart illustrates the medium and long term view of industry consultants, TZMI, which forecast strong pricing over the next few years before reverting to its long term price of US$1516/t.



Source: SFX presentation

The duration of these strong prices is dependent on the time it takes to incentivise new production. We have no doubt that a number of the worlds greenfield projects are now economic, but it is far from clear when they will see the light of day. Thunderbird itself is a good example as to how major and very economic orebodies can be delayed by permitting and funding issues.

We see the following projects as those likely to fill the supply gap, but it is far from clear when many of these will come to fruition:

Project	Company	Size	First production	Status
Coburn	Strandline	Small	2023	Construction
Thunderbird	Thunderbird	Large	2024	BFS complete
Eucla satellites	Iluka	Small	2025	Permitted
Port Durnford	Tronox	Potentially large	?2025?	DFS?
Donald	Astron	Large	?2026?	Re-permitting required
Avonbank	WIM Resources	Large	?2026?	Permitting
Tolliara	Base	Moderate	?2026?	FID in 2023? Permitting risk
Balranald	Iluka	Small	?2026?	PFS
Fingerboards	Kalbar	Large	>2027	Major permitting delays
Goschen	VHM	Small	>2030	Scoping
Zulti South	RBM (Rio Tinto)	Large	??	Unlikely to proceed in the medium term

Source: company releases, BSCP

There does seem to be a major wave of zircon (and therefore ilmenite/rutile/HiTi) coming in 2026, underpinned by two large projects in the Murray Basin of Victoria, Donald and Avonbank. But given recent events in Victoria (the refusal of Kalbar's mining licence) there can be no certainty of timing for these high calibre projects.

We also have reservations regarding Zulti South, Goschen and Iluka's Balranald underground project.

To us it is quite clear that the world's zircon end-users are in urgent need of a project such as Thunderbird. If delays occur to other projects – which seem to us to be inevitable – it's possible zircon pricing will stay high to incentivise the funding and completion of Thunderbird Stage 2 earlier than is projected.

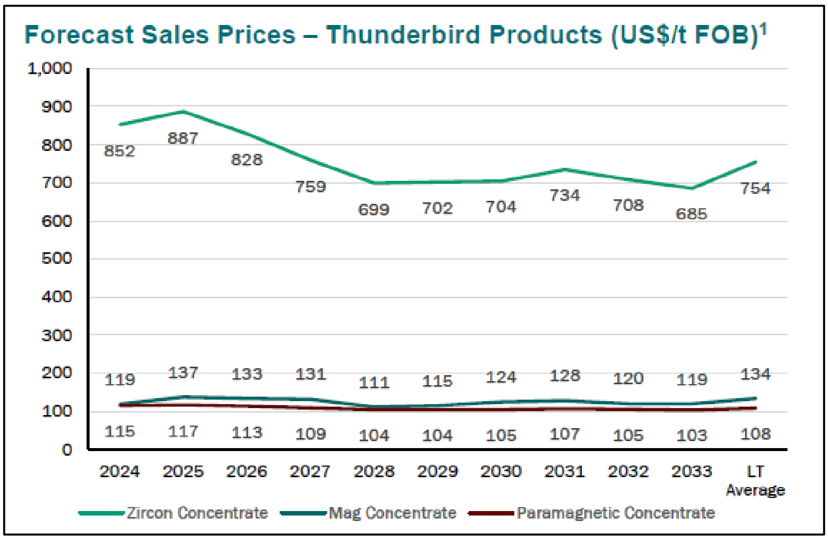
In its June 2021 SFX release provided detail regarding the pricing of zircon concentrates. Concentrates are now the largest source of zircon for Chinese markets, with the total volume of around 800,000 tonnes. This is clearly a well developed market for zircon. Each of the three main concentrate products; HMC, ZIC and Zircon (Non-Mag) concentrate has different mineral contents and expected recoveries and as a result they are valued differently by processors.

Product	Contained Minerals	Value
Heavy Mineral Concentrate (HMC)	Contains 90% Heavy Mineral including Trash Heavy Mineral. Lower value magnetic TiO_2 (ilmenite) has not have been removed	Low
Zircon In Concentrate (ZIC)	Contains harder to recover and lower quality final products and some trash material	Moderate
Zircon (or Non-Mag) Concentrate	Contains zircon, rutile, HiTi and/or monazite and is typically low in trash material and magnetic TiO_2	High

Source: SFX ASX release, June 2021

Much of the 'zircon concentrate' currently sold to the Asian concentrators is of low to moderate grade, often with low levels of premium zircon. One example we are aware of is the zircon concentrate produced by Iluka from the Eneabba tailing ponds, from which much of the premium zircon has been extracted. Thunderbird will be producing a high-value zircon (or non-magnetic) concentrate.

We have yet to drill into price forecasts of Thunderbird's concentrate but will do that following discussions with the company. The following chart presented by SFX is quite instructive and is based on TZMI's independent forecasts.



Source: SFX presentation

The early few years for Thunderbird will benefit from TZMI's forecasts of high zircon, translating into relatively high concentrate prices. Note that the ilmenite concentrate (which makes up around 37% of revenues) has been set at a fixed price for the next 5 years. 100% of the offtake has been secured with partner Yansteel, as feedstock for its pigment plant, currently under construction.

An intermediate product ('paramags') makes up under 5% of projected revenues, so is nothing more than a sweetener.

Investment overview

We anticipate continued rerating of SFX as the debt is finalised and as the project moves this Tier 1 project into production. At the current share price, SFX is trading at a significant discount to its underlying value.

Progressive rerating of the SFX share price is likely to be driven by the following:

- Finalisation of the KMS debt facility (2Q22) and a final investment decision (FID).
- Commencement of construction (2Q22).
- Commencement of commissioning of Thunderbird (4Q23).
- First sales of product (1Q24).

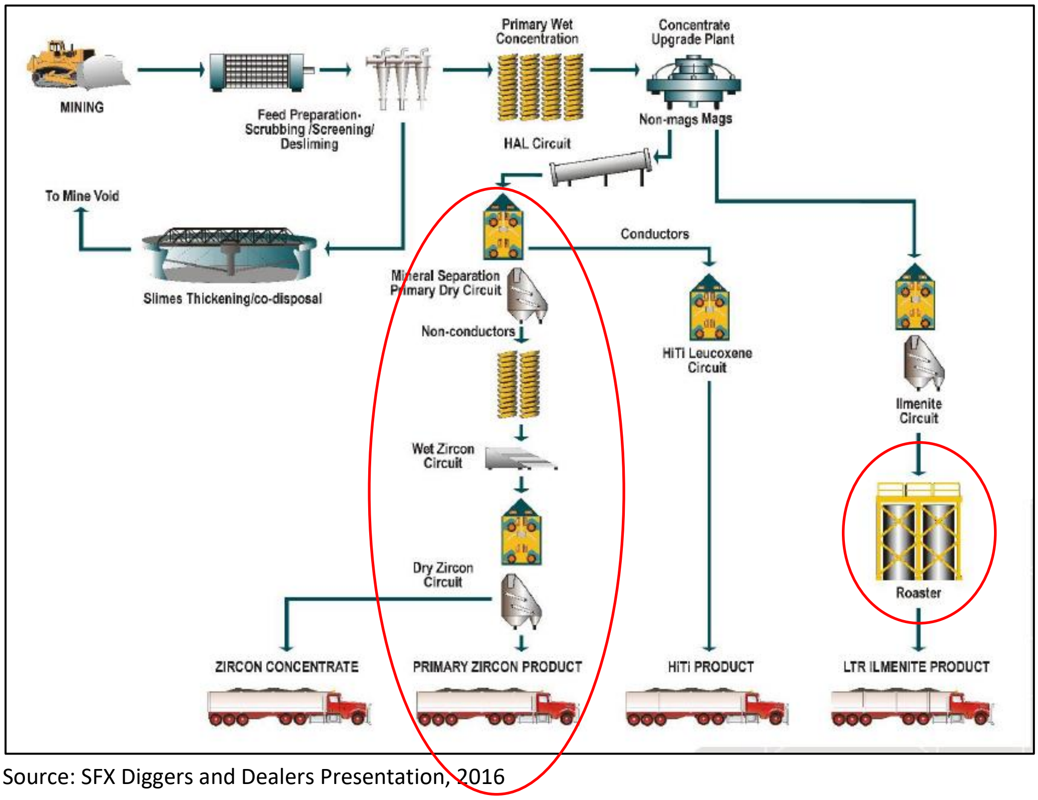
The greatly simplified flowsheet has not only reduced capital requirements, it also reduces the build time and the risk associated with project start up. The removal of the likes of the hot acid wash and low temperature roasting circuits substantially reduces start-up risk.

On top of this we see real upside to the zircon price. We note that Asian (Indonesian) zircon is now changing hands at US$2650-2800/t (CIF) basis. While these trades represent quite small tonnages, this price has become a useful lead indicator for larger contractual pricing. We don't think zircon prices (and therefore zircon concentrate pricing) are coming down any time soon.

This represents a very attractive environment to bring Thunderbird into production.

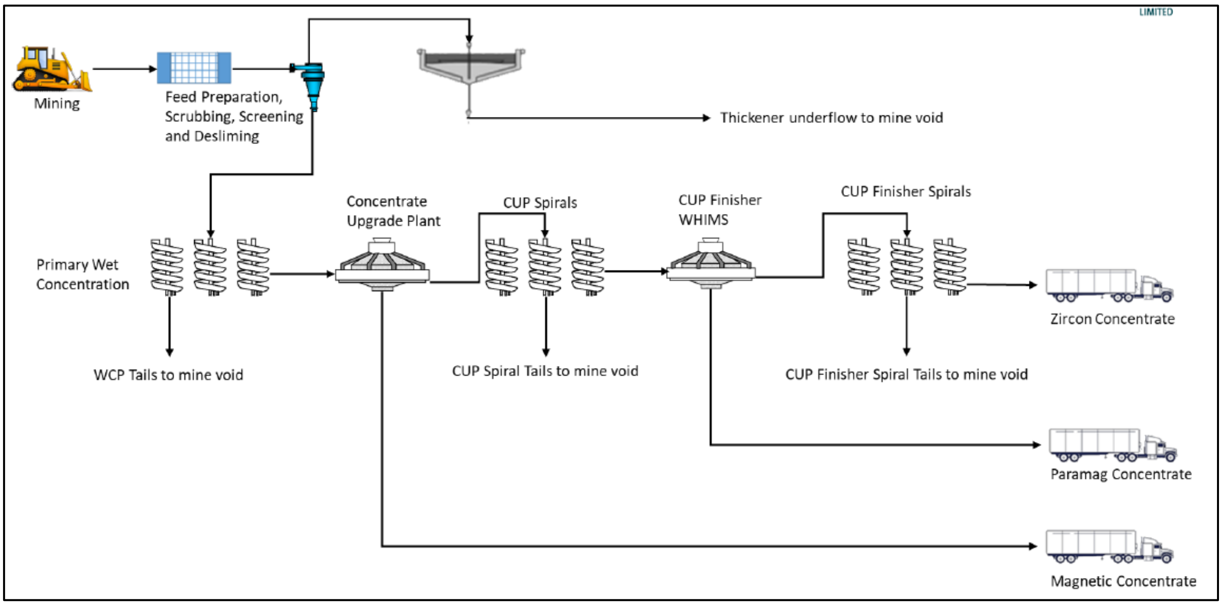
Appendix 1. Significant simplification of the Thunderbird process flow sheet

As it was proposed in 2016:



Source: SFX Diggers and Dealers Presentation, 2016

As it is now:



Source: SFX presentation 23 March 2022

The most important elements of the process design eliminated in the final BFS are highlighted with the red ovals, above. See text for more detail.

The following table summarises the key differences between the original 2017 BFS, the 2019 BFS Update (BFSU) and the final BFS.

Metric	2022 BFS	2019 BFSU[1]	2017 BFS[2]
NPV_8 post-tax	**A$1.28B**	A$0.98B	A$0.62B
IRR post-tax	**27.5%**	24.0%	20.6%
Project Capital (Stage 1)	**A$361m[4]**	A$392m	A$463m
Total Funding Requirement (Stage 1)	**A$484m**	A$478m	A$579m
Life of Mine (LOM) Revenue	**A$16.8B**	A$15.1B	A$13.6B
LOM Operating Costs	**A$7.7B**	A$7.2B	A$7.6B
EBITDA	**A$8.1B**	A$6.8B	A$5.1B
Revenue to Cost Ratio (Year 1 - 10)[3]	**2.4**	2.3	2.1
Capex Payback (Stage 1&2; years)	**5.00**	5.25	6.00
Product sales (avg kt pa; all products)	**1,424**	1,163	775
Process Rate (Stage 1; tonnes per hr)	**1,085**	1,085	788
Mine Life	**36 years**	37 years	42 years
Long Term Average FX Rate (A$/US$)	**0.75**	0.75	0.75
Long Term Zircon Price - FOB (TZMI)	**US$1,516**	US$1,469	US$1,387

Note:
1. ASX Announcement *"BFS Update Materially Improves Project Economics"* 31 July 2019
2. ASX announcement : *"Thunderbird BFS Delivers Outstanding Results" 24 March 2017*
3. *Excludes royalties and taxes*
4. *Includes approximately $36m expended to March 2022*

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Appendix 1

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