



SPEC BUY

Current Price \$0.15
Risky Valuation \$0.40

Tuesday, 3 September 2019

VRX Silica Ltd

Sands of time

Analysts | Matthew Keane | James Wilson

Quick Read

VRX Silica Ltd (VRX) has released a Bankable Feasibility Study (BFS) and maiden Ore Probable Reserve for its Arrowsmith North Silica Sands Project in Western Australia (WA). Reported metrics from the study included a 25 year mine producing ~1.8Mtpa clean silica sand generating a post-tax NPV₁₀ of \$242.3m and a 79% IRR. Pre-production capex is low at just \$28.3m. The project is technically simple incorporating free-digging of dune sands and mechanical processing to remove impurities. Arrowsmith North is the first of three potential silica sand projects in WA, for which VRX has lodged three Mining Lease Applications, including the Arrowsmith Central and Muchea projects. We regard environmental permitting and offtake contracting to be the biggest risks to the projects, however the environmental approval process is progressing and the Company has received several Letters of Intent (LOI) for product offtake. **SPEC BUY recommendation.**

Event & Impact: Release of first BFS - Positive

Strong BFS results: The Arrowsmith North BFS outlined a 25 year mine producing ~1.8Mtpa generating a post-tax NPV₁₀ of \$242.3m and a 79% IRR. Development capex is estimated at \$28.3m with ~average EBIT of \$46mpa. Applying an extended start-up rate of ~1Mtpa for three years, the payback on capital is 2.4 years. A maiden Probable Ore Reserve was defined at 223 Mt @ 99.7% SiO₂. The BFS uses just 24% of this, highlighting the potential for a +100-year operation at the 2Mtpa mining rate.

Simple operations: VRX will be mining unconsolidated sand dunes and using simple gravity and magnetic separation to upgrade silica and remove deleterious matter. Product will be pumped to a processing plant adjacent to an existing rail loop near Eneabba for transport to Geraldton Port. Over 90% of the mined material will be saleable with residue either being sold into local markets or placed back on mined areas. The operation requires no mining dumps, no process tails storage and no chemical processing. Rehabilitation will be conducted on an ongoing basis with only ~14 ha of disturbed land at any time.

First of several potential operations: VRX has also defined Resources at the Arrowsmith Central and Muchea projects (76.5Mt and 208Mt respectively). Muchea is the jewel in the crown with in-situ grades of over 99.6% SiO₂. High purity product from this project may be amenable to high-end glass and other silica markets fetching up to US\$65/t FOB. However, the projects proximity to populated areas is likely to make permitting more onerous. Argonaut estimates the three projects with a combined 6Mt pa throughput rate could generate total EBITDA of +\$130m pa. Successful permitting and market penetration from the Arrowsmith North project should pave the way for subsequent operations.

Recommendation

Argonaut's VRX valuation includes all three potential silica sand projects. We have applied discounts to account permitting, offtake and development risks (detailed on Page 9). Our risky valuation is \$0.40/sh (unrisky \$0.89/sh). We assign a SPEC BUY recommendation.

Ticker:	VRX	
Sector:	Industrial Minerals	
Shares on Issue (m):	404.3	
Market Cap (\$m):	58.6	
Net Cash (\$m):	1.5	
Enterprise Value (\$m):	57.1	
52 wk High/Low:	\$0.19	\$0.06
12m Av Daily Vol (m):	1.12	
Projects	Stage	
Arrowsmith North	BFS	
Arrowsmith Central	Advanced Exploration	
Muchea	Advanced Exploration	
Ore Reserves	Mt	SiO₂ (%)
Arrowsmith North	223	99.7
Mineral Resources	Mt	SiO₂ (%)
Arrowsmith North	771	98
Arrowsmith Central	28	97.7
Muchea	208	99.6
Arrowsmith North BFS Metrics		
Mine Life	25 Years	
Post-Tax NPV ₁₀	\$242.3m	
Post Tax IRR	79%	
Average Annual EBIT	\$45.8m	
Development Capex	\$28.3m	
Board		
Paul Boyatzis	Non-Executive Chairman	
Bruce Maluish	Managing Director	
Peter Pawlowitsch	Non-Executive Director	
Substantial Shareholders:	%	
Australian Silica Pty Ltd	16.1%	
Peter Pawlowitsch	6.3%	

Share Price Graph and ave. trading Vol (M sh/day)



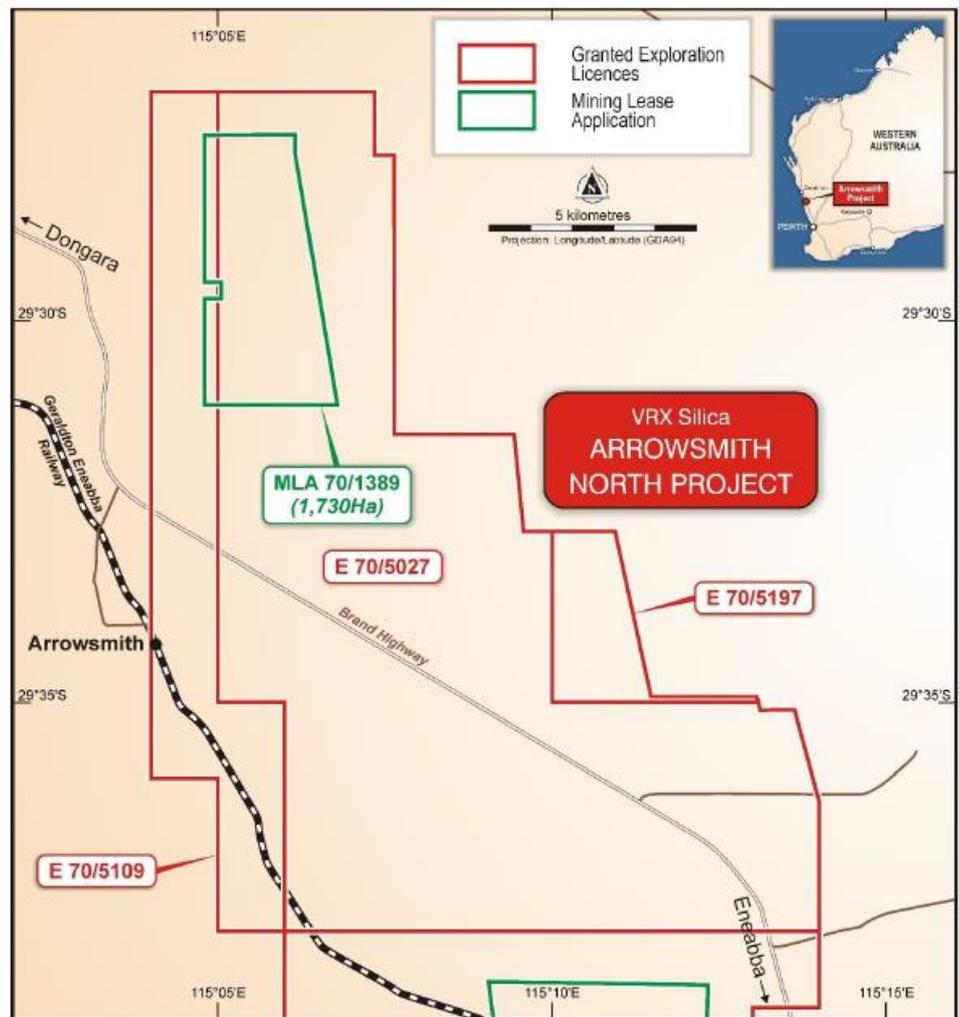
Please refer to important disclosures at end of the report (from page 12)

Project Overview

Arrowsmith is located 270km north of Perth...

Arrowsmith is located 270km north of Perth, just north of the town of Eneabba. Silica sands are deposited in a vegetated relict dune system running parallel to the coast ~10km inland. Importantly, all of VRX's projects are situated on vacant crown land with negligible residences proximal to the proposed areas of disturbance. The dunes comprise heavily leached sand, with little residual soil nutrients and therefore only vegetated by low scrub heath. A Mining Lease Application has been lodged over an area encompassing 204Mt @ 99.7% SiO₂ at Arrowsmith North.

Figure 1. Arrowsmith North project location



...on vacant crown land with access to rail and road transport routes

Source: VRX

Compelling BFS

The Company's BFS outlined a 25-year operation producing 1.8Mtpa clean silica sand

The Arrowsmith North BFS outlined a 25 year mine producing ~1.8Mtpa clean sand generating a post-tax NPV₁₀ of \$242.3m and a 79% IRR. Development capex is estimated at \$28.3m with ~average EBIT of \$46mpa. VRX estimates realised prices of US\$38-58/t (A\$54-83/t) FOB which would generate strong margins against forecast operating costs of ~A\$30/t FOB (incl. royalties). Project payback is 2.4 years, applying an extended start-up rate of ~1Mtpa for three years.

A maiden Probable Ore Reserve was defined at 223 Mt @ 99.7% SiO₂. The BFS uses just 24% of this, highlighting the potential for a +100-year operation at the 2Mtpa mining rate.

Arrowsmith generates a post-tax NPV₁₀ of \$242.3m and a 79% IRR...

...with low development capex of just \$28.3m

Table 1. Key metrics of the Arrowsmith North BFS

Post Tax, ungeared NPV ₁₀	\$242,300,000
Post Tax, ungeared NPV ₂₀	\$99,800,000
Post Tax, ungeared IRR	79%
Payback period (yrs) (post tax) (ramp up rate)	2.4
Exchange Rate US\$/A\$	\$0.70
Life of Mine (yrs) (Scope of BFS)	25
EBIT	\$1,144,000,000
Total Sales (initial 25 years) (no escalation)	\$2,773,000,000
Cashflow after finance and tax	\$835,000,000
Capex (2 mtpa)	\$28,260,000
Capex contingency (inc)	20%
Life of Mine C1 costs, FOB Geraldton (inc royalties)	\$30.18
Tonnes Processed (initial 25 years) (Mt)	53
Production Target (initial 25 years) (Mt)	47.7
Probable Ore Reserves @ 99.7% SiO ₂ (Mt)	204
Ore Reserve life (yrs)	102
JORC Resources (million tonnes)	771

Source: VRX

Access to Infrastructure

Arrowsmith sits alongside the Geraldton to Eneabba railway and adjacent to the Brand Highway. Arrowsmith North can also be accessed by the Mount Adams Road from the north. The project will require power and water infrastructure, but will not require accommodation camp due to its close proximity to the towns of Eneabba and Dongara (~30km). VRX plans to install a small 8Mw diesel power plant and water will be sourced from bores and stored on site in a dam. Note that 95% of all water is envisaged to be recycled.

Operations

VRX proposed low complexity mining, washing and transport operations.

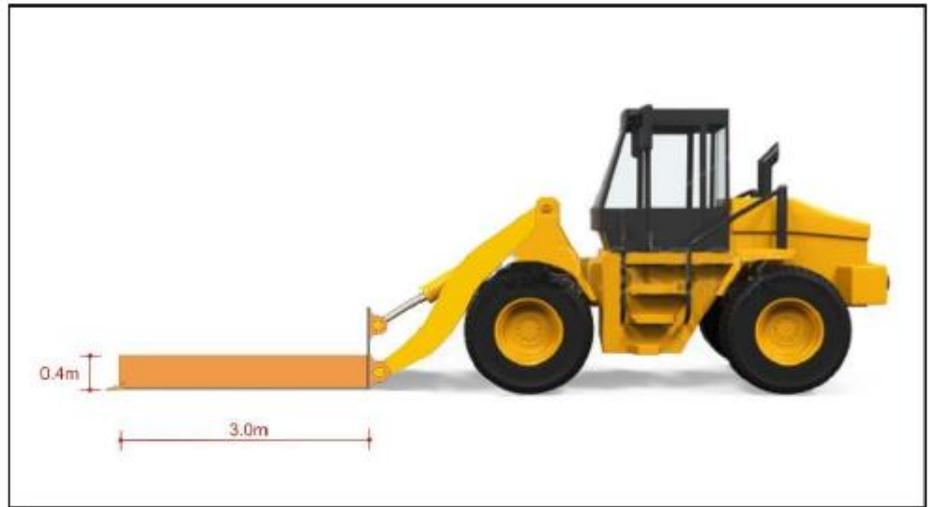
Mining and ongoing rehabilitation

Mining is free-digging and VRX will use a method of continuous rehabilitation

An initial 150m x 150m area will be cleared by bulldozers with topsoil (to ~400mm) moved to one side. A bulldozer mounted mulcher will then trip larger vegetation (0.8-1m height) before the ground is ripped to loosen shrub roots. Then VRX plans to use a process called Direct Vegetation Transfer (DVT) to pick up topsoil and low-level vegetation intact and place it on a cleared area (excavating 3m x 3m x 400mm using the front-end loader setup depicted below).

Vegetation will be directly transferred to mined out areas by taking a slice of surface topsoil...

Figure 2. Front end loader for Direct Vegetation Transfer (DVT)



Source: VRX

...and only ~14ha will remain open at any time

There will be a continuous process of clearing a 2.25ha area then rehabilitating the previously mined out area of equivalent size. Up to eight of these blocks will be mined per year. Silica sand will be mined with a front-end loader, tipped into a feeder bin and conveyed to a trommel. The trommel will screen off oversize and remove organic matter. The sand will then be slurried and pumped to a beneficiation plant, with a proposed location proximal to the Eneabba to Geraldton railway line.

Figure 3. Proposed mining process



Source: VRX

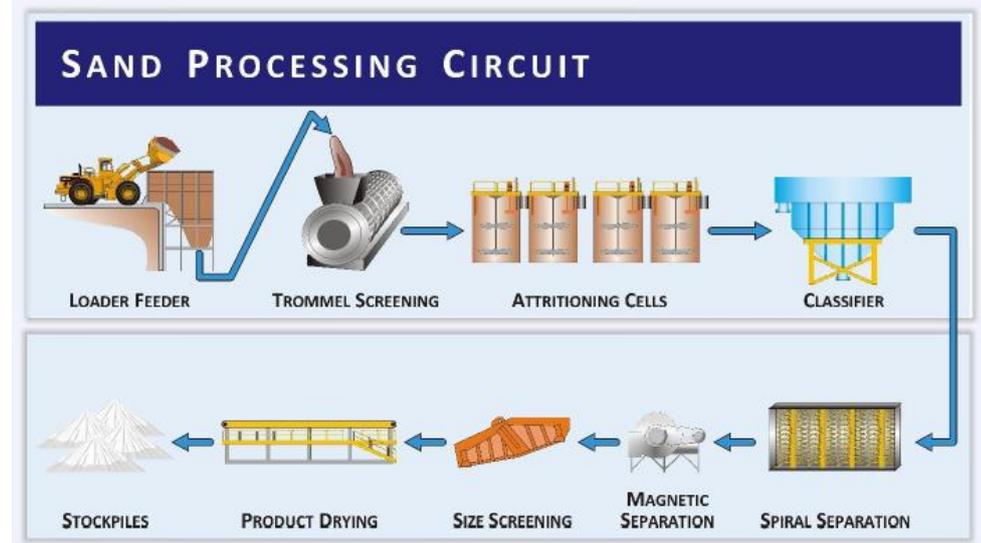
Sand will be screened of oversize and vegetation using a trommel then slurry-piped to a wash plant

Sand processing

Sand from the trommel will be attritioned in tanks to remove fine particles to reduce Al₂O₃, Fe₂O₃ and TiO₂ contents. Material will then move through spirals and magnetic separation to further remove deleterious elements, before being sized and dried into final products.

The silica sand beneficiation processes uses no chemicals and requires no tails storage facility

Figure 4. Sand processing flow sheet



Source: VRX

Both rail and port have capacity to take VRX product

Logistics

VRX plans to position its processing plant alongside the Geraldton to Eneabba Rail line. This was formerly used by Iluka’s Mineral Sands operation which is no longer operating due to mine depletion. The rail is rated at 19 tonnes per axle and is a Tier 1 railway line (note that mineral sands are heavier than silica). There is a rail turnaround at Eneabba and also a passing bay near Dongara. Arrowsmith North would most likely use the Dongara passing bay as a loading point to avoid crossing the Brand Highway. Rail has capacity of ~4Mtpa with two train sets. The rail is privately owned and separately operated by a number of private parties. Bottom dumping carriages are available, but operators would need additional locomotives to accommodate VRX products. Geraldton port operations are operated by Mid West Ports, which also owns the rail unloading and ship loading equipment. Mid West also leases storage areas. Geraldton has the port has excess capacity.

The silica sand market is growing at 3.2% globally and at a higher rate in Asia Pacific

Silica Markets – High Growth

Sand/gravel is the most extracted natural resource globally, higher than fossil fuels. Global consumption of silica is expected to grow by 3.2% pa out to 2022 and at a higher rate of 5.6% pa in the Asia Pacific region, fuelled by infrastructure development. Lower grade sands (lower percentage SiO₂) are used mainly in construction as an aggregate and are graded commonly on physical properties. Higher grade silica products are generally graded on SiO₂ purity. Key contaminant minerals include; iron, titanium, aluminium, chromium and calcium. VRX is targeting the high-grade silica markets with >99% SiO₂.

Historical sources of quality silica sand are declining due to depletion and environmental constraints

Asia Pacific accounts for 47% of global silica sand demand. Currently, the largest high-grade silica operation in Australia is Mitsubishi’s Cape Flattery in Queensland which ships ~2.5Mtpa to Asian countries. In recent years, a number of silica sand producing regions have been curtailed for environmental reasons. Historically, sand has been sourced from environmentally sensitive coastal, river or deltaic regions, such as the Mekong Delta in Vietnam or the Yangtze River in China. VRX’s WA projects offer an alternative, low sovereign risk, lower socio-environmental impacting source of silica sands.

Figure 5. Estimated silica demand by region

Asia Pacific accounts for 47% of global demand

Region	% of Global demand
Asia Pacific	47%
North America	20%
Western Europe	16%
Eastern Europe	8%
Africa/Middle East	5%
Central and South America	4%

Source: Freedonia via VRX

The glass market in Asia is >130Mtpa...

...and growing at ~6% pa

Glassmaking

Silica sand is the primary ingredient for glass. The market is loosely split into two main types, flat glass for the building and automotive sectors and container glass for food and beverage storage and container wares. Current demand growth is ~5% pa and it has beaten global GDP growth over the past 20 years. The current Asian glass market is ~60-65Mt pa for flat glass (~50% of world total) and ~70-75Mtpa for container glass. This market is growing at ~6% pa and demand in China especially is expected to grow significantly in the short to medium term. Silica sand for the glass market fetches US\$35-53 dry metric tonne (dmt). Higher end glass products, such as smart glass for electronics and cover glass (solar panels) fetch premium prices up to US\$65/ t FOB.

Figure 6. Asia Pacific silica sand market demand and growth

Use	Spec	Market in Asia	Growth in Asia
Float (Plate) Glass	99.5% SiO ₂	60 - 65Mt	5% - 6%
Container Glass	99.5% SiO ₂	70 - 75Mt	5% - 6%
Cover Glass (Solar Panels)	99.5% SiO ₂ & Low Fe	5 - 6Mt	+30%
Smart Glass (Ultra Clear)	99.5% SiO ₂ & Low Fe	1 - 2Mt	5% - 6%
Specialist Glass (Thin Screen)	99.7% SiO ₂	500 - 600 kt	+10%

Source: Stratum Resources via VRX

Silica sand is also used to form foundry moulds for metal casting

Foundry sand

High purity silica is used to form moulds for ferrous (iron and steel) and nonferrous (copper, aluminium, brass) metal castings. The former accounts for ~95% of foundry sand. Typically, about 1 tonne of foundry sand is required for each tonne of iron or steel casting produced. Silica sand is also used for other metallurgical purposes, for example, as a flux to lower the melting point and viscosity of slag to make them more reactive and efficient. Silica sand for this market needs to be high purity and uniformly sized. Pricing is currently between US\$38-53/dmt.

Some smaller high-end silica sand markets attain prices >US\$100/t

Other markets

Silica sand has a broad range of other markets including a range of metallurgical applications, chemical production processes (ie. silicon gels), and as an additive in paints and ceramics. It is also used in water purification and filtration and for fibreglass production. High tensile strength sands are also used in large volumes in oil and gas drill fracking. Some high-end markets fetch over US\$100/t. We expect that VRX's Muccha project may be able to place a large proportion of production into higher paying, high end markets.

VRX has a total of four silica sand projects in WA...

A pipeline of projects

VRX also has defined Resources at the Arrowsmith Central and Muccha projects (78.5Mt and 208Mt respectively). Muccha is the jewel in the crown with in-situ grades of over 99.6% SiO₂. However, the project's proximity to populated areas is likely to make permitting more onerous. Argonaut estimates that three projects each with a 2Mtpa throughput rate could generate collective EBITDA of +\$130m pa. Successful permitting and market penetration from the Arrowsmith North project should pave the way for subsequent operations. A BFS is due for the Arrowsmith Central Project in the coming weeks.

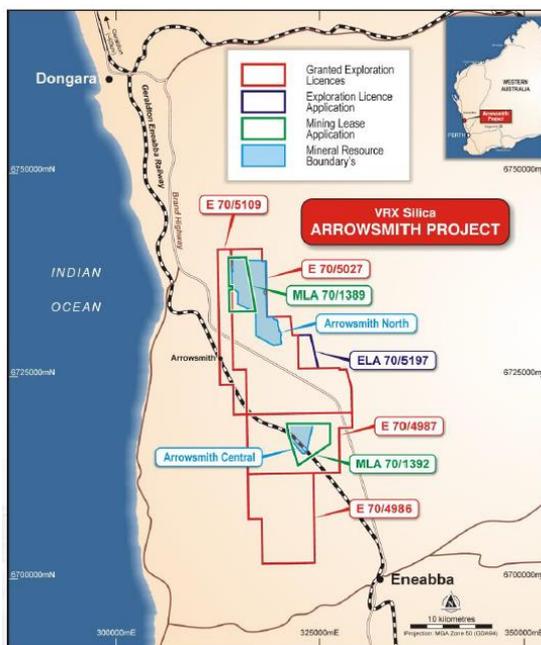
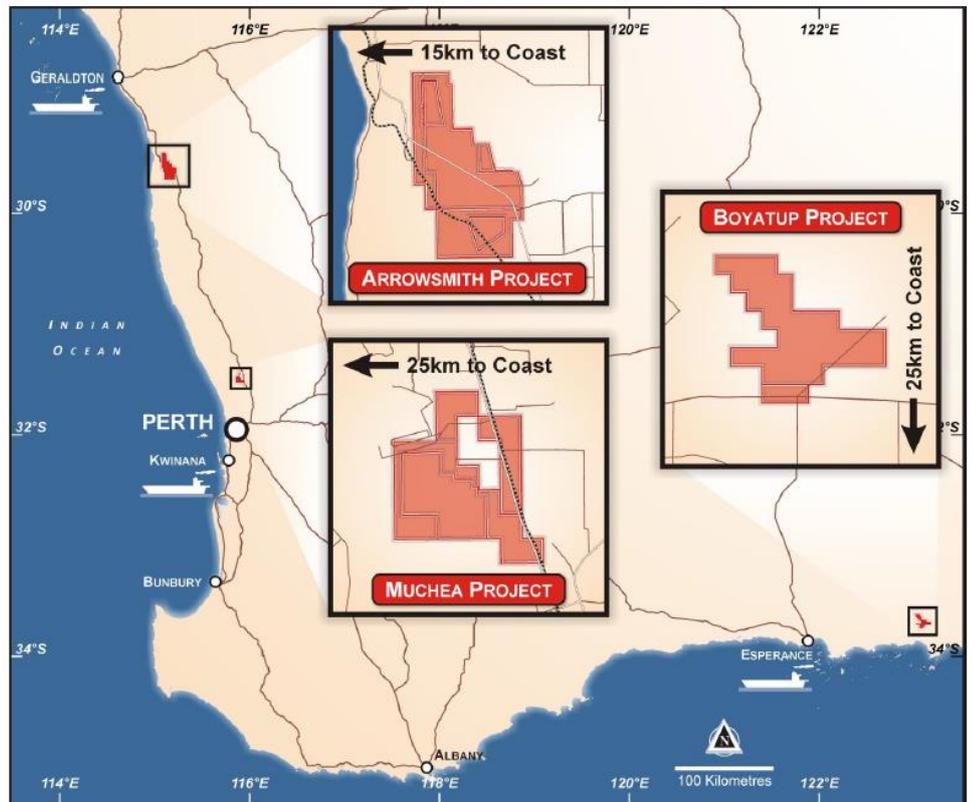
...of which, the three most advanced could collectively attain annual EBITDA of +\$130mpa

VRX recently acquired the Boyatup Silica Sand Project, 100km East of Esperance for two million VRX shares and \$10,000 cash. The project does not have access to rail, but is adjacent to the Fisheries Road which is 100km by road to Esperance Port which has bulk handling facilities. Initial hand auger tests returned SiO₂ grades up to 99.2%.

All VRX's projects are located on vacant crown land...

...and adjacent to key road and/or rail transport routes

Figure 7. VRX's state-wide silica projects, with a zoom in of Arrowsmith below



Source: VRX

Argonaut attains an unrisks post-tax NPV₁₀ of \$412m for a three-project scenario

We apply risk weighting to each project to achieve a risked valuation of \$160m, or \$0.40/sh

Valuation

Argonaut has incorporated three silica sands project in our valuation, including; Arrowsmith North, Arrowsmith Central and Muchea. We have applied risk weighting to each project to account for perceived permitting challenges and stages of development. Our model applies capital and operating costs metrics in line with the BFS. We have assumed each project has similar production capacity and therefore similar cost inputs (excluding variations for estimated haulage and rail distances). Argonaut applies a lower more conservative average realised price of US\$37.50/t for Arrowsmith North (vs VRX US\$40.70/t). We have not made any assumptions regarding debt to equity finance ratios or equity dilution, and therefore, our model is based on simple debt-only funding.

Table 2. Argonaut model assumptions

Key Model Assumptions	Arrowsmith North	Arrowsmith Central	Muchea
Mine Life	25 Yrs	7 Yrs	26 Yrs
Start Construction	2020	2023	2024
Ramp up at 1Mtpa	2021-2023	2024	2025
Steady State Production	2024-2046	2025-2029	2026-2050
Nameplate Production Rate	2Mtpa	2Mtpa	2Mtpa
Recoveries	90%	85%	93%
Grade	99.7%	99.6%	99.9%
Capex	A\$28.3m	A\$28.3m	A\$28.0m
Opex (FOB incl. Royalty)	A\$30.3/t	A\$30.3/t	A\$19.2/t
Product Mix (of saleable product)			
Low End Products	7%	10%	0%
Glass Sand	67%	70%	40%
Foundry Sand	27%	20%	10%
High End Glass Sand	0%	0%	50%
Average realised Price	\$US37.5	\$US36.5	\$US48.9
Applied Risk			
Permitting	20%	20%	50%
Offtake contracting	10%	20%	10%
Financing	5%	5%	5%
Operations/Logistics	5%	5%	5%
Total Risk Applied	40%	50%	70%

Source: VRX

Table 3. Argonaut valuation summary

NAV Valuation				
Core Projects	AUD M	Risk Discount	Risked Valuation	AUD / Share
Arrowsmith North	144.1	40%	86.5	0.21
Muchea	230.1	70%	69.0	0.17
Arrowsmith Central	66.9	50%	33.5	0.08
Non-Core Assets				
Unmined Resources	10.0		10.0	0.02
Other Projects	2.0		2.0	0.00
Unpaid Capital	5.2		5.2	0.01
Corporate NPV	(47.6)		(47.6)	(0.12)
Cash	1.5		1.5	0.00
Debt	-		-	-
Sub Total	412		160	0.40
Discount Rate				10%
Target Price				0.40

Note: Valuation per share applies 465 million fully diluted shares on issue

Source: VRX

Key Risks

We consider the key risks to be...

We regard the following to be the key risks to VRX's West Australian silica operations:

...Environmental permitting, given the proximity to Perth and large areas of pristine scrubland...

Environmental Permitting

Given the vast area of total disturbance over the project life, and the current high level of pristine/undisturbed habitats, it is expected the project will receive a high level of scrutiny from both government regulators and the public. While Arrowsmith and Muchea are located on relatively sparse scrubland, the areas do have a moderate degree of biodiversity. The Company has undertaken flora and fauna surveys, and at Arrowsmith North, no threatened flora species were detected. Arrowsmith may have some significant bird populations including the Carnaby's Black-Cockatoo and the Western Ground Parrot. If present, VRX will need to put in place strict strategies to mitigate risks to species populations.

...product offtake contracting...

Product Offtake

Silica sand contracts are generally negotiated between producer and end user (ie. not traded on a commodity exchange and with few intermediate traders). As such, there is little public visibility on contracts and pricing. Despite the low debt to free cash flow ratio, we believe the project will require a high percentage of saleable product assigned to offtake contacts during the debt servicing period (years 1-5). Fortunately, the silica market is generally based on fixed price contracts with average terms of 3-5 years (to our best understanding). VRX has attained a high level of inbound interest from potential offtake customers and has received a number of LOIs for off-take. We note that while test results to date indicate high product specifications, Arrowsmith will still require customer validation in order to attain broader market penetration (as with most industrial minerals).

...along with logistical contracting and project financing

Logistics and Access to Infrastructure

While VRX has sought preliminary pricing for key contracts including port handling, trucking and rail haulage, logistical contracts have not been finalised. This poses a moderate risk of escalation to BFS cost assumptions given that logistics amount to >60% of total opex. We also see a mild risk for additional capital for rail loading and/or port storage infrastructure.

Financing

As with all mining projects, development capital funding poses a risk. However, as mentioned above, the low ratio of capital to free cashflow makes this less onerous for VRX. In addition, the Company has a substantial market capitalisation to support any potential equity component. We also believe the scale, quality and long-life nature of the project has the potential to attract a cornerstone/strategic investor.

VRX Board

The following bios are edited from the Company's website.

Paul Boyatzis (Non-Executive Chairman)

Mr Boyatzis has a more than 30 years' experience in the investment and equity markets. He has assisted many emerging companies raise investment capital both locally and through overseas institutional investors. Mr Boyatzis is a current member of the Australian Institute of Company Directors, the Securities and Derivative Industry Association and a member of the Certified Practising Accountants of Australia. During the past three years, Mr Boyatzis has held directorships in Nexus Minerals Ltd, Aruma Resources Ltd and Transaction Solutions International Ltd.

Bruce Maluish (Managing Director)

Mr Maluish has more than 30 years' experience in the mining industry with numerous roles as Managing Director and General Manager with organisations such as the Monarch Group of Companies, Matilda Minerals, Abelle, Hill 50 and Forsyth Mining. He has worked in a variety of resource sectors including gold, nickel and mineral sands, from both open pits and underground. His international experience includes identification of projects and negotiations with clients in Asian markets. His qualifications include credentials in surveying, mining, project planning and finance. Mr Maluish also holds a directorship with Nexus Minerals Ltd.

Peter Pawlowitsch (Non-Executive Director)

Mr Pawlowitsch holds a Bachelor of Commerce from the University of Western Australia, is a member of the Certified Practising Accountants of Australia, and holds a Masters of Business Administration from Curtin University. He has more than 10 years' experience in the accounting profession and more recently in business management and the evaluation of businesses and mining projects. During the past three years Mr Pawlowitsch has held listed-company directorships with Dubber Corporation Limited, Department 13 International Limited, Knosys Limited, Novatti Group Limited and Rewardle Holdings Limited.

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Important Disclosures

Argonaut participated in the Placement that raised approximately \$2.25M in March 2019 and received fees commensurate with this service.

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