



**Capital
Markets**

August 15, 2019

Largo Resources Ltd.

Low-cost vanadium producer positioned for a recovery; initiate at Outperform

Our view: We think Largo provides a favourable asymmetric return profile with significant upside to vanadium prices and downside support from low-cost operations and strong financials. We expect the vanadium market to recover and prices should improve. There are also several company-specific catalysts as the Maracas Menchen mine expansion ramps-up and Glencore contract expiration is a positive. We initiate with an Outperform rating and \$3.50 price target.

Key points:

Maracas Menchen a top-tier vanadium asset: Largo's Maracas Menchen mine, located in Brazil, is one of the lowest-cost vanadium assets globally (US\$3.40/lb cash cost vs. US\$8-10/lb marginal cost) due to high ore grades and strong operations. The mine produces a high-purity premium-priced vanadium product and is set to complete a 25% expansion in 2H/19. There are also several satellite deposits that may be developed in the future to extend mine life and expand production.

Strong financial position with several upcoming catalysts: Although recent vanadium market challenges have pressured Largo's shares, the company is debt-free and generates positive cash flow. Upcoming catalysts include - 1) Maracas Menchen expansion; 2) expiration of Glencore contract in May 2020 which should result in higher realized prices - we conservatively estimate +US\$1.50/lb, which adds \$50M EBITDA annually; 3) stabilization and improvement in vanadium prices; 4) higher FCF in 2020 and 2021 - after normalizing for Glencore contract adjustments, we forecast \$109M (12%) and \$154M (17%); and 5) return of capital to shareholders as FCF and market conditions improve.

Vanadium market remains in deficit, expected to recover: Vanadium prices have been volatile in 2018/2019. First rising to a high of US\$29/lb V2O5 in November 2018, due to expectations of strong demand from new Chinese steel rebar standards and potential for vanadium redox batteries (VRBs). Then falling (US\$6.50/lb July 2019) due to slow uptake of rebar standards, niobium substitution in rebar production, inventory draw-downs, and limited VRB adoption. We expect prices to stabilize in 2H/19 as inventories are drawn down, niobium substitution declines, and Chinese rebar standards are gradually enforced - but we remain cautious on VRB adoption. We forecast prices to improve moderately to US\$8/lb through 2021, with long-term prices at US\$10/lb reflecting incentive pricing as the market deficit widens.

Initiate at Outperform, \$3.50 PT: We value Largo using a sum-of-the-parts NAV with an 8% discount rate. Our 1.0x multiple for Maracas Menchen is in line with projects that have been fully ramped up and demonstrate consistent operations. We apply a more conservative 0.5x multiple to Novo Amparo Norte, consistent with development stage assets.

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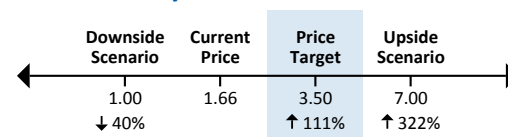
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Outperform

TSX: LGO; CAD 1.66

Price Target CAD 3.50

Scenario Analysis*



*Implied Total Returns

Key Statistics

Shares O/S (MM):	531.6	Market Cap (MM):	882
Dividend:	0.00	Yield:	0.0%
NAVPS:	4.03	P/NAVPS:	0.41x
Float (MM):	290.0	Enterprise Val. (MM):	721
		Avg. Daily Volume:	1,309,426
Strategic Ownership: Arias Resource Capital Management (45%)			

RBC Estimates

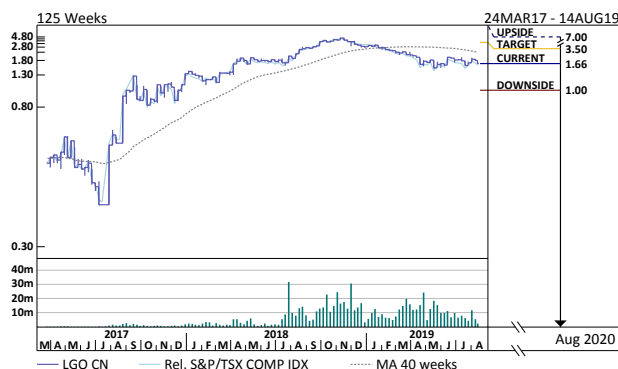
FY Dec	2018A	2019E	2020E	2021E
EPS, Adj Diluted	0.50	(0.01)	0.16	0.24
EBITDA, Adj	392.2	53.8	150.1	208.8
EV/EBITDA	1.8x	13.4x	4.8x	3.5x
EPS, Adj Diluted	Q1	Q2	Q3	Q4
2018	0.07A	0.14A	0.11A	0.17A
2019	0.00A	(0.04)A	0.01E	0.02E
2020	0.03E	0.04E	0.05E	0.05E
EBITDA, Adj				
2018	63.9A	75.4A	114.8A	138.1A
2019	16.1A	(0.6)A	13.9E	24.4E
2020	32.0E	34.2E	41.5E	42.4E

All values in CAD unless otherwise noted.



Target/Upside/Downside Scenarios

Exhibit 1: Largo Resources Ltd.



Source: Bloomberg and RBC Capital Markets estimates for Upside/Downside/Target

Price target/base case

We rate Largo Resources shares Outperform with a \$3.50 price target. We value the company using a net asset value sum-of-the-parts approach with an 8% discount rate, applying 1.0x P/NAV multiple to Maracas Menchen and 0.5x to the Novo Amparo Norte deposit. Our multiple for Maracas Menchen is in line with the multiple used for projects that have been fully ramped up and demonstrate consistent operations. We apply a more conservative multiple to the Novo Amparo Norte deposit, which reflects a typical multiple assigned to development stage assets.

Upside scenario

Our upside scenario of \$7 assumes that vanadium prices recover faster than expected due to faster adoption of high-grade Chinese rebar and tighter supply. We increase our long-term vanadium price forecast to US\$15/lb (V2O5) and maintain our P/NAV valuation multiple at 1.0x.

Downside scenario

Our downside scenario of \$1 assumes that vanadium prices fall to the historical average from 2010-2016, due to lower vanadium demand driven by poor enforcement of rebar standards in China and excess supply. We decrease our long-term vanadium price forecast to US\$5.50/lb (V2O5) and lower our P/NAV valuation multiple to 0.5x.

Investment summary

Largo Resources is a primary vanadium producer headquartered in Toronto, Canada. The company's primary asset is the Maracas Menchen project located in Bahia State, Brazil. Maracas Menchen began commercial production in 2014 and produced 10Kt (22Mlbs) V2O5 in 2018, with an expansion to 12Kt (27Mlbs) annual production expected to ramp-up in 2H/19.

Vanadium market remains in deficit, expected to recover:

We expect prices to stabilize in 2H/19 as inventories are drawn down, niobium substitution declines, and Chinese rebar standards are gradually enforced - although we remain cautious on VRB adoption. We forecast prices to improve moderately to US\$8/lb through 2021, with long-term prices at US\$10/lb reflecting incentive pricing as the market deficit widens starting in 2023.

Maracas Menchen a top-tier vanadium asset:

Largo's Maracas Menchen project, located in Brazil, is one of the lowest-cost vanadium assets globally due to high ore grades and strong operations. The project produces a high-purity premium-priced product and is set to complete a 25% expansion in 2H/19.

Strong financial position: Largo is debt-free and generating positive cash flow. We estimate \$109M and \$154M FCF generation in 2020 and 2021.

Several upcoming catalysts: 1) Maracas Menchen expansion; 2) expiration of Glencore contract in May 2020 which should result in higher realized prices; 3) stabilization and improvement in vanadium prices; 4) higher and more stable FCF in 2020 and 2021; and 5) return of capital shareholders as FCF and market conditions improve.

Risks to rating and price target: We highlight several key risks and sensitivities, including: 1) unexpected changes and volatility in vanadium prices; 2) the adoption rate of new steel rebar standards in China that should require more vanadium; 3) global steel production; 4) management execution on the transition to internal sales & trading after expiration of the Glencore contract; 5) ramp-up of the Maracas Menchen expansion and on-going operations; and 6) currency volatility, especially USD/CAD (as financials and shares are in CAD, while the vanadium market primarily conducts business in USD) and USD/BRL (as mining operations are in Brazil).

Key questions

Our view

- 1. Why is China's adoption of new steel rebar standard a key focus?**

We view the use of vanadium in China for steel production as the most significant factor in our vanadium outlook – China accounts for ~45-50% of global demand and, through our forecast period to 2025, accounts for 60% of global demand growth. China implemented a new standard for steel rebar on November 1, 2018, which would require increased vanadium use to meet new standards. However, early enforcement of the standard has been lax and steel producers have also used niobium as a substitute for vanadium, as prices for the latter rose sharply in 2018. We expect the standard will be gradually adopted following the early grace period while niobium substitution should decline as vanadium prices have fallen in 2019. We estimate the intensity of vanadium used in Chinese steel production should increase to 62g/tonne of steel by 2025, up from 51g/tonne in 2019, as the new rebar standards are adopted.
- 2. How does the Glencore contract expiration help Largo?**

We view the expiration of Largo's sales contract with Glencore in May 2020 as an opportunity to realize higher prices due to reduced commission costs, greater control on selling decisions, better capture of high-purity price premiums, and an increase in high-purity sales. Additionally, while the contract remains in effect, Largo's cash flows and revenue are subject to some uncertainty due to the remeasurement of receivables and payables caused by fluctuations in vanadium prices – this will likely remain an issue in 2019 and early-2020, but resolved when the contract expires. In our base case, we estimate ~US\$1.50/lb higher realized price due to the contract expiration, which adds ~\$50M to our 2021E EBITDA estimates (+30% vs. current contract terms). We are more conservative than management's expectation for US\$3/lb higher realized prices following contract expiration, which indicates potential upside to our forecast.
- 3. What is Largo's financial position?**

Largo announced in July 2019 the redemption of all remaining outstanding debt and that the company is now debt-free. We expect Largo to have \$183 net cash on the balance sheet by end-2019, even after completing the expansion project at Maracas Menchen. We believe Largo has a very strong financial position and balance sheet, which should provide flexibility in dealing with current market challenges and the changing Glencore contract situation. We also estimate 12% and 17% FCF yield (after normalizing working capital changes from Glencore contract) in 2020 and 2021, and positive FCF even in our downside scenarios.
- 4. What is the ownership situation?**

Largo shares are tightly held with two large holders owning >50% of shares outstanding – private equity firm Arias Resource Capital Management own 45%; West Family Investments owns 8%. Arias has been steadily trimming its position since mid-2018. We think Largo should benefit from continued divestments by Arias, a larger free float of shares, and more diverse ownership, but Arias and West have not publicly provided any plans on their share holdings.
- 5. Are mine tailings dams a concern?**

Tailings generated at the Maracas Menchen facility are stored in dry stacks or in tailings ponds. We think Largo has taken the necessary steps to responsibly manage tailings waste. Importantly, we do not view tailings management as a risk to Largo's operations like at other mining operations in Brazil for several reasons – 1) volume of tailings waste is significantly less than other operations; 2) tailings ponds are constructed on a flat surface, unlike tailings dams which are on an incline; and 3) the tailing ponds are lined to mitigate leakage.



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Maracas Menchen a world-class vanadium asset

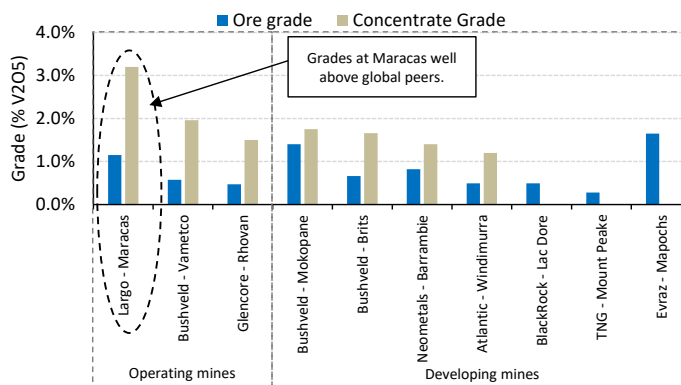
We view Largo's Maracas Menchen mine, located in Brazil, as among the best vanadium assets globally with high grade and significant expansion potential. We believe the world-class asset offers Largo a significant financial and competitive advantage, allowing the company to generate solid cash flows even when market prices are weak and providing optionality to grow future production if the vanadium market tightens. Maracas Menchen produces ~10Kt tonnes annually, equivalent to 6% of global vanadium supply based on 2018 production.

The high grade vanadium ore at the Maracas Menchen Campbell deposit has helped position the project as a low-cost operation near the bottom of the cost curve, while also producing a high-purity premium-priced product. The Campbell deposit has both ore and concentrate grades that are above the global average – 1.2% V2O5 ore and 3.2% V2O5 concentrate grades vs. typical 0.5-1.0% ore and 1.5-2.0% concentrate grades at other vanadium deposits. We estimate cash operating costs at ~US\$3.40/lb V2O5 (excluding royalties), firmly in the bottom quartile of the cost curve. Additionally, there are several satellite deposits that may be developed to increase production and extend the mine life as required.

Please see Appendix II – Maracas Menchen on Page 33 for more details.

Exhibit 2: Largo's Maracas Menchen has higher grades compared to peers

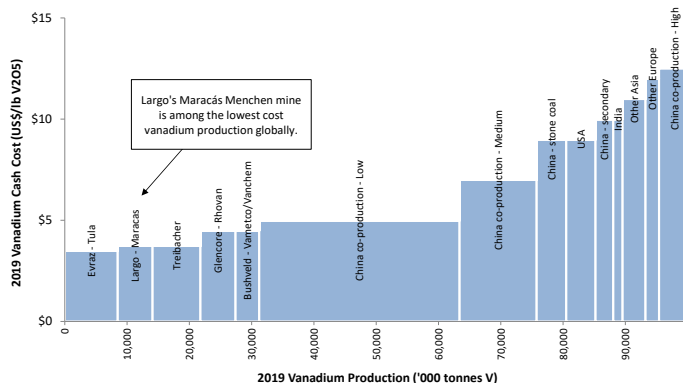
Maracas Menchen ore and concentrate grades are higher than other vanadium deposits.



Source: Roskill, Company reports, RBC Capital Markets estimates

Exhibit 3: High ore grades and strong operations position Maracas as top-tier vanadium asset

Largo is positioned as one of the lowest cost vanadium producers globally.



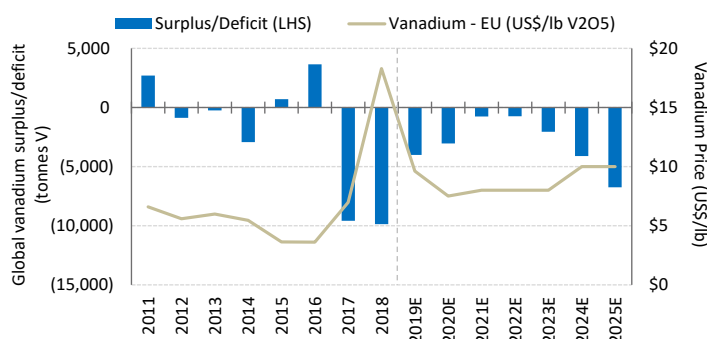
Source: Roskill, TPP, Company reports, RBC Capital Markets estimates

Vanadium market expected to tighten long-term as demand increases in China

We expect the vanadium market to remain in moderate deficit through 2022, as expected new supply is not enough to balance the market. By 2023, we expect the deficit to widen due to increased use by Chinese steel producers and limited new supply.

Exhibit 4: Vanadium market expected to remain in deficit

We expect the vanadium market to remain in moderate deficit through 2022, and widening afterwards due to growing demand in China and limited new supply.



Source: Roskill, Company reports, RBC Capital Markets estimates

- **Demand expected to grow, driven mainly by increased use in steel production:** We model demand growth in vanadium at 2% CAGR through 2025, driven mainly by increased intensity of vanadium used in steel produced by China. We also see steady growth in non-ferrous alloys, chemical production and catalysts, and potential gradual adoption of vanadium redox batteries. (see Appendix I, page 24)
- **Increased vanadium intensity in Chinese steel a key driver:** China implemented a new standard for high-strength low alloy (HSLA) rebar used in construction, which we expect should increase demand for vanadium. Although early enforcement has been lax and steel producers have been granted a grace period, we believe the standard will be gradually enforced and adopted going forward. (see Appendix I, page 25-27)
- **VRBs offer potential demand growth, but comes with uncertainty:** Vanadium redox batteries (VRBs) offer significant growth potential, but we do not include VRB demand in our demand model due to the uncertainty around adoption and feasibility. We believe that US\$7-8/lb sustained vanadium price would be supportive of VRB economics, but any significant growth in VRB uptake would likely tip the market into further deficit and push prices higher. (see Appendix I, page 28-30)
- **Moderate supply growth unless prices increase significantly:** We expect a moderate increase in global vanadium supply at 3% CAGR from 2018 to 2025, mainly driven by new primary production as growth in slag co-production in China, currently the most significant source globally, is limited. We think that new vanadium production above our estimate is possible, but would depend on higher price incentives. (see Appendix I, page 20)
- **Prices expected to stabilize in near-term and rise through mid-2020:** Vanadium prices have been weak to start in 2019 (~US\$8.50/lb V2O5 in 2Q/19 vs. US\$18/lb in 2018), we think primarily due to slow uptake of new Chinese rebar standards, inventory draw-downs, and niobium substitution. We expect vanadium prices to stabilize in 2H/19 as these trends abate, and then rise to US\$8/lb by 2021 as the market remains in moderate deficit. Longer-term, we expect prices to rise to US\$10/lb, as the market deficit widens and prices are required to reflect incentive pricing to build new supply.

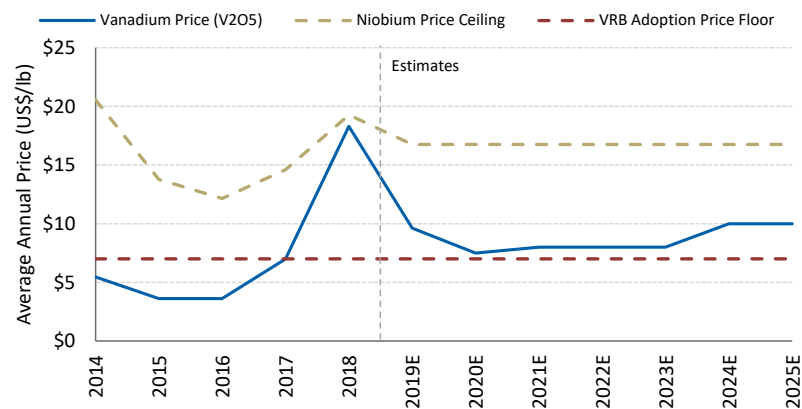
Price forecast – vanadium prices expected to stabilize in 2H/19, gradually improve

We expect vanadium prices to stabilize in 2H/19 as inventories are drawn down and niobium substitution declines. We expect prices to improve moderately to US\$8/lb V2O5 through 2021, reflecting ~85th percentile of the cost curve, as the market remains in moderate deficit and prices should reflect marginal cost. Longer-term, we expect prices to rise to US\$10/lb, as the market deficit widens and there are limited new projects ready to fill the gap. Our long-term price forecast reflects the incentive price we believe will be required to attract investment in new supply.

We think our price forecast is supported on the downside by VRB adoption economics – as prices near US\$7-8/lb, VRBs become more economically viable and stimulate demand. We also believe price upside is capped at US\$15-20/lb, roughly equivalent to long-term average niobium prices, as niobium substitution in steel production would rise and hurt vanadium demand if vanadium prices exceeded niobium prices. We are confident in both these trends on the downside (VRB demand increasing) and on the upside (niobium substitution) as they have come into play through the most recent pricing cycle.

Exhibit 5: Vanadium prices expected to stabilize and gradually improve

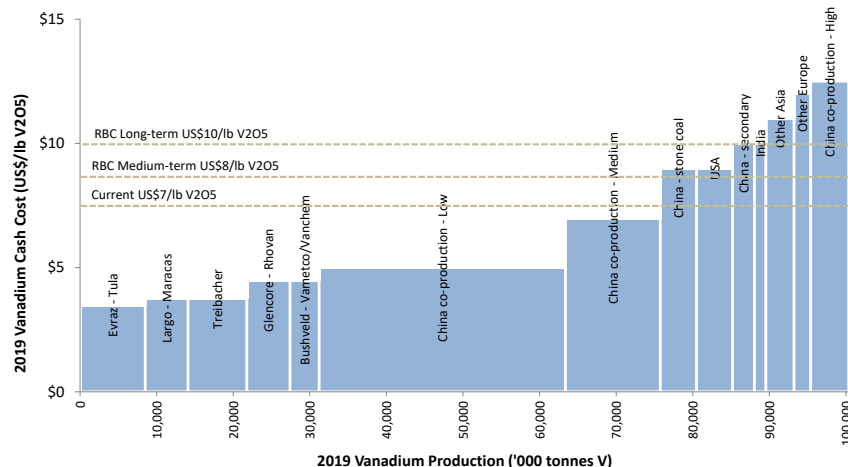
Vanadium prices are supported on the downside by VRB adoption economics at US\$7-8/lb and capped on the upside by niobium substitution at US\$15-20/lb based on average historical niobium prices.



Source: Roskill, Bloomberg, Company reports, RBC Capital Markets estimates

Exhibit 6: Vanadium cost curve points to marginal cost above current prices

Vanadium cost curve supports price at ~US\$8/lb based on 85th cost percentile.



Source: Roskill, Company reports, RBC Capital Markets estimates

Asymmetrical return with significant upside potential, downside protection

We view Largo's steady, low-cost production as especially important due to the volatility in vanadium prices, allowing the company to capture price upside in a bullish market while still generating solid cash flow through a market downturn. Our scenario analysis provides several key takeaways: 1) Largo has an asymmetric upside/downside return profile with our upside scenario providing +340% return vs. our downside scenario at -34%, compared to current share price; 2) our upside scenario is based on a not overly unrealistic expectation that Chinese regulators reinforce rebar standards and prices return to the 2017/18 average level; 3) our downside scenario still yields ~7% FCF yield in 2020; and 4) even in our extreme downside case, with prices below almost the entire cost curve, Largo remains FCF positive. Note we refer to FCF and FCF yield after normalizing for working capital impact from Glencore contract adjustments.

Upside case: We use US\$15.00/lb, equivalent to the average price from mid-2017 to 2018 when the market was in deficit due to expectations for incoming Chinese rebar standards – this price also reflects the level necessary to incentivize higher-cost production. In our upside scenario, we estimate >30% FCF yield in 2020 and \$7.00/sh valuation using a 1.0x P/NAV.

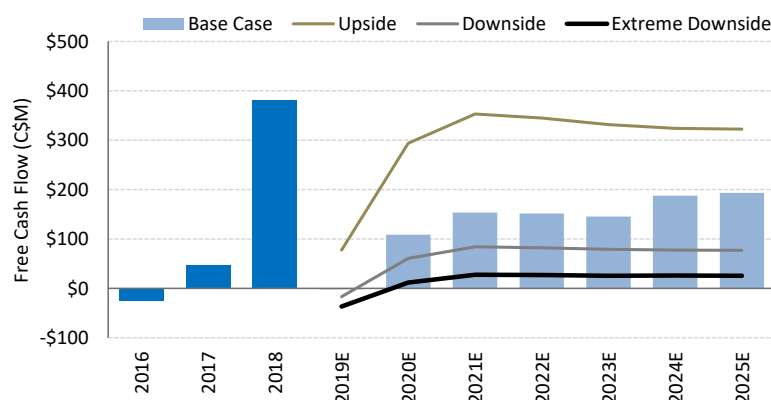
Base case: We use \$7.50-8/lb in the medium-term (2020-2023) to reflect a moderate market deficit and a long-term price of US\$10/lb, which reflects our view on long-term incentive pricing to add more vanadium supply. In our base case, we estimate 12% FCF yield in 2020 and \$3.50/sh valuation using a blended 0.8x P/NAV.

Downside case: We use US\$5.50/lb, equivalent to the average price from the 2010 to 2016 period of over-supply due to lack of rebar standard enforcement in China and steel producers employing quench and temper instead of using vanadium. In our downside scenario, we estimate 7% FCF yield in 2020 and \$1.00/sh valuation using a 0.5x P/NAV.

Extreme downside case: We use US\$3.50/lb, equivalent to the average price in 2015 and 2016, when the market was significantly over-supplied as inventories were built-up due to lack of rebar standard enforcement in China and a slow-down in steel production due to weak macro-economic conditions. In our extreme downside scenario, we estimate 1% FCF yield in 2020.

Please see Sensitivities on Page 17 for more details.

Exhibit 7: Significant FCF upside to vanadium prices with downside support



Note: FCF and FCF yield after normalizing for working capital impact from Glencore contract adjustments.
Source: Roskill, Company reports, RBC Capital Markets estimates

Expect higher realized prices as contract hand-cuffs come off in 2020

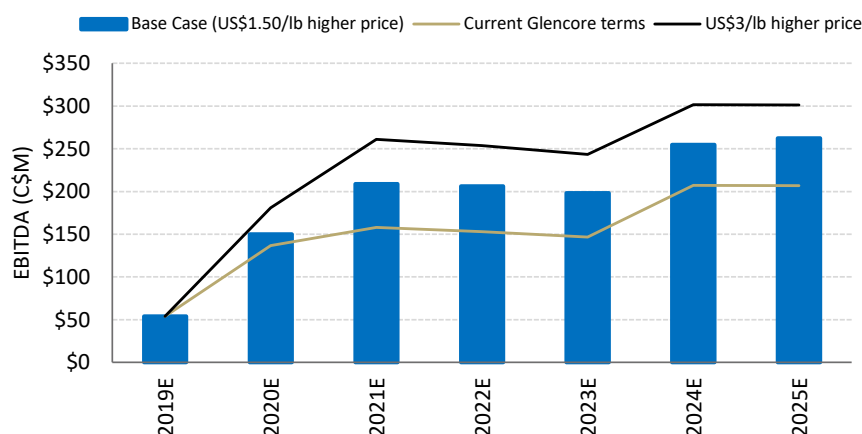
We view the expiration of Largo's sales contract with Glencore in May 2020 as an opportunity to realize higher prices. In 2008, Largo signed an offtake agreement with Glencore for 100% of the company's vanadium production – the contract was necessary as Largo ramped up production and required a steady buyer to satisfy loan agreements. We expect the contract expiration to result in reduced commission costs, greater control on selling decisions, better capture of high-purity price premiums, and an increase in high-purity sales volumes. However, we note that while the contract remains in effect, Largo's cash flows and revenue are subject to some uncertainty due to the remeasurement of receivables and payables caused by fluctuations in vanadium prices – this will likely remain an issue in 2019 and early-2020, but resolved when the contract expires.

Largo is working on building up the company's ability to sell vanadium independently and recently hired a new Director of Sales and Trading with extensive experience in the vanadium market, particularly regarding the premium priced high-purity market. In our base case scenario, we estimate Largo may achieve ~US\$1.50/lb higher realized price due to the Glencore contract expiration, which adds ~\$50M to our 2021E EBITDA estimates (+30% vs. using current contract terms). We are assuming Largo benefits from: 1) capturing the full premium for high-purity sales vs. splitting the premium with Glencore; 2) realizing higher prices by saving commission costs and making better selling decisions that favour Largo; and 3) increasing high-purity sales volumes. Our base case is more conservative than management's expectation for US\$3/lb higher realized prices following the contract expiration, which could indicate potential upside to our forecast – using management's assumption would lift 2021E EBITDA by ~\$100M (+65% vs. using current contract terms).

We estimate Largo's sales of high-purity product increasing to 50% of total volumes by 2021, up from ~20% currently. In late-2018, Largo commissioned an automated high-purity and powder screening and packing system which should ultimately allow the company the option to produce all volumes at a high-purity standard. High-purity vanadium accounts for ~10% of total market demand, and only Largo, Glencore's Rhovan mine, the Evraz Stratcor processing facility, and some smaller assets are currently capable of producing this product. We expect the high-purity market (primarily focused on aerospace alloys, chemical catalysts, and VRBs) to grow at ~4% CAGR, with Largo being the primary beneficiary as the only company with available new high-purity capacity.

Exhibit 8: EBITDA expected to benefit from Glencore contract expiration

Expiration of Glencore contract should result in higher realized sales price due to reduced commissions, better sales timing, and increased high-purity premium sales.



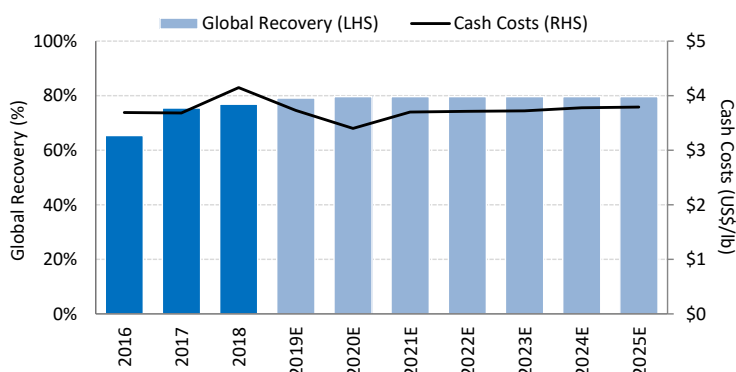
Source: Roskill, Company reports, RBC Capital Markets estimates

Solid operations with moderate low-cost expansion in near-term

We think Largo has done well in ramping up operations at Maracas Menchen after some initial delays and plant modifications. Production has increased steadily since initial start-up in late-2014 and the operating rate has averaged 96% of initial nameplate capacity since mid-2016. Recoveries have improved from 60% since the initial mine start-up phase to 80% currently, helping to lower cash production costs – management has stated a long-term goal to achieve consistent recoveries above 80%, which should further support low cost production. We believe the strong operations at Maracas Menchen help alleviate concerns that Largo carries greater operational risk as a single-asset company.

Exhibit 9: Global recovery and cash costs at Maracas Menchen expected to remain stable

Operations at Maracas Menchen have been strong since start-up in 2014 with stable recovery rates and operating costs.

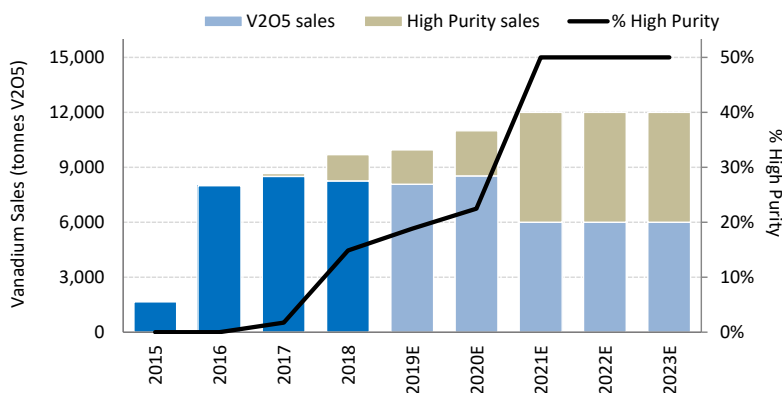


Source: Roskill, TPP, Company reports, RBC Capital Markets estimates

Largo is currently working on a moderate expansion of the Maracas Menchen processing facility, which is expected to increase nameplate production by ~25% (5Mlb increase to 26Mlbs V2O5, from 21Mlbs) and set to be completed in 4Q/19. We think the project has an excellent return on investment with low capex at ~\$25M and an estimated payback period of ~1 year (or less) – based on estimated capex at ~C\$5/lb vs. cash margin at ~C\$5-6/lb (using 2020E realized price at C\$11/lb and operating costs at ~\$5/lb).

Exhibit 10: Maracas Menchen production expected to increase with expansion

Maracas Menchen expected to increase production by +25% and add more capacity for high-purity premium products.



Source: Roskill, Company reports, RBC Capital Markets estimates

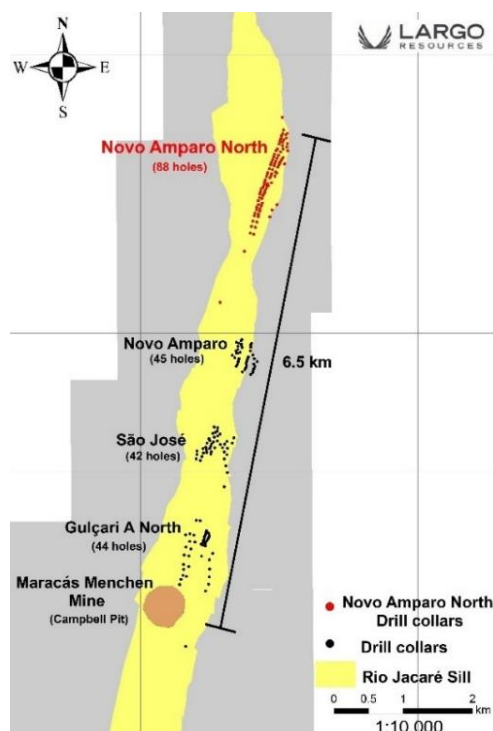
Long-term production optionality with big resource

We believe Largo has potential to significantly increase production at Maracas Menchen if the market moves into a significant deficit and requires more supply. The project is currently mining the Campbell deposit, which we estimate has ~120-130Kt vanadium (V2O5) resource remaining, enough for a 9-10 year mine life at current production. On June 11, 2019, Largo upgraded the mineral resource estimate at the Novo Amparo Norte (“NAN”) deposit, reporting 83Mt measured & indicated, and 79Mt inferred resources. We think the NAN deposit could be developed in the future at relatively lower capex than a greenfield development, with the ore processed at the already operational Maracas Menchen facilities. The deposit could be either used to increase current production if market conditions warrant new supply or held back to be mined when the Campbell deposit is depleted. Management has stated previously the potential to double long-term production if there is demand in the market for increased supply.

We also note that the vanadium mineralization extends for 6.5km North East from the current Maracas Mention operations and has yet to be fully explored. In addition to the currently mined Campbell pit and the recently updated resource at NAN, the company has significant inferred resources at various satellite deposits within the larger project area that could also be further explored and developed in the future – including Gulcari A Norte, Gulcari B, Novo Amparo, and Sao Jose. In July 2019, Largo began a minor drill program (~1,000m) at Campo Alegre de Lourdes. As part of the company’s Exploration Master Plan for 2019-2021, Largo is now guiding to 25,000m of diamond drilling during 2019 across the satellite deposits and others key sites.

Exhibit 11: Largo has significant vanadium resources to extend operations and grow production

Vanadium mineralization extends for 6.5km



Campbell and Novo Amparo Norte mineral resource estimates

	Tonnes (Mt)	% Magnetite	Magnetite Concentrate V2O5 %	V2O5 Contained in Magnetite
Campbell				
Measured	18.1	30.6%	3.2%	176.2
Indicated	1.7	34.6%	3.1%	18.4
M&I	19.8	30.9%	3.2%	194.6
Inferred	1.7	33.1%	3.1%	16.9
Novo Amparo Norte				
Measured	6.3	33.1%	2.3%	45.3
Indicated	6.0	28.1%	2.5%	37.8
M&I	12.2	30.7%	2.4%	83.1
Inferred	11.3	31.2%	2.5%	78.8

Note: Campbell mineral resource estimate based on May 2017 update. Novo Amparo Norte resource estimate based on June 2019 update.
Source: Company reports, RBC Capital Markets estimates

Strong financial position backed by debt-free balance sheet

We believe Largo has a very strong financial position and balance sheet, which should provide flexibility in dealing with current market challenges and the changing Glencore contract situation. Largo announced in early-July 2019 the redemption of all remaining outstanding debt and that the company is now debt-free. We expect Largo to have \$183M net cash on the balance sheet by end-2019, even after completing the expansion project at Maracas Menchen and accounting for the negative cash flow from the trade receivables reversal to Glencore.

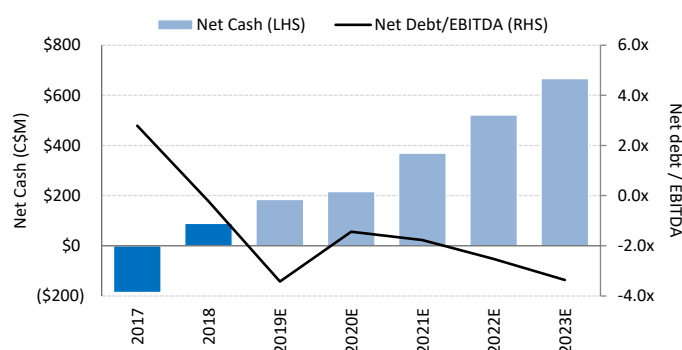
We expect strong FCF going forward at \$109M (12% yield) and \$154M (17%) in 2020 and 2021 (excluding working capital impact from Glencore contract adjustments) based on our vanadium price forecasts of US\$7.50/lb and \$8.00/lb V2O5, due to ramp-up of the Maracas Menchen expansion, expiration of the Glencore contract, and a modest recovery in vanadium prices. However, we acknowledge that FCF has been uneven over the past few years as vanadium prices fluctuated significantly, ranging from -\$26M in 2016 to \$382M (+43% FCF yield) during 2018. The remeasurement of trade receivables and payables related to the Glencore contract has and will continue to result in cash flow volatility through 2019 and early-2020, but will be resolved by May 2020 when the contract expires.

We expect Largo to be in a position to return capital to shareholders later in 2020 through dividends and share buybacks, as the expiration of the Glencore contract, completion of the expansion, and expected improvement in the vanadium market provides more certainty on cash flows. At the company's annual shareholder meeting on June 27, 2019, management announced that it did not intend to return capital to shareholders at the current time, citing near-term vanadium market challenges, cash flow drag from the Glencore contract remeasurements, and working capital requirements for building up the company's sales and trading capability. Although the decision was disappointing, we think it was also sensible to protect Largo's strong financial position.

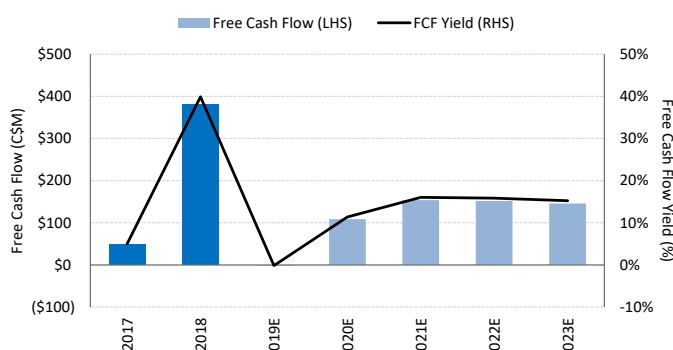
Please see Appendix III – Largo Resources Financial Model on Page 37 for more details.

Exhibit 12: Strong financial position with debt-free balance sheet and improving FCF generation

Strong debt-free balance sheet



FCF expected to improve significantly



Note: FCF excludes working capital impact to normalize for Glencore contract adjustments
Source: Roskill, Company reports, RBC Capital Markets estimates



Management experienced in operating, development and financing

Largo has assembled a management team with extensive experience in the mining industry, particularly with regard to more niche materials (including vanadium, niobium, rare earths) and operating in Brazil. We think the team is well-equipped to guide the company through current vanadium market challenges, maintain strong operations, and deliver on planned expansion projects.

Mark A. Smith, CEO and Director: Mr. Smith has 34 years of experience across a variety of financing, developing and operating roles and geographies. In addition to his role at Largo Resources, Mr. Smith is Executive Chairman at NioCorp Developments which is currently developing a niobium deposit in the United States. Prior to joining Largo, Mr. Smith was President and CEO of Molycorp from 2008 to 2013 and managed the company's transition into being the largest non-Chinese rare earth company. Mr. Smith has also held executive, engineering and legal positions at Chevron and Unocal.

Ernest Cleave, CFO: Mr. Cleave has more than 25 years of experience in financial strategy, reporting, strategic planning, and internal control. His prior roles include Director, CFO and Corporate Controller and in other senior positions at large, global companies including Goldcorp, Cline Mining and Falconbridge.

Paulo Misk, President and COO: Mr. Misk has spent the past 28 years of his career in the operational management at multiple global mining companies with exposure to niobium, chromite, iron, gold, tin, lithium and several other industrial minerals. His most recent position was held at Anglo American's Catalão Project as Head of Niobium Operations and previously served as Niobium General Manager.

Luciano Chaves, Vice President of Finance and Administration, Brazil: Mr. Chaves spent the last 12 of his 20 years of financial management experience in the finance department of a Latin American-based multinational mining company. Mr. Chaves has been with Largo since 2011 and has worked alongside the Maracas Menchen project since the early stages.

Paul Vollant, Director of Sales and Trading: Expected to join Largo's team in September 2019, Mr. Vollant's vanadium-related experience includes his role as General Manager of Sales and Marketing at TNG Limited, where he was responsible for the company's vanadium distribution strategy, and as a founding director of Element Commodities, an international distribution company.

Largo's Board of Directors include: Alberto Arias, founder and President of Arias Resource Capital Management (45% stake in Largo); Jonathan Lee, Vice President of Arias; David Brace, CEO and director of Karmin Exploration (TSXV: KAR) and director of Viking Gold Exploration (TSXV: VGC); Daniel Tellechea, President and CEO of Sierra Metals from 2007-2014; Koko Yamamoto, CPA, partner at McGovern, Hurley, Cunningham; and Mark A. Smith, CEO of Largo Resources.

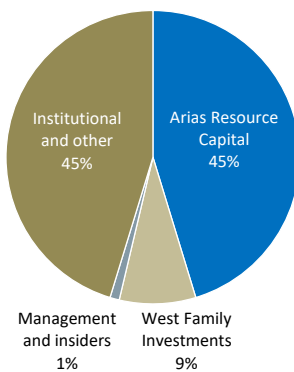
Ownership and share structure

As of its May 2019 filing, 45% (~240M) of Largo's shares outstanding are held by Arias Resource Capital Management, a New York-based private equity firm that specializes in metals and mining. Arias' stake in Largo began in 2010 and subsequently increased via private placements in 2015 and 2016. Arias has been steadily trimming its position since mid-2018. We expect Arias will continue to divest the holdings over time, but the firm has not provided any details on a timeline.

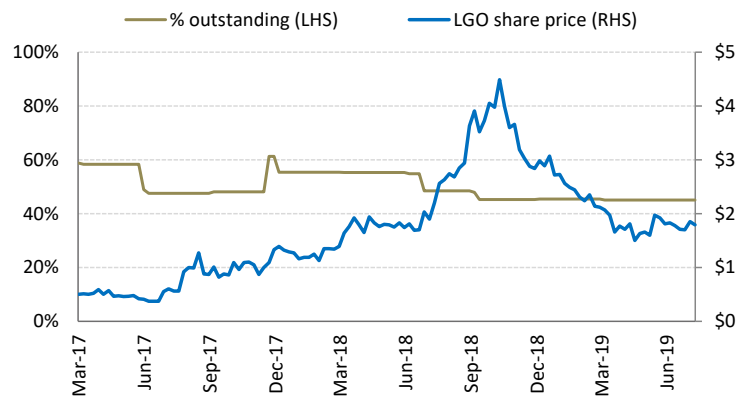
The second largest shareholder is West Family Investments, a family office based in Evanston, IL which has ~8% (44M shares) of the float. Management and board members collectively hold ~1% of the shares.

Exhibit 13: Arias Resource Capital has historically held >40% of Largo's shares outstanding

Largo shareholders as of August 14, 2019



Arias Capital currently holds ~45% of Largo's shares outstanding



Source: Company reports, SEDI, RBC Capital Markets estimates

Valuation – Outperform, \$3.50 price target

We rate Largo Resources shares **Outperform** with a **\$3.50 price target**. We value the company using a net asset value sum-of-the-parts approach with an 8% discount rate, applying 1.0x P/NAV multiple to Maracás Menchen and 0.5x to the Novo Amparo Norte deposit. Our multiple for Maracás Menchen is in line with the multiple used for projects that have been fully ramped up and demonstrate consistent operations. We apply a more conservative multiple to the Novo Amparo Norte deposit, which reflects a typical multiple assigned to development stage assets. Our price target supports an Outperform rating.

Exhibit 14: Largo Resources valuation

NET ASSET VALUE	DR (%)	C\$M	C\$NAV/sh	%NAV	P/NAV	C\$/Sh
Operating Value						
Maracás Menchen	8%	\$1,056	\$1.99	59.4%	1.00x	\$1.99
Novo Amparo Norte	8%	\$723	\$1.36	40.6%	0.50x	\$0.68
Total Operating Value	8%	\$1,779	\$3.35	100.0%	0.80x	\$2.67
Net Cash (end-2021)		\$369	\$0.70			\$0.70
Net Current Assets (ex. Cash)		-\$6	(\$0.01)			(\$0.01)
Total NAV (C\$M)		\$2,142	\$4.03		0.83x	\$3.35

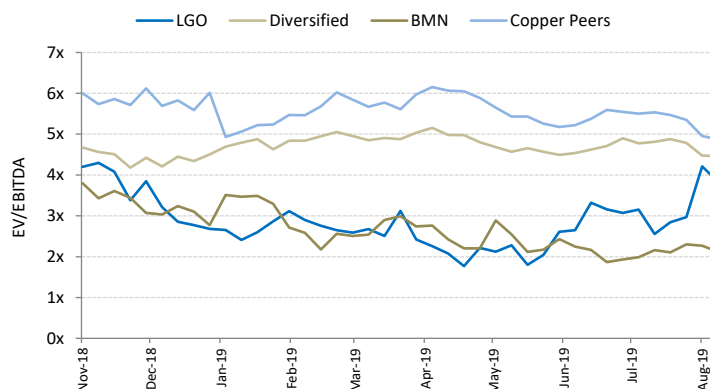
Source: Company reports, RBC Capital Markets estimates

EV/EBITDA valuation

We do not think EV/EBITDA valuation is appropriate for Largo due to several reasons: 1) the historical data for consensus estimates are limited as analyst coverage has been sparse; 2) significant price fluctuations in vanadium prices magnify the limited data set; and 3) EV/EBITDA valuation may not properly capture the potential future improvements with the expiration of the Glencore contract.

On an EV/EBITDA basis, Largo has traded at a ~1-2x discount to global diversified peers and ~1-3x discount to copper peers since November 2018, possibly due to uncertainty regarding vanadium prices and some perceived risk for Largo as a single-asset company. Compared to vanadium producing peer Bushveld Minerals (BMN), Largo has traded in-line through 2018, but has traded at a 1x premium to Bushveld since early-2019. Data before November 2018 is not applicable due to limited consensus estimates – EV/EBITDA varied from 15x to 70x.

Exhibit 15: Largo historical EV/EBITDA comparison



Note: III, IVN and NCU multiples excluded from the copper peer average due to elevated multiples
Source: Bloomberg, Company reports, RBC Capital Markets estimates

Largo trading at ~2x EV/EBITDA premium to Bushveld, but ~1x discount to global diversified miners.

Historical EV/EBITDA is not reliable due to limited data availability.

Vanadium peer comparison

Largo Resources shares are currently trading at a discount to our NAV estimate (0.4x P/NAV) and below copper producers (average 0.7x P/NAV), and global diversified peers (average 1.0x P/NAV). Although Largo is a single-asset company, we believe the wide valuation gap is unwarranted given that Largo is one of the lowest cost vanadium producers globally with strong operations, generates positive cash flow, has a strong balance sheet with no debt, and should benefit from improving vanadium market fundamentals. We include copper producers below in our peer comparison as Largo is a single-commodity, pure-play producer.

Bushveld Minerals is the only other pure-play vanadium producer. The company effectively owns a ~74% stake in the Vametco mine and processing plant in South Africa, which produced over 2,500t V in 2018. Bushveld Vanadium also has interests in the Brits project, which is essentially a Vametco extension in the exploration phase, and Mokopane (64% stake, also in South Africa) which may be developed with the pending acquisition of Vanchem's processing assets to increase production.

Please see Appendix III for more details on vanadium producing peers.

Exhibit 16: Largo Resources trades at 0.4x P/NAV, below the global diversified peer average at 1.0x

Ticker	Rating & Risk	RBC Estimates					Performance		Leverage	CAGR 2019-2021E	Valuation (2020E)			
		Price	Target	Implied Return	NAVPS		QTD	YTD	Net Debt/EBITDA	EBITDA	P/NAV	FCF Yield	Market Cap (US\$)	EV/EBITDA
Largo Resources	LGO-CA	OP	C\$1.66	C\$3.50	110.8%	C\$4.03	(8%)	(41%)	-1.8x	97%	0.4x	4%	\$667	4.6x
Vanadium Producers														
Bushveld Minerals ¹	BMN-GB	NC	£0.21	-	-	£0.16	(12%)	(46%)	-0.5x	30%	1.3x	24%	\$263	3.2x
Copper Producers														
Antofagasta	ANTO-GB	SP	£8.20	£9.20	12%	£7.71	(12%)	5%	0.7x	6%	1.1x	(3%)	\$9,756	5.4x
Capstone Mining	CS-CA	SP*	C\$0.46	C\$1.25	175%	C\$1.29	(23%)	(25%)	1.6x	(10%)	0.4x	28%	\$133	3.5x
Central Asia Metals	CAML-GB	OP	£1.90	£2.90	53%	£2.85	(11%)	(13%)	1.1x	2%	0.7x	0%	\$413	4.6x
First Quantum	FM-CA	OP	C\$8.96	C\$18.00	101%	C\$20.10	(28%)	(19%)	3.7x	30%	0.4x	20%	\$4,668	5.0x
Freeport McMoRan	FCX-US	SP	US\$9.36	US\$14.00	50%	US\$15.32	(19%)	(9%)	2.3x	43%	0.6x	6%	\$13,647	7.3x
HudBay Minerals	HBM-CA	SP	C\$4.23	C\$8.00	89%	C\$12.10	(40%)	(35%)	1.0x	3%	0.3x	(69%)	\$835	3.6x
Imperial Metals	IMI-CA	SP*	C\$2.77	C\$4.00	44%	C\$6.03	9%	79%	n.m.	-	0.5x	6%	\$249	16.6x
Ivanhoe Mines	IVN-CA	OP*	C\$3.66	C\$7.00	91%	C\$7.05	(12%)	54%	n.m.	0%	0.5x	(2%)	\$2,408	n/a
KAZ Minerals	KAZ-GB	SP	£4.95	£6.20	25%	£9.18	(18%)	(7%)	0.2x	39%	0.5x	10%	\$2,671	3.9x
Lundin Mining	LUN-CA	OP	C\$5.97	C\$9.00	51%	C\$10.55	(17%)	6%	1.7x	7%	0.6x	13%	\$3,310	3.3x
Nevada Copper	NCU-CA	OP*	C\$0.33	C\$1.00	203%	C\$1.44	0%	(14%)	n.m.	-	0.2x	(104%)	\$124	12.7x
OZ Minerals	OZL-AU	SP	A\$9.57	A\$10.50	10%	A\$9.66	(5%)	9%	-1.1x	32%	1.0x	25%	\$2,022	3.9x
Sandfire Resources NL	SFR-AU	SP	A\$6.05	A\$8.00	32%	A\$6.52	(10%)	(9%)	-0.7x	12%	0.9x	43%	\$649	2.0x
Turquoise Hill	TRQ-US	SP	US\$0.49	US\$2.00	309%	US\$2.01	(61%)	(70%)	2.3x	7%	0.2x	(187%)	\$985	2.8x
Weighted Average							(18%)	(3%)	1.5x	24%	0.7x	1%		5.6x
Diversified														
Anglo American	AAL-GB	TP	£17.89	£25.00	40%	£25.89	(20%)	2%	0.2x	(4%)	0.7x	5%	\$27,988	4.3x
BHP Group	BHP-GB	SP	£17.83	£20.00	12%	£15.89	(12%)	8%	0.4x	(10%)	1.1x	10%	\$114,858	5.4x
Glencore	GLEN-GB	SP	£2.31	£3.10	34%	£4.08	(16%)	(21%)	0.8x	15%	0.6x	19%	\$39,660	4.7x
Rio Tinto	RIO-GB	UP	£40.62	£41.00	1%	£31.04	(17%)	9%	0.2x	(21%)	1.3x	6%	\$84,902	5.6x
South32	S32-AU	SP	A\$2.93	A\$3.40	16%	A\$3.38	(8%)	(13%)	-0.3x	(100%)	0.9x	14%	\$10,424	4.7x
Teck Resources	TECK-B-CA	OP	C\$22.20	C\$47.00	112%	C\$48.62	(27%)	(24%)	0.5x	(2%)	0.5x	27%	\$9,767	3.3x
Vale S.A.	VALE-US	SP	US\$11.06	US\$12.00	8%	US\$12.85	(18%)	(16%)	0.9x	(20%)	0.9x	9%	\$57,318	4.5x
Weighted Average							(15%)	(1%)	0.4x	(14%)	1.0x	10%		5.0x

¹ FactSet consensus estimates used for Bushveld Minerals.

* Denotes companies with speculative risk ratings.

Based on prices at close on August 14, 2019

Source: Company reports, Bloomberg, FactSet, RBC Capital Markets estimates

Sensitivity

Largo is sensitive to: 1) vanadium price, as the company is a pure-play vanadium producer; 2) Brazilian Real as production is primarily in Brazil; 3) USD as vanadium is typically priced in US dollars; and 4) CAD as the company reports in Canadian dollars.

Exhibit 17: Largo NAV per share (C\$) sensitivity to NAV multiple and vanadium price

		V205 Spot Price (US\$/lb)					
		\$3.00	\$6.00	\$9.00	\$12.00	\$15.00	\$18.00
NAV Multiple	0.50x	\$0.23	\$1.29	\$2.34	\$3.40	\$4.45	\$5.51
	0.75x	\$0.27	\$1.69	\$3.11	\$4.53	\$5.95	\$7.38
	1.00x	\$0.30	\$2.09	\$3.88	\$5.67	\$7.45	\$9.24
	1.25x	\$0.34	\$2.49	\$4.65	\$6.80	\$8.96	\$11.11
	1.50x	\$0.38	\$2.90	\$5.42	\$7.94	\$10.46	\$12.98
	1.75x	\$0.41	\$3.30	\$6.18	\$9.07	\$11.96	\$14.84

Source: Company reports, RBC Capital Markets estimates

Exhibit 18: Largo NAV per share (C\$) sensitivity to discount rate and vanadium price

		V205 Spot Price (US\$/lb)					
		\$3.00	\$6.00	\$9.00	\$12.00	\$15.00	\$18.00
Discount Rate (%)	6%	\$0.33	\$1.99	\$3.64	\$5.30	\$6.96	\$8.62
	7%	\$0.32	\$1.90	\$3.47	\$5.05	\$6.62	\$8.20
	8%	\$0.32	\$1.82	\$3.32	\$4.82	\$6.32	\$7.82
	9%	\$0.31	\$1.75	\$3.18	\$4.62	\$6.05	\$7.48
	10%	\$0.31	\$1.68	\$3.06	\$4.43	\$5.80	\$7.17
	11%	\$0.31	\$1.62	\$2.94	\$4.26	\$5.58	\$6.89

Source: Company reports, RBC Capital Markets estimates

Exhibit 19: Largo NAV per share (C\$) sensitivity to USDCAD and vanadium price

		V205 Spot Price (US\$/lb)					
		\$3.00	\$6.00	\$9.00	\$12.00	\$15.00	\$18.00
USDCAD	1.15	\$0.27	\$1.60	\$2.93	\$4.25	\$5.58	\$6.91
	1.20	\$0.29	\$1.67	\$3.06	\$4.44	\$5.83	\$7.21
	1.25	\$0.30	\$1.75	\$3.19	\$4.63	\$6.07	\$7.52
	1.30	\$0.32	\$1.82	\$3.32	\$4.82	\$6.32	\$7.82
	1.35	\$0.34	\$1.89	\$3.45	\$5.01	\$6.57	\$8.13
	1.40	\$0.35	\$1.97	\$3.58	\$5.20	\$6.82	\$8.43

Source: Company reports, RBC Capital Markets estimates

Exhibit 20: Largo Resources NAV per share (C\$) sensitivity to USDBRL and vanadium price

		V205 Spot Price (US\$/lb)					
		\$3.00	\$6.00	\$9.00	\$12.00	\$15.00	\$18.00
USDBRL	2.50	(\$0.14)	\$1.36	\$2.86	\$4.36	\$5.86	\$7.36
	3.00	\$0.09	\$1.59	\$3.10	\$4.60	\$6.10	\$7.60
	3.50	\$0.26	\$1.77	\$3.27	\$4.77	\$6.27	\$7.77
	4.00	\$0.39	\$1.89	\$3.39	\$4.89	\$6.39	\$7.90
	4.50	\$0.49	\$1.99	\$3.49	\$4.99	\$6.49	\$7.99
	5.00	\$0.57	\$2.07	\$3.57	\$5.07	\$6.57	\$8.07

Source: Company reports, RBC Capital Markets estimates

FCF and EBITDA sensitivity to vanadium price

Exhibit 21: Largo annual EBITDA (C\$M) sensitivity to vanadium price

		EBITDA (C\$M)						
		2019E	2020E	2021E	2022E	2023E	2024E	2025E
V205 Price (US\$/lb)	\$3.00	\$6	(\$1)	\$24	\$24	\$24	\$24	\$24
	\$6.00	\$39	\$94	\$132	\$132	\$132	\$132	\$132
	\$9.00	\$72	\$188	\$239	\$239	\$239	\$239	\$239
	\$12.00	\$106	\$282	\$347	\$347	\$347	\$347	\$347
	\$15.00	\$139	\$376	\$454	\$454	\$454	\$454	\$454
	\$18.00	\$172	\$470	\$562	\$562	\$562	\$562	\$562

Source: Company reports, RBC Capital Markets estimates

Exhibit 22: Largo annual FCF (C\$M) sensitivity to vanadium price

		FCF (C\$M)						
		2019E	2020E	2021E	2022E	2023E	2024E	2025E
V205 Price (US\$/lb)	\$3.00	(\$43)	(\$4)	\$15	\$15	\$15	\$15	\$15
	\$6.00	(\$14)	\$66	\$96	\$96	\$96	\$96	\$96
	\$9.00	\$15	\$137	\$176	\$176	\$176	\$176	\$176
	\$12.00	\$44	\$207	\$257	\$257	\$257	\$257	\$257
	\$15.00	\$73	\$278	\$338	\$338	\$338	\$338	\$338
	\$18.00	\$102	\$348	\$418	\$418	\$418	\$418	\$418

Note: we refer to FCF and FCF yield after normalizing for working capital impact from Glencore contract adjustments.

Source: Company reports, RBC Capital Markets estimates

Exhibit 23: Largo FCF per share (C\$) sensitivity to vanadium price

		FCFPS (C\$M)						
		2019E	2020E	2021E	2022E	2023E	2024E	2025E
V205 Price (US\$/lb)	\$3.00	(\$0.08)	(\$0.01)	\$0.03	\$0.03	\$0.03	\$0.03	\$0.03
	\$6.00	(\$0.03)	\$0.12	\$0.18	\$0.18	\$0.18	\$0.18	\$0.18
	\$9.00	\$0.03	\$0.26	\$0.33	\$0.33	\$0.33	\$0.33	\$0.33
	\$12.00	\$0.08	\$0.39	\$0.48	\$0.48	\$0.48	\$0.48	\$0.48
	\$15.00	\$0.14	\$0.52	\$0.64	\$0.64	\$0.64	\$0.64	\$0.64
	\$18.00	\$0.19	\$0.66	\$0.79	\$0.79	\$0.79	\$0.79	\$0.79

Source: Company reports, RBC Capital Markets estimates

Exhibit 24: Largo FCF yield (%) sensitivity to vanadium price

		FCF Yield (%)						
		2019E	2020E	2021E	2022E	2023E	2024E	2025E
V205 Price (US\$/lb)	\$3.00	(5%)	(0%)	2%	2%	2%	2%	2%
	\$6.00	(2%)	8%	11%	11%	11%	11%	11%
	\$9.00	2%	16%	20%	20%	20%	20%	20%
	\$12.00	5%	23%	29%	29%	29%	29%	29%
	\$15.00	8%	31%	38%	38%	38%	38%	38%
	\$18.00	12%	39%	47%	47%	47%	47%	47%

Note: we refer to FCF and FCF yield after normalizing for working capital impact from Glencore contract adjustments.

Source: Company reports, RBC Capital Markets estimates



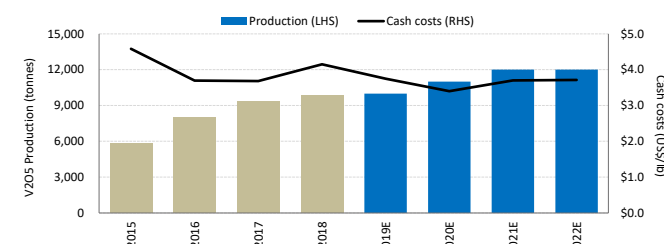
Exhibit 25: Largo Resources summary

Largo Resources Ltd						Price Target: C\$3.50		Rating: Outperform		
RBC Capital Markets / Andrew Wong (416) 842-7830						Share Price (C\$/sh):		\$1.66	Implied Return (%):	110.8%
TSX: LGO						NAV (C\$/sh):		\$4.03	Net Cash (C\$M):	\$190
						P/NAV		0.41x	Issued Shares (diluted)	531.6
All C\$ millions, unless noted						Year Ended December 31				
ASSUMPTIONS SUMMARY						2018A	2019E	2020E	2021E	2022E
Vanadium - Europe (US\$/lb V2O5)						\$18.30	\$9.63	\$7.50	\$8.00	\$8.00
USD/CAD						\$1.31	\$1.34	\$1.36	\$1.37	\$1.33
USD/BRL						\$3.64	\$3.90	\$4.00	\$3.50	\$3.50
INCOME STATEMENT (C\$M)						2018A	2019E	2020E	2021E	2022E
Revenue		CAD	\$521	\$178	\$266	\$346	\$341			
Operating Costs		CAD	(\$160)	(\$158)	(\$152)	(\$177)	(\$174)			
EBITDA		CAD	\$392	\$54	\$150	\$209	\$206			
DD&A		CAD	(\$31)	(\$34)	(\$36)	(\$40)	(\$40)			
EBIT		CAD	\$361	\$20	\$114	\$169	\$167			
Other Income/Expenses		CAD	(\$38)	(\$18)	\$0	\$0	\$0			
EBT		CAD	\$323	\$2	\$114	\$169	\$167			
Taxes		CAD	(\$7)	(\$9)	(\$28)	(\$42)	(\$42)			
Net Income - Reported		CAD	\$316	(\$7)	\$85	\$127	\$125			
Adjustments		CAD	\$0	\$0	\$0	\$0	\$0			
Net Income - Adjusted		CAD	\$316	(\$7)	\$85	\$127	\$125			
Earnings - Adjusted (\$/sh)		CAD	\$0.50	(\$0.01)	\$0.16	\$0.24	\$0.24			
Weighted average diluted shares (M)			635.0	530.5	531.6	531.6	531.6			
EV/EBITDA			1.8x	12.9x	4.6x	3.3x	3.4x			
CASH FLOW STATEMENT (C\$M)						2018A	2019E	2020E	2021E	2022E
Cash Flows from Operating Activities										
Net Income		CAD	\$316	(\$7)	\$85	\$127	\$125			
DD&A		CAD	\$31	\$34	\$36	\$40	\$40			
Taxes Paid		CAD	\$27	\$6	\$28	\$42	\$42			
Finance Costs		CAD	\$39	\$14	\$0	\$0	\$0			
Non-Recurring/Other		CAD	(\$13)	\$4	(\$26)	(\$40)	(\$40)			
Operating Cash Flow		CAD	\$400	\$51	\$124	\$169	\$167			
Changes in Working Capital		CAD	(\$51)	\$115	(\$77)	(\$0)	\$0			
Net Operating Cash Flow		CAD	\$349	\$165	\$47	\$168	\$167			
Cash Flows From Investing Activities										
Net Capital Expenditures		CAD	(\$19)	(\$52)	(\$15)	(\$15)	(\$15)			
Net Purchase/Sale of Investments		CAD	\$0	\$0	\$0	\$0	\$0			
Acquisitions		CAD	\$0	\$0	\$0	\$0	\$0			
Other		CAD	\$0	\$0	\$0	\$0	\$0			
Net Investing Cash Flow		CAD	(\$19)	(\$19)	(\$52)	(\$15)	(\$15)			
Cash Flows From Financing Activities										
Net Issue/Red. Debt		CAD	(\$127)	(\$125)	\$0	\$0	\$0			
Net Sale/Repur. of Stock		CAD	\$9	\$0	\$0	\$0	\$0			
Interest		CAD	\$1	(\$4)	\$0	\$0	\$0			
Other		CAD	(\$61)	\$0	\$0	\$0	\$0			
Net Financing Cash Flow		CAD	(\$178)	(\$129)	\$0	\$0	\$0			
Increase (Decrease) in Cash		CAD	\$149	(\$22)	\$32	\$153	\$152			
Cash at End of Year		CAD	\$206	\$184	\$216	\$369	\$521			
Free Cash Flow		CAD	\$330	\$113	\$32	\$153	\$152			
Free Cash Flow excl. WC		CAD	\$382	(\$2)	\$109	\$154	\$152			
Free Cash Flow Yield			43.2%	(0.2%)	12.3%	17.4%	17.2%			
BALANCE SHEET (C\$M)						2018A	2019E	2020E	2021E	2022E
Cash & Equivalents		CAD	\$206	\$184	\$216	\$369	\$521			
Other Current Assets		CAD	\$80	\$33	\$34	\$39	\$38			
PP&E and Other		CAD	\$266	\$279	\$258	\$233	\$209			
Total Assets		CAD	\$553	\$497	\$508	\$642	\$768			
Current Liabilities		CAD	\$151	\$105	\$30	\$35	\$34			
Long Term Debt		CAD	\$0	\$0	\$0	\$0	\$0			
Other Long Term Liabilities		CAD	\$9	\$10	\$10	\$10	\$10			
Total Liabilities		CAD	\$160	\$115	\$39	\$44	\$43			
Shareholder Equity		\$74	\$393	\$382	\$469	\$598	\$725			
Total Liabilities & Shareholder Equity		CAD	\$553	\$497	\$508	\$642	\$768			
ROE			80.5%	(1.9%)	18.2%	21.2%	17.2%			
ROIC			69.5%	2.8%	18.2%	21.2%	17.2%			

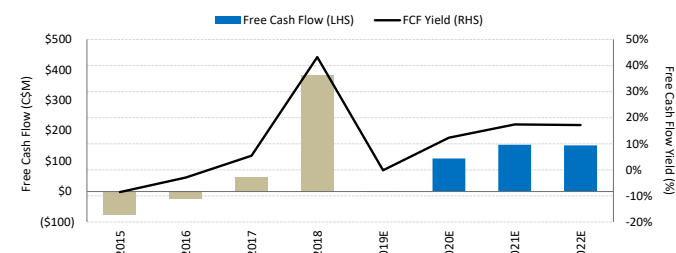
PRODUCTION AND CASH COSTS												
FREE CASH FLOW AND YIELD												
NET ASSET VALUE							DR (%)	C\$M	C\$NAV/sh	%NAV	P/NAV	C\$/Sh
Operating Value												
Maracás Menchen							8%	\$1,056	\$1.99	59.4%	1.00x	\$1.99
Novo Amparo Norte							8%	\$723	\$1.36	40.6%	0.50x	\$0.68
Total Operating Value							8%	\$1,779	\$3.35	100.0%	0.80x	\$2.67
Net Cash (end-2021)								\$369	\$0.70			\$0.70
Net Current Assets (ex. Cash)								-\$5	(\$0.01)			(\$0.01)
Total NAV (C\$M)								\$2,144	\$4.03		0.83x	\$3.35
NET ASSET VALUE FORECAST (C\$M or per share)												
							Downside		Base		Upside	
Vanadium - Europe (US\$/lb V2O5)							\$5.50		\$10.00		\$15.00	
Maracás Menchen							\$465		\$1,056		\$1,929	
Satellite Deposits							\$220		\$723		\$1,149	
Total Operating Value							\$684		\$1,779		\$3,078	
Net Cash (end-2021)							\$241		\$369		\$824	
Net Current Assets (ex. Cash)							(\$1)		(\$5)		(\$15)	
Total NAV (C\$M)							\$925		\$2,144		\$3,887	
Target NAV Multiple							0.50x		0.83x		1.00x	
NAV per Share (C\$)							\$1.10		\$3.35		\$7.31	
Prem/(Disc.) to Current Price							(34%)		102%		341%	

Downside	Base	Upside
Scenarios		
Current Share Price		

PRODUCTION AND CASH COSTS



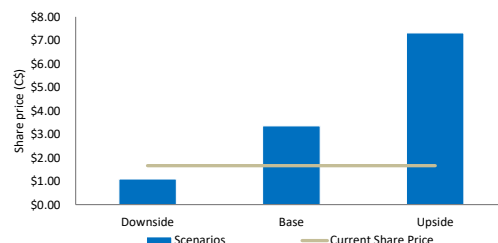
FREE CASH FLOW AND YIELD



NET ASSET VALUE	DR (%)	C\$M	C\$NAV/sh	%NAV	P/NAV	C\$/Sh
Operating Value						
Maracás Menchen	8%	\$1,056	\$1.99	59.4%	1.00x	\$1.99
Novo Amparo Norte	8%	\$723	\$1.36	40.6%	0.50x	\$0.68
Total Operating Value	8%	\$1,779	\$3.35	100.0%	0.80x	\$2.67
Net Cash (end-2021)		\$369	\$0.70			\$0.70
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Total NAV (C\$M)		\$2,144	\$4.03		0.83x	\$3.35

NET ASSET VALUE FORECAST (C\$M or per share)

	Downside	Base	Upside
Vanadium - Europe (US\$/lb V2O5)	\$5.50	\$10.00	\$15.00
Maracás Menchen	\$465	\$1,056	\$1,929
Satellite Deposits	\$220	\$723	\$1,149
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Net Cash (end-2021)	\$241	\$369	\$824
Net Current Assets (ex. Cash)	(\$1)	(\$5)	(\$15)
Total NAV (C\$M)	\$925	\$2,144	\$3,887
Target NAV Multiple	0.50x	0.83x	1.00x
NAV per Share (C\$)	\$1.10	\$3.35	\$7.31
Prem/(Disc.) to Current Price	(34%)	102%	341%



Price at close on August 14, 2019

Source: Company reports, RBC Capital Markets estimates

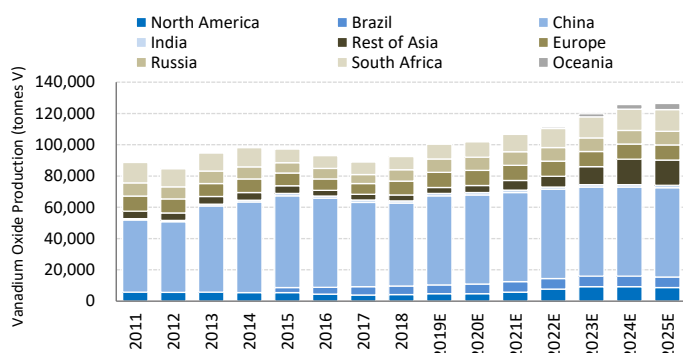
Appendix I: Vanadium market outlook

Vanadium supply – moderate growth from primary producers

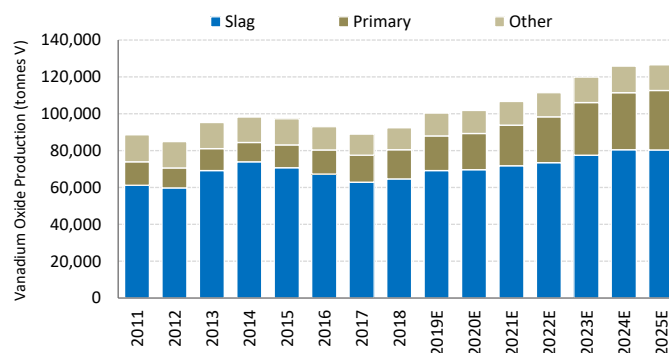
We expect a moderate increase in global vanadium supply at 3% CAGR from 2018 to 2025, mainly driven by new primary production as slag co-production growth is limited. We think that new vanadium production above our estimates is possible, but would depend on higher price incentives for higher-cost stone coal producers in China and new primary projects elsewhere. Overall, we expect the vanadium market deficit to ease moderately through 2022E, before seeing a wider deficit as demand growth outpaces new supply.

Exhibit 26: China expected to continue accounting for majority of global vanadium supply

China expected to remain the largest vanadium producer through 2025E



Global vanadium production by source (tonnes V)

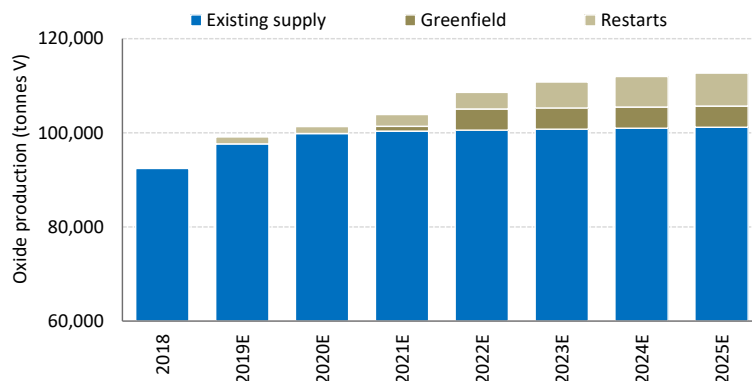


Source: Roskill, Company reports, RBC Capital Markets estimates

We think China will remain the largest contributor to global vanadium supply, although we project China's share to decline to 51% by 2025, from 57% in 2018, due to limited growth opportunities in slag feedstock and environmental restrictions on stone coal based production. Outside of China, we see several projects primary production projects coming online through 2025 including – Largo Maracas Menchen expansion in Brazil; Bushveld Vametco expansion and Mokopane/Vanchem re-start in South Africa; Blackrock Metals in Quebec; and Atlantic Windimurra re-start in Australia.

Exhibit 27: New projects and restarts are expected to contribute new supply through 2025

We estimate greenfield and brownfield will contribute ~6% overall growth to global vanadium supply from 2018-2025.



Source: Roskill, Company reports, RBC Capital Markets estimates

Vanadium supply chain dominated by inelastic slag, but primary growing

Vanadium feedstock is typically converted into vanadium oxide (i.e. vanadium pentoxide), which has a wide variety of applications, including: ferrovanadium and vanadium nitrides, used in steel alloy applications; vanadium metal and alloys, incorporated into non-ferrous alloys; chemicals, used in catalysts and pharmaceutical applications; and electrolytes which are components of vanadium redox batteries (VRBs).

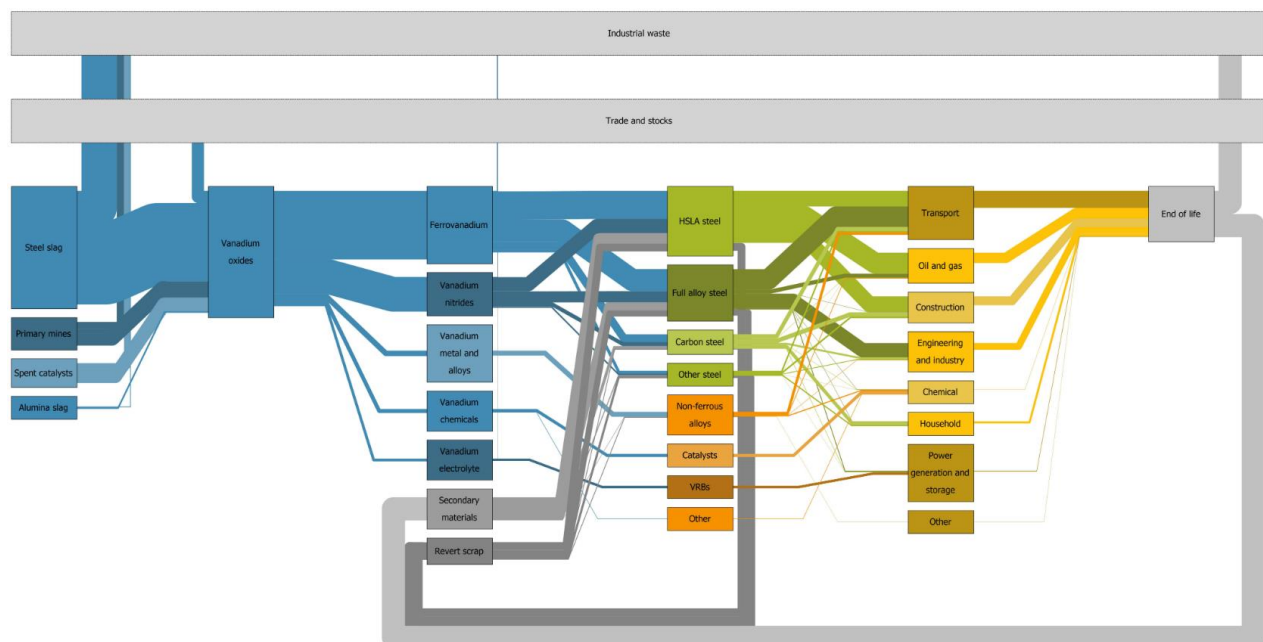
The three main sources of vanadium feedstock are slag, primary and secondary production. We expect new supply to come from primary production (i.e. new mines), as slag and secondary production have limited growth opportunities.

Slag accounted for 70% of global feedstock production in 2018, primarily in China and Russia. Chinese produced slag is processed domestically while Russian slag is either processed within country or exported. Slag feedstock is produced as a by-product of steel production using VTM (vanadium titano-magnetite) iron ore. We think significant increases in slag-based vanadium production is unlikely, as it is heavily dependent on the growth of steel production and the use of VTM iron ore (note other types of iron ore can be used for steel production).

Primary production comprised 17% of feedstock in 2018, which we expect to rise to 26% by 2025 as various projects come online. Primary production typically focuses on vanadium production from VTM ores with relatively high vanadium grade (0.5-1.0% V₂O₅ vs. <0.5% in VTM ores used to produce slag feedstock). We note some operations may also produce titanium and iron, which can add challenges in comparing projects or evaluating incentive pricing for new supply.

Secondary production represents a smaller share of global feedstock at 13% in 2018 and occurs when vanadium is extracted from catalysts, oil residues and industrial waste materials. China and the United States are the largest producers of this higher-cost method. Vanadium can also be produced as a by-product of uranium mining.

Exhibit 28: Vanadium supply chain diagram



Source: Roskill

China's vanadium supply expected to remain relatively unchanged

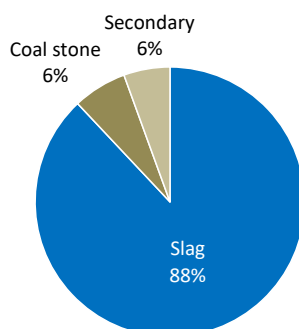
We expect vanadium production in China to remain relatively unchanged through our forecast period, although the country will likely remain the largest producer of vanadium (~57% global production in 2018). Historically, growth in Chinese vanadium production was driven by steel production using VTM iron ores, while high-cost stone coal based primary producers would add supply when prices were favourable and secondary sources account for a smaller portion – in 2018 we estimate the break-down for Chinese vanadium production by the various feedstock types as 70% slag from steel production, 17% primary stone coal production, and 13% secondary production. Going forward, we see several factors that may limit vanadium production growth in China:

- 1) Steel production growth in China is below historical levels, resulting in lower growth in the co-production of vanadium-bearing slag feedstock.
- 2) Chinese steel producers are shifting away from expensive domestic iron ores and using less-expensive imported iron ore, which does not contain vanadium.
- 3) The increasing use of steel scrap and shift towards newer and more environmentally friendly electric arc furnace steel production limits the use of VTM iron ores.
- 4) Stone coal based producers are at the higher-end of the cost curve and would have low (or negative) profitability based on our forecasted prices, but could add some supply if prices improve.
- 5) Environmental restrictions limit new capacity additions.

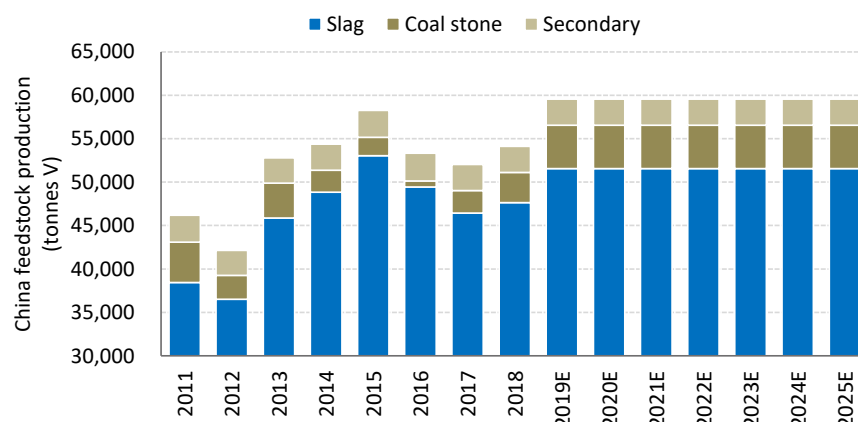
China has the world's largest vanadium reserves, although most are relatively low grade. Feedstock in China is primarily sourced from slag co-produced with steel, with some slag historically imported from New Zealand prior to the ban enacted in January 2018. For primary production, China uses stone coal, a sedimentary rock that is burnt and treated to produce vanadium. Stone coal production is considered higher-cost and acts as a swing producer to meet demand when required, as seen in 2018 when prices increased. However, aside from the short-term reactions to price fluctuations, we do not expect China to increase stone coal production significantly as current prices would not support new capacity and the process is considered harmful to the environment.

Exhibit 29: Slag expected to continue accounting for majority of Chinese feedstock production

Feedstock production in China, 2018



Vanadium feedstock in China has limited room to grow



Source: Roskill, Company reports, RBC Capital Markets estimates

Potential new projects outside of China

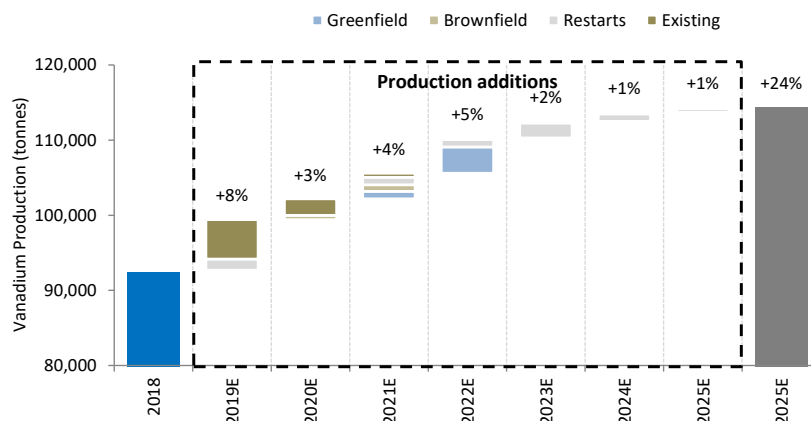
We estimate 24Kt new production coming online from 2019 to 2025, from projects we consider as 'firm or probable' – brownfield expansions at low cost, partially completed projects that require low capex, or new greenfield that has already started construction.

- **Atlantic Windimurra:** The Windimurra project located in Australia had previously produced limited volumes in 2012, but a fire in 2014 damaged the plant and operations were suspended. A re-development study in 2018 indicated ~US\$90M would be required for re-start, with expected annual vanadium production of 4,300 tonnes. Construction was expected to start in 1H/19, but there have been no new updates. We include Windimurra in our supply outlook in 2022.
- **Blackrock Metals:** The Blackrock Metals project in Quebec is privately owned, funded by the Orion Mine Finance Group, a private equity firm, and the Quebec Government. The project plans to produce high purity pig iron, titanium slag, and ferrovandium, with capex at ~\$US750M. Construction expected to start in 2019 and we include the project in our supply outlook starting in 2021.
- **Bushveld Vametco:** In 2018, Bushveld completed the phase 2 expansion at Vametco in South Africa and is expected to ramp-up production to 3,400 tonnes annual vanadium production by 2020. A phase 3 expansion that could start in 2020 is expected to increase annual production to 4,200 tonnes vanadium.
- **Bushveld Vanchem/Mokopane:** Bushveld is in the process of acquiring the Vanchem vanadium processing facility in South Africa. The company has outlined a plan to refurbish the facility over a 5-year period and potentially integrate with the developing Mokopane vanadium mine project, with annual production reaching 4,200 tonnes vanadium after ramp-up.
- **Largo Maracas Menchen:** Largo is currently working on a moderate expansion that should be completed in 2H/19 and is expected to increase annual production to 6,700 tonnes vanadium, from ~5,500 tonnes.

If prices were significantly above our price forecasts, we could see additional new supply from projects we deem as 'possible.' We roughly estimate a sustainable vanadium price of \$10-15/lb V2O5 is required to incentivize this potential new supply, which would provide investment returns at ~30-50% for greenfield capacity and compensate for the risk from historical volatility in vanadium prices.

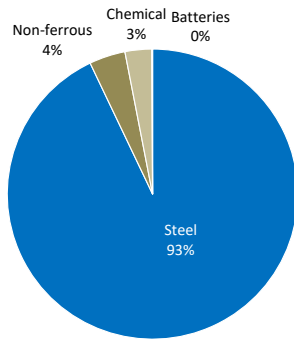
Exhibit 30: Greenfield and brownfield projects expected to comprise ~30% of new supply

Supply increase will mainly come from new greenfield primary production.



Source: Roskill, Company reports, RBC Capital Markets estimates

Exhibit 31: Vanadium demand, % of total (2018)



Source: Roskill, RBC Capital Markets estimates

Demand – steel alloy demand drives long-term growth

We model demand growth in vanadium at 2% CAGR through 2025, driven mainly by increased intensity of vanadium used in China to produce steel. We also see steady growth in non-ferrous alloys used in the aerospace industry, chemical production and catalysts used across a wide variety of industries, and potential gradual adoption of VRBs (vanadium redox batteries) – these applications typically require high-purity vanadium.

Steel: We model vanadium used in the steel industry to grow at 2% CAGR to 112Kt V by 2025. Steel is the largest segment of the vanadium market, accounting for 93% of total vanadium demand in 2018. The main products are high-strength low-alloy (HSLA) steel, full-alloy steel and carbon steel. We expect China to remain the most important market for vanadium used in steel, contributing ~50% of total steel based demand growth during our forecast period through 2025. Recent policy changes in China requiring higher quality rebar, and therefore greater intensity of vanadium, are a key demand driver.

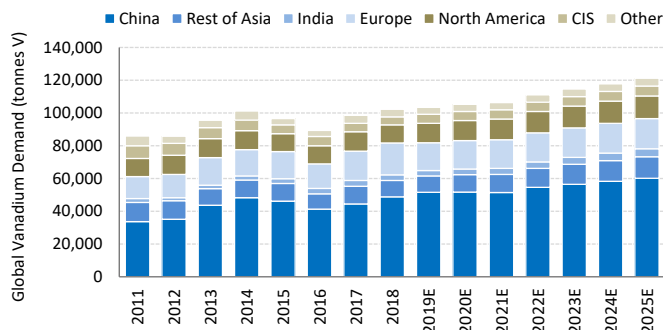
Non-ferrous alloys: Non-ferrous alloys are the second largest market for vanadium, and encompass titanium alloys, high-performance alloys, and magnetic alloys. We expect moderate growth driven by increasing use in titanium alloys, which are the largest demand segment for vanadium aside from steel and primarily used in aerospace engine parts.

Chemical: We estimate vanadium demand from chemicals will grow in line with growth rates of global economic growth. Vanadium demand from chemicals is divided between catalysts (i.e. cleaning industrial waste) and other chemical applications (i.e. pharmaceuticals). The largest markets are Japan and the US (25% of total demand) while China is becoming a more significant consumer.

VRBs: VRBs currently represent a small share of global vanadium demand (<1% in 2018), but the segment has potential to be a significant driver if the technology is adopted for grid storage applications. The factors critical to VRB adoption are vanadium prices (we think in the range of ~\$7-8/lb V2O5 is supportive), increased grid storage demand, and better VRB infrastructure. We do not include VRB demand in our demand model as the adoption rate is uncertain and highly sensitive to vanadium prices, but we have used consultant forecasts to assess the potential upside demand and impact if the technology is adopted.

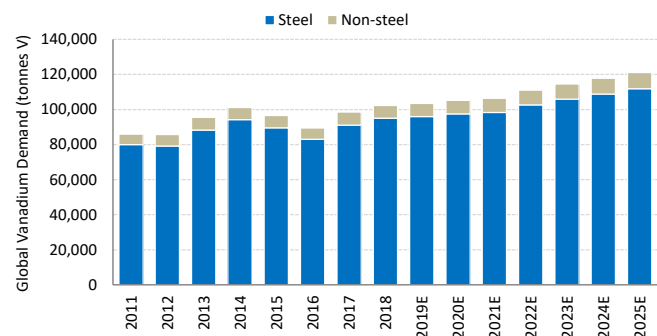
Exhibit 32: Global vanadium demand growth mainly driven by consumption in steel production

Global vanadium demand by region (tonnes V)



Source: Roskill, RBC Capital Markets estimates

Steel is expected to continue accounting for 90%+ of global demand

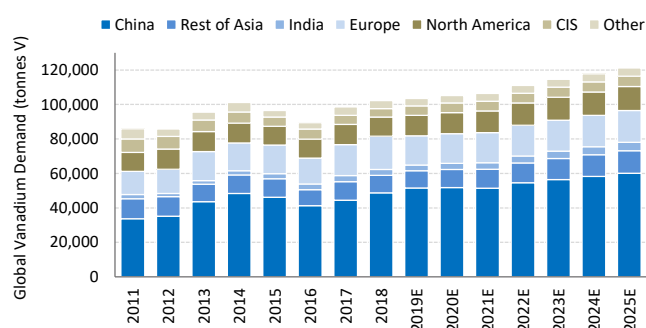


Steel production the main driver for vanadium demand

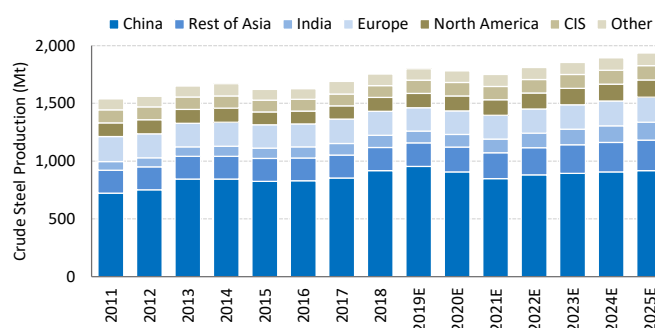
In 2018, the steel industry contributed approximately 93% of global vanadium consumption and we expect this share to remain relatively stable through our forecast period. Increased vanadium demand in steel has resulted from both higher steel production and greater intensity of vanadium used in steel. The largest steel markets for vanadium are high-strength low-alloy (HLSA) steel, full-alloy steel and carbon steel. China is the most important market for vanadium consumption in steel, comprising ~50% of vanadium demand from steel in 2018 and growing at 3% CAGR. We model 2% CAGR growth in the rest of world, generally in line with global steel production.

Exhibit 33: Vanadium demand expected to rise along with steel production

Global vanadium demand used in steel by region (tonnes V)



Global crude steel production by region (Mt)



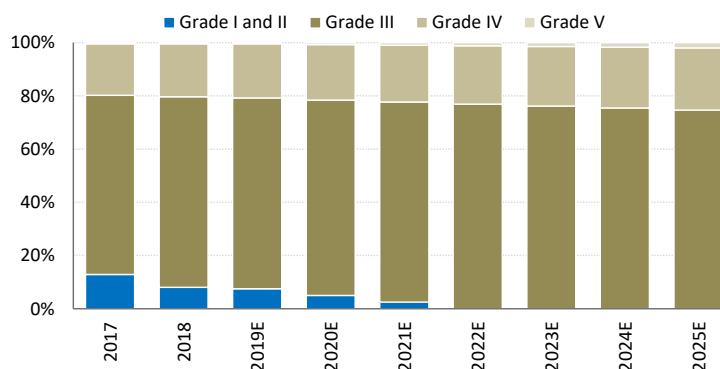
Source: Roskill, Company reports, RBC Capital Markets estimates

China implementing new rebar standards a driver for increased vanadium use

China implemented a new standard (GB/T 1499.2.2018) for high-strength low alloy (HSLA) rebar used in construction, effective November 1, 2018, which we expect should increase demand for vanadium as the standards are more strictly enforced. The policy is intended to limit the use of low-quality steel in rebar and comes after the 2008 Sichuan earthquake, where many buildings collapsed due to poor steel quality. Chinese steel companies are required to stop producing Grade 2 rebar (335MPa tensile strength) and only produce higher-strength Grade 3 (400MPa), Grade 4 (500MPa) and Grade 5 (600MPa), which are more earthquake-resistant. Although no specific vanadium content requirements have been set, higher grade HSLA requires greater vanadium intensity.

Exhibit 34: Adoption of higher grade steel rebar in China a major vanadium driver

China expected to gradually adopt new rebar standards that require steel companies to only produce Grade 3 or higher rebar.

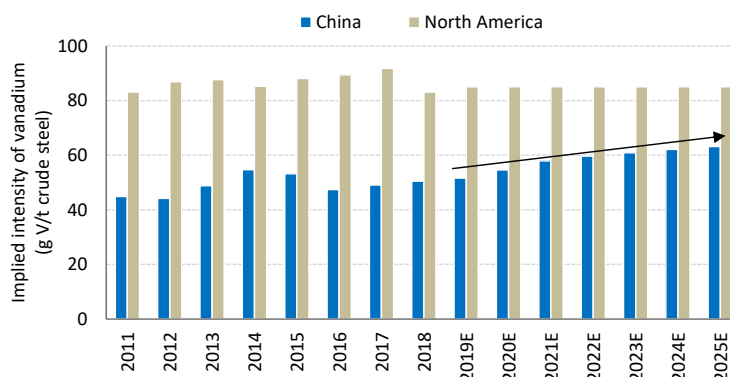


Source: Roskill, Company reports, RBC Capital Markets estimates

We estimate the intensity of vanadium used in Chinese steel production should increase to 62g/tonne of steel by 2025, up from 51g/tonne in 2019, as the new rebar standards are adopted. Based on literature and consultancy discussions on vanadium requirements for HSLA rebar, we assume Grade III requires 0.03% vanadium, Grade IV requires 0.06%, and Grade V requires 0.10%. Early enforcement has been lax and steel producers have been granted a grace period, but we expect the standards to be gradually enforced and adopted going forward. Comparing our estimates of Chinese vanadium use intensity against North American figures, we think our forecasts are reasonable and not unrealistic.

Exhibit 35: China's intensity of vanadium used in steel production expected to increase

We expect Chinese vanadium intensity used in steel should rise as new rebar standards are adopted.



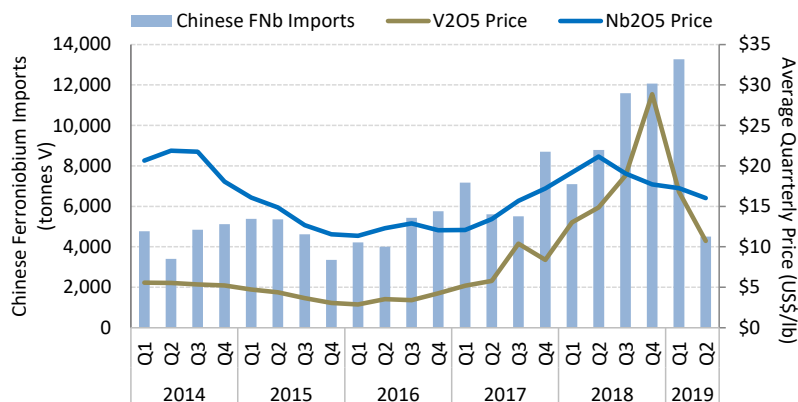
Source: Roskill, Company reports, RBC Capital Markets estimates

Lower vanadium prices likely reverse recent niobium substitution

We think the recent decrease in vanadium prices should discourage steel producers from substituting niobium in place of vanadium. Based on literature we have read, a similar amount of vanadium and niobium (i.e. almost one to one substitution) is required to meet standards for Grade 3 rebar, but vanadium alloyed steel is preferable as it requires lower rolling pressures and temperatures, and niobium is not suitable for higher quality Grade 4 and 5 rebar. However, as vanadium prices increased sharply through 2018, Chinese steel producers increased substitution of niobium in place of vanadium for steel production, which hurt vanadium demand – this is evidenced by increased niobium imports in 2018. With the recent decrease in vanadium price, we believe vanadium is now more attractive on an economic basis, although some steel producers may be waiting for vanadium prices to stabilize before switching processes – we note niobium imports declined in 2Q/19.

Exhibit 36: Niobium substitution expected to decrease as vanadium prices have declined

Niobium can be substituted for vanadium in Grade 3 rebar at a one-to-one ratio. We expect the recent decline in vanadium prices should reverse niobium substitution that increased in 2018.



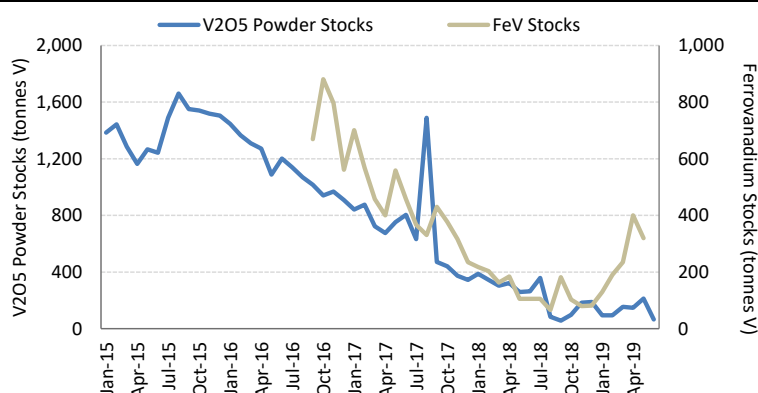
Source: Ferro Alloy Net, Bloomberg, RBC Capital Markets estimates

Reduced inventories in China should be supportive in near-term

Vanadium inventories at the producer level in China are low relative to historical levels based on industry data, which we think should be supportive for stronger prices when rebar enforcement improves and demand for vanadium use in steel increases. Vanadium producer inventories consistently averaged >1Kt V2O5 before 2017, but have since been declining and averaged just 100-200t in early-2019. We believe this indicates that weak demand has been a major cause for the recent price decline and not excess production.

Exhibit 37: Vanadium inventories in China have been drawn down

Industry data indicates that vanadium inventories have been drawn down, which likely contributed to recent price volatility.



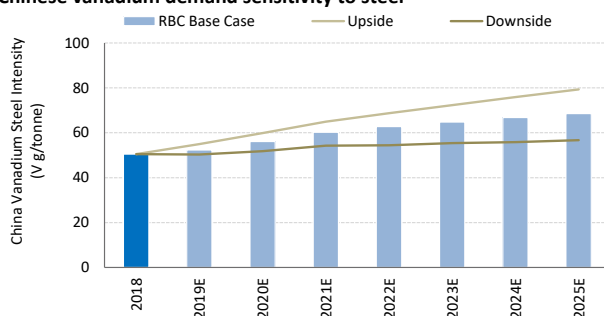
Source: Ferro Alloy Net, RBC Capital Markets estimates

Chinese high grade rebar standards a key swing factor for demand

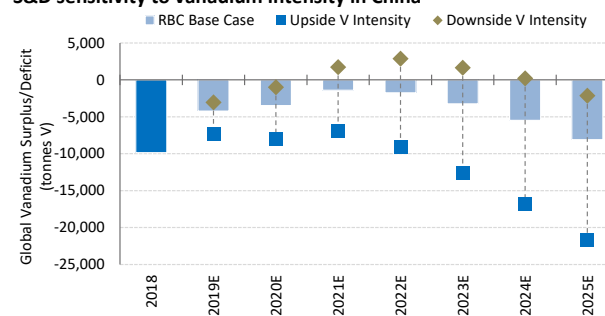
We view the use of vanadium in China for steel production as the most significant swing factor in our S&D outlook. Our upside and downside vanadium demand scenarios depend significantly on the enforcement of new Chinese rebar regulations. In our upside demand case, we model higher vanadium contained in steel with ~50% of Grade 3 rebar containing vanadium by 2025 (vs. 40% in base case), increasing vanadium intensity in China to 78g (2025E) vanadium per tonne of steel produced, up from 62g per tonne in our base case forecasts. This scenario would result in a more severe market deficit, reaching ~21Kt by 2025 (vs. 7Kt deficit in our base case), and supports our US\$15/lb upside vanadium price forecast. In our downside demand scenario, we model a more gradual pickup in vanadium intensity due to relaxed regulatory enforcement and greater niobium substitution, resulting in a moderate 57g vanadium per tonne steel produced and a market surplus in 2021 to 2024.

Exhibit 38: Growth in vanadium demand to come largely from increased adoption of higher rebar standards in China

Chinese vanadium demand sensitivity to steel



S&D sensitivity to vanadium intensity in China



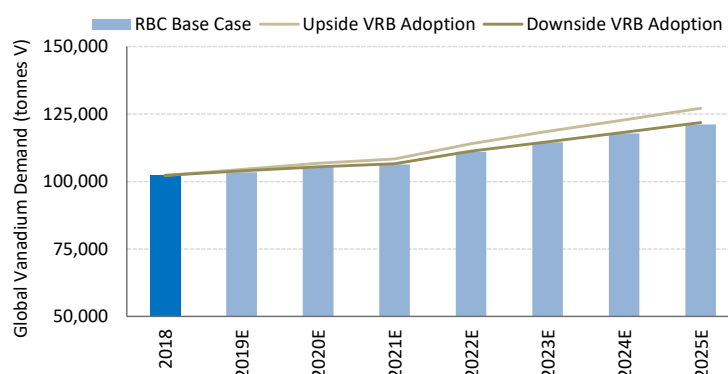
Source: Roskill, Company reports, RBC Capital Markets estimates

Vanadium Redox Flow Batteries

We expect vanadium redox flow batteries (VRBs) to account for a relatively small share of global vanadium demand as economic viability is highly dependent on the market price of vanadium. Since VRB technology has a relatively low market acceptance and has only recently been installed on a large commercial scale, we believe there is significant uncertainty in adoption and have not created our own demand model. Below, we refer to Roskill's base case scenario for our discussion. Roskill forecasts vanadium demand from VRBs to grow at CAGR of 57% to over 2,000t V (~2% of global vanadium demand) by 2025 from only 88t V (0.1% of global vanadium demand) in 2018.

Exhibit 39: VRB adoption could add significant new vanadium demand

VRBs have the potential to add significant vanadium demand growth, but we remain cautious on adoption as economic viability very sensitive to vanadium prices.



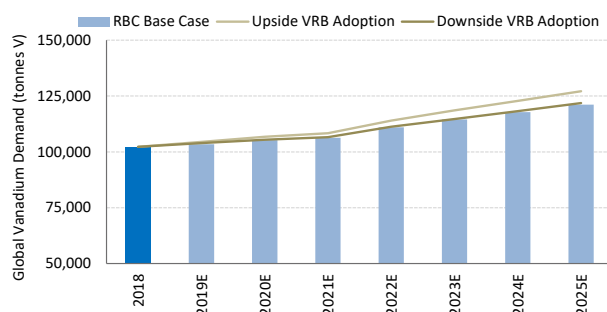
Source: Roskill, RBC Capital Markets estimates

VRBs could drive demand growth, but adoption uncertain

Vanadium redox batteries (VRBs) offer significant growth potential for global vanadium demand, but we do not include VRB demand in our model due to the uncertainty around adoption and feasibility. We use the VRB demand scenarios from consultancy Roskill to illustrate the impact on our S&D model. In Roskill's upside scenario, 6Kt tonnes vanadium demand would be added by 2025 (+5% vs. base case) and we would expect a more severe deficit while Roskill's downside case would have minimal impact on our outlook. We believe that US\$7-8/lb vanadium price would result in competitive economics compared to lithium ion grid storage alternatives, but any significant growth in VRB uptake would likely tip the market into further deficit and push prices higher.

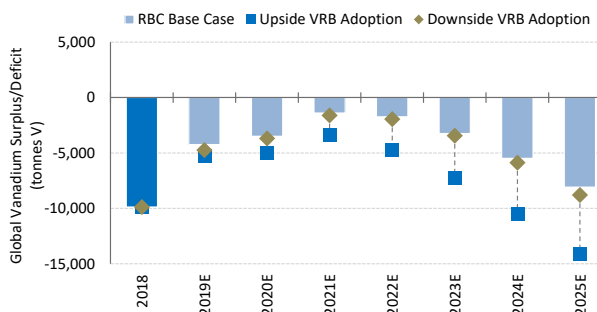
Exhibit 40: VRBs could result in significant vanadium demand growth, but adoption is uncertain

VRB adoption could result in more vanadium demand



Source: Roskill, Company reports, RBC Capital Markets estimates

Additional demand from VRBs would tip the market into further deficit



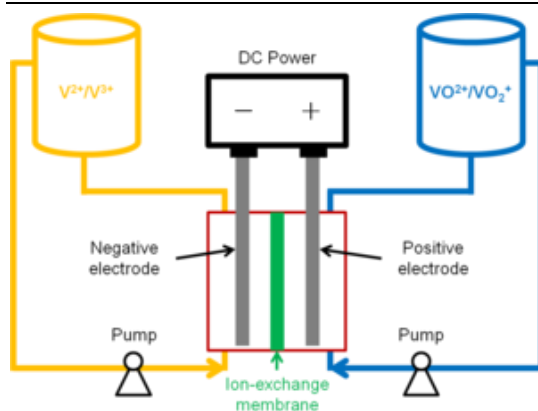
VRB background

VRBs were invented in the 1980s and reached commercial scale production in the early 2000s. VRBs have a number of advantages when compared to other energy storage technologies, such as long lifespan (greater than 10,000 charge cycles) and ability to be left discharged for extended periods without impeding performance. VRBs are better suited for longer duration applications with high energy-to-power ratio, such as being employed as a grid storage battery, because they have relatively low power and energy densities and due to the high upfront cost of the vanadium electrolyte. VRBs are not suited for short duration and high power applications.

VRB applications

VRBs are most effective in bridging power, bulk power management and peak shifting/load leveling applications. Peak shifting and load leveling refers to the smoothing of power generating capacity over peak and off-peak periods. This is achieved when an energy storage system is charged at times when the overall network is experiencing lower demand and/or higher energy generation (wind, solar), then discharges the stored energy when demand picks back up. We think VRBs are better suited for longer-duration load leveling applications (i.e. a cycle greater than 2 hours, such as overnight) since flow batteries have more compelling economics in longer duration use cases. We also believe that as electrification and decarbonisation proliferates, there will be a greater need for renewables, electrical energy storage and grid management solutions.

Exhibit 41: Diagram of a VRB's components

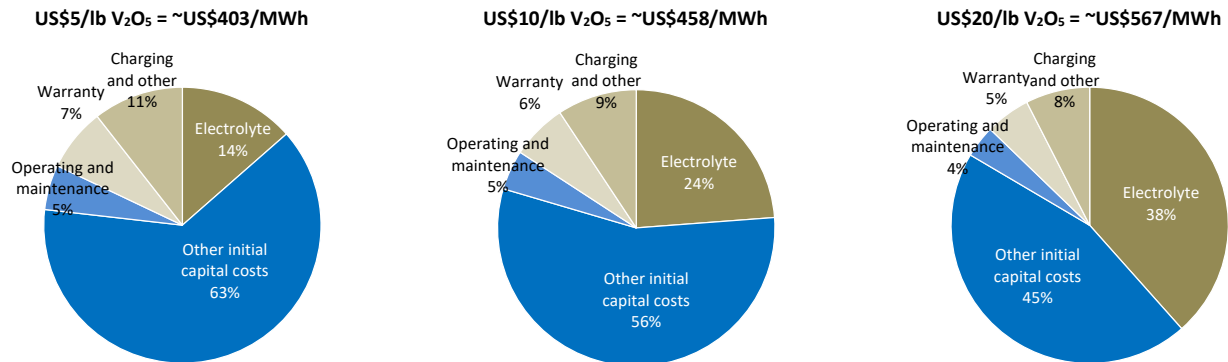


Source: Stanford University

VRB economics

The economics of VRBs depend on the duration of the battery and the market vanadium price. We estimate the vanadium electrolyte as a percentage of total levelized cost of storage (LCOS) ranges from 14-38% of total battery costs using US\$5-20/lb V₂O₅, demonstrating the battery's sensitivity to the vanadium price. Comparing VRB economics with lithium-ion storage solutions on a LCOS basis, we think VRBs are competitive at ~\$7-8/lb V₂O₅.

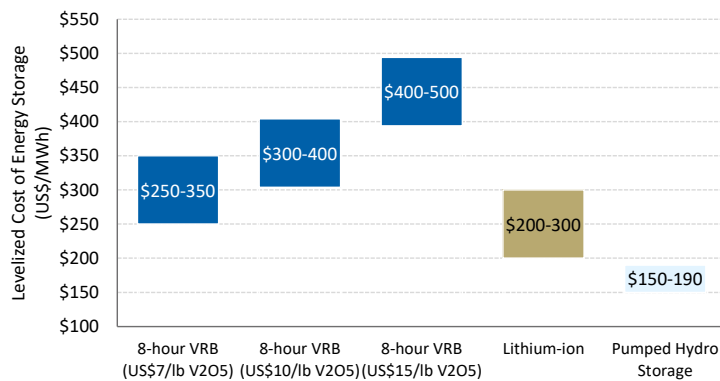
Exhibit 42: Breakdown of 20-year levelized cost of storage by component for a 4-hour VRB at various vanadium prices



Note: We assume that as the vanadium price changes, all costs other than the electrolyte stay constant.

Source: Roskill, Company reports, RBC Capital Markets estimates

Exhibit 43: On LCOS basis, VRBs are competitive with Li-ion at US\$7-8/lb V₂O₅



Source: Roskill, Company Reports, RBC Capital Markets estimates

Exhibit 44: RBC Vanadium S&D Outlook

S&D (tonnes V)	2011	2012	2013	2014	2015	2016	2017	2018	2019E	2020E	2021E	2022E	2023E	2024E	2025E	CAGR (18-25E)
Global Vanadium																
Steel	79,953	79,153	88,309	94,217	89,591	83,030	91,099	95,025	95,921	97,440	98,272	102,668	105,881	108,845	111,881	2%
Other	5,947	6,575	7,196	6,933	6,914	6,356	7,466	7,236	7,510	7,790	8,076	8,363	8,658	8,948	9,250	4%
Demand	85,900	85,728	95,505	101,150	96,505	89,386	98,565	102,261	103,431	105,231	106,348	111,031	114,539	117,793	121,131	2%
Growth (%)	-	0%	11%	6%	-5%	-7%	10%	4%	1%	2%	1%	4%	3%	3%	3%	
Feedstock Production																
Slag	64,312	62,605	72,650	77,126	74,479	68,828	68,160	67,780	72,164	72,164	72,414	72,414	72,414	72,414	72,414	1%
Primary	13,357	11,222	12,482	11,017	13,118	13,382	15,769	16,701	18,530	21,396	23,256	24,456	26,656	27,856	29,056	8%
Other	15,390	14,976	14,951	14,390	14,840	12,920	12,450	12,450	12,950	12,950	12,950	12,950	12,950	12,950	12,450	0%
Total Feedstock Production	93,059	88,803	100,083	102,533	102,437	95,130	96,379	96,931	103,644	106,510	108,620	109,820	112,020	113,220	113,920	2%
Conversion (%)	95%	96%	95%	96%	95%	98%	92%	95%	96%	96%	97%	100%	100%	100%	100%	
Total Oxide Production	88,609	84,858	95,261	98,217	97,209	93,031	88,974	92,392	99,421	102,187	105,584	110,284	112,484	113,684	114,384	3%
Growth (%)	-	-4%	12%	3%	-1%	-4%	-4%	4%	8%	3%	3%	4%	2%	1%	1%	
Surplus/Deficit	2,709	-870	-244	-2,933	704	3,645	-9,591	-9,869	-4,010	-3,044	-764	-746	-2,054	-4,108	-6,746	
Demand as % of supply	97%	101%	100%	103%	99%	96%	111%	111%	104%	103%	101%	101%	102%	104%	106%	
Vanadium - EU (US\$/lb V2O5)	\$6.60	\$5.59	\$5.99	\$5.46	\$3.62	\$3.61	\$6.98	\$18.30	\$9.63	\$7.50	\$8.00	\$8.00	\$8.00	\$10.00	\$10.00	-8%
Ferro Vanadium (US\$/kgV)	\$28.71	\$25.03	\$27.67	\$25.52	\$18.65	\$18.46	\$32.84	\$81.63	\$70.00	\$70.00	\$70.00	\$70.00	\$70.00	\$70.00	\$70.00	-2%

Source: Roskill, Company reports, RBC Capital Markets estimates

Appendix II: Company overview

Largo Resources is a primary vanadium producer headquartered in Toronto, Canada. The company's primary asset is the Maracas Menchen project located in Bahia State, Brazil. Maracas Menchen began commercial production in 2014 and produced ~10Kt V₂O₅ in 2018, with capacity expansion to 12Kt per year currently under way. The satellite deposits, including the recently updated Novo Amparo Norte deposit, may be developed to extend the current ~9-10 year mine life and increase production. Largo's portfolio also includes several undeveloped properties – North Dancer (Yukon, Canada), a large undeveloped tungsten-molybdenum deposit; Currais Novos (Brazil), a tungsten project that has been on care and maintenance since 2013; and Campo Alegre (Brazil), a significant vanadium, tungsten and iron ore deposit that is in the exploration phase.

Company strategy

The company's strategy is focused on: 1) being a low-cost (bottom quartile) primary vanadium producer; 2) targeting the high-purity vanadium market; 3) expanding production to fulfill growing high-purity demand; 4) developing an internal vanadium sales & trading strategy; and 5) returning excess capital to shareholders when prudent.

Low-cost: Largo ranks as one of the lowest cost vanadium producers globally, which we believe provides the company with sufficient cushion in the event of continued vanadium price volatility. This compares well to marginal production costs at \$8-10/lb set by stone coal producers in China and secondary producers globally.

High-purity market: Largo is one of the only global producers qualified to supply the high-purity market, selling high-purity flake and powders into aerospace, chemical and battery end-uses. The company's ore is naturally high-purity, and the ore and concentrate grades at Maracas Menchen are above the global average. High-purity products command a price premium over standard grade vanadium, and we expect high-purity to account for a larger share of sales following the expiration of the Glencore contract in 2020.

Expanding production: Largo is currently undergoing a capacity expansion at Maracas Menchen, which is expected to achieve monthly production of 1,000t V₂O₅ once construction is completed in 2H/19. We believe this positions Largo well to capitalize on the growing demand for high-purity product in what we think will continue to be an undersupplied market over the coming years.

Internal sales & trading: The Glencore off-take contract is set to expire May 2020 and Largo has stated intentions to build up the internal sales & trading business. With the recent hiring of a sales director experienced in the vanadium market, we believe Largo is well-positioned for the transition and should benefit by capturing better price realizations and more high-purity sales.

Capital return to shareholders: Although there may be some disappointment around the June 2019 announcement that Largo would not be returning capital to shareholders at this time, we believe management remains committed to returning excess capital when conditions have stabilized for the company and the vanadium market. In the meantime, Largo has further strengthened the balance sheet by repaying all debt and is working to complete the expansion at Maracas Menchen. We expect more stable conditions in 2020, after the expiration of the Glencore contract and better vanadium price environment, may result in return of capital to shareholders.

Maracas Menchen

Exhibit 45: Maracas Menchen vanadium project

Location: Bahia State, Brazil

Stage: Producing since 2014

Reserve life: ~9 years

Mine type: Open pit

Metals produced: Vanadium (V_2O_5 flake and high purity V_2O_5 flake and powder)

Ownership: 99.84%

Offtake: Take-or-pay offtake agreement for 100% of vanadium material, expires May 2020

Annual production: ~10,000 tonnes V_2O_5 per year through June 2019, ~12,000 tonnes V_2O_5 per year once expansion is completed in 2H/19

Operating cost: ~US\$3.45-3.65/lb V_2O_5 cost guidance excluding royalties



Source: Company reports, RBC Capital Markets estimates

Largo acquired a 90% stake in Maracas Menchen (then Maracas Vanadium-PGM Deposit) in October 2006 before later increasing its interest to ~100% in 2012. Vanadium was first discovered at the site in 1980. The Maracas Menchen property is located in the eastern part of Bahia State, Brazil. It comprises 17,690 hectares and has excellent accessibility via paved roadway. The mine is one of the highest grade vanadium projects worldwide and has bottom-quartile cash costs.

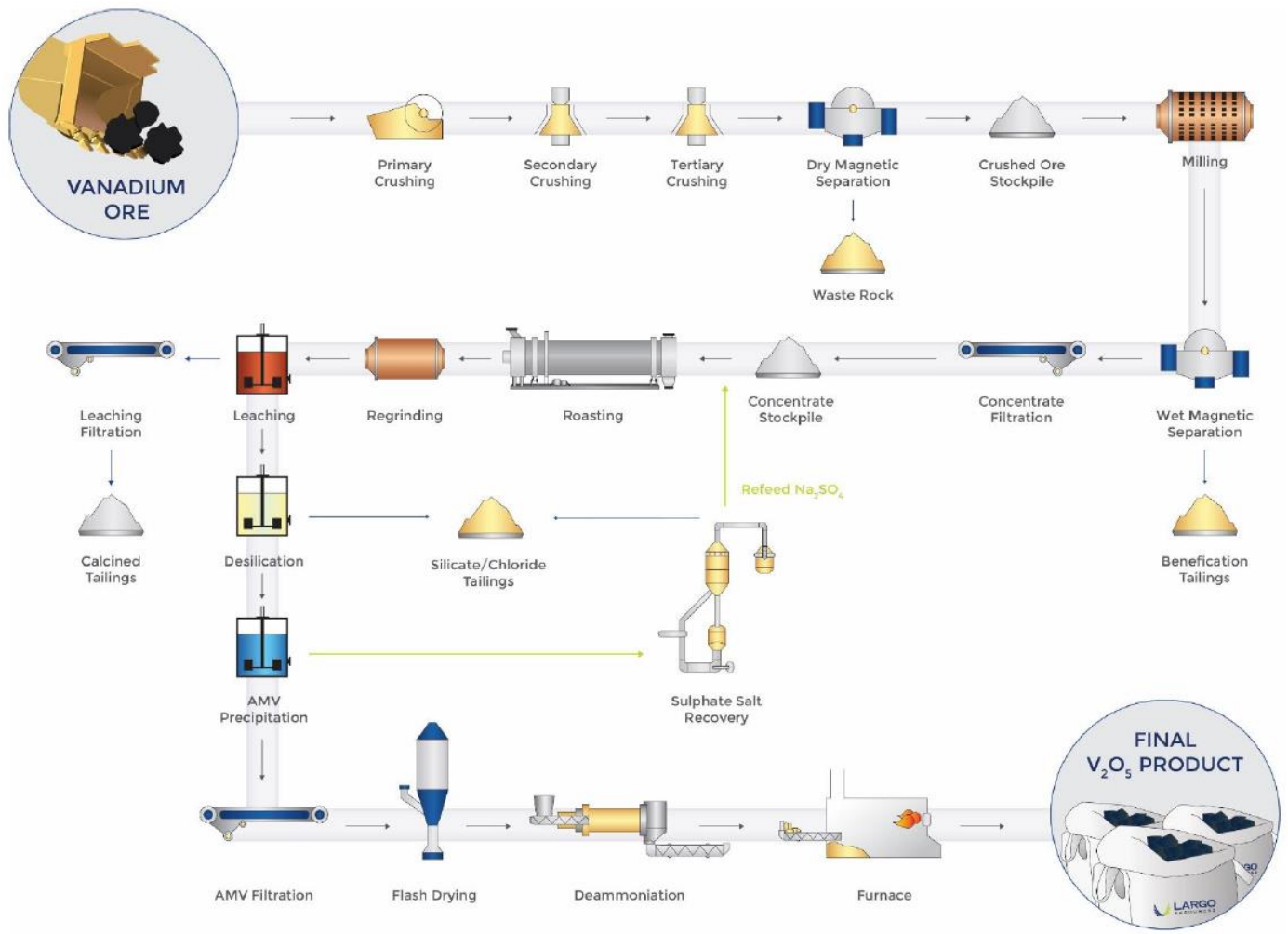
Current reserves at Maracas Menchen's Campbell deposit imply a mine life of 9-10 years, but the satellite deposits which span across the 6.5km mineralization offer significant potential for extending or growing production. The satellite deposits include – Gulcari A Norte, Gulcari B, Sao Jose, Novo Amparo, and Novo Amparo Norte (NAN). NAN is the most well developed satellite deposit with a mineral resource estimate that was updated in June 2019 outlining 83Mt measured & indicated and 79Mt inferred resources of contained V_2O_5 in the magnetite ore – enough to double the mine life or current production.

Construction at Maracas Menchen started in June 2012 and production began in Q3/14. Largo is projecting 2019 total production of between 10,000-11,000 tonnes V_2O_5 , including high purity flake and powder. In April 2018, Largo announced expansion plans for Maracas Menchen, which will increase production by 25% to an estimated 12,000 tonnes V_2O_5 per year starting in 2H/19.

Mining and processing

Vanadium bearing ore is mined in a conventional open pit using hydraulic excavators, front-end loaders, and large haul trucks. The ore is then treated through three stages of crushing, one stage of grinding, and two stages of magnetic separation to produce a vanadium concentrate. The concentrate is processed through hydrometallurgical extraction with roasting, leaching, precipitation, filtration, calcination, and fusing into the final V₂O₅ vanadium flake product.

Exhibit 46: Maracas Menchen process flow sheet



Source: Company reports

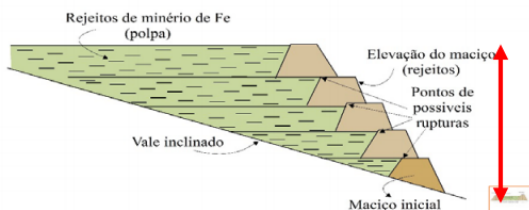
Tailings disposal

Tailings generated at the Maracas Menchen facility are stored in dry stacks (leached calcine tailings) or in tailings ponds (non-magnetics and chloride tailings). We think Largo has taken the necessary steps to responsibly manage tailings waste. Importantly, we do not view tailings management as a risk to Largo's operations like at other mining operations in Brazil for several reasons – 1) volume of tailings waste is significantly less than other operations (i.e. Maracas Menchen tailings pond volume <1% of volume at Samarco); 2) tailings ponds are constructed on a flat surface, unlike tailings dams which are on an incline; and 3) the tailing ponds are lined to mitigate leakage.

Exhibit 47: Conventional tailings dam vs. tailing ponds used at Largo's Maracas Menchen facility

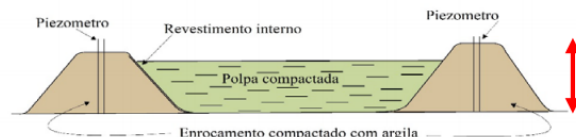
CONVENTIONAL TAILINGS DAM

- HEIGHT: 120 meters (Samarco), 86 meters (Brumadinho)
- VOLUME: 63 Millions m³ (Samarco), 13 Millions m³ (Brumadinho)
- NO LINER
- POSITION: On an inclined valley
- dam construction built over tailings



TAILINGS PONDS

- HEIGHT: **19 meters** maximum (Maracás Menchen Mine)
- VOLUME: **500 thousands m³**
- 4 LAYERS OF INSIDE LINER
- POSITION: Flat places far from rivers
- Wide Walls made by blocks, inside wastepile
- Dam made with rocks (waste from the mine – no limes, no weather material)



Source: Company reports

Additional projects

Largo also has various projects at early development stages. However, we ascribe no value to these projects currently as we expect the main focus will remain on the Maracas Menchen project and subsequent development of the satellite deposits.

Exhibit 48: Largo Resources secondary projects

Northern Dancer	Location: Yukon, Canada Ownership: 100% Stage: PEA completed Primary metals: Tungsten Notes: One of the largest undeveloped tungsten-molybdenum deposits globally. Measured and indicated resources comprise 223.4Mt with grades of 0.102% WO₃ and 0.029% Mo.
Currais Novos	Location: Rio Grande Do Norte, Brazil Ownership: 100% Stage: Care and maintenance (production suspended in 2013 due to extreme regional drought) Primary metals: Tungsten Notes: Tailings operation, production began in late 2011 and continued to ramp up in 2012 before drought-related suspension in 2013
Campo Alegre	Location: Bahia State, Brazil Ownership: 100% Stage: Exploration Primary metals: Vanadium, Tungsten, Iron Ore Notes: Includes 7 concessions across 9,275 hectares with a large iron, titanium, and vanadium deposit



Appendix III: Largo Resources Financial Model

Exhibit 49: Largo Resources Income Statement

Earnings Model								2018				2019				2020			
\$ millions, unless noted								1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Vanadium sales	\$168	\$521	\$178	\$266	\$346	\$341	\$328	\$91	\$103	\$149	\$178	\$44	\$29	\$46	\$58	\$61	\$63	\$71	\$72
Total Revenue	\$168	\$521	\$178	\$266	\$346	\$341	\$328	\$91	\$103	\$149	\$178	\$44	\$29	\$46	\$58	\$61	\$63	\$71	\$72
YOY	106.5%	210.9%	-65.8%	49.0%	30.4%	-1.6%	-3.7%	209.6%	188.6%	179.3%	262.4%	-51.4%	-71.5%	-69.1%	-67.2%	36.7%	113.3%	52.7%	23.0%
Operating Costs	(\$87)	(\$105)	(\$102)	(\$102)	(\$124)	(\$121)	(\$116)	(\$22)	(\$23)	(\$29)	(\$30)	(\$22)	(\$24)	(\$27)	(\$29)	(\$25)	(\$25)	(\$26)	(\$26)
D&A	(\$33)	(\$31)	(\$34)	(\$36)	(\$40)	(\$40)	(\$40)	(\$9)	(\$8)	(\$7)	(\$7)	(\$7)	(\$9)	(\$9)	(\$9)	(\$9)	(\$9)	(\$9)	(\$9)
Consulting fees & salaries	(\$11)	(\$15)	(\$9)	(\$8)	(\$8)	(\$8)	(\$8)	(\$4)	(\$4)	(\$3)	(\$5)	(\$3)	(\$3)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)
G&A	(\$3)	(\$6)	(\$4)	(\$4)	(\$4)	(\$4)	(\$4)	(\$1)	(\$1)	(\$1)	(\$3)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)
Share Based Comp	(\$0)	(\$2)	(\$3)	(\$2)	(\$2)	(\$2)	(\$2)	(\$0)	(\$0)	(\$1)	(\$1)	(\$2)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)
Exploration and Evaluation Costs	(\$0)	(\$1)	(\$5)	\$1	\$1	\$1	\$1	(\$0)	(\$0)	(\$1)	(\$1)	(\$1)	(\$1)	(\$2)	(\$2)	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Operating Expenses	(\$134)	(\$160)	(\$158)	(\$152)	(\$177)	(\$174)	(\$169)	(\$36)	(\$36)	(\$42)	(\$47)	(\$35)	(\$39)	(\$41)	(\$43)	(\$38)	(\$38)	(\$38)	(\$38)
EBIT	\$34	\$361	\$20	\$114	\$169	\$167	\$159	\$55	\$68	\$107	\$131	\$9	(\$10)	\$5	\$15	\$23	\$25	\$32	\$33
Adjusted EBITDA	\$67	\$392	\$54	\$150	\$209	\$206	\$198	\$64	\$75	\$115	\$138	\$16	(\$1)	\$14	\$24	\$32	\$34	\$41	\$42
Financing Costs	(\$39)	(\$40)	(\$18)	\$0	\$0	\$0	\$0	(\$8)	(\$8)	(\$15)	(\$8)	(\$7)	(\$11)	\$0	\$0	\$0	\$0	\$0	\$0
Interest Income	\$0	\$1	\$4	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$0	\$4	\$0	\$0	\$0	\$0	\$0	\$0
FX Gain/Loss	(\$3)	\$0	(\$4)	\$0	\$0	\$0	\$0	\$2	(\$9)	(\$1)	\$8	(\$0)	(\$4)	\$0	\$0	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Pre-tax income	(\$9)	\$323	\$2	\$114	\$169	\$167	\$159	\$50	\$50	\$92	\$131	\$1	(\$20)	\$5	\$15	\$23	\$25	\$32	\$33
Corporate Tax rate	15.3%	(2.1%)	(\$50.6%)	(25.0%)	(25.0%)	(25.0%)	(25.0%)	7.4%	(80.4%)	22.1%	17.6%	253.3%	(1.1%)	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Tax Recovery/Expense	(\$1)	(\$7)	(\$9)	(\$28)	(\$42)	(\$42)	(\$40)	(\$4)	\$40	(\$20)	(\$23)	(\$4)	(\$0)	(\$1)	(\$4)	(\$6)	(\$6)	(\$8)	(\$8)
Net Income	(\$10)	\$316	(\$7)	\$85	\$127	\$125	\$119	\$46	\$91	\$71	\$108	(\$2)	(\$21)	\$4	\$11	\$17	\$19	\$24	\$25
Basic Shares (M)	464.1	522.2	530.5	531.6	531.6	531.6	531.6	518.1	518.8	522.9	529.1	527.2	531.6	531.6	531.6	531.6	531.6	531.6	531.6
Diluted Shares (M)	478.7	635.0	530.5	531.6	531.6	531.6	531.6	615.8	633.7	648.0	642.3	527.2	531.6	531.6	531.6	531.6	531.6	531.6	531.6
EPS - Diluted	-\$0.02	\$0.50	-\$0.01	\$0.16	\$0.24	\$0.24	\$0.22	\$0.07	\$0.14	\$0.11	\$0.17	\$0.00	-\$0.04	\$0.01	\$0.02	\$0.03	\$0.04	\$0.05	\$0.05
Dividend/sh	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Source: Company reports, RBC Capital Markets estimates

Exhibit 50: Largo Resources Cash Flow Summary

Free Cash Flow (Calc)								2018				2019				2020			
\$ millions, unless noted								1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Net Income	(\$10)	\$316	(\$7)	\$85	\$127	\$125	\$119	\$46	\$91	\$71	\$108	(\$2)	(\$21)	\$4	\$11	\$17	\$19	\$24	\$25
D&A	\$33	\$31	\$34	\$36	\$40	\$40	\$40	\$9	\$8	\$7	\$7	\$7	\$9	\$9	\$9	\$9	\$9	\$9	\$9
WC / Other	\$36	\$2	\$139	(\$75)	\$2	\$2	\$2	(\$30)	(\$29)	\$35	\$29	\$90	\$33	\$16	(\$1)	(\$27)	(\$47)	(\$1)	\$0
CFFO	\$59	\$349	\$165	\$47	\$168	\$167	\$161	\$25	\$69	\$114	\$144	\$95	\$22	\$28	\$20	(\$1)	(\$19)	\$33	\$34
Capex	(\$19)	(\$19)	(\$52)	(\$15)	(\$15)	(\$15)	(\$15)	(\$4)	(\$5)	(\$4)	(\$6)	(\$8)	(\$19)	(\$13)	(\$13)	(\$4)	(\$4)	(\$4)	(\$4)
FCF	\$39	\$330	\$113	\$32	\$153	\$152	\$146	\$21	\$64	\$110	\$138	\$87	\$3	\$16	\$8	(\$5)	(\$23)	\$29	\$31
Per Share	\$0.08	\$0.52	\$0.21	\$0.06	\$0.29	\$0.29	\$0.27	\$0.03	\$0.10	\$0.17	\$0.21	\$0.17	\$0.01	\$0.03	\$0.01	(\$0.01)	(\$0.04)	\$0.05	\$0.06
FCF without WC	\$48	\$382	(\$2)	\$109	\$154	\$152	\$146	\$58	\$72	\$117	\$137	\$13	(\$27)	\$1	\$10	\$23	\$25	\$30	\$31
Dividends	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Stock Buyback	\$50	\$9	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
FCF post return to shareholders	\$89	\$340	\$114	\$32	\$153	\$152	\$146	\$21	\$64	\$110	\$138	\$87	\$3	\$16	\$8	(\$5)	(\$23)	\$29	\$31
Per Share	\$0.19	\$0.54	\$0.21	\$0.06	\$0.29	\$0.29	\$0.27	\$0.03	\$0.10	\$0.17	\$0.21	\$0.17	\$0.01	\$0.03	\$0.01	(\$0.01)	(\$0.04)	\$0.05	\$0.06
Acquisitions	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Debt Addition /(Reduction)	(\$4)	(\$127)	(\$125)	\$0	\$0	\$0	\$0	(\$9)	\$187	(\$249)	(\$57)	(\$87)	(\$9)	(\$29)	\$0	\$0	\$0	\$0	\$0
FCF after Acq and Debt Red.	\$85	\$213	(\$11)	\$32	\$153	\$152	\$146	\$12	\$252	(\$139)	\$81	\$1	(\$6)	(\$14)	\$8	(\$5)	(\$23)	\$29	\$31
Per Share	\$0.18	\$0.34	(\$0.02)	\$0.06	\$0.29	\$0.29	\$0.27	\$0.02	\$0.40	(\$0.21)	\$0.13	\$0.00	(\$0.01)	(\$0.03)	\$0.01	(\$0.01)	(\$0.04)	\$0.05	\$0.06

Source: Company reports, RBC Capital Markets estimates



Exhibit 51: Largo Resources Balance Sheet

Balance Sheet								2018				2019				2020			
\$ millions, unless noted								1QA	2QA	3QA	4QA	1QA	2QA	3QE	4QE	1QE	2QE	3QE	4QE
Assets																			
Cash and equivalents	\$55	\$206	\$184	\$216	\$369	\$521	\$667	\$50	\$84	\$128	\$206	\$191	\$190	\$177	\$184	\$180	\$156	\$185	\$216
Restricted Cash	\$4	\$0	\$0	\$0	\$0	\$0	\$0	\$4	\$201	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Accounts Receivable	\$15	\$63	\$10	\$12	\$15	\$14	\$14	\$52	\$42	\$59	\$63	\$4	\$6	\$8	\$10	\$10	\$10	\$12	\$12
Inventories	\$14	\$14	\$17	\$16	\$18	\$18	\$17	\$14	\$12	\$11	\$14	\$17	\$18	\$16	\$17	\$15	\$15	\$15	\$16
Prepaid expenses	\$1	\$3	\$6	\$6	\$6	\$6	\$6	\$1	\$3	\$1	\$3	\$7	\$6	\$6	\$6	\$6	\$6	\$6	\$6
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Current Assets	\$89	\$286	\$217	\$250	\$409	\$560	\$704	\$121	\$342	\$200	\$286	\$218	\$221	\$207	\$217	\$211	\$189	\$219	\$250
PP&E	\$282	\$247	\$264	\$243	\$218	\$193	\$168	\$286	\$249	\$236	\$247	\$243	\$257	\$260	\$264	\$259	\$253	\$248	\$243
Other	\$0	\$19	\$16	\$16	\$16	\$16	\$16	\$0	\$43	\$28	\$19	\$16	\$16	\$16	\$16	\$16	\$16	\$16	\$16
Total Assets	\$371	\$553	\$497	\$508	\$642	\$768	\$888	\$407	\$635	\$464	\$553	\$477	\$493	\$483	\$497	\$485	\$457	\$482	\$508
Liabilities + Shareholders Equity																			
Short-term Debt & Curr. Long-term	\$73	\$117	\$0	\$0	\$0	\$0	\$0	\$56	\$239	\$0	\$117	\$31	\$29	\$0	\$0	\$0	\$0	\$0	\$0
Payables	\$49	\$33	\$105	\$29	\$34	\$33	\$32	\$42	\$33	\$28	\$33	\$55	\$91	\$105	\$105	\$76	\$29	\$29	\$29
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Current Liabilities	\$122	\$151	\$105	\$30	\$35	\$34	\$33	\$98	\$272	\$28	\$151	\$86	\$121	\$105	\$105	\$76	\$29	\$29	\$30
Long-term debt	\$168	\$0	\$0	\$0	\$0	\$0	\$0	\$180	\$157	\$163	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other	\$7	\$9	\$10	\$10	\$10	\$10	\$10	\$8	\$7	\$9	\$9	\$9	\$10	\$10	\$10	\$10	\$10	\$10	\$10
Total Liabilities	\$297	\$160	\$115	\$39	\$44	\$43	\$42	\$286	\$435	\$200	\$160	\$95	\$130	\$115	\$115	\$86	\$39	\$39	\$39
Shareholders' Equity	\$74	\$393	\$382	\$469	\$598	\$725	\$846	\$120	\$199	\$263	\$393	\$382	\$363	\$368	\$382	\$399	\$419	\$443	\$469
Liabilities + Equity	\$371	\$553	\$497	\$508	\$642	\$768	\$888	\$407	\$635	\$464	\$553	\$477	\$493	\$483	\$497	\$485	\$457	\$482	\$508
Net Debt	\$186	(\$89)	(\$184)	(\$216)	(\$369)	(\$521)	(\$667)	\$186	\$311	\$35	(\$89)	(\$160)	(\$161)	(\$177)	(\$184)	(\$180)	(\$156)	(\$185)	(\$216)
Change	(\$89)	(\$275)	(\$595)	(\$32)	(\$153)	(\$152)	(\$146)	\$0	\$125	(\$276)	(\$124)	(\$71)	(\$1)	(\$16)	(\$8)	\$5	\$23	(\$29)	(\$31)
Net Debt / LTM EBITDA	2.8x	-0.2x	-3.4x	-1.4x	-1.8x	-2.5x	-3.4x	1.5x	1.6x	0.1x	-0.2x	-0.5x	-0.6x	-1.1x	-3.4x	-2.6x	-1.5x	-1.4x	-1.4x
Working Capital	(\$20)	\$43	(\$78)	(\$2)	(\$1)	(\$1)	(\$2)	\$24	\$22	\$43	\$43	(\$34)	(\$67)	(\$81)	(\$78)	(\$51)	(\$3)	(\$2)	(\$2)
Working Capital, as % of Sales	-12%	8%	-44%	-1%	0%	0%	0%	26%	21%	29%	24%	-76%	-227%	-176%	-135%	-84%	-5%	-3%	-2%
Change	(\$4)	\$63	(\$122)	\$77	\$0	(\$0)	(\$0)	\$43	(\$2)	\$21	\$1	(\$77)	(\$53)	(\$15)	\$3	\$28	\$48	\$1	\$0

Source: Company reports, RBC Capital Markets estimates

Appendix IV: Vanadium producing peers

Exhibit 52: Vanadium peers

Producers	Est. 2018 production (tonnes V)	
Pangang	23,500	Pangang Group Vanadium Titanium and Resources is a subsidiary of Ansteel Group, a large Chinese steel producer. The company began extracting vanadium in 1972 and is reportedly the largest vanadium feedstock producer worldwide. Pangang has 3 wholly-owned vanadium operations: Panzhihua, Xichang Vanadium and Beihai City.
Evrz	17,000	Headquartered in London, Evraz Group is a publicly traded, multinational steel and mining company with operations in the Czech Republic, Russia and the United States. Evraz is one of the world's largest vanadium producers with slag production in excess of 17,000t V in 2018. The company closed its Evraz Highveld Steel, Vanadium operations in South Africa in Q3 2015.
Treibacher Industrie	7,000	Based in Austria, Treibacher is a diversified manufacturer of ferroalloys for the steel industry as well as powders, high performance ceramics, chemicals and special alloys. Treibacher produces ~720t vanadium feedstock per year and imports the rest from Russia and New Zealand. The company's vanadium products include salts and oxides.
Largo Resources	5,500	Largo Resources is a Toronto-based vanadium producer that has ~100% ownership in the Maracas Menchen mine in Bahia, Brazil. The company also owns: Campo Alegre, a vanadium-iron-titanium deposit in Brazil (exploration stage); Northern Dancer, a tungsten deposit that recently completed its PEA; and Currais Novos, a tungsten mine currently on care and maintenance. Largo achieved commercial production in Q3 2014.
Chengde	5,500	Chengde and Jinzhou Ferroalloys formed a joint venture in 2003 and was renamed CITIC Jinzhou Metal in 2011. The company produces a variety of ferroalloys as well as vanadium pentoxide and ferrovandium. Prior to the 2017 ban on foreign slag in China, the company was a significant importer of steel-making slag from New Zealand Steel. Chengde has estimated capacity of 8,950t V.
Glencore	5,000	As one of the world's largest mining companies, Glencore expanded its operations in 2013 with the acquisition of global mining group Xstrata. The Xstrata takeover included the Rhovan vanadium mine, located within the Bushveld Complex in South Africa. Through Rhovan, Glencore produced over 5,000t V last year and according to Roskill, imports feedstock from New Zealand.
Chuanwei	4,750	Chuanwei Special Steel manufactures steel and vanadium products and is majority owned by Singapore-based Sapphire Corporation. The company sources its feedstock from co-production slag via its Weiyuan Steel subsidiary.
Jianlong	4,000	Jianlong, another Chinese producer, has several subsidiaries that produce co-production slag including: Heilongjian Jianlong, Tangshan Jianlong, Zhejiang Jianlong, Chengde Jianlong and Fushun New Steel. Jianlong produces vanadium pentoxide and has estimated nameplate annual capacity of 5,400t V.

Source: Roskill, Company reports, RBC Capital Markets estimates

Bushveld (Vametco)	2,500	Bushveld Minerals' subsidiary, Bushveld Vanadium, owns a ~74% stake in the Vametco mine and processing plant, which produced over 2,500t V in 2018. Bushveld Vanadium also has interests in the Brits project, which is essentially an exploration phase extension of Vametco, and Mokopane (64% stake) which may be developed with the pending acquisition of Vanchem's processing assets to increase production.
AMG	1,500	AMG Vanadium, an Ohio-based subsidiary of AMG Advanced Metallurgical Group, is a leading North American ferrovanadium producer. The company has completed its feasibility study to construct an additional oil refinery and waste product recycling facility, with construction expected to begin in mid-2019 and completed during 2021. This facility should add an incremental ~2,200t V ferrovanadium capacity per year.
New Zealand Steel	1,500	New Zealand Steel is a fully-integrated steel manufacturer that produces vanadium slag at its Glenbrook, New Zealand steel plant. Since the Chinese ban of importing foreign vanadium slag, New Zealand Steel started exporting its slag to be processed at Glencore's Rhovan mine in South Africa and Treibacher in Austria.
Hindalco	1,000	Based in India, Hindalco owns Essel Mining and is a subsidiary of Aditya Birla Group. Essel is one of the largest iron ore and ferroalloy producers in India. Beyond its vanadium production, Hindalco has exposure to aluminium, copper and specialty chemicals.
Developers	Expected annual capacity (tonnes V)	
Ferro-Alloy Resources	N/A	Ferro-Alloy Resources Group (FAR) is a Guernsey-based company which, through its wholly owned subsidiary Firma Balansa, is developing the Balasausqandiq vanadium deposit located in Kazakhstan. FAR is currently developing the project and intends to expand the plant capacity in multiple stages to reach production on the order of 22,400 tonnes V2O5 (~13k tonnes V) by 2024.
TNG	8,000	TNG is an Australian mining company whose core asset is its 100% owned Mount Peake Vanadium-Titanium-Iron Project. Mount Peake is also a restart and has received its native title mining agreement and can now proceed to the financing and development stage. TNG is targeting a 2022 start-up date with an expected 19-year mine life.
BlackRock Metals	5,000	BlackRock Metals is a privately-owned single-asset resource company located in Quebec, Canada. A DFS for the BlackRock Mine was completed in 2017 and construction began in October 2018. The company expects to reach commercial production by the end of 2021 with an estimated mine life of 15 years. BlackRock has received funding from both Orion and the Quebec provincial government.
Atlantic	4,000	Based in Australia, Atlantic is a subsidiary of Droxford International and part of the Salim Group of Indonesia. In 2016, Atlantic acquired the Windimurra project which is a restart project that the company expects to come online by mid-2020. As of April 2019, Windimurra is still undergoing engineering studies and mine life is an estimated 27 years.
Neometals	3,000	Neometals is an Australian-based developer with three main focuses: Barrambie Titanium and Vanadium Project, lithium-ion battery recycling, and Kalgoorlie Lithium Refinery Project. Barrambie is a restart and is expected to come online by 2021. The company is set to release an updated DFS in spring 2019 and expects a minimum mine life of 12 years.

Source: Roskill, Company reports, RBC Capital Markets estimates

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