

## Scoping Study Confirms Robust Niobium Project

### Investment Highlights

The recently released independent scoping study on Cradle Resources' (CXX) Panda Hill Niobium project (50% owned with right to acquire balance) demonstrated a robust project at current prices. There were several highlights which included lower capital/sustaining costs and higher grades (when compared to our estimates). In addition, the study briefly examined a staged case whereby upfront capital costs were estimated to be c30% lower compared to the base case. On balance the base case was slightly lower than our estimates on an NPV basis due to higher operating costs and lower recoveries which have scope for improvement. We continue to rate CXX a Speculative Buy with a \$0.42/sh price target.

- Robust Niobium Project:** Overall, the scoping study demonstrated a robust Ferroniobium project. Encouragingly, upfront capital costs were c19% lower (US\$185m) than CXX's initial estimates and sustaining capital was lower. Whilst upfront capital was significantly lower this was offset by higher operating costs which were up c26% from our previous estimates. Recoveries were also slightly lower at 62% LOM (PSL est. 65%). Based on the study we estimate a project NPV (@12%) at US\$332m and IRR of 56%. At decision to mine our project NPV (@12%) increases to US\$466m.
- PFS to Further Optimise:** CXX plans to commence a Pre-feasibility Study (PFS) in Q2/2014 which is anticipated to be completed in Q4/2014. The study will examine further project optimisations. The key areas highlighted for improvement include: 1) recoveries and reagent use 2) reduced contract mining rates and 3) power costs. These have the potential to further reduce operating costs.
- Staged Case Considered with 30% Lower Capital Costs:** As part of the scoping study, a staged approach was briefly examined. Under this scenario the study estimated that capital costs would be c30% lower at US\$125m. The plant would initially process 1Mtpa then be expanded to 2.3Mtpa after the first three years. This lower capital option will be further examined in the PFS. The advantage is the reduced dilution with equity and/or lower debt requirements, as this expansion is funded through operating cashflows.
- Valuation:** Our valuation decreases to \$0.42/sh (from \$0.52/sh). The 10cps reduction consists of 6cps related to the lower share price which increases dilution when raising capital to build the project and 4cps from higher operating costs, lower recoveries and a lower Ferroniobium price. We have also conducted an upside case which looks at the staged case and results in an NAV of \$0.67/sh.
- Further Funding:** At the end of the December Q, CXX had \$754k in cash. We anticipate that CXX will need to raise additional capital to drive the project towards a decision to mine.
- Catalysts:** 1) Q3/2014: Metallurgical test work results 2) Q3/2014: Updated resource estimate (category) 3) Q3/2014: Baseline studies for ESIA 4) Q4/2014: PFS 5) Q4/2014: Commence DFS.

6 February 2014

12mth Rating

SPEC BUY

Price	A\$	0.20
Target Price	A\$	0.42
12m Total Return	%	110%

RIC: CXX.AX

BBG: CXX AU

Shares o/s	m	131.3
Market Cap.	A\$m	26.3
Net Debt (Cash)	A\$m	(0.75)
3m Av. D. T'over	A\$m	0.076
52wk High/Low	A\$	0.31/0.13

**Valuation:**

Methodology	DCF
Value per share	A\$ 0.42

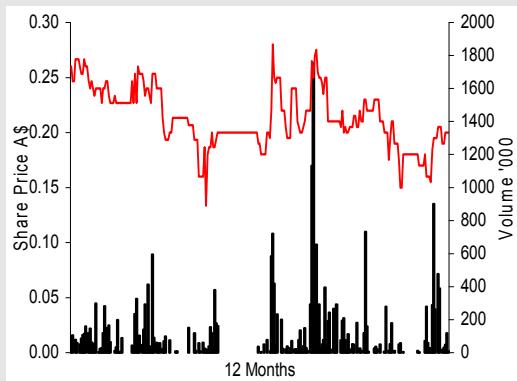
**Analyst:**

Simon Tonkin

**Phone:** (+61 8) 9225 2816

**Email:** stonkin@psl.com.au

### 12 Month Share Price Performance



Performance %	1mth	3mth	12mth
---------------	------	------	-------

Absolute	11.8	-7.3	-23.0
----------	------	------	-------

Rel. S&P/ASX 300	16.1	-0.4	-12.1
------------------	------	------	-------

## Investment Highlights

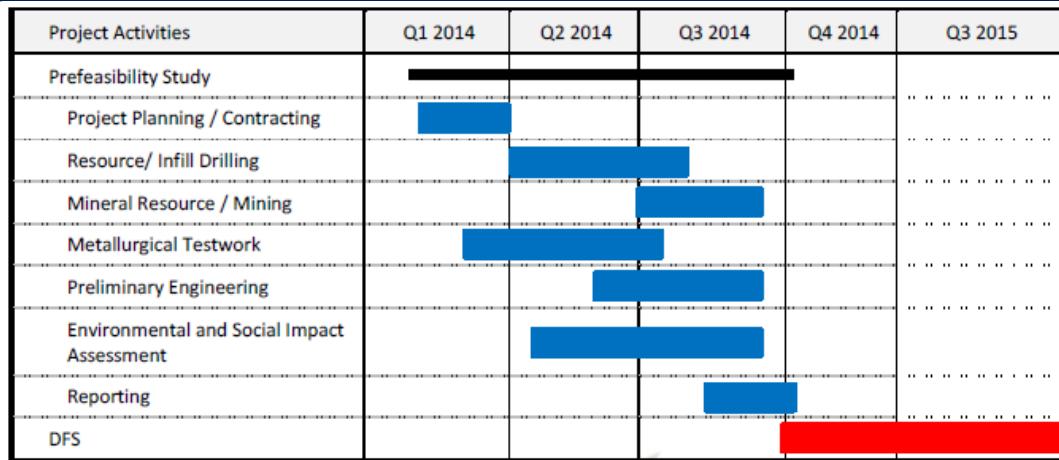
**Robust Niobium Project:** In Figure 1, we outline the parameters used in the independent scoping study which demonstrate a robust Ferroniobium project. Based on these parameters we calculate an NPV of \$332m for the project, discounted back to today. The NPV improves to \$466m at the time of a decision to mine. The most encouraging aspect of the scoping study is the c19% lower capital costs and reduced sustaining capital which could reduce dilution with any future funding arrangement. However, this is offset by increased operating costs which were c26% higher than our previous estimates. The capital cost used in the study had an accuracy of ± 30% with a 20% contingency.

**Figure 1: Scoping Study Estimates**

<b>Panda Hill Niobium Project - Model Assumptions</b>		
Concentrate Price	\$/kg	40
Startup	(year)	2017
Mine Life	(years)	28
Throughput	(Mt)	2
Grades (Yr 1-5)	% Nb <sub>2</sub> O <sub>5</sub>	0.71
Grade (LOM avg)	% Nb <sub>2</sub> O <sub>5</sub>	0.57
Recoveries	%	62%
Recovered Metal (Yr 1-5 avg pa)	t Nb	5364
Recovered Metal (LOM avg pa)	t Nb	4851
Concetrate Grade	%	66
Ferroniobium (LOM pa)	t FeNb	7350
<b>Costs</b>		
Mining	US\$/t	6.1
Processing	US\$/t	30.3
G&A	US\$/t	7.3
Total Costs	US\$/t	43.7
Capex (upfront)	US\$m	185
Sustaining Capex	US\$mpa	3
<b>Financials</b>		
Revenue (LOM Avg pa)	US\$m	188
Costs (LOM Avg pa)	US\$m	88
Gross Profit	US\$m	100
Royalties	US\$m	6
EBITDA	US\$m	95
Tax Rate	%	30%
Royalties	%	3.00%
<b>Project NPV (Based on Decision to Mine)</b>		
NPV (8% Discount)	US\$m	\$693
NPV (10% Discount)	US\$m	\$565
NPV (12% Discount)	US\$m	\$466
NPV (15% Discount)	US\$m	\$357
<b>Project NPV (Discounted Back to Today)</b>		
NPV (8% Discount)	US\$m	\$550
NPV (10% Discount)	US\$m	\$424
NPV (12% Discount)	US\$m	\$332
NPV (15% Discount)	US\$m	\$235

Source: Cradle Resources/Patersons Securities

**Further Optimisation will Improve Project Economics:** The scoping study demonstrates that the project is robust with further areas for optimisation. Firstly, recoveries have good potential for improvement as they are conservative compared to the initial scale bench tests. In November 2013, test work results on the primary carbonatite indicated a niobium recovery of 70% (compared to 65% used in the scoping study) based on bench scale locked cycle tests. In January 2014, CXX released results from preliminary metallurgical testwork on the weathered carbonatite which were in line with the two existing Niobium producers who treat weathered materials (50 to 60% recovery). In addition, the study used conservative contract mining rates which can be improved to reduce operating costs. Finally, power costs used in the study were 24c/KWh, based on onsite power plant using heavy fuel oil (HFO). The option to connect to the national grid and thereby reduce power cost further, will be investigated as part of the next phase. CXX plans to commence a PFS in Q2/2014 and for that study to be completed Q4/2014. A planning schedule is shown below in Figure 2.

**Figure 2: Feasibility Planning Schedule**

Source: Cradle Resources Indaba Presentation

**Stage Case Considered; 30% Lower Capital Costs:** As part of the scoping study, a staged approach was examined. The result was 30% lower upfront capital costs at US\$125m. Under this scenario the plant would initially process 1Mtpa then be expanded to 2.3Mtpa after the first three years. The lower capital option will be further examined in the PFS. The advantage of lower upfront capital is the reduced dilution with equity and/or lower debt requirements as this expansion is funded out of operating cashflows.

**Good Infrastructure:** The project is well located being in close proximity to established infrastructure (Power, Rail, International Airport, and an Industrial Area). This is advantageous for the development of the project whereby capital costs are estimated to be relatively low when compared to more remote projects. In addition, it will provide employees, management and investors easy access to site.

**Strong Management Team:** CXX is building a strong management team which is headed up by Managing Director Grant Davey. Mr Davey is a highly credentialed mining engineer with over 20 years of operational experience in Africa, Australia, South America and Russia. Also on the Board is Craig Burton, who has over 25 years' experience in financing, developing, and managing resource projects and mining service businesses. On the technical team is Keith Bowes, who is an experienced Project and Operations Manager with a metallurgical background and experience in flotation, leaching and roasting of base metals and gold. Neil Inwood is the resource/exploration geologist, who has extensive experience and previously worked with Coffey mining as a principal geologist.

**Valuation:** Our valuation decreases to \$0.42/sh (from \$0.52/sh). The 10cps reduction consists of 6cps related to the lower share price, which increases dilution when raising capital to build the project, and 4cps from higher operating costs, lower recoveries and a lower Ferroniobium price. We have also conducted an upside case which looks at the staged case with optimised recoveries and 15% lower operating costs, which results in an NAV of \$0.67/sh.

**Further Funding:** We anticipate that CXX will need to raise additional capital to drive the project towards a decision to mine. We estimate an additional \$10-15m will be sufficient to complete a DFS. At the end of the December Q, CXX had \$754k in cash.

**Catalysts:** 1) Q3/2014: Metallurgical test work results 2) Q3/2014: Updated resource estimate (category) 3) Q3/2014: Baseline studies for ESIA 4) Q4/2014: PFS 5) Q4/2014: Commence DFS.

## Valuation

### Base Case

Our valuation for CXX decreases to A\$0.42/sh (from A\$0.52/sh). The 10cps reduction consists of 6cps related to the lower share price, which increases dilution when raising capital to build the project, and 4cps from higher operating costs, lower recoveries and a lower Ferroniobium price. We have based our new base case (Figure 3) on the parameters used in the scoping study (Figure 1).

**Figure 3: Cradle Resources – Base Case Sum-Of-Parts Valuation**

Sum-Of-Parts Valuation	US\$m	A\$m	A\$/sh
Panda Hill Project (@12%)	\$332	\$370	0.27
Exploration	\$0.0	\$0.0	0.00
Cash	\$2.4	\$2.7	0.00
Debt	0	0	0
Payment Remaining 50% (US\$9m cash + US\$5m in shares)	(9)	(10)	(0)
Unpaid Capital (To Decision to Mine)	\$13	\$15	0.01
Unpaid Capital (100% Equity)	\$185	\$206	0.15
<b>Net Asset Value (NAV)</b>	<b>\$524</b>	<b>\$584</b>	<b>0.42</b>

*Source: Patersons Securities*

In Figure 4, we provide a comparison between our previous estimates and those used in the scoping study. The price received in the scoping study was 10% lower than we had previously used. Grades were slightly higher; however, this was offset by lower recoveries. As highlighted previously capital cost were c19% lower than our previous estimate which was offset by the higher operating costs.

**Figure 4: Comparison Previous Estimates vs Scoping Study**

	PSL Previous Estimates	Scoping Study/ PSL est	Difference (%)
Price (US\$/kg)	44	40	-9%
Throughput (Mtpa)	2	2	0%
Mine Life	28	28	0%
LOM Grade (Nb <sub>2</sub> O <sub>5</sub> )	0.50%	0.57%	14%
LOM Recovery	65%	62%	-5%
LOM FeNb Sold (kt)	223	200	-10%
Upfront Capex (US\$m)	227	185	-19%
LOM Sustaining (US\$m)	168	86	-49%
LOM Opex (US\$m)	1960	2464	26%
EBITDA (US\$m)	3284	2620	-20%
NPV@12%	446	332	-26%

*Source: Patersons Securities*

For simplicity, we have conservatively assumed that the project is financed using 100% equity, raised at a 10% discount to the current share price. We acknowledge that the final debt/equity mix will be very different; however, this will become clearer as CXX de-risks the project. The Panda Hill Niobium project is at a relatively early stage of development with the Pre-Feasibility Study (PFS) expected to be released by the end of 2014. We have calculated an NPV for Panda Hill of A\$382m based on a 12% discount rate. The higher discount rate is used due to the stage of development and we would consider moving towards a lower discount rate (8-10%) once the project is at Definitive Feasibility Study (DFS) stage. In our model, we have assumed that CXX exercises its four year option to acquire the remaining 51% of Panda Hill.

The financials appear particularly attractive with strong sales revenue of US\$150-\$215mpa with an EBITDA of US\$112mpa over the first five years. Tax rate is 30% and royalty rate is 3%.

## Upside Case

There are elements in the scoping study that appear to be conservative, or require further optimisation, and we have incorporated these into our upside case. We have increased recoveries to 65% LOM (from 62%), this consists of 55% (from 50%) recovery from the weathered carbonatite and 68% (from 65%) recovery from the primary carbonatite. We believe this could be proved achievable through further testwork. We have reduced operating costs by 15% assuming that further cost savings can be made in reagents, power and labour. Finally, we have assumed upfront capital of US\$125m for 1Mtpa and then an additional US\$60m to increase production to 2.3Mtpa. The result is an NPV (@12%) of US\$479m for the project and NAV of \$0.67/sh for CXX.

**Figure 5: Cradle Resources – Upside Case Sum-Of-Parts Valuation**

Sum-Of-Parts Valuation	US\$m	A\$m	A\$/sh
Panda Hill Project (@12%)	\$479	\$534	0.53
Exploration	\$0.0	\$0.0	0.00
Cash	\$2.4	\$2.7	0.00
Debt	0	0	0
Payment Remaining 50% (US\$9m cash + US\$5m in shares)	(9)	(10)	(0)
Unpaid Capital (To Decision to Mine)	\$13	\$15	0.01
Unpaid Capital (100% Equity)	\$125	\$139	0.14
<b>Net Asset Value (NAV)</b>	<b>\$611</b>	<b>\$681</b>	<b>0.67</b>

Source: Patersons Securities

## Niobium Market

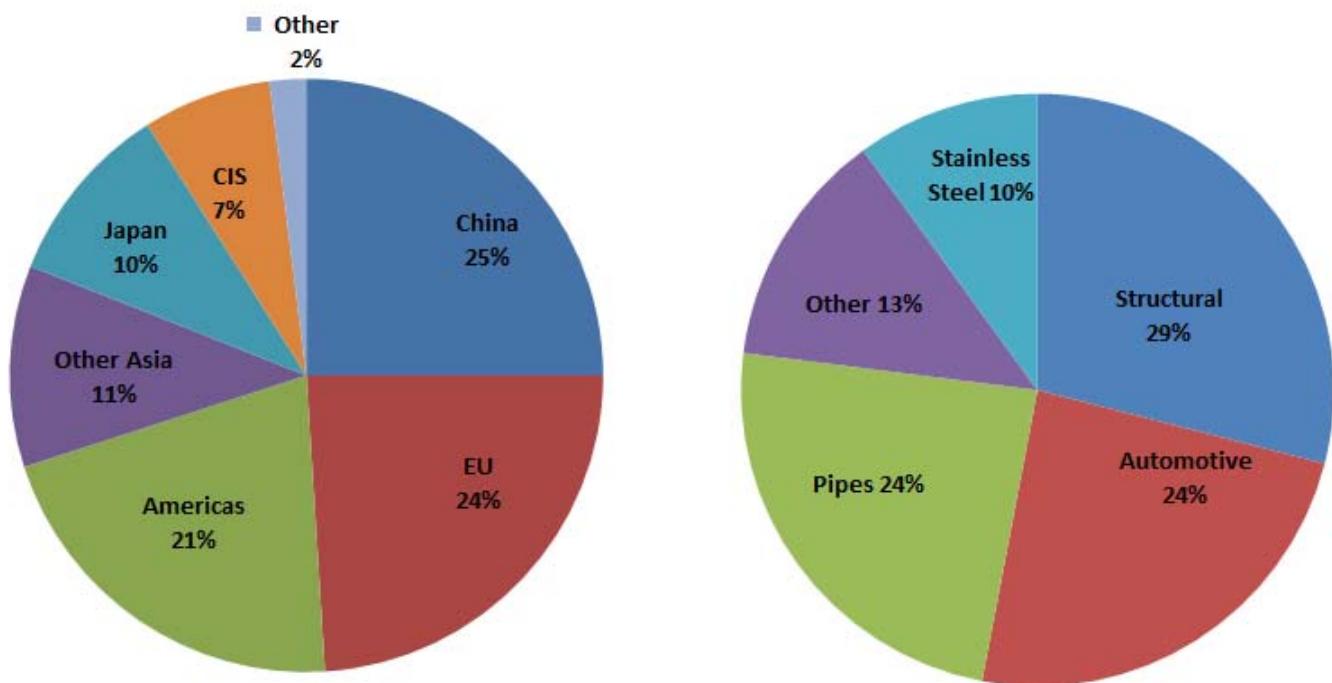
**Major Uses:** Niobium adds significant value to steel products which include: additional strength, durability, anti-corrosion properties, heat resistance and reduced weight. Steel production accounts for 90% of Niobium applications. The US lists Niobium as a strategic metal; however, they do not currently have a stockpile.

The principal Niobium products are:

- 1) **Standard Grade Ferroniobium** (~66% Nb) makes up 90% of the market. This product is used in stainless steels, heat resistant steels and high strength low alloy steel. Major Industries: Automotive, Heavy engineering, petrochemical, power plants and oil and gas pipelines.
- 2) **Vacuum Grade Ferroniobium** (99% Nb) makes up 3% of the market and is used in super alloys e.g., Aircraft engines, power generation and petrochemical sector.
- 3) **Niobium Metals and Alloys** (50-60% Nb) makes up 3-4% of the market and is used in partial accelerators, MRI etc.
- 4) **Niobium Chemicals** which are used in catalysts and ceramics and makes up 3-4% of the market. Used in optical and electronics.

Major consumers are shown in Figure 6 with China, EU, America's and Japan/Other Asia all above 20%.

Figure 6: Global Consumption by Country (left) and Uses (right)



Source: CBMM

**Supply:** Primary world supply of Niobium stands at 69,000t Nb with annual average increase of 10%pa over the past decade (Figure 7).

**Figure 7: World Mine Production and Reserves of Niobium**

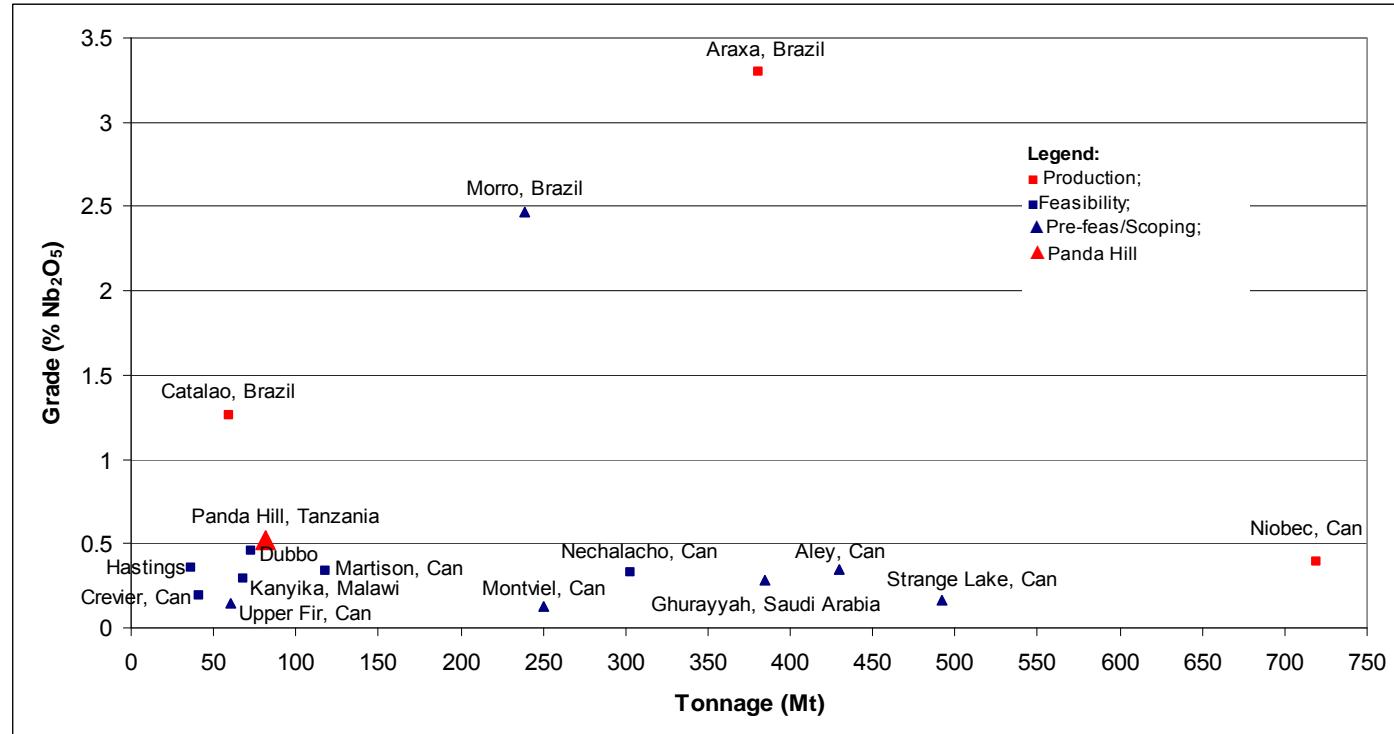
**World Mine Production and Reserves:**

	<b>Mine production 2011</b>	<b>2012<sup>e</sup></b>	<b>Reserves<sup>b</sup></b>
United States	—	—	—
Brazil	58,000	63,000	4,100,000
Canada	4,630	5,000	200,000
Other countries	732	700	NA
World total (rounded)	63,400	69,000	>4,000,000

Source: USGS 2013 Niobium Mineral Commodity Summary

There are three existing producers (CBMM, IAMGOLD, Anglo America), of which Niobec (IAMGOLD) produces from a carbonatite very similar to the mineralisation at Panda Hill. Brazil is the largest Niobium producer in the world, accounting for over 90% of the world's output, where production is estimated to increase by a further 33% from 2016 (Figure 8 – red squares Araxa and Catalao). Most Niobium deposits were discovered in the 1960s with no new producers since 1976 (although the market has grown substantially). Undeveloped Niobium deposits are characterised by low grade, difficult metallurgy and/or high capital costs. CXX's Panda Hill project (Figure 8 – large red triangle) is the highest grade development prospect (outside of Morro, Brazil). It currently has a lower tonnage than many of the other potential projects, however, it is near surface and is an open cut development proposition with good potential to significantly expand the resource.

**Figure 8: Global Niobium Projects Resource (Mt) vs Grade (% Nb<sub>2</sub>O<sub>5</sub>) Selected Projects**



Source: Patersons Securities

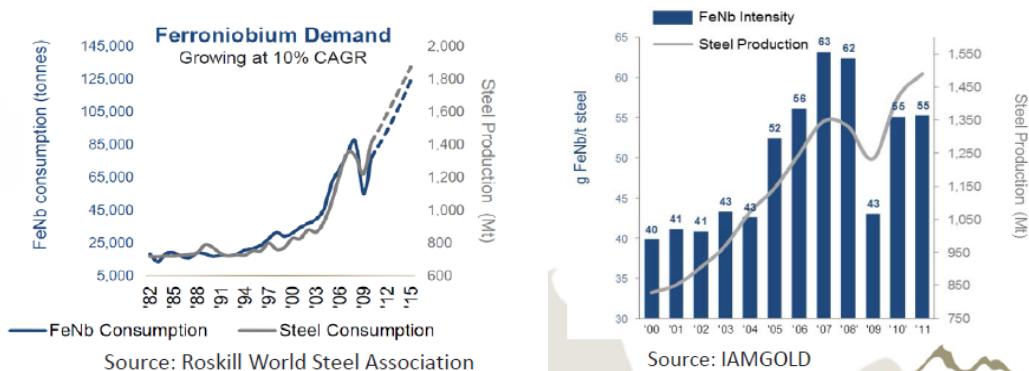
**Demand:** The demand for ferroniobium has grown at a compound annual growth rate (CAGR) of 10% per annum over the last decade and is expected to continue at a similar rate. This has been driven by increased global demand for steel as well as the demand for high quality steel. The demand is being driven by the construction, automotive, oil and gas as well as shipbuilding sectors. High strength low alloy steel is used in applications where lightweight steel is required and is subject to high stress. Typically, Niobium content is a small proportion of the overall costs to steel production, typically less than 0.5% of the total cost of structural steel with less than 0.1% Nb. Therefore according to producer IAMGold, Niobium demand is considered relatively insensitive to changes in price. Major importers of ferroniobium are China, Netherlands, Singapore and the US. Major HSLA steel manufacturers are: Arcelor Mittal, CMC Steel, Gallatin Steel (joint venture between ArcelorMittal and Gerdau Long Steel North America), Nucor Steel, SSAB (Sweden and USA), Steel Dynamics, WCI Steel, US Steel.

The following materials can be substituted for niobium, but a performance or cost penalty may ensue: molybdenum and vanadium, as alloying elements in high-strength low-alloy steels; tantalum and titanium, as alloying elements in stainless and high-strength steels; and ceramics, molybdenum, tantalum, and tungsten in high temperature applications.

**Pricing:** The Niobium price is circa US\$40,000/t, about five to six times the Copper price. Pricing has remained relatively stable from 1990's to mid-2006 with significant recent growth due to a concerted effort to market the benefits of Niobium to steelmakers. Long term Niobium pricing indicates a price of circa US\$45,000/t. Niobium growth is expected to increase by 10% per annum, however there has been a short term decrease in Niobium exports from Brazil. According to data, Brazil exported 5,120 tonnes of ferroniobium in June 2012, reducing by 25% month on month (MoM). Among them, 1,203 tonnes were exported to China, decreasing by 37.8% MoM; 1,261 tonnes were to Netherlands, falling by 33.9% MoM; 1,072 tonnes were to Singapore, rising by 15.4% MoM; 560 tonnes were to Japan, declining by 21.1% MoM; 524 tonnes were to the US, down by 44.8% MoM and 130 tonnes were to South Korea, soaring by 94% MoM. In June 2012, Brazil's average export prices of ferroniobium were at US\$25,536/t, falling by 0.4% from US\$25,631/t in May 2012

**Outlook:** The outlook for prices is promising considering the past demand growth of 10%pa CAGR expected from the use of Niobium in steel (Figure 9). For the purposes of our financial model we use \$40/kg for Niobium (previously \$44/kg).

**Figure 9: Ferro Niobium Demand**



Source: Cradle Resources Presentation

## Company Overview

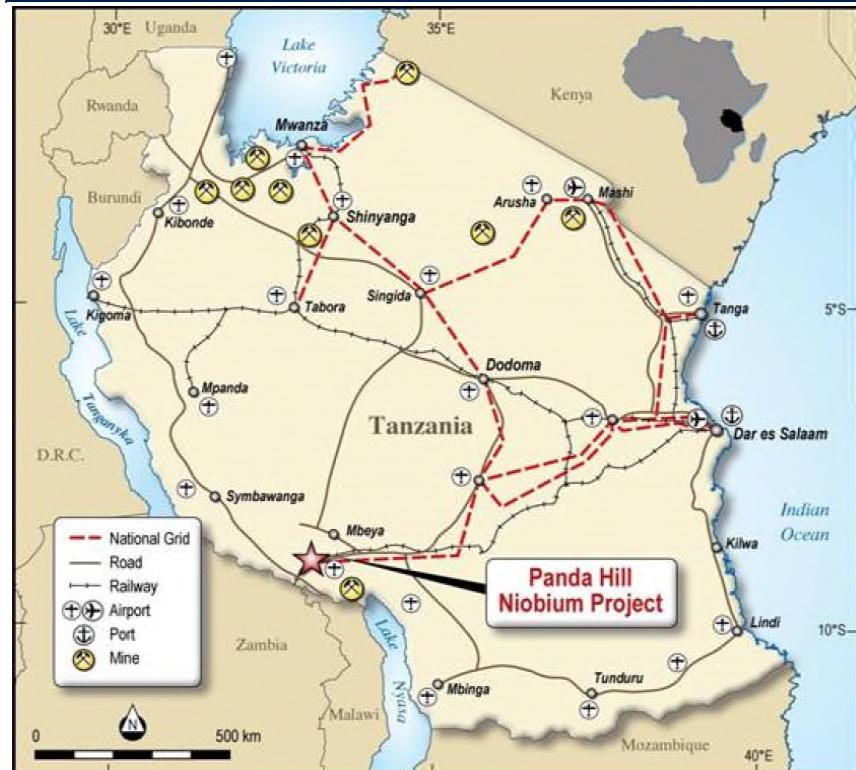
In July 2013, CXX completed a transaction to acquire a 49% interest (with a right to acquire the balance within four years) in the Panda Hill Niobium Project in Tanzania. The acquisition of the Panda Hill project makes CXX one of the few Niobium developers in the world with the market tightly controlled by three large producers and 90% of supply coming from Brazil. The outlook for Niobium is robust given its unique characteristics of strengthening steel while reducing its mass as well as being anti-corrosive. Main areas of growth are in the construction, automotive, oil and gas as well as shipbuilding and aeronautics industries.

## Panda Hill Niobium Project

### Background

The Panda Hill Niobium project is located 26km from the district capital Mbeya in south west Tanzania (Figure 9). The project was first identified by the Geological Survey of Tanzania (GST) who conducted significant exploration work from 1954 to 1963 including excavating numerous pits, development of two shafts and trial mining and construction of a trial gravity and flotation plant on site. Several other companies also completed drilling and metallurgical work in the 70s, 80s and early 2000s. Most recently, the project has been locked up by a single private owner from 2005 who missed the opportunity to realise value during the commodities boom. In June 2012, Panda Hill Mining Pty Ltd acquired an option over the project and arranged an initial JORC resource calculation, a preliminary mine plan and project costs. CXX has acquired 49% of the project from the vendor, which includes three granted mining licences, and is currently in the process of exercising its option to acquire an additional 1%. As shown in Figure 10, the project is well located being in close proximity to established infrastructure (Power, Rail, International Airport, and an Industrial Area).

**Figure 10: Panda Hill Location and Infrastructure**



Source: Cradle Resources - Independent Geologists Report May 2013

## Panda Hill Acquisition Details

On 25 July 2013, CXX completed the acquisition of a 49% interest in the Panda Hill Niobium project with rights to acquire the balance. The consideration paid to Panda Hill Mining Pty Ltd (owned by the shareholders of Verona Capital Pty Ltd) was 37.5m CXX shares (escrowed) and 37.5m performance shares (Figure 11). CXX has a 4 year option to acquire an additional 1% for US\$30k (for tax purposes) and a further 4 year option to acquire the balance of the project for approximately US\$14m, of which US\$9m is payable in cash and US\$5m in shares or capped royalty.

The 37.5m performance rights will vest in two stages. 18.75m shares are expected to be issued to the vendors for the completion of the scoping study in Q1/CY2014, and these remain restricted until the end of July 2015. There are a further 18.75m shares to be issued on completion of the DFS if the NPV (10%) is >US\$400m. Between the range of US\$300-US\$400m a pro-rata conversion applies.

In October 2013, CXX agreed to issue 2.625m performance rights to certain employees and consultants. The principal terms and conditions of the performance rights include continuous employment with or provision of services to the Company, and the fulfilment of specific project-related milestones.

CXX has also agreed to issue 2m listed options (CXXO) at an issue price of 5 cents each (\$100,000). These are to be issued to third party consultants, partly by way of incentive. The issued share capital of the Company is shown in Figure 11.

**Figure 11: Cradle Resources – Capital Structure**

Class of Security	Code	Number of Issued	Tradeable or Restricted	Period of Restriction
<b><u>Shares, Performance Shares and Performance Rights</u></b>				
Ordinary Shares	CXX	53,675,017	Tradeable	n/a
Escrowed Ordinary Shares	CXX	37,500,000	Restricted	Ends 31 July 2015
Class A Performance Rights	n/a	18,750,000	Restricted	Ends 31 July 2015
Class B Performance Rights	n/a	18,750,000	Restricted	Ends 31 July 2015
Performance Rights	n/a	2,625,000	n/a	n/a
<b>Total</b>		<b>131,300,017</b>		
<b><u>Options</u></b>				
Listed Options (ex \$0.2667 exp 24/1/15)	CXXO	17,962,506	Tradeable	n/a
Unlisted Options (ex \$0.2667 exp 31/5/16)	n/a	7,687,500	Unlisted	n/a
<b>Total</b>		<b>25,650,006</b>		

Source: Cradle Resources September 2013 quarterly activities report

## Resource

The Panda Hill deposit is hosted within the Panda Hill carbonatite, an alkaline igneous intrusion of approximately 1.3km in diameter composed primarily of coarse crystalline calcite with broad zones containing the Niobium mineral pyrochlore. The Panda Hill carbonatite intrudes gneisses and amphibolites and is interpreted to have formed in the vent of an alkaline volcano which has been almost completely eroded exposing the crystalline plug. The three active Niobium mines in the world are all hosted in carbonatite.

CXX updated the Panda Hill resource in November 2013. The updated Resource contains 81.8Mt at 0.52% Nb<sub>2</sub>O<sub>5</sub> for 423,000t of contained Nb<sub>2</sub>O<sub>5</sub> at a 0.30% Nb<sub>2</sub>O<sub>5</sub> cut off (Figure 12). This represents a 50% metal increase compared to the 2012 Resource of 56Mt at 0.50% Nb<sub>2</sub>O<sub>5</sub> for 280,000t of Nb<sub>2</sub>O<sub>5</sub>.

The 2013 Resource incorporates a Weathered Carbonatite zone. This zone is characterised by near surface material which has been enriched relative to the underlying primary carbonatite material.

**Figure 12: Panda Hill Updated Resource Estimate**

Table 1 2013 Panda Hill 2013 Resource – Reported Above a 0.3% Nb <sub>2</sub> O <sub>5</sub> Lower Cut-off			
Combined			
Lower Cut-off (Nb <sub>2</sub> O <sub>5</sub> %)	Million Tonnes	Nb <sub>2</sub> O <sub>5</sub> %	Nb <sub>2</sub> O <sub>5</sub> Content (KT)
Indicated	5.4	0.62	33
Inferred	76.4	0.51	390
Total	81.8	0.52	423
Weathered Carbonatite			
Lower Cut-off (Nb <sub>2</sub> O <sub>5</sub> %)	Million Tonnes	Nb <sub>2</sub> O <sub>5</sub> %	Nb <sub>2</sub> O <sub>5</sub> Content (KT)
Indicated	2.1	0.77	16
Inferred	8.6	0.81	69
Total	10.7	0.80	86
Primary Carbonatite			
Lower Cut-off (Nb <sub>2</sub> O <sub>5</sub> %)	Million Tonnes	Nb <sub>2</sub> O <sub>5</sub> %	Nb <sub>2</sub> O <sub>5</sub> Content (KT)
Indicated	3.2	0.52	17
Inferred	67.8	0.47	319
Total	71.1	0.47	336

Note: Figures have been rounded.

Source: Cradle Resources

## Metallurgical Testwork

CXX has conducted preliminary metallurgical testwork on the primary carbonatite and mineralogy testwork on the weathered carbonatite. The primary carbonatite makes up +80% of the Panda Hill deposit with grades around 0.5% Nb<sub>2</sub>O<sub>5</sub> and a recovery of 65% used in the scoping study. The weathered carbonatite represents about 19% of the deposit and is higher grade (0.8% Nb<sub>2</sub>O<sub>5</sub>) with a recovery of 50% used in the scoping study. There is scope to improve on recoveries from the weathered and primary material as demonstrated in recent testwork.

In November 2013, CXX released results from testwork conducted at SGS Lakefield on the primary carbonatite ore. A total of 18 bench scale open circuit were undertaken to investigate various circuit configurations and reagent regimes. The final locked cycle test was carried out on fresh carbonatite and achieved a niobium recovery of 70% at a concentrate grade of 59% Nb<sub>2</sub>O<sub>5</sub>. An earlier lock cycle test carried out on primary carbonatite (which is a combination of fresh and lightly oxidised material) achieved recoveries of 60% at a concentrate grade of 46%. There is good scope to improve on the result significantly.

In January 2014, results were released on mineralogy testwork conducted on the weathered material. The weathered cap consists of a combination of breccias, oxidised carbonatites, and limonitic clay types. The theoretical maximum niobium recovery in the flotation circuit, based on the mineralogy work, is between 75% and 82%, at a 55% Nb<sub>2</sub>O<sub>5</sub> grade. This is compared to the theoretical average for the fresh ore at 88%. We note that desliming and other parts of the circuit are anticipated to cost about 20% in recovery in weathered material. Existing Niobium producers are recovering about 50 to 60% overall in weathered material so CXX's mineralogy results are in line with this.

## Risks

**Financing Risk:** CXX may from time to time need to access the equity/debt markets to finance its exploration and development activities. There can be no assurances that this capital will be available at a reasonable cost; therefore, substantial future dilution could result.

**Country Risk:** Changes in government policies, regulations, tax regimes and political unrest can negatively impact CXX's asset and valuation. Tanzania ranks 74/96 in the Fraser Institute mining survey (2012/2013), which is a significant fall from 44/72 in 2009/2010. In 2010, Tanzania changed its mining code and increased gold royalties to 4% (from 3%), required the Government to own a stake in any mining project and requires mining companies to list on the Dar es Salaam stock exchange. The new mining code was brought about by large tax holidays and low royalties offered to the first large gold miners (e.g.; Barrick Gold), which were seen as not benefiting Tanzanians. The positive for CXX is the Panda Hill project is on an approved mining license, which was granted under the old mining code.

**Renewal of Title:** Since granting of the Panda Hill Licences there have been previous delays in the development of the Panda Hill Project as a result of delays in agreeing terms with the Tanzanian authorities for the relocation of the Songwe Prison. Following meetings with the Ministry of Mines officials in Tanzania, including the Minister for Mining, CXX does not believe that this will have consequences for renewal of the Panda Hill Licences. However, any application for renewal of any licence comprising the Panda Hill Project involves the exercise of discretion by the relevant government authority. There is no assurance that such renewals will be given as a matter of course and there is no assurance that new conditions will not be imposed in connection with the renewal.

**Metallurgical Risk:** Metallurgical testwork from five bulk samples conducted in 2001 by Euromet suggested that fenite and oxide material yielded poor results using conventional processing due to the refractory nature of that particular ore. It will be important to better map this material. There is some enrichment of other metals in the deposit including rare earth elements, phosphate and their concentration should be monitored. At high enough concentrations these could impact the processing of the material.

**Commodity Risk:** The Niobium market appears to be relatively stable and appears to have a strong growth profile. However, should the world economy continue to slow then steel production may fall which could adversely impact Niobium demand.

**Foreign Exchange Risk:** The majority of CXX's cash reserves are held in Australian dollars. Therefore, with the majority of costs in US dollars, there is currency risk should the USD dollar strengthen, which could adversely affect the purchasing power of CXX's cash.

**Tenure:** The three mining licences that host the Panda Hill Niobium project are due to expire on 15 November 2016 and will therefore require renewal. The renewal should be straight forward, however, there are risks associated with this including changes to economic parameters which could be considered under the new mining code.

**Exploration Risk:** Exploration is inherently risky and there is no guarantee that an economic deposit will be delineated. Further drilling is needed to follow-up targets which may or may not result in further discoveries.



**1300 582 256**  
**patersons@psl.com.au**  
**www.psl.com.au**

### **Research**

Rob Brierley – Head of Research  
Tony Farnham – Economist  
Andrew Quin – Research Strategy Coordinator  
Kien Trinh – Senior Quantitative Analyst

Phone: (+61 8) 9263 1611 Email: rbrierley@psl.com.au  
Phone: (+61 2) 9258 8973 Email: tfarnham@psl.com.au  
Phone: (+61 8) 9263 1152 Email: aquin@psl.com.au  
Phone: (+61 3) 9242 4027 Email: ktrinh@psl.com.au

### **Metals and Mining**

Tim McCormack – Resources Analyst  
Simon Tonkin – Senior Resources Analyst  
Matthew Trivett – Research Analyst

Phone: (+61 8) 9263 1647 Email: tmccormack@psl.com.au  
Phone: (+61 8) 9225 2816 Email: stonkin@psl.com.au  
Phone: (+61 7) 3737 8053 Email: mtrivett@psl.com.au

### **Oil and Gas**

Alexis Clark – Oil and Gas Analyst

Phone: (+61 3) 9224 4448 Email: aclark@psl.com.au

### **Industrials**

Marcus Hamilton – Industrial Analyst  
Ben Kakoschke – Industrial Analyst

Phone: (+61 8) 9225 2836 Email: mhamilton@psl.com.au  
Phone: (+61 3) 9242 4181 Email: bkakoschke@psl.com.au

### **Institutional Dealing**

Dan Bahen  
Michael Brindal  
Artie Damaa  
Paul Doherty  
Trent Foxe  
Peter Graham  
Chris Kelly  
Steven Kestel  
Jeremy Nugara  
Phil Schofield  
Josh Welch  
Rob Willis  
Sandy Wylie

Phone: (+61 8) 9263 1274 Email: dbahen@psl.com.au  
Phone: (+61 8) 9263 1186 Email: mbrindal@psl.com.au  
Phone: (+61 2) 8238 6215 Email: adamaa@psl.com.au  
Phone: (+61 3) 8803 0108 Email: pdoherty@psl.com.au  
Phone: (+61 2) 8238 6265 Email: tfoxe@psl.com.au  
Phone: (+61 3) 9242 4129 Email: pgraham@psl.com.au  
Phone: (+61 3) 9242 4078 Email: ckelly@psl.com.au  
Phone: (+61 8) 9263 1631 Email: skestel@psl.com.au  
Phone: (+61 3) 8803 0166 Email: jnugara@psl.com.au  
Phone: (+61 2) 8238 6223 Email: pschofield@psl.com.au  
Phone: (+61 8) 9263 1668 Email: jwelch@psl.com.au  
Phone: (+61 7) 3737 8021 Email: rwillis@psl.com.au  
Phone: (+61 8) 9263 1232 Email: swylie@psl.com.au

*Disclosure: The preparation of this report was funded by the Company in accordance with the terms of an agreement with Patersons.  
This report was prepared by Patersons and not by the Company.*

**Important Notice:** Copyright 2014. The contents contained in this report are owned by Patersons Securities Limited ('Patersons') and are protected by the Copyright Act 1968 and the copyright laws of other countries. The material contained in this report may not be copied, reproduced, republished, posted, transmitted or distributed in any way without prior written permission from Patersons. Modification of the materials or use of the materials for any other purpose is a violation of the copyrights and other proprietary rights of Patersons.

**Disclaimer:** Patersons believes that the information or advice (including any financial product advice) contained in this report has been obtained from sources that are accurate at the time of issue, but it has not independently checked or verified that information and as such does not warrant its accuracy or reliability. Except to the extent that liability cannot be excluded, Patersons accepts no liability or responsibility for any direct or indirect loss or damage caused by any error in or omission from this report. You should make and rely on your own independent inquiries. If not specifically disclosed otherwise, investors should assume that Patersons is seeking or will seek corporate finance business from the companies disclosed in this report.

**Warning:** This report is intended to provide general securities advice, and does not purport to make any recommendation that any securities transaction is appropriate to your particular investment objectives, financial situation or particular needs. Prior to making any investment decision, you should assess, or seek advice from your adviser, on whether any relevant part of this report is appropriate to your individual financial circumstances and investment objectives.

**Disclosure:** Patersons, its director and/or employees may earn brokerage, fees, commissions and other benefits as a result of a transaction arising from any advice mentioned in this report. Patersons as principal, its directors and/or employees and their associates may hold securities in the companies the subject of this report, as at the date of publication. These interests did not influence Patersons in giving the advice contained in this report. Details of any interests may be obtained from your adviser. Patersons as principal, its directors and/or employees and their associates may trade in these securities in a manner which may be contrary to recommendations given by an authorised representative of Patersons to clients. They may sell shares the subject of a general 'Buy' recommendation, or buy shares the subject of a general 'Sell' recommendation.

**Stock recommendations:** Investment ratings are a function of Patersons expectation of total return (forecast price appreciation plus dividend yield) within the next 12 months. The investment ratings are Buy (expected total return of 10% or more), Hold (-10% to +10% total return) and Sell (> 10% negative total return). In addition we have a Speculative Buy rating covering higher risk stocks that may not be of investment grade due to low market capitalisation, high debt levels, or significant risks in the business model. Investment ratings are determined at the time of initiation of coverage, or a change in target price. At other times the expected total return may fall outside of these ranges because of price movements and/or volatility. Such interim deviations from specified ranges will be permitted but will become subject to review by Research Management. This Document is not to be passed on to any third party without our prior written consent.