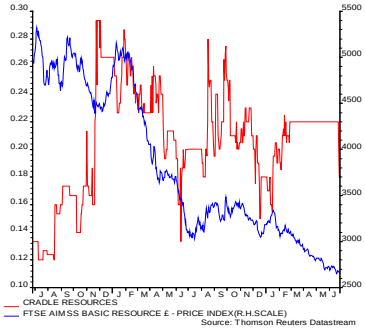
Mining Research

02 July 2014

Cradle Resources

SPECULATIVE BUY

Bloomberg	CXX CN
Price	A$0.19
Valuation	A$0.50
12mth high/low	A$0.28/0.15
Shares out	128.7m
Market Cap	A$24.5m
Enterprise Value (est)	A$22.1m



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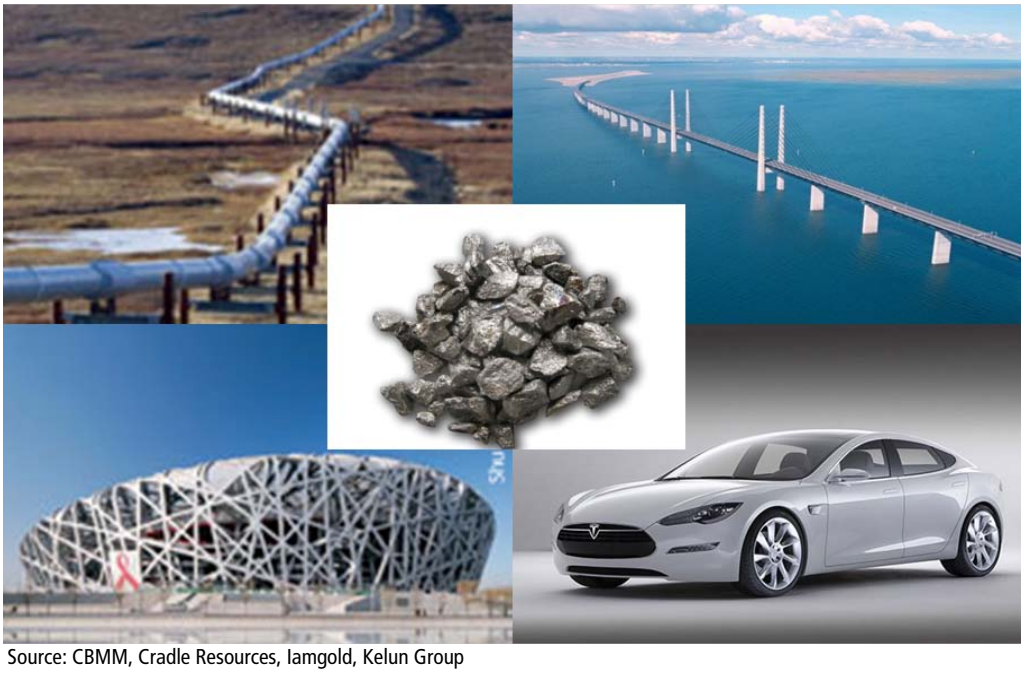
The hand that rocks

Cradle has the rights to, and management control of, an eventual 50% interest in the Panda Hill niobium project in Tanzania, which, following a recent commitment to invest US$20m at the project level by new JV partner Tremont Investments, is now funded to a possible construction decision in H2 2015. A recent scoping study demonstrated the potential for a modest capex (US$185m), low-strip (0.4:1) open-pit operation producing ~5ktpa of niobium, with C1 cash costs estimated at just US$17/kg, and total cash costs at US$19/kg. This low cost structure would yield an operating margin of >50% at current niobium prices.

Panda Hill is one of the very few undeveloped niobium resources known globally with the grade and metallurgical simplicity to compete with the current tightly-controlled supply base of just three primary producers. If developed, it would provide some welcome geographic diversity to this supply base, which is currently dominated (~90%) by Brazil. The only current operation outside Brazil, Iamgold's Niobec operation in Canada, has similar grades and metallurgy, but is a mature underground operation. Located in mining-friendly Tanzania, Panda Hill further benefits from an excellent array of already-installed infrastructure, situated in close proximity to road, rail and power lines and a regional commercial hub with an international airport – luxuries most mining project developers in Africa can only dream of.

Niobium is a growing market, the metal's high-strength, low-weight and anticorrosive properties making it an ideal additive to high-spec steels used in the construction of oil and gas pipelines, bridges and, perhaps most importantly, automobile manufacturing. Demand is closely correlated to global steel production, which continues to grow, but tends to outperform steel owing to the growing intensity of its use in high-spec steelmaking. With Panda Hill's forecast peak production equating to just 5% of current demand, in a market set to grow further, we believe there is ample space for Cradle as a new entrant.

We initiate coverage with a SPECULATIVE BUY and a A$0.50/share valuation.



Source: CBMM, Cradle Resources, Iamgold, Kelun Group

Contents

Investment summary

ASX-listed Cradle Resources is progressing the world-class Panda Hill niobium project in Tanzania. Cradle has acquired a 50% interest in the project plus an exclusive option to acquire the balance for around US$14m at any time over the next three years. Its equity interest and option right were recently transferred to a newly-incorporated JV with Africa-focused mining private-equity group Tremont Investments Ltd (backed by Denham Capital and advised by Pangea Exploration), into which Tremont can earn up to a 50% stake (and therefore 50% of Panda Hill assuming the JV exercises the exclusive option to acquire the balance of ownership in the project) through sole-funding US$20m of direct expenditure. We believe this is a sum sufficient to advance Panda Hill through prefeasibility study, subsequent full feasibility and ultimately to a construction decision.

The niobium market looks set for continued growth on both rising steel production and increasing intensity of Nb usage in high-spec steel making

A poorly understood commodity, niobium's strength, high melting point, low-density and resistance to erosion make it an ideal additive for high-quality steels required in the construction of large-scale, high-stress-bearing structures (eg bridges and oil and gas pipelines), and in the construction of steel car parts given the increasing importance of reducing weight (to reduce fuel consumption and thus CO_2 emissions) without compromising strength. While traditionally closely correlated with global steel production, which is forecast to continue to grow, niobium demand should also benefit from increasing intensity of use in steelmaking as the technologically-driven requirement for high-spec steels grows, particularly in emerging-market economies where its use lags behind that in the developed world.

Which should allow new entrants in to what is a tightly-controlled producer market

Niobium supply is tightly controlled, with currently only three significant producers, one of whom alone accounts for around 85% of the market. However, we believe the demand outlook is sufficiently bright that there will be space for new entrants without adversely impacting price, particularly if those would-be producers can offer a degree of geographic diversity away from the dominant current production base of Brazil. The compound annual growth rate in demand for niobium has been more than 8% over the past decade, and the market continues to expand – Panda Hill, if developed, will in its initial years add just 3-4% of extra supply into this growing market.

Panda Hill's favourable location, grade and straightforward metallurgy stand out from the other undeveloped resources

While a number of undeveloped niobium resources exist, many are within polymetallic projects whose economic viability hinge on the fortunes of other minerals, and/or require complex hydrometallurgical processing solutions. Of the primary niobium projects, we believe Panda Hill stands apart as having the grade and straightforward metallurgy to compare with the established producers – its mineralogy is similar, and grade somewhat higher, than that of Niobec (a subsidiary of Iamgold, and the only current niobium producer to disclose much in the way of operational data). Panda Hill is open-pittable with a likely very low strip ratio, compared with the mature underground operation at Niobec, and should therefore benefit from a lower cost structure. Moreover, Panda Hill benefits from an excellent array of already-installed infrastructure, situated just a few kilometres from an industrialised service centre, road and rail connections and an international airport, and Tanzania is an established mining country.

Panda Hill could sustain ~5ktpa of Nb at direct cash costs of US$17/kg

A recently completed scoping study of Panda Hill demonstrated the potential to built a 2Mtpa open-pit operation for an initial capex requirement of US$185m, with potential for the initial capital outlay to be reduced to US$125m if a staged approach to development is taken, starting at an initial scale of 1Mtpa and subsequently expanding to 2.3Mtpa after the first three years of production (with the later expansion capex of US$71m self-funded from initial operational cash flows).

Based on the operating and cost parameters reported for the base-case (2Mtpa mill throughput) scenario, we estimate Panda Hill could yield average niobium output of around 5ktpa over a 28-year life, contained in standard-grade (66% Nb) ferroniobium (the dominant niobium product form), at average on-site cash costs of US$17/kg (in today's money) and total cash costs (inclusive of royalties, marketing and transport costs) of just over US$19/kg. Assuming a niobium price of US$40/kg, around the market average price over the past 12 months, we estimate that this could generate operational cash flow of >US$100m pa (100% basis) in the initial years, a margin of over 50%.

We estimate a base-case project IRR of >40% and an NPV of US$505m at current spot prices - significant upside on higher niobium prices

On these parameters we calculate a post-tax project IRR of 43% and an NPV of US$505m (assuming a 10% discount rate in nominal terms – we inflate both revenues and costs in our model at an assumed rate of 2.5%). By way of comparison, Iamgold's recently updated economic evaluation of its underground expansion project at Niobec estimates a capex requirement of US$1.8bn, and calculates a project IRR of 15% at Iamgold's assumed long-term niobium price of US$45/kg. Applying the same niobium pricing assumption to our model of Panda Hill would generate an IRR of 51%.

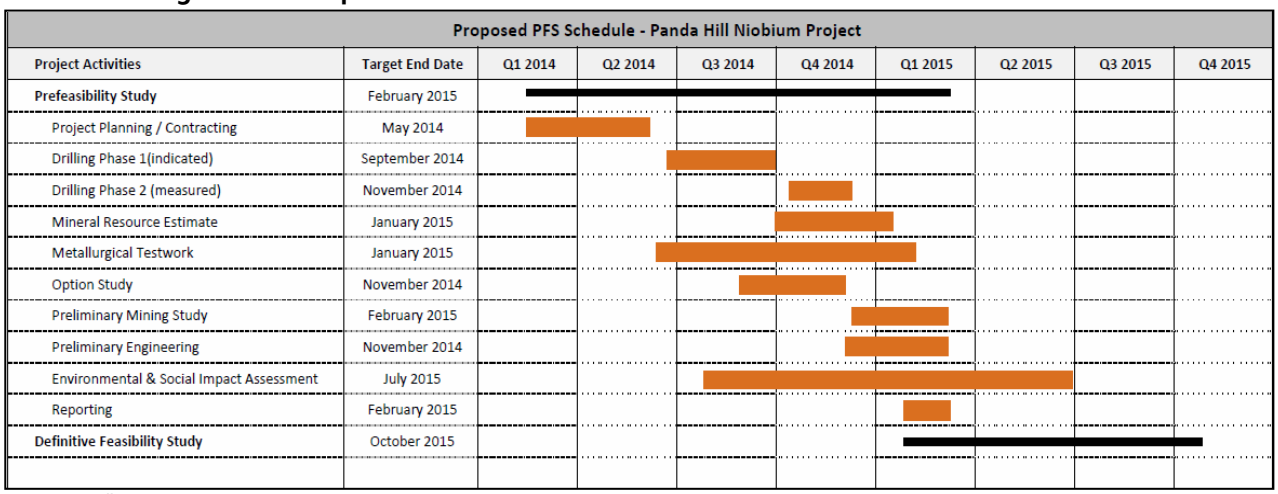
The scoping study results were sufficiently robust to progress to prefeasibility study – results warranting, this programme of work should lead into a full feasibility by early 2015, and a possible construction decision during H2 2015. We believe this entire work stream is now fully funded following Tremont's agreement to invest US$20m in stages, mostly at the project level, for an eventual 50% stake.

Further upside as scoping study results are optimised and resource further drilled

Further in-fill drilling, which will be undertaken as part of the feasibility study work, could further enhance the project economics by enabling better grade optimisation of the mining plan (the scoping study schedule was constrained to access indicated resources first – as indicated resources account for <10% of total currently-delineated niobium resources, this artificially reduces head grade in the early years), while further metallurgical testing may also demonstrate the potential for better processing recoveries from the higher-grade weathered material. Moreover, much of the resource is based on historical data, which Cradle's initial own drilling suggests underestimated the extent of the higher-grade weathered cap and did not close off fresh mineralisation at depth. There is therefore scope for both grade and tonnage upside, which could further enhance the strategic value of this rare primary niobium deposit.

We initiate research coverage of Cradle Resources with a SPECULATIVE BUY recommendation and a valuation of A$0.50 per share.

Panda Hill targeted development timetable



Source: Cradle Resources

Valuation

We value Cradle on a sum-of-the-parts basis, incorporating a risk-adjusted NPV estimate of Panda Hill (at a 10% nominal discount rate) on a Cradle-attributable basis (we assume Tremont earns in its full 50% by funding the project through definitive feasibility, and that the US$14m estimated option payment for the JV company to take full ownership is met 50:50 by Cradle and Tremont) using the operating and cost parameters from the recently completed scoping study of the project (see pp16-18 for details). We assume capital expenditure and construction commence in H2 2015 and first production in 2017.

In our model we have adopted the parameters for the base-case 2Mtpa production scale evaluated in the scoping study. However, we note that the staged developement scenario carries the attraction of a lower initial funding requirement (US$125m estimated in the scoping study, versus US$185m for a 2Mtpa rate from the outset).

We assume a base-case niobium price of US$40/kg in today's money, around the average market price over the past year, and inflate both revenues and costs at an assumed 2.5% pa. We consider this a conservative pricing assumption given the anticipated trend of increasing intensity of niobium use in high-grade steel production (see pp7-9) – the table below illustrates NPV sensitivity to both niobium price (real) and discount rate (nominal).

Panda Hill NPV (US$m) sensitivity to real Nb price and discount rate

	US$36/kg	US$38/kg	US$40/kg	US$42/kg	US$44/kg	US$46/kg
15.0%	192	228	263	299	334	370
12.5%	270	315	361	406	452	497
10.0%	385	445	**505***	565	625	684
7.5%	562	644	726	808	889	971
5.0%	846	962	1,078	1,195	1,311	1,428

Source: Mirabaud Securities estimates *Valuation base case

In arriving at our sum-of-parts valuation of A$0.50/sh, we apply a 65% risk adjustment to Cradle's 50% attributable share of our base-case NPV estimate of Panda Hilll in recognition of the risks to first production, one of which we consider to be financing its share of the capex (and potential associated equity dilution). We note that we would reach approximately the same valuation outcome were we to include Panda Hill on a fully unrisked basis and conservatively assume that Cradle's 50% share of the initial capex requirement is funded through equity at the current share price.

Our A$0.50/share risked valuation equates to 2.6x times Cradle's current share price, and we therefore set our recommendation at BUY. We add a SPECULATIVE qualifier owing to the inherent funding risks.

Cradle Resources – sum-of-parts valuation

	US$m	A$/sh*
Panda Hill, $NPV_{10\%}$ – 50% attributable basis	252	1.80
Risk adjustment - 65%	-164	-1.17
Outstanding ownership payment – 50% attributable basis	-7	-0.05
Project valuation	**81**	**0.58**
Corporate-level costs, NPV 10%	-13	-0.09
Net cash (estimate)	2	0.02
Company valuation	**70**	**0.50**

*128.7m current issued shares, plus 18.75 performance shares issuable on completion of positive DFS
Source: Mirabaud Securities estimates A$1 = US$0.95

Summary operating and financial forecasts

The table below summarises the operating and earnings forecasts (the latter presented on a Cradle-attributable basis, assuming Tremont makes its full 50% earn-in to Panda Hill ahead of construction) generated from our cash flow model. Consistent with the company's target timetable, we assume production commences in CY2017. This schedule assumes feasibility study work begins forthwith, culminating in a construction decision in H2 2015, and an 18-month construction period thereafter (subject to funding).

Our forecasts assume a long-term real niobium price of US$40/kg, (expressed in today's money), and we inflate revenues and costs at a rate of 2.5% pa.

Note that our cash flow model makes no allowance for the financing inflow (debt and/or equity) that would be required to fund Cradle's 50% attributable share of mine development, which explains the large net cash outflows in the construction years (CY2015 and CY2016) and the negative year-end cash positions.

Summary operating estimates (100% basis) – calendar years

CY to Dec 31		2013A	2014F	2015F	2016F	2017F	2018F	2019F	2020F
Ore processed	kt	-	-	-	-	2.0	2.0	2.0	2.0
Nb_2O_5 grade	%	-	-	-	-	0.78%	0.72%	0.69%	0.66%
FeNb produced	kt	-	-	-	-	8.1	7.8	7.7	7.5
Nb price	US$/kg	-	40.00	41.00	42.03	43.08	44.15	45.26	46.39
On-site cash operating costs	US$/kg	-	-	-	-	15.69	16.66	17.39	18.24
Total cash costs	US$/kg	-	-	-	-	18.49	19.54	20.34	21.27

Source: Mirabaud Securities estimates

Summary financial estimates (unfunded, 50% Cradle-attributable basis) – financial years to 30 June

FY to Jun 30		2013A	2014F	2015F	2016F	2017F	2018F	2019F	2020F
Profit and loss									
Gross revenue	US$m	0.1	-	-	-	57.7	114.7	114.5	115.0
Operating costs	US$m	0.0	-	-	-	-25.5	-51.5	-52.6	-53.8
G&A	US$m	-0.8	-1.0	-1.0	-1.1	-1.1	-1.1	-1.1	-1.2
EBITDA	US$m	-0.6	-1.0	-1.0	-1.1	31.1	62.1	60.7	60.0
EBIT	US$m	-0.6	-1.0	-1.0	-1.1	29.1	58.2	56.9	56.1
Net profit	US$m	-0.6	-1.0	-1.0	-1.1	24.7	45.1	39.7	39.0
Cash flow									
Cash-flow from operations	US$m	-0.6	-1.0	-1.0	-1.1	26.6	49.0	43.5	42.9
Cash-flow from investing activities	US$m	-3.5	-1.7	-13.2	-49.7	-37.4	-1.7	-1.7	-1.8
Cash-flow from financing activities	US$m	2.4	4.2	0.8	0.0	0.0	0.0	0.0	0.0
Net cash flow	US$m	-1.6	1.5	-13.4	-50.7	-10.7	47.3	41.8	41.1
Year-end cash balance	US$m	0.4	1.9	-11.5	-62.2	-73.0	-25.7	16.1	57.2
Ratios									
EV/EBITDA	x	na	na	na	na	0.7	0.4	0.4	0.4
PE	x	na	na	na	na	1.0	0.5	0.6	0.6

Source: Cradle Resources, Mirabaud Securities estimates

Niobium market

Niobium (Nb) is a geologically rare transitional metal, occurring in the minerals pyrochlore and columbite, which contain niobium and tantalum in varying proportions. Pyrochlore is mined primarily for its niobium content, while columbite is mined primarily for tantalum with niobium extracted as a by-product.

Niobium's strength, light weight and anticorrosive properties make it an ideal additive in production of HSLA steels, the requirement for which is growing

The main niobium marketed product is standard grade (60-70% Nb) ferroniobium (FeNb), which is used as an alloying agent in the production of high-strength, low-alloy steel (HSLA) and which accounts for around 90% of total niobium consumption. In addition to making steel harder, niobium has the additional beneficial property of being light weight relative to other strength-inducing steel additives, and also has anticorrosive properties. These qualities make niobium-bearing steels desirable to the automobile-manufacturing industry and to constructors of large-scale, high-stress bearing structures (eg bridges, high-pressure oil and gas pipelines), but applications continue to grow with potential end-users' increasing understanding of niobium's many beneficial properties.

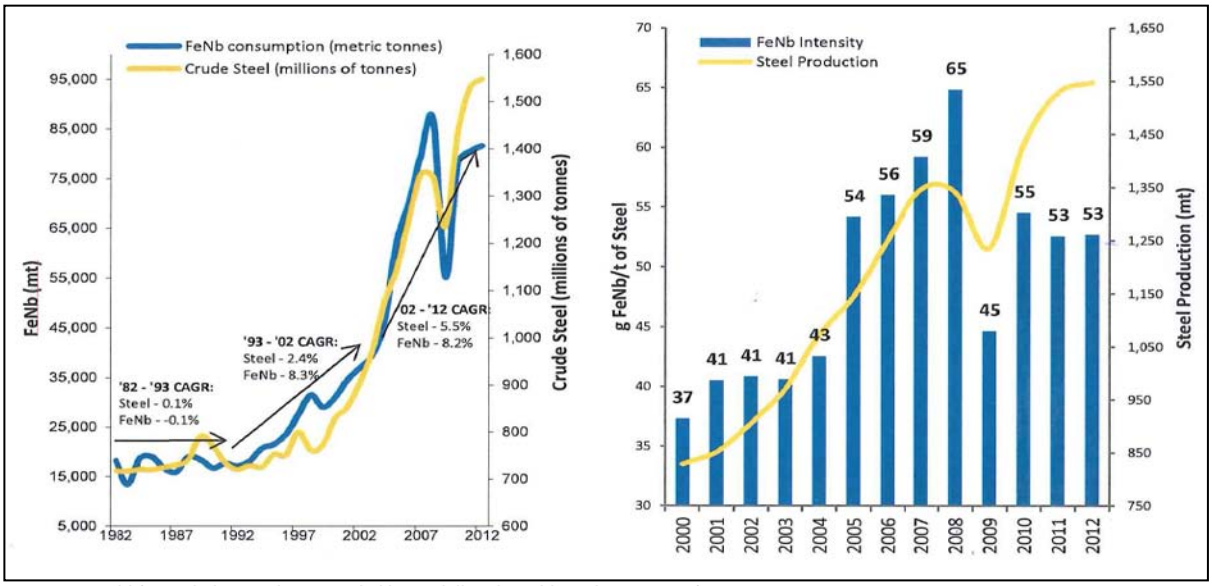
Demand

Niobium demand is closely correlated to global steel production, but tends to outperform owing to increasing intensity of use in steelmaking

With HSLA steel production the dominant end-use, niobium demand is closely correlated to global steel production. Rising steel demand over the past decade, particularly in the BRIC countries, has resulted in a compound annual growth rate in FeNb demand of over 8% over the last ten years. We expect solid growth in steel production to continue, albeit perhaps at a slower rate compared with the past decade (though we note that global steel output rose by 3.5% year-on-year in 2013), and FeNb demand, which is currently around 80,000-100,000tpa, may outpace this growth if the trend established over the past decade is maintained (see chart below).

One reason for this historical outperformance relative to steel production growth is the intensity of niobium's use in steelmaking – as customer requirements for higher-spec steels increase, so steelmakers must increase the amount of niobium used to produce steel products capable of meeting these higher standards. According to Niobec (a subsidiary of TSX-listed Iamgold, and one of only three significant current niobium producers), the average FeNb content of steels was approximately 40g/t in 2000. Across the next eight years this figure rose by over 60%, to 65g/t.

Ferroniobium consumption vs steel production



Source: Iamgold (compiled using data provided by Roskill and World Steel Association)

Average global FeNb intensity levels in steelmaking fell sharply in 2008 in the wake of the global credit crisis, but quickly rebounded and have remained in the 50-60g/t range over recent years, but with a large degree of geographic variation – intensity levels in the EU and US are >100g/t, but in the majority of the emerging-market economies they are significantly below the global average.

Given that niobium represents a very small percentage of the total cost of producing steel, yet adds significant value to those steels by virtue of its strength, weight and durability characteristics, we would expect intensity of use to continue to rise, particularly in the emerging economies (where HSLA steel currently account for just 10% of all steels produced, compared with around 20% in the developed world).

Supply

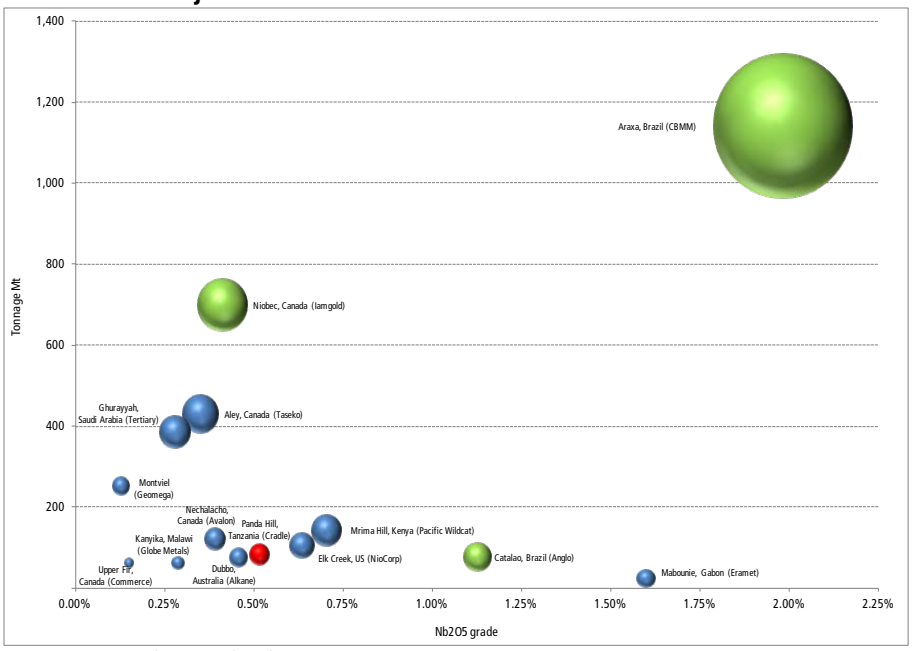
Pyrochlore, the main niobium-bearing mineral, occurs in economic concentrations in Brazil and Canada in particular, which together currently account for all of the world's current primary niobium production, but also in parts of east Africa and in Australia.

Niobium supply is tightly controlled with just three established primary producers and no new entrant in nearly 40 years

The niobium supply market is an oligopoly with only three established primary producers – Companhia Brasileira de Metalurgia e Mineração (CBMM) in Brazil (which accounts for at 80-85% of global output of niobium), Anglo American in Brazil (5-8%) and Niobec in Canada (5-10%). All three producers convert pyrochlore concentrate to FeNb prior to sale, with CBMM also producing a variety of other lesser-used niobium products (such as niobium metal, oxides and alloys).

No new primary producers have come on stream since 1976 (when commercial production of Nb_2O_5 concentrates began at Niobec), even though the market for niobium has grown seven-fold since then. However, we note that the pyrochlore resources of CBMM in particular are enormous, and sufficient to ensure production for many more decades at current rates. A number of other niobium deposits are known but remain undeveloped, in most cases owing to marginal grades, complex metallurgy, a requirement for costly underground extraction, permitting obstacles or reliance on other minerals (such as rare earth elements) for economic viability.

The world's major niobium resources



Source: Company data, Mirabaud Securities estimates

Cradle's Panda Hill project is one of the very few known undeveloped resources with the grade and metallurgy to compete with established supply

Of the main undeveloped resources (see chart on p8), only Panda Hill, Aley and Elk Creek can be considered true primary niobium projects, with Aley having significantly lower grade than the established producers and Elk Creek lying at substantial depth below surface. With the other projects niobium occurs with a suite of other minerals (eg tantalum, zirconium and other rare earth elements), which can present processing challenges and may also mean development prospects are tied to the economic viability of those other commodities.

Price outlook

FeNb tends to be sold on a contract basis (typically on one-year fixed terms), either directly to steel producers or via metals traders. The quoted price is based on the niobium content within the FeNb product. Given FeNb constitutes a very small proportion of the overall cost of producing a niobium-bearing steel (typically less than 1%), demand is relatively inelastic to price and, added to the current producer oligopoly, this has resulted in a relatively stable pricing environment.

Though FeNb has been produced for several decades, it has only come to prominence over the last 20 years owing to technology-driven demand for higher-grade steels. Prices traded in a consistent range of US$12-14/kg throughout the early 2000s, before rising dramatically to over US$30/kg in 2007 on the back of marketing efforts by CBMM, who promoted the many beneficial properties of niobium in steel and successfully argued its historic undervalued pricing. Since then niobium has consistently traded above US$30/kg, and in the current decade to date has held steady around the US$40/kg level.

Niobec, the only one of the three major producers to disclose much in the way of revenue and cost data, adopted a niobium price assumption of US$40.25/kg in providing its production and cost guidance for 2014, and used a US$45/kg long-term price assumption in the economic evaluation of a recent (December 2013) update of its block-cave underground expansion project.

Clearly given its position as the overwhelmingly dominant producer, and ability to expand production significantly over the medium to long term, CBMM has the ability to discourage any prospective new supply by dropping its prices. However, we believe this is a highly unlikely scenario, as the required price drop would be substantial and would therefore have a significantly detrimental impact on the group's own profitability.

Continuing growth in global steelmaking and rising intensity of use in HSLA steels should be positive for niobium demand, creating room for new producers

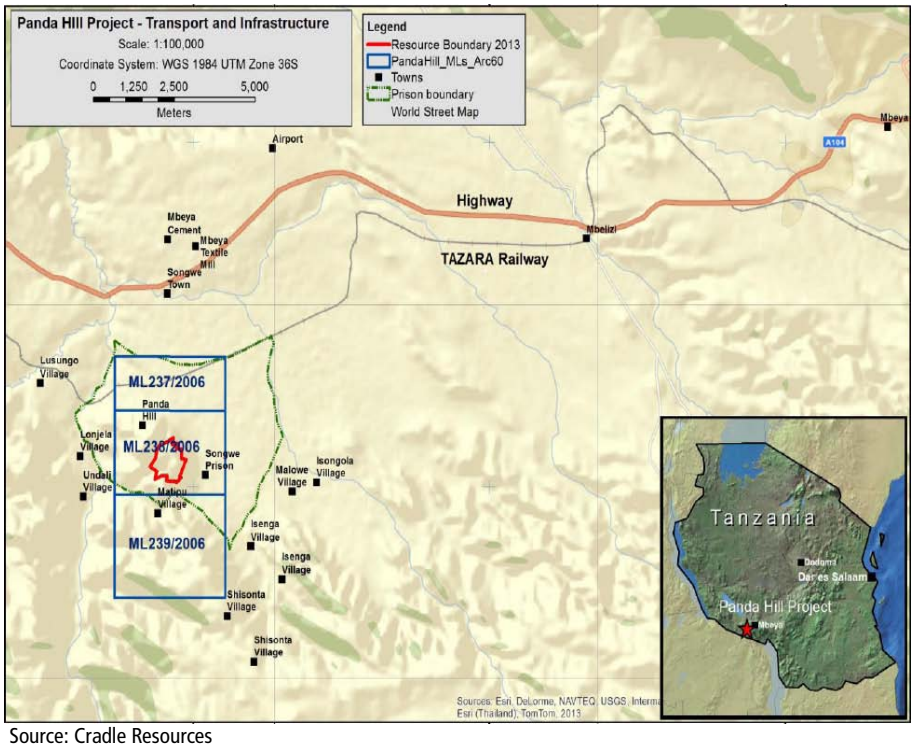
The niobium market is relatively small and predicting future prices is therefore very subjective. However, given the general expectation of continuing growth in global steel production, albeit perhaps at lower rates than over the past decade, and the potential for rising intensity of niobium usage in global steel production as emerging-market economies mature, coupled with the historic discipline of the tightly-controlled supply side, we believe the outlook for prices is positive. Furthermore, given the absence of undeveloped projects with the scale to match CBMM, we believe there is room for new entrants without any detrimental impact on prices, while widening the geographic spread of supply may be welcomed by end users.

Panda Hill project, Tanzania

The Panda Hill project is located in the Mbeya region of southwestern Tanzania, approximately 650km west of the capital city Dar es Salam and just 35km south of the industrialised town of Mbeya. The latter is a significant service and logistics centre (population 280,000), and can be reached directly by highway from Dar Es Salaam and also benefits from a recently completed international airport on its outskirts.

The project is covered by three granted Mining Licenses totalling some 22.1km^2, all of which are valid until November 2016 and are renewable for ten-year terms subject to completion of approved work programmes.

Panda Hill project location



Source: Cradle Resources

Project history

Project benefits from an extensive historical exploration database spanning 60 years

Panda Hill has been subject to a number of exploration efforts since its discovery in the 1950's. The most extensive programme was through the mid-1950s to early-1960s, when first the country's Geological Survey drilled 17 diamond holes (for a total of 1,450m), looking for phosphates as well as niobium, and then Mbeya Exploration Company (MBEXCO, a JV between Billiton and Britain's Colonial Development Corporation) drilled a further 66 diamond holes (for 3,780m), focusing solely on niobium. The latter also undertook trial-scale underground mining, with an estimated 200kt of material extracted (the remnant shafts can still be seen today – see p9) and processed on site through gravity concentration. Yugoslavian company RUDIS, in a JV with the State Mining Company of Tanzania (STAMINCO), later drilled 13 holes (for 1,305m) in 1978-80.

Logging and assay sampling data for most of this historic drilling is available, but drill cores were generally not kept. Private company Euromet utilised this historical data to produce an updated grade-tonnage estimate and preliminary mining study in the early 2000s, and the historic database was revalidated in 2012 by Cradle (via Verona Capital) to estimate a maiden JORC-code compliant resource for the project.

Remnant shaft from 1950s underground trial mining

Source: Mirabaud Securities

Project JV has 50% equity interest, with Cradle having management control, and an option to acquire the balance for ~US$14m

Acquisition by Cradle

Cradle acquired a 50% interest in Panda Hill, plus an exclusive option to acquire the 50% balance, in July 2013 from Verona Capital, a resource-focused private venture-capital group of which current Cradle directors Craig Burton and Grant Davey are executive directors. Verona received 37.5m Cradle shares (valued at A$7.5m at Cradle's then share price of A$0.20) plus 37.5m performance shares (of which half were issued on completion of the project scoping study, with the other half issuable on completion of a feasibility study which demonstrates a project $NPV_{10\%}$ of no less than US$400m).

Verona had earlier acquired the initial 50% stake from a UK-based private vendor whose principal business is metals trading. Under the exclusive option agreement, the 50% balance can be acquired from this private vendor at any time up until March 2017 for US$17.1m (less 25% of project expenditure during the option period), of which up to US$5m can be settled in Cradle shares or via a capped royalty. Cradle estimates that the deduction for expenditure to time of option exercise is likely to be at least US$3m, and on this basis estimates the adjusted option exercise price at US$14m. The vendor has no management input throughout the option period, and is due an initial instalment payment of US$0.5m two years ahead of the final exercise date (unless Cradle, via the project JV (see below) has already exercised the option in full before then).

Funding agreement with Tremont and establishment of project JV

In June 2014 Cradle agreed a deal with Tremont Investments Ltd, an Africa-focused mining private investment group backed by Denham Capital, under which Tremont can earn up to a 50% interest in Cradle's rights to Panda Hill (including its exclusive option to acquire the 50% balance of ownership) for a total investment of US$20m, predominantly at the project level, in four equal stages. Each US$5m investment will earn Tremont a 12.5% interest in the new JV company in which Cradle's rights to Panda Hill will be held,

with the funds used mainly to advance development expenditure, including completion of a definitive feasibility study (which Cradle estimates will be completed upon expenditure of US$15m). The first US$5m investment has already been advanced, and will be used to fund further metallurgical test work and in-fill drilling.

Tremont deal should see Panda Hill funded to point of construction decision in H2 2015

The Tremont deal, if executed in full, should thus fund Panda Hill through to a construction decision without any further direct expenditure required by Cradle until that point. Some US$1.5m (7.5%) of Tremont's total proposed investment will be paid to Cradle as partial reimbursement of previous project expenditure and, together with the net proceeds from a A$3.6m share placement (with sophisticated private investors) that was undertaken concurrently with consummation of the Tremont deal, this should ensure Cradle is also adequately funded to cover its corporate-level running costs (which we estimate at around A$1m pa) until a construction decision, whilst also enabling it to repay a A$1.5m short-term loan that it drew upon whilst arranging the financing.

Once Tremont has invested the entire US$20m and earned its 50% interest in the JV company, both Tremont and Cradle must contribute all subsequent project funding (including the cost of building the project) on a pro-rata basis or be diluted.

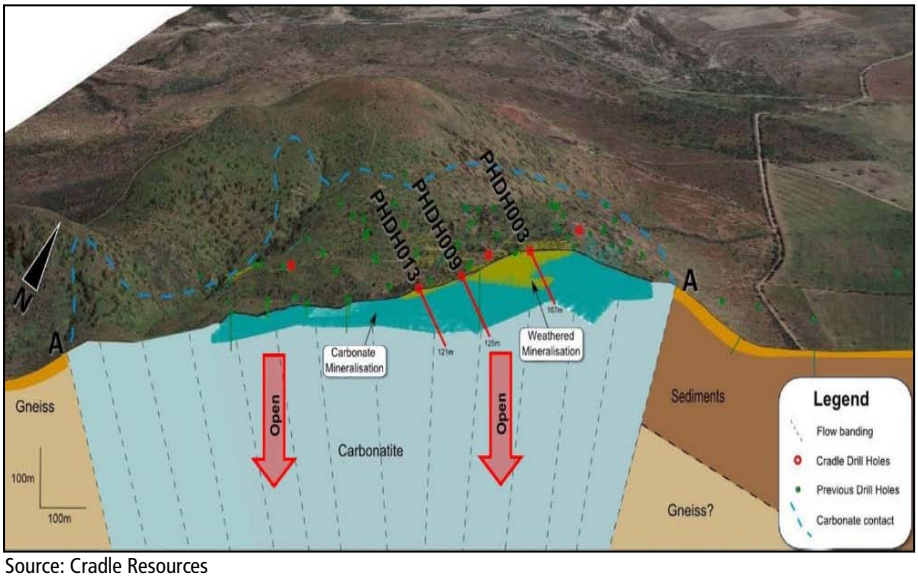
Advised by Pangea Exploration, Tremont also brings additional technical and commercial expertise

In addition to removing near-term funding risk, we believe the Tremont deal carries the further benefit of bringing on board a highly experienced partner with a track-record of successfully developing projects in Africa – Tremont is being advised by Pangea Exploration, a South Africa-based resource-specialist investment group. Pangea boasts a team of technical and commercial professionals led by mining financier Rob Still, which over the past 25 years has developed 16 mineral projects in southern and eastern Africa.

Geology

Panda Hill is a magmatic carbonatite intruded into gneiss and amphibolite country rocks, its emplacement associated with the regional rift valley tectonics. The magmatic body forms a steeply dipping, near circular plug approximately 1.5km in diameter, with some of the hill partly covered by later-stage volcanic soils. Much of the near-surface area of the deposit comprises weathered material (predominantly clays, oxidised carbonite and brecciated carbonatite with a clay matrix), which tends to have enriched levels of niobium mineralisation relative to the fresh carbonatite below.

Conceptual cross-section through Panda Hill deposit



Source: Cradle Resources

The dominant niobium-bearing mineral is pyrochlore, but niobium also occurs to a lesser extent as columbite, which may represent an alteration product of primary pyrochlore. Niobium occurs as an oxide (Nb_2O_5), with grades typically ranging from 0.1% to 1% Nb_2O_5. In addition to the supergene-enriched surficial weathered cap, higher-grade niobium mineralisation occurs within flow banding (schlieren) within the primary carbonatite body.

Resources

Verona Capital estimated an initial JORC compliant inferred resource for Panda Hill of 56Mt grading 0.50% Nb_2O_5, based purely on the historical technical database. Following its acquistion of the project last year, Cradle immediately commenced a 13-hole (for 1,702m) diamond-drilling programme, spaced at 100m x 100m, to verify the tenor and thickness of niobium mineralisation recorded in the historic drilling database that formed the basis of 2012 resource, and to capture material for metallurgical testing.

Assay results from this programme were aggregated with the historic data to re-estimate the resource along JORC standards, resulting in the current resource of 82Mt at 0.52% Nb_2O_5 that was published in November 2008 and which is detailed in the table below.

The 50% increase in resources from the 2012 estimate reflects depth extension but also definition of the high-grade weathered cap

The 50% increase in contained niobuim compared with the 2012 estimate arose due to the latest drilling extending known mineralisation in the primary carbonatite at depth (although still only to an average depth of 140m), but also because it provided better-quality data on the higher-grade weathered cap of the deposit, which was largely not included in the prervious resource (Cradle now believes the historic drilling did not adequately sample the weathered material, assaying it on a sporadic basis only).

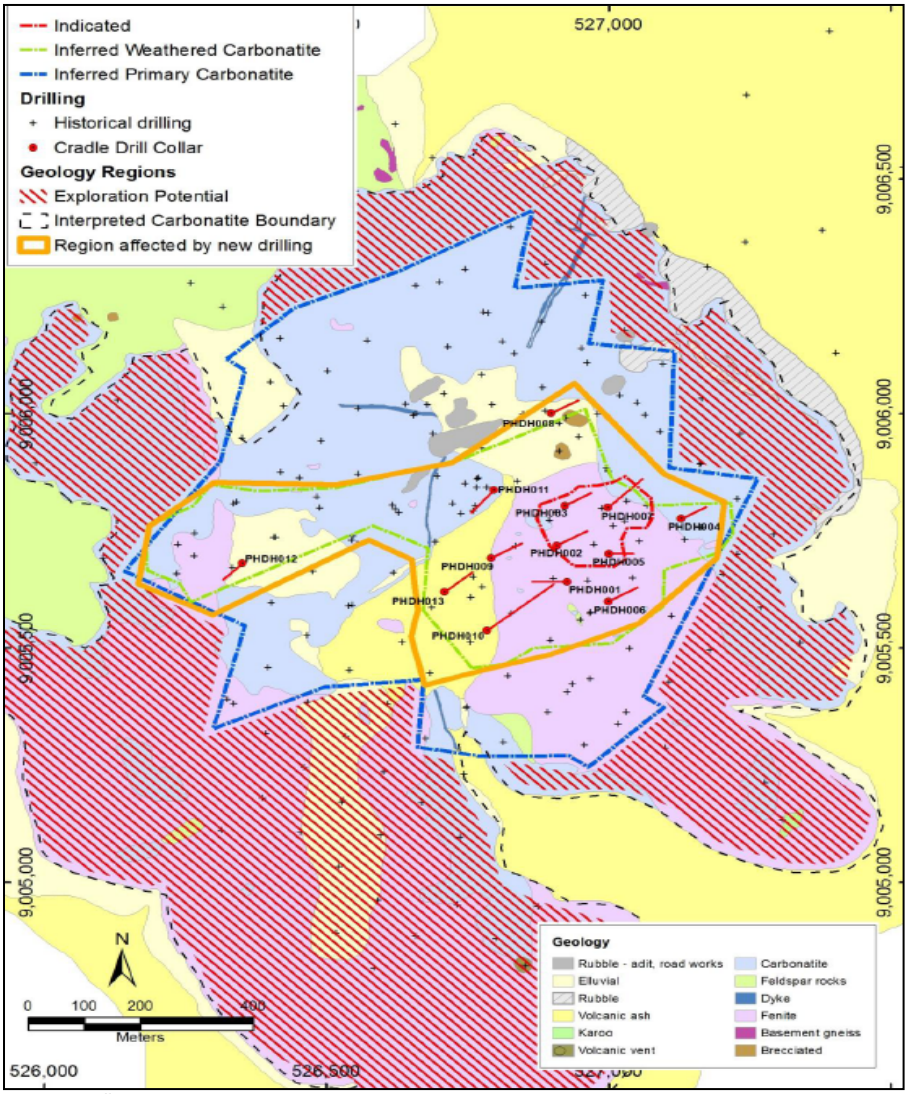
Panda Hill JORC* resources, reported above 0.3% Nb_2O_5 cut-off grade

	Mt	% Nb_2O_5	Nb_2O_5 kt
Weathered carbonatite	2.1	0.77	16
Primary carbonatite	3.2	0.52	17
Sub-total indicated	**5.4**	**0.62**	**33**
Weathered carbonatite	8.6	0.81	69
Primary carbonatite	67.8	0.47	319
Sub-total inferred	**76.4**	**0.51**	**390**
Total weathered carbonatite	10.7	0.80	86
Total primary carbonatite	71	0.47	335
Total resources	**81.8**	**0.52**	**423**

*Resource estimate undertaken by independent consultant Coffey Mining Pty Ltd, October 2013
Source: Cradle Resources

The area of influcence of Cradle's own drilling last year covered less than 50% of the area of the histocrically delineated resouce (see map on p14). **We therefore believe there is considerable resource upside potential on further drilling, both through sampling the weathered cap across the other half of the resource (which may lift grades) and through tonnage additions at depth across this portion of the resource (which historic drilling only sampled to an average depth of 60m).** We also note that mineralisation is considered open to the southeast of the currently-delineated resource, and that the primary carbonatite has yet to be closed off at depth.

Panda Hill project geology



Source: Cradle Resources

Metallurgy

Unlike several of the other undeveloped niobium resources known globally, Cradle's initial testwork suggests that should Panda Hill benefit from relatively straightforward metallurgy, and also compares well with the existing niobium producers.

The vast majority of niobium mineralisation at Panda Hill occurs as pyrochlore, with columbite (which may be altered pyrochlore) of lesser significance. As such, the nobium/tantalum ratio is high, while there is also relatively low levels of rare earth elements and phospates. Initial indications are therefore that the niobium should prove very amenable to concentration via conventional flotation processes.

Primary carbonatite accounts for ~80% of the current resource, and should yield flotation recoveries to acceptable-grade concentrate of 60-70%

Approximately 80% of the current total JORC resource is primary carbonatite. Mineralogical testing undertaken to date indicates that theoretical recoveries of up to 88% could be achieved to produce a concentrate grading 55% Nb_2O_5 (recoveries higher than this level result in lower concentrate grades, which could compromise subsequent conversion to acceptable-grade FeNb). Given that deslimining (pre-removal of ultrafine clays, which would otherwise adversely impact flotation) and losses in other parts of the processing circuit are likely to cost a further 15-20%, and based on initial flotation testwork undertaken, Cradle believes overall recoveries to concentrate of 60-70% could

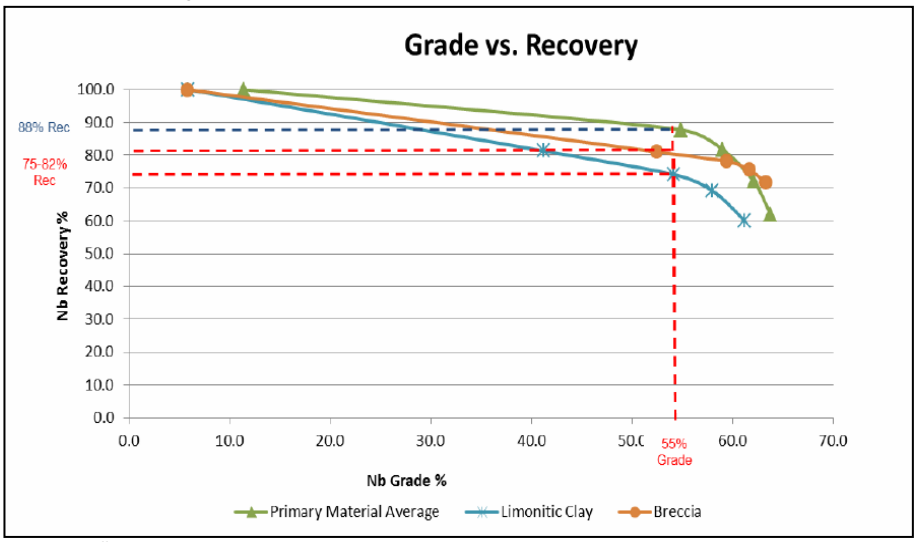
be achievable on fresh ore – the recently completed scoping study (see p16) assumed an average of 65%.

The 20% balance of mineralisation in the currently defined resource is mainly weathered material – breccias, oxidised carbonatite and limonotic clays. Mineralogical analysis of samples of the breccia material (which accounts for around 30% of the weathered material) has indicated theoretical recovery to a 55% Nb_2O_5 grade concentrate of 75-82% (compared with 88% for the fresh ore). Cradle believes desliming of this material would result in further losses of around 20%, which would put overall recovery at 50-60%. Initial open-circuit batch flotation testwork on the breccia sample have however indicated that better-than-expected overal recoveries of 60-70% may be achieveable on this type of material.

Weathered material is metalurgically more challenging, but initial testwork indicates potential recoveries to concentrate of at least 50%

The other weathered materials are not expected to recover as well as the breccia (initial testing of the limonitic clays indicates recovery to concentrate of around 75%, before accounting for deslimining losses), but Cradle nevertheless anticipates an overall recovery for the *combined* weathered material of at least 50%, which would be in line with the recovery rates from weathered material currently being achieved by the existing niobium producers. The company assumed an average recovery for the weathered material of 50% in the recently completed scoping study.

Potential Nb_2O_5 grade–recovery curve (based on grind size of ~200um)



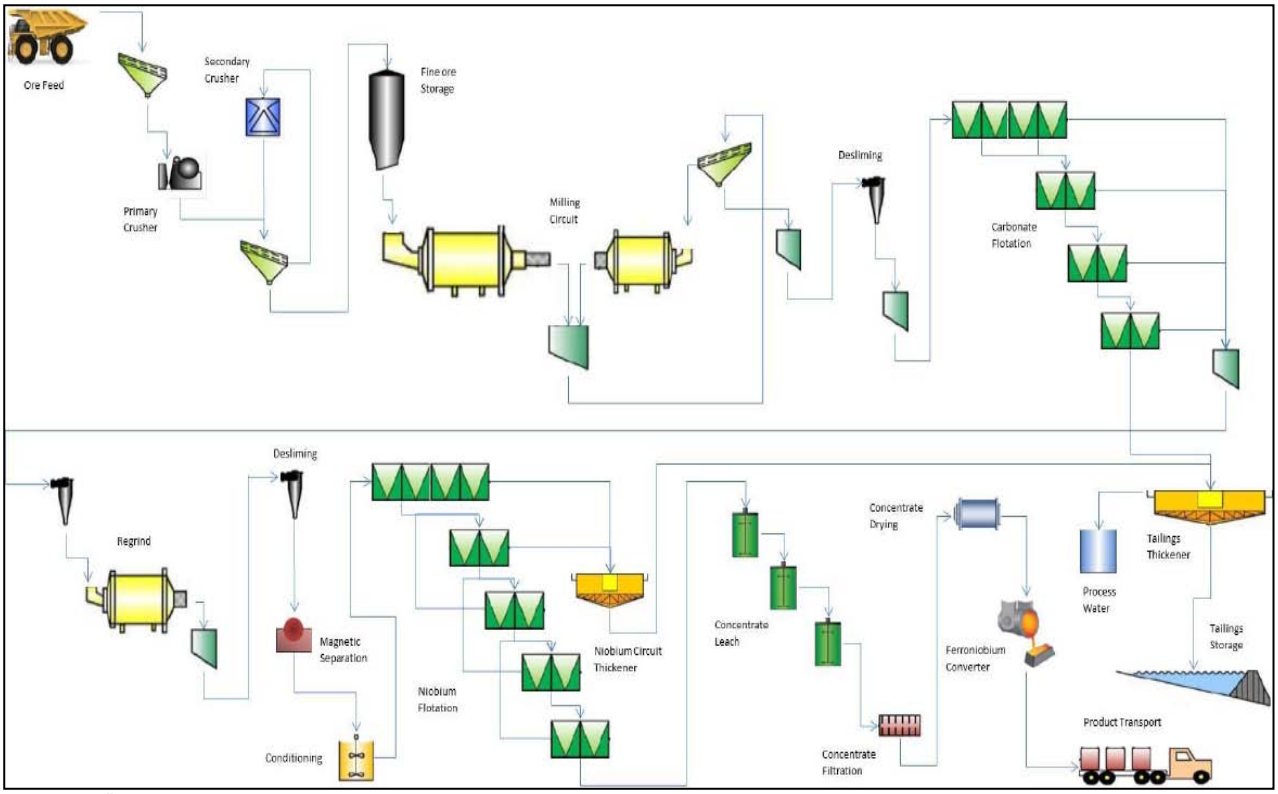
Source: Cradle Resources

But lower recoveries from weathered material should be more than offset by its significantly higher grade

While niobium recoverability from the weathered material to acceptable pyrochlore concentrate grades is in our view one of main areas of the project still to be derisked, it is also one of the key areas of economic upside – as the weathered material is substantially higher grade (averaging 0.80% Nb_2O_5 in the current resource) than the fresh carbonatitie, and benefits from lying at or close to surface (enabling preferential mining and processing of this material in the ealry years), it has the potential to signifincatly enhance the project economics, despite the likely lower recoveries.

Comprehensive flotation testwork on the other weathered materials (clays and oxidised carbonatite) will be a key focus of the prefeasibility work. We note that in the unlikely event that niobium can not be economically recovered from the weathered material, the primary resource is still more than sufficient to sustain a viable operation, albeit a degree of pre-stripping would presumably be required to remove the weathered cover.

Panda Hill conceptual process flowsheet



Source: Cradle Resources

Scoping-study development scenario

In January Cradle announced the headline results of a scoping study of the potential to mine Panda Hill as an open pit at a base-case rate of 2Mtpa, to produce around 4.8kt pa of niobium (contained in FeNb at industry-standard grade of 66% Nb) through flotation concentration and subsequent pyrometallurgical conversion to marketable FeNb.

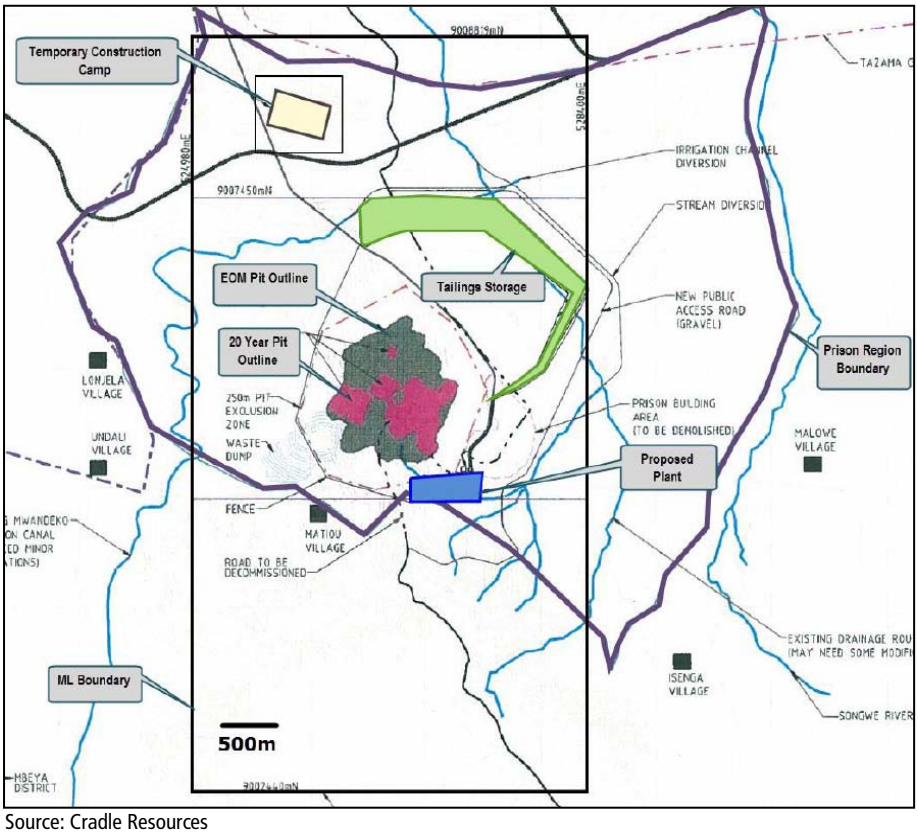
Scoping study may underplay initial head grades as is constrained to mine indicated resources first – potential upside on further in-fill drilling

The production profile is based on the current JORC resource of 81.8Mt grading 0.52% Nb_2O_5, with the modeled conceptual open pit exploiting close to 70% of this by tonnage, at a life-of-mine average strip ratio of just 0.37:1. We note that the mining schedule used in the scoping study was constrained to access the indicated mineral resources first, which artificially reduces the niobium head grade in the early years. Infill drilling of resources in the conceptual pit will be undertaken as part of the upcoming prefeasibility study work, which should allow the production schedule to be even better optimised for grade in the early years.

Upfront capital expenditure was estimated at US$185m (inclusive of approximately 20% contingency), and average on-site cash operating costs (ie before product transport and marketing costs and royalties) were estimated at US$16.67/kg. The capex estimate is considered accurate to a level of +/-30%, and opex to +/-35%.

At an assumed niobium price of US$44/kg (a long-term price outlook quoted by Niobec), the scoping study model yielded extremely positive economic results, indicating wide operating cash margins and the potential for the upfront capex to be repaid within just three years.

Scoping-study conceptual site layout



Source: Cradle Resources

Though the scoping study looked at a 2Mtpa mill throughput rate as the base case, Cradle has also evaluated a staged case, whereby the operation would be built at a starting scale of 1Mtpa (for 2.65ktpa Nb) before being expanded to 2.3Mtpa (for 5.46ktpa Nb) after the first three years of production.

This staged scenario has a similar estimated operating cost structure (US$19.86/kg on-site cash costs across the first three years, dropping to US$16.17/kg once the plant has been expanded to 2.3Mtpa, but has a lower initial capex requirement of US$125m (an additional US$71m would be required in year three for the expansion, but this could be funded internally from cash flow generated over the first two years of production).

Panda Hill scoping study summary results (assuming US$44/kg Nb price)

Development scenario	Mill rate Mtpa	Avg Nb production ktpa	On-site cash cosys US$/kg Nb	Mine life years	EBITDA US$bn	Payback years
Base case	2Mtpa	4,800ktpa	US$16.67	28yrs	US$2.6bn	2.8yrs
Staged case	1 to 2.3Mtpa	2,650-5,460ktpa	US$19.86/US$16.17	27yrs	US$2.7bn	4.5yrs

Source: Cradle Resources

We have developed our own cash flow model of Panda Hill based on the current resource and the reported operating and cost parameters from the scoping study. We have adopted the parameters for the 2Mtpa base case, though we note that, in addition to the obvious benefit of a lower initial funding requirement, a staged approach to development could offer the potential benefit of a 'softer' entrance to what is a highly-concentrated niobium market.

We estimate a project $NPV_{10\%}$ of US$505m and an IRR of 43%

At our base-case niobium price assumption of US$40/kg (in today's money), we estimate an unfunded project NPV of US$505m (100% basis), and a project IRR of 43%. Our NPV and IRR estimates are calculated from today, but exclude drilling and feasibility study

expenditure as we assume that such expenditure is met entirely by Tremont under the terms of its US$20m investment agreement.

Summary of Mirabaud cash-flow modelling assumptions and outputs

Item	Unit	Value
Mineable resource	Mt	58
Life-of-mine	Years	28
Annual mill throughput	Mt	2.0
Average Nb_2O_5 head grade (years 1-5)	%	0.70
Average Nb_2O_5 head grade (LoM average)	%	0.56
Nb recovery to concentrate (years 1-5)	%	54
Nb recovery to concentrate (LoM average)	%	61
Nb-in-concentrate production (years 1-5)	kt	5.3
Nb-in-concentrate production (LoM average)	kt	4.8
FeNb converter recovery	%	97
FeNb matte (66% Nb grade) product (years 1-5)	kt	7.7
FeNb matte (66% Nb grade) product (LoM average)	kt	7.0
Long-term real Nb price	US$/kg	40
On-site cash operating costs	US$/kg	17
Total cash costs (incl of transport and marketing costs and royalties)	US$/kg	19
Annual EBITDA (LoM average)	US$m	93
Tax rate	%	30
Initial capex (incl 20% contingency)	US$m	185
LoM capex (incl of expansion and sustaining capex)	US$m	275
Post-tax NPV (10% discount rate)*	US$m	505
Post-tax IRR*	%	43

*NPV and IRR calculated on a nominal basis, with revenues and costs inflated at 2.5% pa
Source: Mirabaud Securities estimates

Pre and full feasibility study work could reveal further upside

Additional drilling and metallurgical work planned under feasibility study could further enhance project economics

A prefeasibility study work programme is now under way, focussing initially on selection of a preferred mining option and optimisation of the conceptual flotation process through further, comprehensive metallurgical testwork. In parallel with these further technical studies, Cradle will undertake more drilling, both in-fill, to upgrade the largely inferred resource to measured and indicated status (thereby allowing better optimisation of the scoping-study production schedule), but also some exploration drilling to expand the resource envelope at depth and to explore known near-surface areas of higher-grade mineralisation not included in the current resource.

We believe this work could further enhance the already strong project economics demonstrated by the scoping study. In partiuclar, the production schedule is likely to be further optimised with in-fill drilling of the still largely inferred resources (enabling more higher-grade material to be incorporated in the mining plan in the early years), and further metallurgical testing may give confidence in the potential to achieve a higher recovery on the weathered material than the conservative 50% rate assumed in the scoping study.

The prefeasibility study is expectd to be completed by early 2015, transitioning (results warranting) into a full feasibility study thereafter. The latter should be completed in around 6-9 months, and on this schedule we believe construction could commence in H2 2015, facilitating first production in 2017.

Panda Hill has been extensively drilled over the past six decades of exploration, and only a relatively limited anount of in-fill drilling would be required to upgrade resources to 'bankable' (ie measured and indicated) status, with any extension drilling discretionary. Much of the work required to advance the project to the point of construction decision therefore relates to metallurgical and engineering studies which, while time consuming, are relatively inexpensive tasks. Cradle estimates total expenditure to point of completed definitive feasibility study at US$15m, a sum which should be met in its entirety by Tremont's investment if the latter exercises its earn-in rights in full.

Targeted development timetable

Proposed PFS Schedule - Panda Hill Niobium Project									
Project Activities	Target End Date	Q1 2014	Q2 2014	Q3 2014	Q4 2014	Q1 2015	Q2 2015	Q3 2015	Q4 2015
Prefeasibility Study	February 2015								
Project Planning / Contracting	May 2014								
Drilling Phase 1(indicated)	September 2014								
Drilling Phase 2 (measured)	November 2014								
Mineral Resource Estimate	January 2015								
Metallurgical Testwork	January 2015								
Option Study	November 2014								
Preliminary Mining Study	February 2015								
Preliminary Engineering	November 2014								
Environmental & Social Impact Assessment	July 2015								
Reporting	February 2015								
Definitive Feasibility Study	October 2015								

Source: Cradle Resources

Directors & senior management

Craig Burton, chairman

Mr Burton has over 25 years' experience in financing, developing, and managing resource projects and mining-service businesses, with his financing work taking him to Canada and the UK for resource projects involving diamonds, nickel, copper, gold and oil and gas. He is the co-founder of two ASX-quoted companies – Mirabela Nickel Ltd and Panoramic Resources Ltd – and is an active investor in emerging ventures and businesses with a focus on the oil and gas, mining and resource-service sectors. Mr Burton is a non-executive director of Capital Drilling Ltd and executive chairman of Transerv Energy Ltd.

Grant Davey, managing director

Mr Davey is a mining engineer with over 20 years' senior management and operational experience in the construction and operation of gold, platinum and coal mines in Africa, Australia, South America and Russia. More recently, he has been involved in venture capital investments in several exploration and mining projects, and has been instrumental in developing the Panda Hill niobium opportunity which Cradle announced to the market on 3 April 2013. Mr Davey is a member of the Australian Institute of Company Directors (AICD).

Evan Cranston, non-executive director

Mr Cranston is a corporate lawyer with significant experience in corporate and mining law. He holds a Bachelor of Commerce and Bachelor of Laws from the University of Western Australia and was admitted as a barrister and solicitor of the Supreme Court of Western Australia. Mr Cranston has broad experience in the areas of capital raisings, initial public offerings, tenement-acquisition agreements, mineral-rights agreements, joint ventures, mergers and acquisitions, corporate governance, the ASX listing rules and the Corporations Act. He has been involved in the formation of several listed and unlisted companies, and is also a non-executive director of Carbine Resources Ltd.

Didier Murcia, non-executive director

Mr Murcia holds a Bachelor of Jurisprudence and Bachelor of Laws from the University of Western Australia, and has over 25 years' experience in corporate, commercial and resource law, including extensive experience in African resource projects. He is a non-executive director of Gryphon Minerals Ltd and chairman of Centaurus Metals Ltd and Alicanto Minerals Ltd, all of which are ASX-quoted companies. Mr Murcia is also chairman of Perth law firm Murcia Pestell Hillard and the Honorary Consul for the United Republic of Tanzania.

Keith Bowes, project manager, metallurgy

Mr Bowes is an experienced project and operations manager with a metallurgical background and substantial experience in flotation, leaching and roasting of base-metals and gold ores. He has worked in Africa, Australia and South America and is experienced in leading multi-disciplinary owners teams in delivering resource projects.

Neil Inwood, project resource/exploration geologist

Mr Inwood is a professional geologist with 18 years multi-commodity experience in Australia, Africa, USA, Hungary, South America and Central Asia. He was formerly principal resource consultant for Coffey Mining, and has been the Qualified Person (TSX) or Competent Person (ASX) for a variety of international uranium, gold, nickel, base metals, and iron-ore projects.

RECOMMENDATIONS HISTORY

Market index FTSE AIM Basic Resources

Date	Market Index	Stock Price (A$)	Valuation (A$)	Opinion
Cradle Resources Ltd				
02-Jul-2014	2,683	0.19	0.50	Speculative Buy

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BUY: The stock is expected to generate absolute positive price performance of over 20% during the next 12 months.

OVERWEIGHT: The stock is expected to generate absolute positive price performance of 10-20% during the next 12 months

NEUTRAL: The stock is expected to generate absolute price performance of between 10% positive and 10% negative during the next 12 months.

UNDERWEIGHT: The stock is expected to generate absolute negative price performance of 10-20% during the next 12 months

SELL: The stock is expected to generate absolute negative price performance of over 20% during the next 12 months.

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