

Great Thaw of the Rare Earth Ice Age

An interesting trend is starting to become apparent. This week while the Great & Good of the Canadian mining scene are whooping it up and taking Prince's advice to "*Party Like Its 1999*" (not a great year for copper, we might add...) I was being abstemious and attending the Argus Metals Week event in the City of London. While the crowd was primarily traders and end-users, there were also a few serious players from the mining space (i.e. producers and near producers) amongst which (so far seen) were Galaxy Resources and Orocobre.

One trend that has become apparent from this event, some recent digging I have been doing on graphite and from some talks with company executives in the Rare Earth space is that a MAJOR change has taken place since 2010. That change is a shift AWAY from Asia as a value-added location. It may still rank as a prime destination for some of the metals, with end-users being located there but quite a lot of players can't get farther away from China if they tried.

Let us summarise:

- Galaxy Resources talking of a hydroxide lithium plant in Japan
- Syrah Resources talking of a graphite plant in Louisiana
- Ucore talking of a full-scale MRT plant in Alaska (or Utah or another US state)
- Peak Resources with their proposed plant on Teeside in the UK
- Neometals pondering a Lithium plant in either the US or in Australia
- Hastings Technology Metals undertaking talks for locating a REE-upgrading facility in Western Australia
- TriStar planning an Antimony roaster in Oman

- Rare Earth Salts building a plant in Nebraska

Back in 2010 all the talk was of putting plants in China or as close to China as one could locate them. The end result for two players we can think of was either extreme disruption or delays and associated financial near-death experiences. Clearly, much to our surprise, lessons have been learnt. It's not often one can say that in the mining space.

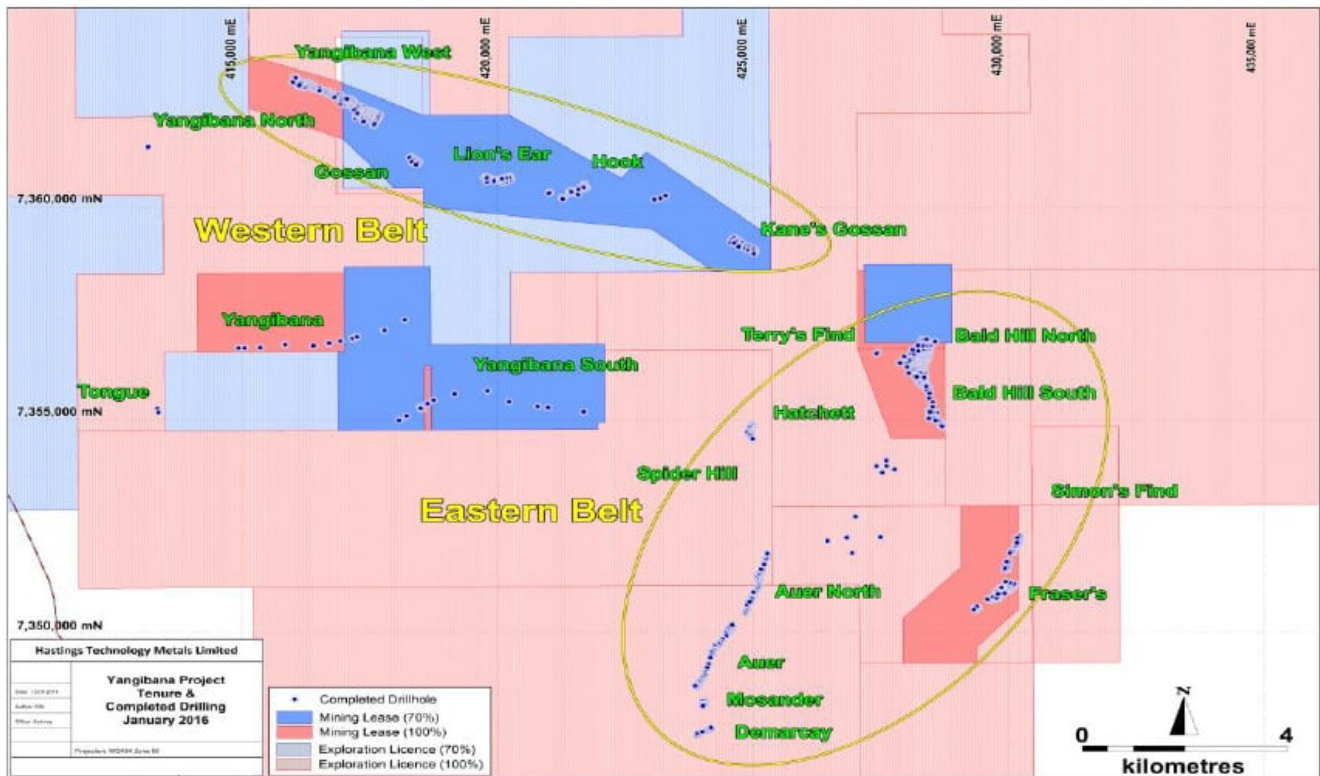
The lightbulb that came on for us and helped us identify (illuminate?) the trend was a meeting we had in London with the CEO of Hastings Technology Metals Ltd. (ASX: HAS), Charles Lew a few weeks ago. I was nearly floored when he said he had been in discussions with the Western Australian government about locating the REE upgrading plant in the state.

Conventional wisdom back in the first flush of Rare Earths was that processing plants anywhere except in "cheap" locations did not work and particularly that Australia was super expensive with molly-coddled workers. The cost of "cheap" then became apparent as did the advantage of being in jurisdictions where the rule of law is good and the rules are the same for all players (not to mention patent protection for one's technology). Hastings in our opinion are making the right decision.

We shall here briefly refresh investors on what the Hastings story looks like now that it has cemented itself in the hardy band of survivors in the REE space.

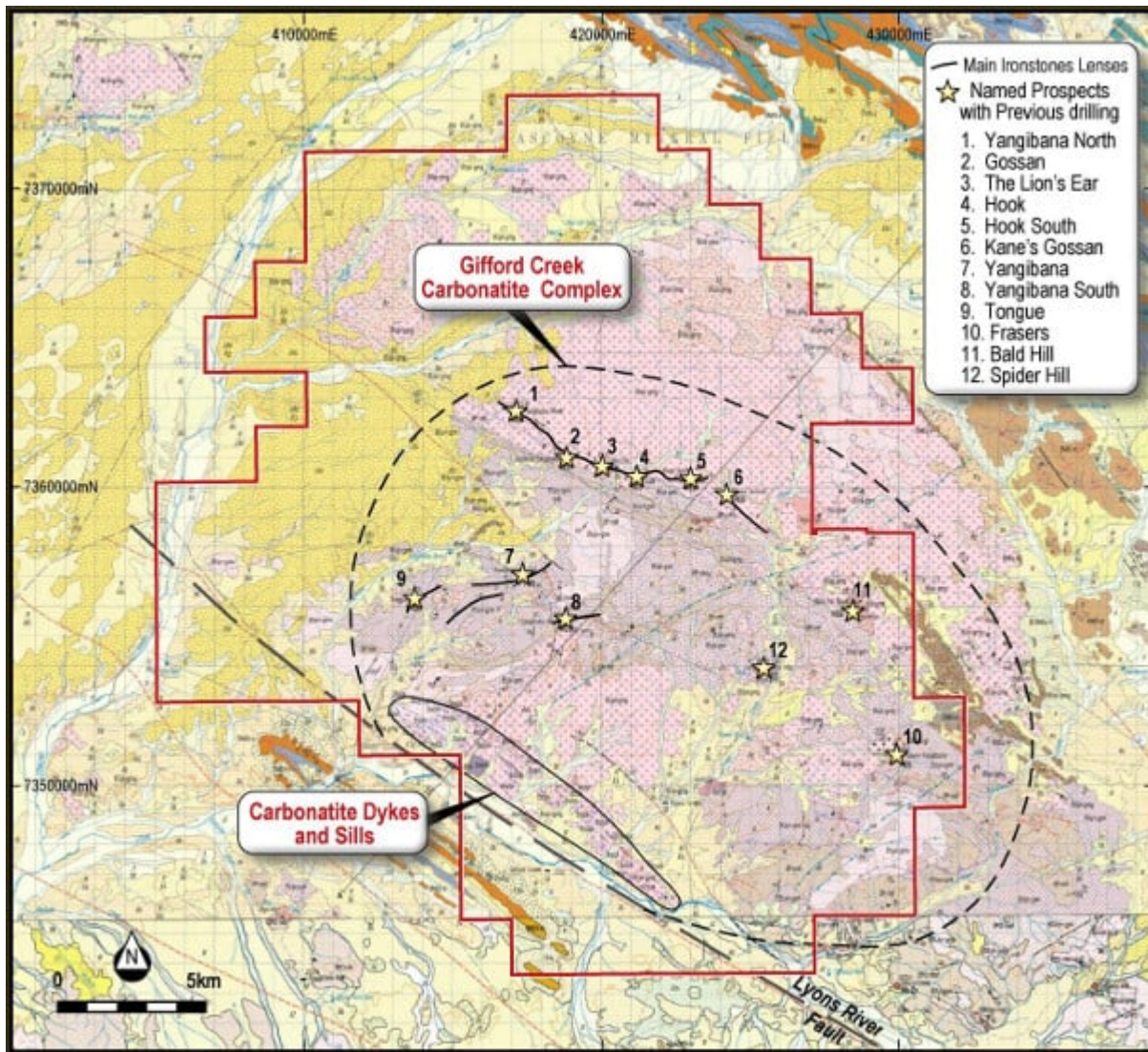
Yangibana

Over recent years Hastings has established a significant tenement package covering approximately 650 sq km which it terms the Yangibana Project. The project is centred approximately 270km east-northeast of Carnarvon on Wanna Station in the Gascoyne region of Western Australia and is best accessed via Gascoyne Junction.

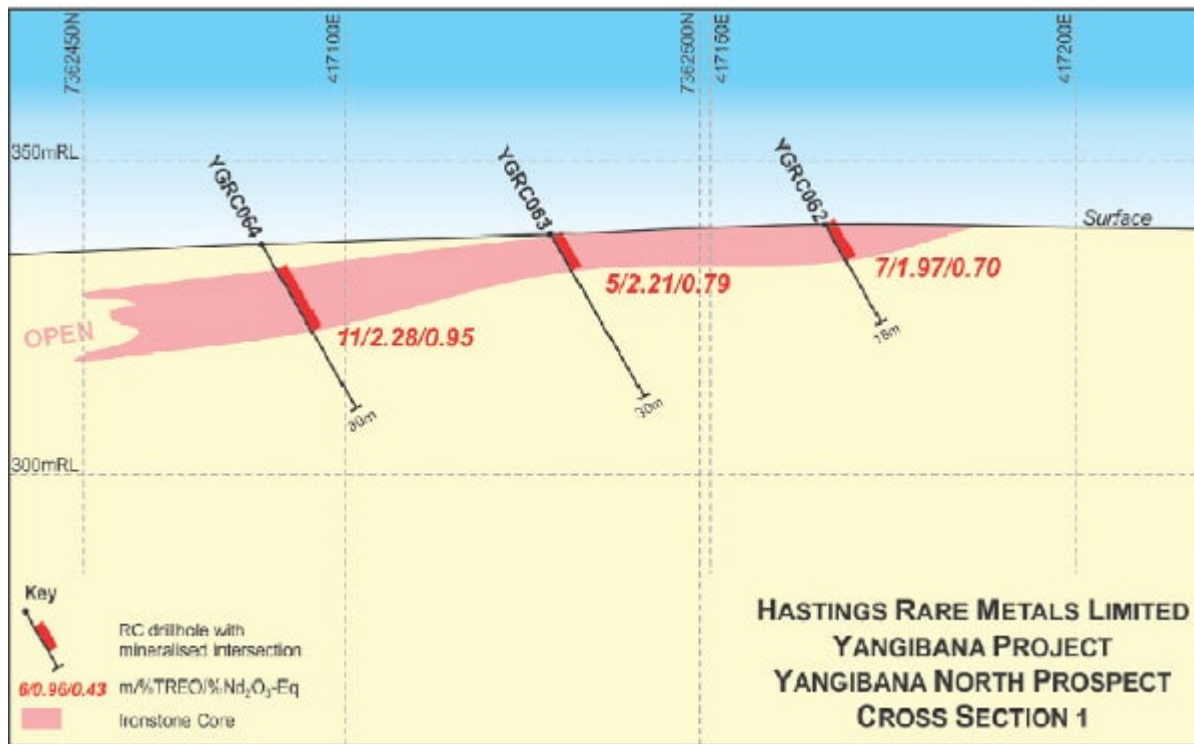


Hastings tenements now cover the bulk of the Gifford Creek Carbonatite Complex. The primary mineralisation targets within the Yangibana Project are narrow, discontinuously outcropping ironstone dykes related to this carbonatite complex. These ironstones are considered to be a younger phase which has cut across the carbonatite dykes, possibly leaching and upgrading Rare Earths (and base metals) from the older dykes.

The ironstone dykes have been shown to carry anomalous Rare Earths associated with monazite mineralisation. The carbonatite dykes themselves, along with the associated fenitic alteration, are considered to be sourced from an as yet undiscovered carbonatite intrusion which the company feels might have significant Rare Earth potential as well as possible base metal potential.



Previous exploration at Yangibana has included reverse circulation drilling at a number of prominent targets, and on the basis of this drilling a non-JORC resource of 3.5 million tonnes at 1.63% TREO was estimated by a previous explorer. The vast majority of this resource lies in the near surface oxidised zone. Below can be seen a cross-section of the Yangibana North part of the deposit with the Rare Earths being exceptionally near to the surface and indeed being in a relatively easily mineable band only ten metres in vertical thickness that outcrops at surface. This helps put Hastings in contention with some of the Xenotime deposits in Western Australia that are also at surface.



As we have noted when we last wrote about Hastings, beyond this proximity to the surface, the Rare Earths mineralisation contains unusually high neodymium values with its oxide, Nd₂O₃, averaging 4000ppm or 25% of TREO.

Resource

The company published an updated resource estimate in January of 2017 that had been prepared by Widenbar and Associates.

The updated resources represented a significant increase and upgrade compared to the October 2015 resource estimate. The contained TREO has increased to 157,950 tonnes, a 19% increase on the October 2015 estimate, and contained Nd₂O₃+Pr₂O₃ has increased to 52,400 tonnes, a 22% increase on the October 2015 estimate. Part of the increase was due to the inclusion of the first Measured Resources to be estimated for the project following the infill drilling program at the Bald Hill and Fraser's showings.

The previous resource had been based on drilling in 2014 that had led to the definition of JORC resources totalling 6.79

million tonnes at 1.5% TREO including 0.35% Nd₂O₃.

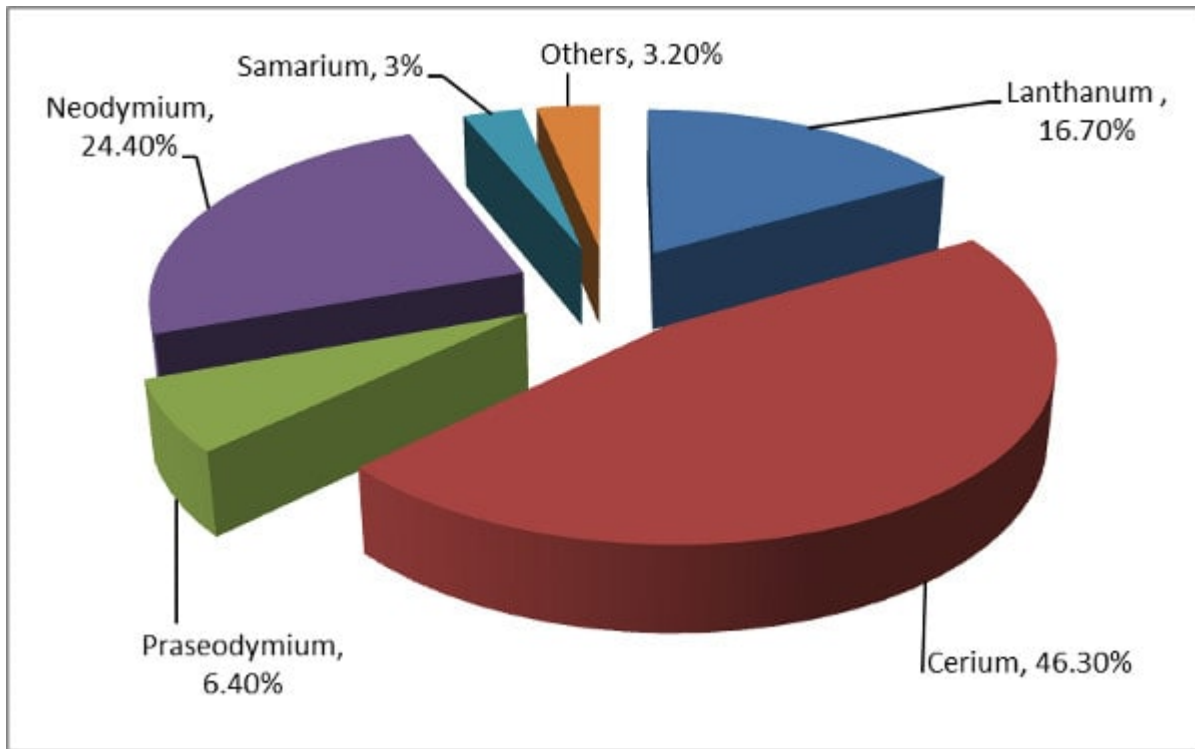
It should be recalled that the Hastings concessions consist of areas that are 100% owned and some that are 70% owned. Thus the 100% owned resource is shown as:

Category	Tonnes	Nd ₂ O ₃ +Pr ₂ O ₃	TREO	Nd ₂ O ₃	Pr ₂ O ₃
		%	%	ppm	ppm
Measured	2,155,000	0.42	1.01	3,410	770
Indicated	3,221,000	0.41	1.13	3,300	820
Inferred	3,416,000	0.36	0.98	2,890	740
TOTAL	8,792,000	0.39	1.04	3,200	780

While the resource on the territory that is 70% held is:

Category	Tonnes	Nd ₂ O ₃ +Pr ₂ O ₃	TREO	Nd ₂ O ₃	Pr ₂ O ₃
		%	%	ppm	ppm
Indicated	2,225,000	0.42	1.55	3,200	940
Inferred	2,391,000	0.35	1.32	2,730	810
TOTAL	4,616,000	0.38	1.43	2,960	870

To visualize the breakdown of the metals in the mix we created this pie chart.



The Next Steps

At this stage Hastings has a Pre-Feasibility Study under its belt and is moving towards a Bankable Feasibility Study. The PFS was prepared by Tetra Tech Proteus, the independent global engineering consultant.

The PFS was based on a 7-year operation extracting only JORC Indicated Resources (as per the 2015 estimate) with a beneficiated concentrate of 20% TREO and 5.05% mass pull (since increased to 30% and 3.1%) being employed in the financial analysis. The key metrics arising from the study were:

- Pre-Tax Net Present Value (NPV) of \$700-750 million at an 8% discount rate
- Internal Rate of Return (IRR) of 40% with a payback on capital of 2.5 years

The company is operating under the premise of a toll-treatment model. The hydrometallurgical concentrate produced on site will be shipped overseas (most likely Vietnam) for further separation and refining into individual rare earths oxides.

Certainly having the Vietnamese facility available certainly lowers the capex and leaves one wondering why so many other REE players are wanting to run before they crawl and eschew this sensible alternative.

The company revealed back in April 2016 that Non-Disclosure Agreements had been signed with potential end customers of separated rare earths oxides and metals. The goal is to secure offtake contracts with management stating that the prospects for supply of hydromet REE concentrate to overseas customers was promising in view of on-going negotiations.

Conclusion

The Darwinian forces that winnowed the Rare Earth crowd were a lesson in capitalist dynamics. However, nature abhors a vacuum and the space could not be left entirely empty. The band of survivors stand out to potential investors (either portfolio or trade) for their sheer persistence and commitment when as one knows any idiot can convert a shell into a gold play and ride the latest fad. Those who persisted in Rare Earths were a hard-core indeed.

All that is needed now is for the Great Thaw of the Rare Earth Ice Age. Excepting one new listing in London, all of the other (less than ten) serious players left in the space are all loaded with DFS's and reworked PEAs etc so ready to come out of the gates once the starting bell is rung in the 2017 running of the long-delayed Rare Earth Stakes. Hastings has to be a favoured runner in this race and its strategy of adding its value-added in relative proximity makes eminent sense.

Hastings Technology Metals – Make It a Double

Divining the tea leaves of Hastings Rare Metals (ASX: HAS) latest press release takes some doing. The moving parts are so many and so varied. The keys to understanding are:

- Focus on the main mineable area
- Ignore the partly-owned pieces of the puzzle (except Yangibana North)
- Ignore the smaller and peripheral deposits that go to make up the global resource

The reason for doing this is not only to minimize confusion with relation to the proliferation of different deposit names but because the mining studies have commenced with pit optimizations utilizing the indicated Resources at Bald Hill South, Fraser's, Yangibana West and Yangibana North deposits. To wrack one's brain with the parts of the deposit that won't be in a pit design is to needlessly torture oneself.

An Important Aside

The Yangibana-REM Joint Venture is the owner of some of the concessions at Yangibana with Hastings holding 70% of the JV. Interestingly the "REM" in question is the AIM-listed Rare Earth Minerals PLC (LON: REM), which is the same entity which is the largest shareholder in Bacanora (TSX-V: BCN), which I wrote of recently in relation to its deal with Tesla on the Sonora Lithium deposit in Mexico. Its is also the partner in the Cinovec Tin-Lithium project in the Czech Republic that Lithium Australia (the former Cobre Montana) is involved in.

The map below shows the current state of the tenements.



It is important to note that the main targets, Fraser's, Bald Hill and Yangibana South are all on the 100% owned territory, while the large and interesting Yangibana North deposit (with a grade of 1.46% TREO) is in the JV territory. The smaller deposits are in the hatched blue mining lease area in the middle which is held by the JV.

Resource

The latest release is focused on the expanded resource. Hitherto the main indication of the potential at Yangibana had been as a result of drilling in 2014, which led to the definition of JORC resources totaling 6.79 million tonnes at 1.5% TREO including 0.35% Nd₂O₃.



However the latest resource has nearly doubled the tonnage, while the grade of TREO has dropped by around a third. Unfortunately the Neodymium grades were not stated in an apples-to-apples mode to make comparisons easier. They have used a Neodymium Oxide equivalent rather than breaking down the individual metals and used a percentage rather than the formerly used PPM measure.



Total project resources are now estimated to contain approximately:

- 33,900 tonnes of Nd₂O₃
- 8,950 tonnes of Pr₂O₃
- 590 tonnes of Dy₂O₃
- 920 tonnes of Eu₂O₃

Yangibana

Hastings tenements cover the bulk of the Gifford Creek Carbonatite Complex. The primary mineralisation targets within

the Yangibana Project are narrow, discontinuously outcropping ironstone dykes related to this carbonatite complex. These ironstones are considered to be a younger phase which has cut across the carbonatite dykes, possibly leaching and upgrading Rare Earths (and base metals) from the older dykes.

The ironstone dykes have been shown to carry anomalous Rare Earths associated with monazite mineralisation. The carbonatite dykes themselves, along with the associated fenitic alteration, are considered to be sourced from an as yet undiscovered carbonatite intrusion which the company feels might have significant Rare Earth potential as well as possible base metal potential.



These ironstone lenses have been explored previously to a limited extent. Twelve targets for rare earths were tested with limited drilling in the 1980s. The map above shows the various deposits scattered around the carbonatite. The string of deposits numbered one to six are mainly the JV deposits, while the others are more dispersed and represent the 100% owned deposits.

The ironstones comprise variable contents of iron oxides and hydroxides, silicates and quartz. Near surface manganese oxides decrease with depth and are replaced by primary carbonate minerals. The rare earths content is largely hosted by monazite with lesser bastnasite and apatite.

The ironstone lenses pinch and swell along strike and with depth, generally ranging from one to eight metres in thickness. The ironstone lenses are often surrounded by fenitised host rocks. Barren quartz veins are also locally associated with the ironstones. Below can be seen the type of outcrop (here at Yangibana North) that makes the deposit so much easier to explore and eventually mine.



Ease of Access

The vast majority of the identified resource lies in the near surface oxidized zone. Below can be seen a cross-section of the Yangibana North part of the deposit with the Rare Earths being exceptionally near to the surface and indeed being in a relatively easily mineable band only ten metres in vertical thickness that outcrops at surface. This helps put Hastings in contention with some of the Xenotime deposits in Western Australia that are also at surface.



Beyond this proximity to the surface, the Rare Earths mineralisation contains unusually high neodymium values with its oxide, Nd_2O_3 , averaging 4000ppm or 25% of TREO.

Conclusion

Being “Rare anything” in the mining space these days is like being a “dot.com” back in 2000-2001. So it’s not unsurprising that Hastings Rare Metals has joined the exodus with the announcement of a name change to Hastings Technology Metals. This move though does not disguise the fact that Hastings’ resource has made a quantum leap in its latest announcements, with some reduction in grade but a massive increase in size. Usually “size does not matter” to us but in this case with the deposit at Yangibana so close to surface it’s a case of the more the merrier. Large and accessible has to be better than Rare Earth deposits in the frozen north or even worse, in the frozen north AND under a lake. The words that come to mind when pondering these aberrations of the first flush of the Rare Earth boom were “what were they thinking?” The answer, alas, is that they were not thinking.

The next step looks to us to be the narrowing down of the targets by overlaying a concept of what some pit shells might look like and then focusing exploration efforts on upgrading

those parts of the deposit to Measured status. The, as always, we repeat the Jack Lifton mantra that REE projects need to be right-sized.

The way things are going Hastings may very well overhaul some of the "household names" of the REE space in Australia and elbow itself to the front of the crowd.