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HALLGARTEN & COMPANY

Initiation of Coverage

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Ionic Rare Earths

(ASX:IXR)

Strategy: LONG

Key Metrics	
Price (AUD)	$0.050
12-Month Target Price (AUD)	$0.15
Upside to Target	200%
12mth hi-low	$0.004-$0.064
Market Cap (AUD mn)	$159.40
Shares Outstanding (mns)	3,188
Fully diluted (mns)	3,577

Ionic Rare Earths

Unique Exposure to Most Sought After Mineralisation

- + There are less than a handful of ion-adsorption clay deposits being developed outside China and Ionic Rare Earths is the only listed entity exclusively devoted to this mineralisation
- + Ion-adsorption clay deposits have been seen as the "Holy Grail" of Rare Earth projects due to their lower weighting in the throw-away REEs (Lanthanum & Cerium) and the reduced presence of the deleterious radioactive elements, Uranium & Thorium
- + New resource for the Makuutu project was released in early March and showed a quantum leap in the size of the deposit and its contained REEs (and Scandium)
- + Rare Earth prices have firmed dramatically in the last two months
- + The pace shall now pick up on the road to a PEA at the end of 1Q2021, and then a BFS and an EIS before 3Q2022, while advancing mine licensing by Oct 2022
- + The low level of radioactive contaminants is a major plus at Makuutu
- + Excellent infrastructure makes Makuutu a standout for projects in Africa
- ✘ China still has the whiphand in REE-pricing and can sink prices, suddenly, at will
- ✘ The absence of precedents of mining in Uganda, in recent times, gives investors not much in the way of comparisons
- ✘ The environment for funding REE projects has been tough (though now improving) so capex to the low side is a virtue

Rare Earths Begin to Buzz

Rare Earths have stirred from their long quiescence in 2019 with a flurry of talk related to resource nationalism and the shocking dependence of the US economy (and its military) upon externally-sourced Rare Earths, primarily from China.

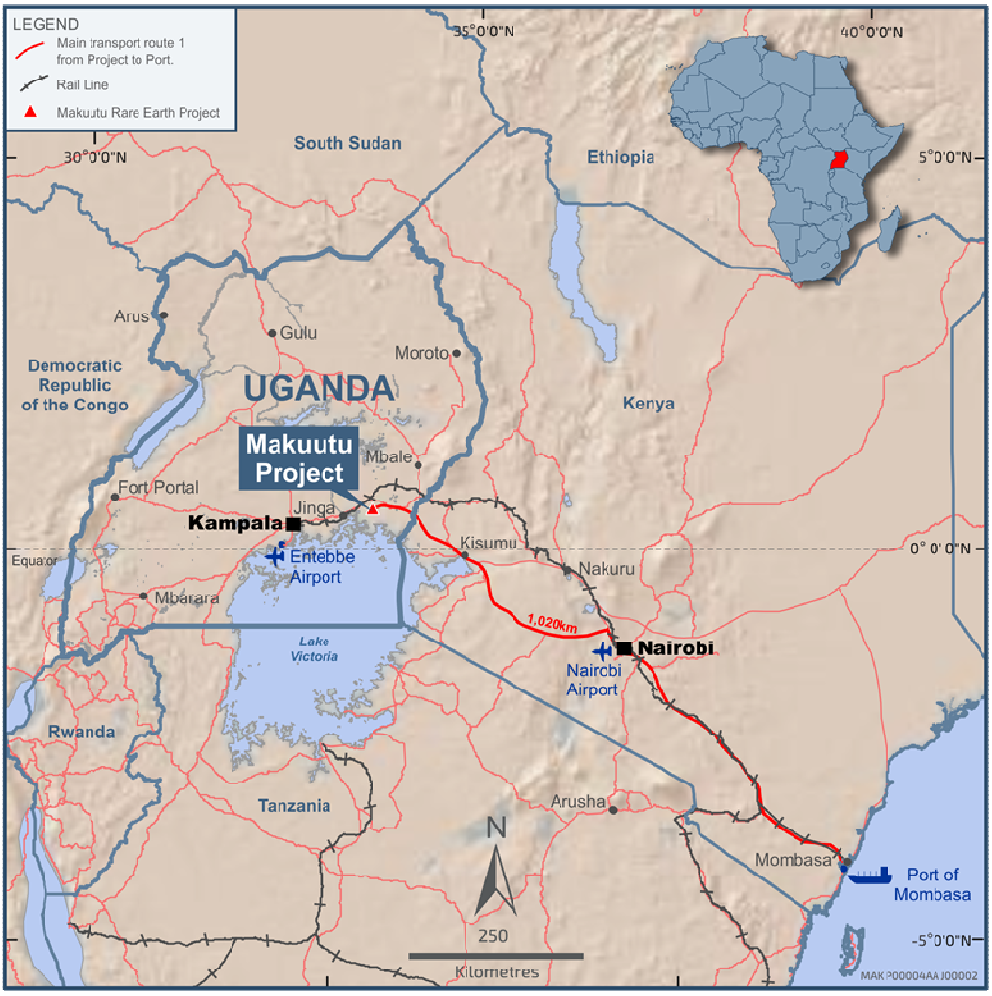
The renewed interest of politicians and investors coincides with the on-going slide in China's own internal production (not that they are trumpeting the fact). This changes the dynamic from the one which has reigned for the last eight years, where China definitively had the whip-hand. With Chinese supplies (particularly of Heavy Rare Earths) under a cloud and the West having added no capacity in recent years, the scenario is potentially one of shortages and rationing, particularly with regard to those REEs most used in EVs, wind turbines, defence and 5G.

The evolving situation has drawn all sorts of players out of the woodwork (or the bunkers where they have been hiding) creating a blizzard of news and misinformation. The eternal dilemma is that most REE mineralisations are overweight in Lanthanum, Cerium and the Light Rare Earths with only ion-adsorption clays and Xenotime countering this preponderance. The number of plays with ion-adsorption clays can be counted on the fingers of one hand and Ionic Rare Earths is one of these.

In this initiation of coverage we shall look at the (relatively) novel mineralisation of IonicRE, and its progress thus far, and next steps upon the road to production.

Makuutu

Makuutu comprises five licences covering approximately 242 km^2 and is located ~40km east of the regional centre of Jinja and 120km east of the capital city of Kampala in eastern Uganda. Makuutu is gifted with excellent infrastructure with tarred roads, nearby rail, power and water, cell-phone coverage, as well as being readily accessible throughout the year irrespective of weather conditions.



The background to this move into Rare Earths is that the company has been listed on the ASX for some time (and was previously called Oro Verde). In July of 2019 the company announced the transaction which brought Makuutu under its control. The project had hitherto been owned 100% by Ugandan-registered Rwenzori Rare Metals Limited (RRM), which in turn was owned 85% by South African-registered Rare Earth Elements Africa Proprietary Limited (REEA). Rwenzori had been founded in 2012.

Under the terms of this deal Oro Verde entered into a binding earn-in agreement to acquire up to a 60% direct interest in RRM, and thereby up to a 60% indirect interest in the project by:

- the payment of US$10,000 for a 30-day exclusive option period
- Upon exercise of the option, the payment of US$100,000 cash and issuing US$150,000 in Oro Verde shares, at a 30-day VWAP in return for an immediate 20% interest in RRM
- OVL to contribute US$1,700,000 of expenditure by 1 October 2020 to earn up to a 51% staged interest in RRM as follows

Spend	Interest earned	Cumulative Interest earned
Exercise of Option US$100,000 as in 2 above	20%	20%
Expenditure contribution of US$650,000	11%	31%
Expenditure contribution of further US$800,000	15%	46%
Expenditure contribution of further US$250,000	5%	51%

- Oro Verde to fund to completion of a Bankable Feasibility Study to earn an additional 9% interest for a cumulative 60% interest in RRM.
- During the earn-in phase there are milestone payments, payable in cash or Oro Verde shares at the election of the Vendor, as follows:
    - US$750,000 on the Grant of Retention licence over RL1693 which is due to expire in November 2020;
    - US$375,000 on production of 10kg of mixed rare-earth product from pilot or demonstration plant
    - US$375,000 on conversion of existing licences to mining licences

IonicRE has now completed the earn-in commitments and acquired 51% and putting the plans together to complete the BFS. IonicRE also has the first right over the remaining 40% of Rwenzori Rare Metals Limited and as such, Makuutu.

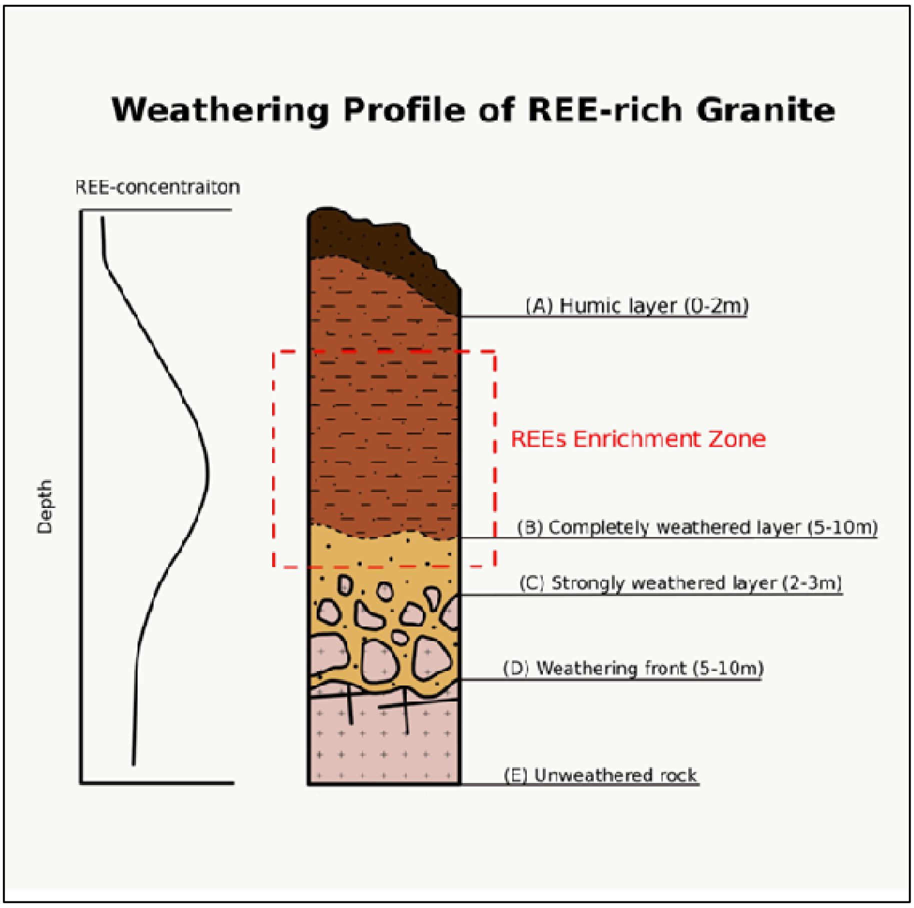
Ion-Adsorption Clays – Rare Indeed

To put this type of Rare Earth mineralisation into a context that is familiar to the more generalist mining investor, the ionic adsorption clay deposits are essentially lateritic, i.e. weathered by climatic conditions.

They were formed by chemical weathering decomposition and dissolution of granite and granite porphyry (containing a relatively high abundance of REEs) and subsequent adsorption and enrichment on clay minerals during the migration and penetration process of Rare Earth mineral solutions. The minerals are therefore also called weathering crust elution-deposited Rare Earths.

This process of the enrichment by natural forces produces deposits preponderant in some of the most desirable Rare Earths. It is for this reason that we have described these clays in the past as the “Holy Grail” of the Rare Earths space.

The ionic adsorption clays are a process-enabling geology. They are massive chromatographic formations. If and when they lie below rocks that contain Rare Earth minerals that are then dissolved in the “pure” rainwater and then “separated” by passage through the clays where the most soluble go on through the fastest and the least soluble stay behind they become Heavy Rare Earth laden, relatively Thorium- free, ionic adsorption clays.



Over the millennia, prodigious flushing of the mineralisation by water flows carries the Rare Earths through the clay. As a result the Light Rare Earths, Thorium, and Uranium have now mostly passed through these clays, but the higher atomic numbered Rare Earths, the "heavier ones," have been slower to follow, so we have now "deposits" trending sharply towards the Heavy Rare Earths in concentrations of 50-500 ppm in southern China and in other places along the rainforest arc of the southeast Asia – Indonesian Archipelago area.

REE Clays & China

Ion-adsorption deposits were first discovered in Ganzhou, China, in 1970. Initially, it was not considered as a mineral phase because it did not behave like any of the known phases of Rare Earth minerals. These particular types of deposits are sparsely distributed throughout seven adjacent provinces of southern China (Jiangxi, Guangdong, Fujian, Zhejiang, Hunan, Guangxi and Yunnan).

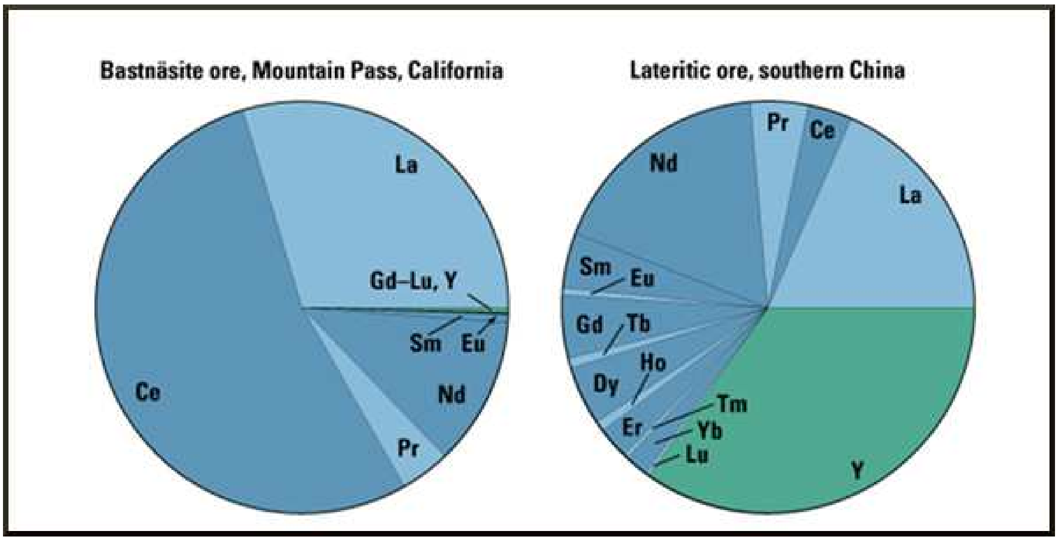
In China these deposits are generally found in small mountains (as pictured below) with a humus topsoil layer of 0.3–1 m, a full- regolith layer of 5–30m (the main ore body, containing 0.03–0.15% REE in general), a semi-regolith layer of 2–3m and a bedrock layer.

As ion-adsorption Rare Earth minerals occur at a simple trivalent cationic state, which is simply adsorbed onto clays, they can be readily extracted by a simple leaching technique with an aqueous electrolyte solution (sodium chloride or ammonium sulfate) via an ion-exchange process.

Therefore, the extraction of ion-adsorption Rare Earths is carried out by open-cut mining followed by tank or heap leaching with sodium chloride or ammonium sulphate solution. Using traditional surface/ mountain top mining and heap-leaching techniques it is estimated that for the production of one tonne of Rare Earth oxide from ion-adsorption Rare Earth ores, 300m2 of vegetation and topsoil are removed, 2000 tonnes of tailings are disposed into adjacent valleys and streams, and 1000 tonnes of waste water, containing high concentrations of ammonium sulphate and heavy metals, is produced.

In spite of an extremely low ratio of ion-adsorption Rare Earth reserves (only 2.9% of China's total REE reserves), this mineralisation of Rare Earth accounted for 26% of China's total REE production between 1988 and 2007 and reached 35% after 2009, before declining due to tightened environmental laws and over-exploitation.

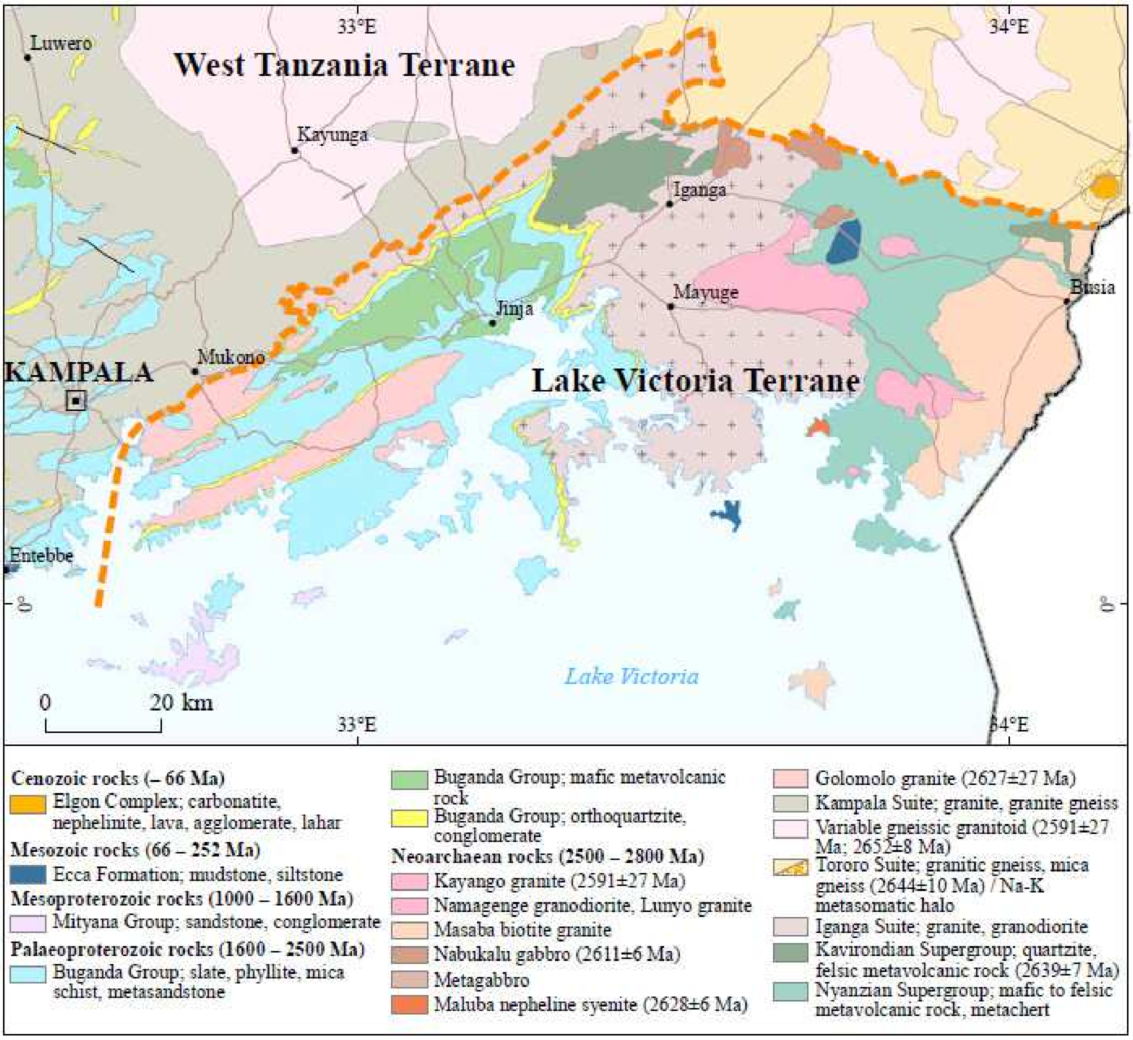
So why should ion-adsorption clays be a “Holy Grail” of Rare Earths? The main reason is that the dynamic forces of the leaching and enrichment have ridded the average IAC deposit from much or its Cerium, a significant portion of Lanthanum and usually, much or all of the Thorium or Uranium (see below for a comparison between Mountain Pass and a southern Chinese IAC deposit). In the place of the unwanted Light Rare Earths there is exceptional concentration on the Mid- & Heavy Rare Earths. Over and beyond this the fact that a miner is dealing with clays rather than hard rock reduces the grinding component in process flowcharts involving clay deposits.



The pie charts above are poignantly illustrative as they show the proportions of individual Rare Earths in two representative ores, bastnäsite (dominated by La, Ce and Nd, with Eu through Lu, & Y making up only a feeble 0.4%). When looking at the Chinese lateritic ion-adsorption ores, one notes that they are dominated by Yttrium, with a dramatic reduction in the throwaway Cerium. Dark blue and light blue segments represent Lanthanides of even or odd atomic numbers with Yttrium indicated in green.

Regional Geology

The Makuutu deposit is located in the so-called Lake Victoria Terrane (LVT) of the Tanzania Craton, a classical Neoarchaean granite-greenstone terrane. The most extensive work on this area has been undertaken by the Finnish Geological Service.



Source: Finnish Geological Service

Greenstones of the Ugandan segment of this terrane include the volcanic-dominated Nyanzian Supergroup and the sediment-dominated Kavirondian Supergroup. Granitoids are mainly syn-kinematic (~2.63 Ga) and 'Younger Granites' (2.59 Ga). This terrane also comprises a nepheline syenite body (2.63 Ga) and several, newly discovered oval-shaped gabbro intrusions (2.61 Ga).

Makuutu is defined as a shallow, near surface orebody, with clay layer averaging 11.9m thick under cover approximately 3m deep. The Kayango Granite underlies much of the Makuutu concession. This granite forms an isolated elliptical E-W trending intrusion, about 400 km2 in surface extent, between the granites of the Iganga Suite and the volcano-sedimentary sequence of the Nyanzian Supergroup. Radiometric data, particularly its potassium signature, allows easy delineation of this granite body from neighbouring rocks. The Kayango granite is a relatively homogeneous, slightly porphyritic, coarse-grained and only weakly deformed rock.

Project Geology

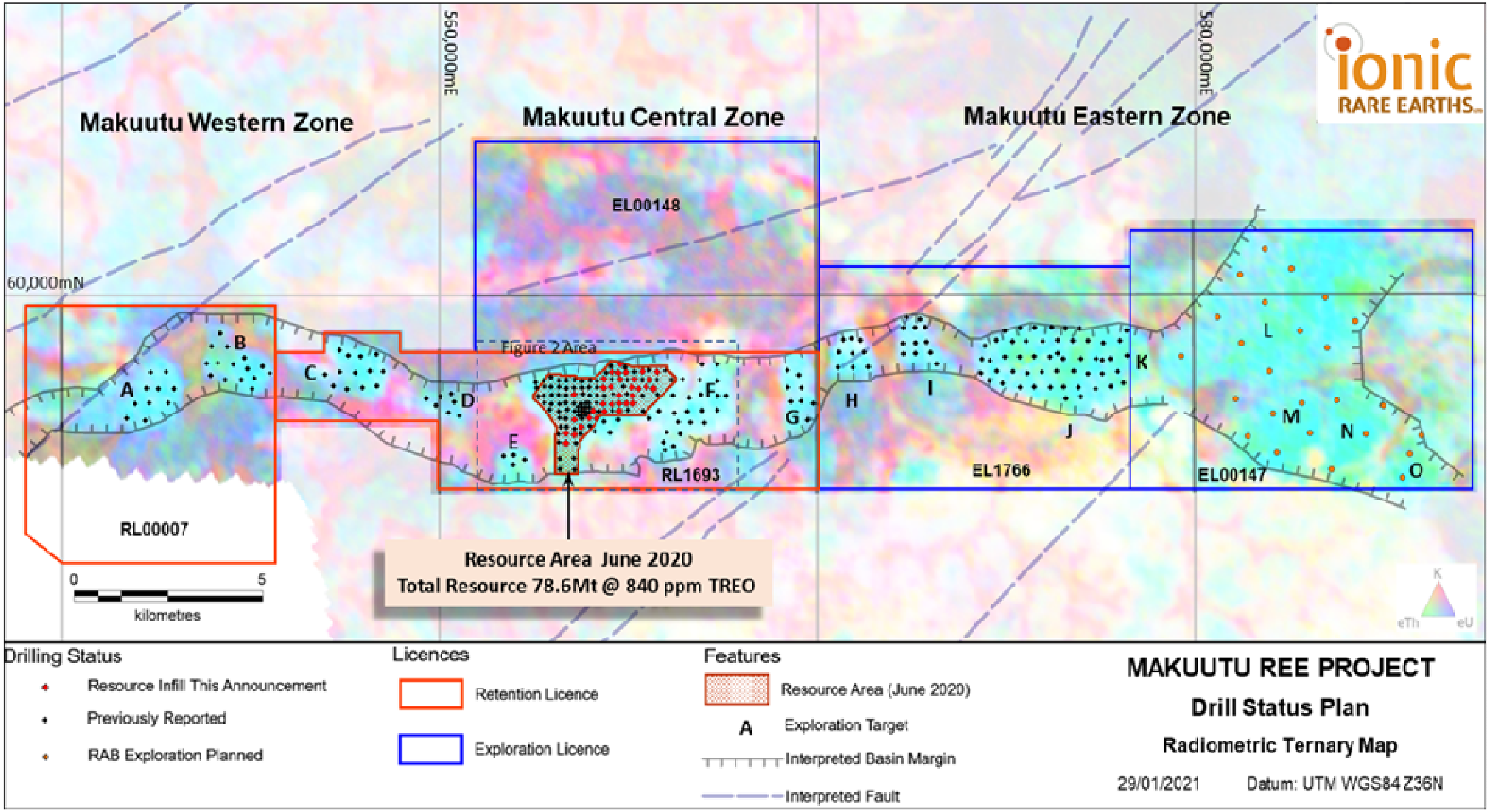
The Makuutu Project is located in the Paleoproterozoic (1600 – 2500 Ma) Lake Victoria Terrane with the Kayango granite and the Iganga Suite granites interpreted as basement rocks and potentially the primary source of the REE.

Overlying the basement granites in the project area is a basin filled with sediments including diamictite/glacial tills, mudstones, siltstones and shales. The upper units of these sediments are potentially derived from degradation of the surrounding granites and represent the protolith for the mineralisation at Makuutu.

The REE mineralisation at Makuutu is considered to be ionic clay style similar to the type of deposits found in China, Myanmar, Madagascar and Brazil, with the mineralisation hosted in the near surface tropical lateritic weathered sediments. The weathered profile is typically comprised of a surface hard-cap, followed by mottled clays grading to saprock and fresh sediments at the base. The hard-cap is variably overlain by recent alluvial soils, up to 1m thick. The average thickness of the mineralised zones >300ppm TREO between the zones ranges from 8m to 20m.

The mineralisation is contained within the tropical lateritic weathering profile of a basin filled with sedimentary rocks including shales, mudstones and sandstones potentially derived from the surrounding granitic rocks. These granitic rocks are considered the original source of the REE which were then accumulated in the sediments of the basin as the granites have degraded. These sediments then form the protolith that was subjected to prolonged tropical weathering.

The weathering developed a lateritic regolith with a surface indurated hardcap, followed downward by clay rich zones that grade down through saprolite and saprock to unweathered sediments. The thickness of the regolith is between 10 and 20 metres from surface.

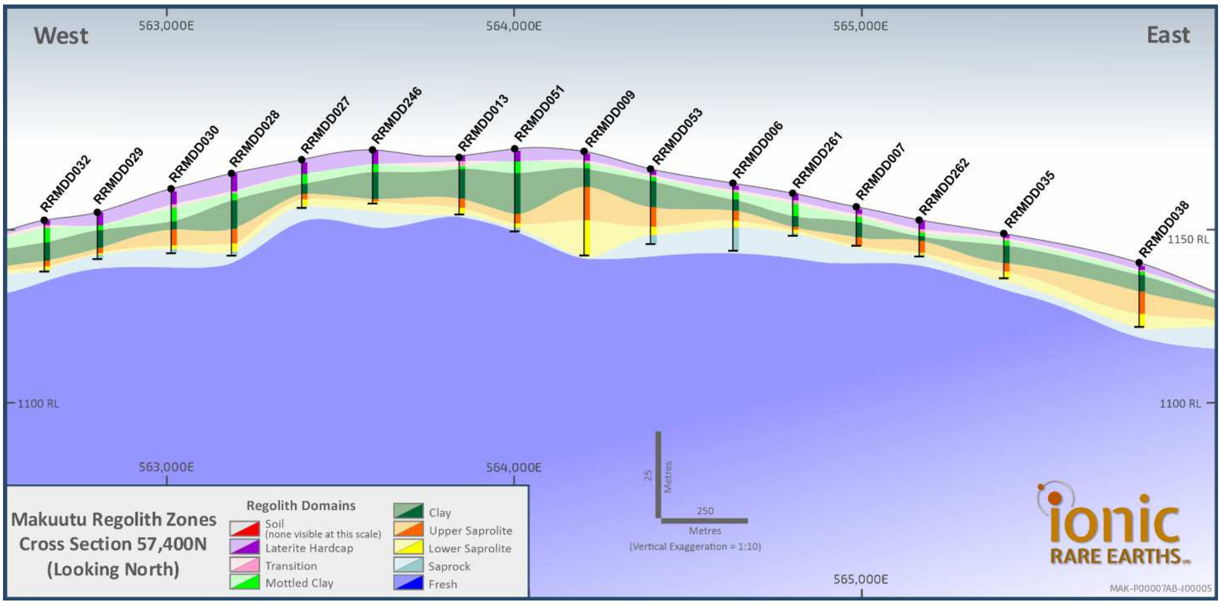


Makuutu Western Zone
Makuutu Central Zone
Makuutu Eastern Zone
ionic
RARE EARTHS
550,000mE
580,000mE
60,000mN
EL00148
RL00007
RL1693
EL1766
EL00147
Figure 2 Area
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
Resource Area June 2020
Total Resource 78.6Mt @ 840 ppm TREO
0
5
kilometres
Drilling Status
Resource Infill This Announcement
Previously Reported
RAB Exploration Planned
Licences
Retention Licence
Exploration Licence
Features
Resource Area (June 2020)
A
Exploration Target
Interpreted Basin Margin
Interpreted Fault
MAKUUTU REE PROJECT
Drill Status Plan
Radiometric Ternary Map
29/01/2021
Datum: UTM WGS84 Z36N

The REE mineralisation is concentrated in the weathered profile where it has dissolved from its primary mineral form, such as monazite and xenotime, then adsorbed on to fine particles of aluminosilicate clays (e.g. kaolinite, illite, smectite). This adsorbed REE is the target for extraction and production of REO.

A typical cross-section through the project area is shown below. The clay band (illustrated in green) demonstrates the generally consistent nature of the profile over the section distance of 2.4 km. The REE mineralisation is dominantly hosted in the clay and laterite, although some rare earths are contained in the shales, albeit at lower concentrations than in the overlying clays.

Below can be seen a cross Section 57,400N (Looking North) of the Regolith Zonation.



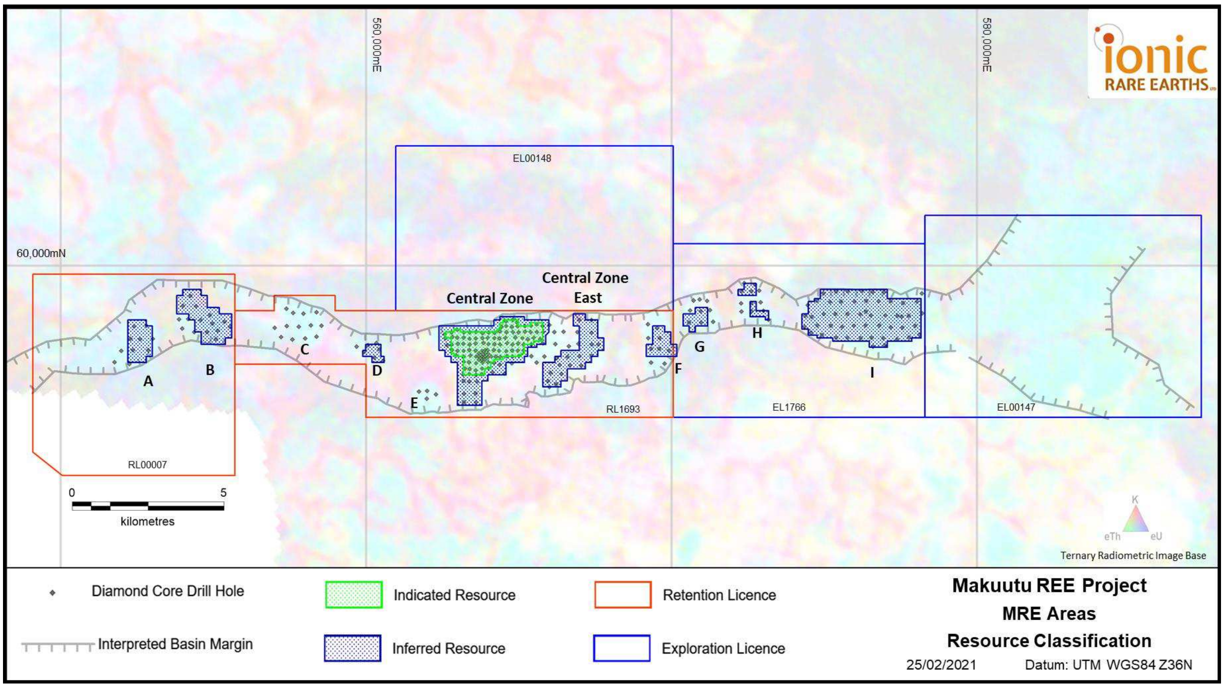
Drilling at the project shows a clear vertical zonation of REE through the weathered profile, which is typical of a laterite style of mineralisation. The zonation is notable as the Light Rare Earths (LREE), particularly cerium, are concentrated in upper portions of the profile, especially the hard-cap. The transitional and the mottled clays beneath the hard cap are more Cerium-rich relative to the rest of the mineralisation. The higher value rare earths such as Neodymium, Praseodymium, Dysprosium and Terbium are generally concentrated toward the mid to lower levels of the weathered sequence, within the clay and upper saprolite regolith.

Resource

The maiden mineral resource estimate for the Makuutu project, released in March 2020, was prepared by independent specialist resource and mining consulting group, Cube Consulting Pty Ltd. As mentioned earlier, this resource was based on only 681.5 m of core drilling undertaken in late 2019.

Despite disruption engendered by the pandemic during 2020, IonicRE drilled an additional 233 core holes for approximately 4,000m of drilling testing the full extent of the 26 kilometres of ion-adsorption clay mineralisation corridor that covered the Makuutu project at the time.

In early March 2021, an updated resource was announced which incorporated the aforementioned extra exploration results. The map below shows the resource estimation areas, with the area of Indicated resource highlighted in green.



The March 2021 resource update showed a significant 210% increase in the Mineral Resource (at a cut-off grade of 200 parts per million Total Rare Earth Oxide minus CeO_2) to 315mn tonnes grading at 650 parts per million Total Rare Earth Oxide.

Makuutu Resource
@ 200 ppm cut-off

Category	Tonnes (Mt)	TREO (ppm)	TREO w/o Ce_2O_3 (ppm)	LREO (ppm)	HREO (ppm)	CREO (ppm)	Sc2O3 (ppm)
Indicated	66	820	570	590	230	300	30
Inferred	248	610	410	450	160	210	30
Total Resource	**314**	**650**	**440**	**480**	**170**	**230**	**30**

In this latest resource estimate, the Heavy Rare Earth Oxides (26%) and Critical Rare Earth Oxides (35%) account for a substantial component of the Resource mineralisation.

Estimates were also made of the uranium and thorium content. Both are found in low concentrations in the deposit with Uranium averaging 10 ppm U_3O_8 and Thorium 30 ppm ThO_2. These are not considered to be at significant levels, particularly compared to some of the quite daunting numbers out there in other projects on offer, like Arafura's Nolan's Bore, for example.

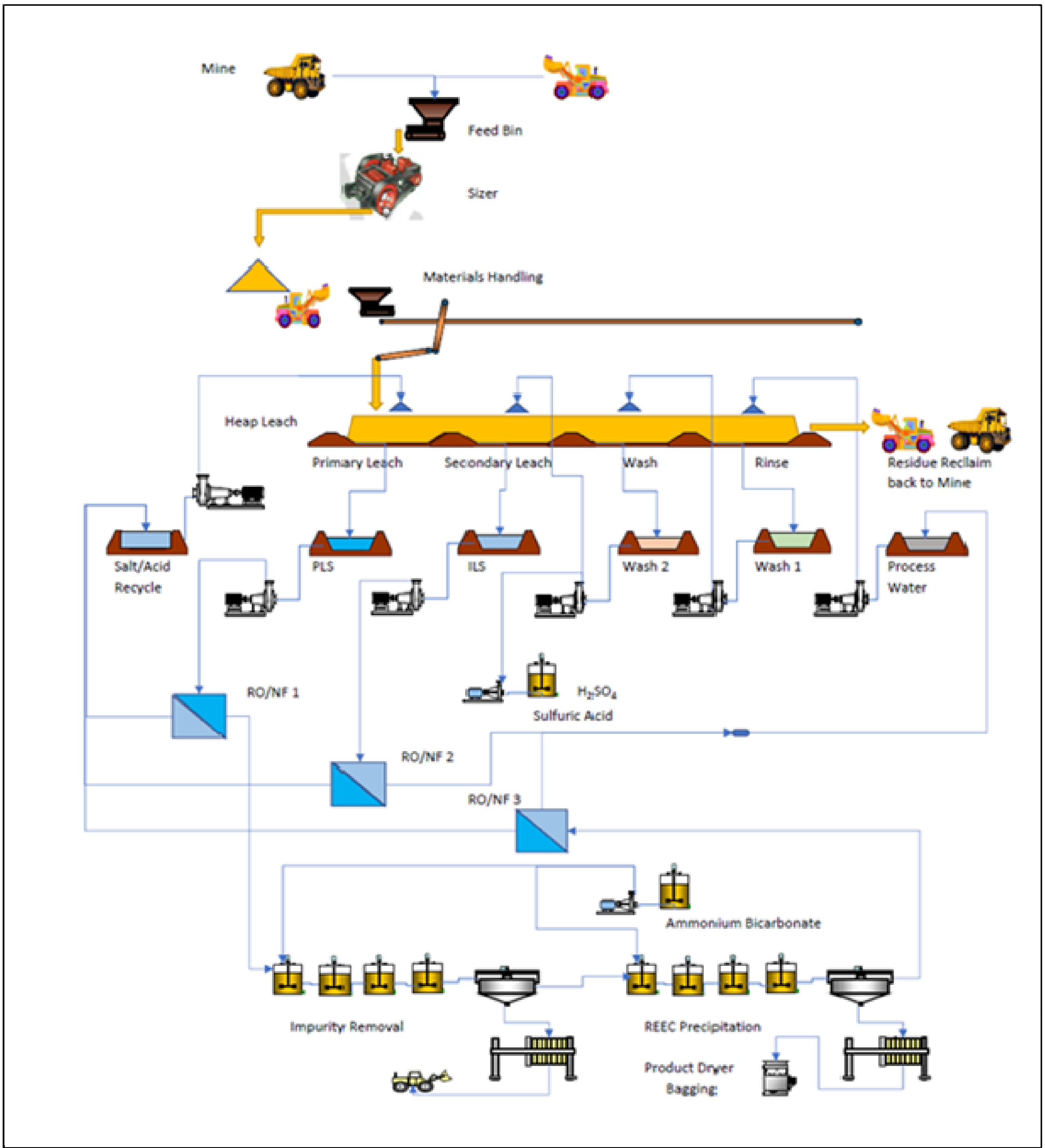
The next step will be publication of a PEA which is expected to be released to the ASX in April 2021. IonicRE has already publicly advised that the intention is then to move directly to a BFS to support a Mining Licence application by the end of October 2022.

Process

Preliminary metallurgical test work on mineralisation at the project was published back in February of 2020. Results indicated that metallurgical recoveries of up to 75% TREE-Ce (Total Rare Earth minus Cerium) were achieved using simple extraction techniques. These results were considered by management to be adequate to achieve reasonable expectations of economic metallurgical processing of the project mineralisation.

The process flowsheet (shown on the following page) is simple and modular in nature, enabling production capacity expansion via additional modules, notionally 2.5 million tonnes per annum each (producing 1000 tpa of REO). The LOM is estimated, at this stage, to be potentially 30 years. Management sees the progress to full production occurring over a period of around seven years with up to four modules (reaching 4,000 tpa REO) with the addition of an extra module approximately every two years until reaching planned capacity. Over and beyond this the company sees the potential for a further

50% increase in annual output pending further expansion of resources on the newly licensed EL00147 which has an exploration target alone that is nearly equivalent to the existing MRE at Makuutu.



The heap leach pads are dynamic, meaning an on/off heap leach arrangement. ROM ore will be stacked approximately three metres high, then irrigated in a counter-current fashion using ammonium sulphate and sulphuric acid to desorb and solubilise the REE into solution.

Recovery from the heap leach is a straightforward process. It is fast with less than an hour of residency to break the ionic bond due to the colloidal nature of the REEs. There will be a total residence period of material on the heap for a period ranging from 14 days to four weeks.

The pregnant leach solution (PLS) is collected in ponds and concentrated using membrane processes prior to precipitation of the Rare Earths as a mixed Rare Earth carbonate product. The mixed Rare Earth carbonate product has a high payability of approximately 70% of the REO content, which is double that of mixed REO mineral concentrates which require significant downstream cracking. The product from ion-adsorption clay deposits is easier to process, has no radionuclides and therefore is a highly sought-after feed stock for REE separation circuits.

The process flowsheet has three membrane circuits which each perform a separate duty:

Membrane circuit 1 in the flowsheet takes the pregnant leach solution (PLS) and increases the concentration of the REEs for downstream precipitation circuit. This reduces the total volumetric flowrate that feeds the precipitation circuit, reducing the size of the equipment and the capital investment. The permeate that is generated is recirculated to the Salt/Acid recycle pond to provide adequate make-up water for the irrigation flowrate.

Membrane circuit 2 in the flowsheet takes the intermediate leach solution (ILS) and increases the concentration of the REEs and the reagents so these can be recirculated to the primary leach stage, where the residual regents are then utilised to generate the PLS. The permeate that is generated, which is essentially high purity clean water, is then recirculated to the process water pond where it is used for rinsing and washing the heap leach / desorption residue in the exhausted leach pads prior to the residue being reclaimed and rehabilitated in the mine out pit areas.

Membrane circuit 3 takes the mother liquor post mixed rare earth carbonate precipitation, which now is rich in ammonium sulfate, and increases the concentration of the ammonium sulfate so this can be recycled back to the Salt / Acid recycle pond which is used to irrigate the Primary Leach stage. The permeate, or clean water that is generated from this stage, can then be recirculated to the clean process water pond which is used to rinse and wash the residue as per above.

The final product is then filtered, dried and bagged prior to transport to a specialist REE separation plant.

Heap leach residues once exhausted, washed and rinsed are then returned to the mined-out pits, which will be back-filled to enable the land to be rehabilitated via progressive rehabilitation.

It is expected that a high proportion of the reagents will be recoverable. Acid supply is available to the project from a fertiliser facility (Sukuru Phosphate) with acid plant that has been developed at Tororo by Chinese interests. The facility, located approximately 93 km away from Makuutu via highway on the Ugandan / Kenyan border. Additionally the project has access to acid production in western Kenya. Some discussions have taken place with reagent suppliers on a proposal to build a new acid plant, near to the project site, in exchange for a long-term acid supply agreement. However, for the moment trucking in acid is a more attractive proposition on a cost basis.

Water will be sourced at the project by harvesting water from the Makuutu site, given the project location in a positive rainfall environment and a net positive process water balance will require membrane processes to be used to process site discharge water for reagent recovery. Excess water management will be a key focus of the project to ensure environmental standards are met and reagent consumption is minimised.

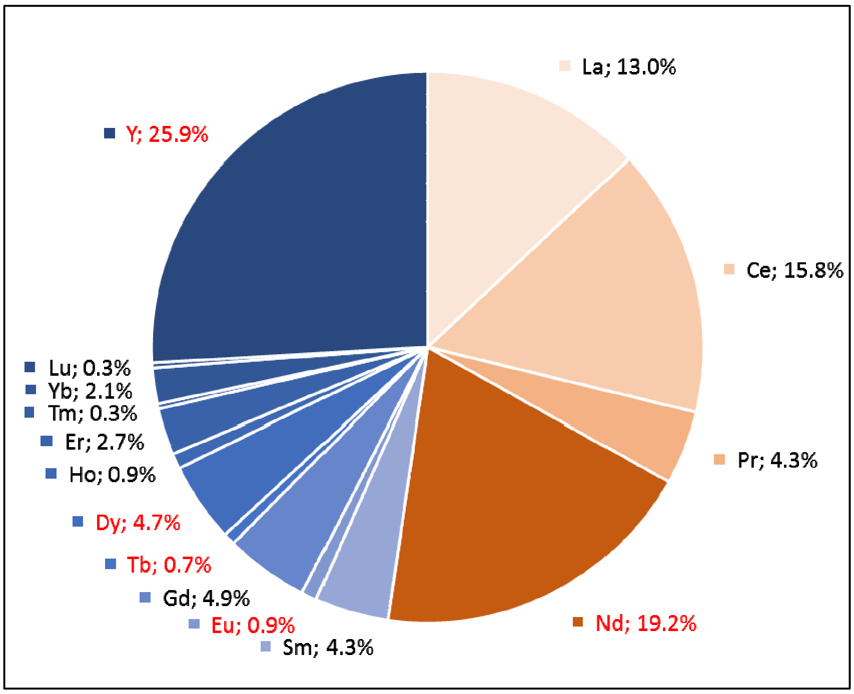
The workforce for the first module will be ~300. The full scale mine and process facility is expected to have an operational workforce exceeding 1000 by year 7.

It is envisaged that there will eventually be a Scandium extraction circuit installed.

Output

After the aforementioned PEA in April 2021, followed by a BFS in and ESIA by or before 3Q2022, the plan is to lodge a Mine License Application before the end of October 2022.

The pie chart, at right, shows the distribution of Rare Earths, within the TREO mixed Rare Earth carbonate product generated, from the Makuutu deposit. The critical and Heavy Rare Earth oxide dominated product makes up between 70 to 75%, another advantage for



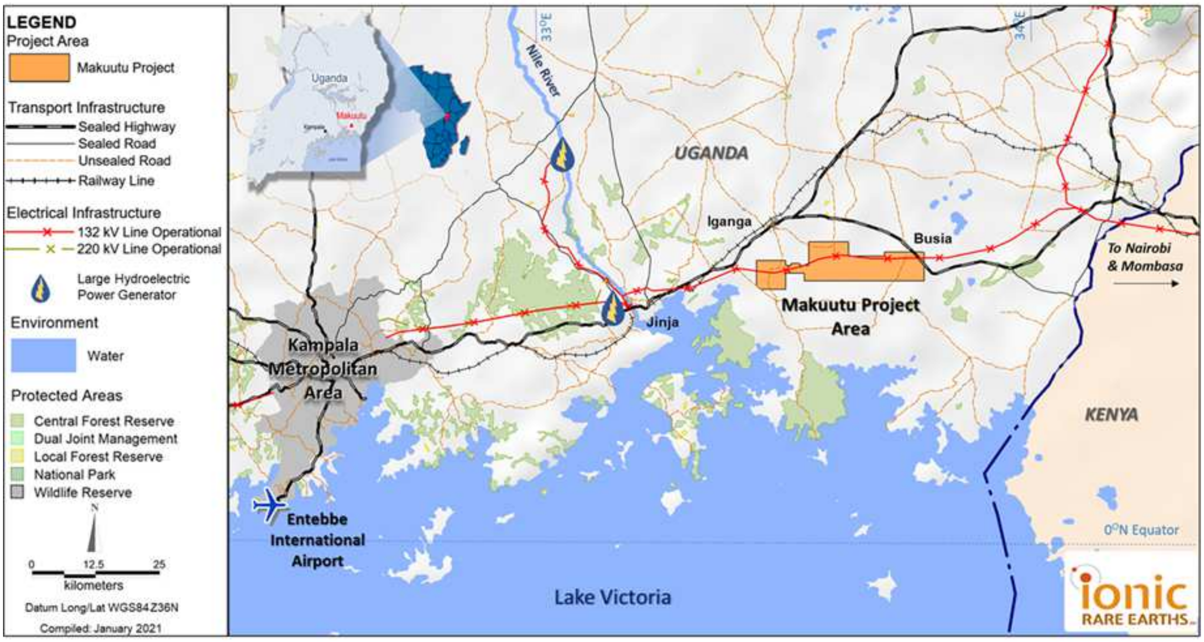
ion-adsorption clay projects.

Infrastructure

The Makuutu site is extraordinarily well positioned for infrastructure considering how few projects in Africa have good access. The site is approximately 10km from Highway 109 which is a sealed bitumen road connecting to Kampala, to Kenya and on to the port of Mombasa. All weather access roads connect the site to the adjacent sealed bitumen highway.

A rail line lies within 10 kilometres north of the Makuutu site near the town of Iganga. There are four hydroelectric power plants located within 65 km of the project area, with total installed generating capacity of approximately ~810 MW, providing an abundant supply of cheap renewable power to the project. The nearest power transmission line (at 132 kwh) passes 100-200 metres from the proposed sites for the processing plant.

Despite the proximity of the rail line, the small initial mixed Rare Earth carbonate product shipments (1,000 REO equivalent tpa) to Mombasa in Kenya will be better dispatched by road as they will only amount to 20 tonnes per week, or a couple of truckloads at most.



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The closest major population centre is Iganga, which has a population of 50,000. The town of Mayuge is approximately 10 km from the site. A workforce of semi-skilled and artisanal workers is available with the company intending to source local operations staff from the immediate districts and train staff accordingly. No fly in – fly out is envisaged, and the number of expatriate staff is intended to be low, and to be phased out over time.

Scandium

For starters Scandium is not a Rare Earth, never has been and never will be. It sometimes appears in Rare Earth deposits (as does Niobium). Having said that Scandium is relatively Rare (with total annual production of 25 tonnes or less and it is very highly valued (being priced at over US$1,000 per kg. While Scandium sometimes appears in Rare Earth deposits it is rarely in recoverable quantities. Management at IonicRE is experienced in the metal due to the MD, Tim Harrison, having previously been involved in the Sunrise project of CleanTeq (ASX: CLQ).

We have written on Scandium at length elsewhere but the potted version is that its potential upside in terms of applications is significant. Its current main usage is in Solid Oxide Fuel cells but it major potential use is as a light-weighting alloy with aluminium, particularly in aerospace but also possibly in EVs.

The problem is currently a supply issue with no primary mines, and that the bulk of production comes as a by-product from Titanium streams (or more recently from a Nickel-Cobalt mine in the Philippines). This has produced a chicken-and-egg dilemma for aerospace majors who will not tool up for Sc-Al componentry if they cannot be guaranteed a reliable and substantial supply of Scandium.

The most recent development in the space has been RTZ talking of moving to commercial production in Canada from its Titanium streams there. This potentially will reduce the Scandium price, but conversely spur potential demand by creating a further, reliable source of supply (from a major). This ultimately will be a positive for IonicRE in marketing the output of Makuutu by turning a niche metal, traded by appointment, into a mainstream metal.

Valuations

On the following page can be seen an in situ valuation of the Rare Earth (plus Scandium) component of IonicRE's project. It's worth noting that the Scandium value (at current prices) almost matches that of the entire Rare Earth component. However, in our vision for increased Scandium uptake by manufacturers/end-users, an inevitable reduction in Sc prices needs to (and shall) cocur to spur greater uptake.

This was calculated using the most recent stated resource estimate at Makuutu.

Makuutu - In situ Valuation

	In Situ Grade		MRE Contained		REO	In Situ Valuation		
REO	Indicated ppm	Inferred ppm	Indicated tonnes	Inferred tonnes	Prices US$/kg	Indicated US$ mns	Inferred US$ mns	Total US$ mns
La2O3	160	120	10,560	29,760	$1.55	16.37	46.13	62.50
Ce2O3	250	200	16,500	49,600	$1.57	25.91	77.87	103.78
Pr2O3	40	30	2,640	7,440	$81.50	215.16	606.36	821.52
Nd2O3	140	100	9,240	24,800	$107.00	988.68	2,653.60	3,642.28
Sm2O3	30	20	1,980	4,960	$2.00	3.96	9.92	13.88
Eu2O3	5	3	330	744	$32.00	10.56	23.81	34.37
Gd2O3	20	20	1,320	4,960	$40.10	52.93	198.90	251.83
Tb4O7	3	2	198	496	$1,545.00	305.91	766.32	1,072.23
Dy2O3	20	10	1,320	2,480	$466.00	615.12	1,155.68	1,770.80
Ho2O3	4	3	264	744	$171.50	45.28	127.60	172.87
Er2O3	10	10	660	2,480	$29.50	19.47	73.16	92.63
Tm2O3	2	1	132	248	$850.00	112.20	210.80	323.00
Yb2O3	10	10	660	2,480	$16.30	10.76	40.42	51.18
Lu2O3	1	1	66	248	$825.00	54.45	204.60	259.05
Y2O3	130	90	8,580	22,320	$7.30	62.63	162.94	225.57
REO Sum	825	620	54,450	153,760		2,539.38	6,358.10	8,897.48
Sc2O3	30	30	1,980	7,440	$885.00	1,752.30	6,584.40	8,336.70
Total						**4,291.68**	**12,942.50**	**17,234.18**

Rounding has been applied to 1Mt and 10ppm which may influence averaging calculation.
REO proces reported by Argus Metals 5/3/2021

Comps

The universe of ion-adsorption clay deposits has always been small. The subset accessible to investors in Western capital markets is even smaller. Even at the peak of the Rare Earth boom of 2009-12 there was only one asset that we knew of amongst the 100s of wannabes on offer. That was Tantalus A.G. with a deposit in Madagascar and its listing was on the Frankfurt Stock Exchange. There was nothing on offer amongst the heaving mass of arm-wavers on the TSX-v and the ASX.

The Ion-adsorption Clay Universe

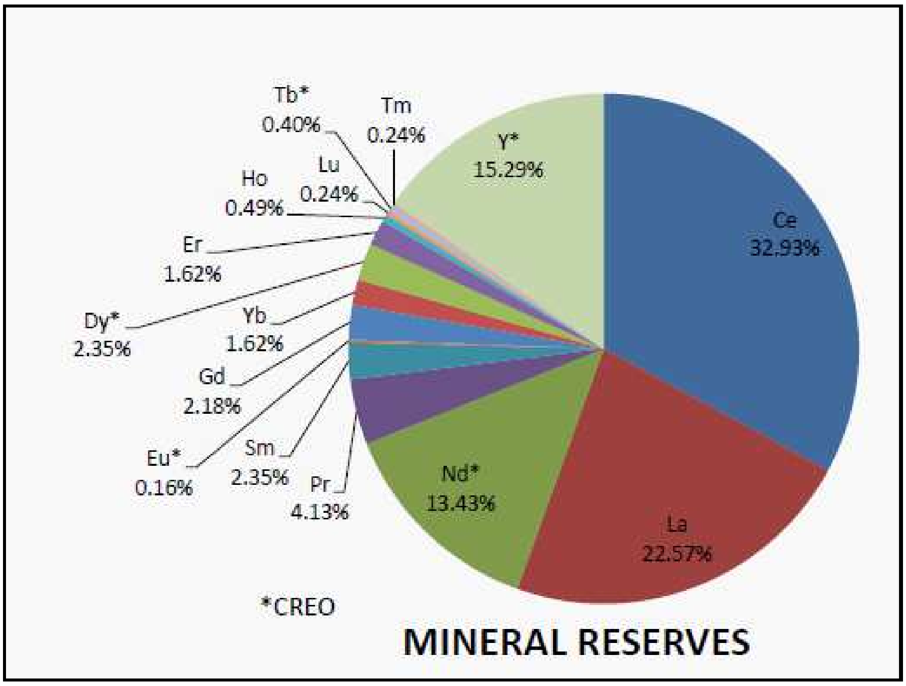
		Tonnage (mns)	REO grade (ppm)	Cut-off (ppm)	Contained REO (tonnes)	Sc2O3 grade
Biolantanidos	Chile	22.2	600	100	13,300	
Ionic Rare Earths	Uganda	315.0	650	200	204,750	30
Serra Verde	Brazil	458.0	980			
Tantalus	Madagascar	197.7	897		177,383	

Alas for Tantalus though it came to grief in the long period of quiescence after 2012 and disappeared off the radar.

Until the appearance on the scene of Ionic Rare Earths, the only parties were two private entities. These were interestingly both in Latin America, a zone which the first REE Boom passed by.

Serra Verde (a venture backed by Denham Capital) has a project in Brazil. It is envisaged that Serra Verde will enter into production in mid-2022 and is currently submitting reports to the government. Tailings dam issues have become a hot topic in Brazil and thus this must be addressed before moving forward.

The problem with Serra Verde is that, despite being an ion-adsorption clay deposit, its REE mix/distribution (shown in pie chart below) looks only slighter better than a conventional Rare Earth mineralisation, with a preponderance of Cerium and Lanthanum coming in at around 55%.



Biolantanidos, on which we have written before is now a subsidiary of the major gold/silver miner, Hochschild (HOC.L), of Peruvian origins but listed on the London Stock Exchange. In October of 2019 Hochschild, acquired the remaining 93.8% stake in the company for US$56.3m. It had previously invested US$2.5mn in the project during 2018 and early 2019 in exchange for a 6.2% equity stake with an option to increase ownership. It was this option that was exercised in the last quarter of 2019.

The BioLantanidos deal brought with it ownership of approximately 72,000 hectares of concessions and an initial modular project developed in the Penco area in an area of 300 hectares, approximately 15km from Concepción in Chile.

Projects	Makuutu	Serra Verde/Pela Ema	Tantalus	Southern China
Form of occurrence	Sedimentary Basin ~ 100km2	Granites/Batholith >100km2	Syenites & Granites/Stocks <100km2	Granites/Stocks <100km2
Mineralised Bodies	Discontinuous due to watercourse erosion	Continuous	Discontinuous	Discontinuous
Sediment (bedrock) – TREO grade	0.03 – 0.05%	0.12-0.16%	0.08%	0.025-0.04%
Saprolite – TREO grade (%)	0.01 – 1.4 %	0.1-1.0%	0.08%	0.03-0.3%
Saprolite – HREO/TREO ratio	10% – 70%	25-60%	19%	25-50%
Mining Method	Strip mining - no blasting	Strip mining - no blasting	Strip mining - no blasting	Strip mining - no blasting - in situ leach
TREO - Extraction	Ammonium Sulphate	Sodium Chloride	Sodium Chloride & Ammonium	Ammonium Sulphate

Radioactivity

It is not a truism to say that radioactivity comes with the territory in regard to Rare Earth projects. While many projects or indeed a majority have radioactive components (the presence of Uranium or Thorium) there are some that have little to no radioactivity. When it comes to dealing with these elements a host of challenges are thrown up. These cannot be ignored or willed away by wishful thinking.

A large number of the REE projects in the first boom were repurposed Uranium projects (as were the corporate vehicles they were housed in). This factor was ultimately the demise of many a project.

On the following page can be seen the widely differing ppm rates for a selection of mines/projects in the Rare Earth space at the current time.

A word of caution is required on the reported data as, in some instances, it does not report what the likely mineral concentrates would be increased to in the hard rock Rare Earth projects. Low grades *in situ* increase as the TREO grades increase, and it is also important to understand that as those grades are concentrated, the U_3O_8 and ThO_2 grade also concentrates. However, that is not the case with the ion-adsorption clays, as the radionuclides remain in the clay as refractory minerals.

REE Projects - Radioactive Elements Comps

Project	Jurisdiction	Owner	TREO %	Cut-off	U3O8 ppm	Thorium ppm
Mountain Pass	US	MP Materials	7.98%	5.00%	n/a	250
Browns Range	Australia	Northen Minerals	0.63%	0.15%	26	28
(Dazzler)			2.33%	1.15%		
Mount Weld	Australia	Lynas	5.40%	2.50%	20	700
Round Top	US	US Rare Earths/TMRC	0.06%	NSR US$16/t	37	179
Bear Lodge	US	Rare Element Resources	3.05%	1.50%	31	134
La Paz	US	American Rare Earths	0.04%	0.03%	1.2	6
Makuutu	Uganda	IonicRE	0.07%	200ppm	10	30
Nolan's Bore	Australia	Arafura Resources	2.60%	1.00%	22	328
Norra Karr	Sweden	Leading Edge	0.61%	0.40%	13	6
Nechalacho	Canada	Avalon	1.27%	NMR US$320/t	28	139
		Vital Metals	2.70%	0.3% Nd2O3	15	100
Bokan Mountain	US	Ucore Resources	0.60%	0.40%	77	155

We would note that effectively Solvay's La Rochelle refinery has been neutralized as a force in processing due to an excessive build-up of thorium stockpiles, which no-one wants to buy off them. Thus the French government will not let them process any radioactive REE ore, at what was the largest non-Chinese processor when it was owned by Rhodia-STER.

Then there are the on-going travails of Lynas. Much of its grief in Malaysia has to do with the radioactive component in the ores that it brings in for processing from its Mt Weld mine in Western Australia. This delayed completion of the initial plant build and has been continuous source of trouble with local residents, politicians and NGOs.

Uganda

Like many countries in Africa Uganda has a history of artisanal gold mining that stretches back through the centuries. It has in the last fifty years hosted one of the world's largest Cobalt mines (now exhausted). However a history of civil strife reaching back to Idi Amin (and before) means that it has largely fallen of the mining radar despite sharing propitious geology with some of its neighbours such as the DRC, Rwanda and South Sudan.

From a minimal level of mining activity ten years ago, the country has now clambered up the rankings as a gold exporter. In recent times, three more gold refineries have recently been built in Uganda, stimulating the country's processing capacity and allowing Uganda to slowly emerge as a regional gold trading (rather than mining) hub. The four refineries source their gold from regional countries, including

Democratic Republic of Congo. There have been questions raised over the source of Uganda's gold. A report in early 2020 in the Wall Street Journal, said Ugandan dealers were using the cover of coronavirus restrictions to stealthily ship in gold from the Democratic Republic of Congo (DRC) and South Sudan.

Uganda's Central Bank reported that Uganda shipped US$1.25bn worth of gold in 2019, more than double its 2018 gold export values of US$514.8mn. Gold massively outperformed other export with cumulative earnings hitting US$1.7bn (Shs6.3 trillion) for the period between December 2019 and November 2020.

The earnings represent a 44% contribution out of total exports, which during the period stood at US$3.8bn (Shs14.3 trillion), according to data from Bank of Uganda. Gold has in the last five years become Uganda's largest export overtaking coffee, which during the period earned $509m (Shs1.8 trillion), representing a percentage contribution of 13%.

Whatever its source, the gold exporting has become a promotional point for the government and certainly focused their minds on the country being more than just a narrow-focus agricultural exporter.

The country has a Mineral Act, which is under revision. Mineral exploration and exploitation is governed by several types of licenses. These are: the Prospecting Licence which is mineral or area specific and is valid for one year; under Exclusive Prospecting Licence (EPL), mineral specific. and is limited to an area of 20.48 square kilometres (7.91 sq mi) and the Special Exclusive Prospecting Licence (SEPL) is for a minimum area of 76.8 square kilometres (29.7 sq mi); Mining License for developers which could be location specific as Mining License is limited to an area of 16 hectares (40 acres) with validity of 1 year; in the case of large mining area the lease could be for 21 years for areas up to 251 hectares (620 acres); and Mineral Dealers Licence which is a permit to use water resources for mining operations with validity of one year ending December.

Directors & Management

Trevor Benson, Chairman, has over 30 years' experience within investment banking and stockbroking, specialising in the resources sector. He has also worked for large Australian and international corporations and held a number of directorships with ASX-listed companies. His focus within the investment banking industry was within SE Asia and China specialising in merger and acquisitions and equity capital market transactions, and advising Australian and International companies, including being an adviser to Chinese State-Owned Enterprises, and Hong Kong listed resource companies.

Tim Harrison, Managing Director, has over 20 years' experience in the resources industry that has involved roles in project development, process and flowsheet development, studies, test work planning and supervision, engineering, construction, commissioning, operations, project management, and as owners' team representative. He holds a Bachelor of Chemical Engineering degree from Adelaide

University and has over 20 years of experience and an extensive track record in the fields of mineral processing and hydrometallurgy.

He joined IonicRE as Project Manager in February 2020 and was appointed CEO in June 2020. He was appointed MD in December 2020. Prior to joining IonicRE, he was the Manager – Process Development for Clean TeQ's Sunrise Nickel-Cobalt-Scandium Project, where he managed Process Development from conception to a development ready project. Previous employers include Bechtel, BHP, Fluor, Ivanhoe Australia, WMC Resources and specialist consultancies.

Bradley Marwood, non-executive director, is a mining engineer and a highly experienced resources industry executive with more than 35 years' in development of new mines and management of existing mines across Africa, Asia and Europe. He was instrumental in bringing into production the copper mines at Kipoi (DRC) and Rapu Rapu (Philippines) and completing development of the Svartliden gold mine (Sweden). Additionally, he has a history of equity and debt investment advisory on Feasibility Studies and advanced stage resource projects in Australia, Africa, North America and Asia, with a subsequent 20 mines developed. He has worked in senior roles for groups such as Normandy, Perseus Mining, Dragon Mining, Lafayette, Moto Goldmines, and Minproc Engineers before his most recent role as MD of Consolidated Zinc, which is operating a high-grade zinc-lead-silver mine in Mexico.

Brett Dickson, company secretary and CFO, has over 30 years' experience focusing on the start-up, restructuring, management, growth and financing of emerging publicly listed exploration and mining companies, including projects advancing from exploration through development to production. Brett's experience ranges through a spectrum of activities; from capital and debt raisings, corporate restructuring and stock exchange listings. He has been a director of, and involved in the executive management of, a number of publicly-listed resource companies with operations in Australia, Nicaragua, Chile, Mexico, Finland, Ukraine, Laos, Papua New Guinea and South Africa.

He has a Bachelor's degree in Economics and Finance and is a Fellow of the Australian Society of Certified Practising Accountants. He has been Company Secretary and Chief Financial Officer (CFO) for a number of resource companies listed on the ASX.

Risks

The whole Rare Earth industry finds itself in a different world with some constants from the previous "boom", but also quite a few things have changed. However it is worth enumerating some of the risks that may be faced:

- A return to weak Rare Earth prices
- The REE market is still controlled largely by China

- Financing difficulties for mine build
- Failure of demand to match rising production (i.e. build it and no-one comes)
- Excessive number of competing projects could crowd the scene and investors' attention in the event that REE prices turn up

Rare Earth prices are not likely to go lower than the levels they have been at in recent years, even the Chinese are not running a charity any more. Prices have been ebullient for the last three months but there is no rationale for them to even vaguely test the highs of 2011-12. The Chinese have learnt their lesson from last boom and that lesson is that the best way to maintain control and discipline market players is by aggressive predatory pricing. Even now there is talk swirling of the Chinese pondering ramping down (!) LREE prices.

Despite the hullabaloo, there is not a lot of money for major REE capex pipedreams out there. The MP SPAC came with $500mn embedded, which got the company off to the races. UUUU are running on the smell of an oil rag. Many of the fakers and wannabes are promoting the hell out of the concept but not actually spending anything.

With the EV "revolution" finally gaining traction outside of China the potential for greater demand for REE magnets from the quarter is enhanced. We see no reason for REE demand to slacken and indeed there is the potential for it to finally start to meet some of the bullish projections of 10 years ago.

Finally, there is the issue of competing projects. The Canadian projects have a few contenders to be real, but most of the promoters there remind us of Mark Twain's definition of miners, except they don't even have a hole to stand at the top of. Projects farther away (and we don't mean Greenland or Angola) stand some prospect (particularly if located on the territory of US allies, i.e. Australia) of being seen as being "as good as onshore".

Conclusion

In the first Rare Earth boom there was a certain "couldn't care less" attitude towards mineralisations and other finer details of the art of developing a Rare Earth mining and processing operation. This time around the focus is on processability (and the cost thereof). Thus the key consideration now is if the host mineral for the REEs is economically mineable and then can be subjected to a processing regime that is not too expensive in terms of opex or capex. A key difference this time is that the first boom saw indiscriminately high prices for ALL Rare Earth Oxides. This time the prices of Lanthanum and Cerium are so low they can be scraped off the floor. The implication of this is that the economics of also-ran deposits with high Le-Ce preponderance are shot to pieces in the market place.

From over 300 claimants to be potential Rare Earth producers in 2011, at the end of the last Rare Earths boom, the number of developers shrunk to less than twenty survivors. This number has seen some augmentation in recent times, but nothing like the surge of 2010. Curiously though, of all the listed explorers back then, there was only one targeting ion-adsorption clays (Tantalus A.G.) and now there is still only one listed champion of this type of deposit, and that is Ionic Rare Earths.

Back then these clays were regarded as the Holy Grail of REE deposits but they were also regarded as very rare unicorns, in which only the Chinese (supposedly) had cornered the market. In a marketplace rife with speculation and ignorance this was one of a plethora of lies doing the rounds. In fact, while not common, these clays do exist around the world in laterite form where natural weathering has leached out much of the "undesirable" material, whether it be radioactive elements or the "throwaway" REEs like Cerium and Lanthanum.

Less is more might be the mantra of this go-around in Rare Earths. IonicRE has less Lanthanum, less Cerium and less radioactive elements. That must put the company in a stronger position than those trying to compete with the burden of these deleterious elements. The challenge now for the company is to use this advantage (and its good infrastructure) to present a Feasibility Study with attractive economics which puts it in the Final Five of companies that will make it to production in the current cycle.

Thus we have given IXR a **LONG** rating with a 12-month target price of 15 cts.

Important disclosures

I, Christopher Ecclestone, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

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