



# Positioning Greenland To Be A Major International Rare Earth Supplier

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## GREENLAND MINERALS LTD



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## **JORC Code (2012) Competent Person Statement – Mineral Resources and Ore Reserves**

*The information in this report that relates to Mineral Resources is based on information compiled by Mr Robin Simpson, a Competent Person who is a Member of the Australian Institute of Geoscientists. Mr Simpson is employed by SRK Consulting (UK) Ltd ("SRK"), and was engaged by Greenland Minerals and Energy Ltd on the basis of SRK's normal professional daily rates. SRK has no beneficial interest in the outcome of the technical assessment being capable of affecting its independence. Mr Simpson has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Robin Simpson consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.*

*The information in the statement that relates to the Ore Reserves Estimate is based on work completed or accepted by Mr Damien Krebs of Greenland Minerals and Energy Ltd and Mr Scott McEwing of SRK Consulting (Australasia) Pty Ltd.*

*Damien Krebs is a Member of The Australasian Institute of Mining and Metallurgy and has sufficient experience that is relevant to the type of metallurgy and scale of project under consideration, and to the activity he is undertaking, to qualify as Competent Persons in terms of The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code, 2012 edition). The Competent Persons consent to the inclusion of such information in this report in the form and context in which it appears.*

*Scott McEwing is a Fellow and Chartered Professional of The Australasian Institute of Mining and Metallurgy and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration, and to the activity he is undertaking, to qualify as Competent Persons in terms of The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code, 2012 edition). The Competent Persons consent to the inclusion of such information in this report in the form and context in which it appears.*

The mineral resource estimate for the Kvanefjeld Project was updated and released in a Company Announcement on February 12<sup>th</sup>, 2015. The ore reserves estimate was released in a Company Announcement on June 3<sup>rd</sup>, 2015. There have been no material changes to the mineral resource estimate, or ore reserves estimate since the release of these announcements.



- Operating in Greenland for over 10 years; well positioned to become a globally significant supplier of rare earth materials

- Rare earths are critical to electrification of transport systems and energy efficiency through rare earth magnets [**Nd, Pr, Tb, Dy**]

- Rare earth sector undergoing substantial restructure, with major near-term demand growth due to the roll-out of EV's – a global agenda

- 100% owned Kvanefjeld Project one of the most significant, advanced rare earth projects globally: well-positioned for development window

- Working closely with major RE international supplier Shenghe Resources to establish fully integrated supply chains to global end-users

# Rare Earth Sector: Change is Approaching

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- Rare earth metals and oxides are produced via multiple processing steps
- China leads in the downstream area of separation – both technology and capacity
- Production restrictions applied to RE mine supply in China
- New ex-China mines needed to meet massive demand surge for magnet metals
- Successful integration with downstream processing is key
- Greenland - Shenghe working collaboratively for 3 years, successful cooperation
- Shenghe is focussed on growth through moving into international supply
- Greenland well-placed to work with Shenghe to establish new fully integrated rare earth supply business – full proficiency from mine to separated product

# Kvanefjeld Project

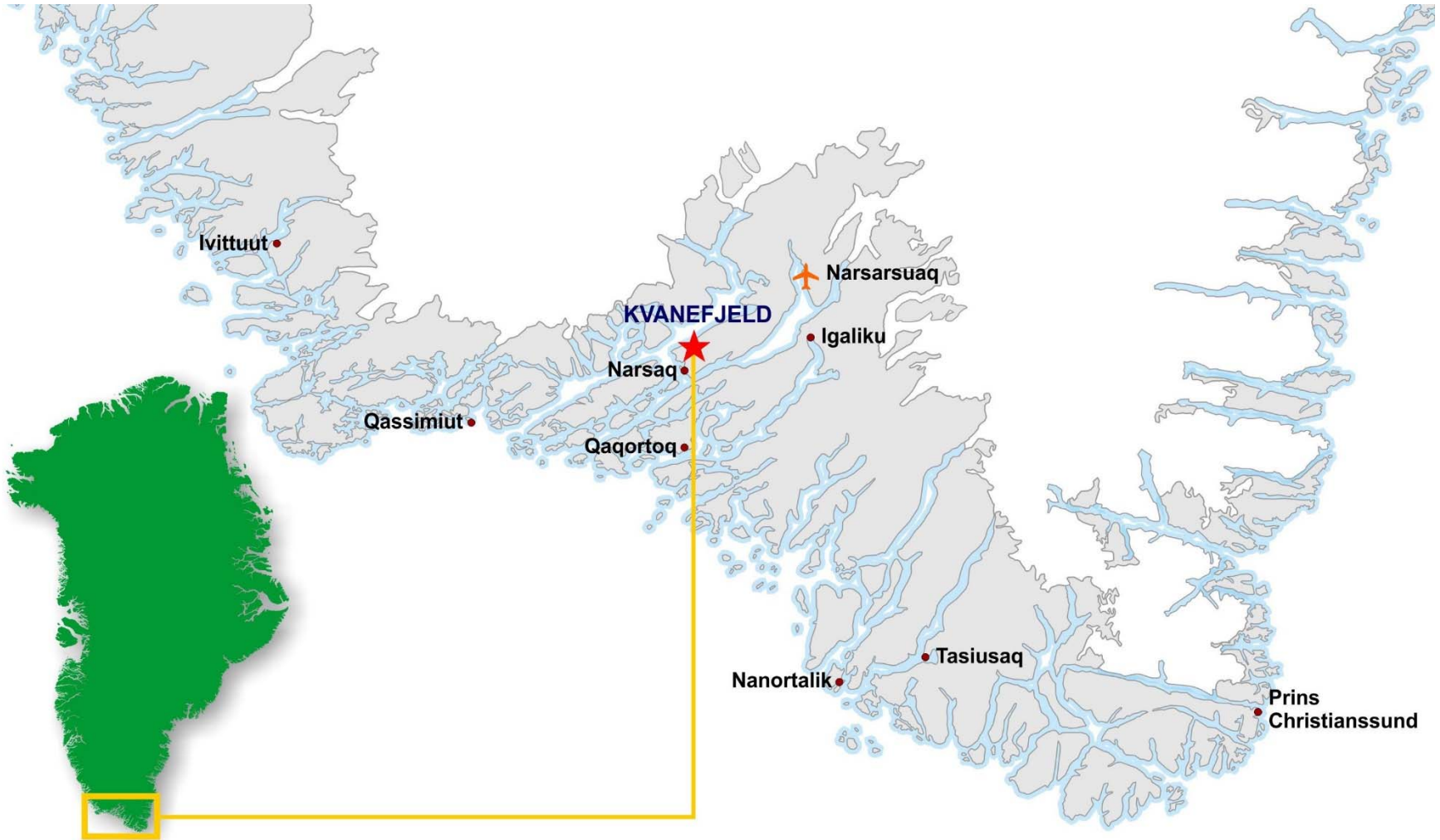
## Start Point of Major New Rare Earth Supply



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- >1 billion tonne multi-element JORC resource, 108 Mt JORC ore reserve
- Initial 37 year mine life, scope for significant extension, expansion
- Close to existing infrastructure with year-round direct shipping access
- Simple configuration and processing, low technical risk
- Globally significant supplier of **Nd, Pr, Dy, Tb**, with U, Zn by-product credits
- Highly competitive economic metrics – long life, lowest cost quartile production
- Optimised by sector leader and major shareholder Shenghe Resources

# Kvanefjeld Project Setting – Southern Greenland



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**Kvanefjeld** is located near existing infrastructure in southern Greenland, with year-round direct shipping access, airport nearby, and a mild climate; an optimal location

# Kvanefjeld Project Setting – Narsaq Valley

- Direct shipping access to a world class ore body provides a major logistical advantage
- New industry and economic growth important to southern Greenland municipality

## Project Components:

- Mine and concentrator (flotation circuit): REE mineral con, zinc con, fluorspar
- Atmospheric acid leach circuit & impurity removal: intermediate REE product, U by-product

### Kvanefjeld Plateau

(670 Mt Resource, 108 Mt Reserve)

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# Rare Earth Value Chain Integration

Greenland Minerals has been engaging China's RE industry groups since 2012

Shenghe – publicly-listed, international growth strategy, rapidly growing (a sector leader/major)

Shenghe studied over 50 international projects, Kvanefjeld selected, alignment in strategy and timing recognised

In 2016, Shenghe invested in Greenland Minerals and commenced collaboration

Successful optimisation, now developing downstream processing strategy, off-take and marketing

Looking to strengthen ties with European Industry - a major new demand centre for REE's



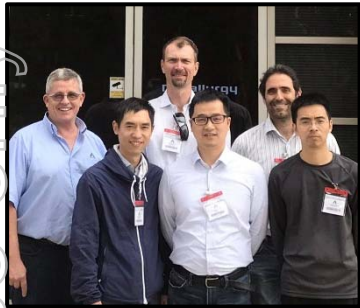
**盛和资源**  
SHENGHE RESOURCES

Shenghe founder Mr Wang Quangen, and John Mair, October 2017 Shenghe HQ, Chengdu

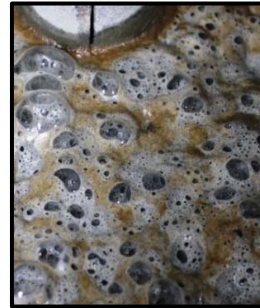
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# Kvanefjeld Project: Optimised With Specialist Guidance



Test work programs conducted in both China and Australia



Flotation improvements generate a higher-grade, low-volume RE mineral concentrate



SHENGHE

TEST WORK

IMPROVEMENTS

FLOTATION

REFINING

Guided by Shenghe, draws on world-leading rare earth processing technology



Major improvements developed to both flotation and refinery circuits



Single stage atmospheric leach circuit (refinery circuit)

RESULTS

**Improved recoveries, 40% reduction in annual operating costs**

**Unit costs of <US\$4/kg of REO, net of by-product credits**

(lowest of undeveloped REE projects in ASX-listed companies)

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A team of leading international engineering firms visited Kvanefjeld in August 2018 for collaborative onsite surveys/studies

**Nuna Logistics, Tetra Tech, PDN Engineers, China-CCC**

Follow-up studies have resulted in a **44% reduction** in civil construction costs to US \$175M – including indirect costs and contingencies

Major reductions in civil construction costs accompany cost reductions achieved through metallurgical optimisation to reduce overall capital costs substantially

# Optimised Feasibility Study - 2019

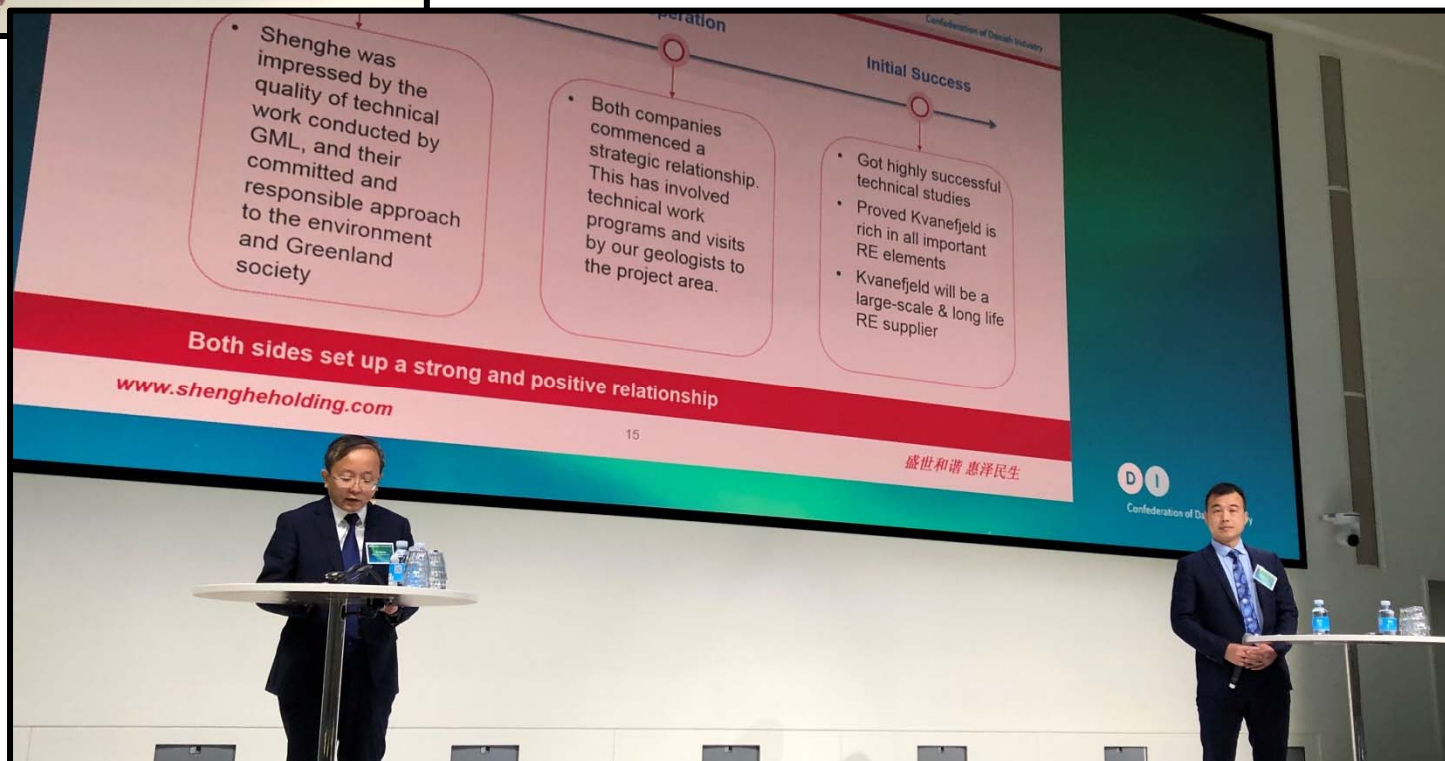
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- ✓ Capital costs reduced to US\$505M (inclusive of 15% contingency on direct and indirect costs)
- ✓ Rare earth production of 32,100t/a REO in intermediate product
- ✓ Inclusive of 5,692 t NdPr oxide, 270 t Dy oxide, 44t Tb oxide
- ✓ Initial 37 year mine life based on 108 Mt ore reserve
- ✓ Simplest flow sheet of emerging RE projects – low technical risk
- ✓ Lowest operating costs and capital intensity of emerging RE projects

# Rare Earth Value Chain Integration – Path to Market



- Shenghe Chairman Mr Hu Zesong presented at the 2019 Confederation of Danish Industry's Greenland Conference
- GML – Shenghe updated Greenland, Danish governments on project status and development strategy
- With technical optimisation complete – focus on commercial development – Europe strategy



Kvanefjeld plateau

## Project Permitting - Review phase nearing completion

### Social Impact Assessment

Reviewed, updated and accepted for public consultation

### Environmental Impact Assessment

Reviewed, additional supporting studies on track for completion in March 2020

## Thorough and rigorous approach to impact assessments:

### Environmental Impact Assessment

GHD (International), Orbicon (Denmark/Greenland), KCB, Arcadis, Danish Hydraulic Institute, Environmental Resource Management, DTU, Blue Water Shipping, Wood Group

### Social Impact Assessment

Shared Resources (International), NIRAS (Denmark)



Kvanefjeld Project is located in Kommune Kujalleq (Southern Greenland Municipality), behind the town of Narsaq



Over 10 years of stakeholder engagement in the local community, including important input into project 'Terms of Reference', approved in 2015



In March 2019 MoU entered with municipality and local business council to negotiate a participation agreement to cover community involvement and capacity development



Stakeholder meetings with specialist consultants and company representatives conducted in June, presentation of impact assessments to municipality

# Strong Foundation Set for Development Success



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- >1 billion tonne multi-element resource, largest REO inventory under JORC code
- Project optimised in conjunction with major shareholder and industry leader
- Highly efficient processing, lowest cost quartile production costs
- Regulatory framework in legislated by Greenland and Danish governments
- Permitting advanced, EIA soon to be finalised (Q1 2020)
- Developing a downstream processing strategy with Shenghe Resources
- Well-positioned for upcoming development window to meet RE demand surge

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# Appendix

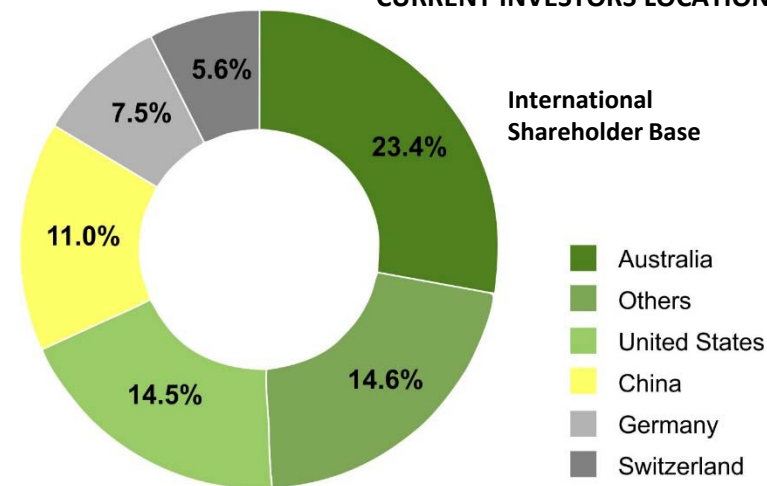


# Corporate Snapshot

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**CURRENT INVESTORS LOCATION**



International Shareholder Base

- Australia
- Others
- United States
- China
- Germany
- Switzerland

## Board

Non-Executive Chairman	Tony Ho
Managing Director	Dr John Mair
Non-Executive Director	Simon Cato
Non-Executive Director	Xiaolei Guo

## Top Shareholders

Shenghe Resources Holdings	125M shares
Tracor Limited	53M shares

## Capital Structure

Shares outstanding	1,190 M
Market capitalization	<b>A\$120M</b> (@10 cents)

## Kvanefjeld Project Ownership - 100%

# Regulatory Framework & Permitting Process

## IAEA Director General visits Kvanefjeld – May 2017



Jakob Rohmann Hard (Chief of Protocol, Foreign Department, Greenland), Liselotte Plesner (Danish Ambassador, Vienna), Nuka Møller (Greenland Business), Jørn Skov Nielsen (Deputy Minister, Industry Trade and Labour, Greenland), Kim Kielsen (Greenland Premier), John Mair (MD, GMEL), Yukiya Amano (Director General, IAEA)

- The Governments of Greenland and Denmark have worked to establish a regulatory framework to manage the production and export of uranium from Greenland
- Enabling legislation passed by both respective parliaments to implement safeguards and export controls in accordance with IAEA and EURATOM
- In September 2016, Greenland formalised status as signatory to IAEA conventions
- Routine site inspection conducted by IAEA in August 2018, with all in good order

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# Statement of Identified Mineral Resources (JORC – Code Compliant 2012)

Cut-off (U <sub>3</sub> O <sub>8</sub> ppm) <sup>1</sup>	Classification	Multi-Element Resources Classification, Tonnage and Grade								Contained Metal				
		M tonnes Mt	TREO <sup>2</sup> ppm	U <sub>3</sub> O <sub>8</sub> ppm	LREO ppm	HREO ppm	REO ppm	Y <sub>2</sub> O <sub>3</sub> ppm	Zn ppm	TREO Mt	HREO Mt	Y <sub>2</sub> O <sub>3</sub> Mt	U <sub>3</sub> O <sub>8</sub> M lbs	Zn Mt
<b><i>Kvanefjeld - February 2015</i></b>														
150	<b>Measured</b>	143	12,100	303	10,700	432	11,100	978	2,370	<b>1.72</b>	0.06	0.14	<b>95</b>	0.34
150	<b>Indicated</b>	308	11,100	253	9,800	411	10,200	899	2,290	<b>3.42</b>	0.13	0.28	<b>172</b>	0.71
150	<b>Inferred</b>	222	10,000	205	8,800	365	9,200	793	2,180	<b>2.22</b>	0.08	0.18	<b>100</b>	0.48
150	<b>Grand Total</b>	673	10,900	248	9,600	400	10,000	881	2,270	<b>7.34</b>	0.27	0.59	<b>368</b>	1.53
200	<b>Measured</b>	111	12,900	341	11,400	454	11,800	1,048	2,460	<b>1.43</b>	0.05	0.12	<b>83</b>	0.27
200	<b>Indicated</b>	172	12,300	318	10,900	416	11,300	970	2,510	<b>2.11</b>	0.07	0.17	<b>120</b>	0.43
200	<b>Inferred</b>	86	10,900	256	9,700	339	10,000	804	2,500	<b>0.94</b>	0.03	0.07	<b>49</b>	0.22
200	<b>Grand Total</b>	368	12,100	310	10,700	409	11,200	955	2,490	<b>4.46</b>	0.15	0.35	<b>252</b>	0.92
250	<b>Measured</b>	93	13,300	363	11,800	474	12,200	1,105	2,480	<b>1.24</b>	0.04	0.10	<b>75</b>	0.23
250	<b>Indicated</b>	134	12,800	345	11,300	437	11,700	1,027	2,520	<b>1.72</b>	0.06	0.14	<b>102</b>	0.34
250	<b>Inferred</b>	34	12,000	306	10,800	356	11,100	869	2,650	<b>0.41</b>	0.01	0.03	<b>23</b>	0.09
250	<b>Grand Total</b>	261	12,900	346	11,400	440	11,800	1,034	2,520	<b>3.37</b>	0.11	0.27	<b>199</b>	0.66
300	<b>Measured</b>	78	13,700	379	12,000	493	12,500	1,153	2,500	<b>1.07</b>	0.04	0.09	<b>65</b>	0.20
300	<b>Indicated</b>	100	13,300	368	11,700	465	12,200	1,095	2,540	<b>1.34</b>	0.05	0.11	<b>82</b>	0.26
300	<b>Inferred</b>	15	13,200	353	11,800	391	12,200	955	2,620	<b>0.20</b>	0.01	0.01	<b>12</b>	0.04
300	<b>Grand Total</b>	194	13,400	371	11,900	471	12,300	1,107	2,530	<b>2.60</b>	0.09	0.21	<b>159</b>	0.49
350	<b>Measured</b>	54	14,100	403	12,400	518	12,900	1,219	2,550	<b>0.76</b>	0.03	0.07	<b>48</b>	0.14
350	<b>Indicated</b>	63	13,900	394	12,200	505	12,700	1,191	2,580	<b>0.87</b>	0.03	0.07	<b>54</b>	0.16
350	<b>Inferred</b>	6	13,900	392	12,500	424	12,900	1,037	2,650	<b>0.09</b>	0.00	0.01	<b>6</b>	0.02
350	<b>Grand Total</b>	122	14,000	398	12,300	506	12,800	1,195	2,570	<b>1.71</b>	0.06	0.15	<b>107</b>	0.31

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		M tonnes Mt	TREO <sup>2</sup> ppm	U <sub>3</sub> O <sub>8</sub> ppm	LREO ppm	HREO ppm	REO ppm	Y <sub>2</sub> O <sub>3</sub> ppm	Zn ppm	TREO Mt	HREO Mt	Y <sub>2</sub> O <sub>3</sub> Mt	U <sub>3</sub> O <sub>8</sub> M lbs	Zn Mt
<b>Sørensen - March 2012</b>														
150	Inferred	242	11,000	304	9,700	398	10,100	895	2,602	<b>2.67</b>	0.10	0.22	<b>162</b>	0.63
200	Inferred	186	11,600	344	10,200	399	10,600	932	2,802	<b>2.15</b>	0.07	0.17	<b>141</b>	0.52
250	Inferred	148	11,800	375	10,500	407	10,900	961	2,932	<b>1.75</b>	0.06	0.14	<b>123</b>	0.43
300	Inferred	119	12,100	400	10,700	414	11,100	983	3,023	<b>1.44</b>	0.05	0.12	<b>105</b>	0.36
350	Inferred	92	12,400	422	11,000	422	11,400	1,004	3,080	<b>1.14</b>	0.04	0.09	<b>85</b>	0.28
<b>Zone 3 - May 2012</b>														
150	Inferred	95	11,600	300	10,200	396	10,600	971	2,768	<b>1.11</b>	0.04	0.09	<b>63</b>	0.26
200	Inferred	89	11,700	310	10,300	400	10,700	989	2,806	<b>1.03</b>	0.04	0.09	<b>60</b>	0.25
250	Inferred	71	11,900	330	10,500	410	10,900	1,026	2,902	<b>0.84</b>	0.03	0.07	<b>51</b>	0.20
300	Inferred	47	12,400	358	10,900	433	11,300	1,087	3,008	<b>0.58</b>	0.02	0.05	<b>37</b>	0.14
350	Inferred	24	13,000	392	11,400	471	11,900	1,184	3,043	<b>0.31</b>	0.01	0.03	<b>21</b>	0.07
<b>Project Total</b>														
150	Measured	143	12,100	303	10,700	432	11,100	978	2,370	<b>1.72</b>	0.06	0.14	<b>95</b>	0.34
150	Indicated	308	11,100	253	9,800	411	10,200	899	2,290	<b>3.42</b>	0.13	0.28	<b>172</b>	0.71
150	Inferred	559	10,700	264	9,400	384	9,800	867	2,463	<b>6.00</b>	0.22	0.49	<b>326</b>	1.38
150	<b>Grand Total</b>	<b>1010</b>	<b>11,000</b>	<b>266</b>	<b>9,700</b>	<b>399</b>	<b>10,100</b>	<b>893</b>	<b>2,397</b>	<b>11.14</b>	<b>0.40</b>	<b>0.90</b>	<b>593</b>	<b>2.42</b>

<sup>1</sup>There is greater coverage of assays for uranium than other elements owing to historic spectral assays. U<sub>3</sub>O<sub>8</sub> has therefore been used to define the cutoff grades to maximise the confidence in the resource calculations.

<sup>2</sup>Total Rare Earth Oxide (TREO) refers to the rare earth elements in the lanthanide series plus yttrium.

Note: Figures quoted may not sum due to rounding.