

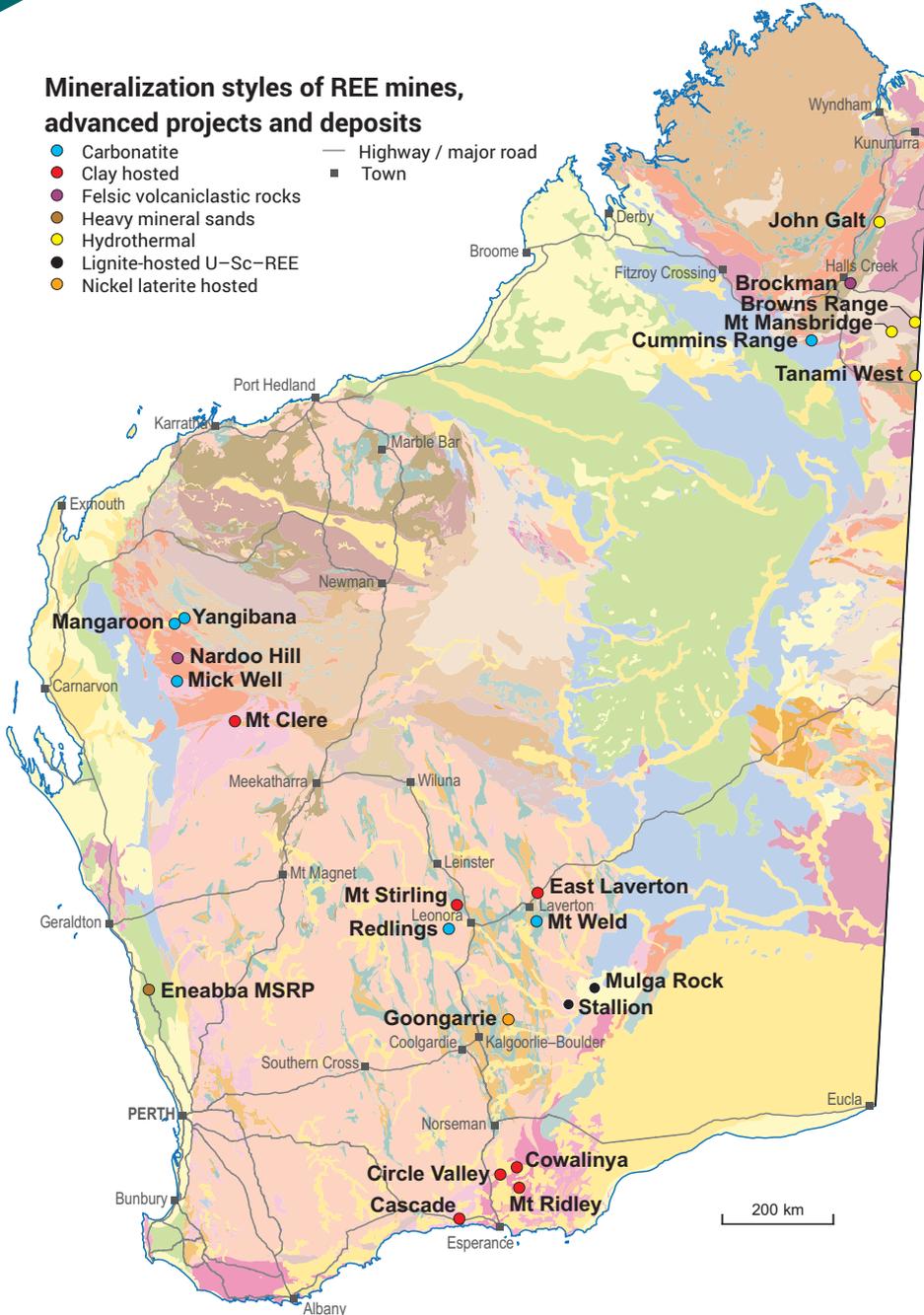
# RARE EARTH ELEMENTS

INVESTMENT OPPORTUNITIES

WORLD-CLASS RESOURCE PROVINCE | SECURE INVESTMENT LOCATION  
WORLD-LEADING GEOSCIENTIFIC DATA | GLOBAL MINING SERVICES INDUSTRY

## Mineralization styles of REE mines, advanced projects and deposits

- Carbonatite
- Clay hosted
- Felsic volcanoclastic rocks
- Heavy mineral sands
- Hydrothermal
- Lignite-hosted U–Sc–REE
- Nickel laterite hosted
- Highway / major road
- Town



## Western Australia is expanding its role in supplying rare earth oxides to the world

### Mining activity

- Lynas Rare Earths Ltd announced an approximately \$500 m project to expand capacity at the Mt Weld mine and concentration plant to meet accelerating market demand for rare earth material
- In April 2022, the Iluka Board approved the Final Investment Decision for a fully integrated rare earths refinery at Eneabba
- Early works continue at Yangibana to produce a rare earth carbonate product. The project has also been approved for a \$140 million loan facility from the Northern Australia Infrastructure Facility (NAIF)

### Advanced exploration

- Browns Range – Northern Minerals and Iluka have reached an agreement to supply rare earth concentrate. Iluka will secure this feedstock for its Eneabba Refinery by funding Northern Minerals to complete a definitive feasibility study for Browns Range, with a final investment decision anticipated in the next 12 months
- Cummins Range – RareX Ltd announced a positive scoping study to produce rare earth and phosphate products

### Exploration

- Western Australia has seen a large increase in exploration for rare earths including the Mangaroon project (Dreadnought Resources), Mt Stirling (Torian Resources), Tanami West project (PVW Resources) and the new mineralization style – ion adsorption clays recently discovered at the Circle Valley (Meeka Metals), Mt Ridley (Mt Ridley Mines), Cascade (Meeka Metals), Cowalinya (HRE Ltd) and Mt Clere projects (Krakatoa Resources)

29 968 t  
Tonnes sold



317  
Full-time employees



\$3591 m†  
Investment projects



4th  
Production world ranking



(2021–22 financial year)

† Includes projects planned, possible, committed or under construction as of September 2022

Government of Western Australia  
Department of Mines, Industry Regulation and Safety

Geological Survey of  
Western Australia



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## REE ranked by contained TREO

Resources estimated according to JORC 2012

Project	Status	Owner	Type	Resources (Mt)	Av. grade* (% TREO)	Contained TREO (kt)	Rare Earth Elements
Mt Weld	Operating	Lynas	regolith, carbonatite	54.70	5.30	2 867	La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y
Coors-Crown		Lynas	regolith, carbonatite	37.70	1.16	437	Ta, Nb
Yangibana	Feasibility	Hastings Technology Metals / Mojito Resources	carbonatite	27.42	0.97	266	La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y
Cummins Range	Scoping	RareX	regolith, carbonatite	18.80	1.15	216	La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y
Brockman	Pre-feasibility	Hastings Technology Metals	trachytic tuff	41.60	0.20	83	La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y
Browns Range	Operating	Northern Minerals	hydrothermal	9.23	0.67	62	La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y
Cowalinya	Exploration	Heavy Rare Earths Ltd	ion-adsorption clay (IAC) deposit	29.00	0.06	18	La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y

Resource estimates have been rounded

\* Total lanthanide rare earth oxides, including yttrium

Abbreviations: LREE, light rare earth elements; HREE, heavy rare earth elements; TREO, total rare earth oxide

Spatial and resource estimates data sourced from WA Mines and Mineral Deposit database (MINEDEX)

### Classification of REE

57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	39
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Y
138.91	140.12	140.91	144.24	(145)	150.36	151.96	157.25	158.93	162.50	164.93	167.26	168.93	173.04	174.97	88.906

## LREE

## HREE

Note: all promethium (Pm) isotopes are radioactive. Therefore, promethium cannot be recovered from mineralized ore

<b>La</b> Lanthanum	<b>Ce</b> Cerium	<b>Pr</b> Praseodymium	<b>Nd</b> Neodymium
<b>Pm</b> Promethium	<b>Sm</b> Samarium	<b>Eu</b> Europium	<b>Gd</b> Gadolinium
<b>Tb</b> Terbium	<b>Dy</b> Dysprosium	<b>Ho</b> Holmium	<b>Er</b> Erbium
<b>Tm</b> Thulium	<b>Yb</b> Ytterbium	<b>Lu</b> Lutetium	<b>Y</b> Yttrium

### REE prospectivity of Western Australia

**Western Australia has great exploration potential for REE in:**

- carbonatite and alkaline to peralkaline ring complexes
- felsic volcanoclastic rocks
- hydrothermal systems
- heavy mineral sands
- sandstone-hosted and lignite-hosted U-REE

**Currently REE are used across the technology, automobile and renewable sectors in:**

- batteries in electric and hybrid cars
- smart phones and computers
- magnets
- pigments and chemical catalysts

#### For more information

MINEDEX is a spatial and textual database of mining and exploration activity

**MINEDEX** [www.dmirs.wa.gov.au/minedex](http://www.dmirs.wa.gov.au/minedex)

GeoVIEW.WA is a free GIS-based spatial viewer

**GeoVIEW.WA** [www.dmirs.wa.gov.au/geoview](http://www.dmirs.wa.gov.au/geoview)

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