

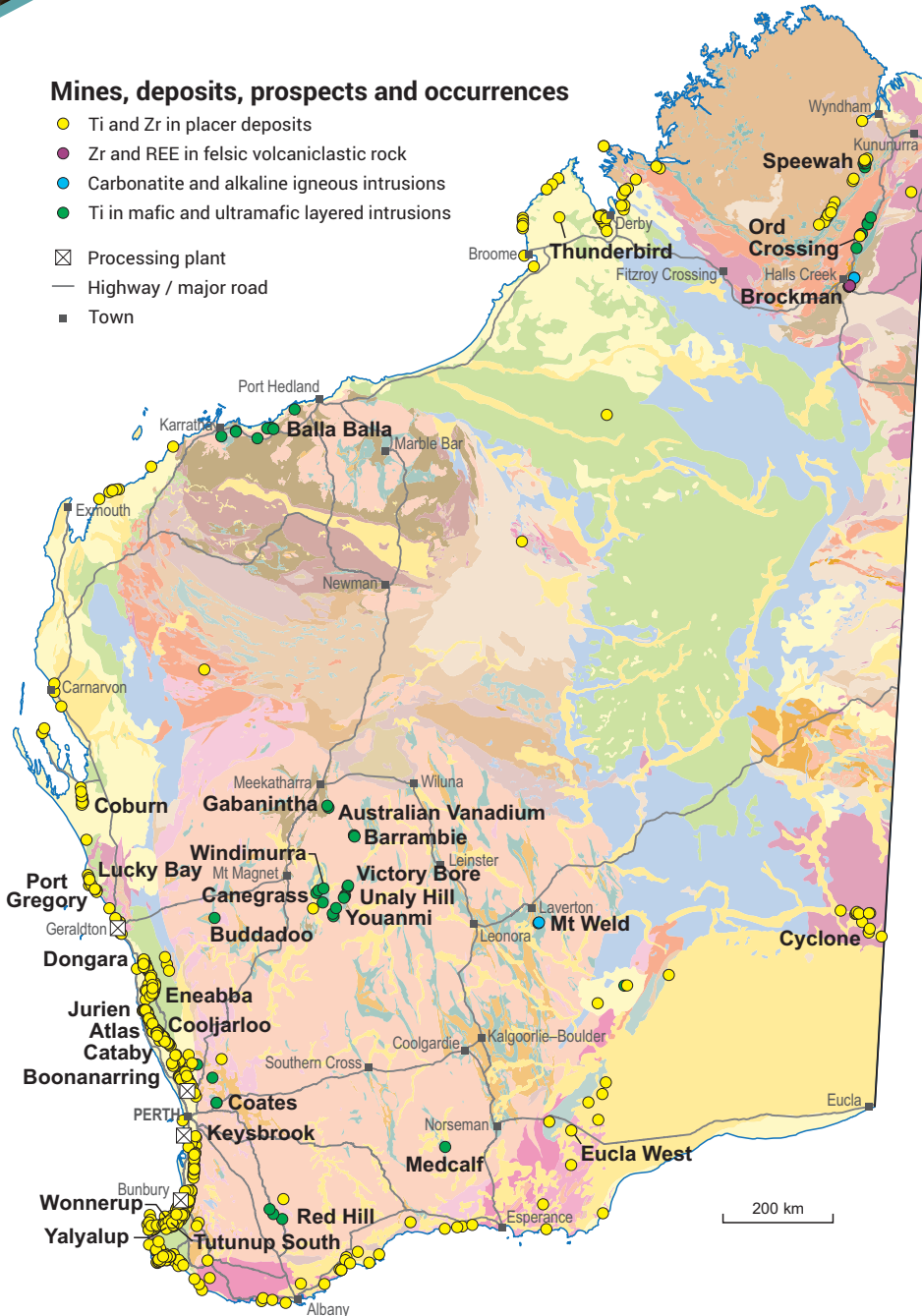
TITANIUM–ZIRCON

INVESTMENT OPPORTUNITIES

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

Mines, deposits, prospects and occurrences

- Ti and Zr in placer deposits
- Zr and REE in felsic volcanoclastic rock
- Carbonatite and alkaline igneous intrusions
- Ti in mafic and ultramafic layered intrusions
- Processing plant
- Highway / major road
- Town



Western Australia is a world-class producer of titanium and zircon from heavy mineral sands

- Western Australia is one of the world's leading suppliers of titanium (from ilmenite, rutile and leucoxene) and zircon
- Heavy mineral exports in 2020–21 were valued at \$1421 million
- Production of the State's titanium minerals is dominated by Iluka Resources, Image Resources, Tronox and Doral

Mining

- Mining activity is focused within the Perth Basin at the Boonanarring (Image Resources), Bunbury (Tronox), Cataby (Iluka), Cooljarloo (Tronox) and Keysbrook (Doral) operations

Recent project activity

- The Thunderbird project is now under development, located east of Broome
- Doral are developing the Yalyalup deposit, located in the southern Perth Basin
- Other developing project include Coburn which is due to start production in 2022
- There is also significant potential for titanium and zircon in layered mafic intrusions and alkaline igneous rocks, which are often associated with other valuable minerals such as vanadium, rare earth elements and platinum group elements

\$139 m (Ti)[#]
\$324 m (Zr)
Sales value

390 555 t (Ti)[#]
221 078 t (Zr)
Tonnes sold

\$1469 m⁺
Exports

1876⁺
Full-time employees

\$1217 m⁺⁺
Investment projects

5.0%
Royalty rate



(2020–21 financial year)

* Note that exports of mineral sands are higher than sales due to the use of refining and export capacity in Western Australia for mineral sands produced outside of the State, as well as exports from projects on minerals to owner land that are not captured in sales data

[†] For all heavy minerals (zircon, ilmenite, rutile, leucoxene and garnet)

[‡] Includes projects planned, possible, committed or under construction as of September 2021

[§] Includes ilmenite, leucoxene and rutile



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

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Selected titanium–zircon resources in heavy mineral sands

Resources estimated according to JORC 2012

Project	Status	Owner	Resources (Mt)	Grade THM (%)	Contained HM (Mt)	Mineral Assemblage Grade (%) ¹				Resource date
						Ilmenite*	Leucoxene*	Rutile*	Zircon	
Thunderbird	Proposed	Sheffield Resources	3230.0	6.9	223.0	28.0	5.8	NA	8.3	30/06/2021
McCalls	Exploration	Sheffield Resources	5800.0	1.4	84.0	79.0	3.1	2.4	4.7	03/10/2018
Perth Basin	Operating	Iluka Resources	989.0	5.6	54.9	56.0	NA	5.0	10.0	31/12/2020
Eucla West [^]	Exploration	Forge Res. / Wild Side / Westover Holdings	470.0	4.6	21.5	NA	NA	NA	NA	06/02/2012
Coburn (Amy)	Proposed	Strandline Resources	1606.0	1.2	19.6	48.0	5.0	7.0	22.0	16/04/2019
Cooljarloo	Operating	Tronox Holdings	476.5	1.8	8.5	61.2	2.3	5.0	10.3	31/12/2018
Dongara	Proposed	Tronox Holdings	175.0	3.6	6.1	48.7	2.8	6.1	10.9	31/12/2018
Dredge	Exploration	Image Resources	293.0	2.0	5.8	62.0	15.0	4.0	8.0	31/03/2021
Eneabba	Exploration	Sheffield Resources	193.3	3.0	5.7	60.0	4.2	6.8	12.0	03/10/2018
Cyclone	Proposed	Diatreme Resources	203.0	2.3	4.7	13.0	32.0	3.0	27.0	27/04/2017
Night Train	Exploration	Sheffield Resources	130.0	3.3	4.2	22.0	46.0	5.4	14.0	31/02/2019
Cooljarloo West	Proposed	Tronox Holdings	211.0	1.8	3.8	NA	NA	NA	NA	31/12/2018
Cooljarloo Northwest	Exploration	Tronox Holdings	141.6	2.1	3.0	NA	NA	NA	NA	31/12/2018
Boonanarring ¹	Operating	Image Resources	30.3	6.0	2.9	46.0	3.6	2.7	20.4	20/12/2019
Governor Broome	Scoping	Astro Resources	58.0	5.0	2.9	NA	NA	NA	NA	30/06/2021
Keysbrook	Operating	Doral	139.0	2.0	2.8	NA	82.1	NA	12.0	30/06/2018
Wonnerup North	Operating	Tronox Holdings	38.7	5.2	2.0	75.6	13.3	NA	9.3	31/12/2018
Atlas	Exploration	Image Resources	18.1	6.1	2.1	46.0	4.0	6.4	9.3	31/12/2020
Yalyalup	Under construction	Doral	21.8	4.8	1.0	NA	NA	NA	NA	31/12/2019
Jack Track	Exploration	Astro Resources	18.8	4.7	0.9	75.0	6.9	2.4	10.8	26/07/2016
Cooljarloo North	Exploration	Image Resources	16.7	5.5	0.9	43.0	12.0	5.7	7.6	31/12/2019

All are JORC 2012 compliant except [^]

* Titanium-bearing mineral

¹ Includes Boonanarring satellite deposits

Abbreviations: NA, not available

Titanium resources in mafic and ultramafic layered intrusions

Project	Status	Owner	Resources (Mt)	Av. grade TiO ₂ (%)	Contained TiO ₂ (Mt)	Resource date
Speewah	Pre-feasibility	King River Resources	4712.0	3.3	156.0	01/04/2019
Balla Balla [^]	Proposed	Todd Corporation	455.9	13.7	63.0	31/07/2009
Barrambie	Proposed	Neometals	280.1	9.2	25.7	17/04/2018
Australian Vanadium Project	Proposed	Australian Vanadium	239.0	8.9	21.2	01/11/2021
Youanmi	Scoping	Venus Metals / Legendre	354.7	6.0	21.3	18/03/2019
Victory Bore	Exploration	Surefire Resources	151.0	6.7	10.2	29/06/2017
Gabanintha	Feasibility	Technology Metals	109.5	10.2	10.1	01/07/2020
Canegrass	Exploration	Flinders Mines	79.0	6.2	4.9	30/01/2018
Unaly Hill	Exploration	Surefire Resources	86.2	4.5	3.9	21/11/2011
Medcalf	Pre-feasibility	Audalia Resources	32.0	9.0	2.9	31/08/2018
Yarrabubba	Exploration	Technology Metals	27.7	9.9	2.7	29/06/2020

[^] Resource estimate is not JORC 2012 compliant

For more information



Geological Survey of
Western Australia

www.dmirs.wa.gov.au/gswa

MINEDEX

www.dmirs.wa.gov.au/minedex

GeoVIEW.WA

www.dmirs.wa.gov.au/geoview

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