

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 leucosene) and zircon
- Heavy mineral exports in 2019 were valued at \$1178 million
- There is also significant potential for titanium and zircon in layered mafic intrusions and alkaline igneous rocks. Resources of these types of rocks are often associated with other valuable minerals such as vanadium, rare earth elements and platinum group elements
- Production of the State's titanium minerals is dominated by Iluka Resources, Tronox and Doral

New mines

- Wonerup North – commissioned June 2019
- Cataby – commissioned June 2019
- Boonanarring – commissioned December 2019

Recent project activity

- Updated titanium and zircon reserves announced for the Wonerup North, Dongara, Cooljarloo and Boonanarring heavy mineral sands projects
- Significant increases in titanium resources for the Gabanintha and Australian Vanadium projects, both associated with vanadium

\$182 m (Ti)*
\$267 m (Zr)
Sales value

579 104 t (Ti)*
168 597 t (Zr)
Tonnes sold

\$1220 m*
Exports

1951*
Full-time employees

\$1113 m*
Investment projects

5.0%
Royalty rate



(2019–20 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, leucosene and garnet)

* Includes projects planned, possible, committed or under construction as of September 2020

* Includes ilmenite, leucosene and rutile



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	31/01/2019
McCalls	Exploration	Sheffield Resources	5800.0	1.4	84.0	79.0	3.1	2.4	4.7	03/10/2018
Perth Basin [†]		Iluka Resources	994.0	5.6	55.6	56.0	NA	5.0	10.0	31/12/2019
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	14/11/2018
Cooljarloo	Operating	Tronox Holdings	476.5	1.8	8.5	61.2	2.3	5.0	10.3	31/12/2018
Governor Broome	Scoping	Astro Resources	214.0	4.1	8.8	59.0	5.0	NK	5.0	26/04/2016
Dongara	Proposed	Tronox Holdings	175.0	3.6	6.1	48.7	2.8	6.1	10.9	31/12/2018
Eneabba	Exploration	Sheffield Resources	193.3	3.0	5.7	60.0	4.2	6.8	12.0	03/10/2018
North Perth Basin – Dredge	Exploration	Image Resources	236.2	2.1	4.9	73.0	2.6	3.2	9.0	31/12/2019
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	Operating	Image Resources	30.3	6.0	2.9	46.0	3.6	2.7	20.4	20/12/2019
Keysbrook	Operating	Doral	139.0	2.0	2.8	NK	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	28/02/2019
Atlas	Exploration	Image Resources	18.1	6.0	1.1	46.1	4.0	6.5	9.3	03/10/2018
Yongarillup	Operating	Doral	9.2	8.9	0.8	68.3	7.4	NA	9.3	31/12/2019

* Titanium-bearing mineral

[†] Remainder of project resource relates to non-operating Eneabba Project

¹ Percentage of contained heavy minerals (HM)

Abbreviations: NK, not known; 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	208.2	9.0	18.8	04/03/2020
Gabarintha	Feasibility	Technology Metals Australia	137.2	10.1	13.9	01/07/2020
Victory Bore	Exploration	Surefire Resources	151.0	6.7	10.2	29/06/2017
Youanmi	Scoping	Venus Metals / Legendre	354.7	6.0	21.3	18/03/2019
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	Feasibility	Audalia Resources	32.0	9.0	2.9	31/08/2018

[^] Resource estimates are 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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