



VANADIUM

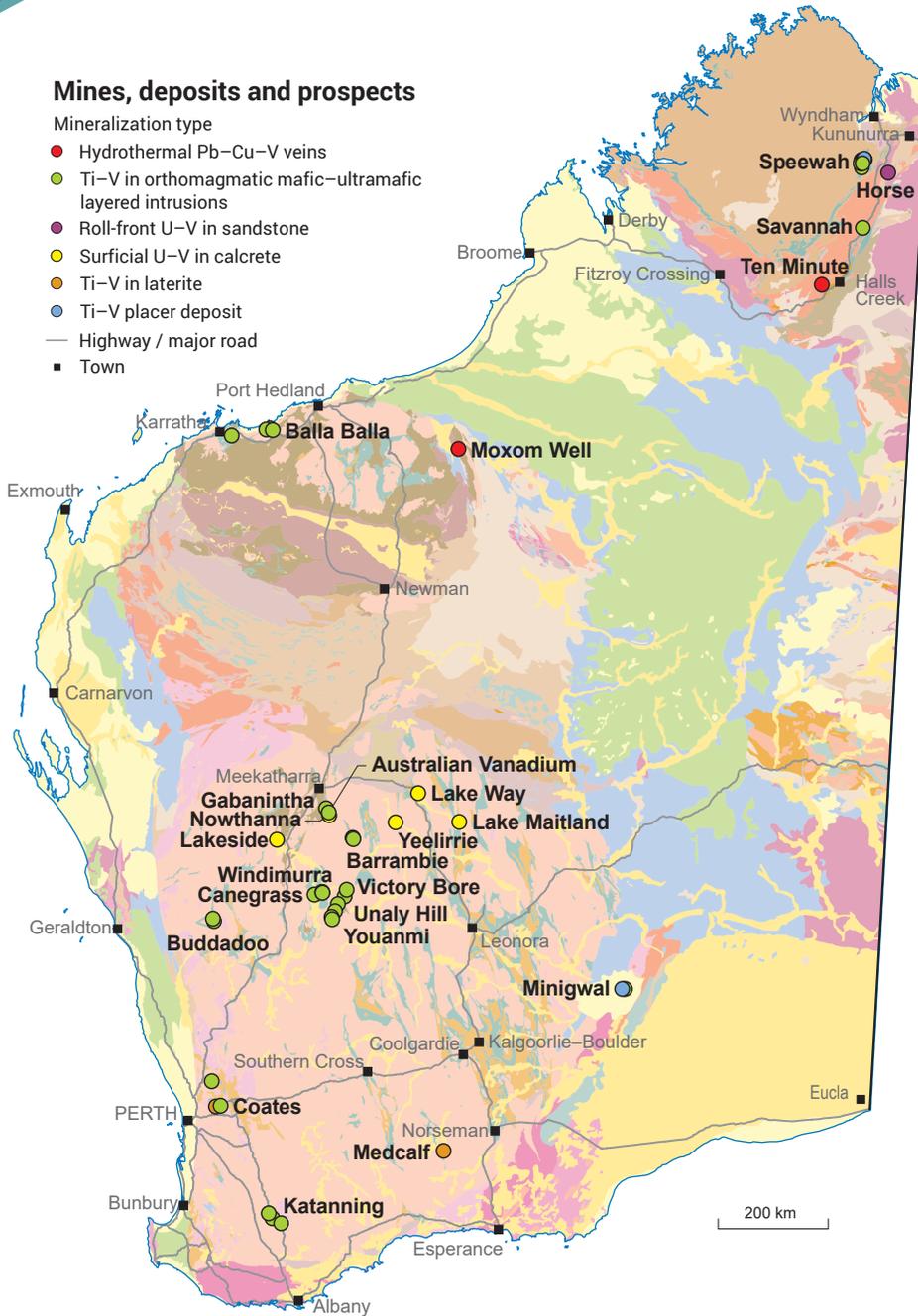
INVESTMENT OPPORTUNITIES

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

Mines, deposits and prospects

Mineralization type

- Hydrothermal Pb-Cu-V veins
- Ti-V in orthomagmatic mafic-ultramafic layered intrusions
- Roll-front U-V in sandstone
- Surficial U-V in calcrete
- Ti-V in laterite
- Ti-V placer deposit
- Highway / major road
- Town



Western Australia continues to grow into a global vanadium hub

- Historical vanadium production since 2000 is 14 100 tonnes of V_2O_5 from the Windimurra mine
- Uses for vanadium are primarily as an alloy to produce high-strength steel. Another emerging application is in redox flow batteries for energy storage uses
- Western Australia has substantial JORC-compliant resources – 24.09 Mt of contained V_2O_5

Seven projects at feasibility/pre-feasibility/scoping stages

Yilgarn Craton

- Windimurra
- Australian Vanadium
- Gabanintha
- Barrambie
- Medcalf

Kimberley Craton

- Speewah

Pilbara Craton

- Balla Balla

\$2523m*
Investment projects



(2018 calendar year)

3rd
Resources world ranking



5.0%
Royalty rate



* Includes projects planned, possible, committed or under construction as of September 2019



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

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Geological Survey of
Western Australia



Top vanadium projects with resources

Resources estimated according to JORC

Project	Status	Owner	Ore V ₂ O ₅ (Mt)	Av. grade V ₂ O ₅ (%)	Contained V ₂ O ₅ (kt)
Speewah	Pre-feasibility study	King River Resources	4712.0	0.30	13 922.4
Balla Balla	Feasibility study	BBI Group Pty Ltd	455.9	0.66	2 987.5
Australian Vanadium project – Gabanintha	Feasibility study	Australian Vanadium Limited	183.7	0.76	1 398.6
Barrambie	Feasibility study	Neometals Ltd	280.1	0.44	1 234.4
Windimurra	Proposed	Atlantic Ltd	234.0	0.49	1 145.5
Gabanintha	Feasibility study	Technology Metals Australia Limited	131.0	0.84	1 101.8
Victory Bore	Exploration	Surefire Resources NL	151.0	0.44	664.4
Youanmi	Exploration	Diversity Resources Pty Ltd / Lithium Australia	185.0	0.33	610.5
Canegrass	Exploration	Bluebird Battery Metals Australia Pty Ltd	79.0	0.64	503.4
Youanmi	Exploration	Venus Metals Corporation	134.7	0.34	459.3

 Ti–V in orthomagmatic mafic–ultramafic layered intrusions

Summary of top vanadium resource projects

- **Windimurra** (Yilgarn): Australia's only vanadium producer between 2000–04 and 2012–14. Established mine with V₂O₅ production facility; feasibility study completed for proposed production restart in 2020 (initial mine life 27 years); reserve of 55.1 Mt at 0.5% V₂O₅
- **Speewah** (Kimberley): Australia's largest vanadiferous titanomagnetite deposit. Metallurgical testwork underway for pre-feasibility study; focus on production of high-purity vanadium electrolyte and titanium dioxide over a project mine life >100 years. The viability of producing high-purity alumina is also under review
- **Balla Balla** (Pilbara): metallurgical testwork (TIVAN process) results from Balla Balla ore; reserve of 229 Mt at 0.62% V₂O₅ (initial mine life 16 years)
- **Gabanintha/Australian Vanadium** (Yilgarn): pre-feasibility work included modelling of vanadium and titanium metal production (mine life >20 years). Possible vanadium–electrolyte pilot plant
- **Gabanintha/Technology Metals** (Yilgarn): pilot plant testwork for definitive feasibility study completed; reserve of 16.7 Mt at 0.96% V₂O₅ (mine life 13 years)
- **Barrambie** (Yilgarn): definitive feasibility study confirms high-purity vanadium pentoxide and ferrovandium potential; plans for pilot-scale metallurgical testwork; reserve of 39.9 Mt at 0.78% V₂O₅ (mine life 20 years)
- **Medcalf** (Yilgarn): lateritic vanadium–titanium over layered sill. Pre-feasibility study supports V₂O₅ and TiO₂ production from Vesuvius, Fuji and Egmont deposits (mine life 12 years)

For more information



Geological Survey of
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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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