Department of Energy, Mines, Industry Regulation and Safety
GOVERNMENT OF WESTERN AUSTRALIA

# MINEDEX — Investor information

Geological Survey of Western Australia

## Western Australia Exploration and Mining Highlights

The project has received a co-funded drilling grant under the Western Australia Government Exploration Incentive Scheme (EIS)

Battery metal
Critical mineral

JULY 2024

### Mines, deposits and prospects

- Iron (Fe)
- Gold (Au), silver (Ag), stibnite (Sbn)
- Alumina (Al), kaolin
- Heavy mineral sands (HMS), silica
- Nickel (Ni), cobalt (Co), platinum (Pt), chromium (Cr)
- Copper (Cu), lead (Pb), zinc (Zn)
- Diamond (DMD), lithium (Li), niobium (Nb), tantalum (Ta), yttrium (Y)
- Vanadium (V), manganese (Mn), titanium (Ti), tungsten (W), molybdenum (Mo)
- Phosphate, potash and salt
- Graphite
- Diamond
- Coal
- Uranium

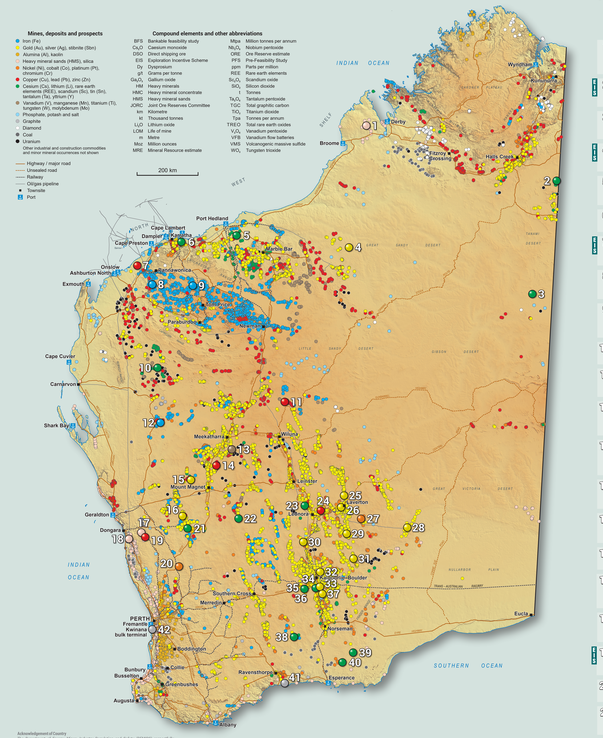
Other industrial and construction commodities and minor mineral occurrences not shown

Highway / major road
Unsealed road
Railway
Origin pipeline
Townsite

### Compound elements and other abbreviations

| | |
|---|---|
| BFS | Bankable feasibility study |
| $CaO$ | Caesium monoxide |
| DSO | Direct shipping ore |
| EIS | Exploration Incentive Scheme |
| Dy | Dysprosium |
| gpt | Grams per tonne |
| $Ga_2O_3$ | Gallium oxide |
| HM | Heavy minerals |
| HMC | Heavy mineral concentrate |
| HMS | Heavy mineral sands |
| JORC | Joint Ore Reserves Committee |
| km | Kilometre |
| kt | Thousand tonnes |
| $Li_2O$ | Lithium oxide |
| LOM | Life of mine |
| m | Metre |
| Mst | Million ounces |
| MRE | Mineral Resource estimate |
| Mtpa | Million tonnes per annum |
| $Nb_2O_5$ | Niobium pentoxide |
| ORE | Ore Reserve estimate |
| PFS | Pre-Feasibility Study |
| ppm | Parts per million |
| REE | Rare earth elements |
| $Sc_2O_3$ | Scandium oxide |
| $SiO_2$ | Silicon dioxide |
| t | Tonnes |
| $Ta_2O_5$ | Tantalum pentoxide |
| TGC | Total graphitic carbon |
| $TiO_2$ | Titanium dioxide |
| Tpa | Tonnes per annum |
| TREO | Total rare earth oxides |
| $V_2O_5$ | Vanadium pentoxide |
| VFS | Vanadium feasibility study |
| VMS | Volcanogenic massive sulfide |
| WO$_3$ | Tungsten trioxide |

200 km




| | | | |
|---|---|---|---|
| 1 | **Thunderbird** HMS Operating | A maiden shipment of ~300 metric tonnes of bagged non-magnetic zircon from the **Thunderbird** mineral sands mine was exported via Port Hedland due to final production commencing at site. An additional bulk shipment of approximately 10 000 metric tonnes of non-magnetic zircon concentrate departed from the Port of Broome. *Sheffield Resources Ltd* | |
| 2 | **Browns Range** Rare earths Exploration | Assay results from the drilling program partially funded by grant monies from the Federal Government's Critical Minerals Development Program at the **Wolverine** deposit comprised intercepts of 15.6 m at 9.99% TREO and 36 m at 3.39% TREO. *Northern Minerals Ltd* | |
| 3 | **West Arunta** Rare earths Exploration | Drilling at West Arunta's **Luni** prospect continued to intersect niobium mineralisation within **Central** and **Eastern** zones with intersections including 34 m at 4.8% $Nb_2O_5$ and 72 m at 1% $Nb_2O_5$. A maiden Inferred MRE comprised 200 Mt at 1% $Nb_2O_5$ with a high-grade subset of 53 Mt at 2.1% $Nb_2O_5$. *WA1 Resources Ltd* | |
| 4 | **Minyari Dome** Gold Operating | EIS diamond drilling at **GEO-01** returned 27 m at 0.7 g/t Au, 23 m at 0.8 g/t Au and 0.02% Cu, and at **Tetris** target results included 6.7 m at 0.54% Zn, 0.12% Pb, and 1.0 g/t Ag. Further drilling at **GEO-01** intersected thick, near-surface gold and copper intervals of up to 66 m at 1.4 g/t Au and 0.04% Cu. *Antipa Minerals Ltd* | |
| 5 | **Tabba Tabba – Strelley** Lithium Exploration | Drilling at the **Tabba Tabba** project, targeting the 2.2 km long **Leia** pegmatite, intersected 119.2 m at 1% $Li_2O$ and 105.3 m at 1.1% $Li_2O$. *Discovery of a new zone named 'Luke' was reported returning assays of 41 m at 1% $Li_2O$. Wildcat Resources Ltd* | |
| 6 | **Andover** Lithium Exploration | Drilling around the **Andover** lithium project's **Target Area 3** intersected mineralisation, with intercepts including 102.5 m at 1% $Li_2O$ (**AP0004** pegmatite), 47.1 m at 1.27% $Li_2O$ (**AP0002** pegmatite) and 112.9 m at 1.63% $Li_2O$ (**AP0011** pegmatite). *Azure Minerals Ltd* | |
| 7 | **Onslow Copper-Gold** Copper–gold Pre-Feasibility | A high-grade silver result of 1 m at 1060 g/t Ag, 0.23% Cu and 0.99% WO$_3$ was intersected within a broader geological zone of 6 m at 179 g/t Ag from an EIS drillhole at the **CT3** prospect. *Terra Metals Ltd* | |
| 8 | **West Pilbara – Red Hill** Iron Operating | The **Onslow Iron** project delivered first ore on ship, ahead of schedule, comprising 113 000 wet metric tonnes of 58.5% Fe fines, mined from West Pilbara Red Hill Iron Ore JV, for delivery to China Baowu Steel Group. *Mineral Resources Ltd* | |
| 9 | **Pilbara Iron** Iron Pre-Feasibility | A PFS was completed for the **Blacksmith** iron ore project (including **Delta**, **Paragon**, **Blackjack** and **Champion** deposits) demonstrating the economic viability of a 5 Mtpa DSO operation with a 23-year LOM and product grade of 60.5% Fe. At Delta, the maiden ORE comprised 46 Mt at 61.5% Fe and the MRE was updated to 86.3 Mt at 60.1% Fe with a cut-off grade of 57.5% Fe. *Red Hawk Mining Ltd* | |
| 10 | **Yinnetharra** Lithium Exploration | Assay results from drilling at the **Yinnetharra** project intersected 94 m at 0.94% $Li_2O$ at the **M1** deposit, 30 m at 1.9% $Li_2O$ at the **M36** deposit, 17 m at 1.2% $Li_2O$ at the **M47** deposit and 18 m at 1.5% $Li_2O$ at **Jameson** prospect. *Delta Lithium Ltd* | |
| 11 | **Earaheedy** Zinc–lead–silver Exploration | Results for high-grade Zn–Pb sulfide intersections in exploration drilling in both the updip position of, and 350 m along strike to, the northwest of the original **Matu** discovery were announced. Results include 12 m at 6.07% Zn + Pb and 19 m at 4.23% Zn + Pb. *Rumble Resources Ltd* | |
| 12 | **Byro Magnetite** Iron Scoping | A scoping study for the **FE1** deposit at the **Byro** magnetite project was completed, the project is economically robust, underpinned by a MRE of 29.3 Mt at 24.7% Fe and a production target of 16.96 Mt at 26.1% Fe. Based on a potential 2.4 Mtpa processing rate and a 0.72 Mtpa magnetite concentrate production target, the project could support an 8-year LOM. *Athena Resources Ltd* | |
| 13 | **Australian Vanadium** Vanadium + titanium Scoping | Australian Vanadium Limited announced the successful commissioning of its vanadium electrolyte manufacturing facility with the production of its first high purity vanadium electrolyte, ready for use in VFBs. The capability to produce greater than 99.9% ultra-high purity $V_2O_5$ was also demonstrated at pilot-scale using ore from the Australian Vanadium sites. *Australian Vanadium Ltd* | |
| 14 | **Hollandaire–Eelya** Copper–gold–zinc Exploration | A high-grade copper discovery at the **Hexler** prospect had assay results including 15 m at 3.26% Cu, 0.7 g/t Au, 7.4 g/t Ag and 151 ppm Co. *Cygnum Metals Ltd* | |
| 15 | **Dalgaranga–Gilbey** Gold Feasibility | Substantial high-grade results were returned from the **Never Never** deposit including 170 m at 4.13 g/t Au, 30.79 m at 12.12 g/t Au and 3 m at 52.02 g/t Au. Drilling intersected a new high-grade discovery, **Pepper** prospect, under the current **Gilbeys** openpit. Results include 9.22 m at 27.89 g/t Au and 30.79 m at 12.12 g/t Au. *Spartan Resources Ltd* | |
| 16 | **Golden Range** Gold Exploration | Gold mineralisation was intersected at the **Ricciardo** deposit, including the **Ardmore** and **Silverstone** pits, demonstrating the high-grade nature of the area with a current strike length of 2 500 m. Results include 32 m at 3.59 g/t Au. *Warrietor Resources Ltd* | |
| 17 | **Yandanooka** HMS Pre-Feasibility | The results of a PFS were announced along with an updated MRE and a maiden ORE for the **Yandanooka** HMS project. The study proposes an 8.2-year LOM with a total HMC 1.04 Mt. The maiden ORE comprised 30 Mt Probable Ore Reserves at 3.9% HM with assemblage of 14% zircon, 3.3% rutile, 27% leucoxene, 46% ilmenite and 0.19% monazite. *Image Resources NL* | |
| 18 | **Arrowsmith North** Silica sand Feasibility | Updated BFS for the **Arrowsmith North** silica sand project, confirmed robust project economic metrics potentially supplying up to four silica sand products with a Proved and Probable Ore Reserve of 221 Mt at 99.6% $SiO_2$, and a potential LOM in excess of 100 years. *VRX Silica Ltd* | |
| 19 | **Pittield** Copper–titanium–Gold Exploration | Higher grades of $TiO_2$ mineralisation were confirmed in the near- surface, highly weathered sandstone, creating a new, discreet high-grade saprolite-hosted deposit at the **Cosgrove** and **Thomas** prospects with significant intercepts including 154 m at 6.76% $TiO_2$and 142 m at 6.05% $TiO_2$. *Empire Metals Ltd* | |
| 20 | **Melrose** Nickel Exploration | First pass aircore drilling of magnetic and geochemical targets at the **Melrose** project confirmed nickel mineralisation in the weathered zone above the ultramafic assemblage. The best intercepts included 11 m at 0.7% Ni and 12 m at 1% Ni. *Cauldron Energy Ltd* | |
| 21 | **Smokebush** Rare earths + gallium Exploration | REE and $Ga_2O_3$results were reported from aircore drilling at the **Larin's Lane** prospect. The REE results include 9 m at 1095.23 ppm TREO and 13 m at 1069 ppm TREO, while the gallium results include 20 m at 48.33 g/t $Ga_2O_3$ and 16 m at 53.74 ppm $Ga_2O_3$. *The gallium sits within clay regolith layers above the REE mineralisation. Terrain Minerals Ltd* | |
| 22 | **Youanmi** Lithium Exploration | Drilling at the **Deep South** prospect tested outcropping pegmatites at **East Zone** and **North Zone.** Drilling intersected significant zones of mineralised LCT pegmatites, with the best assays returned including 24 m at 1.71% $Li_2O$. *Venus Metals Corporation Ltd* | |
| 23 | **Mount Stirling REE** Rare earths Exploration | A maiden MRE was announced for the **Yttria** REE deposit at **Mount Stirling.** The MRE of 15 Mt at 490 ppm TREO with 67% $Sc_2O_3$ covers only the first 2 km of strike at the **Yttria** REE deposit. *Asra Minerals Ltd* | |
| 24 | **Cardinia Base Metals** Zinc–copper–lead Exploration | High-grade VMS-type mineralisation was discovered at the **Albus** prospect at **Cardinia East**, with drill samples from the prospective VMS horizon returning results of 5.7 m at 5.3% Zn, 0.34% Cu, 0.3% Pb, 40 ppm Ag and 1 ppm Au. *Kin Mining NL* | |
| 25 | **Cork Tree Well – Delta** Gold Scoping | Drilling results from the **Cork Tree Well** deposit includes 27 m at 17.8g/t Au with bonanza-grade gold assays of up to 1028.9 g/t Au, substantiated by numerous observations of visible gold. *Brightstar Resources Ltd* | |
| 26 | **Lady Julie** Gold Pre-Feasibility | Results of a PFS for the **Lady Julie** project show a technically and financially robust project with an initial five year LOM focusing on mining of **Lady Julie North 4**, **Lady Julie Central** and **Hawks Nest 9**. The MRE for the **Lady Julie** and **Ironsword** deposit deposits were updated to 24.9 Mt at 1.66 g/t Au totalling 1.33 Moz of gold. Recent drill intersections from the **Lady Julie North 4** includes 23 m at 6.29 g/t Au. *Magnetic Resources NL* | |
| 27 | **Coglia** Nickel + cobalt Exploration | The MRE for the **Coglia** deposit was updated to 102.8 Mt at 0.6% Ni and 370 ppm Co, containing 614 kt of nickel and 37.7 kt of cobalt. The update represents a 30% increase in total nickel tonnes with over 23 Mt now included in the indicated category. A Scoping Study based on only 32.3 Mt of the global resource, and a conservative leach recovery of 50%, indicated an initial 10-year LOM resulting in recovery of 94.7 kt nickel and 9.3 kt cobalt. *Panther Metals Ltd* | |
| 28 | **Tropicana** Gold Operating | The MRE for the **Tropicana** project was updated to 100.5 Mt at 1.85 g/tAu for 5.9 Moz and ORE were updated to 46.3 Mt at 1.9 g/t Au for 2.3 Moz. Further, thick intersections of up to 49 m at 2.6 g/t Au were reported from the **Boston Shaker** underground mine. *AngloGold Ashanti Plc / Regis Resources Ltd* | |
| 29 | **Mt Celia – Kangaroo Bore** Gold Operating | Legacy Iron Ore announced that first gold from the **Blue Peter** mine was produced, and the maiden ore sale completed in March 2024. *Legacy Iron Ore Ltd* | |
| 30 | **Menzies** Gold Operating | Maiden gold pour marked the first gold from the **Selkirk** joint venture at the **Menzies Gold** project. High-grade results were received from the **Link Zone**, with up to 54.77 g/t Au intersected at the **Merrylaan Deposit**. *Brightstar Resources Ltd* | |
| 31 | **Kirgella–Pinjin** Gold Exploration | Thick gold zones were intersected at the **Kirgella Gift** prospect, with assay results including 35 m at 1.15 g/t Au and 45 m at 2.36 g/t Au defining three gold lodes, and at the **Providence** prospect, including 45 m at 0.52 g/t Au and 23 m at 1.06 g/t Au, defining two gold lodes. Thick gold intercepts of up to 28 m at 1.27 g/t Au were also intersected from initial drilling at the **Wessex** prospect. *Kalgoorlie Gold Mining Ltd* | |
| 32 | **Kanowna – Golden Valley** Gold Operating | High-grade drilling results for the **Red Hill** deposit include 136 m at 1.8 g/t Au and 83 m at 2.3 g/t Au. The MRE for the deposit was updated to 49.9 Mt at 1.2 g/t for 1.9 Moz (up from 32.4 Mt for 1.1 Moz) while a maiden ORE of 15.9 Mt at 1.1 g/t for 0.6 Moz was reported. *Northern Star Resources Ltd* | |
| 33 | **South Kalgoorlie Operations** Gold Operating | High-grade assay results from drilling at the **Hampton–Boulder** (**HBJ**) underground included 144 m at 3.4 g/t Au, 37.4 m at 6.1 g/t Au, and 25 m at 7.5 g/t Au. The updated MRE now totals 111.905 Mt at 2.1 g/t Au for 7.469 Moz Au, and the ORE is 24.122 Mt at 2 g/t Au for 1.546 Moz Au. *Northern Star Resources Ltd* | |
| 34 | **Mt Marion** Lithium Operating | The MRE for the **Mt Marion** underground mine increased 111% to 19.3 Mt at 1.22% $Li_2O$. The global MRE for the openpit and underground now totals 61.1 Mt at 1.36 % $Li_2O$, including 54.7 Mt at 1.4 % $Li_2O$ in the Inferred category. *Mineral Resources Ltd* | |
| 35 | **Kangaroo Hills** Lithium Exploration | Drilling at the northern extension of **Big Red** and additional resistivity targets intersected 31 m at 1.19% $Li_2O$ and 12 m at 1.02% $Li_2O$. Additional step-out drilling 200 m north of **Big Red Extension** intersected a new pegmatite zone named **Potoroo** with intercepts of 14 m at 1.04% $Li_2O$ and 8 m at 0.51% $Li_2O$. *Future Battery Minerals Ltd* | |
| 36 | **Lepidolite Hill** Lithium Exploration | Initial assay results from the maiden drilling at **Lepidolite Hill** project returned 11 m at 2.63% $Li_2O$ and 401 ppm $Ta_2O_5$, and 13 m at 1.47% $Li_2O$ and 1.23% $Cs_2O$, highlighting lithium mineralisation may extend over 1 km of strike. *Eastern Resources Ltd* | |
| 37 | **Kambalda Gold** Gold Operating | Drilling results from the **Beta Hunt** underground gold mine within the **Fletcher South** zone include 33 m at 3.8 g/t Au, and the best grade × length results to date from the **Fletcher Zone** of 14.5 m at 17.3 g/t Au. *Westgold Resources Ltd* | |
| 38 | **Lake Johnston** Lithium Exploration | Drilling at the **Burmeister** prospect intersected mineralisation returning significant assays including 20 m at 1.38% $Li_2O$ and 23.5 m at .52% $Li_2O$. The *Burmeister* prospect occurs in several lodes over a strike length of ~1500 m. *TG Metals Ltd* | |
| 39 | **Salazar** Rare earths Exploration | Maiden MRE for scandium was reported from the **Newmont** deposit in the **Salazar** project. The estimate is for an Inferred MRE of 103 ppm Sc. Additional test work showed scandium leach recovery up to 81.2% at atmospheric pressure. *West Cobar Metals Ltd* | |
| 40 | **Mount Ridley** Rare earths Exploration | A maiden Inferred MRE of 168 Mt at 1201 ppm TREO was reported for the **Mia** prospect in the **Mount Ridley** clay-hosted REE project. *Mount Ridley Mines Ltd* | |
| 41 | **Springdale** Graphite Scoping | Key findings from the **Springdale–Collie** Integrated Mine to Market Scoping Study proposes a 15-year operation, with the **Springdale** concentrator throughput of 500 000 tpa for an average feed grade of 9.5% TGC with an average concentrate production of 45 000 tpa and waste to ore ratio 4.3 to 1. The new micronising plant at Collie was also successfully commissioned and a A$ 6.5 million grant was awarded by the Government of Western Australia for Australia's first downstream graphite plant at Collie. *International Graphite Ltd* | |
| 42 | **Kwinana EcoGraf** Graphite Scoping | EcoGraf Limited announced the commissioning of their product qualification facility in **Kwinana**, Western Australia with commencement of operations in April 2024. The facility is jointly funded through the Commonwealth Government's A$48.9 million Critical Minerals Development Program. *EcoGraf Ltd* | |

Commodity flyer

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## Critical minerals mines and deposits in Western Australia

Mine (**operating**, feasibility or *care and maintenance*)
Deposit (scoping, **pre-feasibility**, **feasibility**)
Deposit
Graphite
High-purity alumina (HPA)
Lithium (Li)
Manganese (Mn)
Nickel (Ni)
Nickel (Ni), cobalt (Co)
Rare earth elements (REE)
Vanadium (V)

Town
Highway / major road
Port, operating

200 km

Acknowledgement of Country
The Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) respectfully acknowledges the Traditional Custodians throughout Western Australia and their continuing connection to the land, waters and community. We pay our respect to Elders both past and present, and acknowledge the value brought to our department through the collective contributions of Aboriginal and Torres Strait Islander peoples across Western Australia.


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