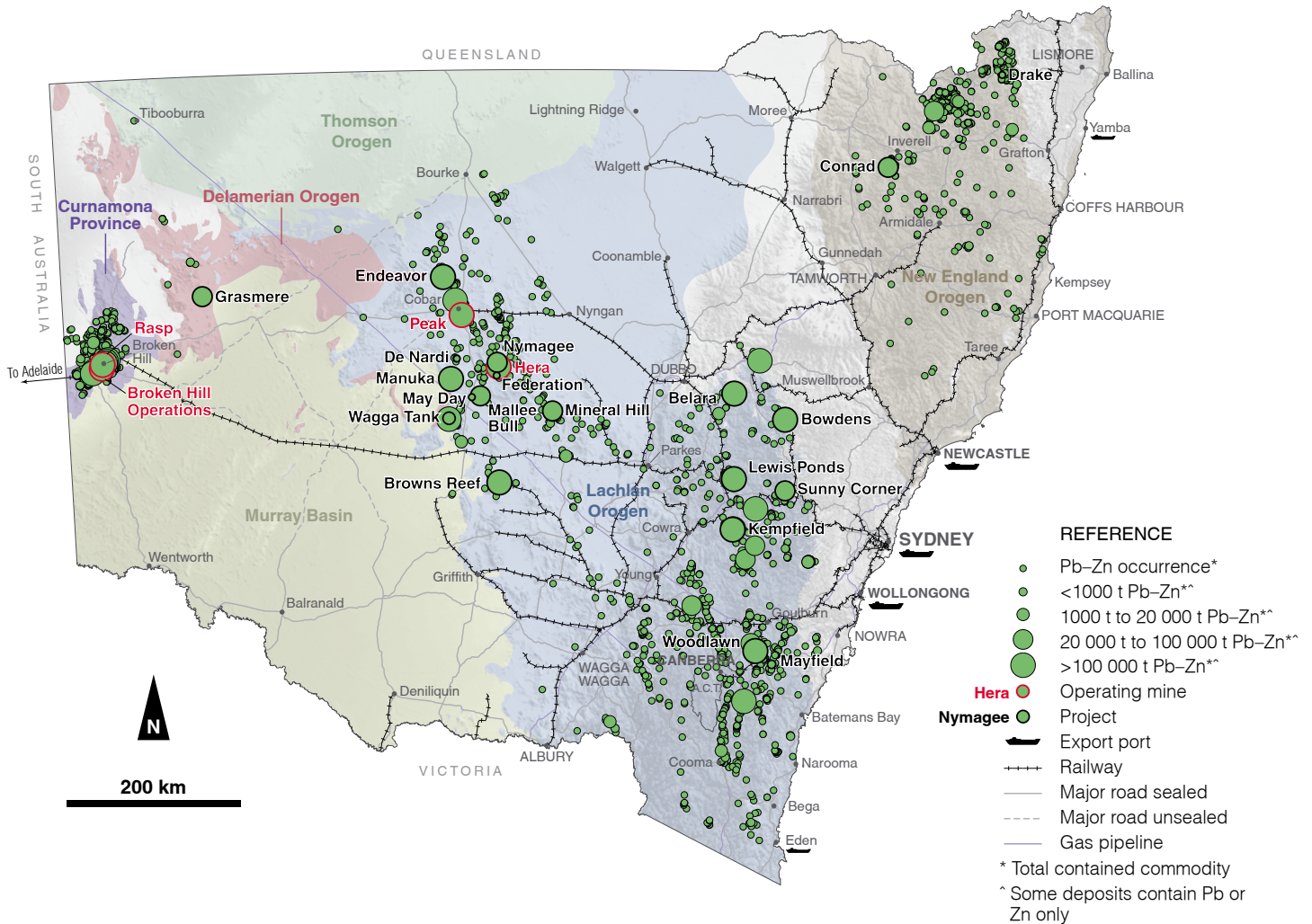


Lead and zinc

Opportunities in New South Wales, Australia

Pb-Zn

DECEMBER 2021



Overview

- New South Wales (NSW) is a major producer of lead and zinc and home of the iconic Broken Hill Line of Lode. Other major deposits include the Woodlawn and Endeavor deposits.
- The total endowment identified in NSW is >26.9 Mt of lead and >31.3 Mt of zinc (past production and identified resources).
- Excellent opportunities exist for the discovery of major new deposits and for development of existing resources.

Deposit types

NSW hosts a range of deposit styles hosted by a variety of tectonic settings where Pb and Zn are produced as the primary commodity (e.g. Broken Hill, Endeavor) with Ag, Au and Cu. Some of the zinc-rich deposits also have significant indium.

Deposit types in NSW include:

- Broken Hill Type (BHT) world-class Pb-Zn deposits including Broken Hill Operations and Rasp mine.
- Volcanic-Associated Massive Sulfide (VAMS) including Woodlawn, Lewis Ponds and many others.
- Sediment-Hosted Massive Sulfide or SHMS (SEDEX), Pb-Zn systems include the world-class Endeavor base metal (Pb-Zn-Ag) mine, located in the northwestern Cobar Basin.
- Carbonate-hosted (Mississippi Valley Type (MVT)) deposits in NSW include the large Manuka Ag-Pb and De Nardi Pb-Zn deposits.
- Orogenic base-metal deposits can be large, often high grade and are vertically extensive (e.g. Browns Reef).
- Epithermal deposits including intermediate sulfidation epithermal systems commonly have significant Pb-Zn, Au and Ag. Examples include Mineral Hill (Au-Cu-Pb-Zn-Ag) which includes several high-grade zones, Bowdens (Ag-Pb) and Red Rock (Au-Ag) in the Drake district.



- Intrusion-related and skarn deposits are commonly polymetallic and include a range of precious, base and specialty metals such as Ag, Au, Sn and In. Several important Cobar-style deposits have recently been re-interpreted as intrusion-related (e.g. Peak and CSA). Other key examples include the polymetallic Conrad lode system and a number of zinc-lead skarns such as Mayfield.

Prospective terranes

The Curnamona Craton

This craton hosts the world-famous Broken Hill Line of Lode (Broken Hill Operations, Rasp) and Pinnacles Ag-Pb-Zn mine. Many of the deposits in this area are BHT deposits although there is also potential for SHMS (SEDEX)-type in areas away from the Line of Lode, including under cover.

The Lachlan Orogen

The Ordovician to Carboniferous Lachlan Orogen is remarkably prospective for Pb and Zn. Recent exploration has largely focussed on the large Cu and Au systems, however the region is host to many significant VAMS and SHMS (SEDEX)-type deposits. Many prospective areas (e.g. the Cobar Basin) are under shallow cover and have not been subjected to modern exploration techniques such as airborne electromagnetic surveys.

Key exploration targets include:

- Silurian to Devonian marine basins (e.g. the Hill End Trough and Goulburn Basin) for VAMS-type deposits such as Woodlawn and Lewis Ponds.
- The eastern margin of Cobar Basin-Rast Trough. Deep drilling beneath known mineralisation has consistently met with exploration success for structurally controlled deposits which are now thought to be intrusion-related.
- Turbidite-hosted and carbonate-hosted base-metal-silver deposits of the western Cobar Basin. These include the Endeavor mine (SHMS (SEDEX)) and the Manuka deposit (carbonate-hosted).
- Epithermal systems associated with shallow submarine to subaerial volcanism of Silurian to Permian age (e.g. Carbelligo-Mineral Hill Belt and Eden-Comerong-Yalwal rift zone).

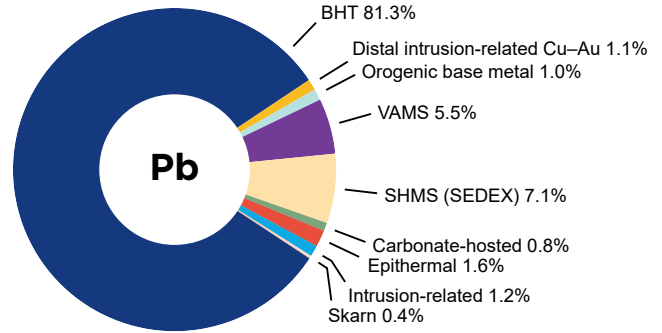
New England Orogen

The Devonian to Triassic New England Orogen is under-explored by Australian standards. The orogen is host to many intrusion-related systems with significant Pb and Zn (e.g. Conrad) as well as intermediate sulfidation epithermal systems (Drake). The potential for VAMS deposits remains largely untested.

Total endowment (past production + resources) for NSW, classified by deposit type

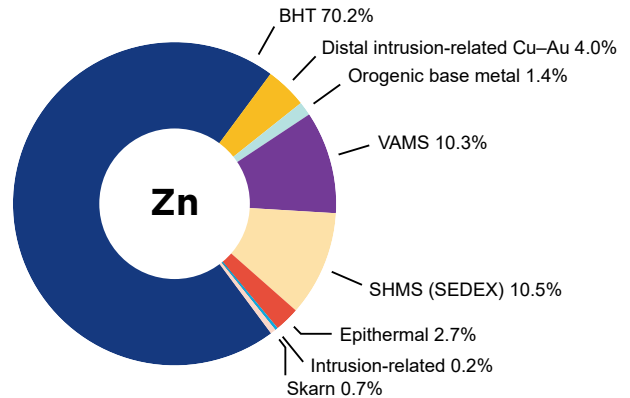
Lead

Total endowment >26.9 Mt; current resources >5.6 Mt



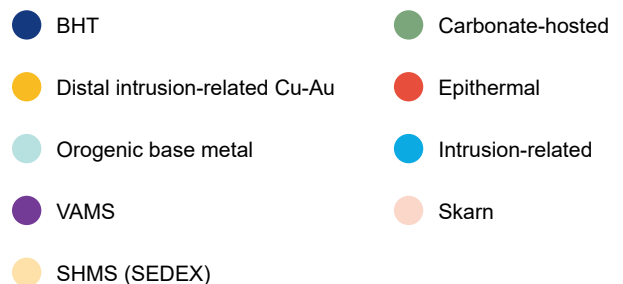
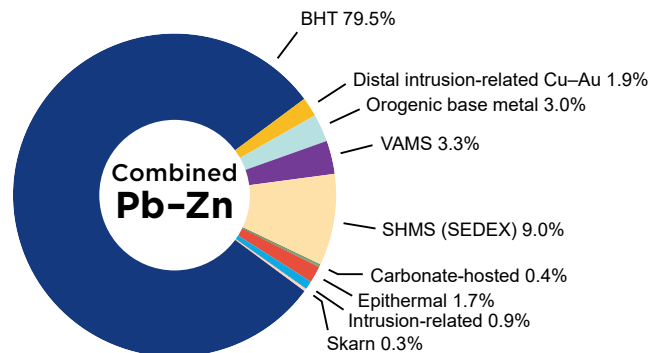
Zinc

Total endowment >31.3 Mt; current resources >8.4 Mt



Combined lead and zinc

Total endowment >58.2 Mt; current resources >14 Mt



Summary of significant lead and zinc resources within NSW

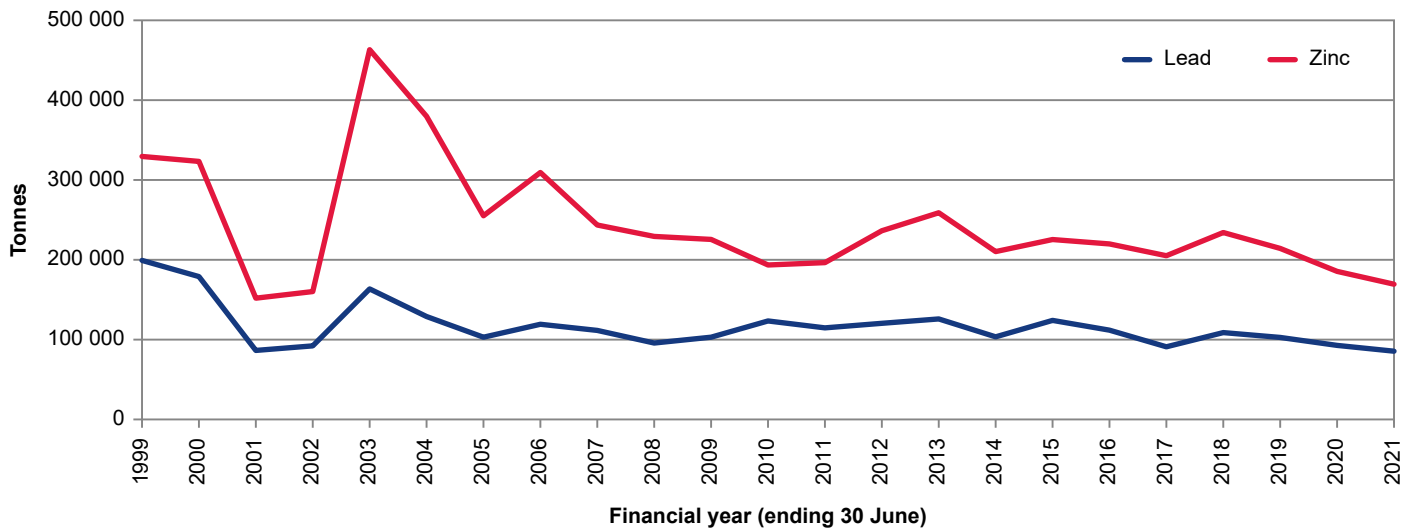
	Mine name Deposit type	Current resources and reserves (JORC)	Contained lead ('000 t)	Contained zinc ('000 t)
M I N E S	Broken Hill Operations BHT	Southern Operations: (total resources) 11.7 Mt @ 9.3% Zn, 6.8% Pb, 72 g/t Ag Southern Operations: (proved & probable) 11.7 Mt @ 6.2% Zn, 4.8% Pb, 89 g/t Ag Central Blocks: (inferred) 0.7 Mt @ 5% Zn, 4% Pb, 43 g/t Ag North Mine Upper: (total resources) 1.0 Mt @ 7% Zn, 9% Pb, 140 g/t Ag North Mine Deeps: (measured & indicated) 3.3 Mt @ 11.5 Zn, 13.8 % Pb, 224.4 g/t Ag Potosi: (inferred) 1.6 Mt @ 14% Zn, 3% Pb, 46 g/t Ag Silver Peak: (inferred) 0.4 Mt @ 5% Zn, 9% Pb, 77 g/t Ag Flying Doctor: (indicated & inferred) 1.5 Mt @ 3% Zn, 4% Pb, 44 g/t Ag	1,513	1,862
	Hera Skarn	(total resources) 1.7 Mt @ 1.8 g/t Au, 2.3% Pb, 3.5% Zn, 25 g/t Ag (total reserves) 0.94 Mt @ 1.4 g/t Au, 2.6% Pb, 4.1% Zn, 32 g/t Ag	39	60
	Peak Gold Mines Distal intrusion-related Cu-Au	(total resources) 2.9 Mt @ 1.8 g/t Au, 0.3% Cu, 5.3% Pb, 6.9% Zn, 29 g/t Ag (total reserves) 1.0 Mt @ 2.7 g/t Au, 0.3% Cu, 5.4% Pb, 6.5% Zn, 23 g/t Ag	154	200
	Project name Deposit type			
P R O J E C T S	Belara VAMS	(inferred) 3.8 Mt @ 3.1% Zn, 0.4% Cu, 1% Pb, 0.2 g/t Au, 34 g/t Ag	38	118
	Bowdens Epithermal	(total resources) 128 Mt @ 40 g/t Ag, 0.26% Pb, 0.38% Zn (proved & probable) 29.9 Mt @ 69.01 g/t Ag, 0.44% Zn, 0.32% Pb	333	486
	Browns Reef Orogenic base metal	(inferred) 20.5 Mt @ 2% Zn, 1.1% Pb, 0.1% Cu, 9 g/t Ag	226	410
	Endeavor SHMS (SEDEX)	(total resources) 26.2 Mt @ 6.7% Zn, 4.1% Pb, 62 g/t Ag, 0.18% Cu (proved & probable) 3.7 Mt @ 7.6% Zn, 4.8% Pb, 74 g/t Ag	1,074	1,755
	Federation Distal intrusion-related Cu-Au	(indicated & inferred) 5.1 Mt @ 5.5% Pb, 9.3% Zn, 0.9 g/t Au, 0.3% Cu, 7 g/t Ag	281	474
	Grasmere-Peveril VAMS Cu-Zn-(Ag)	(indicated & inferred) 5.75 Mt @ 1.03% Cu, 0.35% Zn, 2.3 g/t Ag, 0.05 g/t Au	-	20
	Lewis Ponds VAMS	Open Pit: (indicated & inferred) 14.39 Mt @ 0.4 g/t Au, 26.8 g/t Ag, 1.2% Zn, 0.5% Pb, 0.1% Cu Underground: (indicated & inferred) 5.85 Mt @ 0.7 g/t Au, 49.1 g/t Ag, 2.1% Zn, 1.1% Pb, 0.1% Cu	142	304
	Mallee Bull Distal intrusion-related Cu-Au	(indicated & inferred) 6.76 Mt @ 1.3% Cu, 0.6% Pb, 0.6% Zn, 31 g/t Ag, 0.4 g/t Au	41	41
	May Day Distal intrusion-related Cu-Au	Open pit and underground (indicated) 1.07 Mt @ 1.02 g/t Au, 26.3 g/t Ag, 0.74% Zn, 0.5% Pb	5	8
	Mayfield Skarn	Zn-rich zone: (indicated & inferred) 0.927 Mt @ 0.1% Cu, 0.07 g/t Au, 5.9 g/t Ag, 2.36% Zn Cu-Au zone: (indicated & inferred) 3.984 Mt @ 0.41% Cu, 0.74 g/t Au, 8.8 g/t Ag, 0.2% Zn, 25.4% Fe	-	30
	Mineral Hill Epithermal	Parkers Hill (oxide & sulfide): (indicated & inferred) 2.28 Mt @ 0.18 g/t Au, 53.5 g/t Ag, 1.4% Cu, 2.5% Pb, 0.9% Zn Southern Ore Zone: (total resources) 1.985 Mt @ 1.2% Cu, 1.4% Pb, 1.1% Zn, 1.8 g/t Au, 19 g/t Ag	85	42
	Nymagee Distal intrusion-related Cu-Au	(indicated & inferred) 1.5 Mt @ 2.3% Cu, 0.8% Pb, 1.5% Zn, 18 g/t Ag	12	23
	Rasp (care and maintenance) BHT	(indicated & inferred) 16.503 Mt @ 6.6% Zn, 5.1% Pb, 89 g/t Ag (probable) 3.17 Mt @ 6% Zn, 4.6% Pb, 64 g/t Ag	842	1,089
Sunny Corner VAMS	(inferred) 1.5 Mt @ 0.17 g/t Au, 2.13% Pb, 3.7% Zn, 0.39% Cu, 24 g/t Ag	32	56	

Table continued on back.

Project name Deposit type	Current resources and reserves (JORC)	Contained lead ('000 t)	Contained zinc ('000 t)
Wagga Tank VAMS	Southern Nights (indicated & inferred) 4.14 Mt @ 5.0% Zn, 2.0% Pb, 77 g/t Ag, 0.3 g/t Au, 0.2% Cu Wagga Tank (indicated & inferred) 0.81 Mt @ 5% Zn, 2.4% Pb, 81 g/t Ag, 0.5 g/t Au, 0.4% Cu	102	248
Woodlawn VAMS	Underground: (measured & indicated) 4.6 Mt @ 6.7% Zn, 1.9% Cu, 2.4% Pb, 0.5 g/t Au, 52 g/t Ag Underground: (inferred) 2.6 Mt @ 5.6% Zn, 1.8% Cu, 2.2% Pb, 0.6 g/t Au, 48 g/t Ag Underground: (probable) 2.8 Mt @ 5.5% Zn, 1.6% Cu, 1.9% Pb, 0.45 g/t Au, 42 g/t Ag Reclaimed tailings: (measured & indicated) 9.8 Mt @ 2.3% Zn, 0.51% Cu, 1.3% Pb, 0.31 g/t Au, 32 g/t Ag Reclaimed tailings: (inferred) 1.1 Mt @ 2.3% Zn, 0.47% Cu, 1.2% Pb, 0.25 g/t Au, 27 g/t Ag Reclaimed tailings: (proved & probable) 9.5 Mt @ 2.2% Zn, 0.5% Cu, 1.3% Pb, 0.31 g/t Au, 31 g/t Ag	308	705

Note: Project totals for contained lead and zinc are based on combined resources.

Lead and zinc production in New South Wales (1999–2021)



Stalactitic coronadite from Broken Hill. Specimen 7 × 7 × 4 cm.

Contact: mra.info@geoscience.nsw.gov.au | +61 2 4063 6500



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