

Australian & New Zealand Gold Operations

December Quarter 2020 - Final Report

Overview

The average All-in Sustaining Cost (AISC) for Australia and New Zealand was A\$1,375/oz, which is down 3.3% (A\$47/oz) on the previous quarter average AISC of A\$1,422/oz. Evolution Mining's part of the Ernest Henry operations was the lowest cost producer reporting an AISC of **A\$-710/oz** followed by Newcrest's Cadia Valley operations with an AISC of **A\$-8/oz**, then by Kirkland Lakes' Fosterville mine (A\$429/oz). The average gold spot price for the quarter was A\$2,566/oz (US\$1,874/oz). It should be noted that Ernest Henry and Cadia Valley benefit from significant base metal by-products. Aurum Analytics' estimate of these operations AISC on a co-product basis (Co-AISC) is as follows; Ernest Henry Co-AISC of A\$715/oz and Cadia Valley Co-AISC of A\$896/oz. The lowest cost "gold only" operations were Kirkland Lakes' Fosterville mine with an AISC of A\$429/oz, then Saracen's Thunderbox mine (A\$870/oz) and Evolution's Cowal operation (A\$958/oz).

Newcrest's Cadia Valley operation took out top spot as Australia's largest gold producer with 194,088 oz for the quarter, followed by Newmont's Boddington (192,000 oz) then Kirkland Lake's Fosterville operation (164,008 oz). Of the mines where gold is a by-product, OZ Minerals' Prominent Hill produced the most gold 45,183 oz followed by Evolution's part of Ernest Henry with 24,569 oz and BHP's Olympic Dam with 23,837 oz.

Grade wise for the companies that report AISC, the average reported mill head/feed grade was 3.25 g/t (Open Pit (OP) - 1.04 g/t, Underground (UG) - 5.14 g/t, Open Pit & Underground (OP/UG) - 2.13 g/t) which was down on the previous quarter, 3.33 g/t (-2.6%). Kirkland Lake's Fosterville mine again took out the honour as the operation with the highest average feed grade with 28.10 g/t, followed by Mandalay Resources' Costerfield mine 11.21 g/t. The lowest grade mine was Evolution's part of the Ernest Henry mine processing an average head grade of 0.61 g/t. The high-grade operations that do not report an AISC were Tribune Resources' and Rand Mining's share of the East Kundana Joint Venture with 4.40 g/t and LionGold Corp's Ballarat mine with 3.70 g/t.

Top 10 Gold Producing Operations

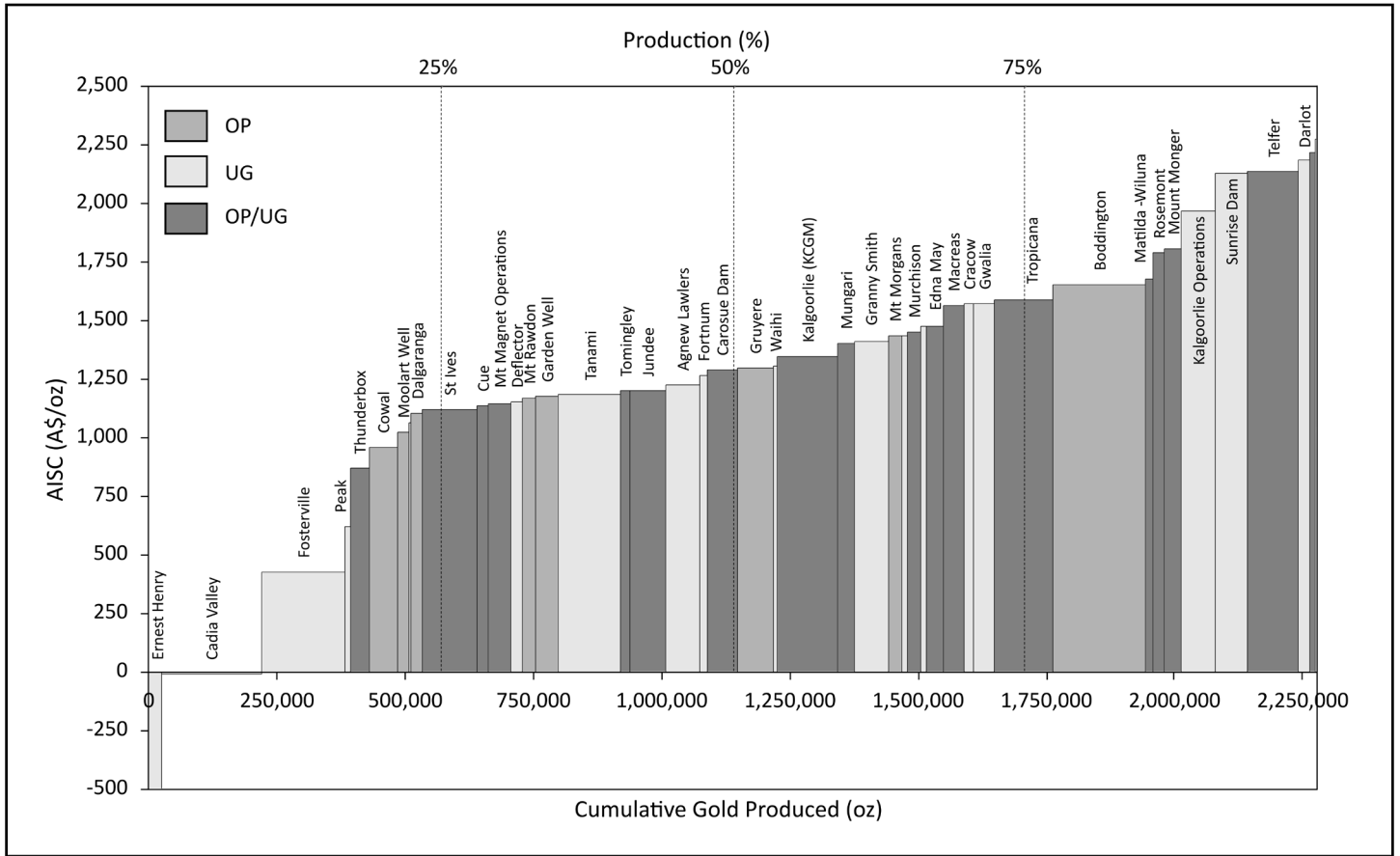
Rank	Operation	Company	Mine Type	Au Produced (oz)
1	Cadia Valley	Newcrest Mining Limited	UG	194,088
2	Boddington	Newmont Corporation	OP	182,000
3	Fosterville	Kirkland Lake Gold Limited	UG	164,008
4	Tanami	Newmont Corporation	UG	122,000
5	Kalgoorlie	JV Northern Star Resources Limited/Saracen Mineral Holdings Limited	OP/UG	118,892
6	Tropicana	JV AngloGold Ashanti Limited/IGO Limited	OP/UG	112,050
7	St Ives	Gold Fields Limited	OP/UG	106,400
8	Telfer	Newcrest Mining Limited	OP/UG	98,855
9	Jundee	Northern Star Resources Limited	OP/UG	70,802
10	Gruyere	JV Gold Fields Limited/Gold Road Resources Limited	OP	70,794

Gold Operations That Report AISC

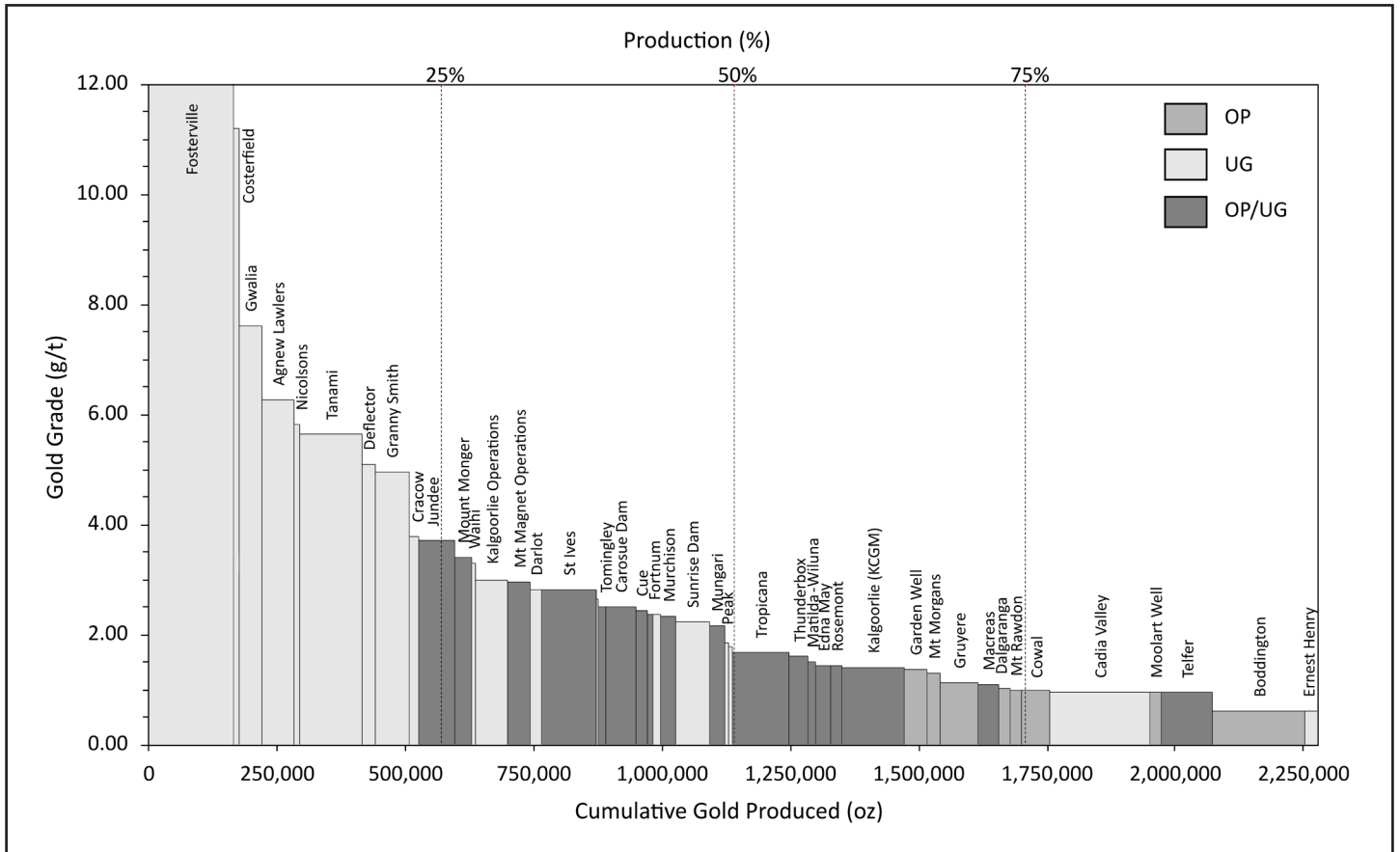
AISC Rank	Operation	Company	Mine Type	AISC (A\$/oz)	Grade (g/t)	Grade Rank	Au Produced (oz)
1	Ernest Henry	Evolution Mining Limited	UG	-710	0.61	46	24,473
2	Cadia Valley	Newcrest Mining Limited	UG	-8	0.95	42=	194,088
3	Fosterville	Kirkland Lake Gold Limited	UG	429	28.10	1	164,008
4	Peak	Aurelia Metals Limited	UG	621	1.84	27	8,991
5	Thunderbox	Saracen Mineral Holdings Limited	OP/UG	870	1.60	30	37,338
6	Cowal	Evolution Mining Limited	OP	958	0.97	41	54,926
7	Moolart Well	Regis Resources Limited	OP	1,021	0.95	42=	23,093
8	Hera	Aurelia Metals Limited	UG	1,060	1.78	28	5,796
9	Dalgaranga	Gascoyne Resources Limited	OP	1,100	1.03	39	20,381
10	St Ives	Gold Fields Limited	OP/UG	1,123	2.80	16	106,400
11	Cue	Westgold Resources Limited	OP/UG	1,135	2.45	21	22,754
12	Mt Magnet Operations	Ramelius Resources Limited	OP/UG	1,147	2.96	14	43,055
13	Deflector	Silver Lake Resources Limited	UG	1,155	5.10	7	23,790
14	Mt Rawdon	Evolution Mining Limited	OP	1,170	1.00	40	24,306
15	Garden Well	Regis Resources Limited	OP	1,172	1.36	35	45,628
16	Tanami	Newmont Corporation	UG	1,183	5.66	6	122,000
17	Tomingley	Alkane Resources Limited	OP/UG	1,201	2.50	19=	15,909
18	Jundee	Northern Star Resources Limited	OP/UG	1,203	3.70	10	70,802
19	Agnew Lawlers	Gold Fields Limited	UG	1,226	6.26	4	65,300
20	Fortnum	Westgold Resources Limited	UG	1,261	2.36	23	15,314
21	Carosue Dam	Saracen Mineral Holdings Limited	OP/UG	1,285	2.50	19=	58,338
22	Gruyere	JV Gold Fields/Gold Road Resources	OP	1,295	1.12	37	70,794
23	Waihi	OceanaGold Corporation	UG	1,308	3.29	12	7,600
24	KCGM	JV Northern Star/Saracen	OP/UG	1,342	1.40	34	118,892
25	Mungari	Evolution Mining Limited	OP/UG	1,402	2.15	26	30,463
26	Granny Smith	Gold Fields Limited	UG	1,413	4.96	8	66,400
27	Mt Morgans	Dacian Gold Limited	OP	1,430	1.30	36	27,162
28	Nicolsons	Pantoro Limited	UG	1,435	5.81	5	10,143
29	Murchison	Westgold Resources Limited	OP/UG	1,446	2.33	24	27,146
30	Costerfield	Mandalay Resources Limited	UG	1,475	11.21	2	12,236
31	Edna May	Ramelius Resources Limited	OP/UG	1,478	1.44	32=	29,841
32	Macreas	OceanaGold Corporation	OP/UG	1,561	1.08	38	42,600
33	Cracow	Aeris Resources Limited	UG	1,567	3.80	9	18,011
34	Gwalia	St Barbara Limited	UG	1,573	7.60	3	42,198
35	Tropicana	JV AngloGold Ashanti/IGO Limited	OP/UG	1,586	1.69	29	112,050
36	Boddington	Newmont Corporation	OP	1,650	0.62	45	182,000
37	Matilda-Wiluna	Wiluna Mining Corporation Limited	OP/UG	1,675	1.50	31	13,398
38	Rosemont	Regis Resources Limited	OP/UG	1,792	1.44	32=	22,689
39	Mount Monger	Silver Lake Resources Limited	OP/UG	1,807	3.40	11	33,776
40	Kalgoorlie Operations	Northern Star Resources Limited	UG	1,968	3.00	13	63,938
41	Sunrise Dam	AngloGold Ashanti Limited	UG	2,126	2.22	25	65,000
42	Telfer	Newcrest Mining Limited	OP/UG	2,136	0.94	44	98,855
43	Darlot	Red 5 Limited	UG	2,181	2.81	15	21,534
44	Mt Carlton	Evolution Mining Limited	OP/UG	2,214	2.38	22	12,428
45	Red October	Matsa Resources Limited	UG	2,272	2.66	18	1,689
46	Dargues	Aurelia Metals Limited	UG	3,522	2.77	17	1,086

Notes: Operations are shown on a 100% basis, except Northern Star's Kalgoorlie Operations. The Plutonic, Ballarat and Higginsville operations usually report AISC but had not reported at the time this report was compiled.

Gold Production Cost Curve Ranked By Reported AISC



Gold Production Grade Curve Ranked By Average Mill Feed/Head Grade



Gold Mines That Did Not Report All-in Sustaining Costs

Rank	Operation	Company	Mine Type	Grade (g/t)	Au Produced (oz)
1	Kundana EKJV	Tribune Resources Limited/Rand Mining Limited	UG	4.40	32,063
2	Higginsville Operations	Karora Resources Inc ¹	OP/UG	NA	25,637
3	Plutonic	Superior Gold Inc ¹	UG	1.61	15,838
4	Jaurdi	Beacon Minerals Limited	OP	1.95	7,870
5	Boorara	Horizon Minerals Limited	OP	1.47	4,336
6	Mt Boppy	Manuka Resources Limited	OP	2.78	3,628
NR	Marvel Loch	Minjar Gold Pty Ltd ²	OP/UG	NA	NA
NR	Paddington	Zijin Mining Group Company Limited ²	OP/UG	NA	NA
NR	Pajingo	Minjar Gold Pty Ltd ²	UG	NA	NA
NR	Ravenswood	EMR Capital ²	OP/UG	NA	NA
NR	Ballarat	LionGold Corp Ltd ¹	UG	3.70	NA
NR	Morning Star	AuStar Gold Limited ²	UG	NA	NA

1. These companies usually report AISC but had not at the time of compiling this report.
2. These companies do not provide detailed quarterly production statistics for these mines.

Mines Where Gold Is A By-Product

Rank	Operation	Company	Mine Type	Au Produced (oz)
1	Prominent Hill	OZ Minerals Limited	UG	45,183
2	Ernest Henry	Evolution Mining Limited	UG	24,473
3	Olympic Dam	BHP Billiton Limited	UG	23,837
4	Carrapateena	OZ Minerals Limited	UG	19,865
5	DeGrussa	Sandfire Resources Ltd	UG	9,660
6	Rosebery	MMG Limited	UG	3,279
NR	North Parkes ¹	JV China Molybdenum Co Ltd/Sumitomo Australia Pty Ltd	UG	NA
NR	Golden Grove	EMR Capital	UG	NA
NR	Jaguar	Washington H. Soul Pattinson and Company Limited	UG	NA

1. North Parkes is a joint venture between China Molybdenum Co Ltd (80%) and Sumitomo Australia Pty Ltd (20%). It had not reported its gold production at the time of compiling this report.

Quarter on Quarter Change in AISC and Grade

Statistic	AISC (A\$/oz)	Change (%)	Grade (g/t)	Change (%)
Average (Simple) ¹	1,375	-3.3%	3.25	-2.6%
Average (Weighted) ²	1,226	-2.3%	1.52	1.9%
Minimum	-710	-37.9%	0.61	3.4%
First Quartile ³	1,123	11.1%	0.97	-4.9%
Median ³	1,285	-7.4%	1.69	5.6%
Third Quartile ³	1,586	3.7%	3.70	5.7%
Maximum	3,522	31.7%	28.10	-7.3%

1. Simple averages done by number of mining operations.
2. AISC weighted by gold ounces produced, Au grade weighted by ore tonnes milled.
3. First Quartile, Median and Third Quartile values are based on production in the AISC Cost Curve and Grade Curve.

Top 5 Gold Operations - Major Gold Miners

Gold Production (Attributable)			All-in Sustaining Costs		
Rank	Operation	oz	Rank	Operation	A\$/oz
1	Cadia Valley	194,088	1	Cadia Valley	-8
2	Boddington	182,000	2	Fosterville	429
3	Fosterville	164,008	3	St Ives	1,123
4	Tanami	122,000	4	Tanami	1,183
5	St Ives	106,400	5	Agnew Lawlers	1,226

Top 5 Gold Operations - Mid-Tier Gold Miners

Gold Production (Attributable)			All-in Sustaining Costs		
Rank	Operation	oz	Rank	Operation	A\$/oz
1	Kalgoorlie (KCGM) ¹	118,892	1	Ernest Henry	-710
2	Jundee	70,802	2	Thunderbox	870
3	Kalgoorlie Operations ²	63,938	3	Cowal	958
4	Carosue Dam	58,338	4	Moolart Well	1,021
5	Cowal	54,926	5	Cue	1,135

1. Kalgoorlie (KCGM) is a Joint Venture between Northern Star Resources Limited (50%) and Saracen Mineral Holdings Limited (50%).

2. Kalgoorlie Operations gold produced represents Northern Star Resources Limited's attributable gold production.

Top 5 Gold Operations - Junior Gold Miners

Gold Production (Attributable)			All-in Sustaining Costs		
Rank	Operation	oz	Rank	Operation	A\$/oz
1	Gruyere (50% Gold Road Resources Limited) ¹	35,397	1	Peak	621
2	Mt Morgans	27,162	2	Hera	1,060
3	Higginsville Ops	25,637	3	Dalgaranga	1,100
4	Kundana EKJV	24,047	4	Tomingley	1,201
5	Darlot	21,534	5	Gruyere (50% Gold Road Resources Limited) ¹	1,265

1. Gruyere gold produced and AISC represents Gold Road Resources Limited's 50% attributable interest.

Top 5 Pure Gold Operations (No Base Metal By or Co-Products)

Gold Production (Total)			All-in Sustaining Costs		
Rank	Operation	oz	Rank	Operation	A\$/oz
1	Fosterville	164,008	1	Fosterville	429
2	Tanami	122,000	2	Thunderbox	870
3	Kalgoorlie (KCGM) ¹	118,892	3	Cowal	958
4	Tropicana ²	112,050	4	Moolart Well	1,021
5	St Ives	106,400	5	Dalgaranga	1,100

1. Kalgoorlie (KCGM) is a Joint Venture between Northern Star Resources Limited (50%) and Saracen Mineral Holdings Limited (50%).

2. Tropicana is a joint venture between AngloGold Ashanti Limited (70%) and IGO Limited (30%).

General Notes

Data was sourced from company quarterly reports. Aurum Analytics created the cost and grade curves. Mine Type reflects the source of the ore mined for the quarter, OP - Open Pit, UG - Underground, OP/UG - Open Pit and Underground and NM - No Mining.

For operations in joint venture such as Gruyere, Kalgoorlie (KCGM) and Tropicana AISC values were apportioned by equity ownership percentages. Kalgoorlie Operations is based on Northern Star Resources Limited's reported AISC only as Tribune Resources Limited and Rand Mining Limited do not report an AISC.

Where AISC values were reported in US\$ and no A\$ equivalent provided, the quarterly average US\$/A\$ exchange rate (0.7304) from the Reserve Bank of Australia was used.

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About Aurum Analytics

Aurum Analytics is an independent business providing information and analysis on the Australian and New Zealand gold industry. The information and analysis given is a by-product of Sam Ulrich's PhD research at The University of Western Australia's Centre for Exploration Targeting titled "Insights into the Economic Cost Structure of Gold Mining: From All-in Sustaining Costs to Quantifying Externalities."

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