

Australian & New Zealand Gold Operations

March Quarter 2021 - Final Report

Overview

The average All-in Sustaining Cost (AISC) for Australia and New Zealand was A\$1,453/oz, which is up 5.7% (A\$78/oz) on the previous quarter average AISC of A\$1,375/oz. Evolution Mining's part of the Ernest Henry operations was the lowest cost producer reporting an AISC of **A\$-1,027/oz** followed by Newcrest's Cadia Valley operations with an AISC of **A\$-160/oz**, then by Kirkland Lakes' Fosterville mine (A\$547/oz). The average gold spot price for the quarter was A\$2,320/oz (US\$1,793/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\$691/oz and Cadia Valley Co-AISC of A\$840/oz. The lowest cost "gold only" operations were Kirkland Lakes' Fosterville mine with an AISC of A\$547/oz, then OceanaGold's Waihi mine (A\$908/oz) and Alkane's Tomingley operation (A\$997/oz).

Newcrest's Cadia Valley operation took out top spot as Australia's largest gold producer with 179,546 oz for the quarter, followed by Newmont's Boddington (152,000 oz) and Tanami (117,000 oz) mines. Of the mines where gold is a by-product, BHP's Olympic Dam produced the most gold 45,183 oz followed by OZ Minerals' Prominent Hill with 34,809 oz and Evolution's part of Ernest Henry with 22,408 oz.

Grade wise for the companies that report AISC, the average reported mill head/feed grade was 3.05 g/t (Open Pit (OP) - 0.96 g/t, Underground (UG) – 4.73 g/t, Open Pit & Underground (OP/UG) - 2.01 g/t) which was down on the previous quarter, 3.25 g/t (-6.2%). Kirkland Lake's Fosterville mine again took out the honour as the operation with the highest average feed grade with 19.80 g/t, followed by Mandalay Resources' Costerfield mine 11.00 g/t. The lowest grade mine was Evolution's Mt Rawdon mine processing an average head grade of 0.51 g/t. The high-grade operations that do not report an AISC were Shen Yao Holding's (formerly LionGold Corp) Ballarat mine with 4.50 g/t and Tribune Resources' and Rand Mining's share of the East Kundana Joint Venture with 4.13 g/t.

Top 10 Gold Producing Operations

Rank	Operation	Company	Mine Type	Au Produced (oz)
1	Cadia Valley	Newcrest Mining Limited	UG	179,546
2	Boddington	Newmont Corporation	OP	152,000
3	Tanami	Newmont Corporation	UG	117,000
4	KCGM	Northern Star Resources Limited	OP/UG	111,278
5	Fosterville	Kirkland Lake Gold Limited	UG	108,679
6	Telfer	Newcrest Mining Limited	OP/UG	105,228
7	St Ives	Gold Fields Limited	OP/UG	94,000
8	Tropicana	JV AngloGold Ashanti Limited/IGO Limited	OP/UG	82,393
9	Gruyere	JV Gold Fields Limited/Gold Road Resources Limited	OP	66,213
10	Jundee	Northern Star Resources Limited	UG	63,648

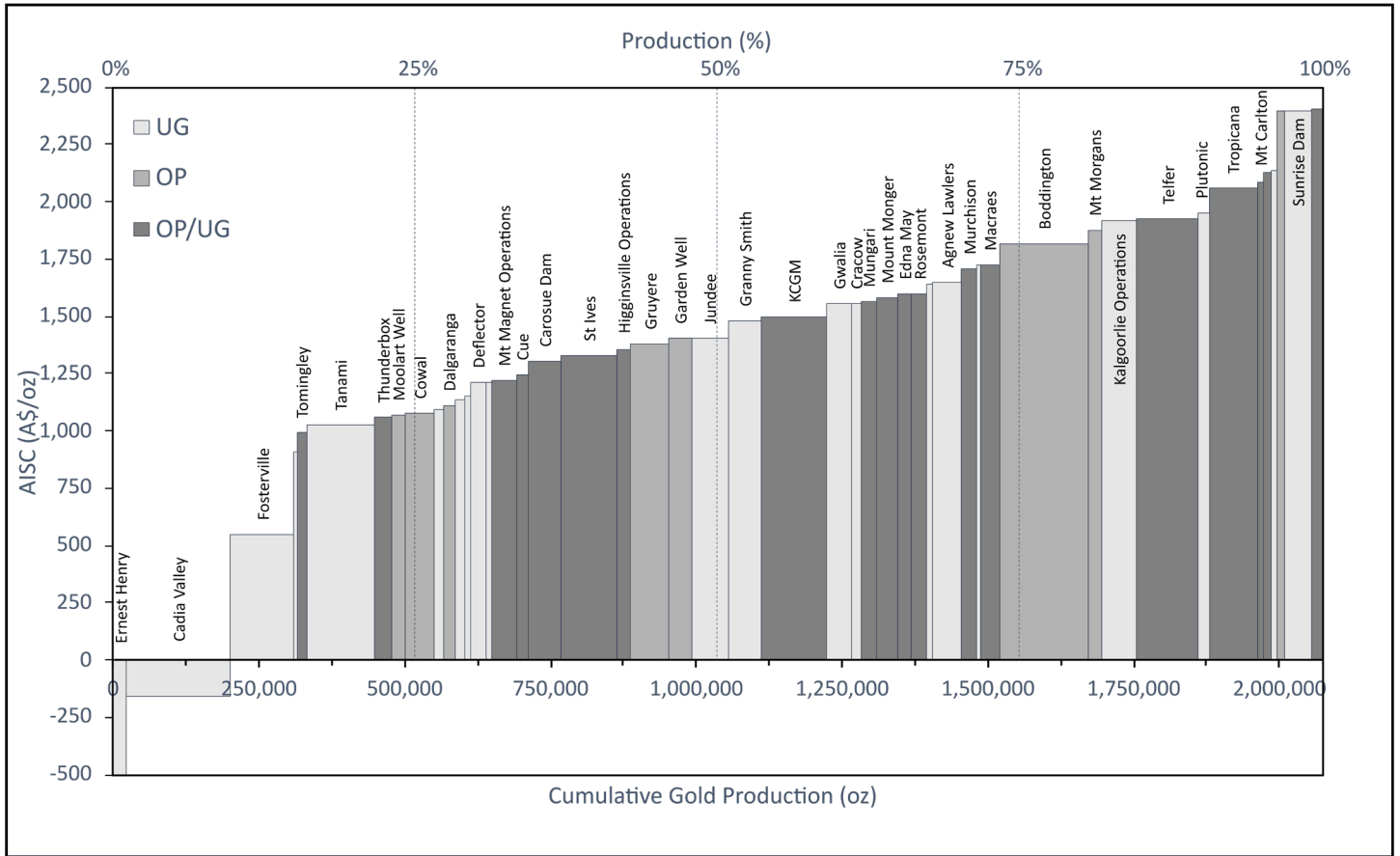
All-in Sustaining Costs & Grade

Gold Operations That Report AISC

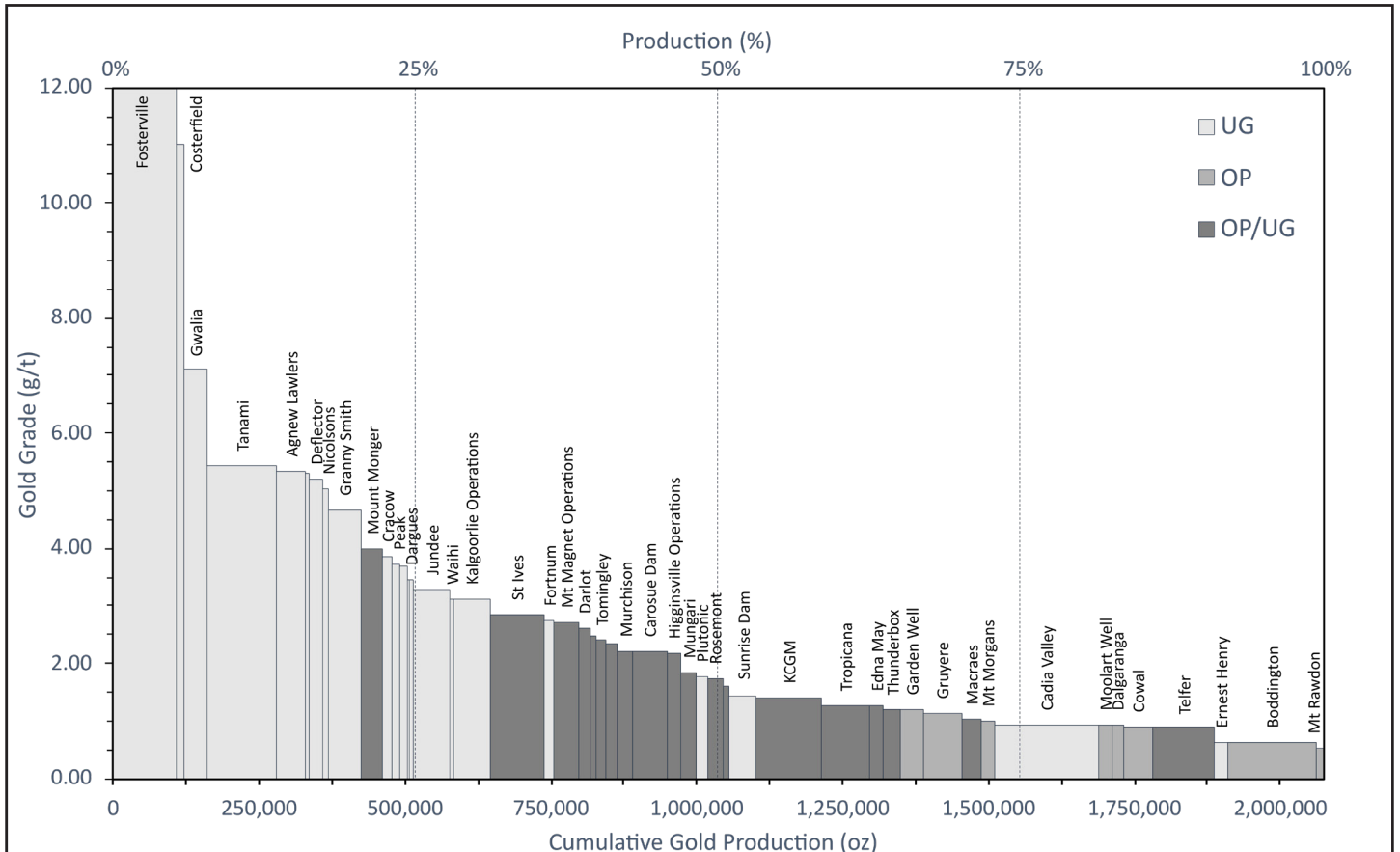
AISC Rank	Operation	Company	Mine Type	AISC (A\$/oz)	Grade (g/t)	Grade Rank	Au Produced (oz)
1	Ernest Henry	Evolution Mining Limited	UG	-1,027	0.62	47=	22,408
2	Cadia Valley	Newcrest Mining Limited	UG	-160	0.94	42=	179,546
3	Fosterville	Kirkland Lake Gold Limited	UG	547	19.80	1	108,679
4	Waihi	OceanaGold Corporation	UG	908	3.12	17	4,337
5	Tomingley	Alkane Resources Limited	OP/UG	997	2.40	24	16,040
6	Tanami	Newmont Corporation	UG	1,029	5.42	4	117,000
7	Thunderbox	Northern Star Resources Limited	OP/UG	1,061	1.20	37=	29,792
8	Moolart Well	Regis Resources Limited	OP	1,072	0.94	42=	22,088
9	Cowal	Evolution Mining Limited	OP	1,078	0.90	45	51,823
10	Peak	Aurelia Metals Limited	UG	1,097	3.71	12	14,378
11	Dalgaranga	Gascoyne Resources Limited	OP	1,114	0.92	44	19,203
12	Fortnum	Westgold Resources Limited	UG	1,135	2.74	20	16,926
13	Hera	Aurelia Metals Limited	UG	1,153	3.68	13	11,658
14	Deflector	Silver Lake Resources Limited	UG	1,210	5.20	7	24,033
15	Costerfield	Mandalay Resources Limited	UG	1,212	11.00	2	11,082
16	Mt Magnet Operations	Ramelius Resources Limited	OP/UG	1,219	2.70	21	41,832
17	Cue	Westgold Resources Limited	OP/UG	1,247	2.34	25	20,543
18	Carosue Dam	Northern Star Resources Limited	OP/UG	1,305	2.20	27	57,630
19	St Ives	Gold Fields Limited	OP/UG	1,329	2.85	19	94,000
20	Higginsville Operations	Karora Resources Inc	OP/UG	1,357	2.16	28	24,694
21	Gruyere	JV Gold Fields/Gold Road	OP	1,384	1.12	39	66,213
22	Garden Well	Regis Resources Limited	OP	1,408	1.20	37=	36,942
23	Jundee	Northern Star Resources Limited	UG	1,409	3.30	16	63,648
24	Granny Smith	Gold Fields Limited	UG	1,482	4.65	9	57,600
25	KCGM	Northern Star Resources Limited	OP/UG	1,496	1.40	34	111,278
26	Gwalia	St Barbara Limited	UG	1,555	7.10	3	42,716
27	Cracow	Aeris Resources Limited	UG	1,557	3.85	11	15,548
28	Mungari	Evolution Mining Limited	OP/UG	1,561	1.85	29	27,226
29	Mount Monger	Silver Lake Resources Limited	OP/UG	1,580	4.00	10	36,469
30	Edna May	Ramelius Resources Limited	OP/UG	1,597	1.25	36	24,197
31	Rosemont	Regis Resources Limited	OP/UG	1,602	1.74	31	26,718
32	Nicolsons	Pantoro Limited	UG	1,644	5.02	8	8,429
33	Agnew Lawlers	Gold Fields Limited	UG	1,645	5.33	5	50,900
34	Murchison	Westgold Resources Limited	OP/UG	1,704	2.21	26	25,023
35	Henty	Catalyst Metals Limited	UG	1,721	5.30	6	5,283
36	Macraes	OceanaGold Corporation	OP/UG	1,727	1.03	40	34,513
37	Boddington	Newmont Corporation	OP	1,816	0.62	47=	152,000
38	Mt Morgans	Dacian Gold Limited	OP	1,874	1.00	41	21,400
39	Kalgoorlie Operations	Northern Star Resources Limited	UG	1,922	3.10	18	62,158
40	Telfer	Newcrest Mining Limited	OP/UG	1,926	0.88	46	105,228
41	Plutonic	Superior Gold Inc	UG	1,953	1.78	30	17,603
42	Tropicana	JV AngloGold/IGO Limited	OP/UG	2,063	1.26	35	82,393
43	Mt Carlton	Evolution Mining Limited	OP/UG	2,090	2.48	23	12,117
44	Matilda-Wiluna	Wiluna Mining Corporation Limited	OP/UG	2,130	1.60	32	12,271
45	Dargues	Aurelia Metals Limited	UG	2,137	3.45	15	8,865
46	Red October	Matsa Resources Limited	UG	2,150	3.46	14	1,990
47	Mt Rawdon	Evolution Mining Limited	OP	2,400	0.51	49	11,930
48	Sunrise Dam	AngloGold Ashanti Limited	UG	2,401	1.45	33	46,000
49	Darlot	Red 5 Limited	OP/UG	2,402	2.61	22	19,047

Notes: Operations shown on a 100% basis, except Northern Star's Kalgoorlie Operations. Ballarat usually reports AISC but had not 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	JV Tribune Resources Limited/Rand Mining Limited	UG	4.13	16,473
2	Ballarat	Shen Yao Holdings Limited ^{1,2}	UG	4.50	9,246
3	Jaurdi	Beacon Minerals Limited	OP	1.94	7,926
4	Davyhurst	Ora Banda Mining Limited	OP/UG	1.53	5,737
5	Mt Boppy	Manuka Resources Limited	OP	3.03	5,268
6	Beatons Creek	Novo Resources Corp ²	OP	NA	3,497
7	Boorara	Horizon Minerals Limited	OP	1.22	1,183
8	Hillgrove	Red River Resources Limited	UG	1.60	667
NR	Marvel Loch	Minjar Gold Pty Ltd ³	OP/UG	NA	NA
NR	Paddington	Zijin Mining Group Company Limited ³	OP/UG	NA	NA
NR	Ravenswood	EMR Capital ³	OP/UG	NA	NA
NR	Pajingo	Minjar Gold Pty Ltd ³	UG	NA	NA
NR	Morning Star	AuStar Gold Limited ³	UG	NA	NA

1. These companies usually report AISC but had not at the time of compiling this report.

2. Gold production was estimated based on gold sold in the quarter.

3. These companies did not provide detailed quarterly production statistics.

Mines Where Gold Is A By-Product

Rank	Operation	Company	Mine Type	Au Produced (oz)
1	Olympic Dam	BHP Billiton Limited	UG	37,075
2	Prominent Hill	OZ Minerals Limited	UG	34,809
3	Ernest Henry	Evolution Mining Limited	UG	22,408
4	Carrapateena	OZ Minerals Limited	UG	18,872
5	DeGrussa	Sandfire Resources NL	UG	9,100
6	North Parkes ¹	JV China Molybdenum Co Ltd/Sumitomo Australia Pty Ltd	UG	5,611
7	Rosebery	MMG Limited	UG	2,372
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	1,453	5.7%	3.05	-6.2%
Average (Weighted) ²	1,326	8.2%	1.43	-5.8%
Minimum	-1,027	-44.6%	0.51	-16.4%
First Quartile ³	1,078	-4.0%	0.94	-3.1%
Median ³	1,409	9.6%	1.74	3.0%
Third Quartile ³	1,816	14.5%	3.30	-10.8%
Maximum	2,402	-31.8%	19.80	-29.5%

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	179,546	1	Cadia Valley	-160
2	Boddington	152,000	2	Fosterville	547
3	Tanami	117,000	3	Tanami	1,029
4	KCGM	111,278	4	Thunderbox	1,061
5	Fosterville	108,679	5	Carosue Dam	1,305

Top 5 Gold Operations - Mid-Tier Gold Miners

Gold Production (Attributable)			All-in Sustaining Costs		
Rank	Operation	oz	Rank	Operation	A\$/oz
1	Cowal	51,823	1	Ernest Henry	-1,027
2	Gwalia	42,716	2	Waihi	908
3	Mt Magnet Operations	41,832	3	Moolart Well	1,072
4	Garden Well	36,942	4	Cowal	1,078
5	Mount Monger	36,469	5	Fortnum	1,135

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	33,107	1	Tomingley	997
2	Higginsville Operations	24,694	2	Peak	1,097
3	Mt Morgans	21,400	3	Dalgaranga	1,114
4	Dalgaranga	19,203	4	Hera	1,153
5	Darlot	19,047	5	Costerfield	1,212

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	Tanami	117,000	1	Fosterville	547
2	KCGM	111,278	2	Waihi	908
3	Fosterville	108,679	3	Tomingley	997
4	St Ives	94,000	4	Tanami	1,029
5	Tropicana ¹	82,393	5	Thunderbox	1,061

1. Tropicana is a joint venture between AngloGold Ashanti Limited (70%) and IGO Limited (30%). IGO Limited has sold its 30% interest to Regis Resources Limited.

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 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 (0.7730) 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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