PERSEUS MINING LIMITED
TECHNICAL REPORT

YAOURÉ GOLD MINE – CÔTE D'IVOIRE

Qualified Persons

Adrian Ralph	FAusIMM	Perseus Mining Ltd
Daniel Saunders	FAusIMM	Perseus Mining Ltd

Effective Date: September 18, 2023

Issue Date: December 19, 2023

DATE AND SIGNATURE PAGE

The Qualified Persons for the purposes of this report:

Technical Report, Yaouré Gold Mine – Côte d'Ivoire
with an effective date of September 18, 2023

are:

Name	Affiliation	Signature	Date
Adrian Ralph	Perseus Mining Limited		December 18, 2023
Daniel Saunders	Perseus Mining Limited		December 18, 2023

CERTIFICATE OF QUALIFIED PERSON – ADRIAN RALPH

I, Adrian Ralph, FAusIMM, as an author of the report entitled "Technical Report, Yaouré Gold Mine – Côte d'Ivoire" (the "Report") prepared for Perseus Mining Limited ("Perseus") and with an effective date of September 18, 2023, do hereby state:

a) I am employed as General Manager Studies – Corporate by Perseus of Level 2, 437 Roberts Road, Subiaco, Western Australia.
b) I graduated with a Bachelor of Engineering in Mining Engineering from the Western Australian School of Mines in 2001. I completed a Master of Science in Mineral Economics from the Western Australian School of Mines in 2011.
c) I am a registered Fellow of the Australasian Institute of Mining and Metallurgy (#301892). I have worked as a mining engineer, in the mining industry for a total of 22 years since my graduation. My relevant experience for the purpose of the Report is prior experience as a Project Manager and Mining Manager for both Open Pit and Underground Operations, and as a Study Manager, Principal Consultant and General Manager of Studies for mining projects in Australia, Africa, South America and Asia.
d) I have read the definition of "qualified person" set out in National Instrument 43-101 (Standards of Disclosure for Mineral Projects) (the "Instrument") and certify that by reason of my education, affiliation with a professional association (as defined in the Instrument) and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of the Instrument.
e) I have visited Yaouré Gold Mine site on numerous occasions, the first being in March 2022 and the latest being from November 8 to November 10, 2023. The purpose of the visits was to provide support to operations and to carry out Studies for the site in my roles as General Manager Studies – Corporate and Study Manager – Business Growth – Corporate.
f) I am responsible for Sections 1.1, 1.9, 1.11-1.20, 2-3, 13, and 15-27 of the Report.
g) I am not independent of Perseus pursuant to Section 1.5 of the Instrument.
h) I have read the Instrument and the sections of the Report for which I am responsible and which have been prepared in compliance with the Instrument.
i) My involvement with the Yaouré Gold Mine is limited to my work as an employee of Perseus, commencing August 2021.
j) At the effective date of the Report, to the best of my knowledge, information and belief, the sections of the Report I am responsible for contain all scientific and technical information that is required to be disclosed to make the Report not misleading.

Dated this 18th day of December 2023 at Perth, Western Australia.



Adrian Ralph, BEng (Mining), MSc (Mineral Economics), FAusIMM

CERTIFICATE OF QUALIFIED PERSON – DANIEL SAUNDERS

I, Daniel Richard Saunders, FAusIMM, as an author of the report entitled "Technical Report, Yaouré Gold Mine – Côte d'Ivoire" (the "Report") prepared for Perseus Mining Limited ("Perseus") and with an effective date of September 18, 2023, do hereby state:

a) I am employed as Group Geologist – Business Growth – Corporate by Perseus of Level 2, 437 Roberts Road, Subiaco, Western Australia.
b) I graduated with a Bachelor of Science in Mineral Exploration and Mining Geology from the Western Australian School of Mines in 1999. I completed a Graduate Certificate in Mine Planning and Design at Curtin University, Western Australia in 2009, and a Graduate Certificate in Geostatistics at Edith Cowan University, Western Australia in 2014.
c) I am a registered Fellow of the Australasian Institute of Mining and Metallurgy (#220021). I have been practicing my profession continuously since 1999 and my experience covers 24 years in the mining industry involving exploration, development, production, resource evaluation, geological consulting and corporate technical roles working on projects in Australia, Africa, South America, North America and Asia.
d) I have read the definition of "qualified person" set out in National Instrument 43-101 (Standards of Disclosure for Mineral Projects) (the "Instrument") and certify that by reason of my education, affiliation with a professional association (as defined in the Instrument) and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of the Instrument.
e) I visited the Yaouré Gold Mine site between September 3 and September 4, 2023. The purpose of the visit was to provide support to operations and to review drilling and sampling practices and the project geology in my role as Group Geologist – Business Growth - Corporate.
f) I am responsible for Sections 1.2-1.8, 1.10, 4-12 and 14 of the Report.
g) I am not independent of Perseus pursuant to Section 1.5 of the Instrument.
h) I have read the Instrument and the sections of the Report for which I am responsible and which have been prepared in compliance with the Instrument.
i) My involvement with the Yaouré Gold Mine is limited to my work as an employee of Perseus, commencing August 2023.
j) At the effective date of the Report, to the best of my knowledge, information and belief, the sections of the Report I am responsible for contain all scientific and technical information that is required to be disclosed to make the Report not misleading.

Dated this 18th day of December 2023 at Perth, Western Australia.



Daniel Saunders, BSc, FAusIMM

Table of Contents

DATE AND SIGNATURE PAGE I

CERTIFICATE OF QUALIFIED PERSON – ADRIAN RALPH II

CERTIFICATE OF QUALIFIED PERSON – DANIEL SAUNDERS III

TABLE OF CONTENTS IV

FIGURES XII

TABLES XXI

1 SUMMARY 1

1.1 Introduction, Location and Ownership 1
1.2 History 1
1.3 Geological Setting and Mineralisation 3
1.4 Deposit Types 4
1.5 Exploration 4
1.6 Drilling 5
1.7 Sample Preparation, Analyses and Security 6
1.8 Data Verification 8
1.9 Mineral Processing and Metallurgical Testing 8
1.10 Mineral Resource Estimates 13
1.11 Mineral Reserve Estimates 15
1.12 Mining Methods 16
1.12.1 Open Pit 16
1.12.2 Underground 17
1.13 Recovery Methods 17
1.14 Project Infrastructure 19
1.15 Market Studies and Contracts 21
1.16 Environmental Studies, Permitting and Social or Community Impact 21
1.17 Capital and Operating Costs 22
1.18 Economic Analysis 24
1.19 Interpretation and Conclusions 24
1.20 Recommendations 24

2 INTRODUCTION 26

2.1 Terms of Reference 26
2.2 Qualified Person Responsibilities and Site Visits 26
2.3 Currency and Units of Measure 27
2.4 Data Sources 33
2.5 Acknowledgements 34

3 RELIANCE ON OTHER EXPERTS 35

3.1 Other Experts 35
4 PROPERTY DESCRIPTION AND LOCATION 36
4.1 Location 36
4.2 Property Description 36
4.3 Ownership and Title 38
4.4 Mineral Rights and Legal Obligations 39
4.5 Land Access and Compensation 39
4.6 Environmental Liabilities 39
4.7 Permits and Approvals 39
4.7.1 Water Abstraction 40
4.7.2 Dangerous Goods 40
4.7.3 Explosives, Storage and Use 40
4.7.4 Emergency Response Plan 40
4.7.5 Environmental Operating Permit 40
4.7.6 Mining Convention 40
4.7.7 Power Station Permit 40
4.7.8 Heliport Permit 41
4.7.9 Radiation Permit 41
4.7.10 Fuel Facility 41
4.8 Other Factors 41
5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY 42
5.1 Accessibility 42
5.2 Physiography 42
5.3 Climate 44
5.4 Infrastructure 45
5.5 Labour Availability 45
5.6 Local Economy 46
6 HISTORY 47
6.1 Pre-BRGM Exploration 47
6.2 BRGM Exploration 47
6.3 Compagnie Minière d'Afrique 47
6.4 Cluff Gold (West Africa) Côte d'Ivoire SARL 48
6.5 Perseus Mining Limited 51
6.6 Historical Mineral Resource Estimates 52
7 GEOLOGICAL SETTING AND MINERALISATION 56
7.1 Regional Geology 56
7.2 Local Geology 57
7.3 Structure 59

7.4 Alteration and Mineralisation 60
8 DEPOSIT TYPES 63
9 EXPLORATION 64
9.1 Overview 64
9.2 Coordinates, Survey Controls and Topographic Surveys 64
9.3 Exploration Activity and Results 64
9.3.1 Overview 64
9.3.1 Drilling Activities 64
9.3.2 Geophysics 75
9.3.3 Mineralogical and Multi-element Analysis 79
9.3.4 Petrology, Mineralogy & Other Research Studies 82
10 DRILLING 84
10.1 Drilling Summary 84
10.2 Collar Surveys 87
10.3 Downhole Surveys 87
10.4 Geological Logging 87
10.5 RC Sampling and Sample Recoveries 88
10.6 Diamond Core Sampling and Core Recoveries 88
11 SAMPLE PREPARATION, ANALYSES AND SECURITY 90
11.1 Pre-Perseus Drilling 90
11.1.1 Sample Preparation and Assay Laboratories 90
11.1.2 QAQC 92
11.2 Perseus Drilling – CMA and Yaouré Open Pits 93
11.2.1 Sample Preparation and Assay Laboratories 93
11.2.2 QAQC 94
11.3 Perseus Drilling – CMA Underground 102
11.3.1 Sample Preparation and Assay Laboratories 102
11.3.2 QAQC 103
11.4 Assay Methods 112
11.5 Chain of Custody and Security 113
11.6 QAQC Conclusions 113
12 DATA VERIFICATION 114
12.1 Summary 114
12.2 Cluff Gold West Africa and BRGM Drilling 114
12.3 Amara Drilling 114
12.4 Perseus Drilling 115
13 MINERAL PROCESSING AND METALLURGICAL TESTING 116
13.1 Historical Metallurgical Test Work 116
13.2 CMA Pit Fresh Ore Test Work 118

13.2.1 Samples Selected 119
13.2.2 Head Grade and Specific Gravity 125
13.2.3 Comminution 129
13.2.4 Gravity Recovery and Cyanidation 132
13.2.5 Mineralogical Investigation 153
13.2.6 Carbon Adsorption Kinetics 162
13.2.7 Oxygen Uptake Rate 163
13.2.8 Cyanide Detoxification 163
13.2.9 Viscosity 165
13.2.10 Thickening and Settling Rate 166
13.2.11 Tailings Geochemistry 167
13.3 Yaouré Pit Fresh Ore Test Work 167
13.3.1 Samples Selected 168
13.3.2 Head Grade and Specific Gravity 178
13.3.3 Comminution 180
13.3.4 Gravity Recovery and Cyanidation 184
13.3.5 Mineralogical Investigation 195
13.3.6 Carbon Adsorption Kinetics 209
13.3.7 Oxygen Uptake Rate 209
13.3.8 Cyanide Detoxification 210
13.3.9 Viscosity 211
13.3.10 Thickening and Settling Rate 211
13.3.11 Tailings Geochemistry 212
13.4 CMA Pit and Yaouré Pit Oxide and Transition Ore Test Work 213
13.4.1 Samples Selected 214
13.4.2 Head Grade and Specific Gravity 221
13.4.3 Comminution 223
13.4.4 Gravity Recovery and Cyanidation 225
13.4.5 Oxygen Uptake Rate 233
13.4.6 Viscosity 234
13.4.7 Thickening and Settling Rate 235
13.4.8 Tailings Geochemistry 235
13.5 Heap Leach Dump Residue Test Work 236
13.5.1 Samples Selected 236
13.5.2 Head Grade and Specific Gravity 238
13.5.3 Comminution 240
13.5.4 Gravity Recovery and Cyanidation 240
13.5.5 Viscosity 241
13.6 CMA Southwest Test Work 242
13.6.1 Samples Selected 242
13.6.2 Cyanidation 244
13.7 Angovia 2 Test Work 246

13.7.1 Samples Selected 247
13.7.2 Head Grade and Specific Gravity 250
13.7.3 Comminution 251
13.7.4 Gravity Recovery and Cyanidation 252
13.7.5 Viscosity 254
13.8 Govisou Test Work 255
13.8.1 Samples Selected 255
13.8.2 Head Grade and Specific Gravity 258
13.8.3 Comminution 260
13.8.4 Gravity Recovery and Cyanidation 261
13.8.5 Viscosity 264
13.9 CMA Underground Test Work 265
13.9.1 Samples Selected 266
13.9.2 Head Grade and Specific Gravity 269
13.9.3 Comminution 271
13.9.4 Gravity Recovery and Cyanidation 273
13.9.5 Mineralogical Investigation 281
13.9.6 Viscosity 289
13.9.7 Thickening and Settling Rate 289
13.10 Predicted Metallurgical Performance 291
13.11 Deleterious Elements 298
14 MINERAL RESOURCE ESTIMATES 299
14.1 Overview 299
14.2 Methods Summary 299
14.3 Data 300
14.3.1 Drilling Databases 301
14.3.2 Topographic Surveys 301
14.4 Geological Interpretation and Modelling 302
14.4.1 Weathering 302
14.4.2 Lithology 308
14.4.3 Mineralisation (Domains) 309
14.5 Bulk Densities 314
14.6 Statistical Analysis, Compositing and Grade Capping 315
14.7 Variography 323
14.8 Block Model Parameters 329
14.9 Estimation 330
14.10 Validation 336
14.11 Classification of Mineral Resources 346
14.12 Reasonable Prospects of Eventual Economic Extraction 351
14.13 Depletion for Mining 355
14.14 Stockpiles and Heap Leach 356

14.14.1 Stockpiles 356
14.14.2 Heap Leach 357
14.15 Mineral Resource Statement 358
14.16 Factors Affecting Mineral Resource Estimates 359
15 MINERAL RESERVE ESTIMATES 361
15.1 Introduction 361
15.2 Mineral Reserve Statement 361
15.3 Open Pit 362
15.3.1 Mineral Reserve Cut-off Grades 362
15.3.2 Mineral Reserve Dilution and Ore Loss 362
15.3.3 Mineral Reserve Modifying Factors 363
15.4 Underground 366
15.4.1 Mineral Reserve Cut-off Grades 367
15.4.2 Mineral Reserve Dilution and Ore Loss 367
15.4.3 Mineral Reserve Modifying Factors 369
15.5 Economic Modelling 370
15.6 Factors Affecting Mineral Reserve Estimates 370
16 MINING METHODS 372
16.1 Open Pit 372
16.1.1 Introduction 372
16.1.2 Mining Method 372
16.1.3 Open Pit Mining Operations 380
16.2 Underground 380
16.2.1 Introduction 380
16.2.2 Site Layout 380
16.2.3 Geotechnical 381
16.2.4 Hydrology and Hydrogeology 381
16.2.5 Mining Method 382
16.2.6 Mine Design 382
16.2.7 Mine Ventilation 384
16.2.8 Mine Schedule 386
16.2.9 Mining Equipment and Infrastructure 387
16.3 Combined Open Pit and Underground Mining Schedule 387
17 RECOVERY METHODS 392
17.1 Introduction 392
17.2 Design Criteria Development 392
17.3 Process Flowsheet 394
17.4 Process and Plant Description 398
17.4.1 ROM Pad 398
17.4.2 Crushing Circuit and Coarse Ore Stockpile 398
17.4.3 Grinding Circuit 398

17.4.4 Gravity Gold Recovery Circuit 399
17.4.5 Leach and Adsorption Circuit 399
17.4.6 Acid Wash, Elution and Carbon Regeneration 399
17.4.7 Gold Recovery 400
17.4.8 Cyanide Destruction Circuit and Tailings Disposal 400
17.4.9 Reagents 401
17.4.10 Process Plant Services 401
17.5 Plant Operating Performance 402
17.6 Predicted Metallurgical Performance 405
17.7 Power Requirements 405
17.8 Water Requirements 405
18 PROJECT INFRASTRUCTURE 407
18.1 Roads 407
18.2 Buildings 407
18.3 Mine Services 408
18.3.1 Additional Infrastructure for CMA Underground Project 408
18.4 Workforce Accommodation 409
18.5 Power Supply and Reticulation 409
18.6 Emergency Power 410
18.7 Communications 410
18.8 Water Supply 411
18.9 Tailings Storage Facility 411
19 MARKET STUDIES AND CONTRACTS 413
19.1 Markets 413
19.2 Gold Price 413
19.3 Bullion Transport 413
19.4 Contracts 413
20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT 414
20.1 Environmental Studies 414
20.1.1 Environmental Monitoring 414
20.1.2 Water Management 415
20.1.3 Biodiversity 416
20.2 Traffic and Transportation 416
20.3 Soil and Land Capability 417
20.4 Waste Management 417
20.5 Emissions and Energy 418
20.6 Mine Rehabilitation and Closure 419
20.7 Permitting Requirements 419
20.7.1 Explosives Storage and Use 420

20.7.2 Emergency Plan Report 420
20.7.3 Mining Convention 420
20.8 Social Development 420
20.8.1 Social Development Aspects 421
20.8.2 Operation of the Social Development Program 422
20.8.3 Community Training and Educational Support 424
20.8.4 Management of the Local Mining Development Committee 424
20.8.5 Local Recruitment Plan 424
20.8.6 Local Procurement Plan 424
20.8.7 Artisanal and Illegal Mining 425
21 CAPITAL AND OPERATING COSTS 426
21.1 Capital Cost Estimate 426
21.2 Operating Cost Estimate 426
21.3 Bullion Transport and Refining Costs 427
21.4 Royalties 427
21.5 Community Development Fund 428
21.6 Taxes 428
22 ECONOMIC ANALYSIS 429
23 ADJACENT PROPERTIES 430
24 OTHER RELEVANT DATA AND INFORMATION 431
25 INTERPRETATION AND CONCLUSIONS 432
25.1 Mineral Resources 432
25.2 Mineral Reserves 432
25.3 Mining 432
25.3.1 Open Pit Mining 432
25.3.2 Underground Mining 433
25.4 Metallurgy and Mineral Processing 433
25.5 Project Infrastructure 433
25.6 Environment, Social Impact and Permitting 434
25.7 CMA Underground Risk and Opportunity 434
25.8 CMA Underground Project Implementation 435
26 RECOMMENDATIONS 436
26.1 Mineral Resources 436
26.2 Mineral Reserves 436
26.3 CMA Underground Project 436
26.4 Mineral Processing and Metallurgical Testing 438
27 REFERENCES 439

Figures

Figure 4-1: Yaouré Gold Mine location 36
Figure 4-2: Yaouré Gold Project mineral permits 37
Figure 5-1: Access to Yaouré Gold Mine (Perseus, 2023) 42
Figure 5-2: Yaouré Gold Mine: topography and drainage 43
Figure 5-3: Yaouré Gold Mine: typical savannah vegetation (foreground) and Lake Kossou (background) 44
Figure 5-4: Annual temperature variation at Yamoussoukro showing the average high (red line) and low (blue line) temperatures (Source: https://weatherspark.com/) (2023) 45
Figure 5-5: Average monthly rainfall at Yamoussoukro (Source: https://weatherspark.com/) (2023) 45
Figure 6-1: View of Cluff Gold West Africa's Yaouré Pit, looking north (Perseus, 2017) 49
Figure 6-2: View of the laterite cap mined on Blangan Hill (Perseus, 2017) 50
Figure 7-1: Geological map of Côte d'Ivoire, Modified from BRGM: West African Gold Deposits in their Lower Proterozoic Litho-structural Setting. 56
Figure 7-2: Litho-structural map of the Yaouré district, from Tourigny & Wehrle 2022..... 58
Figure 7-3: Principal mineralised structures at the Yaouré Gold Project (Perseus, 2017) 60
Figure 7-4: CMAHW1 and CMAFW1 intercepts in YDD0068. 12.74 m at a gold grade of 2.32 g/t and 22.5 m at a gold grade of 4.90 g/t..... 62
Figure 9-1: Auger drill hole layout of 2018 and 2019 drilling (Perseus, 2023) 66
Figure 9-2: Drill hole layout showing sterilisation holes (red) with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023) 67
Figure 9-3: Drill hole layout showing satellite drilling at Saykiro (red), Kongonza (green), Akokro (yellow), and Extension NE (blue), with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023)..... 68
Figure 9-4: Drill hole layout showing infill drilling at Y2N & Y3N (yellow), Angovia 2 (red), Govisou (green), and CMA SW (cyan) with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023)..... 69
Figure 9-5: Drill hole layout showing resource definition drilling in the Yaouré pit (red), GC test (cyan), CMA pit (green) with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023)..... 70
Figure 9-6: Drill hole layout CMA Extension test holes (cyan) with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023) 71
Figure 9-7: Cross-section line referenced in Figure 9-6, looking north, showing CMA Extension drill hole YDD0541 (Perseus, 2023)..... 72
Figure 9-8: Drill hole layout showing drilling testing the basin contact (cyan) with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023)..... 73
Figure 9-9: Drill hole layout showing conceptual drilling (cyan) with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023) 74
Figure 9-10: Cross-section at 778,200N looking north showing YDD0578 intersection with interpreted igneous intrusion (Perseus, 2023) 75

Figure 9-11: Airbourne magnetic survey (enhanced RTP) image with Yaouré mine footprint (white outlines) (Perseus, 2020) 76
Figure 9-12: Plan showing seismic sounding locations (Perseus, 2020) 77
Figure 9-13: Cross-section 777,340N looking north showing drilling and the interpretation of the CMA over seismic response (Perseus, 2020) 78
Figure 9-14: Oblique view of seismic cube with sliced data in section, long-section and plan view (Perseus, 2020) 78
Figure 9-15: Gravity maps showing: Shape Index (top left); Tensor Tz (top right); Structural interpretation of integrated geophysical data (bottom left); Structural interpretation over digital elevation model (bottom right) (Perseus, 2021) 79
Figure 9-16: Trace element concentrations by distance to the CMA showing Mo (top left), W (top right), Te (bottom left) and Be (bottom right) with smoothed trend (red line). Note – Positive X-axis values represent hanging wall, negative values represent footwall (Perseus, 2023) 80
Figure 9-17: Smoothed trend lines of major and minor element concentration by distance to the CMA. Note – Positive X-axis values represent hanging wall, negative values represent footwall (Perseus, 2023) 81
Figure 9-18: Downhole cell plot across the CMA intercept in YRC1856D showing relative dominance of major alteration minerals (Perseus, 2023) 82
Figure 10-1: Drill hole layout showing recent drilling (red) and other existing drilling (blue) (Perseus, 2023) 84
Figure 10-2: Cross-section 777,340N looking north showing CMA UG RES (red), CMA UG DDIP (cyan), CMA N&S (yellow) and previous drilling (grey) (Perseus, 2023) 85
Figure 10-3: Drill hole layout showing recent drilling. CMA UG Res (red), CMA UG DDIP (cyan), CMA N&S (yellow), CMA NW (green), CMA Deeps (magenta) and Yaouré Pit (blue) (Perseus, 2023) 86
Figure 10-4: 2021-2022 core recoveries by 3 m down-hole depth increment 89
Figure 11-1: CRM control chart – OxE113 (Actlabs) – expected value (green line), average value (blue line), control limits (green shading) 96
Figure 11-2: CRM control chart – OxG103 (Actlabs) – expected value (green line), average value (blue line), control limits (green shading) 96
Figure 11-3: CRM control chart – SE68 (Actlabs) – expected value (green line), average value (blue line), control limits (green shading) 97
Figure 11-4: CRM control chart – SJ80 (Actlabs) – expected value (green line), average value (blue line), control limits (green shading) 97
Figure 11-5: CRM control chart – SE68 (BVML) – expected value (green line), average value (blue line), control limits (green shading) 98
Figure 11-6: CRM control chart – SJ80 (BVML) – expected value (green line), average value (blue line), control limits (green shading) 98
Figure 11-7: CRM control chart – OxA89 (MSALABS) – expected value (green line), average value (blue line), control limits (green shading) 99

Figure 11-8: CRM control chart – SJ121 (MSALABS) – expected value (green line), average value (blue line), control limits (green shading) 99
Figure 11-9: CRM control chart – SK120 (MSALABS) – expected value (green line), average value (blue line), control limits (green shading) 100
Figure 11-10: HARD plots for coarse duplicates - diamond core (left) and RC (right) 101
Figure 11-11: HARD plots for pulp duplicates - diamond core (left) and RC (right) 101
Figure 11-12: Q-Q plots for diamond core (left) and RC (right) – coarse duplicates 102
Figure 11-13: Q-Q plots for diamond core (left) and RC (right) – pulp duplicates 102
Figure 11-14: CRM control chart – SI81 (ALS) – expected value (green line), average value (blue line), control limits (green shading) 105
Figure 11-15: CRM control chart – SN75 (ALS) – expected value (green line), average value (blue line), control limits (green shading) 105
Figure 11-16: CRM control chart – SG115 (Intertek) – expected value (green line), average value (blue line), control limits (green shading) 106
Figure 11-17: CRM control chart – SI81 (Intertek) – expected value (green line), average value (blue line), control limits (green shading) 106
Figure 11-18: CRM control chart – SJ121 (Intertek) – expected value (green line), average value (blue line), control limits (green shading) 107
Figure 11-19: CRM control chart – SN75 (Intertek) – expected value (green line), average value (blue line), control limits (green shading) 107
Figure 11-20: CRM control chart – SG115 (MSALABS) – expected value (green line), average value (blue line), control limits (green shading) 108
Figure 11-21: CRM control chart – SJ121 (MSALABS) – expected value (green line), average value (blue line), control limits (green shading) 108
Figure 11-22: HARD plots for diamond field duplicates - coarse (left) and pulp (right) 110
Figure 11-23: Q-Q Plots for diamond core– coarse duplicates (left), pulp duplicates (right) 110
Figure 11-24: Yaouré sample preparation laboratory – size fraction analysis passing 75 µm 111
Figure 11-25: Size fraction analysis not passing 75 µm over time 111
Figure 11-26: HARD plot (left) and Q-Q plot (right) for MSA CPA vs. Intertek CPA 112
Figure 13-1: Location of CMA Pit Fresh Ore Master Composite samples within the CMA deposit, plan view (Perseus, 2023) 120
Figure 13-2: Location of CMA Pit Fresh Ore Master Composite samples within the CMA deposit, perspective view looking northeast (Perseus, 2023) 121
Figure 13-3: Location of fresh ore comminution and metallurgical variability samples within the CMA deposit, plan view (Perseus, 2023) 122
Figure 13-4: Location of fresh ore comminution and metallurgical variability samples within the CMA deposit, perspective view looking northeast (Perseus, 2023) 123
Figure 13-5: Relationship between hardness and competency for Yaouré Gold Mine ore samples tested 131
Figure 13-6: Mineral abundance of gravity concentrate from CMA Pit Fresh Ore Master Composite 154

Figure 13-7: Image grid showing the distribution of gold grain sizes of gravity concentrate from the CMA Pit Fresh Ore Master Composite 155
Figure 13-8: Image grid showing the distribution of gold grains between locking classes of gravity concentrate from CMA Pit Fresh Ore Master Composite 156
Figure 13-9: BSE images of (L): host particle 5, gold grain 6; and (R): host particle 6, gold grains 7 to 11 from gravity concentrate of CMA Pit Fresh Ore Master Composite 158
Figure 13-10: BSE images of (L): host particle 7, gold grains 12 to 15; and (R): host particle 8, gold grains 16 to 20 from gravity concentrate of CMA Pit Fresh Ore Master Composite 158
Figure 13-11: BSE images of (L): host particle 9, gold grains 21 to 23; and (R): host particle 10, gold grain 24 from gravity concentrate of CMA Pit Fresh Ore Master Composite... 159
Figure 13-12: BSE images of (L): host particle 11, gold grain 25; and (R): host particle 12, gold grains 26 to 28 from gravity concentrate of CMA Pit Fresh Ore Master Composite 159
Figure 13-13: Optical images of (L): gold grain 1; and (R): gold grains 2 and 3 from gravity concentrate of CMA Pit Fresh Ore Master Composite 160
Figure 13-14: Optical images of (L): gold grain 4; and (R): gold grain 5 from gravity concentrate of CMA Pit Fresh Ore Master Composite 160
Figure 13-15: Optical image of gold grain 6 from gravity concentrate of CMA Pit Fresh Ore Master Composite 161
Figure 13-16: Settling rates of CMA Pit Fresh Ore Master Composite at 10% w/w solids in static cylinder tests 166
Figure 13-17: Location of fresh ore master composite samples within the Yaouré deposit, plan view (Perseus, 2023) 169
Figure 13-18: Location of fresh ore master composite samples within the Yaouré deposit, perspective view looking northeast (Perseus, 2023) 170
Figure 13-19: Location of fresh ore comminution and metallurgical variability samples within the Yaouré deposit, plan view (Perseus, 2023) 171
Figure 13-20: Location of fresh ore comminution and metallurgical variability samples within the Yaouré deposit, perspective view looking northeast (Perseus, 2023)..... 172
Figure 13-21: Mineral abundance of gravity concentrate fractions from Yaouré pit fresh ore master composites 196
Figure 13-22: Image grid showing the distribution of gold grain sizes from Yaouré fresh ore master composite gravity fractions 197
Figure 13-23: Image grid showing the distribution of locking of gold grains for Yaouré fresh ore master composite gravity fractions 199
Figure 13-24: BSE images of (L): host particle 1, gold grain 1; and (R): host particle 2, gold grain 2 from the gravity concentrate fraction of the Yaouré Granodiorite Master Composite 201
Figure 13-25: BSE images of (L): host particle 3, gold grain 3; and (R): host particle 4, gold grain 4 from the gravity concentrate fraction of the Yaouré Granodiorite Master Composite 201

Figure 13-26: BSE images of (L): host particle 5, gold grains 5 to 9; and (R): host particle 6, gold grains 10 to 14 from the gravity concentrate fraction of the Yaouré Granodiorite Master Composite 202
Figure 13-27: BSE images of (L): host particle 7, gold grain 14; and (R): host particle 8, gold grain 15 from the gravity concentrate fraction of the Yaouré Granodiorite Master Composite 202
Figure 13-28: BSE images of (L): host particle 1, gold grain 1; and (R): host particle 2, gold grain 2 from the gravity concentrate fraction of the Yaouré S-Basalt Master Composite ... 203
Figure 13-29: BSE images of (L): host particle 3, gold grain 3; and (R): host particle 4, gold grain 4 from the gravity concentrate fraction of the Yaouré S-Basalt Master Composite ... 204
Figure 13-30: BSE images of (L): host particle 5, gold grains 5 and 6; and (R): host particle 6, gold grain 7 from the gravity concentrate fraction of the Yaouré S-Basalt Master Composite 204
Figure 13-31: BSE images of (L): host particle 7, gold grain 8; and (R): host particle 8, gold grains 9 to 11 from the gravity concentrate fraction of the Yaouré S-Basalt Master Composite 205
Figure 13-32: BSE images of (L): host particle 1, gold grains 1 to 3; and (R): host particle 2, gold grain 4 from the gravity concentrate fraction of the Yaouré Y-Basalt Master Composite 206
Figure 13-33: BSE images of (L): host particle 3, gold grain 5; and (R): host particle 4, gold grain 6 from the gravity concentrate fraction of the Yaouré Y-Basalt Master Composite ... 206
Figure 13-34: BSE images of (L): host particle 5, gold grains 7 and 8; and (R): host particle 6, gold grain 9 from the gravity concentrate fraction of the Yaouré Y-Basalt Master Composite 207
Figure 13-35: BSE images of (L): host particle 7, gold grain 10; and (R): host particle 8, gold grains 11 and 12 from the gravity concentrate fraction of the Yaouré Y-Basalt Master Composite 207
Figure 13-36: Optical images of gold grains 1-4 from gravity concentrate fraction of the Yaouré Granodiorite Master Composite 208
Figure 13-37: Location of CMA/Yaouré Oxide Master Composite samples within the CMA and Yaouré deposits, plan view (Perseus, 2023) 215
Figure 13-38: Location of CMA/Yaouré Oxide Master Composite samples within the CMA and Yaouré deposits, perspective view looking northeast (Perseus, 2023) 216
Figure 13-39: Location of oxide and transition ore metallurgical variability samples within the CMA and Yaouré deposits, plan view (Perseus, 2023) 217
Figure 13-40: Location of oxide and transition ore metallurgical variability samples within the CMA and Yaouré deposits, perspective view looking northeast (Perseus, 2023) 218
Figure 13-41: Heap leach dump residue sample locations (Perseus, 2017) 237
Figure 13-42: Location of samples within the CMA SW deposit, plan view (Perseus, 2023) 243
Figure 13-43: Location of samples within the CMA SW deposit, perspective view looking northeast (Perseus, 2023) 243
Figure 13-44: Location of samples within the Angovia 2 deposit, plan view (Perseus, 2023) 248

Figure 13-45: Location of samples within the Angovia 2 deposit, perspective view looking northeast (Perseus, 2023) 248
Figure 13-46: Location of samples within the Govisou deposit, plan view (Perseus, 2023) 256
Figure 13-47: Location of samples within the Govisou deposit, section view looking north (Perseus, 2023) 257
Figure 13-48: Location of samples in relation to the CMA underground mine design, looking west (Perseus, 2023) 266
Figure 13-49: Comparison of CMA underground gold extractions to CMA pit fresh ore gold extractions at P_{80} of 75 µm 275
Figure 13-50: Tails solid gold assay by size fraction for CMA underground metallurgical variability samples 276
Figure 13-51: Tails solid gold distribution by size fraction for CMA underground metallurgical variability samples 276
Figure 13-52: Mineral abundance of gravity concentrate from CMA-UG-COMP-800-1000 282
Figure 13-53: Mineral liberation of pyrite and combined silicates of gravity concentrate from CMA-UG-COMP-800-1000 283
Figure 13-54: Image grid showing the distribution of gold grain sizes of gravity concentrate from CMA-UG-COMP-800-1000 284
Figure 13-55: Image grid showing the distribution of gold grains between locking classes of gravity concentrate from CMA-UG-COMP-800-1000 285
Figure 13-56: BSE image of host particle 5, gold grain 8 from gravity concentrate of CMA-UG-COMP-800-1000 287
Figure 13-57: BSE images of (L): host particle 6, gold grain 9; and (R): host particle 7, gold grains 10 and 11 from gravity concentrate of CMA-UG-COMP-800-1000 287
Figure 13-58: BSE images of (L): host particle 8, gold grain 12; and (R): host particle 9, gold grain 13 from gravity concentrate of CMA-UG-COMP-800-1000 288
Figure 13-59: BSE images of (L): host particle 10, gold grain 14; and (R): host particle 11, gold grain 15 from gravity concentrate of CMA-UG-COMP-800-1000 288
Figure 13-60: Settling rates of CMA-UG-COMP-800-1000 metallurgical composite at 10% w/w solids in static cylinder tests 290
Figure 13-61: Yaouré hydrocyclone modelling cases on Weir Cavex® hydrocyclone capacity chart (Weir Minerals, 2016) 295
Figure 13-62: Heat map of predicted gold recovery across the CMA underground orebody (cooler colours indicate lower recoveries from 77%; warmer colours indicate higher recoveries up to 97%) (Perseus, 2023) 297
Figure 14-1: Location and spatial distribution of RC and DD drill holes at Yaouré Gold Mine 300
Figure 14-2: Yaouré topographic LiDAR surface (Perseus, 2017) 302
Figure 14-3: Isometric view of modelled weathering surfaces in the Yaouré open pit and CMA underground resource models 303
Figure 14-4: Weathering profile in cross-section 777,000 mN (±12.5 m) in the Yaouré open pit and CMA underground resource models 304

Figure 14-5: Isometric view of modelled weathering surfaces in the CMA open pit and CMA SW resource model 305
Figure 14-6: Isometric view of modelled weathering surfaces in the Govisou resource model . 306
Figure 14-7: Weathering profile in cross-section 777,450 mN (±12.5 m) in the Govisou resource models 307
Figure 14-8: Isometric view of modelled lithology in the Yaouré open pit and CMA underground resource models 308
Figure 14-9: Modelled lithology in cross-section 777,000 mN (±12.5 m) in the Yaouré open pit and CMA underground resource models 309
Figure 14-10: Isometric view of modelled Y and S structure domains in the Yaouré open pit and CMA underground resource models 310
Figure 14-11: Isometric view of modelled background domains in the Yaouré open pit and CMA underground resource models 311
Figure 14-12: Isometric view of mineralised domain in the Govisou resource model 312
Figure 14-13: Plan view of the south and north mineralised domains for the Angovia 2 resource model 314
Figure 14-14: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 1010 337
Figure 14-15: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 1020 338
Figure 14-16: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 1050 338
Figure 14-17: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 2010 339
Figure 14-18: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 3010 339
Figure 14-19: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 3020 340
Figure 14-20: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 4010 340
Figure 14-21: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 4020 341
Figure 14-22: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 4040 341
Figure 14-23: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 8020 342
Figure 14-24: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 8030 342
Figure 14-25: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 8040 343

Figure 14-26: Easting, northing and elevation swath plots and histogram showing estimated gold grade for the Indicated classified 0.4 g/t recovery probability blocks versus composite gold grade for CMA Domain (5) 344
Figure 14-27: Easting, northing and elevation swath plots and histogram showing estimated gold grade for the Indicated classified 0.4 g/t recovery probability blocks versus composite gold grade for CMA SW Domain (6) 344
Figure 14-28: Easting, northing and elevation swath plots and histogram showing estimated gold grade for the Indicated and Inferred classified 0.4 g/t recovery probability blocks versus composite gold grade for Govisou mineralised Domain 345
Figure 14-29: Easting, northing and elevation swath plots and histogram showing estimated gold grade for the Indicated and Inferred classified 0.4 g/t recovery probability blocks versus composite gold grade for Angovia 2 mineralised domain 346
Figure 14-30: Mineral Resource classification for the Yaouré open pit Mineral Resource at June 30, 2023 347
Figure 14-31: CMA underground Mineral Resource long section looking west, showing extents of CMA resource classification at June 30, 2023 348
Figure 14-32: Mineral Resource classification for the CMA open pit and CMA SW Mineral Resource at June 30, 2023 349
Figure 14-33: Mineral Resource classification for the Govisou Mineral Resource at June 30, 2023 350
Figure 14-34: Mineral Resource classification for the Angovia 2 Mineral Resource at June 30, 2023 351
Figure 14-35: Yaouré open pit Mineral Resource estimate showing estimated gold grades and the RPEEE $1,800/oz pit optimisation shell 352
Figure 14-36: CMA open pit and CMA SW Mineral Resource estimate showing estimated gold grades and the RPEEE $1,800/oz pit optimisation shells 353
Figure 14-37: Govisou Mineral Resource estimate showing estimated gold grades and the RPEEE $1,800/oz pit optimisation shells 354
Figure 14-38: Angovia 2 Mineral Resource estimate showing estimated gold grades and the RPEEE $1,800/oz pit optimisation shells 355
Figure 14-39: Surveyed mined surface for CMA open pit at June 30, 2023 356
Figure 14-40: Heap leach components and drilling (Perseus, 2017) 358
Figure 15-1: CMA underground design showing vent pillars (pink), stope pillars (yellow) and crown pillar (blue) 368
Figure 16-1: Yaouré Gold Mine site layout 373
Figure 16-2: CMA pit design – plan view (Perseus, 2023) 374
Figure 16-3: CMA pit design – oblique view looking northwest (Perseus, 2023) 374
Figure 16-4: Yaouré pit design – plan view (Perseus, 2023) 375
Figure 16-5: Yaouré pit design – oblique view looking northwest (Perseus, 2023) 375
Figure 16-6: Govisou pit design – plan view (Perseus, 2023) 376
Figure 16-7: Govisou pit design – oblique view looking northwest (Perseus, 2023) 376

Figure 16-8: Angovia 2 pit design – plan view (Perseus, 2023) 377
Figure 16-9: Angovia 2 pit design – oblique view looking northwest (Perseus, 2023) 377
Figure 16-10: CMA Southwest pit design – plan view (Perseus, 2023) 378
Figure 16-11: CMA Southwest pit design – oblique view looking northwest (Perseus, 2023) 378
Figure 16-12: Isometric (inclined) view of CMA stage 3 open pit and CMA Underground Mineral Reserve showing pillar locations 383
Figure 16-13: Feasibility Study mine design showing main airways 385
Figure 16-14: Example installation with 3 × Clemcorp CC1800 Fans and an escapeway man-door (note 4 fans are needed for CMA UG in each exhaust) 385
Figure 16-15: Side view of fans shown in Figure 16-14 386
Figure 16-16: CMA underground mine, coloured by annual mining sequence (schedule) 387
Figure 16-17: Yaouré Gold Mine total movement ex-pit by year 388
Figure 16-18: Yaouré Gold Mine total processing tonnes by year 389
Figure 16-19: Yaouré Gold Mine additional ounce production contribution by ore source relative to August 2021 LOM plan 390
Figure 16-20: Yaouré Gold Mine annual ounce production profile by ore source and grade to mill 390
Figure 17-1: Simplified processing plant flowsheet 396
Figure 17-2: Yaouré process plant ore throughput rate with ore blend data for July 2022 to August 2023 403
Figure 17-3: Yaouré process plant gold recovery with ore blend data for January 2021 to June 2023 404
Figure 18-1: Yaouré Gold Mine site layout with key infrastructure 407
Figure 18-2: CIE hydroelectric power station infrastructure, Kossou 410
Figure 18-3: Conceptual 32 Mt tailings storage facility layout (Knight Piésold, 2023) 412
Figure 20-1: Proportions of national and expatriate personnel 420

Tables

Table 1-1: Predicted metallurgical performance by ore type 12
Table 1-2: Yaouré Measured and Indicated Mineral Resource effective as at June 30, 2023 [9,10,11,12] 14
Table 1-3: Yaouré Inferred Mineral Resource effective as at June 30, 2023 [9,10,11,12] 15
Table 1-4: Yaouré Mineral Reserves [1,2,3,4,5,6,7] 16
Table 1-5: Summary of key process design and operating criteria 18
Table 1-6: Installed and maximum electrical power demand 19
Table 1-7: Yaouré LOM capital costs summary 23
Table 1-8: Operating cost summary 23
Table 2-1: Summary of Qualified Persons 26
Table 2-2: Summary of abbreviations 27
Table 3-1: Other experts 35
Table 4-1: Yaouré Gold Project mineral permits 37
Table 4-2: Yaouré Gold Project mineral permit coordinates 38
Table 4-3: Yaouré exploitation permit scale of royalties 38
Table 6-1: Yaouré Gold Mine production from 2008 to 2012 50
Table 6-2: Yaouré Gold Mine production 2021-2023 52
Table 6-3: 2007 Auverdi Mineral Resource Estimate in SRK (2008) 52
Table 6-4: Yaouré Indicated and Inferred Resources at March 25, 2013 53
Table 6-5: Yaouré Indicated and Inferred Resources at December 1, 2013 53
Table 6-6: Yaouré Measured, Indicated and Inferred Resources at December 20, 2015 54
Table 6-7: Yaouré Gold Mine Mineral Resources at November 3, 2017 54
Table 9-1: Summary of drilling since 2016 by Perseus 65
Table 9-2: Infill drilling inside optimised pit shells prior to 2022 completed by Perseus 70
Table 9-3: Significant intercepts from conceptual deep drilling program 75
Table 10-1: Summary of recent drilling supporting Mineral Resources 86
Table 11-1: Yaouré Project – Summary of drilling sample preparation, assaying and quality controls 91
Table 11-2: Yaouré open pit and CMA open pit – Summary of drill sample preparation, assaying and quality controls 94
Table 11-3: Distribution of oxide CRMs by laboratory – Yaouré and CMA Open Pit 95
Table 11-4: Distribution of sulfide CRMs by laboratory– Yaouré and CMA Open Pit 95
Table 11-5: Summary of blank performance – Yaouré and CMA open pits 100
Table 11-6: CMA UG – Summary of drill sample preparation, assaying and quality controls 103
Table 11-7: Distribution of oxide CRMs by laboratory –CMA underground 104
Table 11-8: Distribution of sulfide CRMs by laboratory–CMA underground 104
Table 11-9: Summary of blank performance –CMA underground 109

Table 13-1: CMA pit fresh ore variability samples for comminution testing 124
Table 13-2: CMA Pit Fresh Ore Master Composite recipe 124
Table 13-3: CMA pit fresh ore metallurgical variability samples 125
Table 13-4: Head assay (select analytes) for CMA Pit Fresh Ore Master Composite and variability samples 126
Table 13-5: True SG for CMA Pit Fresh Ore Master Composite and variability samples 128
Table 13-6: Ore competency classification 129
Table 13-7: SMC Test® results for CMA Pit Fresh Ore Master Composite and comminution variability samples 129
Table 13-8: Ore grindability/hardness classification 130
Table 13-9: BWi for CMA Pit Fresh Ore Master Composite and comminution variability samples 130
Table 13-10: RWi for CMA pit fresh ore comminution variability samples 131
Table 13-11: Ore abrasion classification 132
Table 13-12: Bond abrasion index for CMA Pit Fresh Ore Master Composite and comminution variability samples 132
Table 13-13: Whole ore grind size optimisation test results for CMA Pit Fresh Ore Master Composite 135
Table 13-14: Gravity/grind size optimisation test results for CMA Pit Fresh Ore Master Composite 136
Table 13-15: Gravity/cyanide dosage optimisation test results for CMA Pit Fresh Ore Master Composite 137
Table 13-16: Gravity/leach slurry pulp density optimisation test results for CMA Pit Fresh Ore Master Composite 139
Table 13-17: Additional gravity/leach slurry pulp density optimisation test results for CMA Pit Fresh Ore Master Composite 140
Table 13-18: Gravity/oxygenation optimisation test results for CMA Pit Fresh Ore Master Composite 141
Table 13-19: Gravity/leach lead nitrate optimisation test results for CMA Pit Fresh Ore Master Composite 143
Table 13-20: Gravity/leach and gravity/CIL test results at optimised conditions for CMA Pit Fresh Ore Master Composite 144
Table 13-21: Tails solid gold assay and gold distribution by size fraction for test WH7648 residue 145
Table 13-22: Gravity optimisation/leach test results for CMA Pit Fresh Ore Master Composite 146
Table 13-23: Whole Ore Leach Test Results at Optimised Conditions for CMA Pit Fresh Ore Master Composite 148
Table 13-24: Gold extraction at standard Yaouré test conditions for CMA metallurgical variability samples (Part 1) 150
Table 13-25: Gold extraction at standard Yaouré test conditions for CMA metallurgical variability samples (Part 2) 151

Table 13-26: Diagnostic leach test results for CMA Open Pit Master Composite and metallurgical variability samples 152
Table 13-27: Indicative gold grain size distribution of gravity concentrate from CMA Pit Fresh Ore Master Composite 155
Table 13-28: Indicative locking of gold grains of gravity concentrate from CMA Pit Fresh Ore Master Composite 156
Table 13-29: Gold grain data from EDS analysis of gravity concentrate from CMA Pit Fresh Ore Master Composite 157
Table 13-30: Coarse gold grain sizes identified by optical microscopy of gravity concentrate of CMA Pit Fresh Ore Master Composite 160
Table 13-31: Mineral abundance of gravity tail of CMA Pit Fresh Ore Master Composite 162
Table 13-32: Sequential triple contact CIP leach test work results for CMA Pit Fresh Ore Master Composite cyanidation slurry 162
Table 13-33: Oxygen uptake rate for CMA Pit Fresh Ore Master Composite 163
Table 13-34: Continuous SO_2/air cyanide detoxification test results on CMA Pit Fresh Ore Master Composite cyanidation tailings slurry 164
Table 13-35: Hydrogen peroxide cyanide detoxification test results on CMA Pit Fresh Ore Master Composite cyanidation tailings solution 165
Table 13-36: Viscosity results for the CMA Pit Fresh Ore Master Composite sample 165
Table 13-37: Dynamic thickening test work results for the CMA Pit Fresh Ore Master Composite 167
Table 13-38: Yaouré pit fresh ore variability samples for comminution testing 173
Table 13-39: Yaouré Granodiorite Master Composite recipe 175
Table 13-40: Yaouré S-Basalt Master Composite recipe 175
Table 13-41: Yaouré Y-Basalt Master Composite recipe 176
Table 13-42: Yaouré pit fresh ore metallurgical variability samples 177
Table 13-43: Additional Yaouré pit fresh ore metallurgical variability samples after 2023 recategorisation by lithology 178
Table 13-44: Head assay (select analytes) for Yaouré pit fresh ore master composite and variability samples 179
Table 13-45: True SG for Yaouré pit fresh ore master composite and variability samples 180
Table 13-46: SMC Test® results for Yaouré pit fresh ore master composite and comminution variability samples 181
Table 13-47: Bond ball mill work index for Yaouré pit master composite and comminution variability samples 182
Table 13-48: Bond rod mill work index for Yaouré pit comminution variability samples 183
Table 13-49: Bond abrasion index for Yaouré pit master composite and comminution variability samples 183
Table 13-50: Gravity/grind size optimisation test results for Yaouré pit fresh ore master composites 186

Table 13-51: Gravity/leach test results at optimised conditions for Yaouré pit fresh ore master composites 187
Table 13-52: Tails solid gold assay and gold distribution by size fraction for Yaouré pit fresh ore master composite residues 188
Table 13-53: Whole ore leach test results at optimised conditions for Yaouré pit fresh ore master composites 189
Table 13-54: Gold extraction at standard Yaouré test conditions for Yaouré pit granodiorite metallurgical variability samples 191
Table 13-55: Gold extraction at standard Yaouré test conditions for Yaouré pit S-basalt metallurgical variability samples 192
Table 13-56: Gold extraction at standard Yaouré test conditions for Yaouré pit Y-basalt metallurgical variability samples 193
Table 13-57: Gold extraction at standard Yaouré test conditions for Yaouré pit porphyry metallurgical variability samples 194
Table 13-58: Mass distribution to gravity concentrate and tails fractions for Yaouré pit fresh ore master composites 195
Table 13-59: Indicative gold grain size distribution in gravity concentrate fractions from Yaouré fresh ore master composites 197
Table 13-60: Indicative locking of gold grains of gravity concentrate fractions from Yaouré fresh ore master composites 198
Table 13-61: Gold grain data from EDS analysis of gravity concentrate fraction from the Yaouré Granodiorite Master Composite 200
Table 13-62: Gold grain data from EDS analysis of gravity concentrate fraction from the Yaouré S-Basalt Master Composite 203
Table 13-63: Gold grain data from EDS analysis of gravity concentrate fraction from the Yaouré Y-Basalt Master Composite 205
Table 13-64: Coarse gold grain sizes identified in gravity concentrate fraction of the Yaouré Granodiorite Master Composite 208
Table 13-65: Mineral abundance of gravity tail fractions of Yaouré pit fresh ore master composites 209
Table 13-66: Sequential triple contact CIP leach test work results for cyanidation slurry from Yaouré pit fresh ore master composites 209
Table 13-67: Oxygen uptake rate for Yaouré pit fresh ore master composites 210
Table 13-68: Continuous SO_2/air cyanide detoxification test results on Yaouré Y-Basalt Master Composite cyanidation tailings slurry 210
Table 13-69: Viscosity results for the Yaouré Y-Basalt Master Composite sample 211
Table 13-70: Dynamic thickening test work results for the Yaouré Granodiorite Master Composite 212
Table 13-71: Dynamic thickening test work results for the Yaouré Combined Basalt Master Composite 212
Table 13-72: CMA/Yaouré pit oxide ore variability sample COMM-11 for comminution testing 218

Table 13-73: CMA/Yaouré Oxide Master Composite recipe 219
Table 13-74: CMA/Yaouré oxide and transition metallurgical variability samples 220
Table 13-75: Head assay (select analytes) for CMA/Yaouré oxide and transition variability samples and Oxide Master Composite 221
Table 13-76: True SG for CMA/Yaouré oxide and transition variability samples and Oxide Master Composite 223
Table 13-77: SMC Test® results for CMA/Yaouré oxide variability and Oxide Master Composite samples 223
Table 13-78: BWi for CMA/Yaouré oxide variability and Oxide Master Composite samples 224
Table 13-79: RWi for CMA/Yaouré oxide comminution variability sample COMM-11 224
Table 13-80: Bond abrasion index for CMA/Yaouré oxide variability and Oxide Master Composite samples 224
Table 13-81: Gravity/grind size optimisation test results for the CMA/Yaouré Oxide Master Composite 225
Table 13-82: Gravity/leach test results at optimised conditions for CMA/Yaouré Oxide Master Composite 226
Table 13-83: Tails solid gold assay and gold distribution by size fraction for test WH8161B residue 227
Table 13-84: Whole ore leach test results at optimised conditions for CMA/Yaouré Oxide Master Composite 228
Table 13-85: Gold extraction at standard Yaouré test conditions for CMA/Yaouré oxide metallurgical variability samples 229
Table 13-86: Gold extraction at standard Yaouré test conditions for CMA/Yaouré transition metallurgical variability samples 230
Table 13-87: Gravity/leach and Gravity/CIL test results at optimised conditions for select CMA/Yaouré oxide metallurgical variability samples 231
Table 13-88: Tails solid gold assay and gold distribution by size fraction for test WH8328 residue 232
Table 13-89: Diagnostic leach test results for CMA/Yaouré oxide variability sample OX-VAR-03 233
Table 13-90: Oxygen uptake rate for CMA/Yaouré Oxide Master Composite 234
Table 13-91: Viscosity results for the CMA/Yaouré Oxide Master Composite sample 234
Table 13-92: Dynamic thickening test work results for the CMA/Yaouré Oxide Master Composite 235
Table 13-93: Heap leach dump residue composite sample recipes 238
Table 13-94: Head assay (select analytes) for heap leach dump residue composite samples 239
Table 13-95: True SG for heap leach dump residue composite samples 239
Table 13-96: BWi for heap leach tails composite samples 240
Table 13-97: Gold recovery at standard Yaouré test conditions for heap leach tails composite samples 241
Table 13-98: Viscosity results for select heap leach tails composite samples 242

Table 13-99: CMA SW metallurgical variability samples 244
Table 13-100: CMA SW BLEG test results 246
Table 13-101: Angovia 2 oxide metallurgical variability samples 249
Table 13-102: Angovia 2 transition and fresh metallurgical variability samples 250
Table 13-103: Head assay (select analytes) for Angovia 2 metallurgical variability samples 250
Table 13-104: True SG for Angovia 2 metallurgical variability samples 251
Table 13-105: SMC Test® results for Angovia 2 fresh variability samples 252
Table 13-106: BWi for Angovia 2 fresh variability samples 252
Table 13-107: Gold recovery at standard Yaouré test conditions for Angovia 2 metallurgical variability samples 253
Table 13-108: Diagnostic leach test results for Angovia 2 metallurgical variability sample ANG-VAR-OX-001 254
Table 13-109: Viscosity results for select Angovia 2 oxide metallurgical variability samples 255
Table 13-110: Govisou metallurgical variability samples 258
Table 13-111: Head assay (select analytes) for Govisou metallurgical variability samples 259
Table 13-112: True SG for Govisou metallurgical variability samples 260
Table 13-113: SMC Test® results for Govisou fresh variability samples 260
Table 13-114: BWi for Govisou fresh variability samples 261
Table 13-115: Gold recovery at standard Yaouré test conditions for Govisou metallurgical variability samples 262
Table 13-116: Diagnostic leach test results for select Govisou metallurgical variability samples 264
Table 13-117: Viscosity results for select Govisou oxide metallurgical variability samples 265
Table 13-118: CMA underground comminution variability samples 267
Table 13-119: CMA underground metallurgical variability samples 268
Table 13-120: Composite recipe for CMA-UG-COMP-800-1000 269
Table 13-121: Head assay (select analytes) for CMA underground metallurgical variability and composite samples 270
Table 13-122: True SG for CMA underground metallurgical variability samples 271
Table 13-123: SMC test® results for CMA underground comminution variability samples 272
Table 13-124: BWi for CMA underground comminution variability samples 272
Table 13-125: Ai for CMA underground comminution variability samples 273
Table 13-126: Gold recovery at standard Yaouré test conditions for CMA underground metallurgical variability samples 274
Table 13-127: Tails solid gold grade comparison for CMA underground metallurgical variability samples 277
Table 13-128: Diagnostic leach test results for select CMA underground metallurgical variability samples 278
Table 13-129: Gold recovery at elevated cyanide and oxygen levels for select CMA underground metallurgical variability samples 279

Table 13-130: Gold recovery at grind size P_{80} of 53 µm for CMA underground metallurgical variability samples 280
Table 13-131: Indicative gold grain size distribution of gravity concentrate from CMA-UG-COMP-800-1000 283
Table 13-132: Indicative exposure of gold grains of gravity concentrate from CMA-UG-COMP-800-1000 284
Table 13-133: Indicative locking of gold grains of gravity concentrate from CMA-UG-COMP-800-1000 285
Table 13-134: Gold grain data from EDS analysis of gravity concentrate from CMA-UG-COMP-800-1000 286
Table 13-135: Mineral abundance of gravity tail of CMA-UG-COMP-800-1000 289
Table 13-136: Viscosity results for metallurgical composite sample CMA-UG-COM-800-1000 . 289
Table 13-137: Dynamic thickening test work results for CMA-UG-COMP-800-1000 metallurgical composite 291
Table 13-138: Specific energy and modelled and selected plant throughput at target grind size, by ore type 292
Table 13-139: Yaouré plant hydrocyclone modelling for grind sizes P_{80} of 75 µm and P_{80} 53 µm at different comminution circuit throughputs and circulating loads 294
Table 13-140: Predicted overall plant gold recovery, by ore type 296
Table 13-141: Predicted sodium cyanide and lime consumption, by ore type 298
Table 14-1: Yaouré Gold Mine drilling summary 300
Table 14-2: Drilling data subsets, per-deposit/Mineral Resource estimate, Yaouré Gold Mine. 301
Table 14-3: Weathering codes in the CMA open pit and CMA SW resource model 305
Table 14-4: Weathering domain thickness for Govisou resource model 306
Table 14-5: Weathering domain thickness for Angovia 2 resource model 307
Table 14-6: Yaouré open pit and CMA underground resource model domains 310
Table 14-7: Mineralisation domains in the CMA open pit and CMA SW resource model 312
Table 14-8: Angovia 2 resource model domains 313
Table 14-9: Assigned density values – Yaouré Mineral Resource Estimates 315
Table 14-10: Summary statistics and grade caps for Yaouré open pit and CMA underground estimates 315
Table 14-11: CMA open pit and CMA SW resource model composite dataset statistics 318
Table 14-12: Upper bin thresholds and bin gold grades for CMA open pit and CMA SW resource model 319
Table 14-13: Govisou resource model composite dataset statistics 319
Table 14-14: Govisou resource model indicator thresholds and class grades 320
Table 14-15: Angovia 2 resource model composite dataset statistics 321
Table 14-16: Angovia 2 resource model indicator thresholds and class grades 322
Table 14-17: Upper bin thresholds and class gold grades for Angovia 2 resource model 322

Table 14-18: Model semi-variogram parameters, Yaouré open pit and CMA underground estimates 324
Table 14-19: Assignment of semi-variogram models to CMA open pit and CMA SW resource estimate 325
Table 14-20: Semi-variogram models applied to CMA open pit and CMA SW resource estimate 325
Table 14-21: Semi-variogram models applied to Govisou resource estimate 328
Table 14-22: Semi-variogram models applied to Angovia 2 resource estimate 329
Table 14-23: Yaouré Gold Mine individual block model parameters 330
Table 14-24: Yaouré open pit and CMA underground search and estimation parameters 331
Table 14-25: Assigned domain gold grades – Yaouré open pit and CMA underground resource estimates 333
Table 14-26: CMA open pit and CMA SW resource model estimate search parameters 334
Table 14-27: CMA open pit and CMA SW resource model variance adjustment parameters 335
Table 14-28: Govisou resource model estimate search parameters 335
Table 14-29: Govisou resource model variance adjustment parameters 336
Table 14-30: Angovia 2 resource model estimate search parameters 336
Table 14-31: Angovia 2 resource model variance adjustment parameters 336
Table 14-32: RPEEE open pit shell optimisation summary parameters 352
Table 14-33: Yaouré Gold Mine closing stockpile balances at June 30, 2023 357
Table 14-34: Yaouré Measured and Indicated Mineral Resource effective as at September 18, 2023 [9,10,11,12] 359
Table 14-35: Yaouré Inferred Mineral Resource effective as at September 18, 2023[9,10,11,12] 359
Table 15-1: Yaouré Mineral Reserves effective as at September 18, 2023 [1,2,3,4,5,6,7] 362
Table 15-2: Yaouré Open Pit Mineral Reserve cut-off grades 362
Table 15-3: Slope parameters for rock exposures 365
Table 15-4: Slope parameters for regolith and fill material 365
Table 15-5: Assumed average operating costs (open pit) 366
Table 15-6: Metal Selling cost and gold price assumption 366
Table 15-7: Ore Loss due to pillars by pillar type 367
Table 15-8: CMA underground unplanned dilution and mining recovery assumptions for stopes 368
Table 16-1: Mine design parameters 379
Table 17-1: Summary of key process design and operating criteria 394
Table 17-2: Summary of major process equipment 397
Table 17-3: Reconciled Yaouré Gold Mine quarterly plant production data – Project to end of June 2023 403
Table 17-4: Installed and maximum electrical power demand 405
Table 20-1: Energy emission predictions for LOM 419

Table 21-1: Yaouré LOM capital costs summary..... 426
Table 21-2: Operating cost summary..... 427

1 Summary

1.1 Introduction, Location and Ownership

This report, entitled the "Technical Report, Yaouré Gold Mine – Côte d'Ivoire" (the Report), was prepared by Perseus Mining Limited (Perseus or the Company). Perseus is a Producing Issuer, as defined in the Canadian Securities Administrator's National Instrument 43-101 - Standards of Disclosure for Mineral Projects (NI 43-101). The Report complies with the requirements of NI 43-101.

The Report was prepared for the purposes of updating the existing Perseus Technical Report, Yaouré Gold Project, Côte d'Ivoire (Perseus Mining Limited, 2017) (the 2017 Report) to align with the Company's continuous disclosure of exploration results, Mineral Resources and Mineral Reserves in accordance with NI 43-101 and the 2012 Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC Code). The effective date of this Report is September 18, 2023 (the Effective Date).

Specifically, the objective of this Report is to summarise the results of an updated life of mine (LOM) plan to demonstrate the technical and economic viability of an extended mine life at the Yaouré Gold Mine, inclusive of a Feasibility Study on an underground mine on the CMA orebody.

The Yaouré Gold Project is located in a rural area of central Côte d'Ivoire, West Africa, 35 km north-west of the capital Yamoussoukro (the Project). The property lies close to the southern shore of man-made Lake Kossou and 25 km ENE of the district administrative centre of Bouaflé. The Kossou hydroelectric power station is situated 6 km east of the Project.

Perseus acquired the Project in the first quarter of 2016 via a friendly takeover of Amara Mining plc (Amara). The Project comprises a single 49.77 km^2 permis d'exploitation (PE 50) that covers the active mining area and two contiguous permis de recherche (PRs) covering an additional 313.46 km^2.

The Company's interest in PE 50 is held via 90% owned Ivorian subsidiary company Perseus Mining Yaouré S.A. The remaining 10% of Perseus Mining Yaouré S.A. is owned by the Government of Côte d'Ivoire. The Company's interests in the PRs are held by 100% owned Perseus Mining Yaouré SARL.

1.2 History

Artisanal gold mining is known to have been conducted at Yaouré since 1913. Société des Mines d'Or completed the first exploration program in the Yaouré district on six prospects in 1931. Gold mineralisation was discovered in 1932 at two occurrences known as the Filon de Angovia (Angovia Lode) and the Filon de Akakro (Akakro Lode). The two occurrences were along the same WNW-ESE oriented quartz vein extending along a 2 km strike between Angovia and Kouakougnanou villages. Historical official annual gold production records indicate significant exploitation activity in the region prior to the outbreak of World War II. Annual gold production is reported to have increased from 1.5 kg in 1939 to 107 kg in 1941.

The French Bureau de Recherches Géologiques et Minières (BRGM) completed regional and detailed exploration between 1982 and 1988, conducting regional soil and stream sediment geochemical sampling programs. BRGM identified a total of eight prospects referred as Angovia 1, Angovia 2, Kouakougnanou, Yaouré, Blangan, Magazine, Zone North and Govisou prospects (collectively, the BRGM Prospects). Subsequent work through to 1991 consisted of geophysics, trenching, motorised auger drilling and drilling of two diamond core holes and 100 reverse circulation (RC) holes.

In March 1993, a PE was granted to Compagnie Minière d'Afrique (CMA), who completed further drilling at Angovia 1, leading to a Feasibility Study in 1994. CMA established an open pit mining and heap leach processing operation in 1999 and production continued until the mine closed towards the end of 2003. The Angovia 1 prospect is now referred to as the CMA deposit.

CMA reportedly extracted 1.9 million tonnes of ore, with a mean plant feed grade of 3.9 g/t gold from three open pits: CMA North, CMA Central, and CMA South. The CMA North pit and Central pit eventually merged into one pit, reaching a maximum depth of 40 m below-surface. Treatment of the oxidised ore in a heap leach facility reportedly achieved a mean recovery of approximately 85%.

CMA was also granted a 485 km^2 PR) in July 2002 with the aim of delineating further near-surface oxidised material close to the existing process plant. However, following the closure of the mine in late 2003, the permits were relinquished in 2004, and subsequently transferred to Cluff Gold (West Africa) Côte d'Ivoire SARL (Cluff Gold West Africa), a subsidiary of Cluff Gold plc (Cluff) on October 8, 2004.

The exploration information available to Cluff Gold West Africa indicated the Yaouré zone, immediately west of the CMA pit (the Yaouré Zone), to be the most prospective target after the CMA Zone, with consistent grades in RC drill holes along a 600 m strike. Consequently, Cluff Gold West Africa prioritised exploration of the Yaouré Zone for near surface oxide resources. Over the period of 2005-2008, Cluff Gold West Africa drilled 481 mainly RC holes into the Yaouré Zone and at the Angovia 2 prospect.

Cluff Gold West Africa brought a conventional open pit mine with heap leach processing into production in March 2008 without completing a Feasibility Study. The company also mined the laterite cap on Blangan Hill during this period. Cluff Gold West Africa recovered a total of 54,382 oz of gold from 2.1 Mt of ore processed at a grade of 1.0 g/t Au up until mining and processing ceased in January 2011.

Cluff Gold plc changed its name to Amara Mining plc (Amara) in mid-2012. Between 2012 and 2015, Amara undertook several programs of RC and diamond core drilling to delineate sulfide-hosted gold resources in the Yaouré and CMA mineralised zones. In November 2014, Amara prepared an initial Pre-Feasibility Study (the Amara PFS), which included mineral processing and metallurgical testing, mining and recovery methods, project infrastructure and economic analysis. The Amara PFS, based on a January 2015 Mineral Resource estimate, supported an 11-year mine life with ore processed at a rate of 6.5 Mt/a. Optimisation studies, following the completion of the 2015 drilling campaign and an updated resource model, determined the optimal plant size should be reduced to 4.5 Mt/a.

Perseus acquired the Yaouré property in April 2016 following the acquisition of all outstanding shares of London-based Amara. The Yaouré exploitation permit was transferred to Perseus Mining Yaouré S.A., 90% owned by Perseus Mining Limited and 10% by the Ivorian Government.

Perseus commenced a Definitive Feasibility Study (DFS) in June 2016. The DFS included additional drilling to increase confidence in resource estimates, further investigated geotechnical parameters, gained additional samples for metallurgical test work and to sterilise areas prior to planning placement of infrastructure.

An updated Mineral Resource estimate was completed in October 2017 and Lycopodium updated the mineral processing and metallurgical testing section for the DFS. The DFS outlined open pit Mineral Reserves of 26.8 Mt at a grade of 1.76 g/t Au for 1.52 Moz of contained gold. The DFS anticipated open pit mining over six years and ore processing for 8.5 years to produce a total of 1.36 Moz of gold in doré.

After a program of additional resource definition and sterilisation drilling in 2018, Perseus undertook a Front-End Engineering and Design (FEED) Study that updated Mineral Resources, Mineral Reserves and capital and operating costs estimates.

Construction of the Yaouré processing plant commenced in October 2019, mining commenced in August 2020 and ore processing began in late November 2020. First gold was poured in December 2020 and start of commercial production was declared in March 2021. Until May 2021, process plant feed comprised oxide ore from the Cluff Gold West Africa spent heap leach material. Processing of ore from CMA Stage 1 pit commenced in June 2021.

Open pit mining and ore processing has operated continuously since commencement. To June 30, 2023, Perseus has produced 633,884 oz of gold from Yaouré.

1.3 Geological Setting and Mineralisation

The Yaouré gold deposit lies within the eastern half of the informally named Bouaflé greenstone belt in central Côte d'Ivoire. The belt is a NNE-trending assemblage of Palaeoproterozoic volcanic, sedimentary and intrusive rocks of the Birimian Supergroup.

Rock types in the Yaouré district are, for the most part, mafic volcanic rocks with minor chert, turbiditic metasedimentary rocks and a fluvio-deltaic formation. The volcano-sedimentary rocks were intruded by tonalite-trondhjemite-granodiorite (TTG) type plutonic rocks and undifferentiated granitoids. Mafic to ultramafic complexes are also found in the Yaouré district.

The entire Birimian rock suite has been metamorphosed to lower greenschist facies.

The Yaouré deposit is located immediately south of a major break in the structural-stratigraphic architecture of the Birimian host rocks. South of the break, the sequence is dominated by variably altered, pillowed and massive basalts that host the bulk of gold mineralisation. Metre scale feldspar and quartz-feldspar porphyry dykes and a granodiorite plug, in the Yaouré pit west of CMA, also host minor volumes of mineralisation.

The area immediately north of the deposit comprises a distinctly different volcano-sedimentary sequence dominated by homogeneous dacitic sandstone with no bedding or deposition features that is thought to have been deposited in a fault-bound basin. Based on drill core exposures, it has been divided into an upper and lower unit. Drill core exposures indicate that the basin-bounding faults were reactivated as reverse faults during basin inversion, and it is possible that such reactivation was contemporaneous with gold mineralisation.

Gold mineralisation at Yaouré has been subdivided into two main zones: the CMA Zone to the east and the Yaouré Zone to the west. Subsidiary gold resources have also been delineated at Govisou and Angovia 2, each of which show characteristics different to the main Yaouré and CMA systems.

The CMA Zone is a relatively continuous 20-45 m thick fault zone featuring quartz-carbonate (dominantly ankerite) veining and disseminated pyrite in albite-carbonate altered wall rocks. It strikes approximately north-south, dips at 30 degrees to the east, extends along 1,200 m strike and its down-dip continuity has been tested to a depth in excess of 800 m. At its northern end, the main CMA footwall lode abruptly turns to strike northwest, merging into the NNE dipping fault that juxtaposes the basalt and volcano-sedimentary terranes.

The Yaouré Zone comprises a system of structures in a 300 m wide zone, 200 m below the CMA Zone beneath the Yaouré Central Pit. Gold mineralisation is hosted by a series of brittle-ductile structures divided for convenience into 'Y' and 'S' types. The 'Y' fault zones, parallel to the CMA Zone, consist of the Y1, Y2 and Y3 structures which are shallow easterly dipping reverse faults with associated albite, carbonate and quartz veins in variably altered host rocks with disseminated

pyrite. The 'S' type structures comprise sub-vertical faults filled with quartz-tourmaline veins. The 'S' type structures are oriented WNW, ESE and north-east, south-west. Gold mineralisation also occurs along granodiorite and porphyry contacts and along zones of competency contrast such as the contacts between massive and pillowed basalts.

Gold occurs within quartz, quartz-carbonate and quartz-tourmaline veins and in adjacent altered wall rocks, typically associated with disseminated pyrite. Other than for very fine particles that may be occluded by silicates or pyrite, the gold is free milling, i.e., cyanide soluble.

1.4 Deposit Types

The CMA lodes are structurally controlled, orogenic style gold deposits similar to many exploited elsewhere in the Birimian terranes of West Africa.

Gold mineralisation is accompanied by traces of molybdenum, tungsten, antimony, bismuth and tellurium indicating that the mineralisation may have affinities with the reduced intrusion-related gold systems (IRGS). The predominance of structural controls and association with carbonatisation, sericitisation and silicification, however, are characteristics that more clearly point to its classification as an orogenic, mesothermal gold deposit.

1.5 Exploration

Exploration activities that have been conducted on PE 50, that covers the Yaouré gold deposits, and contiguous permits PR 615 and PR 853 include:

- Soil geochemical sampling, trenching and drilling by BRGM between 1982 and 1991.
- Resource definition drilling by CMA between 1993 and 1999.
- Stream sediment (BLEG) and soil geochemical sampling and drilling by Cluff Gold West Africa between 2005 and mid-2012.
- An airborne geophysical survey (magnetics and radiometrics) in March-April 2012.
- Further soil geochemical sampling, open pit mapping and resource definition drilling by Amara between mid-2012 and the end of 2015.
- Infill soil geochemical sampling, additional open pit mapping, infill resource definition drilling, and drilling for geotechnical test work and sterilisation of areas for planned mine infrastructure by Perseus during 2016 and 2017.
- Testing of the basin contact via drilling, initiated in 2017 with a follow-up program completed in 2020.
- Extensional drilling of the CMA structure down-dip, completed by Perseus in 2019.
- An airborne geophysical survey (magnetics and radiometrics) completed in December 2019 over the entire permit and adjacent Yaouré West permit area.
- A 3D seismic survey carried out in 2021 over the Yaouré gold deposit, covering an area of approximately 17 km^2.
- An airborne gravity survey carried out in 2021 covering the entire permit and the adjacent Yaouré West permit.
- Routinel collection of portable X-ray fluorescence (pXRF) readings on pulps of all new drilling samples since 2020. In mid-2021, Perseus commenced mineralogical analysis of all drill samples, with a selection of samples being tested for multi-element geochemistry.

- A range of petrological and mineralogical assessments commissioned by Perseus to assist with exploration targeting across 2022 and 2023.

Exploration in the immediate vicinity of the Yaouré gold deposits is hampered by extensive areas of transported cover and a complicated weathering profile resulting from multiple episodes of lateritisation, erosion and profile inversion. Historic exploration drill holes and recent sterilisation drill holes have located many gold-mineralised structures beneath transported cover that require follow-up by further drilling.

1.6 Drilling

Prior to 2021, drill coverage of the CMA lodes below the pit shell that constrains the open pit Mineral Resource was limited to approximately 50 m × 50 m and there were few intercepts below 1,000 m RL (approximately 350 m below surface). Since June 2021, a total of six drilling campaigns were completed informing the Yaouré and CMA Mineral Resources.

- CMA underground resource definition targeting the extension of the CMA Zone below the currently planned final pit shell. Drilling was completed in April 2022 and covered the zone on a nominal 25 m × 25 m grid. A total of 280 holes for over 77,000 m were completed.
- CMA underground extension drilling testing mineralisation of the CMA Zone beyond the above-mentioned resource area was completed in May 2022. The campaign included 35 holes for approximately 18,000 m.
- CMA North and South (CMA N&S) – testing extension of the CMA Zone where the CMA underground resource definition program suggested continuation of economic mineralisation. A total of 73 holes have been drilled during October 2022 to February 2023 after completion of the initial CMA underground resource definition program.
- CMA Northwest (CMA NW) – testing mineralisation for economic potential at the contact of the CMA Zone with the sedimentary basin to the north and northwest. A total of 32 holes, all oriented 200 degrees towards the southwest were completed in November 2022.
- CMA Deeps – conceptual exploration holes testing potentially mineralised structures at depth, as identified by the seismic survey. The program comprised seven holes between 500 m and 1,600 m in length and was completed in May 2023.
- Yaouré Pit – resource definition and infill drilling of portions of the Yaouré Pit area to improve confidence in Mineral Resources declared in 2017. A total of 132 RC, RC/DD and DD holes were completed between February 2023 and May 2023. Infill drilling totalled 19,164 m RC and 58,576 m core in 280 pre-collared core holes. The down-dip program totalled 2,783 m RC and 15,129 m core in 35 pre-collared core holes.

All drill hole collars have been surveyed in UTM grid (WGS 84 datum) and locations are considered reliable to ±0.5 m in each of x, y and z directions.

Downhole surveys are available for all drill holes that inform the estimate of CMA underground resources. Late in the 2021-2022 drill program, it emerged that some holes showed 3-4 degrees variation in azimuth between the bottom of hole survey in the pre-collar and the first survey in the cored section. The variations are too large to be explained by hole deviation and appear to have arisen out of inconsistencies between instruments used by different drilling contractors. The impact on the overall resource estimate will be negligible but the accuracy of mineralisation location and local estimates of gold grades will be impacted somewhat.

RC drill samples were collected over one metre intervals and manually split using multi-stage riffle splitters. In drilling undertaken prior to 2021, every one metre sample was normally submitted for gold assay.

In pre-collars drilled during the 2021-2022 campaign, samples were normally combined into 4 m composite samples for assaying.

Diamond core holes collared from surface were normally drilled in HQ diameter to the top of fresh rock and the core diameter then reduced to NQ or NQ2, depending on the drilling contractor. Pre-collared holes were normally drilled NQ or NQ2 diameter from the commencement of coring.

All intervals showing quartz veining, carbonate alteration and/or sulfide mineralisation were sampled along with at least 15 m up-hole and down-hole from such intervals. Long intervals of obviously barren and unaltered rock were normally not sampled. Diamond core was sawn in half, with half submitted for assay. Sample intervals were normally 1 m, varying between 0.5 and 1.5 m length to accommodate sampling to geological contacts and mineralisation boundaries.

RC sample recoveries were measured by weighing of the entire recovered sample for each metre drilled. Drill core recoveries were logged linearly by drill run. Core recoveries below about 75 m down-hole, the approximate depth to fresh rock, are consistently near 100% for all holes that inform the estimate of underground resources.

1.7 Sample Preparation, Analyses and Security

Between December 2016 and June 2018, RC and diamond core drilling has been carried out over what are now known as the Yaouré and CMA open pits. All samples have been assayed for gold by 50 g fire assay (FA), at Actlabs Burkina Faso SARL laboratory in Ouagadougou (Actlabs) and Bureau Veritas Minerals Limited Abidjan (BVML). Both laboratories are accredited and considered independent of the Company.

Between February and May 2023, 132 mainly deeper holes to depths up to 350 m have been added over the Yaouré pit by RC, DD and RCDD to inform the Mineral Resource Estimate at deeper portions of the deposit and improve confidence. All samples for this program have been analysed for gold with a CPA unit operated by the independent and accredited MSALABS (MSA) in Yamoussoukro. Suitability, reliability, accuracy and repeatability of this new technology has been tested and verified by inter-laboratory check and umpire assaying, before using the data to inform the Mineral Resource Estimate.

Between August 2021 and April 2023, Perseus carried out close spaced drilling over the extension of the CMA, called the CMA underground drill program. The bulk of samples has been analysed by Intertek Minerals Limited (Intertek) and ALS Minerals (ALS) (both independent and accredited), until mid-January 2023, by 50 g FA. Since mid-January 2023, samples have been predominantly analysed by MSA using a CPA unit.

All drilling campaigns followed routine monitoring of assay quality through the insertion of QAQC samples (standards, blanks and duplicates), and immediate re-assaying where results reported for client-submitted standards or blanks casted doubts on the accuracy and quality of the analytical process.

Sample preparation procedures for both core and RC samples analysed by FA have been consistent for all drilling that informs the resource estimate:

- dry at 110°C for 10-12 h
- crush the entire sample to -2 mm

- split to approximately 1.5 kg
- pulverise, normally using LM2 disc pulverisers, to 90% passing 75 µm
- mat roll and dip approximately 300 g subsample into a kraft packet.

RC sample splitting is undertaken at drill sites under the supervision of Perseus geologists. Sub-samples are methodically bagged and transported to the Yaouré sample preparation facility which is located within a secure compound within the mine take area.

Core is logged and sampled at the Yaouré exploration compound, located in the same secure area.

Half core samples or RC sample splits that are sent for preparation by commercial laboratories are securely packed and transported to Yamoussoukro by Perseus personnel. Kraft paper packets containing pulps from samples prepared at Yaouré are packed into custom cardboard boxes and securely wrapped prior to transport to commercial assay laboratories.

A sample submission form, detailing sample number sequences and number of samples, accompanies each shipment of pulps or RC or core which is transported to a commercial assay laboratory.

Digital assay reports and electronic certificates are emailed by the laboratories to a pre-set list of Perseus recipients.

In the QP's opinion, sample security is not considered a significant risk to the reliability of Mineral Resource estimates at Yaouré.

A consistent QAQC regime has been maintained during drilling by Amara (2012-2016) and by Perseus:

- CRMs were inserted as 60 g sachets at a ratio of 1:20 samples of both RC chips and diamond core despatched for assay. For 2021-2022 drilling, CRMs were sourced from Geostats Pty Ltd.
- Blank samples, comprising approximately 3 kg of barren granite sourced from a commercial quarry, were submitted at a ratio of 1:20 samples despatched.
- Duplicate riffle splits (field re-splits) of RC samples were submitted at a ratio of 1:25 for RC samples only. Quarter core duplicate splits of diamond core samples were not generated.
- For samples prepared at the Yaouré facility, one in 20 pulps were screened to monitor grind size.
- For samples prepared at the Yaouré facility, a barren quartz wash was passed through crushing and grinding equipment between every sample.

Perseus employees inserted QAQC samples during sample preparation at Yaouré, prior to sample pulps being transported to commercial assay laboratories.

For samples that were prepared by commercial laboratories, quality control samples were inserted in the sample streams prior to sample despatch.

Assays reported for CRMs and blank samples were routinely checked against tolerance limits when importing assays from digital laboratory reports into the acQuire database. Re-assays were requested for entire laboratory batches for which more than one CRM or blank failure arose.

The performances of CRMs and blank samples have been examined in detail. The precision indicated by assays of CRMs indicate relatively poor precision, typical of assaying for gold by commercial laboratories. CRM assays are spread fairly symmetrically about expected grades, indicating no significant bias.

Blank samples indicate no significant cross-contamination in samples preparation and assaying processes.

In the opinion of the QP, the available quality control data are considered sufficient to establish that the assay data are free of any biases or other factors that would materially affect confidence in estimates of Mineral Resources.

1.8 Data Verification

Routine drill hole data validation procedures included:

- Checks that surveyed locations of drill hole collars are within tolerance of proposed locations and locations recorded on field logging sheets
- Sense checks of down-hole surveys
- Checks for missing sample intervals, overlapping sample intervals and duplicate sample numbers
- Comparisons of gold assays to visually logged intervals of alteration and mineralisation
- Targeted checks of laboratory assay reports against assays in the drill hole database
- Visual comparisons, in cross-section and plan views, of gold grades and logged geology in neighbouring drill holes.

In the opinion of the QP the drill hole data are considered adequate and sufficiently reliable to be used to inform estimates of Mineral Resources.

1.9 Mineral Processing and Metallurgical Testing

The metallurgy of CMA and Yaouré mineralisation was examined in five historical test work programs by Cluff Gold West Africa and Amara between 2012 and 2015. That work determined that:

- No deleterious elements were noted in assays performed.
    - The organic carbon content was 0.03% for the oxide composite, and 0.01% or 0.02% for transition and fresh ore composites. This indicates that the composites tested are unlikely to exhibit preg-robbing behaviour.
    - Low assay values across the data set for arsenic, copper, lead and zinc.
    - The sulfide sulfur assay data set indicates that sulfide minerals are present in the transition and fresh ore composites. Mineralogical analysis performed on the transition and fresh ore composites confirms the dominant sulfide mineral is pyrite. No arsenopyrite was detected during the mineralogical analysis.
    - Gold tellurides were not observed in any sample, but silver telluride minerals were noted in selected fresh ore composites.
- Extended leaching tests showed a peak extraction around 24 h, with falling extraction to 48 h. Repeat testing with activated carbon did not achieve higher leach extractions suggesting that preg-robbing was not an issue, but no satisfactory explanation was provided for this trend.
- Cyanide gold leach extractions were highest at a grind size P_{80} of 75 µm, with extractions of between 90 and 93% across all domains.

- Across tests, air and oxygen addition was beneficial to leach kinetics. Oxygen addition was beneficial to overall gold extraction.
- Gold was noted to be associated predominantly with pyrite, but also with silicates and chlorites.
- Cyanide consumption ranged from 0.2 kg/t NaCN for fresh ore samples to over 2 kg/t NaCN for oxide samples. Most of the cyanide leach tests had cyanide added during the test to maintain cyanide concentration.
- Gravity concentration was able to recover approximately 15% to 30% of the gold into a concentrate. The combined extraction from leaching the concentrate and tailing was no greater than whole ore leaching.
- Flotation achieved good recovery on some samples, but the combined flotation and leach extraction was lower than that achieved by whole ore leaching. Flotation response between samples was variable.
- SMC Test® results, characterising ore competency results, indicated that:
    - The transition ore composite is moderately competent to competent, with A×b of 38.0.
    - Fresh ore composites are very competent, with A×b of 19.6 to 29.2.
- Bond ball work indices (BWi) of samples tested, at a closing screen size of 106 µm, were:
    - 6.2 kWh/t for oxide ore (very soft).
    - 9.9 kWh/t for transition ore (medium hard).
    - 12.4 kWh/t to 17.7 kWh/t for fresh ore (medium hard to hard).
- Bond rod work indices (RWi) of samples tested, at a closing screen size of 1,180 µm were:
    - 6.3 kWh/t for oxide ore (very soft).
    - 12.0 kWh/t for transition ore (medium hard).
    - 15.1 kWh/t to 26.3 kWh/t for fresh ore (hard to very hard).
- Bond abrasion indices (Ai) indicated that oxide ore was non-abrasive and transition and fresh ores were slightly abrasive.

The metallurgy of Yaouré Gold Mine deposits was examined in further detail by Perseus in subsequent test work programs (CMA and Yaouré pit oxide, transition and fresh ores in 2017-2018; heap leach dump residues in 2017-2018; CMA SW oxide, transition and fresh ores in 2021; Angovia 2 oxide, transition and fresh ores in 2020-2021; Govisou oxide, transition and fresh ores in 2021; and CMA underground ore in 2022-2023). Ore samples were selected across deposits and weathering profiles and were tested to determine:

- the most suitable processing route.
- the optimum plant operating parameters for each ore type for the determined processing route, specifically throughput rate, gold recovery and reagent consumption.
- the variability in metallurgical performance for the range of ore types, weathered states, and mineralisation styles.
- engineering design data required for plant and tailings storage facility (TSF) design and operation.

The test work program included the following stages:

- Selection of samples for comminution, gold extraction and physical characterisation test work that were representative of the range of Yaouré Gold Mine mineralised ore types, oxidation states, locations and head grades.
- Comminution test work carried out on variability samples representing the range of mineralised material types and spatial distributions within the deposits, and on composites to represent specific mill feed blends expected during the life of the Project.
- For CMA pit and Yaouré pit ores, an ore type master composite optimisation test work program was conducted. Ore type master composites were formed by combining selected drill core intervals representing the main mineralised material types, to determine:
  - mineralogy and gold extraction, assessing the key elements present in each material type and identifying differences in gravity recovery and cyanidation characteristics.
  - optimal process conditions for the economic optimum maximum gold recovery and minimum reagent consumption.
  - engineering parameters necessary for process plant design.
- Metallurgical variability test work program was conducted on individual samples (and some limited composite samples) representing the range of mineralised material types, grades and spatial distributions across all ore deposits. For heap leach dump residues, Angovia 2 pit, Govisou pit and CMA underground, select engineering parameters were determined using variability samples or material composites.

Key outcomes from the 2017 to 2023 test work programs were:

- Selection of the Yaouré processing plant flowsheet (consisting of primary crushing, SABC comminution, gravity gold concentration and recovery, cyanidation, elution, electrowinning, doré production by smelting, and SO_2/air destruction of WAD cyanide species in tailings slurry before deposition in the TSF), and confirmation of the suitability of this flowsheet to recover gold across the range of ore types, weathered states, and mineralisation styles tested.
- With respect to comminution test work and subsequent modelling:
  - Yaouré Gold Mine oxidised ores have low competency and are soft to medium hard.
  - Yaouré Gold Mine transition ores are of medium hardness.
  - Yaouré Gold Mine fresh ores range from medium competent to very competent, and range from medium hard to very hard.
  - Variation in ore competency and hardness results in variable instantaneous throughput rates in the SABC comminution circuit.
  - Open pit oxide, transition and fresh ores require grinding to P_{80} of 75 µm to optimise gold recovery in cyanidation. CMA underground ores require finer grinding to P_{80} of 53 µm.
- With respect to gravity/cyanidation test work and subsequent modelling:
  - Approximately one third of gold is gravity recoverable. Although whole of ore leach gold extractions are comparable to gravity/leach gold extractions, a gravity gold recovery circuit has been included to improve gold accounting and security outcomes.

    - Predicted gravity/leach gold recovery across open pit ore types ranges from 91.0% to 93.4% for oxide ores, 91.9% to 94.5% for transition ores and 89.5% to 93.8% for fresh ores at a nominal residence time of 30 h. Predicted gold recovery for CMA underground ore ranges from 80.5% to 92.1% on a monthly basis, with an average of 87.2% for the CMA Underground Mineral Reserves.
    - Sufficient data were generated to predict reagent consumptions when treating the range of ore types, weathered states, and mineralisation styles tested.
- Gold diagnostic leach and mineralogical investigations confirm that gold is predominantly associated with labile pyrite and silicates.
- Sufficient engineering design data were generated to size key process plant equipment.

The test work results from 2017-2023 test work programs, considered in the context of updated orebody interpretations during 2023, were used to derive throughput rate, gold recovery and reagent consumption predictions by ore type for business planning, mine design and optimisation and economic modelling. Metallurgical performance parameters selected by Perseus are summarised in Table 1-1, which are derived from both metallurgical test work and plant operating data.

Table 1-1: Predicted metallurgical performance by ore type

ORE TYPE	TARGET GRIND P_{80} (µm)	THROUGHPUT (t/h)	GOLD RECOVERY (%)	NaCN CONSUMPTION (kg/t)	LIME CONSUMPTION (kg/t)
CMA pit oxide	75	475	92.5	0.49	2.10
CMA pit transition	75	475	92.0	0.42	1.00
CMA pit fresh	75	475	91.5	0.43	1.40
Yaouré pit oxide	75	475	93.0	0.49	2.10
Yaouré pit transition	75	475	93.3	0.42	1.00
Yaouré pit granodiorite	75	389	93.8	0.38	0.50
Yaouré pit basalt	75	365	92.6	0.44	0.50
Heap leach pad residue – CMA1	75	475	84.5	0.49	2.10
Heap leach pad residue – CMA2	75	475	82.5	0.49	2.10
Heap leach pad residue – CMA3	75	475	63.0	0.49	2.10
Heap leach pad residue – Cluff	75	475	78.8	0.49	2.10
Heap leach pad residue – EGlobal	75	475	83.7	0.49	2.10
CMA SW oxide	75	475	93.4	0.49	2.10
CMA SW transition	75	475	94.5	0.42	1.00
CMA SW fresh	75	475	89.5	0.43	1.40
Angovia 2 oxide	75	475	92.9	0.35	4.35
Angovia 2 transition	75	475	92.0	0.33	2.36
Angovia 2 fresh	75	290	91.1	0.30	0.37
Govisou oxide	75	475	91.0	0.45	3.21
Govisou transition	75	475	91.9	0.44	1.70
Goivsou fresh, Au ≥1.1 g/t	75	330	91.7	0.41	0.39
Govisou fresh, Au <1.1 g/t	75	330	49.81×Au + 38.21	0.41	0.39
CMA underground	53	394	Based on recovery algorithm. Mineral Reserves weighted recovery of 87.2	0.36	1.63

For CMA underground ore, ground to target P_{80} of 53 µm, regression modelling indicated that gold recovery was dependent on both gold and sulfur head grade. This statistical outcome was supported by findings from mineralogical investigations and diagnostic leach test work on CMA underground metallurgical samples. CMA underground gold recovery prediction, based on gold head grade (Au, in g/t) and sulfur head grade (S, in %) is:

$$Recovery = 90.1005 + 1.42642\ Au\ - 4.38991\ S$$

Given that sulfur interval assays and block models are still under development for CMA underground, an alternative gold recovery prediction algorithm has been developed, based on gold head grade (Au, in g/t), x coordinate (UTM easting in m), y coordinate (UTM northing in m) and z coordinate (mine RL in m), to facilitate economic modelling and business planning. CMA underground gold recovery prediction, based on position coordinates is:

$$Recovery = 1.854953745\ Au\ + 0.020944227\ x + 0.018691957\ y + 0.056966098\ z - 19147.80314$$

The recovery equations are constrained to gold grades below 10 g/t, a minimum gold recovery of 77.0% and a maximum gold recovery of 97.0%.

It is preferred to use the gold and sulfur head grade recovery algorithm once resource sulfur assay data and modelling supports this.

Yaouré Gold Mine ores contain no known deleterious elements or minerals that could have a significant effect on potential economic recovery of gold in a hybrid leach/carbon-in-leach cyanidation process, based on metallurgical test work and/or operational experience.

1.10 Mineral Resource Estimates

The Yaouré Gold Mine Mineral Resource estimate consists of five deposits that includes Yaouré, CMA, CMA Southwest (CMA SW), Govisou and Angovia 2. The CMA SW, Govisou and Angovia 2 deposits are collectively referred to as satellite deposits (the Satellite Deposits). The data cut-off date for this latest resource update is June 30, 2023; with Mineral Resources depleted for mining activities and operating stockpiles, including the previously processed Yaouré heap leach pads, current as of June 30, 2023. Mineral Resources are inclusive of Mineral Reserves.

Mineral Resources reported herein have been estimated using a geostatistical block modelling approach, informed from gold assay data obtained from predominantly core and RC drill chips sampling data. The geological wireframes consider structural and lithological interpretations of the gold mineralisation.

The Yaouré open pit and CMA underground Mineral Resource estimates were prepared using Seequent Leapfrog Geo software using the Edge module, with block model editing and resource reporting conducted using Micromine™ software.

The CMA open pit and Satellite Deposits' Mineral Resource estimates were prepared using Micromine™ software for data compilation, domain modelling, compositing and resource reporting. GS3M software was used to conduct the resource estimation.

The evaluation of the Yaouré Mineral Resources involves the following procedures:

- Database compilation and verification.
- Generation and verification of three-dimensional geological models.
- Data conditioning (including compositing and grade capping), statistical analysis and variography.

- Selection of estimation strategies and estimation parameters.
- Block model generation, grade estimation and validation.
- Classification and depletion for mining.
- Preparation of the Mineral Resource estimate and reporting.

The Mineral Resources are constrained by optimised pit shells using appropriate cost and revenue factors, together with a reporting cut-off grade. Mineral Resources reported herein are therefore considered to have met reasonable prospects for eventual economic extraction.

Table 1-2: Yaouré Measured and Indicated Mineral Resource effective as at June 30, 2023 [9,10,11,12]

DEPOSIT	DEPOSIT TYPE	MEASURED			INDICATED			MEASURED & INDICATED		
		Mt	g/t Au	'000 oz Au	Mt	g/t Au	'000 oz Au	Mt	g/t Au	'000 oz Au
CMA[1,3,4, 6]	Open Pit	-	-	-	16.7	1.32	710	16.7	1.32	710
Yaouré[2,3,4, 6]	Open Pit	-	-	-	19.2	1.27	784	19.2	1.27	784
Satellite Deposits[5,6]	Open Pit	-	-	-	6.6	0.97	206	6.6	0.97	206
Sub Total		**-**	**-**	**-**	**42.6**	**1.24**	**1,700**	**42.6**	**1.24**	**1,700**
CMA[8]	Underground	-	-	-	7.3	4.17	976	7.3	4.17	976
Heap Leach[3,7]	Stockpile	-	-	-	0.4	0.61	8	0.4	0.61	8
Stockpiles	Stockpile	4.4	0.84	119	-	-	-	4.4	0.84	119
TOTAL		**4.4**	**0.84**	**119**	**50.3**	**1.66**	**2,684**	**54.7**	**1.59**	**2,804**

Notes:
Prepared using the CIM Definition Standards for Mineral Resources and Mineral Reserves adopted by the CIM Council on May 19, 2014 (the CIM Definition Standards) and CIM Estimation of Mineral Resource and Mineral Reserves Best Practice Guidelines adopted by the CIM Council on November 29, 2019 (the CIM Guidelines).

1. Based on June 2022 Mineral Resource estimate.
2. Based on June 2023 Mineral Resource estimate.
3. Depleted for previous mining and to June 30, 2023 mining surface.
4. 0.4 g/t gold cut-off applied to in situ open pit material.
5. Based on Angovia 2 April 2021, Govisou June 2022 and CMA SW August 2022 Mineral Resource models.
6. In situ open pit resources constrained to $1,800/oz pit shells.
7. Heap leach resources are stated at 0 g/t gold cut-off; only heap leach components with average grade above 0.4 g/t included.
8. June 2023 Mineral Resource estimate, below Stage 3 pit and above 1.5 g/t block grade cut-off.
9. Mineral Resources current as of June 30, 2023.
10. Rounding of numbers to appropriate precision may result in summary inconsistencies.
11. Mineral Resources are reported inclusive of Mineral Reserves.
12. The Yaouré Mineral Resources are reported on a 100% basis.

Table 1-3: Yaouré Inferred Mineral Resource effective as at June 30, 2023 [9,10,11,12]

DEPOSIT	DEPOSIT TYPE	INFERRED		
		Mt	g/t Au	'000 oz Au
CMA [1,3,4, 6]	Open Pit	2.6	0.7	58
Yaouré[2,3,4,6]	Open Pit	3.0	1.3	124
Satellite Deposits[5,6]	Open Pit	1.3	0.8	34
CMA[8]	Underground	4.4	3.4	485
Total		**11.3**	**1.9**	**701**

Notes:
Prepared using the CIM Definition Standards and CIM Guidelines.

1. Based on June 2022 Mineral Resource estimate.
2. Based on June 2023 Mineral Resource estimate.
3. Depleted for previous mining and to June 30, 2023 mining surface.
4. 0.4 g/t gold cut-off applied to in situ open pit material.
5. Based on Angovia 2 April 2021, Govisou June 2022 and CMA SW August 2022 Mineral Resource models.
6. In situ open pit resources constrained to $1,800/oz pit shells.
7. Heap leach resources are stated at 0 g/t gold cut-off; only heap leach components with average grade above 0.4 g/t included.
8. June 2023 Mineral Resource estimate, below Stage 3 pit and above 1.5 g/t block grade cut-off.
9. Mineral Resources current as of June 30, 2023.
10. Rounding of numbers to appropriate precision may result in summary inconsistencies.
11. Mineral Resources are reported inclusive of Mineral Reserves.
12. The Yaouré Mineral Resources are reported on a 100% basis.

The QP is not aware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant factors that could materially affect the Mineral Resource estimate.

In the QP's opinion, the estimates of Measured and Indicated Mineral Resources are sufficiently reliable to support estimation of Mineral Reserves.

1.11 Mineral Reserve Estimates

Yaouré Gold Mine open pit Mineral Reserves are extensions to the existing mining operation, and are supported by additional test work and studies where necessary to demonstrate technical and economic viability. Such studies include additional geotechnical test work and metallurgical confirmatory test work and analysis.

The CMA underground Mineral Reserve is supported by a Feasibility Study which establishes the technical and economic viability of the CMA underground project. Studies include metallurgical, geotechnical and hydrogeological test work, as well as analyses and investigations in relation to mining ventilation, paste backfill, mining methods, and capital and operating cost estimates. Studies have been undertaken by Perseus technical staff and expert consultants.

Mineral Resources are reported inclusive of Mineral Reserves (that is, Mineral Reserves are not additional to Mineral Resources). Mineral Reserves may be subdivided into Proven Mineral Reserves and Probable Mineral Reserves categories to reflect the confidence in the underlying Mineral Resource data and modifying factors applied during mine planning. The Yaouré Gold Mine estimate comprises Proven and Probable Mineral Reserves.

The Proven and Probable Mineral Reserves for Yaouré Gold Mine, both open pit and underground are supported by this Feasibility Study and are estimated as 37.2 Mt, grading 1.73 g/t gold and containing 2.1 Moz of gold. Details of the estimate are shown in Table 1-4.

Table 1-4: Yaouré Mineral Reserves [1,2,3,4,5,6,7]

DEPOSIT	DEPOSIT TYPE	PROVEN			PROBABLE			PROVEN + PROBABLE		
		QUANTITY Mt	GRADE g/t gold	GOLD '000 oz	QUANTITY Mt	GRADE g/t gold	GOLD '000 oz	QUANTITY Mt	GRADE g/t gold	GOLD '000 oz
CMA[1,2]	Open Pit	-	-	-	11.9	1.81	692	11.9	1.81	692
Yaouré[2,3]	Open Pit	-	-	-	11.8	1.49	565	11.8	1.49	565
Satellite Deposits[2,3]	Open Pit	-	-	-	4.1	1.03	137	4.1	1.03	137
Sub-Total		-	-	-	27.8	1.56	1,394	27.8	1.56	1,394
CMA[4]	Underground	-	-	-	4.9	3.51	559	4.9	3.51	559
Stockpiles	Stockpile	4.4	0.84	119	-	-	-	4.4	0.84	119
TOTAL		**4.4**	**0.84**	**119**	**32.8**	**1.85**	**1,953**	**37.2**	**1.73**	**2,072**

Notes:
Prepared using the CIM Definition Standards and CIM Guidelines.

1. Based on depletion to June 30, 2023 mining surfaces.
2. Variable gold grade cut-offs for each material type, ranging from 0.35 g/t to 0.75 g/t.
3. Pit designs are based on $1,300/oz gold price for satellites and $1,500/oz for CMA and Yaouré open pits.
4. Based upon cut-off for development and stoping of 0.5 g/t Au and 2.5 g/t Au.
5. Inferred Mineral Resource is considered as waste for optimisation purposes.
6. Rounding of numbers to appropriate precision may have resulted in apparent inconsistencies.
7. The Yaouré Mineral Reserves are reported on a 100% basis.

Under the assumptions in this Report, the Yaouré Gold Mine shows a positive cash flow over the life-of-mine and supports the Mineral Reserve estimates. The projected mine plan is achievable under the set of assumptions and parameters used.

The QP is not aware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant factors that could materially affect the Mineral Reserve estimate.

1.12 Mining Methods

The Yaouré Gold Mine comprises existing open pit mining methods and proposed underground mining via a flat longhole open stoping mining method.

1.12.1 Open Pit

The Yaouré Gold Mine open pits use conventional hydraulic excavator and rigid off-highway rear dump truck fleet, with drill and blast where required in transitional and fresh rock material. Mining bench heights are 10 m with 2.5 m flitches for selective mining to minimise ore loss and waste rock dilution. Bulk waste mining is also mined on 10 m benches.

Trucks haul ore to surface ore stockpiles, with waste being hauled to, and disposed in, waste disposal dumps. Stockpile rehandle is by front-end loader.

Drill and blast practices are be employed to break the rock. Drill and blast techniques, including pre-split and trim shots are applied to minimise open pit wall damage, and blasting is configured to minimise ore loss and waste dilution.

The open pit mining operation has a current mining rate of approximately 30 Mt/a total movement for the LOM to deliver ore feed to support the target of average processing rate of 3.4 Mt/a. The operation is operated by a mining contractor, whose activities include stripping free dig material such as topsoil, clays and highly weathered rock near surface.

To balance waste stripping and ore grades, the pits are designed to mine to the ultimate boundary limit using cutbacks. Access to the pit is by 24 m wide haul roads and ramps incorporating a 10% gradient with windrow and drain. Single lane ramps are used as required, especially towards the

end of pit life to maximise ore recovery and minimise waste mining. Rock is hauled to surface with ore placed on stockpiles at the ROM pad and waste dumped to waste disposal dump.

RC drilling is completed for grade control, with the assays used to define the ore boundaries.

There are a total of five open pits to be mined during the proposed life of the Project. These are CMA, Yaouré, Angovia 2, Govisou and the CMA SW pits. The CMA and Yaouré pits are the main open pits as measured by gold production and will be mined in five cutbacks (three for CMA and two for Yaouré).

1.12.2 Underground

The CMA underground will be mined by a combination of flat longhole open stoping and conventional longhole open stoping mining methods. These methods have been selected as the most cost effective and productive mining methods for the flat-dipping CMA orebody. The mining method is dependent upon the dip of the orebody which ranges from 5 degrees to 20 degrees for the majority of flat longhole stoping, and from 50 degrees up to 62 degrees for conventional longhole stoping. The mine design encompasses significant variability in plunge and dip across the deposit, for which a flexible mining method is required. Flat longhole stoping accounts for the majority of ore tonnes (98%), while conventional stoping applies only to the CMA northwest area of the mine (2% of ore tonnes).

Mining equipment will be mechanised, and equipment is planned to include electric-hydraulic drills for development and production, and rubber tyred loaders and trucks for load and haul activities. Production loading will incorporate tele-remote loading for non-entry mining stopes.

The CMA underground is based on a case without backfill for mining the CMA deposit. At this stage, a high recovery of the CMA orebody using pillars means that backfill is not part of the mine plan. If Mineral Reserves increase and the mine gets deeper, there may be a case in the future for implementation of a reticulated backfill system, such as paste fill.

Mining extraction ratios for CMA underground Mineral Reserves are dependent upon the dimensions and spacing of pillars throughout the orebody. The CMA Mineral Reserve assumes 40 m open stopes (along strike) and pillars of 10 m × 10 m, which combines with strategically placed vent pillars to provide an overall 81% extraction ratio (mining recovery).

1.13 Recovery Methods

The Yaouré Gold Mine process plant has been in operation since late November 2020 and consists of the following unit processes:

- Primary crushing with a single toggle jaw crusher to produce a coarse crushed product
- A live stockpile from which ore is reclaimed to feed the milling circuit
- SAG milling in closed circuit with pebble crushing and ball milling in closed circuit with hydrocyclones (SABC comminution)
- Gravity concentration and removal of coarse gold from the circulating load within the milling circuit, and treatment of gravity concentrate by intensive cyanidation and electrowinning
- Hybrid leach/CIL cyanidation, comprising one leach stage followed by six stages of leaching with carbon present for gold adsorption
- Split AARL elution treating loaded carbon

- Electrowinning
- Carbon regeneration
- Smelting of electrowinning sludge, producing doré for sale
- SO_2/air cyanide destruction
- Tailings pumping to the TSF.

The unit operations and equipment selected are typical of the industry and are suitable for the required duty and projected mine life. The maintenance requirements and costs of the equipment installed are well understood.

Minor plant upgrades are required to enable processing of CMA underground. In particular, Perseus is currently studying upgrading tramp metal removal systems.

Table 1-5 summarises key process design and operating criteria for the Yaouré processing plant.

Table 1-5: Summary of key process design and operating criteria

CRITERIA	UNITS	VALUE	SOURCE
Plant throughput – oxide (design)	t/a	3,800,000	(Lycopodium, 2019)
Plant throughput – CMA fresh (design)	t/a	3,300,000	(Lycopodium, 2019)
Plant throughput – operations forecast	t/a	Refer to Table 13-138 for selected plant throughput at target grind size by ore type	
Head grade – design	g/t Au	3.44	Perseus
Gold recovery – design	%	93	Test work
Gold recovery – operations forecast	%	Refer to Table 13-140 for selected gold recovery at target grind size by ore type	
Crushing plant run time	%	80.0	(Lycopodium, 2019)
Grinding/process plant utilisation	%	91.3	(Lycopodium, 2019)
Grind size P_{80} – open pit ores	µm	75	Test work
Grind size P_{80} – CMA underground ore	µm	53	Test work
Number of leach tanks	-	1	(Lycopodium, 2019)
Leach tank volume	m^3/tank	3,250	(Lycopodium, 2019)
Number of CIL tanks	-	6	(Lycopodium, 2019)
CIL tank volume	m^3/tank	3,250	(Lycopodium, 2019)
Elution circuit type	-	Split AARL	(Lycopodium, 2019)
Elution circuit – mass of carbon batch	t	10.0	(Lycopodium, 2019)
Frequency of elution	strips/week	8	(Lycopodium, 2019)
TSF supernatant CN_{WAD} concentration	mg/L	<50	Perseus; (International Cyanide Management Institute, 2021)

The plant site-wide electrical power requirement for the process plant, mining and site infrastructure has been calculated based on equipment sizing and demand, and is summarised in Table 1-6.

Table 1-6: Installed and maximum electrical power demand

AREA	INSTALLED LOAD		MAXIMUM DEMAND		AVERAGE DEMAND
	(MW)	(MVA)	(MW)	(MVA)	(GWh/a)
Process plant	23.15	25.66	17.18	18.86	142.2
Site infrastructure (current)	1.93	2.33	1.50	1.81	10.3
Underground mine + upgrades to infrastructure	5.45	6.64	4.36	5.13	29.5
Total	30.53	34.63	23.04	25.80	182.0

The Yaouré processing plant uses water sourced from the Bandama River, surface run-off, ground water bores and pit dewatering. After the establishment of the CMA underground mine, dewatering from the underground mine will also be recovered and available for ore processing. The Bandama River is the largest source of raw water during the life of the Yaouré Gold Mine operation.

River abstraction is required to make up the process water shortfall under average and 100-year dry climatic design conditions. As modelled by Knight Piésold (2017a), a critical supply rate of 139 L/s (3.6 Mm^3/a, or 1.1 m^3/t) from river abstraction is required to process 3.3 Mt/a of ore when mine dewatering sources are unavailable, to prevent process water shortfalls under design dry conditions (1 in 100 year recurrence interval, 12 month dry rainfall sequence). When mine dewatering is included in the water balance, the critical supply rate from river abstraction is reduced to 91 L/s (2.4 Mm^3/a, or 0.7 m^3/t) to process 3.3 Mt/a of ore under design dry conditions.

Under average climatic conditions, the raw water supply rate reduces to 123 L/s (3.2 Mm^3/a, or 1.0 m^3/t) to process 3.3 Mt/a of ore when mine dewatering sources are unavailable, and 76 L/s (2.0 Mm^3/a, or 0.6 m^3/t) to process 3.3 Mt/a of ore when mine dewatering sources are included in the water balance.

In consideration of variable water demands by ore type, downtime required for pump and pipeline maintenance, and higher than nameplate processing plant ore throughput, installed river abstraction pumping capacity is 250 L/s.

As of September 2023, the Yaouré pit is being used for excess raw water storage on site. As open pit mining activities transition to the Yaouré pit, it is anticipated that the ROMSE pit will be used for excess raw water storage.

Within the process plant, the process water pond has an installed capacity of 6,300 m^3 and the raw water pond has an installed capacity of 6,300 m^3.

1.14 Project Infrastructure

The main access route to site is via the 230 km multi-lane, modern motorway connecting Abidjan to Yamoussoukro. From Yamoussoukro, the site is accessed using a 25 km section of the A6 highway to Bouaflé, with the turn-off to Kossou at Toumbokro village, 28 km north-west of Yamoussoukro.

The site has a network of gravel roads that provide access to the accommodation camp, administration buildings, processing plant, TSF, pits, waste dumps, water bores, various water sources and miscellaneous infrastructure items.

The site has a number of buildings, including the following facilities:

- Administration
- Mining services

- Warehouse
- Clinic and emergency services
- Light vehicle workshop
- Exploration office and core shed
- Staff mess
- Security gatehouse, with boom gate control
- Processing and maintenance offices
- Workshop
- Laboratory
- Various electrical switch room buildings.

The open pit mining contractor has been provided with a mine services area to enable mine fleet servicing and maintenance. Additional infrastructure installed on site that supports current mining operations includes a diesel fuel storage facility and an explosives magazine.

A similar area will be required for the underground mining contractor to service and maintain underground mining fleet and ancillary vehicles on the surface. Additional surface and underground infrastructure and technology will also be required for the CMA underground mine, including power, water, air, communication and upgrades to other existing site infrastructure.

Staff, contractors and visitors that require accommodation stay at the 517-bed on-site accommodation camp. 257 of these beds are in single occupancy rooms. It is estimated that an additional 90 beds will be required for personnel associated with the CMA underground mine. Further upgrades to sewage systems, potable water and power infrastructure will be required to enable the additional growth to the accommodation camp.

Power supply to Yaouré Gold Mine is sourced from the national grid, and power outages from the grid are infrequent. Power supply to site is sourced by a 6 km 225 kV overhead power line from the Kossou substation attached to the Kossou hydroelectric power station. An 11 kV feeder from the 225/11 kV substation supplies the plant main 11 kV switchboard, which then reticulates power to all locations on site. An 18 MW diesel fired power station provides emergency and backup power across site in the event of an interruption to the national grid supply.

The Yaouré Gold Mine leases are serviced by reliable mobile phone networks supplied by multiple carriers. A secure digital radio network has been established for Yaouré Gold Mine, with dedicated operational, security and emergency channels. A local ground station is installed that provides global satellite voice and data connection.

Raw water for the site is sourced from the Bandama River, surface run-off, ground water bores and pit dewatering. Raw water from the Bandama River and mine dewatering are the main sources of process water top-up, with the remainder of process water recycled from TSF supernatant. Modular potable water treatment plants are located across site and treat bore water to potable quality by filtration, ultraviolet sterilisation and chlorination for site ablutions and other uses. Effluent from all ablutions drain to sewage treatment plant systems.

The TSF, located approximately 2.5 km south of the process plant site, was commissioned in December 2020 and consists of a single cell, valley storage formed by two multi-zoned earth-fill embankments. The facility is designed to be raised in stages over the mine life using downstream embankment construction techniques. Current designs allow for 32 Mt of tailings storage, with a

facility footprint of approximately 162 ha. The embankments can be raised by a further 17 m, for a total of 64 Mt storage capacity.

Tailings slurry is discharged into the TSF by sub-aerial deposition methods, using a combination of spigots at regularly spaced intervals from embankment walls. Supernatant water is removed from the TSF via submersible pumps located within a tower decant system and return to the process water system.

At the end of the TSF operation, the overall slope profile of the TSF will be approximately 3.5H:1V. The downstream profile will be inherently stable under both normal and seismic loading conditions and allows for revegetation.

1.15 Market Studies and Contracts

Gold is a commodity freely traded on the world market for which there is a steady demand from numerous buyers. It is also possible to sell gold for delivery at a fixed price at a future date (forward sale).

Côte d'Ivoire permits export of gold bullion. Perseus has entered into a contract for refining Yaouré doré. The refiner arranges transport of the doré bars to its refinery, where it refines the gold to the purity (generally 99.8% to 99.95%) accepted in international markets. The refined gold is credited to the Company's gold account with its bank, to enable it to be sold on international markets or delivered into forward sales contracts. The refiner deducts transportation costs, insurance, refining and other charges.

The gold prices of $1,500 and $1,700 per ounce, respectively, used for delineation of Mineral Reserves and financial evaluation, were nominated by Perseus.

The gold price of $1,800 per ounce applied to estimate Mineral Resources was nominated by Perseus.

1.16 Environmental Studies, Permitting and Social or Community Impact

Yaouré Gold Mine has undergone extensive studies and reviews on its environmental, social and community (ESC) impact during the Project development stages. The mine is now operational and as such, Perseus has defined obligations and commitments in relation to its ESC impact. Given the CMA underground mine is below the existing CMA open pit and within the current mining lease fence, the majority of the ESC areas are covered by existing work and processes.

Amara commissioned baseline studies to support an Environmental and Social Impact Assessment (ESIA) that was lodged with government authorities in July 2015. The ESIA includes an Environmental Management Plan (EMP) which, in turn, includes a Water Management Plan, Waste Management Plan and preliminary Mine Closure and Rehabilitation Plan. The permit was transferred and approved from Perseus Yaouré SARL to Perseus Mining Yaouré S.A. on August 8, 2019. This transfer had no effect on the content of the operating permit.

Robust monitoring programs have been implemented at Yaouré, both on site and in the surrounding communities. On site, regular operational inspections and monitoring are conducted on both the waste rocks dumps and the TSF, and the TSF is subjected to annual auditing. Monitoring programs on site and in surrounding communities focus on items such as water quality, air quality and dust monitoring, noise level monitoring, and blasting vibration monitoring. Results of these monitoring programs have not identified ongoing negative impacts to the environment. Any exceedances recorded are investigated and control measures put in place.

In accordance with the provisions of Article 144 of the Mining Code, a reclamation bond equal to an agreed percentage of the estimated total cost of the rehabilitation and closure work for the site has been paid into an environmental rehabilitation escrow account following first commercial production. The amount can be reviewed every three years to capture any changes to the mine plan or completed rehabilitation. The actual percentage to be paid was determined during the mining convention negotiations and is captured in the mining convention between the Government of Côte d'Ivoire and Perseus dated December 9, 2019 (the Mining Convention). The annual Rehabilitation Plan and associated budget will also be communicated to the Government.

Yaouré Gold Mine has a rehabilitation and closure estimate within the Mine Closure Plan which is updated each year. The last update to the closure estimate was done in June 2023, and includes cost allowances for infrastructure demolition, site rehabilitation, groundwater and surface water monitoring, vegetation monitoring and vegetation maintenance.

The additional surface disturbance areas from underground activities will be incorporated into the model. The additional land clearance is considered minimal compared to the existing disturbance and is within the perimeter fence.

Yaouré Gold Mine is an operating project and as such has existing permits in place to support open pit mining activities. Additional permits that may be required to support the commencement of underground operations include:

- Modification to the explosives permit, to incorporate additional blasting supplies for the underground operation.
- Update of the emergency management plan, to capture additional hazards and emergency scenarios associated with underground mining.
- An addendum to the Mining Convention, to include mining via underground operations on the CMA orebody.

The Yaouré Gold Mine represents a large source of employment and economic opportunities for the region in which it operates. It now employs more than 1,200 employees and contractors and about 93% of them are Ivorian nationals, of which 48% come from the local communities. The proportion of nationals is expected to reduce slightly with commencement of the underground operations due to the need to recruit expatriate personnel with specialised skills and experience. Following this initial phase of the underground project, the proportion of nationals will return to ~90% with ongoing training and upskilling of underground personnel.

1.17 Capital and Operating Costs

The overall capital cost of the Yaouré Gold Mine LOM plan is $289.4 M and includes CMA underground development capital of $131.7 M (Table 1-7). The costs are based on a combination of first principals estimates and quotes from suppliers/contractors.

Table 1-7: Yaouré LOM capital costs summary

CAPITAL ITEM	UNIT	VALUE
Sustaining Capital		
Mining open pit	$M	36.04
Mining underground	$M	12.53
Processing & maintenance	$M	57.70
General and administrative (G&A)	$M	10.86
SUBTOTAL	**$M**	**117.13**
Development and Rehabilitation Capital		
Rehabilitation and demobilisation	$M	30.54
Development community road	$M	10.00
Development underground	$M	131.69
SUBTOTAL	**$M**	**172.23**
TOTAL CAPITAL	**$M**	**289.36**

The operating cost estimate for the Yaouré Gold Mine LOM plan is summarised in Table 1-8.

Table 1-8: Operating cost summary

COST AREA	UNIT	OPEN PIT	UNDERGROUND	TOTAL
Mine	$/t mined	3.93	-	-
Mine	$/t ore	-	71.12*	-
Processing	$/t ore	-	-	13.23
G&A	$/t ore	-	-	7.05

*Excludes capitalised underground development costs

The underground mine operating costs are derived from Feasibility Study cost modelling while open pit operating costs are based upon current contract rates.

Estimated operating costs include:

- costs associated with the contract mining of ore and waste and its delivery to the process plant ROM bin and the placement of waste on the waste rock dump
- labour costs for supervision, management and reporting of on-site organisational, commercial, technical, environmental, security, training and occupational activities
- labour costs for operating and maintaining the mobile equipment, light vehicles, process plant and supporting infrastructure, as well as for monitoring of the environment
- all power, fuels, reagents, consumables and maintenance materials utilised in operating the mobile equipment, light vehicles, process plant and supporting infrastructure, as well as for monitoring of the environment
- operating costs of an on-site assay laboratory
- costs associated with G&A activities
- import duties on consumable unit costs.

The capital and operating cost estimates are expressed in US dollars and are based on prices and market conditions current at the Effective Date.

1.18 Economic Analysis

Perseus, being a Producing Issuer, is not required to prepare an economic analysis as this Report does not describe a material expansion of current production.

Perseus has performed an economic analysis related to the existing Yaouré Gold Mine for the current LOM plan at the forecasted metal prices, production rates, metal recoveries, and capital and operating costs estimated in this Report. Perseus confirms that the outcome is a positive cash flow that supports the Mineral Reserve estimate.

1.19 Interpretation and Conclusions

This Report summarises the results of an updated LOM plan to demonstrate the technical and economic viability of an extended mine life at the Yaouré Gold Mine, inclusive of a Feasibility Study on an underground mine on the CMA orebody.

Data that inform the resource estimate are considered to be representative and free of any biases or other factors that may materially impact the reliability of the sampling or significantly affect confidence in estimated resources. Checks to confirm the validity of the drilling database indicate that it forms a sufficiently reliable basis for resource estimation.

Open pit mining at Yaouré Gold Mine is well understood. The transition from mining of the CMA open pit to the Yaouré open pit is considered to be a low-risk activity, and the same equipment and processes will be utilised. Grade control for the Yaouré open pit will vary in spacing from the CMA open pit, due to the nature of the orebody, which is more constrained and consists of multiple lenses with different orientations.

Underground mining at Yaouré Gold Mine will involve the introduction of new skill sets, equipment and practices compared to the current mining activities on site. Nonetheless, the methods of underground mining and the mechanised equipment and process which are planned to be employed are well understood across the mining industry, and hence the Feasibility Study parameters, mining rates, recoveries and costs are expected to be both achievable and reliable.

The Yaouré gold processing plant has been in operation since late November 2020. The Yaouré processing plant flow sheet is suitable for processing all future ore types with minimal equipment changes, based on metallurgical test work and/or operational experience, depending on the ore source. The maintenance requirements and operating cost structure for the processing plant are well understood.

Yaouré Gold Mine ores contain no known deleterious elements or minerals that could have a significant effect on potential economic recovery of gold in a hybrid leach/carbon-in-leach cyanidation process, based on metallurgical test work and/or operational experience.

Environmental permitting for the Yaouré mine is up to date, and Perseus has a positive and constructive relationship with the government, and with local communities. Ongoing renewal of licenses and agreements with the Ivorian government and other stakeholders, including local communities, is well managed by the site-based community and environmental departments.

1.20 Recommendations

Based upon the work undertaken to develop this LOM plan for the Yaouré Gold Mine, the following key recommendations are identified:

- Assess the results of current drilling programs within the Yaouré Gold Mine area, including the Yaouré pit and CMA underground extensions, for the potential to add to reported Mineral Resources.
- If further Mineral Resources are defined at Yaouré open pit and CMA underground, further studies should be conducted to determine if new Mineral Reserves can be estimated. Concurrently with resource definition drilling, extra programs should be conducted to gather samples for geotechnical and metallurgical test work and analysis to support expansion of Mineral Reserves.
- Monitor resource to mill reconciliation performance for each of the key production areas to identify areas of improvement in the Mineral Resource estimates to support improvements in short- and long-term planning assumptions.
- Further refinement of the underground design and schedule is recommended in order to optimise production and to improve operating aspects of the underground design and schedule prior to start of mining.
- Continued pre-operational engagement with potential contractors who are experienced in mechanised underground mining in Africa with longhole open stoping, in order to engineer solutions into the operational plan so far as practicable.
- Selection and mobilisation of underground mining contractor that is experienced in mechanised underground mining in Africa with longhole open stoping.
- Complete detailed designs of in-pit and surface infrastructure to support underground mining operations, including input from all stakeholders.
- Execute installation and commissioning of in-pit and surface infrastructure to support underground mining operations
- Monitoring boreholes in the vicinity of the underground mine should be monitored as an early sign of changes to groundwater drawdown relating to mining activity. If any impacts are measured which indicate a likely future impact to either Perseus or other stakeholders, then mitigation measures, such as extending boreholes or providing additional water sources, should be implemented.
- The suitability of monitoring bores for the purpose of identifying and predicting groundwater impacts should be reviewed on an ongoing basis as mine plans change.
- Conduct a multi-day plant trial on CMA pit fresh ore at a target grind size P_{80} of 53 µm to better understand the operational performance and constraints of running the plant under this configuration.

A summary of the cost for these programs and additional recommendations can be found in Section 26.

2 Introduction

2.1 Terms of Reference

This Report was prepared for and by Perseus on the Yaouré Gold Project, Côte d'Ivoire.

The Report complies with the requirements of NI 43-101 for reports filed under Canadian jurisdiction, for the Effective Date of the Exploration Results, Mineral Resource and Mineral Reserve estimates.

This Report was prepared for the purposes of updating the 2017 Report to align with Company's continuous disclosure of Exploration Results, Mineral Resources and Mineral Reserves in accordance NI 43-101 and the JORC Code.

The classification categories of Measured, Indicated and Inferred under the JORC Code are equivalent to the CIM categories of the same names (CIM, 2014). Proved and Probable Ore Reserves under the JORC Code are equivalent to Proven and Probable Mineral Reserve categories defined in CIM. For the avoidance of doubt, the term Mineral Reserves will be used for Ore Reserves and Mineral Reserves in this report. Classifications will be referred to according to the CIM nomenclature.

The Effective Date is September 18, 2023.

2.2 Qualified Person Responsibilities and Site Visits

A summary of the QPs responsible for the information contained in this report is provided in Table 2-1. Perseus is a Producing Issuer according to the definition in NI 43-101 and therefore an independence test for QPs is not required.

Table 2-1: Summary of Qualified Persons

ITEM	REPORT SECTION	SUB-SECTIONS	QUALIFIED PERSON	COMPANY
1	Summary	1.1, 1.9, 1.11-1.20	Adrian Ralph	Perseus
		1.2-1.8, 1.10	Daniel Saunders	Perseus
2	Introduction	All	Adrian Ralph	Perseus
3	Reliance on Other Experts	All	Adrian Ralph	Perseus
4	Property Location and Description	All	Daniel Saunders	Perseus
5	Accessibility, Climate, Local Resources, Infrastructure and Physiography	All	Daniel Saunders	Perseus
6	History	All	Daniel Saunders	Perseus
7	Geological Setting and Mineralisation	All	Daniel Saunders	Perseus
8	Deposit Types	All	Daniel Saunders	Perseus
9	Exploration	All	Daniel Saunders	Perseus
10	Drilling	All	Daniel Saunders	Perseus
11	Sample Preparation, Analyses and Security	All	Daniel Saunders	Perseus
12	Data Verification	All	Daniel Saunders	Perseus
13	Mineral Processing and Metallurgical Testing	All	Adrian Ralph	Perseus
14	Mineral Resource Estimates	All	Daniel Saunders	Perseus

ITEM	REPORT SECTION	SUB-SECTIONS	QUALIFIED PERSON	COMPANY
15	Mineral Reserve Estimates	All	Adrian Ralph	Perseus
16	Mining Methods	All	Adrian Ralph	Perseus
17	Recovery Methods	All	Adrian Ralph	Perseus
18	Project Infrastructure	All	Adrian Ralph	Perseus
19	Marketing Studies and Contracts	All	Adrian Ralph	Perseus
20	Environmental Studies, Permitting and Social or Community Impact	All	Adrian Ralph	Perseus
21	Capital and Operating Costs	All	Adrian Ralph	Perseus
22	Economic Analysis	All	Adrian Ralph	Perseus
23	Adjacent Properties	All	Adrian Ralph	Perseus
24	Other Relevant Data and Information	All	Adrian Ralph	Perseus
25	Interpretation and Conclusions	All	Adrian Ralph	Perseus
26	Recommendations	All	Adrian Ralph	Perseus
27	References	-	Adrian Ralph	Perseus

Mr Adrian Ralph and Mr Daniel Saunders have visited the Property as employees of Perseus. Mr Adrian Ralph first visited the Property on March 19, 2022, and most recently in November 2023. Mr Daniel Saunders visited the Property in September 2023.

Mr Ben Strong acted as a Contributing Author for Sections 13, 17 and 18.

2.3 Currency and Units of Measure

In this Report, all currency amounts are US dollars (US$) unless otherwise stated. Quantities are generally stated in Système international d'unités (SI) metric units, including metric tonnes (tonnes, t) for mass, and kilometres (km) or metres (m) for distance. The abbreviations provided in Table 2-2 are used in this Report.

Table 2-2: Summary of abbreviations

ABBREVIATION	DESCRIPTION
’	Minutes of latitude or longitude
”	Seconds of latitude or longitude
µm	Micrometre, micron
$	Dollar
$/oz	Dollar per troy ounce
$/t	Dollar per metric tonne
$M	Million dollars
%	Percent
% w/w	Percent weight by weight
% w/v	Percent weight by volume
°	Degree
°C	Degree Celsius
#	Number
2D	Two-dimensional
3D	Three-dimensional
>	Greater than
≥	Greater than or equal to
<	Less than
≤	Less than or equal to

ABBREVIATION	DESCRIPTION
a	Year
A	Ampere
AARL	Anglo American Research Laboratories
AAS	Atomic absorption spectroscopy
AC	Aircore drilling
ACS	African Consulting Surveyors
Ag	Silver
Ai	Bond abrasion index
Al	Aluminium
ANAC	Autorité Nationale de l'Aviation Civile de Côte d'Ivoire, or Ivorian National Authority of Civil Aviation
ANADER	Agence Nationale d'Appui au Développement Rural, or National Agency Supporting Rural Development
ANC	Acid neutralising capacity
ANCOLD	Australian National Committee on Large Dams
ANDE	Agence Nationale de l'Environnement, or National Environment Agency
ARD	Acid rock drainage
As	Arsenic
ASD	Analytical Spectral Devices
ASM	Artisanal and small scale mining
ASX	Australian Securities Exchange
Au	Gold
Ba	Barium
bcm	Bank cubic metre
Be	Beryllium
BEng	Bachelor of Engineering
Bi	Bismuth
BLEG	Bulk leach extractable gold
Blk	Blank
BNETD	Bureau National d'Etudes de Techniques et de Développement, or National Office for Technical Studies and Development
BRGM	Bureau de Recherches Géologiques et Minières, or Geological and Mining Research Office
BSc	Bachelor of Science
BSE	Back-scattered electron
BVML	Bureau Veritas Minerals Limited
BWi	Bond ball mill work index
Ca	Calcium
CaO	Calcium oxide
CCC	Community Consultative Committee
CCT	Centre de Cartographie et Télédétection, or Cartography and Remote Sensing Centre
CDLM	Comité de Développement Local Minier, or Local Mining Development Committee
CFA	Communauté Financière Africaine franc, or African Financial Community franc
CIAPOL	Centre Ivorien Anti-Pollution, or Ivorian Anti-Pollution Centre
CIE	Compagnie Ivoirienne d'Electricité, or Ivorian Electricity Company
CIL	Carbon-in-leach
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
CIP	Carbon-in-pulp
CMA	Compagnie Minière d'Afrique
CN_{total}	Total cyanide
CN_{WAD}	Weak acid dissociable cyanide
Con	Concentrate
$C_{organic}$	Organic carbon

ABBREVIATION	DESCRIPTION
cP	Centipoise
CPA	Chrysos PhotonAssay™
CRM	Certified reference material
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cu	Copper
Cum Prob	Cumulative probability
$CuSO_4.5H_2O$	Copper sulfate pentahydrate
CV	Coefficient of variation
d	Day
dB LAeq	A-weighted equivalent continuous sound level in decibels
DD	Diamond core drilling
DFS	Definitive Feasibility Study
DGPS	Differential global positioning system
DO	Dissolved oxygen
DWI	Drop-weight index
E	East
EDS	Energy dispersive spectrometry
EGL	Effective grinding length
EGM	Earth Gravitational Model
E-GRG	Extended gravity recoverable gold test
EMP	Environmental Management Plan
ENE	East-north-east
ESC	Environmental, social and community
ESE	East-south-east
ESIA	Environmental and Social Impact Assessment
FA	Fire assay
FAusIMM	Fellow of the Australasian Institute of Mining and Metallurgy
Fdup	Field duplicate
Fe	Iron
FEED	Front-End Engineering and Design
FEL	Front end loader
FS	Feasibility Study
FTG	Full tensor gravity
FY	Financial year
g	Gram
g/L	Gram per litre
g/t	Gram per metric tonne
G&A	General and Administrative
GC	Grade control
GISTM	Global Industry Standard on Tailings Management
GWh/a	Gigawatt-hour per year
h	Hour
h^{-1}	Per hour
h/a	Hours per year
H_2O_2	Hydrogen peroxide
H_2SO_4	Sulfuric acid
ha	Hectare
HARD	Half Absolute Relative Difference
HDPE	High density polyethylene
Hg	Mercury
HQ or HQ2	Drill core size
HSEC	Health, safety, environment and community

ABBREVIATION	DESCRIPTION
ID^3	Inverse distance cubed
IDW	Inverse distance weighting
IEC	International Electrotechnical Commission
IFC	International Finance Corporation
ILR	Intensive leach reactor
IRGS	Intrusion-related gold system
IRR	Internal rate of return
IRSA	Inter-ramp slope angle
ISO	International Organisation for Standardisation
JORC	Joint Ore Reserves Committee
K	Potassium
kg	Kilogram
kg/bcm	Kilogram per bank cubic metre
kg/t	Kilogram per metric tonne
km	Kilometre
km^2	Square kilometre
koz	Thousand troy ounces
koz/a	Thousand troy ounces per year
kPa	Kilopascal
kt	Metric kilotonne
kt/a	Metric kilotonne per year
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt-hour
kWh/m^3	Kilowatt-hour per cubic metre
kWh/t	Kilowatt-hour per metric tonne
L	Left
L	Litre
L/min	Litre per minute
L/min/L	Litre per minute per litre
L/s	Litre per second
lb/kWh	Avoirdupois pounds per kilowatt-hour
LiDAR	Laser imaging detection and ranging survey
LOM	Life of mine
LRFP	Livelihood Restoration Framework Program
Ltd	Limited
m	Metre
m/a	Metre per year
m/h	Metre per hour
m/s	Metre per second
m^2	Square metre
$m^2/(t/h)$	Square metres per metric tonne per hour
m^3	Cubic metre
m^3/a	Cubic metre per year
m^3/h	Cubic metre per hour
m^3/s	Cubic metre per second
m^3/t	Cubic metre per metric tonne
M	Million
Ma	Million years
mASL	Metres above sea level
Max.	Maximum
mE	Metres east

ABBREVIATION	DESCRIPTION
mg	Milligram
mg/L	Milligram per litre
mg/L/min	Milligram per litre per minute
Mg	Magnesium
M_{ia}	Coarse ore work index (for tumbling mills, from SMC Test®)
M_{ic}	Crushing ore work index (for conventional reciprocating crushers, from SMC Test®)
MIK	Multiple indicator kriging
min	Minute
Min.	Minimum
mL	Millilitre
mm	Millimetre
Mm^3/a	Million cubic metres per year
mN	Metres north
Mo	Molybdenum
mol/mol	Mole per mole
Moz	Million troy ounces
MPA	Maximum potential acidity
MPR	MPR Geological Consultants Pty Ltd
mRL	Metres reduced level
MSc	Master of Science
Mt	Million metric tonnes
Mt/a	Million metric tonnes per year
MVA	Megavolt-ampere
MW	Megawatt
n/a	Not applicable
N	North
Na	Sodium
$Na_2S_2O_5$	Sodium metabisulfite
NaCN	Sodium cyanide
NAG	Net acid generating
NaOH	Sodium hydroxide
NAPP	Net acid producing potential
NATA	National Association of Testing Authorities
NE	Northeast
No.	Number
Ni	Nickel
NI	National Instrument
NNE	North-north-east
NPV	Net present value
NQ or NQ2	Drill core size
NW	Northwest
OF	Overflow
OK	Ordinary kriging
OMC	Orway Mineral Consultants
ONPC	Office National de Protection Civile, or National Office for Civil Protection
oz	Troy ounce
P_{80}	80% passing size of particles
P_{95}	95% passing size of particles
Pa	Pascal
Pdup	Pulp duplicate
PE	Permis d'exploitation, or exploitation permit
PFS	Pre-feasibility Study

ABBREVIATION	DESCRIPTION
pH	Potential of hydrogen
PhD	Doctor of Philosophy
plc	Public Limited Company
p.m.	Post meridiem
PM2.5	Particulate matter with a diameter of 2.5 microns or less
PM10	Particulate matter with a diameter of 10 microns or less
POI	Plan d'Operation Interne, or Emergency Response Plan
ppb	Part per billion
ppm	Part per million
PR	Permis de recherche, or exploration permit
Pty	Proprietary
pXRF	Portable X-ray fluorescence
QAQC	Quality assurance/quality control
QEMSCAN	Quantitative evaluation of minerals by scanning electron microscopy
QEMSCAN-FS	Quantitative evaluation of minerals by scanning electron microscopy using field scan
QEMSCAN-PMA	Quantitative evaluation of minerals by scanning electron microscopy using particle mineral analysis
QEMSCAN-TMS	Quantitative evaluation of minerals by scanning electron microscopy using trace mineral search
QP	Qualified Person
Q-Q	Quantile-quantile plots
R	Right
R^2	Square of Pearson product moment coefficient
RAB	Rotary air blast drilling
RACI	Règlement aéronautique de Côte d'Ivoire, or Aeronautical Regulations of Côte d'Ivoire
RC	Reverse circulation drilling
RCDD	Drilling with reverse circulation collars and diamond core tails
RIR	Reference intensity ratio
RL	Reduced level
RMU	Ring main unit
ROM	Run-of-mine
ROMSE	Deposit to the southeast of the run-of-mine pad
RPEEE	Reasonable prospects for eventual economic extraction
rpm	Revolutions per minute
RQD	Rock quality designation
RTP	Reduction to the pole
RWi	Bond rod mill work index
s	Second
s^{-1}	Per second
S	South
S.A.	Société anonyme
SABC	Semi-autogenous grinding and ball milling with pebble crushing
SAG	Semi-autogenous grinding
SANAS	South African National Accreditation System
SARL	Société à responsabilité limitée
Sb	Antimony
SCSE	SAG (semi-autogenous grinding mill) circuit specific energy
SD	Standard deviation
SE	Southeast
SG	Specific gravity
SGC	Southern Geoscience Consultants
SI	Système international d'unités
SMBS	Sodium metabisulfite

ABBREVIATION	DESCRIPTION
SO_2	Sulfur dioxide
SODEMI	Société pour le Développement Minier de la Côte d'Ivoire, or Society for Mining Development in Côte d'Ivoire
SQL	Structured Query Language
Sr	Strontium
$S_{sulfide}$	Sulfide sulfur
Std	Standard
SW	Southwest
t	Metric tonne
t/a	Metric tonne per year
t/d	Metric tonne per day
t/h	Metric tonne per hour
$t/m^2/h$	Metric tonne per square metre per hour
t/m^3	Metric tonne per cubic metre
t CO_2e/a	Metric tonne of carbon dioxide equivalent per year
t CO_2e/oz	Metric tonne of carbon dioxide equivalent per troy ounce
Te	Tellurium
Ti	Titanium
TL	Testing Laboratory
TMS	Trace mineral search
Tripl	Triplicate
TSF	Tailings storage facility
TTG	Tonalite-trondhjemite-granodiorite
UF	Underflow
UG	Underground
US or USA	United States of America
UTM	Universal Transverse Mercator
V	Vanadium
V	Volt
VAT	Value-added tax
VSD	Variable speed drive
VTEM	Versatile time domain electromagnetic survey
W	Tungsten
W	West
WAD	Weak acid dissociable
WAI	Wardell Armstrong International
WGS	World Geodetic System
Wi-Fi	Wireless fidelity
WNW	West-north-west
XRD	X-ray diffraction
Zn	Zinc

2.4 Data Sources

A list of the sources of information and data contained in this report is provided in Section 27 of this report. Project-specific information relied upon in preparing this report has been provided by Perseus.

2.5 Acknowledgements

Mr Ian Patterson (Study Manager) contributed to Sections 15, 16, 18 and 21 of the Report. Mr Ben Strong (Group Metallurgist) provided first drafts of Sections 13, 17 and 18 of the Report. Both Mr Patterson and Mr Strong are full time employees of Perseus.

3 Reliance on Other Experts

3.1 Other Experts

The authors contributing to this report have relied in good faith on information provided by other experts in relation to the aspects listed in Table 3-1.

The QPs have not independently investigated the Ownership and Title, Mineral Rights and Legal Obligations, Permits and Approvals, and Environmental Liabilities of the Property. In relation to these sections of the report, the authors have relied upon the subject matter expertise of Mr Martijn Bosboom (General Council and Company Secretary), Mrs Melanie Pollard (Group General Manager Communications and Corporate Services), and Mr Pascal Ettien (Health, Safety and Environment Manager of the Yaouré Gold Mine). Mr Bosboom, Mrs Pollard and Mr Ettien are full time employees of Perseus (or its subsidiaries).

Information concerning Ownership and Title, Mineral Rights and Legal Obligations provided by Mr Bosboom includes that contained in the section "Mineral Concession Interests at August 2, 2023" contained in the Perseus Annual Report (2023). Mr Bosboom has confirmed to the QPs by review of the Report on December 12, 2023, that no material changes have occurred to Yaouré Gold Mine tenure ownership, mineral rights and legal obligations in the period to the Effective Date. The QPs relied on this information in Section 4 and the Summary of this report.

Information concerning Permits and Approvals, and Environmental Liabilities of the Property including outlining operational management practices and compliance was provided by Mrs Pollard and Mr Ettien via written statement on 28 November, 2023. The QPs relied on this information in Section 20 and the Summary of this report.

Table 3-1: Other experts

REPORT SECTION	INFORMATION	SOURCE
4.3	Ownership and Title	Martijn Bosboom
4.4	Mineral Rights and Legal Obligations	Martijn Bosboom
4.6	Environmental Liabilities	Pascal Ettien
4.7	Permits and Approvals	Martijn Bosboom and Pascal Ettien
20	Environmental Studies, Permitting and Social or Community Impact	Melanie Pollard and Pascal Ettien

4 Property Description and Location

4.1 Location

The Yaouré Gold Mine is located in a rural area of central Côte d'Ivoire, West Africa, 35 km northwest of the capital Yamoussoukro. The property lies close to the southern shore of man-made Lake Kossou and 25 km ENE of the district administrative centre of Bouaflé. The Kossou hydroelectric power station is situated 6 km east of the Project. The villages of Angovia and Allahou-Bazi are situated about 1 km from the mine (Figure 4-1).

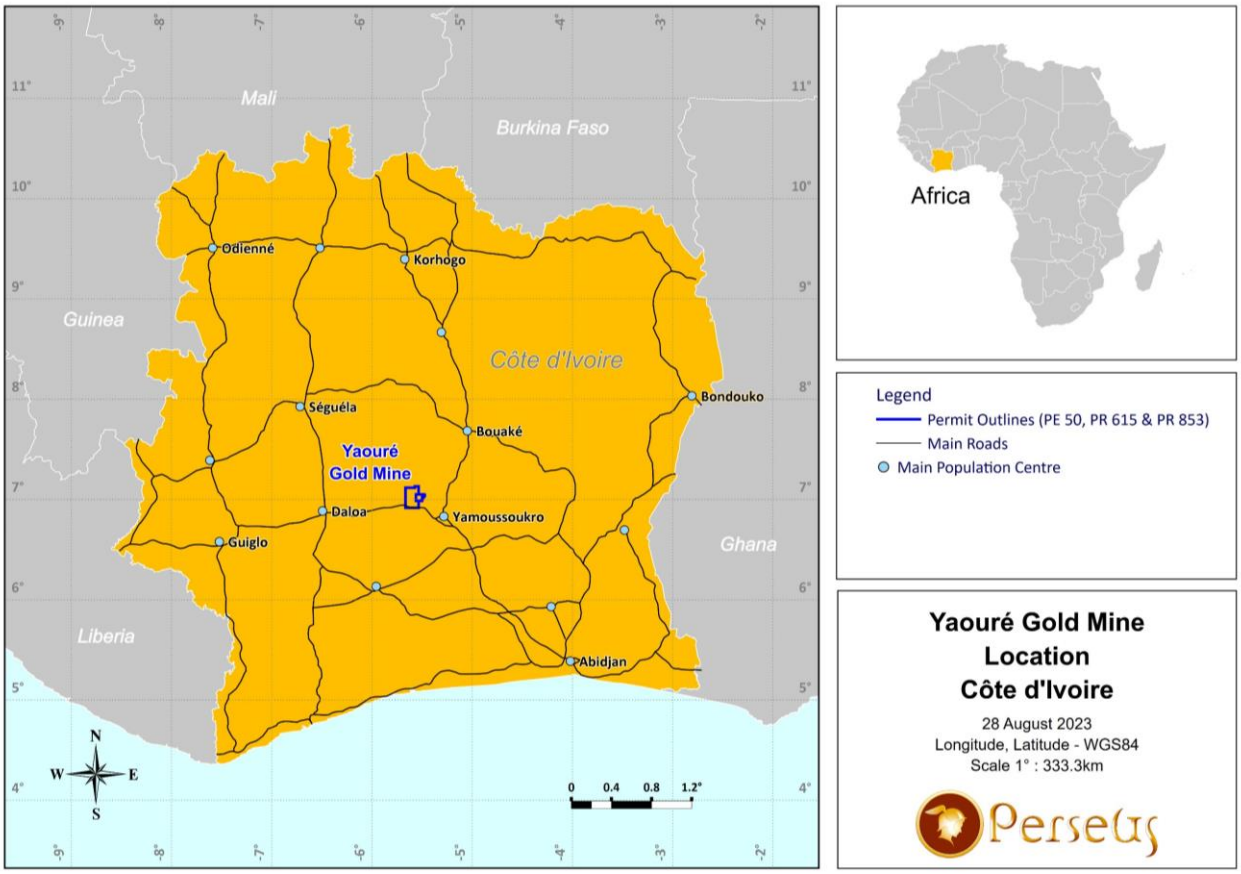


Figure 4-1: Yaouré Gold Mine location

4.2 Property Description

The Yaouré Gold Project comprises one PE (PE 50) and two contiguous PRs (PR 615 and PR 853) covering a total of 363.23 km^2 area (Figure 4-2). The details of the original permit grant dates, renewal information, expiry dates and surface areas are detailed in Table 4-1. The coordinates for the exploitation and exploration permits are listed in Table 4-2.

The Mineral Resources and Mineral Reserves that are the subject of this report are located within PE 50 covering an area of 49.77 km^2. The results of exploration on contiguous PR 615 and PR 853 are also discussed in Section 9 of this report for context.

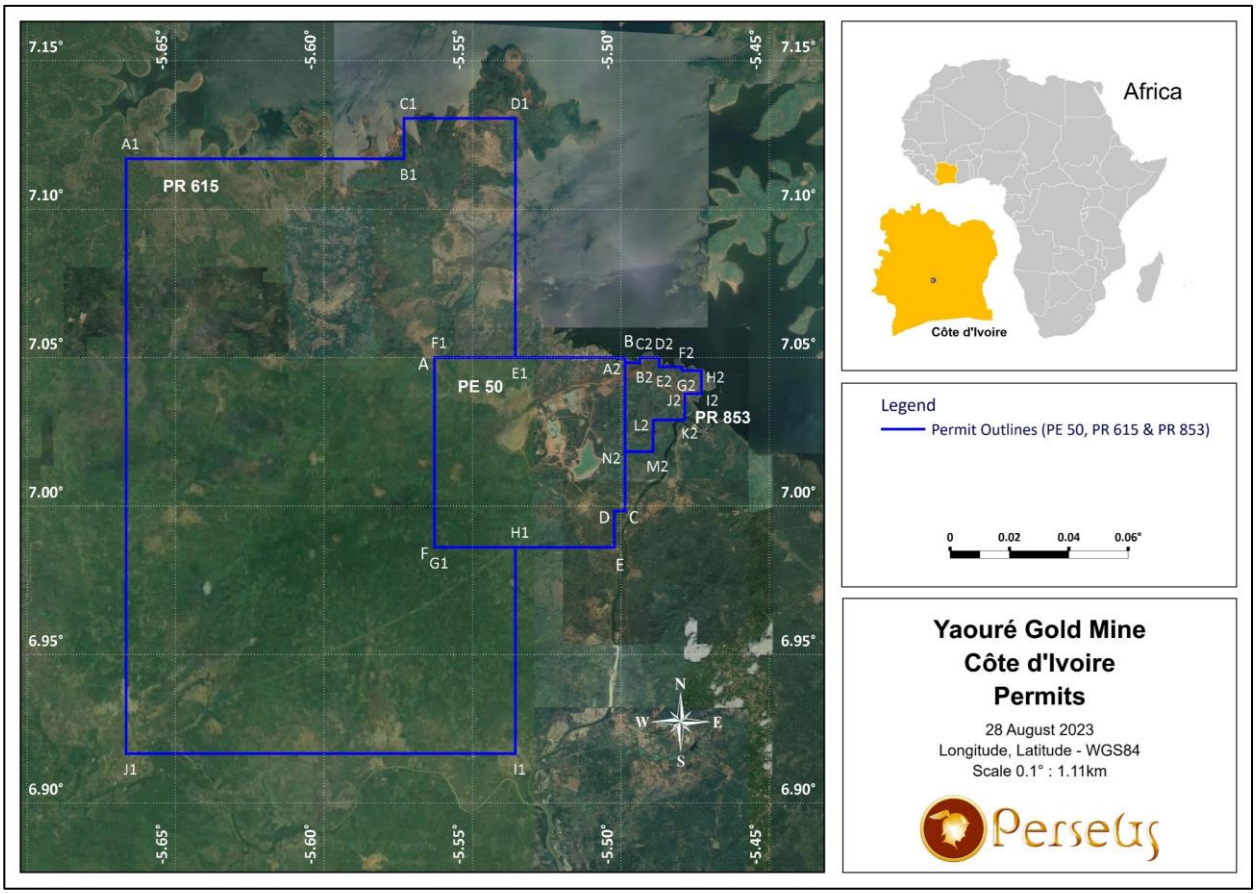


Figure 4-2: Yaouré Gold Project mineral permits

Table 4-1: Yaouré Gold Project mineral permits

ITEM	PE 50	PR 615	PR 853
Permit holder	Perseus Mining Yaouré S.A.	Perseus Yaouré SARL	Perseus Yaouré SARL
Permit type	Exploitation	Exploration	Exploration
Status	Active	Active (pending renewal)	Active
Original grant date	24/04/2019	30/09/2015	15/01/2020
Latest renewal date	-	30/09/2019	-
Expiry date	23/04/2030	29/09/2022	14/01/2024
Surface area (km^2)	49.77	307.0	6.46
Minimum annual expenditure*	-	$199,675	$4,727
Comment		Renewal submitted, 18/05/2022	

* Annual expenditure is calculated at CFA 450,000 per km^2

Table 4-2: Yaouré Gold Project mineral permit coordinates

PERMIT	POINT	LATITUDE	LONGITUDE
PE 50	A	07°03'00"	05°33'46"
	B	07°03'00"	05°29'55"
	C	06°59'54"	05°29'55"
	D	06°59'54"	05°30'08"
	E	06°59'10"	05°30'08"
	F	06°59'10"	05°33'46"
PR 615	A1	07°07'01"	05°40'00"
	B1	07°07'01"	05°34'23"
	C1	07°07'50"	05°34'23"
	D1	07°07'50"	05°32'08"
	E1	07°03'00"	05°32'08"
	F1	07°03'00"	05°33'46"
	G1	06°59'10"	05°33'46"
	H1	06°59'10"	05°32'08"
	I1	06°55'00"	05°32'08"
	J1	06°55'00"	05°40'00"
PR 853	A2	05°29'55"	07°02'54"
	B2	05°29'37"	07°02'54"
	C2	05°29'37"	07°03'00"
	D2	05°29'13"	07°03'00"
	E2	05°29'13"	07°02'49"
	F2	05°28'46"	07°02'49"
	G2	05°28'46"	07°02'44"
	H2	05°28'22"	07°02'44"
	I2	05°28'22"	07°02'16"
	J2	05°28'42"	07°02'16"
	K2	05°28'42"	07°01'46"
	L2	05°29'21"	07°01'46"
	M2	05°29'21"	07°01'06"
	N2	05°29'55"	07°01'06"

4.3 Ownership and Title

The Yaouré Gold Mine Mineral Resources and Mineral Reserves lie entirely within PE 50. The permit is held by Perseus's subsidiary Perseus Mining Yaouré S.A. in which the government of Côte d'Ivoire holds a 10% free carried interest. The permit has an expiry date of April 23, 2030. Extensions to the permit are permitted where there is no breach of permit conditions and where supported by a Mineral Reserve. The permit remains valid while any renewal process is ongoing.

In addition to the free carried interest, the Government of Côte d'Ivoire is entitled to a royalty on revenue as shown in Table 4-3.

Table 4-3: Yaouré exploitation permit scale of royalties

SPOT PRICE PER OUNCE – LONDON p.m. FIX	ROYALTY RATE
Less than or equal to $1,000	3%
Higher than $1,000 and less than or equal to $1,300	3.5%
Higher than $1,300 and less than or equal to $1,600	4%
Higher than $1,600 and less than or equal to $2,000	5%
Higher than $2,000	6%

A further 0.5% of revenue is required to be paid to a local community development fund.

Perseus Yaouré SARL, a wholly owned subsidiary of Perseus, holds the two exploration permits PR 615 and PR 853. There have been no Mineral Resources delineated on those permits and activities on those areas remain at the exploration stage.

4.4 Mineral Rights and Legal Obligations

Mineral rights and mining activities in the Republic of Côte d'Ivoire are administered by the Ministry of Mines, Petroleum and Energy. The Mining Code sets out the terms and conditions of maintaining an exploitation permit in good standing. These conditions include but are not limited to:

- Payment of rental land rates, royalties and government charges
- Presentation of regular returns and annual returns
- Utilisation of the mining rights through exploitation of the minerals
- Compliance with the requirements of statutory authorities that administer safety, environmental and employment regulations
- Payment of bonds and maintenance of rehabilitation programs.

On December 9, 2019, the Mining Convention was executed which confirms fiscal stability and other arrangements that apply to the Yaouré Gold Mine.

4.5 Land Access and Compensation

Ownership of surface land rights is held by the central government of Côte d'Ivoire. Local traditional governing bodies administer land usage and charge rent on behalf of the government.

Perseus has acquired surface land rights over a 11.09 km^2 mine take area by agreement with the traditional governing bodies. The mine take area has been completely enclosed by a perimeter fence.

In addition, the Company paid crop compensation to farmers affected by the mining operations. Crop compensation rates were negotiated on the basis of values set by the Agriculture Department.

Development of an underground mining operation to exploit the CMA lodes does not require disturbance of any additional area outside of the current mine take area.

4.6 Environmental Liabilities

A government audit by the National Environmental Agency was completed on PE 50 (PR 397 at the time) to assess the environmental effects from previous mining by CMA and Cluff Gold West Africa (2D Consulting, 2014).

Since open pit mining recommenced at Yaouré in 2020, Perseus has operated in conformity with operating permits issued by the National Environmental Agency and the reporting requirements imposed by those permits. Disturbed areas are progressively rehabilitated and revegetated.

There are presently no outstanding environmental liabilities that are subject to dispute or that might prevent development of an underground mining operation.

4.7 Permits and Approvals

Perseus Mining Yaouré prepared an ESIA and an EMP in August 2016 and obtained an exploitation permit on April 20, 2018 to permit open pit mining and processing operations. The permit is dated April 24, 2019 and is valid for 8 years.

Other permits obtained to conduct operations at Yaouré Gold Mine are discussed in the sections below.

4.7.1 Water Abstraction

The water abstraction permit was granted on February 12, 2018 and is currently under renewal. This permit allows Perseus to extract raw water under certain conditions from the Bandama River for use at the Yaouré Gold Mine.

4.7.2 Dangerous Goods

The dangerous goods permit allows for the purchasing, transportation and use of certain dangerous goods (e.g., sodium cyanide) for the Yaouré Gold Mine.

4.7.3 Explosives, Storage and Use

The explosives, storage and use permit was granted on October 15, 2021 and is still active. The explosives magazine is inspected internally on a monthly basis, and quarterly by the Regional Director of Mines and Geology located in the Yaouré district.

4.7.4 Emergency Response Plan

Perseus developed its Plan d'Operation Interne (POI, or Emergency Response Plan) to safely and effectively manage any emergency that can happen during mining operations. To meet all legal requirements, it has been adapted and presented to the validation committee on February 11, 2022. The validation committee comprises representatives from CIAPOL (Ivorian Anti-Pollution Centre), the ONPC (Office National de Protection Civile, or National Office for Civil Protection), and the Fire Brigade.

4.7.5 Environmental Operating Permit

To ensure that the Yaouré Gold Mine is meeting its environmental commitments, CIAPOL regularly visits the mine to inspect operations, infrastructure and systems. The compliance checks aim to gather information to confirm that Perseus is meeting its obligations based on the final version of the ESIA and Ivoirian standards with regards to water, dust, noise, vibration, waste management, and risk management. This authorisation was granted January 11, 2022 and is still active.

4.7.6 Mining Convention

A mining convention is a contract signed between the state or a national company of a producer country and a foreign company for the exploration and exploitation of a mining or hydrocarbon deposit. The state retains full ownership of the resources. The agreement sets out the rights and obligations of the license holder. It also defines the general, legal, financial, economic, social, administrative, and environmental conditions under which the license holder can carry out its exploitation activities.

The Mining Convention for the Yaouré Gold Mine between the Republic of Côte d'Ivoire and Perseus Mining Yaouré S.A. was signed on December 9, 2019.

4.7.7 Power Station Permit

Perseus was granted a power station permit, to operate Yaouré's diesel backup power station described in Section 18.6, on September 8, 2021 and the permit is still active.

4.7.8 Heliport Permit

Yaouré Gold Mine's helipad has been built under the technical supervision of the Yaouré projects team and the administration supervision of the HSEC department. On the administrative authorities' side, the coordination of supervision has been conducted by the National Authority of Civil Aviation (ANAC). The helipad has been built according to Ivoirian aeronautical regulations relating to the design and technical operation of heliports, codified as RACI 6002.

Following several site visits for audit purposes, the technical aspects of Yaouré helipad were validated by the ANAC and a permit was granted on April 13, 2022. This permit is still active.

4.7.9 Radiation Permit

The radiation permit for Yaouré Gold Mine was granted on November 16, 2020 and is currently under renewal. This permit has been given for the exclusive use of nucleonic slurry density and soil compaction gauges and requires accessibility to the density gauges to be restricted and does not allow transfer of the units to any other location.

4.7.10 Fuel Facility

Perseus has built a fuel farm for the safe storage and use of fuel for mining operations. The permit to operate the fuel farm was granted on March 30, 2021 and is still active. The fuel supply for Yaouré is managed by Total under the supervision of the supply chain and commercial department.

4.8 Other Factors

The QP is not aware of any other significant factors or risks that may affect access, title, or the right or ability to perform work on the Property.

5 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1 Accessibility

The Yaouré Gold Mine is accessed using the national paved road network. The 230 km stretch between Abidjan and Yamoussoukro comprises a four-lane motorway. From Yamoussoukro, the site is accessed using a 25 km section of the main road to Bouaflé up to the village of Toumbokro.

The Yaouré site may also be accessed from Abidjan by air. Yamoussoukro Airport, situated 12 km north-west of Yamoussoukro, is 39 km by road from the mine site (Figure 5-1).

The Yaouré Gold Mine site also has a helipad.

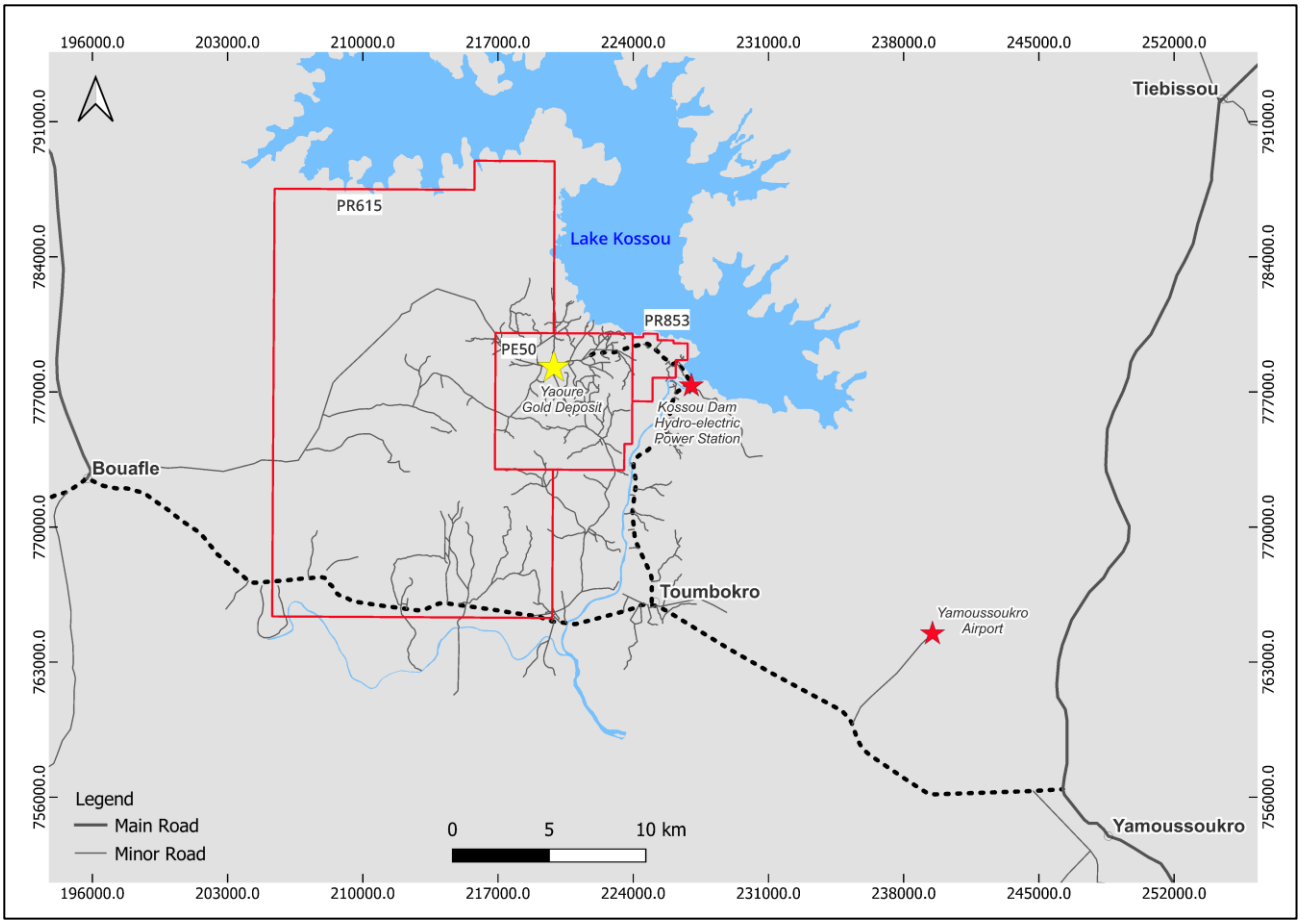


Figure 5-1: Access to Yaouré Gold Mine (Perseus, 2023)

5.2 Physiography

The terrain of the Yaouré project area is dominated by the Mount Yaouré hills (Figure 5-2) in the centre of the southern portion of PR 615. The terrain elsewhere is mostly flat to undulating plains, which in turn gives way to the north to the man-made Kossou Lake (Figure 5-3). In addition to the primary river, the Bandama River, which flows southwards from the Kossou hydroelectric power station, there is a radial pattern of rivers and streams which drain from the Mount Yaouré hills.

The Yaouré process plant is located at an elevation of 220-230 mASL.

Ecologically, the area is classified as a forest-savannah mosaic, consisting of variably degraded forest interlaced with savannah and grassland habitats, with areas cleared for settlement and agriculture.

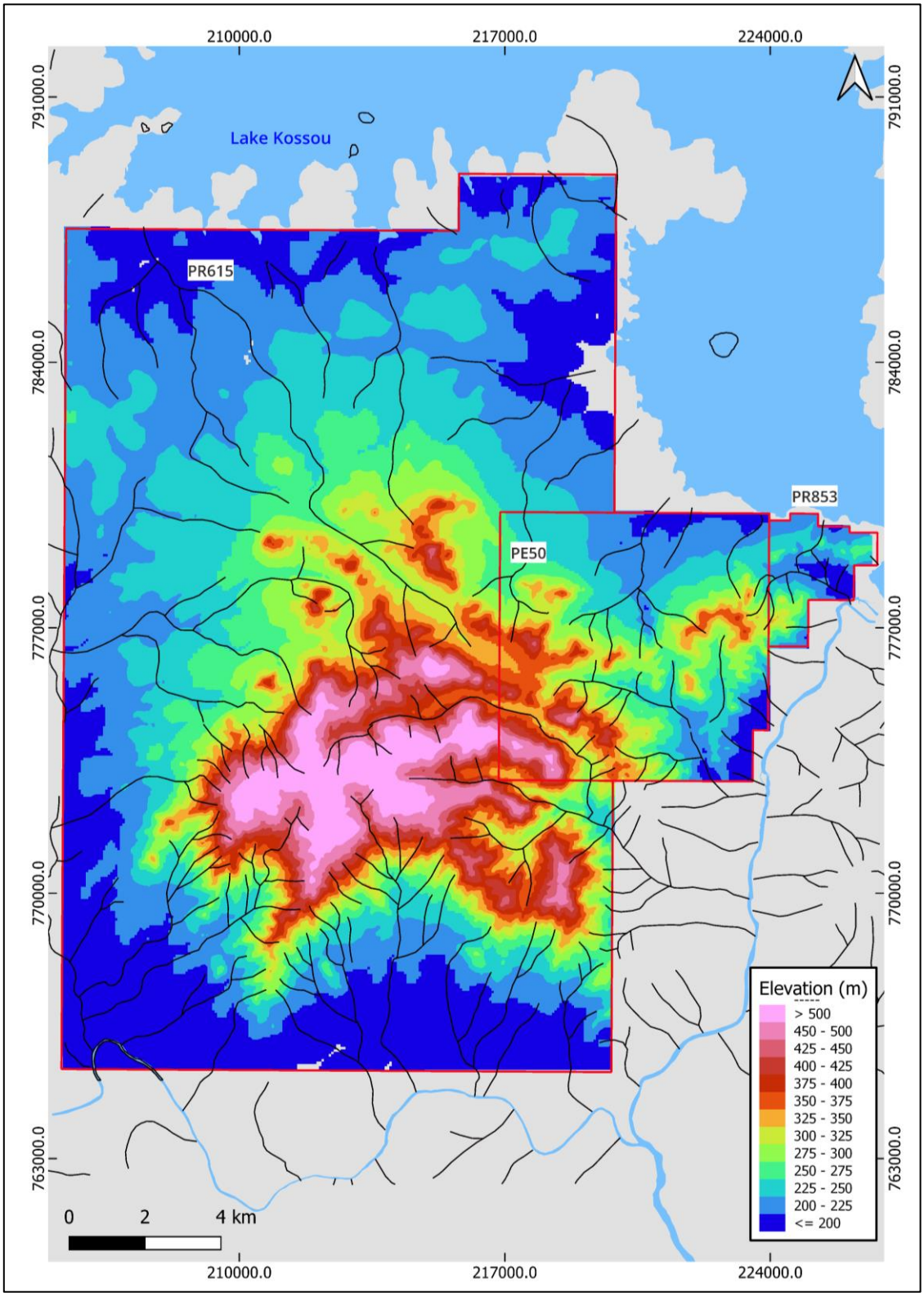


Figure 5-2: Yaouré Gold Mine: topography and drainage



Figure 5-3: Yaouré Gold Mine: typical savannah vegetation (foreground) and Lake Kossou (background)

5.3 Climate

The Project falls into ecological Zone 2 of Côte d'Ivoire, which is an equatorial transition zone. Three seasons can be distinguished, namely: warm and dry (November to March), hot and dry (March to May), and hot and wet (June to October). Average daytime maximum temperatures range between 28°C and 35°C throughout the year, and average daytime minimum temperatures range between 19°C and 23°C (Figure 5-4). The average annual rainfall over the period of 1991 to 2021 is 1,098 mm, with the peak average monthly rainfall occurring in June (Figure 5-5). Prevailing winds are the southwest monsoon and the northeast Harmattan. Exploration and operations can take place year-round.

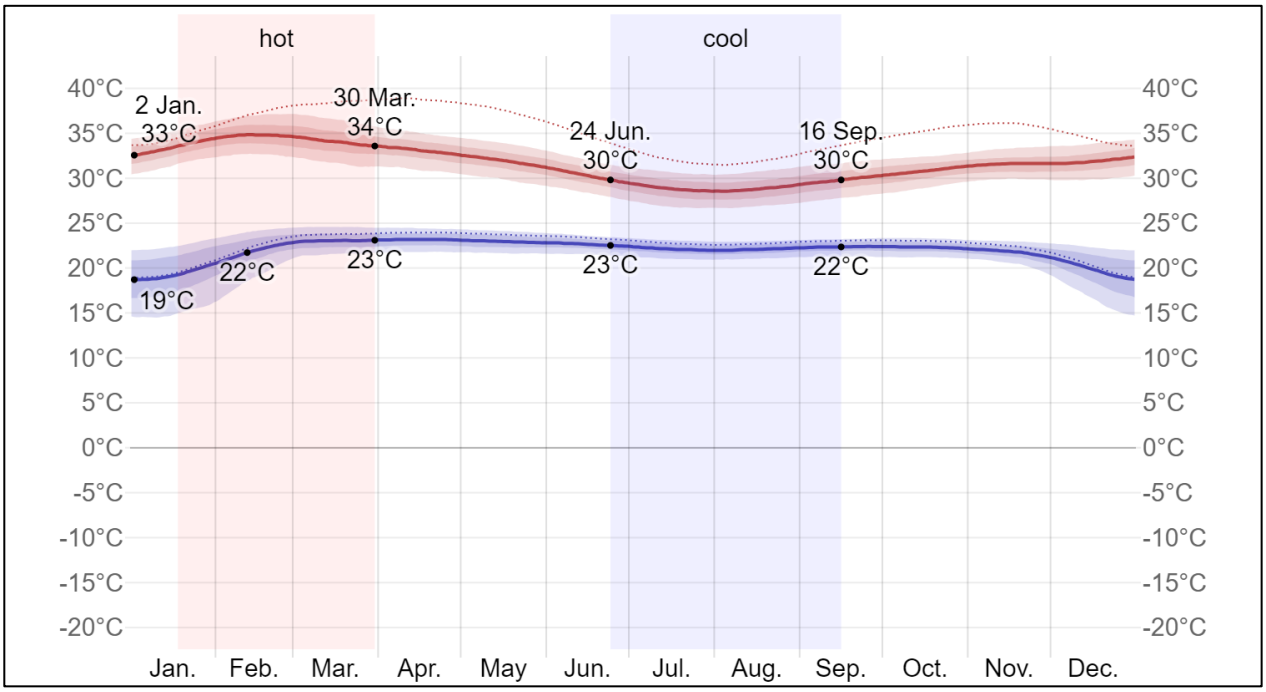


Figure 5-4: Annual temperature variation at Yamoussoukro showing the average high (red line) and low (blue line) temperatures (Source: https://weatherspark.com/) (2023)

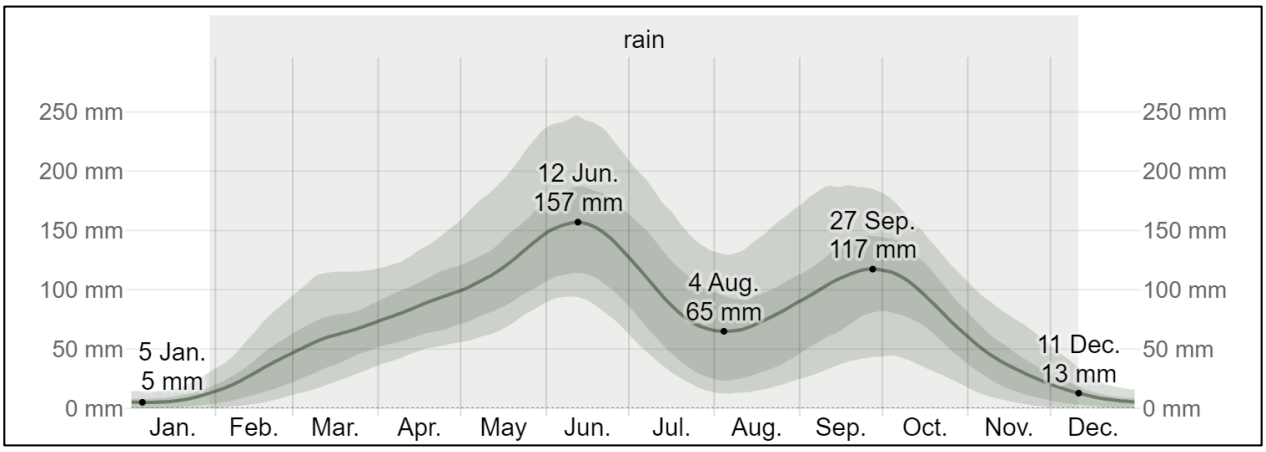


Figure 5-5: Average monthly rainfall at Yamoussoukro (Source: https://weatherspark.com/) (2023)

5.4 Infrastructure

Existing infrastructure, both external infrastructure that services the Yaouré Gold Mine and infrastructure internal to the mine site, is discussed in Section 18 of this report. There is sufficient access to surface rights and adequate infrastructure installed to support ongoing mining operations.

5.5 Labour Availability

The mining operation sources unskilled and semi-skilled labour from villages in the immediate vicinity (e.g., Angovia and Allahou-Bazi villages, situated within 1 km of the existing office complex). Qualified tradespersons are available in Bouaflé and Yamoussoukro, with professional personnel sourced from major centres in Côte d'Ivoire.

5.6 Local Economy

The main economic activities in the area are pastoral and cultivated agriculture, forestry, artisanal mining, and fishing. Artisanal mining has taken place in the Angovia area for more than 100 years (Chauveau, 1978; Gaston, 1913).

The primary working activity is reported in the 2015 ESIA as: agriculture 51%, artisanal and small scale mining (ASM) 18%, and trade 12%. Secondary working activity is reported as: ASM 27%, agriculture 17% and trade 12%. The average monthly income per household is reported in the 2015 ESIA to be CFA 120,000 (about $240) and the average monthly expenditure per household is CFA 85,000 (about $170).

6 History

6.1 Pre-BRGM Exploration

Artisanal gold mining is known to have been conducted at Yaouré since 1913 (Gaston, 1913). The Société des Mines d'Or completed the first exploration program in the Yaouré district on six prospects in 1931. Gold mineralisation was discovered in 1932 by J. Dupuy at two occurrences known as the Angovia Lode and the Akakro Lode. The two occurrences were along the same WNW-ESE oriented quartz vein extending along a 2 km strike between Angovia and Kouakougnanou villages.

Official historical annual gold production records indicate significant exploitation activity in the region prior to the outbreak of the Second World War. Annual gold production is reported to have increased from 1.5 kg in 1939 to 107 kg in 1941. In 1947, E. Molly completed regional geological reconnaissance and described ten occurrences of gold mineralisation in rocks from the Angovia, Bénou and M'Bouessou prospects. At Bénou, gold mineralisation was discovered in quartzites and conglomerates outcropping in the Bandama River. Société pour le Développement Minier de la Côte d'Ivoire (SODEMI) completed work in 1968, re-sampling the quartz veins at Dupuy's discovery site and completed trenching and shallow drilling at the Bénou prospect (Sonnendrucker, 1968).

6.2 BRGM Exploration

The French Bureau de Recherches Géologiques et Minières (BRGM) completed regional and detailed exploration between 1982 and 1988, conducting regional soil and stream sediment geochemical sampling programs across exploration permit PRA No. 36.

BRGM completed the first phase of soil sampling on 100 m spaced grid lines at 50 m intervals over an area of 1,500 m × 600 m centred on Filon de Angovia in 1983. The results of the survey did not identify the expected east-west anomaly along the strike of the vein but instead very strong gold anomalism to the north of the vein, oriented NE-SW with gold concentrations ranging between 300 ppb and 900 ppb. Subsequent soil geochemical sampling programs identified a 2,000 m long, 300 m wide anomaly. A second prominent NW-SE trending soil anomaly was delineated near the village of Kouakougnanou. Subsequent work through to 1991 consisted of geophysics, trenching, motorised auger drilling and diamond drilling to evaluate these two main anomalies.

The BRGM identified a total of eight prospects (the BRGM Prospects) from their geochemical exploration program. These were referred as Angovia 1, Angovia 2, Kouakougnanou, Yaouré, Blangan, Magazine, Zone North and Govisou prospects. A regional soil anomaly was also delineated in the Alekran area near the village of Kouassi Pelita in the south-western corner of PR 615. Between 1987 and 1991, BRGM drilled two diamond core holes and 100 RC holes in the various prospects.

6.3 Compagnie Minière d'Afrique

On March 25, 1993, a PE was granted to CMA (Permit Number 30 by Order Number 048/MME/DM), who completed further drilling at Angovia 1, leading to a Feasibility Study in 1994. CMA's drill core and the Feasibility Study report are not available for review. CMA established an open pit mining and heap leach processing operation in 1999 and production continued until the mine closed towards the end of 2003. The Angovia 1 prospect is now referred to as the CMA deposit.

CMA reportedly extracted 1.9 Mt of ore, with a mean plant feed grade of 3.9 g/t gold from three open pits: CMA North, CMA Central, and CMA South (SRK Consulting, 2008). The CMA North pit and CMA Central pit eventually merged into one pit, reaching a maximum depth of 40 m below the

topographic surface. Treatment of the oxidised ore in a heap leach facility reportedly achieved a mean gold recovery of approximately 85%.

CMA was also granted a 485 km^2 exploration permit in July 2002, with the aim of delineating further near-surface oxidised material close to the existing process plant. However, following the closure of the mine in late 2003, the permits were relinquished in 2004 and subsequently transferred to Cluff Gold West Africa on October 8, 2004.

6.4 Cluff Gold (West Africa) Côte d'Ivoire SARL

Cluff Gold West Africa acquired prospecting permit EXPL168 on October 8, 2004 following the end of the first civil war in Côte d'Ivoire. When Cluff Gold West Africa commenced exploration in 2005, the historical exploration data from BRGM and CMA comprised information from 79 test pits, 179 diamond drill holes, 134 RC holes and 205 trenches. This data derived principally from the CMA and CMA South deposits previously mined, but also from the Yaouré Zone and the Angovia 2, Blangan and Kongonza prospects. This information clearly demonstrated the Yaouré Zone to be the most prospective target after the CMA Zone, with consistent grades in RC drill holes along a 600 m strike. Consequently, Cluff Gold West Africa prioritised exploration of the Yaouré Zone for near surface oxide resources. Over the period of 2005-2008, Cluff Gold West Africa drilled 481 mainly RC holes into the Yaouré Zone and at the Angovia 2 prospect.

Cluff Gold West Africa brought a conventional open pit mine (Figure 6-1) with heap leach processing into production in March 2008 without completing a Feasibility Study. The company also mined the laterite cap on Blangan Hill during this period (Figure 6-2). Cluff Gold West Africa recovered a total of 54,382 oz of gold from 2.1 Mt of ore processed at a grade of 1.0 g/t Au up until mining and processing ceased in January 2011 (Table 6-1). The total production figure includes the mining of 581,075 tonnes of laterite on Blangan Hill which produced 17,870 oz of gold at an average grade of 1.23 g/t (Perseus Mining Limited, 2017).

The mine waste from Cluff Gold West Africa's mining activities was backfilled into the pre-existing CMA pit.



Figure 6-1: View of Cluff Gold West Africa's Yaouré Pit, looking north (Perseus, 2017)



Figure 6-2: View of the laterite cap mined on Blangan Hill (Perseus, 2017)

Table 6-1: Yaouré Gold Mine production from 2008 to 2012

ITEM	UNITS	TOTAL	2012	2011	2010	2009	2008
Ore Mined	t	2,393,192	n/a	176,418	903,301	880,538	432,935
Waste Mined	t	12,697,959	n/a	878,233	3,343,923	5,233,896	3,171,907
Ore Processed	t	2,095,293	n/a	172,460	811,921	738,832	372,080
Head Grade	g/t	1.00	n/a	0.86	0.90	1.20	0.90
Gold Produced	oz	54,382	1,381*	6,470	20,222	21,632	4,577

* No mining, ounces processed from heap leach pads

Between 2009 and January 2011, soil sampling was carried out along the Kongonza trend, between Kongonza and Blangan, and at the Zone North, Govisou and Magazine prospects. Cluff Gold West Africa evaluated the prominent soil anomalies with shallow rotary air blast (RAB) drilling initially due to limited budgets at that time. Cluff reported in-house mineralisation estimates at Angovia 2 (2.8 Mt at a gold grade of 0.98 g/t for 85,000 oz), Kongonza (1.68 Mt at a gold grade of 1.39 g/t for 75,100 oz) and at Zone North (30,000 oz from ore at a gold grade of 0.70 g/t). These estimates are historical, included for information only and should not be regarded as current Mineral Resource estimates.

The start of the second civil war in March 2011 saw the closure of Cluff Gold West Africa's mining operations and the suspension of exploration activities due to security concerns. The exploration program resumed in August 2011, and a diamond drill program to assess the potential in the sulfide zone directly below the mined oxide zones commenced.

The first hole of the sulfide drill program was planned to twin a Cluff Gold West Africa RC hole (ARC0024) which had intersected 28 m grading 3.54 g/t gold. Due to the wet condition of the RC samples, this result was regarded as unreliable and requiring confirmation with core drilling. Due to flooding of the pit, the drilling of this hole was delayed whilst dewatering operations proceeded, and the rig diverted to drill a series of short holes into the steep structures that had been identified during the mining phase.

Once pit dewatering was completed, hole YDD0021 was drilled to twin ARC0024. It confirmed the RC intercept with a remarkably similar aggregate intersection of 28 m grading 3.27 g/t gold. YDD0021 was effectively the discovery hole that led to the complete re-orientation of exploration at Yaouré towards delineating sulfide resources.

Cluff Gold plc changed its name to Amara Mining plc in 2012 and completed a Pre-Feasibility drill program between 2011 and 2015. In November 2014, Amara prepared the Amara PFS which included mineral processing and metallurgical testing, mining and recovery methods, project infrastructure and economic analysis (Tetra Tech, 2015). The Amara PFS, based on a Mineral Resource estimate dated January 5, 2015, supported an 11-year mine life with ore processed at a rate of 6.5 Mt/a.

Optimisation studies, following the completion of the 2015 drilling campaign and an updated resource model, determined the optimal plant size should be reduced to 4.5 Mt/a (Tamlyn, 2016). Economic evaluation for the 15-year operating life, mining and processing 62.2 Mt of ore at a grade of 1.62 g/t gold and operating at a treatment rate of 4.5 Mt/a, gave post-tax financial parameters of 38% IRR, 2.1-year undiscounted payback on $334 million initial capital, and an NPV of $55 million using a discount rate of 8% and a gold price of $1,200/oz (Tamlyn, 2016).

6.5 Perseus Mining Limited

Perseus acquired the Yaouré property in April 2016 following the acquisition of all outstanding shares of London-based Amara Mining plc. The exploitation permit was transferred to Perseus Mining Yaouré S.A., 90% owned by Perseus and 10% by the Ivorian Government.

Perseus commenced a DFS in June 2016, selecting several independent consultants for various aspects of the study. The DFS included additional drilling to increase confidence in resource estimates; to further investigate geotechnical parameters; to gain additional samples for metallurgical test work; and to sterilise areas prior to planning placement of infrastructure.

Perseus undertook a substantial drilling campaign between January and June 2017, and an updated resource estimate was completed in October 2017. Also in October 2017, Lycopodium updated the mineral processing and metallurgical testing section for the DFS (Perseus Mining Limited, 2017). The DFS outlined open pit Mineral Reserves of 26.8 Mt at a grade of 1.76 g/t Au for 1.52 Moz of contained gold. The DFS anticipated open pit mining over six years and ore processing for 8.5 years to produce a total of 1.357 Moz of gold in doré.

After a program of additional resource definition and sterilisation drilling in 2018, Perseus undertook a Front-End Engineering and Design (FEED) Study that updated Mineral Resources, Mineral Reserves and capital and operating costs estimates.

Construction of the Yaouré processing plant commenced in October 2019, mining commenced in August 2020 and ore processing began in late November 2020. First gold was poured in December 2020 and start of commercial production was declared in March 2021. Until May 2021, process plant feed comprised oxide ore from the Cluff spent heap leach material. Processing of ore from CMA Stage 1 pit commenced in June 2021.

Open pit mining and ore processing has operated continuously since commencement. To June 30, 2023, Perseus had produced 633,884 oz of gold from the Yaouré Gold Mine (Table 6-2).

Table 6-2: Yaouré Gold Mine production 2021-2023

PARAMETER	UNITS	YEAR TO JUNE 30, 2021	YEAR TO JUNE 30, 2022	YEAR TO JUNE 30, 2023
Total ore and waste mined	kt	23,429	34,387	33,415
Ore mined	kt	788	5,811	5,291
Ore processed	kt	1,585	3,921	3,900
Head grade	g/t Au	1.37	2.53	2.35
Gold recovery	%	88.7	93.4	92.8
Gold produced	oz	62,125	297,818	273,941

Perseus has maintained an active exploration program since commencement of mining, delineating open pit Mineral Resources and Mineral Reserves at CMA SW, Angovia 2 and Govisou deposits and conducting earlier stage exploration elsewhere within the Company's permits.

6.6 Historical Mineral Resource Estimates

The estimates described below are historical, included for information only and should not be regarded as current Mineral Resource estimates. A QP has not done sufficient work to classify the historical estimates as current Mineral Resources or Mineral Reserves and the Company is not treating the historical estimates as current Mineral Resources or Mineral Reserves.

The first Mineral Resource estimates at Yaouré were prepared for Cluff Gold West Africa by consultants SRK in 2005 and 2006, and by Dr Simon Ingram of Auverdi in 2007. The resource estimate by Auverdi combined Prospect 2 and Prospect 4 (Yaouré Zone) with SRK's 2006 estimate which combined the sulfide-hosted mineralisation below the base of the previously mined CMA oxide pits, with near-surface oxidised mineralisation defined within the entire exploration permit including the Angovia 2 prospect. The Auverdi estimate in 2007, documented by SRK (2008), is presented in Table 6-3.

Table 6-3: 2007 Auverdi Mineral Resource Estimate in SRK (2008)

OXIDATION STATE	CATEGORY	TONNES (Mt)	GRADE (g/t GOLD)	GOLD (oz)
Oxidised	Measured	2.10	1.4	97,000
	Indicated	2.01	1.4	91,000
	Inferred	0.56	1.6	28,000
Sulphide	Measured	2.97	1.5	147,000
	Indicated	2.21	1.7	117,000
	Inferred	0.30	1.6	16,000

Amara Mining's first resource estimate for Yaouré was announced in March 2013, informed by assays up to drill hole YDD0112. The resource estimate by Arnold (2013) reported an Indicated and Inferred gold resource of 2 million ounces using a 0.80 g/t gold cut-off (Table 6-4).

Table 6-4: Yaouré Indicated and Inferred Resources at March 25, 2013

RESOURCE CATEGORY	UNIT	CUT-OFF GOLD GRADE (g/t)		
		0.5	0.8	1.0
Indicated	Tonnes (Mt)	13.5	8.02	5.65
	Grade (g/t)	1.04	1.31	1.49
	Content (koz)	450	340	270
Inferred	Tonnes (Mt)	59.3	34.6	24.7
	Grade (g/t)	1.15	1.52	1.78
	Content (koz)	2,200	1,700	1,400

Amara's second resource model in December 2013 was based on the complex litho-logging code system designed by Bond (2013) who generated 145 different logging codes incorporating alteration styles into rock code nomenclature. This modelling was largely due to the limited structural understanding of Yaouré at this stage in the Project. The Yaouré total Indicated and Inferred Mineral Resources detailed in Table 6-5 reported significantly increased resources as the drilling progressed (Rossi, Hallewell, & Brown, 2014). These results continued to confirm the potential for a large-scale sulfide deposit underlying the previously mined oxide resources.

Table 6-5: Yaouré Indicated and Inferred Resources at December 1, 2013

RESOURCE CATEGORY	UNIT	CUT-OFF GOLD GRADE (g/t)		
		0.5	0.8	1.0
Indicated	Tonnes (Mt)	20.2	13.3	10.0
	Grade (g/t)	1.20	1.48	1.68
	Content (koz)	778	637	541
Inferred	Tonnes (Mt)	133	85.7	65.5
	Grade (g/t)	1.29	1.65	1.89
	Content (koz)	5,518	4,554	3,974

The resource model prepared in December 2015 (Table 6-6) was changed from using a litho-code based estimation into one using structural domains (Rossi & Brown, 2015). Gold grades were estimated using a combination of ordinary kriging (OK), inverse distance cubed (ID^3) and multiple indicator kriging (MIK), both for grades and to probabilistically estimate the proportion of rock type for those domains that could not be interpreted and wireframed.

Table 6-6: Yaouré Measured, Indicated and Inferred Resources at December 20, 2015

RESOURCE CATEGORY	UNIT	CUT-OFF GOLD GRADE (g/t)		
		0.5	0.8	1.0
Measured	Tonnes (Mt)	18.6	14.3	11.9
	Grade (g/t)	1.86	2.23	2.49
	Content (koz)	1,114	1,024	957
Indicated	Tonnes (Mt)	85.5	60.5	47.4
	Grade (g/t)	1.47	1.81	2.07
	Content (koz)	4,042	3,527	3,151
Measured & Indicated	Tonnes (Mt)	104.1	74.8	59.4
	Grade (g/t)	1.54	1.89	2.15
	Content (koz)	5,155	4,552	4,108
Inferred	Tonnes (Mt)	47.7	34.0	27.1
	Grade (g/t)	1.41	1.71	1.92
	Content (koz)	2,156	1,874	1,674

The wireframes used in the 2015 model were CMA, CMA South, Y1, Y2, Y3, S1 and S2. The Yaouré total Measured and Indicated Mineral Resources in December 2015 were 4.55 Moz at a 0.80 g/t cut-off (Table 6-6). These resources were tabulated within the global envelope, and a pit shell defined using a $1,500/oz gold price, with inter-ramp slopes of 44° in oxides and 53° in fresh rock, as well as other costs published in Amara PFS.

Subsequent to the Amara 2015 Mineral Resource estimate, Perseus published an NI 43-101 Mineral Resource estimate completed for the Yaouré and CMA deposits (including the Heap Leach) in the 2017 Report (Perseus Mining Limited, 2017), and is presented in Table 6-7. The 2017 Perseus generated Mineral Resource was reported at a 0.4 g/t gold cut-off within optimal pit shells using a $1,800/oz metal price. No Measured Mineral Resource was reported. The total Indicated Mineral Resource published on November 3, 2017 was 43.1 Mt at an average gold grade of 1.39 g/t for 1.93 Moz contained gold, and Inferred Mineral Resource of 46 Mt at an average gold grade of 1.0 g/t for 1.5 Moz contained metal.

Table 6-7: Yaouré Gold Mine Mineral Resources at November 3, 2017

INDICATED RESOURCES			
ZONE	TONNES (M)	GOLD GRADE (g/t)	CONTAINED GOLD (Moz)
CMA	24.8	1.81	1.44
Yaouré	16.5	0.81	0.43
Sub-total	41.3	1.41	1.87
Heap Leach	1.8	1.02	0.06
Total	**43.1**	**1.39**	**1.93**
INFERRED RESOURCES			
ZONE	TONNES (M)	GOLD GRADE (g/t)	CONTAINED GOLD (Moz)
CMA	16	1.2	0.6
Yaouré	30	0.9	0.9
Sub-total	46	1.0	1.5
Heap Leach	-	-	-
Total	**46**	**1.0**	**1.5**

The 2017 Mineral Resource estimate was prepared as part of the Perseus Feasibility Study for the Yaouré Gold Project. The Yaouré Gold Mine Mineral Resources have been annually updated and reported on the Australian Stock Exchange (ASX) according to the JORC Code since 2017. No material changes are considered to have occurred between 2017 and 2023 that required an update of the 2017 Report. This Report includes the underground Mineral Resource estimate for the CMA deposit. There are no known historical estimates of underground Mineral Resources for the CMA deposit prior to Perseus.

In May 2018, Perseus undertook an estimate of Inferred Mineral Resources that formed the basis of an underground mining Scoping Study (Hunt-Davies, 2018). The estimate considered only material within the modelled CMA main lode to a maximum depth of approximately 350 m below surface, below the $1,800/oz pit shell that constrains open pit resources, and above a 2 g/t gold block grade cut-off based on estimated incremental stoping costs and a gold price of $1,200/oz.

That estimate was publicly reported in August 2019 (Perseus Mining Limited, 2019). The published estimate was 1.8 Mt at a grade of 6.1 g/t for 346 koz contained gold.

The CMA underground Mineral Resource estimate was subsequently updated to support the underground Pre-feasibility Study (PFS) reported to the ASX on October 11, 2022 (Perseus Mining Limited, 2022). The published 2022 estimate included Indicated Mineral Resources of 3.7 Mt at a grade of 4.48 g/t for 537 koz contained gold and Inferred Mineral Resources of 3.7 Mt at a grade of 4.1 g/t for 488 koz contained gold. This substantial increase in the CMA underground Mineral Resource was supported by successive campaigns of drilling conducted throughout 2021 and 2022 targeting the underground portion and depth extensions of the CMA Zone.

The November 3, 2017 reported NI 43-101 Mineral Resource estimate is superseded by the September 18, 2023 Perseus Mineral Resource estimate update presented in Section 14 of this report.

7 Geological Setting and Mineralisation

7.1 Regional Geology

The geology of Côte d'Ivoire mainly consists of Archaean and Palaeoproterozoic terranes (Figure 7-1). The coastal part of the country is largely covered by a Mesozoic-Cenozoic sedimentary basin.

Archaean rocks that form the pre-Birimian basement occur in the western part of the country. The Archaean terranes are generally composed of hypersthene-bearing rocks (termed charnockitic suite or granulitic suite). Ferruginous quartzite, basic and ultrabasic rocks (pyroxenite and amphibole pyroxenite), gneiss, migmatite, and granite also occur. The metamorphism varies between granulite and amphibolite facies.

Palaeoproterozoic rocks of the Birimian Supergroup cover more than two-thirds of the country. They consist predominantly of granitoid zones with volcano-sedimentary greenstone belts. The predominant strike is north-northeast to south-southwest, with typically sub-vertical dips. The dominant regional metamorphism is greenschist facies.

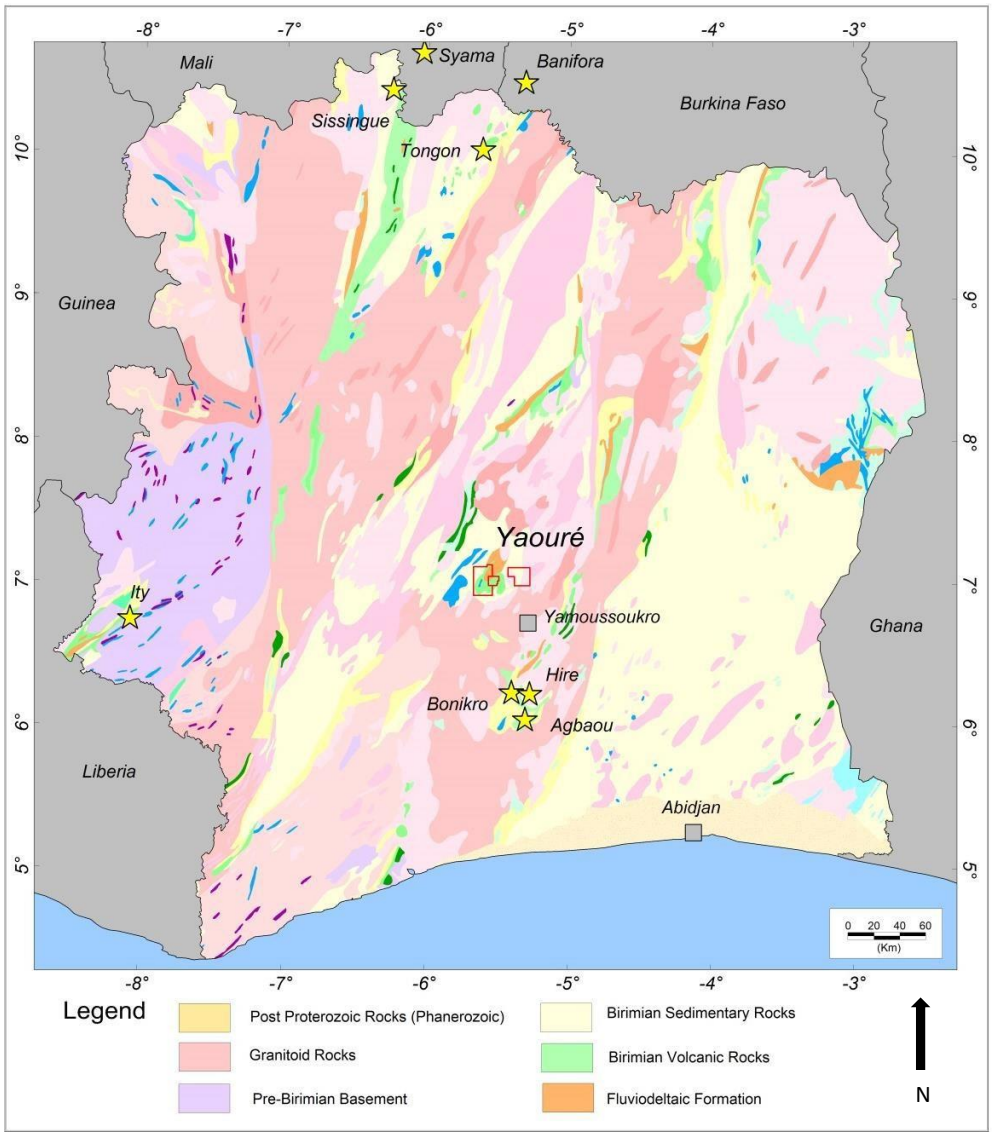


Figure 7-1: Geological map of Côte d'Ivoire, Modified from BRGM: West African Gold Deposits in their Lower Proterozoic Litho-structural Setting.

7.2 Local Geology

The Yaouré gold deposit lies within the eastern half of the informally named Bouaflé greenstone belt in central Côte d'Ivoire. The belt is a NNE-trending assemblage of Palaeoproterozoic volcanic, sedimentary and intrusive rocks of the Birimian Supergroup.

Rock types in the Yaouré district are, for the most part, mafic volcanic rocks with minor chert, turbiditic metasedimentary rocks and a fluvio-deltaic formation. The volcano-sedimentary rocks were intruded by tonalite-trondhjemite-granodiorite (TTG) type plutonic rocks and undifferentiated granitoids. Mafic to ultramafic complexes are also found in the Yaouré district.

Despite local relief of up to 100 metres, bedrock exposures are rare. Remnant laterite caps mostly comprise re-lateritised transported material overlying either in situ or transported saprolite. Much of the area immediately surrounding the Yaouré deposits is covered by up to 20 m of transported material.

The entire Birimian rock suite has been metamorphosed to lower greenschist facies. Original ferromagnesian minerals are variably replaced by chlorite and leucoxene and rare actinolite and biotite. Plagioclase is typically saussuritised and variably replaced by albite, sericite and minor calcite.

The Yaouré deposit is located immediately south of a major break in the structural-stratigraphic architecture of the Birimian host rocks (Figure 7-2).

South of the break, the sequence is dominated by variably altered, pillowed and massive basalts that host the bulk of gold mineralisation. Thin (1-3 m) quartz and quartz-feldspar porphyry dykes and a granodiorite plug, in the Yaouré pit west of CMA, also host minor volumes of mineralisation.

The orientation of the primary layering in the basalt sequence is not known but recent exposures of pillowed basalts in the CMA open pit possibly indicate a sequence striking approximately east-west. Drilling has intersected thin (2-4 m) units of mafic and carbonaceous sediments in the basalts that form the hanging-wall of the CMA structure, but they appear to be quite discontinuous as may be expected in a sub-aqueous volcanic depositional environment.

The area immediately north of the deposit comprises a distinctly different volcano-sedimentary sequence that is thought to have been deposited in a fault-bound basin. Based on drill core exposures, it has been divided into an upper and lower unit. The basal unit consists of basaltic volcanoclastic rocks interbedded with layers of pebble conglomerate with fine ash and crystal-rich tuffs. The characteristics of this unit suggest it was deposited as a series of mass and pyroclastic flows with minor episodes of high energy fluvial sedimentation. The upper unit comprises a homogenous sequence of sandstone of dacitic composition, with no bedding or deposition features. The unusual lack of depositional or sedimentary reworking textures throughout this unit suggests an extremely voluminous and proximal volcanic source (Mériaud, 2017). Drill core exposures indicate that the basin-bounding faults have been reactivated as reverse faults during basin inversion and it is possible that such reactivation was contemporaneous with gold mineralisation.

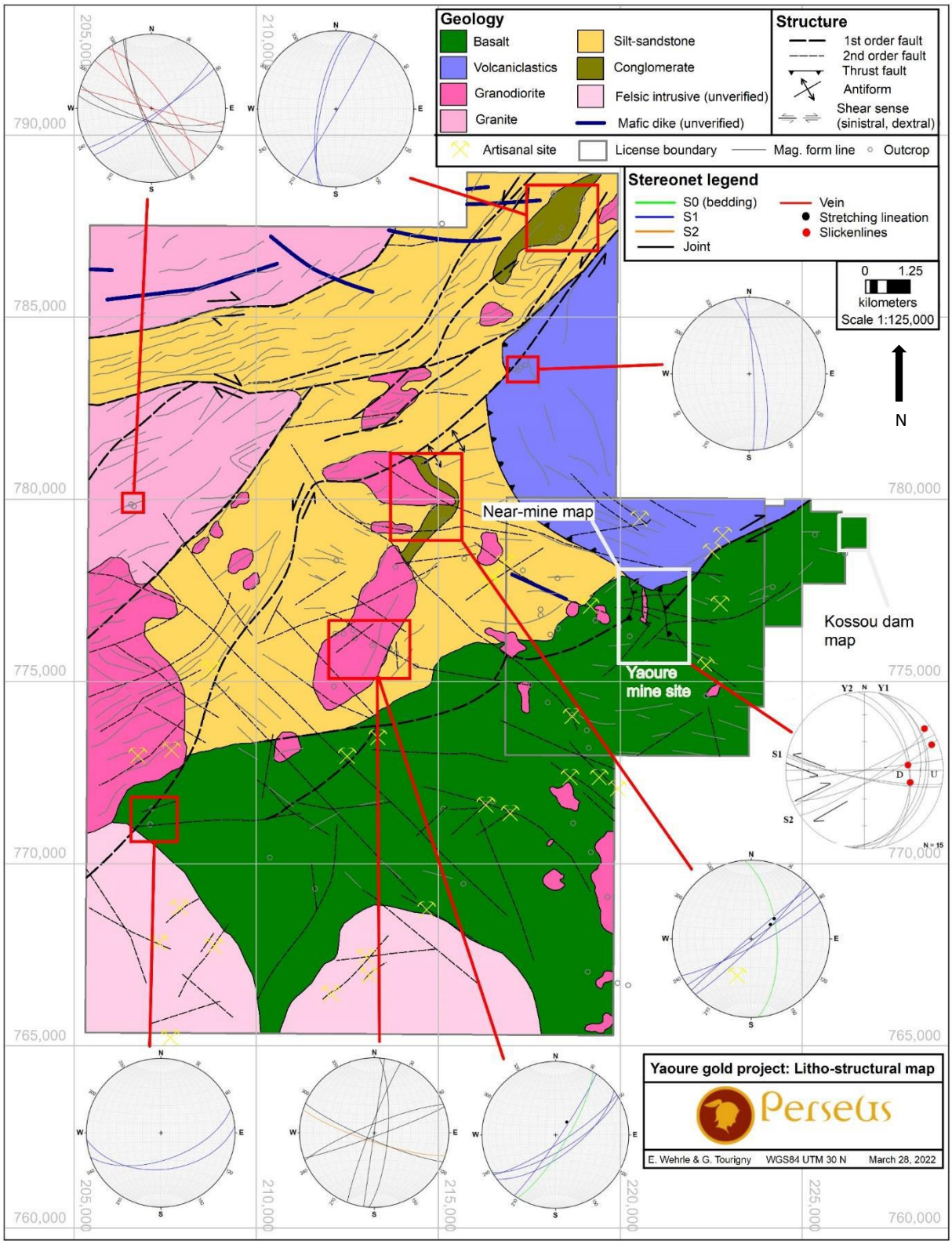


Figure 7-2: Litho-structural map of the Yaouré district, from Tourigny & Wehrle 2022

7.3 Structure

Outside of the main mineralised structures, penetrative deformation fabrics are rarely observed at Yaouré. Features such as basalt pillow margins are well preserved; a spaced fracture cleavage is observed only in places.

The major structure relating to mineralisation at Yaouré is described as the CMA Zone, a relatively continuous 20-45 m thick fault zone featuring quartz- carbonate (dominantly ankerite) veining and disseminated pyrite in albite-carbonate altered wall rocks. It strikes approximately north-south, dips at 30 degrees to the east, extends along 1,200 metres strike and its down-dip continuity has been tested for in excess of 1,000 m. The structure splits and bifurcates into more than one zone, often forming two or more distinct strands. The superimposition of brittle and ductile fabrics and cross-cutting vein relationships indicate multiple reactivations over an extended time period.

Within the Yaouré zone, located approximately 200 m below the CMA Zone, mineralisation is hosted by a series of brittle-ductile structures divided for convenience into 'Y' and 'S' types (Figure 7-3). The 'Y' fault zones, parallel to CMA, consist of Y1, Y2 and Y3 - shallow easterly dipping reverse faults with associated albite, carbonate and quartz veins in variably altered host rocks with disseminated pyrite. The first structure with similar characteristics to the CMA, Y1, occurs 200 m below the CMA, Y2 occurs 440 m below CMA and Y3 occurs 550 m below CMA. Y1 and Y2 are less well developed than CMA and contain less cataclasite material. Y3 contains both brittle and ductile fabrics similar to CMA and is considered the base of the Yaouré reverse fault system.

The 'S' type structures comprise steep, sub-vertical faults filled with quartz tourmaline veins. The 'S' type structures were identified as S1 and S2 according to orientation. The S1 and S1 parallel structures are oriented WNW-ESE, and the S2 structure is orientated NE-SW. A nomenclature system has been developed whereby prominent veins parallel to S1 are allotted odd numbers and those parallel to S2 even numbers. Thus, S9 is sub-parallel to S1; S4 is sub-parallel to S2.

It is thought that the 'S' and 'Y' type structures developed in the same stress field, with the maximum principal stress direction oriented approximately east-west. Subtle differences in the alteration and vein mineral assemblages associated with each of the two types of structures may, however, indicate that their formation was not entirely coeval.

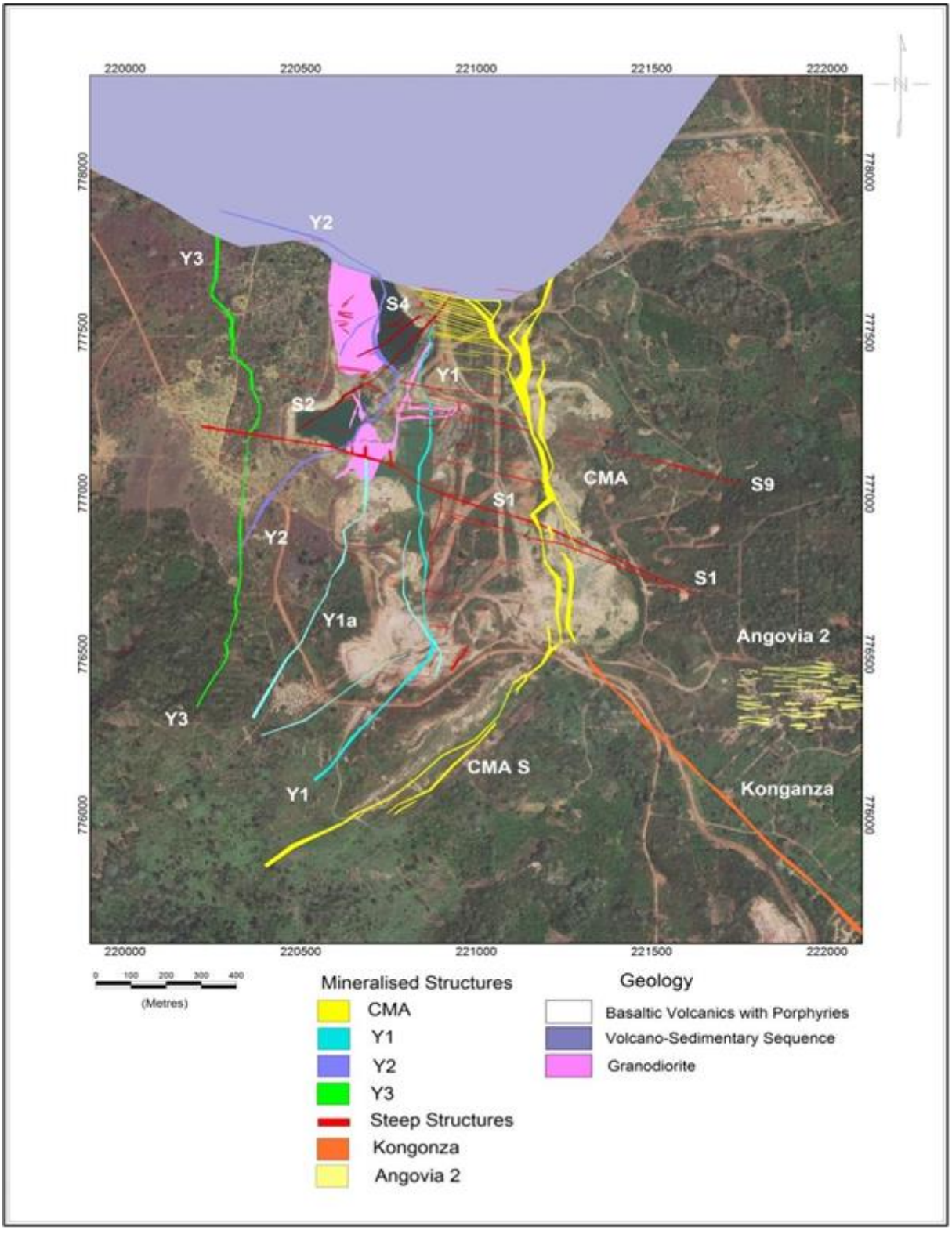


Figure 7-3: Principal mineralised structures at the Yaouré Gold Project (Perseus, 2017)

7.4 Alteration and Mineralisation

The earliest phase of alteration at Yaouré, predating gold mineralisation, resulted in widespread metasomatic precipitation of calcium rich phases such as clinozoisite, epidote, clinoamphibole and

andradite garnet (Townend, 2016). Early boron metasomatism, possibly related to the intrusion of granodiorite, resulted in the development fine grained prismatic tourmaline, and the release of magnesium and iron lead to the formation of chlorite.

The most common style of alteration associated with gold mineralisation at Yaouré is quartz veining and intense silicification with albite, ankerite, sericite, biotite and chlorite and pyrite mineralisation, best developed in the CMA structure. This CMA-type alteration is clearly distinguished by its pervasive, moderate to strong, pink-pale brown albite and carbonate alteration (Figure 7-4). Visible gold is relatively common in the CMA Zone within both quartz veins and intensely altered and sheared host rocks. Zones of strong chlorite magnetite pyrite alteration are common in the footwall rocks immediately adjacent to the main 'Y'-type shear zones.

The 'S' type structures are marked by steep, sub-vertical faults filled with quartz tourmaline veins. Wall rock alteration adjacent to the veins commonly consists of quartz carbonate veinlets with variably developed shear textures with pyrite, biotite, and carbonate selvedges. 'S' type mineralisation lacks the characteristic orange-brown and pink coloured albite and ankerite alteration associated with the 'Y' type structures.

Numerous, less well-developed mineralised structures also occur in the deposit. The majority strike approximately east-west and dip sub-vertically and are best developed in the granodiorite stock where, in places, they combine with less common flat-lying veins to form a stockwork. Gold mineralisation also occurs along granodiorite and porphyry contacts and along zones of competency contrast such as the contacts between massive and pillowed basalts.

Gold occurs within quartz, quartz-carbonate and quartz-tourmaline veins and in adjacent altered wall rocks, typically associated with disseminated pyrite. Other than for very fine particles that may be occluded by silicates or labile pyrite, the gold is free milling, i.e., cyanide soluble.



Figure 7-4: CMAHW1 and CMAFW1 intercepts in YDD0068. 12.74 m at a gold grade of 2.32 g/t and 22.5 m at a gold grade of 4.90 g/t

8 Deposit Types

The deposits (including Yaouré and CMA) at the Yaouré Gold Mine are structurally controlled, orogenic style gold deposits similar to many exploited elsewhere in the Birimian terranes of West Africa.

The Yaouré deposit is characterised by mineralised reverse and strike-slip faults with multiple accommodating transfer faults. The sub-vertical strike-slip faults commonly referred to as S structures generally strike in an east-west direction; while the shallow to moderately dipping reverse faults referred to as Y structures generally strike north-south and typically dip between 25-40 degrees to the east.

The CMA deposit is characterised by two dominant lodes that host approximately 98% of the underground resources described in this report. These lodes are hosted by a reverse fault system that dips consistently at 25-30 degrees due east.

Gold mineralisation is accompanied by traces of molybdenum, tungsten, antimony, bismuth and tellurium indicating that the mineralisation may have affinities with the reduced intrusion-related gold systems (IRGS). The predominance of structural controls and association with carbonatisation, sericitisation and silicification, however, are characteristics that more clearly point to its classification as an orogenic, mesothermal gold deposit.

Other deposit types known in the Yaouré district include:

- lateritic oxide deposits as ferricrete remnants on the tops of hills, consisting of transported and re-cemented iron-rich pisoliths and quartz fragments; the only known examples are Blangan and Zone North;
- small elluvial and alluvial deposits which have been mined by artisanal miners.

9 Exploration

9.1 Overview

Exploration undertaken prior to the acquisition of Yaouré by Perseus in 2016 is discussed in Section 6, above.

9.2 Coordinates, Survey Controls and Topographic Surveys

Locations of Yaouré exploration data and drill holes are based on the UTM coordinate system, Zone 30 North in World Geodetic System (WGS) 84 datum on the Earth Gravitational Model (EGM) 96 Geoid.

Eight ground survey control points were established throughout the Project area in 2007 by Centre de Cartographie et Télédétection (CCT, Cartography and Remote Sensing Centre), a division of Bureau National d'Etudes de Techniques et de Développement (BNETD, National Office for Technical Studies and Development).

Historic mine survey data are available for the Yaouré and CMA pits. The Yaouré pit survey is dated March 2011 and is a reliable representation of the pit void at the cessation of mining. The CMA survey data are available only as an uncontrolled triangulation of point data. Points were recovered from the triangulation and re-strung to recover crest, toe and ramp strings prior to reforming a triangulated surface. The resulting surface agrees closely with drill intercepts of the bottom of backfill material in most areas. Perseus considers that it forms a reasonable representation of the CMA pit void at the cessation of mining.

In January 2017, Perseus contracted African Consulting Surveyors (ACS) to undertake an airborne LiDAR survey over an 11 km × 8 km area centred on the Yaouré mine. Data were rectified using the established control points referred to above. ACS provided the full point cloud, model key points (filtered ground points), and a series of orthorectified aerial photographs forming a mosaic over the entire survey area.

Since commencement of open pit mining by Perseus, qualified mine surveyors have maintained up-to-date surfaces for areas affected by mining, waste dumps, and other changes to the site layout.

The exploration group at Yaouré employs a dedicated qualified surveyor to set out and survey drill hole collars.

9.3 Exploration Activity and Results

9.3.1 Overview

Since late 2016, Perseus has undertaken a series of exploration activities across the Yaouré project including drilling, geophysical surveys, and mineralogical and geochemical analysis. Details of these activities are presented in the following sections.

9.3.1 Drilling Activities

Drilling programs at Yaouré since 2016 have been completed for a range of purposes including to improve confidence in the estimated Mineral Resources (completed in 2017); to identify and delineate additional prospects across the permit; to investigate depth extension of known mineralisation, particularly the continuation of the CMA; and to improve the understanding of the structural and geochemical controls on mineralisation. In addition, sterilisation drilling programs to

test the suitability of the planned mine infrastructure locations were completed. Table 9-1 shows a summary of various drill programs carried out since 2016.

Table 9-1: Summary of drilling since 2016 by Perseus

DRILL PROGRAM	PURPOSE	NO. HOLES	TOTAL METRES	PERIOD
HEAP LEACH	Metallurgical Work	48	575	Feb 2017 – Dec 2017
AUGER	Exploration	1,189	9,751	Mar 2018 – Dec 2019
STERILISATION	Mine Planning	829	29,411	Jan 2017 – Jul 2018
GC	Resource Definition	417	12,709	Dec 2016 – Oct 2017
CMA PIT	Resource Definition	145	25,719	Jan 2017 – Jun 2018
YAOURE PIT	Resource Definition	296	22,715	Jan 2017 – Jun 2018
Y2N	Infill	81	5,078	May 2018 – Aug 2020
Y3N	Infill	50	2,708	May 2018 – May 2018
CMA SW	Infill	147	11,208	Jul 2017 – Jun 2021
ANGOVIA 2	Infill	149	10,890	Jan 2017 – Jul 2021
GOVISOU	Infill	88	9,769	May 2017 – Jun 2021
AKAKRO	Exploration	6	1,567	Mar 2020 – Apr 2020
KONGONZA	Exploration	44	1,025	Jun 2017 – Jun 2021
SAYIKRO	Exploration	89	9,143	Apr 2020 – Jul 2021
EXT NE	Exploration	738	41,750	Jan 2017 – Aug 2019
EAST ANALOGUES	Conceptual	74	6,448	Jun 2021 – Oct 2021
CMA EXTENSION	Depth Extension	3	3,302	Oct 2019 – Jan 2020
BASIN CONTACT	Depth Potential	15	2,319	Feb 2017 – Jul 2020
CMA UG *	Underground Resource Definition	446	139,993	Jul 2021 – Sep 2023
YAOURE PIT *	Resource Definition	133	22,344	Feb 2023 – May 2023
CMA DEEPS	Conceptual Depth Exploration	7	7,999	May 2022 – May 2023

* Resource definition drilling from the CMA underground and Yaouré open pit drill programs are discussed in detail in Section 10.

9.3.1.1 Auger Drilling

In 2018 and 2019, the until then untested southwestern corner of the permit was covered by an auger drill program on a regular, nominally 50 m × 100 m and 100 m × 100 m spaced grid resulting in the identification of the Sayikro prospect (Figure 9-1). Data from auger drilling have not been used to inform the estimates of Mineral Resources and Mineral Reserves.

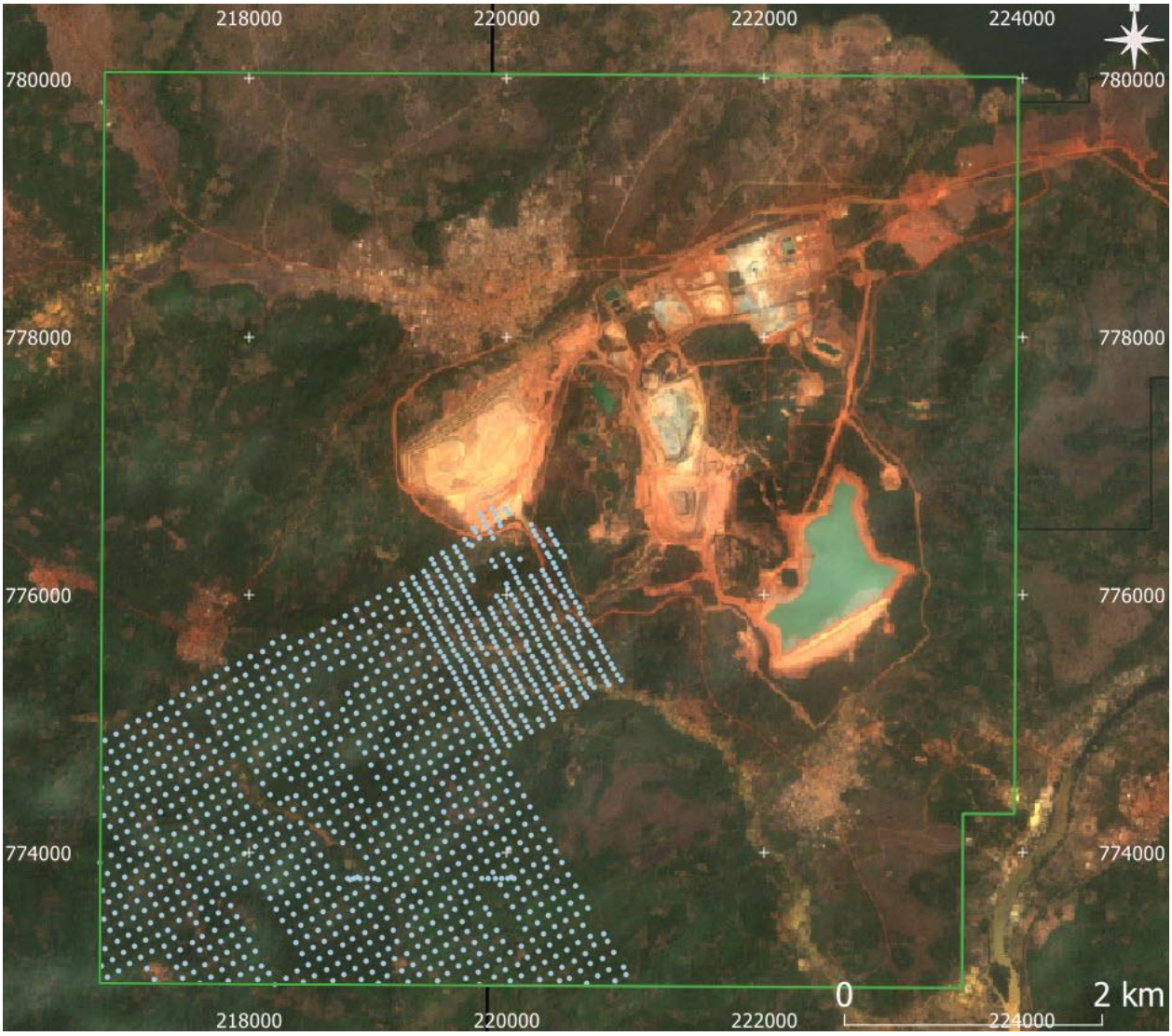


Figure 9-1: Auger drill hole layout of 2018 and 2019 drilling (Perseus, 2023)

9.3.1.2 Heap Leach Sampling

The heap leach pads from Cluff Gold West Africa's mining operation were already drill tested by Amara in 2015. Perseus added 48 vertical auger holes in February and December 2017, totalling 575.3 m. The purpose of this drilling was to gain material for metallurgical test work. Holes were spaced approximately 75 m × 75 m. Samples were not individually assayed, and the results have not been used to inform the estimates of Mineral Resources and Mineral Reserves.

9.3.1.3 Sterilisation Drilling

Between January 2017 and August 2018, prior to mine construction, areas planned to be covered by mine infrastructure were drill tested to confirm the absence of economic mineralisation. Air core fences were completed over the areas earmarked for waste dumps, the ROM pad and processing plant, mine offices, mine camp areas, the explosive magazine area, and the TSF (Figure 9-2). Data from the sterilisation programs have not been used to inform the estimates of Mineral Resources and Mineral Reserves.

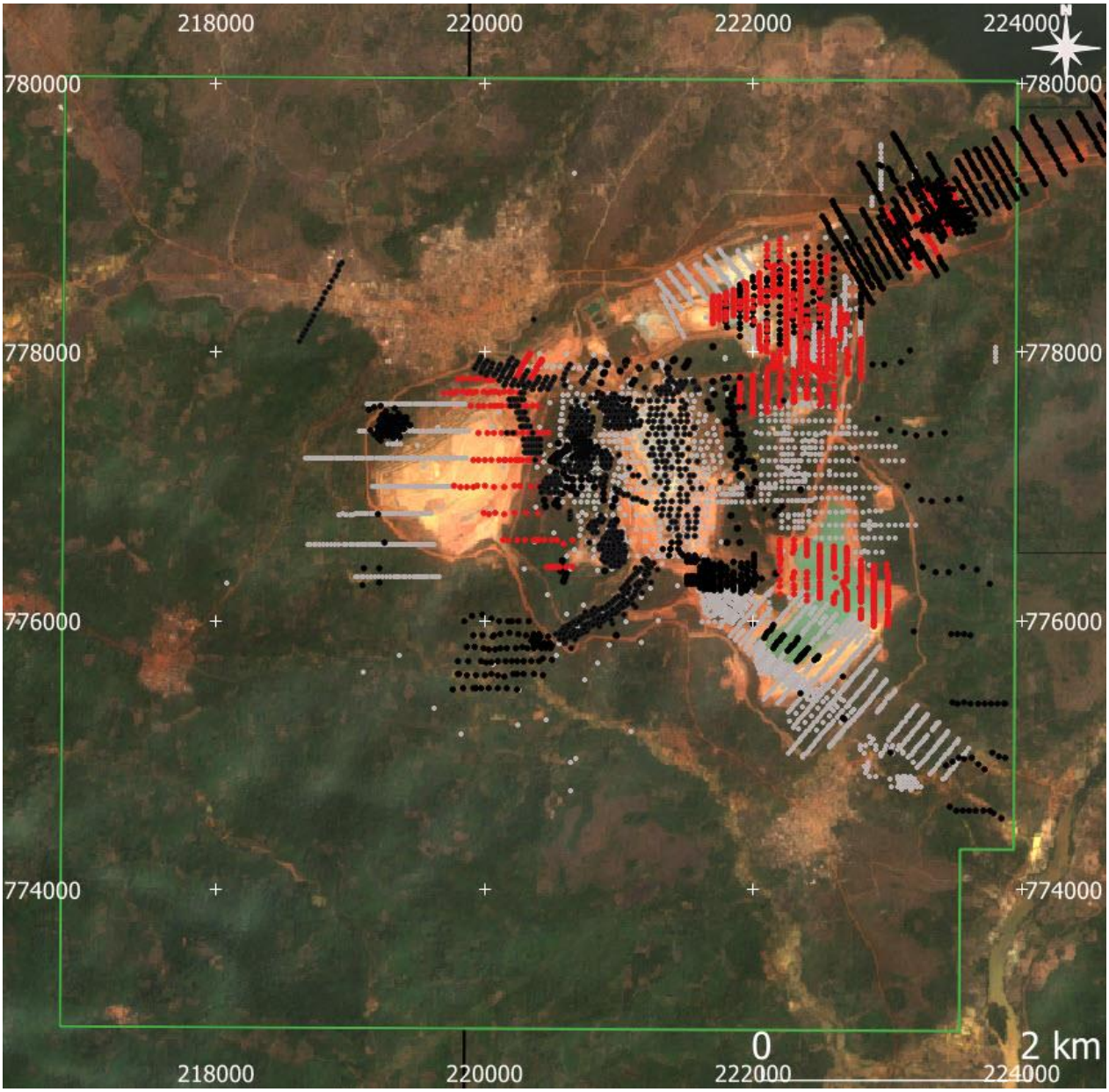


Figure 9-2: Drill hole layout showing sterilisation holes (red) with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023)

9.3.1.4 Satellite Projects

Various prospects have been drill tested in the hope to add ore to the current mining operation from nearby satellite pits, including Akokro, Sayikro, Kongonza and the contact zone termed Extension NE between the basalt package and the volcanoclastic basin (Figure 9-3). A summary of drill holes and drill metres are given in Table 9-1.

To date, none of these prospects have been developed to a Mineral Resource. Data from these drill programs have not been used to inform the estimates of Mineral Resources and Mineral Reserves.

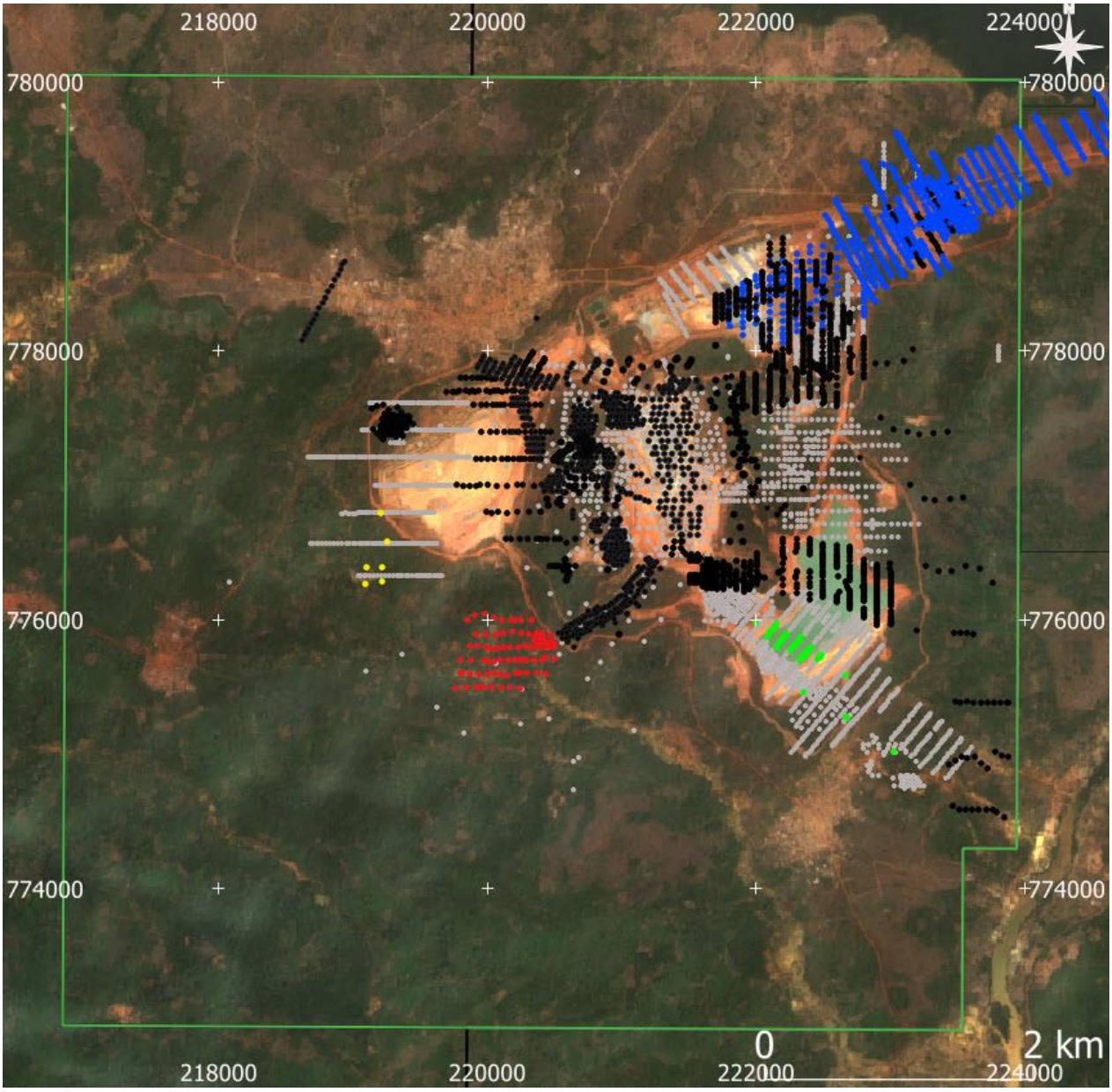


Figure 9-3: Drill hole layout showing satellite drilling at Saykiro (red), Kongonza (green), Akokro (yellow), and Extension NE (blue), with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023)

9.3.1.5 Infill Drilling

Several smaller prospects have been drill tested during mine construction and during early production. This includes the prospects Y2N, Y3N, CMA SW, Angovia 2 and Govisou. A summary of drill holes and drill metres is given in Table 9-1.

With exception of the CMA SW prospect, a perceived continuation of CMA bending towards a south-westerly strike, the economic portions of the respective prospects have been mined out.

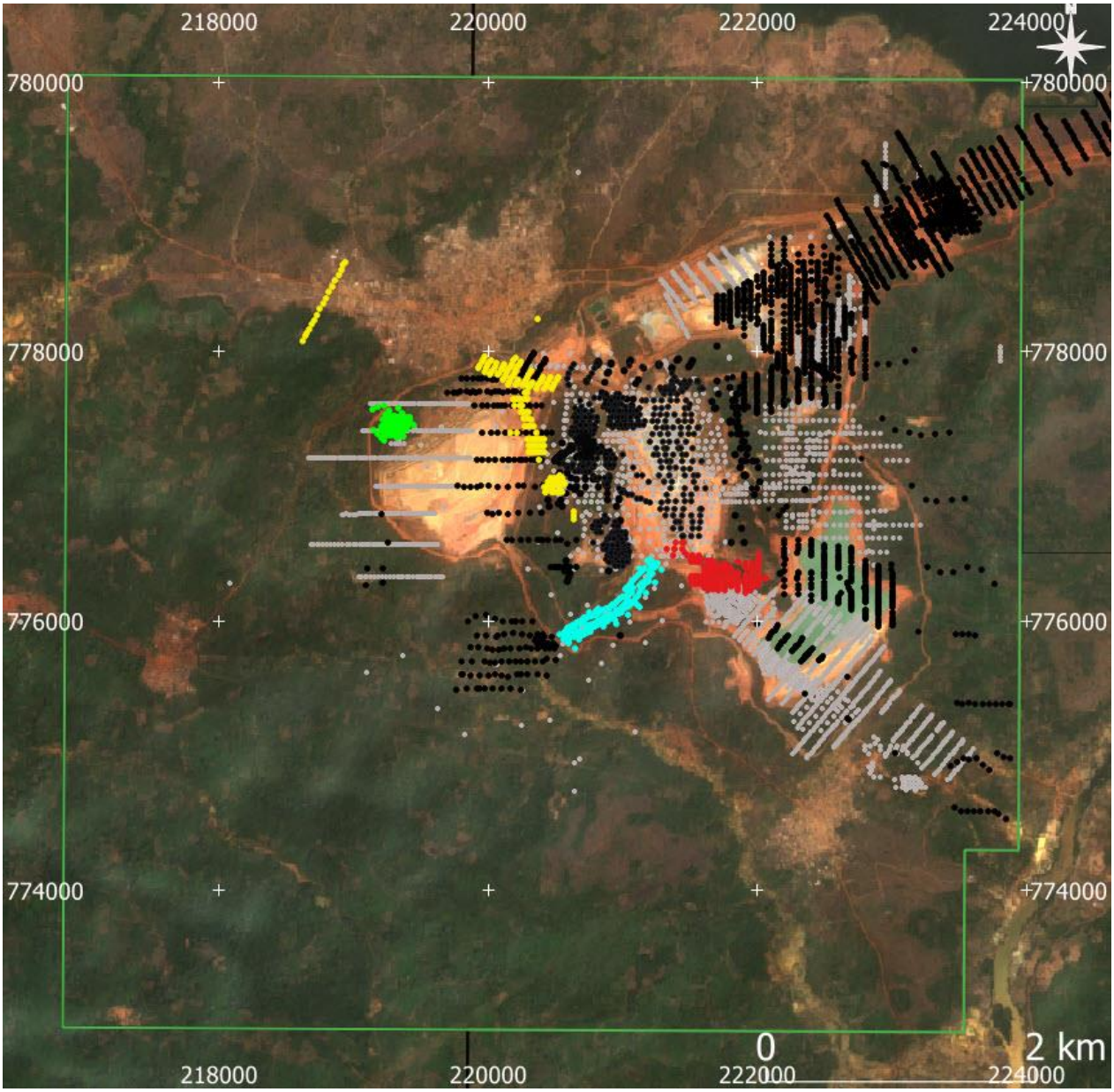


Figure 9-4: Drill hole layout showing infill drilling at Y2N & Y3N (yellow), Angovia 2 (red), Govisou (green), and CMA SW (cyan) with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023)

9.3.1.6 Resource Definition Drilling (Pre-2022)

Between December 2016 and June 2018, a series of holes were drilled inside the planned pit shell to improve the understanding the mineralised structures and to achieve the best drill orientation and drill spacing configuration for grade control and production (Figure 9-5).

A tight 10 m × 10 m spaced drill program was completed as a grade control (GC) to test the variance in thickness and grade continuity of the narrow, SE- and ENE-striking S-structures inside the optimised Yaouré pit shell. A total of 403 RC holes for 12,304 m were completed between December 2016 and April 2017, with a further 13 RC holes for 402 m added between August and October 2017.

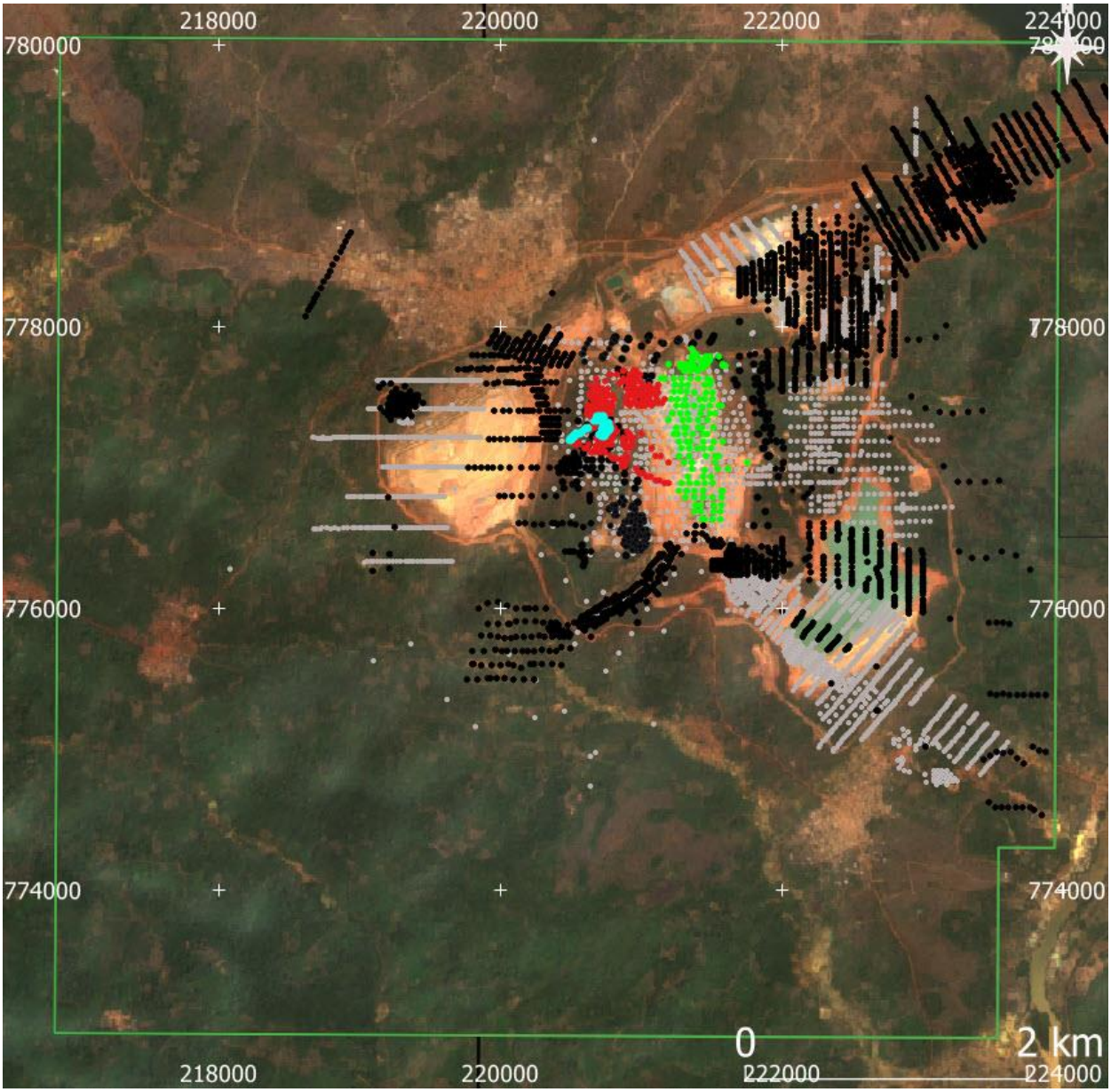


Figure 9-5: Drill hole layout showing resource definition drilling in the Yaouré pit (red), GC test (cyan), CMA pit (green) with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023)

Further drilling by RC, DD and RCDD was completed between January 2017 and June 2018. Details are shown in Table 9-2.

Table 9-2: Infill drilling inside optimised pit shells prior to 2022 completed by Perseus

DRILL PROGRAM	DRILL TYPE	NO. HOLES	TOTAL METRES
CMA PIT	RC	26	2,956
	RCDD	101	19,360
	DD	18	3,403
YAOURE PIT	RC	269	20,503
	RCDD	11	990
	DD	16	1,222
YAOURE PIT GC	RC	417	12,709

9.3.1.7 CMA Extension Drilling

In late 2019, three conceptual holes (YDD0539, YDD0540 & YDD0541), with each exceeding 1,000 m in length, were drilled to test the geometry and continuation of the CMA Zone at depth. A plan view of the collar locations is presented in Figure 9-6, while a cross section showing the interpreted extension of the CMA structure is presented in Figure 9-7.

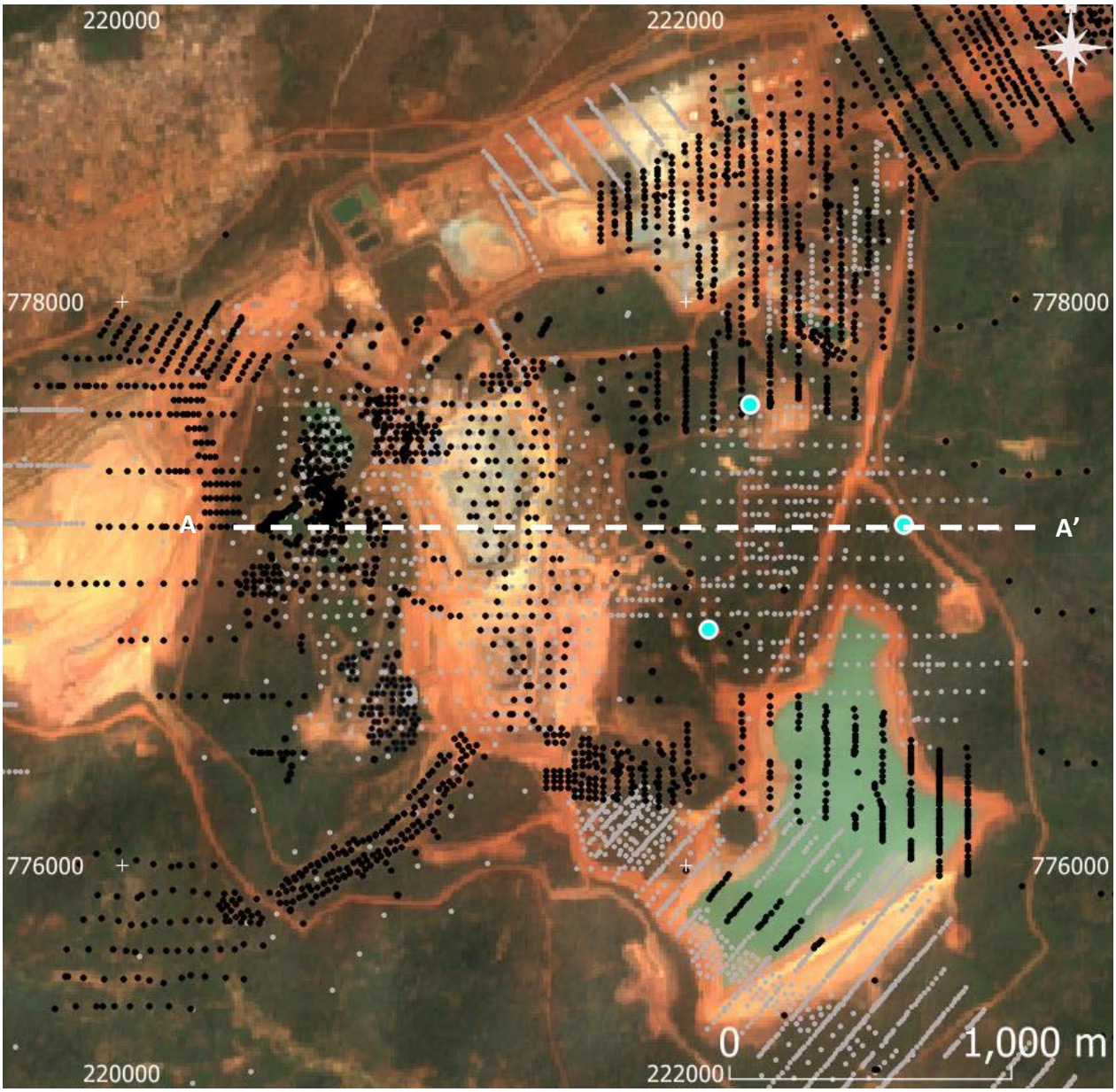


Figure 9-6: Drill hole layout CMA Extension test holes (cyan) with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023)

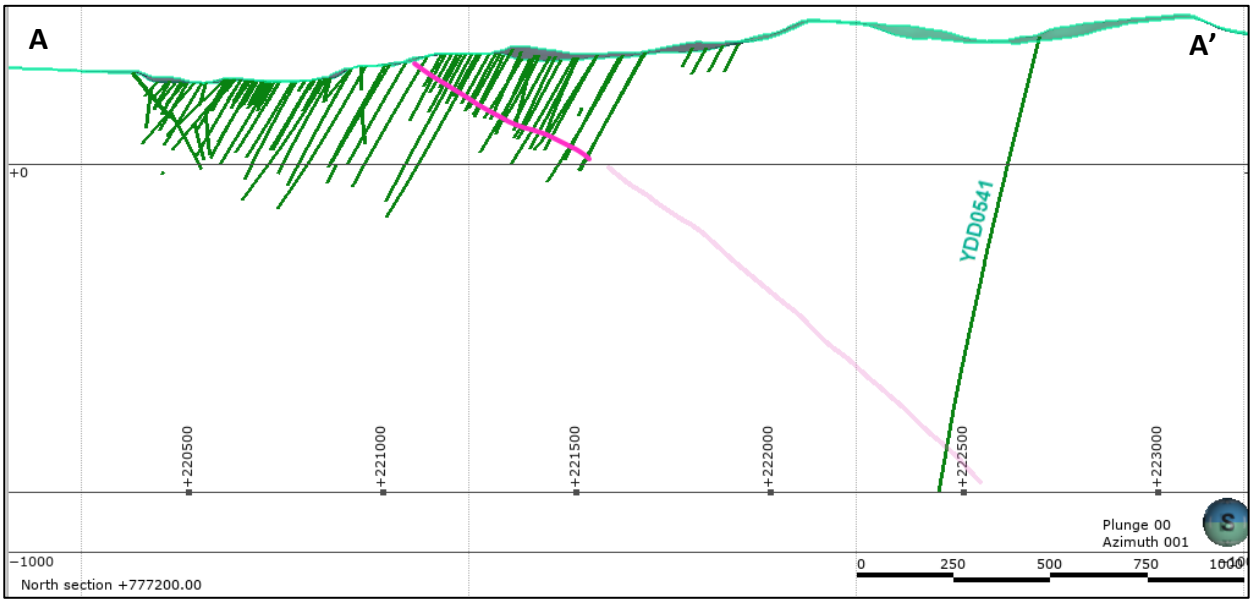


Figure 9-7: Cross-section line referenced in Figure 9-6, looking north, showing CMA Extension drill hole YDD0541 (Perseus, 2023)

9.3.1.8 Basin Contact Drilling

Between February and May 2017, 12 holes were completed to test the mineralisation at the contact of the basalt package hosting the CMA, and the volcanoclastic basin. It is interpreted that mineralised fluids ascending through the CMA and analogue structures, such as Y1, Y2 and Y3, continued along this contact zone after these structures have met the sedimentary basin without extending into the basin lithologies. Three diamond core holes were added in July 2020 to test the continuation, strength, and width of mineralisation at depth of this steeply north plunging contact zone (Figure 9-8).

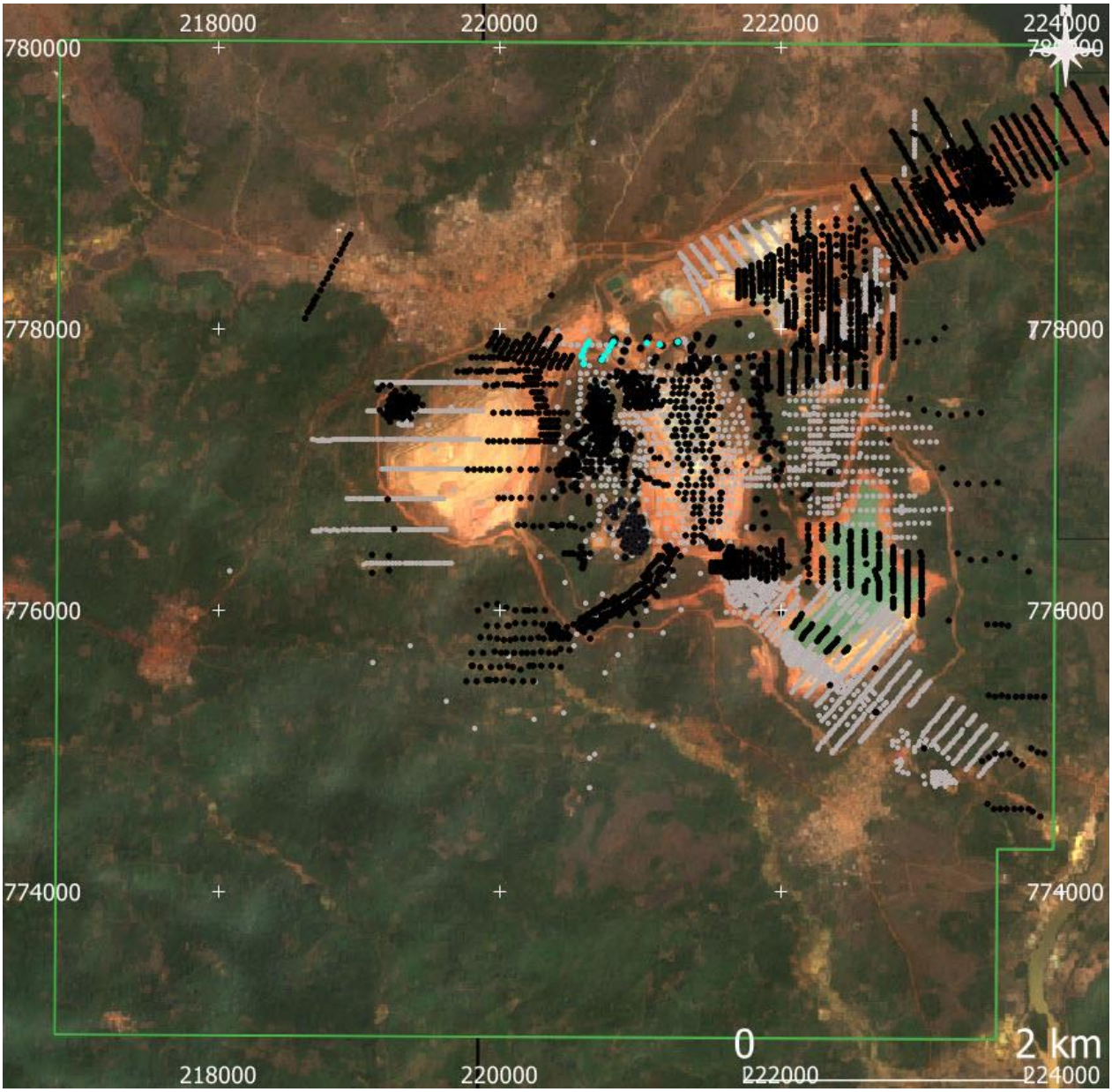


Figure 9-8: Drill hole layout showing drilling testing the basin contact (cyan) with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023)

9.3.1.9 Conceptual Drilling – East Analogues

After completion and interpretation of the 3D seismic survey in 2020, several conceptual targets were identified. East of the CMA Zone, several structures are interpreted to be analogous to the CMA and potentially mineralised at or close to surface. These conceptual targets were tested on west-east oriented fences with nominally 100 m deep RC holes. In total 74 holes were completed in mid-2021, inside and outside the mine fence, for 6,448 m (Figure 9-9).

To date, none of the East Analogue prospects have been developed to a Mineral Resource. Data from these drill programs have not been used to inform the estimates of Mineral Resources and Mineral Reserves.

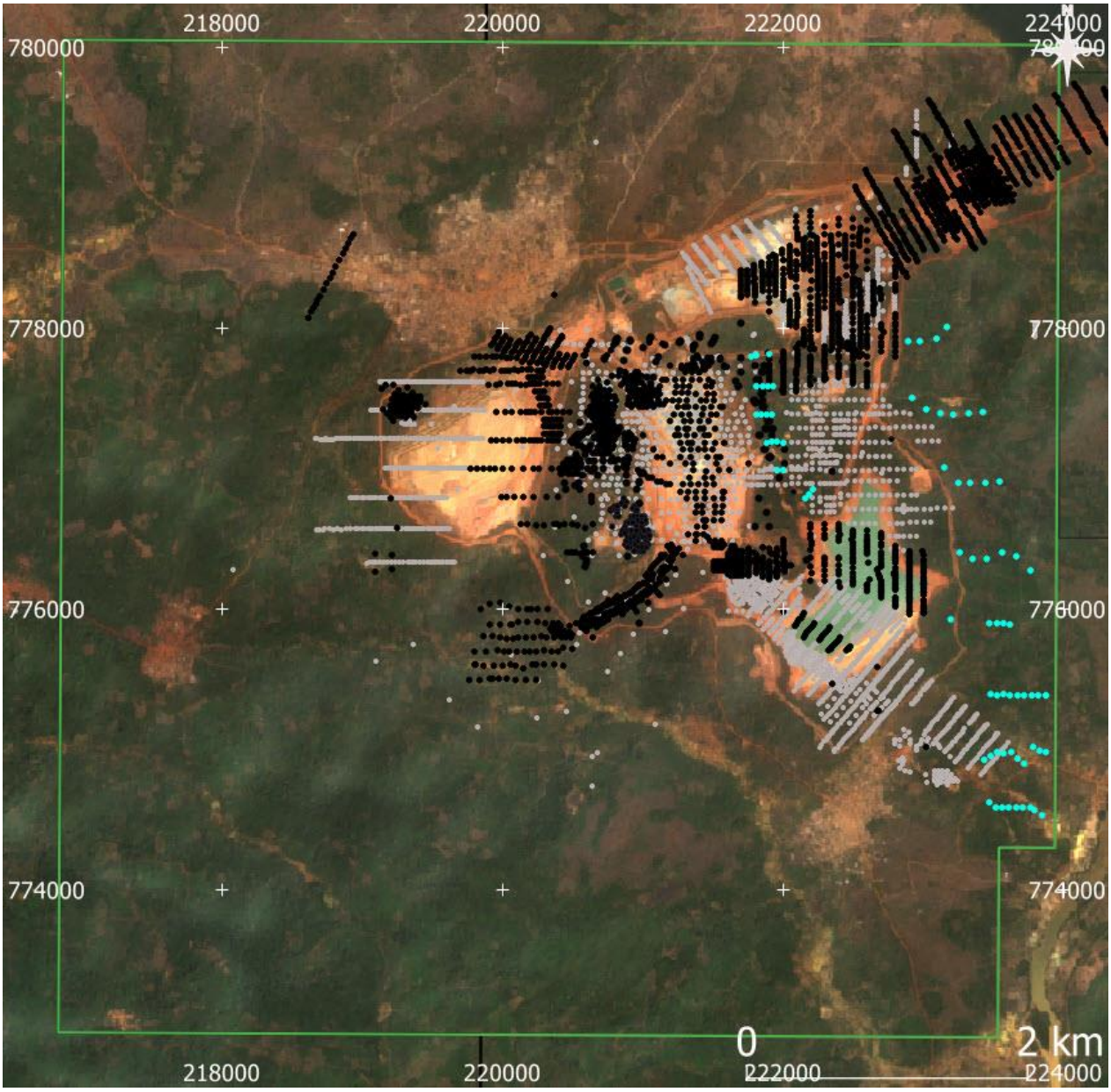


Figure 9-9: Drill hole layout showing conceptual drilling (cyan) with historic drilling (grey) and Perseus drilling (black) (Perseus, 2023)

9.3.1.10 Conceptual Drilling – Deep Targets

Since 2022, seven diamond core drill holes have been completed to test conceptual targets at depth, as identified from interpretation of the 3D seismic data (see Section 9.3.2.2). Several significant intercepts were returned from the exercise, as summarised in Table 9-3.

Table 9-3: Significant intercepts from conceptual deep drilling program

HOLE ID	FROM	TO	INTERVAL (m)	GOLD GRADE (g/t)
YDD0570	326	344	18	4.64
	960.56	971.65	11.09	1.46
YDD0575	370	377	7	2.99
	510	514.8	4.8	6.01
	774	777	3	6.38
YDD0578	1,126	1,141	15	2.78

Drill hole YDD0578 targeted and successfully intercepted an intrusive body at depth, as predicted from the seismic survey (Figure 9-10). Anomalous gold mineralisation was returned within the granodiorite intrusive over the 300 m intersected at the base of the hole.

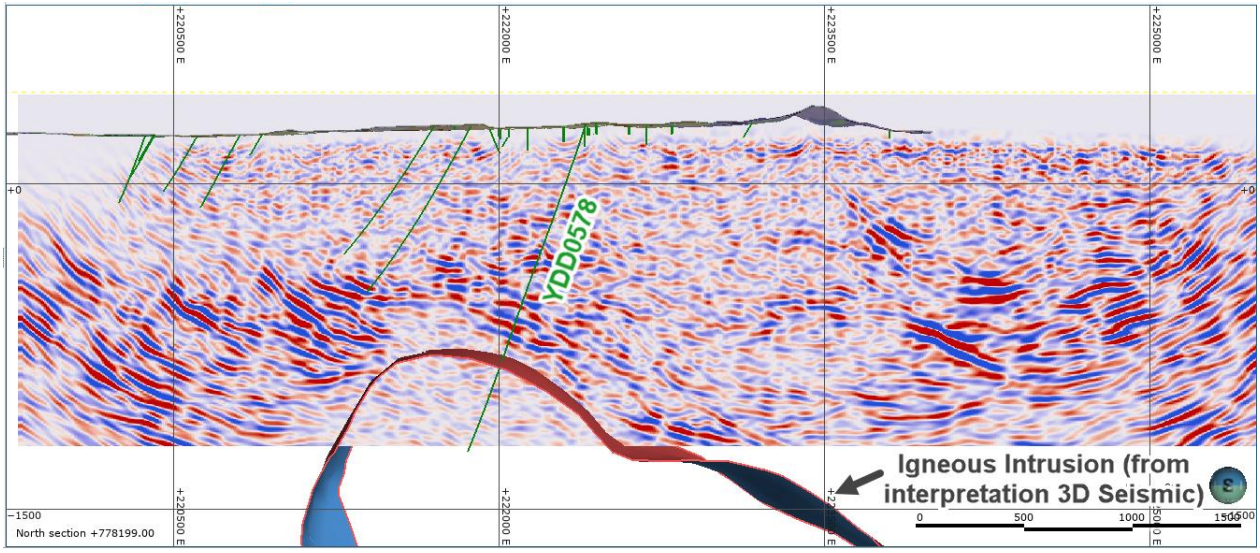


Figure 9-10: Cross-section at 778,200N looking north showing YDD0578 intersection with interpreted igneous intrusion (Perseus, 2023)

9.3.2 Geophysics

9.3.2.1 VTEM and Geomagnetics

In the period December 2019 to January 2020, Canada-based company Geotech conducted an airborne versatile time domain electromagnetic (VTEM), magnetic, and radiometric survey. The survey covered the entire permit, as well as the adjacent exploration permit Yaouré West. Flight line spacing was 100 m and flight orientation was 135°/315° (Figure 9-11). The data was interpreted by Australian-based Southern Geoscience Consultants (Couston, 2020), including target recommendations.

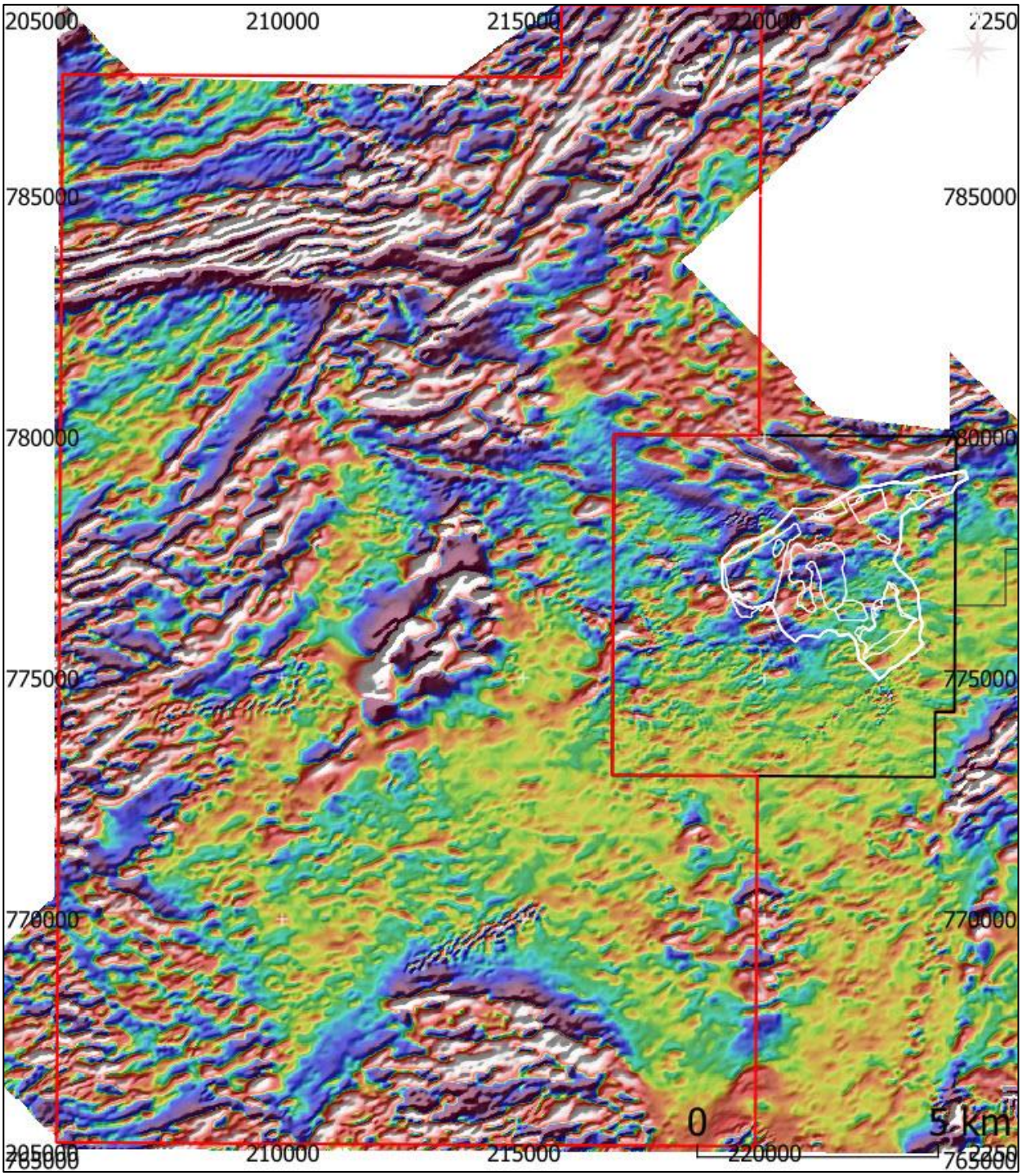


Figure 9-11: Airbourne magnetic survey (enhanced RTP) image with Yaouré mine footprint (white outlines) (Perseus, 2020)

9.3.2.2 Seismic Survey

In early 2020, a 3D seismic survey was carried out by the Australian-based company HiSeis over the Yaouré gold deposit, covering an area of approximately 17 km² between 219,800E and 225,500E, and 775,500N and 778,500N (Figure 9-12).

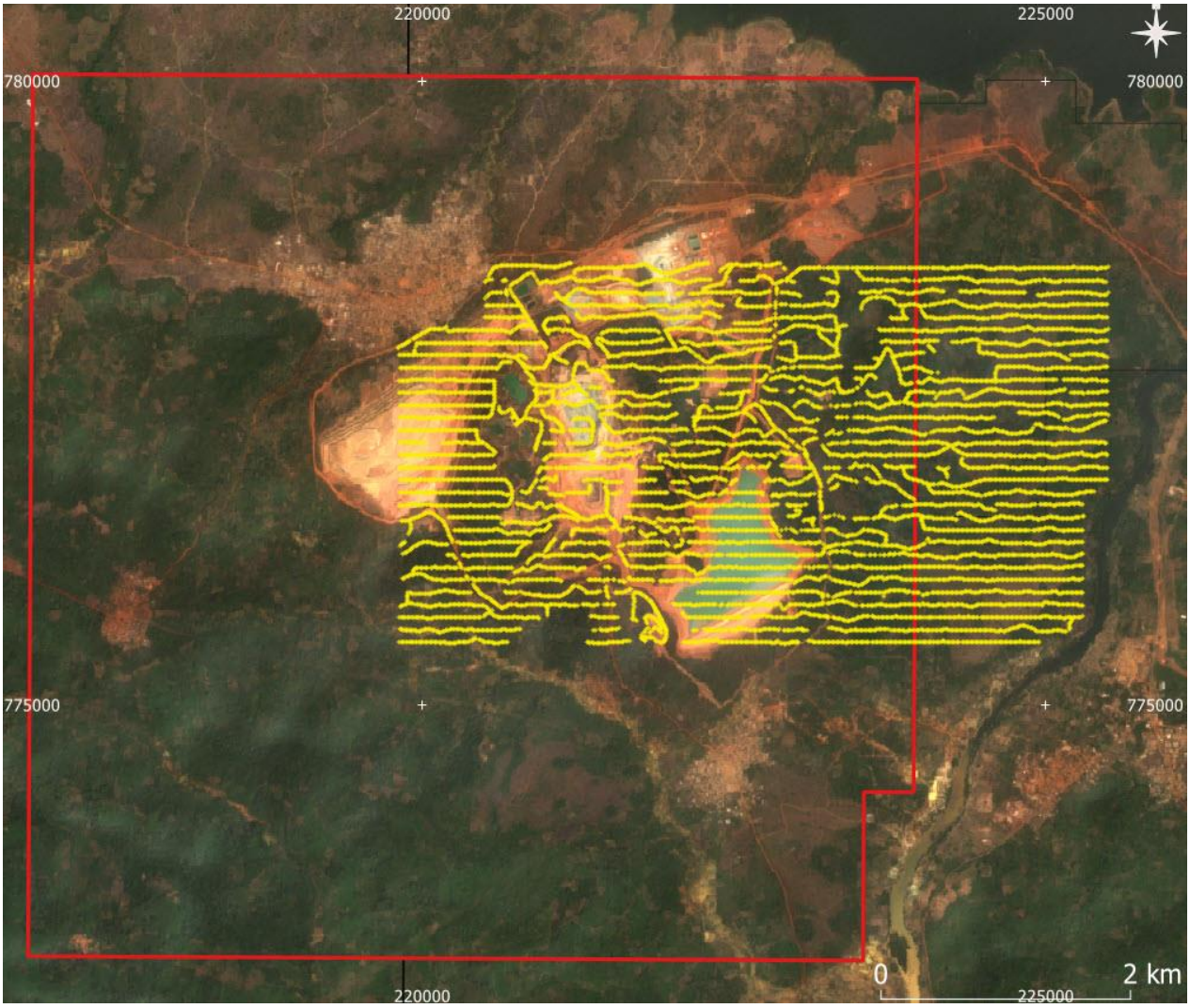


Figure 9-12: Plan showing seismic sounding locations (Perseus, 2020)

Low-frequency signals were injected into the earth by two truck-mounted vibrators on nominally 100 m spaced lines at every 25 m, moving from west to east. The reflected signals, with a penetration depth of up to 4 km, were received by geophones laid out on a 50 m N-S and 100 m E-W spaced grid.

Subsequently, geophysical downhole surveys on a selection of accessible, deeper drill holes recorded seismic impedance and other geophysical rock properties in the drill hole to correlate seismic reflectors in the 3D survey with the downhole data.

The data was processed by HiSeis and provided to Perseus, but also independently interpreted by HiSeis with the objective of increasing the understanding of the CMA mineralisation, its continuation at depth, and the structural architecture of the Yaouré deposit. Additionally, the interpretation aimed to identify additional targets at depth or close-by.

Further work involved completion of an approximately 25 km long 2D seismic traverse originating from the centre of the 3D survey area towards the west across the Yaouré West exploration permit. Figure 9-13 and Figure 9-14 show examples of visualisation of the 3D seismic results.

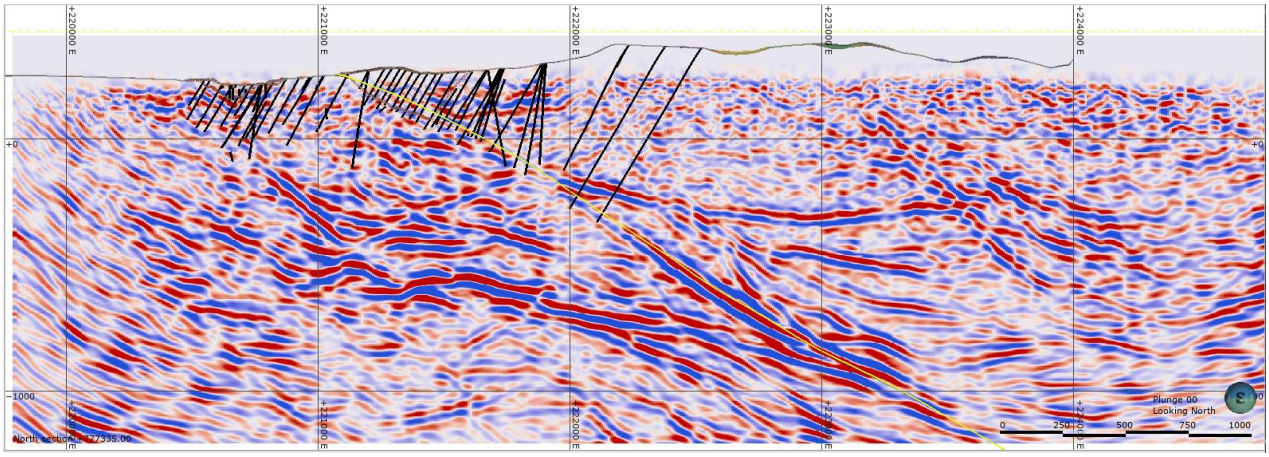


Figure 9-13: Cross-section 777,340N looking north showing drilling and the interpretation of the CMA over seismic response (Perseus, 2020)

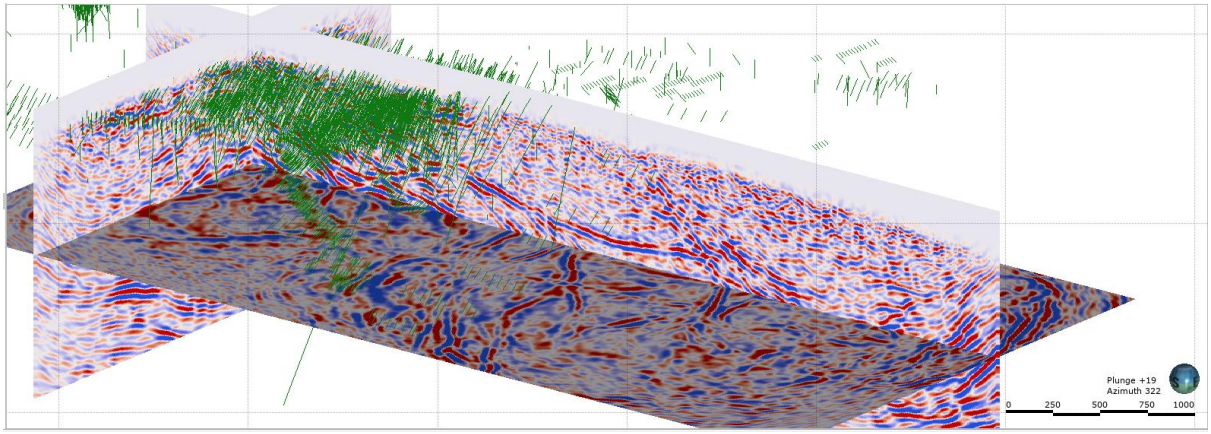


Figure 9-14: Oblique view of seismic cube with sliced data in section, long-section and plan view (Perseus, 2020)

9.3.2.3 Gravity Survey

In 2021, an airborne gravity survey was carried out covering the entire permit and the adjacent Yaouré West permit. Gravity gradiometer data were acquired by USA-based company Bell Geospace using the Air-FTG system which measures all the independent gravitational components Tzz, Txz, Tyz, Txx and Tyy. Flight lines were spaced 100 m and flight orientation was N-S (0°/180°).

Data were processed and interpreted by Southern Geoscience Consultants (SGC) and integrated with the seismic and magnetic data to improve the understanding of the structural and stratigraphic architecture of the Yaouré project.

Figure 9-13 below shows examples of resulting maps and their integrated structural interpretation.

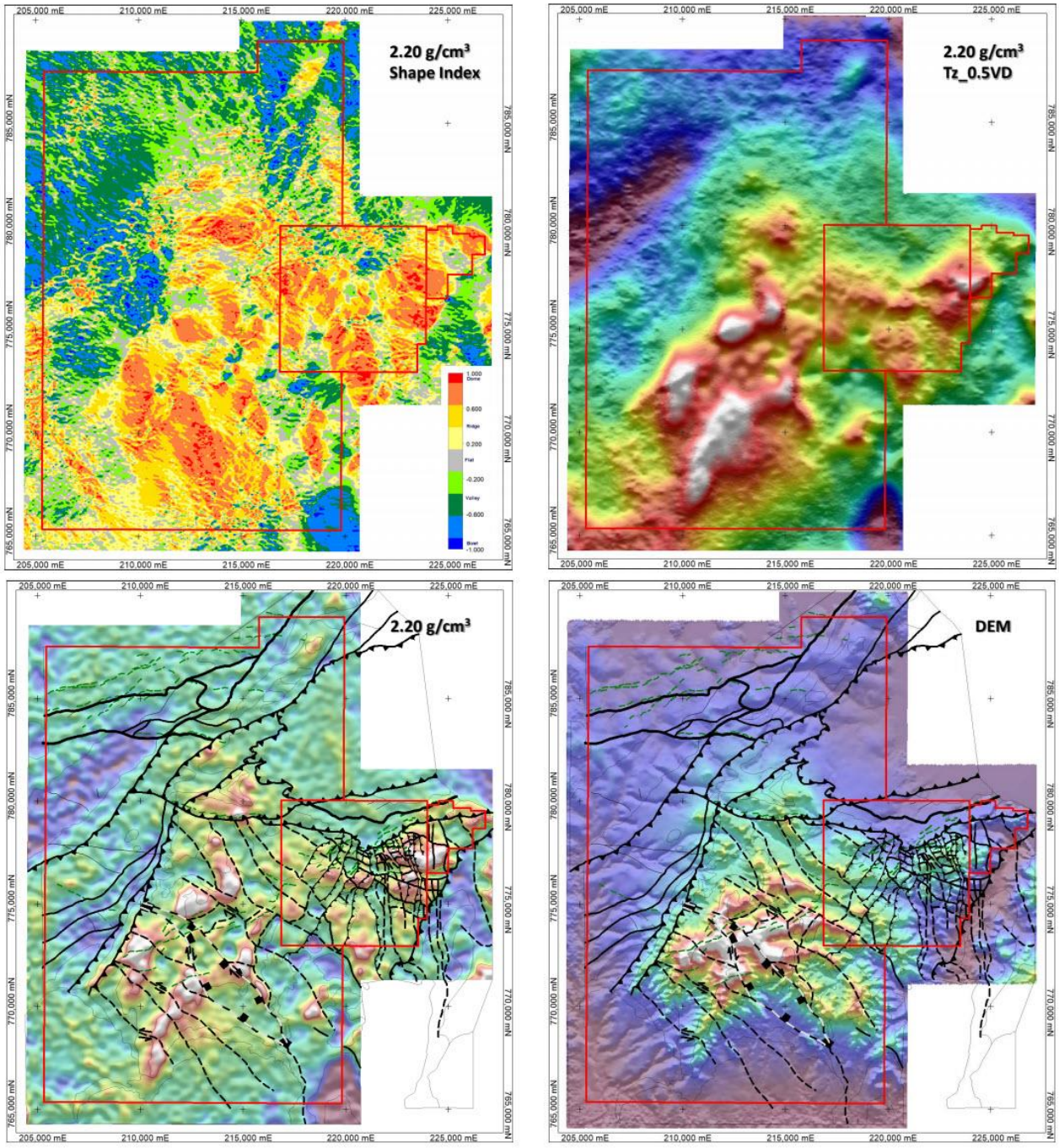


Figure 9-15: Gravity maps showing: Shape Index (top left); Tensor Tz (top right); Structural interpretation of integrated geophysical data (bottom left); Structural interpretation over digital elevation model (bottom right) (Perseus, 2021)

9.3.3 Mineralogical and Multi-element Analysis

Since 2020, Perseus routinely takes portable X-ray fluorescence (pXRF) readings on pulps of all new drilling samples, and on selected pulps, where available, of previous drilling by Amara and Perseus. In mid-2021, Perseus acquired a Terraspec ASD spectrometer to treat all incoming new drill samples. About 2,000 spectra are being selected every month and uploaded to AiSiris, an online service to interpret the mineralogical alteration assemblage from ASD spectra. Additionally, selected pulps have been submitted for low-level 4-acid digest multi-element analysis. To date, a total of 1,322 samples from Yaouré and adjacent exploration permits have been analysed for multi-

element chemistry. The geochemical and mineralogical tools are being used to identify and describe the signature of the prevailing mineralisation at Yaouré and to identify gradients and vectors to mineralisation.

ASD spectrometry and multi-element analysis of the CMA deposit produces a distinct signature. Elevated tenors of Mo, W, Te and Be (Figure 9-16), compared to unmineralised basalt, are strong indicators for a felsic igneous origin of the mineralised fluids. Noteworthy is the lack of any perceivable correlation of gold mineralisation with As, usually a very common and reliable pathfinder for orogenic gold of the Birimian.

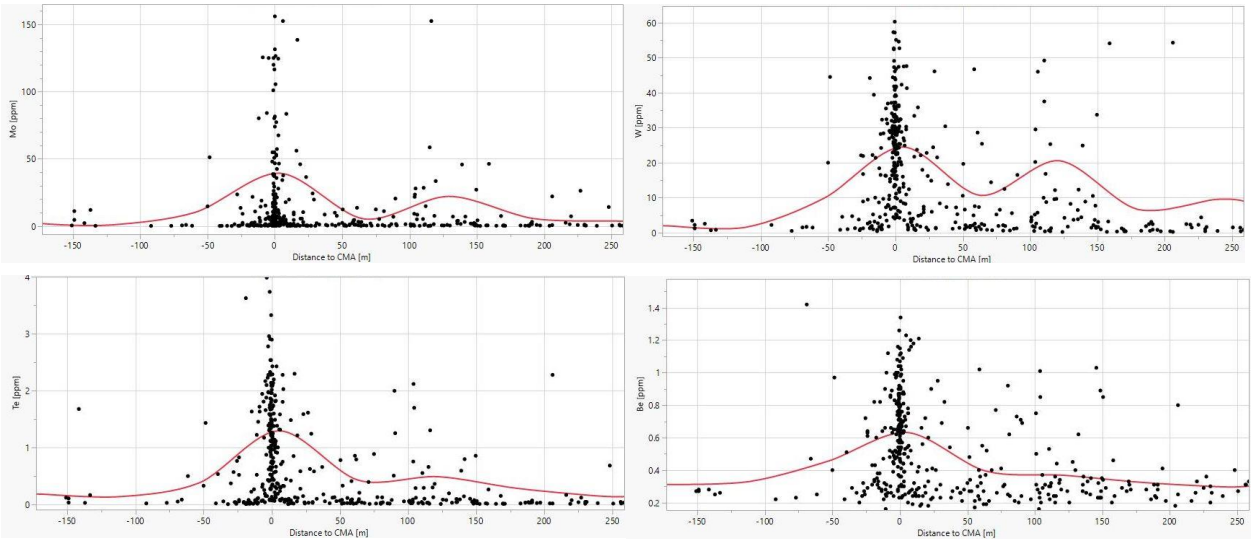


Figure 9-16: Trace element concentrations by distance to the CMA showing Mo (top left), W (top right), Te (bottom left) and Be (bottom right) with smoothed trend (red line). Note – Positive X-axis values represent hanging wall, negative values represent footwall (Perseus, 2023)

The CMA displays strong trends in a series of major and minor elements, due to alteration and consequently relative enrichment or depletion (Figure 9-17). Centre-log transformed ratios show relative enrichment of K due to plagioclase conversion to sericite, subtle enrichment of Na, clear enrichment of Ba and Sr (presumably as a function of carbonate alteration), and strong depletion of Fe, Ti (and V) due to conversion of ferromagnesian silicates to sulphides. Copper is also relatively depleted, which may be explained by the striking absence of amphiboles, thus the breakdown of amphibole to chlorite and sericite, within the CMA (Figure 9-18).

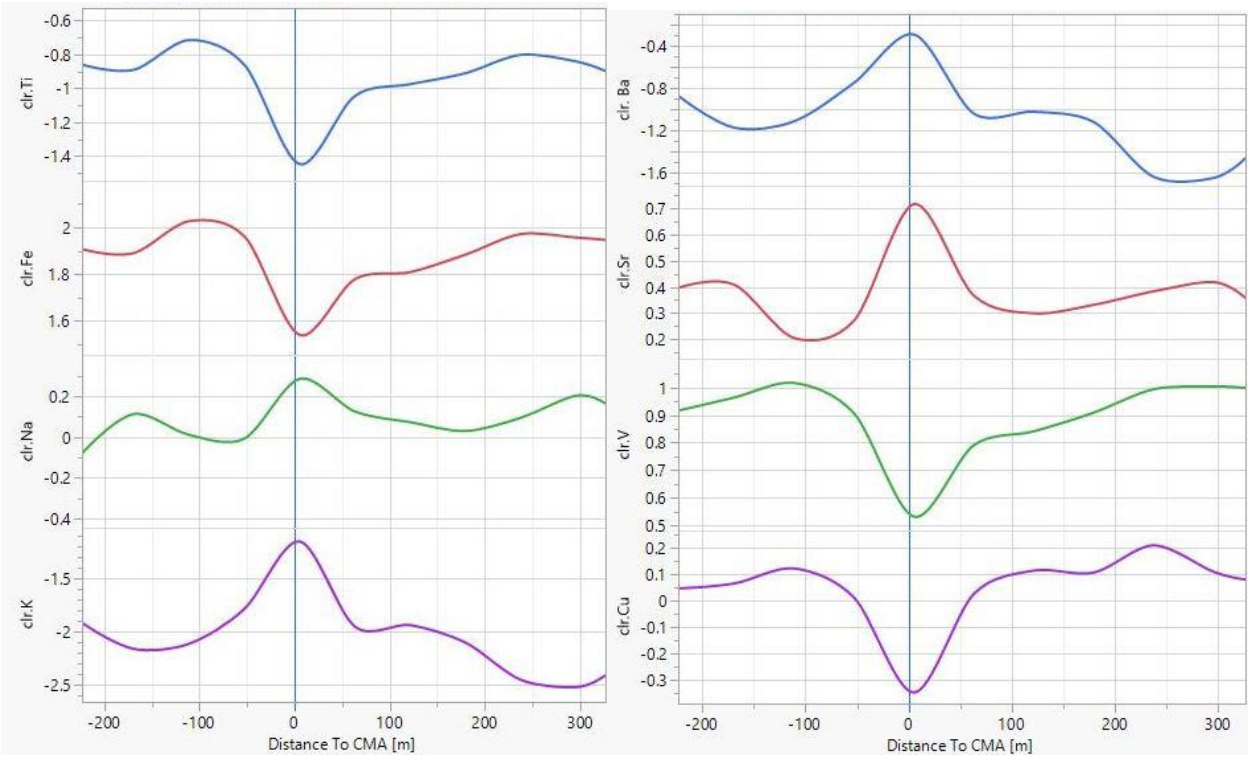


Figure 9-17: Smoothed trend lines of major and minor element concentration by distance to the CMA. Note – Positive X-axis values represent hanging wall, negative values represent footwall (Perseus, 2023)

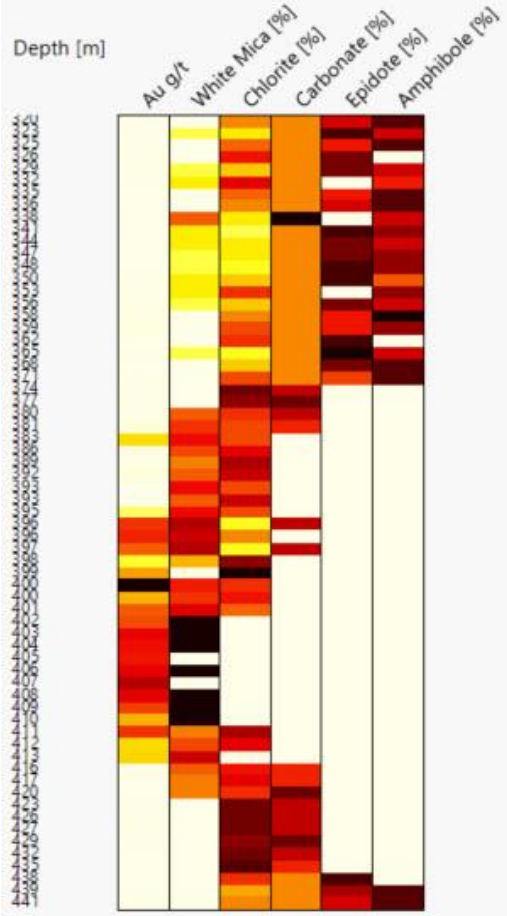


Figure 9-18: Downhole cell plot across the CMA intercept in YRC1856D showing relative dominance of major alteration minerals (Perseus, 2023)

9.3.4 Petrology, Mineralogy & Other Research Studies

Petrological analyses were completed on 27 thin sections in July 2012 by Microsearch CC to aid with core logging. The range of sample types covered all main rock types and sulphide mineralisation types. Petrological and geochemical studies of the Yaouré deposit were also completed by N'Guessan (2014) as part of a company sponsored MSc project.

A further 49 samples (YTS001-YTS049) were submitted to Townend Laboratory in 2016 for petrographic and mineralogical description covering the main rock types and styles of alteration. The lithologies were classified as altered, albitised, spillitic basalts with intrusive porphyries of andesitic, dioritic and tonalitic composition. Some of the basalts retained a porphyritic texture that is found in submarine basalts. The intrusive rocks are generally intermediate in composition. The alteration of the rocks is in the lower greenschist facies. Most of the basalts show no significant deformation with the retention of their volcanic groundmass texture. Some mafic rocks were considered possibly to be later mafic intrusions (Townend, 2016).

Additional samples were submitted for petrological studies, carried out by consulting geologist G. Tourigny on thin sections of 21 samples in 2022 (Tourigny, 2022). and 13 samples in 2023 (Tourigny, 2023). Sample selection included unmineralised and mineralised basalt, tuffaceous sediments from the volcanoclastic basin, the deep granodioritic intrusion, and the Govisou monzonite.

In 2020, Nicolas Mériaud presented his company sponsored PhD thesis comprehensively describing the Yaouré litho-tectonic setting in relation to the evolution of the West African Craton (Mériaud, 2020).

In July 2023, L. Parra-Avila, from the Centre for Microscopy at the University of Western Australia in Perth, completed geochronological dating of zircons from samples of the deep granodioritic intrusion intercepted in YDD0578, as well as from the monzonite of Govisou (Parra-Avila, 2023). The ages of emplacement are interpreted as follows:

- Deep Granodiorite: 2,168.0 Ma ± 14.0 Ma
- Govisou monzonite: 2,115.7 Ma ± 4.3 Ma

The age of the deep, gold-anomalous granodiorite corresponds well with the mineralised granodiorite in the Yaouré open pit.

10 Drilling

10.1 Drilling Summary

Unless otherwise specified, all information given in this section refers to drilling carried out since mid-2021 that has been used to support Mineral Resource estimates of the Yaouré and CMA areas. Figure 10-1 shows the location of pre-2021 RC and diamond core holes, and the location of drill holes of the 2021-2023 campaigns. All drilling discussed herein has been carried out by contract drilling operators Geodrill and Capital Drilling.

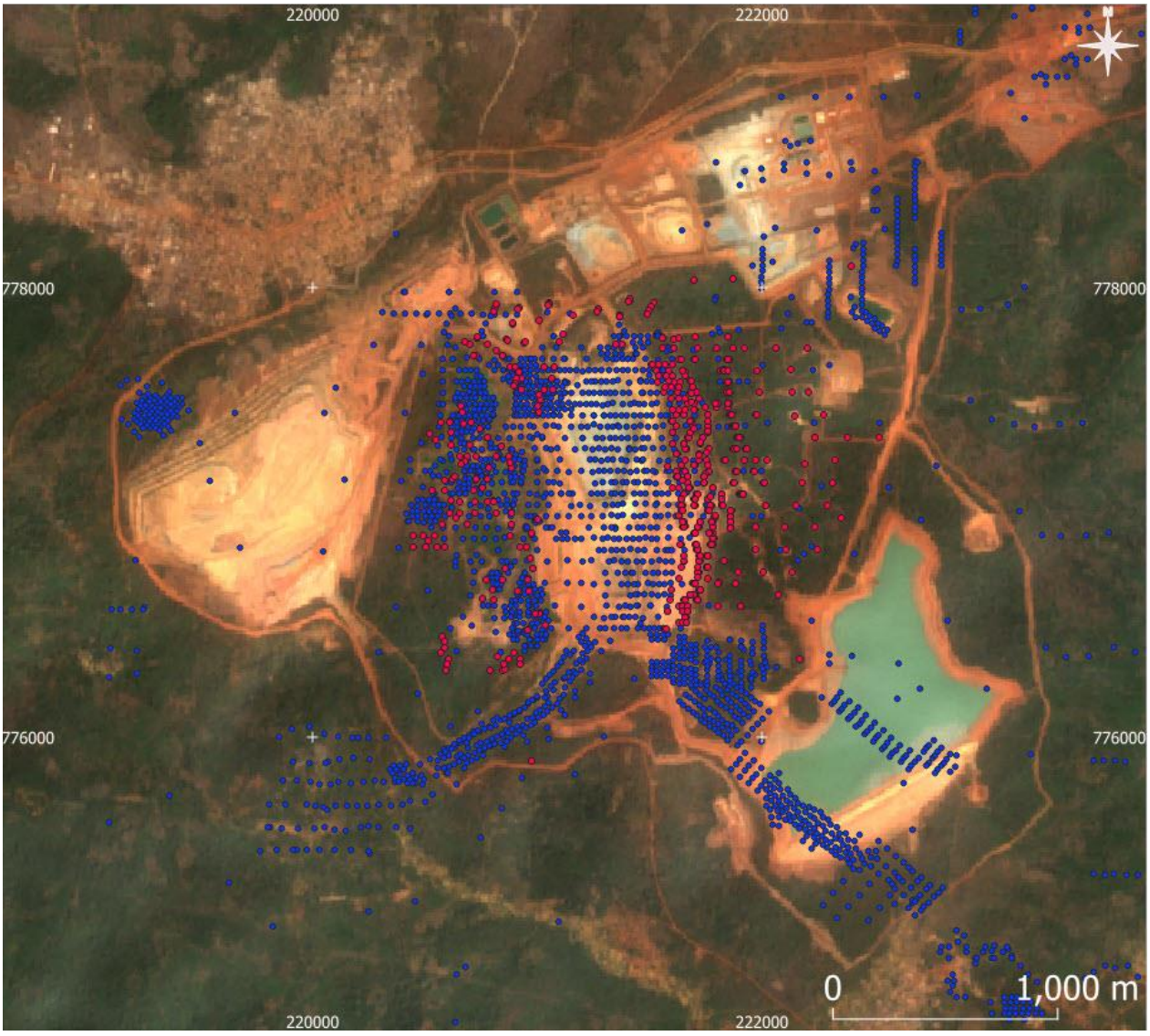


Figure 10-1: Drill hole layout showing recent drilling (red) and other existing drilling (blue) (Perseus, 2023)

Since June 2021 a total of six drilling campaigns were completed informing the Yaouré and CMA Mineral Resources.

1. CMA Underground Resource Definition (CMA UG RES) – targeting the extension of the CMA Zone below the currently planned final pit shell. Drilling covered the zone on a nominal 25 m × 25 m grid. Drill holes were generally angled at -60° and oriented 270° towards the west

(Figure 10-2). The drill program comprising 280 holes was completed in April 2022. Diamond core (NQ) was selectively sampled and assayed.

2. CMA Underground Downdip Extension (CMA UG DDIP) – testing mineralisation of the CMA Zone beyond the above-mentioned resource area. The campaign included 35 holes, drilled in May 2022 and nominally spaced at 100 m × 100 m. Diamond NQ core was selectively sampled and assayed.
3. CMA North & South (CMA N&S) – testing extension of the CMA Zone where the CMA UG RES program suggested continuation of economic mineralisation. A total of 73 holes have been drilled during October 2022 to February 2023 after completion of the initial CMA UG RES program.
4. CMA Northwest (CMA NW) – testing mineralisation for economic potential at the contact of the CMA Zone with the sedimentary basin to the north and northwest. A total of 32 holes, all oriented 200° towards the southwest were completed in November 2022.
5. CMA Deeps – conceptual exploration holes testing potentially mineralised structures at depth, as identified by the seismic survey. The program comprised seven holes between 500 m and 1,600 m in length and was completed in May 2023.
6. Yaoure Pit – resource definition and infill drilling of portions of the Yaouré Pit area to improve confidence in Mineral Resources declared in 2017. A total of 132 RC, RC/DD and DD holes were completed between February 2023 and May 2023.

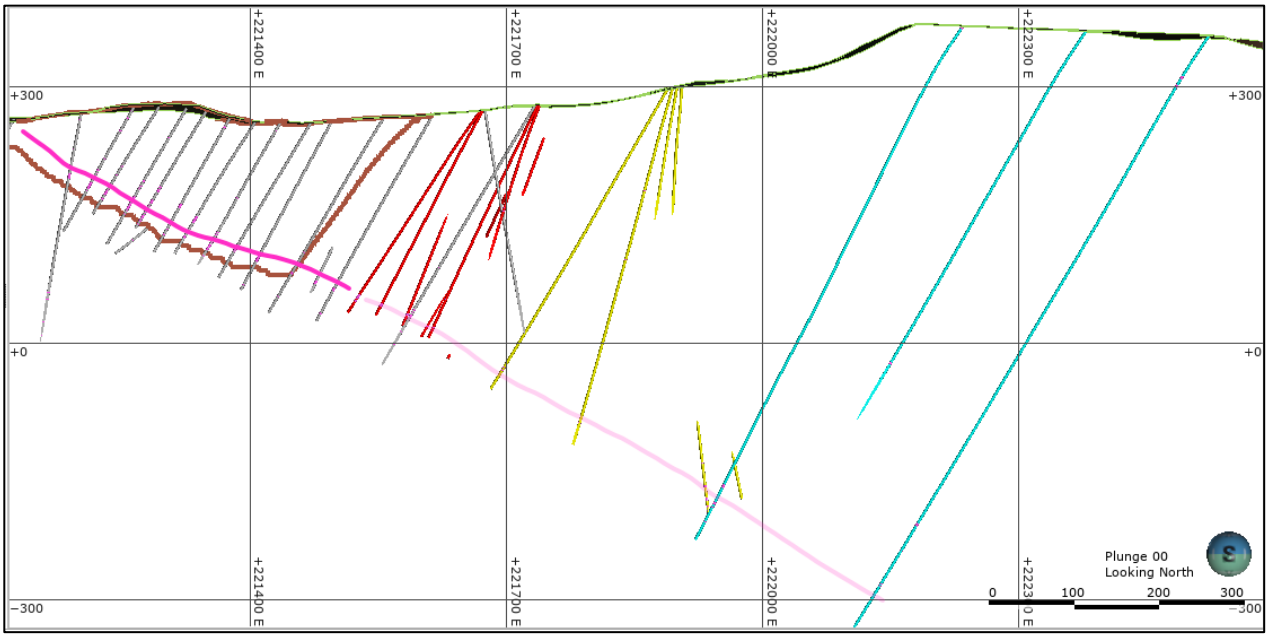


Figure 10-2: Cross-section 777,340N looking north showing CMA UG RES (red), CMA UG DDIP (cyan), CMA N&S (yellow) and previous drilling (grey) (Perseus, 2023)

Most holes targeting the CMA Zone at depth were pre-collared by RC through weathered horizons. All RC intervals were sampled and assayed as 4 m composites. Mineralised intercepts were re-submitted as 1 m samples. Diamond core from the CMA drill programs were selectively sampled after core logging and identification of potentially mineralised intervals. All drill intervals 10 m either side of the CMA Zone were sampled and assayed. All drill holes from the Yaouré pit drill program

were sampled and assayed in their entity. Table 10-1 summarises the various drill programs, while a breakdown of the drilling programs is presented in Figure 10-3.

Table 10-1: Summary of recent drilling supporting Mineral Resources

DRILL PROGRAM	DRILL TYPE	NO. HOLES	TOTAL METRES	RC PRE-COLLAR (m)	RC PRE-COLLAR AVG. DEPTH (m)
CMA UG RES	RC_DD	277	76,789	19,084	74
	DD	3	950	-	-
CMA UG DDIP	RC_DD	35	17,911	2,783	93
CMA N&S	RC_DD	73	29,919	5,146	72
CMA NW	RC_DD	28	8,423	1,948	70
	DD	4	1,332	-	-
CMA DEEPS	DD	7	8,019	-	-
YAOURE PIT	RC	47	5,124	889	
	RC_DD	71	14,847	3,005	42
	DD	14	2,333	-	-

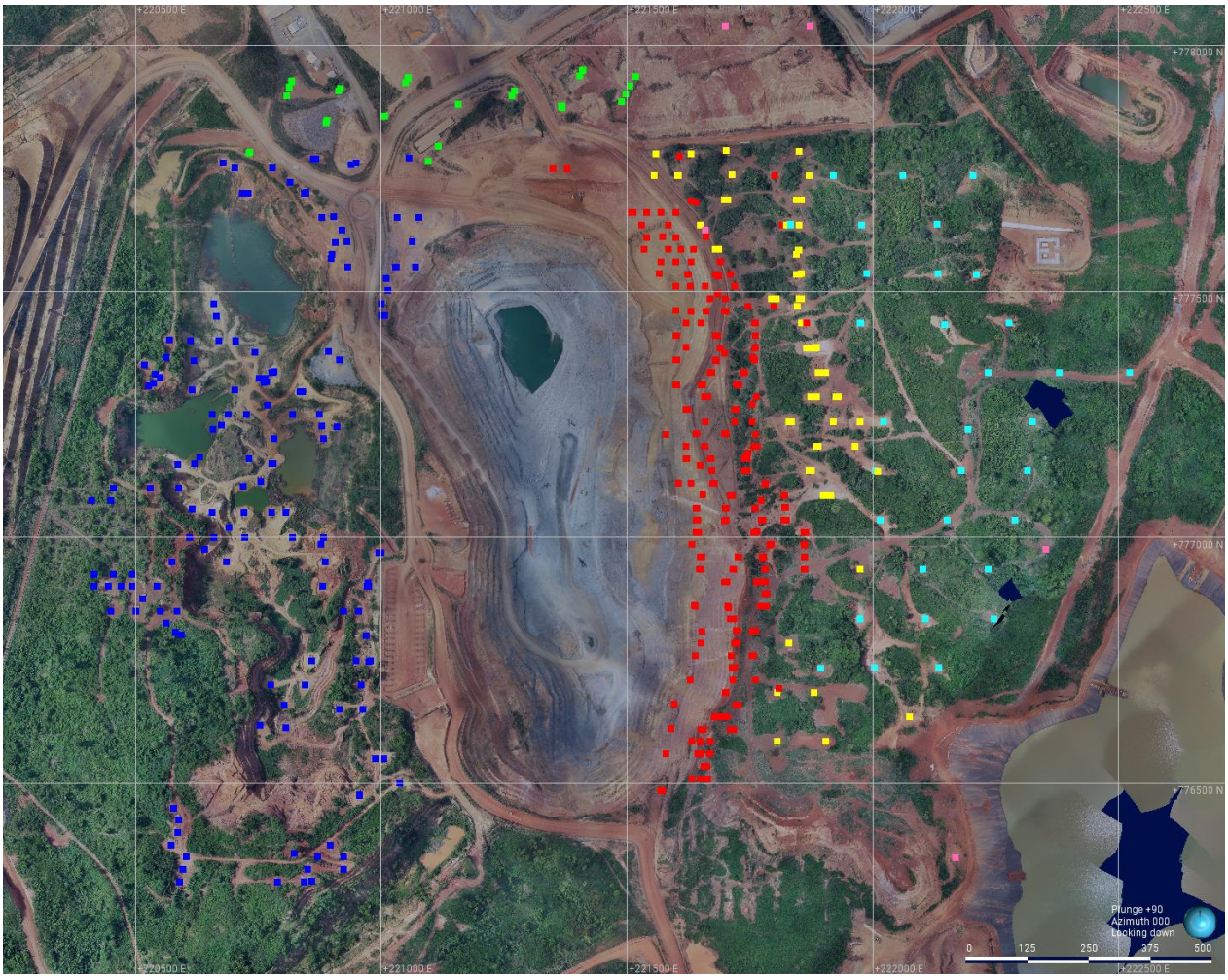


Figure 10-3: Drill hole layout showing recent drilling. CMA UG Res (red), CMA UG DDIP (cyan), CMA N&S (yellow), CMA NW (green), CMA Deeps (magenta) and Yaouré Pit (blue) (Perseus, 2023)

10.2 Collar Surveys

Drill hole collars have been surveyed in UTM grid (WGS 84 datum) by Perseus mine surveyors using DGPS (differential global positioning system) equipment. Elevations are adjusted by adding 1,000 m to avoid the potential for negative values in future mining scenarios.

Locations of drill hole collars are considered reliable to ±0.5 m in each of x, y and z directions.

10.3 Downhole Surveys

Downhole surveys are routinely undertaken by drilling contractors using digital magnetic instruments. A first survey was normally taken at 12 m depth and then further surveys at approximately 30 m down-hole intervals. The survey at 12 m was normally adopted as the hole orientation at the collar.

Survey results were inspected and verified immediately on-site by the company geologist. Where a drill hole deviated from its planned path and risked intercepting the target zone too far away from the expected interception point, the hole was stopped and re-drilled.

Drill hole survey data were sense checked for large deviations probably arising out of instrument or transcription errors. Review of downhole survey results between the end of RC pre-collar survey and the start of the coring downhole survey (typically 6 m after commencing coring) showed several holes (45 in total drilled between July 2021 and June 2022) reported differences of approximately 3-4 degrees. An investigation identified that there was a calibration issue with one of the downhole survey tools between the respective RC and diamond contractors.

Perseus has made no attempt to adjust the azimuth data, and the locations of lode intercepts may thus be in error by 5-10 m. This error will likely be mitigated by the recent infill and extensional drilling at CMA and Yaouré, reducing the influence of the holes with problematic downhole azimuths.

10.4 Geological Logging

All drill holes have been logged in entirety. All logging, including comments, was manually entered into spreadsheets, from where it is imported into an acQuire relational database maintained by Perseus. Digital logging of structures in drill core using a Reflex IQ-logger was implemented during the 2021-2022 drilling campaign.

Holes were logged under six principal fields: weathering, oxidation, lithology, alteration, structure, mineralisation (including estimated percent sulfide concentrations) and veining.

RC samples were also logged qualitatively for sample condition (dry, moist, damp, wet) and visual indications of down-hole sample contamination, and bulk samples weighed at the drill site. A small quantity of chips was sieved from each metre sample and then stored in plastic sample chip trays, which were subsequently photographed.

Diamond core is assembled in an angle-iron holder allowing the marking of a top-of-core orientation line. A confidence value is assigned to each oriented section based on the number of matching orientations. A value of 1 indicates the orientation line is based on only one orientation mark; 2 indicates the orientation line is based on two matching orientation marks; while a value of 3 indicates the orientation line is based on more than two matching orientation marks.

The total length of recovered core is recorded by a geotechnician, and metre interval marks are drawn. The core run length, recovered core length, solid core length, RQD, fracture frequency, and rock type are logged and recorded. The core is transferred into metal core boxes then transported

to the core yard for further logging. More than 95% of drill core in fresh rock was oriented using a Reflex digital device. Structural logging of oriented core includes recording of alpha and beta angles of fault planes, joints, veins and contacts. Selected core holes are also logged in more detail for geotechnical data. Diamond core is routinely photographed before cutting.

10.5 RC Sampling and Sample Recoveries

RC drill samples were collected over one metre intervals and manually split using multi-stage riffle splitters. In drilling undertaken prior to 2021, every 1 m sample was normally submitted for gold assay.

In pre-collars since 2021, samples were normally combined into 4 m composite samples for assaying. Composite samples were made by combining approximately equal mass riffle split sub-samples from each metre sample. Assay sub-samples despatched to the laboratory averaged around 3 kg. All RC pre-collars were assayed in entirety. Where composite samples returned gold assays greater than 0.25 g/t, second splits were generated for the constituent one metre samples and those were submitted for assay. The one metre assays are prioritised over the original composite assays in the acQuire database.

RC sample recoveries were routinely monitored by weighing the entire recovered sample for each metre at the rig site. RC sample recoveries in drilling prior to 2018 have previously been evaluated and found to be satisfactory (Perseus Mining Limited, 2017).

10.6 Diamond Core Sampling and Core Recoveries

Diamond core holes collared from surface were normally drilled in HQ diameter to the top of fresh rock and the core diameter then reduced to NQ or NQ2, depending on the drilling contractor. Pre-collared holes were normally drilled to NQ or NQ2 diameter from the commencement of coring.

Diamond core was sawn in half, with half submitted for assay. Sample intervals were normally 1 m, varying to between 0.5 m and 1.5 m in length to accommodate sampling to geological contacts and mineralisation boundaries.

All intervals showing quartz veining, carbonate alteration and/or sulfide mineralisation were sampled along with at least 15 m up-hole and down-hole from such intervals. Long intervals of obviously barren and unaltered rock were normally not sampled.

Core recoveries below about 75 m down-hole, the approximate depth to fresh rock, are consistently near 100% for all holes. Figure 10-4 shows average core recoveries by 3 m down-hole depth increments (core runs were generally 3 m). Note that the averages at shallow depths and below about 650 m are affected by the small numbers of intervals in those depth ranges.

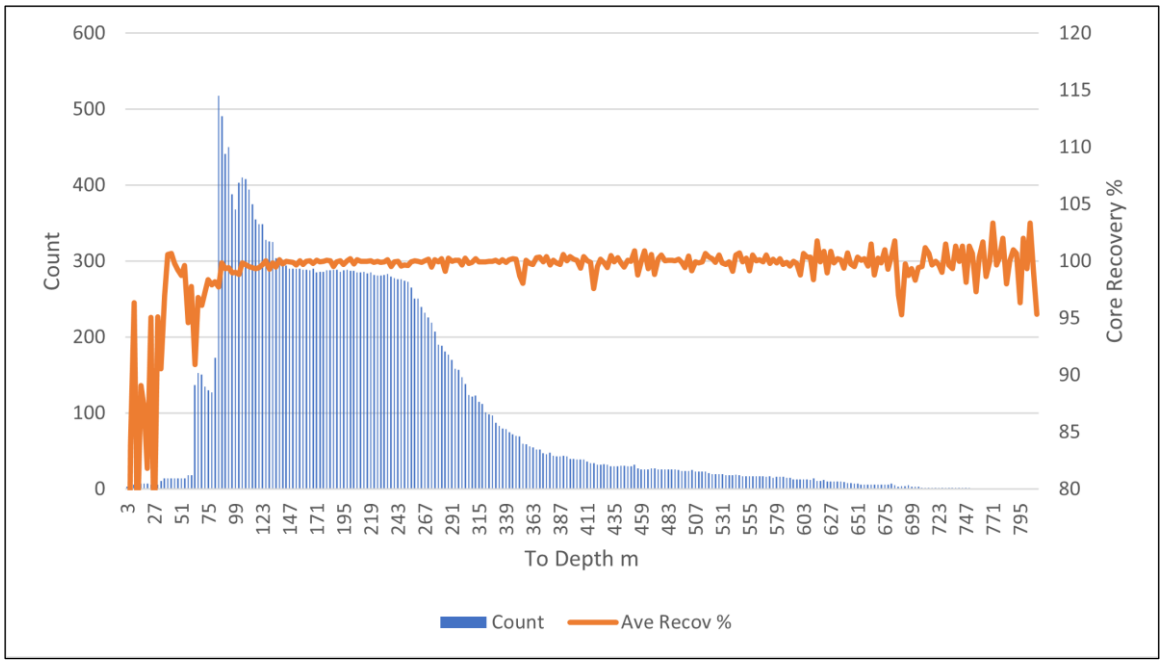


Figure 10-4: 2021-2022 core recoveries by 3 m down-hole depth increment

11 Sample Preparation, Analyses and Security

11.1 Pre-Perseus Drilling

11.1.1 Sample Preparation and Assay Laboratories

Table 11-1 shows a summary of the drilling and sampling completed before Perseus acquired the Project in 2016.

Sample preparation procedures for both core and RC samples have been consistent for all drilling that informs the resource estimate:

- dry at 110°C for 10-12 h
- crush the entire sample to -2 mm
- split to approximately 1.5 kg
- pulverise, normally using LM2 disc pulverisers, to 90% passing 75 µm.

Since mid-2013, Amara operated a sample preparation facility at Yaouré site. That facility and the personnel operating it are not independent of the Company. During major drilling campaigns by Amara, operation of the sample preparation facility was directed by a supervisor seconded from Actlabs.

Table 11-1: Yaouré Project – Summary of drilling sample preparation, assaying and quality controls

YEAR	COMPANY	DRILL TYPE	METRES	NO. SAMPLES	PREPARATION LAB	ASSAY LAB	ASSAY METHOD	QAQC
1987-2002	BRGM/CMA	DD	12,915	6,161	n/a	n/a	n/a	n/a
		RC	8,669	8,480	n/a	n/a	n/a	n/a
2005-2007	Cluff Gold	DD	6,484	5,853	Abilab[1]	Abilab[1]	FA	1:20 Fdup, 1:40 Blk, 1:20 Std
		RC	53,056	51,333			BLEG	1:10 Fdup, 1:20 Tripl, No Blk, No Std
2010	Cluff Gold	RC	8,714	11,362	Site lab	Site Lab	BLEG	1:20 Fdup, 1:20 Blk
		RAB	480					
		AC	1,884					
2011	Cluff Gold - Phase 1	DD	3,066	4,122	SGS[2]	SGS[2]	FA	1:20 Fdup, 1:40 Blk, 1:20 Std
		RC	1,669	1,566	Site lab	Site lab	BLEG	1:20 Fdup, 1:20 Blk, 1:20 Tripl, No Std
		RAB	14,293	13,680				
2012	Cluff Gold - Phase 2	DD	6,442	6,884	SGS[2]	SGS[2]	FA	1:20 Fdup, 1:40 Blk, 1:20 Std
		RC	12,881	12,808	Site lab	Site lab	BLEG	1:20 Fdup, 1:20 Blk, 1:20 Tripl, No Std
2012	Amara - Phase 3	DD	23,545	23,806	Site lab	Site lab	BLEG	1:20 Fdup, 1:25 Blk, 1:20 Std
		RC	21,425	21,047				1:20 Fdup, 1:25 Blk, 1:50 Std
		RAB	13,994	12,630				
2013	Amara - Phase 4	DD	15,435	15,039	Intertek[3]+ Site Lab	Intertek[3]	FA	1:20 Fdup, 1:25 Blk, 1:20 Std, 1:20 Pdup
2014	Amara - Phase 5	DD	68,995	67,248	Site lab	Actlabs[4]	FA	1:20 Fdup, 1:20 Blk, 1:20 Std, 1:20 Pdup
2015	Amara - Phase 6	DD	11,904	11,626	Site lab	Actlabs[4]	FA	1:20 Fdup, 1:20 Blk, 1:20 Std, 1:20 Pdup
		RC	6,718	6,638				

Fdup = Field duplicate; Tripl = Triplicate; Blk = Blank; Std = Standard (CRM); Pdup = Pulp duplicate

Notes:

1. Abilab Ougadougou (Burkina Faso) at the time was part of the ALS Laboratory Group but was not itself accredited by any independent authority. Abilab is considered independent of the Company.

2. Sample preparation by SGS Laboratory Services (SGS) was carried out in Yamoussoukro, Côte d'Ivoire, where SGS operates a sample preparation facility. Assaying of the samples was carried out in Tarkwa, Ghana. The SGS Tarkwa laboratory was not ISO 17025 accredited, however all services at SGS Tarkwa are provided with a quality assurance protocol in line with ISO 17025, the quality accreditation system for commercial laboratories. SGS is considered independent of the Company.
3. Sample preparation by Intertek was carried out in Yamoussoukro, Côte d'Ivoire, where Intertek operates a sample preparation facility. Assaying of the samples was carried out in Tarkwa, Ghana. The Intertek laboratory in Tarkwa operates under the umbrella of its technical centre for geochemical services at Intertek/Genalysis Services Pty Ltd in Australia (NATA Accreditation No: 3244), and its methods are based on ISO 17025 accredited methods. Intertek is considered independent of the Company.
4. Actlabs is accredited under ISO 9001:2208 for provision of testing and development services for the geological and mining industries. Actlabs is considered independent of the Company.

11.1.2 QAQC

Amara routinely monitored assay results for blanks, standards and coarse and fine duplicate samples as results arrived from assay laboratories. Sample preparation and assay procedures and quality control measures have remained essentially unchanged throughout that period. Re-assays are routinely requested for batches of samples with failed assays for blanks or standards. Re-assays, in addition to the original assays, are stored in a digital drill hole database with assays from the most reliable laboratory job prioritised as final data.

The entirety of BRGM, Cluff Gold West Africa and Amara drilling has been scrutinised by Perseus with regards to sample and assaying quality and reliability, during the 2016 due diligence prior to acquisition of the Project. This included review and statistical assessment of:

- RC sample condition by drilling depth and weathering domain
- RC sample recovery by weathering domain and sample condition
- RC sample recovery by drilling depth
- Gold grade versus RC sample recovery
- Diamond core gold grade versus core recovery
- Inter-laboratory check assaying
    - Selective re-assaying of BLEG and FA
    - Screen-fire assays on selected samples with gold grades >10 g/t Au
- QAQC data
    - Average grades achieved on client-submitted standards
    - Performance of blanks and investigation of possible cross-contamination
    - Duplicate analysis (field and pulp duplicates)
- Paired comparison of drill data within 3 m and 4 m separation distances of each other that derived from drill campaigns with different assaying methods (nearest-neighbour comparison)
- Bulk density data
- Amara's chain of custody and sample security.

The review of the data, in conjunction with the implemented quality control regime by Amara, and the results of inter-laboratory check assays, demonstrated that sampling by Amara is representative and free of any biases or other factors that may materially impact the reliability of the sampling.

No information is available to directly demonstrate the sampling and assaying reliability for drilling by BRGM, and the compilation of quality control data for Cluff drilling is incomplete. The reliability of those data have been verified by Perseus during the preparation of the Mineral Resources Estimate in 2017 by nearest neighbour comparisons with other sampling types. This confirmed the reliability of the bulk of the BRGM and Cluff Gold West Africa sampling and assaying with sufficient confidence to be used to inform a Mineral Resources Estimate.

Mineralised intervals of 15 drill holes (representing 451 m) have been excluded from the resource dataset because the sample or assay quality of these holes could not be demonstrated to be adequate. These intervals remain excluded from the preparation of Mineral Resource Estimates.

11.2 Perseus Drilling – CMA and Yaouré Open Pits

11.2.1 Sample Preparation and Assay Laboratories

Between December 2016 and June 2018, RC and diamond core drilling has been carried out over what are now known as the Yaouré and CMA open pits, including 417 trial RC grade control holes to a maximum depth of 35 m. Details are given in Section 9.3.1.6.

All samples have been assayed for gold by 50 g FA, at Actlabs and BVML.

Table 11-2 summarises the sampling, preparation and assaying of these samples. All drilling campaigns followed routine monitoring of assay quality through the insertion of QAQC samples (standards, blanks and duplicates), and immediate re-assaying where results reported for client-submitted standards or blanks casted doubt on the accuracy and quality of the analytical process.

Between February and May 2023, 132 mainly deeper holes to depths up to 350 m have been added over the Yaouré pit by RC, DD and RCDD to inform the Mineral Resources estimate at deeper portions of the deposit and improve confidence. Details of this drilling campaign are given in Section 10.

All samples for this program have been analysed for gold with a CPA unit operated by MSA. Suitability, reliability, accuracy and repeatability of this new technology has been tested and verified by inter-laboratory check and umpire assaying, before using the data to inform the Mineral Resources Estimate. This is discussed further in Section 11.4.

Sample preparation procedures for both core and RC samples analysed by FA have been consistent for all drilling that informs the resource estimate:

- dry at 110°C for 10-12 h
- crush the entire sample to -2 mm
- split to approximately 1.5 kg
- pulverise, normally using LM2 disc pulverisers, to 90% passing 75 µm.

In the case of more recent CPA analysis, sample preparation does not involve preparation of a pulp as the analysis is completed on coarse crushed sample.

Table 11-2: Yaouré open pit and CMA open pit – Summary of drill sample preparation, assaying and quality controls

DRILL TYPE	METRES	NO. SAMPLES	PREPARATION LAB	ASSAY LAB	ASSAY METHOD	QAQC
DD	7,740.04	7,923	Site Lab	Actlabs[5]	50FA	1:20 Fdup, 1:20 Blk, 1:20 Std, 1:20 Pdup
	1,258.05	1,320	Site Lab	BVML[6]	50FA	1:20 Fdup, 1:20 Blk, 1:20 Std, 1:20 Pdup
	1,195.2	1,111	MSA[7]	MSA[7]	50FA	1:20 Fdup, 1:20 Blk, 1:20 Std, 1:20 Pdup
	14,138.14	15,036	Site Lab	MSA[7]	CPA	1:20 Fdup, 1:20 Blk, 1:20 Std, 1:20 Pdup
RC	454	454	Actlabs[5]	Actlabs[5]	50FA	1:20 Fdup, 1:20 Blk, 1:20 Std, 1:20 Pdup
	32,048.75	32,050	Site Lab	Actlabs	50FA	1:20 Fdup, 1:20 Blk, 1:20 Std, 1:20 Pdup
	11,244.82	11,285	Site Lab	BVML[6]	50FA	1:20 Fdup, 1:20 Blk, 1:20 Std, 1:20 Pdup
	8,008	6,054	Site Lab	MSA[7]	CPA	1:20 Fdup, 1:20 Blk, 1:20 Std, 1:20 Pdup

Fdup = Field duplicate; Blk = Blank; Std = Standard (CRM); Pdup = Pulp duplicate; 50FA = 50 g fire assay

Notes:

5. Actlabs is accredited under ISO 9001:2208 for provision of testing and development services for the geological and mining industries. Actlabs is considered independent of the Company.
6. BVML is accredited under ISO 9001:2008 for testing of metals and minerals (certificate no. 44 100 160145-103). BVML is considered independent of the Company.
7. MSA hub laboratory in South Africa is an accredited assay and geochemical laboratory under the ISO/IEC 17025 standard (TL-736). All other operations operate to the guidelines as prescribed in ISO/IEC 17025. Internal and external audits and management reviews are conducted annually to ensure the effectiveness of the Quality Management System. MSA is considered independent of the Company.

11.2.2 QAQC

11.2.2.1 Certified Reference Material

CRM used during the Yaouré and CMA open pit drilling campaigns has been sourced exclusively from Scott Automation Rocklabs series, supplied in 60 g sachets. The CRM samples have been used to test the accuracy of the sample analysis for both RC and diamond drilling. A total of 26 different standards have been used to represent the different oxidation regimes and grade ranges. The expected value of the standards ranged from 0.08 g/t to 8.67 g/t Au.

Submitted CRMs have been labelled failed when the reported grade exceeded the acceptable thresholds, which was set at ±3 times the standard deviation (SD), as defined by the associated certificates. In all failed cases, the sample sequence between the passed control samples has been re-assayed, regardless of whether the failure occurred in a mineralised or unmineralised interval.

A summary of the standards used is presented in Table 11-3 for the oxide matrix samples, and Table 11-4 for the sulfide matrix samples, while control charts for the more significant CRMs and laboratories are presented in Figure 11-1 to Figure 11-9.

Table 11-3: Distribution of oxide CRMs by laboratory – Yaouré and CMA Open Pit

CRM	NUMBER	GRADE (Au g/t)	SD	NO. ACTLABS	NO. BVML	NO. MSA
OxA89	218	0.084	0.008	-	-	218
OxE113	348	0.609	0.014	210	138	-
OxE143	34	0.621	0.013	-	13	21
OxF125	121	0.806	0.02	-	116	5
OxG123	29	1.008	0.024	-	-	29
OxG103	219	1.019	0.028	219	-	-
OxH163	18	1.313	0.026	-	-	18
OxI96	133	1.802	0.039	73	60	-
OxI121	119	1.834	0.05	100	11	8
OxJ176	6	2.385	0.048	-	-	6
OxK119	27	3.604	0.105	4	23	-
OxL118	3	5.828	0.141	-	-	3

Table 11-4: Distribution of sulfide CRMs by laboratory– Yaouré and CMA Open Pit

CRM	NUMBER	GRADE (Au g/t)	SD	NO. ACTLABS	NO. BVML	NO. MSA
SE86	38	0.595	0.015	-	18	20
SE68	824	0.599	0.013	555	269	-
SG115	466	1.017	0.015	-	-	466
SG84	35	1.026	0.025	15	-	20
SG66	577	1.086	0.032	577	-	-
SJ80	622	2.656	0.057	494	116	12
SJ121	195	2.715	0.062	-	-	195
SK94	8	3.899	0.084	-	-	8
SK120	226	4.075	0.092	-	-	226
SK78	196	4.134	0.138	196	-	-
SL76	85	5.96	0.192	-	-	85
SN117	39	8.443	0.11	-	-	39
SN75	92	8.671	0.199	72	17	3

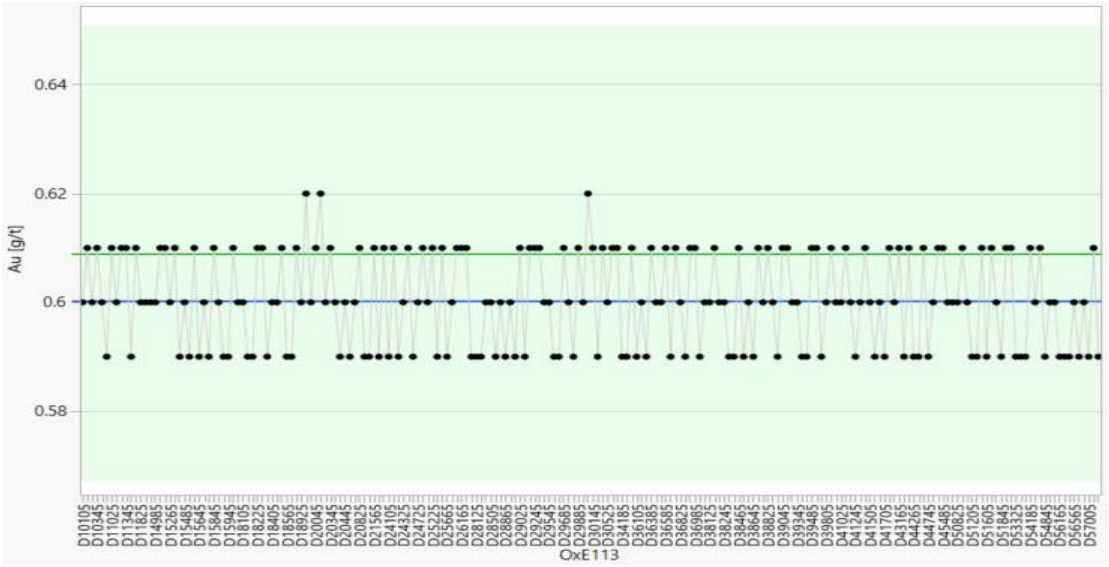


Figure 11-1: CRM control chart – OxE113 (Actlabs) – expected value (green line), average value (blue line), control limits (green shading)

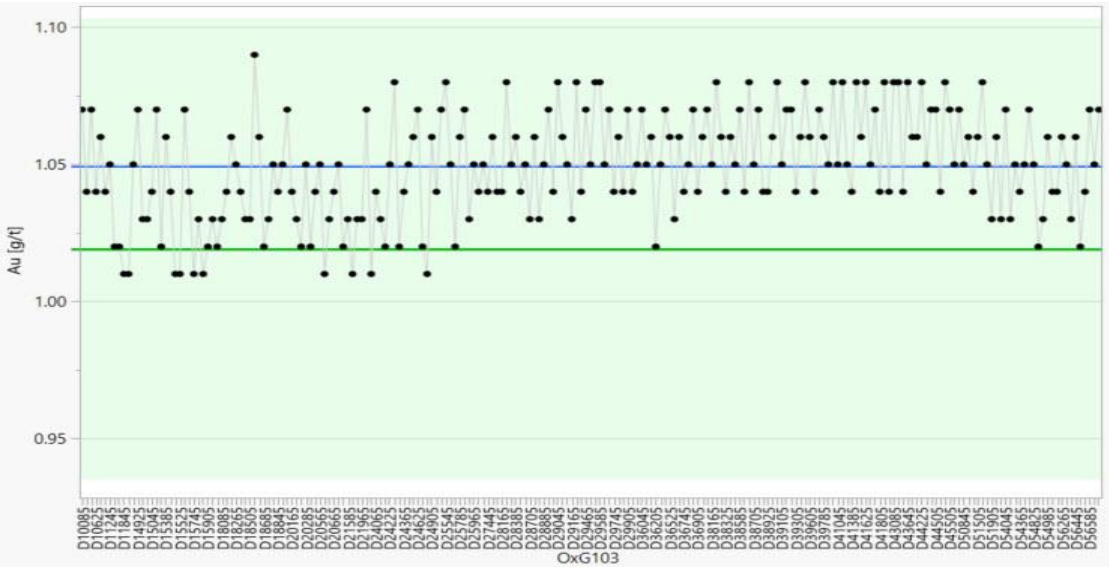


Figure 11-2: CRM control chart – OxG103 (Actlabs) – expected value (green line), average value (blue line), control limits (green shading)

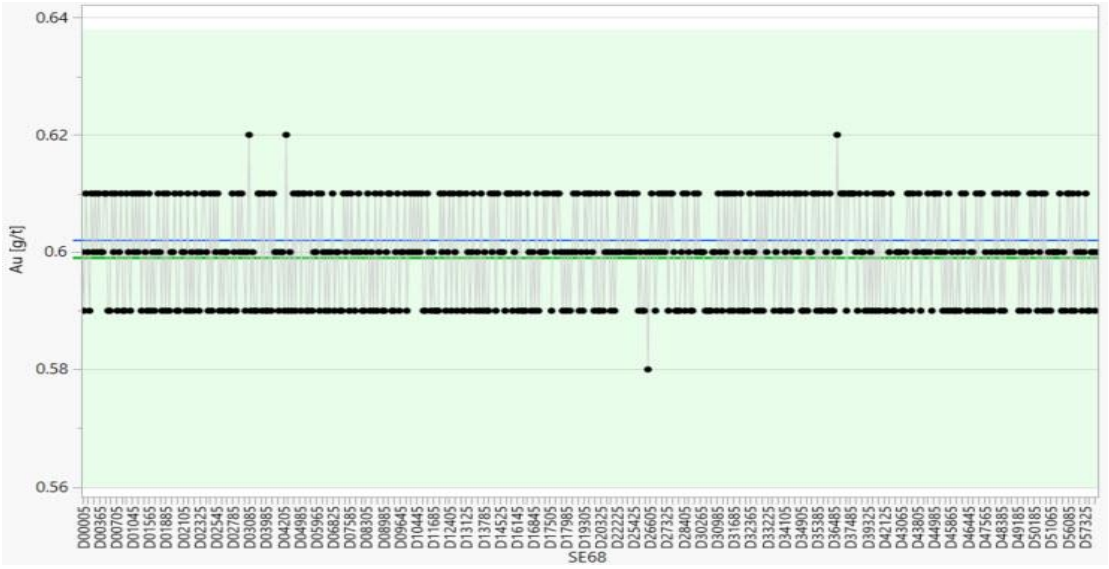


Figure 11-3: CRM control chart – SE68 (Actlabs) – expected value (green line), average value (blue line), control limits (green shading)

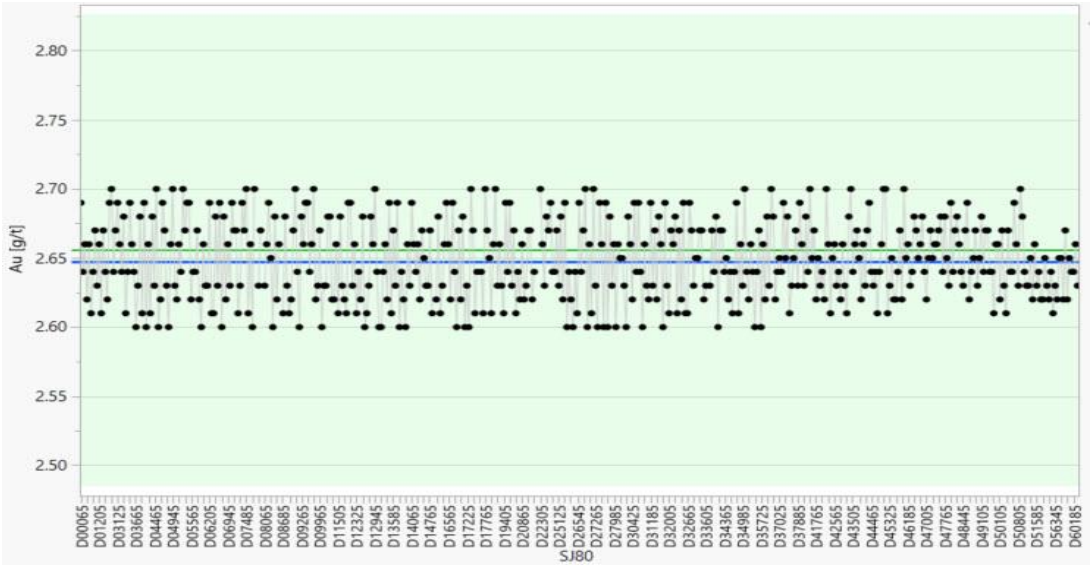


Figure 11-4: CRM control chart – SJ80 (Actlabs) – expected value (green line), average value (blue line), control limits (green shading)

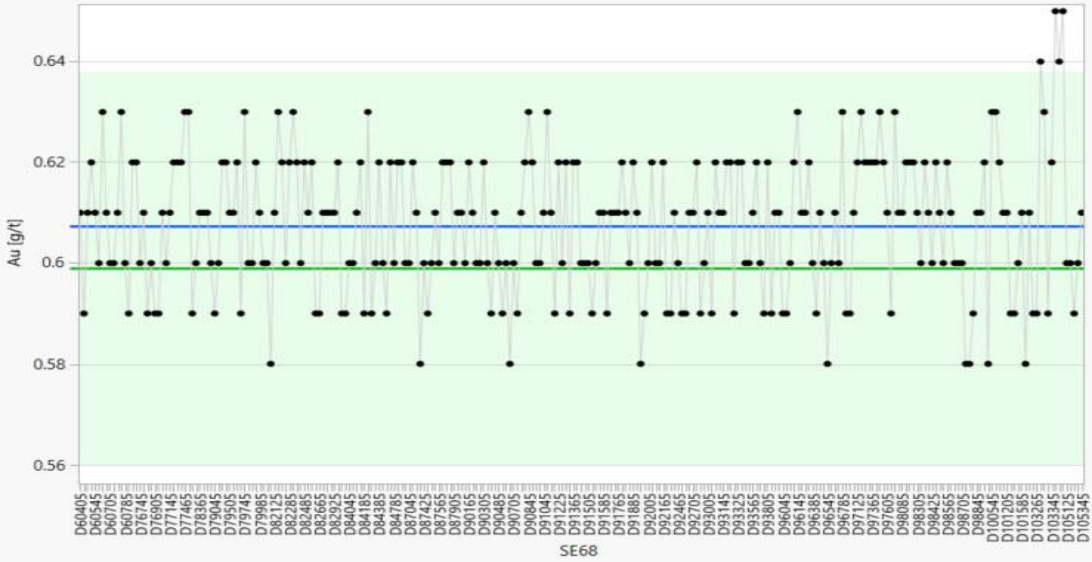


Figure 11-5: CRM control chart – SE68 (BVML) – expected value (green line), average value (blue line), control limits (green shading)

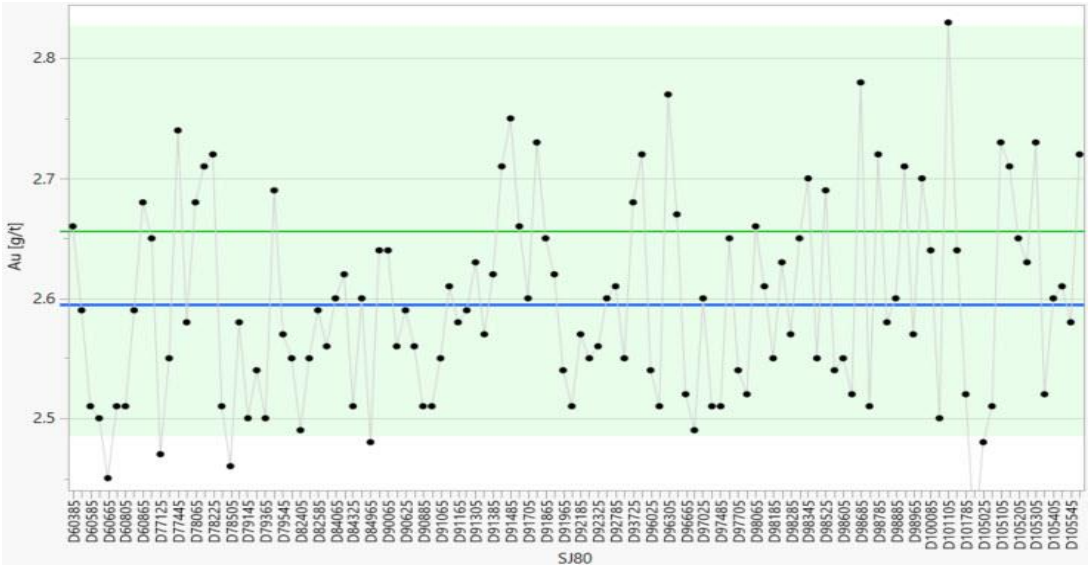


Figure 11-6: CRM control chart – SJ80 (BVML) – expected value (green line), average value (blue line), control limits (green shading)

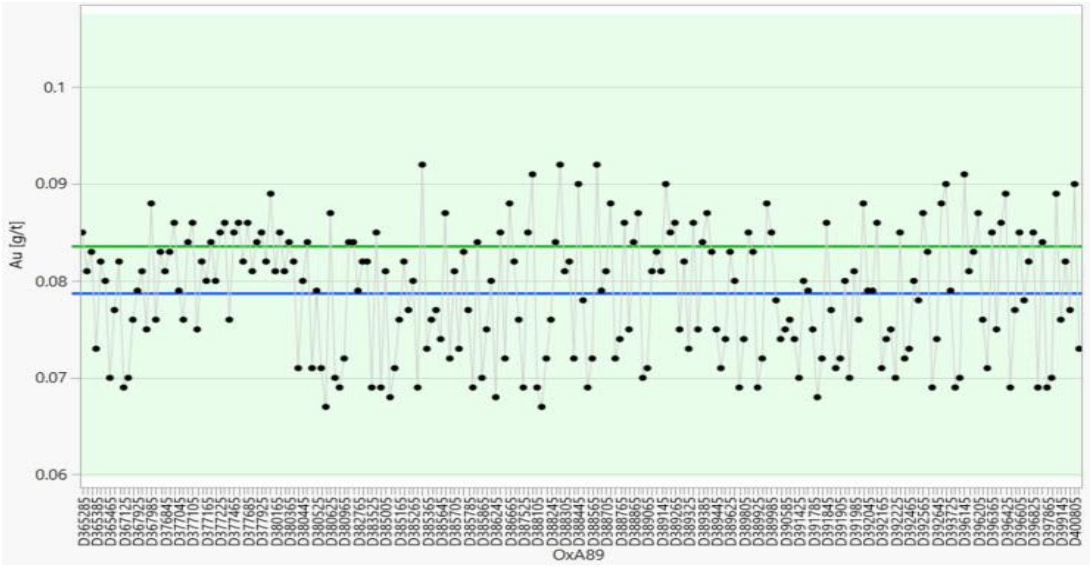


Figure 11-7: CRM control chart – OxA89 (MSALABS) – expected value (green line), average value (blue line), control limits (green shading)

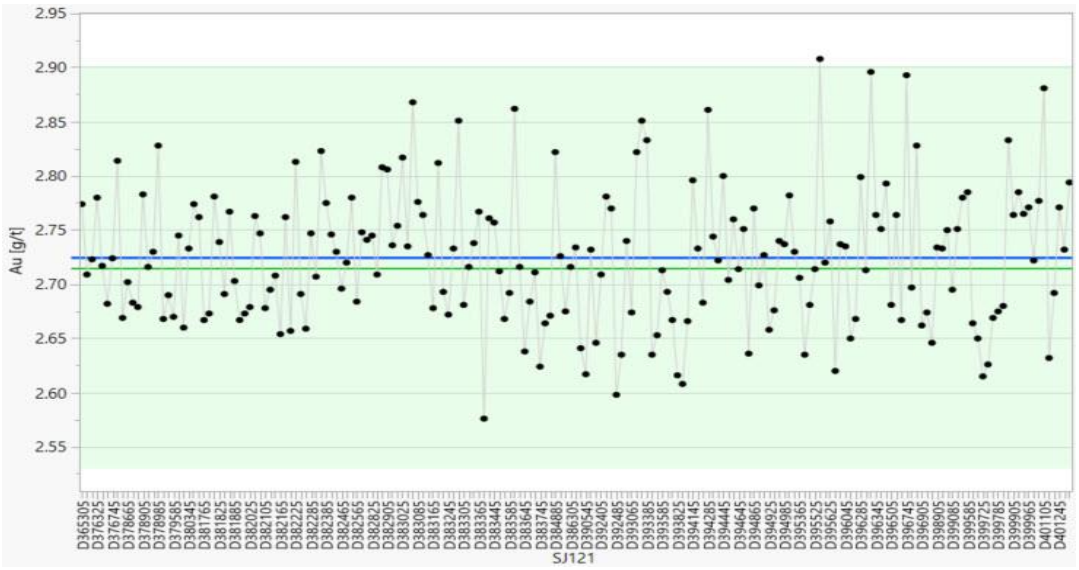


Figure 11-8: CRM control chart – SJ121 (MSALABS) – expected value (green line), average value (blue line), control limits (green shading)

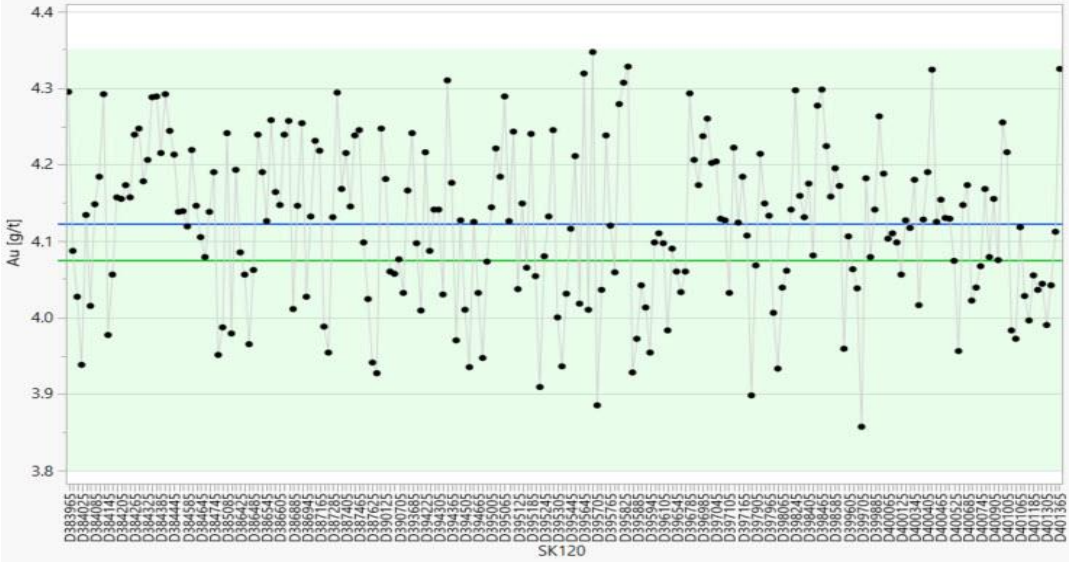


Figure 11-9: CRM control chart – SK120 (MSALABS) – expected value (green line), average value (blue line), control limits (green shading)

Review of the respective control charts demonstrates acceptable performance in the majority of cases. Of note is the slight positive bias evident for OxG103 reported from Actlabs, and the minor negative bias reported for SJ80 from BVML. In the case of SJ80, there is a relatively large spread of results, and some instances of values reporting outside of the ± 3 SDs (green shading)

11.2.2.2 Blanks

Every twentieth sample submitted was a blank. Blank material submitted is considered to be barren and has been used to check the absence of cross-contamination from mineralised samples during sample preparation and along the analytical process. The material used at Yaouré has been sourced from a local granite quarry. The material is not certified and does not qualify as a CRM. A blank is considered to have failed if it reports a gold grade greater than 0.05 g/t Au. Blank performance is presented in Table 11-5. The low failure rate on blanks demonstrates that acceptable levels of hygiene are maintained in the sample preparation process.

Table 11-5: Summary of blank performance – Yaouré and CMA open pits

LABORATORY	NO. SUBMITTED	NO. FAILED (>0.05 g/t Au)	% FAILED
ACTLABS	2,297	0	0
BVML	785	0	0
MSA CPA	1,380	1	0

11.2.2.3 Field Duplicates

Field duplicates have been routinely taken at a nominal ratio of 1:20 from all RC drilling, where the duplicate was collected by re-splitting the original sample obtained at the cyclone.

Diamond core duplicates represent a second split taken from the original crushed half core sample and are termed a coarse duplicate, collected at a ratio of 1:20. Additionally, a second split was taken from the original sample after the pulverisation stage and is termed a pulp duplicate, also submitted in a ratio of 1:20.

Quantile-quantile plots (Q-Q plots) and half absolute relative difference (HARD) plots have been generated to assess quality and representativity of the primary sample/duplicate sample process.

HARD plots are generated by calculating |x1-x2|/(x1+x2) expressed as a percentage and sorted from smallest to largest. Pairs that are identical will give a value of 0% and values completely different (i.e., 0 and 1) will give a value of 100%. As a rule of thumb, 80% of field duplicate pairs should have less than 20% difference in grade. Since very low values close to detection limit can give artificially poor precision and consequently a high HARD value, data below 0.1 g/t Au is filtered from the analysis.

The HARD plots for the coarse duplicates of the diamond core and RC samples show a similar profile, with close to 80% of samples within 20% relative difference in grade (Figure 11-10). As expected, the pulp duplicate performance is improved relative to the coarse duplicates, reflecting the greater level of homogenisation at this stage (Figure 11-11).

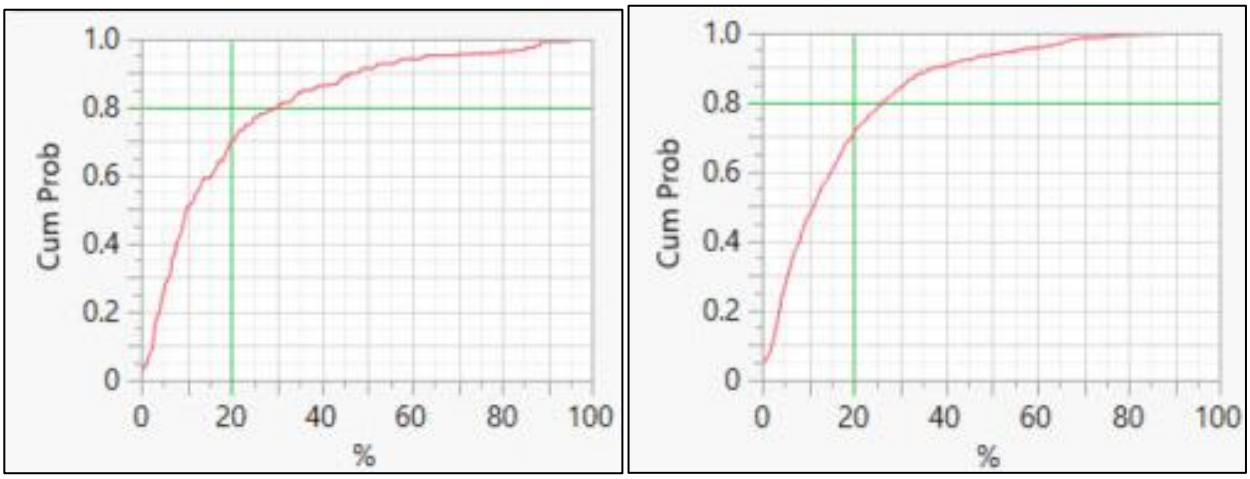


Figure 11-10: HARD plots for coarse duplicates - diamond core (left) and RC (right)

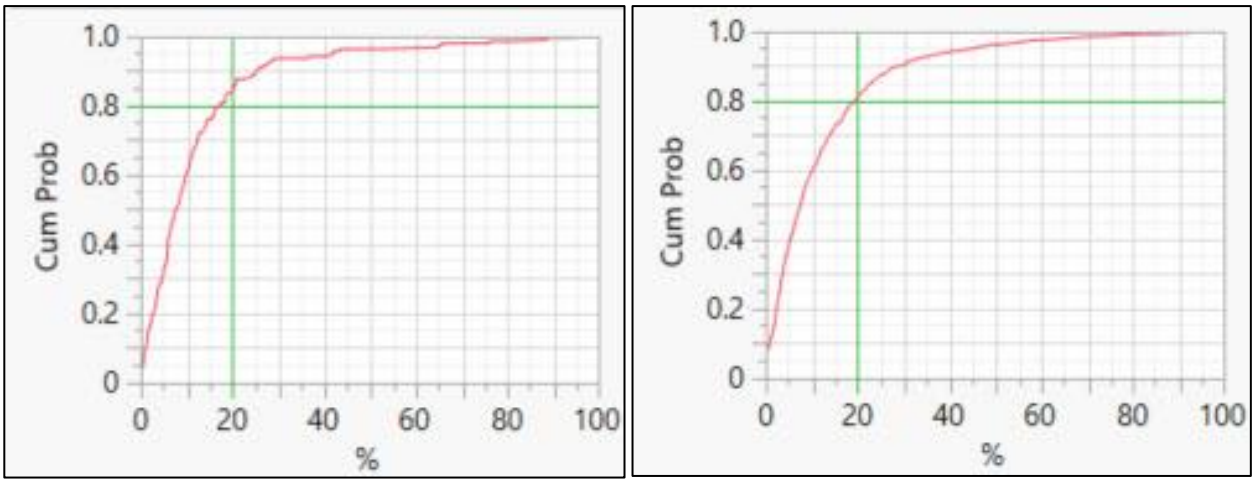


Figure 11-11: HARD plots for pulp duplicates - diamond core (left) and RC (right)

Both the coarse and pulp duplicate Q-Q plots for each of the diamond core and RC samples show a consistent grade population indicating that the differences reported between the primary and duplicate samples for each of the coarse and pulp duplicates are not inherently biased (Figure 11-12 and Figure 11-13).

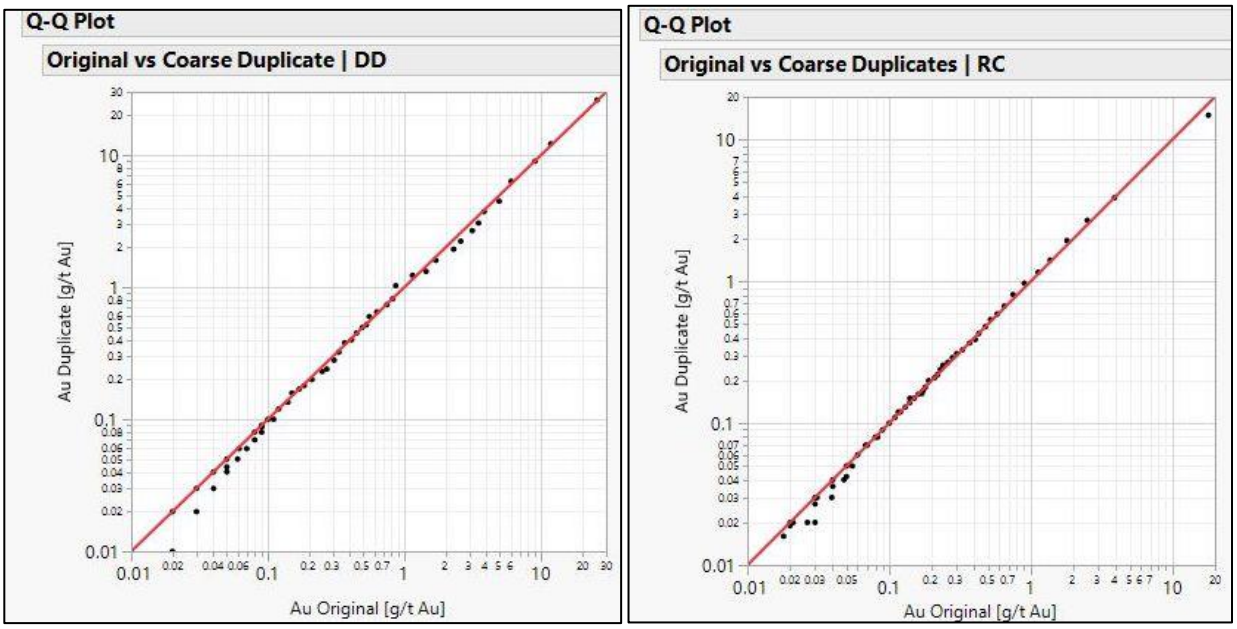


Figure 11-12: Q-Q plots for diamond core (left) and RC (right) – coarse duplicates

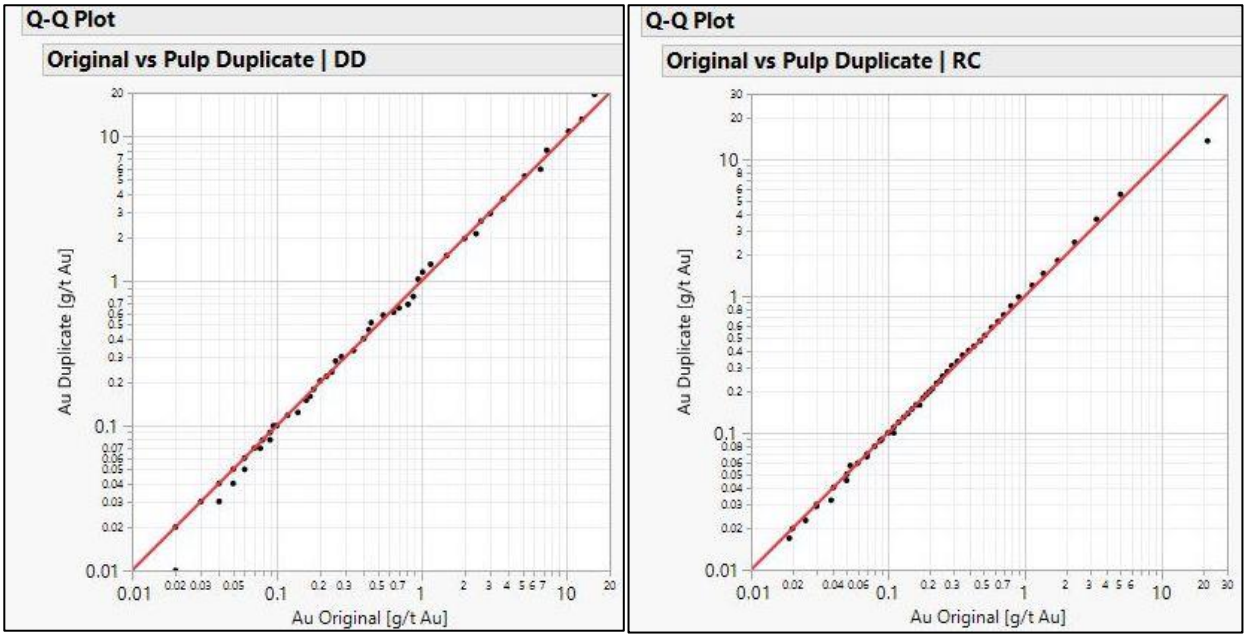


Figure 11-13: Q-Q plots for diamond core (left) and RC (right) – pulp duplicates

11.3 Perseus Drilling – CMA Underground

11.3.1 Sample Preparation and Assay Laboratories

Between August 2021 and April 2023, Perseus carried out close spaced drilling over the extension of the CMA, called the CMA UG drill program. During the CMA UG drilling, CRM standards have been submitted with the drill samples to Intertek, ALS, MSA, BVML and SGS laboratory in Tarkwa (SGS).

The bulk of samples have been analysed by Intertek and ALS until mid-January 2023, by 50 g FA. Since mid-January 2023, samples have been predominantly analysed by MSA using a CPA unit.

The total number of diamond core drill samples (exclusive of QC samples) relevant to the CMA UG program separated by analysis laboratory is listed in Table 11-6. RC collars through the weathered horizons have been sampled and assayed but are not part of the mineralisation.

Table 11-6: CMA UG – Summary of drill sample preparation, assaying and quality controls

LABORATORY	NO. SUBMITTED	FROM	TO
ALS	27,561	2-Feb-02	6-Oct-22
BVML	70	19-Nov-21	19-Nov-21
INTERTEK	25,864	31-Aug-21	8-Apr-23
MSA CPA	6,952	15-Jan-23	28-Mar-23
MSA FA	132	12-May-22	16-Sep-22
SGS	2,123	29-Mar-23	29-Mar-23

The Intertek laboratory in Tarkwa operates under the umbrella of its technical centre for geochemical services at Intertek/Genalysis Services Pty Ltd in Australia (NATA Accreditation No: 3244), and its methods are based on ISO 17025 accredited methods. The laboratory is independent of the Company.

ALS operations are ISO 9001:2015 certificated for the provision of assay and geochemical analytical services by QMI Quality Registrars. The ALS laboratory in Ouagadougou/Burkina Faso is not ISO 17025 accredited but operates under the umbrella of its technical centre in Johannesburg/South Africa, which is ISO 17025 accredited by the South African National Accreditation System (SANAS). The laboratory is independent of the Company.

MSA hub laboratory in South Africa is an accredited assay and geochemical laboratory under the ISO/IEC 17025 standard (TL-736). All other operations operate to the guidelines as prescribed in ISO/IEC 17025. Internal and external audits and Management Review are conducted annually to ensure the effectiveness of the Quality Management System. The laboratory is independent of the Company.

The SGS laboratory is not ISO 17025 accredited, however all services at SGS Tarkwa are provided with a quality assurance protocol in line with ISO 17025, the quality accreditation system for commercial laboratories. The laboratory is independent of the Company.

BVML is accredited under ISO 9001:2008 for testing of metals and minerals (certificate no. 44 100 160145-103). The laboratory is independent of the Company.

11.3.2 QAQC

11.3.2.1 Certified Reference Material

CRM used during the CMA UG drilling campaigns since August 2021 has been sourced exclusively from Scott Automation Rocklabs series, supplied in 60 g sachets. The CRM samples have been used to test the accuracy of the sample analysis for both RC and diamond drilling. A total of 26 different standards have been used to represent the different oxidation regimes and grade ranges. The expected value of the standards ranged from 0.08 g/t to 8.67 g/t Au.

Submitted CRMs have been labelled failed when the reported grade exceeded the acceptable thresholds, which was set at ± 3 times SD, as defined by the associated certificates. In all failed cases,

the sample sequence between the passed control samples has been re-assayed, regardless of whether the failure occurred in a mineralised or unmineralised interval.

A summary of the standards used is presented in Table 11-7 and Table 11-8 for the oxide and sulfide CRMs respectively. Selected control charts are presented in Figure 11-14 to Figure 11-21.

Table 11-7: Distribution of oxide CRMs by laboratory –CMA underground

CRM	NUMBER	GRADE (Au g/t)	SD	NO. INTERTEK	NO. MSA FA	NO. MSA CPA	NO. ALS	NO. BVML	NO. SGS
OxA89	105	0.0836	0.0079	13	5	87	-	-	-
OxE143	152	0.621	0.013	76	-	9	65	2	-
OxE182	6	0.663	0.012	5	1	-	-	-	-
OxG98	2	1.017	0.019	2	-	-	-	-	-
OxG123	78	1.008	0.024	45	-	15	16	2	-
OxH163	7	1.313	0.026	-	-	7	-	-	-
OxI121	79	1.834	0.05	47	-	4	23	5	-
OxJ176	6	2.385	0.048	-	-	6	-	-	-
OxK119	7	3.604	0.105	5	-	-	2	0	-
OxL118	5	5.828	0.141	-	-	5	-	-	-

Table 11-8: Distribution of sulfide CRMs by laboratory–CMA underground

CRM	NUMBER	GRADE (Au g/t)	SD	NO. INTERTEK	NO. MSA FA	NO. MSA CPA	NO. ALS	NO. BVML	NO. SGS
SE86	9	0.595	0.015	8	1	-	-	-	-
SF67	149	0.835	0.021	46	-	-	103	-	-
SF85	338	0.848	0.018	116	-	-	221	1	-
SG84	430	1.026	0.025	229	1	-	198	2	-
SG115	808	1.017	0.015	297	1	457	-	-	53
SI64	45	1.78	0.042	32	2	-	11	-	-
SI81	648	1.79	0.03	140	-	-	507	1	-
SJ80	35	2.656	0.057	31	-	-	1	3	-
SJ121	383	2.715	0.062	168	-	207	-	-	8
SK78	362	4.134	0.138	89	1	-	246	-	26
SK94	253	3.899	0.084	113	5	9	126	-	-
SK120	227	4.075	0.092	107	-	120	-	-	-
SL76	157	5.96	0.192	88	1	54	1	-	13
SN60	193	8.595	0.223	88	-	-	105	-	-
SN75	307	8.671	0.199	134	-	-	172	1	-
SN117	247	8.443	0.11	160	-	55	-	-	32

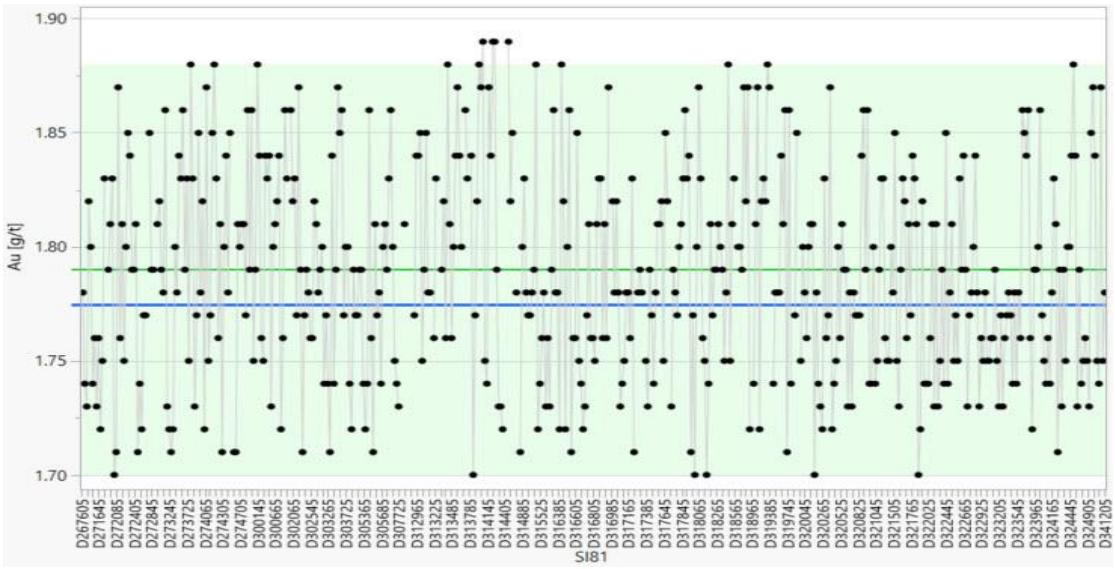


Figure 11-14: CRM control chart – SI81 (ALS) – expected value (green line), average value (blue line), control limits (green shading)

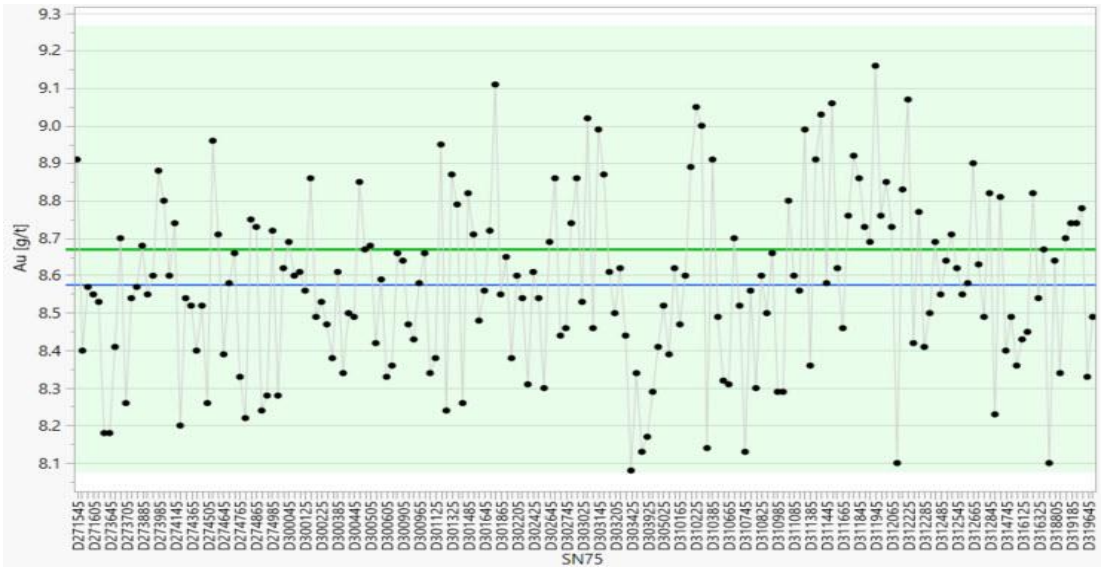


Figure 11-15: CRM control chart – SN75 (ALS) – expected value (green line), average value (blue line), control limits (green shading)

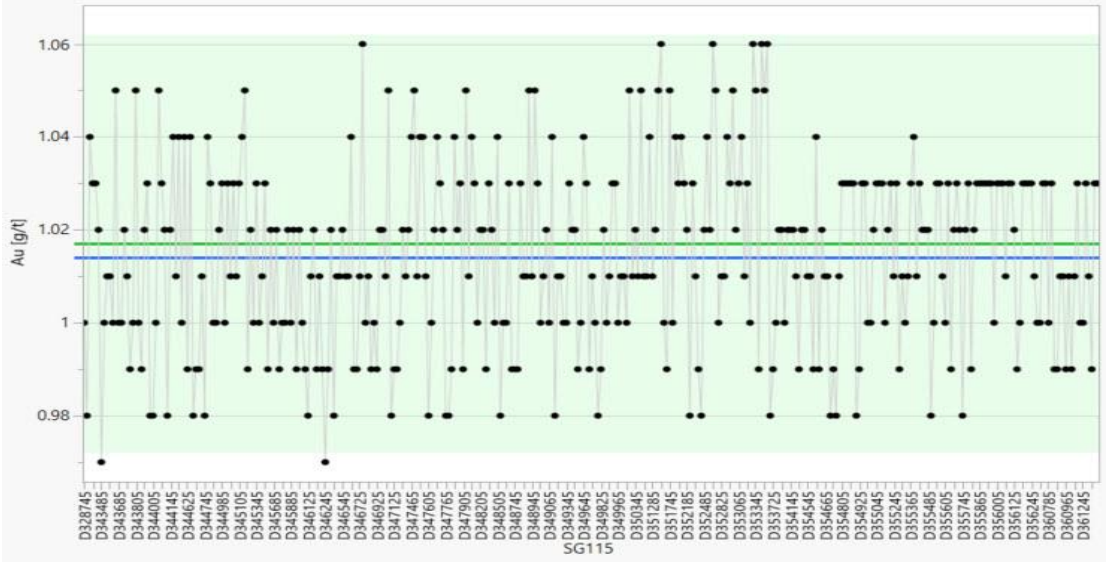


Figure 11-16: CRM control chart – SG115 (Intertek) – expected value (green line), average value (blue line), control limits (green shading)

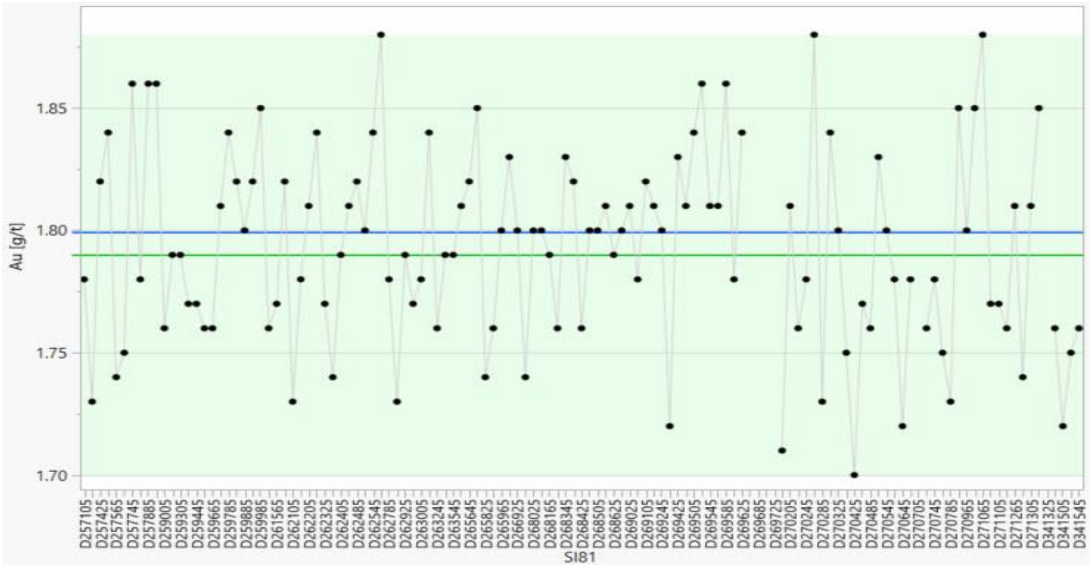


Figure 11-17: CRM control chart – SI81 (Intertek) – expected value (green line), average value (blue line), control limits (green shading)

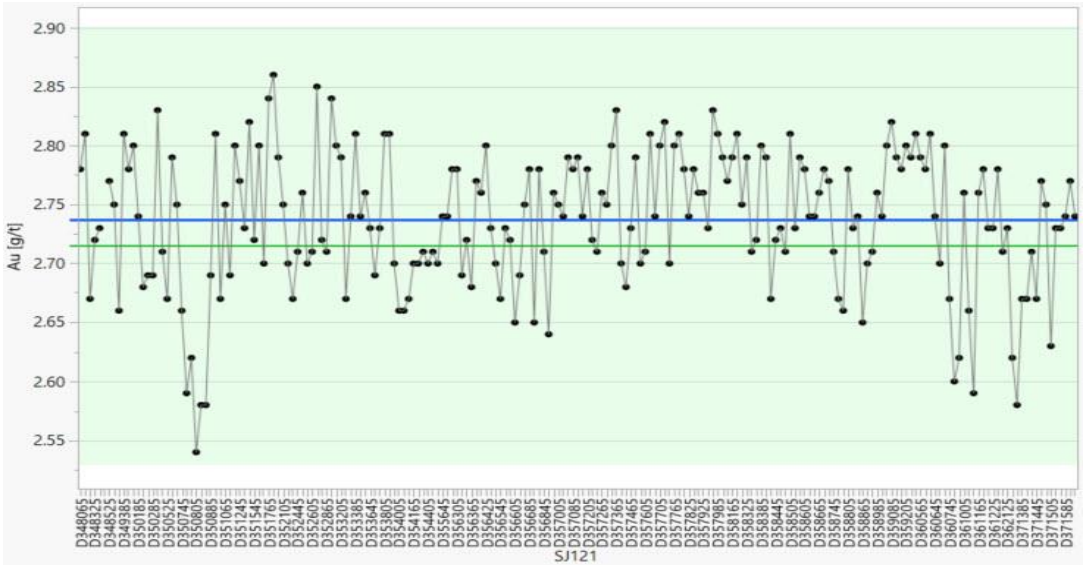


Figure 11-18: CRM control chart – SJ121 (Intertek) – expected value (green line), average value (blue line), control limits (green shading)

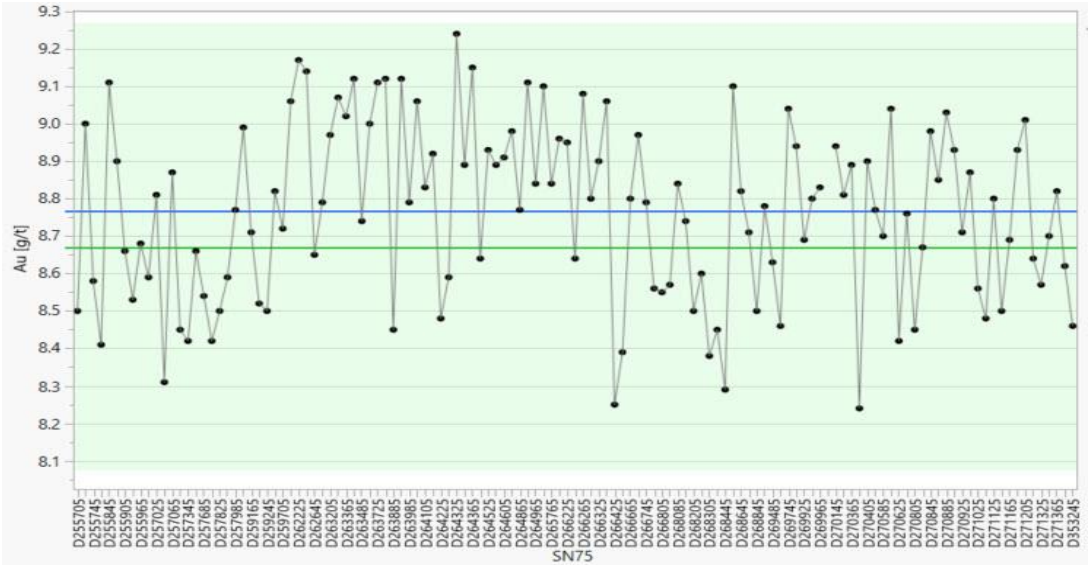


Figure 11-19: CRM control chart – SN75 (Intertek) – expected value (green line), average value (blue line), control limits (green shading)

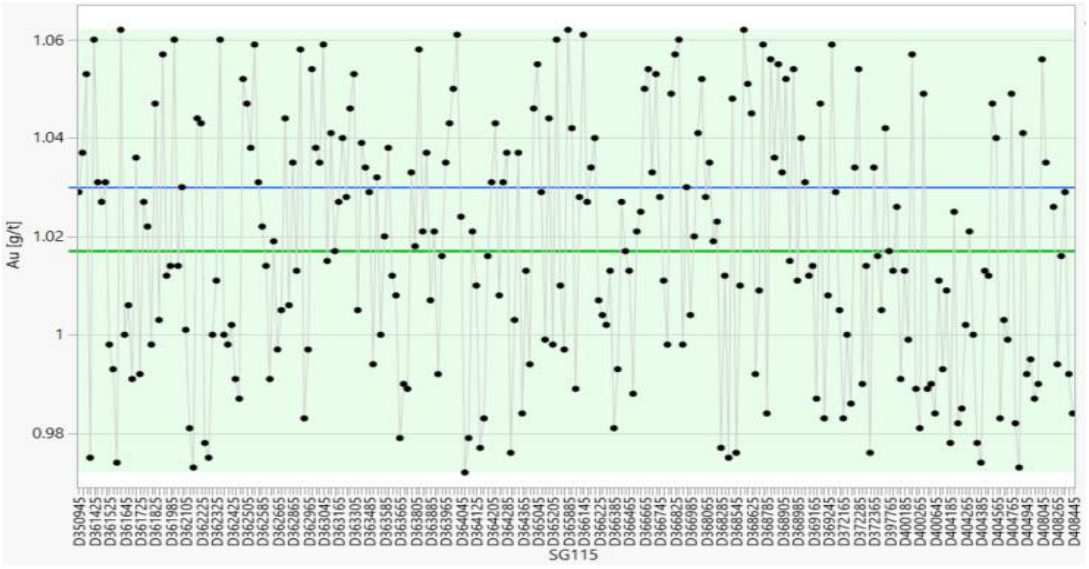


Figure 11-20: CRM control chart – SG115 (MSALABS) – expected value (green line), average value (blue line), control limits (green shading)

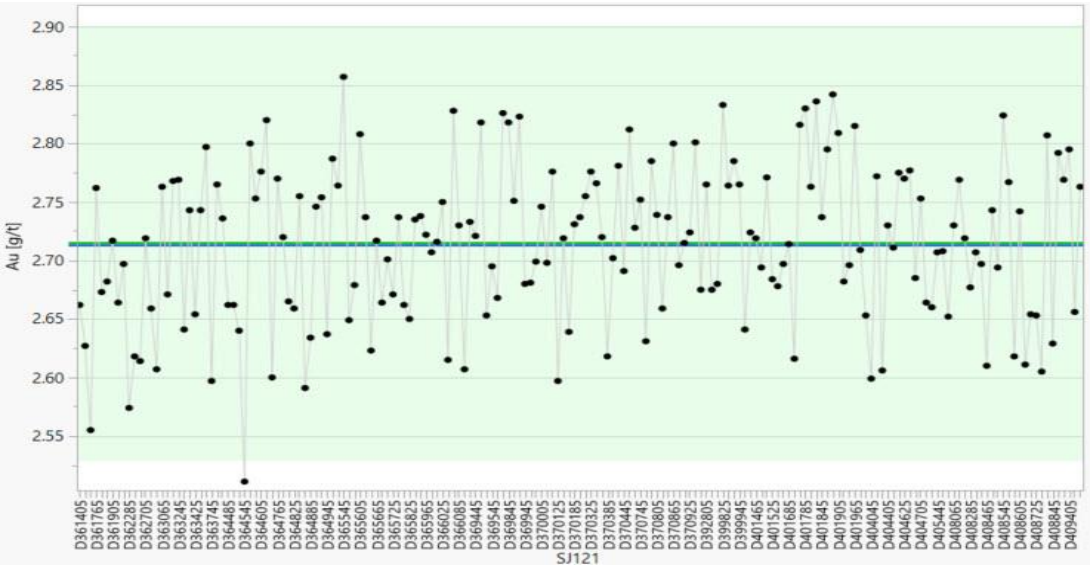


Figure 11-21: CRM control chart – SJ121 (MSALABS) – expected value (green line), average value (blue line), control limits (green shading)

Review of the respective control charts demonstrates acceptable performance in the majority of cases. The performance of SI81 and SN75 analysed at ALS show a reasonable spread of results, however with a limited overall bias, suggesting results are broadly accurate, but not precise. Overall, very few results are outside of the control chart limits.

11.3.2.2 Blanks

Every twentieth sample submitted was a blank. Blank material submitted is considered to be barren and has been used to check the absence of cross-contamination from mineralised samples during sample preparation and along the analytical process. The material used at Yaouré has been sourced from a local granite quarry. The material is not certified and does not qualify as a CRM. A blank is considered to have failed if it reports a gold grade greater than 0.05 g/t Au. Blank performance is

presented in Table 11-5. The low failure rate on blanks demonstrates that acceptable levels of hygiene are maintained in the sample preparation process.

Table 11-9: Summary of blank performance –CMA underground

LABORATORY	NO. SUBMITTED	NO. FAILED (>0.05 g/t Au)	% FAILED
ALS	1,859	2	0.1
BVML	17	-	-
INTERTEK	1,759	10	0.56
MSA CPA	1,018	-	-
MSA FA	17	-	-
SGS	133	-	-

11.3.2.3 Field Duplicates

Field duplicates have been routinely taken at a nominal ratio of 1:20 from all RC drilling, where the duplicate was collected by re-splitting the original sample obtained at the cyclone. RC samples, however, are not discussed herein. All drill intercepts relevant to the CMA UG mineralisation derive from diamond core drilling.

Diamond core duplicates represent a second split taken from the original crushed half core sample and are termed a coarse duplicate, collected at a ratio of 1:20. Additionally, a second split was taken from the original sample after the pulverisation stage and is termed a pulp duplicate, also submitted in a ratio of 1:20.

Q-Q plots and HARD plots have been generated to assess quality and representativity of the primary sample/duplicate sample process. HARD plots are generated by calculating $|x1-x2|/(x1+x2)$ expressed as a percentage and sorted from smallest to largest. Pairs that are identical will give a value of 0% and values completely different (i.e., 0 and 1) will give a value of 100%. As a rule of thumb, 80% of field duplicate pairs should have less than 20% difference in grade. Since very low values close to detection limit can give artificially poor precision and consequently a high HARD value, data below 0.1 g/t Au is filtered from the analysis.

The HARD plots for the coarse duplicates of the diamond core shows an almost straight line, resulting from relatively large differences between primary and duplicate sample (Figure 11-22). More than 70% of all duplicates differ by more than 20% from the primary sample, suggesting mineralisation is inhomogeneous and that the primary sub-sample is not entirely representative of the overall sample mass submitted for preparation, suggesting the presence of nuggety mineralisation. The equivalent plot for the pulp duplicates shows an improved performance related to the more homogenous nature of the pulp material.

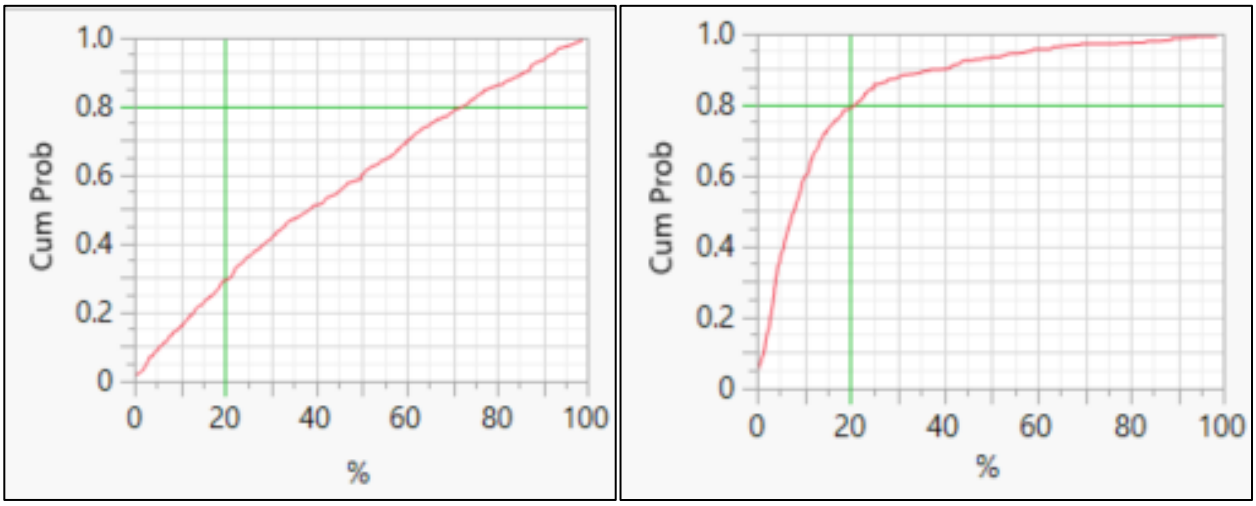


Figure 11-22: HARD plots for diamond field duplicates - coarse (left) and pulp (right)

Both the coarse and pulp duplicate Q-Q plots of the diamond core show a consistent grade population, indicating that the differences reported between the primary and duplicate samples for each are not inherently biased (Figure 11-23).

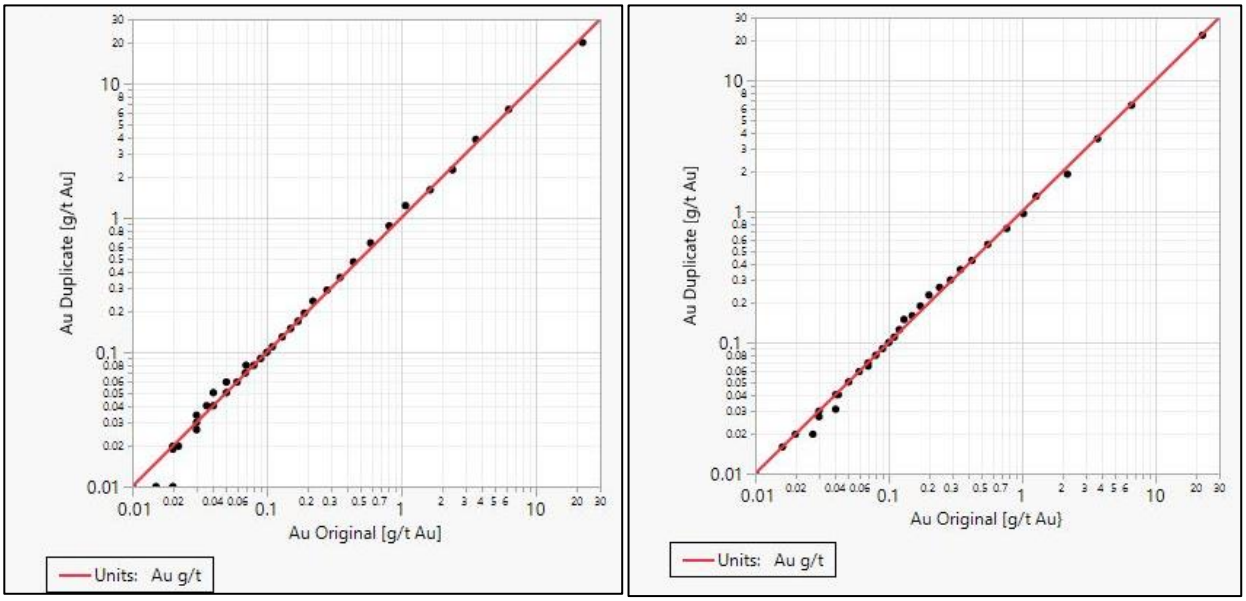


Figure 11-23: Q-Q Plots for diamond core– coarse duplicates (left), pulp duplicates (right)

11.3.2.4 Grind Checks

Samples are prepared by Perseus at the Yaouré laboratory and pulps dispatched for analysis. As part of the Yaouré QAQC, grind size checks were completed on prepared pulps at a rate of 1:20 samples. Grind size checks ensure the samples are suitably pulverised to be considered homogenous, with pulps required to achieve 90% passing 75 µm (200 mesh).

In total, over 3,300 grind size checks have been conducted between August 2021 and April 2023. Review of the distribution of the percentage of sample passing 75 µm shows that more than 75% of samples tested reported >95% of material passing 75 µm (Figure 11-24).

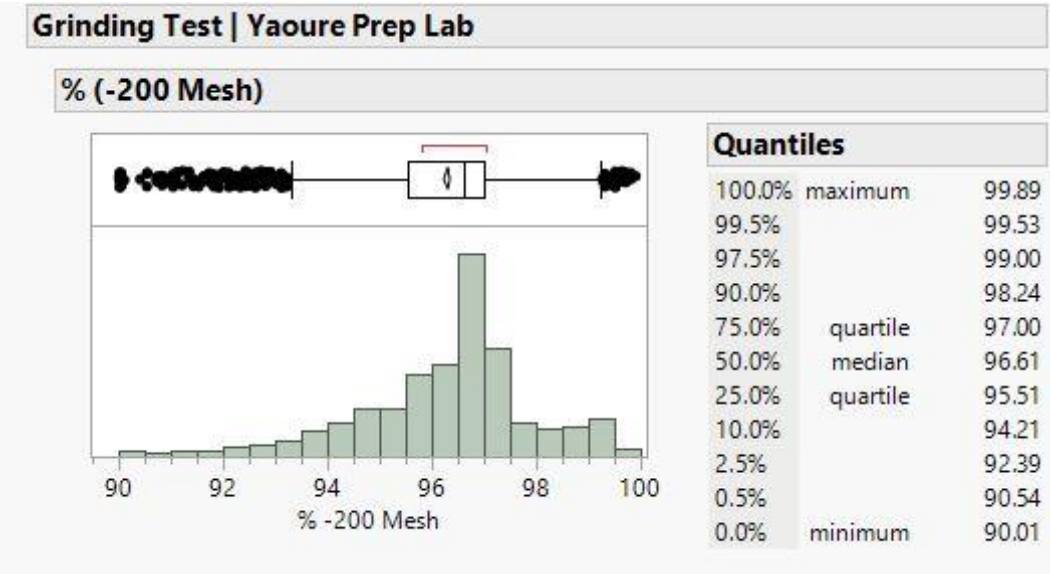


Figure 11-24: Yaouré sample preparation laboratory – size fraction analysis passing 75 µm

There is a change in grinding quality after September 2022, which coincides with a breakdown period of the sample preparation lab (Figure 11-25). The minor deterioration of grinding quality may be attributed to the increased backlog in the sample preparation chain, or perhaps the slightly lower quality of the replacement parts in the mills. The quality of pulverisation since October 2022, however, is still well within the acceptable thresholds.

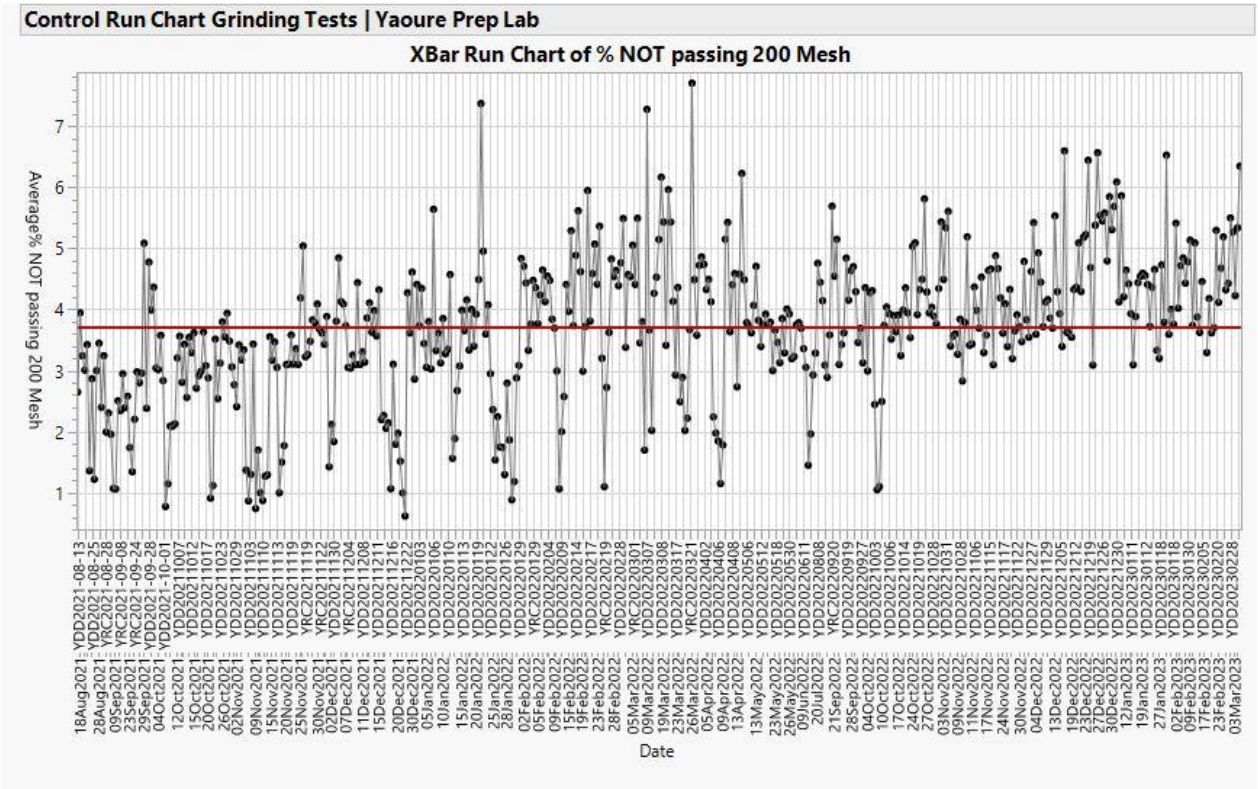


Figure 11-25: Size fraction analysis not passing 75 µm over time

11.3.2.5 Umpire Assays

Umpire assaying of samples analysed by FA has not been carried out, mainly due to logistic difficulties and the significant delays between reception of primary results, the return of pulps from laboratories in Ghana and Burkina Faso, and the selection and submission of selected pulps again outside the country for umpire assaying.

In mid-2023, 20% of all mineralised samples (Au >1 g/t), originally assayed by CPA at MSA in Yamoussoukro, were selected to be submitted to Intertek Tarkwa, who operate the same device, for umpire assaying to test the accuracy and repeatability of the principal CPA. A total of 345 samples were analysed by Intertek.

Comparison of Intertek and MSA CPA results shows excellent repeatability of the assays. Plots for Q-Q and HARD performance confirm the absence of any bias across the entire grade range and excellent precision of the two instruments (Figure 11-26).

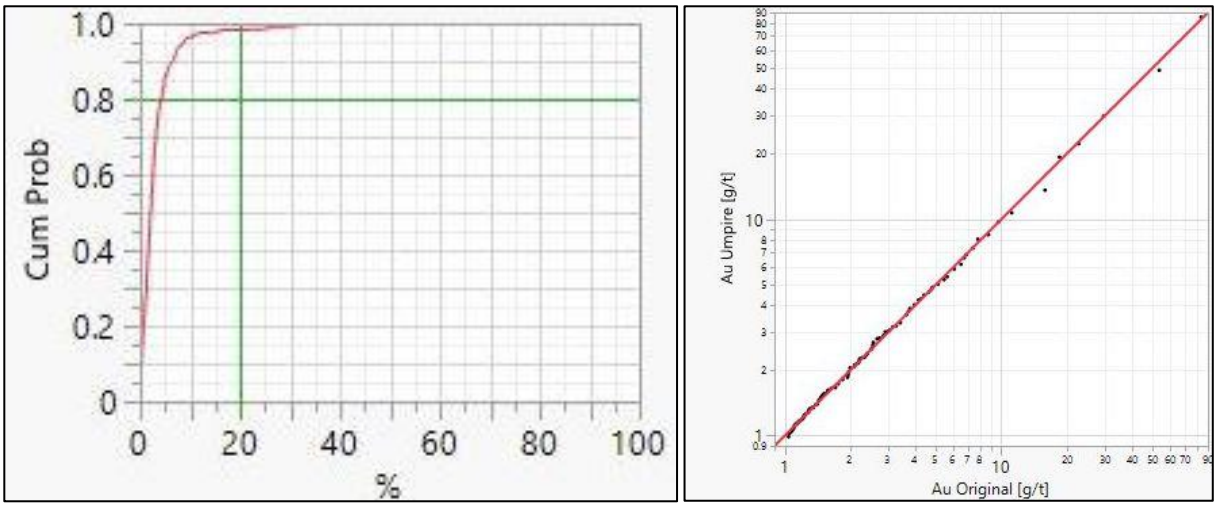


Figure 11-26: HARD plot (left) and Q-Q plot (right) for MSA CPA vs. Intertek CPA

11.4 Assay Methods

All RC and core samples that inform the Mineral Resource estimate were assayed for gold (only) using either 50 g FA with aqua regia digest and AAS finish, or via CPA. The FA method is regarded as a total extraction technique, while CPA is a non-destructive total analysis.

CPA uses high-energy, high-power X-rays to activate gold atoms inside large samples with a typical mass of 500 g. Samples are placed into sealed, barcoded plastic jars in which they remain throughout the analysis process. Gamma-rays of characteristic energy emitted by the activated gold are measured and counted to estimate the gold content of the sample. The method takes 2-3 minutes to complete, is non-destructive and fully automated. The high energies of the source X-rays and activation gamma-rays make them highly penetrating, meaning that the entire sample mass is analysed (Chrysos Corporation, 2020).

In demonstration of CPA as an appropriate analysis method for gold mineralisation, Chrysos, the commercial vendor of the technology developed by the Australian national science agency Commonwealth Scientific and Industrial Research Organisation (CSIRO), completed a range of assessments. These were aimed to demonstrate comparable results to traditional FA methods. In total over 12,000 paired analyses were completed on mineral samples sourced from Australian and international operations on approximately 2,000 separate materials (Chrysos Corporation, 2020). These results demonstrated that CPA analysis of drill core, RC drilling, and coarse reject materials

crushed to a top size of 2-3 mm are strongly correlated with those obtained using FA. Statistical tests suggest that the two analysis techniques can be used interchangeably during a drilling program (Chrysos Corporation, 2020).

11.5 Chain of Custody and Security

The chain-of-custody for Perseus samples collected and shipped from site was as follows:

- RC samples are riffle split in the field to create sub-samples for assay. The sub-samples are packed into large polyweave bags in the field and the numbers recorded. The batches are stored in the secure site compound prior to processing through the Yaouré sample preparation facility or shipment to a commercial assay laboratory.
- Core is transported to the secure compound by Perseus geologists and field technicians.
- Core samples are placed in the core logging area of the exploration compound where the sample intervals are marked, recoveries are measured, and core is photographed and logged. Sampling takes place in the compound using diamond core saws.
- Half core samples are placed in plastic sample bags with a sample tag; the tops of the bags are folded over several times and stapled shut. Bags are then combined in numerical sequence in large bags and moved to the Yaouré sample preparation facility or packed for transport to a commercial laboratory.
- Kraft paper packets containing pulps from samples prepared at Yaouré are packed into custom cardboard boxes and securely wrapped prior to transport to commercial assay laboratories.
- A sample submission form accompanies each shipment of pulps or RC or core which is transported to a commercial assay laboratory.
- Samples are generally transported to Yamoussoukro by Perseus personnel, at which point they were handed over to representatives of the destination commercial laboratory. Perseus notified the intended recipient laboratory prior to each shipment going out.
- Digital assay reports and electronic certificates are emailed by the laboratories to a pre-set list of Perseus recipients.

The QP is of the opinion that sample security is not a significant risk to the reliability of Mineral Resource estimates at Yaouré.

11.6 QAQC Conclusions

Perseus, as well as the principal laboratories that have been used for analytical services (Intertek Tarkwa, ALS Ouagadougou, MSA Yamoussoukro, BVML and SGS Tarkwa) have well established QAQC protocols along the entire sample chain. The protocols are considered in line with industry best practice.

Review of the QAQC data from the drilling at Yaouré demonstrates the protocols have been implemented and adhered to, and that any quality issue has been addressed in a timely manner by consequent re-assaying of all sequences that returned potentially unreliable results, as highlighted by the submitted control samples.

It is the opinion of the QP that the sample preparation, security, analytical procedures, and drill assay data is therefore of sufficient quality to support reporting of Mineral Resources.

12 Data Verification

12.1 Summary

Verification checks undertaken by the QP to confirm the validity of the Yaouré drilling database compiled for the current study include the following:

- Checking for internal consistency between and within database tables
- Comparison of assay values between nearby holes
- Comparisons between assay results from different sampling phases
- Spot check comparisons between database entries and original field sampling record
- comparison of assay entries with laboratory source files
- Checks that surveyed locations of drill hole collars are within tolerance of proposed locations and locations recorded on field logging sheets
- Sense checks of down-hole surveys
- Checks for missing sample intervals, overlapping sample intervals and duplicate sample numbers
- Comparisons of gold assays to visually logged intervals of alteration and mineralisation
- Visual comparisons, in cross-section and plan views, of gold grades and logged geology in neighbouring drill holes.

These checks were undertaken using the compiled acQuire database implemented by Perseus. The QP's database checks showed no significant inconsistencies. The available information indicates that the drilling database has been carefully compiled and validated, and in the QP's opinion forms an appropriately reliable basis for resource estimation.

12.2 Cluff Gold West Africa and BRGM Drilling

No original sampling records or laboratory source files are available for Cluff Gold West Africa or BRGM drilling. Direct database checks were limited to consistency checks between, and within, database tables which showed no significant inconsistencies.

With the exception of a small number of anomalous intervals excluded from resource estimates, comparison of assay results from Cluff Gold West Africa and BRGM drilling with nearby drilling from other phases, including nearest neighbour comparisons of composited gold grades, showed no significant anomalies. These comparisons support the general reliability of BRGM and Cluff Gold West Africa data.

12.3 Amara Drilling

Consistency checks between and within database tables for Amara's RC and diamond drilling showed no significant inconsistencies.

In September 2022, original field sampling sheets were compared to database entries for selected Amara RC and diamond drilling. Initially, sample records for every approximately tenth hole were checked, with additional checking concentrating on sequences of holes or sampling groups where minor inconsistencies were noted.

The sampling sheet checks included 9,543 intervals from 33 diamond and 11 RC holes and 428 auger samples. These checks, which represent around 7% of Amara resource area RC and diamond sampling, showed no significant inconsistencies. Minor inconsistencies noted by the review include the following:

- The database excluded 132 field coarse or pulp duplicates for sequences of drill holes
- The database excluded 24 triplicate samples (second duplicates)
- For seven end of hole samples, database depth entries slightly differed from hard copy records. These inconsistencies mostly reflected rounding, and affected assay, collar and geological tables.

Review of down-hole survey entries against hard copy records for around 10% of Amara RC and diamond holes was completed. Virtually all of these records had incorrect survey method entries, and 24 inconsistent azimuth or dip entries were noted. These were subsequently corrected.

For 112,722 sample intervals, which represent 74% of the Amara resource RC and diamond sampling, comparisons of the database assay entries with laboratory source files were completed. For 99.8% of checked samples, database entries matched source file records. The small proportion of inconsistencies appear to reflect the database including portions of assay batches repeated due to, for example, failed reference standards which were either not included in the supplied files, or not correctly merged for the database checks. For these samples, the differences in gold grades between database entries and source files are generally small and these inconsistencies do not impact general database confidence.

12.4 Perseus Drilling

Consistency checks between, and within, database tables for Perseus's AC, RC and diamond drilling showed no significant inconsistencies in the database used for the current estimates.

Sample intervals representing 95% of Perseus RC and diamond drilling, compared with database assay entries with laboratory source files.

For 99.4% of checked samples, database entries match source file records. The small proportion of inconsistencies reflect repeated portions of assay batches, for which results were not included in the supplied files, or those not correctly merged prior to the database checks. For these samples, the differences in gold grades between database entries and source files are generally small and these inconsistencies do not impact general database confidence.

13 Mineral Processing and Metallurgical Testing

The Yaouré Plant has been in operation since late November 2020 with feed coming from select historical heap leach stockpiles, CMA pit, Govisou pit and ROMSE (deposit to the southeast of the run-of-mine pad). It has a nameplate capacity of 3.8 Mt/a on soft ores and 3.3 Mt/a on the design CMA fresh ore and adopts a conventional flow sheet consisting of primary crushing, SAG and ball milling with pebble crushing (SABC), gravity recovery and hybrid carbon-in-leach (CIL) cyanidation. Since commissioning to the end of June 2023, the plant has treated a total of 9.4 Mt of ore at an average grade of 2.26 g/t to yield 634 koz of gold at an average recovery of 92.7%.

This section of the report summarises metallurgical test work and predicted metallurgical performance of Yaouré Gold Mine by deposit. Section 13.1 summarises historical metallurgical test work programs conducted before the 2017-2018 DFS test work programs (the 2017-2018 DFS Programs). Section 13.2 to Section 13.5 summarises the 2017-2018 DFS Programs on the CMA and Yaouré open pit deposits, including some re-interpretation of metallurgical data and reclassification of metallurgical samples based on 2023 geological re-interpretations of deposits, particularly for the Yaouré pit. Section 13.6 to Section 13.9 summarises metallurgical test work programs conducted on other Yaouré Gold Mine deposits after the 2017-2018 DFS programs. Section 13.10 summarises predicted metallurgical performance for Yaouré Gold Mine deposits, based on both metallurgical test work and plant operating data.

13.1 Historical Metallurgical Test Work

The metallurgy of CMA and Yaouré mineralisation has been examined in five historical test work programs before the 2017-2018 DFS Programs. These metallurgical investigations were commissioned by Cluff Gold West Africa and Amara, with four test work programs having been conducted by SGS Mineral Services UK Ltd (SGS) in 2012 and 2013 (SGS Mineral Services UK Ltd, 2012a); (SGS Mineral Services UK Ltd, 2012b); (SGS Mineral Services UK Ltd, 2013a); (SGS Mineral Services UK Ltd, 2013b) and the fifth program conducted in 2014 by Wardell Armstrong International (WAI) in the United Kingdom (Wardell Armstrong, 2015).

The metallurgical test work programs conducted by SGS ran between January 2012 and November 2013. The SGS programs determined the following:

- Whole ore cyanide leaching at a grind size P_{80} of 75 µm or P_{80} of 106 µm generally achieved gold extractions exceeding 90% with moderate cyanide consumption.
- Gold extraction was observed to improve with fineness of grind, with the incremental benefit starting to taper off at grind sizes finer than P_{80} of 106 µm.
- Overall gold extraction, as well as extraction kinetics, improved with air addition.
- Extended leaching tests showed a peak extraction around 24 h with falling extraction to 48 h. Repeat testing with activated carbon did not achieve higher leach extractions suggesting that preg-robbing was not an issue, but no satisfactory explanation was provided for this trend.
- Diagnostic leach test work indicated that most of the gold that was not recoverable by cyanidation was associated with sulfide minerals.
- Gravity concentration was able to recover approximately 15% to 30% of the gold into a concentrate, with the best gravity recovery obtained across a range of tests in size fractions between 45 µm and 250 µm. The combined extraction from leaching the concentrate and tailing was no greater than whole ore leaching.

- Similarly, flotation achieved good recovery on some samples, but the combined flotation and leach extraction was lower than that achieved by whole ore leaching. Flotation response between samples was variable.
- BWi of two samples tested were 13.9 kWh/t and 14.8 kWh/t at a closing screen size of 106 µm, close to the median value of SGS tests. The samples tested are characterised as medium hard to hard, as per the ore hardness characterisation in Table 13-8.
- RWi of a single Yaouré sample tested was 26.3 kWh/t at a closing screen of 1,180 µm. This ranked the Yaouré material tested as among the hardest of all rocks tested by SGS, and as per the ore hardness characterisation in Table 13-8, the sample is characterised as very hard.
- Abrasion index of a single sample tested, using the method developed by Allis-Chalmers, was determined to be 0.1816 lb/kWh. This is an average result when compared to the SGS database.

The main results from the WAI program were as follows:

- Gold head grades for composite samples ranged between 1.23 g/t and 3.96 g/t.
- Silver is not present in economic quantity.
- No deleterious elements were noted in assays performed.
    - The organic carbon content was 0.03% for the oxide composite, and 0.01% or 0.02% for transition and fresh ore composites. This indicates that the composites tested are unlikely to exhibit preg-robbing behaviour.
    - Low assay values across the data set for arsenic, copper, lead and zinc.
- The sulfide sulfur assay data set indicates that sulfide minerals are present in the transition and fresh ore composites. Mineralogical analysis performed on the transition and fresh ore composites confirms the dominant sulfide mineral is pyrite, with minor traces of pyrrhotite and chalcopyrite. No arsenopyrite was detected during the mineralogical analysis.
- Gold tellurides were not observed in any sample, but silver telluride minerals were noted in the Yaouré fresh ore composites.
- Gold was noted to be associated predominantly with pyrite, but also with quartz, chlorites and silicates.
- Across transition and fresh ore composites, the majority of gold not recoverable by cyanidation was associated with sulfide minerals. For the oxide composite, the majority of gold not recoverable by cyanidation was associated with silicates.
- Analysis identified key gangue mineralogy as quartz, feldspar, mica, chlorites and carbonates.
- SMC Tests®, characterising ore competency results as per Table 13-6, indicated that:
    - The transition ore composite is moderately competent to competent, with A×b of 38.0.
    - The CMA fresh ore composites are very competent, with A×b of 28.0 and 29.2.
    - The Yaouré fresh ore composites are very competent, with A×b of 19.6 and 21.6.
- BWi tests, conducted at a closing screen size of 106 µm, and characterising ore hardness results as per Table 13-8, indicated that:
    - The oxide ore composite is very soft, with a BWi of 6.2 kWh/t.

  - The transition ore composite is medium hard, with a BWi of 9.9 kWh/t.
  - The CMA fresh ore composites are medium hard, with BWi values of 12.4 kWh/t and 12.7 kWh/t.
  - The Yaouré fresh ore composites are hard, with BWi values of 15.6 kWh/t and 17.7 kWh/t.
- RWi tests, conducted at a closing screen size of 1,180 µm, and characterising ore hardness results as per Table 13-8, indicated that:
  - The oxide ore composite is very soft, with a RWi of 6.3 kWh/t.
  - The transition ore composite is medium hard, with a RWi of 12.0 kWh/t.
  - The CMA fresh ore composites are hard, with RWi values of 15.1 kWh/t and 15.5 kWh/t.
  - The Yaouré fresh ore composites are hard, with RWi values of 18.7 kWh/t and 19.0 kWh/t.
- Ai, characterised as per Table 13-11, indicated that the oxide ore composite was non-abrasive and the transition and fresh ore composites were slightly abrasive.
- Gold recovery to a gravity concentrate averaged 45.8% across all domains. Extended gravity recoverable gold (E-GRG) testing indicated that gravity recoverable gold could be up to 53.9%.
- Variability flotation test work on the main domains showed only the CMA fresh ore composites achieved gold recoveries above 90%. The other composites tested achieved gold recoveries less than the whole of ore cyanide leach extraction.
- Cyanide gold leach extractions were highest at a grind size P_{80} of 75 µm, with extractions of between 90 and 93% across all domains. Oxygen addition was beneficial kinetically and to overall gold extraction. Air addition was beneficial kinetically but achieved similar final extractions to standard bottle roll tests. Cyanide consumption ranged from 0.2 kg/t NaCN for fresh ore samples to over 2 kg/t NaCN for oxide samples. Most of the cyanide leach tests had cyanide added during the test to maintain cyanide concentration.
- Thickening test work determined that a unit area of 1.23 m^2/(t/h) was required for the oxide composite and 0.10 m^2/(t/h) for the sulfide composite.

13.2 CMA Pit Fresh Ore Test Work

The CMA deposit, specifically fresh ore mineable within an economic open pit shell, was the subject of the 2017-2018 DFS Programs. To date, the CMA pit (as shown in plan view in Figure 16-1) has been the primary source of both ore tonnes and gold ounces to the Yaouré process plant.

Samples of fresh ore from within the CMA pit shell were tested to determine:

- the most suitable processing route.
- the plant operating parameters for CMA pit fresh ore for the determined processing route, specifically throughput rate, gold recovery and reagent consumption.
- engineering design data required for plant and TSF design.

The program was completed by ALS Metallurgy in Perth, Western Australia (ALS, 2017); (ALS, 2018) and Knight Piésold in Perth (Knight Piésold, 2017a); (Knight Piésold, 2017b), and included the following:

- comminution tests (SMC Test®, BWi and Ai on seven comminution variability samples and one master composite; and RWi on three comminution variability samples)
- ore type master composite test work program on a single CMA Pit Fresh Ore Master Composite:
    - gold extraction test work to assess gravity and leaching characteristics across a range of process conditions, leading to selection of an optimised extraction flowsheet and process conditions
    - mineralogical investigation and multi-stage diagnostic leach to gain understanding of gold deportment, as well as ore and gangue mineralogy
    - cyanide detoxification test work
    - determination of parameters necessary for process plant and TSF design and operation (carbon adsorption kinetics, oxygen uptake rate, viscosity, thickening and settling rate, tailings geochemistry)
- gravity/cyanidation tests under optimised process conditions on 36 fresh ore metallurgical variability samples
- multi-stage diagnostic leach tests on three fresh ore metallurgical variability samples.

13.2.1 Samples Selected

One fresh ore master composite sample, seven comminution variability samples, and 36 metallurgical variability samples were selected from core and RC drill sample rejects taken from 42 drill holes spread evenly across fresh ore within the 2017 preliminary CMA pit shell to provide spatial representivity. Samples were taken from the non-oxidised profile over an approximate range of:

- 238 m east to west
- 904 m north to south
- 160 m in RL.

The location of the CMA Fresh Ore Master Composite sample intervals within the deposit are shown as green dots in Figure 13-1 and Figure 13-2. The location of the comminution variability sample intervals (red dots) and metallurgical variability sample intervals (blue dots) are shown in Figure 13-3 and Figure 13-4.

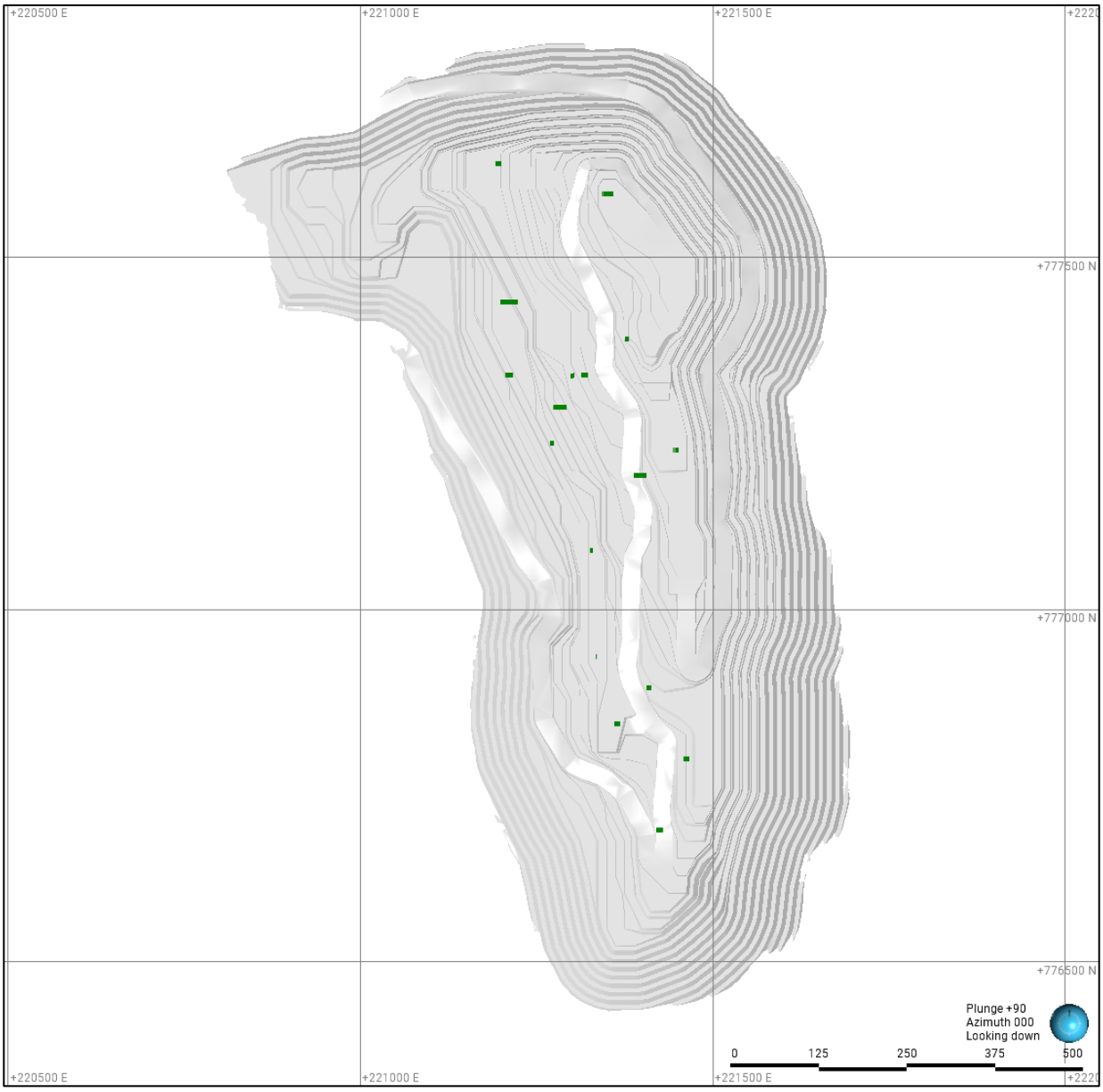


Figure 13-1: Location of CMA Pit Fresh Ore Master Composite samples within the CMA deposit, plan view (Perseus, 2023)

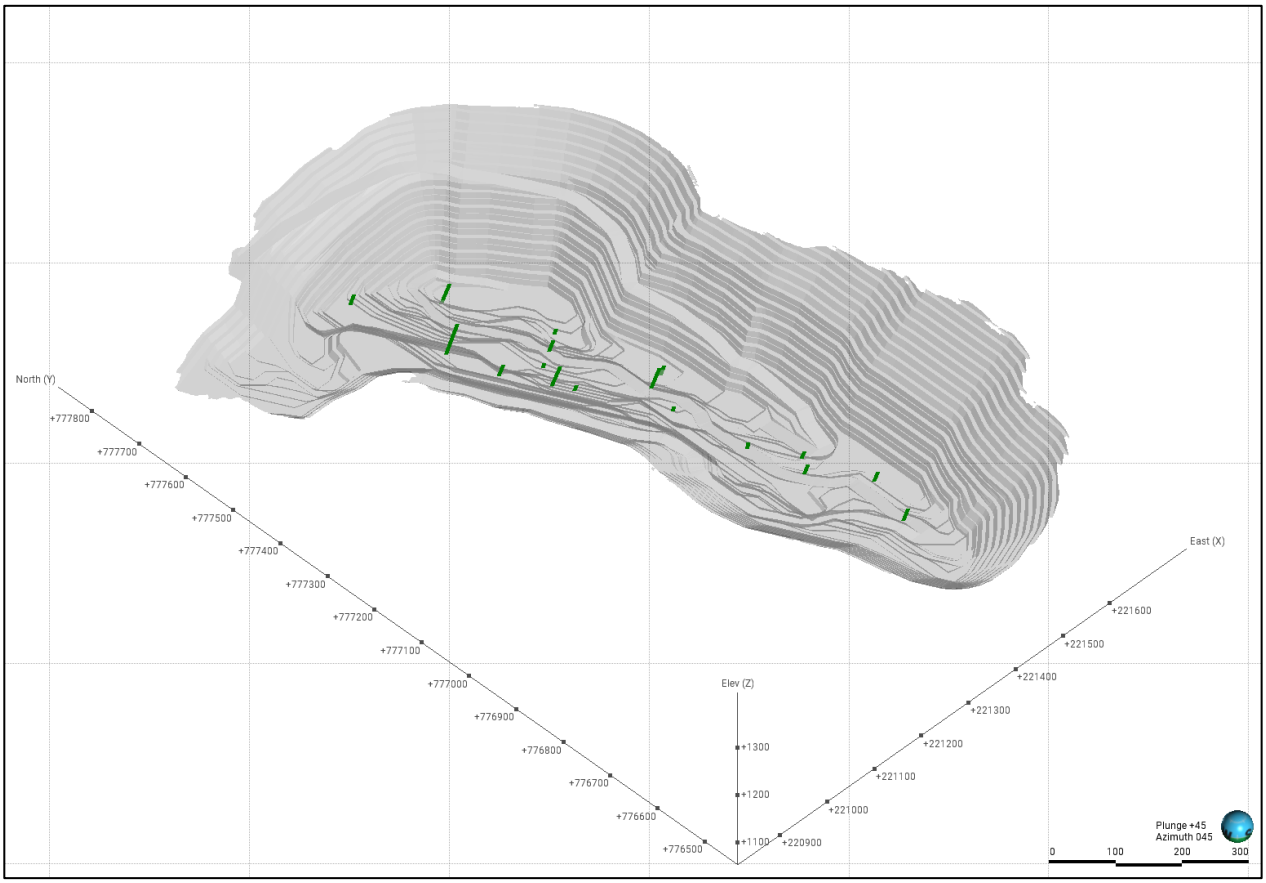


Figure 13-2: Location of CMA Pit Fresh Ore Master Composite samples within the CMA deposit, perspective view looking northeast (Perseus, 2023)

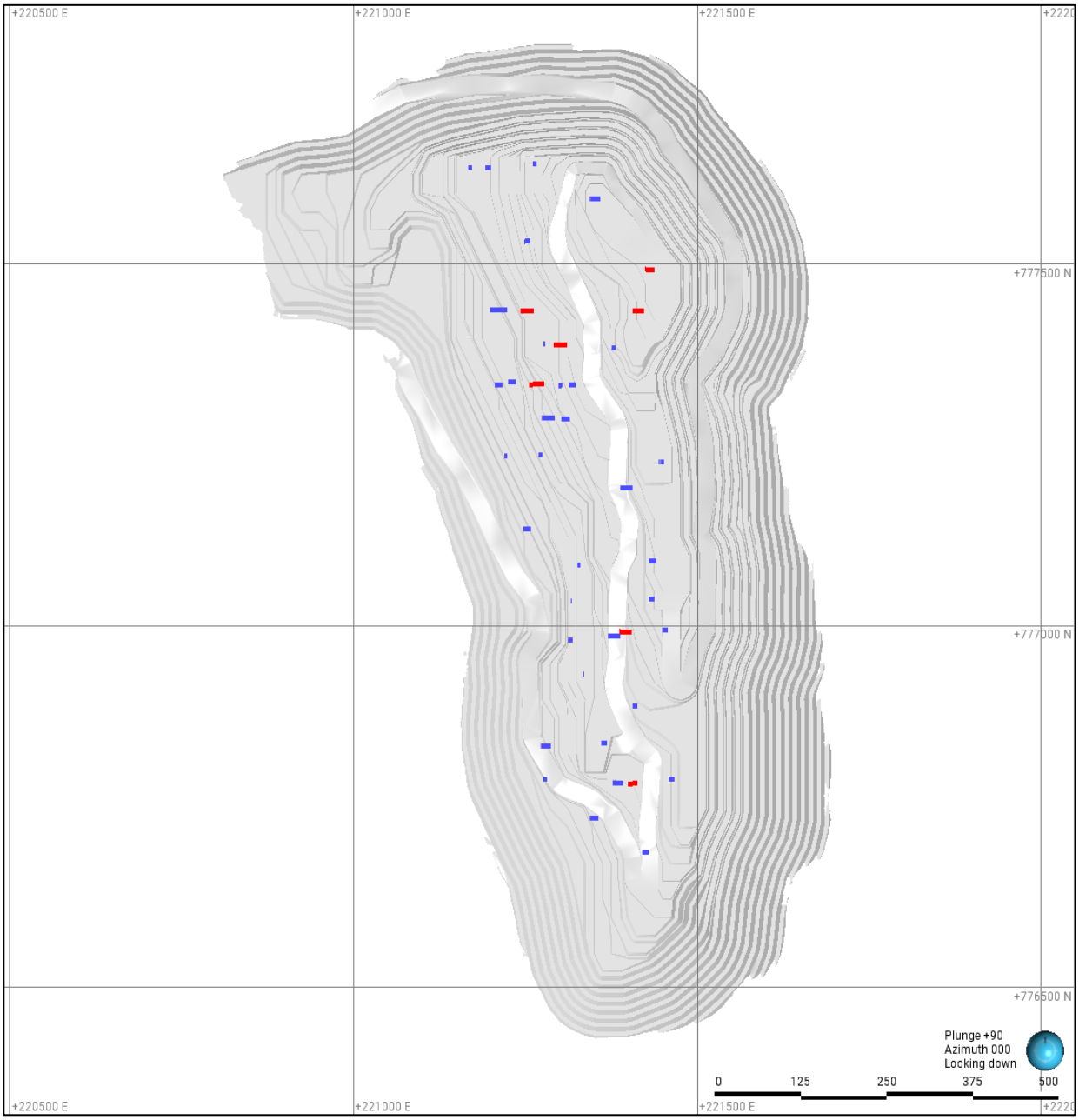


Figure 13-3: Location of fresh ore comminution and metallurgical variability samples within the CMA deposit, plan view (Perseus, 2023)

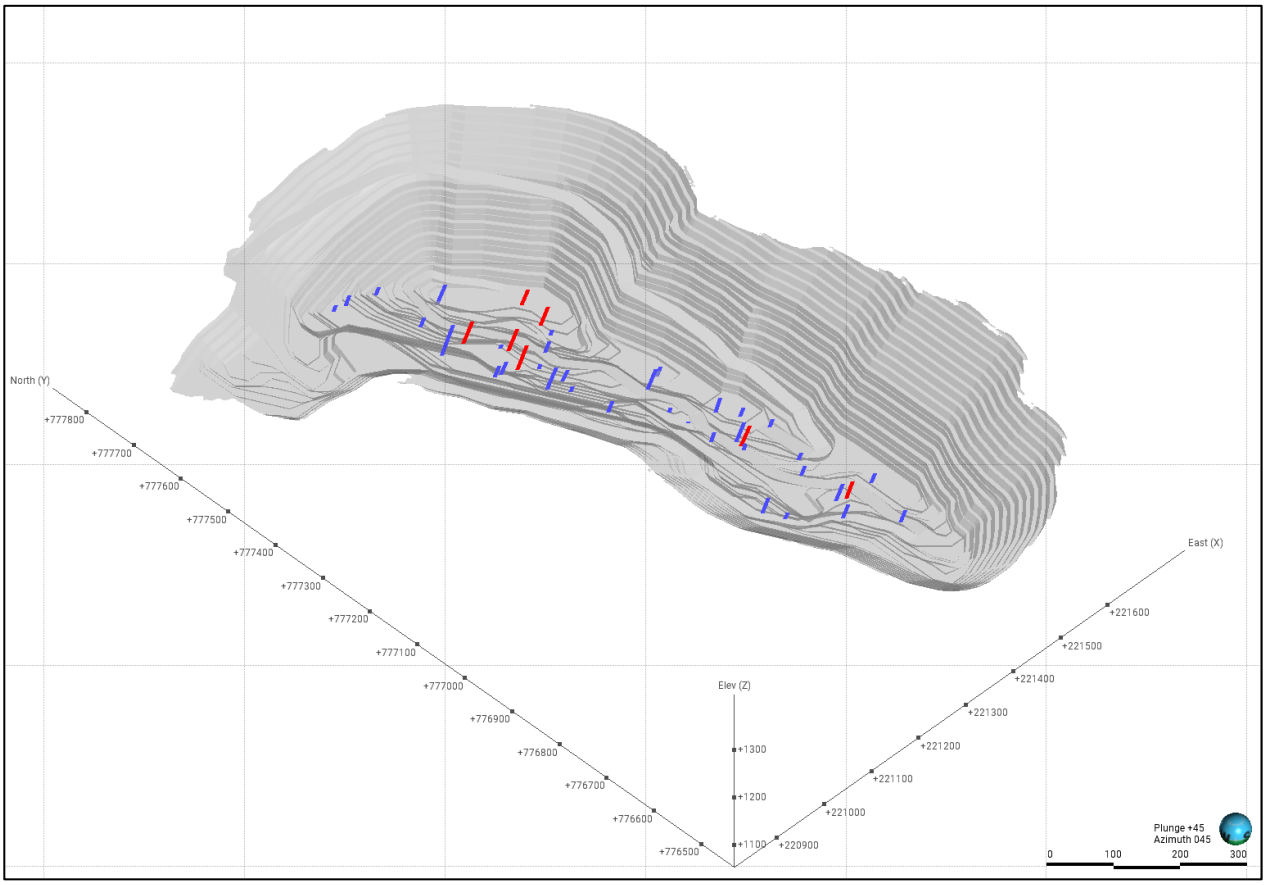


Figure 13-4: Location of fresh ore comminution and metallurgical variability samples within the CMA deposit, perspective view looking northeast (Perseus, 2023)

13.2.1.1 Comminution Variability Samples

Eight CMA fresh ore comminution samples (seven variability samples and one master composite sample) were selected from drill core. The comminution samples represent basalt ore, the dominant lithology of the CMA deposit. Sample origins for the seven variability samples are shown in Table 13-1. Sample origins and masses used to generate the CMA Pit Fresh Ore Master Composite Sample are shown in Table 13-2 in Section 13.2.1.2.

Table 13-1: CMA pit fresh ore variability samples for comminution testing

SAMPLE	DRILL HOLE	FROM (m)	TO (m)
COMM-1	YDD0256	116	145
COMM-2	YDD0068	102.88	141.02
COMM-3	YDD0345	182	215
COMM-4	YDD0079	198	225
COMM-5	YDD0278	77	115
COMM-6	YDD0348	97	139
COMM-7	YDD0149	160	197

13.2.1.2 Metallurgical Composite Sample

A single CMA Pit Fresh Ore Master Composite was formulated for comminution, metallurgical optimisation, and engineering definition test work. Table 13-2 details the sub-sample origins and masses used to generate the CMA Pit Fresh Ore Master Composite.

Table 13-2: CMA Pit Fresh Ore Master Composite recipe

SAMPLE	DRILL HOLE	FROM (m)	TO (m)	MASS TO COMPOSITE (kg)
CMA Pit Fresh Ore Master Composite	YDD034	162	190	12.9
	YDD0055	126.62	136.54	2.9
	YDD0056	122.85	143.73	12.3
	YDD0061	105.8	114.83	2.9
	YDD0065	87.92	104.6	10.8
	YDD0131	141	154	12.0
	YDD0134	160	169	8.8
	YDD0141	148	184	38.9
	YDD0142	202	237	24.5
	YDD0157	153	171	17.5
	YDD0251	108	128	9.5
	YDD0251	147	157	5.3
	YDD0263G	74	85	4.7
	YDD0309	136	172	17.3
	YDD0353	96	117	10.2
	YDD0357	123	140	3.9
	YDD0366	62	116	35.4
	YDD0389	192	209	8.9

13.2.1.3 Metallurgical Variability Samples

Thirty-six metallurgical variability samples representing CMA fresh ore were selected for test work at optimised flowsheet conditions. Sample origins are shown in Table 13-3.

Table 13-3: CMA pit fresh ore metallurgical variability samples

SAMPLE	DRILL HOLE	FROM (m)	TO (m)
CMA-VAR-11	YDD0056	122.85	143.73
CMA-VAR-12	YDD0157	153	171
CMA-VAR-13	YDD0065	87.92	104.6
CMA-VAR-14	YDD0131	141	154
CMA-VAR-15	YDD0263G	74	85
CMA-VAR-16	YDD0061	105.8	114.83
CMA-VAR-17	YDD0055	126.62	136.54
CMA-VAR-18	YDD0309	136	172
CMA-VAR-19	YDD0353	96	117
CMA-VAR-20	YDD0251	108	128
CMA-VAR-21	YDD0366	62	116
CMA-VAR-22	YDD0389	192	209
CMA-VAR-23	YDD0251	147	157
CMA-VAR-24	YDD0134	160	169
CMA-VAR-25	YDD034	162	190
CMA-VAR-26	YDD0357	123	140
CMA-VAR-27	YDD0141	148	184
CMA-VAR-28	YDD0142	202	237
CMA-VAR-29	YDD0490	119.39	127
CMA-VAR-30	YRC0927D	142	159
CMA-VAR-31	YRC0961D	124	135
CMA-VAR-32	YRC0924D	184	198
CMA-VAR-33	YRC0842D	76	85
CMA-VAR-34	YDD0491	152	172
CMA-VAR-35	YRC0952D	109.45	131
CMA-VAR-36	YRC0971D	196	221
CMA-VAR-37	YRC0836D	67	87
CMA-VAR-38	YRC0969D	188	203
CMA-VAR-39	YRC0848D	92.87	97.35
CMA-VAR-40	YRC0970D	182	198
CMA-VAR-41	YRC0851D	76	88.6
CMA-VAR-42	YRC0893D	82	99
CMA-VAR-43	YRC0947D	137	172.25
CMA-VAR-44	YDD0474	105	134.5
CMA-VAR-45	YDD0470	72	97
CMA-VAR-46	YDD0472	83	110

13.2.2 Head Grade and Specific Gravity

Each metallurgical variability sample and composite was subjected to duplicate head assays for gold by standard FA, assays for a further 34 analytes, and true specific gravity determination. A summary of select assay results is shown in Table 13-4.

Table 13-4: Head assay (select analytes) for CMA Pit Fresh Ore Master Composite and variability samples

SAMPLE	Au (g/t)	Ag (g/t)	As (ppm)	Corganic (%)	Hg (ppm)	Ssulfide (%)	Sb (ppm)
CMA-VAR-11	1.29/1.84	0.3	50	0.06	<0.1	0.76	0.2
CMA-VAR-12	1.98/2.06	0.6	30	<0.03	0.1	0.88	0.4
CMA-VAR-13	1.13/1.59	0.6	20	0.03	0.1	0.24	0.3
CMA-VAR-14	1.62/3.18	0.6	<10	<0.03	0.2	0.78	0.4
CMA-VAR-15	1.49/1.52	0.6	20	<0.03	0.2	0.22	0.4
CMA-VAR-16	1.84/2.55	0.6	<10	<0.03	0.2	0.78	0.3
CMA-VAR-17	2.41/2.71	0.6	<10	0.03	0.3	0.56	0.3
CMA-VAR-18	2.24/2.80	0.6	<10	0.03	0.1	0.74	0.4
CMA-VAR-19	2.70/1.86	0.6	<10	<0.03	0.1	0.58	0.8
CMA-VAR-20	1.56/1.73	0.6	<10	<0.03	0.1	0.66	0.4
CMA-VAR-21	1.87/1.41	0.6	10	0.06	0.3	0.22	0.5
CMA-VAR-22	1.61/1.42	0.6	10	<0.03	0.2	0.52	0.5
CMA-VAR-23	1.21/1.33	0.3	<10	<0.03	<0.1	0.40	0.7
CMA-VAR-24	1.91/1.62	0.6	<10	<0.03	0.2	0.70	0.5
CMA-VAR-25	1.58/1.17	0.6	<10	<0.03	0.2	0.28	0.7
CMA-VAR-26	3.54/3.52	0.3	<10	0.03	1.9	0.58	0.4
CMA-VAR-27	1.49/1.36	0.6	<10	<0.03	0.5	0.56	0.4
CMA-VAR-28	2.88/3.18	0.6	<10	<0.03	0.2	0.70	0.4
CMA-VAR-29	1.13/1.42	1.5	<10	0.06	0.2	0.26	0.3
CMA-VAR-30	1.46/1.28	1.8	<10	<0.03	0.5	0.22	0.4
CMA-VAR-31	0.35/0.45	1.2	<10	<0.03	1.0	<0.02	0.3
CMA-VAR-32	4.99/4.84	1.2	<10	<0.03	3.2	0.02	0.6
CMA-VAR-33	1.81/1.85	0.6	<10	<0.03	<0.1	<0.02	0.4
CMA-VAR-34	0.65/0.60	1.5	<10	<0.03	<0.1	<0.02	0.3
CMA-VAR-35	1.97/2.51	0.9	<10	<0.03	<0.1	<0.02	0.5
CMA-VAR-36	1.57/1.35	1.2	20	<0.03	<0.1	<0.02	0.6
CMA-VAR-37	1.30/1.17	0.9	10	<0.03	0.2	0.08	0.6
CMA-VAR-38	2.63/2.14	0.9	<10	<0.03	0.3	0.40	0.4
CMA-VAR-39	2.47/2.65	1.8	20	<0.03	<0.1	0.30	0.7
CMA-VAR-40	2.51/2.52	1.5	10	<0.03	0.3	0.40	0.6
CMA-VAR-41	1.11/1.25	0.6	20	<0.03	0.1	<0.02	0.6
CMA-VAR-42	2.04/1.90	1.8	<10	<0.03	0.3	0.28	0.6
CMA-VAR-43	2.03/3.23	1.5	20	<0.03	<0.1	0.30	0.8
CMA-VAR-44	2.40/4.27	1.5	20	<0.03	0.3	0.48	0.5
CMA-VAR-45	2.81/2.44	1.5	10	<0.03	0.3	0.36	0.4
CMA-VAR-46	2.35/2.60	1.2	20	<0.03	0.1	0.36	0.6
CMA Pit Fresh Ore Master Composite	1.84/2.36	0.6	<10	0.03	0.2	0.52	0.4

From the data:

- The duplicate gold assays were mostly consistent, with some (e.g., CMA-VAR-14, CMA-VAR-19, CMA-VAR-44) exhibiting inconsistency that may be associated with the presence of coarse spotty gold.

- The gold grade of the CMA Pit Fresh Ore Master Composite (average 2.10 g/t Au) approximates the 2023 Mineral Reserves grade for the CMA Pit stated in Table 15-1 (1.81 g/t Au, predominantly being fresh ore).
- Silver is not present in economic quantity.
- The sulfide sulfur assay data set indicates that sulfide minerals are present. Mineralogical analysis performed on the CMA Pit Fresh Ore Master Composite, presented in Section 13.2.5, confirms the dominant sulfide mineral is pyrite (~99% of the mass of sulfide minerals identified). This finding is also supported by low assay values across the data set for arsenic, copper and base metals other than iron.
- Organic carbon values are low, indicating that ore is unlikely to exhibit preg-robbing behaviour.
- Mercury is present in only some samples – health monitoring of gold room personnel is in place to manage residual risk.
- Antimony levels are low, lessening the risk of gold passivation that can occur at high pH.

The true specific gravity (SG) for each metallurgical variability sample and composite is shown in Table 13-5. The average true SG value of the CMA metallurgical variability samples is 2.83, which closely aligns with the CMA Pit Fresh Ore Master Composite true SG value of 2.85.

Table 13-5: True SG for CMA Pit Fresh Ore Master Composite and variability samples

SAMPLE	TRUE SG
CMA-VAR-11	2.88
CMA-VAR-12	2.88
CMA-VAR-13	2.86
CMA-VAR-14	2.89
CMA-VAR-15	2.82
CMA-VAR-16	2.89
CMA-VAR-17	2.86
CMA-VAR-18	2.89
CMA-VAR-19	2.88
CMA-VAR-20	2.90
CMA-VAR-21	2.83
CMA-VAR-22	2.88
CMA-VAR-23	2.89
CMA-VAR-24	2.89
CMA-VAR-25	2.80
CMA-VAR-26	2.88
CMA-VAR-27	2.84
CMA-VAR-28	2.88
CMA-VAR-29	2.09
CMA-VAR-30	2.83
CMA-VAR-31	2.82
CMA-VAR-32	2.87
CMA-VAR-33	2.83
CMA-VAR-34	2.86
CMA-VAR-35	2.85
CMA-VAR-36	2.82
CMA-VAR-37	2.80
CMA-VAR-38	2.80
CMA-VAR-39	2.86
CMA-VAR-40	2.86
CMA-VAR-41	2.78
CMA-VAR-42	2.83
CMA-VAR-43	2.80
CMA-VAR-44	2.85
CMA-VAR-45	2.81
CMA-VAR-46	2.84
CMA Pit Fresh Ore Master Composite	2.85

13.2.3 Comminution

13.2.3.1 SMC Test®

The SMC Test® is used to determine the breakage characteristics of an ore. It provides a number of parameters that can be used to calculate the power requirement of a grinding circuit to treat the ore.

One parameter generated by the test is the A×b parameter. It can be used to classify an ore's competency. The more competent an ore, the more grinding energy is required and the less efficient a SAG mill becomes. Ore competency can be described as shown in Table 13-6 (Lynch, Mainza, & Morrell, 2015).

Table 13-6: Ore competency classification

CLASSIFICATION	A×b
Very low competency	>127
Low competency	67-127
Moderately low competency	56-67
Medium competency	43-56
Moderately competent	38-43
Competent	30-38
Very competent	<30

A standard SMC Test® was conducted on each of the comminution variability samples. The SMC Test® results are summarised in Table 13-7.

Table 13-7: SMC Test® results for CMA Pit Fresh Ore Master Composite and comminution variability samples

SAMPLE	DWI (kWh/m³)	A×b	M_{ia} (kWh/t)	M_{ic} (kWh/t)	SG	SCSE (kWh/t)
COMM-1	8.63	32.4	23.0	9.2	2.80	11.17
COMM-2	7.61	36.5	21.0	8.2	2.77	10.47
COMM-3	8.40	33.5	22.5	9.0	2.80	10.99
COMM-4	8.02	34.6	21.8	8.6	2.79	10.79
COMM-5	5.90	47.4	17.0	6.4	2.78	9.28
COMM-6	8.41	33.4	22.5	9.0	2.80	11.01
COMM-7	8.41	33.3	22.6	9.1	2.80	10.96
CMA Pit Fresh Ore Master Composite	7.34	37.8	20.3	7.9	2.79	10.33

The results show CMA pit fresh ore to be between medium competency and competent, with an average A×b of the comminution variability samples being 35.9, which closely aligns to the CMA Pit Fresh Ore Master Composite A×b value of 37.8. These samples are less competent than the CMA fresh ore composite samples tested in historical test work (Section 13.1), that were characterised as very competent, with A×b values of 28.0 and 29.2.

13.2.3.2 Bond Ball Mill Work Index

The grindability or hardness of an ore can be classified by the BWi value according to Table 13-8 (Lynch, Mainza, & Morrell, 2015).

Table 13-8: Ore grindability/hardness classification

CLASSIFICATION	BOND WORK INDEX (kWh/t)
Very soft	<7.0
Soft	7.0-9.0
Medium hard	9.0-14.0
Hard	14.0-20.0
Very hard	>20.0

A standard BWi test was conducted on each of the comminution variability samples. A closing screen of 106 µm was used, to yield a P_{80} of 75 µm. The target grind size P_{80} of 75 µm was determined from the gravity/leach grind size optimisation test work in Section 13.2.4.5. The results are presented in Table 13-9.

Table 13-9: BWi for CMA Pit Fresh Ore Master Composite and comminution variability samples

SAMPLE	BWi (kWh/t)
COMM-1	13.6
COMM-2	12.9
COMM-3	14.2
COMM-4	14.4
COMM-5	10.3
COMM-6	12.9
COMM-7	13.8
CMA Pit Fresh Ore Master Composite	13.5

The results show the CMA pit fresh ores to be medium hard to hard, with an average BWi of the comminution variability samples being 13.2 kWh/t, which closely aligns with the CMA Pit Fresh Ore Master Composite BWi value of 13.5 kWh/t. The characterisation of CMA fresh ores as medium hard to hard aligns with observations from historical test work in Section 13.1.

The relationship of hardness and competency for Yaouré Gold Mine fresh ore deposits and ore types is shown in Figure 13-5, with CMA pit fresh ores shown as yellow squares (CMA Pit data set).

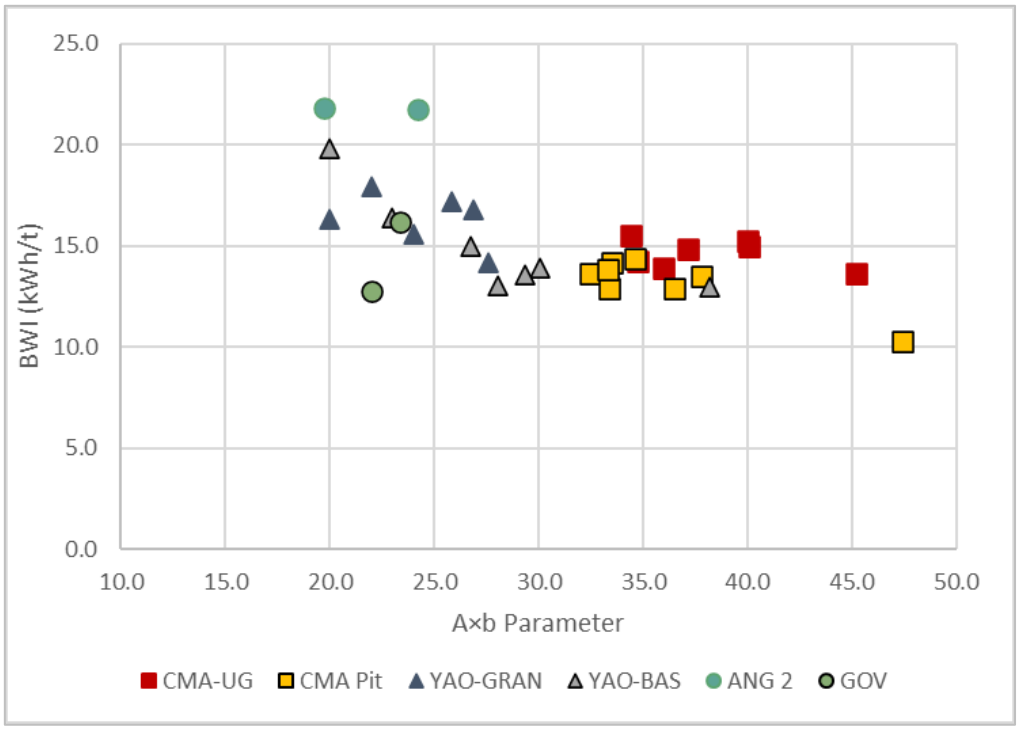


Figure 13-5: Relationship between hardness and competency for Yaouré Gold Mine ore samples tested

From the results, the CMA pit fresh ores are:

- Similar in hardness and competency to the CMA underground ore samples tested (CMA-UG)
- Generally similar in hardness to Yaouré pit basalt (YAO-BAS) ores, but less competent
- Generally softer and less competent than Yaouré pit granodiorite (YAO-GRAN) ores and the Angovia 2 (ANG 2) ores
- Less competent than the Govisou (GOV) ores.

13.2.3.3 Bond Rod Mill Work Index

A standard RWi test was conducted on three comminution variability samples (COMM-2, COMM-6, and COMM-7). A closing screen of 1,180 µm was used. The results are presented in Table 13-10.

Table 13-10: RWi for CMA pit fresh ore comminution variability samples

SAMPLE	RWi (kWh/t)
COMM-2	17.4
COMM-6	18.2
COMM-7	18.5

As per the ore hardness classification in Table 13-8, the test results show the CMA open pit ores to be hard, with an average RWi of the three variability samples tested being 18.1 kWh/t. The average BWi for the same three samples is 13.2 kWh/t. When RWi values are higher than BWi values for the same samples, it is indicative of ores that are more competent (lower A×b values), which was observed for CMA open pit fresh ores in Section 13.2.3.1.

The characterisation of CMA fresh ores as hard, based on RWi, aligns with observations from historical test work in Section 13.1.

13.2.3.4 Bond Abrasion Index

The abrasiveness of an ore can be classified by the Ai value according to Table 13-11 (Metso Outotec, 2023).

Table 13-11: Ore abrasion classification

CLASSIFICATION	Ai (g)
Non-abrasive	<0.1
Slightly abrasive	0.1-0.4
Medium abrasive	0.4-0.6
Abrasive	0.6-0.8
Very abrasive	>0.8

A standard Ai test was conducted on each of the comminution variability samples. The results are presented in Table 13-12.

Table 13-12: Bond abrasion index for CMA Pit Fresh Ore Master Composite and comminution variability samples

SAMPLE	BOND ABRASION INDEX (g)
COMM-1	0.1524
COMM-2	0.1836
COMM-3	0.1049
COMM-4	0.2405
COMM-5	0.1128
COMM-6	0.1359
COMM-7	0.2118
CMA Pit Fresh Ore Master Composite	0.1057

The results show the CMA pit fresh ores to be slightly abrasive, with an average Ai of the comminution variability samples being 0.1631 g. The average Ai of the comminution variability samples is 55% higher than the CMA Pit Fresh Ore Master Composite Ai value of 0.1057 g.

The characterisation of CMA fresh ores as slightly abrasive aligns with observations from historical test work in Section 13.1.

13.2.4 Gravity Recovery and Cyanidation

A series of tests were conducted on the CMA Pit Fresh Ore Master Composite under varying gravity recovery and cyanidation conditions, aimed at selecting and optimising a gold recovery flowsheet for the treatment of Yaouré Project gold bearing ores. The CMA Pit Fresh Ore Master Composite was selected for flowsheet development and optimisation work, given that at the time of the 2017 DFS, the CMA pit was to deliver 67% of tonnes and 79% of contained gold during life of mine.

A summary of test work procedures used for flowsheet development and optimisation test work is included in Section 13.2.4.1 to Section 13.2.4.3. Results from the CMA Pit Fresh Ore Master Composite flowsheet development and optimisation test work are summarised in Section 13.2.4.4 to Section 13.2.4.12. The optimised gravity/leach conditions are collated in Section 13.2.4.13, and these are referred to in gravity recovery and cyanidation test work summaries for other Yaouré Gold Mine orebodies as standard Yaouré gravity/leach test conditions. Results from test work conducted on metallurgical variability samples at standard Yaouré gravity/leach test conditions are summarised in Section 13.2.4.14.

13.2.4.1 Gravity Separation Test Procedures

In general, gravity recovery tests were conducted as follows:

1. The gravity feed sample, prepared to a target P_{80} grind size, was passed through a laboratory KC-MD3 gravity concentrator with a 0.12 kW drive, operating at 1,500 rpm with 3.5 L/min fluidisation flow rate.
2. The gravity concentrate and tail streams were then processed via one of the following processes:
    a. The gravity concentrate was transferred to a leach bottle with a screw-on lid and subjected to mercury amalgamation. 5 g of mercury was added to the bottle, which was placed on a roller for a period of at least 2 h. On completion of the amalgamation, the loaded amalgam was recovered and assayed for gold and silver. The combined gravity/amalgam tail was then processed via the pre-oxygenation procedure (Section 13.2.4.2) or the cyanidation procedure (Section 13.2.4.3).
    b. The gravity concentrate was subjected to an intensive leach at 20% w/w solids with oxygen sparge for a period of 24 h. Sodium hydroxide (NaOH) was added to a concentration of 0.8% w/v, LeachWELL reagent was added to a concentration of 2.0% w/v and sodium cyanide (NaCN) was added to a concentration of 5% w/v. On completion of the intensive leach, the solution was assayed for gold, silver and arsenic. The combined gravity/intensive cyanidation tail was then processed via the cyanidation procedure (Section 13.2.4.3).
    c. The gravity concentrate was subjected to an intensive leach at 20% w/w solids with oxygen sparge for a period of 24 h. Sodium hydroxide (NaOH) was added to a concentration of 0.8% w/v, LeachWELL reagent was added to a concentration of 2.0% w/v and sodium cyanide (NaCN) was added to a concentration of 5% w/v. On completion of the intensive leach, the solution was assayed for gold, silver and arsenic. The combined gravity/intensive leach tail from the first stage was then ground to a finer target P_{80} grind size and subjected to a further 24 h intensive leach under the same conditions. The combined gravity/intensive cyanidation tail from the second stage was then processed via the cyanidation procedure (Section 13.2.4.3).
    d. The gravity concentrate was panned to achieve a reduced mass pull of 0.5%. The pan concentrate was subjected to an intensive leach (as described in Step 2b). The combined gravity/pan/intensive cyanidation tail was then processed via the cyanidation procedure (Section 13.2.4.3).

13.2.4.2 Pre-Oxygenation Test Procedure

One leach test investigated a pre-oxygenation stage (Section 13.2.4.8) before cyanidation. Pre-oxygenation was conducted as follows:

1. The cyanidation feed sample, prepared to a target P_{80} grind size, was transferred into a leach bottle with screw-on lid. Slurry agitation was applied by mechanical rollers.
2. Perth tap water was added to slurrify the sample to establish the target pulp density (% w/w solids).
3. Hydrated lime (60% w/w CaO) was added to the slurry to establish a pH of 10.5.

4. The slurry was sparged with oxygen and agitated for 4 h to complete the pre-oxygenation stage. At regular intervals (0.5, 1, 2, 3 and 4 h), slurry pH and dissolved oxygen (DO) were monitored and recorded.

The direct cyanidation procedure (Section 13.2.4.3) is then followed from Step 4.

13.2.4.3 Cyanidation Test Procedure

In general, cyanidation tests were conducted as follows:

1. The cyanidation feed sample, prepared to a target P_{80} grind size, was transferred into a leach bottle with a screw-on lid. Slurry agitation was applied by mechanical rollers.
2. Perth tap water was added to slurrify the sample to establish the target pulp density (% w/w solids).
3. Hydrated lime (60% w/w CaO) was added to the slurry to establish a pH of approximately 10.5. The slurry was agitated thoroughly for 5 min. The pH of the slurry sample was measured again and, if necessary, more lime was added to achieve a pH of 10.5.
4. Sodium cyanide was added to the slurry to establish the target initial cyanide concentration.
5. The slurry was sparged with oxygen or air to provide an elevated DO content.
6. At regular intervals (2, 4, 8, 16, 24, and 36 h), slurry pH, DO, and sodium cyanide concentration were monitored and recorded. Solution sub-samples were taken and assayed for gold, silver, and arsenic.
7. If required during the test duration, lime and sodium cyanide were added to maintain target levels. pH was maintained >9.8 for all tests.
8. At the conclusion of the test (48 h), the terminal pH, oxygen, and cyanide levels were determined. A solution sub-sample was taken and assayed for gold, silver, and arsenic. The residual slurry sample was filtered, washed, and dried to provide leach residue solids, and a sub-sample of residue solid was assayed for gold, silver, and arsenic.

13.2.4.4 Whole Ore Leach Grind Size Optimisation

CMA Pit Fresh Ore Master Composite was subjected to five tests under the following conditions:

- No gravity separation
- No pre-oxygenation
- Direct cyanidation of the ore sample, as per steps 1 to 8 in Section 13.2.4.3, with the following parameters:
    - Pulp density of 40% w/w solids
    - Oxygen sparging in cyanidation
    - Initial sodium cyanide concentration of 0.10% w/v
    - Grind size was the variable parameter for this test (P_{80} of 106, 90, 75, 63 and 53 µm).

The results from these tests are presented in Table 13-13. Column headers prefixed with WH refer to the individual test numbers from the relevant ALS Metallurgy report.

Table 13-13: Whole ore grind size optimisation test results for CMA Pit Fresh Ore Master Composite

PARAMETER	UNIT	WH7089	WH7090	WH7091	WH7092	WH7093
P_{80} grind size	µm	106	90	75	63	53
Assay head grade (Au)	g/t	2.10	2.10	2.10	2.10	2.10
Calc. head grade (Au)	g/t	2.21	2.60	2.56	2.11	1.81
Gravity recovery	%	-	-	-	-	-
Extraction at time						
2 hours	%	74.5	72.6	82.2	79.8	83.6
4 hours	%	84.5	86.2	90.8	88.9	90.9
8 hours	%	90.3	87.8	91.3	90.2	91.6
16 hours	%	91.0	90.0	91.9	91.6	93.2
24 hours	%	91.0	90.5	92.4	92.2	93.2
36 hours	%	91.0	91.6	93.0	92.2	93.2
48 hours	%	91.0	91.6	93.0	92.9	93.9
Solid residue grade (Au)	g/t	0.20	0.22	0.18	0.15	0.11
NaCN usage	kg/t	0.67	0.67	0.67	0.67	0.67
Lime usage	kg/t	0.50	0.48	0.49	0.49	0.50
Average DO	ppm	32.1	27.8	31.5	35.1	34.3

Key points from the data are:

- Gold leach kinetics are fast, with the bulk of the gold leaching in the first 4-8 h for all tests.
- The CMA Pit Fresh Ore Master Composite is slightly grind sensitive, with a general trend towards lower solid residue grades at finer grind sizes.
- Sodium cyanide and lime consumption rates are low.
- There is generally good correlation between calculated gold head grades and the assayed head grade.

13.2.4.5 Gravity/Leach Grind Size Optimisation

CMA Pit Fresh Ore Master Composite was subjected to five tests under the following conditions:

- Gravity separation at a grind size P_{80} of 850 µm, with gravity concentrate treatment by amalgamation as described in Step 2a of Section 13.2.4.1
- No pre-oxygenation
- Cyanidation of combined gravity/amalgam tail, as per steps 1 to 8 of Section 13.2.4.3, with the following parameters:
    - Pulp density of 40% w/w solids
    - Oxygen sparging in cyanidation
    - Initial sodium cyanide concentration of 0.10% w/v
    - Grind size was the variable parameter for this test (P_{80} of 106, 90, 75, 63 and 53 µm).

The results from these tests are presented in Table 13-14.

Table 13-14: Gravity/grind size optimisation test results for CMA Pit Fresh Ore Master Composite

PARAMETER	UNIT	WH7246	WH7247	WH7248	WH7249	WH7250
P_{80} grind size	µm	850/106	850/90	850/75	850/63	850/53
Assay head grade (Au)	g/t	2.10	2.10	2.10	2.10	2.10
Calc. head grade (Au)	g/t	1.82	1.94	1.94	2.23	2.28
Gravity recovery	%	14.3	10.8	12.1	17.9	16.0
Extraction at time						
2 hours	%	74.9	74.9	74.0	77.4	71.5
4 hours	%	80.6	80.2	77.4	82.0	76.0
8 hours	%	83.4	85.1	81.1	86.8	81.0
16 hours	%	84.9	87.6	86.2	90.0	91.2
24 hours	%	85.3	89.0	88.6	91.2	92.4
36 hours	%	87.5	89.0	90.0	91.8	93.0
48 hours	%	87.9	89.7	90.7	92.4	93.0
Solid residue grade (Au)	g/t	0.22	0.20	0.18	0.17	0.16
NaCN usage	kg/t	0.50	0.47	0.33	0.58	0.54
Lime usage	kg/t	0.87	0.77	0.71	0.75	0.79
Average DO	ppm	29.1	29.2	28.8	29.8	28.1

Key points from the data are:

- Gravity recovery ranges between 10.8% and 17.9%, with an average of 14.2%.
- 48 h gold extractions for gravity/leach tests are comparable to 48 h whole ore cyanidation extractions (Section 13.2.4.4).
- The gold leach kinetics for the combined gravity/amalgam tail were slightly slower than kinetics observed in the whole ore grind size optimisation tests (Section 13.2.4.4), with the bulk of the gold leaching in the first 8-16 h.
- The combined gravity/amalgam tail of the CMA Pit Fresh Ore Master Composite is slightly grind sensitive, with a trend towards lower solid residue grades at finer grind sizes.
- With less gold reporting to cyanidation, sodium cyanide consumption is lower for the gravity/leach grind size optimisation tests compared to the whole ore grind size optimisation tests (Section 13.2.4.4). (Note that this excludes any cyanide consumption that would occur in an intensive cyanidation process at plant scale.)
- Lime consumption is low but was noted to be higher than for the whole ore grind size optimisation tests (Section 13.2.4.4).
- There is generally good correlation between calculated gold head grades and the assayed head grade.

In completing technoeconomic trade-off studies based on the gravity/leach extraction data at varying grind sizes, it was noted that the benefits of grinding to sizes finer than P_{80} of 75 µm are mostly offset by increased capital and operating costs. Based on the technoeconomic evaluation, a grind size P_{80} of 75 µm for cyanidation was selected for future tests.

13.2.4.6 Gravity/Leach Cyanide Dosage Optimisation

CMA Pit Fresh Ore Master Composite was subjected to three tests under the following conditions:

- Gravity separation at a grind size P_{80} of 850 µm, with gravity concentrate treatment by amalgamation as described in Step 2a of Section 13.2.4.1
- No pre-oxygenation
- Cyanidation of combined gravity/amalgam tail, as per steps 1 to 8 in Section 13.2.4.3, with the following parameters:
    - Grind size P_{80} of 75 µm
    - Pulp density of 40% w/w solids
    - Oxygen sparging in cyanidation
    - Cyanide concentration was the variable parameter for this test (initial sodium cyanide concentrations of 0.15% w/v, 0.05% w/v and 0.025% w/v).

The results from these tests are presented in Table 13-15. The result from test WH7248 (from Section 13.2.4.5), at initial sodium cyanide concentration of 0.10% w/v, is also included in Table 13-15 to provide a fourth data point for comparison.

Table 13-15: Gravity/cyanide dosage optimisation test results for CMA Pit Fresh Ore Master Composite

PARAMETER	UNIT	WH7251	WH7248	WH7252	WH7253
P_{80} grind size	µm	850/75	850/75	850/75	850/75
Assay head grade (Au)	g/t	2.10	2.10	2.10	2.10
Calc. head grade (Au)	g/t	1.82	1.94	2.03	2.11
Initial conc. NaCN	%w/v	0.15	0.10	0.05	0.025
Gravity recovery	%	15.4	12.1	18.3	15.4
Extraction at time					
2 hours	%	73.0	74.0	78.6	77.7
4 hours	%	77.9	77.4	81.9	81.8
8 hours	%	82.2	81.1	86.5	85.6
16 hours	%	88.8	86.2	88.6	88.3
24 hours	%	89.2	88.6	90.0	88.9
36 hours	%	89.6	90.0	90.3	90.2
48 hours	%	90.7	90.7	91.6	91.5
Solid residue grade (Au)	g/t	0.17	0.18	0.17	0.18
NaCN usage	kg/t	1.00	0.33	0.29	0.15
Lime usage	kg/t	0.38	0.71	0.87	0.96
Average DO	ppm	30.1	28.8	28.1	31.0

Key points from the data are:

- Gravity recovery range aligns with previous tests (Section 13.2.4.5).

- Cyanidation extraction of the combined gravity/amalgam tail of the CMA Pit Fresh Ore Master Composite is not sensitive to variations in cyanide concentration over the range tested.
- The gold leach kinetics for the combined gravity/amalgam tail were slightly slower than observed in the whole ore grind size optimisation tests (Section 13.2.4.4), with the bulk of the gold leaching in the first 8-16 h.
- There is generally good correlation between calculated gold head grades and the assayed head grade.

An initial sodium cyanide concentration of 0.05% w/v was selected for future tests.

13.2.4.7 Gravity/Leach Slurry Pulp Density Optimisation

CMA Pit Fresh Ore Master Composite was subjected to four tests under the following conditions:

- Gravity separation at a grind size P_{80} of 850 µm, with gravity concentrate treatment by amalgamation as described in Step 2a of Section 13.2.4.1
- No pre-oxygenation
- Cyanidation of combined gravity/amalgam tail, as per steps 1 to 8 in Section 13.2.4.3, with the following parameters:
    - Grind size P_{80} of 75 µm
    - Oxygen sparging in cyanidation
    - Initial sodium cyanide concentration of 0.05% w/v
    - Slurry pulp density was the variable parameter for this test (40% w/w, 45% w/w, 50% w/w, 55% w/w solids).

The results from these tests are presented in Table 13-16. As test WH7438 was conducted under the same conditions as test WH7252 (from Section 13.2.4.6), it has been included in Table 13-16 for comparison.

Table 13-16: Gravity/leach slurry pulp density optimisation test results for CMA Pit Fresh Ore Master Composite

PARAMETER	UNIT	WH7252	WH7438	WH7439	WH7440	WH7441
P_{80} grind size	µm	850/75	850/75	850/75	850/75	850/75
Assay head grade (Au)	g/t	2.10	2.10	2.10	2.10	2.10
Calc. head grade (Au)	g/t	2.03	2.27	2.33	2.18	2.40
Pulp density	% w/w	40	40	45	50	55
Gravity recovery	%	18.3	20.0	15.7	13.1	14.2
Extraction at time						
2 hours	%	78.6	79.5	82.2	72.8	67.4
4 hours	%	81.9	83.4	86.8	76.9	71.6
8 hours	%	86.5	87.2	90.3	81.6	73.6
16 hours	%	88.6	90.3	91.3	86.6	78.1
24 hours	%	90.0	91.5	92.2	88.2	83.3
36 hours	%	90.3	92.1	92.7	90.6	88.3
48 hours	%	91.6	92.1	92.7	91.7	92.1
Solid residue grade (Au)	g/t	0.17	0.18	0.17	0.18	0.19
NaCN usage	kg/t	0.29	0.24	0.20	0.19	0.15
Lime usage	kg/t	0.87	1.11	1.10	1.07	1.17
Average DO	ppm	28.1	28.1	27.0	27.6	27.2

Key points from the data are:

- Results for tests WH7252 and WH7438, performed under the same conditions, align well.
- Gravity recovery range aligns with previous tests (Sections 13.2.4.5 to 13.2.4.6).
- The combined gravity/48 h cyanidation extractions and residues grades are comparable for all leach slurry pulp densities tested.
- Leach kinetics for tests conducted at pulp densities of 50% and 55% w/w solids (WH7440 and WH7441) were noticeably slower than for the tests conducted at 40% and 45% w/w solids.
- There is generally good correlation between calculated gold head grades and the assayed head grade.

It was hypothesised that the lower ratio of solution (at a fixed cyanide concentration) available to react with a fixed mass of ore may be a factor in the slower gold leach kinetics observed at pulp densities of 50% and 55% w/w solids. This was investigated in two additional tests under the following conditions:

- Gravity separation at a grind size P_{80} of 850 µm, with gravity concentrate treatment by amalgamation as described in Step 2a of Section 13.2.4.1
- No pre-oxygenation
- Cyanidation of combined gravity/amalgam tail, as per steps 1 to 8 in Section 13.2.4.3, with the following parameters:
    - Grind size P_{80} of 75 µm

- Pulp density of 50% or 55% w/w solids
- Oxygen sparge
- Sodium cyanide addition rate of 0.75 kg/t.

The results from these tests are presented in Table 13-17. Results from tests WH7440 and WH7441 (initial sodium cyanide concentration of 0.05% w/w) conducted at pulp densities of 50% and 55% w/w solids have been included in Table 13-17 for comparison.

Table 13-17: Additional gravity/leach slurry pulp density optimisation test results for CMA Pit Fresh Ore Master Composite

PARAMETER	UNIT	WH7440	WH7527	WH7441	WH7528
P_{80} grind size	µm	850/75	850/75	850/75	850/75
Assay head grade (Au)	g/t	2.10	2.10	2.10	2.10
Calc. head grade (Au)	g/t	2.18	1.90	2.40	2.19
Pulp density	% w/w	50	50	55	55
Gravity recovery	%	13.1	19.0	14.2	15.3
Extraction at time					
2 hours	%	72.8	79.0	67.4	72.1
4 hours	%	76.9	82.6	71.6	75.4
8 hours	%	81.6	84.6	73.6	77.8
16 hours	%	86.6	87.5	78.1	82.1
24 hours	%	88.2	88.9	83.3	88.2
36 hours	%	90.6	91.6	88.3	90.6
48 hours	%	91.7	91.6	92.1	91.8
Solid residue grade (Au)	g/t	0.18	0.16	0.19	0.18
NaCN addition	kg/t	0.50	0.75	0.41	0.75
NaCN usage	kg/t	0.19	0.20	0.15	0.28
Lime usage	kg/t	1.07	0.93	1.17	0.75
Average DO	ppm	27.6	34.7	27.2	29.7

Key points from the data are:

- The combined gravity/48 h cyanidation extractions and residues grades are comparable for all leach slurry pulp densities and cyanide addition rates tested.
- Leach kinetics for tests conducted at higher cyanide addition rates of 0.75 kg/t (WH7527 and WH7528) were noticeably faster than for the tests conducted at initial sodium cyanide concentration of 0.05% w/w, supporting the hypothesis being tested.
- There is generally good correlation between calculated gold head grades and the assayed head grade.

Leach slurry pulp density of 40% w/w solids was selected for future tests.

13.2.4.8 Gravity/Leach Oxygenation Optimisation

CMA Pit Fresh Ore Master Composite was subjected to four tests under the following conditions:

- Gravity separation at a grind size P_{80} of 850 µm, with gravity concentrate treatment by amalgamation as described in Step 2a of Section 13.2.4.1
- Cyanidation of combined gravity/amalgam tail, as per steps 1 to 8 in Section 13.2.4.3, with the following parameters:
    - Grind size P_{80} of 75 µm
    - Pulp density of 40% w/w solids
    - Initial sodium cyanide concentration of 0.05% w/v
    - Oxygenation was the variable parameter for this test (pre-oxygenation with air sparging in cyanidation, no pre-oxygenation and no air/oxygen sparging in cyanidation, no pre-oxygenation with air sparging in cyanidation, and no pre-oxygenation with oxygen sparging in cyanidation).

The results from these tests are presented in Table 13-18. As test WH7437 was conducted under the same conditions as tests WH7252 and WH7438 (from Sections 13.2.4.6 and 13.2.4.7), they have been included in Table 13-18 for comparison.

Table 13-18: Gravity/oxygenation optimisation test results for CMA Pit Fresh Ore Master Composite

PARAMETER	UNIT	WH7653	WH7435	WH7436	WH7437	WH7252	WH7438
P_{80} grind size	µm	850/75	850/75	850/75	850/75	850/75	850/75
Assay head grade (Au)	g/t	2.10	2.10	2.10	2.10	2.10	2.10
Calc. head grade (Au)	g/t	2.23	2.28	2.56	1.91	2.03	2.27
Pre-oxygenation	-	yes	no	no	no	no	no
Sparge	-	air	none	air	O_2	O_2	O_2
Gravity recovery	%	16.6	12.9	12.9	14.4	18.3	20.0
Extraction at time							
2 hours	%	65.3	60.0	58.6	79.9	78.6	79.5
4 hours	%	75.8	72.6	74.2	82.6	81.9	83.4
8 hours	%	79.3	80.2	83.7	86.7	86.5	87.2
16 hours	%	85.6	84.5	89.2	89.7	88.6	90.3
24 hours	%	88.1	88.1	90.9	90.8	90.0	91.5
36 hours	%	90.5	91.1	91.4	91.1	90.3	92.1
48 hours	%	91.7	91.7	91.4	91.1	91.6	92.1
Solid residue grade (Au)	g/t	0.19	0.19	0.22	0.17	0.17	0.18
NaCN usage	kg/t	0.24	0.25	0.17	0.24	0.29	0.24
Lime usage	kg/t	1.10	1.04	1.13	1.15	0.87	1.11
Average DO	ppm	25.6/7.3	7.7	7.7	27.6	28.1	28.1

Key points from the data are:

- Results for tests WH7437, WH7252 and WH7438, performed under the same conditions, align well.
- Gravity recovery range aligns with previous tests (Sections 13.2.4.5 to 13.2.4.7).

- The combined gravity/48 h cyanidation extractions and residues grades are comparable for all oxygenation regimes tested.
- There does not appear to be any benefit from running a 4 h pre-oxygenation stage.
- When comparing the tests with no pre-oxygenation stage, the tests using oxygen sparging in cyanidation have the fastest leach kinetics. The test using air sparging in cyanidation has slightly faster kinetics than the test with no air/oxygen sparging in cyanidation. This finding concurs with observations from historical test work (Section 13.1).
- There is negligible difference in reagent consumption rates across tests.
- There is generally good correlation between calculated gold head grades and the assayed head grade.

No pre-oxygenation and air sparging during cyanidation were selected for future tests.

13.2.4.9 Gravity/Leach Lead Nitrate Dosage Optimisation

CMA Pit Fresh Ore Master Composite was subjected to three tests under the following conditions:

- Gravity separation at a grind size P_{80} of 850 µm, with gravity concentrate treatment by amalgamation as described in Step 2a of Section 13.2.4.1
- No pre-oxygenation
- Cyanidation of combined gravity/amalgam tail, as per steps 1 to 8 in Section 13.2.4.3, with the following parameters:
    - Grind size P_{80} of 75 µm
    - Pulp density of 40% w/w solids
    - Initial sodium cyanide concentration of 0.05% w/v
    - Air sparging in cyanidation
    - Lead nitrate dosage was the variable parameter for this test (25 g/t, 50 g/t, 100 g/t).

The results from these tests are presented in Table 13-19. Tests WH7436 and WH7648 (Section 13.2.4.10), conducted at the same conditions without the addition of lead nitrate, have been included in Table 13-19 for comparison.

Table 13-19: Gravity/leach lead nitrate optimisation test results for CMA Pit Fresh Ore Master Composite

PARAMETER	UNIT	WH7436	WH7648	WH7650	WH7651	WH7652
P_{80} grind size	µm	850/75	850/75	850/75	850/75	850/75
Assay head grade (Au)	g/t	2.10	2.10	2.10	2.10	2.10
Calc. head grade (Au)	g/t	2.56	2.29	2.21	2.20	2.27
Lead nitrate addition	g/t	0	0	25	50	100
Gravity recovery	%	12.9	15.3	17.4	16.6	16.5
Extraction at time						
2 hours	%	58.6	69.0	72.4	79.5	76.1
4 hours	%	74.2	77.0	75.7	83.8	83.2
8 hours	%	83.7	81.0	77.6	85.5	83.8
16 hours	%	89.2	84.7	82.1	86.1	84.5
24 hours	%	90.9	85.9	84.3	88.0	85.7
36 hours	%	91.4	87.7	88.9	91.1	90.5
48 hours	%	91.4	91.7	90.1	92.3	91.6
Solid residue grade (Au)	g/t	0.22	0.19	0.22	0.17	0.19
NaCN usage	kg/t	0.17	0.22	0.29	0.29	0.29
Lime usage	kg/t	1.13	1.11	0.93	0.95	1.05
Average DO	ppm	7.8	7.6	7.5	7.5	7.4

Key points from the data are:

- Gravity recovery range aligns with previous tests (Sections 13.2.4.5 to 13.2.4.8).
- The combined gravity/48 h cyanidation extractions and residues grades are comparable across all lead nitrate dosages tested.
- There appears to be a marginal benefit to gold leach kinetics at lead nitrate dosages of 50 g/t and 100 g/t, particularly in the first 4 h.
- There is generally good correlation between calculated gold head grades and the assayed head grade.

No lead nitrate dosing was selected for future tests.

13.2.4.10 Master Composite Gravity/Leach and Gravity/CIL at Optimised Conditions

CMA Pit Fresh Ore Master Composite was subjected to a confirmatory test (WH7648) under the following optimised conditions:

- Gravity separation at a grind size P_{80} of 850 µm, with gravity concentrate treatment by amalgamation as described in Step 2a of Section 13.2.4.1
- No pre-oxygenation
- Cyanidation of combined gravity/amalgam tail, as per steps 1 to 8 in Section 13.2.4.3, with the following parameters:
    - Grind size P_{80} of 75 µm
    - Pulp density of 40% w/w solids

- Initial sodium cyanide concentration of 0.05% w/v
- Air sparging in cyanidation.

The results from this test are presented in Table 13-20. Test WH7436 (from Section 13.2.4.8) was conducted under the same conditions as test WH7648 and has been included in Table 13-20 for comparison.

A further test was conducted on the CMA Pit Fresh Ore Master Composite under the conditions listed above with 20 g/L activated carbon added during the cyanidation step, to simulate CIL conditions. The results from this test (WH7649) are also presented in Table 13-20.

Table 13-20: Gravity/leach and gravity/CIL test results at optimised conditions for CMA Pit Fresh Ore Master Composite

PARAMETER	UNIT	WH7648	WH7436	WH7649
P_{80} grind size	µm	850/75	850/75	850/75
Assay head grade (Au)	g/t	2.10	2.10	2.10
Calc. head grade (Au)	g/t	2.29	2.56	3.13
Carbon concentration	g/L	0	0	20
Gravity recovery	%	15.3	12.9	26.2
Extraction at time				
2 hours	%	69.0	58.6	60.0
4 hours	%	77.0	74.2	72.7
8 hours	%	81.0	83.7	76.1
16 hours	%	84.7	89.2	80.8
24 hours	%	85.9	90.9	87.8
36 hours	%	87.7	91.4	88.9
48 hours	%	91.7	91.4	91.0
Solid residue grade (Au)	g/t	0.19	0.22	0.28
NaCN usage	kg/t	0.22	0.17	0.45
Lime usage	kg/t	1.11	1.13	0.90
Average DO	ppm	7.6	7.8	7.5

Key points from the data are:

- Results for tests WH7648 and WH7436, performed under the same conditions, align well with extractions greater than 91%, comparable residue grades and comparable reagent consumptions.
- Gravity recovery range for tests WH7648 and WH7436 align with previous tests (Sections 13.2.4.5 to 13.2.4.7).
- There was good correlation between calculated gold head grade and assayed head grade for test WH7648.
- The poor correlation between calculated gold head grade and assayed head grade for test WH7649, along with the elevated gravity recovery of gold and residue grade, suggests that this particular sub-sample of CMA Pit Fresh Ore Master Composite contains an elevated presence of coarse gold.

- Due to the misalignment in calculated head grades between tests WH7648 and WH7649, no firm comparisons between the two leach systems could be drawn.

A sub-sample of the leach residue from test WH7648 was subject to gold size assay analysis using 106 µm, 75 µm, 53 µm, 38 µm and 25 µm screens. The gold assay and distribution for each size fraction of leach residue are presented in Table 13-21.

Table 13-21: Tails solid gold assay and gold distribution by size fraction for test WH7648 residue

SCREEN SIZE (µm)	SIZE FRACTION GOLD ASSAY (g/t)	SIZE FRACTION GOLD DISTRIBUTION (%)
106	0.58	23.6
75	0.40	19.1
53	0.50	24.1
38	0.38	17.3
25	0.14	4.8
-25	0.05	11.2

The back-calculated tails grade from the size assay data (0.23 g/t Au) was slightly higher than the tails solids assay from test WH7648 (0.19 g/t Au). Most of the remaining gold in the tails residue from test WH7648 is distributed in coarser size fractions.

13.2.4.11 Gravity Optimisation/Leach

CMA Pit Fresh Ore Master Composite was subjected to four tests under the following conditions:

- Gravity separation and treatment of gravity concentrate was the variable parameter for this test:
    - WH7698: amalgamation of single stage Knelson gravity concentrate at grind size P_{80} of 75 µm, as described in Steps 1 and 2a of Section 13.2.4.1
    - WH7667/7668: single stage Knelson gravity separation at grind size P_{80} of 850 µm and intensive leach of gravity concentrates, as described in Steps 1 and 2b of Section 13.2.4.1
    - WH7654/7655/7656: first stage Knelson gravity separation at grind size P_{80} of 850 µm with intensive leach of first stage gravity concentrate, and second stage Knelson gravity separation at grind size P_{80} of 75 µm with intensive leach of second stage gravity concentrate, as described in Steps 1 and 2c of Section 13.2.4.1
    - WH7693/7697: gravity panning of single stage Knelson gravity concentrate at grind size P_{80} of 75 µm (to achieve a reduced mass pull of 0.5%), with intensive leach of pan concentrate, as described in Steps 1 and 2d of Section 13.2.4.1
- No pre-oxygenation
- Cyanidation of combined gravity/amalgam tail or gravity/intensive leach tail, as per steps 1 to 8 in Section 13.2.4.3, with the following parameters:
    - Grind size P_{80} of 75 µm
    - Pulp density of 40% w/w solids
    - Initial sodium cyanide concentration of 0.05% w/v
    - Air sparging in cyanidation.

The results from these tests are presented in Table 13-22. Gravity concentrate treatment in Table 13-22 refers to the relevant gravity concentrate treatment step described in Section 13.2.4.1. For purposes of comparison, results from optimised test WH7648 (from Section 13.2.4.10, considering amalgamation of single stage Knelson gravity concentrate at grind size P_{80} of 850 µm) are also included in Table 13-22.

Table 13-22: Gravity optimisation/leach test results for CMA Pit Fresh Ore Master Composite

PARAMETER	UNIT	WH7648	WH7698	WH7667/ WH7668	WH7654/ WH7655/ WH7656	WH7693/ WH7697
P_{80} grind size	µm	850/75	75/75	850/75	850/75/75	75/75
Assay head grade (Au)	g/t	2.10	2.10	2.10	2.10	2.10
Calc. head grade (Au)	g/t	2.29	2.15	2.40	2.20	2.09
Gravity con treatment		2a	2a	2b	2c	2d
Gravity recovery	%	15.3	41.5	64.1	71.4	36.7
Extraction at time						
2 hours	%	69.0	78.2	88.8	89.1	83.8
4 hours	%	77.0	85.0	90.3	90.1	86.3
8 hours	%	81.0	89.7	91.0	90.4	88.4
16 hours	%	84.7	90.4	91.2	90.8	89.5
24 hours	%	85.9	90.7	91.2	91.1	89.8
36 hours	%	87.7	91.3	91.5	91.4	90.2
48 hours	%	91.7	91.6	92.1	91.4	90.9
Solid residue grade (Au)	g/t	0.19	0.18	0.19	0.19	0.19
NaCN usage – intensive leach 1	kg/t	-	-	4.8	20.0	4.7
NaOH usage – intensive leach 1	kg/t	-	-	32.0	28.0	92.0
LeachWELL usage – intensive leach 1	kg/t	-	-	80.0	80.0	80.1
NaCN usage – intensive leach 2	kg/t	-	-	-	0.8	-
NaOH usage – intensive leach 2	kg/t	-	-	-	32.1	-
LeachWELL usage – intensive leach 2	kg/t	-	-	-	80.1	-
NaCN usage - cyanidation	kg/t	0.22	0.18	0.18	0.18	0.25
Lime usage - cyanidation	kg/t	1.11	0.84	0.74	0.93	0.88
Average DO - cyanidation	ppm	7.6	8.2	8.9	8.0	8.2

Key points from the data are:

- The combined gravity/48 h cyanidation extractions and residues grades are comparable across all gravity recovery and concentrate treatment test conditions.
- When comparing tests WH7648 and WH7698, the finer grind size during the gravity separation step for test WH7698 results in a significantly higher gold recovery via amalgamation.
- Two stages of Knelson gravity concentration and intensive leach (WH7654/ WH7655/ WH7656) produced the highest gravity concentration from the five tests compared in Table 13-22.

- Two stages of Knelson gravity concentration and intensive leach (WH7654/ WH7655/ WH7656) recovered an additional 7.3% of gold compared to a single stage of Knelson gravity concentration and intensive leach (WH7667/ WH7668).
- Recoveries of gold after intensive cyanidation are generally higher than after amalgamation, as amalgalm will only collect clean free gold whereas intensive cyanidation will account for clean free gold as well as exposed gold on sulfide particles.
- Gold leach kinetics are generally faster when more gold has been recovered in the gravity separation step.
- There is generally good correlation between calculated gold head grades and assayed head grade.

Due to the tendency to over recover precious metals on a bench scale relative to full scale operations, mercury amalgamation of single stage Knelson gravity concentrate at grind size P_{80} of 75 µm was selected for future tests. Mercury amalgamation will generally only recover the coarse/free gold, whereas intensive cyanidation will also extract fine grained or partially liberated gold particles, and thereby further overestimate the gravity recoverable gold content.

13.2.4.12 Master Composite Whole Ore Leach at Optimised Conditions

CMA Pit Fresh Ore Master Composite was subjected to five tests under the following conditions:

- No gravity separation
- No pre-oxygenation
- Direct cyanidation of the ore sample, as per steps 1 to 8 in Section 13.2.4.3, with the following parameters:
    - Grind size P_{80} of 75 µm
    - Pulp density of 40% w/w solids
    - Initial sodium cyanide concentration of 0.05% w/v
    - Air sparging in cyanidation.

With regards to Step 1 of Section 13.2.4.3, WH7694, WH7695 and WH7696 were conducted at bench scale on 1 kg of solids in the leach bottle roll. The purpose of these triplicate tests was to confirm reproducibility of gold recovery at optimised cyanidation conditions. Test WH7734 was an agitated vat leach, rather than a bottle roll, on 9 kg of solids to produce sufficient leach slurry for carbon adsorption kinetic tests (Section 13.2.6). Test WH7735 was an agitated vat leach on 15 kg of solids to produce sufficient slurry for cyanide detoxification tests (Section 13.2.8). Test WH8096 was an agitated vat leach on 15 kg of solids to produce sufficient material for tailings characterisation tests (Section 13.2.11).

The results from these tests are presented in Table 13-23.

Table 13-23: Whole Ore Leach Test Results at Optimised Conditions for CMA Pit Fresh Ore Master Composite

PARAMETER	UNIT	WH7694	WH7695	WH7696	WH7734	WH7735	WH8096
P_{80} grind size	µm	75	75	75	75	75	75
Assay head grade (Au)	g/t	2.10	2.10	2.10	2.10	2.10	2.10
Calc. head grade (Au)	g/t	2.05	2.73	2.45	2.40	2.17	2.80
Leach test type		bottle	bottle	bottle	vat	vat	vat
Gravity recovery	%	-	-	-	-	-	-
Extraction at time							
2 hours	%	53.4	45.6	46.5	47.5	39.0	55.2
4 hours	%	81.3	76.9	74.7	59.6	51.4	83.6
8 hours	%	89.0	88.5	87.1	66.8	58.6	90.6
16 hours	%	90.4	90.0	91.7	72.3	70.3	91.6
24 hours	%	91.1	91.6	91.7	80.4	81.2	91.6
36 hours	%	91.7	92.6	92.2	88.4	88.8	92.2
48 hours	%	91.7	93.0	92.2	93.3	93.6	93.2
Solid residue grade (Au)	g/t	0.17	0.19	0.19	0.16	0.14	0.19
NaCN usage	kg/t	0.28	0.24	0.28	0.78	0.85	0.52
Lime usage	kg/t	0.89	0.94	0.87	0.36	0.39	0.86
Average DO	ppm	8.3	8.4	8.4	7.9	7.8	7.2

Key points from the data are:

- The 48 h cyanidation recoveries and residues grades are comparable across all six tests. When comparing this data set to the gravity/leach tests at optimum cyanidation conditions (Section 13.2.4.10), it is possible to achieve a similar gold recovery from a whole of ore leach at 48 h under the same optimum cyanidation conditions without a preceding gravity recovery stage.
- The gold recoveries, residue grades, reagent consumptions and gold leach kinetics for the triplicate bottle roll tests (WH7694, WH7695 and WH7696) are comparable and meet the objective of demonstrating reproducibility.
- For the triplicate bottle roll tests, even with gravity recoverable gold present in the feed, the gold leach kinetics were reasonably fast, with the bulk of cyanidable gold leaching in the first 8 h.
- Gold leach kinetics for the two of the bulk vat leach tests (WH7734 and WH7735) were slow, with final gold extractions only being realised at 48 h. It is hypothesised that the slower kinetics may be due to less efficient mixing in the large, agitated vat, compared to a bottle roll test.
- The gold leach kinetics for the third vat leach test (WH8096) were faster that for the other two vat leach tests (WH7734 and WH7735) and were comparable to the triplicate bottle roll tests. The agitation rate for test WH8096 was recorded as being higher than for tests WH7734 and WH7735 and it is hypothesised that the faster agitation rotational speed allowed the coarser gravity gold to leach more rapidly.

- Sodium cyanide consumption was approximately 2 to 3 times higher for the vat leach tests. It is likely that vat leach tests experienced cyanide loss from solution due to the nature of agitation and the configuration of the leach vat.
- The presence of gravity recoverable gold in leach feed may have influenced the wider variation observed between calculated gold head grade and assayed head grade across the five tests.

13.2.4.13 Yaouré Standard Gravity/Leach Conditions

The following optimised gravity/leach test conditions were carried forward for testing of other Yaouré Gold Mine gold bearing ores:

1. 1 kg of feed sample, prepared to target grind size P_{80} of 75 µm, is passed through a laboratory KC-MD3 gravity concentrator with a 0.12 kW drive, operating at 1,500 rpm with 3.5 L/min fluidisation flow rate.
2. The gravity concentrate is transferred to a leach bottle with a screw-on lid and subjected to mercury amalgamation. 5 g of mercury is added to the bottle, which is placed on a roller for a period of at least 2 h. On completion of the amalgamation, the loaded amalgam is recovered and assayed for gold and silver.
3. The combined gravity/amalgam tail is transferred into a leach bottle with a screw-on lid. Slurry agitation is applied by mechanical rollers.
4. Perth tap water is added to slurrify the sample to establish the target pulp density of 40% w/w solids.
5. Hydrated lime is added to the slurry to establish a pH of approximately 10.5. The slurry is agitated thoroughly for 5 min. The pH of the slurry sample is measured again and, if necessary, more lime is added to achieve a pH of 10.5.
6. Sodium cyanide is added to the slurry to establish the target initial cyanide concentration of 0.05% w/v.
7. The slurry is sparged with air to provide an elevated DO content.
8. At regular intervals (2, 4, 8, 16, 24, and 36 h), slurry pH, DO, and sodium cyanide concentration are monitored and recorded. Solution sub-samples are taken and assayed for gold, silver, and arsenic.
9. If required during the test duration, lime and sodium cyanide were added to maintain target levels. pH is maintained >9.8 and sodium cyanide is maintained to >0.025% w/v.
10. At the conclusion of the test (48 h), the terminal pH, oxygen, and cyanide levels are determined. A solution sub-sample is taken and assayed for gold, silver, and arsenic. The residual slurry sample is filtered, washed, and dried to provide leach residue solids, and a sub-sample of residue solid is assayed for gold, silver, and arsenic.

13.2.4.14 Variability Samples – Gravity/Leach at Yaouré Standard Conditions

36 CMA fresh ore metallurgical variability samples were subjected to the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13. Hydrated lime used for these tests contained 60% CaO. The results of the tests are summarised in Table 13-24 and Table 13-25.

Table 13-24: Gold extraction at standard Yaouré test conditions for CMA metallurgical variability samples (Part 1)

PARAMETER	UNIT	WH7736	WH7737	WH7738	WH7739	WH7740	WH7741	WH7742	WH7743	WH7744	WH7745	WH7746	WH7747	WH7748	WH7749	WH7750	WH7751	WH7752	WH7753
Sample		CMA-VAR-11	CMA-VAR-12	CMA-VAR-13	CMA-VAR-14	CMA-VAR-15	CMA-VAR-16	CMA-VAR-17	CMA-VAR-18	CMA-VAR-19	CMA-VAR-20	CMA-VAR-21	CMA-VAR-22	CMA-VAR-23	CMA-VAR-24	CMA-VAR-25	CMA-VAR-26	CMA-VAR-27	CMA-VAR-28
P_{80} grind size	µm	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Assay head grade (Au)	g/t	1.57	2.02	1.36	2.40	1.51	2.20	2.56	2.52	2.28	1.65	1.64	1.52	1.27	1.77	1.38	3.53	1.43	3.03
Calc. head grade (Au)	g/t	1.52	1.89	1.68	1.99	1.95	2.75	2.17	2.43	2.96	2.01	4.01	1.83	1.13	2.74	1.68	3.68	1.71	3.22
Gravity recovery	%	34.9	30.2	55.1	33.8	30.0	53.8	29.8	47.8	54.0	23.2	33.3	39.4	44.8	38.9	41.7	29.9	26.9	52.3
Extraction at time																			
2 hours	% Au	77.0	78.2	79.6	83.5	81.9	81.9	82.0	84.5	88.5	73.7	50.5	80.8	84.7	84.7	83.7	84.2	82.3	88.5
4 hours	% Au	78.9	80.9	89.7	84.6	86.4	84.4	83.7	86.9	90.7	83.6	64.5	84.4	87.3	87.1	87.6	89.4	84.4	91.4
8 hours	% Au	79.8	81.7	93.6	86.8	90.1	85.1	85.0	87.8	90.9	88.2	89.5	86.8	88.6	89.0	89.8	92.5	88.6	92.3
16 hours	% Au	82.6	83.9	95.2	88.9	91.6	86.2	85.7	89.3	91.9	90.0	95.0	88.0	89.9	89.5	91.4	93.3	89.5	93.2
24 hours	% Au	83.1	84.6	95.6	89.2	93.0	86.2	86.9	89.8	92.1	90.7	96.7	88.3	92.3	90.5	92.7	93.6	89.5	93.6
36 hours	% Au	83.5	85.0	95.6	89.6	93.7	87.4	87.2	90.4	92.4	91.7	97.3	89.4	92.9	91.2	92.7	94.0	89.9	94.2
48 hours	% Au	83.5	85.7	96.4	90.2	94.4	87.6	87.6	90.9	92.6	93.0	98.3	90.2	92.9	91.2	93.4	94.0	90.6	94.2
Solid residue grade (Au)	g/t	0.25	0.27	0.06	0.20	0.11	0.34	0.27	0.22	0.22	0.14	0.07	0.18	0.08	0.24	0.11	0.22	0.16	0.18
NaCN usage	kg/t	0.22	0.25	0.29	0.22	0.22	0.22	0.17	0.22	0.17	0.24	0.32	0.28	0.29	0.24	0.18	0.25	0.25	0.22
Lime usage	kg/t	0.51	0.44	0.78	0.51	0.71	0.52	0.47	0.70	0.47	0.36	1.05	0.47	0.36	0.34	0.30	0.41	0.32	0.45
Average DO	ppm	7.7	7.8	7.8	7.8	7.9	7.8	7.8	7.8	7.8	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.4	8.3

Table 13-25: Gold extraction at standard Yaouré test conditions for CMA metallurgical variability samples (Part 2)

PARAMETER	UNIT	WH7981	WH7982	WH7983	WH7984	WH7985	WH7986	WH7987	WH7988	WH7989	WH7990	WH7991	WH7992	WH7993	WH7994	WH7995	WH7996	WH7997	WH7998
Sample		CMA-VAR-29	CMA-VAR-30	CMA-VAR-31	CMA-VAR-32	CMA-VAR-33	CMA-VAR-34	CMA-VAR-35	CMA-VAR-36	CMA-VAR-37	CMA-VAR-38	CMA-VAR-39	CMA-VAR-40	CMA-VAR-41	CMA-VAR-42	CMA-VAR-43	CMA-VAR-44	CMA-VAR-45	CMA-VAR-46
P_{80} grind size	µm	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Assay head grade (Au)	g/t	1.28	1.37	0.40	4.92	1.83	0.63	2.24	1.46	1.24	2.39	2.56	2.52	1.18	1.97	2.63	3.34	2.63	2.48
Calc. head grade (Au)	g/t	1.11	1.59	0.63	3.69	1.65	0.85	2.38	1.44	2.40	2.07	2.76	2.75	2.24	1.86	2.48	2.81	2.74	2.33
Gravity recovery	%	41.1	35.0	35.6	28.2	31.5	40.7	46.2	29.4	58.8	36.4	29.7	42.8	25.4	35.0	51.0	32.6	31.3	37.6
Extraction @time																			
2 hours	% Au	85.1	82.3	67.7	78.2	75.5	81.4	84.7	80.4	79.4	84.8	79.3	84.2	59.2	81.0	86.9	73.4	80.8	84.0
4 hours	% Au	87.8	84.1	75.9	81.8	83.5	84.9	89.0	81.9	88.6	87.3	83.3	86.4	74.7	82.9	89.3	76.3	84.6	86.9
8 hours	% Au	89.7	86.8	82.7	84.1	86.6	86.6	90.2	85.4	91.0	88.4	83.6	89.0	89.4	84.9	90.4	78.6	85.3	88.7
16 hours	% Au	90.4	88.2	87.2	86.0	87.0	87.4	91.4	85.9	91.6	89.4	85.9	90.3	93.8	85.6	90.7	81.1	87.9	90.5
24 hours	% Au	91.0	89.9	89.4	87.5	89.1	88.2	92.3	86.4	92.8	90.0	86.4	90.8	95.1	86.0	91.0	83.8	88.4	90.8
36 hours	% Au	91.0	89.9	93.7	89.0	89.1	88.2	92.6	87.8	93.3	90.4	86.9	91.0	96.3	86.7	91.3	87.2	88.4	91.1
48 hours	% Au	91.0	89.9	93.7	89.7	89.1	88.2	92.9	88.2	93.3	90.4	87.3	91.3	96.9	87.1	91.5	88.6	88.9	91.4
Solid residue grade (Au)	g/t	0.10	0.16	0.04	0.38	0.18	0.10	0.17	0.17	0.16	0.20	0.35	0.24	0.07	0.24	0.21	0.32	0.31	0.20
NaCN usage	kg/t	0.17	0.17	0.22	0.21	0.22	0.22	0.22	0.24	0.22	0.22	0.24	0.22	0.22	0.28	0.21	0.25	0.25	0.25
Lime usage	kg/t	0.32	0.32	0.64	0.30	0.52	0.31	0.34	0.31	1.04	0.30	0.31	0.32	0.59	0.33	0.30	0.28	0.30	0.32
Average DO	ppm	7.6	7.7	7.6	7.7	7.7	7.7	7.7	7.7	7.8	7.8	7.6	7.7	7.8	7.7	7.7	7.6	7.6	7.7

Key points from the data are:

- Gravity gold recoveries for CMA pit fresh ores ranged between 23.2% and 58.8%. This range is consistent with the range observed for CMA underground ore (Section 13.9.4).
- Leach kinetics are generally fast. Most of the gold leaches in the first 8 h and the leach is largely complete after 16 to 24 h.
- Gold extraction was variable, averaging 91.0% at 48 h, with a range of 83.5% to 98.3%.
- Reagent consumptions were low, averaging 0.23 kg/t and 0.45 kg/t for sodium cyanide and 60% CaO hydrated lime respectively.

The gold extractions for the CMA pit fresh ore metallurgical variability samples (CMA-Pit) tested are shown graphically in Figure 13-49. The gold extractions for CMA underground variability samples (CMA-UG) tested under the same conditions are also shown in Figure 13-49. Discussion on the difference in performance between the two groups of samples is included in Section 13.9.4.

13.2.4.15 Multi-Stage Diagnostic Leach

Sub-samples of CMA Pit Fresh Ore Master Composite and metallurgical variability samples CMA-VAR-11, CMA-VAR-12 and CMA-VAR-28 were subjected to multi-stage diagnostic leach tests. CMA-VAR-11 and CMA-VAR-12 were included in this investigation as they had the lowest combined gravity/leach gold extractions of the variability samples. The preliminary residue assay for CMA-VAR-28 was 0.63 g/t Au, corresponding to a low gold extraction of 82.8%, and hence it was also selected for further investigation. Only the tests conducted on the metallurgical variability samples included the intensive cyanidation step after the direct cyanidation step. The results are summarised in Table 13-26.

Table 13-26: Diagnostic leach test results for CMA Open Pit Master Composite and metallurgical variability samples

STAGE	DESCRIPTION	UNIT	CMA PIT MASTER COMP (FR)	CMA VAR-11	CMA VAR-12	CMA VAR-28
Gravity concentration/ amalgamation	Free gravity gold	g/t Au	1.18	0.53	0.57	1.69
Direct cyanidation leach of gravity tails	Cyanide recoverable gold	g/t Au	0.99	0.74	1.05	1.35
Intensive cyanidation of leach tails	Remaining cyanide recoverable gold	g/t Au	-	0.04	0.02	0.04
Dilute HCl digest/ cyanidation	Carbonate locked gold, labile[1] sulfide (pyrrhotite) locked gold	g/t Au	0.02	0.03	0.03	0.02
Dilute HNO_3 digest/ cyanidation	Gold associated with arsenical minerals, labile reactive sulfide minerals (including labile pyrite), and/or telluride	g/t Au	0.14	0.19	0.20	0.13
Aqua regia digestion	Gold associated with stable pyritic sulfide minerals and iron oxides	g/t Au	0.009	0.006	0.006	0.003
Total FA smelt	Silicates/gangue and/or graphitic carbon encapsulated gold	g/t Au	0.005	0.005	0.005	0.003
	Back-calculated gold content	g/t Au	2.34	1.56	2.02	3.03
	Assayed gold content	g/t Au	2.10	1.54	1.88	3.23

From the data, it is noted that:

[1] Unstable; easily decomposed; prone to chemical change

- the majority of gold (85.1% to 95.2%) is either as free gold or recoverable by cyanide.
- there is reasonably good correlation between back-calculated gold head grades and assayed head grades.
- the back-calculated residue grade from the diagnostic leach test for CMA-VAR-28 was 0.21 g/t Au. Given the discrepancy between the preliminary residue grade of 0.63 g/t Au, the gravity/leach test residue was re-assayed in duplicate. The repeat assays of 0.20/0.17 g/t Au (average of 0.185 g/t Au) compare well with the back-calculated residue grade from the diagnostic leach test. The average of the repeat duplicate gravity/leach test residue assays has been reported in Table 13-24 and the extraction data reflects the average of the duplicate residue re-assays.
- the great majority of gold lost to tails solids was recovered after the dilute nitric acid digestion stage. Given the low arsenic assays for the master composite and the variability samples, it is most likely that these gold losses are associated with labile reactive pyrite. This conclusion is supported by the mineralogical analysis data presented in Section 13.2.5, where ~99% of sulfides by mass in the gravity concentrate fraction of the CMA Pit Fresh Ore Master Composite were identified as pyrite. This observation is further supported by mineralogical findings from historical test work, discussed in Section 13.1.

13.2.5 Mineralogical Investigation

A sub-sample of the CMA Pit Fresh Ore Master Composite was ground to P_{80} of 75 µm and subjected to a mineralogical investigation to gain further understanding of gold occurrences and mineral associations, as well as gangue mineralogy, at this grind size.

The sample was separated into gravity concentrate and gravity tail fractions using a Knelson concentrator and hand-panning before being submitted for mineralogy. Mass distribution to gravity concentrate and gravity tail fractions following separation was 3.28% and 96.72% respectively.

13.2.5.1 Mineral Abundance of Gravity Concentrate

A sub-sample of gravity concentrate from the CMA Pit Fresh Ore Master Composite was prepared into a polished section and analysed using quantitative mineralogical analysis by QEMSCAN-PMA (quantitative evaluation of minerals by scanning electron microscopy using particle mineral analysis mode) at 6 µm pixel spacing.

For the gravity concentrate, it was found that pyrite is the dominant sulfide, making up 18.8% by mass of the total sample, and ~99% of sulfide minerals identified, with a P_{80} of 56 µm. A trace of chalcopyrite (0.13%) and other sulfides(/tellurides) (0.01%, being galena, sphalerite, arsenopyrite and coloradoite) are also present. The remaining sample mass of the gravity concentrate is mainly made-up of silicate (predominantly quartz, chlorite, albite, and micas), carbonate (predominantly ankerite-dolomite and calcite) and iron oxide/oxyhydroxide (predominantly magnetite and hematite) gangue minerals. <0.01% native gold (with silver content typically <8%) is present in the gravity concentrate of the CMA Pit Fresh Ore Master Composite. The mineral abundance of the gravity concentrate by grouping is shown in Figure 13-6.

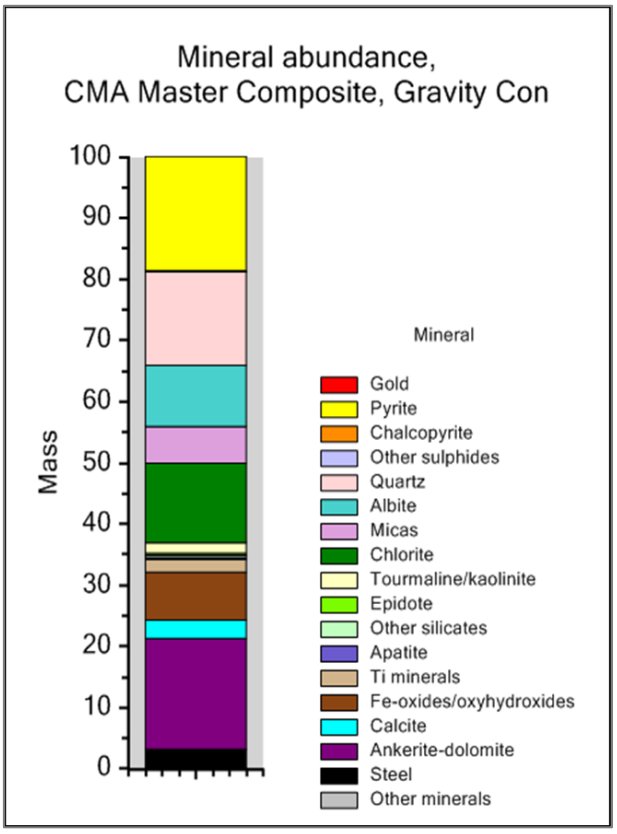


Figure 13-6: Mineral abundance of gravity concentrate from CMA Pit Fresh Ore Master Composite

13.2.5.2 Mineral Liberation of Gravity Concentrate

Mineral liberation data were derived from the QEMSCAN-PMA analysis of the gravity concentrate of the CMA Pit Fresh Ore Master Composite. Particle liberation classes are defined as follows:

- Well-liberated (>90% surface area)
- High grade middlings (60-90% surface area)
- Medium grade middlings (30-60% surface area)
- Low grade middlings (10-30% surface area)
- Locked (<10% surface area).

84.5% of pyrite particles were found to be well-liberated, with 13.1% classified as high grade middlings.

13.2.5.3 Gold Grain Size Distribution of Gravity Concentrate

Bright phase search for minerals with high atomic density and strong electron backscatter response, including gold-rich mineral phases, was undertaken using the QEMSCAN-TMS (quantitative evaluation of minerals by scanning electron microscopy using trace mineral search) analysis. The particles measured during the TMS scan were mapped with 1 µm spacing. 53 native gold grains were identified in the polished section of gravity concentrate from the CMA Pit Fresh Ore Master Composite. The indicative gold grain size distribution data that were derived from this analysis are presented in Table 13-27. For the calculation of grain sizes, the gold-bearing grains were digitally extracted from images of the gold-hosting particles.

Table 13-27: Indicative gold grain size distribution of gravity concentrate from CMA Pit Fresh Ore Master Composite

GRAIN SIZE (µm)	NUMBER OF NATIVE GOLD GRAINS	NATIVE GOLD MASS %
27 - 38	1	26.6
20 - 27	0	0.0
15 - 20	2	16.0
10 - 15	5	20.1
5 - 10	14	24.1
2 - 5	23	12.0
1 - 2 [2]	8	1.2

Figure 13-7 sorts the gold grains (in red) by size fraction, as well as providing an overview of host minerals and host mineral distribution within gold grain size classes. It is noted that composite fine gold grains (1 to 20 µm grain size) are predominantly associated with pyrite.

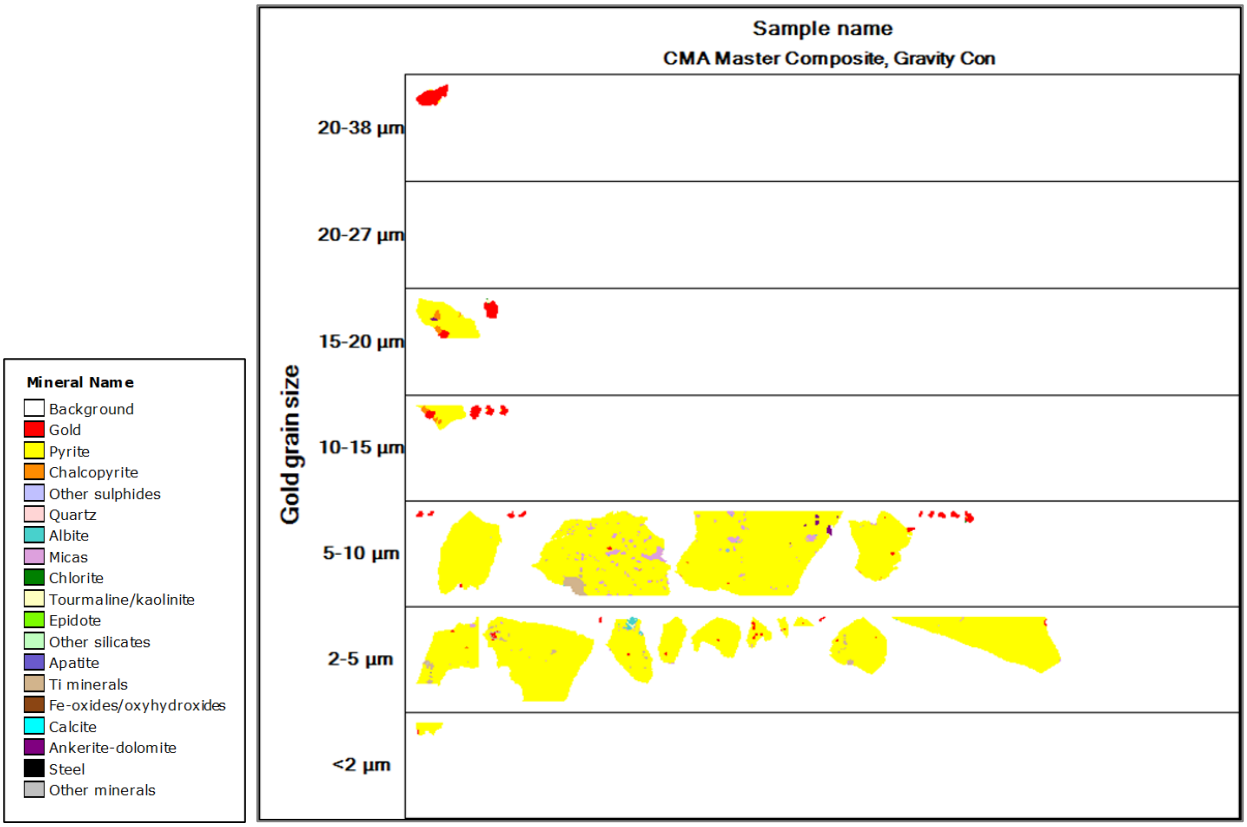


Figure 13-7: Image grid showing the distribution of gold grain sizes of gravity concentrate from the CMA Pit Fresh Ore Master Composite

13.2.5.4 Gold Locking of Gravity Concentrate

Indicative gold locking data were derived from the QEMSCAN-TMS analysis for 37 particles that were identified in the polished section of gravity concentrate from the CMA Pit Fresh Ore Master Composite. The locking data reflects the major mineral(s) that the gold-hosting particle is comprised of (not necessarily adjacent to the gold grain). Gold locking classes are defined as follows:

- Gold >90% (particles having gold >90% surface area)

[2] Gold grains smaller than 1 µm and solid solution gold in sulfides are beyond the detection limit of QEMSCAN

- Pyrite >90% (particles having pyrite > 90% surface area)
- Gold + pyrite >90% (particles having gold + pyrite >90% surface area)
- Pyrite >75% (particles having pyrite >75% and ≤90% surface area).

The indicative gold locking data are presented in Table 13-28, and graphically in the image grid in Figure 13-8. 16 gold grains are well liberated, ranging in size from 5 µm to 38 µm, and represent 74.0% of native gold by mass. The remaining gold grains are smaller than 15 µm (mostly smaller than 10 µm) and occur in pyrite.

Table 13-28: Indicative locking of gold grains of gravity concentrate from CMA Pit Fresh Ore Master Composite

GOLD LOCKING CLASS	NUMBER OF PARTICLES	NATIVE GOLD MASS %
Gold >90%	16	74.0
Pyrite >90%	18	17.0
Gold + pyrite >90%	1	3.92
Pyrite >75%	2	5.10

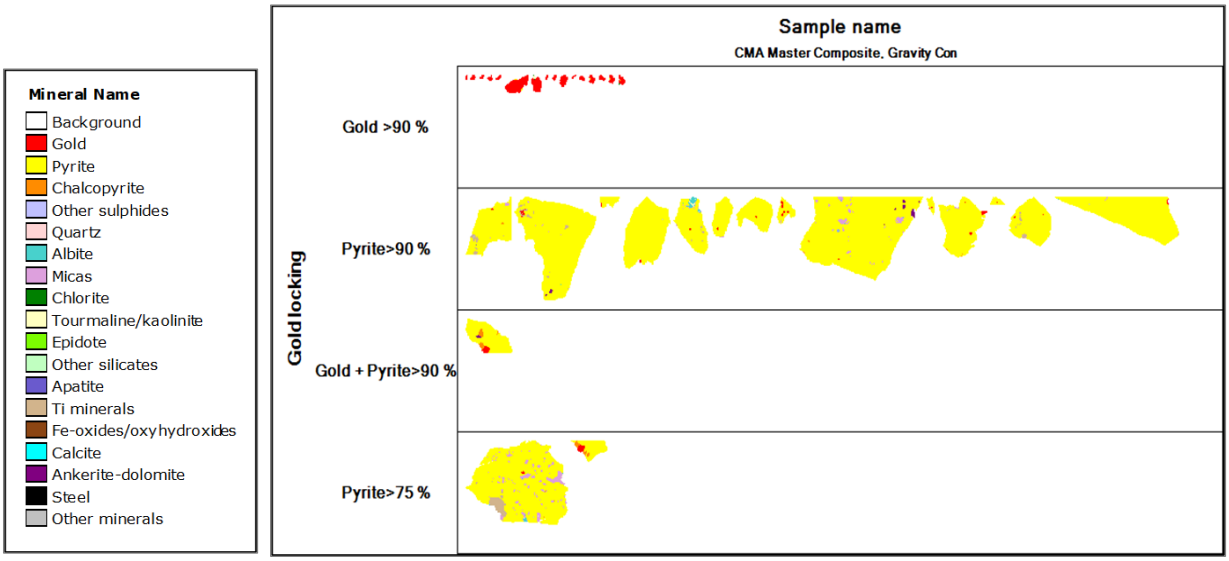


Figure 13-8: Image grid showing the distribution of gold grains between locking classes of gravity concentrate from CMA Pit Fresh Ore Master Composite

13.2.5.5 Energy Dispersive Spectrometry and Back Scattered Electron Images of Gold Grains

Spot analysis of 28 native gold grains identified was undertaken by manual EDS (energy dispersive spectrometry) using standardless quantification. A summary of findings from the manual EDS analysis is displayed in Table 13-29.

Table 13-29: Gold grain data from EDS analysis of gravity concentrate from CMA Pit Fresh Ore Master Composite

HOST PARTICLE NUMBER	HOST MINERAL	GOLD GRAIN NUMBER	GOLD MINERAL	LIBERATION [3]	Au (%)*	Ag (%)*
1	none	1	native gold	liberated	100	0
2	none	2	native gold	liberated	100	0
	none	3	native gold	liberated	100	0
3	none	4	native gold	liberated	92	8
4	none	5	native gold	liberated	95	5
5	pyrite/ chalcopyrite	6	native gold	exposed	100	0
6	pyrite	7	native gold	encapsulated	100	0
	pyrite	8	native gold	encapsulated	94	6
	pyrite	9	native gold	encapsulated	100	0
	pyrite	10	native gold	encapsulated	97	3
	pyrite	11	native gold	encapsulated	100	0
7	pyrite	12	native gold	encapsulated	100	0
	pyrite	13	native gold	encapsulated	100	0
	pyrite	14	native gold	exposed	100	0
	pyrite	15	native gold	exposed	93	7
8	pyrite	16	native gold	encapsulated	95	5
	pyrite	17	native gold	encapsulated	95	5
	pyrite	18	native gold	encapsulated	93	7
	pyrite	19	native gold	encapsulated	95	5
	pyrite	20	native gold	encapsulated	100	0
9	pyrite/rutile	21	native gold	encapsulated	100	0
	pyrite/rutile	22	native gold	encapsulated	100	0
	pyrite/rutile	23	native gold	encapsulated	100	0
10	pyrite	24	native gold	encapsulated	100	0
11	pyrite	25	native gold	encapsulated	100	0
12	pyrite	26	native gold	encapsulated	98	2
	pyrite	27	native gold	encapsulated	100	0
	pyrite	28	native gold	encapsulated	100	0

* normalised % phase composition, host response excluded

Five out of 28 gold grains are free native gold particles, with 19 gold grains associated with pyrite, three gold grains associated with pyrite/rutile and one gold grain associated with pyrite/chalcopyrite. Eight out of 28 gold grains were either liberated or exposed (and therefore would be available to cyanidation). The native gold grains contain 92-100% gold and 0-8% silver.

Back-scattered electron (BSE) images of the 28 native gold grains were also captured. Images for composite particles (host particles 5 to 12) are presented in Figure 13-9 to Figure 13-12, which provide further visual detail on the degree of liberation of gold grains within these composite particles.

[3] Liberated = >90% surface area of gold grain exposed; Exposed = >0 ≤90% surface area of gold grain exposed; Encapsulated = gold grain without surface exposure

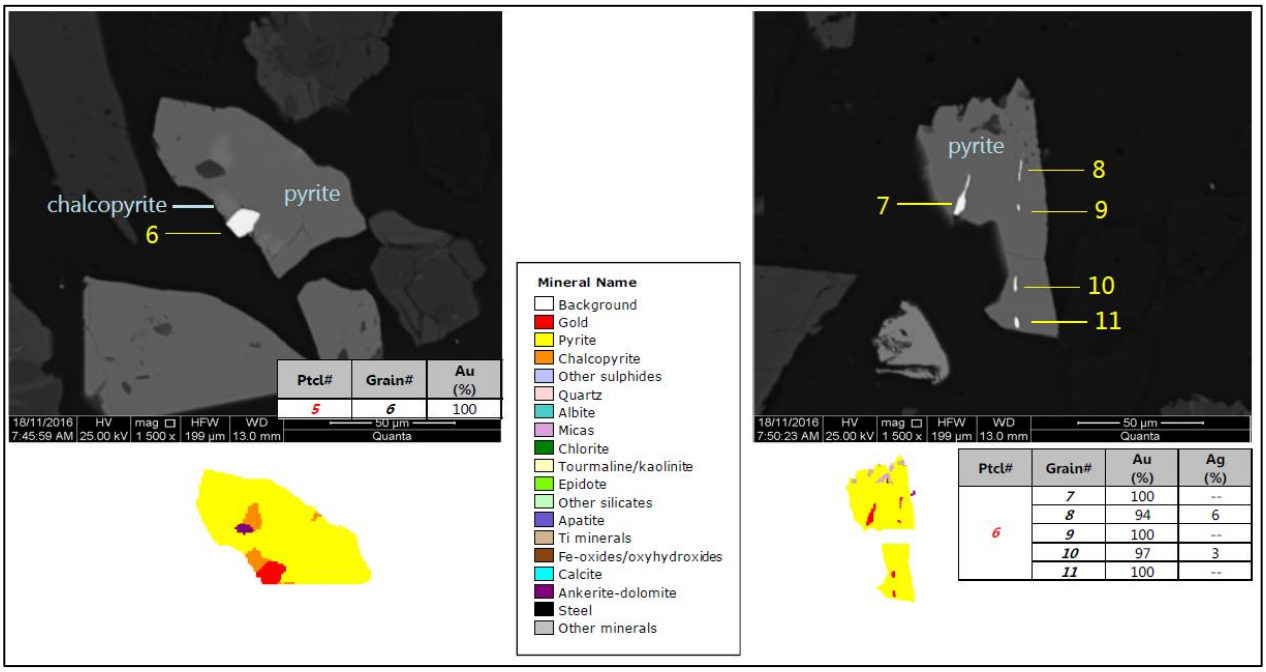


Figure 13-9: BSE images of (L): host particle 5, gold grain 6; and (R): host particle 6, gold grains 7 to 11 from gravity concentrate of CMA Pit Fresh Ore Master Composite

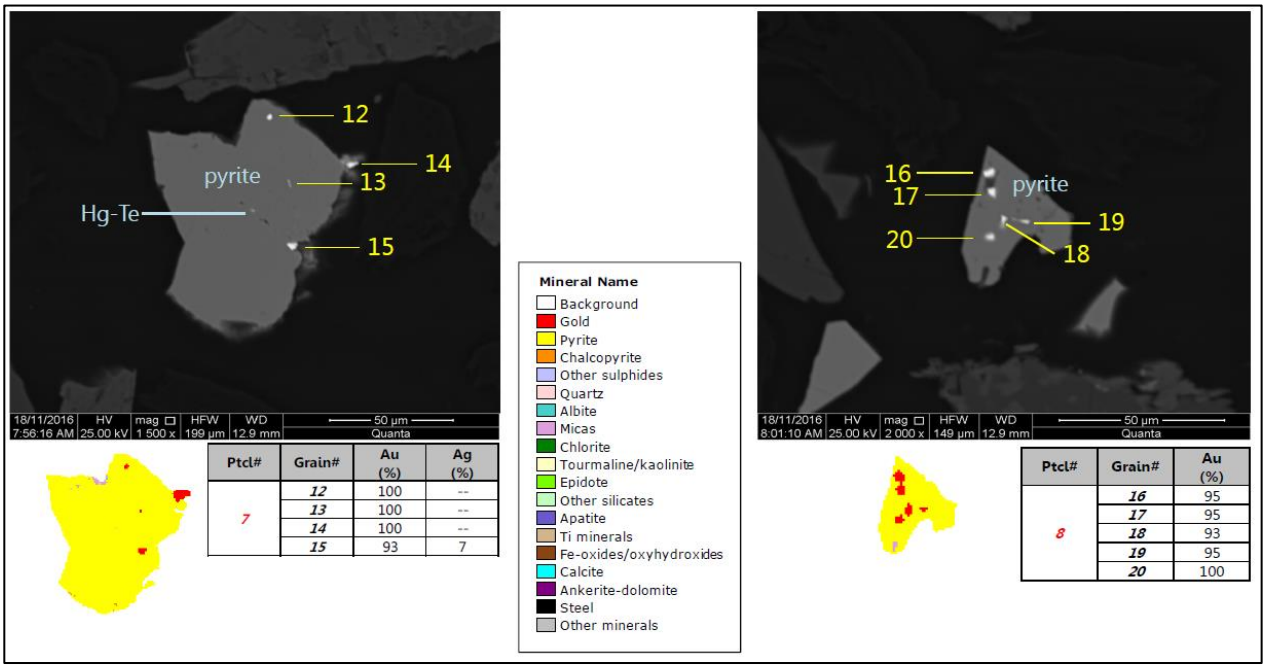


Figure 13-10: BSE images of (L): host particle 7, gold grains 12 to 15; and (R): host particle 8, gold grains 16 to 20 from gravity concentrate of CMA Pit Fresh Ore Master Composite

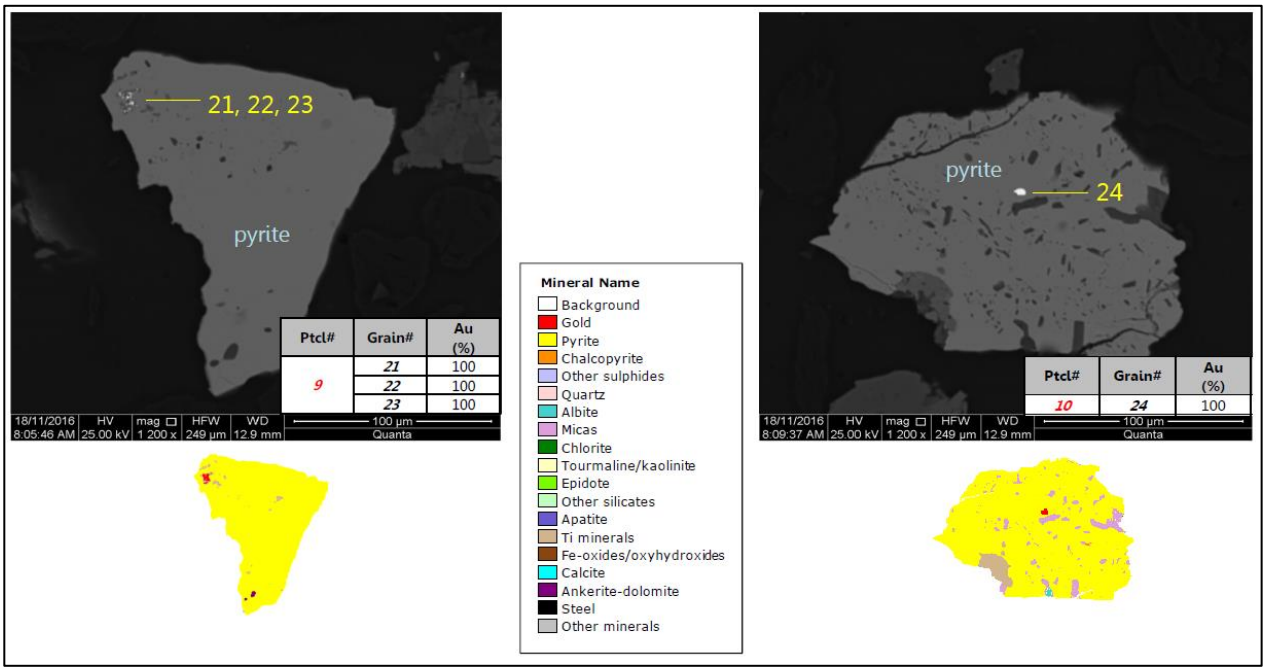


Figure 13-11: BSE images of (L): host particle 9, gold grains 21 to 23; and (R): host particle 10, gold grain 24 from gravity concentrate of CMA Pit Fresh Ore Master Composite

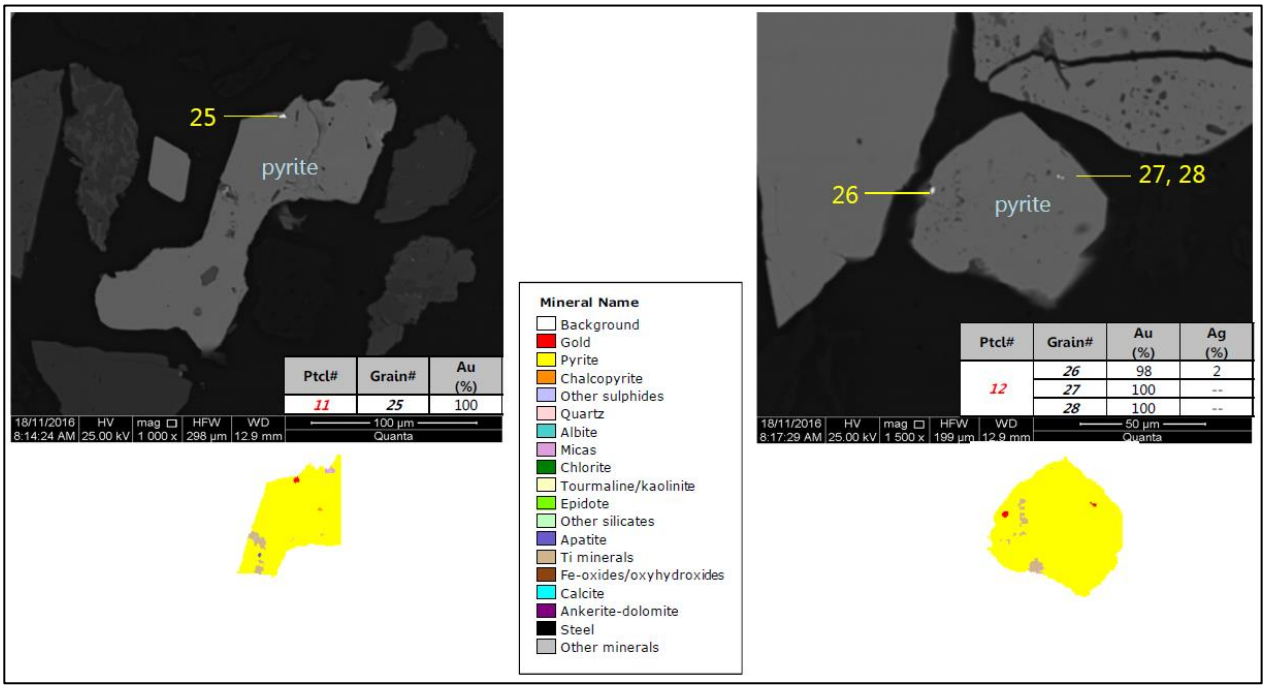


Figure 13-12: BSE images of (L): host particle 11, gold grain 25; and (R): host particle 12, gold grains 26 to 28 from gravity concentrate of CMA Pit Fresh Ore Master Composite

13.2.5.6 Optical Microscopy of Coarse Gold Grains

About half of the gravity concentrate (that was not mounted in the polished section for QEMSCAN) was hand-panned and examined for the presence of coarse, free gold grains using a stereomicroscope. Optical images of six coarse gold grains were captured in the sub-sample of

gravity concentrate from the CMA Pit Fresh Ore Master Composite. Coarse gold grain size data is presented in Table 13-30, and optical images of the gold grains are shown in Figure 13-13 to Figure 13-15.

Table 13-30: Coarse gold grain sizes identified by optical microscopy of gravity concentrate of CMA Pit Fresh Ore Master Composite

GOLD GRAIN NUMBER	GRAIN SIZE (µm)
1	130 × 60
2	170 × 40
3	110 × 70
4	190 × 90
5	130 × 90
6	200 × 70

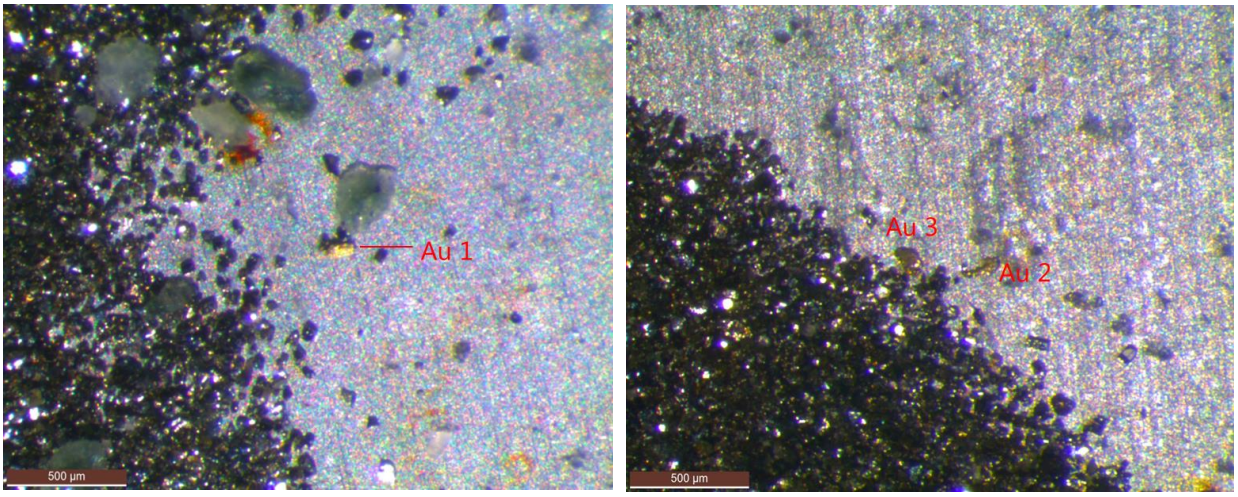


Figure 13-13: Optical images of (L): gold grain 1; and (R): gold grains 2 and 3 from gravity concentrate of CMA Pit Fresh Ore Master Composite

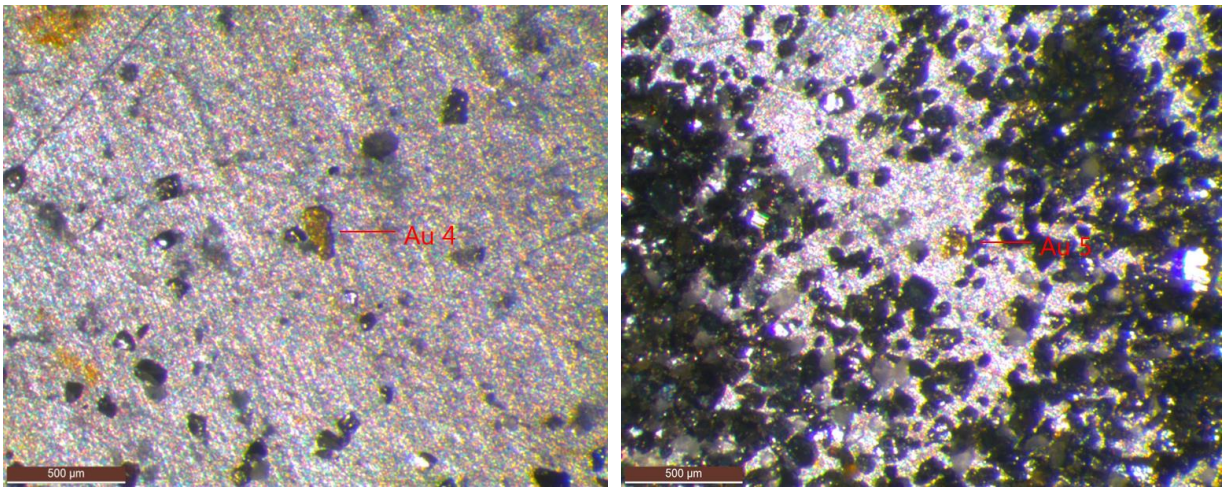


Figure 13-14: Optical images of (L): gold grain 4; and (R): gold grain 5 from gravity concentrate of CMA Pit Fresh Ore Master Composite

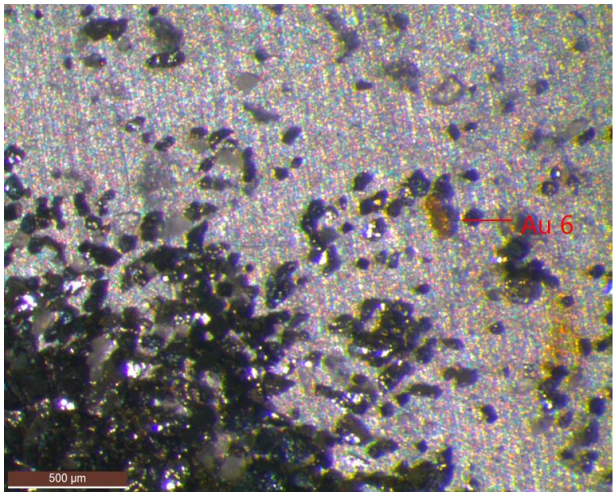


Figure 13-15: Optical image of gold grain 6 from gravity concentrate of CMA Pit Fresh Ore Master Composite

13.2.5.7 Gravity Tail of Mineralogical Composite

A sub-sample of the gravity tail of the CMA Pit Fresh Ore Master Composite was pressed into a back-packed sample holder to minimise preferred orientation of the particles. Powder X-ray diffraction (XRD) was used to analyse the gravity tail sample and a combination of matrix flushing and reference intensity ratio (RIR) derived constants were used in the quantification of the minerals identified in the sample. Quantitative results were normalised to 100%, representing the relative proportions of crystalline minerals in the sample. Any amorphous minerals that may be present in the gravity tail of the CMA Pit Fresh Ore Master Composite cannot be detected by the powder XRD method.

The gravity tail contains only a minor amount of pyrite (± sphalerite, 1%). Most of the sample mass is made up of non-sulfide gangue minerals, with clinochlore, quartz and dolomite-ankerite being dominant. The mineral abundance of the gravity tail of the CMA Pit Fresh Ore Master Composite is shown in Table 13-31. It was observed by the mineralogist that part of the clinochlore appeared to be altered. It was also noted that traces of serpentine, kaolinite and brochantite might also be present in the gravity tail of the CMA Pit Fresh Ore Master Composite.

Table 13-31: Mineral abundance of gravity tail of CMA Pit Fresh Ore Master Composite

MINERAL GROUP	MASS %
Clinochlore	52
Alpha quartz	17
Dolomite-ankerite	11
Sodic plagioclase	5
Calcite and Mg-calcite	4
Muscovite	3
Tourmaline	2
Pyrite (± sphalerite)	1
Microcline-rutile-titanite	1
Clay minerals	1
Chalcopyrite	<1
Hematite	<1
Magnetite	<1
Stilpnomelane	<1
Annite-biotite	<1

13.2.6 Carbon Adsorption Kinetics

The adsorption of gold from solution by activated carbon in a continuous carbon-in-pulp (CIP) adsorption train generally obeys the following empirically derived relationship:

$$\Delta[Au]_C = k.[Au]_S.t^n$$

Where:

- $\Delta[Au]_C$ = Change in the concentration of gold on carbon since time t=0 (in mg/L)
- k = Empirical rate constant dependent upon slurry mixing efficiency, pulp viscosity and carbon particle size (in h^{-1})
- $[Au]_S$ = Equilibrium concentration of gold in solution (in mg/L)
- t = Elapsed time (in h)
- n = Exponential constant relating to the gold loading capacity (typically in the range of 0.6 to 1.2).

Although the above model was derived for continuous CIP systems, experience has shown that indicative values of k and n (referred to as Fleming gold adsorption constants) can be determined by applying regression analysis to data from the first 6 h of a sequential batch CIP test.

Slurry from CMA Pit Fresh Ore Master Composite bulk direct leach test WH7734 (refer to Section 13.2.4.12) was subjected to sequential triple-contact CIP leach test work. A summary of results from regression analysis of the test work data to determine indicative Fleming gold adsorption constants for the CMA Pit Fresh Ore Master Composite cyanidation slurry is presented in Table 13-32.

Table 13-32: Sequential triple contact CIP leach test work results for CMA Pit Fresh Ore Master Composite cyanidation slurry

SAMPLE/TEST NUMBER	FLEMING CONSTANT k (h^{-1})	FLEMING CONSTANT n	ASSAYED LOADED CARBON CONCENTRATION (g/t Au)	CALCULATED CIP LOADED CARBON CONCENTRATION (g/t Au)
CMA Fresh Ore Master Composite (WH7734)	163.19	0.803	1,884	2,134

The Fleming carbon adsorption kinetics are within the range typically observed in carbon-in-leach (CIL) operations. The average gold assay on the carbon of 1,884 g/t Au is 12% lower than the CIP calculated carbon gold loading level of 2,134 g/t Au. Typical for cyanidation leach systems, the loaded carbon was also noted to contain elevated levels of Al, Ca, Mg and Na.

13.2.7 Oxygen Uptake Rate

An oxygen uptake rate determination test was conducted on a sub sample of CMA Pit Fresh Ore Master Composite, following the standard procedure described by Fraser (1984). The sample was prepared as follows:

- 1 kg of solids ground to 80% passing 75 µm (P_{80} of 75 µm) and slurrified to 50% w/w solids using Perth tap water
- Adjust initial slurry pH to 10.5 using lime
- Adjust NaCN concentration to 0.05% w/v.

Oxygen uptake rate data for the CMA Pit Fresh Ore Master Composite, collected at ambient temperature, are presented in Table 13-33. Note that data at 0 h represents baseline data prior to aeration.

Table 13-33: Oxygen uptake rate for CMA Pit Fresh Ore Master Composite

TIME (h)	OXYGEN UPTAKE RATE (mg/L/min)
0	-0.0200
1	-0.0187
2	-0.0169
3	-0.0110
4	-0.0087
5	-0.0091
6	-0.0031
24	-0.0059

The data indicate that the CMA Pit Fresh Ore Master Composite is not an aggressive oxygen consumer. The resultant dissolved oxygen levels tend to agree with the general dissolved oxygen levels observed in the WH7435 no sparge and WH7436 air sparge optimisation gravity leach tests in Section 13.2.4.8.

Although the oxygen uptake demand is typically low, the addition of oxygen instead of air to the CIL tanks is noted as an option for future expansion of the CIL plant.

13.2.8 Cyanide Detoxification

13.2.8.1 SO_2/Air Cyanide Detoxification Test Work

Continuous SO_2/air cyanide detoxification tests were undertaken on a CMA Pit Fresh Ore Master Composite cyanidation tailings sample from leach test WH7735 (refer to Section 13.2.4.12). Addition rates of SO_2 (as sodium metabisulfite, $Na_2S_2O_5$ or SMBS), copper sulfate pentahydrate ($CuSO_4.5H_2O$) and lime (60% CaO) were varied across the range of tests to optimise reagent addition rates and weak acid dissociable cyanide (CN_{WAD}) concentrations in effluent. CN_{WAD} assay was by direct spectrophotometric determination with picric acid reagent. CN_{total} was calculated as CN_{WAD} + 2.80×Fe.

The test work was conducted on cyanidation tailings slurry at 40% w/w solids. The pH target range for the reaction was 8.0 to 9.0, and the target aeration rate was 1 L/min/L reactor volume. A nominal residence time of 60 minutes was chosen. The results from the series of tests are presented in Table 13-34.

Table 13-34: Continuous SO_2/air cyanide detoxification test results on CMA Pit Fresh Ore Master Composite cyanidation tailings slurry

SAMPLE TEST NUMBER	pH	RETENTION TIME (min)	SO_2 (g/g CN_{WAD})	$CuSO_4.5H_2O$ (mg/L)	LIME (g/g SO_2)	CN_{WAD} (mg/L)	CN_{TOTAL} (mg/L)	Cu (mg/L)	Fe (mg/L)	Ni (mg/L)	Zn (mg/L)
Feed	9.57	-	-	-	-	89.2	150	9.90	21.6	0.40	0.88
D1	8.57	55.21	5.00	230	3.45	0.41	1.92	0.06	0.55	0.20	<0.02
D2	8.54	56.63	4.00	230	2.42	0.79	2.17	0.06	0.50	0.18	<0.02
D3	8.55	57.35	3.00	230	1.98	0.48	1.30	0.05	0.30	0.20	<0.02
D4	8.61	58.54	3.00	0	1.17	1.20	19.3	7.24	6.60	0.28	<0.02
D5	8.47	59.26	3.00	0	0.00	8.13	24.1	6.81	5.80	0.35	0.07
D6	8.90	29.81	3.00	0	0.00	28.3	54.0	9.50	9.35	0.40	0.24

From the results:

- For tests D1 to D3, where $CuSO_4.5H_2O$ was added, residual CN_{WAD} levels <1 mg/L were achieved. The catalysis benefit of $CuSO_4.5H_2O$ is noted when comparing residual CN_{WAD} levels from tests D1 to D3 with tests D4 to D6.
- For tests D1 to D3, varying the ratio of SO_2:CN_{WAD} resulted in no major difference in residual CN_{WAD} levels.
- All six tests achieve residual CN_{WAD} levels <50 mg/L, which aligns with industry guidelines for TSFs such as Standard of Practice 4.4 of International Cyanide Management Institute's *Mining Operations Verification Protocol* (2021).
- The optimal addition ratio from the six tests is 3.0 g SO_2/g CN_{WAD}. It was noted that a slightly higher ratio would likely be required on a commercial scale.
- Superior detoxification performance was achieved in the series of SO_2/air cyanide detoxification tests, compared to the hydrogen peroxide tests (Section 13.2.8.2), particularly considering that the SO_2/air tests are conducted on the entire cyanidation tailings slurry stream (instead of a decanted solution stream).

13.2.8.2 Hydrogen Peroxide Cyanide Detoxification Test Work

Cyanide detoxification tests using hydrogen peroxide were undertaken on a CMA Pit Fresh Ore Master Composite cyanidation tailings solution sample from leach test WH7735 (refer to Section 13.2.4.12). Addition rates of hydrogen peroxide (H_2O_2) and copper sulfate pentahydrate ($CuSO_4.5H_2O$) were varied across the range of tests to optimise reagent addition rates and weak acid dissociable cyanide (CN_{WAD}) concentrations in effluent. CN_{WAD} assay was by direct spectrophotometric determination with picric acid reagent.

The test work was conducted on solution decanted from cyanidation tailings slurry. The addition of pH modifiers was not required to meet the target range of 9.0 to 9.5 (after hydrogen peroxide dosing and mixing). A nominal residence time of 30 minutes was chosen. The results from the series of tests are presented in Table 13-35.

Table 13-35: Hydrogen peroxide cyanide detoxification test results on CMA Pit Fresh Ore Master Composite cyanidation tailings solution

SAMPLE TEST NUMBER	pH	RETENTION TIME (min)	H_2O_2 (mol/mol CN_{WAD})	H_2O_2 (g/L)	$CuSO_4.5H_2O$ (mg/L)	CN_{WAD} (mg/L)	CN_{TOTAL} (mg/L)	Cu (mg/L)	Fe (mg/L)	Ni (mg/L)	Zn (mg/L)
Feed	9.57	-	-	-	-	89.2	150	9.90	21.6	0.40	0.88
P1	9.33	30	3.00	0.35	0.18	19.2	20.9	18.2	0.60	0.15	0.04
P2	9.32	30	2.00	0.23	0.18	34.0	37.5	31.4	1.30	0.20	0.08
P3	9.32	30	1.50	0.18	0.18	40.6	50.2	43.1	3.50	0.30	0.24
P4	-	30	4.00	0.47	0.18	19.7	23.0	48.2	1.20	0.45	0.10
P5	-	30	5.00	0.58	0.18	12.3	12.6	28.1	<0.10	0.45	<0.02
P6	9.13	30	5.00	0.58	0	13.8	44.1	14.4	11.0	0.50	0.60

From the results:

- The lowest residual CN_{WAD} level achieved was 12 mg/L, catalysed by copper, after 30 minutes residence time with the maximum molar ratio trialled (test P5).
- Superior detoxification performance was achieved in the series of SO_2/air cyanide detoxification tests (Section 13.2.8.1), compared to the hydrogen peroxide tests, particularly considering that the SO_2/air tests are conducted on the entire cyanidation tailings slurry stream (instead of a decanted solution stream).

13.2.9 Viscosity

A series of rheology tests were performed at four different pulp densities on the CMA Pit Fresh Ore Master Composite sample ground to P_{80} of 75 µm. The slurry was adjusted to pH 10.5 using milk of lime, thereby simulating CIL operating conditions. The viscosities were measured using a Bohlin Visco 88 bench viscometer and all tests were conducted at ambient temperature. The results are summarised in Table 13-36.

Table 13-36: Viscosity results for the CMA Pit Fresh Ore Master Composite sample

SAMPLE	SOLIDS CONC (% w/w)	VISCOSITY (cP) AT SHEAR RATE (s^{-1})							
		4.2	7.4	13.1	21.9	38.9	67.4	119.2	209.5
CMA Fresh Ore Master Composite	55	0	170	120	93	57	58	66	83
	50	0	0	0	0	28	33	46	63
	45	0	0	0	0	0	23	36	56
	40	0	0	0	0	0	12	25	44

As described by Norgaard (2019), if viscosity:

- <100 cP at a shear rate of 119.2 s^{-1}, then there should be no pumping issues
- <3,500 cP at a shear rate of 4.2 s^{-1}, then there should be no mixing or screening issues.

Based on these guidelines, there should be no viscosity related materials handling issues when treating CMA fresh ore in the Yaouré processing plant at any of the pulp densities tested.

13.2.10 Thickening and Settling Rate

CMA Pit Fresh Ore Master Composite slurry, at pH of 10.5 and target grind size P_{80} of 75 µm (measured as P_{80} of 69 µm by laser diffraction size analysis in Outotec report), was subjected to thickening and settling rate test work by Outotec, Perth as part of the ALS Metallurgy test work program. The objectives of the test work were to determine:

- flocculant type and dose.
- overflow clarity.
- underflow density.
- underflow yield stress.

13.2.10.1 Flocculant Screening

Flocculant screening was conducted on the CMA Pit Fresh Ore Master Composite in 500 mL static cylinder tests at a pulp density of 10% w/w solids. Common BASF flocculants (Magnafloc® 10, 155, 351 and 5250) were tested. Results are shown in Figure 13-16.

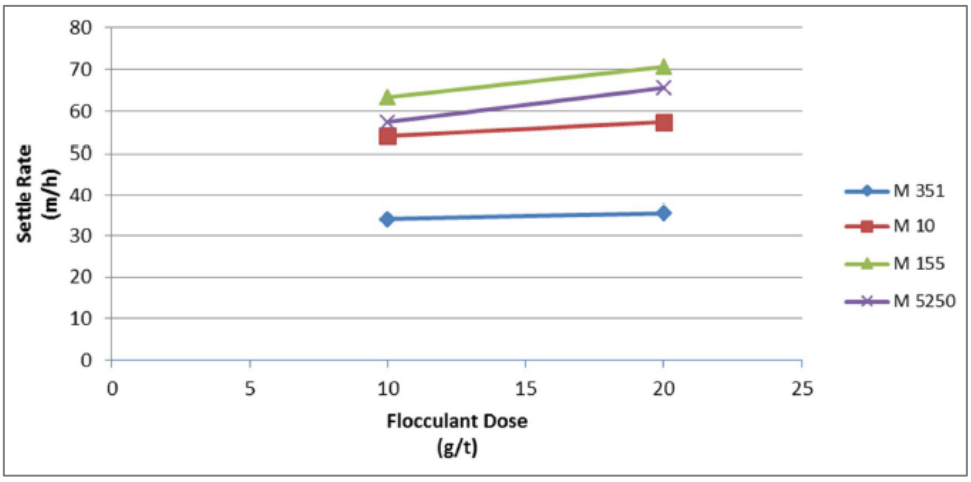


Figure 13-16: Settling rates of CMA Pit Fresh Ore Master Composite at 10% w/w solids in static cylinder tests

BASF Magnafloc® 155 (M155) was selected for dynamic thickening test work as it gave clean, robust and fast settling flocculation at a low dose.

13.2.10.2 Dynamic Thickening Tests

Dynamic thickening tests on the CMA Pit Fresh Ore Master Composite were conducted using a 99 mm diameter Supaflo high-rate thickener test rig. Slurry was drawn from an agitated stock tank by a variable speed peristaltic pump, diluted and pH adjusted to 10.5 with lime. Stock flocculant solution was mixed to 0.25% w/v (2.5 g/L), and then diluted as required before being dosed to the test rig at a set flow rate, which was varied across the series of tests between 5 and 15 g/t. Diluted flocculant was dosed half into the diluent line and half into the diluted feed line further downstream. The flocculated solids bed was raked continuously at 2 rpm with two rotating pickets, in conjunction with two stationary pickets to aid dewatering.

Overflow samples were collected and analysed to determine suspended solids content. Underflow samples were collected to determine solids concentration and a simple unsheared vane yield stress was measured using a Thermo Haake VT550 rheometer and an OK600 4 blade vane to assist with thickener rake drive sizing.

A summary of results from the dynamic thickening tests is presented in Table 13-37.

Table 13-37: Dynamic thickening test work results for the CMA Pit Fresh Ore Master Composite

TEST	FEED FLUX ($t/m^2/h$)	FEED LIQUOR RISE RATE (m/h)	FLOCCULANT TYPE	FLOCCULANT DOSE (g/t)	UNDERFLOW SOLIDS CONC. (% w/w)	UNDERFLOW YIELD STRESS (Pa)	OVERFLOW SOLIDS CONC. (mg/L)
1	0.50	3.02	M155	10	65.0	32	<100
2	0.50	3.02	M155	5	64.0	20	<100
3	0.50	3.02	M155	15	64.6	30	<100
4	1.00	6.05	M155	10	61.7	20	<100
5	1.50	9.07	M155	10	60.0	15	<100

The test work results show that the CMA Pit Fresh Ore Master Composite can be thickened by high rate thickening to underflow pulp densities of 60.0-65.0% w/w solids over a flux rate range of 0.50-1.50 $t/m^2/h$, with simultaneously good overflow clarity.

13.2.11 Tailings Geochemistry

Cyanidation tailings slurry from bulk whole ore leach test WH8096 on CMA Fresh Ore Master Composite (Section 13.2.4.12) was submitted to Knight Piésold for geochemical testing (Knight Piésold, 2017a); (Knight Piésold, 2017b).

The total sulfur results for the CMA Fresh ore Master Composite tailings sample (0.57%) aligned well with the head assay performed by ALS on the same sample (0.53%, Section 13.2.2). The sample was essentially devoid of sulfate (0.01%), indicating that nearly all sulfur is present as sulfide. The maximum potential acidity (MPA) for the CMA Fresh ore Master Composite tailings sample was high at 17.1 kg H_2SO_4/t.

The acid neutralising capacity (ANC) of the CMA Fresh ore Master Composite tailings sample was very high at 205 kg H_2SO_4/t, and concurred with the ANC estimated as being available from carbonate minerals (220 kg H_2SO_4/t).

The net acid producing potential (NAPP) was calculated from the MPA and the ANC, along with the ANC/MPA ratio (12.0 for the CMA Fresh Ore Master Composite tailings sample). The NAPP value was -188 kg H_2SO_4/t, which along with the high ANC/NPA ratio indicates excess neutralising capacity. In the net acid generating (NAG) test, the CMA Fresh Ore Master Composite tailings sample did not produce any measurable acid, with a final pH value of 8.9. The CMA Fresh Ore Master Composite tailings sample was classified as acid consuming and, as such, there are no specific controls required with respect to acid generation during operations of a TSF or on closure.

The results of the multi-element analysis indicate that the level of element enrichment in the tailings solids is low and that no specific controls are required with respect to element enrichments during TSF operations. A closure cover system will be required for the TSF.

Given that the cyanidation process leads to the presence of cyanide, cyanide complexes and dissolved metals in the supernatant, an engineered low permeability liner across the TSF basin and underdrainage system were installed. A store and release cover system is required for closure.

13.3 Yaouré Pit Fresh Ore Test Work

The Yaouré deposit, specifically fresh ore mineable within an economic open pit shell, was the subject of metallurgical investigation as part of the 2017-2018 DFS Programs. The Yaouré pit is located to the west of the CMA pit, as shown in the site plan in Figure 16-1. The program specifically considered ore mineable within an economic open pit shell.

Samples of fresh ore from within the Yaouré pit shell were tested to determine:

- whether the optimised processing route and conditions selected for the CMA pit fresh ore are also applicable to the Yaouré pit fresh ore
- the plant operating parameters for Yaouré pit fresh ore for the determined processing route, specifically throughput rate, gold recovery and reagent consumption
- engineering design data required for plant and TSF design.

The program was completed by ALS Metallurgy in Perth, Western Australia (ALS, 2017); (ALS, 2018) and Knight Piésold in Perth (Knight Piésold, 2017a); (Knight Piésold, 2017b), and included the following:

- comminution tests (SMC Test®, BWi and Ai on ten comminution variability samples and three ore type master composites; and RWi on six comminution variability samples)
- ore type master composite test work program on Yaouré pit fresh ore master composites:
    - gold extraction test work to assess gravity and leaching characteristics across a range of grind sizes, leading to selection of optimised process conditions
    - mineralogical investigation and multi-stage diagnostic leach to gain understanding of gold deportment, as well as ore and gangue mineralogy
    - cyanide detoxification test work
    - determination of parameters necessary for process plant and TSF design and operation (carbon adsorption kinetics, oxygen uptake rate, viscosity, thickening and settling rate, tailings geochemistry)
- gravity/cyanidation tests under optimised process conditions on 24 fresh ore metallurgical variability samples.

13.3.1 Samples Selected

Four master composite samples, 11 comminution variability samples, and 24 metallurgical variability samples were selected from core and RC drill sample rejects taken from 56 drill holes spread across fresh ore within the 2017 preliminary Yaouré pit. Samples were taken from the non-oxidised profile over an approximate range of:

- 375 m east to west
- 496 m north to south
- 180 m in RL.

The location of the Yaouré fresh ore master composite sample intervals within the deposit are shown as green dots in Figure 13-17 and Figure 13-18. The location of the comminution variability sample intervals (red dots) and metallurgical variability sample intervals (blue dots) are shown in Figure 13-19 and Figure 13-20. Across the four figures, the 2017 preliminary Yaouré pit shell is shown in grey, and the re-interpreted 2023 Yaouré pit shell is shown in light blue.

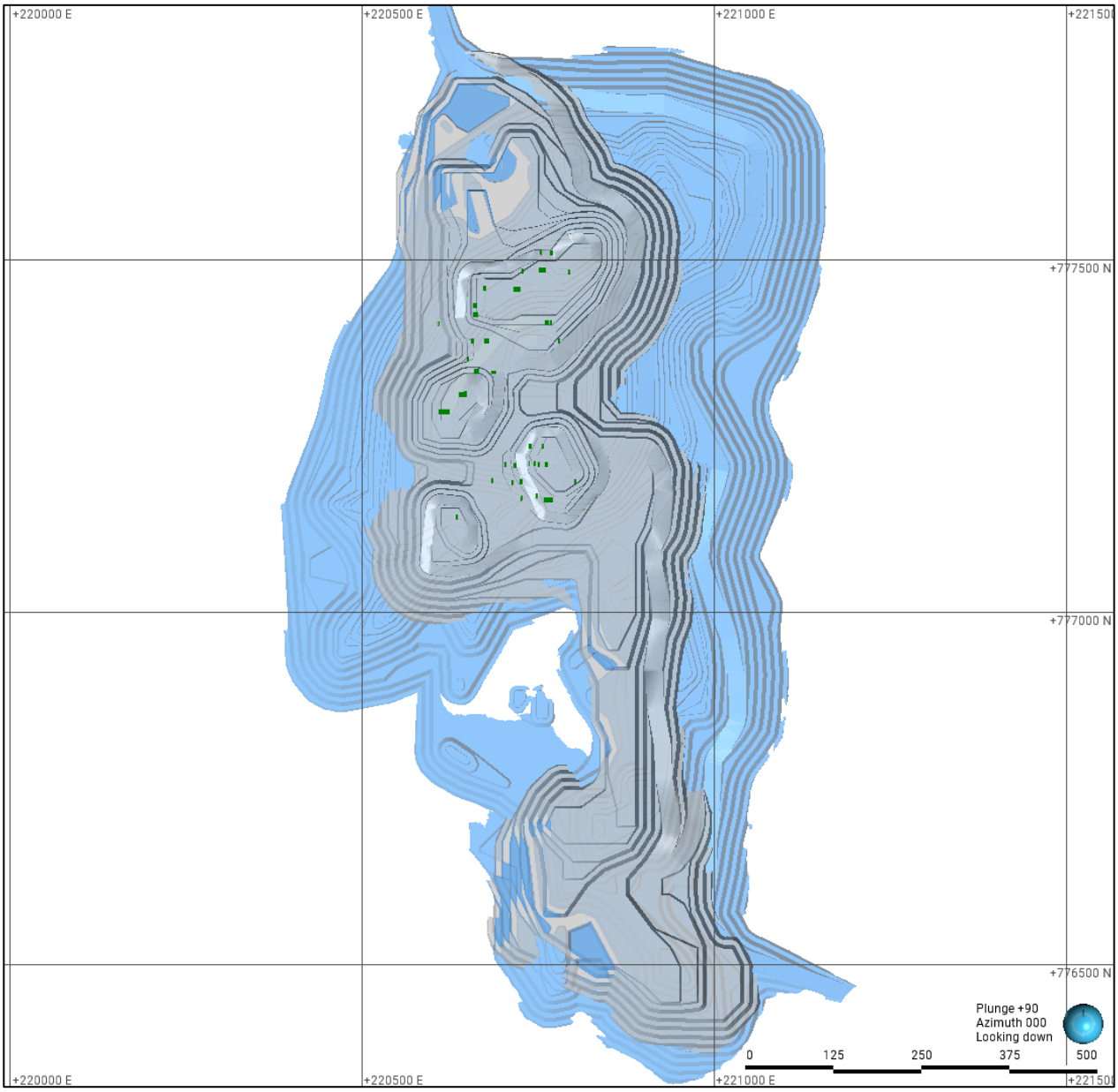


Figure 13-17: Location of fresh ore master composite samples within the Yaouré deposit, plan view (Perseus, 2023)

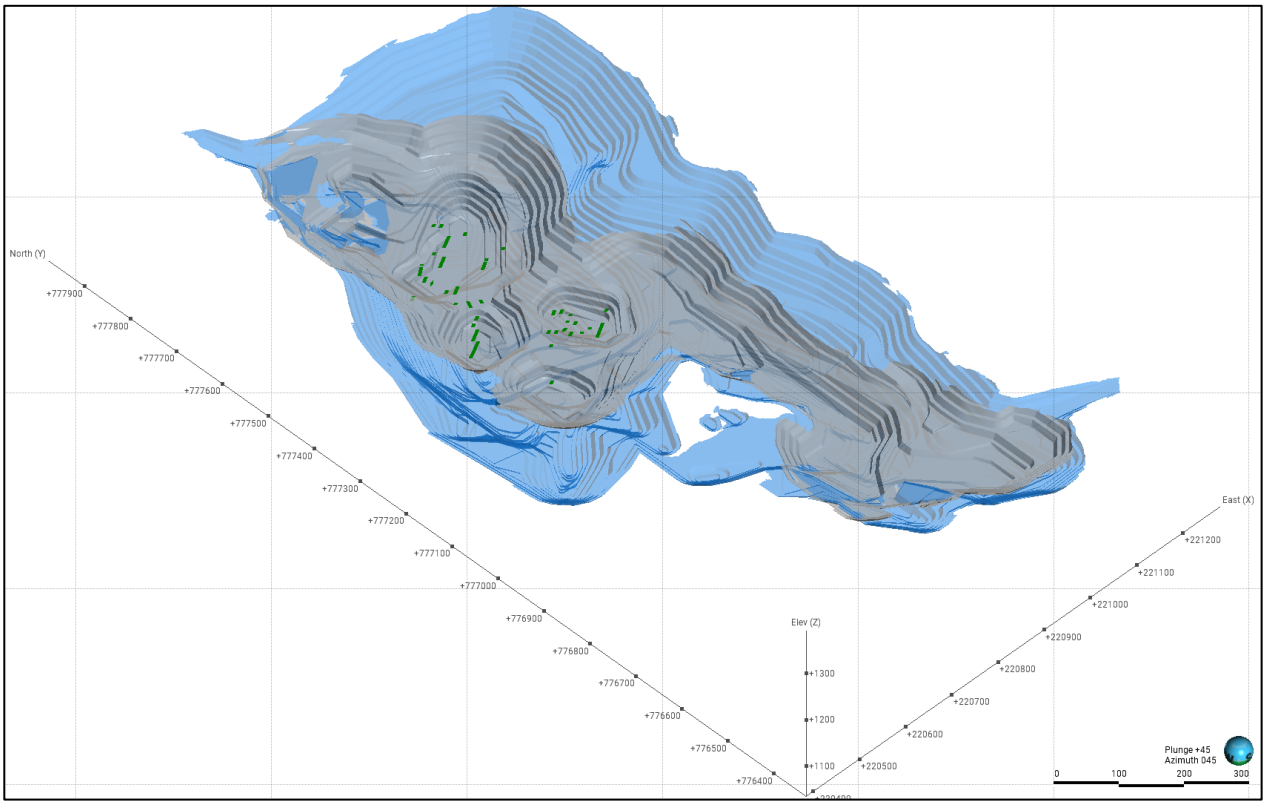


Figure 13-18: Location of fresh ore master composite samples within the Yaouré deposit, perspective view looking northeast (Perseus, 2023)

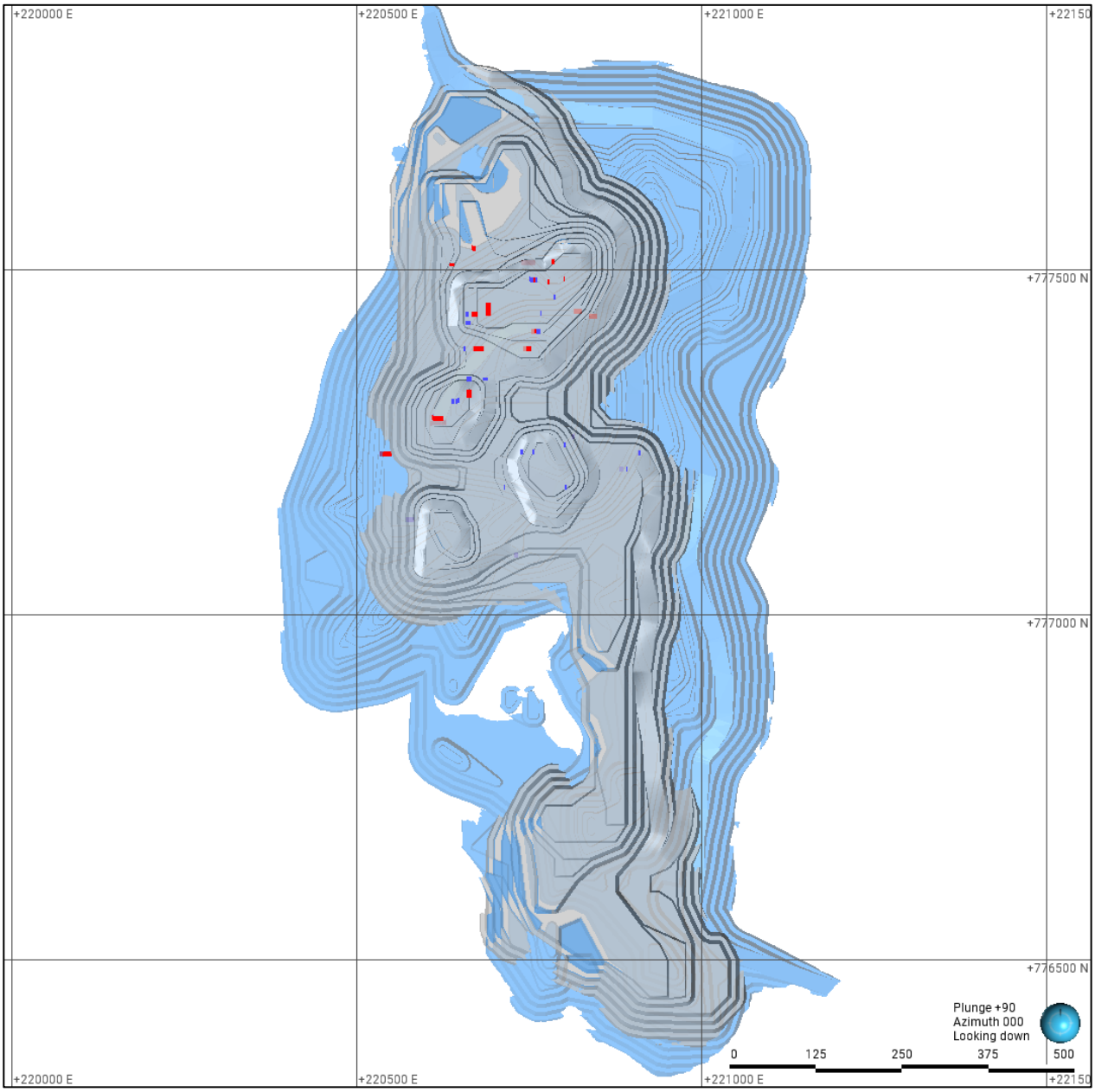


Figure 13-19: Location of fresh ore comminution and metallurgical variability samples within the Yaouré deposit, plan view (Perseus, 2023)

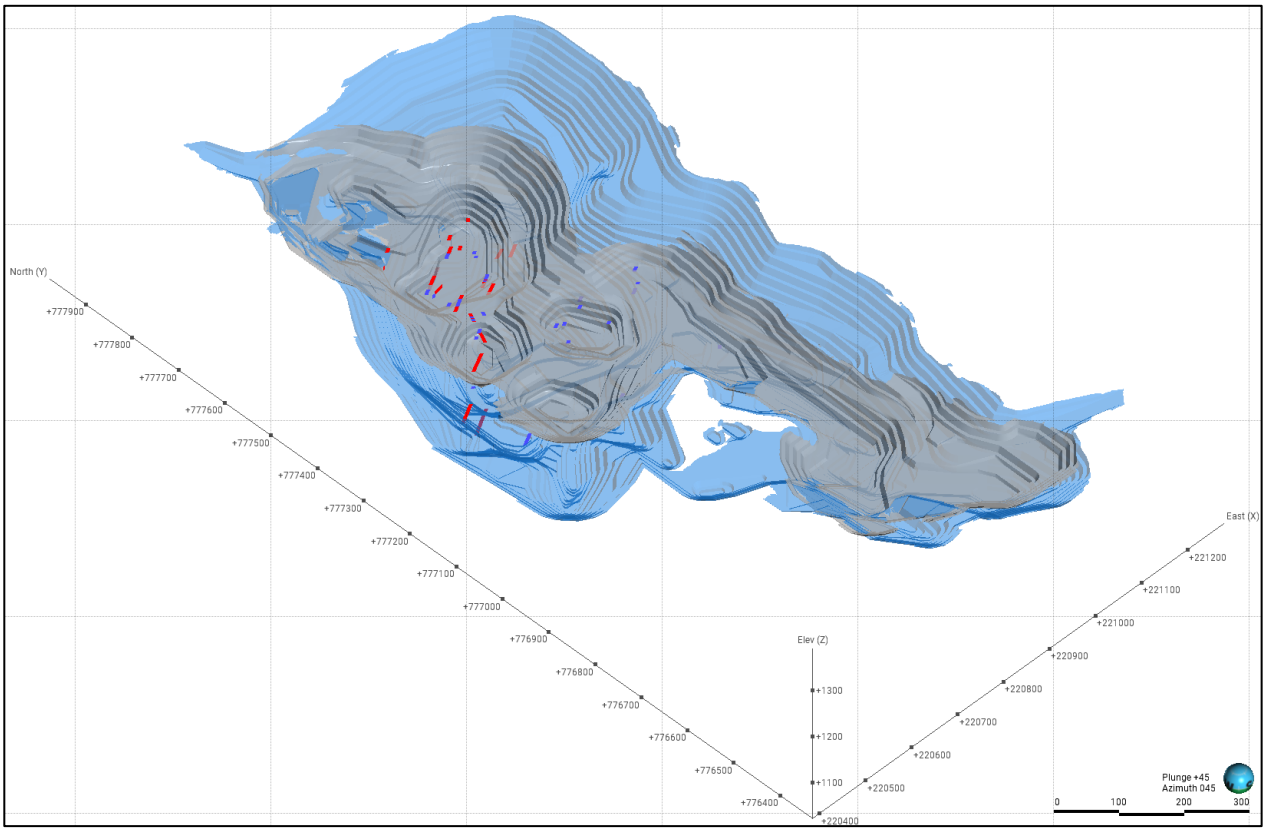


Figure 13-20: Location of fresh ore comminution and metallurgical variability samples within the Yaouré deposit, perspective view looking northeast (Perseus, 2023)

13.3.1.1 Comminution Variability Samples

Fourteen fresh ore comminution samples (11 variability samples and three master composite samples) were selected from drill core during the 2017 DFS. The comminution samples were grouped between granodiorite ore and basalt ore, the dominant lithologies of the Yaouré deposit, based on the 2017 interpretation of the Yaouré orebody. Sample origins for the 11 variability samples are shown in Table 13-38. Sample origins and masses used to generate the three Yaouré pit fresh ore master composites are shown in Table 13-39 to Table 13-41 in Section 13.3.1.2.

Table 13-38: Yaouré pit fresh ore variability samples for comminution testing

SAMPLE	DRILL HOLE	FROM (m)	TO (m)	2017 LITHOLOGY	2023 LITHOLOGY
COMM-8	YDD0455	34	67	granodiorite	granodiorite
COMM-9	YDD0003	21.97	36	granodiorite	basalt
	YDD0003	55.45	73.69		
COMM-10	YDD0363	19	49	granodiorite	granodiorite
COMM-11	YDD0007	3.9	11	granodiorite	oxide
	YDD0435	0	9		
	YDD0436	0	17		
COMM-12	YDD0010	37.75	73.15	granodiorite	granodiorite
COMM-13	YDD0193	177	223	granodiorite	granodiorite
COMM-14	YDD0021	33.8	42.33	basalt	basalt
	YDD0022	37.66	46.63		
	YDD0059	38.96	48.43		
	YDD0434	28	41		
COMM-15	YDD0215	100	123	basalt	basalt
	YDD0264	112	130		
COMM-16	YDD0014	51.8	69.64	basalt	basalt
	YDD0444	49	70		
COMM-17	YDD0460	54	90	basalt	granodiorite
COMM-18	YDD0022	94.47	136.09	basalt	basalt

Based on the 2017 interpretation of the Yaouré orebody:

- Samples COMM-14 and COMM-15 were selected from Yaouré Y-structures
- Samples COMM-16 and COMM-17 were selected from Yaouré S-structures
- Sample COMM-18 was selected from an unclassified basalt.

Given that the Yaouré orebody was re-interpreted in 2023 as part of updates to the Mineral Resource and Mineral Reserve, including re-interpreting the weathering surface and updating lithologies and mineralisation domains, the categorisation of Yaouré pit fresh ore comminution samples was reviewed.

Findings with reference to the 2023 Yaouré pit orebody model include:

- For COMM-8, 66.5% of the sample interval length is categorised as fresh granodiorite
- For COMM-9, 71.4% of the sample interval length is categorised as fresh basalt
- For COMM-10, 83.5% of the sample interval length is categorised as fresh granodiorite
- For COMM-11, 79.3% of the sample interval length is categorised as fully weathered, with a further 5.2% categorised as partially weathered
- For COMM-12, 100% of the sample interval length is categorised as fresh granodiorite
- For COMM-13, 100% of the sample interval length is categorised as fresh granodiorite
- For COMM-14, 76.3% of the sample interval length is categorised as fresh basalt
- For COMM-15, 100% of the sample interval length is categorised as fresh basalt
- For COMM-16, 57.3% of the sample interval length is categorised as fresh basalt

- For COMM-17, 100% of the sample interval length is categorised as fresh granodiorite
- For COMM-18, 100% of the sample interval length is categorised as fresh basalt.

For the purposes of comparison, the 2017 and 2023 lithological groupings of the comminution samples have been included in Table 13-38. Given the oxidised nature of COMM-11, the comminution results for this sample have been reported in Section 13.4 and will not be further referenced in Section 13.3.3. For the remainder of the samples, comminution results will be discussed as per the 2023 lithological groupings in Section 13.3.3.

13.3.1.2 Metallurgical Composite Samples

Four Yaouré pit fresh ore master composites, representing dominant Yaouré pit fresh rock lithologies, were formulated for comminution, metallurgical optimisation, and engineering definition test work during the 2017 DFS:

- Yaouré Granodiorite Master Composite
- Yaouré S-Basalt Master Composite
- Yaouré Y-Basalt Master Composite
- Yaouré Combined Basalt Master Composite.

The selection and categorisation of these fresh ore master composites was based on the 2017 interpretation of the Yaouré orebody. Table 13-39 to Table 13-41 details the sub-sample origins and masses used to generate the Yaouré pit fresh ore master composites.

Table 13-39: Yaouré Granodiorite Master Composite recipe

SAMPLE	DRILL HOLE	FROM (m)	TO (m)	MASS TO COMPOSITE (kg)
Yaouré Granodiorite Master Composite	YDD0004	27.22	40.2	7.29
	YDD0014	36.8	41.95	5.72
	YDD0267	2	7	5.11
	YDD0335	27	31	3.72
	YDD0363	26	40	6.37
	YDD0436	24	34	10.16
	YDD0455	45	66	9.47
	YDD0475	19	25	4.97
	YDD0477	25	29	3.45
	YDD0484	44	50	5.35
	YRC0900	21	25	7.86
	YRC0900	26	29	5.77
	YRC1023	27	34	13.44
	YRC1038	41	53	23.94
	YRC1053	50	70	41.11
	YRC1054	26	30	7.83
	YRC1056	11	20	17.07
	YRC1101	4	8	8.03
	YRC1107	19	25	11.56
	YRC1116	24	26	3.85
	YRC1123	19	21	3.80
	YRC1126	21	24	5.68
	YRC1126	27	43	31.35

Table 13-40: Yaouré S-Basalt Master Composite recipe

SAMPLE	DRILL HOLE	FROM (m)	TO (m)	MASS TO COMPOSITE (kg)
Yaouré S-Basalt Master Composite	YDD0003	21.97	35.15	6.86
	YDD0008	31.90	39.15	4.47
	YDD0014	43.75	57.95	8.56
	YDD0455	36	45	4.58
	YRC1052	15	23	15.89
	YRC1052	28	34	11.79

Table 13-41: Yaouré Y-Basalt Master Composite recipe

SAMPLE	DRILL HOLE	FROM (m)	TO (m)	MASS TO COMPOSITE (kg)
Yaouré Y-Basalt Master Composite	YRC0964	7	12	9.62
	YRC0975	44	50	12.36
	YRC1102	9	13	8.35
	YRC1111	26	33	12.99
	YRC1116	12	17	9.62
	YRC1116	26	29	5.64
	YRC1116	39	44	9.94
	YRC1122	9	36	53.93
	YRC1123	16	19	5.77
	YRC1127	39	47	16.28
	YDD0185	19	25	5.29
	YDD0257	16	25	6.85
	YDD0335	31	34	2.68
	YDD0434	30	51	11.00
	YDD0486	27	34	6.14
	YRC1038	34	41	15.14

For the purposes of thickening and tailings geochemistry test work, a Yaouré Combined Basalt Master Composite was generated. The Yaouré Combined Basalt Master Composite is a 50:50 blend by mass of Yaouré Y-Basalt Master Composite and Yaouré S-Basalt Master Composite.

Given that the Yaouré orebody was re-interpreted in 2023 as part of updates to the Mineral Resource and Mineral Reserve, including re-interpreting the weathering surface and updating lithologies and mineralisation domains, the categorisation of Yaouré pit fresh ore master composite samples was reviewed.

For the Yaouré Granodiorite Master Composite selected in 2017, there is good correlation (>87% of the sample interval lengths and >85% by composite mass) to the lithology (granodiorite) and weathering profile (fresh) in the 2023 model. The deviation is associated with lithology (granodiorite that was recharacterised basalt) and/or weathering characterisation (partially weathered, rather than fresh).

For the Yaouré S-Basalt Master Composite selected in 2017, there is 100% correlation to the lithology (basalt) and weathering profile (fresh) in the 2023 model.

For the Yaouré Y-Basalt Master Composite selected in 2017, there is good correlation (>91% of the sample interval lengths and >88% by composite mass) to the lithology (basalt) and weathering profile (fresh) in the 2023 model. Nearly all of the deviation is associated with weathering characterisation (partially weathered, rather than fresh).

Based on a 50:50 blend by mass of Yaouré Y-Basalt Master Composite and Yaouré S-Basalt Master Composite to generate the Yaouré Combined Basalt Master Composite, there is notionally good correlation (>94% by composite mass) to the lithology (basalt) and weathering profile (fresh) in the 2023 model. Nearly all of the deviation is associated with weathering characterisation (partially weathered, rather than fresh).

Based on the 2023 review, all four Yaouré pit fresh ore master composite samples are deemed to be appropriately and substantially representative of their lithologies.

13.3.1.3 Metallurgical Variability Samples

Twenty-four samples representing Yaouré pit fresh rock lithologies were formulated for metallurgical variability test work during the 2017 DFS:

- granodiorite (YG)
- S-basalt (YBS)
- Y-basalt (YBY)
- porphyry (YPOR).

The selection and categorisation of the fresh ore metallurgical variability samples was based on the 2017 interpretation of the Yaouré orebody. Sample origins are shown in Table 13-42. Note that there was insufficient sample to generate variability samples YG-VAR-48, YG-VAR-50, YBY-VAR-64 and YBY-VAR-71 and therefore they do not appear in this report.

Table 13-42: Yaouré pit fresh ore metallurgical variability samples

SAMPLE	DRILL HOLE	FROM (m)	TO (m)	2023 LITHOLOGY
YG-VAR-47	YDD0004	27.22	40.20	granodiorite
YG-VAR-49	YDD0267	2	7	granodiorite
YG-VAR-51	YDD0363	26	40	granodiorite
YG-VAR-52	YDD0436	24	34	granodiorite
YG-VAR-53	YDD0455	45	66	granodiorite
YG-VAR-54	YDD0475	19	25	granodiorite
YBS-VAR-55	YDD0003	21.97	35.15	basalt
YBS-VAR-56	YDD0008	31.90	39.15	basalt
YBS-VAR-57	YDD0455	36	45	basalt
YBS-VAR-58	YRC1052	15	23	basalt
YBS-VAR-59	YRC1052	28	34	basalt
YBS-VAR-60	YDD0014	43.75	57.95	basalt
YBS-VAR-61	YDD0479	79	102	basalt
YBS-VAR-62	YDD0496	72	81	basalt
YBS-VAR-63	YDD0480	112	117	basalt
YBY-VAR-65	YDD0027	35.94	40.78	basalt
YBY-VAR-66	YDD0257	16	25	basalt
YBY-VAR-67	YDD0432	16	20	basalt
YBY-VAR-68	YDD0434	30	51	basalt
YBY-VAR-69	YDD0486	27	34	basalt
YBY-VAR-70	YDD0185	19	25	basalt
YPOR-VAR-72	YRC0978	30	36	basalt
	YRC0990	21	30	
YPOR-VAR-73	YRC1022	30	41	basalt
	YRC1114	32	41	
YPOR-VAR-74	YRC1022	19	23	basalt
	YRC1121	32	40	

Given that the Yaouré orebody was re-interpreted in 2023 as part of updates to the Mineral Resource and Mineral Reserve, including re-interpreting the weathering surface and updating

lithologies and mineralisation domains, the categorisation of Yaouré pit fresh ore metallurgical variability samples was reviewed.

For the variability samples that were categorised as granodiorite in 2017, there is very good correlation (>99% of the sample intervals) to the lithology (granodiorite) and weathering profile (fresh) in the 2023 model.

For the variability samples that were categorised as S-basalt in 2017, there is very good correlation (>98% of the sample intervals) to the lithology (basalt) and weathering profile (fresh) in the 2023 model.

For the variability samples that were categorised as Y-basalt in 2017, there is very good correlation (>98% of the sample intervals) to the lithology (basalt) and weathering profile (fresh) in the 2023 model.

For the variability samples that were categorised as porphyry in 2017, they have been recategorised as basalt by lithology in the 2023 model.

As discussed in Section 13.4.1.3, two metallurgical variability samples categorised as transition ore in 2017 (TRN-VAR-80 and TRN-VAR-81) were found to be fresh ore within the 2023 re-interpreted weathering profile. Drill core sample origins for variability samples TRN-VAR-80 and TRN-VAR-81, and their revised lithological categorisation, are shown in Table 13-43.

Table 13-43: Additional Yaouré pit fresh ore metallurgical variability samples after 2023 recategorisation by lithology

SAMPLE	DRILL HOLE	FROM (m)	TO (m)	2023 LITHOLOGY
TRN-VAR-80	YRC0963D	38	47	basalt (fresh)
TRN-VAR-81	YRC1074	18	25	granodiorite (fresh)

Given the re-categorisation of variability samples TRN-VAR-80 and TRN-VAR-81, they have been included in Section 13.3 of this report.

When discussing metallurgical variability results in Section 13.3 of this report, references will be made to 2017 lithological groupings, as well as the re-interpreted 2023 lithological groupings (granodiorite or basalt, as included in the right hand column of Table 13-42).

13.3.2 Head Grade and Specific Gravity

Each metallurgical variability sample and composite was subjected to duplicate head assays for gold by standard FA, assays for a further 34 analytes and true SG determination. A summary of select assay results is shown in Table 13-44. From the data:

- There is good correlation between many of the duplicate gold assays, with some samples (e.g., YG-VAR-49, YBS-VAR-60, YBY-VAR-65, YBY-VAR-67, YBY-VAR-68, YBY-VAR-69, Yaouré Granodiorite Master Composite) exhibiting inconsistency that may be associated with the presence of coarse spotty gold
- The gold grades of the Yaouré pit fresh ore master composites (averaging between 2.42 g/t Au and 2.57 g/t Au) are higher than the 2023 Mineral Reserves grade for the Yaouré pit stated in Table 15-1 (1.49 g/t Au)
- Silver is not present in economic quantity
- The sulfide sulfur assay data set indicates that sulfide minerals are present. Mineralogical analysis performed on Yaouré pit fresh ore master composites, presented in Section 13.3.5, confirms the dominant sulfide mineral is pyrite (~93-99% of the mass of sulfide minerals

identified). This finding is also supported by low assay values across the data set for arsenic, copper and base metals other than iron

- A number of variability samples (e.g., YBS-VAR-58, YBS-VAR-59, YPOR-VAR-73, YPOR-VAR-74), as well as all three master composites, have elevated organic carbon assays, increasing the possibility of preg-robbing of gold in solution during cyanidation. There was no evidence of gold preg-robbing or negative effect on gold extraction when these samples were tested at optimised gravity/leach conditions in Sections 13.3.4.4 and 13.3.4.2.
- Mercury is present in only some samples – health monitoring of gold room personnel is in place to manage residual risk
- Antimony levels are low, lessening the risk of gold passivation that can occur at high pH.

Table 13-44: Head assay (select analytes) for Yaouré pit fresh ore master composite and variability samples

SAMPLE	Au (g/t)	Ag (g/t)	As (ppm)	$C_{ORGANIC}$ (%)	Hg (ppm)	$S_{SULFIDE}$ (%)	Sb (ppm)
YG-VAR-47	0.62/1.43	<0.3	<25	0.03	<0.1	0.32	0.6
YG-VAR-49	1.34/3.06	<0.3	25	0.03	<0.1	0.20	0.5
YG-VAR-51	1.42/1.06	<0.3	<25	0.03	<0.1	0.54	0.3
YG-VAR-52	0.75/0.61	<0.3	<25	0.03	0.2	0.34	0.4
YG-VAR-53	2.72/3.14	0.3	25	0.06	0.2	0.28	0.9
YG-VAR-54	5.31/5.81	0.3	<25	0.06	0.2	0.36	0.5
YBS-VAR-55	2.43/5.94	0.3	<25	0.03	0.3	0.68	0.7
YBS-VAR-56	7.32/5.95	0.9	25	0.03	0.3	1.48	1.8
YBS-VAR-57	0.72/0.98	0.6	25	0.06	0.1	0.90	2.3
YBS-VAR-58	1.77/1.64	0.3	25	0.18	<0.1	0.90	1.4
YBS-VAR-59	2.31/1.96	0.6	125	0.12	0.1	0.72	7.9
YBS-VAR-60	3.40/2.89	0.6	<25	0.03	0.1	1.08	0.7
YBS-VAR-61	23.7/23.6	3.0	25	0.03	0.5	1.72	1.0
YBS-VAR-62	3.45/2.95	0.9	25	0.03	0.1	0.86	0.6
YBS-VAR-63	3.03/2.08	<0.3	<25	0.06	0.1	0.30	0.9
YBY-VAR-65	1.69/3.09	0.3	25	0.03	<0.1	0.80	0.7
YBY-VAR-66	3.26/3.14	0.6	<25	0.03	0.1	1.26	0.6
YBY-VAR-67	2.99/4.85	0.3	<25	0.03	<0.1	0.98	0.7
YBY-VAR-68	4.67/2.83	0.9	<25	0.06	<0.1	0.74	1.5
YBY-VAR-69	3.34/2.62	0.6	25	0.03	<0.1	1.02	0.9
YBY-VAR-70	1.31/1.66	0.3	<25	0.06	0.1	0.48	0.8
YPOR-VAR-72	1.16/1.77	<0.3	<25	0.12	0.3	0.24	0.7
YPOR-VAR-73	1.76/2.11	0.3	25	0.18	<0.1	0.16	0.6
YPOR-VAR-74	2.20/2.42	0.3	<25	0.15	<0.1	0.44	1.9
TRN-VAR-80	1.27/1.20	0.3	<25	0.03	<0.1	0.68	2.3
TRN-VAR-81	2.47/2.20	0.3	<25	0.21	<0.1	0.14	0.6
Yaouré Granodiorite Master Composite	3.13/1.71	0.6	10	0.18	<0.1	0.34	0.80
Yaouré S-Basalt Master Composite	2.65/2.49	0.6	60	0.09	0.1	0.84	2.80
Yaouré Y-Basalt Master Composite	2.64/2.23	0.6	10	0.12	<0.1	0.72	0.90

The true SG for each metallurgical variability sample and composite is shown in Table 13-45. The average true SG value of the granodiorite variability samples is 2.76, which closely aligns with the granodiorite master composite true SG value of 2.75. The average true SG value of the S-basalt variability samples is 2.82, which aligns with the S-basalt master composite true SG value of 2.82. The average true SG value of the Y-basalt variability samples is 2.84, which aligns with the Y-basalt master composite true SG value of 2.84.

Table 13-45: True SG for Yaouré pit fresh ore master composite and variability samples

SAMPLE	TRUE SG
YG-VAR-47	2.76
YG-VAR-49	2.77
YG-VAR-51	2.77
YG-VAR-52	2.76
YG-VAR-53	2.76
YG-VAR-54	2.76
YBS-VAR-55	2.75
YBS-VAR-56	2.84
YBS-VAR-57	2.85
YBS-VAR-58	2.84
YBS-VAR-59	2.80
YBS-VAR-60	2.85
YBS-VAR-61	2.84
YBS-VAR-62	2.82
YBS-VAR-63	2.79
YBY-VAR-65	2.80
YBY-VAR-66	2.86
YBY-VAR-67	2.86
YBY-VAR-68	2.83
YBY-VAR-69	2.87
YBY-VAR-70	2.85
YPOR-VAR-72	2.76
YPOR-VAR-73	2.76
YPOR-VAR-74	2.58
TRN-VAR-80	3.49
TRN-VAR-81	2.72
Yaouré Granodiorite Master Composite	2.75
Yaouré S-Basalt Master Composite	2.82
Yaouré Y-Basalt Master Composite	2.84

13.3.3 Comminution

13.3.3.1 SMC Test®

A standard SMC Test® was conducted on each of the comminution samples. The results are summarised in Table 13-46.

Table 13-46: SMC Test® results for Yaouré pit fresh ore master composite and comminution variability samples

SAMPLE	DWI (kWh/m³)	A×b	M_{ia} (kWh/t)	M_{ic} (kWh/t)	SG	SCSE (kWh/t)
YAOURÉ GRANODIORITE (as per 2023 characterisation)						
COMM-8	10.05	27.6	26.5	11.0	2.74	11.92
COMM-10	11.24	24.0	29.2	12.4	2.72	12.76
COMM-12	13.41	20.0	33.8	14.8	2.71	14.02
COMM-13	10.58	25.8	27.7	11.6	2.73	12.31
COMM-17	12.65	22.0	31.9	13.8	2.74	13.43
Yaouré Granodiorite Master Composite	10.20	26.9	27.1	11.3	2.71	12.00
YAOURÉ BASALT (as per 2023 characterisation)						
COMM-9	9.23	30.1	24.7	10.1	2.75	11.45
COMM-14	7.21	38.2	20.3	7.9	2.74	10.17
COMM-15	10.31	26.8	26.9	11.2	2.76	12.18
COMM-16	11.93	23.0	29.9	12.8	2.79	13.31
COMM-18	14.71	20.0	33.6	15.0	2.93	15.01
Yaouré S-Basalt Master Composite	10.07	28.0	26.0	10.8	2.80	12.02
Yaouré Y-Basalt Master Composite	9.51	29.3	24.8	10.2	2.80	11.75

As per the ore competency classification in Table 13-6, the results show Yaouré granodiorite comminution variability samples to be very competent, with an average A×b of 23.9. The Yaouré Granodiorite Master Composite is also classified as very competent (A×b value of 26.9).

The Yaouré basalt comminution samples are between moderate competency and very competent, with an average A×b of 27.6 (the average itself being classified as very competent). The A×b values of the Yaouré basalt master composite samples are also classified as very competent (A×b of 28.0 for the Yaouré S-Basalt Master Composite; 29.3 for the Yaouré Y-Basalt Master Composite).

Except for two samples (COMM-12 and COMM-18), the samples listed in Table 13-46 are less competent than the Yaouré fresh ore composite samples tested in historical test work (Section 13.1), that were characterised as very competent, with A×b values of 19.6 and 21.6.

13.3.3.2 Bond Ball Mill Work Index

A standard BWi test was conducted on each of the comminution samples. A closing screen of 106 µm was used, to yield a P_{80} of 75 µm. The target grind size P_{80} of 75 µm was determined from the gravity/leach grind size optimisation test work in Section 13.3.4.1. The results are presented in Table 13-47.

Table 13-47: Bond ball mill work index for Yaouré pit master composite and comminution variability samples

SAMPLE	BOND BALL MILL WORK INDEX (kWh/t)
YAOURÉ GRANODIORITE (as per 2023 characterisation)	
COMM-8	14.2
COMM-10	15.6
COMM-12	16.3
COMM-13	17.2
COMM-17	18.0
Yaouré Granodiorite Master Composite	16.8
YAOURÉ BASALT (as per 2023 characterisation)	
COMM-9	13.9
COMM-14	13.0
COMM-15	15.0
COMM-16	16.4
COMM-18	19.8
Yaouré S-Basalt Master Composite	13.0
Yaouré Y-Basalt Master Composite	13.6

As per the ore hardness classification in Table 13-8, the results show the Yaouré pit fresh ores to be medium hard to hard. The average BWi of the granodiorite comminution variability samples is 16.3 kWh/t (classified as hard), which aligns well with the Yaouré Granodiorite Master Composite BWi of 16.8 kWh/t (also classified as hard).

The average BWi of the basalt comminution variability samples is 15.6 kWh/t (classified as hard), which is 15% higher than the Yaouré Y-Basalt Master Composite BWi of 13.6 kWh/t (classified as medium hard) and 20% higher than the Yaouré S-Basalt Master Composite BWi of 13.0 kWh/t (classified as medium hard).

The characterisation of Yaouré fresh ores as medium hard to hard aligns with observations from historical test work in Section 13.1.

The relationship of hardness and competency for Yaouré Gold Mine fresh ore deposits and ore types is shown in Figure 13-5, with Yaouré pit ores shown as triangles (granodiorite samples plotted as the YAO-GRAN series and basalt samples plotted as the YAO-BAS series). From the results, the Yaouré pit fresh ores are amongst the most competent and hard of all fresh ore types tested for Yaouré Gold Mine deposits, with only Angovia 2 (ANG 2) ores being harder than the Yaouré pit ores.

13.3.3.3 Bond Rod Mill Work Index

A standard RWi test was conducted on six comminution variability samples (COMM-12 to COMM-17). A closing screen of 1,180 µm was used. The results are presented in Table 13-48.

Table 13-48: Bond rod mill work index for Yaouré pit comminution variability samples

SAMPLE	BOND ROD MILL WORK INDEX (kWh/t)
YAOURÉ GRANODIORITE (as per 2023 characterisation)	
COMM-12	22.1
COMM-13	23.2
COMM-17	26.4
YAOURÉ BASALT (as per 2023 characterisation)	
COMM-14	19.7
COMM-15	22.4
COMM-16	22.8

As per the ore hardness classification in Table 13-8, the test results show the Yaouré pit ores to be hard to very hard. The average RWi of the granodiorite comminution variability samples is 23.9 kWh/t (classified as very hard). The average BWi for the same three granodiorite samples is 17.2 kWh/t. When RWi values are higher than BWi values for the same samples, it is indicative of ores that are more competent (lower A×b values), which was observed in Section 13.3.3.1.

The characterisation of Yaouré fresh ores as hard to very hard, based on RWi, aligns with observations from historical test work in Section 13.1. The highest RWi value from historical test work (26.3 kWh/t at a closing screen size of 1,180 µm) approximates the value for the hardest Yaouré granodiorite sample tested (COMM-17).

The average RWi of the basalt comminution variability samples is 21.6 kWh/t (classified as very hard). The average BWi for the same three basalt samples is 14.8 kWh/t. The higher RWi values are indicative that the Yaouré basalt ores are competent (lower A×b values), as was observed in Section 13.3.3.1.

13.3.3.4 Bond Abrasion Index

A standard Ai test was conducted on each of the comminution samples. The results are presented in Table 13-49.

Table 13-49: Bond abrasion index for Yaouré pit master composite and comminution variability samples

SAMPLE	BOND ABRASION INDEX (g)
YAOURÉ GRANODIORITE (as per 2023 characterisation)	
COMM-8	0.2106
COMM-10	0.3376
COMM-12	0.2632
COMM-13	0.3274
COMM-17	0.1554
Yaouré Granodiorite Master Composite	0.2649
YAOURÉ BASALT (as per 2023 characterisation)	
COMM-9	0.1402
COMM-14	0.1040
COMM-15	0.0873
COMM-16	0.1006
COMM-18	0.2612
Yaouré S-Basalt Master Composite	0.1020
Yaouré Y-Basalt Master Composite	0.0945

As per the ore abrasion classification in Table 13-11, the results show the Yaouré granodiorite ores to be slightly abrasive, with an average Ai of the granodiorite variability samples being 0.2588 g. This aligns well with the Yaouré granodiorite master composite Ai value of 0.2649 g.

The Yaouré basalt ores are characterised as non-abrasive to slightly abrasive, with an average Ai of the basalt variability samples being 0.1387 g, which is higher than the Yaouré Y-Basalt Master Composite and Yaouré S-Basalt Master Composite Ai values of 0.0945 g and 0.1020 g respectively.

Results from historical test work (Section 13.1) categorised Yaouré fresh ore composites as slightly abrasive, which aligns with the observed results in Table 13-49.

13.3.4 Gravity Recovery and Cyanidation

13.3.4.1 Gravity/Leach Grind Size Optimisation

Sub-samples of the Yaouré Granodiorite Master Composite, Yaouré S-Basalt Master Composite and Yaouré Y-Basalt Master Composite were subjected to the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13, with the following variations to grind size in Step 1:

- P_{80} of 106 µm
- P_{80} of 90 µm
- P_{80} of 75 µm
- P_{80} of 63 µm
- P_{80} of 53 µm.

Hydrated lime used for these tests contained 60% CaO. The results of the tests are summarised in Table 13-50. Key points from the data are:

- The Yaouré Granodiorite Master Composite contains elevated levels of gravity gold, with gravity recovery ranging between 49.7% and 56.8%.
- Combined gravity/leach extraction at 48 h for the Yaouré Granodiorite Master Composite is high, ranging between 94.4% and 96.9%.
- The Yaouré Granodiorite Master Composite is grind sensitive, with a decrease in residue grade observed when grind size is decreased.
- The Yaouré S-Basalt Master Composite gravity recovery ranges between 22.3% and 33.0%.
- Combined gravity/leach extraction at 48 h for the Yaouré S-Basalt Master Composite is high, but lower than the Yaouré Granodiorite Master Composite, ranging between 90.3% and 92.2%.
- Below P_{80} of 90 µm, there appears to be low grind sensitivity for the Yaouré S-Basalt Master Composite, with solids residue grades plateauing between P_{80} of 90 µm and P_{80} of 63 µm.
- The Yaouré Y-Basalt Master Composite contains elevated levels of gravity gold, with gravity recovery ranging between 40.4% and 53.1%.
- Combined gravity/leach extraction at 48 h for the Yaouré Y-Basalt Master Composite is high, but slightly lower than the Yaouré Granodiorite Master Composite, ranging between 92.8% and 94.9%.
- Below P_{80} of 90 µm, there appears to be low grind sensitivity for the Yaouré Y-Basalt Master Composite, with solids residue grades plateauing between P_{80} of 90 µm and P_{80} of 63 µm.

- For each master composite tested, sodium cyanide and hydrated lime consumption rates are low and are consistent across each grind size test for a master composite.

After completing technoeconomic trade-off studies, a grind size P_{80} of 75 µm was selected.

Table 13-50: Gravity/grind size optimisation test results for Yaouré pit fresh ore master composites

PARAMETER	UNIT	WH8172	WH8173	WH8174	WH8175	WH8176	WH8167	WH8168	WH8169	WH8170	WH8171	WH8162	WH8163	WH8164	WH8165	WH8166
Sample		Yaouré Granodiorite Master Composite					Yaouré S-Basalt Master Composite					Yaouré Y-Basalt Master Composite				
P_{80} grind size	µm	106	90	75	63	53	106	90	75	63	53	106	90	75	63	53
Assay head grade (Au)	g/t	2.42	2.42	2.42	2.42	2.42	2.57	2.57	2.57	2.57	2.57	2.44	2.44	2.44	2.44	2.44
Calc. head grade (Au)	g/t	2.85	2.55	3.46	2.45	2.62	2.85	2.30	1.95	2.09	2.04	2.64	2.69	2.26	2.31	2.15
Gravity recovery	%	51.8	56.8	56.7	51.7	49.7	28.6	33.0	22.3	28.0	26.7	49.6	53.1	50.0	48.8	40.4
Extraction at time																
2 hours	% Au	84.5	88.0	89.2	90.0	89.5	79.0	83.4	81.4	84.8	85.5	82.8	84.8	84.8	88.1	87.8
4 hours	% Au	89.9	92.0	93.0	93.9	93.7	83.2	86.6	86.7	87.3	89.1	88.3	89.7	90.4	91.6	92.6
8 hours	% Au	92.4	92.9	94.7	94.8	95.6	86.7	88.5	88.9	88.3	90.9	90.2	92.1	91.9	93.5	93.9
16 hours	% Au	93.7	93.4	94.9	95.1	96.7	88.2	88.8	89.2	90.0	90.9	91.3	92.9	93.5	93.8	94.9
24 hours	% Au	94.1	94.0	95.7	95.9	96.7	89.6	90.9	89.6	90.3	90.9	91.8	93.9	93.8	94.1	94.9
36 hours	% Au	94.4	94.5	95.7	95.9	96.7	89.6	91.2	90.3	91.3	91.2	92.3	94.2	93.8	94.4	94.9
48 hours	% Au	94.4	94.5	95.7	95.9	96.9	90.5	91.8	90.3	91.6	92.2	92.8	94.4	93.8	94.4	94.9
Solid residue grade (Au)	g/t	0.16	0.14	0.15	0.10	0.08	0.27	0.19	0.19	0.18	0.16	0.19	0.15	0.14	0.13	0.11
NaCN usage	kg/t	0.17	0.17	0.17	0.17	0.21	0.25	0.21	0.29	0.24	0.29	0.25	0.29	0.25	0.25	0.24
Lime usage	kg/t	0.34	0.30	0.26	0.27	0.27	0.31	0.32	0.29	0.30	0.31	0.32	0.35	0.34	0.37	0.32
Average DO	ppm	8.4	8.4	8.4	8.3	8.4	8.6	8.6	8.6	8.6	8.6	8.5	8.5	8.5	8.6	8.6

13.3.4.2 Master Composite Gravity/Leach at Optimised Conditions

Sub-samples of the Yaouré Granodiorite Master Composite, Yaouré S-Basalt Master Composite and Yaouré Y-Basalt Master Composite were subjected to the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13, at the grind size P_{80} of 75 µm stated in the standard conditions. Confirmation of this grind size for the three Yaouré pit fresh ore master composites is noted in Section 13.3.4.1. Hydrated lime used for these tests contained 60% CaO.

The results from these tests are presented in Table 13-51. Tests WH8174, WH8169 and WH8164 (from Section 13.3.4.1) were conducted under the same conditions as tests WH8160, WH8159 and WH8158 and have been included in Table 13-51 for comparison.

Table 13-51: Gravity/leach test results at optimised conditions for Yaouré pit fresh ore master composites

PARAMETER	UNIT	WH8160	WH8174	WH8159	WH8169	WH8158	WH8164
Sample		Yaouré Granodiorite Master Composite		Yaouré S-Basalt Master Composite		Yaouré Y-Basalt Master Composite	
P_{80} grind size	µm	75	75	75	75	75	75
Assay head grade (Au)	g/t	2.42	2.42	2.57	2.57	2.44	2.44
Calc. head grade (Au)	g/t	2.21	3.46	2.20	1.95	2.33	2.26
Gravity recovery	%	54.4	56.7	30.1	22.3	44.9	50.0
Extraction at time							
2 hours	%	90.1	89.2	85.4	81.4	84.0	84.8
4 hours	%	92.8	93.0	88.1	86.7	88.1	90.4
8 hours	%	94.1	94.7	90.7	88.9	90.2	91.9
16 hours	%	94.4	94.9	91.0	89.2	90.5	93.5
24 hours	%	94.7	95.7	91.0	89.6	90.8	93.8
36 hours	%	95.0	95.7	91.3	90.3	91.1	93.8
48 hours	%	95.0	95.7	91.3	90.3	92.3	93.8
Solid residue grade (Au)	g/t	0.11	0.15	0.19	0.19	0.18	0.14
NaCN usage	kg/t	0.14	0.17	0.22	0.29	0.24	0.25
Lime usage	kg/t	0.36	0.26	0.37	0.29	0.36	0.34
Average DO	ppm	7.9	8.4	7.9	8.6	7.8	8.5

Key points from the data are:

- Results for tests performed under the same conditions on the Yaouré Granodiorite Master Composite (WH8160 and WH8174) align well with similar gravity recoveries (~55%), similar combined gravity/leach extractions at 48 h (≥95%), fast leach kinetics, comparable residue grades and comparable reagent consumptions.
- Results for tests performed under the same conditions on the Yaouré S-Basalt Master Composite (WH8159 and WH8169) align well with similar combined gravity/leach extractions at 48 h (>90%), fast leach kinetics, the same residue grades and comparable reagent consumptions.
- Results for tests performed under the same conditions on the Yaouré Y-Basalt Master Composite (WH8158 and WH8164) align well with similar gravity recoveries (45-50%),

similar combined gravity/leach extractions at 48 h (>92%), fast leach kinetics, comparable residue grades and comparable reagent consumptions.

Sub-samples of the leach residue from tests WH8160, WH8159 and WH8158 were subjected to gold size assay analysis using 106 µm, 75 µm, 53 µm, 38 µm and 25 µm screens. The gold assay and distribution for each size fraction of the leach residues are presented in Table 13-52.

Table 13-52: Tails solid gold assay and gold distribution by size fraction for Yaouré pit fresh ore master composite residues

SCREEN SIZE (µm)	SIZE FRACTION GOLD ASSAY (g/t)	SIZE FRACTION GOLD DISTRIBUTION (%)	SIZE FRACTION GOLD ASSAY (g/t)	SIZE FRACTION GOLD DISTRIBUTION (%)	SIZE FRACTION GOLD ASSAY (g/t)	SIZE FRACTION GOLD DISTRIBUTION (%)
	Yaouré Granodiorite Master Composite		Yaouré S-Basalt Master Composite		Yaouré Y-Basalt Master Composite	
106	0.13	10.0	0.38	17.3	0.33	19.6
75	0.13	17.0	0.39	21.5	0.39	23.2
53	0.15	19.5	0.38	19.7	0.36	20.2
38	0.15	19.8	0.30	15.6	0.27	15.8
25	0.11	12.8	0.19	9.3	0.16	8.2
-25	0.04	20.9	0.06	16.7	0.04	13.0

For the Yaouré Granodiorite Master Composite, Yaouré S-Basalt Master Composite and Yaouré Y-Basalt Master Composite, the back-calculated tails grades from the size assay data (0.09 g/t Au, 0.19 g/t Au and 0.16 g/t Au respectively) correspond well with the residue assays from tests WH8160 (0.11 g/t Au), WH8159 (0.19 g/t) and WH8158 (0.18 g/t) respectively. Remaining gold in tails residues is relatively evenly distributed across size fractions for all samples, with the Yaouré Y-Basalt Master Composite being slightly biased towards coarser fractions.

13.3.4.3 Master Composite Whole Ore Leach at Optimised Conditions

The Yaouré Granodiorite Master Composite was subjected to two tests, the Yaouré Y-Basalt Master Composite was subjected to two tests, and the Yaouré Combined Basalt Master Composite was subjected to one test under the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13, with the following exceptions:

- No gravity separation for all tests (Steps 1 and 2 excluded)
- With regards to Step 3:
    - Tests WH8388 (Yaouré Y-Basalt Master Composite) and WH8389 (Yaouré Granodiorite Master Composite) were agitated vat leaches, rather than bottle rolls, on 9 kg of solids to produce sufficient leach slurry for carbon adsorption kinetic tests (Section 13.3.6)
    - Test WH8390 (Yaouré Y-Basalt Master Composite) was an agitated vat leach on 15 kg of solids to produce sufficient slurry for cyanide detoxification tests (Section 13.3.8)
    - Tests WH8097 (Yaouré Combined Basalt Master Composite) and WH8098 (Yaouré Granodiorite Master Composite) were agitated vat leaches on 15 kg of solids to produce sufficient material for tailings characterisation tests (Section 13.3.11).

Hydrated lime used for these tests contained 60% CaO. The results from these tests are presented in Table 13-53.

Table 13-53: Whole ore leach test results at optimised conditions for Yaouré pit fresh ore master composites

PARAMETER	UNIT	WH8389	WH8098	WH8388	WH8390	WH8097
Master Composite		Granodiorite		Y-Basalt		Combined Basalt
P_{80} grind size	µm	75	75	75	75	75
Assay head grade (Au)	g/t	2.42	2.42	2.44	2.44	2.50 [4]
Calc. head grade (Au)	g/t	2.12	2.56	2.52	2.58	2.51
Leach test type		vat	vat	vat	vat	vat
Gravity recovery	%	-	-	-	-	-
Extraction at time						
2 hours	%	55.2	66.8	60.2	56.0	70.0
4 hours	%	66.5	74.9	78.0	75.5	82.5
8 hours	%	75.7	80.8	86.4	84.8	86.7
16 hours	%	82.0	84.3	88.7	86.5	89.7
24 hours	%	85.5	88.9	92.3	89.4	90.2
36 hours	%	91.1	91.3	92.9	90.0	92.0
48 hours	%	95.3	96.5	94.0	93.4	93.2
Solid residue grade (Au)	g/t	0.10	0.09	0.15	0.17	0.17
NaCN usage	kg/t	0.40	0.82	0.58	0.66	0.48
Lime usage	kg/t	0.37	0.27	0.58	0.42	0.50
Average DO	ppm	6.2	7.1	6.0	6.3	7.0

Key points from the data are:

- Results for the vat leach tests performed on the Yaouré Granodiorite Master Composite (WH8389 and WH8098) align well with similar leach extractions at 48 h (95-96%), and comparable residue grades. When comparing this data to the 48 h gravity/leach extraction data for the Yaouré Granodiorite Master Composite (Section 13.3.4.2), it is possible to achieve a similar gold recovery from a whole of ore leach at 48 h under the same optimum cyanidation conditions without a preceding gravity recovery stage.
- The leach kinetics for the vat leach tests performed on the Yaouré Granodiorite Master Composite (WH8389 and WH8098) are slow, with the bulk of the gold leaching only after 48 h. The leach kinetics for the vat leach tests are slower than the comparable gravity/leach tests for the Yaouré Granodiorite Master Composite (Section 13.3.4.2). It is hypothesised that the slower kinetics are due to the presence of coarse gold and less efficient mixing in the large, agitated vat, compared to a bottle roll test.
- Results for the vat leach tests performed on the Yaouré Y-Basalt Master Composite (WH8388 and WH8390) align well with similar leach extractions at 48 h (93-94%), and comparable residue grades. When comparing this data to the 48 h gravity/leach extraction data for the Yaouré Y-Basalt Master Composite (Section 13.3.4.2), it is possible to achieve a

[4] Yaouré Combined Basalt Master Composite was not separately assayed. Given that the Yaouré Combined Master Composite is a 50:50 blend by mass of Yaouré Y-Basalt Master Composite and Yaouré S-Basalt Master Composite, the assayed head grade quoted is a weighted average of the Yaouré Y-Basalt Master Composite and Yaouré S-Basalt Master Composite head assays.

similar gold recovery from a whole of ore leach at 48 h under the same optimum cyanidation conditions without a preceding gravity recovery stage.

- The leach kinetics for the vat leach tests performed on the Yaouré Y-Basalt Master Composite (WH8388 and WH8390) are slow, with the bulk of the gold leaching only after 48 h. The leach kinetics for the vat leach tests are slower than the comparable gravity/leach tests for the Yaouré Y-Basalt Master Composite (Section 13.3.4.2). It is hypothesised that the slower kinetics are due to the presence of coarse gold and less efficient mixing in the large, agitated vat, compared to a bottle roll test.
- When comparing results for the whole of ore vat leach test performed on the Yaouré Combined Basalt Master Composite (WH8097) to the 48 h gravity/leach extraction data for the Yaouré S-Basalt and Y-Basalt Master Composites (Section 13.3.4.2), it is possible to achieve a similar gold recovery from a whole of ore leach at 48 h under the same optimum cyanidation conditions without a preceding gravity recovery stage.
- The leach kinetics for the vat leach test performed on the Yaouré Combined Basalt Master Composite (WH8097) are slower than the leach kinetics for the gravity/leach tests for the Yaouré S-Basalt and Y-Basalt Master Composites (Section 13.3.4.2). It is hypothesised that the slower kinetics are due to the presence of coarse gold and less efficient mixing in the large, agitated vat, compared to a bottle roll test.
- Higher NaCN consumptions were observed for 15 kg vat leach tests (WH8098 and WH8390), compared to 9 kg vat leach tests on comparable material (WH8389 and WH8388). It is likely that the 15 kg vat leach tests experienced higher cyanide losses from solution due to the nature of agitation and the configuration of the leach vat.
- There is good correlation between calculated gold head grades and assayed head grades.

13.3.4.4 Variability Samples – Gravity/Leach at Yaouré Standard Conditions

Six Yaouré pit granodiorite ore variability samples, nine Yaouré pit S-basalt ore variability samples, six Yaouré pit Y-basalt ore variability samples and three Yaouré pit porphyry ore variability samples (as per 2017 lithological characterisations) were subjected to the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13. Hydrated lime used for these tests contained 60% CaO.

The results of the tests performed on the Yaouré granodiorite variability samples are summarised in Table 13-54. The data presented in Table 13-54 reflect 2017 lithological groupings of granodiorite variability samples for samples with YG prefix, and 2023 lithological groupings of granodiorite variability samples for all sample prefixes.

Table 13-54: Gold extraction at standard Yaouré test conditions for Yaouré pit granodiorite metallurgical variability samples

PARAMETER	UNIT	WH8134	WH8135	WH8136	WH8137	WH8138	WH8139	WH8132
Sample		YG-VAR-47	YG-VAR-49	YG-VAR-51	YG-VAR-52	YG-VAR-53	YG-VAR-54	TRN-VAR-81
P_{80} grind size	µm	75	75	75	75	75	75	75
Assay head grade (Au)	g/t	1.02	2.20	1.24	0.68	2.93	5.56	2.34
Calc. head grade (Au)	g/t	1.15	0.93	2.37	0.81	2.12	6.35	2.96
Gravity recovery	%	65.8	63.6	78.1	40.0	46.3	84.6	57.1
Extraction at time								
2 hours	%	91.4	91.8	96.5	83.4	87.8	95.1	88.7
4 hours	%	92.6	92.6	97.4	87.9	89.9	96.7	92.9
8 hours	%	93.9	94.2	97.7	90.6	91.6	97.4	95.1
16 hours	%	93.9	95.7	98.0	90.6	92.6	98.2	95.4
24 hours	%	93.9	95.7	98.3	90.6	93.5	98.6	96.1
36 hours	%	93.9	95.7	98.3	91.4	93.9	98.7	96.5
48 hours	%	93.9	95.7	98.3	91.4	93.9	98.9	97.0
Solid residue grade (Au)	g/t	0.07	0.04	0.04	0.07	0.13	0.07	0.09
NaCN usage	kg/t	0.15	0.15	0.24	0.14	0.17	0.22	0.18
Lime usage	kg/t	0.36	0.32	0.32	0.35	0.25	0.34	0.98
Average DO	ppm	8.2	8.1	7.8	7.6	7.6	7.7	8.1

From the data presented in Table 13-54 for the Yaouré granodiorite variability samples:

- Gravity gold recoveries ranged between 40.0% and 84.6%. The gravity recoveries reported for the Yaouré Granodiorite Master Composite in Section 13.3.4.2 fall within this range.
- The leach kinetics were rapid, as was observed for the Yaouré Granodiorite Master Composite in Section 13.3.4.2.
- 48 h gold extraction was high, averaging 95.3% at 48 h, with a range of 91.4% to 98.9%. The 48 h combined gravity/leach extractions reported for the Yaouré Granodiorite Master Composite in Section 13.3.4.2 fall within this range and are close to the mean.
- Reagent consumptions were low, averaging 0.18 kg/t and 0.28 kg/t for sodium cyanide and 60% CaO hydrated lime respectively. The lime consumption for TRN-VAR-81 is higher than the other samples as it contains 47.8% (by interval length) of partially weathered material (as noted in Section 13.4.1.3).

The results of the tests performed on the Yaouré S-basalt variability samples are summarised in Table 13-55.

Table 13-55: Gold extraction at standard Yaouré test conditions for Yaouré pit S-basalt metallurgical variability samples

PARAMETER	UNIT	WH8140	WH8141	WH8142	WH8143	WH8144	WH8145	WH8146	WH8147	WH8148
Sample		YBS-VAR-55	YBS-VAR-56	YBS-VAR-57	YBS-VAR-58	YBS-VAR-59	YBS-VAR-60	YBS-VAR-61	YBS-VAR-62	YBS-VAR-63
P_{80} grind size	µm	75	75	75	75	75	75	75	75	75
Assay head grade (Au)	g/t	4.18	6.64	0.85	1.70	2.14	3.14	25.2	3.20	2.56
Calc. head grade (Au)	g/t	2.02	6.01	0.84	1.86	2.23	5.95	28.4	2.85	2.11
Gravity recovery	%	49.0	42.5	34.5	34.2	47.8	54.7	67.6	37.6	21.9
Extraction at time										
2 hours	%	85.5	86.9	86.2	84.2	87.2	91.2	92.6	72.0	82.5
4 hours	%	88.4	89.9	87.0	87.3	88.9	94.0	94.8	88.1	84.6
8 hours	%	90.2	91.5	89.6	87.7	90.8	95.4	96.2	91.4	85.6
16 hours	%	90.9	92.7	90.5	88.5	91.5	96.4	96.8	93.0	88.3
24 hours	%	92.2	93.4	91.3	90.0	91.5	96.4	97.2	93.0	90.0
36 hours	%	92.6	93.4	92.1	90.3	92.4	96.6	97.2	93.9	91.6
48 hours	%	92.6	93.8	92.9	91.4	92.4	96.8	97.6	94.4	91.9
Solid residue grade (Au)	g/t	0.15	0.37	0.06	0.16	0.17	0.19	0.69	0.16	0.17
NaCN usage	kg/t	0.22	0.25	0.22	0.22	0.17	0.22	0.24	0.39	0.17
Lime usage	kg/t	0.32	0.30	0.31	0.33	0.33	0.30	0.45	0.36	0.39
Average DO	ppm	7.6	7.6	7.6	7.6	7.6	7.6	8.7	8.8	8.6

From the data presented in Table 13-55 for the Yaouré S-basalt variability samples:

- Gravity gold recoveries ranged between 21.9% and 67.6%. The gravity recoveries reported for the Yaouré S-Basalt Master Composite in Section 13.3.4.2 fall within this range.
- The leach kinetics were rapid, as was observed for the Yaouré S-Basalt Master Composite in Section 13.3.4.2.
- 48 h gold extraction was high, averaging 93.7% at 48 h, with a range of 91.4% to 97.6%. The 48 h combined gravity/leach extractions reported for the Yaouré S-Basalt Master Composite in Section 13.3.4.2 fall at or below the lower end of this range.
- Reagent consumptions were low, averaging 0.23 kg/t and 0.34 kg/t for sodium cyanide and 60% CaO hydrated lime respectively.

The results of the tests performed on the Yaouré Y-basalt variability samples are summarised in Table 13-56. Variability sample TRN-VAR-80, recategorised as a basalt in 2023, has also been included in this table.

Table 13-56: Gold extraction at standard Yaouré test conditions for Yaouré pit Y-basalt metallurgical variability samples

PARAMETER	UNIT	WH8149	WH8150	WH8151	WH8152	WH8153	WH8154	WH8131
Sample		YBY-VAR-65	YBY-VAR-66	YBY-VAR-67	YBY-VAR-68	YBY-VAR-69	YBY-VAR-70	TRN-VAR-80
P_{80} grind size	µm	75	75	75	75	75	75	75
Assay head grade (Au)	g/t	2.39	3.20	3.92	3.75	2.98	1.48	1.24
Calc. head grade (Au)	g/t	2.54	3.67	3.31	4.37	2.73	1.06	1.17
Gravity recovery	%	71.3	50.3	54.9	58.6	49.0	25.7	32.9
Extraction at time								
2 hours	%	93.4	85.0	87.4	88.8	85.0	83.4	84.9
4 hours	%	94.5	87.6	89.2	91.6	87.2	88.3	89.3
8 hours	%	95.4	89.0	89.8	92.7	88.0	90.4	89.9
16 hours	%	95.7	89.8	90.9	93.6	88.2	93.1	90.6
24 hours	%	95.7	90.4	91.5	94.5	89.2	93.1	91.7
36 hours	%	95.9	90.4	92.2	94.5	89.5	94.4	91.7
48 hours	%	96.4	90.7	92.2	94.5	89.7	94.4	92.3
Solid residue grade (Au)	g/t	0.09	0.34	0.26	0.24	0.28	0.06	0.09
NaCN usage	kg/t	0.17	0.17	0.17	0.32	0.24	0.31	0.24
Lime usage	kg/t	0.32	0.34	0.35	0.34	0.37	0.39	0.39
Average DO	ppm	8.9	9.0	8.9	8.9	8.9	8.9	8.1

From the data presented in Table 13-56 for the Yaouré Y-basalt variability samples:

- Gravity gold recoveries were variable, ranging between 25.7% and 71.3% and with a mean of 49.0%. The gravity recoveries reported for the Yaouré Y-Basalt Master Composite in Section 13.3.4.2 align with the mean of the variability sample data set.
- The leach kinetics were rapid, as was observed for the Yaouré Y-Basalt Master Composite in Section 13.3.4.2.
- 48 h gold extraction averaged 92.9% at 48 h, with a range of 89.7% to 96.5%. The 48 h combined gravity/leach extractions reported for the Yaouré Y-Basalt Master Composite in Section 13.3.4.2 fall within this range and are close to the mean.
- Reagent consumptions were low, averaging 0.23 kg/t and 0.36 kg/t for sodium cyanide and 60% CaO hydrated lime respectively.

The results of the tests performed on the Yaouré porphyry variability samples are summarised in Table 13-57.

Table 13-57: Gold extraction at standard Yaouré test conditions for Yaouré pit porphyry metallurgical variability samples

PARAMETER	UNIT	WH8155	WH8156	WH8157
Sample		YPOR-VAR-72	YPOR-VAR-73	YPOR-VAR-74
P_{80} grind size	µm	75	75	75
Assay head grade (Au)	g/t	1.46	1.94	2.31
Calc. head grade (Au)	g/t	1.12	1.84	2.57
Gravity recovery	%	40.7	38.4	64.6
Extraction at time				
2 hours	%	87.5	88.5	93.5
4 hours	%	91.5	92.6	95.8
8 hours	%	92.2	94.2	95.8
16 hours	%	92.8	94.2	96.4
24 hours	%	93.4	94.9	96.6
36 hours	%	94.0	95.7	96.9
48 hours	%	94.6	95.7	96.9
Solid residue grade (Au)	g/t	0.06	0.08	0.08
NaCN usage	kg/t	0.14	0.17	0.29
Lime usage	kg/t	0.38	0.39	0.38
Average DO	ppm	8.8	8.8	8.9

From the data presented in Table 13-57 for the Yaouré porphyry variability samples:

- Gravity gold recoveries ranged between 38.4% and 64.6%.
- The leach kinetics are rapid.
- 48 h combined gravity/leach gold extraction ranged between 94.6% and 96.9%.
- Reagent consumptions are low, averaging 0.20 kg/t and 0.38 kg/t for sodium cyanide and 60% CaO hydrated lime respectively.

Given that variability samples categorised by lithology as S-basalt, Y-basalt and porphyry in 2017 were all recategorised by lithology as basalt in 2023, an aggregated summary of test work results from Table 13-55 to Table 13-57 is as follows:

- Gravity gold recoveries for Yaouré basalt variability samples ranged between 21.9% and 71.3%, with a mean of 46.1%.
- The leach kinetics for Yaouré basalt variability samples are rapid.
- 48 h combined gravity/leach gold extraction for Yaouré basalt variability samples averaged 93.7%, with a range of 89.7% to 97.6%.
- Reagent consumptions for Yaouré basalt variability samples were low, averaging 0.23 kg/t and 0.35 kg/t for sodium cyanide and 60% CaO hydrated lime respectively.

13.3.5 Mineralogical Investigation

Sub-samples of the Yaouré Granodiorite Master Composite, Yaouré S-Basalt Master Composite and Yaouré Y-Basalt Master Composite were ground to P_{80} of 75 µm and subjected to a mineralogical investigation to gain further understanding of gold occurrences and mineral associations, as well as gangue mineralogy, at this grind size.

The samples were separated into gravity concentrate and gravity tail fractions using a Knelson concentrator and hand-panning before being submitted for mineralogy. The mass distribution to gravity concentrate and gravity tail fractions following the separation of each Yaouré pit master composite is shown in Table 13-58.

Table 13-58: Mass distribution to gravity concentrate and tails fractions for Yaouré pit fresh ore master composites

GRAVITY FRACTION	YAOURÉ GRANODIORITE MASTER COMPOSITE MASS %	YAOURÉ S-BASALT MASTER COMPOSITE MASS %	YAOURÉ Y-BASALT MASTER COMPOSITE MASS %
Gravity Concentrate	2.16	2.97	3.48
Gravity Tail	97.84	97.03	96.52

13.3.5.1 Mineral Abundance of Gravity Concentrates

Sub-samples of gravity concentrate from the Yaouré Granodiorite Master Composite, Yaouré S-Basalt Master Composite and Yaouré Y-Basalt Master Composite were prepared into individual polished sections and analysed using quantitative mineralogical analysis by QEMSCAN-PMA at 6 µm pixel spacing.

It was found that pyrite is the dominant sulfide in the gravity concentrate fractions of all three Yaouré fresh ore master composites, making up between 10.0% and 22.7% by mass of the total sample, ranging between 93% and 99% of sulfide minerals identified, with a P_{80} of 54 µm to 60 µm. Traces of chalcopyrite(/chalcocite/digenite and covellite; 0.06% to 0.19%) and other sulfides(/tellurides) (0.01% to 0.15%, being galena, sphalerite, arsenopyrite and coloradoite) are also present. The remaining sample mass of the gravity concentrates of the master composites is mainly made-up of silicate (predominantly quartz, albite, chlorite and micas), carbonate (predominantly ankerite-dolomite and calcite) and iron oxide/oxyhydroxide (predominantly magnetite and hematite) gangue minerals. <0.01% native gold (with silver content typically <20%) is present in the gravity concentrate fractions of the master composites. The mineral abundance of the gravity concentrate fractions by grouping is shown in Figure 13-21.

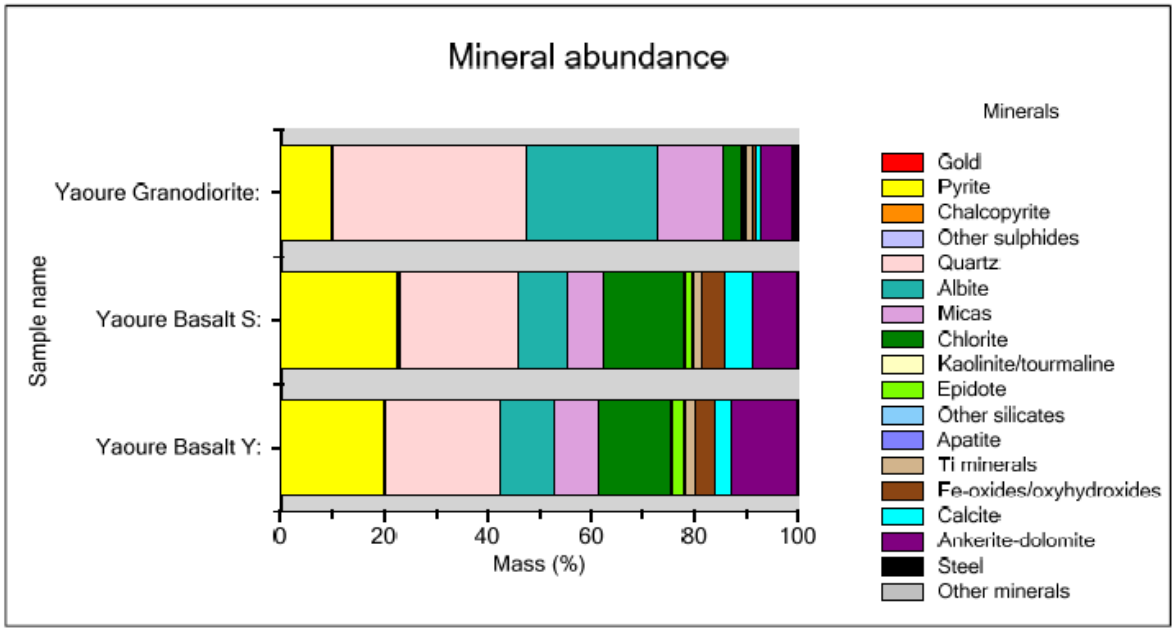


Figure 13-21: Mineral abundance of gravity concentrate fractions from Yaouré pit fresh ore master composites

13.3.5.2 Mineral Liberation of Gravity Concentrate

Mineral liberation data were derived from the QEMSCAN-PMA analysis of the gravity concentrate fractions from the Yaouré Granodiorite Master Composite, Yaouré S-Basalt Master Composite and Yaouré Y-Basalt Master Composite. Particle liberation classes are defined as follows:

- Well-liberated (>90% surface area)
- High grade middlings (60-90% surface area)
- Medium grade middlings (30-60% surface area)
- Low grade middlings (10-30% surface area)
- Locked (<10% surface area).

84.4% to 88.7% of pyrite particles were found to be well-liberated, with 8.9% to 12.2% classified as high-grade middlings.

13.3.5.3 Gold Grain Size Distribution of Gravity Concentrate

Bright phase searches for minerals with high atomic density and strong electron backscatter response, including gold-rich mineral phases, were undertaken using QEMSCAN-TMS analysis. The particles measured during the TMS scans were mapped with 1 µm spacing. 16 native gold grains were identified in the polished section of the gravity concentrate fraction from the Yaouré Granodiorite Master Composite, 16 grains from the Yaouré S-Basalt Master Composite and 30 grains from the Yaoure Y-Basalt Master Composite. The indicative gold grain size distribution data that were derived from the analyses are presented in Table 13-59. For the calculation of grain sizes, the gold-bearing grains were digitally extracted from images of the gold-hosting particles.

Table 13-59: Indicative gold grain size distribution in gravity concentrate fractions from Yaouré fresh ore master composites

GRAIN SIZE (µm)	YAOURÉ GRANODIORITE MASTER COMPOSITE		YAOURÉ S-BASALT MASTER COMPOSITE		YAOURÉ Y-BASALT MASTER COMPOSITE	
	NUMBER OF NATIVE GOLD GRAINS	NATIVE GOLD MASS %	NUMBER OF NATIVE GOLD GRAINS	NATIVE GOLD MASS %	NUMBER OF NATIVE GOLD GRAINS	NATIVE GOLD MASS %
53 - 75	0	0.0	0	0.0	1	16.4
38 - 53	1	75.2	0	0.0	1	12.5
27 - 38	0	0.0	0	0.0	2	41.0
20 - 27	0	0.0	0	0.0	2	21.2
15 - 20	0	0.0	0	0.0	0	0.0
10 - 15	1	12.3	2	85.7	2	4.1
5 - 10	2	5.7	0	0.0	4	3.0
2 - 5	8	6.1	10	13.1	11	1.6
1 - 2 [5]	4	0.6	4	1.2	7	0.2

Figure 13-22 sorts the gold grains (in red) by size fraction, as well as providing an overview of host minerals and host mineral distribution within gold grain size classes. It is noted that composite fine gold grains (1 to 15 µm grain size) are predominantly associated with pyrite in the gravity concentrate fractions of all Yaouré fresh ore master composites.

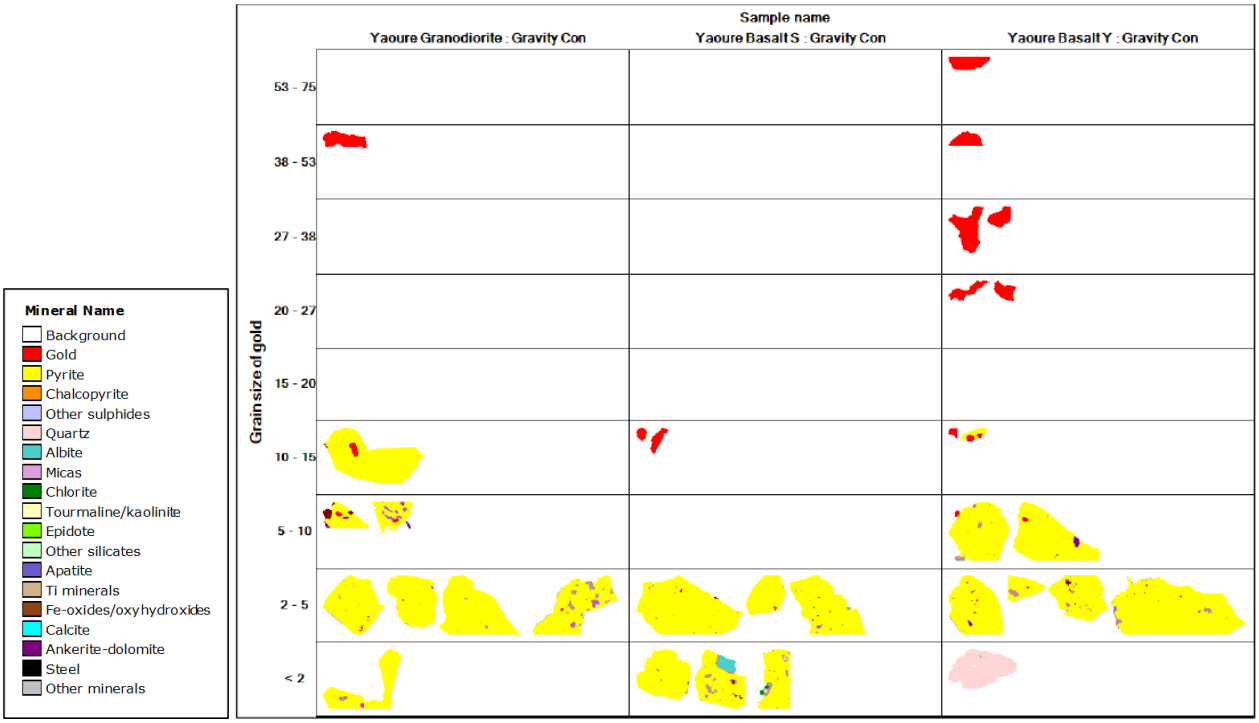


Figure 13-22: Image grid showing the distribution of gold grain sizes from Yaouré fresh ore master composite gravity fractions

13.3.5.4 Gold Locking of Gravity Concentrate

Indicative gold locking data were derived from the QEMSCAN-TMS analysis for particles that were identified in the polished section of the gravity concentrate fractions from the Yaouré Granodiorite Master Composite, Yaouré S-Basalt Master Composite and Yaouré Y-Basalt Master Composite. The

[5] Gold grains smaller than 1 µm and solid solution gold in sulfides are beyond the detection limit of QEMSCAN

locking data reflects the major mineral(s) that the gold-hosting particle is comprised of (not necessarily adjacent to the gold grain). Gold locking classes are defined as follows:

- Gold >90% (particles having gold >90% surface area)
- Gold >60% (particles having gold >60% surface area)
- Pyrite >90% (particles having pyrite >90% surface area)
- Pyrite >60% (particles having pyrite >60% surface area)
- Sil >90% (particles having silicates >90% surface area).

The indicative gold locking data are presented in Table 13-60, and graphically in the image grid in Figure 13-23. Well liberated gold grains, ranging in size from 10 µm to 75 µm, represent between 75.2% and 93.6% of native gold by mass. The remaining gold grains are smaller than 15 µm (mostly smaller than 10 µm) and occur predominantly in pyrite. The association of gold with pyrite for Yaouré fresh ores was also noted in historical test work in Section 13.1.

Table 13-60: Indicative locking of gold grains of gravity concentrate fractions from Yaouré fresh ore master composites

GOLD LOCKING CLASS	YAOURÉ GRANODIORITE MASTER COMPOSITE		YAOURÉ S-BASALT MASTER COMPOSITE		YAOURÉ Y-BASALT MASTER COMPOSITE	
	NUMBER OF NATIVE GOLD GRAINS	NATIVE GOLD MASS %	NUMBER OF NATIVE GOLD GRAINS	NATIVE GOLD MASS %	NUMBER OF NATIVE GOLD GRAINS	NATIVE GOLD MASS %
Gold >90%	1	75.2	2	85.7	7	93.6
Gold >60%	0	0	0	0	0	0
Pyrite >90%	8	19.1	8	13.3	11	4.1
Pyrite >60%	2	5.7	1	1.1	1	2.2
Sil >90%	0	0	0	0	1	0.02

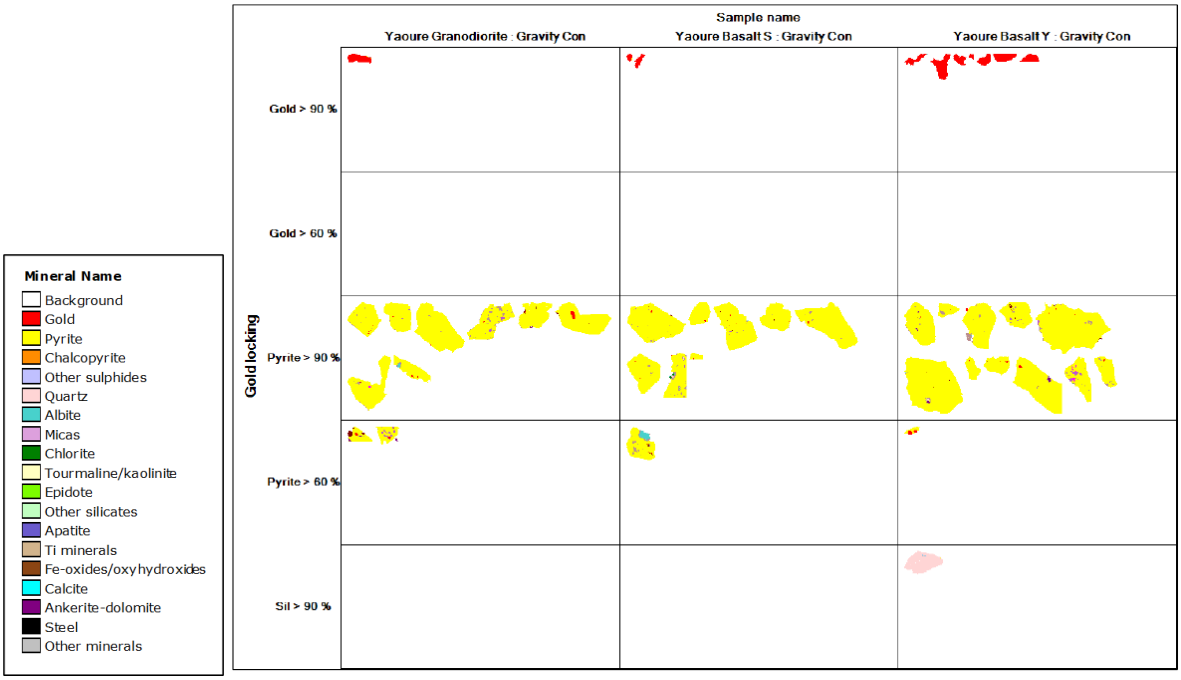


Figure 13-23: Image grid showing the distribution of locking of gold grains for Yaouré fresh ore master composite gravity fractions

13.3.5.5 Energy Dispersive Spectrometry and Back Scattered Electron Images of Gold Grains

Spot analysis of native gold grains identified in the gravity concentrate fractions of the Yaouré fresh ore master composites was undertaken by manual EDS using standardless quantification.

A summary of findings from the manual EDS analysis for the Yaouré Granodiorite Master Composite is displayed in Table 13-61.

Table 13-61: Gold grain data from EDS analysis of gravity concentrate fraction from the Yaouré Granodiorite Master Composite

HOST PARTICLE NUMBER	HOST MINERAL	GOLD GRAIN NUMBER	GOLD MINERAL	LIBERATION [6]	Au (%)*	Ag (%)*
1	none	1	native gold	liberated	90	10
2	pyrite	2	native gold	encapsulated	96	4
3	pyrite	3	native gold	encapsulated	97	3
4	pyrite	4	native gold	encapsulated	86	14
5	pyrite	5	native gold	encapsulated	100	0
	pyrite	6	native gold	encapsulated	100	0
	pyrite	7	native gold	encapsulated	98	2
	pyrite	8	native gold	encapsulated	100	0
	pyrite	9	native gold	encapsulated	98	2
6	pyrite	10	native gold	encapsulated	100	0
	pyrite	11	native gold	encapsulated	100	0
	pyrite	12	native gold	encapsulated	100	0
	pyrite	13	native gold	encapsulated	100	0
7	pyrite	14	native gold	encapsulated	100	0
8	pyrite-Bi-Te	15	native gold	encapsulated	89	11

* normalised % phase composition, host response excluded

One out of 15 gold grains are free native gold, 13 gold grains are associated with pyrite and one gold grain is associated with pyrite-bismuth-tellurium. Only one out of 15 gold grains are liberated or exposed (and therefore would be available to cyanidation). The native gold grains contain 86-100% gold and 0-14% silver.

BSE images of the 15 native gold grains in the gravity concentrate fraction of the Yaouré Granodiorite Master Composite were also captured. Images of host particles 1 to 8 are presented in Figure 13-24 to Figure 13-27, which provide further visual detail on the degree of liberation of gold grains within the particles identified.

[6] Liberated = >90% surface area of gold grain exposed; Exposed = >0 ≤90% surface area of gold grain exposed; Encapsulated = gold grain without surface exposure

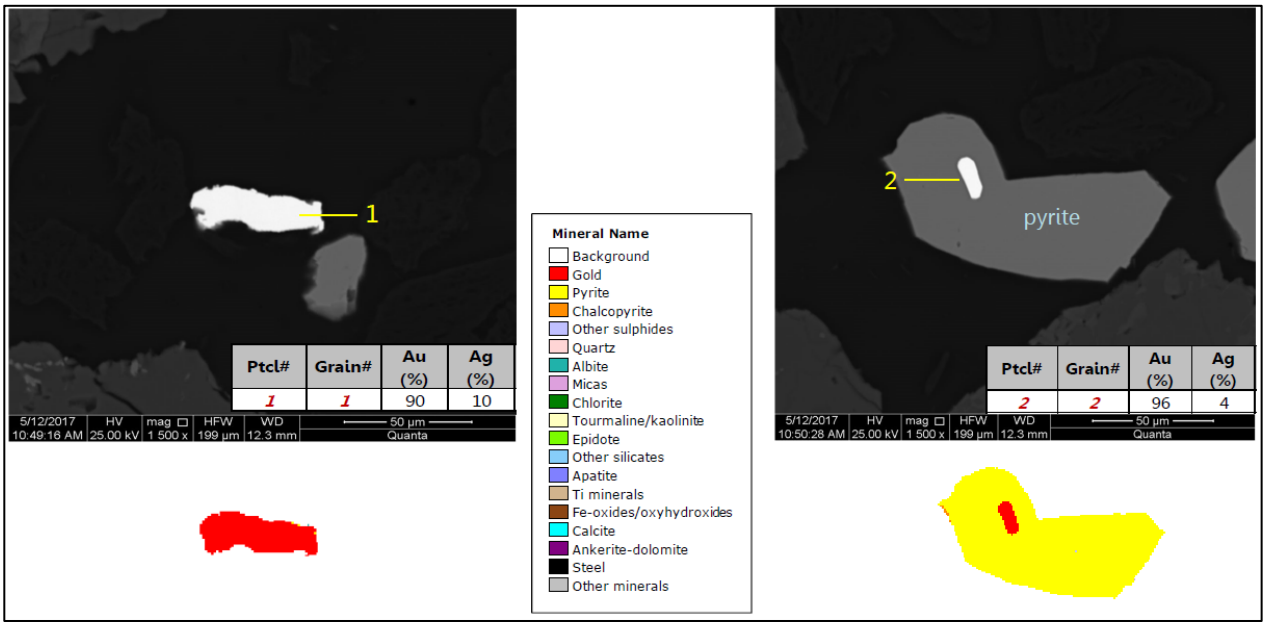


Figure 13-24: BSE images of (L): host particle 1, gold grain 1; and (R): host particle 2, gold grain 2 from the gravity concentrate fraction of the Yaouré Granodiorite Master Composite

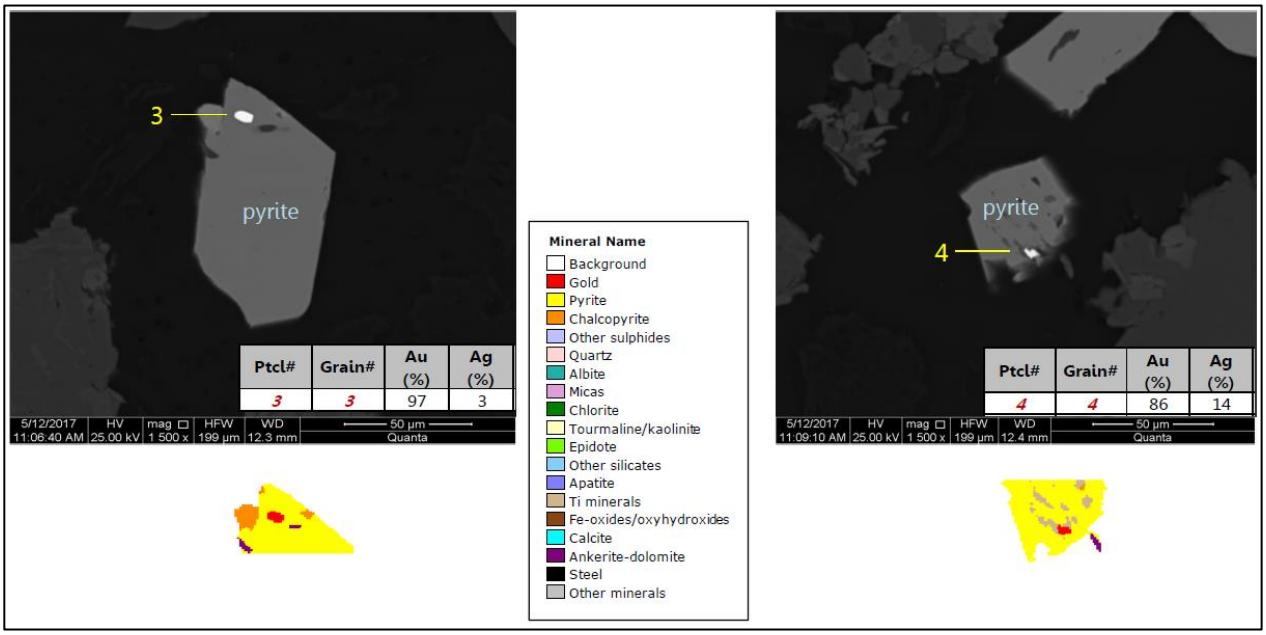
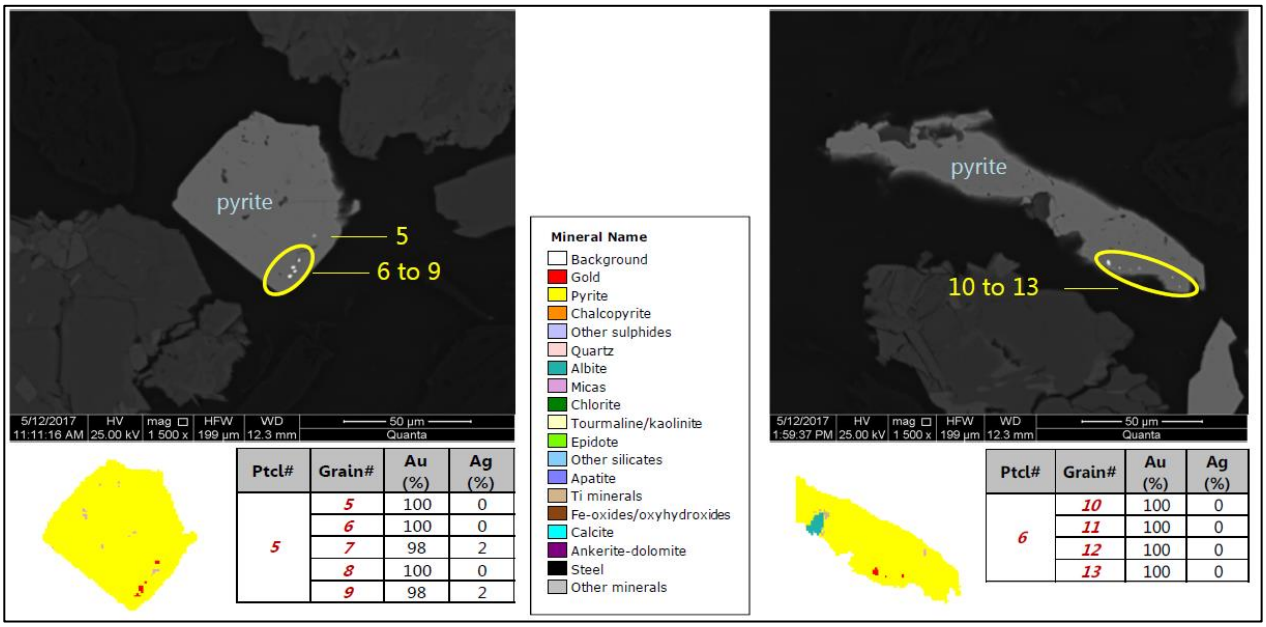


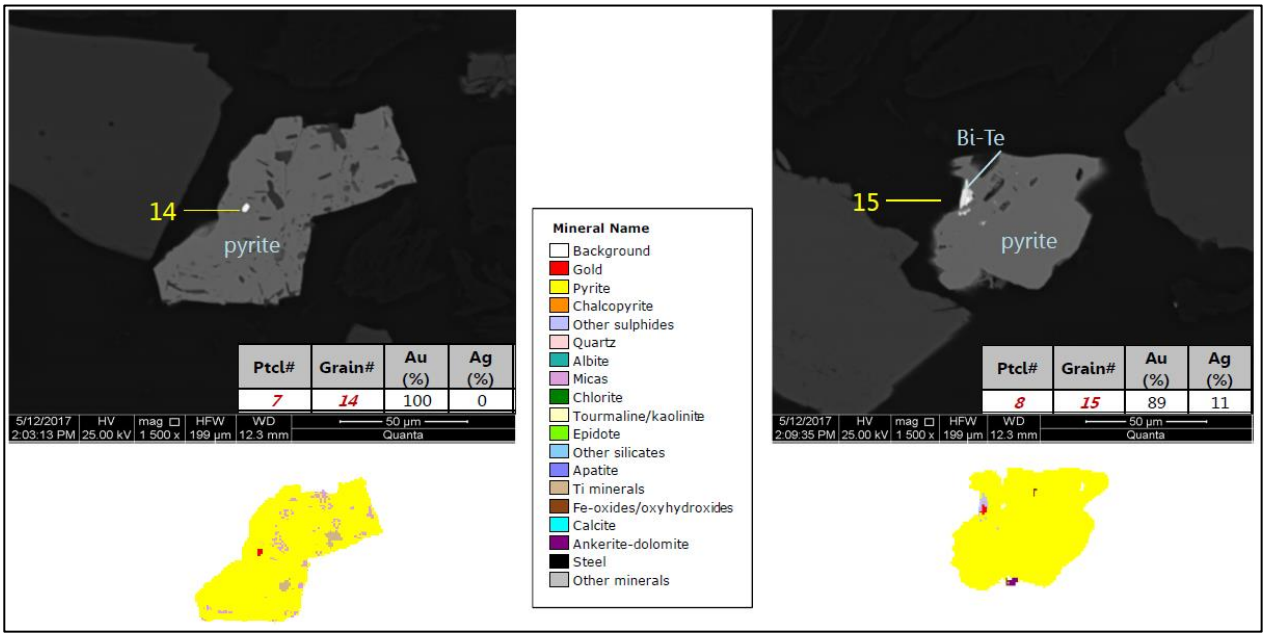
Figure 13-25: BSE images of (L): host particle 3, gold grain 3; and (R): host particle 4, gold grain 4 from the gravity concentrate fraction of the Yaouré Granodiorite Master Composite



Ptcl#	Grain#	Au (%)	Ag (%)
5	5	100	0
	6	100	0
	7	98	2
	8	100	0
	9	98	2

Ptcl#	Grain#	Au (%)	Ag (%)
6	10	100	0
	11	100	0
	12	100	0
	13	100	0

Figure 13-26: BSE images of (L): host particle 5, gold grains 5 to 9; and (R): host particle 6, gold grains 10 to 14 from the gravity concentrate fraction of the Yaouré Granodiorite Master Composite



Ptcl#	Grain#	Au (%)	Ag (%)
7	14	100	0

Ptcl#	Grain#	Au (%)	Ag (%)
8	15	89	11

Figure 13-27: BSE images of (L): host particle 7, gold grain 14; and (R): host particle 8, gold grain 15 from the gravity concentrate fraction of the Yaouré Granodiorite Master Composite

A summary of findings from the manual EDS analysis for the Yaouré S-Basalt Master Composite is displayed in Table 13-62.

Table 13-62: Gold grain data from EDS analysis of gravity concentrate fraction from the Yaouré S-Basalt Master Composite

HOST PARTICLE NUMBER	HOST MINERAL	GOLD GRAIN NUMBER	GOLD MINERAL	LIBERATION [7]	Au (%)*	Ag (%)*
1	none	1	native gold	liberated	92	8
2	none	2	native gold	liberated	100	0
3	pyrite	3	native gold	exposed	81	19
4	pyrite	4	native gold	encapsulated	100	0
5	pyrite	5	native gold	encapsulated	100	0
	pyrite	6	native gold	encapsulated	100	0
6	pyrite	7	native gold	encapsulated	97	3
7	pyrite	8	native gold	encapsulated	100	0
8	pyrite	9	native gold	encapsulated	100	0
	pyrite	10	native gold	encapsulated	96	4
	pyrite	11	native gold	encapsulated	100	0

* normalised % phase composition, host response excluded

Two out of 11 gold grains are free native gold particles, and nine gold grains are associated with pyrite. Three out of 11 gold grains are liberated or exposed (and therefore would be available to cyanidation). The native gold grains contain 81-100% gold and 0-19% silver.

BSE images of the 11 native gold grains in the gravity concentrate fraction of the Yaouré S-Basalt Master Composite were also captured. Images of host particles 1 to 8 are presented in Figure 13-28 to Figure 13-31, which provide further visual detail on the degree of liberation of gold grains within the particles identified.

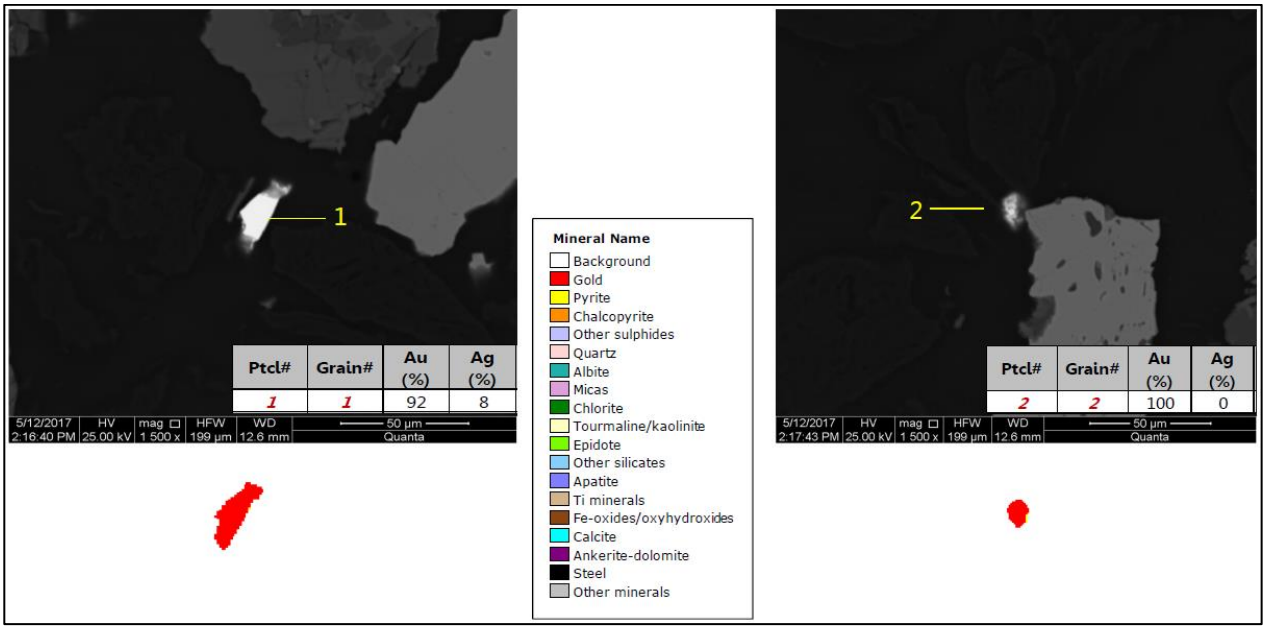


Figure 13-28: BSE images of (L): host particle 1, gold grain 1; and (R): host particle 2, gold grain 2 from the gravity concentrate fraction of the Yaouré S-Basalt Master Composite

[7] Liberated = >90% surface area of gold grain exposed; Exposed = >0 ≤90% surface area of gold grain exposed; Encapsulated = gold grain without surface exposure

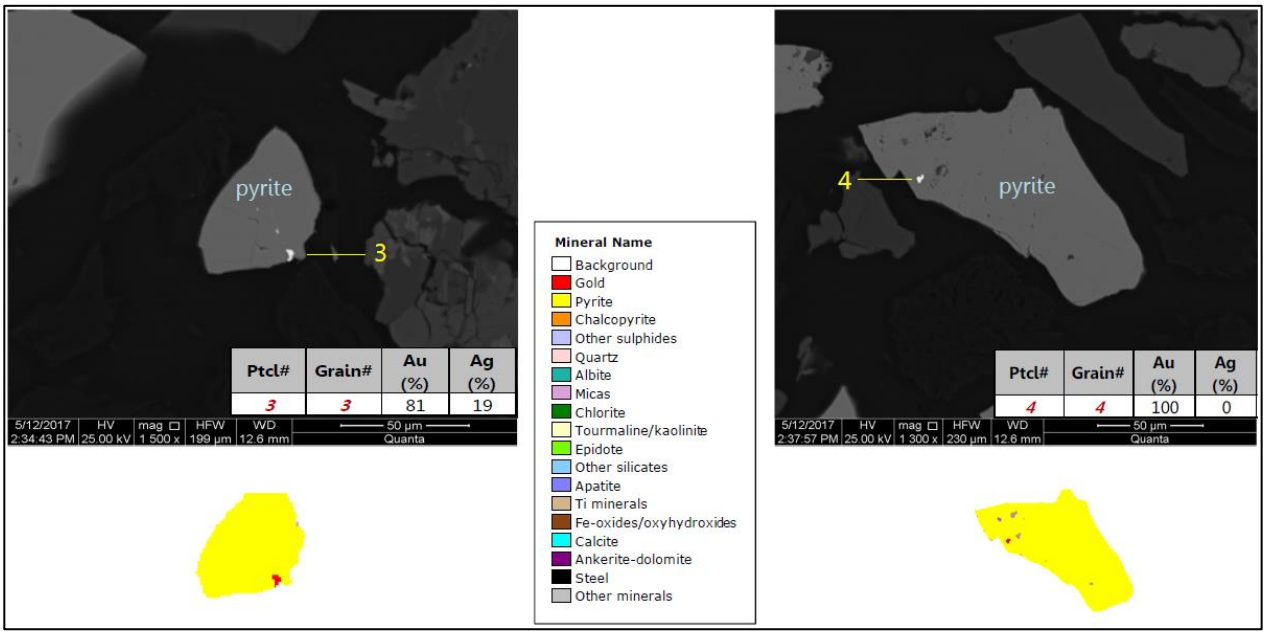


Figure 13-29: BSE images of (L): host particle 3, gold grain 3; and (R): host particle 4, gold grain 4 from the gravity concentrate fraction of the Yaouré S-Basalt Master Composite

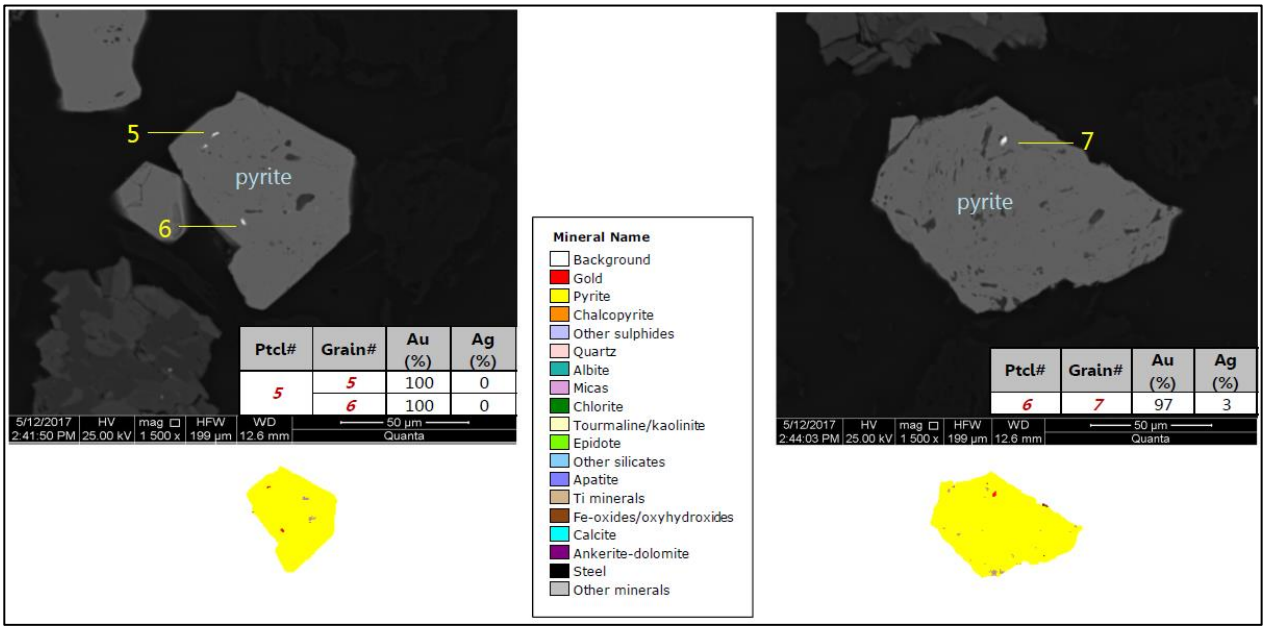


Figure 13-30: BSE images of (L): host particle 5, gold grains 5 and 6; and (R): host particle 6, gold grain 7 from the gravity concentrate fraction of the Yaouré S-Basalt Master Composite

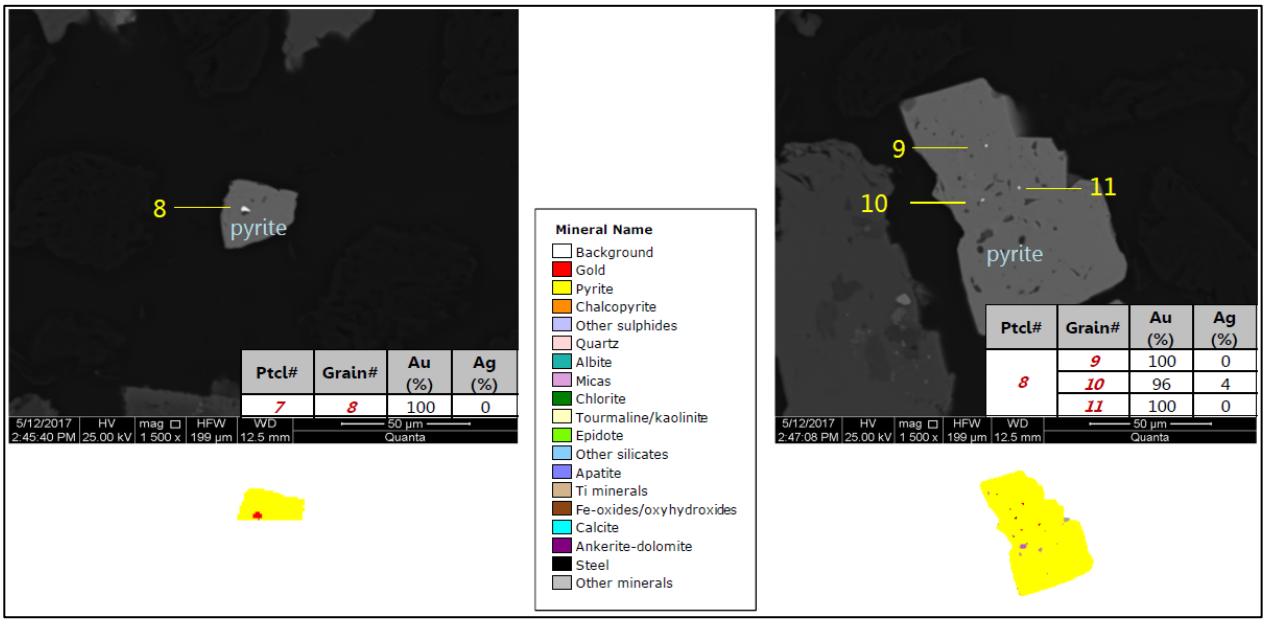


Figure 13-31: BSE images of (L): host particle 7, gold grain 8; and (R): host particle 8, gold grains 9 to 11 from the gravity concentrate fraction of the Yaouré S-Basalt Master Composite

A summary of findings from the manual EDS analysis for the Yaouré Y-Basalt Master Composite is displayed in Table 13-63.

Table 13-63: Gold grain data from EDS analysis of gravity concentrate fraction from the Yaouré Y-Basalt Master Composite

HOST PARTICLE NUMBER	HOST MINERAL	GOLD GRAIN NUMBER	GOLD MINERAL	LIBERATION [8]	Au (%)*	Ag (%)*
1	none	1	native gold	liberated	100	0
	none	2	native gold	liberated	100	0
	none	3	native gold	liberated	100	0
2	none	4	native gold	liberated	100	0
3	none	5	native gold	liberated	92	8
4	none	6	native gold	liberated	89	11
5	pyrite	7	native gold	exposed	100	0
	pyrite	8	native gold	exposed	100	0
6	pyrite	9	native gold	exposed? liberated?	100	0
7	pyrite	10	native gold	encapsulated	100	0
8	pyrite	11	native gold	encapsulated	100	0
	pyrite	12	native gold	encapsulated	100	0

* normalised % phase composition, host response excluded

Six out of 12 gold grains are free native gold particles, and six gold grains are associated with pyrite. Nine out of 11 gold grains are liberated or exposed (and therefore would be available to cyanidation). The native gold grains contain 89-100% gold and 0-11% silver.

BSE images of the 12 native gold grains in the gravity concentrate fraction of the Yaouré Y-Basalt Master Composite were also captured. Images of host particles 1 to 8 are presented in Figure 13-32

[8] Liberated = >90% surface area of gold grain exposed; Exposed = >0 ≤90% surface area of gold grain exposed; Encapsulated = gold grain without surface exposure

to Figure 13-35, which provide further visual detail on the degree of liberation of gold grains within the particles identified.

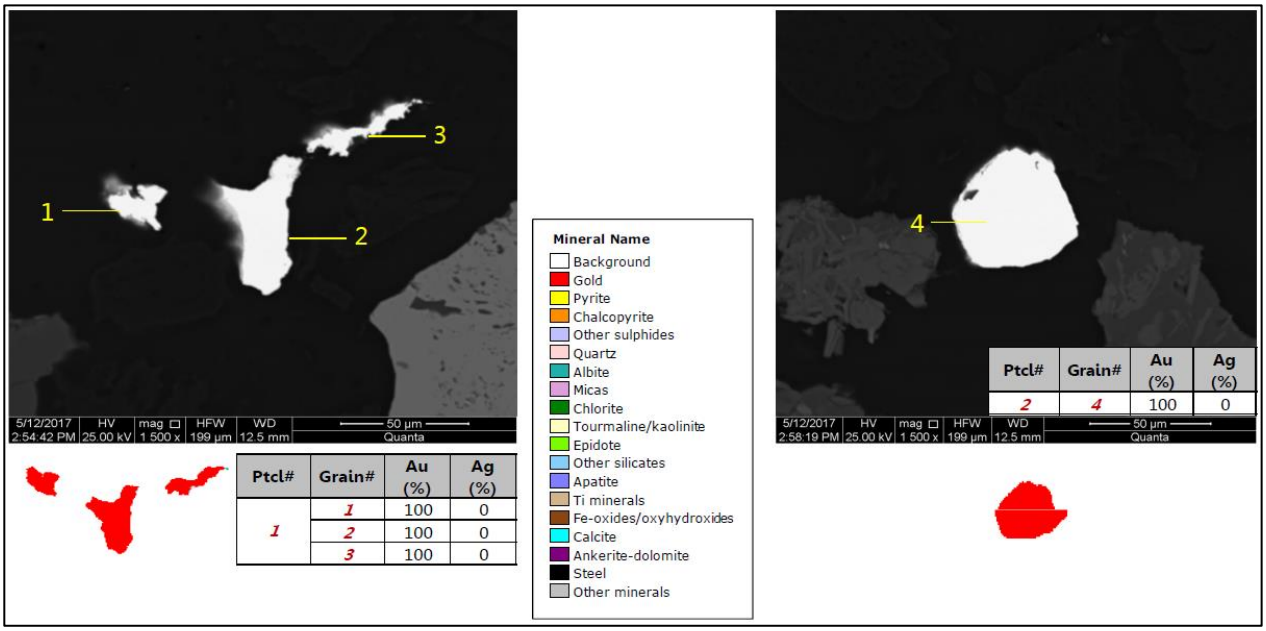


Figure 13-32: BSE images of (L): host particle 1, gold grains 1 to 3; and (R): host particle 2, gold grain 4 from the gravity concentrate fraction of the Yaouré Y-Basalt Master Composite

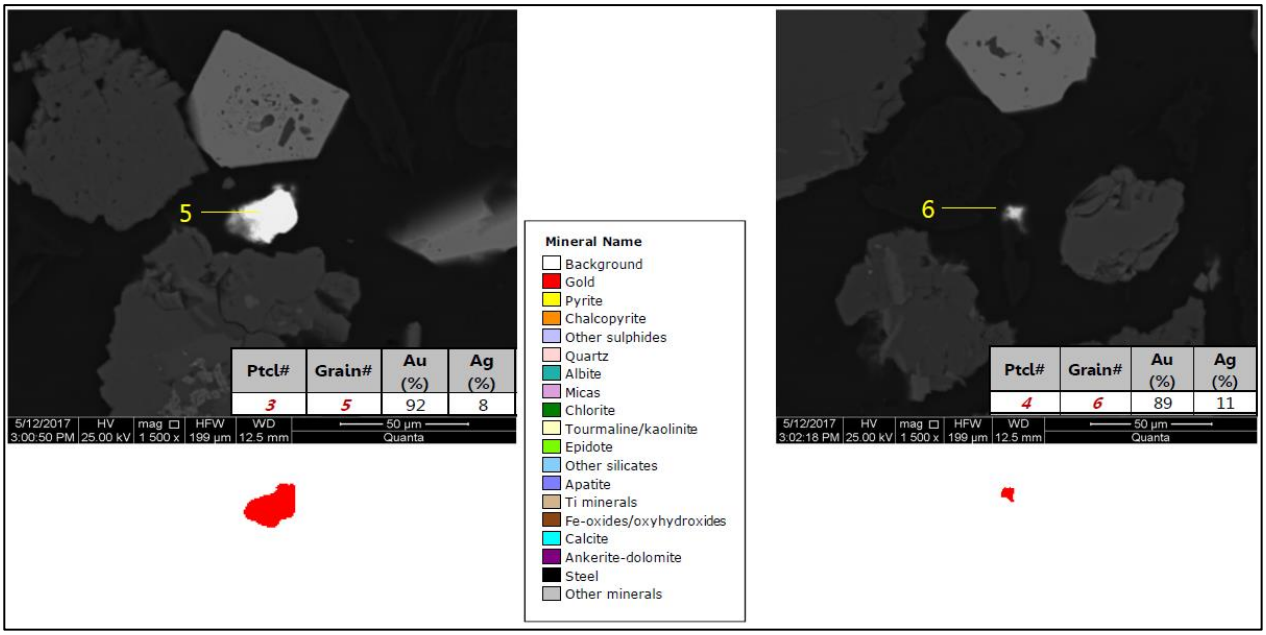


Figure 13-33: BSE images of (L): host particle 3, gold grain 5; and (R): host particle 4, gold grain 6 from the gravity concentrate fraction of the Yaouré Y-Basalt Master Composite

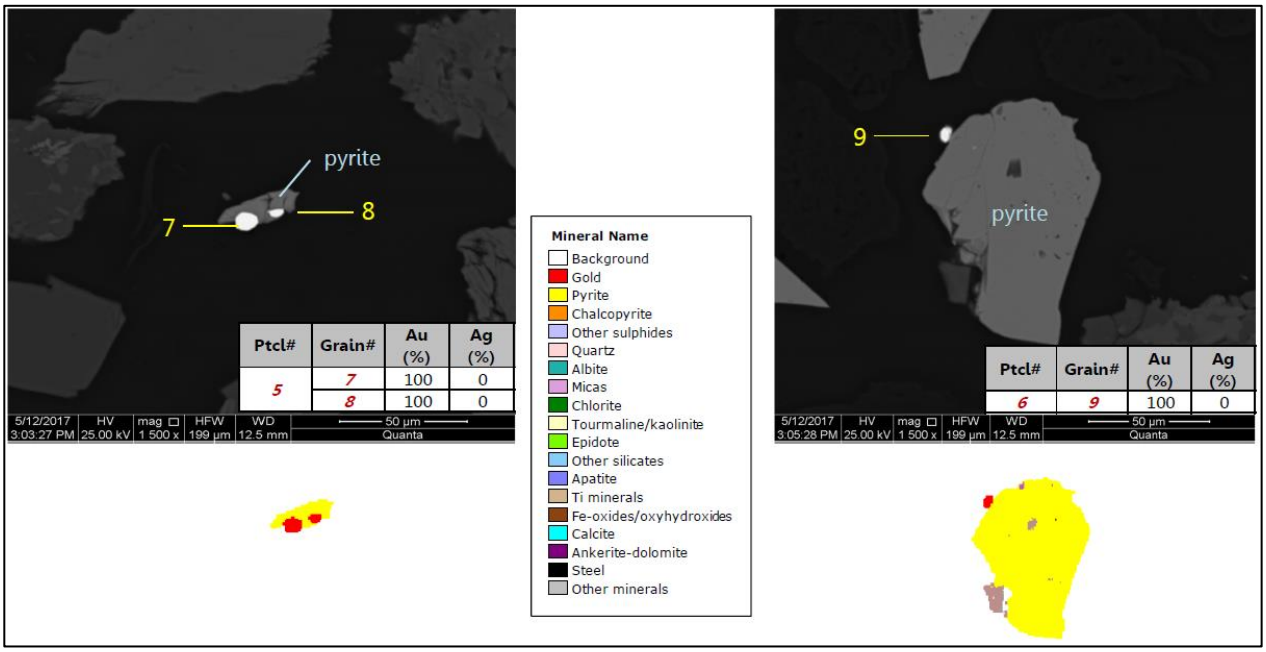


Figure 13-34: BSE images of (L): host particle 5, gold grains 7 and 8; and (R): host particle 6, gold grain 9 from the gravity concentrate fraction of the Yaouré Y-Basalt Master Composite

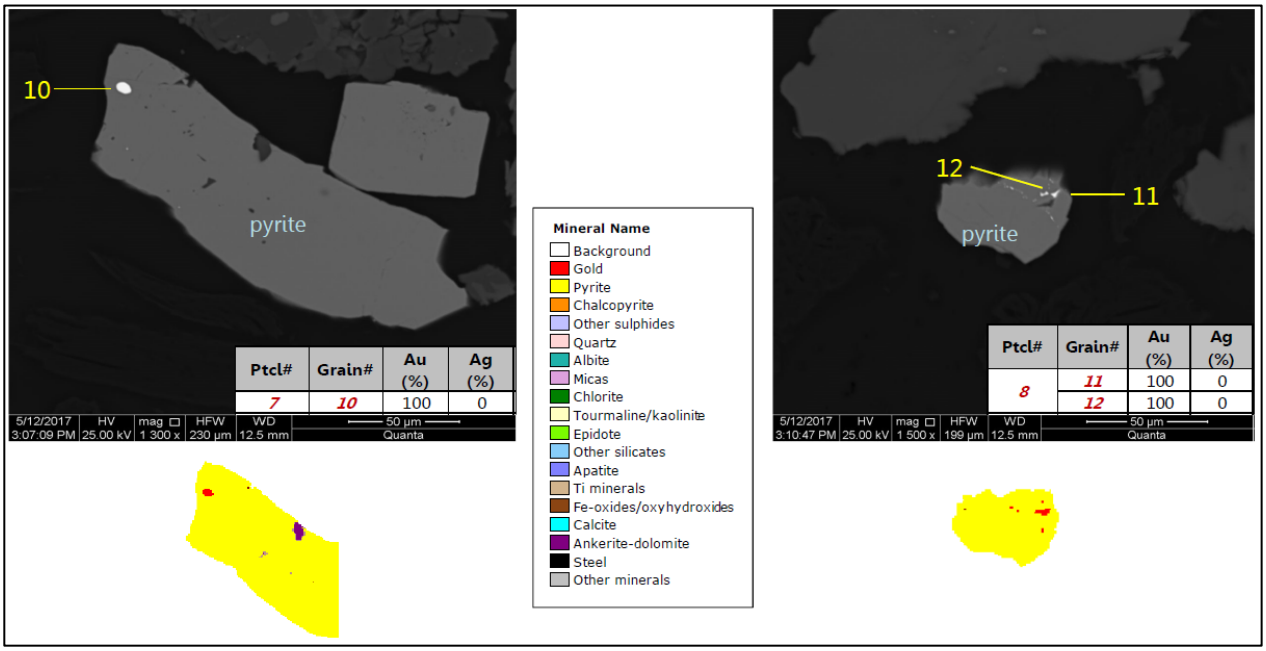


Figure 13-35: BSE images of (L): host particle 7, gold grain 10; and (R): host particle 8, gold grains 11 and 12 from the gravity concentrate fraction of the Yaouré Y-Basalt Master Composite

13.3.5.6 Optical Microscopy of Coarse Gold Grains

About half of the gravity concentrate fraction of the Yaouré Granodiorite Master Composite (that was not mounted in the polished section for QEMSCAN) was hand-panned and examined for the presence of coarse, free gold grains using a stereomicroscope. Optical images of four coarse gold grains were captured. Coarse gold grain size data are presented in Table 13-64, and optical images of the gold grains are shown in Figure 13-36.

Table 13-64: Coarse gold grain sizes identified in gravity concentrate fraction of the Yaouré Granodiorite Master Composite

GOLD GRAIN NUMBER	GRAIN SIZE (µm)
1	4,290 × 2,500
2	890 × 320
3	360 × 180
4	640 × 210

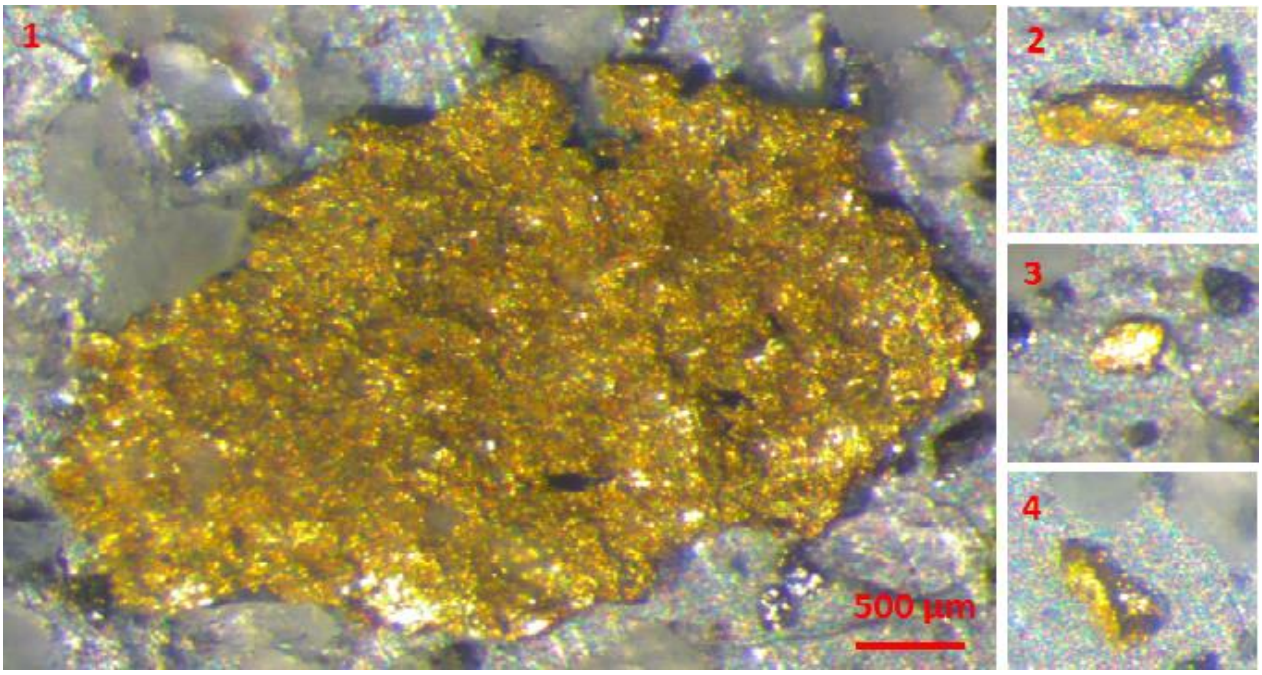


Figure 13-36: Optical images of gold grains 1-4 from gravity concentrate fraction of the Yaouré Granodiorite Master Composite

13.3.5.7 Gravity Tail Fractions of Mineralogical Composites

Sub-samples of gravity tail from the Yaouré Granodiorite Master Composite, Yaouré S-Basalt Master Composite and Yaouré Y-Basalt Master Composite were pressed into a back-packed sample holder to minimise preferred orientation of the particles. Powder XRD was used to analyse the gravity tail sample and a combination of matrix flushing and RIR derived constants were used in the quantification of the minerals identified in the sample. Quantitative results were normalised to 100%, representing the relative proportions of crystalline minerals in the sample. Any amorphous minerals that may be present in the gravity tail of the Yaouré fresh ore master composites cannot be detected by the powder x-ray diffraction method.

The gravity tail fractions of all three Yaouré fresh ore master composites contain only a minor amount of pyrite (1%). Most of the sample mass of the gravity tail fractions is made up of non-sulfide gangue minerals, with chlorite, quartz, sodic and calcic plagioclase, ankerite-dolomite and muscovite being dominant. The mineral abundance of the gravity tails fractions by grouping is shown in Table 13-65.

It was observed by the mineralogist that smectite and vermiculite were the dominant clay minerals in the samples. More than one type of chlorite is present, with clinochlore dominating. Phlogopite and biotite were the dominant mica minerals.

Table 13-65: Mineral abundance of gravity tail fractions of Yaouré pit fresh ore master composites

MINERAL GROUP	YAOURÉ GRANODIORITE MASTER COMP MASS %	YAOURÉ S-BASALT MASTER COMP MASS %	YAOURÉ Y-BASALT MASTER COMP MASS %
Chlorite	14	50	48
Quartz	27	19	17
Sodic and calcic plagioclase	35	7	7
Ankerite-dolomite	7	5	11
Muscovite	10	5	6
Calcite	2	8	6
Annite-biotite-phlogopite	3	2	2
Pyrite	1	1	1
Clay mineral	1	1	1
K-feldspar and/or rutile	<1	1	1
Magnetite	0	1	1
Illite	<1	<1	<1
Serpentine	0	0	<1

13.3.6 Carbon Adsorption Kinetics

Slurry samples from Yaouré Granodiorite Master Composite bulk direct leach test WH8389 and Yaouré Y-Basalt Master Composite bulk direct leach test WH8388 (from Section 13.3.4.3) were subjected to sequential triple-contact CIP leach test work. A summary of results from regression analysis of the test work data to determine indicative Fleming gold adsorption constants for the Yaouré Granodiorite Master Composite and Yaouré Y-Basalt Master Composite cyanidation slurries is presented in Table 13-66.

Table 13-66: Sequential triple contact CIP leach test work results for cyanidation slurry from Yaouré pit fresh ore master composites

SAMPLE/TEST NUMBER	FLEMING CONSTANT *k* (h^{-1})	FLEMING CONSTANT n	ASSAYED LOADED CARBON CONCENTRATION (g/t Au)	CALCULATED CIP LOADED CARBON CONCENTRATION (g/t Au)
Yaouré Granodiorite Master Composite (WH8389)	96.56	0.486	951	996
Yaouré Y-Basalt Master Composite (WH8388)	121.64	0.539	1,344	1,437

The Fleming carbon adsorption constants for the Yaouré fresh ore master composites are lower than those observed for the CMA Fresh Ore Master Composite in Section 13.2.6, but the kinetics are still within the range typically observed in CIL operations. The average gold assays for the loaded carbon samples compare well with the CIP calculated carbon gold loading concentrations. Typical for cyanidation leach systems, the loaded carbon samples were also noted to contain elevated levels of Al, Ca, Fe, Mg and Na.

13.3.7 Oxygen Uptake Rate

Oxygen uptake rate determination tests were conducted on sub-samples of Yaouré Granodiorite Master Composite, Yaouré S-Basalt Master Composite and Yaouré Y-Basalt Master Composite, following the standard procedure described by Fraser (1984), with samples prepared as described in Section 13.2.7.

Oxygen uptake rate data for the Yaouré pit fresh ore master composites, collected at ambient temperature, are presented in Table 13-67. Note that data at 0 h represents baseline data prior to aeration.

Table 13-67: Oxygen uptake rate for Yaouré pit fresh ore master composites

TIME (h)	YAOURÉ GRANODIORITE MASTER COMPOSITE OXYGEN UPTAKE RATE (mg/L/min)	YAOURÉ S-BASALT MASTER COMPOSITE OXYGEN UPTAKE RATE (mg/L/min)	YAOURÉ Y-BASALT MASTER COMPOSITE OXYGEN UPTAKE RATE (mg/L/min)
0	-0.0030	-0.0282	-0.0141
1	-0.0020	-0.0055	-0.0100
2	-0.0019	-0.0070	-0.0080
3	-0.0017	-0.0028	-0.0048
4	-0.0020	-0.0019	-0.0027
5	-0.0007	-0.0032	-0.0009
6	0.0000	-0.0016	-0.0013
24	-0.0006	0.0000	-0.0006

The data indicate that the Yaouré pit fresh ore master composites are low potential oxygen consumers. Although the oxygen uptake demand is typically low, the addition of oxygen instead of air to the CIL tanks is noted as an option for future expansion of the CIL plant.

13.3.8 Cyanide Detoxification

13.3.8.1 SO_2/Air Cyanide Detoxification

Continuous SO_2/air cyanide detoxification tests were undertaken on a Yaouré Y-Basalt Master Composite cyanidation tailings sample from leach test WH8390 (from Section 13.3.4.3). Addition rates of SO_2 (as SMBS), $CuSO_4.5H_2O$ and lime (60% CaO) were varied across the range of tests to optimise reagent addition rates and CN_{WAD} concentrations in effluent. CN_{WAD} assay was by direct spectrophotometric determination with picric acid reagent. CN_{total} was calculated as CN_{WAD} + 2.80×Fe.

The test work was conducted on cyanidation tailings slurry at 40% w/w solids, agitated vigorously at 1,100 rpm. pH target range for the reaction was 8.0 to 9.0, and target aeration rate was 1 L/min/L reactor volume. A residence time of nominally 60 minutes was chosen for tests D1 to D5, and a shorter nominal residence time of 30 minutes was chosen for test D6. The results from the series of tests are presented in Table 13-68.

Table 13-68: Continuous SO_2/air cyanide detoxification test results on Yaouré Y-Basalt Master Composite cyanidation tailings slurry

SAMPLE/ TEST NUMBER	pH	RETENTION TIME (min)	SO_2 (g/g CN_{WAD})	$CuSO_4.5H_2O$ (mg/L)	LIME (g/g SO_2)	CN_{WAD} (mg/L)	CN_{TOTAL} (mg/L)	Cu (mg/L)	Fe (mg/L)	Ni (mg/L)	Zn (mg/L)
Feed	9.44	-	-	-	-	108	113	13.2	1.80	0.25	0.54
D1	8.96	55.43	5.84	44	2.15	0.42	18.3	0.80	2.65	0.05	<0.02
D2	8.57	56.39	4.27	42	2.03	0.20	8.04	0.11	2.85	0.05	<0.02
D3	8.61	57.49	3.00	40	1.45	0.31	6.50	0.04	2.25	0.05	<0.02
D4	8.40	57.35	3.10	0	2.49	0.24	11.8	0.07	4.20	0.13	<0.02
D5	8.07	57.26	3.00	0	2.73	0.86	9.25	0.04	3.05	0.13	<0.02
D6	8.52	29.80	3.20	0	0.00	28.5	54.6	18.1	9.50	0.40	0.33

From the results:

- For tests D1 to D5, residual CN_{WAD} levels <1 mg/L were achieved, regardless of $CuSO_4.5H_2O$ addition.
- For tests D1 to D5, varying the ratio of SO_2:CN_{WAD} resulted in no major difference in residual CN_{WAD} levels.
- Reducing the residence time to 30 minutes (test D6) resulted in a higher residual CN_{WAD} level than the other five tests (tests D1 to D5).
- All six tests achieve residual CN_{WAD} levels <50 mg/L, which aligns with industry guidelines for TSFs such as Standard of Practice 4.4 of International Cyanide Management Institute's *Mining Operations Verification Protocol* (2021).
- Tests D1 and D4 achieve residual CN_{WAD} levels <0.5 mg/L, which aligns with industry guidelines for discharge to surface water such as Standard of Practice 4.5 of International Cyanide Management Institute's *Mining Operations Verification Protocol* (2021).
- The optimal addition ratio from the tests is 3.0 g SO_2/g CN_{WAD}. It was noted that a slightly higher ratio would likely be required on a commercial scale.

13.3.9 Viscosity

A series of rheology tests were performed on the Yaouré Y-Basalt Master Composite sample, as per the procedure described in Section 13.2.9. The results are summarised in Table 13-69.

Table 13-69: Viscosity results for the Yaouré Y-Basalt Master Composite sample

SAMPLE	SOLIDS CONC (% w/w)	VISCOSITY (cP) AT SHEAR RATE (s^{-1})							
		4.2	7.4	13.1	21.9	38.9	67.4	119.2	209.5
Yaouré Y-Basalt Master Composite	55	0	0	0	0	40	49	57	80
	50	0	0	0	0	0	30	45	68
	45	0	0	0	0	0	21	34	58
	40	0	0	0	0	0	16	25	47

As described by Norgaard (2019), if viscosity:

- <100 cP at a shear rate of 119.2 s^{-1}, then there should be no pumping issues
- <3,500 cP at a shear rate of 4.2 s^{-1}, then there should be no mixing or screening issues.

Despite clay minerals, such as smectite, being present in the sample (as noted in Section 13.3.5.7), this has not resulted in high viscosity readings. Based on the guidelines above, there should be no viscosity related materials handling issues within the Yaouré processing plant when treating Yaouré Y-basalt fresh ore at any of the pulp densities tested.

13.3.10 Thickening and Settling Rate

Yaouré Granodiorite Master Composite slurry and Yaouré Combined Basalt Master Composite slurry, at pH of 10.5 and target grind size P_{80} of 75 µm, were subjected to thickening test work by Outotec, Perth as part of the ALS Metallurgy test work program. Laser diffraction size analysis of the composites measured P_{80} of 78 µm for the Yaouré Granodiorite Master Composite and P_{80} of 66 µm for the Yaouré Combined Basalt Master Composite.

Flocculant screening tests were conducted on the CMA Pit Fresh Ore Master Composite only (Section 13.2.10.1) and not on the Yaouré Granodiorite Master Composite or the Yaouré Combined

Basalt Master Composite. The selection of BASF Magnafloc® 155 (M155) for the CMA Pit Fresh Ore Master Composite was applied to thickening tests for the Yaouré Granodiorite Master Composite and the Yaouré Combined Basalt Master Composite.

13.3.10.1 Dynamic Thickening Tests

Dynamic thickening tests on the Yaouré Granodiorite Master Composite and the Yaouré Combined Basalt Master Composite followed the same procedure as for the CMA Pit Fresh Ore Master Composite, described in Section 13.2.10.2. A summary of results from the dynamic thickening tests on the Yaouré Granodiorite Master Composite is presented in Table 13-70, and results from dynamic thickening tests on the Yaouré Combined Basalt Master Composite are presented in Table 13-71.

Table 13-70: Dynamic thickening test work results for the Yaouré Granodiorite Master Composite

TEST	FEED FLUX ($t/m^2/h$)	FEED LIQUOR RISE RATE (m/h)	FLOCCULANT TYPE	FLOCCULANT DOSE (g/t)	UNDERFLOW SOLIDS CONC. (% w/w)	UNDERFLOW YIELD STRESS (Pa)	OVERFLOW SOLIDS CONC. (mg/L)
1	0.50	3.03	M155	20	67.9	35	410
2	0.50	3.03	M155	30	68.0	46	330
3	0.50	3.03	M155	40	67.7	44	180
4	1.00	6.06	M155	40	64.1	34	160
5	1.50	9.08	M155	40	61.6	31	140

Table 13-71: Dynamic thickening test work results for the Yaouré Combined Basalt Master Composite

TEST	FEED FLUX ($t/m^2/h$)	FEED LIQUOR RISE RATE (m/h)	FLOCCULANT TYPE	FLOCCULANT DOSE (g/t)	UNDERFLOW SOLIDS CONC. (% w/w)	UNDERFLOW YIELD STRESS (Pa)	OVERFLOW SOLIDS CONC. (mg/L)
1	0.50	3.02	M155	10	67.8	27	<100
2	0.50	3.02	M155	5	68.1	23	<100
3	0.50	3.02	M155	2.5	67.6	19	170
4	1.00	6.05	M155	5	65.6	15	<100
5	1.50	9.07	M155	5	63.4	13	<100

For the Yaouré Granodiorite Master Composite, slurry can be thickened by high rate thickening to underflow pulp densities of 61.6-68.0% w/w solids over a flux rate range of 0.50-1.50 $t/m^2/h$. Should thickening be included in the Yaouré process plant flowsheet in future, it is recommended that further flocculant screening tests are conducted to improve overflow clarity.

For the Yaouré Combined Basalt Master Composite, slurry can be thickened by high rate thickening to underflow pulp densities of 63.4-68.1% w/w solids over a flux rate range of 0.50-1.50 $t/m^2/h$, with simultaneously good overflow clarity.

13.3.11 Tailings Geochemistry

Cyanidation tailings slurry from bulk whole ore leach tests WH8098 on Yaouré Granodiorite Master Composite and WH8097 on Yaouré Combined Basalt Master Composite (Section 13.3.4.3) were submitted to Knight Piésold for geochemical testing (Knight Piésold, 2017a); (Knight Piésold, 2017b).

The total sulfur results for the Yaouré Granodiorite Master Composite and Yaouré Combined Basalt Master Composite tailings samples (0.36% and 0.72% respectively) aligned well with the head assays performed by ALS on the same samples (0.34% and 0.78% respectively, Section 13.3.2). The samples were essentially devoid of sulfate (0.01% to 0.02%), indicating that nearly all sulfur is present as sulfide. The MPA for the Yaouré Granodiorite Master Composite tailings sample was

moderate at 10.7 kg H_2SO_4/t, and was high for the Yaouré Combined Basalt Master Composite at 21.6 kg H_2SO_4/t.

The ANC of the Yaouré Granodiorite Master Composite tailings sample was high at 92 kg H_2SO_4/t and was very high for the Yaouré Combined Basalt Master Composite at 201 kg H_2SO_4/t. These values concurred with the ANC estimated as being available from carbonate minerals (100 kg H_2SO_4/t and 186 kg H_2SO_4/t respectively).

The NAPP value for the Yaouré Granodiorite Master Composite tailings sample was -81 kg H_2SO_4/t, which along with a high ANC/NPA ratio of 8.6 indicates excess neutralising capacity. The NAPP value for the Yaouré Combined Basalt Master Composite tailings sample was -179 kg H_2SO_4/t, which along with a high ANC/NPA ratio of 9.3 indicates excess neutralising capacity. In the NAG test, both master composite tailings samples did not produce any measurable acid, with final pH values of 9.5 for the Yaouré Granodiorite Master Composite tailings sample and 8.9 for the Yaouré Combined Basalt Master Composite tailings sample. The Yaouré Granodiorite Master Composite tailings sample was classified as non-acid forming, and the Yaouré Combined Basalt Master Composite tailings sample was classified as acid consuming.

The results of the multi-element analyses indicate that the level of element enrichment in the tailings solids for both master composites is low.

The same TSF controls recommended in Section 13.2.11 apply for all Yaouré property tailings samples tested.

13.4 CMA Pit and Yaouré Pit Oxide and Transition Ore Test Work

Oxide and transition ore, specifically fully and partially oxidised ore mineable within economic open pit shells for the CMA and Yaouré deposits, was the subject of the DFS test work program in 2018. As can be observed in Figure 13-37 to Figure 13-43, a number of the oxide and transition ore samples submitted for metallurgical test work were taken from the saddle that is projected to join the CMA and Yaouré pits. Hence, the summary of the metallurgical performance of CMA and Yaouré oxide and transition ores has been grouped together for this report.

Samples of oxide and transition ore from within the CMA and Yaouré pit shells were tested to determine:

- whether the optimised processing route and conditions selected for the CMA pit fresh ore are also applicable to the CMA and Yaouré pit oxide and transition ores
- the plant operating parameters for Yaouré pit fresh ore for the determined processing route, specifically throughput rate, gold recovery and reagent consumption
- engineering design data required for plant and TSF design.

The program was completed by ALS Metallurgy in Perth, Western Australia (ALS, 2018), and included the following:

- comminution tests (SMC Test®, BWi and Ai on one oxide comminution variability sample and one oxide master composite; and RWi on one oxide comminution variability sample)
- ore type master composite test work program on CMA/Yaouré pit oxide ore master composite:
    - gold extraction test work to assess gravity and leaching characteristics across a range of grind sizes, leading to selection of optimised process conditions

    - determination of parameters necessary for process plant and TSF design and operation (oxygen uptake rate, viscosity, thickening and settling rate, tailings geochemistry)
- gravity/cyanidation tests under optimised process conditions on ten oxide metallurgical variability samples and six transition metallurgical variability samples
- diagnostic leach test on one oxide metallurgical variability sample.

13.4.1 Samples Selected

One oxide master composite sample and 18 metallurgical variability samples were selected from core and RC drill sample rejects taken from 31 drill holes spread across remnant fully and partially oxidised ore within the 2017 preliminary CMA and Yaouré pit shells. Samples were taken from the fully and partially weathered profiles over an approximate range of:

- 495 m east to west
- 1,178 m north to south
- 109 m in RL.

The location of the CMA/Yaouré Oxide Master Composite sample intervals within the deposit are shown in Figure 13-37 and Figure 13-38. The location of oxide ore metallurgical variability sample intervals (red dots) and transition ore metallurgical variability sample intervals (green dots) are shown in Figure 13-39 and Figure 13-40. Across the four figures, the 2017 preliminary Yaouré pit shell is shown in grey, the re-interpreted 2023 Yaouré pit shell is shown in light blue, and the CMA pit shell is shown in yellow.

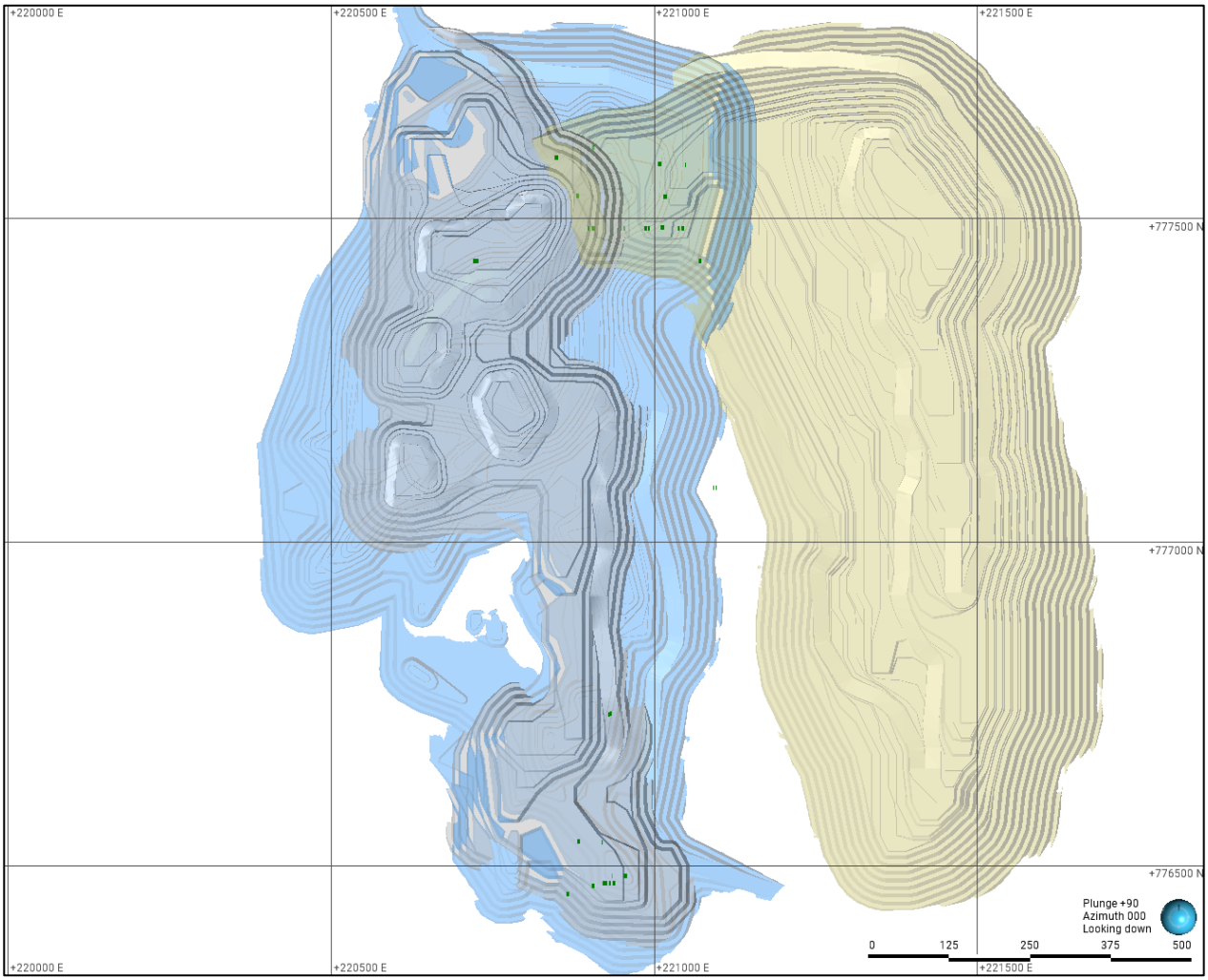


Figure 13-37: Location of CMA/Yaouré Oxide Master Composite samples within the CMA and Yaouré deposits, plan view (Perseus, 2023)

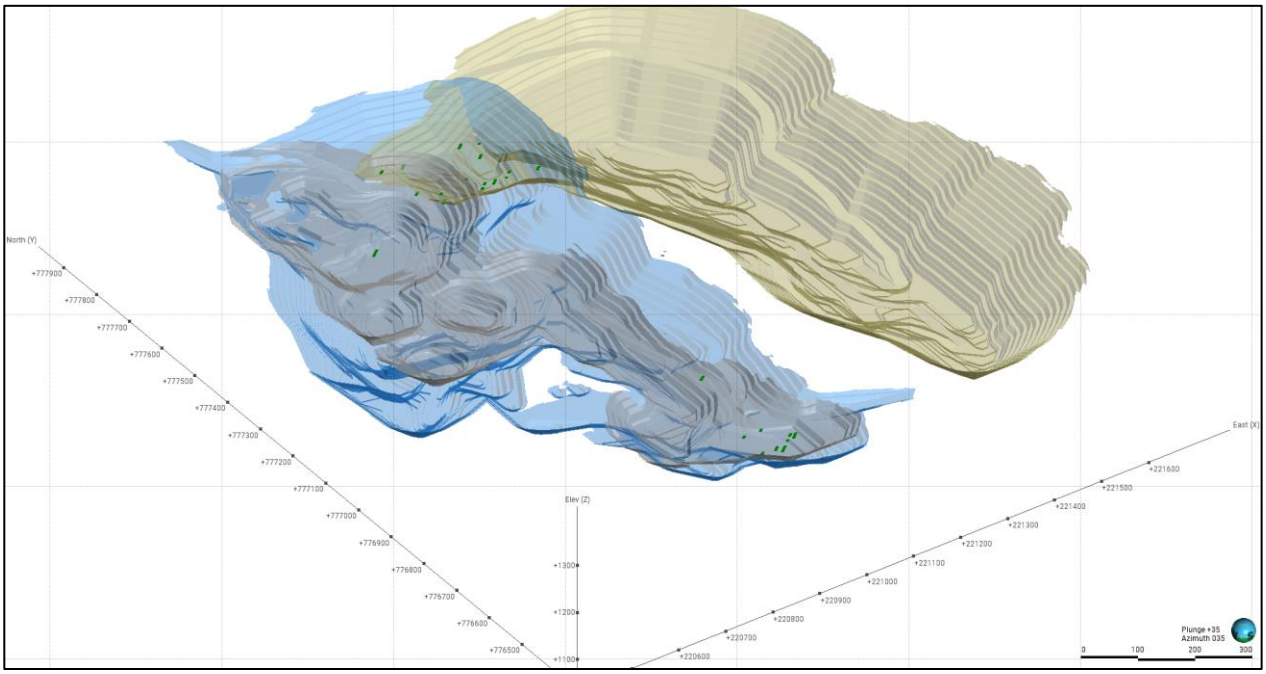


Figure 13-38: Location of CMA/Yaouré Oxide Master Composite samples within the CMA and Yaouré deposits, perspective view looking northeast (Perseus, 2023)

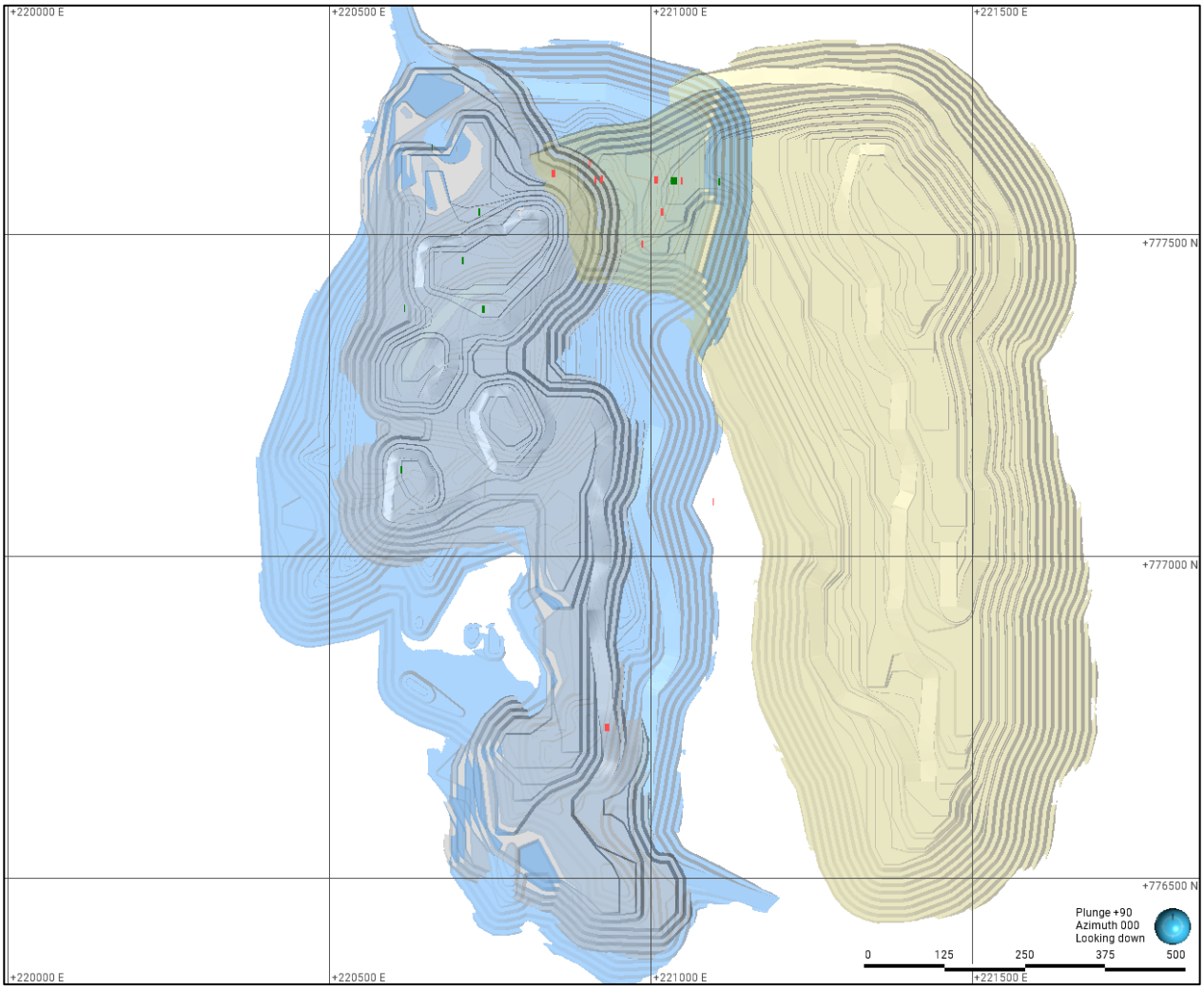


Figure 13-39: Location of oxide and transition ore metallurgical variability samples within the CMA and Yaouré deposits, plan view (Perseus, 2023)

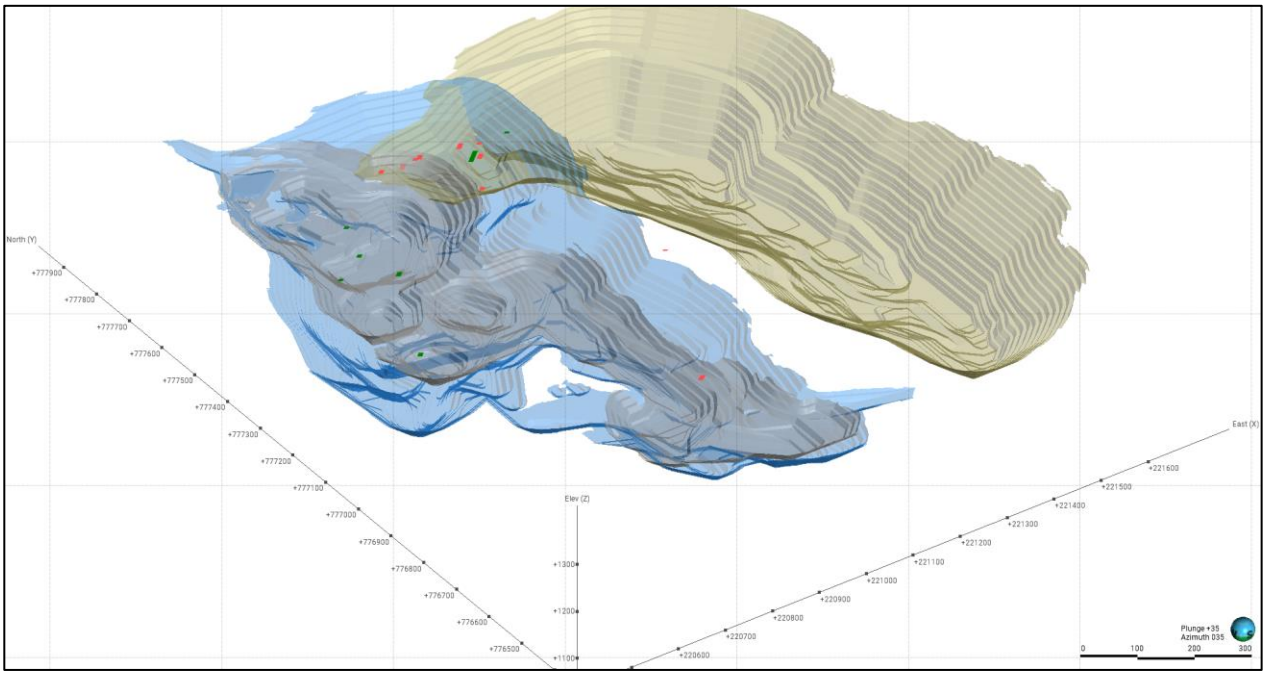


Figure 13-40: Location of oxide and transition ore metallurgical variability samples within the CMA and Yaouré deposits, perspective view looking northeast (Perseus, 2023)

13.4.1.1 Comminution Samples

The Yaouré orebody was re-interpreted in 2023 as part of updates to the Mineral Resource and Mineral Reserve, including re-interpreting the weathering surface. As discussed in Section 13.3.1.1, sample COMM-11 was found to be substantially oxidised (79.3% of the sample interval length categorised as fully weathered, with a further 5.2% categorised as partially weathered). Given the re-categorisation of sample COMM-11, it has been included in Section 13.4 of this report.

Drill core sample origins for comminution variability sample COMM-11 are shown in Table 13-72.

Table 13-72: CMA/Yaouré pit oxide ore variability sample COMM-11 for comminution testing

SAMPLE	DRILL HOLE	FROM (m)	TO (m)	2017 LITHOLOGY	2023 WEATHERING
COMM-11	YDD0007	3.9	11	granodiorite	oxide
	YDD0435	0	9		
	YDD0436	0	17		

Further to this variability sample, one CMA/Yaouré Oxide Master Composite sample was subjected to comminution testing. Sample origins and masses used to generate the CMA/Yaouré Oxide Master Composite are shown in Table 13-73 in Section 13.4.1.2.

13.4.1.2 Metallurgical Composite Sample

One CMA/Yaouré Oxide Master Composite sample was selected from drill core and RC drill sample rejects for comminution, metallurgical optimisation and engineering definition test work during the 2017 DFS. The selection and categorisation of the oxide ore master composite was based on the 2017 interpretation of the Yaouré orebody. Table 13-73 details the sub-sample origins and masses used to generate the CMA/Yaouré Oxide Master Composite.

Table 13-73: CMA/Yaouré Oxide Master Composite recipe

SAMPLE	DRILL HOLE	FROM (m)	TO (m)	MASS TO COMPOSITE (kg)
CMA/Yaouré Oxide Master Comp	YDD0030	35	46.35	6.70
	YDD0033	42.7	53.5	8.14
	YDD0225	37	45	9.12
	YDD0428	0	14	8.99
	YDD0481	0	7	9.70
	YDD0482	3	9	7.54
	YRC0864	6	14	17.13
	YRC0865	15	19	8.92
	YRC0866	6	11	10.22
	YRC0867	40	46	11.46
	YRC0867	50	56	11.46
	YRC0868	33	40	15.68
	YRC0868	46	50	8.95
	YRC0873	13	23	21.80
	YRC0879	12	23	24.08
	YRC0880	28	32	8.21
	YRC0913	1	9	17.27
	YRC0929	19	21	3.91
	YRC0929	27	29	4.17
	YRC0937D	21	30	17.25
	YRC0938D	5	12	13.92
	YRC0938D	18	23	9.95
	YRC0938D	30	44	26.10
	YRC0939D	19	31	24.42
	YRC0939D	66	69	3.22
	YRC0940D	12	21	18.54
	YRC1046	29	38	19.72
	YRC1095	12	20	15.80

Given that the Yaouré orebody was re-interpreted in 2023 as part of updates to the Mineral Resource and Mineral Reserve, including re-interpreting the weathering surface and updating lithologies and mineralisation domains, the categorisation of the CMA/Yaouré Oxide Master Composite sample was reviewed.

For the CMA/Yaouré Oxide Master Composite selected in 2017, there is good correlation (>90% of the sample interval lengths and >90% by composite mass) to the weathering profile in the 2023 model. The remaining ~10% of sample interval lengths and masses were recharacterised as partially oxidised. Based on the 2023 review, the CMA/Yaouré Oxide Master Composite sample is deemed to be appropriately and substantially representative of complete oxidation within the weathering profile.

13.4.1.3 Variability Samples

18 metallurgical variability samples representing oxide (OX) and transition (TRN) ore across the CMA and Yaouré deposits were selected for the DFS test work program in 2018. The selection and

categorisation of the oxide and transition ore metallurgical variability samples was based on the 2017 interpretation of the Yaouré orebody. Sample origins are shown in Table 13-74.

Table 13-74: CMA/Yaouré oxide and transition metallurgical variability samples

SAMPLE	DRILL HOLE	FROM (m)	TO (m)	2023 LITHOLOGY
OX-VAR-01	YDD0031	0	8.5	oxide
OX-VAR-02	YDD0487	2	7	oxide
OX-VAR-03	YRC0867	50	56	oxide
OX-VAR-04	YRC0873	13	23	oxide
OX-VAR-05	YRC0879	12	23	oxide
OX-VAR-06	YRC0880	28	32	transition
OX-VAR-07	YRC0913	1	9	oxide
OX-VAR-08	YRC0929	17	19	oxide
OX-VAR-09	YRC0940D	12	21	oxide
OX-VAR-10	YRC1046	29	38	oxide
TRN-VAR-75	YDD0024	4.72	10.34	transition
TRN-VAR-76	YDD0479	16	23	transition
TRN-VAR-77	YRC0852	5	10	transition
TRN-VAR-78	YRC0880	45	66	transition
TRN-VAR-79	YRC0881	30	34	oxide
TRN-VAR-80	YRC0963D	38	47	basalt (fresh)
TRN-VAR-81	YRC1074	18	25	granodiorite (fresh)
TRN-VAR-82	YRC0898	39	41	transition

Given that the Yaouré orebody was re-interpreted in 2023 as part of updates to the Mineral Resource and Mineral Reserve, including re-interpreting the weathering surface, the categorisation of Yaouré pit oxide and transition ore metallurgical variability samples was reviewed.

For the variability samples that were categorised as transition ore in 2017, TRN-VAR-76, TRN-VAR-78 and TRN-VAR-82 are all partially oxidised and correlate to the weathering profile in the 2023 model. 70.3% of the sample interval length for TRN-VAR-75 is partially oxidised (according to the 2023 weathering profile) and has been categorised as transition ore in 2023. 55.0% of the sample interval length for TRN-VAR-77 is partially oxidised (according to the 2023 weathering profile) and has been categorised as transition ore in 2023.

Variability sample TRN-VAR-79 was noted to be fully oxidised (according to the 2023 weathering profile) and has been re-categorised as oxide in 2023.

Variability sample TRN-VAR-80 is noted to be fresh along the entire interval length (according to the 2023 weathering profile); with 73.0% of the sample interval length being categorised as basalt by lithology, TRN-VAR-80 has been re-categorised as fresh basalt in 2023. 52.2% of the sample interval length for TRN-VAR-81 is noted to be fresh (according to the 2023 weathering profile); combining lithology, TRN-VAR-81 has been re-categorised as fresh granodiorite in 2023.

Given that samples TRN-VAR-80 and TRN-VAR-81 have been categorised as fresh ore, the head grade, specific gravity and gravity/leach results for these samples have been reported in Section 13.3 and will not be further referenced in Section 13.4. For the remainder of the samples, head grade, specific gravity and gravity/leach results will reference the re-interpreted 2023 weathering profile in Section 13.4 of this report (as included in the right hand column of Table 13-74.

13.4.2 Head Grade and Specific Gravity

Each metallurgical variability sample and composite was subjected to duplicate head assays for gold by standard FA, assays for a further 34 analytes and true SG determination. Variability samples OX-VAR-03 and OX-VAR-04 had assays reported for an additional two analytes (tellurium and selenium). A summary of select assay results is shown in Table 13-75.

Table 13-75: Head assay (select analytes) for CMA/Yaouré oxide and transition variability samples and Oxide Master Composite

SAMPLE	Au (g/t)	Ag (g/t)	As (ppm)	$C_{ORGANIC}$ (%)	Hg (ppm)	S_{ULFIDE} (%)	Sb (ppm)	Te (ppm)
OX-VAR-01	0.69/0.71	1.2	50	0.12	0.5	<0.02	9.9	-
OX-VAR-02	0.73/0.74	1.2	100	0.09	0.4	<0.02	9.5	-
OX-VAR-03	1.56/1.25	0.3	<25	0.39	0.1	<0.02	2.1	0.8
OX-VAR-04	2.10/2.65	0.6	50	0.03	0.2	<0.02	4.6	2.0
OX-VAR-05	3.40/3.48	0.6	50	0.09	0.3	<0.02	3.3	-
OX-VAR-07	5.08/0.74	1.2	50	0.12	0.2	<0.02	8.3	-
OX-VAR-08	1.33/0.66	0.6	50	0.27	0.2	<0.02	6.3	-
OX-VAR-09	0.40/0.41	0.9	25	0.12	0.1	<0.02	5.1	-
OX-VAR-10	2.44/2.61	0.6	25	0.12	0.3	<0.02	1.5	-
TRN-VAR-79	10.2/10.5	1.2	<25	0.15	1.1	<0.02	1.1	-
OX-VAR-06	3.66/3.38	0.6	25	0.06	0.8	<0.02	2.3	-
TRN-VAR-75	3.09/3.34	0.9	25	<0.03	<0.1	0.62	0.9	-
TRN-VAR-76	4.74/5.41	1.2	<25	<0.03	0.1	0.68	0.7	-
TRN-VAR-77	2.41/5.05	0.3	25	0.27	<0.1	0.16	0.8	-
TRN-VAR-78	1.39/1.15	0.3	<25	0.06	0.3	<0.02	2.6	-
TRN-VAR-82	1.05/0.84	0.6	<25	0.09	<0.1	0.16	0.6	-
CMA/Yaouré Oxide Master Composite	2.19/3.65	0.6	30	0.09	0.1	<0.02	2.3	-

From the data:

- There is good correlation between many of the duplicate gold assays, with some samples (e.g., OX-VAR-07, TRN-VAR-76, TRN-VAR-77, CMA/Yaouré Oxide Master Composite) exhibiting inconsistency that may be associated with the presence of coarse spotty gold.
- The gold grade of the CMA/Yaouré Oxide Master Composite (average of 2.92 g/t) is higher than the 2023 Mineral Reserves grades for the CMA pit (1.81 g/t Au) and the Yaouré pit (1.49 g/t Au), as stated in Table 15-1.
- Silver is not present in economic quantity.
- Arsenic levels are low, indicating that the presence of refractory gold locked in arsenopyrite is unlikely. This finding is also supported by relatively low assay values across the dataset for sulfide sulfur.
- A number of variability samples (e.g., OX-VAR-03, OX-VAR-08, TRN-VAR-77), as well as the CMA/Yaouré Oxide Master Composite, have elevated organic carbon assays, increasing the possibility of preg-robbing of gold in solution during cyanidation.
    - For the CMA/Yaouré Oxide Master Composite and metallurgical variability samples OX-VAR-08 and TRN-VAR-77, there was no evidence of gold preg-robbing or

negative effect on gold extraction when these samples were tested at optimised gravity/leach conditions (Section 13.4.4.2 and Section 13.4.4.4).

- Sample OX-VAR-03 (with the highest organic carbon head assay from the sample set) was observed to have slow leach kinetics under gravity/leach conditions (Section 13.4.4.4) and gravity/CIL conditions at two different pulp densities (Section 13.4.4.5). The two gravity/CIL tests on OX-VAR-03 returned 48 h combined gold extractions more than 4% higher than the gravity/leach test, which may indicate that some gold preg-robbing occurred with this sample under gravity/leach conditions.

- Mercury is present in only some samples – health monitoring of gold room personnel is in place to manage residual risk.
- Antimony levels are low, lessening the risk of gold passivation that can occur at high pH.
- For samples that were assayed for tellurium, assay levels are low, reducing the likely presence of refractory telluride minerals.

Base metal assays were also noted to be present in low concentrations across the variability samples and the CMA/Yaouré Oxide Master Composite, decreasing the likelihood of excess cyanide consumption through preferential complexing with these metals.

The true SG for each metallurgical variability sample and the CMA/Yaouré Oxide Master Composite is shown in Table 13-76. The average true SG value of the oxide variability samples is 2.94, which approximates the CMA/Yaouré Oxide Master Composite true SG value of 2.78. There are some anomalously high values in the oxide sample data set, when comparing to other specific gravity determinations for CMA/Yaouré oxide samples (2.26-2.58 from SMC tests® in Section 13.4.3.1) and other Yaouré property oxide ores (2.59-2.87 for Angovia 2 oxide ores in Section 13.7.2, and 2.56-2.68 for Govisou oxide ores in Section 13.8.2). It is also expected that the SG of oxide ores to be lower than Yaouré pit transition ores (average true SG value of the transition ore metallurgical variability samples is 2.77) and Yaouré pit fresh ores (average variability sample values and composite values for the Yaouré pit fresh ores ranged between 2.75 and 2.84 in Section 13.3.2). A specific gravity of 2.60 was used for oxide ores in process plant design.

Table 13-76: True SG for CMA/Yaouré oxide and transition variability samples and Oxide Master Composite

SAMPLE	TRUE SG
OX-VAR-01	3.32
OX-VAR-02	3.28
OX-VAR-03	2.53
OX-VAR-04	2.68
OX-VAR-05	2.83
OX-VAR-07	3.25
OX-VAR-08	3.01
OX-VAR-09	3.08
OX-VAR-10	2.74
TRN-VAR-79	2.71
OX-VAR-06	2.67
TRN-VAR-75	2.87
TRN-VAR-76	2.83
TRN-VAR-77	2.80
TRN-VAR-78	2.70
TRN-VAR-82	2.74
CMA/Yaouré Oxide Master Composite	2.78

13.4.3 Comminution

13.4.3.1 SMC Test®

A standard SMC Test® was conducted on oxide comminution variability sample COMM-11 and the CMA/Yaouré Oxide Master Composite sample. The results are summarised in Table 13-77.

Table 13-77: SMC Test® results for CMA/Yaouré oxide variability and Oxide Master Composite samples

SAMPLE	DWI (kWh/m³)	A×b	M_{ia} (kWh/t)	M_{ic} (kWh/t)	SG	SCSE (kWh/t)
COMM-11	3.65	71.0	12.5	4.2	2.58	7.68
CMA/Yaouré Oxide Master Composite	1.97	114.3	8.7	2.6	2.26	6.85

As per the ore competency classification in Table 13-6, the results show COMM-11 and the CMA/Yaouré Oxide Master Composite to have low competency, with A×b values of 71.0 and 114.3 respectively.

As noted in historical test work in Section 13.1, transition ore has been determined to be moderately competent to competent, with an A×b value of 38.0.

13.4.3.2 Bond Ball Mill Work Index

A standard BWi test was conducted on oxide comminution variability sample COMM-11 and the CMA/Yaouré Oxide Master Composite sample. A closing screen of 106 µm was used, to yield a P_{80} of 75 µm. The target grind size P_{80} of 75 µm was determined from the gravity/leach grind size optimisation test work in Section 13.4.4.1. The results are presented in Table 13-78.

Table 13-78: BWi for CMA/Yaouré oxide variability and Oxide Master Composite samples

SAMPLE	BWi (kWh/t)
COMM-11	11.9
CMA/Yaouré Oxide Master Composite	7.2

As per the ore hardness classification in Table 13-8, the results show oxide variability sample COMM-11 to be medium hard, with a BWi of 11.9 kWh/t. The CMA/Yaouré Oxide Master Composite sample is soft, with a BWi of 7.2 kWh/t. The classification of CMA/Yaouré oxide ore as soft to medium hard aligns with observations for from historical test work in Section 13.1, as well as for heap leach dump residue samples in Section 13.5.3.1. Most of the material that was presented to the historical heap leach pads was oxide ore.

As noted in Section 13.1, transition ore has been determined to be medium hard, with a BWi of 9.9 kWh/t.

13.4.3.3 Bond Rod Mill Work Index

A standard RWi test was conducted on oxide comminution variability sample COMM-11. A closing screen of 1,180 µm was used. The results are presented in Table 13-79.

Table 13-79: RWi for CMA/Yaouré oxide comminution variability sample COMM-11

SAMPLE	RWi (kWh/t)
COMM-11	12.3

As per the ore hardness classification in Table 13-8, the test results show oxide variability sample COMM-11 to be medium hard, with a RWi of 12.3 kWh/t. This is harder than the sample tested in historical test work in Section 13.1 (6.3 kWh/t, characterised as very soft).

As noted in Section 13.1, transition ore has been determined to be medium hard, with a RWi of 12.0 kWh/t.

13.4.3.4 Bond Abrasion Index

A standard Ai test was conducted on oxide comminution variability sample COMM-11 and the CMA/Yaouré Oxide Master Composite sample. The results are presented in Table 13-80.

Table 13-80: Bond abrasion index for CMA/Yaouré oxide variability and Oxide Master Composite samples

SAMPLE	Ai (g)
COMM-11	0.1032
CMA/Yaouré Oxide Master Composite	0.0474

As per the ore abrasion classification in Table 13-11, the results show oxide variability sample COMM-11 to be slightly abrasive, with an Ai of 0.1032 g. The CMA/Yaouré Oxide Master Composite sample is non-abrasive, with an Ai of 0.0474 g. The characterisation of the CMA/Yaouré Oxide Master Composite sample as non-abrasive aligns with observations from other tests on an oxide composite sample in historical test work (Section 13.1).

As noted in Section 13.1, transition ore has been determined to be slightly abrasive.

13.4.4 Gravity Recovery and Cyanidation

13.4.4.1 Gravity/Leach Grind Size Optimisation

Sub-samples of the CMA/Yaouré Oxide Master Composite were subjected to the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13, with the following variations to grind size in Step 1:

- P_{80} of 106 µm
- P_{80} of 90 µm
- P_{80} of 75 µm
- P_{80} of 63 µm
- P_{80} of 53 µm.

Hydrated lime used for these tests contained 60% CaO. The results of the tests are summarised in Table 13-.

Table 13-81: Gravity/grind size optimisation test results for the CMA/Yaouré Oxide Master Composite

PARAMETER	UNIT	WH8177	WH8178	WH8179	WH8180	WH8181
Sample		CMA/Yaouré Oxide Master Composite				
P_{80} grind size	µm	106	90	75	63	53
Assay head grade (Au)	g/t	2.92	2.92	2.92	2.92	2.92
Calc. head grade (Au)	g/t	2.48	2.37	2.60	2.12	2.19
Gravity recovery	%	26.4	35.0	38.6	37.1	36.6
Extraction at time						
2 hours	% Au	63.6	72.1	76.9	82.5	82.4
4 hours	% Au	69.3	78.0	81.4	87.0	87.1
8 hours	% Au	75.1	82.3	85.6	90.0	89.8
16 hours	% Au	79.3	86.4	88.6	92.7	92.4
24 hours	% Au	81.8	88.2	90.7	94.3	93.3
36 hours	% Au	85.1	90.2	93.0	95.0	95.4
48 hours	% Au	88.3	92.4	93.3	96.2	96.4
Solid residue grade (Au)	g/t	0.29	0.18	0.18	0.08	0.08
NaCN usage	kg/t	0.30	0.36	0.32	0.32	0.36
Lime usage	kg/t	3.01	2.64	2.64	3.08	2.65
Average DO	ppm	8.3	8.4	8.3	8.3	8.2

Key points from the data are:

- The CMA/Yaouré Oxide Master Composite gravity recovery ranges between 26.4% and 38.6%.
- Combined gravity/leach extraction at 48 h for the CMA/Yaouré Oxide Master Composite ranges between 88.3% and 96.4%.

- The CMA/Yaouré Oxide Master Composite appears to be slightly grind sensitive, with a step down in residue grade observed when grind size is decreased between P_{80} of 106 µm and P_{80} of 90 µm, and a further step down in residue grade when grind size is decreased between P_{80} of 75 µm and P_{80} of 63 µm.
- Reagent consumptions are relatively consistent across all grind sizes tested. Sodium cyanide consumption is low but hydrated lime consumption is elevated.

After completing technoeconomic trade-off studies, a grind size P_{80} of 75 µm was selected.

13.4.4.2 Master Composite Gravity/Leach at Optimised Conditions

A sub-sample of the CMA/Yaouré Oxide Master Composite was subjected to the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13, at the grind size P_{80} of 75 µm stated in the standard conditions. Confirmation of this grind size for the CMA/Yaouré Oxide Master Composite is noted in Section 13.4.4.1. Hydrated lime used for these tests contained 60% CaO.

The results from this test (WH8161B) are presented in Table 13-82. Test WH8179 (from Section 13.4.4.1) was conducted under the same conditions as test WH8161B and has been included in Table 13-82 for comparison.

Table 13-82: Gravity/leach test results at optimised conditions for CMA/Yaouré Oxide Master Composite

PARAMETER	UNIT	WH8161B	WH8179
P_{80} grind size	µm	75	75
Assay head grade (Au)	g/t	2.92	2.92
Calc. head grade (Au)	g/t	2.33	2.60
Gravity recovery	%	38.6	38.6
Extraction at time			
2 hours	%	78.1	76.9
4 hours	%	81.2	81.4
8 hours	%	85.3	85.6
16 hours	%	88.3	88.6
24 hours	%	90.6	90.7
36 hours	%	91.2	93.0
48 hours	%	92.1	93.3
Solid residue grade (Au)	g/t	0.19	0.18
NaCN usage	kg/t	0.32	0.32
Lime usage	kg/t	2.59	2.64
Average DO	ppm	7.9	8.3

Key points from the data are:

- Results for tests performed under the same conditions on the CMA/Yaouré Oxide Master Composite (WH8161B and WH8179) align well with the same gravity recoveries (38.6%), similar combined gravity/leach extractions at 48 h (92-93%), comparable residue grades and comparable reagent consumptions.

- Gold leach kinetics for the two tests are similar and are slower than the Yaouré pit fresh ore master composites under similar conditions (Section 13.3.4.2). Most of the cyanidable gold is leached within 24 h.

A sub-sample of the leach residue from test WH8161B was subjected to gold size assay analysis using 106 µm, 75 µm, 53 µm, 38 µm and 25 µm screens. The gold assay and distribution for each size fraction of the leach residue is presented in Table 13-83.

Table 13-83: Tails solid gold assay and gold distribution by size fraction for test WH8161B residue

SCREEN SIZE (µm)	SIZE FRACTION GOLD ASSAY (g/t)	SIZE FRACTION GOLD DISTRIBUTION (%)
106	0.62	70.9
75	0.22	8.4
53	0.14	4.6
38	0.11	4.0
25	0.06	2.0
-25	0.02	10.0

For the CMA/Yaouré Oxide Master Composite, the back-calculated tails grade from the size assay data (0.13 g/t Au) is lower than the residue assay from test WH8161B (0.19 g/t Au). The remaining gold in tails residue is predominantly in the coarsest size fraction.

13.4.4.3 Master Composite Whole Ore Leach at Optimised Conditions

The CMA/Yaouré Oxide Master Composite was subjected to one test under the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13, with the following exceptions:

- No gravity separation (Steps 1 and 2 excluded)
- With regards to Step 3, test WH8099B was an agitated vat leach, rather than a bottle roll, on 15 kg of solids to produce sufficient material for tailings characterisation tests (Section 13.4.8).

Hydrated lime used for these tests contained 60% CaO. The results from this test are presented in Table 13-84.

Table 13-84: Whole ore leach test results at optimised conditions for CMA/Yaouré Oxide Master Composite

PARAMETER	UNIT	WH8099B
P_{80} grind size	µm	75
Assay head grade (Au)	g/t	2.92
Calc. head grade (Au)	g/t	2.72
Leach test type		vat
Gravity recovery	%	-
Extraction at time		
2 hours	%	59.5
4 hours	%	65.0
8 hours	%	71.6
16 hours	%	77.1
24 hours	%	79.8
36 hours	%	84.2
48 hours	%	88.1
Solid residue grade (Au)	g/t	0.33
NaCN usage	kg/t	1.11
Lime usage	kg/t	2.53
Average DO	ppm	7.1

Key points from the data are:

- When comparing results for the whole of ore vat leach test performed on the CMA/Yaouré Oxide Master Composite (WH8099B) to the 48 h gravity/leach extraction data for the CMA/Yaouré Oxide Master Composite (Section 13.4.4.2), a lower gold extraction is achieved.
- The leach kinetics for the whole of ore vat leach test performed on the CMA/Yaouré Oxide Master Composite (WH8099B) are slower than the leach kinetics for the gravity/leach tests for the CMA/Yaouré Oxide Master Composite (Section 13.4.4.2).
- It is hypothesised that the lower gold extraction and slower kinetics are due to the presence of coarse gold, slurry viscosity, and less efficient mixing in the large, agitated vat, compared to a bottle roll test. It is recommended to include and operate a gravity recovery circuit when treating oxide ore to minimise these effects.
- There is good correlation between the calculated gold head grade and assayed head grade.

13.4.4.4 Variability Samples – Gravity/Leach at Yaouré Standard Conditions

Ten CMA/Yaouré pit oxide ore variability samples and six CMA/Yaouré pit transition ore variability samples were subjected to the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13. Hydrated lime used for these tests contained 60% CaO.

The results of the tests performed on the CMA/Yaouré oxide variability samples are summarised in Table 13-85.

Table 13-85: Gold extraction at standard Yaouré test conditions for CMA/Yaouré oxide metallurgical variability samples

PARAMETER	UNIT	WH8116	WH8117	WH8118B	WH8119B	WH8120	WH8122	WH8123	WH8124	WH8125	WH8130
Sample		OX-VAR-01	OX-VAR-02	OX-VAR-03	OX-VAR-04	OX-VAR-05	OX-VAR-07	OX-VAR-08	OX-VAR-09	OX-VAR-10	TRN-VAR-79
P_{80} grind size	µm	75	75	75	75	75	75	75	75	75	75
Assay head grade (Au)	g/t	0.55	0.74	1.40	2.38	3.44	2.91	1.00	0.40	2.52	10.4
Calc. head grade (Au)	g/t	0.94	0.91	2.06	1.98	4.11	2.64	1.03	0.64	2.96	10.1
Gravity recovery	%	22.4	16.0	18.2	6.6	22.7	73.4	49.4	32.0	41.0	46.2
Extraction at time											
2 hours	%	98.2	96.9	48.8	54.6	77.8	97.8	84.3	95.2	85.6	87.6
4 hours	%	98.2	96.9	53.8	57.6	81.0	98.1	88.5	95.2	88.8	90.4
8 hours	%	98.9	99.3	61.5	61.2	85.2	98.4	94.8	96.3	90.3	93.8
16 hours	%	99.7	99.3	66.0	65.9	86.9	98.4	94.8	97.4	93.4	95.6
24 hours	%	99.0	99.3	68.0	70.0	88.2	98.6	95.5	97.4	93.4	96.0
36 hours	%	97.5	98.5	71.0	72.4	90.5	98.9	95.5	98.4	93.8	97.1
48 hours	%	96.8	97.8	73.5	73.8	92.5	98.9	96.1	98.4	95.6	97.3
Solid residue grade (Au)	g/t	0.03	0.02	0.55	0.52	0.31	0.03	0.04	0.01	0.13	0.27
NaCN usage	kg/t	0.25	0.25	0.36	0.25	0.25	0.37	0.37	0.30	0.32	0.30
Lime usage	kg/t	3.59	3.77	2.89	4.67	3.85	2.20	2.81	3.16	2.18	3.01
Average DO	ppm	8.3	8.6	8.5	8.6	8.7	8.6	8.3	8.6	8.6	8.2

From the data presented in Table 13-85 for the CMA/Yaouré oxide variability samples:

- Gravity recovery across oxide samples was variable, ranging between 6.6% and 73.4% and averaging 32.9%. The gravity recoveries reported for the CMA/Yaouré Oxide Master Composite in Section 13.4.4.2 fall within this range.
- Variability samples OX-VAR-01 and OX-VAR-02 have high 48 h gravity/leach gold extractions and rapid gold leach kinetics, with the bulk of cyanidable gold leaching in the first 2 h. A drop in gold extraction in the last 24 h of leaching for both samples was noted, indicating that minor preg-robbing of gold may be occurring.
- Variability samples OX-VAR-03 and OX-VAR-04 have the lowest 48 h gravity/leach gold extractions, at 73.5% and 73.8% respectively. Gravity recovery is low and leach kinetics for these two samples are slow, with leaching likely still occurring at 48 h. Variability samples OX-VAR-03 and OX-VAR-04 were further investigated in tests summarised in Sections 13.4.4.5 and 13.4.4.6.
- For variability samples OX-VAR-05 to OX-VAR-10 and TRN-VAR-79, high 48 h gravity/leach extractions ranging between 90.2% and 98.9% were observed. Gold leach kinetics were fast, with the bulk of cyanidable gold leaching in the first 2-16 h.
- The 48 h gravity/leach extractions reported for the CMA/Yaouré Oxide Master Composite in Section 13.4.4.2 falls within the range observed for the oxide variability samples.

- Sodium cyanide consumptions were low, averaging 0.30 kg/t.
- Lime consumptions were elevated, averaging 3.21 kg/t 60% CaO hydrated lime.

The results of the tests performed on the CMA/Yaouré transition variability samples are summarised in Table 13-86.

Table 13-86: Gold extraction at standard Yaouré test conditions for CMA/Yaouré transition metallurgical variability samples

PARAMETER	UNIT	WH8126	WH8127	WH8128	WH8129	WH8133	WH8121
Sample		TRN-VAR-75	TRN-VAR-76	TRN-VAR-77	TRN-VAR-78	TRN-VAR-82	OX-VAR-06
P_{80} grind size	µm	75	75	75	75	75	75
Assay head grade (Au)	g/t	3.22	5.08	3.73	1.27	0.94	3.52
Calc. head grade (Au)	g/t	2.09	6.10	4.73	1.28	1.20	3.48
Gravity recovery	%	52.5	61.6	73.4	19.8	55.9	13.7
Extraction at time							
2 hours	%	88.4	90.6	92.8	67.4	89.7	76.7
4 hours	%	91.2	93.3	94.5	71.4	91.5	82.6
8 hours	%	92.6	94.9	96.1	76.5	92.7	83.4
16 hours	%	94.9	95.6	97.0	80.4	93.3	88.3
24 hours	%	94.9	95.8	97.3	80.9	94.4	89.1
36 hours	%	94.9	96.1	97.5	83.0	95.0	89.1
48 hours	%	95.2	96.7	97.5	85.1	95.0	90.2
Solid residue grade (Au)	g/t	0.10	0.20	0.12	0.19	0.06	0.34
NaCN usage	kg/t	0.29	0.17	0.21	0.25	0.07	0.33
Lime usage	kg/t	0.72	0.53	1.37	3.34	0.51	3.19
Average DO	ppm	8.1	8.1	8.2	8.1	8.2	8.6

From the data presented in Table 13-86 for the CMA/Yaouré transition variability samples:

- Gravity gold recoveries ranged between 13.7% and 73.4%, with an average of 46.1%.
- Apart from variability sample TRN-VAR-78, gravity/leach extractions were high and leach kinetics were rapid. 48 h gold extraction averaged 92.2% across all transitional variability samples, with a range of 85.1% to 97.5%.
- Sodium cyanide consumptions were low, averaging 0.22 kg/t.
- Lime consumptions were variable, ranging between 0.51 kg/t and 3.34 kg/t and averaging 1.61 kg/t 60% CaO hydrated lime. The variability in lime consumption is likely due to the variable oxidation state of transition ore samples. The range of lime consumptions observed covers the range observed for fresh and oxide samples from the CMA and Yaouré pits.

13.4.4.5 Variability Samples – Gravity/CIL

Two CMA/Yaouré pit oxide ore variability samples (OX-VAR-03 and OX-VAR-04) were subjected to the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13, with the following exceptions:

- Cyanidation for test WH8327 was conducted at 40% w/w solids. Cyanidation for tests WH8328 and WH8329 was conducted at 35% w/w solids.
- 20 g/L activated carbon was added during the cyanidation step, to simulate CIL conditions.

Hydrated lime used for these tests contained 60% CaO.

The results for the gravity/CIL tests are included in Table 13-87. For the purposes of comparison, results from gravity/leach tests conducted on OX-VAR-03 and OX-VAR-04 at standard Yaouré gravity/leach test conditions (WH8118B and WH8119B from Section 13.4.4.4) are also presented in Table 13-87.

Table 13-87: Gravity/leach and Gravity/CIL test results at optimised conditions for select CMA/Yaouré oxide metallurgical variability samples

PARAMETER	UNIT	WH8118B	WH8327	WH8328	WH8119B	WH8329
Sample		OX-VAR-03	OX-VAR-03	OX-VAR-03	OX-VAR-04	OX-VAR-04
P_{80} grind size	µm	75	75	75	75	75
Assay head grade (Au)	g/t	1.40	1.40	1.40	2.38	2.38
Calc. head grade (Au)	g/t	2.06	1.72	1.66	1.98	1.50
Carbon concentration	g/L	0	20	20	0	20
Pulp density	% w/w	40	40	35	40	35
Gravity recovery	%	18.2	12.8	14.5	6.6	14.0
Extraction at time						
2 hours	%	48.8	43.0	51.4	54.6	70.2
4 hours	%	53.8	52.1	53.3	57.6	84.7
8 hours	%	61.5	61.3	59.9	61.2	84.5
16 hours	%	66.0	65.8	65.5	65.9	84.2
24 hours	%	68.0	69.4	70.6	70.0	84.2
36 hours	%	71.0	72.9	74.6	72.4	84.2
48 hours	%	73.5	77.9	77.7	73.8	87.4
Solid residue grade (Au)	g/t	0.55	0.38	0.37	0.52	0.19
NaCN usage	kg/t	0.36	0.71	0.80	0.25	0.85
Lime usage	kg/t	2.89	4.99	4.68	4.67	3.39
Average DO	ppm	8.5	8.0	8.1	8.6	8.0

Key points from the data are:

- Tests WH8118B, WH8327 and WH8328 on OX-VAR-03 returned comparable gravity recoveries. Slow leach kinetics were observed under the gravity/leach and gravity/CIL

conditions tested. Calculated gold head grades were higher for all tests than the average assayed head grade from two fire assays.

- The two gravity/CIL tests (WH8327 and WH8328) on OX-VAR-03 returned 48 h combined gold extractions more than 4% higher than the gravity/leach test, which may indicate that some gold preg-robbing occurred with this sample under gravity/leach conditions. OX-VAR-03 had the highest organic carbon head assay of the CMA/Yaouré oxide variability samples, at 0.39%.
- Results from tests WH8327 and WH8328 are comparable, indicating that the high viscosity observed for this sample does not have a significant impact on the overall gold extraction. Confirmatory sizing was conducted on tails residue for OX-VAR-03, and a P_{80} of 30 µm was observed. It was noted that as-received, this sample was already very fine and consequently, it was only given a 20 s polish grind to produce fresh particle surfaces prior to leach. Based on the as-received samples, some of the other CMA/Yaouré oxide variability samples may also be finer than P_{80} of 75 µm (due to the use of RC drill sample reject material).
- Although reporting a higher gravity recovery, tests WH8329 confirmed the relatively low gold recovery for variability sample OX-VAR-04 observed in test WH8119B.
- Gold leach kinetics and 48 h gold extraction for test WH8329 (gravity/CIL test on OX-VAR-04) were significantly improved compared to test WH8119B (gravity/leach test on OX-VAR-04). The improved performance indicates that either OX-VAR-04 gold extraction is dependent on pulp density (and slurry viscosity) or that OX-VAR-04 was experiencing some gold preg-robbing effect under gravity/leach conditions.

A sub-sample of the leach residue from test WH8328 was subject to gold size assay analysis using 106 µm, 75 µm, 53 µm, 38 µm and 25 µm screens. The gold assay and distribution for each size fraction of leach residue are presented in Table 13-88.

Table 13-88: Tails solid gold assay and gold distribution by size fraction for test WH8328 residue

SCREEN SIZE (µm)	SIZE FRACTION GOLD ASSAY (g/t)	SIZE FRACTION GOLD DISTRIBUTION (%)
106	3.19	78.1
75	0.75	6.1
53	0.34	3.7
38	0.19	2.8
25	0.11	1.5
-25	0.03	7.8

The back-calculated tails grade from the size assay data (0.30 g/t Au) was slightly lower than the tails solids assay from test WH8328 (0.37 g/t Au). Most of the remaining gold in the tails residue from test WH8328 is distributed in the coarsest size fraction.

13.4.4.6 Multi-Stage Diagnostic Leach

A sub-sample of CMA/Yaouré oxide variability sample OX-VAR-03 was subjected to a multi-stage diagnostic leach test. OX-VAR-03 was selected for investigation due to its low 48 h combined gravity/leach gold extraction. The results are summarised in Table 13-89.

Table 13-89: Diagnostic leach test results for CMA/Yaouré oxide variability sample OX-VAR-03

STAGE	DESCRIPTION	UNIT	OX-VAR-03
Gravity concentration/ amalgamation	Free gravity gold	g/t Au	0.22
Direct cyanidation leach of gravity tails	Cyanide recoverable gold	g/t Au	1.12
Intensive cyanidation of leach tails	Remaining cyanide recoverable gold	g/t Au	0.18
Dilute HCl digest/ cyanidation	Carbonate locked gold, labile[9] sulfide (pyrrhotite) locked gold	g/t Au	0.05
Dilute HNO_3 digest/ cyanidation	Gold associated with arsenical minerals, labile reactive sulfide minerals (including labile pyrite), and/or telluride	g/t Au	0.03
Aqua regia digestion	Gold associated with stable pyritic sulfide minerals and iron oxides	g/t Au	0.060
Total FA smelt	Silicates/gangue and/or graphitic carbon encapsulated gold	g/t Au	0.013
	Back-calculated gold content	g/t Au	1.40
	Assayed gold content	g/t Au	1.67

From the data, it is noted that:

- the back-calculated gold head grade from the diagnostic test of 1.67 g/t Au is slightly higher than the assayed head grade of 1.25/1.56 g/t Au (average 1.40 g/t Au).
- the majority of gold (91.1%) is either as free gold or recoverable by cyanide. In the gravity/leach and gravity/CIL tests for OX-VAR-03 (Sections 13.4.4.4 and 13.4.4.5), the gold leach kinetics were slow and the resultant leach profile indicated that gold leaching was still occurring at the 48 h termination point. This most likely explains why there is a significant amount of additional cyanidable gold in the intensive leach stage (10.8%).
- outside of the likely slow leaching cyanidable gold component recovered in the intensive cyanidation step, the remainder of gold lost to tails solids was associated with a mixture of carbonate, sulfide and silicate minerals. The observation of non-cyanidable gold associated with silicate minerals was also observed in historical test work (Section 13.1).

13.4.5 Oxygen Uptake Rate

An oxygen uptake rate determination test was conducted on a sub sample of the CMA/Yaouré Oxide Master Composite, following the standard procedure described by Fraser (1984) , with samples prepared as described in Section 13.2.7.

Oxygen uptake rate data for the CMA/Yaouré Oxide Master Composite, collected at ambient temperature, are presented in Table 13-90. Note that data at 0 h represents baseline data prior to aeration.

[9] Unstable; easily decomposed; prone to chemical change

Table 13-90: Oxygen uptake rate for CMA/Yaouré Oxide Master Composite

TIME (h)	OXYGEN UPTAKE RATE (mg/L/min)
0	-0.0043
1	-0.0016
2	-0.0008
3	-0.0009
4	0.0000
5	-0.0027
6	-0.0009
24	-0.0006

The data indicate that the CMA/Yaouré Oxide Master Composite has low potential as an oxygen consumer. Although the oxygen uptake demand is typically low, the addition of oxygen instead of air to the CIL tanks is noted as an option for future expansion of the CIL plant.

13.4.6 Viscosity

A series of rheology tests were performed on the CMA/Yaouré Oxide Master Composite, as per the procedure described in Section 13.2.9. The results are summarised in Table 13-91.

Table 13-91: Viscosity results for the CMA/Yaouré Oxide Master Composite sample

SAMPLE	SOLIDS CONC (% w/w)	VISCOSITY (cP) AT SHEAR RATE (s^{-1})							
		4.2	7.4	13.1	21.9	38.9	67.4	119.2	209.5
CMA/Yaouré Oxide Master Composite	55	0	0	0	0	0	0	0	0
	50	16,993	10,197	5,952	3,675	2,356	1,474	934	573
	45	5,727	3,781	2,292	1,457	909	574	360	225
	40	2,732	1,699	1,032	653	396	250	156	132

As described by Norgaard (2019), if viscosity:

- <100 cP at a shear rate of 119.2 s^{-1}, then there should be no pumping issues.
- <3,500 cP at a shear rate of 4.2 s^{-1}, then there should be no mixing or screening issues.

Based on these guidelines, when treating Yaouré oxide ore alone in the process plant:

- there is potential for mixing and screening issues at pulp densities >40% w/w solids.
- it is likely that pumping straight oxide ore could be challenging. Lowering pulp density reduces these effects.

Viscous oxide ore slurries can also have result in low mass transfer rates and poor dissolved oxygen levels in the leach and adsorption.

Viscosity related issues when treating CMA/Yaouré oxide ore can be mitigated by:

- slurry dilution to 40% w/w solids or less
- increasing blend ratios of less weathered ores to oxide ores, as fresh ores tested (Section 13.2.9, Section 13.3.9, Section 13.9.6) do not present viscosity related material handling challenges
- addition of viscosity modifiers.

13.4.7 Thickening and Settling Rate

CMA/Yaouré Oxide Master Composite slurry, at pH of 10.5 and target grind size P_{80} of 75 µm (measured significantly finer by laser diffraction size analysis in Outotec report, with P_{80} of 25 µm), was subjected to thickening test work by Outotec, Perth as part of the ALS Metallurgy test work program. Flocculant screening tests were conducted on the CMA Pit Fresh Ore Master Composite only (Section 13.2.10.1) and not on the CMA/Yaouré Oxide Master Composite. The selection of BASF Magnafloc® 155 (M155) for the CMA Pit Fresh Ore Master Composite was applied to thickening tests for the CMA/Yaouré Oxide Master Composite.

13.4.7.1 Dynamic Thickening Tests

Dynamic thickening tests on the CMA/Yaouré Oxide Master Composite followed the same procedure as for the CMA Pit Fresh Ore Master Composite, described in Section 13.2.10.2. A summary of results from the dynamic thickening tests on the CMA/Yaouré Oxide Master Composite is presented in Table 13-92.

Table 13-92: Dynamic thickening test work results for the CMA/Yaouré Oxide Master Composite

TEST	FEED FLUX ($t/m^2/h$)	FEED LIQUOR RISE RATE (m/h)	FLOCCULANT TYPE	FLOCCULANT DOSE (g/t)	UNDERFLOW SOLIDS CONC. (% w/w)	UNDERFLOW YIELD STRESS (Pa)	OVERFLOW SOLIDS CONC. (mg/L)
1	0.50	4.25	M155	20	43.8	38	<100
2	0.50	4.25	M155	10	41.2	23	140
3	0.50	4.25	M155	30	43.6	47	<100
4	0.25	2.13	M155	20	45.3	35	<100
6	1.00	8.50	M155	20	41.9	33	<100
7	1.50	12.75	M155	20	38.6	20	<100

The test work results show that the CMA/Yaouré Oxide Master Composite can be thickened to underflow pulp densities of 38.6-45.3% w/w solids, significantly lower than those achieved for the CMA Pit Fresh Ore Master Composite, Yaouré Granodiorite Master Composite and Yaouré Combined Basalt Master Composite (Section 13.2.10.2 and 13.3.10.1). The CMA/Yaouré Oxide Master Composite sample required higher feed dilution than the other samples. Feed flux rate ranged between 0.25-1.50 $t/m^2/h$. Good overflow clarity was noted across tests, with only Test 2 exceeding 100 mg/L solids.

The observed performance is likely due to the fineness of the sample, as measured by the laser diffraction size analysis. Should thickening be included in the Yaouré process plant flowsheet in future, the following mitigation strategies should be considered for oxide ore:

- Increase blend ratios of less weathered ores to oxide ores, as fresh ores tested do not present the same thickening challenges.
- Consider the ability to bypass the thickener when high oxide blend feeds are being processed.
- Conduct further test work to optimise flocculant and coagulant selection and dosing rates.

13.4.8 Tailings Geochemistry

Cyanidation tailings slurry from bulk whole ore leach test WH8099B on CMA/Yaouré Oxide Master Composite (Section 13.4.4.3) was submitted to Knight Piésold for geochemical testing (Knight Piésold, 2017a); (Knight Piésold, 2017b).

The total sulfur results for the CMA/Yaouré Oxide Master Composite tailings sample (0.01%, at the limit of detection) aligned well with the head assay performed by ALS on the same sample (<0.02%, Section 13.4.2). The sample is essentially devoid of sulfur and as such, the MPA for the CMA/Yaouré Oxide Master Composite tailings sample was negligible.

The ANC of the CMA/Yaouré Oxide Master Composite tailings sample was 16 kg H_2SO_4/t. The ANC estimated as being available from carbonate minerals (1 kg H_2SO_4/t) was lower. As such, the ANC of 16 kg H_2SO_4/t recorded for the oxide tailings is likely derived from non-carbonate minerals, which tend to be less reactive and may only offer buffering capacity under low pH conditions.

The NAPP value for the CMA/Yaouré Oxide Master Composite tailings sample was -16 kg H_2SO_4/t, indicating excess neutralising capacity. In the NAG test, the CMA/Yaouré Oxide Master Composite tailings sample did not produce any measurable acid, with a final pH values of 8.4. The CMA/Yaouré Oxide Master Composite tailings sample was classified as non-acid forming.

The results of the multi-element analysis indicates that the level of element enrichment in the tailings solids is low.

The same TSF controls recommended in Section 13.2.11 apply for all Yaouré property tailings samples tested.

13.5 Heap Leach Dump Residue Test Work

Heap leach dump residue material from five historical heap leach pads was the subject of metallurgical investigation as part of the 2017-2018 DFS Programs.

Samples of heap leach dump residue were tested to determine:

- the plant operating parameters for heap leach dump residue material for the selected processing route, specifically throughput rate, gold recovery and reagent consumption
- engineering design data required for plant design and operation (viscosity).

The program was completed by ALS Metallurgy in Perth, Western (ALS, 2017); (ALS, 2018), and included the following:

- comminution tests (BWi on five heap leach dump residue composite samples)
- gravity/cyanidation tests under standard Yaouré test conditions (as per Section 13.2.4.13) on five heap leach dump residue composite samples
- determination of engineering parameters necessary for process plant design and operations (viscosity).

13.5.1 Samples Selected

Sample composites were generated from each of the five existing heap leach dumps: CMA 1, CMA 2, CMA 3, Cluff and EGlobal. The heap leach composite samples were generated from a 37-hole auger program conducted on the heaps in February 2017. Locations of the auger samples are shown in Figure 13-41.



Figure 13-41: Heap leach dump residue sample locations (Perseus, 2017)

For each auger hole, samples of each metre were collected and weighed. Each metre sample was riffle split and the individual splits combined to make a composite of the hole. Table 13-93 details the sub-sample origins and masses used to generate the heap leach dump residue composites. With regards to the coordinate references in Table 13-93, the x-coordinate is UTM easting (m), y-coordinate is UTM northing (m), and z-coordinate is UTM RL (m).

Table 13-93: Heap leach dump residue composite sample recipes

SAMPLE	AUGER HOLE	X -COORD	Y-COORD	Z-COORD	DEPTH (m)	HEAP THICKNESS (m)	MASS TO COMPOSITE (kg)
CMA 1 heap leach tail	YAG0252	221595.34	778332.26	239.17	10	6	8.0
	YAG0253	221623.96	778268.25	239.80	8	4	12.0
	YAG0254	221674.34	778212.16	243.72	6	5	8.0
	YAG0255	221514.69	778305.70	239.69	7	6	8.0
	YAG0256	221544.57	778242.12	243.72	7	7	10.0
	YAG0257	221578.52	778180.88	244.06	6	4	10.0
CMA 2 heap leach tail	YAG0258	221372.88	778109.75	243.42	8	7	9.0
	YAG0259	221286.68	778240.07	241.23	9	8	10.0
	YAG0260	221332.43	778170.86	245.54	10	10	8.0
	YAG0261	221304.38	778069.76	248.54	11	10	8.0
	YAG0262	221261.32	778134.65	242.98	10	10	8.0
	YAG0263	221218.93	778196.02	241.72	10	9	9.0
CMA 3 heap leach tail	YAG0277	221058.26	778131.06	231.91	8	6	8.0
	YAG0278	221096.89	778072.30	234.62	8	8	9.0
	YAG0279	221140.48	778006.17	237.96	4	4	11.0
	YAG0280	221018.79	778000.39	242.70	11	11	8.0
	YAG0281	221063.47	777934.99	245.65	11	11	9.0
	YAG0288	220996.79	778075.18	237.98	8	8	8.0
Cluff heap leach tail	YAG0264	221453.16	777851.61	255.58	8	8	8.0
	YAG0265	221418.08	777892.74	254.36	9	9	9.0
	YAG0266	221391.55	777940.38	255.13	12	12	9.0
	YAG0267	221530.26	778008.67	259.34	14	14	9.0
	YAG0268	221551.46	777966.98	261.64	16	16	9.0
	YAG0269	221585.94	777913.68	265.00	12	12	8.0
	YAG0270	221610.41	777880.79	266.72	16	16	9.0
	YAG0271	221701.10	777930.99	267.24	14	14	8.0
	YAG0272	221672.36	777976.66	264.57	15	15	8.0
	YAG0273	221645.00	778019.52	262.83	12	12	9.0
	YAG0274	221757.07	778020.78	264.64	18	18	8.0
	YAG0275	221789.32	777973.93	267.67	25	16	9.0
	YAG0276	221819.12	777931.88	270.23	18	17	9.0
EGlobal heap leach tail	YAG0282	220930.62	777790.29	240.02	9	7	9.0
	YAG0283	220896.57	777801.88	241.91	11	11	8.0
	YAG0284	220867.47	777850.10	239.94	13	13	9.0
	YAG0285	220849.22	777822.12	243.90	16	16	9.0
	YAG0286	220910.84	777839.71	239.09	9	9	10.0
	YAG0287	220954.73	777819.66	240.31	11	11	9.0

13.5.2 Head Grade and Specific Gravity

Each heap leach dump residue composite was subjected to duplicate head assays for gold by standard FA, assays for a further 34 analytes and true SG determination. A summary of select assay results is shown in Table 13-94.

Table 13-94: Head assay (select analytes) for heap leach dump residue composite samples

SAMPLE	Au (g/t)	Ag (g/t)	As (ppm)	Corganic (%)	Hg (ppm)	Ssulfide (%)	Sb (ppm)
CMA 1 heap leach tail	1.13/1.11	0.3	40	0.09	0.3	<0.02	1.6
CMA 2 heap leach tail	3.31/1.36	0.6	30	0.09	0.3	<0.02	1.4
CMA 3 heap leach tail	7.44/13.2	0.6	40	0.06	0.2	<0.02	2.0
Cluff heap leach tail	0.19/0.24	0.6	30	0.15	0.2	<0.02	2.6
EGlobal heap leach tail	1.56/0.75	0.3	40	0.21	0.2	<0.02	1.8

From the data:

- The duplicate gold assays were inconsistent for CMA 2, CMA 3 and EGlobal heap leach tails composites. This may be associated with the presence of coarse spotty gold.
- The overall CMA 3 heap leach tail composite head grade is elevated at an average of 10.3 g/t Au. The CMA 3 heap leach tails separate auger hole interval assays indicate clearly that the YAG0279 auger interval is the likely contributor to this elevated result. Also, this drill core interval contributed the most mass to the composite.
- Silver is not present in economic quantity.
- Arsenic levels are low, indicating that the presence of refractory gold locked in arsenopyrite is unlikely. This finding is also supported by assay values below detection limit across the dataset for sulfide sulfur.
- Organic carbon values are slightly elevated, increasing the potential of preg-robbing of gold in solution during cyanidation. There was no evidence of gold preg-robbing or negative effect on gold extraction when these samples were tested at standard Yaouré gravity/leach conditions in Section 13.5.4.
- Mercury is present in low levels – health monitoring of gold room personnel is in place to manage residual risk.
- Antimony levels are low, lessening the risk of gold passivation that can occur at high pH.

Base metal assays were also noted to be present in low concentrations across the heap leach dump residue composites, decreasing the likelihood of excess cyanide consumption through preferential complexing with these metals.

The true SG for each heap leach dump residue composite sample is shown in Table 13-95. The average true SG value of the heap leach dump residue composite samples is 2.79.

Table 13-95: True SG for heap leach dump residue composite samples

SAMPLE	TRUE SG
CMA 1 heap leach tail	2.79
CMA 2 heap leach tail	2.67
CMA 3 heap leach tail	2.84
Cluff heap leach tail	2.85
EGlobal heap leach tail	2.79

13.5.3 Comminution

13.5.3.1 Bond Ball Mill Work Index

A standard BWi test was conducted on each of the heap leach tails composites. A closing screen of 106 µm was used, to yield a P_{80} of 75 µm. The target grind size P_{80} of 75 µm is as per the standard Yaouré gravity/leach conditions (Section 13.2.4.13) and aligns with the gravity/leach grind size optimisation test work on CMA/Yaouré oxide ore in Section 13.4.4.1. The results are presented in Table 13-96.

Table 13-96: BWi for heap leach tails composite samples

SAMPLE	BWi (kWh/t)
CMA 1 heap leach tail	11.3
CMA 2 heap leach tail	11.9
CMA 3 heap leach tail	8.9
Cluff heap leach tail	11.8
EGlobal heap leach tail	13.0

Due to the high fines content in the heap leach tails composite samples, it was necessary to conduct a number of zero-rev cycles to produce sufficient oversize mass to satisfy the operating conditions of the BWi test. As such, the data are based on the coarser and possibly harder component of the tailings samples.

As per the ore hardness classification in Table 13-8, the results show the heap leach tails composite samples to be soft to medium hard. The average BWi of the heap leach tails composite samples is 11.4 kWh/t (classified as medium hard).

13.5.4 Gravity Recovery and Cyanidation

Each of the heap leach tails composites were subjected to the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13. Hydrated lime used for these tests contained 60% CaO.

The results of the tests are summarised in Table 13-97.

Table 13-97: Gold recovery at standard Yaouré test conditions for heap leach tails composite samples

PARAMETER	UNIT	WH7760	WH7761	WH7762	WH7763	WH7764
Sample		CMA 1 heap leach tail	CMA 2 heap leach tail	CMA 3 heap leach tail	Cluff heap leach tail	EGlobal heap leach tail
P_{80} grind size	µm	75	75	75	75	75
Assay head grade (Au)	g/t	1.12	2.34	10.3	0.22	1.16
Calc. head grade (Au)	g/t	1.15	2.55	12.1	0.90	1.56
Gravity recovery	%	23.9	60.5	73.6	73.1	63.4
Extraction at time						
2 hours	%	71.4	86.1	91.2	89.7	85.0
4 hours	%	78.4	89.0	94.0	92.2	87.8
8 hours	%	82.8	91.8	96.1	93.0	88.7
16 hours	%	84.6	92.1	97.3	93.0	89.6
24 hours	%	85.2	92.7	98.4	93.7	90.9
36 hours	%	86.4	93.5	98.6	94.5	91.8
48 hours	%	87.0	93.7	98.8	94.5	92.6
Solid residue grade (Au)	g/t	0.15	0.16	0.14	0.05	0.12
NaCN usage	kg/t	0.25	0.21	0.32	0.29	0.29
Lime usage	kg/t	0.72	0.53	1.37	3.34	0.51
Average DO	ppm	8.1	8.1	8.2	8.1	8.2

Key points from the data are:

- Significant gravity gold recovery was noted for all composites, ranging from 23.9% to 73.6%.
- Rapid leach kinetics were observed for all samples, with excellent combined gravity/leach extractions of 87.0-98.8% at 48 h. Sodium cyanide consumption was low, averaging 0.27 kg/t. Lime consumption was comparable to CMA and Yaouré pit transition ore samples, averaging 1.23 kg/t of 60% CaO hydrated lime.
- For most of the tests, there is reasonably good correlation between calculated gold head grades and assayed head grade, particularly considering the high gravity gold recoveries observed. However, there was poor correlation noted for the low grade Cluff heap leach tails composite, with the calculated head grade of 0.90 g/t being significantly higher than the assayed head grade of 0.22 g/t.

13.5.5 Viscosity

A series of rheology tests were performed at two different pulp densities on three of the heap leach tails composite samples ground to P_{80} of 75 µm. The slurry was adjusted to pH 10.5 using milk of lime, thereby simulating CIL operating conditions. The viscosities were measured using a Bohlin Visco 88 bench viscometer and all tests were conducted at ambient temperature. The results are summarised in Table 13-98.

Table 13-98: Viscosity results for select heap leach tails composite samples

SAMPLE	SOLIDS CONC (% w/w)	VISCOSITY (cP) AT SHEAR RATE (s^{-1})							
		4.2	7.4	13.1	21.9	38.9	67.4	119.2	209.5
CMA 1 heap leach tail	40	0	0	0	0	0	35	44	59
	38	0	0	0	0	0	23	34	54
CMA 2 heap leach tail	40	0	0	0	0	40	37	46	62
	38	0	0	0	0	32	30	41	59
EGlobal heap leach tail	40	0	0	0	72	57	51	55	70
	38	0	0	0	0	36	35	45	61

As described by Norgaard (2019), if viscosity:

- <100 cP at a shear rate of 119.2 s^{-1}, then there should be no pumping issues.
- <3,500 cP at a shear rate of 4.2 s^{-1}, then there should be no mixing or screening issues.

Based on these guidelines, there should be no viscosity related materials handling issues within the Yaouré processing plant when treating CMA 1 heap leach tail, CMA 2 heap leach tail or EGlobal heap leach tail at the pulp densities tested.

13.6 CMA Southwest Test Work

The CMA Southwest (CMA SW) deposit is located to the southwest of the CMA pit, as shown in the site plan in Figure 16-1. The dominant lithology of the CMA SW deposit is basalt, with some granodiorite towards the southwest end of the deposit.

Samples of oxide, transition and fresh ore from within the CMA SW pit shell were tested to determine the gold recovery parameters for CMA SW oxide, transition and fresh ore when processed by the Yaouré processing plant.

The program was completed by Intertek Minerals Limited in Tarkwa, Ghana (Intertek Minerals Limited, Tarkwa, 2021), and included the following:

- Bulk leach extractable gold (BLEG) tests on 30 metallurgical variability samples (11 oxide samples, 11 transition samples and eight fresh samples).

13.6.1 Samples Selected

30 samples were selected from RC drill sample rejects taken from 24 drill holes spread across the CMA SW deposit to provide spatial representivity. Samples were taken across the weathering profile over an approximate range of:

- 425 m east to west
- 299 m north to south
- 56 m in RL.

The samples were selected to give a spatial representation of the deposit, as shown in Figure 13-42 and Figure 13-43. Red dots denote oxide ore (complete oxidation) sample intervals; green dots denote transition ore (partial oxidation) sample intervals; and blue dots denote fresh ore (no oxidation) sample intervals.

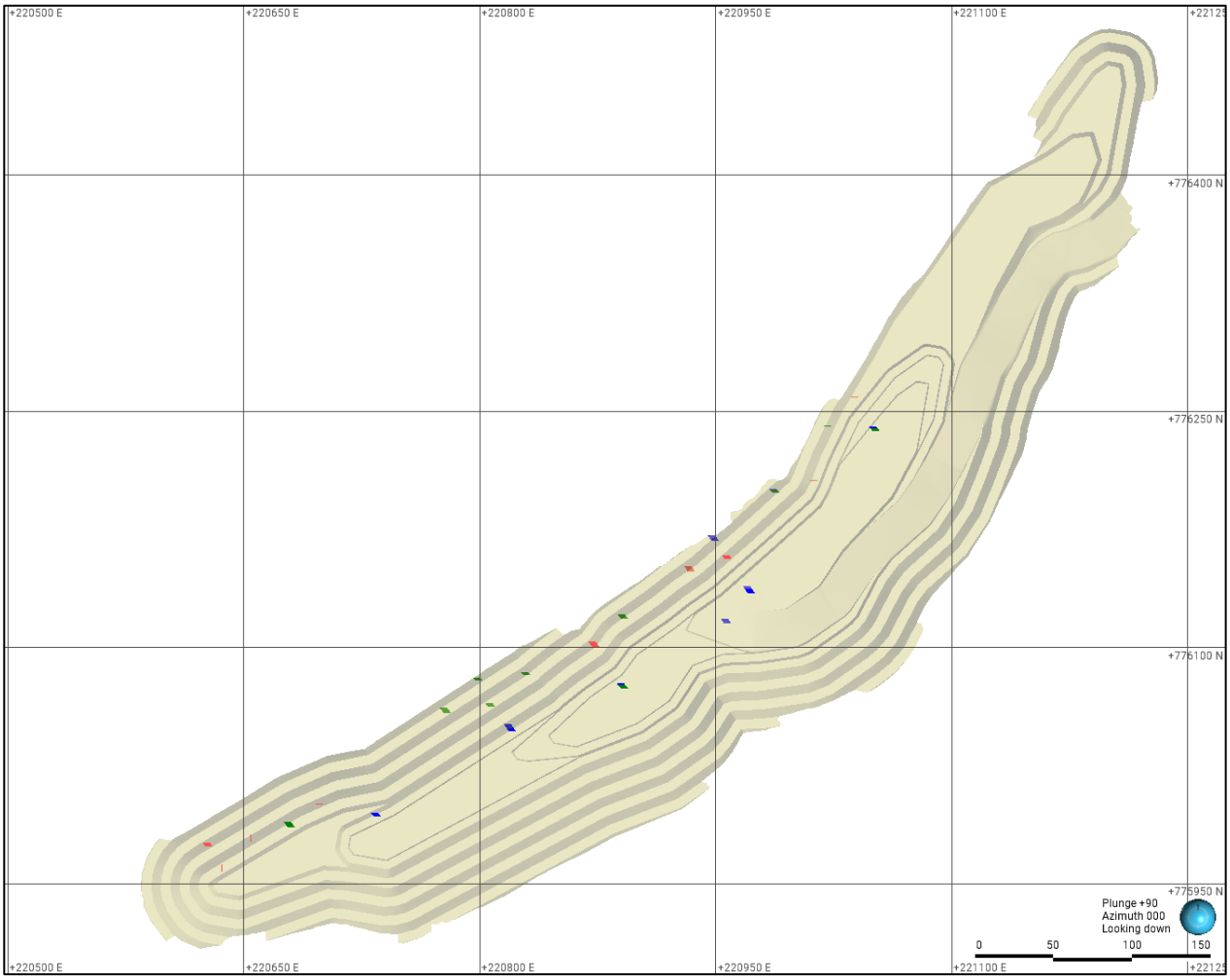


Figure 13-42: Location of samples within the CMA SW deposit, plan view (Perseus, 2023)

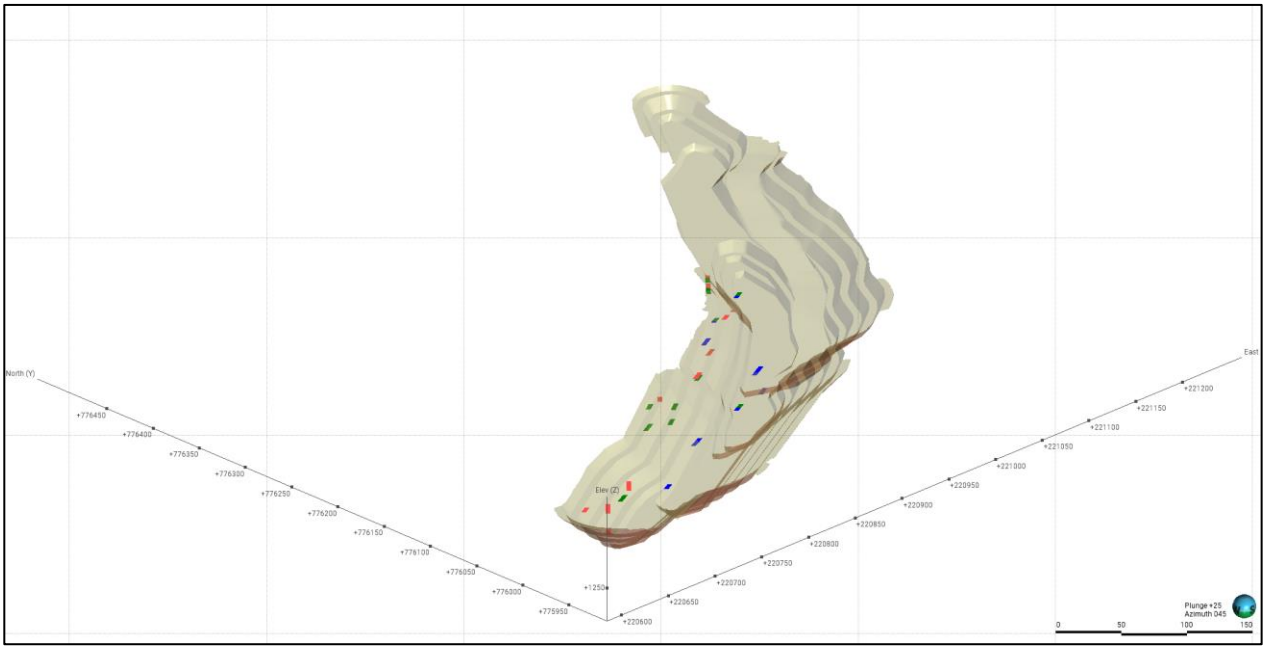


Figure 13-43: Location of samples within the CMA SW deposit, perspective view looking northeast (Perseus, 2023)

13.6.1.1 Metallurgical Variability Samples

Thirty metallurgical variability samples representing oxide, transition and fresh ore were selected for test work. Table 13-99 provides details on the origin of samples used for BLEG test work.

Table 13-99: CMA SW metallurgical variability samples

SAMPLE	OXIDATION	DRILL HOLE	FROM (m)	TO (m)
CMASW-VAR-001	fresh	YRC1649	57	67
CMASW-VAR-002	fresh	YRC1650	62	69
CMASW-VAR-003	oxide	YRC1653	26	33
CMASW-VAR-004	transition	YRC1675	49	53
CMASW-VAR-005	fresh	YRC1675	53	56
CMASW-VAR-006	oxide	YRC1724	10	12
CMASW-VAR-007	transition	YRC1724	12	16
CMASW-VAR-008	oxide	YRC1729	22	27
CMASW-VAR-009	oxide	YRC1731	13	21
CMASW-VAR-010	oxide	YRC1733	8	13
CMASW-VAR-011	transition	YRC1734	19	26
CMASW-VAR-012	transition	YRC1741	17	25
CMASW-VAR-013	transition	YRC1743	23	29
CMASW-VAR-014	oxide	YRC1745	15	23
CMASW-VAR-015	oxide	YRC1746	8	12
CMASW-VAR-016	transition	YRC1746	12	17
CMASW-VAR-017	transition	YRC1747	24	30
CMASW-VAR-018	transition	YRC1749	22	28
CMASW-VAR-019	oxide	YRC1750	16	20
CMASW-VAR-020	transition	YRC1751	12	17
CMASW-VAR-021	oxide	YRC1754	8	12
		YRC1754	13	15
CMASW-VAR-022	oxide	YRC1755	3	8
CMASW-VAR-023	fresh	YRC1755	28	36
CMASW-VAR-024	transition	YRC1757	34	37
CMASW-VAR-025	fresh	YRC1757	37	39
CMASW-VAR-026	oxide	YRC1758	50	52
CMASW-VAR-027	transition	YRC1759	55	59
CMASW-VAR-028	fresh	YRC1759	59	61
CMASW-VAR-029	fresh	YRC1684	59	68
CMASW-VAR-030	fresh	YRC1690	43	48

13.6.2 Cyanidation

13.6.2.1 Bulk Leach Extractable Gold Tests

Thirty variability samples were subjected to BLEG tests. BLEG test conditions were:

- 1 kg of solids ground to 95% passing 75 µm (P_{95} of 75 µm) and slurried to 40% w/w solids using local Ghanian water supply

- pH established and maintained within a range of 9.0 to 11.0
- Initial NaCN concentration of 1,000 ppm
- 24 h bottle roll cyanidation, with FA of solid residue.

Note that the grind size for the BLEG tests, at P_{95} of 75 µm, produces a finer particle size distribution that the Yaouré standard gravity/leach test conditions (Section 13.2.4.13). The leach time for the BLEG tests, at 24 h, is less than the Yaouré standard leach test conditions at 48 h. The results of the tests are summarised in Table 13-100. The head grade is calculated by an addition of the cyanide recoverable portion of the sample plus the leach solid residue grade.

Key points from the data are:

- BLEG extractions for oxide samples ranged between 83.1% and 95.1%, with an average of 90.0%. When comparing the BLEG extractions to CMA/Yaouré oxide and heap leach sample gravity/cyanidation extractions, the BLEG extractions are approximately 2.0% to 2.5% lower.
- BLEG extractions for transition samples ranged between 77.2% and 92.2%, with an average of 86.6%. When comparing the BLEG extractions to CMA/Yaouré transition sample gravity/cyanidation extractions, the BLEG extractions are approximately 6.0% to 7.0% lower.
- BLEG extractions for fresh samples ranged between 74.6% and 88.3%, with an average of 83.2%. When comparing the BLEG extractions to CMA fresh sample gravity/cyanidation extractions, the BLEG extractions are approximately 7.0% to 8.0% lower.
- Transition and fresh ores exhibited unexpected decreasing recovery with increasing grade. It is possible that the leach conditions were not optimised (e.g., insufficient NaCN, DO or mixing), leaving cyanide recoverable gold in tails solids in the higher grade samples.
- It is recommended before processing CMA SW ore that additional tests be performed on a range of variability samples across the weathering profile at the Yaouré standard gravity/leach test conditions to gain better understanding of metallurgical performance compared to other Yaouré Gold Mine ore sources.

Table 13-100: CMA SW BLEG test results

SAMPLE	OXIDATION	CALCULATED HEAD GRADE (g/t Au)	RESIDUE GRADE (g/t Au)	EXTRACTION (%)
OXIDE SAMPLES				
CMASW-VAR-003	oxide	1.78	0.15	91.6
CMASW-VAR-006	oxide	3.52	0.38	89.2
CMASW-VAR-008	oxide	1.44	0.17	88.2
CMASW-VAR-009	oxide	4.57	0.25	94.5
CMASW-VAR-010	oxide	0.99	0.09	90.9
CMASW-VAR-014	oxide	2.00	0.18	91.0
CMASW-VAR-015	oxide	0.87	0.12	86.2
CMASW-VAR-019	oxide	1.13	0.1	91.2
CMASW-VAR-021	oxide	1.84	0.09	95.1
CMASW-VAR-022	oxide	1.36	0.23	83.1
CMASW-VAR-026	oxide	16.4	1.72	89.5
TRANSITION SAMPLES				
CMASW-VAR-004	transition	1.28	0.13	89.8
CMASW-VAR-007	transition	0.77	0.06	92.2
CMASW-VAR-011	transition	1.24	0.11	91.1
CMASW-VAR-012	transition	2.52	0.39	84.5
CMASW-VAR-013	transition	1.00	0.1	90.0
CMASW-VAR-016	transition	2.28	0.52	77.2
CMASW-VAR-017	transition	1.24	0.2	83.9
CMASW-VAR-018	transition	1.16	0.14	87.9
CMASW-VAR-020	transition	0.80	0.08	90.0
CMASW-VAR-024	transition	1.67	0.23	86.2
CMASW-VAR-027	transition	3.82	0.77	79.8
FRESH SAMPLES				
CMASW-VAR-001	fresh	1.68	0.28	83.3
CMASW-VAR-002	fresh	2.92	0.54	81.5
CMASW-VAR-005	fresh	1.54	0.18	88.3
CMASW-VAR-023	fresh	1.59	0.27	83.0
CMASW-VAR-025	fresh	1.61	0.26	83.9
CMASW-VAR-028	fresh	2.32	0.59	74.6
CMASW-VAR-029	fresh	0.90	0.15	83.3
CMASW-VAR-030	fresh	1.20	0.15	87.5

13.7 Angovia 2 Test Work

The Angovia 2 deposit is located to the immediate southeast of the CMA pit and borders one side of the TSF, as shown in the site plan in Figure 16-1. The dominant lithology of the Angovia 2 deposit is basalt. Samples of oxide, transition and fresh ore from within the Angovia 2 pit shell were tested to determine:

- the plant operating parameters for Angovia 2 oxide, transition and fresh ore when processed by the Yaouré processing plant, specifically throughput rate, gold recovery and reagent consumption.

- engineering design data required for plant operation (viscosity).

The test work program was completed over 2020 and 2021 by ALS Metallurgy in Perth, Western Australia (ALS, 2021a), and included the following:

- comminution tests (SMC Test® and BWi) on two basalt composite samples
- gravity/cyanidation tests under standard Yaouré test conditions (as per Section 13.2.4.13) on ten metallurgical variability samples (six oxide samples, one transition sample and three fresh samples).
- multi-stage diagnostic leach tests on one oxide metallurgical variability sample.
- determination of engineering parameters necessary for plant operations when processing oxide ore (viscosity).

13.7.1 Samples Selected

Ten samples were selected from core taken from eight drill holes spread across the Angovia 2 deposit. Samples were taken across the weathering profile over an approximate range of:

- 318 m east to west
- 106 m north to south
- 116 m in RL.

The location of the samples within the deposit are shown in Figure 13-44 and Figure 13-45. Red dots denote oxide ore (complete oxidation) metallurgical variability sample intervals; green dots denote transition ore (partial oxidation) metallurgical variability sample intervals; dark blue dots denote fresh ore (no oxidation) metallurgical variability sample intervals; and light blue dots denote fresh ore (no oxidation) comminution/metallurgical variability sample intervals.

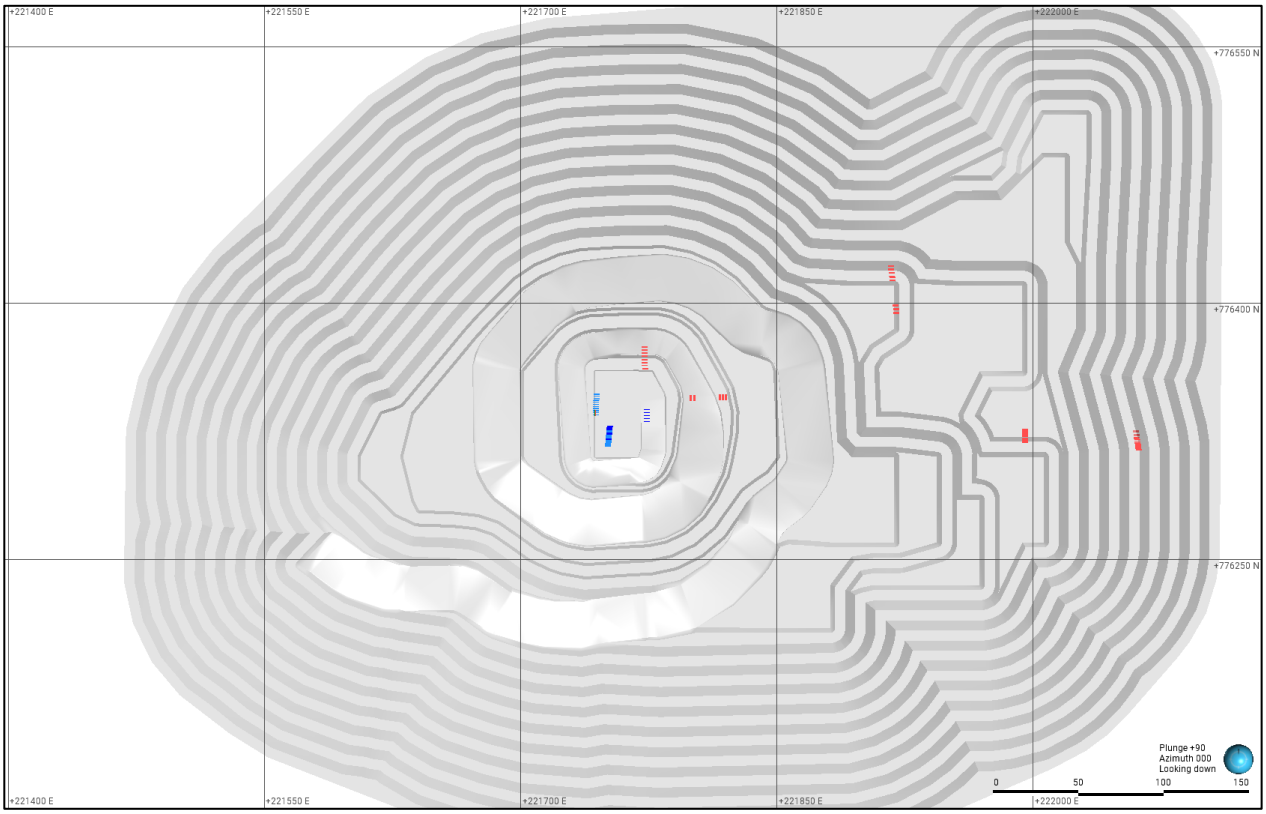


Figure 13-44: Location of samples within the Angovia 2 deposit, plan view (Perseus, 2023)

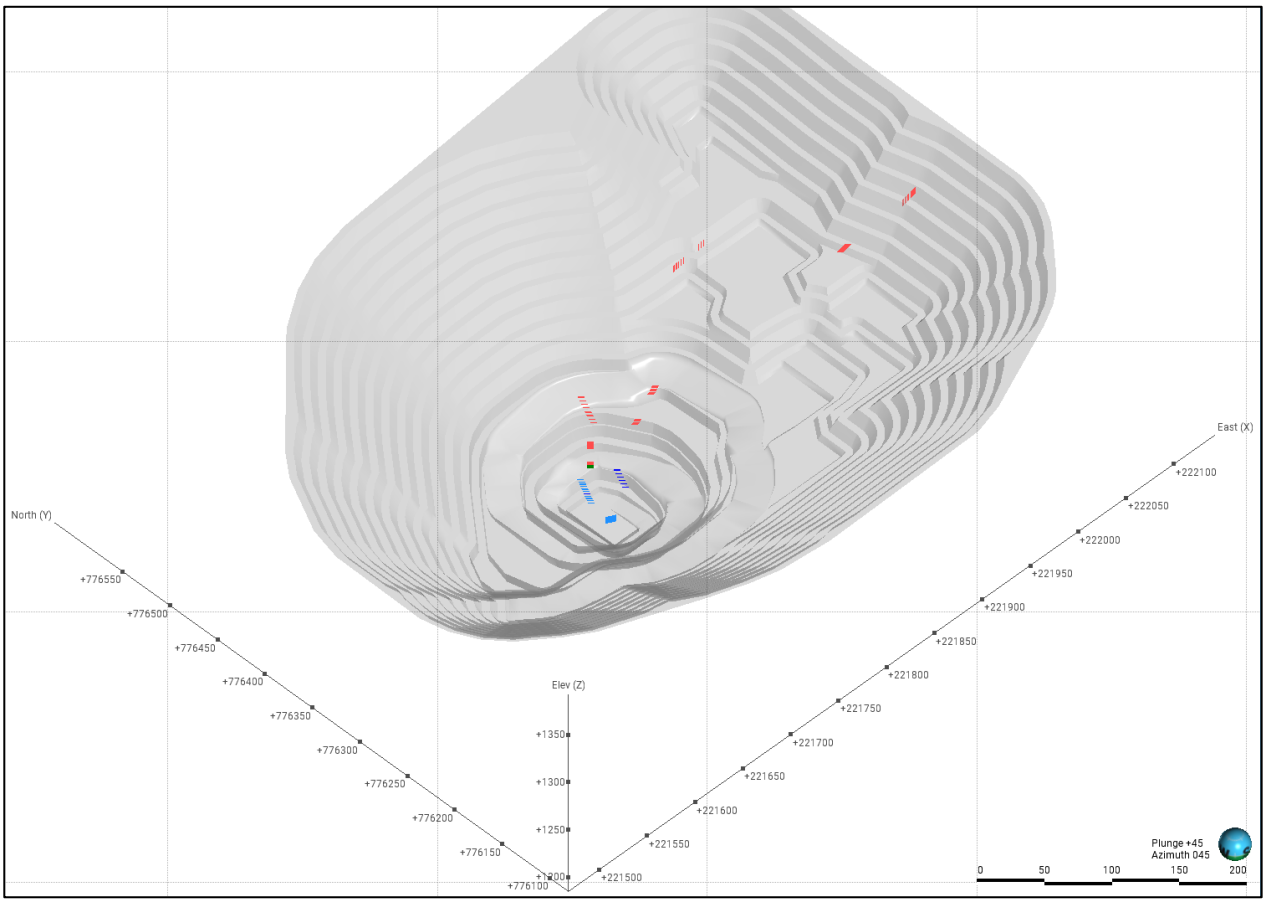


Figure 13-45: Location of samples within the Angovia 2 deposit, perspective view looking northeast (Perseus, 2023)

13.7.1.1 Comminution Variability Samples

Two metallurgical variability samples, ANG-VAR-FR-008 and ANG-VAR-FR-009, were subjected to comminution test work. These samples represent basalt ore, the dominant lithology of the Angovia 2 deposit. Sample origins are shown in Table 13-102.

13.7.1.2 Metallurgical Variability Samples

Ten metallurgical variability samples representing oxide, transition and fresh ore were selected for test work. Sample origins for oxide samples are shown in Table 13-101 and sample origins for transition and fresh samples are shown in Table 13-102.

Table 13-101: Angovia 2 oxide metallurgical variability samples

SAMPLE	DRILL HOLE	FROM (m)	TO (m)
OXIDE SAMPLES			
ANG-VAR-OX-001	YDD0517	4.9	7
	YDD0517	9	11
	YDD0517	13	15
	YDD0517	41	43
	YDD0517	45	47
	YDD0517	49	51
	YDD0517	53	55
	YDD0517	57	59
ANG-VAR-OX-002	YDD0518	0	5.9
	YDD0518	6.9	17
ANG-VAR-OX-003	YDD0527	1	10.5
	YDD0527	12	13
	YDD0527	14	17
	YDD0527	17.5	21
	YDD0527	22	25
ANG-VAR-OX-004	YDD0552	30	32
	YDD0552	33	35
	YDD0552	36	38
	YDD0552	59	61
	YDD0552	62	64
ANG-VAR-OX-005	YDD0554	9.7	18
	YDD0554	31	34
ANG-VAR-OX-006	YDD0555	45	46
	YDD0555	48	49
	YDD0555	51	52
	YDD0555	54	55
	YDD0555	58	59
	YDD0555	61	62
	YDD0555	64	65
	YDD0555	67	68

Table 13-102: Angovia 2 transition and fresh metallurgical variability samples

SAMPLE	DRILL HOLE	FROM (m)	TO (m)
TRANSITION SAMPLES			
ANG-VAR-TR-007	YDD0554	34	38
FRESH SAMPLES			
ANG-VAR-FR-008	YDD0553	91	92
	YDD0553	93	94
	YDD0553	95	96
	YDD0553	97	98
	YDD0553	99	100
	YDD0553	101	102
	YDD0553	103	104
	YDD0553	105	106
	YDD0553	107	108
	YDD0553	109	110
	YDD0553	111	112
ANG-VAR-FR-009	YDD0531	103	121
ANG-VAR-FR-010	YDD0555	108	109
	YDD0555	111	112
	YDD0555	114	115
	YDD0555	117	118
	YDD0555	120	121
	YDD0555	123	123.6

13.7.2 Head Grade and Specific Gravity

Each metallurgical variability sample was subjected to duplicate head assays for gold by standard FA (one in quadruplicate), assays for a further 35 analytes and true SG determination. A summary of select assay results is shown in Table 13-103.

Table 13-103: Head assay (select analytes) for Angovia 2 metallurgical variability samples

SAMPLE	Au (g/t)	Ag (g/t)	As (ppm)	$C_{ORGANIC}$ (%)	Hg (ppm)	$S_{SULFIDE}$ (%)	Sb (ppm)	Te (ppm)
ANG-VAR-OX-001	1.18/3.68/ 1.30/1.36	0.6	30	<0.03	<0.1	<0.02	2.0	3.4
ANG-VAR-OX-002	0.86/1.01	0.6	60	0.06	<0.1	<0.02	2.4	1.4
ANG-VAR-OX-003	1.68/2.04	1.5	70	0.15	0.5	<0.02	3.3	1.0
ANG-VAR-OX-004	0.97/1.07	0.6	<10	<0.03	0.2	<0.02	1.1	1.8
ANG-VAR-OX-005	1.18/1.36	0.3	<10	<0.03	0.1	<0.02	1.4	1.8
ANG-VAR-OX-006	2.64/3.86	0.3	10	<0.03	0.1	<0.02	1.5	1.0
ANG-VAR-TR-007	4.08/4.61	0.6	<10	<0.03	0.2	<0.02	0.8	4.0
ANG-VAR-FR-008	1.15/1.39	0.3	<10	<0.03	<0.1	0.06	0.8	1.8
ANG-VAR-FR-009	0.92/1.02	0.3	10	<0.03	<0.1	0.04	0.9	4.4
ANG-VAR-FR-010	1.94/2.32	0.3	20	<0.03	0.1	0.12	0.7	2.4

From the data:

- The duplicate (or quadruplicate) gold assays were mostly consistent, with only some exhibiting inconsistency that may be associated with the presence of coarse spotty gold.
- Silver is not present in economic quantity.
- Arsenic levels are low, indicating that the presence of refractory gold locked in arsenopyrite is unlikely. This finding is also supported by low assay values across the dataset for sulfide sulfur.
- Organic carbon values are generally low, indicating that ore is generally unlikely to exhibit preg-robbing behaviour. Although ANG-VAR-OX-003 was noted to have an elevated organic carbon assay, this sample returned an excellent 48 h gold extraction in gravity/cyanidation tests detailed in Section 13.7.4.1.
- Mercury levels are low – health monitoring of gold room personnel is in place to manage residual risk.
- Antimony levels are low, lessening the risk of gold passivation that can occur at high pH.
- Tellurium assays are low, reducing the likely presence of refractory telluride minerals.

Base metal assays were also noted to be present in low concentrations across the ten variability samples, decreasing the likelihood of excess cyanide consumption through preferential complexing with these metals.

The true SG for each metallurgical variability sample is shown in Table 13-104.

Table 13-104: True SG for Angovia 2 metallurgical variability samples

SAMPLE	TRUE SG
ANG-VAR-OX-001	2.66
ANG-VAR-OX-002	2.82
ANG-VAR-OX-003	2.87
ANG-VAR-OX-004	2.59
ANG-VAR-OX-005	2.66
ANG-VAR-OX-006	2.68
ANG-VAR-TR-007	2.77
ANG-VAR-FR-008	2.97
ANG-VAR-FR-009	2.96
ANG-VAR-FR-010	2.97

The average true SG values for the Angovia 2 samples were noted to be:

- 2.73 for oxide ore
- 2.77 for transition ore
- 2.97 for fresh ore.

13.7.3 Comminution

13.7.3.1 SMC Test®

A standard SMC Test® was conducted on two Angovia 2 fresh ore comminution variability samples. The test results are summarised in Table 13-105.

Table 13-105: SMC Test® results for Angovia 2 fresh variability samples

SAMPLE	DWI (kWh/m³)	A×b	Mia (kWh/t)	Mic (kWh/t)	SG	SCSE (kWh/t)
ANG-VAR-FR-008	15.10	19.7	34.2	15.4	2.93	15.14
ANG-VAR-FR-009	12.10	24.2	28.9	12.5	2.92	13.46

As per the ore competency classification in Table 13-6, the results show Angovia 2 fresh ore to be very competent, with an average A×b of 21.9.

13.7.3.2 Bond Ball Mill Work Index

A standard BWi test was conducted on two Angovia 2 fresh ore comminution composite samples. A closing screen of 106 µm was used, to yield a P_{80} of 75 µm. The target grind size P_{80} of 75 µm is as per the standard Yaouré gravity/leach conditions (Section 13.2.4.13) and the Yaouré plant target operating grind size P_{80} of 75 µm for open pit ores. The results are presented in Table 13-106.

Table 13-106: BWi for Angovia 2 fresh variability samples

SAMPLE	BWi (kWh/t)
ANG-VAR-FR-008	21.8
ANG-VAR-FR-009	21.7

As per the ore hardness classification in Table 13-8, the results show the Angovia 2 fresh ores to be very hard, with an average BWi of 21.8 kWh/t. The relationship of hardness and competency for Angovia 2 fresh ore (ANG 2) is compared with fresh ore from other deposits at Yaouré Gold Mine in Figure 13-5. From the results, the Angovia 2 fresh ores are:

- Amongst the most competent of Yaouré Gold Mine fresh ores tested
- The hardest of all Yaouré Gold Mine fresh ores tested.

13.7.4 Gravity Recovery and Cyanidation

13.7.4.1 Variability Samples – Gravity/Leach at Yaouré Standard Conditions

Ten variability samples were subjected to the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13. Hydrated lime used for these tests contained 68% CaO. The results of the tests are summarised in Table 13-107.

Table 13-107: Gold recovery at standard Yaouré test conditions for Angovia 2 metallurgical variability samples

PARAMETER	UNIT	WH11246	WH11247	WH11248	WH11249	WH11250	WH11251	WH11252	WH11253	WH11254	WH11255
		OXIDE SAMPLES						TRANSITION SAMPLE	FRESH SAMPLES		
Sample		ANG-VAR-OX-001	ANG-VAR-OX-002	ANG-VAR-OX-003	ANG-VAR-OX-004	ANG-VAR-OX-005	ANG-VAR-OX-006	ANG-VAR-TR-007	ANG-VAR-FR-008	ANG-VAR-FR-009	ANG-VAR-FR-010
P_{80} grind size	µm	75	75	75	75	75	75	75	75	75	75
Assay head grade (Au)	g/t	1.88	0.94	1.86	1.02	1.27	3.25	4.35	1.27	0.97	2.13
Calc. head grade (Au)	g/t	1.78	1.36	2.24	1.33	1.49	4.17	3.93	1.50	1.14	2.21
Gravity recovery	%	34.5	36.0	30.6	17.3	18.8	61.7	31.3	53.6	26.4	44.0
Extraction at time											
2 hours	% Au	67.7	79.5	86.9	79.5	79.9	77.9	85.9	89.5	79.9	83.0
4 hours	% Au	73.9	83.8	90.1	85.1	87.3	81.4	90.8	92.9	84.4	87.0
8 hours	% Au	78.7	88.0	94.0	89.4	91.6	85.5	95.2	93.9	88.2	88.9
16 hours	% Au	83.4	93.2	95.9	93.7	93.5	88.9	95.5	95.3	88.8	90.2
24 hours	% Au	86.1	94.7	96.2	94.7	95.4	90.6	95.9	96.7	88.8	90.8
36 hours	% Au	89.2	97.2	97.1	95.7	95.9	92.4	96.2	96.7	90.0	92.0
48 hours	% Au	89.9	98.2	97.1	96.2	96.3	94.2	97.6	96.7	91.2	92.3
Solid residue grade (Au)	g/t	0.18	0.03	0.07	0.05	0.06	0.24	0.10	0.05	0.10	0.17
NaCN usage	kg/t	0.39	0.29	0.29	0.30	0.32	0.25	0.25	0.24	0.21	0.24
Lime usage	kg/t	6.22	1.91	2.04	7.58	7.04	3.37	4.89	0.36	0.38	0.35
Average DO	ppm	7.8	7.9	7.9	7.9	8.0	7.9	7.9	7..9	7.9	7.9

Key points from the data are:

- Gravity gold recovery across the ore types are similar with observations for CMA/Yaouré oxide and transition ore samples (Section 13.4.4), CMA pit fresh ore samples (Section 13.2.4) and Yaouré pit fresh ore samples (Section 13.3.4).
- Oxide ore samples had mostly rapid leach kinetics, with excellent gravity/leach extractions of 89.9% to 98.2% at 48 h. Sodium cyanide consumption was low, averaging 0.31 kg/t, and aligning well with tests for CMA/Yaouré oxide ore samples (Section 13.4.4). Lime consumption was high, averaging 4.69 kg/t of 68% CaO hydrated lime, which is higher than the lime consumption observed for tests for CMA/Yaouré oxide ore samples (Section 13.4.4). The sample with the lowest gold extraction and slowest leaching kinetics, ANG-VAR-OX-001, was subjected to a multi-stage diagnostic leach test, as reported in Section 13.7.4.2.
- The transition ore sample had rapid leach kinetics, with an excellent gravity/leach extraction of 97.6% at 48 h. Sodium cyanide consumption was low, at 0.25 kg/t, and aligning well with tests for CMA/Yaouré transition ore samples (Section 13.4.4). Lime consumption was high,

at 4.89 kg/t of 68% CaO hydrated lime, which is significantly higher than the lime consumption observed for tests for CMA/Yaouré transition ore samples (Section 13.4.4).

- Fresh ore samples had rapid leach kinetics, and returned very good gravity/leach extractions of 91.2% to 96.7% at 48 h. Reagent consumptions were low, averaging 0.23 kg/t sodium cyanide and 0.36 kg/t of 68% CaO hydrated lime respectively. The reagent consumptions align with the ranges observed for CMA pit fresh ore samples (Section 13.2.4) and Yaouré pit fresh ore samples (Section 13.3.4).

13.7.4.2 Multi-Stage Diagnostic Leach

For the variability sample that returned the lowest 48 h gravity/leach gold extraction (ANG-VAR-OX-001), a sub-sample was subjected to a multi-stage diagnostic leach test. The results are summarised in Table 13-108.

Table 13-108: Diagnostic leach test results for Angovia 2 metallurgical variability sample ANG-VAR-OX-001

STAGE	DESCRIPTION	UNIT	ANG-VAR-OX-001 (oxide)
Gravity concentration/ amalgamation	Free gravity gold	g/t Au	0.63
Direct cyanidation leach of gravity tails	Cyanide recoverable gold	g/t Au	1.14
Dilute HCl digest/ cyanidation	Carbonate locked gold, labile[10] sulfide (pyrrhotite) locked gold	g/t Au	0.11
Dilute HNO_3 digest/ cyanidation	Gold associated with arsenical minerals, labile reactive sulfide minerals (including labile pyrite), and/or telluride	g/t Au	0.00
Aqua regia digestion	Gold associated with stable pyritic sulfide minerals and iron oxides	g/t Au	0.010
Total FA smelt	Silicates/gangue and/or graphitic carbon encapsulated gold	g/t Au	0.005
	Back-calculated gold content	g/t Au	1.89
	Assayed gold content	g/t Au	1.88

From the data, it is noted that:

- the majority of gold (93.5%) is either as free gold or readily recoverable by cyanide.
- there is very good correlation between the back-calculated gold head grade and the assayed head grade for ANG-VAR-OX-001.
- the remaining 6.5% of gold is locked within other particles and is deemed unrecoverable at this grind size. The great majority of gold lost to tails solids was recovered after the dilute hydrochloric acid digestion stage. Given that the sulfide sulfur head grade for ANG-VAR-OX-001 is below assay detection limit, it is likely that most of the gold lost is held within carbonates.

13.7.5 Viscosity

A series of rheology tests were performed at two different pulp densities for three of the oxide samples ground to P_{80} of 75 µm. The slurry was adjusted to pH 10.5 using milk of lime, thereby simulating CIL operating conditions. The viscosities were measured using a Bohlin Visco 88 bench viscometer and all tests were conducted at ambient temperature. The results are summarised in Table 13-109.

[10] Unstable; easily decomposed; prone to chemical change

Table 13-109: Viscosity results for select Angovia 2 oxide metallurgical variability samples

SAMPLE	SOLIDS CONC (% w/w)	VISCOSITY (cP) AT SHEAR RATE (s^{-1})							
		4.2	7.4	13.1	21.9	38.9	67.4	119.2	209.5
ANG-VAR-OX-001	45	2,059	1,232	768	510	327	212	158	157
	40	711	467	276	187	121	91	87	98
ANG-VAR-OX-003	45	898	552	348	230	141	100	91	97
	40	374	234	144	108	73	61	59	70
ANG-VAR-OX-006	45	449	297	1982	129	89	75	75	91
	40	0	0	0	57	44	44	47	66

As described by Norgaard (2019), if viscosity:

- <100 cP at a shear rate of 119.2 s^{-1}, then there should be no pumping issues.
- <3,500 cP at a shear rate of 4.2 s^{-1}, then there should be no mixing or screening issues.

Based on these guidelines, there should be no viscosity related materials handling issues within the plant, with the possible exception that if oxides similar to ANG-VAR-OX-001 are batch treated at 45% w/w solids in CIL. Slurry dilution or blending with less weathered ores would alleviate any rheological problem. The most likely scenario is that Angovia 2 oxide ores will be processed as part of a blend with fresh ore. In this case, viscosity will not be an issue within the Yaouré plant.

13.8 Govisou Test Work

The Govisou deposit is located to the immediate west of the main CMA waste dump, as shown in the site plan in Figure 16-1. The dominant lithology of the Govisou deposit is basalt. Samples of oxide, transition and fresh ore from within the Govisou pit shell were tested to determine:

- the plant operating parameters for Govisou oxide, transition and fresh ore when processed by the Yaouré processing plant, specifically throughput rate, gold recovery and reagent consumption.
- engineering design data required for plant operation (viscosity).

The program was completed during 2021 by ALS Metallurgy in Perth, Western Australia (ALS, 2021b), and included the following:

- comminution tests (SMC Test® and BWi) on two basalt composite samples.
- gravity/cyanidation tests under standard Yaouré test conditions (as per Section 13.2.4.13) on fourteen metallurgical variability samples (five oxide samples, four transition samples and five fresh samples).
- multi-stage diagnostic leach tests on three metallurgical variability samples (two oxide samples and one transition sample).
- determination of engineering parameters necessary for plant operations when processing oxide ore (viscosity).

13.8.1 Samples Selected

16 samples were selected from core and RC drill sample rejects taken from 12 drill holes spread across the Govisou deposit to provide spatial representivity. Samples were taken across the weathering profile over an approximate range of:

- 89 m east to west
- 64 m north to south
- 71 m in RL.

The location of the samples within the deposit are shown in Figure 13-46 and Figure 13-47. Red dots denote oxide ore (complete oxidation) metallurgical variability sample intervals; green dots denote transition ore (partial oxidation) metallurgical variability sample intervals; dark blue dots denote fresh ore (no oxidation) metallurgical variability sample intervals; and light blue dots denote fresh ore (no oxidation) comminution/metallurgical variability sample intervals.

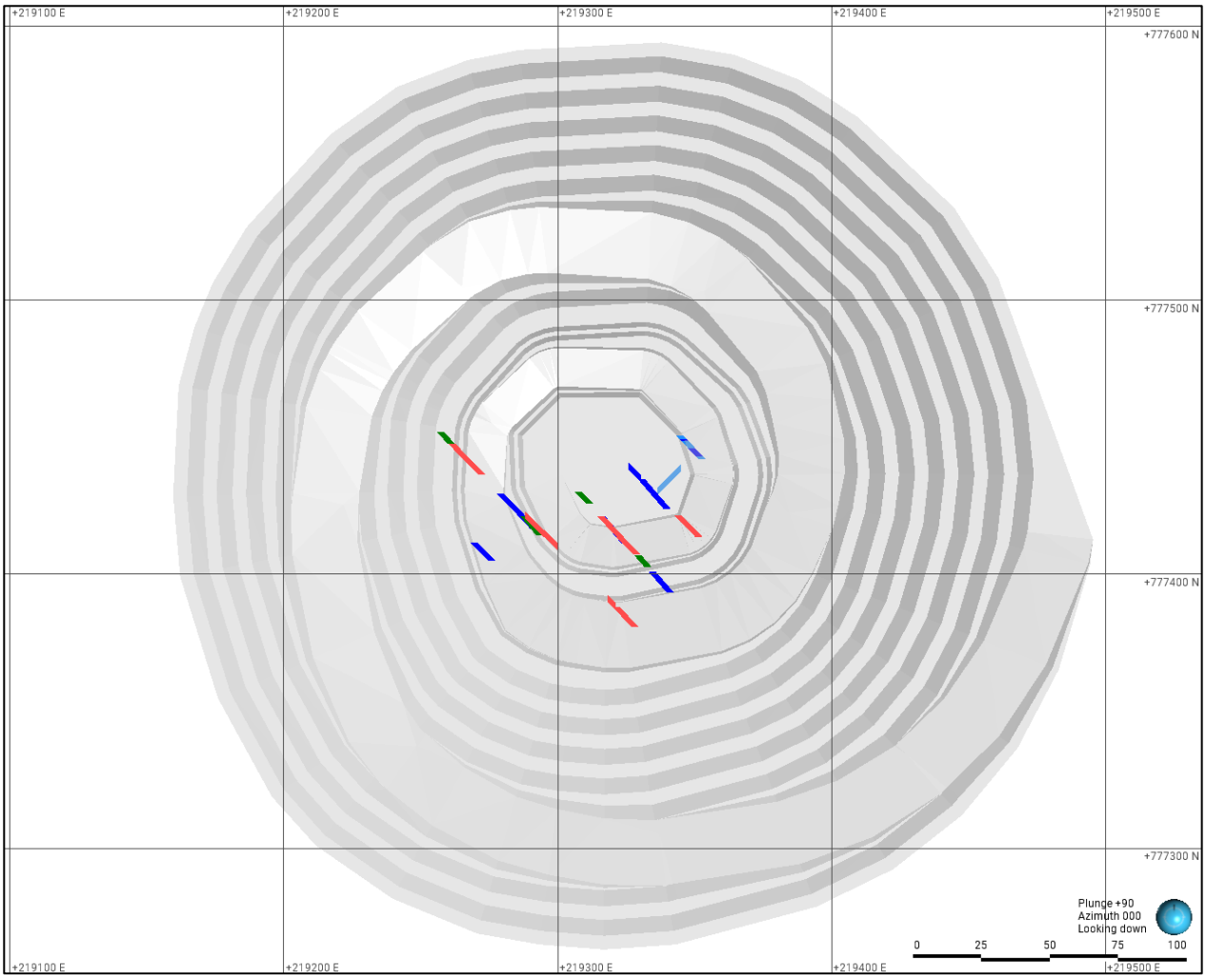


Figure 13-46: Location of samples within the Govisou deposit, plan view (Perseus, 2023)

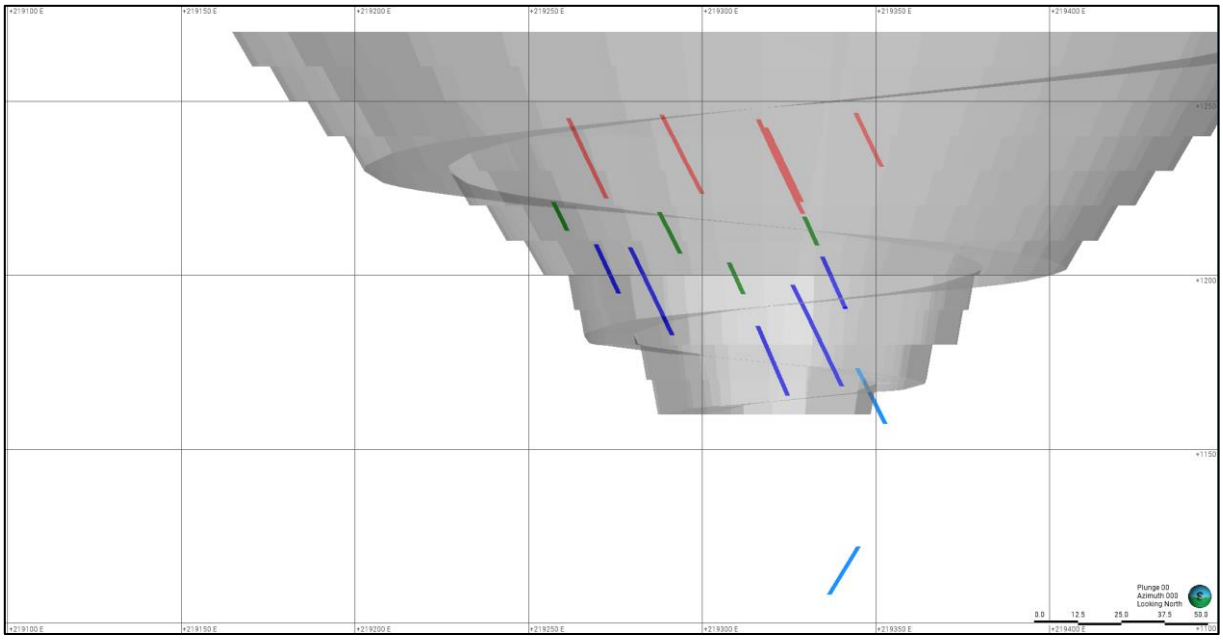


Figure 13-47: Location of samples within the Govisou deposit, section view looking north (Perseus, 2023)

13.8.1.1 Comminution Variability Samples

Two metallurgical variability samples, GIV-VAR-015 and GIV-VAR-16, were subjected to comminution test work. These samples represent basalt ore, the dominant lithology of the Govisou deposit. Sample origins are shown in Table 13-110.

13.8.1.2 Metallurgical Variability Samples

Sixteen metallurgical variability samples representing oxide, transition and fresh ore were selected for test work. Sample origins are shown in Table 13-110.

Table 13-110: Govisou metallurgical variability samples

SAMPLE	DRILL HOLE	FROM (m)	TO (m)
OXIDE SAMPLES			
GIV-VAR-001	YRC1562	6	25
GIV-VAR-002	YRC1565	9	42
GIV-VAR-003	YRC1570	14	40
GIV-VAR-004	YRC1572	8	36
GIV-VAR-005	YRC1574	8	36
TRANSITION SAMPLES			
GIV-VAR-011	YRC1564	57	68
GIV-VAR-012	YRC1565	43	53
GIV-VAR-013	YRC1573	42	57
GIV-VAR-014	YRC1590	32	42
FRESH SAMPLES			
GIV-VAR-006	YRC1559	64	100
GIV-VAR-007	YRC1564	79	103
GIV-VAR-008	YRC1565	57	75
GIV-VAR-009	YRC1574	53	84
GIV-VAR-010	YRC1575	53	70
GIV-VAR-015	YDD0503	89	109
GIV-VAR-016	YDD0542	160	178.3

13.8.2 Head Grade and Specific Gravity

Each metallurgical variability sample was subjected to duplicate head assays for gold by standard FA, assays for a further 35 analytes and true SG determination. A summary of select assay results are shown Table 13-111.

Table 13-111: Head assay (select analytes) for Govisou metallurgical variability samples

SAMPLE	Au (g/t)	Ag (g/t)	As (ppm)	$C_{ORGANIC}$ (%)	Hg (ppm)	$S_{SULFIDE}$ (%)	Sb (ppm)	Te (ppm)
OXIDE SAMPLES								
GIV-VAR-001	2.33/2.54	0.6	60	<0.03	0.1	<0.02	2.2	0.6
GIV-VAR-002	3.32/3.43	0.6	30	<0.03	<0.1	<0.02	1.5	0.6
GIV-VAR-003	0.87/0.89	0.3	20	<0.03	0.1	<0.02	0.7	0.2
GIV-VAR-004	3.92/4.60	0.6	40	0.03	0.2	<0.02	1.1	1.0
GIV-VAR-005	2.27/3.16	0.3	20	<0.03	0.1	<0.02	0.7	1.2
TRANSITION SAMPLES								
GIV-VAR-011	4.98/5.34	0.3	<10	0.12	0.1	0.32	0.5	0.6
GIV-VAR-012	2.49/2.49	0.3	40	<0.03	0.1	<0.02	1.0	0.6
GIV-VAR-013	4.32/5.47	0.3	30	<0.03	0.1	<0.02	0.8	0.8
GIV-VAR-014	1.08/1.11	0.3	20	<0.03	<0.1	<0.02	0.5	0.4
FRESH SAMPLES								
GIV-VAR-006	2.28/2.57	0.3	<10	0.18	0.1	0.62	0.5	0.4
GIV-VAR-007	1.07/1.12	0.6	<10	0.18	0.2	0.46	0.4	0.2
GIV-VAR-008	1.46/1.48	0.3	10	0.18	0.2	0.34	0.9	0.4
GIV-VAR-009	3.27/3.85	0.3	20	0.15	0.1	0.56	0.6	0.8
GIV-VAR-010	1.51/1.64	0.6	20	0.21	0.1	0.62	1.4	0.4
GIV-VAR-015	1.74/2.31	<0.3	<10	<0.03	0.2	0.28	0.3	0.6
GIV-VAR-016	0.40/0.43	<0.3	20	<0.03	0.6	0.96	0.5	0.8

From the data:

- The duplicate gold assays were mostly consistent, with only some exhibiting inconsistency that may be associated with the presence of coarse spotty gold.
- Silver is not present in economic quantity.
- Arsenic levels are low, indicating that the presence of refractory gold locked in arsenopyrite is unlikely.
- For variability samples GIV-VAR-001 to GIV-VAR-005 and GIV-VAR-012 to GIV-VAR-016, organic carbon values are generally low, indicating that these samples are generally unlikely to exhibit preg-robbing behaviour. Although variability samples GIV-VAR-006 to GIV-VAR-011 were noted to have elevated organic carbon assays (ranging from 0.12% to 0.21%), these samples returned excellent 48 h gold extraction in gravity/cyanidation tests detailed in Section 13.8.4.1.
- Mercury levels are low – health monitoring of gold room personnel is in place to manage residual risk.
- Sulfide sulfur assays are very low for all oxide and most transition variability samples (except GIV-VAR-011), indicating that little to no sulfide minerals are present in these samples. The sulfide sulfur assays for GIV-VAR-011 and the fresh variability samples indicate that sulfide minerals are present. For these samples, the sulfide sulfur assays are similar to those of the 2017 DFS CMA fresh ore samples (Section 13.2.2).
- Antimony levels are low, lessening the risk of gold passivation that can occur at high pH.
- Tellurium assays are low, reducing the likely presence of refractory telluride minerals.

Base metal assays were also noted to be present in moderately low concentrations across the 16 variability samples, decreasing the likelihood of excess cyanide consumption through preferential complexing with these metals.

The true SG for each metallurgical variability sample is shown in Table 13-112.

Table 13-112: True SG for Govisou metallurgical variability samples

SAMPLE	TRUE SG
OXIDE SAMPLES	
GIV-VAR-001	2.68
GIV-VAR-002	2.61
GIV-VAR-003	2.61
GIV-VAR-004	2.63
GIV-VAR-005	2.56
TRANSITION SAMPLES	
GIV-VAR-011	2.73
GIV-VAR-012	2.69
GIV-VAR-013	2.69
GIV-VAR-014	2.66
FRESH SAMPLES	
GIV-VAR-006	2.76
GIV-VAR-007	2.76
GIV-VAR-008	2.79
GIV-VAR-009	2.78
GIV-VAR-010	2.84
GIV-VAR-015	2.76
GIV-VAR-016	2.76

The average true SG values for the Govisou samples were noted to be:

- 2.62 for oxide ore
- 2.69 for transition ore
- 2.78 for fresh ore.

13.8.3 Comminution

13.8.3.1 SMC Test®

A standard SMC Test® was conducted on the two Govisou fresh ore comminution composite samples. The test results are summarised in Table 13-113.

Table 13-113: SMC Test® results for Govisou fresh variability samples

SAMPLE	DWI (kWh/m^3)	A×b	M_{ia} (kWh/t)	M_{ic} (kWh/t)	SG	SCSE (kWh/t)
GIV-VAR-015	11.20	22.0	31.3	13.5	2.71	13.32
GIV-VAR-016	11.60	23.4	29.7	12.7	2.74	13.01

As per the ore competency classification in Table 13-6, the results show Govisou fresh ore to be very competent, with an average A×b of 22.7.

13.8.3.2 Bond Ball Mill Work Index

A standard BWi test was conducted on the two Govisou fresh ore comminution composite samples. A closing screen of 106 µm was used, to yield a P_{80} of 75 µm. The target grind size P_{80} of 75 µm is as per the standard Yaouré gravity/leach conditions (Section 13.2.4.13) and the Yaouré plant target operating grind size P_{80} of 75 µm for open pit ores. The results are presented in Table 13-114.

Table 13-114: BWi for Govisou fresh variability samples

SAMPLE	BWi (kWh/t)
GIV-VAR-015	12.8
GIV-VAR-016	16.2

As per the ore hardness classification in Table 13-8, the results show the Govisou fresh ores to be medium hard to hard, with an average BWi of 14.5 kWh/t. The relationship of hardness and competency for Govisou fresh ore (GOV) is compared with fresh ore from other deposits at Yaouré Gold Mine in Figure 13-5. From the results, the Govisou fresh ores are:

- amongst the most competent of Yaouré Gold mine fresh ores tested
- of average hardness compared to the other Yaouré Gold Mine fresh ores tested. The Govisou fresh ores have a similar hardness to the CMA open pit fresh ores (CMA Pit), CMA underground ores (CMA-UG) and Yaouré open pit granodiorite samples (YAO-GRAN).

13.8.4 Gravity Recovery and Cyanidation

13.8.4.1 Variability Samples – Gravity/Leach at Yaouré Standard Conditions

16 variability samples were subjected to the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13. Hydrated lime used for these tests contained 68% CaO. The results of the tests are summarised in Table 13-115.

Table 13-115: Gold recovery at standard Yaouré test conditions for Govisou metallurgical variability samples

PARAMETER	UNIT	WH11643	WH11644	WH11645	WH11646	WH11647	WH11653	WH11654	WH11655	WH11656	WH11648	WH11649	WH11650	WH11651	WH11652	WH11657	WH11658
		OXIDE SAMPLES					TRANSITION SAMPLES				FRESH SAMPLES						
Sample		GIV-VAR-001	GIV-VAR-002	GIV-VAR-003	GIV-VAR-004	GIV-VAR-005	GIV-VAR-011	GIV-VAR-012	GIV-VAR-013	GIV-VAR-014	GIV-VAR-006	GIV-VAR-007	GIV-VAR-008	GIV-VAR-009	GIV-VAR-010	GIV-VAR-015	GIV-VAR-016
P_{80} grind size	µm	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Assay head grade (Au)	g/t	2.44	3.38	0.88	4.26	2.27	5.16	2.49	4.90	1.10	2.43	1.10	1.47	3.56	1.58	2.03	0.42
Calc. head grade (Au)	g/t	2.43	3.89	0.81	4.01	2.66	5.71	3.12	4.50	1.38	2.32	1.10	1.72	3.16	1.59	2.81	0.46
Gravity recovery	%	21.2	36.1	31.4	27.5	25.7	21.4	42.3	43.2	37.4	40.7	34.1	30.5	38.0	15.7	61.5	9.0
Extraction at time																	
2 hours	% Au	64.9	78.9	79.4	79.5	77.8	67.8	83.5	83.2	81.6	85.9	84.5	79.3	82.6	76.7	89.8	56.4
4 hours	% Au	69.1	83.8	84.0	84.6	83.1	82.5	88.2	87.4	85.9	90.1	89.2	87.4	87.8	86.4	93.2	58.0
8 hours	% Au	73.6	90.4	87.5	87.9	85.8	87.6	91.7	89.7	89.6	91.6	91.1	90.0	90.5	89.1	94.5	59.5
16 hours	% Au	77.9	90.4	90.1	90.7	89.0	88.8	92.6	91.3	91.6	92.5	93.0	90.8	90.9	90.4	95.5	61.1
24 hours	% Au	80.5	92.2	91.0	92.4	91.0	89.3	93.0	92.2	92.1	92.8	93.0	91.2	92.2	90.9	95.5	61.1
36 hours	% Au	82.4	92.9	91.8	92.7	92.6	90.2	93.4	93.4	93.1	93.4	93.0	91.6	92.7	92.1	96.3	61.1
48 hours	% Au	83.0	93.6	92.6	93.4	93.1	90.5	94.7	94.6	93.1	94.0	93.6	91.6	93.5	92.1	96.3	61.1
Solid residue grade (Au)	g/t	0.42	0.25	0.06	0.27	0.19	0.55	0.17	0.25	0.10	0.14	0.07	0.15	0.21	0.13	0.11	0.07
NaCN usage	kg/t	0.29	0.32	0.32	0.32	0.32	0.32	0.30	0.29	0.29	0.25	0.37	0.37	0.21	0.25	0.14	0.21
Lime usage	kg/t	3.25	3.36	2.83	3.20	3.39	1.00	1.54	2.36	1.89	0.46	0.36	0.37	0.36	0.38	0.36	0.43
Average DO	ppm	10.1	10.2	10.2	10.2	10.1	10.5	10.5	10.4	10.4	10.0	10.1	10.2	10.4	10.5	10.3	10.2

Key points from the data are:

- Gravity gold recovery across the ore types are similar with observations for CMA/Yaouré oxide and transition ore samples (Section 13.4.4), CMA pit fresh ore samples (Section 13.2.4) and Yaouré pit fresh ore samples (Section 13.3.4).
- Oxide ore samples had rapid leach kinetics, with gravity/leach extractions of 83.0% to 93.6% at 48 h. Sodium cyanide consumption was low, averaging 0.31 kg/t, and aligning well with tests for CMA/Yaouré oxide ore samples (Section 13.4.4). Lime consumption was high, averaging 3.21 kg/t of 68% CaO hydrated lime, aligning well with the lime consumption observed for tests for CMA/Yaouré oxide ore samples (Section 13.4.4). The sample with the lowest gold extraction, GIV-VAR-001, was subjected to a diagnostic leach test, as reported in Section 13.8.4.2. Oxide variability sample GIV-VAR-004 was also subjected to a diagnostic leach test.
- Transition ore samples had rapid leach kinetics, with gravity/leach extractions of 90.5% to 94.7% at 48 h. Sodium cyanide consumption was low, averaging 0.30 kg/t, which is higher than observed for tests on CMA/Yaouré transition ore samples (Section 13.4.4). Lime consumption was moderate, averaging 1.70 kg/t of 68% CaO hydrated lime, aligning well with the lime consumption observed for tests for CMA/Yaouré transition ore samples (Section 13.4.4). The sample with the lowest gold extraction, GIV-VAR-011, was subjected to a diagnostic leach test, as reported in Section 13.8.4.2.
- Fresh ore samples had rapid leach kinetics and returned gravity/leach extractions of 61.1% to 96.3% at 48 h. The sample with the lowest gold extraction, GIV-VAR-016, was influenced by a very low head grade of 0.46 g/t. When excluding this sample, gravity/leach extractions range between 91.6% and 96.3% at 48 h. Reagent consumptions were low, averaging 0.26 kg/t sodium cyanide and 0.39 kg/t of 68% CaO hydrated lime respectively. The reagent consumptions align with the ranges observed for CMA pit fresh ore samples (Section 13.2.4) and Yaouré pit fresh ore samples (Section 13.3.4).

13.8.4.2 Multi-Stage Diagnostic Leach

Two oxide variability samples (GIV-VAR-001 and GIV-VAR-004) and one transition variability sample (GIV-VAR-011) were subjected to a multi-stage diagnostic leach test. The results are summarised in Table 13-116.

Table 13-116: Diagnostic leach test results for select Govisou metallurgical variability samples

STAGE	DESCRIPTION	UNIT	GIV-VAR-001 (oxide)	GIV-VAR-004 (oxide)	GIV-VAR-011 (transition)
Gravity concentration/ amalgamation	Free gravity gold	g/t Au	0.27	0.65	0.90
Direct cyanidation leach of gravity tails	Cyanide recoverable gold	g/t Au	1.65	2.99	4.17
Dilute HCl digest/ cyanidation	Carbonate locked gold, labile[11] sulfide (pyrrhotite) locked gold	g/t Au	0.07	0.05	0.06
Dilute HNO_3 digest/ cyanidation	Gold associated with arsenical minerals, labile reactive sulfide minerals (including labile pyrite), and/or telluride	g/t Au	0.03	0.01	0.08
Aqua regia digestion	Gold associated with stable pyritic sulfide minerals and iron oxides	g/t Au	0.173	0.087	0.043
Total FA smelt	Silicates/gangue and/or graphitic carbon encapsulated gold	g/t Au	0.016	0.031	0.041
	Back-calculated gold content	g/t Au	2.21	3.80	5.28
	Assayed gold content	g/t Au	2.44	4.26	5.16

From the data, it is noted that:

- for GIV-VAR-001, there is good correlation between the back-calculated gold head grades and assayed head grade. The majority of gold (86.9%) is either as free gold or readily recoverable by cyanide. This is 3.9% higher than the gravity/leach test and suggests the residue grade from test WH11643 may have been overstated. The great majority of gold lost to tails solids was recovered after the aqua regia digestion. Given the low sulfide sulfur head grade, it is likely that most of the gold lost is associated with iron oxides.
- for GIV-VAR-004, there is reasonably good correlation (within ±15%) between the back-calculated gold head grades and assayed head grade. The majority of gold (95.5%) is either as free gold or readily recoverable by cyanide. This is 2.1% higher than the gravity/leach test. Again, for this sample, the majority of gold lost to tails solids was recovered after the aqua regia digestion. Given the low sulfide sulfur head grade, it is likely that the gold lost at this stage is associated with iron oxides.
- for GIV-VAR-011, there is good correlation between the back-calculated gold head grades and assayed head grade. The majority of gold (95.9%) is either as free gold or readily recoverable by cyanide. This is 5.4% higher than the gravity/leach test and suggests the residue grade from test WH11653 may have been overstated. Taking into account the elevated sulfide sulfur assay, the low arsenic and tellurium assays, and the diagnostic leach data for this transition ore variability sample, it is most likely that the majority of gold losses for GIV-VAR-011 are associated with labile and stable pyritic minerals.

13.8.5 Viscosity

A series of rheology tests were performed at two different pulp densities for three of the Govisou oxide variability samples ground to P_{80} of 75 µm. The slurry was adjusted to pH 10.5 using milk of lime, thereby simulating CIL operating conditions. The viscosities were measured using a Bohlin

[11] Unstable; easily decomposed; prone to chemical change

Visco 88 bench viscometer and all tests were conducted at ambient temperature. The results are summarised in Table 13-117.

Table 13-117: Viscosity results for select Govisou oxide metallurgical variability samples

SAMPLE	SOLIDS CONC (% w/w)	VISCOSITY (cP) AT SHEAR RATE (s^{-1})							
		4.2	7.4	13.1	21.9	38.9	67.4	119.2	209.5
GIV-VAR-001	45	7,224	4,335	2,616	1,687	1,026	641	398	275
	40	2,732	1,593	1,008	653	404	259	170	143
GIV-VAR-003	45	749	467	288	194	129	100	98	106
	40	0	212	132	93	69	61	59	76
GIV-VAR-005	45	1,160	701	420	273	178	119	112	118
	40	0	234	168	122	85	68	70	81

As described by Norgaard (2019), if viscosity:

- <100 cP at a shear rate of 119.2 s^{-1}, then there should be no pumping issues.
- <3,500 cP at a shear rate of 4.2 s^{-1}, then there should be no mixing or screening issues.

Based on these guidelines, when treating Govisou oxide ore alone in the process plant:

- there is potential for mixing and screening issues at pulp densities >40% w/w solids.
- it is likely that pumping straight oxide ore could be challenging. Lowering pulp density reduces these effects.

Viscous oxide ore slurries can also result in low mass transfer rates and poor dissolved oxygen levels in the leach and adsorption.

Viscosity related issues when treating Govisou oxide ore can be mitigated by:

- slurry dilution to 40% w/w solids or less.
- increasing blend ratios of less weathered ores to oxide ores, as fresh ores tested (Section 13.2.9, Section 13.3.9, Section 13.9.6) do not present viscosity related material handling challenges.
- addition of viscosity modifiers.

The most likely scenario is that Govisou oxide ores will be processed as part of a blend with fresh ore, in which case viscosity should not be an issue within the Yaouré plant.

13.9 CMA Underground Test Work

The ore that is the subject of the CMA underground project is a continuation of the main lode targeted by the current CMA open cut mine.

Samples of fresh ore from within the proposed CMA underground mine were tested to determine:

- whether the optimised processing route and conditions selected for the CMA pit fresh ore are also applicable to the CMA underground ore.
- the plant operating parameters for CMA underground ore for the determined processing route, specifically throughput rate, gold recovery and reagent consumption.
- engineering design data required for plant operation (viscosity).

The program was completed during 2022 and 2023 by ALS Metallurgy in Perth, Western Australia (ALS, 2022); (ALS, 2023a); (ALS, 2023b), and included the following:

- comminution tests (SMC Test® and BWi) on seven comminution variability samples.
- Ai tests on two comminution variability samples.
- gravity/cyanidation tests on 22 variability samples, including:
  - 22 tests at standard Yaouré test conditions (as per Section 13.2.4.13)
  - 8 tests using oxygen sparging (rather than air sparging) and higher initial cyanide concentration (0.10% w/v NaCN, rather than 0.05% w/v NaCN)
  - 22 tests at a finer grind size than the standard Yaouré conditions (P_{80} 53 µm, rather than P_{80} 75 µm)
- multi-stage diagnostic leach on six variability samples
- mineralogical investigation for one composite sample
- determination of parameters necessary for process plant design and operation (viscosity and thickening and settling rate).

13.9.1 Samples Selected

Twenty-nine samples were selected from 69 drill holes spread evenly across the deposit to provide spatial representivity. Samples were taken over an approximate range of:

- 557 m east to west
- 1,045 m north to south
- 320 m in RL.

The location of the samples within the deposit (midpoint of the sample intervals used for comminution and metallurgical variability samples) is shown in Figure 13-48. Red dots denote sample intervals used for comminution samples and blue dots denote sample intervals used for metallurgical variability samples.

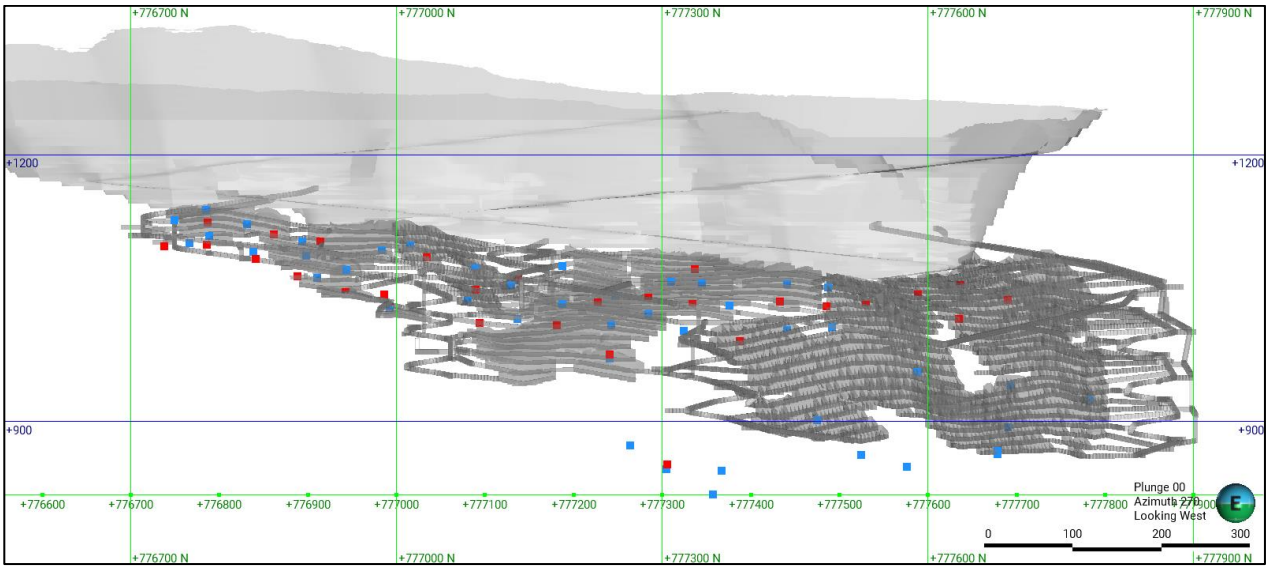


Figure 13-48: Location of samples in relation to the CMA underground mine design, looking west (Perseus, 2023)

13.9.1.1 Comminution Variability Samples

The origins of the seven comminution variability samples are shown in Table 13-118. The comminution samples represent basalt ore, the dominant lithology of the CMA deposit.

Table 13-118: CMA underground comminution variability samples

SAMPLE	DRILL HOLE	FROM (m)	TO (m)
CMA-UG-COM-01	YDD0271	229	237
	YRC1888D	284	286
	YRC1927D	285.8	287.7
	YRC1938D	283	286
	YRC1945D	330	331.6
	YRC2045D	278	281.2
CMA-UG-COM-02	YRC1878D	338	340
	YRC1902D	280	287
	YRC1923D	260	262.2
	YRC1943D	336.65	340
	YRC1971D	344	348.2
	YRC2044D	278.4	281.5
CMA-UG-COM-03	YDD0354	266	268
	YRC1904D	296	304
	YRC1961D	269.9	277
	YRC2008D	247.3	250
CMA-UG-COM-04	YDD0266	284	288
	YDD0284	265	269
	YDD0501	232	236.75
	YRC1909D	304	309
	YRC1915D	273	279
CMA-UG-COM-05	YDD0140	245.5	248
	YDD0261	261	266
	YDD0385	232	238
	YDD0397	255	259
	YDD0403	256	262
CMA-UG-COM-020	YRC2181D	333	339
CMA-UG-COM-021	YRC2199D	447	453.4

13.9.1.2 Metallurgical Variability Samples

The origins of the 22 metallurgical variability samples and the local grid coordinates of each centroid are shown in Table 13-119. With regards to the coordinate references in Table 13-119, the x-coordinate is UTM easting (m), y-coordinate is UTM northing (m), and z-coordinate is mine RL (m).

Table 13-119: CMA underground metallurgical variability samples

SAMPLE	DRILL HOLE	FROM (m)	TO (m)	X-COORD	Y-COORD	Z-COORD
CMA-UG-VAR-06	YRC1822D	228	234.2	221517.032	776784.707	1137.758
	YRC1886D	279	283	221571.217	776788.215	1108.492
	YRC1889D	284	286	221532.422	776749.272	1126.626
	YRC1985D	303	305	221578.704	776766.364	1100.812
CMA-UG-VAR-07	YDD0146	261	264	221547.910	776894.015	1102.734
	YDD0248	234	237	221540.083	776830.962	1122.523
	YRC1883D	329.2	335.2	221584.665	776897.741	1086.422
	YRC1885D	283.3	285.3	221591.694	776838.191	1090.637
CMA-UG-VAR-08	YDD0145	245	252	221562.793	776983.307	1093.009
	YRC1929D	346	348	221661.184	776992.296	1025.512
	YRC1946D	276	282	221618.629	776943.791	1070.296
	YRC2049D	328	331	221619.357	776910.607	1061.329
CMA-UG-VAR-09	YDD0143	259	262	221538.296	777088.286	1072.613
	YRC1970D	278.1	284	221614.426	777080.379	1036.097
	YRC1975D	224.6	233	221549.215	777015.363	1097.829
CMA-UG-VAR-10	YDD0299	295	299	221614.828	777187.568	1032.588
	YRC1899D	295	297	221628.731	777136.811	1015.307
	YRC1900D	235	237	221501.202	777187.100	1074.999
	YRC1960D	265	268	221546.148	777129.166	1052.739
CMA-UG-VAR-11	YDD0100	294	299	221618.814	777284.461	1020.249
	YDD0259	263	268	221568.413	777247.097	1041.333
CMA-UG-VAR-12	YDD0276	274	278	221585.498	777376.356	1030.760
	YRC1906D	258	263	221526.639	777344.660	1055.695
	YRC1908D	289	291	221649.885	777324.388	1002.287
	YRC2014D	249	251	221520.158	777309.676	1056.819
CMA-UG-VAR-13	YDD0094	297	300.23	221596.398	777491.690	1006.144
	YRC1912D	240.85	244.3	221531.770	777440.657	1054.890
	YRC1913D	305.9	309.9	221613.773	777440.658	1002.572
	YRC1914D	257.5	260	221524.809	777487.296	1051.332
CMA-UG-VAR-022	YRC2181D	339	342.8	221718.665	777240.650	970.645
CMA-UG-VAR-023	YRC2194D	418.6	422.12	221804.018	777524.278	861.872
CMA-UG-VAR-024	YRC2195D	428	432.5	221795.531	777575.966	849.195
CMA-UG-VAR-025	YRC2197D	453	457.3	221869.378	777367.453	844.195
CMA-UG-VAR-026	YRC2198D	482.6	487.5	221934.490	777357.109	817.644
CMA-UG-VAR-027	YRC2199D	453.5	456.7	221877.446	777305.102	846.479
CMA-UG-VAR-028	YRC2200D	426.1	434.25	221870.260	777263.677	872.598
CMA-UG-VAR-029	YRC2215D	424.1	427.1	221710.393	777678.156	866.846
	YRC2215D	428.9	430.35	221709.306	777678.184	863.520
CMA-UG-VAR-030	YRC2157D	313	321	221618.837	777587.709	955.314
CMA-UG-VAR-031	YRC2159D	368.9	378.45	221540.612	777782.667	923.959
CMA-UG-VAR-032	YRC2161D	348	354.3	221564.305	777693.449	940.832
CMA-UG-VAR-033	YRC2162D	420	428	221647.085	777689.838	893.718
CMA-UG-VAR-034	YRC2166D	392.2	400	221742.170	777474.408	901.007
CMA-UG-VAR-035	YRC2180D	322	330	221667.574	777242.535	1008.161

13.9.1.1 Metallurgical Composite Sample

A single CMA underground ore composite (CMA-UG-COMP-800-1000) was formulated for mineralogical investigation, viscosity test work, and thickening and settling test work. Sufficient mass of metallurgical variability samples CMA-UG-VAR-022 to CMA-UG-VAR-035 was available for sub-sampling into the composite. CMA-UG-VAR-022 and CMA-UG-VAR-030 were excluded from the composite, as the gold grades of these samples (>11 g/t) more than doubled the expected monthly plant feed grade variation envelope for CMA underground ore of 1.15-5.03 g/t Au. Table 13-120 details the sub-samples and masses used to generate the CMA underground ore composite.

Table 13-120: Composite recipe for CMA-UG-COMP-800-1000

METALLURGICAL VARIABILITY SAMPLE	MASS TO COMPOSITE (kg)
CMA-UG-VAR-023	1.0
CMA-UG-VAR-024	1.0
CMA-UG-VAR-025	1.0
CMA-UG-VAR-026	1.0
CMA-UG-VAR-027	1.0
CMA-UG-VAR-028	1.0
CMA-UG-VAR-029	1.0
CMA-UG-VAR-031	1.0
CMA-UG-VAR-032	1.0
CMA-UG-VAR-033	1.0
CMA-UG-VAR-034	1.0
CMA-UG-VAR-035	1.0

13.9.2 Head Grade and Specific Gravity

Each metallurgical variability sample and composite was subjected to duplicate head assays for gold by standard FA (four samples in quadruplicate), assays for a further 35 analytes and true SG determination. A summary of select assay results are shown in Table 13-121, which includes the range of assays recorded for CMA pit fresh ores for comparison (from Section 13.2.2).

Table 13-121: Head assay (select analytes) for CMA underground metallurgical variability and composite samples

SAMPLE	Au (g/t)	Ag (g/t)	As (ppm)	Corganic (%)	Hg (ppm)	Ssulfide (%)	Sb (ppm)	Te (ppm)
CMA-UG-VAR-06	5.28/5.57	0.6	20	0.06	0.1	1.62	1.0	1.2
CMA-UG-VAR-07	5.48/6.80	0.6	30	0.06	0.3	1.40	1.5	1.4
CMA-UG-VAR-08	4.11/5.65	0.6	10	0.06	0.2	2.20	0.6	1.6
CMA-UG-VAR-09	4.43/4.50	0.6	10	0.06	<0.1	2.46	0.7	1.6
CMA-UG-VAR-10	3.17/3.63	0.3	20	0.06	0.1	1.46	1.3	1.2
CMA-UG-VAR-11	6.32/6.72	0.6	20	0.06	0.3	2.42	0.7	2.4
CMA-UG-VAR-12	3.63/3.66	0.9	20	0.06	1.8	1.14	0.6	3.2
CMA-UG-VAR-13	6.93/7.72	0.6	10	0.06	0.2	1.00	0.7	2.8
CMA-UG-VAR-022	18.5/18.8	2.4	40	<0.03	0.3	2.30	3.2	1.8
CMA-UG-VAR-023	5.71/5.81	0.6	20	<0.03	0.5	1.62	1.3	2.2
CMA-UG-VAR-024	4.23/5.72/ 4.48/4.84	0.3	30	<0.03	0.4	1.18	1.2	1.0
CMA-UG-VAR-025	3.98/4.55	0.6	10	<0.03	0.3	1.88	0.8	2.2
CMA-UG-VAR-026	4.52/4.67	0.6	<10	<0.03	0.9	2.08	0.6	2.2
CMA-UG-VAR-027	2.36/2.73	0.6	40	<0.03	0.4	3.22	1.0	2.2
CMA-UG-VAR-028	1.57/1.58	0.6	10	<0.03	0.2	2.30	1.2	3.0
CMA-UG-VAR-029	6.23/6.27	0.6	20	<0.03	0.4	1.48	0.7	1.0
CMA-UG-VAR-030	11.5/11.5	0.9	<10	0.06	0.2	3.06	0.9	1.4
CMA-UG-VAR-031	4.30/7.14/ 4.46/5.10	0.9	<10	0.03	<0.1	2.20	0.6	1.4
CMA-UG-VAR-032	3.17/3.36	1.2	<10	<0.03	0.1	0.94	0.7	0.8
CMA-UG-VAR-033	4.16/4.42	0.6	<10	0.03	0.3	1.46	0.5	1.4
CMA-UG-VAR-034	8.27/11.4/ 8.21/8.28	0.6	<10	<0.03	0.2	1.00	0.4	1.0
CMA-UG-VAR-035	3.61/3.75	0.6	20	0.03	0.1	1.92	0.7	0.8
CMA-UG-COMP-800-1000	3.35/3.93	0.6	10	<0.03	0.4	1.80	0.6	1.4
CMA pit fresh ore samples	0.35-4.99	0.3-1.8	<10-50	<0.03-0.06	<0.1-3.2	0.01-0.88	0.2-0.8	N/A

From the data:

- The duplicate (or quadruplicate) gold assays were mostly consistent, with only some exhibiting inconsistency that may be associated with the presence of coarse spotty gold.
- The gold grade of CMA-UG-COMP-800-1000 (average 3.64 g/t Au) closely approximates the 2023 Mineral Reserves grade for the CMA underground stated in Table 15-1 (3.51 g/t Au).
- Silver is not present in economic quantity.
- Organic carbon values are low, indicating that ore is unlikely to exhibit preg-robbing behaviour.
- Mercury is present in only some samples – health monitoring of gold room personnel is in place to manage residual risk.
- There are sulfide minerals present, with the average sulfide sulfur assay for the CMA underground samples being 4.8 times higher than those of the CMA pit fresh ore samples. Mineralogical analysis, presented in Section 13.9.5, confirms the dominant sulfide mineral

is pyrite (~99% of the mass of sulfide minerals identified in CMA-UG-COMP-800-1000). This finding is also supported by low assay values across the dataset for arsenic, copper and base metals other than iron.

- Antimony levels are low, lessening the risk of gold passivation that can occur at high pH.
- Tellurium assays are slightly elevated, indicating the possible presence of refractory telluride minerals. Telluride minerals were not identified, however, in the mineralogical analysis presented in Section 13.9.5.
- With the exception of sulfide sulfur, the CMA underground samples have similar values to those recorded for the CMA pit fresh ores.

The true SG for each metallurgical variability sample and composite is shown in Table 13-122.

Table 13-122: True SG for CMA underground metallurgical variability samples

SAMPLE	TRUE SG
CMA-UG-VAR-06	2.84
CMA-UG-VAR-07	2.88
CMA-UG-VAR-08	2.87
CMA-UG-VAR-09	2.89
CMA-UG-VAR-10	2.84
CMA-UG-VAR-11	2.89
CMA-UG-VAR-12	2.86
CMA-UG-VAR-13	2.79
CMA-UG-VAR-022	2.80
CMA-UG-VAR-023	2.84
CMA-UG-VAR-024	2.83
CMA-UG-VAR-025	2.82
CMA-UG-VAR-026	2.85
CMA-UG-VAR-027	2.97
CMA-UG-VAR-028	2.87
CMA-UG-VAR-029	2.86
CMA-UG-VAR-030	2.88
CMA-UG-VAR-031	2.89
CMA-UG-VAR-032	2.83
CMA-UG-VAR-033	2.86
CMA-UG-VAR-034	2.88
CMA-UG-VAR-035	2.93
CMA-UG-COMP-800-1000	2.87

The average true SG value of the CMA underground variability samples is 2.86, which is very close to the average value of 2.83 for the CMA pit fresh ore samples (Section 13.2.2).

13.9.3 Comminution

13.9.3.1 SMC Test®

A standard SMC Test® was conducted on seven CMA underground comminution variability samples. The test results are summarised in Table 13-123.

Table 13-123: SMC test® results for CMA underground comminution variability samples

SAMPLE	DWI (kWh/m³)	A×b	Mia (kWh/t)	Mic (kWh/t)	SG	SCSE (kWh/t)
CMA-UG-COM-01	8.5	34.7	21.5	8.6	2.95	11.21
CMA-UG-COM-02	6.4	45.2	17.5	6.6	2.89	9.72
CMA-UG-COM-03	8.8	34.4	21.8	8.8	3.00	11.39
CMA-UG-COM-04	7.8	37.2	20.5	8.1	2.91	10.73
CMA-UG-COM-05	7.0	40.1	19.4	7.5	2.79	10.05
CMA-UG-COM-020	8.1	35.9	21.0	8.3	2.92	10.94
CMA-UG-COM-021	7.3	40.0	19.3	7.5	2.89	10.30

As per the ore competency classification in Table 13-6, the results show CMA underground ore to be between medium competency and competent, with an average A×b of 38.2. This closely aligns with the results observed for CMA pit fresh ore (Section 13.2.3.1), which were classified to be between medium competency and competent with an average A×b of 35.9.

13.9.3.2 Bond Ball Mill Work Index

A standard BWi test was conducted on seven CMA underground comminution variability samples. A closing screen of 106 µm was used, to yield a P_{80} of 75 µm, so that ore hardness data for CMA underground ore can be directly compared to other Yaouré Gold Mine ore sources. The results are presented in Table 13-124.

Table 13-124: BWi for CMA underground comminution variability samples

SAMPLE	BWi (kWh/t)
CMA-UG-COM-01	14.3
CMA-UG-COM-02	13.7
CMA-UG-COM-03	15.5
CMA-UG-COM-04	14.9
CMA-UG-COM-05	15.0
CMA-UG-COM-020	13.9
CMA-UG-COM-021	15.2

As per the ore hardness classification in Table 13-8, the results show the CMA underground ores to be medium hard to hard, with an average BWi of 14.6 kWh/t. This is marginally higher than the average of the CMA pit fresh ore samples (13.2 kWh/t, as noted in Section 13.2.3.2).

The relationship of hardness and competency for CMA underground ore (CMA-UG) is compared with fresh ore from other deposits at the Yaouré Gold Mine in Figure 13-5. From the results, the CMA underground ores are:

- Similar in hardness and competency to the CMA pit fresh ores (CMA Pit)
- Comparable in hardness to Yaouré pit basalt (YAO-BAS) and Govisou (GOV) fresh ores
- Generally softer than Yaouré pit granite (YAO-GRAN) ores
- Generally less competent than Yaouré pit basalt and granite ores
- Softer and less competent than Angovia 2 (ANG 2) fresh ores
- Less competent than the Govisou fresh ores.

13.9.3.3 Bond Abrasion Index

A standard Ai test was conducted on two CMA underground comminution variability samples (CMA-UG-COM-020 and CMA-UG-COM-021). The results are presented in Table 13-125.

Table 13-125: Ai for CMA underground comminution variability samples

SAMPLE	Ai (g)
CMA-UG-COM-020	0.1174
CMA-UG-COM-021	0.1081

As per the ore abrasion classification in Table 13-11, the results show the CMA underground ores to be slightly abrasive. The two samples tested fell at the lower end of the range observed for CMA pit fresh ore samples (0.1049 to 0.2405 g, as noted in Section 13.2.3.4).

13.9.4 Gravity Recovery and Cyanidation

13.9.4.1 Variability Samples – Gravity/Leach at Yaouré Standard Conditions

22 variability samples were subjected to the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13, at the grind size P_{80} of 75 µm stated in the standard conditions. Hydrated lime used for tests WH2310 to WH2317 contained ~65% CaO, and hydrated lime used for tests WH12632 to WH12691 contained ~60% CaO.

The results of the tests are summarised in Table 13-126.

Table 13-126: Gold recovery at standard Yaouré test conditions for CMA underground metallurgical variability samples

PARAMETER	UNIT	WH12310	WH12311	WH12312	WH12313	WH12314	WH12315	WH12316	WH12317	WH12632	WH12634	WH12636	WH12638	WH12640	WH12642	WH12644	WH12646	WH12681	WH12683	WH12685	WH12687	WH12689	WH12691
Sample		CMA-UG-VAR-06	CMA-UG-VAR-07	CMA-UG-VAR-08	CMA-UG-VAR-09	CMA-UG-VAR-10	CMA-UG-VAR-11	CMA-UG-VAR-12	CMA-UG-VAR-13	CMA-UG-VAR-022	CMA-UG-VAR-023	CMA-UG-VAR-024	CMA-UG-VAR-025	CMA-UG-VAR-026	CMA-UG-VAR-027	CMA-UG-VAR-028	CMA-UG-VAR-029	CMA-UG-VAR-030	CMA-UG-VAR-031	CMA-UG-VAR-032	CMA-UG-VAR-033	CMA-UG-VAR-034	CMA-UG-VAR-035
P_{80} grind size	µm	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Assay head grade (Au)	g/t	5.43	6.14	4.88	4.47	3.40	6.52	3.65	7.33	18.7	5.76	4.52	4.27	4.60	2.55	1.58	6.25	11.5	4.62	3.27	4.29	8.25	3.68
Calc. head grade (Au)	g/t	5.96	6.51	4.69	5.13	3.23	6.04	4.05	8.58	17.4	5.55	4.92	3.73	4.83	2.43	1.42	5.52	10.2	4.40	3.60	3.87	7.32	4.09
Gravity recovery	%	30.6	25.3	27.6	28.8	27.6	31.0	36.2	56.9	39.2	34.7	45.0	20.7	24.6	15.7	10.9	34.1	38.6	35.4	43.0	44.4	61.4	41.3
Extraction at time																							
2 hours	% Au	75.9	73.9	75.3	71.5	76.9	77.5	80.2	86.4	84.8	84.7	86.5	77.0	74.0	68.2	69.5	83.2	83.6	83.8	86.3	85.1	92.5	85.3
4 hours	% Au	78.8	75.7	79.7	75.2	81.0	79.9	83.1	89.5	86.1	87.6	88.3	79.0	76.1	71.5	72.6	87.0	85.6	86.5	88.7	86.6	94.9	88.2
8 hours	% Au	79.6	78.8	81.0	77.2	81.4	81.6	84.2	90.7	87.2	89.1	90.3	80.9	78.2	73.3	74.6	88.8	87.3	87.8	89.1	88.1	96.1	89.3
16 hours	% Au	81.2	79.5	81.3	78.6	82.3	82.5	85.6	90.8	88.5	90.7	91.5	82.9	78.5	74.2	75.6	90.4	88.0	88.1	89.5	88.1	96.5	90.3
24 hours	% Au	82.4	79.7	81.9	80.2	83.6	83.2	85.9	92.1	89.0	91.4	91.8	82.9	78.8	74.2	75.6	91.1	88.3	89.1	89.5	88.1	96.5	91.0
36 hours	% Au	82.8	80.7	81.9	80.5	84.8	84.5	86.9	92.3	89.9	91.4	92.9	83.2	78.8	74.5	76.1	91.1	88.7	88.8	90.3	88.8	96.5	91.0
48 hours	% Au	83.7	81.7	81.9	80.7	86.1	84.5	87.9	92.4	90.4	91.4	92.9	83.2	79.4	74.5	76.1	91.1	89.7	89.1	90.3	89.2	96.5	91.3
Solid residue grade (Au)	g/t	0.97	1.19	0.85	0.99	0.45	0.94	0.49	0.65	1.67	0.48	0.35	0.63	1.00	0.62	0.34	0.49	1.06	0.48	0.35	0.42	0.26	0.36
NaCN usage	kg/t	0.24	0.24	0.24	0.17	0.17	0.22	0.17	0.17	0.22	0.18	0.22	0.22	0.15	0.22	0.22	0.22	0.22	0.15	0.18	0.14	0.22	0.18
Lime usage	kg/t	0.41	0.40	0.36	0.33	0.32	0.35	0.34	0.32	0.84	0.87	0.67	0.69	0.84	1.15	1.16	1.00	0.57	0.50	0.62	0.74	0.57	0.89
Average DO	ppm	9.7	9.7	9.7	9.7	9.8	9.7	9.7	9.7	8.3	8.3	8.4	8.3	8.1	8.0	8.1	8.1	8.3	8.5	8.5	8.5	8.4	8.3

Key points from the data are:

- Gravity gold recoveries for CMA underground ore are consistent with observations for CMA open pit fresh ore (Section 13.2.4).
- Leach kinetics are rapid, with total extraction largely complete after 24 h.
- Gravity/leach gold extraction was variable, averaging 86.5% at 48 h, with a range of 74.5% to 96.5%.
- Sodium cyanide consumption is low, averaging 0.20 kg/t. This aligns well with the sodium cyanide consumption observed for CMA pit fresh ore metallurgical variability samples (average of 0.23 kg/t, as noted in Section 13.2.4.14).
- Lime consumption is also low, averaging 0.60 kg/t of 60-65% CaO hydrated lime. Lime consumption is higher than was observed for CMA pit fresh ore metallurgical variability samples (average of 0.45 kg/t of 60% CaO hydrated lime, as noted in Section 13.2.4.14), likely due to the higher (acid forming) sulfide sulfur head grades for the CMA underground samples.

As shown graphically in Figure 13-49, 48 h gravity/leach gold extractions for the CMA underground samples (CMA-UG) at P_{80} of 75 µm are on average 4.5% lower than those recorded for CMA pit fresh ores (CMA Pit) at P_{80} of 75 µm.

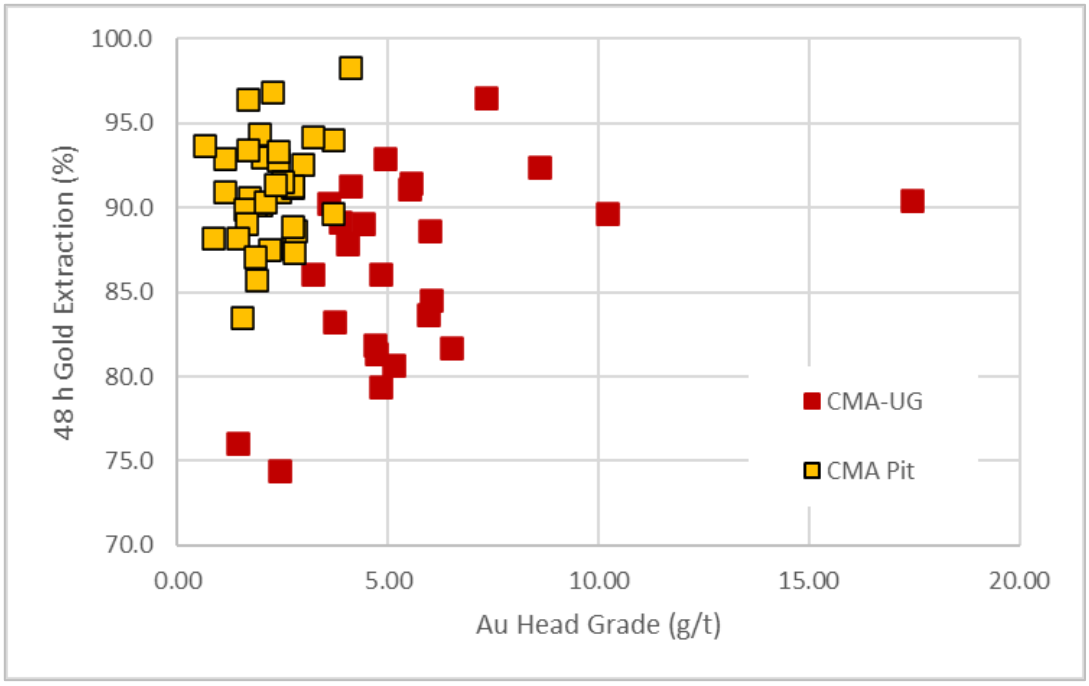


Figure 13-49: Comparison of CMA underground gold extractions to CMA pit fresh ore gold extractions at P_{80} of 75 µm

13.9.4.2 Size Assay Analysis for Leach Residues from Yaouré Standard Conditions

Samples of leach residue for the 22 metallurgical variability samples tested under standard Yaouré gravity/leach conditions were subjected to gold size assay analysis using 106 µm, 75 µm and 38 µm screens. The assays for each size fraction of leach residue are presented graphically in Figure 13-50.

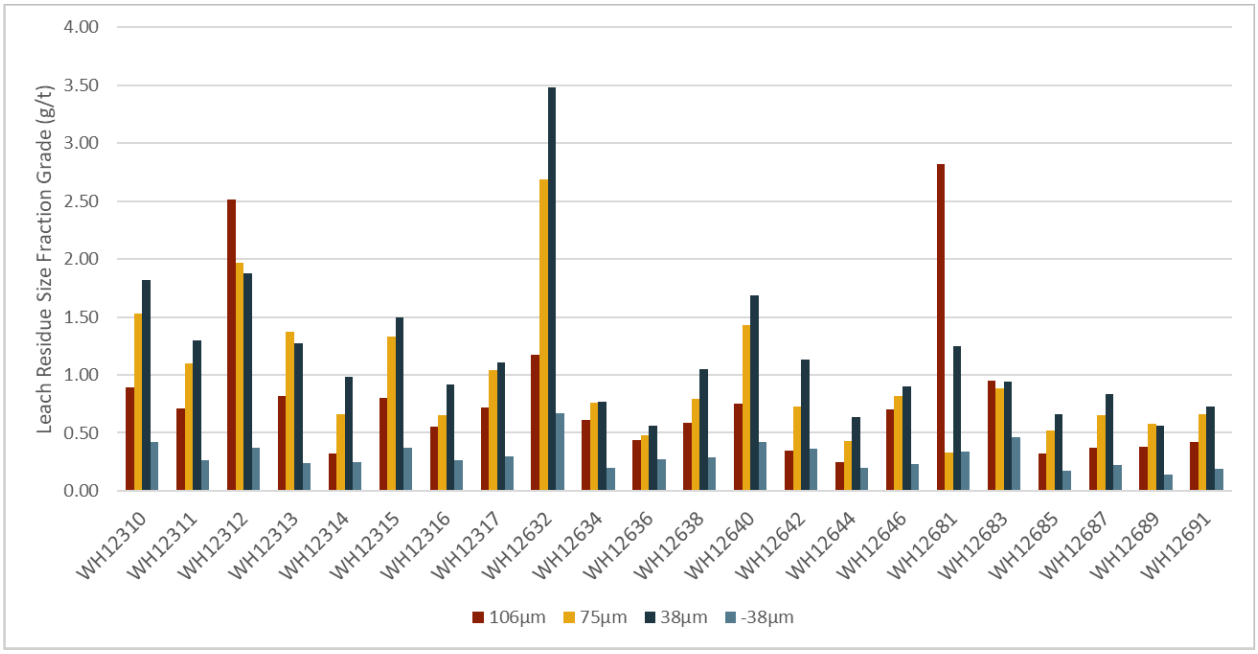


Figure 13-50: Tails solid gold assay by size fraction for CMA underground metallurgical variability samples

The gold assay of the finest fraction (<38 µm) is much lower than the others, suggesting that recovery is sensitive to grind size. The gold distribution was calculated for each size fraction and is presented graphically in Figure 13-51.

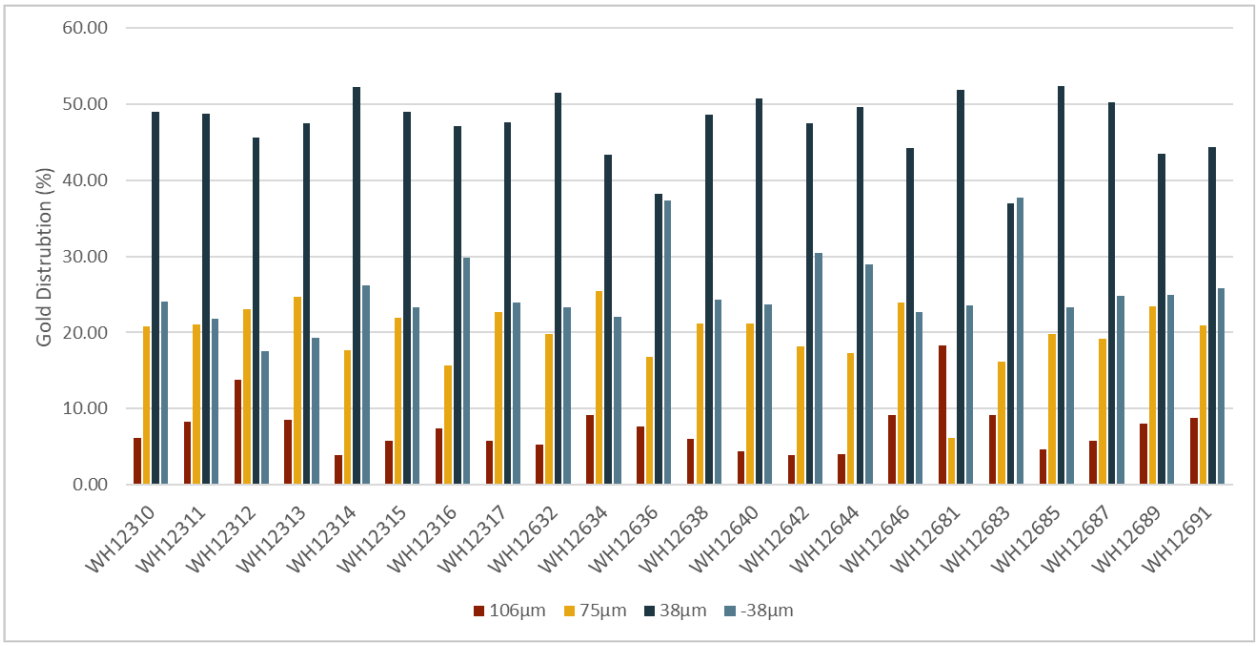


Figure 13-51: Tails solid gold distribution by size fraction for CMA underground metallurgical variability samples

37-52% of the gold in each of the leach residue samples was in the +38 µm -75 µm size fraction. The opportunity to grind finer and further liberate gold in this size fraction to improve recovery is investigated in Section 13.9.4.5.

The back-calculated tails grade from the size assay data was compared with the tails solids assay from the original leach tests, with the level of agreement being a measure in the confidence level of the data. The results are presented in Table 13-127.

Table 13-127: Tails solid gold grade comparison for CMA underground metallurgical variability samples

TEST	UNIT	LEACH RESIDUE ASSAY	BACK-CALCULATED TAILS ASSAY	VARIANCE
WH12310	g/t Au	0.96/0.98	0.96	-0.01
WH12311	g/t Au	1.17/1.21	0.66	-0.53
WH12312	g/t Au	0.84/0.86	1.12	+0.27
WH12313	g/t Au	0.98/1.00	0.68	-0.31
WH12314	g/t Au	0.45/0.45	0.51	+0.06
WH12315	g/t Au	0.92/0.95	0.84	-0.10
WH12316	g/t Au	0.49/0.49	0.49	0.00
WH12317	g/t Au	0.64/0.66	0.66	+0.01
WH12632	g/t Au	1.63/1.70	1.62	-0.04
WH12634	g/t Au	0.47/0.48	0.46	-0.02
WH12636	g/t Au	0.35/0.35	0.39	+0.04
WH12638	g/t Au	0.61/0.64	0.60	-0.03
WH12640	g/t Au	0.98/1.01	0.93	-0.06
WH12642	g/t Au	0.61/0.63	0.62	0.00
WH12644	g/t Au	0.34/0.34	0.36	+0.02
WH12646	g/t Au	0.49/0.49	0.53	+0.04
WH12681	g/t Au	1.00/1.11	0.73	-0.32
WH12683	g/t Au	0.48/0.48	0.67	+0.19
WH12685	g/t Au	0.34/0.36	0.37	+0.02
WH12687	g/t Au	0.41/0.43	0.46	+0.04
WH12689	g/t Au	0.25/0.26	0.31	+0.06
WH12691	g/t Au	0.34/0.37	0.40	+0.05

There is poorer agreement between assays for tests WH12311, WH12312, WH12313, WH12681 and WH12683. There is no clear sample or mineralogical bias contributing to the poor correlation for these five tests; the first three tests listed correspond to moderate recoveries within the data set and the last two tests listed correspond to higher recoveries within the data set.

There is typically only one gold assay performed per size fraction for the size assay, compared to duplicate assays for the whole pre-screened leach residue sample. Given that there is good correlation between the duplicate assays for the whole pre-screened leach residue samples, it is most likely that either misclassification during leach residue sample screening or erroneous assay(s) in mass dominant size fraction(s) are causing variance in the back-calculated tails assay values.

13.9.4.3 Multi-Stage Diagnostic Leach

For the six leach variability samples with the lowest gold extractions (CMA-UG-VAR-07, CMA-UG-VAR-08, CMA-UG-VAR-09, CMA-UG-VAR-026, CMA-UG-VAR-027 and CMA-UG-VAR-028; used for WH12311, WH12312, WH12313, WH12640, WH12642 and WH12644 respectively), sub samples were subjected to a multi-stage diagnostic leach test. The results are summarised in Table 13-128.

Table 13-128: Diagnostic leach test results for select CMA underground metallurgical variability samples

STAGE	DESCRIPTION	UNIT	CMA-UG-VAR-07	CMA-UG-VAR-08	CMA-UG-VAR-09	CMA-UG-VAR-026	CMA-UG-VAR-027	CMA-UG-VAR-028
Gravity concentration/ amalgamation	Free gravity gold	g/t Au	1.65	1.57	1.57	1.16	0.43	0.36
Direct cyanidation leach of gravity tails	Cyanide recoverable gold	g/t Au	1.97	3.20	2.45	2.64	1.34	1.05
Dilute HCl digest/ cyanidation	Carbonate locked gold, labile[12] sulfide (pyrrhotite) locked gold	g/t Au	0.04	0.07	0.06	0.03	0.04	0.04
Dilute HNO_3 digest/ cyanidation	Gold associated with arsenical minerals, labile reactive sulfide minerals (including labile pyrite), and/or telluride	g/t Au	0.41	0.52	0.60	0.86	0.54	0.29
Aqua regia digestion	Gold associated with stable pyritic sulfide minerals and iron oxides	g/t Au	0.02	0.01	0.02	0.04	0.04	0.01
Total FA smelt	Silicates/gangue and/or graphitic carbon encapsulated gold	g/t Au	0.01	0.01	0.01	0.01	0.00	0.01
	Back-calculated gold content	g/t Au	4.09	5.36	4.70	4.73	2.38	1.77
	Assayed gold content	g/t Au	6.14	4.88	4.47	4.60	2.55	1.58

From the data, it is noted that:

- the majority of gold (73.8% to 88.3%) is either as free gold or readily recoverable by cyanide.
- there is reasonable correlation (within ±15%) between back-calculated gold head grades and assayed head grades for CMA-UG-VAR-08, CMA-UG-VAR-09, CMA-UG-VAR-026, CMA-UG-VAR-027 and CMA-UG-VAR-028.
- there is poor correlation between back-calculated gold head grades for CMA-UG-VAR-07.
- the great majority of gold lost to tails solids was recovered after the dilute nitric acid digestion stage. Given the low arsenic and tellurium assays for these samples, it is most likely that these gold losses are associated with labile reactive pyrite. This conclusion is supported by the mineralogical analysis data presented in Section 13.9.5, where ~99% of sulfides by mass in the gravity concentrate of mineralogical composite CMA-UG-COMP-800-1000 were identified as pyrite. Arsenopyrite and tellurides were not identified in the mineralogical analysis.

13.9.4.4 Variability Samples – Gravity/Leach at Modified Leach Conditions

Eight variability samples were subjected to modified leach conditions to determine whether gold extraction could be increased at the standard grind size P_{80} of 75 µm. The samples were tested at the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13, at the grind size P_{80} of 75 µm stated in the standard conditions, but with the following variations:

[12] Unstable; easily decomposed; prone to chemical change

- Initial NaCN concentration of 0.10% w/v and maintained to >0.05% w/v
- Oxygen sparging
- 48 h bottle roll leach test with samples taken at 8, 24, 36 and 48 h.

The results are presented in Table 13-129.

Key points from the data are:

- Average gravity/leach gold extraction at 48 h is 86.9% and largely unchanged from tests at the standard Yaouré gravity/leach test conditions without variations (Section 13.9.4.1).
- Sodium cyanide consumption increased by approximately 100%, while hydrated lime consumption was largely unchanged for the same variability samples.

Table 13-129: Gold recovery at elevated cyanide and oxygen levels for select CMA underground metallurgical variability samples

PARAMETER	UNIT	WH12408	WH12409	WH12410	WH12411	WH12412	WH12413	WH12414	WH12415
Sample		CMA-UG-VAR-06	CMA-UG-VAR-07	CMA-UG-VAR-08	CMA-UG-VAR-09	CMA-UG-VAR-10	CMA-UG-VAR-11	CMA-UG-VAR-12	CMA-UG-VAR-13
P_{80} grind size	µm	75	75	75	75	75	75	75	75
Assay head grade (Au)	g/t	5.43	6.14	4.88	4.47	3.40	6.52	3.65	7.33
Calc. head grade (Au)	g/t	5.57	6.57	5.35	4.70	3.26	6.22	4.12	7.86
Gravity Recovery	%	27.7	38.3	37.1	32.3	34.0	33.7	36.6	54.8
Extraction at time									
8 hours	% Au	80.8	88.7	82.2	82.1	84.6	84.3	86.8	90.9
24 hours	% Au	81.8	89.4	83.0	84.6	85.0	86.0	87.9	91.4
36 hours	% Au	82.3	89.6	84.1	84.6	85.9	86.2	88.2	91.8
48 hours	% Au	82.3	89.6	84.9	84.6	86.4	86.4	88.2	92.5
Solid residue grade (Au)	g/t	0.99	0.69	0.81	0.73	0.45	0.85	0.49	0.59
NaCN usage	kg/t	0.47	0.44	0.37	0.40	0.40	0.40	0.37	0.25
Lime usage	kg/t	0.37	0.37	0.37	0.34	0.44	0.37	0.36	0.37
Average DO	ppm	21.0	21.5	22.5	21.5	23.0	23.7	23.8	23.8

13.9.4.5 Variability Samples – Gravity/Leach at Finer Grind

Twenty-two variability samples were ground to a finer grind size to determine whether gold extraction could be increased by further liberating gold that was noted in Section 13.9.4.2 as being dominant in the +38 µm -75 µm size fraction of leach residues from cyanidation tests conducted at the standard grind size (P_{80} of 75 µm). The samples were tested at the standard Yaouré gravity/leach test conditions, as described in Section 13.2.4.13, except using a grind size P_{80} of 53 µm. The results of the tests are shown in Table 13-130.

Table 13-130: Gold recovery at grind size P_{80} of 53 µm for CMA underground metallurgical variability samples

PARAMETER	UNIT	WH12400	WH12401	WH12402	WH12403	WH12404	WH12405	WH12406	WH12407	WH12633	WH12635	WH12637	WH12639	WH12641	WH12643	WH12645	WH12647	WH12682	WH12684	WH12686	WH12688	WH12690	WH12692
Sample		CMA-UG-VAR-06	CMA-UG-VAR-07	CMA-UG-VAR-08	CMA-UG-VAR-09	CMA-UG-VAR-10	CMA-UG-VAR-11	CMA-UG-VAR-12	CMA-UG-VAR-13	CMA-UG-VAR-022	CMA-UG-VAR-023	CMA-UG-VAR-024	CMA-UG-VAR-025	CMA-UG-VAR-026	CMA-UG-VAR-027	CMA-UG-VAR-028	CMA-UG-VAR-029	CMA-UG-VAR-030	CMA-UG-VAR-031	CMA-UG-VAR-032	CMA-UG-VAR-033	CMA-UG-VAR-034	CMA-UG-VAR-035
P_{80} grind size	µm	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Assay head grade (Au)	g/t	5.43	6.14	4.88	4.47	3.40	6.52	3.65	7.33	18.7	5.76	4.52	4.27	4.60	2.55	1.58	6.25	11.5	4.62	3.27	4.29	8.25	3.68
Calc. head grade (Au)	g/t	5.84	5.91	4.53	4.74	3.20	6.21	3.82	8.01	17.0	5.61	4.10	3.74	4.83	2.56	1.43	5.26	9.59	4.04	3.06	3.12	9.78	3.68
Gravity recovery	%	34.2	33.2	30.2	38.0	36.6	41.4	37.6	56.4	39.0	41.9	39.1	26.0	32.5	20.0	13.3	35.5	44.1	33.1	40.0	39.5	70.2	35.7
Extraction at time																							
2 hours	% Au	84.5	88.3	81.5	82.3	86.7	86.1	85.9	92.2	87.0	89.8	87.8	82.5	82.1	75.4	74.3	88.6	90.6	85.8	88.3	86.9	95.7	88.3
4 hours	% Au	85.5	88.8	82.5	84.8	87.2	87.1	87.4	93.9	89.5	91.4	89.2	82.5	83.6	77.7	75.8	90.8	92.0	88.0	90.0	88.6	96.4	89.5
8 hours	% Au	86.0	89.3	83.1	85.7	88.1	87.3	88.6	94.4	90.2	92.2	91.0	85.6	84.5	79.2	78.3	91.6	93.6	89.8	90.9	89.5	97.2	90.7
16 hours	% Au	86.5	90.0	83.7	86.3	88.5	88.7	88.9	94.6	91.6	92.9	91.3	85.6	85.1	79.7	78.8	92.7	94.5	90.2	90.9	89.9	97.3	91.5
24 hours	% Au	87.0	90.5	84.0	86.6	88.5	88.9	89.3	94.6	91.4	93.7	93.1	86.4	85.1	79.7	79.3	93.0	94.4	90.5	90.9	89.9	97.5	92.2
36 hours	% Au	87.0	90.9	84.0	86.9	88.5	88.9	89.7	94.6	91.4	93.7	93.1	86.8	85.4	79.7	79.3	93.2	94.7	90.5	90.9	89.9	97.5	92.6
48 hours	% Au	87.0	90.9	84.0	87.4	88.9	88.9	89.7	94.6	92.1	93.7	93.1	86.8	85.4	80.2	79.3	93.2	94.7	90.8	91.3	90.4	97.6	93.3
Solid residue grade (Au)	g/t	0.76	0.54	0.73	0.60	0.36	0.69	0.40	0.44	1.35	0.36	0.29	0.50	0.71	0.51	0.30	0.36	0.51	0.37	0.27	0.30	0.24	0.25
NaCN usage	kg/t	0.37	0.25	0.24	0.24	0.18	0.28	0.24	0.17	0.18	0.22	0.18	0.22	0.18	0.22	0.18	0.24	0.21	0.17	0.17	0.22	0.18	0.18
Lime usage	kg/t	0.48	0.39	0.33	0.33	0.62	0.43	0.46	0.32	0.77	1.00	0.73	0.80	0.94	1.18	1.43	1.09	0.56	0.54	0.58	0.50	0.79	0.87
Average DO	ppm	9.1	9.2	9.1	9.1	9.1	9.1	9.2	9.1	8.3	8.3	8.4	8.3	8.1	8.0	8.0	8.0	8.5	8.6	8.5	8.4	8.4	8.3

Key points from the data are:

- Gold extraction from all samples increased by 0.2% to 9.2% over the standard Yaouré gravity/leach test conditions. The average increase from all tests was 3.5%.
- Sodium cyanide consumption was largely unchanged compared to tests conducted at the standard Yaouré gravity/leach test conditions at P_{80} of 75 µm (average consumption was 0.21 kg/t for samples tested at P_{80} of 53 µm).
- Lime consumption increased by ~10% on what was observed during tests conducted at the standard Yaouré gravity/leach test conditions at P_{80} of 75 µm (average consumption was 0.69 kg/t of 60-65% CaO hydrated lime for samples tested at P_{80} of 53 µm).

Perseus conducted a technoeconomic trade-off between blending CMA underground ore with open pit ore at target grind size P_{80} of 75 µm and campaign processing CMA underground ore alone at target grind size P_{80} of 53 µm. The assessment for campaign processing of CMA underground ore at a finer grind size indicated that the positive recovery and cashflow benefits modelled outweighed lower plant throughput and higher unit processing cost. It was noted that only minor adjustments to Yaouré process plant equipment and operating strategy were required to accommodate campaign processing of CMA underground ore (as discussed in Section 17). Therefore, a grind size P_{80} of 53 µm was selected for the future processing of CMA underground ore.

13.9.5 Mineralogical Investigation

Composite sample CMA-UG-COMP-800-1000 was ground to P_{80} of 53 µm and subjected to a mineralogical investigation to gain further understanding of gold occurrences and mineral associations, as well as gangue mineralogy, at this grind size.

The sample was separated into gravity concentrate and gravity tail fractions using a Falcon concentrator and hand-panning before being submitted for mineralogy. Mass distribution to gravity concentrate and gravity tail fractions following separation was 2.57% and 97.43% respectively.

13.9.5.1 Mineral Abundance of Gravity Concentrate

A sub-sample of the gravity concentrate from CMA-UG-COMP-800-1000 was prepared into a polished section and analysed using quantitative mineralogical analysis by QEMSCAN-FS (quantitative evaluation of minerals by scanning electron microscopy using field scan) at 6 µm analysis point spacing.

For the gravity concentrate, it was found that pyrite is the dominant sulfide, making up 39.7% by mass of the total sample, and ~99% of sulfide minerals identified, with a P_{80} of 81 µm. A trace of chalcopyrite (0.10%) and other sulfides (0.01%) is also present. The remaining sample mass of the gravity concentrate is mainly made-up of silicate (predominantly quartz, albite and chlorite) and carbonate (predominantly ankerite-dolomite and calcite) gangue minerals. <0.01% native gold is present in the gravity concentrate of CMA-UG-COMP-800-1000. The mineral abundance of the gravity concentrate by grouping is shown in Figure 13-52.

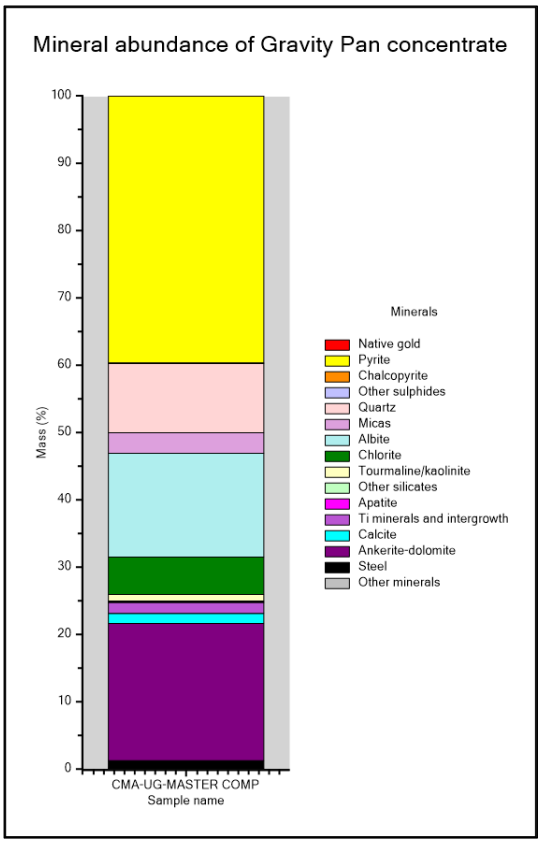


Figure 13-52: Mineral abundance of gravity concentrate from CMA-UG-COMP-800-1000

13.9.5.2 Mineral Liberation of Gravity Concentrate

Mineral liberation data were derived from the QEMSCAN-FS analysis of the gravity concentrate from CMA-UG-COMP-800-1000. Particle liberation classes are defined as follows:

- Well-liberated (>90% surface area)
- High grade middlings (60-90% surface area)
- Medium grade middlings (30-60% surface area)
- Low grade middlings (10-30% surface area)
- Locked (<10% surface area).

Figure 13-53 presents the mass fraction of particles by liberation class for pyrite particles in the gravity concentrate from CMA-UG-COMP-800-1000 (Con: Py) and the combined silicates in the gravity concentrate from CMA-UG-COMP-800-1000 (Con: Sil). 92.0% of pyrite particles were found to be well-liberated.

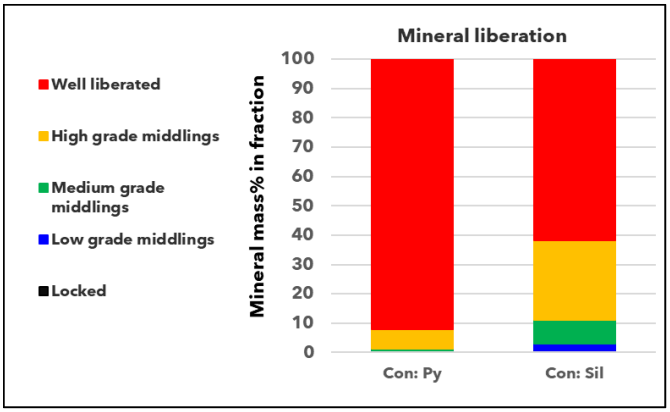


Figure 13-53: Mineral liberation of pyrite and combined silicates of gravity concentrate from CMA-UG-COMP-800-1000

13.9.5.3 Gold Grain Size Distribution of Gravity Concentrate

Bright phase search for minerals with high atomic density and strong electron backscatter response, including gold-rich mineral phases, was undertaken using the QEMSCAN-TMS analysis. The particles measured during the TMS scan were mapped with 1 µm spacing. 39 native gold grains were identified in the polished section of gravity concentrate from CMA-UG-COMP-800-1000. The indicative gold grain size distribution data that were derived from this analysis are presented in Table 13-131. For the calculation of grain sizes, the gold-bearing grains were digitally extracted from images of the gold-hosting particles.

Table 13-131: Indicative gold grain size distribution of gravity concentrate from CMA-UG-COMP-800-1000

GRAIN SIZE (µm)	NUMBER OF NATIVE GOLD GRAINS	NATIVE GOLD MASS %
38 - 53	1	43.3
27 - 38	1	19.4
20 - 27	2	16.3
15 - 20	0	0.0
10 - 15	1	1.7
5 - 10	15	15.0
2 - 5	18	4.0
1 - 2 [13]	1	0.2

Figure 13-54 sorts the gold grains (in red) by size fraction, as well as providing an overview of host minerals and host mineral distribution within gold grain size classes. It is noted that fine gold grains (1 to 15 µm grain size) are predominantly associated with pyrite.

[13] Gold grains smaller than 1 µm and solid solution gold in sulfides are beyond the detection limit of QEMSCAN

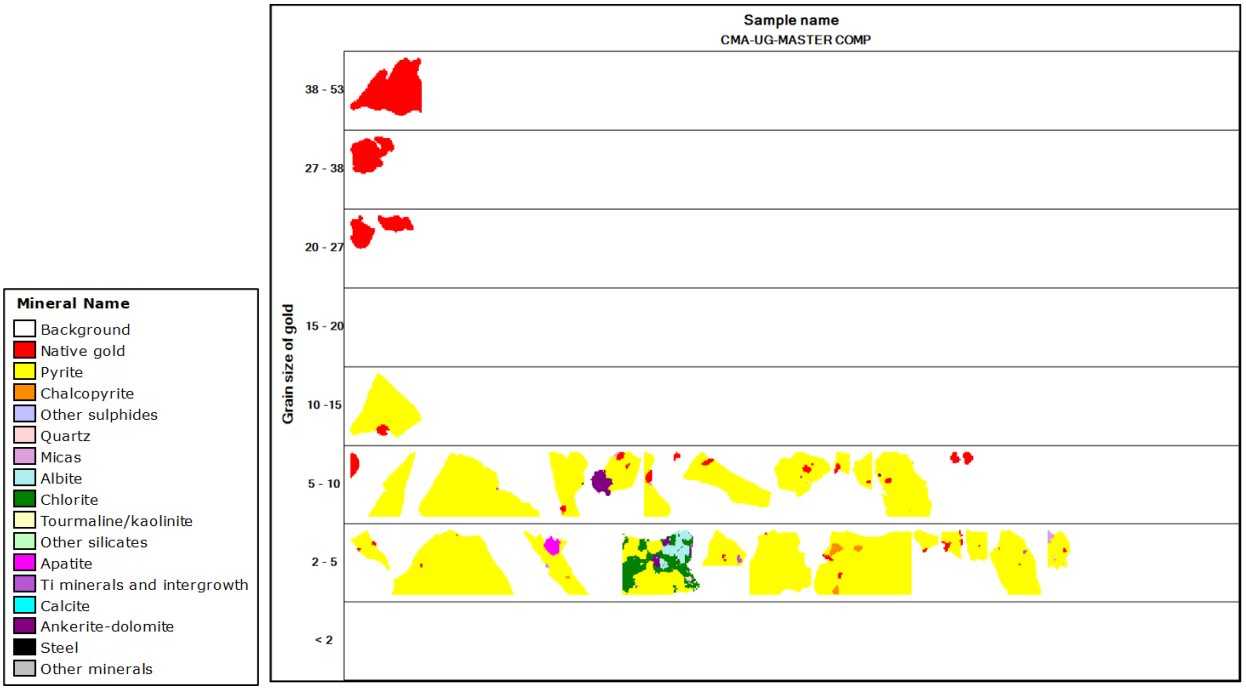


Figure 13-54: Image grid showing the distribution of gold grain sizes of gravity concentrate from CMA-UG-COMP-800-1000

13.9.5.4 Gold Exposure of Gravity Concentrate

Indicative gold exposure data were derived from the QEMSCAN-TMS analysis for the 39 native gold grains that were identified in the polished section of gravity concentrate from CMA-UG-COMP-800-1000. The indicative data for the exposure of gold grains is presented in Table 13-132. For the calculation of gold exposure, the gold-bearing grains were digitally extracted from images of the gold-hosting particles.

Table 13-132: Indicative exposure of gold grains of gravity concentrate from CMA-UG-COMP-800-1000

PARTICLE SURFACE AREA EXPOSED (%)	NUMBER OF NATIVE GOLD GRAINS	NATIVE GOLD MASS %
>90	8	85.4
60-90	2	0.5
30-60	11	7.5
0-30	3	2.4
Fully encapsulated in host particle	15	4.1

Eight gold grains, ranging in size from 5 to 53 µm and contributing an indicative 85.4% of gold mass, occur as well exposed or free grains. The remaining 31 gold grains are moderately exposed (~8.1% by mass) or are enclosed within pyrite (~6.6% by mass) and are smaller than 15 µm.

13.9.5.5 Gold Locking of Gravity Concentrate

Indicative gold locking data were derived from the QEMSCAN-TMS analysis for the 39 native gold grains that were identified in the polished section of gravity concentrate from CMA-UG-COMP-800-1000. The locking data reflects the major mineral(s) that the gold-hosting particle is comprised of (not necessarily adjacent to the gold grain). Gold locking classes are defined as follows:

- Liberated native gold (particles having gold >90% surface area)

- Binary native gold-pyrite (particles having gold + pyrite >90% surface area)
- Native gold-pyrite-NSG (particles having gold + pyrite + non-sulfide gangue >90% surface area).

The indicative gold locking data is presented in Table 13-133, and graphically in the image grid in Figure 13-55.

Table 13-133: Indicative locking of gold grains of gravity concentrate from CMA-UG-COMP-800-1000

GOLD LOCKING CLASS	NUMBER OF PARTICLES	NUMBER OF NATIVE GOLD GRAINS	NATIVE GOLD MASS %
Liberated native gold	8	8	85.4
Binary native gold-pyrite	20	27	13.1
Native gold-pyrite-NSG	3	4	1.5

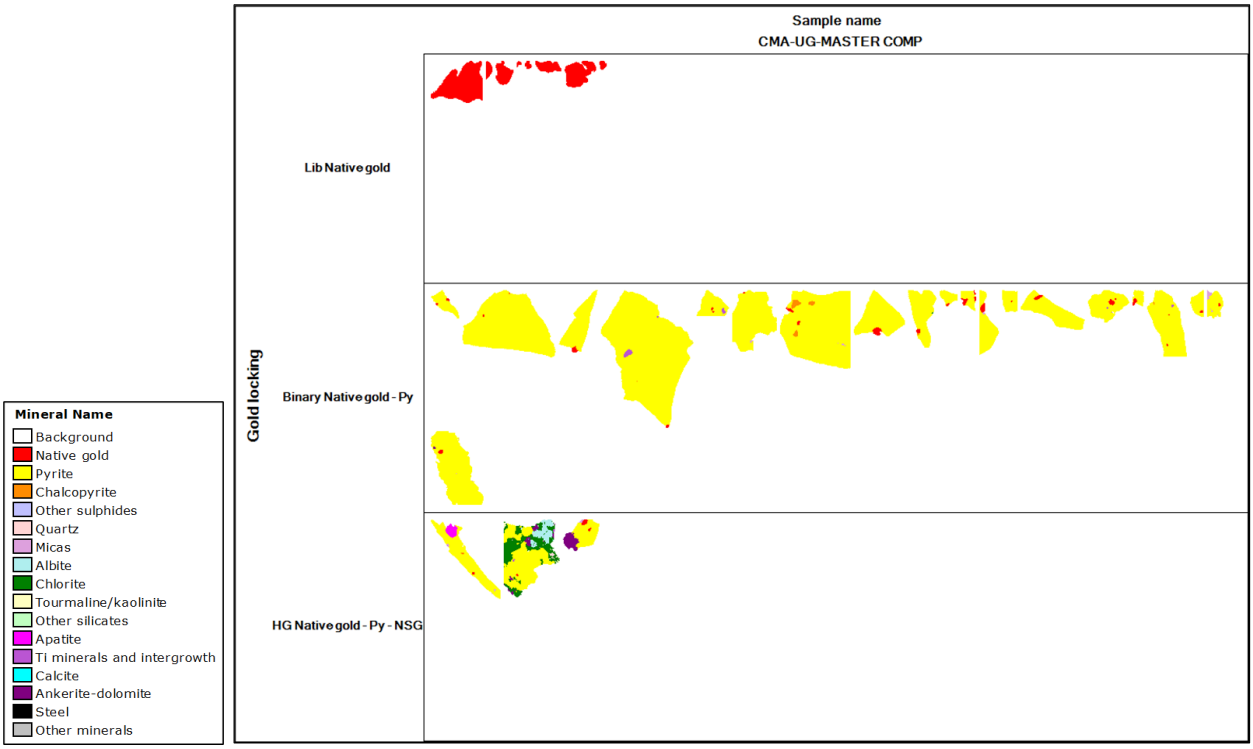


Figure 13-55: Image grid showing the distribution of gold grains between locking classes of gravity concentrate from CMA-UG-COMP-800-1000

13.9.5.6 Energy Dispersive Spectrometry and Back Scattered Electron Images of Gold Grains

Spot analysis of 15 native gold grains identified was undertaken by manual EDS using standardless quantification. A summary of findings from the manual EDS analysis is displayed in Table 13-134.

Table 13-134: Gold grain data from EDS analysis of gravity concentrate from CMA-UG-COMP-800-1000

HOST PARTICLE NUMBER	HOST MINERAL	GOLD GRAIN NUMBER	GOLD MINERAL	LIBERATION [14]	Au (%)*	Ag (%)*
1	none	1	native gold	liberated	94	6
2	none	2	native gold	liberated	92	8
	none	3	native gold	liberated	92	8
3	none	4	native gold	liberated	91	9
	none	5	native gold	liberated	92	8
	none	6	native gold	liberated	92	8
4	none	7	native gold	liberated	94	6
5	pyrite	8	native gold	exposed	94	6
6	pyrite	9	native gold	exposed	92	8
7	pyrite	10	native gold	exposed	95	5
	pyrite	11	native gold	encapsulated	97	3
8	pyrite	12	native gold	encapsulated	100	0
9	pyrite	13	native gold	exposed	89	11
10	pyrite	14	native gold	encapsulated	97	3
11	pyrite	15	native gold	encapsulated	94	6

* normalised % phase composition, host response excluded

Seven out of 15 gold grains are free native gold particles, with the other 8 gold grains being associated with pyrite. 11 out of 15 gold grains were either liberated or exposed (and therefore would be available to cyanidation). The native gold grains contain 89-100% gold and 0-11% silver.

BSE images of the 15 native gold grains were also captured. Images for composite particles (host particles 5 to 11) are presented in Figure 13-56 to Figure 13-59, which provide further visual detail on the degree of liberation of gold grains within these composite particles.

[14] Liberated = >90% surface area of gold grain exposed; Exposed = >0 ≤90% surface area of gold grain exposed; Encapsulated = gold grain without surface exposure

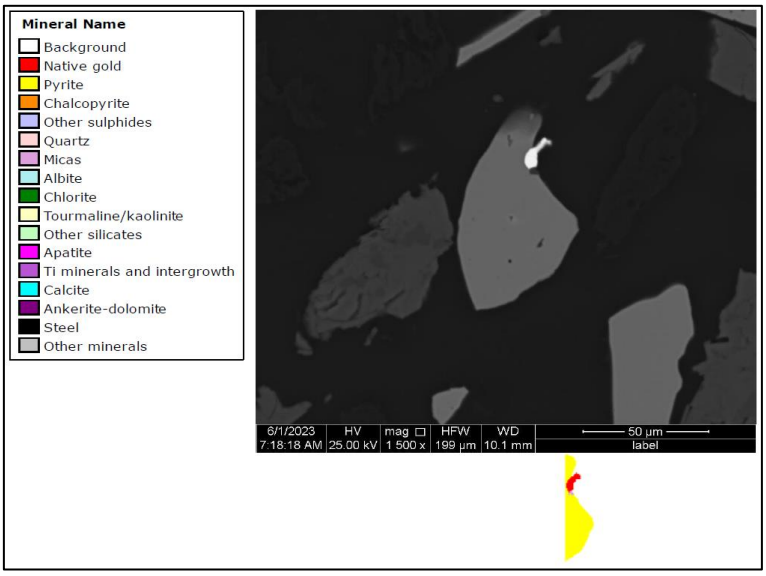


Figure 13-56: BSE image of host particle 5, gold grain 8 from gravity concentrate of CMA-UG-COMP-800-1000

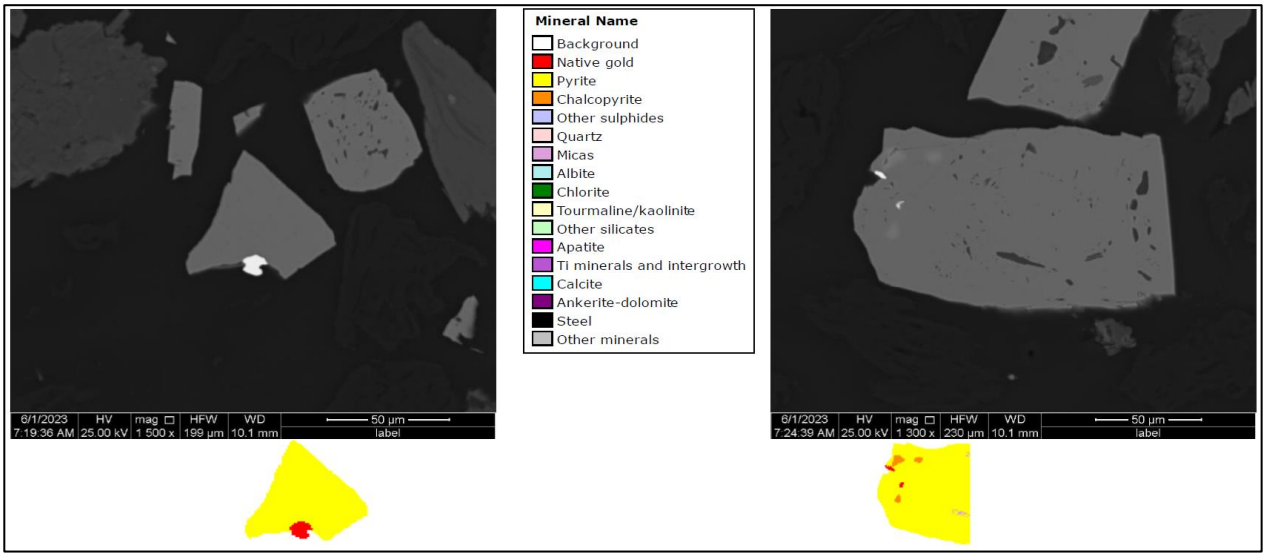


Figure 13-57: BSE images of (L): host particle 6, gold grain 9; and (R): host particle 7, gold grains 10 and 11 from gravity concentrate of CMA-UG-COMP-800-1000

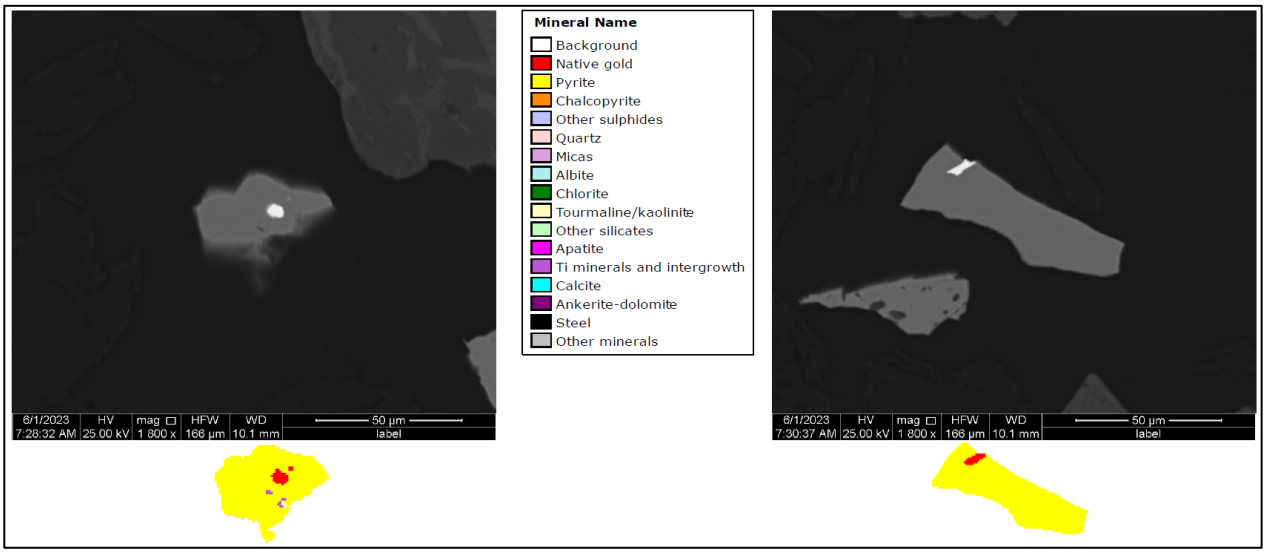


Figure 13-58: BSE images of (L): host particle 8, gold grain 12; and (R): host particle 9, gold grain 13 from gravity concentrate of CMA-UG-COMP-800-1000

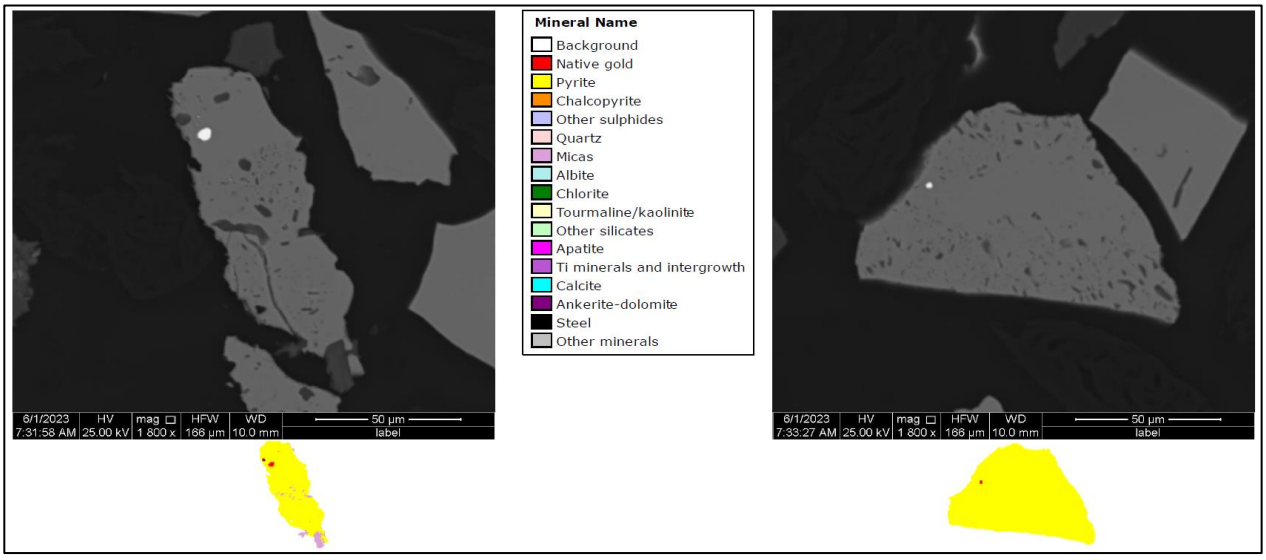


Figure 13-59: BSE images of (L): host particle 10, gold grain 14; and (R): host particle 11, gold grain 15 from gravity concentrate of CMA-UG-COMP-800-1000

13.9.5.7 Gravity Tail of Mineralogical Composite

A sub-sample of the gravity tail from CMA-UG-COMP-800-1000 was pressed into a back-packed sample holder to minimise preferred orientation of the particles. Powder XRD was used to analyse the gravity tail sample and a combination of matrix flushing and RIR derived constants were used in the quantification of the minerals identified in the sample. Quantitative results were normalised to 100%, representing the relative proportions of crystalline minerals in the sample. Any amorphous minerals that may be present in the gravity tail of CMA-UG-COMP-800-1000 cannot be detected by the powder XRD method.

The gravity tail contains only a minor amount of pyrite (3%). Most of the sample mass is made up of non-sulfide gangue minerals, with dolomite-ankerite, chlorite, plagioclase and quartz being

dominant. The mineral abundance of the gravity tail of CMA-UG-COMP-800-1000 is shown in Table 13-135.

Table 13-135: Mineral abundance of gravity tail of CMA-UG-COMP-800-1000

MINERAL GROUP	MASS %
Dolomite-ankerite	31
Chlorite	27
Plagioclase	17
Quartz	11
Muscovite	5
Pyrite	3
Calcite	3
Annite-biotite-phlogopite	1
Tourmaline	1
K-feldspar and/or rutile	1
Clay minerals	1

13.9.6 Viscosity

A series of rheology tests were performed at five different pulp densities on metallurgical composite sample CMA-UG-COMP-800-1000 ground to P_{80} of 53 µm. The slurry was adjusted to pH 10.5 using milk of lime, thereby simulating CIL operating conditions. The viscosities were measured using a Bohlin Visco 88 bench viscometer and all tests were conducted at ambient temperature. The results are summarised in Table 13-136.

Table 13-136: Viscosity results for metallurgical composite sample CMA-UG-COM-800-1000

SAMPLE	SOLIDS CONC (% w/w)	VISCOSITY (cP) AT SHEAR RATE (s^{-1})							
		4.2	7.4	13.1	21.9	38.9	67.4	119.2	209.5
CMA-UG-COMP-800-1000	55	374	340	216	144	97	77	76	91
	50	337	297	192	129	85	65	67	80
	45	225	191	156	115	77	56	58	68
	40	0	170	132	93	65	51	51	64
	35	0	0	120	86	61	44	45	56

As described by Norgaard (2019), if viscosity:

- <100 cP at a shear rate of 119.2 s-1, then there should be no pumping issues.
- <3,500 cP at a shear rate of 4.2 s-1, then there should be no mixing or screening issues.

Based on these guidelines, there should be no viscosity related materials handling issues when treating CMA underground ore in the Yaouré processing plant at any of the pulp densities tested when ground to P_{80} of 53 µm.

13.9.7 Thickening and Settling Rate

Modelling of the Yaouré process plant hydrocyclone cluster when campaign treating CMA underground ore at target P_{80} of 53 µm (summarised in Section 13.10.1.2) indicates that operating the existing cluster to achieve target cut size and target process stream pulp densities is achievable. Given the similarities between CMA pit fresh ore and CMA underground ore, it is recommended

that a multi-day plant trial is run on CMA pit fresh ore at a target grind size P_{80} of 53 µm to better understand the operational performance and constraints of running the plant under this configuration, using the outcomes to determine whether further plant modifications are required. In the case that controlling a water balance around the grinding circuit becomes challenging during the plant trial or campaign processing of CMA underground ore, it is anticipated that test work results from Section 13.9.7 can be used in trade-off studies considering the selection and installation of a pre-leach thickener to mitigate these effects.

CMA-UG-COMP-800-1000 metallurgical composite slurry, at pH of 10.5 and target grind size P_{80} of 53 µm (measured as P_{80} of 57 µm by laser diffraction size analysis in Metso report), was subjected to thickening and settling rate test work by Metso, Perth as part of the ALS Metallurgy test work program. The objectives of the test work were to determine:

- flocculant type and dose.
- overflow clarity.
- underflow density.
- underflow yield stress.

13.9.7.1 Flocculant Screening

Flocculant screening was conducted on CMA-UG-COMP-800-1000 metallurgical composite in 500 mL static cylinder tests at a pulp density of 10% w/w solids. Common BASF flocculants (Magnafloc® 10, 155, 351 and 5250) were tested. Results are shown in Figure 13-60.

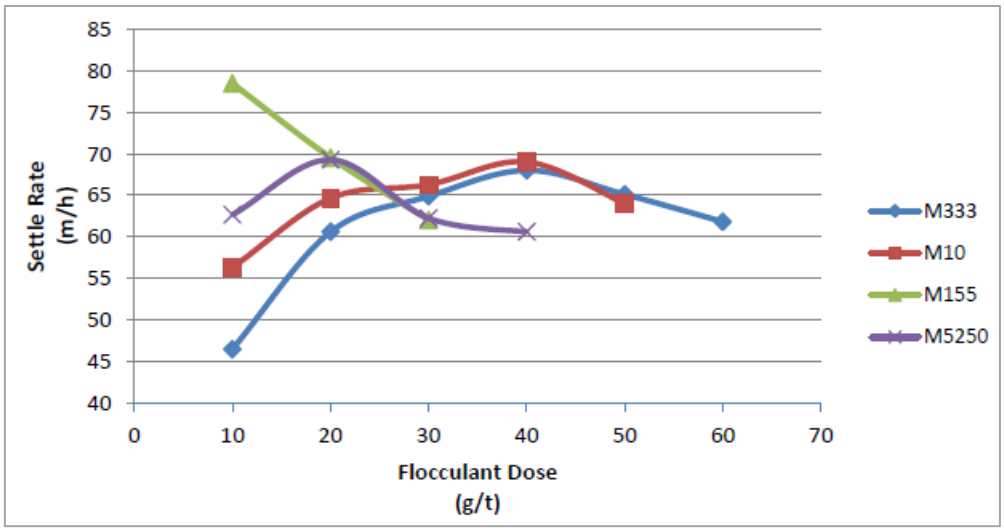


Figure 13-60: Settling rates of CMA-UG-COMP-800-1000 metallurgical composite at 10% w/w solids in static cylinder tests

BASF Magnafloc® 155 (M155) was selected for dynamic thickening test work due to its superior settling rate and excellent overflow clarity.

13.9.7.2 Dynamic Thickening Tests

Dynamic thickening tests on CMA-UG-COMP-800-1000 metallurgical composite were conducted using a 99 mm diameter high-rate thickener test rig. Slurry was drawn from an agitated stock tank by a variable speed peristaltic pump, diluted and pH adjusted to 10.5 with lime. Stock flocculant solution was mixed to 0.25% w/v (2.5 g/L), and then diluted as required before being dosed to the test rig at a set flow rate, which was varied across the series of tests between 2 and 10 g/t. Diluted

flocculant was dosed half into the diluent line and half into the diluted feed line further downstream. The flocculated solids bed was raked continuously at 2 rpm with two rotating pickets, in conjunction with two stationary pickets to aid dewatering.

Overflow samples were collected and analysed to determine suspended solids content. Underflow samples were collected to determine solids concentration and a simple unsheared vane yield stress was measured using a Thermo Haake VT550 rheometer and an OK600 4 blade vane to assist with thickener rake drive sizing.

A summary of results from the dynamic thickening tests is presented in Table 13-137.

Table 13-137: Dynamic thickening test work results for CMA-UG-COMP-800-1000 metallurgical composite

TEST	FEED FLUX ($t/m^2/h$)	FEED LIQUOR RISE RATE (m/h)	FLOCCULANT TYPE	FLOCCULANT DOSE (g/t)	UNDERFLOW SOLIDS CONC. (% w/w)	UNDERFLOW YIELD STRESS (Pa)	OVERFLOW SOLIDS CONC. (mg/L)
1	0.50	2.46	M155	10	67.6	11	<100
2	0.50	2.46	M155	5	68.2	11	<100
3	0.50	2.46	M155	2	68.0	7	100
4	0.75	3.69	M155	5	66.4	5	<100
5	1.00	4.92	M155	5	65.4	4	<100

The test work results show that CMA-UG-COMP-800-1000 metallurgical composite can be thickened by high rate thickening to underflow pulp densities of 65.4-68.2% w/w solids over a flux rate range of 0.50-1.00 $t/m^2/h$, with simultaneously good overflow clarity.

13.10 Predicted Metallurgical Performance

Section 13.10 discusses the parameters derived by Perseus for the processing of different Yaouré Gold Mine ore sources in LOM plans, and the rationale for the selection of these parameters.

13.10.1.1 Comminution Circuit Throughput

The specific energy required to grind Yaouré Gold Mine ores from an F_{80} of 173 mm (modelled crushed ore size distribution from (Lycopodium, 2019)) to the required target grind size has been calculated. Specific energy modelling for oxide and transition ores is by OMC (Orway Mineral Consultants (WA) Pty Ltd, 2017), using OMC's proprietary power modelling techniques. All other ore types have been modelled by Perseus using the methodology described by (Morrell, 2009). For all ores, the 85^{th} percentile of specific energy data has been used to conservatively model the throughput achievable within the maximum mill pinion power draw (5,700 kW for each mill) and comminution circuit configuration of the Yaouré processing plant (as described in Section 17.4.3).

From the 85^{th} percentile specific energy data, a modelled plant throughput was calculated, taking into account the dimensions and maximum pinion power draw for each mill, pebble crusher capacity and the Yaouré comminution circuit configuration. A summary of these results is presented in Table 13-138.

It is expected over time that the average process plant throughput achieved for each ore type should closely correlate to the modelled plant throughput rate based on the average (rather than 85^{th} percentile) total specific energy of the ore type population dataset. A limit of 92.5% of maximum pinion power draw for each mill was considered for the average specific energy throughput cases, based on operational data collected from the Yaouré processing plant. Explanatory notes are provided in the right-hand column of Table 13-138 for any variances between modelled and selected comminution circuit throughput rates.

Table 13-138: Specific energy and modelled and selected plant throughput at target grind size, by ore type

DEPOSIT/ORE TYPE	P_{80} GRIND SIZE (µm)	SAG MILL SPECIFIC ENERGY (kWh/t)	BALL MILL SPECIFIC ENERGY (kWh/t)	PEBBLE CRUSHER SPECIFIC ENERGY (kWh/t)	TOTAL SPECIFIC ENERGY (kWh/t)	MODEL THROUGHPUT (t/h)	SELECTED THROUGHPUT (t/h)	SELECTED THROUGHPUT (Mt/a)	NOTES
CMA pit fresh	75	11.8	10.9	0.3	22.9	482	475	3.80	Selected throughput based on actual plant throughput achieved during May to August 2023 (Figure 17-3)
Yaouré pit granodiorite	75	15.4	13.1	0.4	28.9	360	389	3.11	Selected throughput based on average total specific energy of the ore type population dataset
Yaouré pit basalt	75	16.8	14.9	0.4	32.1	340	365	2.92	Selected throughput based on average total specific energy of the ore type population dataset
CMA/Yaouré pit oxide	75	2.5	5.7	0.0	8.2	871	475	3.80	Selected throughput capped to the same throughput as CMA pit fresh ore as it is anticipated to be a minor blend component moving forward
CMA/Yaouré pit transition	75	7.8	8.3	0.2	16.3	570	475	3.80	Selected throughput capped to the same throughput as CMA pit fresh ore as it is anticipated to be a minor blend component moving forward
Heap leach pad residue	75	2.5	5.7	0.0	8.2	871	475	3.80	Given oxidised nature of the heap leach material, assumed to be the same as oxide ore
CMA SW oxide	75	2.5	5.7	0.0	8.2	871	475	3.80	As per CMA/Yaouré pit oxide ore
CMA SW transition	75	7.8	8.3	0.2	16.3	570	475	3.80	As per CMA/Yaouré pit transition ore
CMA SW fresh	75	11.8	10.9	0.3	22.9	482	475	3.80	As per CMA pit fresh ore
Angovia 2 oxide	75	2.5	5.7	0.0	8.2	871	475	3.80	As per CMA/Yaouré pit oxide ore
Angovia 2 transition	75	7.8	8.3	0.2	16.3	570	475	3.80	As per CMA/Yaouré pit transition ore
Angovia 2 fresh	75	16.5	18.2	0.4	35.1	290	290	2.32	Selected throughput based on average total specific energy of the ore type population dataset
Govisou oxide	75	2.5	5.7	0.0	8.2	871	475	3.80	As per CMA/Yaouré pit oxide ore
Govisou transition	75	7.8	8.3	0.2	16.3	570	475	3.80	As per CMA/Yaouré pit transition ore
Govisou fresh	75	16.0	10.9	0.4	27.2	331	330	2.64	Selected throughput based on average total specific energy of the ore type population dataset
CMA underground	53	10.5	11.0	0.2	21.7	394	394	3.15	Selected throughput based on average total specific energy of the ore type population dataset

In practice, the Yaouré processing plant will follow the operating strategy whereby ore throughput is maximised by drawing as close as practical to the design maximum mill pinion power on the power limited mill, whilst achieving steady state operations throughout the plant. In cases where the comminution circuit is ball mill power limited, additional load can be sent to the SAG mill with recirculation of a bleed stream from the cyclone underflow splitter box (132-BX-002).

13.10.1.2 Comminution Circuit Classification

Given that the campaign treatment of CMA underground ore targets a finer grind size P_{80} of 53 µm (and therefore finer hydrocyclone cut size), modelling of the existing cyclone cluster (133-CS-001) was required to confirm whether the hydrocyclones can operate at this duty and what changes are required to the grinding circuit water balance or hydrocyclone cluster to achieve the required throughput and cut size. Currently installed is a 16-way cluster, fitted with 15 Cavex® 400CVD10 hydrocyclones supplied by Weir Minerals (Weir).

The results of the hydrocyclone modelling are included in Table 13-139. The hydrocyclone modelling aimed to:

- Utilise cyclone internal components with common dimensions for all cases, where possible, and preferably utilise the dimensions of the internal cyclone components currently installed
- Achieve cyclone overflow and underflow slurry solids concentrations within an acceptable range, as noted in Table 13-139
- Achieve cyclone overflow P_{80} within ±5 µm of the target size
- Ensure that the flow rate and operating pressure per cyclone falls within the published ranges for Cavex® 400 model cyclones, as shown in Figure 13-61. Note that the hydrocyclone capacity curve for the 400CVD10 cyclones closely aligns to that of 400CVX10 cyclones.

The modelled results for P_{80} of 75 µm Case 1 in Table 13-139 align to observed plant operating performance and conditions, as discussed in Section 17.5.1.2.

Table 13-139: Yaouré plant hydrocyclone modelling for grind sizes P_{80} of 75 µm and P_{80} 53 µm at different comminution circuit throughputs and circulating loads

PARAMETER	P_{80} 75 µm CASE 1	P_{80} 75 µm CASE 2	P_{80} 53 µm CASE 1	P_{80} 53 µm CASE 2	NOTES
Fresh feed (t/h)	475	475	394	394	
Circulating Load (%)	250	400	300	450	250-400% circulating load for P_{80} of 75 µm as per (Lycopodium, 2019). Higher circulating load range of 300-450% considered for finer grinding case P_{80} of 53 µm
Modelled Ore SG	2.80	2.80	2.80	2.80	As per (Lycopodium, 2019)
Feed (m^3/h)	1,667	2,329	1,781	2,369	
Number cyclones	12	15	11	15	15 fitted as per original supply, capacity for 16
Feed per cyclone (m^3/h)	139	155	162	158	
Feed Slurry (%w/w solids)	60.8	61.6	56.4	57.6	
OF Slurry (%w/w solids)	42.5	40.0	40.0	39.0	Targeting 40%w/w solids for CIL circuit feed (acceptable range 39-43% w/w solids)
UF Slurry (%w/w solids)	73.5	71.2	65.3	64.4	Targeting 72%w/w solids (acceptable range 64-75% w/w solids)
Number cyclones	12	15	11	15	15 fitted as per original supply, capacity for 16
Cyclone Inlet (mm)	130	130	130	130	130 mm as per original supply
Vortex Finder (mm)	100	100	100	100	100 mm as per original supply; 100 and 110 mm currently in warehouse; Supplied by Weir in sizes 100-150 mm
Spigot (mm)	80	80	80	80	90 mm originally supplied; 80 mm currently installed; 80, 90 and 100 mm currently in warehouse; Supplied by Weir in sizes 32-120 mm
Modelled OF P_{80} (µm)	75	75	53	58	Target grind size ±5 µm
Operating pressure (kPa)	123	154	168	160	Max distributor pressure 300 kPa; max safe operating pressure 250 kPa

The modelled outcomes for the operating cases are shown as red crosses in Figure 13-61. All fall comfortably within the capacity range for the Cavex® 400CVD10 hydrocyclone model, with

modelling also predicting that roping of cyclone underflow will not occur under any of the modelled conditions.

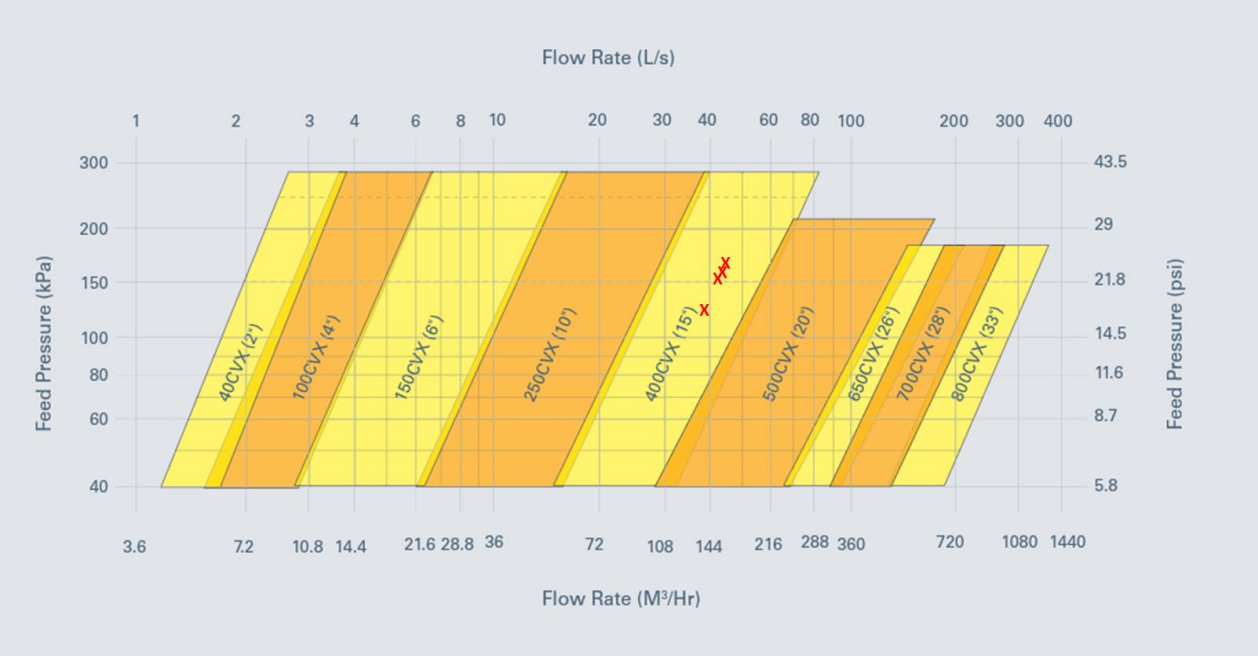


Figure 13-61: Yaouré hydrocyclone modelling cases on Weir Cavex® hydrocyclone capacity chart (Weir Minerals, 2016)

Based on the above assessment, it is recommended that a sixteenth hydrocyclone is fitted to the hydrocyclone cluster to provide additional capacity for operational contingency.

In the case that controlling a water balance around the grinding circuit becomes challenging during a plant trial on CMA pit fresh ore at grind size P_{80} of 53 µm or campaign processing of CMA underground ore at P_{80} of 53 µm, it is anticipated that test work results from Section 13.9.7 can be used in trade-off studies considering the selection and installation of a pre-leach thickener to mitigate these effects.

13.10.1.3 Overall Plant Gold Recovery

The test work results from 2017-2023 test work programs, considered in the context of updated orebody interpretations during 2023, as well as processing plant operating data, were used to estimate gold recovery by ore type for life of mine planning and economic modelling. Table 13-140 summarises average combined gravity/leach extraction data from test work at 24 h, 30 h (nominal plant leach/CIL circuit residence time, interpolated) and 36 h, as well as the plant recovery (combined gravity/leach) selected by Perseus for business planning, mine design and optimisation and economic modelling by ore type. Notes on the rationale for the selected plant recoveries by ore type are included in the right-hand column of Table 13-140.

Table 13-140: Predicted overall plant gold recovery, by ore type

ORE TYPE	TARGET GRIND P_{80} (µm)	24 h TEST WORK EXTRACTION (%)	30 h TEST WORK EXTRACTION (%)	36 h TEST WORK EXTRACTION (%)	SELECTED PLANT RECOVERY (%)	NOTES
CMA pit oxide	75	90.7	91.1	91.5	92.5	Test work extraction data refers to combined data set for CMA and Yaouré pit oxide samples. Selected plant recovery derived from test work and plant recovery data from the period of April to June 2021
CMA pit transition	75	92.1	92.3	92.6	92.0	Test work extraction data refers to combined data set for CMA and Yaouré pit transition samples. Selected plant recovery derived from test work and plant recovery data from June 2021
CMA pit fresh	75	89.9	90.3	90.6	91.5	Selected plant recovery derived from test work and plant recovery data from the period of September 2021 to June 2023
Yaouré pit oxide	75	90.7	91.1	91.5	93.0	Test work extraction data refers to combined data set for CMA and Yaouré pit oxide samples. Selected plant recovery derived from plant recovery data for CMA pit oxide ore from June 2021 to July 2021
Yaouré pit transition	75	92.1	92.3	92.6	93.3	Test work extraction data refers to combined data set for CMA and Yaouré pit oxide samples. Selected plant recovery derived from plant recovery data for CMA pit transition ore from June 2021 to July 2021
Yaouré pit granodiorite	75	94.7	94.8	94.9	93.8	Selected plant recovery derived from 30 h test work extraction for ore-grade samples, de-rated for CIL plant solution loss
Yaouré pit basalt	75	92.9	93.2	93.4	92.6	Selected plant recovery derived from 30 h test work extraction, de-rated for CIL plant solution loss
Heap leach pad residue – CMA1	75	85.2	85.8	86.4	84.5	Selected plant recovery derived from recovery from historic heap leach operation for ore type
Heap leach pad residue – CMA2	75	92.7	93.1	93.5	82.5	Test work extraction data not used due to CMA3 heap residue not realising test work extractions in plant. Selected plant recovery derated and derived from recovery from historic heap leach operation for ore type
Heap leach pad residue – CMA3	75	98.4	98.5	98.6	63.0	Selected plant recovery derived from plant recovery data from the period of November 2020 to December 2020
Heap leach pad residue – Cluff	75	93.7	94.1	94.5	78.8	Test work extraction data not used due to CMA3 heap residue not realising test work extractions in plant. Selected plant recovery derated and derived from recovery from historic heap leach operation for ore type
Heap leach pad residue – EGlobal	75	90.9	91.4	91.8	83.7	Test work extraction data not used due to CMA3 heap residue not realising test work extractions in plant. Selected plant recovery derated and derived from recovery from historic heap leach operation for ore type
CMA SW oxide	75	-	-	-	93.4	Given proximity to CMA pit and similar style of mineralisation, selected plant recovery based on plant recovery data for CMA pit oxide ore from June 2021. Further confirmatory test work required
CMA SW transition	75	-	-	-	94.5	Given proximity to CMA pit and similar style of mineralisation, selected plant recovery based on plant recovery data for CMA pit transition ore from June 2021. Further confirmatory test work required
CMA SW fresh	75	-	-	-	89.5	BLEG test recoveries averaged 4-5% lower recovery for CMA SW fresh ores, compared to CMA SW oxide and transition ores. 5% recovery deduction taken from selected CMA SW transition ore recovery. Further confirmatory test work required
Angovia 2 oxide	75	93.0	93.8	94.6	92.9	Selected plant recovery derived from 30 h test work extraction, de-rated for CIL plant solution loss
Angovia 2 transition	75	95.9	96.1	96.2	92.0	Given that there is only a single variability test sample, the same recovery as CMA pit transition ore was selected
Angovia 2 fresh	75	92.1	92.5	92.9	91.1	Selected plant recovery derived from 30 h test work extraction, de-rated for CIL plant solution loss
Govisou oxide	75	89.4	89.9	90.5	91.0	Selected plant recovery based on apparent flat 30 h extraction across samples tested (92.0%), minus 1.0% deduction for solution loss
Govisou transition	75	91.6	92.1	92.5	91.9	Selected plant recovery based on apparent flat 30 h extraction across samples tested (92.9%), minus 1.0% deduction for solution loss
Govisou fresh Au ≥1.1 g/t	75	92.9	92.9	93.2	91.7	Selected plant recovery based on apparent flat 30 h extraction across samples tested (92.7%), minus 1.0% deduction for solution loss
Govisou fresh Au <1.1 g/t	75	77.1	77.1	77.1	49.81×Au + 38.21	Trend line for 30 h extraction across samples within grade range
CMA underground	53	89.4	89.5	89.5	See equations below	87.2% is average Mineral Reserves gold recovery from secondary regression equation applied to block models

For CMA underground ore, multivariable regression modelling of 30 h leach variability test work extraction data at target grind size P_{80} of 53 µm, de-rated for CIL plant solution loss, indicated that gold recovery had the strongest correlation to both gold and sulfur head grade. CMA underground gold recovery prediction, based on gold head grade (g/t) and sulfur head grade (%), was determined by the primary regression equation to be:

$$Recovery = 90.1005 + 1.42642\ Au\ - 4.38991\ S$$

In simplistic terms the R-squared (R^2) coefficient of determination (square of Pearson product moment coefficient) from linear regression modelling is a goodness of fit measure of how well data fits a model, with a perfect correlation have an R^2 value of 1. The recovery regression using gold and sulfur head grades has an R^2 of 0.81 and a corrected R^2 of 0.79. This equation is constrained to gold grades below 10 g/t, a minimum gold recovery of 77.0% and a maximum gold recovery of 97.0%.

Given that sulfur interval assays and block models are still under development for CMA underground, an alternative gold recovery prediction algorithm has been developed, based on gold head grade (g/t), x coordinate (UTM easting in m), y coordinate (UTM northing in m) and z coordinate (mine RL in m), to facilitate economic modelling and business planning. CMA underground gold recovery prediction, based on gold head grade and position coordinates, was determined by the secondary regression equation to be:

$$Recovery = 1.854953745\ Au\ + 0.020944227\ x + 0.018691957\ y + 0.056966098\ z - 19147.80314$$

This regression has an R^2 of 0.75 and a corrected R^2 of 0.69. This equation is also constrained to gold grades below 10 g/t, a minimum gold recovery of 77.0% and a maximum gold recovery of 97.0%.

It is hypothesised that the 3D position within the CMA underground orebody is acting as a predictor for sulfur grade, which appears to correlate to the higher-grade shoots in CMA. Figure 13-62 is a heat map of predicted gold recoveries across the CMA underground orebody. Cooler colours indicate lower recoveries (from 77%) and warmer colours indicate higher recoveries (up to 97%).

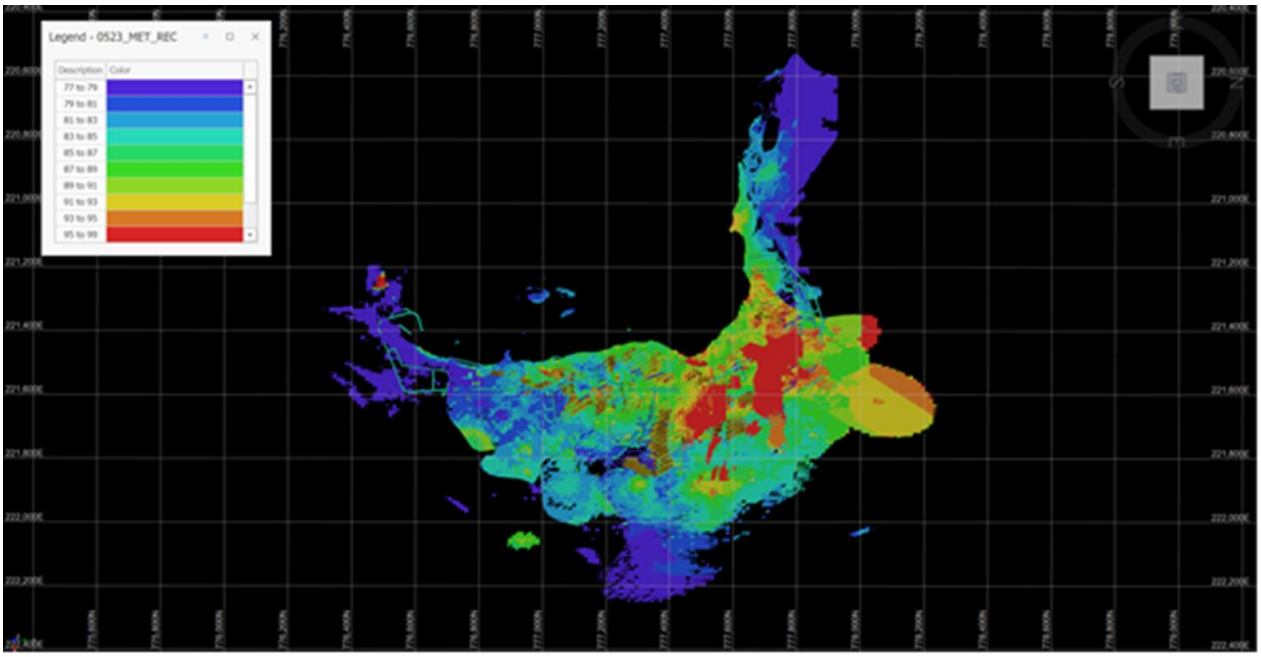


Figure 13-62: Heat map of predicted gold recovery across the CMA underground orebody (cooler colours indicate lower recoveries from 77%; warmer colours indicate higher recoveries up to 97%) (Perseus, 2023)

It is preferred to use the gold and sulfur head grade recovery algorithm to predict gold recovery from CMA underground ore once resource sulfur assay data and modelling supports and allows this.

13.10.1.4 Reagent Consumptions

Results from 2017-2023 metallurgical test work programs, considered in the context of updated orebody interpretations during 2023, as well as process plant operating data, were used to estimate key reagent consumptions by ore type for LOM planning and economic modelling.

For sodium cyanide consumption, additional allowance is included for a residual sodium cyanide concentration of 100 mg/L leaving CIL, as well as consumption in the intensive leach reactor (ILR) and elution circuit.

For lime, the selected consumption rate includes an adjustment for the difference in CaO content between lime used in laboratory test work (60% to 68% CaO) and lime supplied to the process plant (90% CaO), as well as an allowance for addition to cyanide destruction. Table 13-141 summarises sodium cyanide and lime consumptions, by ore type. Notes on the reagent consumptions selected are included in the right-hand column of Table 13-141.

Table 13-141: Predicted sodium cyanide and lime consumption, by ore type

ORE TYPE	TARGET GRIND P_{80} (µm)	NaCN CONSUMPTION (kg/t)	LIME CONSUMPTION (kg/t)	NOTES
CMA pit fresh	75	0.43	1.40	Based on reconciled process plant consumption rates
Yaouré pit granodiorite	75	0.38	0.50	Based on variability test work consumption data, with corrections as described above
Yaouré pit basalt	75	0.44	0.50	Based on variability test work consumption data, with corrections as described above
CMA/Yaouré pit oxide	75	0.49	2.10	Based on variability test work consumption data, with corrections as described above
CMA/Yaouré pit transition	75	0.42	1.00	Based on variability test work consumption data, with corrections as described above
Heap leach pad residue – CMA1	75	0.49	2.10	CMA/Yaouré pit oxide consumption rate used, due to oxidised nature of material
Heap leach pad residue – CMA2	75	0.49	2.10	CMA/Yaouré pit oxide ore consumption rate used, due to oxidised nature of material
Heap leach pad residue – CMA3	75	0.49	2.10	CMA/Yaouré pit oxide ore consumption rate used, due to oxidised nature of material
Heap leach pad residue – Cluff	75	0.49	2.10	CMA/Yaouré pit oxide ore consumption rate used, due to oxidised nature of material
Heap leach pad residue – EGlobal	75	0.49	2.10	CMA/Yaouré pit oxide ore consumption rate used, due to oxidised nature of material
CMA SW oxide	75	0.49	2.10	CMA/Yaouré pit oxide ore consumption rate used
CMA SW transition	75	0.42	1.00	CMA/Yaouré pit transition ore consumption rate used
CMA SW fresh	75	0.43	1.40	CMA pit fresh ore consumption rate used
Angovia 2 oxide	75	0.35	4.35	Based on variability test work consumption data, with corrections as described above
Angovia 2 transition	75	0.33	2.36	Based on variability test work consumption data, with corrections as described above
Angovia 2 fresh	75	0.30	0.37	Based on variability test work consumption data, with corrections as described above
Govisou oxide	75	0.45	3.21	Based on variability test work consumption data, with corrections as described above
Govisou transition	75	0.44	1.70	Based on variability test work consumption data, with corrections as described above
Govisou fresh	75	0.41	0.39	Based on variability test work consumption data, with corrections as described above
CMA underground	53	0.36	1.63	Based on variability test work consumption data, with corrections as described above

13.11 Deleterious Elements

Yaouré Gold Mine ores contain no known deleterious elements or minerals that could have a significant effect on potential economic recovery of gold in a hybrid leach/carbon-in-leach cyanidation process, based on metallurgical test work and/or operational experience.

Mercury is present at levels at which it is recommended that regular monitoring of gold room emissions is undertaken to ensure the risk of exposure to personnel is managed.

14 Mineral Resource Estimates

14.1 Overview

The Yaouré Gold Mine Mineral Resource estimate consists of five deposits: Yaouré, CMA, CMA SW, Govisou and Angovia 2. The CMA SW, Govisou and Angovia 2 deposits are collectively referred to as the Satellite Deposits. The data cut-off date for this latest resource update is June 30, 2023 with Mineral Resources depleted for mining activities and operating stockpiles, including the previously processed Yaouré heap leach pads current as of June 30, 2023. Mineral Resources are inclusive of Mineral Reserves.

Geological and mineralisation wireframes and the estimation for the Yaouré open pit and CMA underground models were prepared by Mr Hans Andersen, as a former employee of Perseus in the role of Group Geologist. Geological and mineralisation wireframes and the estimation for the CMA, CMA SW, Govisou and Angovia 2 open pits were prepared by Mr Jonathon Abbott of MPR Geological Consultants Pty Ltd (MPR). Mr Daniel Saunders has reviewed each estimate, validated any relevant depletion for mining, and confirmed reporting for each Mineral Resource. Mr Saunders assumes responsibility for the Mineral Resource estimates disclosed in this report.

The updated Yaouré Gold Mine Mineral Resource estimate has an Effective Date of September 18, 2023 and has been disclosed in accordance NI 43-101 and prepared using the CIM Definition Standards and CIM Best Practice Guidelines. This Report summarises the work completed by Perseus to prepare the Mineral Resource models and Mineral Resource estimates.

The September 18, 2023 Yaouré Gold Mine Mineral Resource estimate is an update of the 2017 Report.

Previous (historical) Mineral Resource estimates for the Yaouré Gold Mine are described in Section 6.6.

14.2 Methods Summary

Mineral Resources reported herein have been estimated using a geostatistical block modelling approach, informed from gold assay data obtained from predominantly core and RC drill chip samples. The geological wireframes consider structural and lithological interpretations of the gold mineralisation.

The Yaouré open pit and CMA underground Mineral Resource estimates were prepared using Seequent Leapfrog Geo software using the Edge module, with block model editing and resource reporting conducted using Micromine™ software.

The CMA open pit and Satellite Deposits Mineral Resource estimates were prepared using Micromine™ software for data compilation, domain modelling, compositing and resource reporting. The resource estimation was conducted using GS3M software.

The evaluation of the Yaouré Mineral Resources involves the following procedures:

- Database compilation and verification.
- Generation and verification of three-dimensional geological models.
- Data conditioning (including compositing and grade capping), statistical analysis and variography.
- Selection of estimation strategies and estimation parameters.

- Block model generation, grade estimation and validation.
- Classification and depletion for mining.
- Preparation of the Mineral Resource estimate and reporting.

14.3 Data

The Yaouré Gold Mine geological database as of June 30, 2023, comprised a combination of exploration and resource definition stage data sourced from RC and DD drilling for a total of 542,208 m of sampling summarised in Table 14-1. The spatial distribution of the exploration and Resource definition drilling is shown in Figure 14-1.

All geological data are captured and stored in an acQuire™ SQL geological database hosted securely through Azures cloud servers managed by Perseus staff. User access to the database is regulated by specific user permissions.

Table 14-1: Yaouré Gold Mine drilling summary

HOLE TYPE	HOLE COUNT	TOTAL METRES
Diamond	659	164,470
Reverse Circulation	2,890	210,606
RC/Diamond Tail	581	167,132
Total	**4,130**	**542,208**

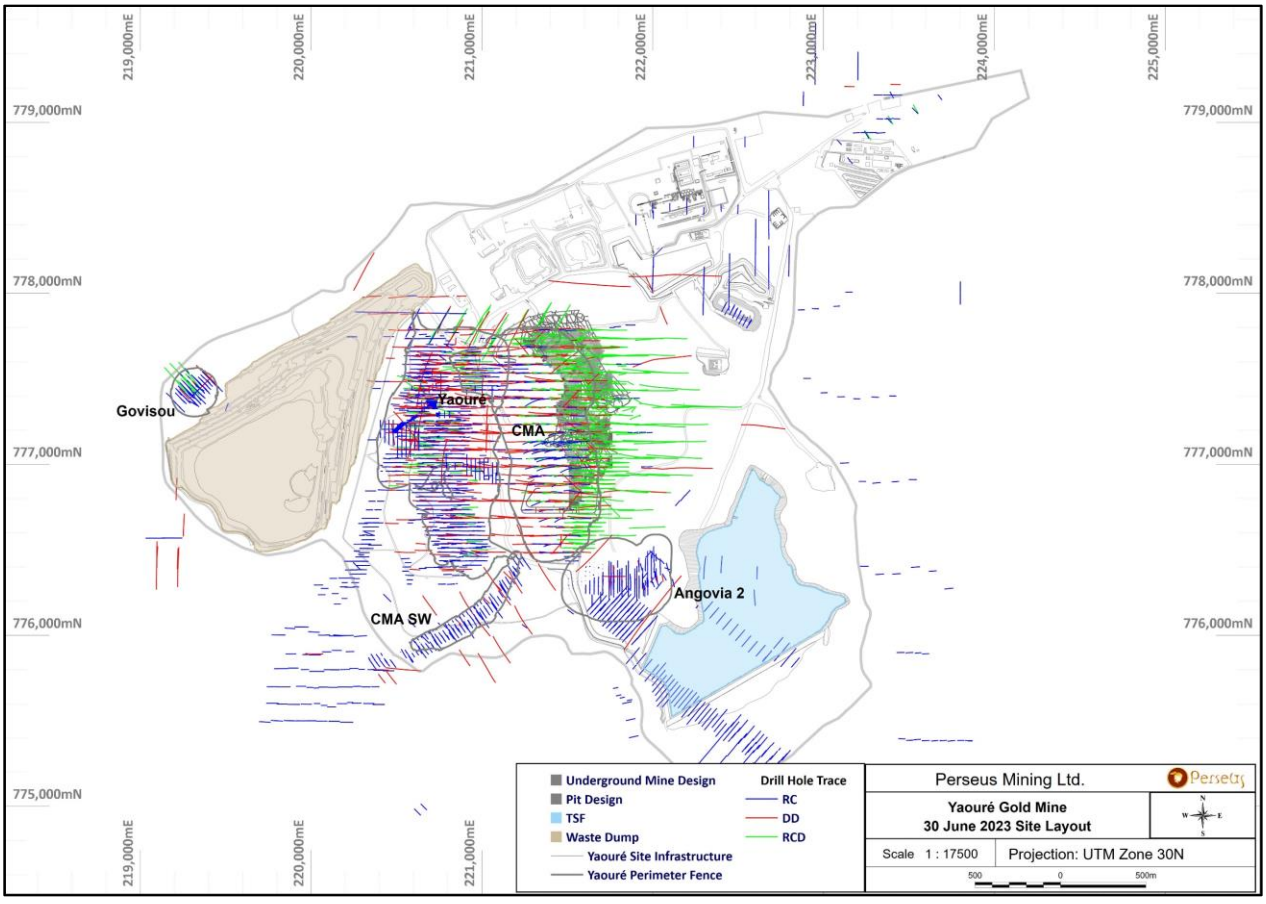


Figure 14-1: Location and spatial distribution of RC and DD drill holes at Yaouré Gold Mine

14.3.1 Drilling Databases

Subsets of data relevant to each of the Mineral Resource estimates were extracted from the Yaouré Gold Mine database. Summaries of the data used for each of the models are presented in Table 14-2. Data subsets (with given cut-off dates) for each deposit are not necessarily mutually exclusive; each deposit subset may also contain holes relevant to the other deposits/estimates.

Table 14-2: Drilling data subsets, per-deposit/Mineral Resource estimate, Yaouré Gold Mine

DEPOSIT/ESTIMATE	HOLE TYPE	HOLE COUNT	TOTAL METRES
Yaouré (June 2023)	Diamond	379	81,482
	Reverse Circulation	1,486	90,348
	RC/Diamond Tail	94	18,211
	Total	**1,959**	**190,041**
CMA open pit & CMA SW (June 2022)	Diamond	1,083	239,899
	Air Core	50	2,030
	Reverse Circulation	2,442	224,644
	Total	**3,575**	**466,573**
CMA underground (April 2023)	Diamond	81	34,537
	Reverse Circulation	21	5,156
	RC/Diamond Tail	373	126,860
	Total	**475**	**166,553**
Govisou (April 2021)	Diamond	15	2,320
	Reverse Circulation	76	7,779
	Total	**91**	**10,099**
Angovia 2 (March 2021)	Diamond	19	2,707
	Reverse Circulation	501	23,927
	Total	**520**	**26,634**

14.3.2 Topographic Surveys

The topographic surface used at each of the deposits that form the Yaouré Gold Mine Mineral Resources is based on an aerial LiDAR survey conducted in 2017 (Figure 14-2). The LiDAR survey is reliable to ±0.2 m and considered appropriate for use in estimating the Mineral Resources.

All estimates are conducted in the Yaouré mine grid coordinate system which is a UTM coordinate system based on WGS84 Zone 30N. The mine elevation datum is increased by 1,000 m to the natural topographic datum.

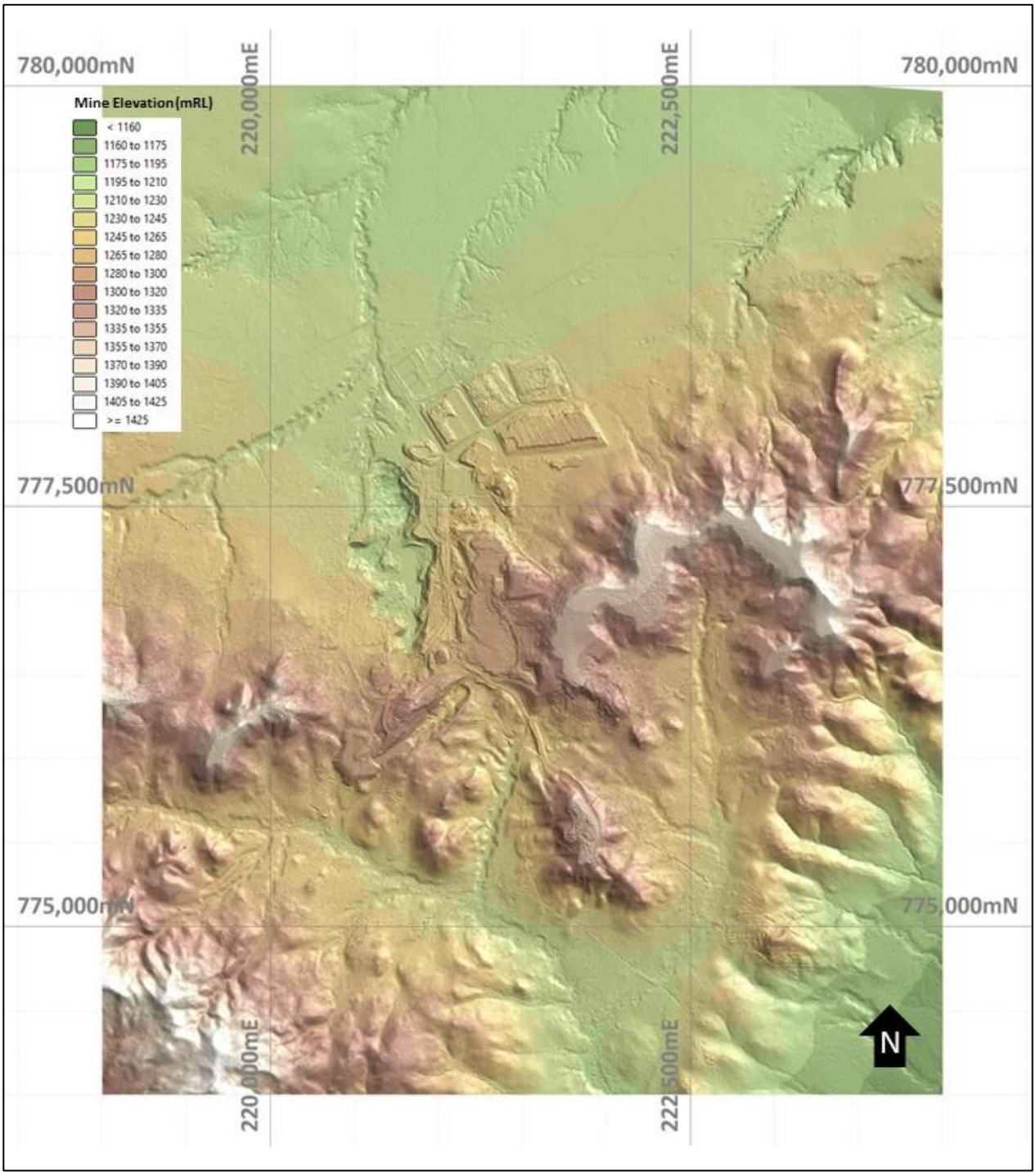


Figure 14-2: Yaouré topographic LiDAR surface (Perseus, 2017)

14.4 Geological Interpretation and Modelling

14.4.1 Weathering

Modelled weathering surfaces are below the respective topographic surface and are used to flag the oxide states in the respective Yaouré Gold Mine resource estimate block models. Modelled weathering surfaces are based on recorded geological logs with intersection points digitised to the base of the corresponding interval which informs the three-dimensional surfaces. The Yaouré Gold

Mine Mineral Resources are reported including oxide material, with adjustments made for the lower densities of this material.

14.4.1.1 Yaouré Open Pit and CMA Underground Mineral Resource Estimates

The modelled weathering profile for the Yaouré open pit and CMA underground models are shown in Figure 14-3 and Figure 14-4. The weathering profile defines zones of complete and partial oxidisation, as well as fresh rock. The weathering surfaces are used to assign density to the Yaouré open pit and CMA underground resource models.

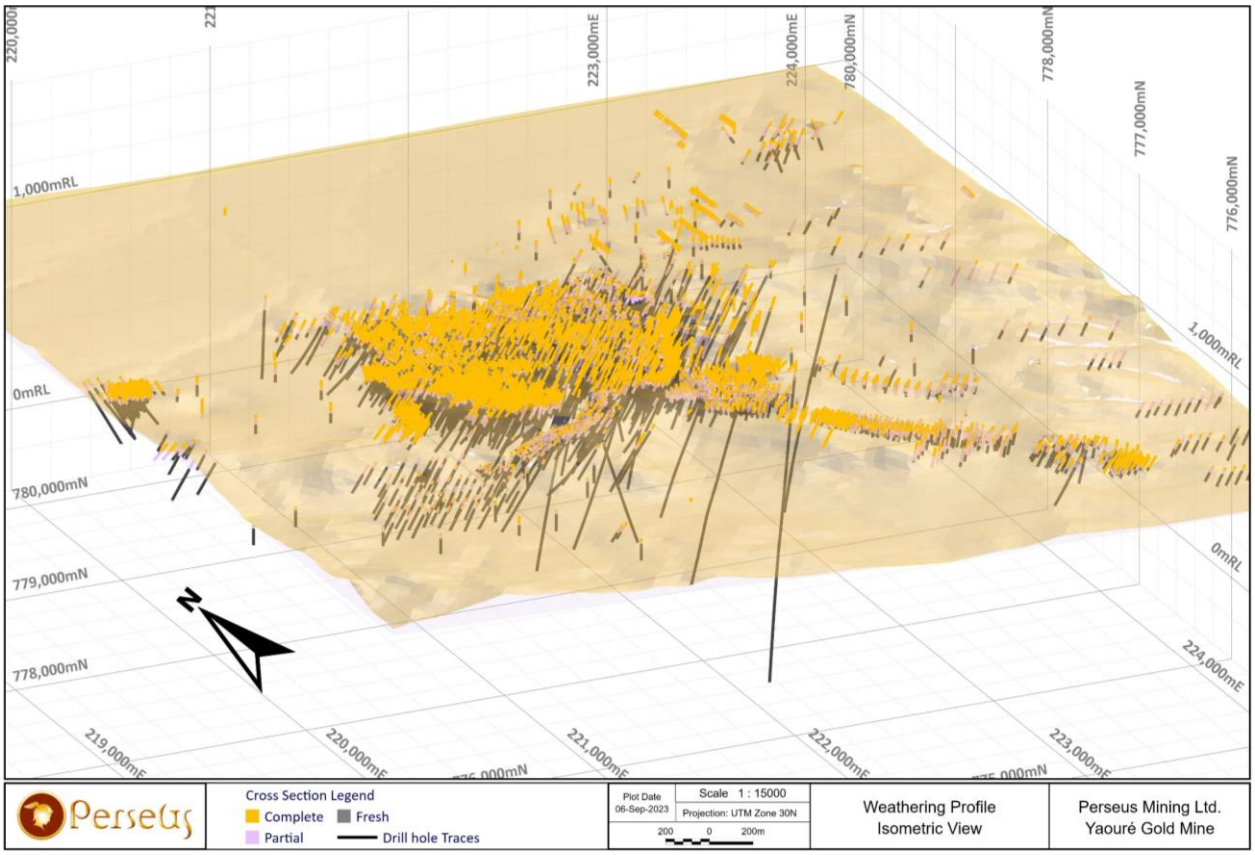


Figure 14-3: Isometric view of modelled weathering surfaces in the Yaouré open pit and CMA underground resource models

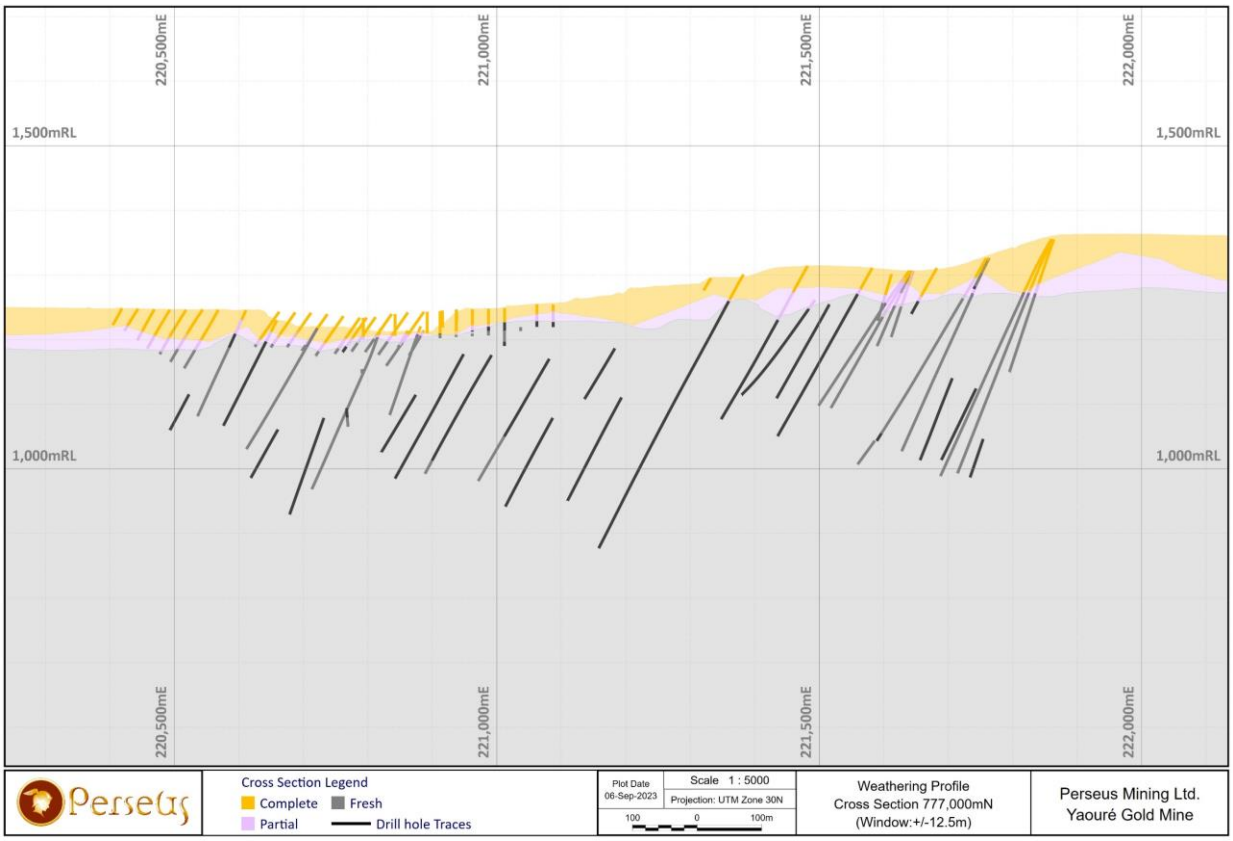


Figure 14-4: Weathering profile in cross-section 777,000 mN (±12.5 m) in the Yaouré open pit and CMA underground resource models

14.4.1.2 CMA Open Pit and CMA SW Mineral Resource Estimate

The combined weathering domains range from around 9 m to 100 m in thickness with fresh rock occurring at an average depth of around 50 m below the pre-mining surface. Information supplied for the CMA open pit and CMA SW resource estimate included weathering surfaces interpreted by Perseus from drill hole geological logs. These surfaces represent the base of laterite, base of complete weathering upper, base of complete weathering lower, base of partial weathering and base of fracture associated weathering (top of fresh rock) as detailed in Table 14-3. The supplied surfaces were slightly modified by MPR to remove small areas of overlaps and were combined with the mineralised domains to generate the multiple indicator kriged (MIK) estimates, including density assignment in the resource model.

Perseus supplied surfaces representing the base of complete and partial oxidation respectively (Figure 14-5). Although not directly used for resource estimation, the block model was coded by these surfaces to facilitate assignment of metallurgical parameters for mine planning purposes.

Table 14-3: Weathering codes in the CMA open pit and CMA SW resource model

MODEL CODE	DESCRIPTION
1	Laterite
2	Completely weathered upper
3	Completely weathered lower
4	Partially weathered
5	Fracture weathering
6	Fresh

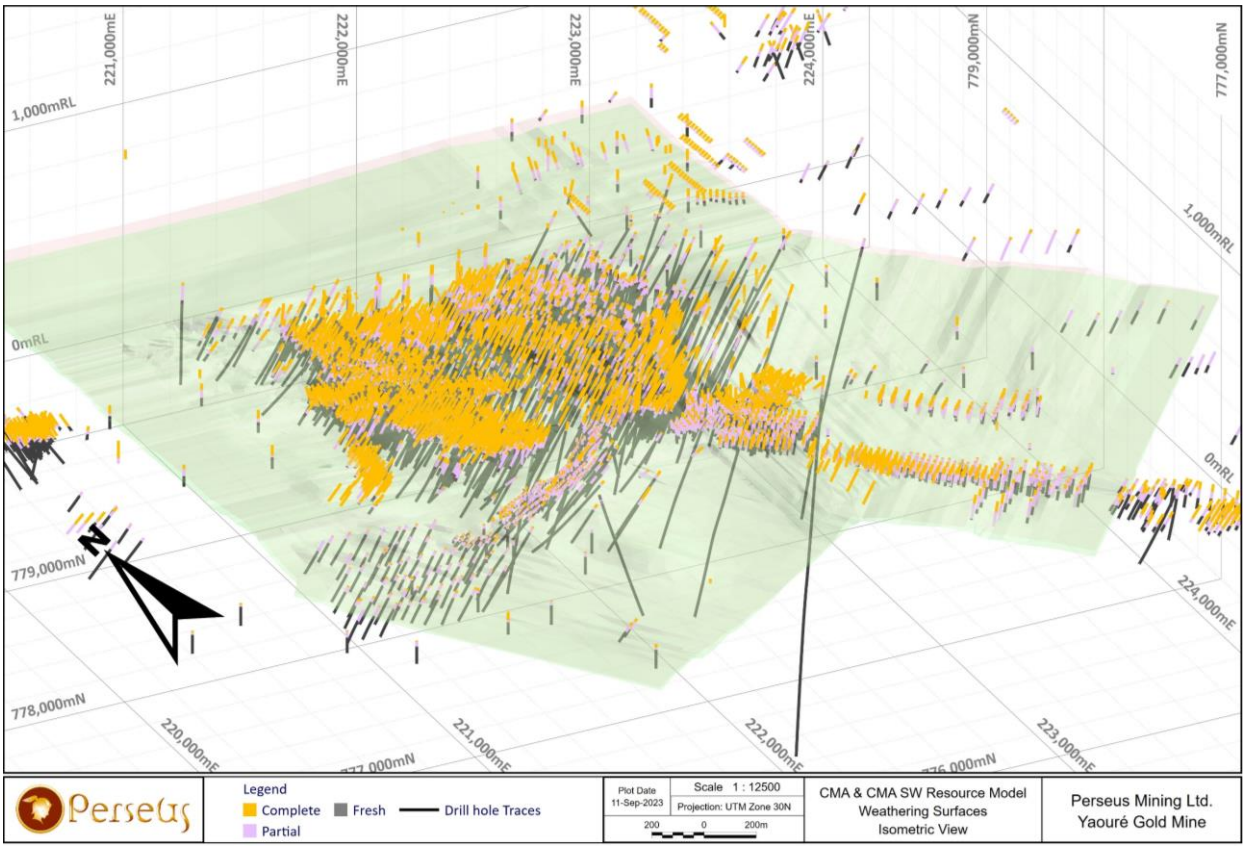


Figure 14-5: Isometric view of modelled weathering surfaces in the CMA open pit and CMA SW resource model

14.4.1.3 Govisou Mineral Resource Estimate

Surfaces representing the base of laterite, base of complete weathering upper, base of complete weathering lower, base of partial weathering and base of fracture associated weathering (top of fresh rock) were interpreted by Perseus from drill hole geological logs (Figure 14-6 and Figure 14-7). Closed solid wireframes produced from these surfaces were used for assigning weathering zones for the modelling, including density assignment. To simplify nomenclature of these zones, the surficial laterite is described as a weathering zone.

The combined weathering domains range from approximately 26 m to 60 m in thickness, with fresh rock occurring at an average depth of around 44 m below surface, as detailed in Table 14-4.

Table 14-4: Weathering domain thickness for Govisou resource model

WEATHERING ZONE	THICKNESS (m)		
	Min.	Mean	Max.
Laterite	0.0	6.4	15.5
Completely weathered upper	4.6	10.4	18.5
Completely weathered lower	3.2	12.0	22.7
Partially weathered	0.1	8.3	18.8
Fracture weathered	0.9	6.6	19.6
Combined weathering	**25.7**	**43.7**	**60.3**

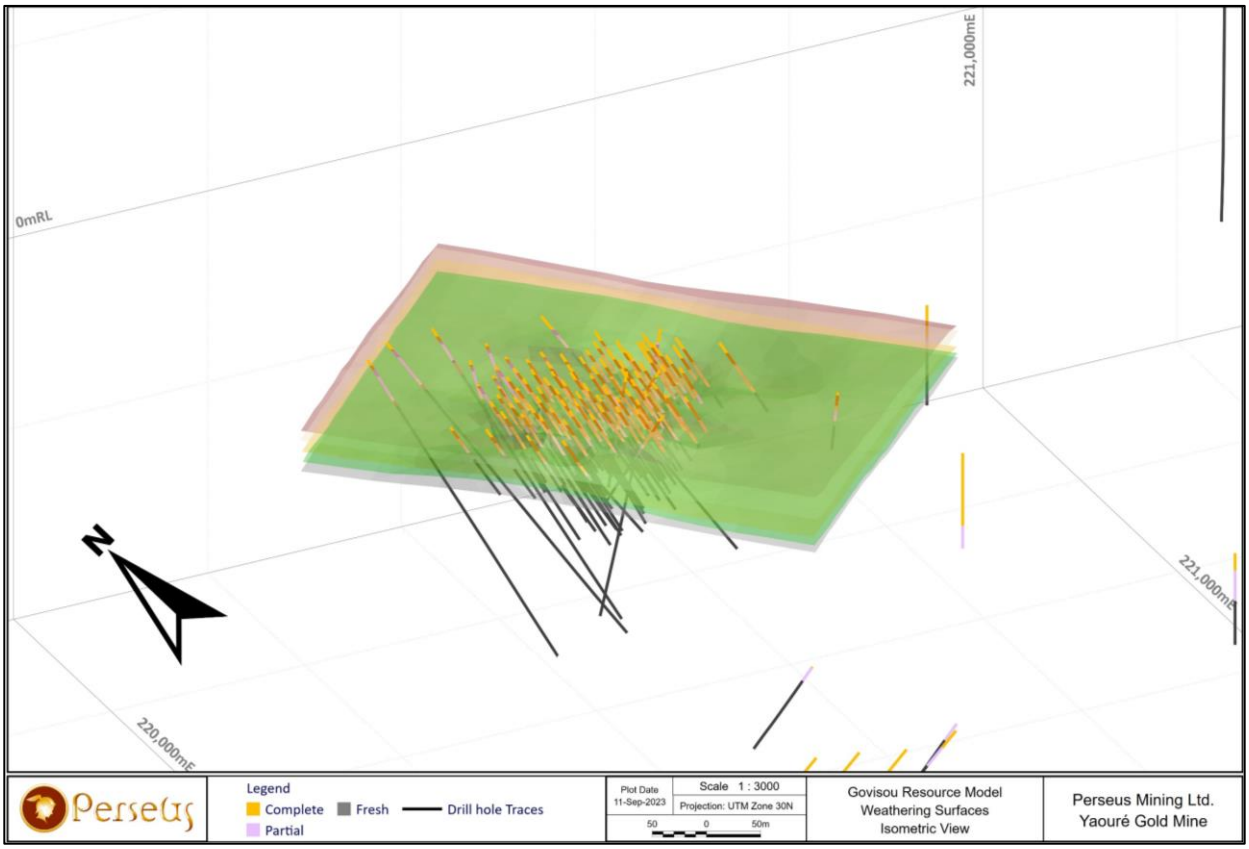


Figure 14-6: Isometric view of modelled weathering surfaces in the Govisou resource model

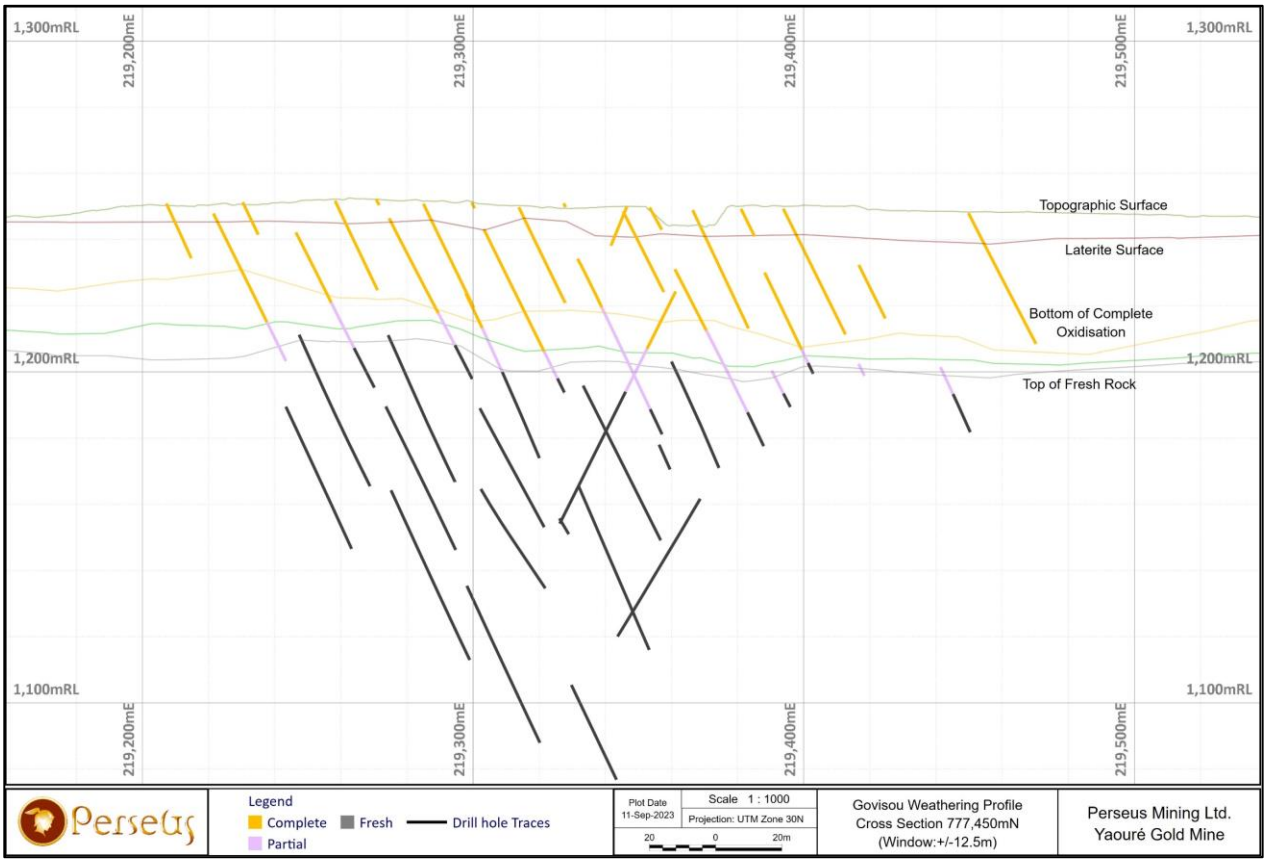


Figure 14-7: Weathering profile in cross-section 777,450 mN (±12.5 m) in the Govisou resource models

14.4.1.4 Angovia 2 Mineral Resource Estimate

The Angovia 2 resource estimate utilises the modelled weathering surfaces from the CMA open pit and CMA SW resource model shown in Figure 14-5.

At the Angovia 2 deposit, the combined weathering domains range from approximately 25 m to 92 m in thickness, with fresh rock occurring at an average depth of around 60 m below surface, as detailed in Table 14-5.

Table 14-5: Weathering domain thickness for Angovia 2 resource model

WEATHERING ZONE	THICKNESS (m)		
	Min.	Mean	Max.
Laterite	0.0	2.3	11.2
Completely weathered upper	4.8	21.8	38.8
Completely weathered lower	4.9	20.2	37.0
Partially weathered	0.8	8.7	22.9
Fracture weathered	1.4	8.8	24.8
Combined weathering	**25.5**	**60.0**	**92.4**

14.4.2 Lithology

14.4.2.1 Yaouré Open Pit and CMA Underground Mineral Resource Estimates

The modelled lithology for the Yaouré open pit and CMA underground resource models comprises a deep monzogranite intrusive, multiple granodiorites and intrusive late stage dykes intruding a massive basalt sequence that is truncated by an unconformity of overlying sediment (volcaniclastic) basin sequence in the north (Figure 14-8 and Figure 14-9).

The modelled dykes are interpreted to be post mineralisation and are considered barren for the Yaouré and CMA underground resource estimates.

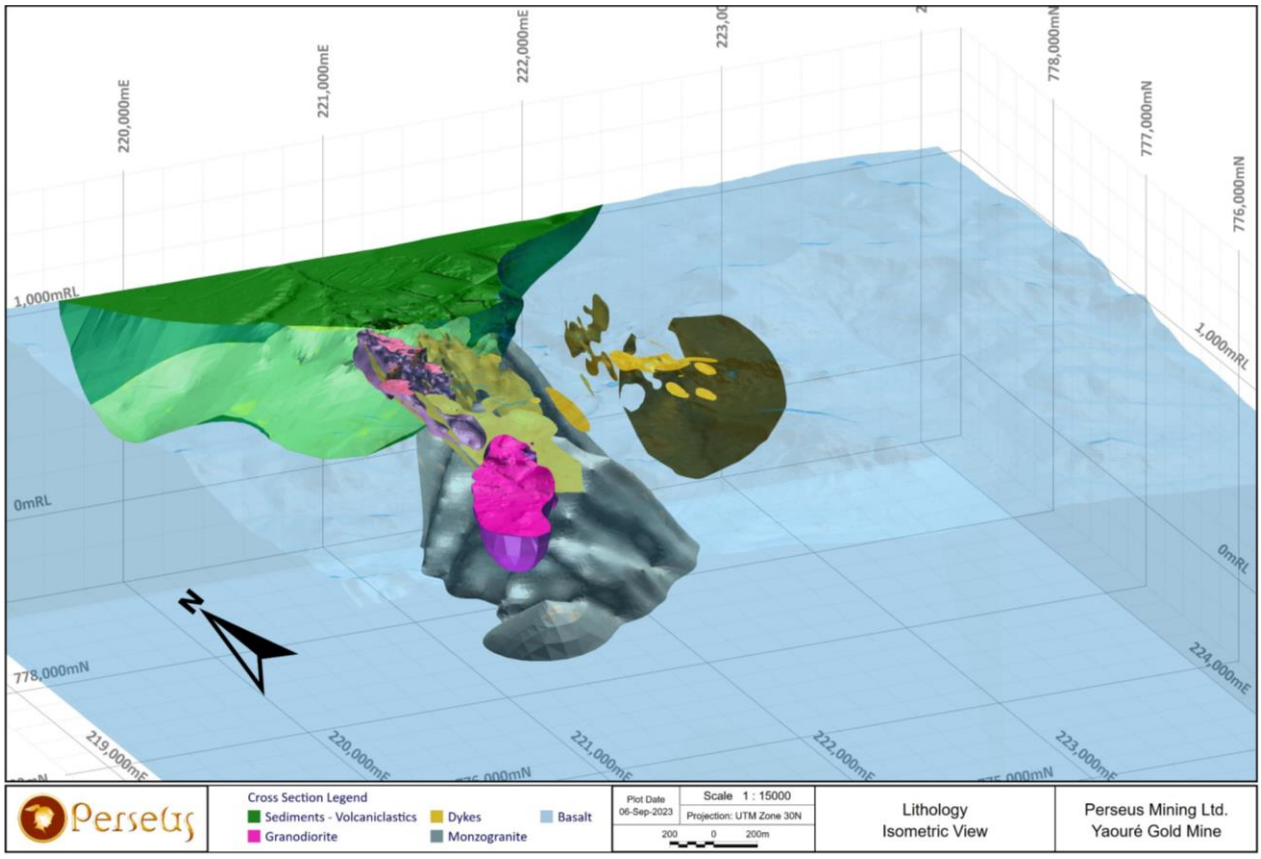


Figure 14-8: Isometric view of modelled lithology in the Yaouré open pit and CMA underground resource models

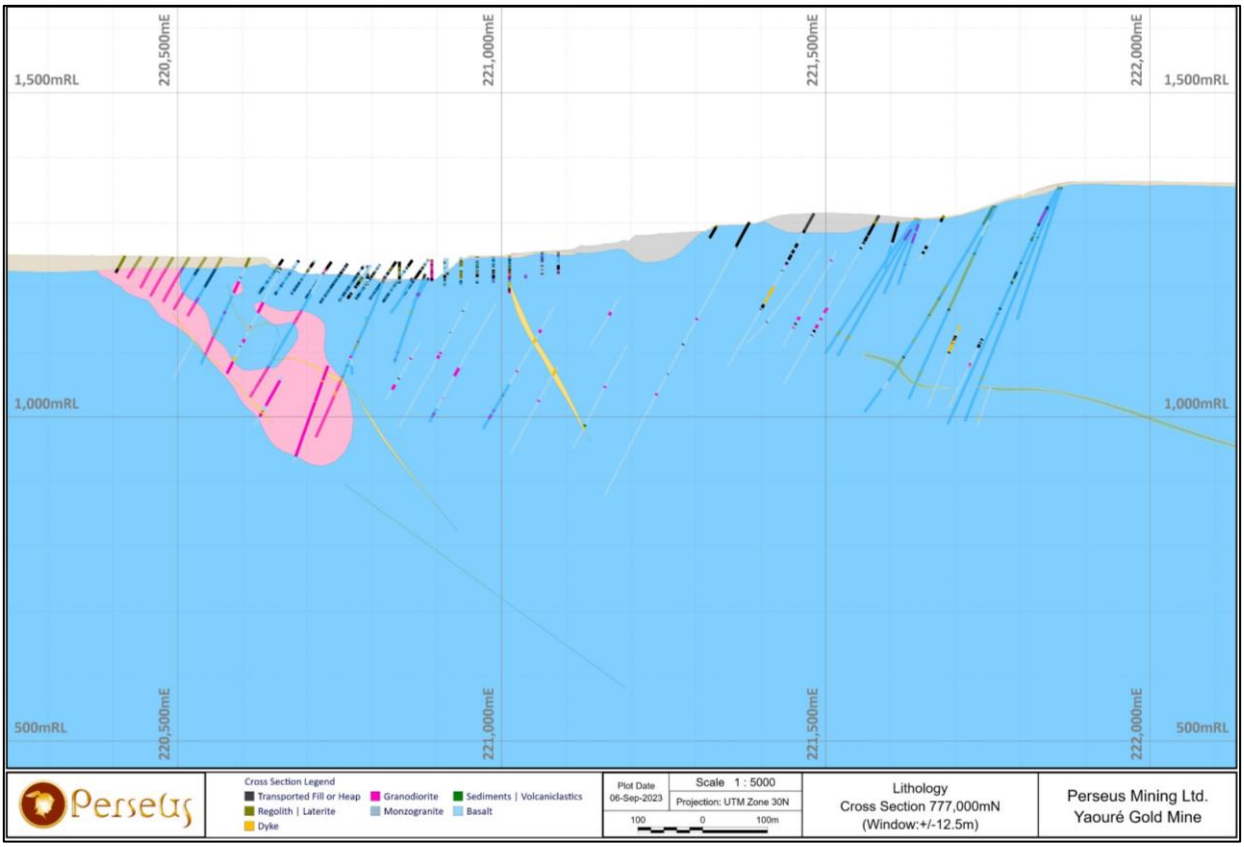


Figure 14-9: Modelled lithology in cross-section 777,000 mN (±12.5 m) in the Yaouré open pit and CMA underground resource models

14.4.3 Mineralisation (Domains)

14.4.3.1 Yaouré Open Pit and CMA Underground Mineral Resource Estimates

A total of 50 discrete mineralised domains identified by numerical series were modelled for the CMA and Yaouré deposits that reflect the inter-relationship of the mineralised Y and S structures, as well as connecting transfer structures and splays (Figure 14-10). In addition to the 50 discrete higher-grade gold domains, the background regions of the resource model are separated into five separate domains shown in Figure 14-11.

The discrete individual lodes (domains) were modelled using the interval selection tool and vein modelling function in Leapfrog Geo™. Domain intervals for the CMA estimates were selected based on geological characteristics of the CMA mineralisation and a nominal cut-off grade of 0.5 g/t gold. In the Yaouré estimate the domain intervals were selected based on geological characteristics of the mineralisation styles and a nominal cut-off grade of 0.2 g/t gold.

A list of the resource model domains with descriptions that form the Yaouré open pit and CMA underground Mineral Resource estimates is provided in Table 14-6.

Table 14-6: Yaouré open pit and CMA underground resource model domains

SERIES	MAIN DOMAINS	DESCRIPTION
100	101	Transported Fill or Heap
	102	Regolith
	103	Dykes
1,000	1010, 1020	Main CMA lode and hangingwall lode (Y structure)
2,000	2010	CMA northwest lode
3,000	3010, 3020, 3030	S structures
4,000	4010, 4020, 4035, 4040, 4050, 4060	Y structures
5,000	5010	CMA southwest zone
7,000	7010	Supergene zone
8,000	8010, 8020, 8030, 8040, 8050	Background domains separated by key Y structures (1010, 4010 and 4040) and Sediment basin

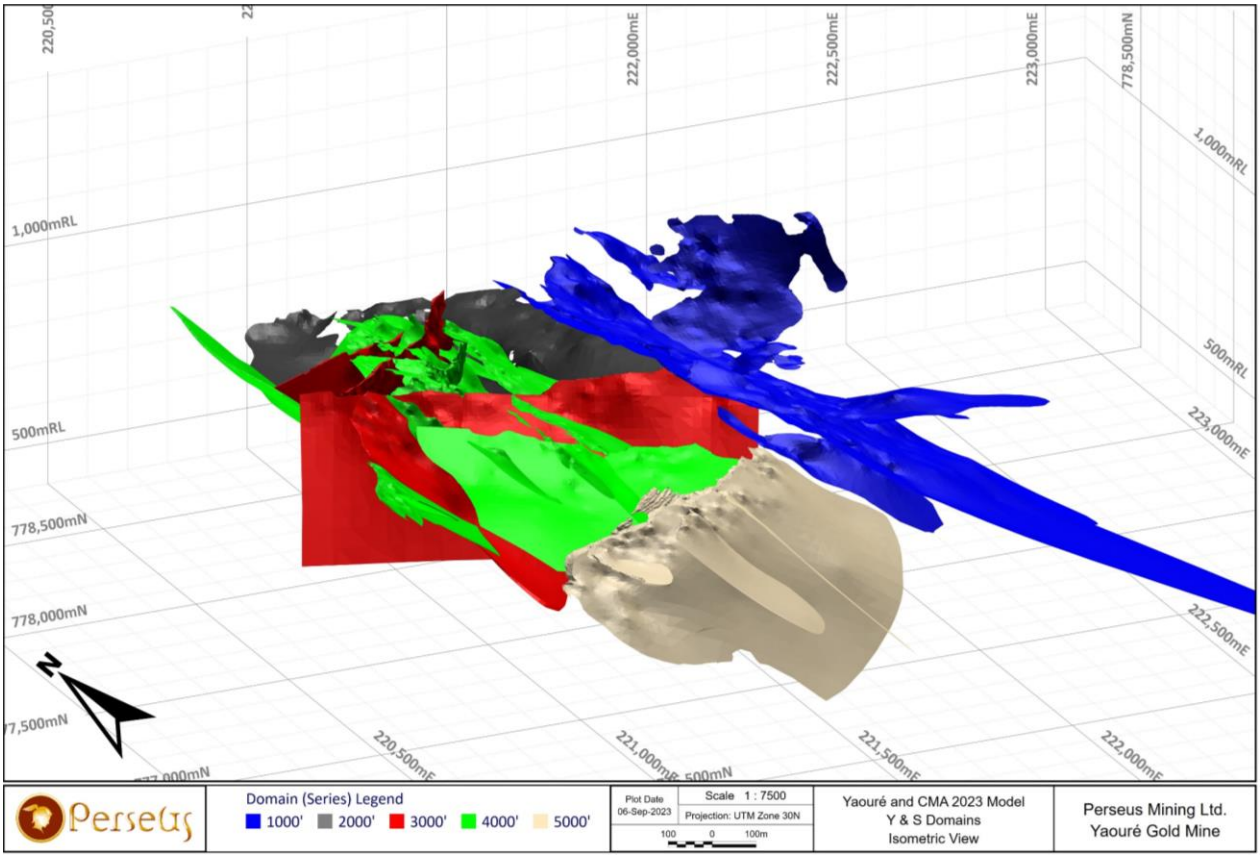


Figure 14-10: Isometric view of modelled Y and S structure domains in the Yaouré open pit and CMA underground resource models

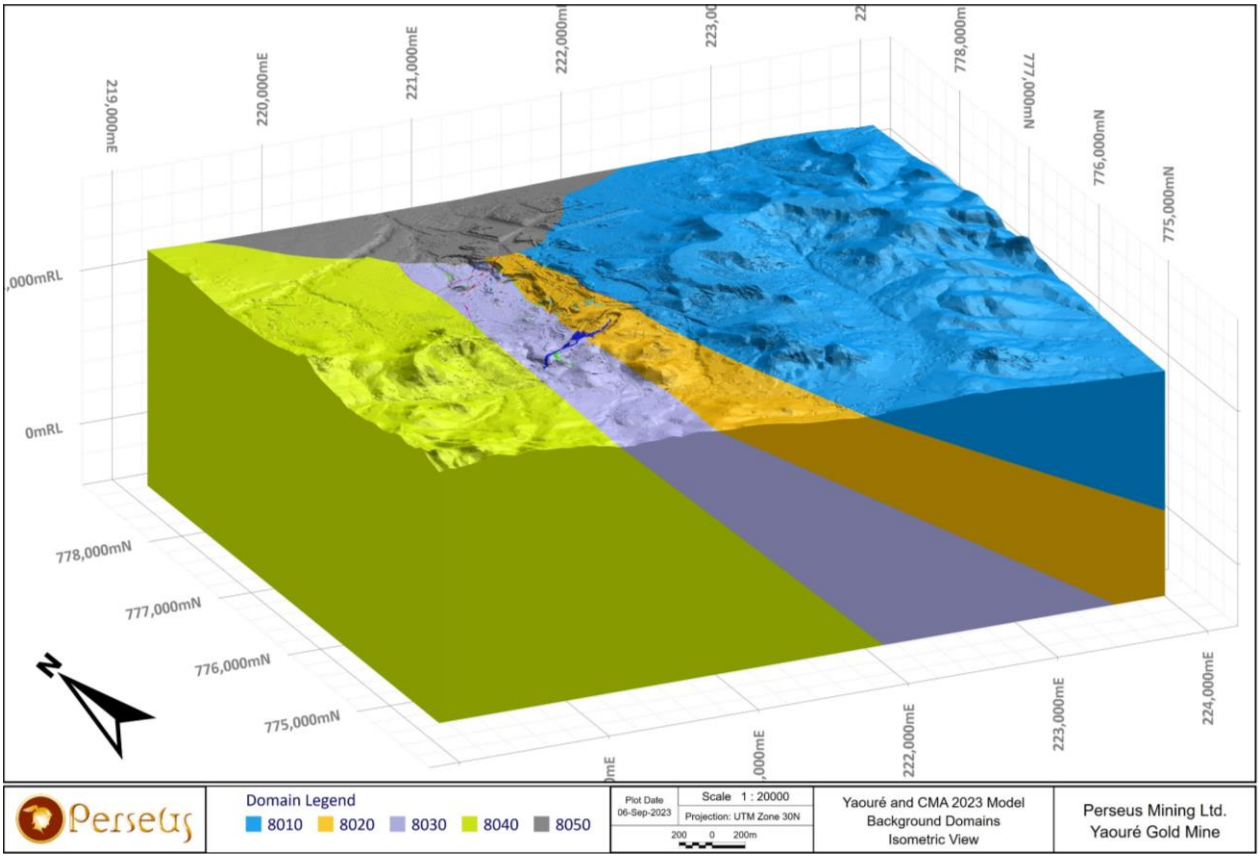


Figure 14-11: Isometric view of modelled background domains in the Yaouré open pit and CMA underground resource models

14.4.3.2 CMA Open Pit and CMA SW Mineral Resource Estimate

Mineralisation domains used in the CMA open pit and CMA SW resource estimate were interpreted by MPR on the basis of two metre down hole composited gold grades and geological wireframes supplied by Perseus. These domains, which are designated as Domains 1 to 10, are consistent with those used in previous MPR models and delineate zones within which the tenor and spatial trends of mineralisation are similar. Mineralisation domain details are provided in Table 14-7.

String files (i.e., polygons) representing the limits of the mineralisation domains were interpreted on cross sections aligned with the generally 25 m to 50 m spaced drilling traverses. These string files were wireframed to produce open surfaces, which were merged and intersected to create closed 3D volume wireframes for each domain.

The mineralised domains extend from constant elevations well below the base of drilling, to well above pre-mining topography. This approach ensures consistent coding of drill hole samples during compositing and assigning domain codes to in the block model.

Table 14-7: Mineralisation domains in the CMA open pit and CMA SW resource model

DOMAIN	DESCRIPTION
1	Western footwall background zone comprising generally un-mineralised metabasalt
2	Northern background zone comprising rarely mineralised volcaniclastics
3	Eastern metabasalt hanging wall to CMA mineralisation
4	Central zone (drilling within this area includes rare discontinuous intercepts)
5	Main CMA mineralisation
6	CMA South mineralisation
7	Yaouré Zone metabasalt
8	Yaouré Zone granodiorite
9	Yaouré footwall zone representing moderately easterly inclined grade mineralisation adjacent to Domain 1
10	Yaouré northern zone representing northerly inclined mineralisation adjacent to Domain 2

14.4.3.3 Govisou Mineral Resource Estimate

Govisou mineralisation is interpreted to trend northeast and dip moderately to the northwest with a package of felsic to intermediate intrusive rocks and metabasalts. The constraining wireframe which extends approximately 300 metres north-south and 200 metres east-west to 1,055 mRL which approximates 190 metres depth was also used to constrain informed model panels (Figure 14-12).

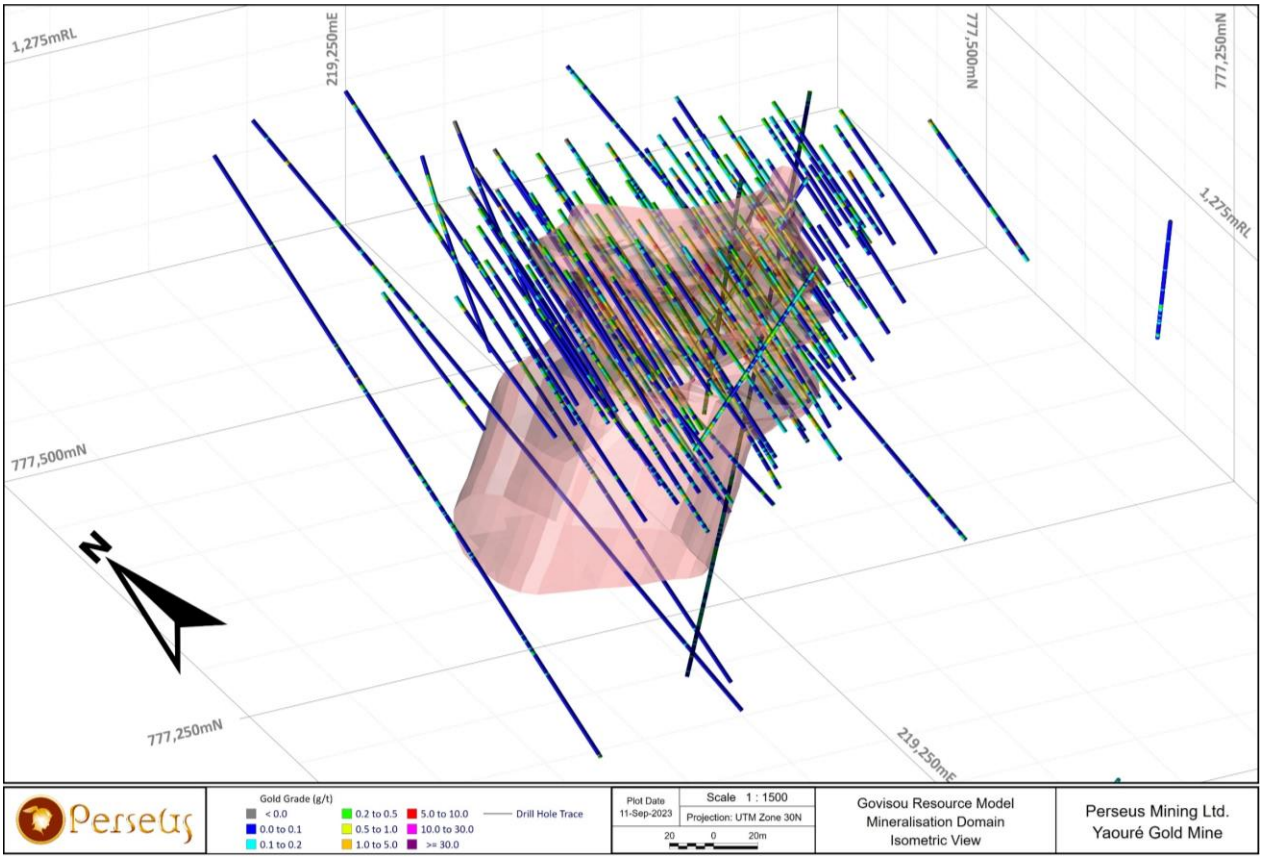


Figure 14-12: Isometric view of mineralised domain in the Govisou resource model

14.4.3.4 Angovia 2 Mineral Resource Estimate

Angovia 2 mineralisation is characterised by a high degree of variability, with no clearly distinct continuous zones of barren and elevated gold grades respectively. Mineralisation is interpreted to trend east-west and dip moderately towards the south within a package of metabasalts and metasediments which include carbonaceous shales.

Mineralised domains adopted for the Angovia 2 estimate subdivides the deposit into a southern domain tested by generally inclined drill holes, and a northern zone of comparatively lower average gold grades primarily tested by vertical GC holes (Figure 14-13). These domains were defined by plan-view polygons, with a cross sectional polygon used to exclude composites in sparsely drilled peripheral areas from the estimation dataset.

The Angovia 2 resource estimate was trimmed by a set of wireframes representing zones of carbonaceous shales interpreted by Perseus from drill hole logging.

Table 14-8 summarises the mineralisation domains and weathering subdomains used for the current estimates including the domain codes used for coding estimation composites and block models.

Table 14-8: Angovia 2 resource model domains

CODE	DESCRIPTION
Mineralised Domains	
1	South Domain
2	North Domain
Weathering subdomains	
1	Laterite
2	Completely weathered upper
3	Completely weathered lower
4	Partially weathered
5	Fracture weathered
6	Fresh

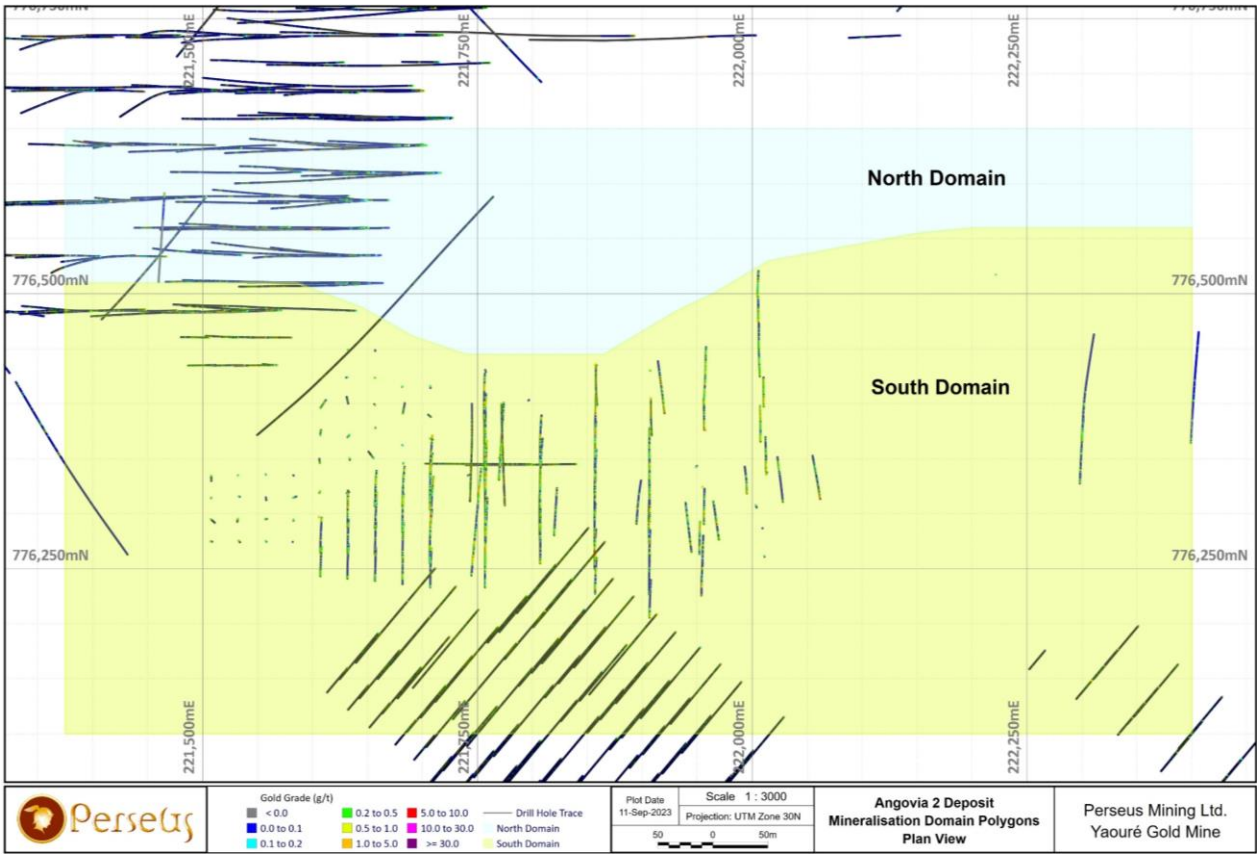


Figure 14-13: Plan view of the south and north mineralised domains for the Angovia 2 resource model

14.5 Bulk Densities

Perseus measured bulk density from representative core samples from selected assay intervals using a water displacement technique. A total of 11,024 measurements were collected and used in the determination of bulk density values for the Mineral Resource estimates. These measurements are grouped by lithology and weathering type with the assigned bulk density values for each estimate provided in Table 14-9.

Tonnage estimates are completed on a dry basis.

Table 14-9: Assigned density values – Yaouré Mineral Resource Estimates

WEATHERING PROFILE	LITHOLOGY/ SUBDOMAIN	ASSIGNED DENSITY BY ESTIMATE (t/m³)			
		YAOURÉ OPEN PIT AND CMA UNDERGROUND	CMA OPEN PIT AND CMA SW	ANGOVIA 2	GOVISOU
Complete	Laterite	1.80	1.85	1.85	1.85
	Upper		1.60 – 1.75	1.75	1.65
	Lower		1.70 – 1.80	1.80	1.80
Partial	-	2.10	2.05 – 2.10	2.05	2.10
	Fracture		2.35 – 2.55	2.35	2.40
Fresh	Volcaniclastic Sediments	2.70	2.65 – 2.85	2.75	2.75
	Basalt	2.85			
	Porphyritic Dykes	2.80			
	Granodiorite	2.75			

14.6 Statistical Analysis, Compositing and Grade Capping

14.6.1.1 Yaouré Open Pit and CMA Underground Mineral Resource Estimates

The Yaouré open pit and CMA underground drilling datasets were composited to nominal 1 m lengths using Leapfrog's best-fit algorithm with minimum and maximum allowable composite lengths of 0.3 m and 1.0 m respectively with residual lengths added to the previous interval.

A review of grade outliers was undertaken to ensure that extreme grades are treated appropriately during grade interpolation. Although extreme grade outliers within the grade populations of variables are real, they are potentially not representative of the volume they inform during estimation. If these values are capped, they have the potential to result in significant grade over-estimation on a local basis.

Grade caps were selected following statistical review of the sample population. The grade capping strategy was applied on the following criteria:

- Skewness of the data
- Probability plots
- Spatial position of extreme grades.

To determine grade caps, histograms and log-probability plots were reviewed for gold grades within the composites of each individual mineralisation solid. Summary statistics for capped and uncapped composites with applied capping value on a per-domain basis are detailed in Table 14-10.

Table 14-10: Summary statistics and grade caps for Yaouré open pit and CMA underground estimates

DOMAIN	COUNT	UNCAPPED				CAPPED			
		MEAN (Au g/t)	CV	MIN (Au g/t)	MAX (Au g/t)	CAP VALUE (Au g/t)	NUMBER CUT	MEAN (Au g/t)	CV
1010	4,090	3.96	1.36	0.01	170	30.0	15	3.89	1.13
1011	9	2.46	0.37	1.27	3.86	-	-	-	-
1012	32	3.57	1.55	0.17	31.6	-	-	-	-
1013	37	2.14	1.52	0.10	19.2	-	-	-	-
1015	119	2.36	1.12	0.01	14.5	-	-	-	-
1020	1,546	3.76	1.34	0.01	86.7	25.0	13	3.69	1.20
1021	12	2.60	0.79	0.85	8.81	-	-	-	-

DOMAIN	COUNT	UNCAPPED				CAPPED			
		MEAN (Au g/t)	CV	MIN (Au g/t)	MAX (Au g/t)	CAP VALUE (Au g/t)	NUMBER CUT	MEAN (Au g/t)	CV
1022	42	4.39	0.91	0.03	16.6	-	-	-	-
1030	319	3.39	1.93	0.01	97.3	10.0	19	2.83	1.02
1031	20	2.01	0.83	0.65	6.79	-	-	-	-
1040	101	1.67	1.00	0.02	7.35	-	-	-	-
1050	401	1.54	2.52	0.01	51.3	10.0	6	1.28	1.57
1060	99	2.24	2.50	0.01	52.4	20.0	1	1.91	1.57
1070	101	3.43	1.15	0.01	23.8	-	-	-	-
2010	566	2.24	2.21	0.01	69.7	20.0	6	2.02	1.48
3010	3,189	1.51	2.78	0.01	88.9	25.0	19	1.40	2.13
3020	474	2.16	2.11	0.01	76.1	30.0	1	2.06	1.58
3030	1,465	1.57	4.25	0.01	113	30.0	14	1.28	2.81
3040	1,054	1.23	2.92	0.01	77.0	25.0	6	1.15	2.18
4010	1,063	2.47	2.40	0.01	99.6	30.0	10	2.26	1.76
4011	22	1.49	1.45	0.11	9.75	-	-	-	-
4020	2,069	1.80	2.39	0.01	159	40.0	5	1.75	1.92
4021	192	1.80	1.16	0.01	16.7	-	-	-	-
4022	157	2.06	1.69	0.01	30.9	-	-	-	-
4023	287	1.41	1.55	0.02	18.0	-	-	-	-
4024	372	0.99	1.69	0.01	12.1	-	-	-	-
4026	164	3.59	7.35	0.01	439	30.0	3	1.79	2.06
4027	261	0.96	1.34	0.01	10.9	-	-	-	-
4030	496	2.03	1.83	0.01	48.5	-	-	-	-
4031	232	1.15	1.12	0.09	11.9	-	-	-	-
4032	77	1.96	1.78	0.10	24.5	-	-	-	-
4033	64	2.01	0.95	0.13	7.74	-	-	-	-
4035	409	2.88	2.54	0.01	88.0	30.0	4	2.54	1.72
4036	61	1.77	1.39	0.05	14.9	-	-	-	-
4037	63	1.91	1.63	0.03	19.1	-	-	-	-
4040	315	1.81	2.00	0.01	43.3	30.0	2	1.74	1.68
4050	76	1.98	1.82	0.01	22.8	-	-	-	-
4051	227	1.70	4.16	0.01	111	30.0	1	1.40	2.17
4052	259	3.10	4.67	0.01	170	25.0	5	1.95	2.33
4053	339	1.95	3.51	0.01	82.4	20.0	4	1.53	2.03
4054	46	1.29	1.18	0.13	8.61	-	-	-	-
4055	62	3.13	3.21	0.01	71.9	20.0	1	2.13	1.77
4060	210	0.88	2.07	0.01	19.5	-	-	-	-
4061	152	0.90	1.45	0.03	10.3	-	-	-	-
4062	30	0.77	1.35	0.11	3.85	-	-	-	-
5010	1,027	1.36	1.45	0.01	22.5	-	-	-	-
5011	46	1.07	1.43	0.01	7.61	-	-	-	-
5012	82	0.78	1.23	0.04	5.24	-	-	-	-
5013	46	0.81	1.06	0.11	4.90	-	-	-	-
7010	3,729	0.49	14.8	0.01	478	20.0	6	0.35	2.79
8010	164,933	0.14	6.61	0.01	153	-	-	-	-
8020	66,725	0.16	5.46	0.01	50.0	15.0	32	0.15	4.16
8030	133,236	0.22	7.71	0.01	165	20.0	103	0.20	4.47
8040	20,698	0.15	15.3	0.01	197	15.0	10	0.12	4.20
8050	14,181	0.09	5.48	0.01	28.7	-	-	-	-

NB: All values shown to 3 significant figures

14.6.1.2 CMA Open Pit and CMA SW Mineral Resource Estimate

The CMA open pit and CMA SW MIK resource estimate is based on nominal 2 m down hole composites.

For some drilling groups, un-assayed intervals in the supplied assay file were coded by Perseus geologists as either deliberately un-assayed due to being interpreted as barren from geological observations, or un-assayed for some other reason, such as sample loss. MPR assigned intervals specified as being barren with a gold grade of 0.001 g/t.

Table 14-11 presents summary statistics for the estimation dataset subdivided by mineralised domain and simplified weathering domain. For this table composites are subdivided into laterite (Lat., Subdomain 1), combined weathered (Weath., Subdomain 2 to 5) and fresh (Subdomain 6) groups. These statistics reflect the datasets primarily informing each portion of the compiled block model.

Notable features of the statistics in this Table 14-11 include the following:

- For each mineralised domain, laterite composites show reasonably consistent, low-grade mineralisation with average gold grades around 0.2 g/t.
- Weathered and fresh components of the background mineralised domains (Domains 1 and 2) have very low average gold grades demonstrating that the domaining has successfully assigned the majority of mineralised intervals to the mineralised domains.
- Coefficients of variation (CV) for mineralised domain composites are generally high at around 3, reflecting the highly variable nature of the gold grades and demonstrating that MIK is an appropriate estimation technique in this circumstance.

Table 14-11: CMA open pit and CMA SW resource model composite dataset statistics

DOMAIN	WEATHERING	NO. COMPS	MEAN (Au g/t)	CV	MIN. (Au g/t)	25th PERCENTILE	MEDIAN (Au g/t)	75th PERCENTILE	MAX (Au g/t)
1	Lat.	119	0.07	0.94	0.005	0.03	0.05	0.08	0.43
	Weath.	1,830	0.06	2.31	0.003	0.01	0.03	0.05	2.02
	Fresh	1,003	0.07	5.23	0.005	0.01	0.02	0.03	6.78
2	Lat.	405	0.19	1.76	0.001	0.08	0.13	0.20	4.92
	Weath.	2,582	0.04	7.54	0.001	0.01	0.01	0.03	14.6
	Fresh	1,537	0.01	4.07	0.001	0.01	0.01	0.01	1.65
3	Lat.	1,459	0.19	2.35	0.001	0.02	0.09	0.20	7.36
	Weath.	15,039	0.10	6.14	0.001	0.01	0.02	0.05	25.1
	Fresh	44,094	0.06	7.12	0.001	0.00	0.01	0.02	25.7
4	Lat.	474	0.30	1.89	0.003	0.11	0.20	0.31	6.41
	Weath.	4,48	0.18	21.9	0.002	0.01	0.02	0.06	241
	Fresh	13,651	0.08	6.16	0.001	0.01	0.02	0.05	25.2
5	Lat.	233	0.24	0.95	0.001	0.13	0.19	0.28	1.91
	Weath.	3,451	0.40	3.47	0.001	0.03	0.08	0.23	23.3
	Fresh	16,735	0.76	2.89	0.001	0.02	0.05	0.37	85.1
6	Lat.	52	0.33	1.17	0.055	0.13	0.28	0.41	2.87
	Weath.	1,671	0.28	2.92	0.005	0.02	0.07	0.24	14.5
	Fresh	3,009	0.33	2.74	0.005	0.02	0.07	0.25	26.3
7	Lat.	3,628	0.31	3.67	0.005	0.11	0.18	0.31	54.1
	Weath.	20,491	0.32	6.09	0.001	0.03	0.06	0.16	154
	Fresh	35,382	0.34	4.57	0.005	0.02	0.04	0.17	107
8	Lat.	215	0.37	1.75	0.005	0.15	0.20	0.36	5.61
	Weath.	1,939	0.57	3.39	0.004	0.05	0.16	0.45	50.9
	Fresh	8,167	0.47	4.21	0.004	0.04	0.13	0.39	86.8
9	Lat.	192	0.21	2.61	0.015	0.09	0.11	0.17	5.25
	Weath.	1,161	0.21	2.51	0.005	0.03	0.05	0.16	9.78
	Fresh	203	0.41	2.79	0.005	0.02	0.05	0.23	9.53
10	Lat.	289	0.25	3.30	0.005	0.06	0.11	0.27	13.7
	Weath.	1,669	0.29	2.97	0.005	0.03	0.06	0.18	11.3
	Fresh	741	0.28	3.20	0.005	0.02	0.05	0.21	14.8

The estimation dataset was grouped by mineralised domain and weathering subdomain to determine the indicator thresholds and bin mean grades in the MIK resource model. Composites were generally subdivided into laterite, combined weathered and fresh datasets for each mineralised domain with several smaller datasets being combined. The laterite portion of Domain 6, which contains very few composites, was estimated using indicator statistics derived from the laterite component of Domain 5.

Indicator thresholds for each mineralised domain and weathering domain combination, were defined using a consistent set of thresholds representing the following percentiles of each dataset: 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 0.97 and 0.99.

All bin grades were selected from the bin mean grade, with the exception of the upper bin which was selected on a case-by-case basis. Upper bin grades were generally derived from the bin median, or bin mean excluding a small number of outlier composite grades, or otherwise rarely set to the bin threshold. This approach reduces the impact of small numbers of extreme gold grades on estimated resources and is considered an appropriate approach for MIK modelling of highly variable mineralisation occurring at the Yaouré Gold Mine.

Table 14-12 shows the grouping of composites for determination of indicator thresholds with bin mean gold grades and the methodology used to determine upper bin grades. This table reflects the MIK modelling underpinning the CMA open pit and CMA SW resource estimate.

Table 14-12: Upper bin thresholds and bin gold grades for CMA open pit and CMA SW resource model

DOMAIN	WEATHERING	THRESHOLD (Au g/t)	BIN GRADE (Au g/t)	SOURCE OF BIN GRADE
1	Combined	0.745	1.145	Mean excluding 3 outliers
2	Laterite	1.110	1.181	Mean excluding 2 outliers
	Weathered	0.510	0.850	Median
	Fresh	0.165	0.460	Mean
3	Laterite	1.810	3.030	Median
	Weathered	1.315	2.440	Median
	Fresh	0.980	1.705	Median
4	Laterite	2.785	2.785	Threshold
	Weathered	1.400	3.005	Median
	Fresh	0.966	1.630	Median
5	Laterite	1.010	1.507	Mean
	Weathered	6.595	10.905	Mean excluding 2 outliers
	Fresh	10.180	13.849	Mean excluding 5 outliers
6	Laterite	1.11	1.50	Use Domain 5 from 2018 model
	Weathered	3.24	5.10	Median
	Fresh	3.91	4.89	Median
7,8,9	Laterite	2.288	3.960	Median
7	Weathered	4.495	8.525	Median
	Fresh	5.052	7.750	Median
8	Weathered	9.935	13.091	Mean excluding 2 outliers
	Fresh	4.597	7.365	Median
9	Weathered + Fresh	4.257	6.96	Mean excluding 1 outlier
10	Laterite	0.990	1.025	Median
	Weathered	3.915	6.375	Median
	Fresh	2.880	5.255	Median

14.6.1.3 Govisou Mineral Resource Estimate

The Govisou MIK resource estimate is based on nominal 2 m down hole composites.

The composite estimation dataset comprises 4,399 composites with gold grades ranging from 0.01 g/t to 25.1 g/t and averaging 0.50 g/t. Table 14-13 presents summary statistics for the Govisou resource composite dataset subdivided by weathering zone, showing notable features including the following:

- Coefficients of variation are moderately high at around 2.6, reflecting the highly variable nature of the gold grades.
- There is a general increase in average composite grades from the laterite zone (0.30 g/t), to the combined weathered zone (0.47 g/t) to the fresh zone (0.50 g/t).

Table 14-13: Govisou resource model composite dataset statistics

DOMAIN (WEATHERING)	NO. COMPS	MEAN (Au g/t)	CV	MIN. (Au g/t)	25th PERCENTILE	MEDIAN (Au g/t)	75th PERCENTILE	MAX. (Au g/t)
Laterite	316	0.30	1.99	0.02	0.10	0.17	0.26	4.95
Completely weathered upper	499	0.40	2.57	0.01	0.04	0.10	0.23	10.7
Completely weathered lower	645	0.48	2.59	0.01	0.05	0.11	0.27	6.714.9
Partially weathered	404	0.65	2.10	0.01	0.05	0.12	0.44	8.37
Fracture weathered	290	0.46	2.54	0.01	0.03	0.09	0.28	8.58
Fresh	2,245	0.54	2.60	0.01	0.05	0.13	0.44	25.1
Total	4,399	0.50	2.55	0.01	0.05	0.12	0.35	25.1

The Govisou estimation dataset was grouped by weathering subdomain to determine the indicator thresholds and bin mean grades in the MIK resource model. For each weathering zone, indicator thresholds were defined using a consistent set of thresholds representing the following percentiles of each dataset: 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 0.97 and 0.99. Table 14-14 lists the indicator thresholds and class mean grades for each group, with the upper bin median shown below the upper bin mean.

For determination of indicator thresholds and class grades, four composites with outlier gold grades were excluded from the dataset of laterite composites. Two of these composites are from a single four metre sample. The full set of composites from this zone were included in the estimation dataset.

All bin grades were selected from the bin mean grade, with the exception of the upper bin grades which were selected on a case-by-case basis. Upper bin grades were generally derived from the mean excluding a small number of outlier composite grades. Details of the Govisou resource model indicator thresholds and upper bin gold grades are provided in Table 14-14.

Table 14-14: Govisou resource model indicator thresholds and class grades

PERCENTILE	LATERITE		COMBINED WEATHERED		FRESH	
	THRESHOLD (Au g/t)	MEAN (Au g/t)	THRESHOLD (Au g/t)	MEAN (Au g/t)	THRESHOLD (Au g/t)	MEAN (Au g/t)
10%	0.06	0.04	0.02	0.01	0.02	0.01
20%	0.08	0.07	0.03	0.03	0.04	0.03
30%	0.11	0.10	0.05	0.04	0.06	0.05
40%	0.13	0.12	0.07	0.06	0.09	0.07
50%	0.17	0.15	0.11	0.09	0.13	0.11
60%	0.19	0.18	0.15	0.13	0.21	0.17
70%	0.23	0.21	0.21	0.18	0.33	0.26
75%	0.25	0.24	0.28	0.25	0.44	0.38
80%	0.28	0.27	0.39	0.33	0.59	0.51
85%	0.33	0.30	0.61	0.50	0.84	0.70
90%	0.39	0.36	1.26	0.87	1.31	1.03
95%	0.61	0.50	2.71	1.84	2.50	1.79
97%	1.00	0.80	4.12	3.41	3.43	2.93
99%	1.58	1.30	6.29	5.15	5.32	4.38
100%	3.63	2.58	14.93	8.01	25.15	9.93
Upper Bin	2.58 Bin mean		7.40 Bin median		8.498 Bin mean (<20 g/t)	

14.6.1.4 Angovia 2 Mineral Resource Estimate

The Angovia 2 MIK resource estimate is based on nominal three metre down hole composites coded by the mineralisation domains and weathering subdomains, excluding composites from drilling within waste dumps. The composite length represents the lowest common multiple of dominant sample lengths for resource and GC drilling.

The composite estimation dataset comprises 5,830 composites with gold grades ranging from 0.00 to 46.7 g/t and averaging 0.45 g/t. Table 14-15 presents summary statistics for the Angovia 2 resource composite dataset by mineralised domain and subdivided by weathering zone, showing notable features including the following:

- All North domain composites within the laterite, and completely weathered weathering subdomains, reflecting the comparatively shallow drilling in this area which does not extend below the base of complete weathering.

- North domain composites show notably lower average gold grades and lower maximum grades than for the South domain.
- For each mineralised domain Subdomain 1 (laterite) composites show higher average grades than the underlying weathering subdomains.
- Coefficients of variation for are generally moderately high at 3.21 for the combined dataset reflecting the highly variable nature of the gold grades.

Table 14-15: Angovia 2 resource model composite dataset statistics

SUBDOMAIN (WEATHERING)	NO. COMPS	MEAN (Au g/t)	CV	MIN. (Au g/t)	25th PERCENTILE	MEDIAN (Au g/t)	75th PERCENTILE	MAX. (Au g/t)
South Domain								
Laterite (1)	170	0.93	3.83	0.00	0.27	0.43	0.74	45.7
Completely weathered upper (2)	1,588	0.46	3.10	0.00	0.08	0.21	0.48	39.9
Completely weathered lower (3)	1,525	0.48	2.51	0.01	0.05	0.15	0.45	22.6
Partially weathered (4)	525	0.43	2.85	0.01	0.04	0.12	0.34	17.0
Fracture weathered (5)	612	0.35	1.91	0.01	0.03	0.13	0.40	8.35
Fresh (6)	996	0.43	4.12	0.01	0.04	0.10	0.30	46.8
Total	**5,416**	**0.46**	**3.21**	**0.00**	**0.05**	**0.16**	**0.43**	**46.8**
North Domain								
Laterite (1)	68	0.40	0.75	0.00	0.20	0.31	0.50	1.77
Completely weathered upper (2)	315	0.23	1.73	0.01	0.04	0.09	0.23	4.17
Completely weathered lower (3)	31	0.26	1.77	0.01	0.05	0.08	0.17	2.39
Partially weathered (4)	-	-	-	-	-	-	-	-
Fracture weathered (5)	-	-	-	-	-	-	-	-
Fresh (6)	-	-	-	-	-	-	-	-
Total	**414**	**0.26**	**1.51**	**0.00**	**0.05**	**0.12**	**0.29**	**4.17**

The Angovia 2 estimation dataset was grouped by mineralised domain and weathering subdomain to determine the indicator thresholds and bin mean grades in the MIK resource model. For each mineralised and weathering zone, indicator thresholds were defined using a consistent set of thresholds representing the following percentiles of each dataset: 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 0.97 and 0.99.

All bin grades were selected from the bin mean grade, with the exception of the upper bin grades which were selected on a case-by-case basis. Details of the Angovia 2 resource model indicator thresholds and upper bin gold grades are provided in Table 14-16 and Table 14-17.

Table 14-16: Angovia 2 resource model indicator thresholds and class grades

PERCENTILE	SOUTH DOMAIN					
	SUBDOMAIN 1		SUBDOMAIN 2		SUBDOMAIN 3	
	THRESHOLD (Au g/t)	MEAN (Au g/t)	THRESHOLD (Au g/t)	MEAN (Au (g/t)	THRESHOLD (Au g/t)	MEAN (Au g/t)
10%	0.125	0.082	0.030	0.015	0.017	0.010
20%	0.247	0.181	0.065	0.047	0.037	0.026
30%	0.317	0.280	0.103	0.084	0.065	0.049
40%	0.375	0.354	0.145	0.122	0.100	0.081
50%	0.430	0.402	0.205	0.173	0.150	0.123
60%	0.527	0.472	0.277	0.242	0.225	0.186
70%	0.630	0.590	0.400	0.335	0.350	0.282
75%	0.737	0.677	0.477	0.438	0.450	0.394
80%	0.863	0.806	0.565	0.515	0.567	0.512
85%	0.920	0.890	0.690	0.621	0.780	0.665
90%	1.263	1.036	0.940	0.807	1.083	0.943
95%	1.993	1.552	1.577	1.216	1.917	1.485
97%	2.287	2.198	1.923	1.772	2.500	2.180
99%	6.265	4.159	3.200	2.524	5.080	3.391
100%	45.700	26.584	39.872	9.575	22.640	9.399

PERCENTILE	SOUTH DOMAIN		NORTH DOMAIN			
	SUBDOMAIN 4 to 6		SUBDOMAIN 1		SUBDOMAIN 2 to 3	
	THRESHOLD (Au g/t)	MEAN (Au g/t)	THRESHOLD (Au g/t)	MEAN (Au g/t)	THRESHOLD (Au g/t)	MEAN (Au g/t)
10%	0.013	0.007	0.120	0.088	0.020	0.013
20%	0.028	0.020	0.173	0.152	0.035	0.026
30%	0.047	0.038	0.200	0.190	0.050	0.041
40%	0.073	0.059	0.245	0.228	0.065	0.058
50%	0.117	0.091	0.305	0.271	0.090	0.080
60%	0.173	0.141	0.390	0.359	0.128	0.111
70%	0.257	0.213	0.475	0.442	0.185	0.152
75%	0.343	0.293	0.495	0.484	0.230	0.208
80%	0.453	0.394	0.515	0.508	0.280	0.253
85%	0.620	0.523	0.705	0.595	0.355	0.314
90%	0.867	0.739	0.815	0.787	0.585	0.465
95%	1.553	1.160	0.930	0.861	0.975	0.793
97%	2.160	1.846	1.060	1.060	1.165	1.093
99%	4.460	2.926	1.770	1.447	1.680	1.416
100%	46.747	9.573	2.485	2.485	4.170	2.636

Table 14-17: Upper bin thresholds and class gold grades for Angovia 2 resource model

MINERALISED DOMAIN	WEATHERING SUBDOMAIN	UPPER BIN Au (g/t)			SOURCE OF BIN GRADE
		THRESHOLD	MAX.	BIN GRADE	
South	Sub. 1	6.265	45.7	7.467	Lowest of two values in bin
	Sub. 2	3.200	39.9	6.003	Median
	Sub. 3	5.080	22.6	7.163	Median
	Sub. 4 – 6	4.460	46.7	6.697	Median
North	Sub. 1	1.770	2.49	1.770	Threshold
	Sub. 2 -3	1.680	4.17	2.390	Median

14.7 Variography

14.7.1.1 Yaouré Open Pit and CMA Underground Mineral Resource Estimates

For each estimation domain, exploratory data analysis and assessment of spatial continuity within the input data was conducted using Seequent Leapfrog Geo software using the Edge module. Experimental semi-variograms were constructed accounting for observed anisotropy in each of the three principal directions of continuity identified within the data for each domain. A semi-variogram model was fitted to the experimental results for each domain considered to have an appropriate number of composites informing the semi-variogram (typically >20 composites).

In general, the spatial continuity of the input data for each estimation domain was adequately described by a nugget component, and two spherical components for the semi-variogram models.

Modelled semi-variogram parameters for the Yaouré open pit and CMA underground resource estimate are provided in Table 14-18.

Table 14-18: Model semi-variogram parameters, Yaouré open pit and CMA underground estimates

DOMAIN	ROTATION (°)			NUGGET	SPHERICAL STRUCTURE 1				SPHERICAL STRUCTURE 2			
	DIP	DIP DIR	PITCH		SILL	RANGE (m)			SILL	RANGE (m)		
						U	V	W		U	V	W
1010	28	72	43	6.17	16.91	47	15	7	5.89	95	45	20
1015	30	69	16	1.22	4.01	65	45	7	0.86	120	70	20
1020	32	82	46	8.19	10.24	60	27	7	7.12	115	55	15
1030	22	50	47	9.95	10.76	40	30	3	2.81	70	70	6
1040	11	308	70	0.23	0.83	15	40	4	0.44	50	50	7
1070	32	82	102	5.01	7.98	30	20	7	2.66	85	50	15
2010	52	9	52	2.07	5.12	25	20	7	1.80	90	60	15
3010	90	320	61	3.25	9.92	15	10	5	2.1	80	45	15
3020	42	117	20	4.14	10.30	50	25	10	5.01	100	65	20
3030	90	25	124	7.54	30.81	25	15	8	6.12	70	50	20
3040	90	330	55	3.13	7.47	60	25	10	1.69	110	60	25
4010	28	72	62	6.72	6.09	35	15	5	18.78	85	55	15
4011	51	122	35	0.96	0.87	45	25	10	2.68	90	60	25
4020	51	122	35	6.03	5.46	45	25	10	16.85	90	60	25
4021	29	55	46	1.13	1.03	25	15	5	3.16	55	30	15
4022	66	32	65	2.88	2.61	25	15	5	8.05	55	35	15
4023	55	40	155	1.09	2.85	15	15	5	1.20	55	30	15
4024	90	302	124	0.42	1.29	15	10	5	0.27	90	50	20
4026	32	91	139	739	365	30	25	5	523	55	40	15
4027	32	108	130	0.80	0.39	35	20	5	0.56	60	40	15
4030	28	59	39	2.59	7.66	35	25	7	1.92	65	40	15
4031	18	105	31	0.40	1.17	30	20	7	0.29	55	35	15
4032	64	6	130	2.36	9.42	40	25	10	3.28	90	50	20
4033	24	80	27	0.87	0.28	25	15	5	1.68	50	30	15
4035	31	86	34	7.30	21.58	55	30	7	5.42	90	45	15
4036	40	96	41	1.48	3.17	50	30	9	0.87	80	50	15
4037	41	87	36	2.72	5.82	50	30	9	1.60	80	50	15
4040	42	90	25	4.16	7.72	65	35	7	3.32	115	70	20
4050	40	112	135	3.92	5.44	35	15	8	3.40	90	50	15
4051	54	74	97	14.90	4.76	35	25	8	28.83	70	65	15
4052	63	27	131	52.50	141.83	55	40	10	30.99	125	75	25
4053	69	37	46	16.71	19.64	30	30	8	5.80	110	60	20
4054	56	62	114	0.60	0.40	35	35	10	1.46	110	75	25
4055	38	96	153	35.69	6.16	40	40	10	46.17	110	75	25
4060	38	99	44	0.92	0.03	50	30	8	2.50	110	75	25
4061	34	100	34	0.40	0.68	40	35	8	0.42	90	60	20
4062	37	68	25	0.20	0.34	35	25	8	0.21	70	50	15
5010	38	138	119	0.79	1.57	45	30	7	1.37	120	70	20
5011	38	120	50	0.63	0.31	30	30	8	1.38	70	70	15
5012	44	90	49	0.30	0.08	35	25	8	0.56	80	55	15
5013	18	98	13	0.12	0.16	35	30	8	0.40	65	50	15
7010	0	340	116	7.05	18.39	35	35	8	37.31	65	65	15
8020	28	72	30	0.07	0.20	30	20	5	0.18	65	35	10
8030	28	72	30	0.18	1.26	30	12	5	0.50	65	35	10
8040	42	92	155	0.33	2.36	30	12	7	0.93	80	50	20

14.7.1.2 CMA Open Pit and CMA SW Mineral Resource Estimate

The MIK resource modelling included semi-variograms modelled for each of the mineralised domains. For determination of variance adjustment factors, a semi-variogram model of composite gold grades was also developed for each of these datasets. Some domains contain too few regularly

spaced composites for meaningful semi-variogram modelling. As summarised in Table 14-19, these domains were estimated using semi-variograms modelled from more comprehensively drilled domains.

Composited gold grades within the laterite zone show flat lying continuity, notably differing from continuity of underlying zones. For estimation of the laterite subdomain, semi-variograms were modelled from a combined dataset of laterite composites. Below the base of laterite, for each mineralised domain, gold grades show comparable continuity within the weathered and fresh zones. Variably weathered and fresh composites were combined for semi-variogram modelling.

Modelled semi-variogram parameters for the CMA open pit and CMA SW resource estimate are provided in Table 14-20.

Table 14-19: Assignment of semi-variogram models to CMA open pit and CMA SW resource estimate

DOMAIN	WEATHERING SUBDOMAIN	VARIOGRAM SOURCE
All	Laterite	Modelled for combined dataset
1 and 2	Weathered and Fresh	Domain 7 and 8
3	Weathered and Fresh	Domain 4
4	Weathered and Fresh	Modelled
5	Weathered and Fresh	Modelled
6	Weathered and Fresh	Domain 5
7 and 8	Weathered and Fresh	Modelled for combined dataset
9	Weathered and Fresh	Modelled
10	Weathered and Fresh	Modelled

Table 14-20: Semi-variogram models applied to CMA open pit and CMA SW resource estimate

PERCENTILE	NUGGET	STRUCTURE 1 EXPONENTIAL		STRUCTURE 2 SPHERICAL		STRUCTURE 3 SPHERICAL	
		SILL	RANGE (X,Y,Z)	SILL	RANGE (X,Y,Z)	SILL	RANGE (X,Y,Z)
Combined Laterite: Rotation Z+0, Y+0, X+0							
10%	0.15	0.41	7.5,9.5,14.5	0.11	26,22,86	0.33	365,120,838
20%	0.17	0.27	4,8.5,4	0.22	23,22,8	0.34	242,140,40
30%	0.18	0.29	4,7.5,4	0.20	5,23,10	0.33	225,166,31
40%	0.19	0.19	4,8,4	0.30	5,25,5	0.32	273,211,34
50%	0.20	0.45	6.5,8,4	0.04	25,12,23	0.31	259,259,32
60%	0.21	0.45	12,8,4	0.04	16,9,12	0.30	325,329,41
70%	0.22	0.45	4,8,4	0.04	8,11,22	0.29	221,260,32
75%	0.24	0.45	4,7.5,4	0.08	20,20,15	0.23	212,197,26
80%	0.26	0.49	5,7.5,4	0.05	17,16,8	0.20	156,154,19
85%	0.30	0.47	4.5,18.5,4	0.07	16,24,9	0.16	149,145,18
90%	0.32	0.47	4,17,4	0.07	17,27,21	0.14	157,124,22
95%	0.34	0.47	4,9,4	0.11	23,26,15	0.08	123,99,16
97%	0.39	0.55	4,16,4	0.03	52,26,9	0.03	170,102,24
99%	0.50	0.45	4,7,1.5	0.03	5,10,3	0.02	115,231,8.5
Au g/t	0.40	0.41	9.5,8.5,4	0.09	21,31,5	0.10	55,44,17
Domain 4: Rotation Z+10, Y+30, X+0							
10%	0.35	0.53	8,24.5,3	0.08	52,84,271	0.04	149,350,295
20%	0.25	0.48	6.5,3.5,3	0.13	7,12,38	0.14	130,195,196
30%	0.23	0.40	7.5,15.5,4.5	0.18	23,50,63	0.19	82,212,77
40%	0.24	0.40	12,12,4	0.18	33,13,33	0.18	135,171,115
50%	0.25	0.40	18,16.5,4	0.18	36,48,21	0.17	161,171,1102
60%	0.26	0.40	19.5,3.5,4	0.18	24,65,18	0.16	104,190,330

PERCENTILE	NUGGET	STRUCTURE 1 EXPONENTIAL		STRUCTURE 2 SPHERICAL		STRUCTURE 3 SPHERICAL	
		SILL	RANGE (X,Y,Z)	SILL	RANGE (X,Y,Z)	SILL	RANGE (X,Y,Z)
70%	0.27	0.40	7,3.5,4.5	0.18	16,56,18	0.15	115,167,347
75%	0.28	0.40	6.5,3.5,4	0.18	23,32,18	0.14	135,146,258
80%	0.29	0.40	6.5,13.5,3.5	0.18	9,74,20	0.13	157,88,351
85%	0.30	0.40	6.5,23,3.5	0.18	14,63,17	0.12	115,86,227
90%	0.31	0.40	10.5,19.5,3.5	0.18	25,54,13	0.11	49,89,393
95%	0.34	0.43	26,27.5,3.5	0.15	28,32,10	0.08	29,80,165
97%	0.36	0.43	9.5,6.5,4	0.15	41,7,12	0.06	42,44,328
99%	0.39	0.43	7,7.5,3.5	0.15	22,8,19	0.03	42,97,339
Au g/t	0.35	0.47	7.5,8.5,3.5	0.02	14,23,4	0.16	19,27,74
Domain 5: Rotation Z+10, Y+30, X+0							
10%	0.18	0.40	16,21,5.5	0.22	32,28,42	0.20	395,149,190
20%	0.17	0.41	17,21,5.5	0.22	34,28,24	0.20	400,169,88
30%	0.18	0.42	20,22,5.5	0.22	47,31,24	0.18	400,224,66
40%	0.19	0.41	20,23,6.5	0.20	48,31,13	0.20	380,229,64
50%	0.20	0.41	20,22,7	0.20	46,29,14	0.19	380,249,34
60%	0.21	0.42	23,21,7	0.20	54,28,13	0.17	380,249,26
70%	0.22	0.42	23,21,7	0.20	54,30,13	0.16	345,249,26
75%	0.23	0.40	23,21,7	0.20	58,28,12	0.17	275,239,20
80%	0.24	0.37	23,21,7	0.20	60,32,9	0.19	275,234,19
85%	0.25	0.35	23,19,7	0.20	60,34,8	0.20	235,234,17
90%	0.26	0.34	22,22,7	0.22	58,33,7.5	0.18	220,225,16
95%	0.28	0.41	21,22,5.5	0.20	58,31,6.5	0.11	175,220,13
97%	0.30	0.47	21,21,3.5	0.16	52,28,8	0.07	160,150,12
99%	0.39	0.50	23,18,3	0.06	47,16,8	0.05	62,68,8
Au g/t	0.14	0.41	25,20,5.5	0.29	52,32,8.5	0.16	255,200,15
Domain 6: Rotation Z+10, Y+30, X+0							
10%	0.21	0.41	12,15,6	0.29	23,32,65	0.09	940,192,70
20%	0.19	0.41	18,19,5.5	0.23	27,36,29	0.17	350,176,133
30%	0.18	0.41	16,17,6	0.16	26,34,19	0.25	304,202,58
40%	0.18	0.41	26,29,6.5	0.16	27,42,14	0.25	248,204,48
50%	0.19	0.40	20,26,7	0.16	22,27,13	0.25	206,217,32
60%	0.20	0.40	21,25,7	0.16	48,26,12	0.24	200,200,25
70%	0.21	0.40	29,26,8	0.16	42,30,8.5	0.23	190,200,23
75%	0.22	0.40	16,53,8	0.16	59,75,8.5	0.22	185,190,22
80%	0.23	0.40	22,60,7.5	0.16	77,85,11	0.21	175,187,21
85%	0.24	0.40	22,75,8	0.16	73,80,9	0.20	154,165,19
90%	0.25	0.30	27,47,5.5	0.22	36,65,7.5	0.23	166,166,18
95%	0.27	0.19	27,41,4	0.35	31,56,4.5	0.19	124,165,13
97%	0.30	0.51	31,32.5,4	0.08	32,33,6.5	0.11	92,100,11
99%	0.39	0.51	24,20,4	0.08	46,47,6.5	0.02	75,93,11
Au g/t	0.20	0.16	18,35,4.5	0.44	33,50,6	0.20	168,151,17
Domain 7 and 8: Rotation Z+10, Y+30, X+0							
10%	0.13	0.57	10,8,4	0.16	23,17,41	0.14	101,106,248
20%	0.13	0.57	9,8.5,4	0.16	31,20,42	0.14	143,158,105
30%	0.12	0.53	17,22,4	0.20	32,31,22	0.15	141,151,1125
40%	0.13	0.53	10.5,31,4.5	0.20	39,32,24	0.14	177,177,1413
50%	0.14	0.53	24.5,26,4.5	0.20	32,39,24	0.13	257,261,1811
60%	0.15	0.53	15.5,31.5,4	0.20	41,32,25	0.12	269,386,2147
70%	0.16	0.53	21,4,4	0.20	41,40,20	0.11	313,288,2305
75%	0.17	0.53	13,4,4	0.20	44,39,18	0.10	301,284,2269
80%	0.18	0.56	25.5,4,4	0.17	40,38,17	0.09	273,247,1980
85%	0.19	0.56	11.5,4,4	0.17	42,38,14	0.08	286,191,314
90%	0.21	0.56	17,4,3.5	0.17	40,35,11	0.06	254,165,162
95%	0.24	0.56	17.5,4,3	0.17	43,37,10	0.03	589,231,1840
97%	0.27	0.62	7.5,20.5,3.5	0.09	55,32,10	0.03	424,150,1200
99%	0.33	0.62	15.5,4,3.5	0.02	27,5,5	0.03	78,77,9

PERCENTILE	NUGGET	STRUCTURE 1 EXPONENTIAL		STRUCTURE 2 SPHERICAL		STRUCTURE 3 SPHERICAL	
		SILL	RANGE (X,Y,Z)	SILL	RANGE (X,Y,Z)	SILL	RANGE (X,Y,Z)
Au g/t	0.40	0.41	9.5,8.5,4	0.09	21,31,5	0.10	55,44,17
Domain 9: Rotation Z-10, Y-40, X+0							
10%	0.24	0.44	4,30,32.5	0.05	7,45,58	0.27	10,53,81
20%	0.23	0.39	4,4,4	0.10	6,21,6	0.28	14,113,93
30%	0.23	0.31	4,32,4	0.18	6,49,30	0.28	15,74,83
40%	0.24	0.31	4.5,23.5,4	0.18	6,47,49	0.27	15,71,122
50%	0.25	0.42	4,10.5,32	0.07	5,31,41	0.26	16,125,130
60%	0.26	0.47	4,32.5,32.5	0.14	5,41,41	0.13	18,147,149
70%	0.27	0.54	4,32.5,32.5	0.08	5,35,40	0.11	16,129,132
75%	0.28	0.40	4,31,30	0.12	5,39,36	0.20	8,65,63
80%	0.29	0.40	4,32.5,32.5	0.03	6,50,49	0.28	7,60,58
85%	0.30	0.52	4,22,32.5	0.05	8,30,62	0.13	10,47,79
90%	0.31	0.54	4,12.5,4	0.03	8,28,60	0.13	16,30,129
95%	0.33	0.53	4,20.5,4	0.04	5,30,5	0.10	14,32,49
97%	0.38	0.58	4,4,4	0.00	5,8,5	-	-
99%	0.45	0.53	4,4,1	0.00	5,5,2	-	-
Au g/t	0.40	0.46	4,13,31.5	0.03	8,25,65	0.11	11,29,91
Domain 10: Rotation Z+50, Y+50, X+0							
10%	0.21	0.43	28.5,11,4.5	0.31	29,12,31	0.05	245,29,35
20%	0.20	0.43	28,20,4	0.33	35,39,26	0.04	110,41,29
30%	0.20	0.43	33.5,17.5,5	0.33	35,40,20	0.04	128,126,82
40%	0.19	0.43	27.5,22.5,4	0.33	32,34,19	0.05	107,92,60
50%	0.20	0.43	22,17.5,4.5	0.33	39,30,18	0.04	111,113,52
60%	0.21	0.43	24.5,11,3.5	0.33	44,33,15	0.03	62,217,52
70%	0.23	0.45	15,26,3.5	0.31	50,28,15	0.01	735,133,100
75%	0.25	0.47	14,24,3.5	0.27	55,25,15	0.01	723,293,46
80%	0.27	0.47	12,17,3.5	0.25	42,21,13	0.01	114,101,14
85%	0.28	0.47	14,8,3.5	0.23	35,19,9	0.02	590,473,21
90%	0.32	0.61	20,11,3.5	0.05	39,15,9	0.02	1348,376,170
95%	0.34	0.16	24,3.5,3.5	0.47	27,13,4	0.03	2293,3233,1441
97%	0.37	0.23	28,5,3.5	0.40	33,17,4	-	-
99%	0.45	0.31	4,6.5,3.5	0.22	4.5,9,4	0.02	25,26,4.5
Au g/t	0.35	0.22	20,15,3.5	0.40	36,16,5	0.03	75,25,10

14.7.1.3 Govisou Mineral Resource Estimate

The MIK resource modelling included semi-variograms modelled for each indicator based on the combined estimation dataset subdivided into laterite and the combined deeper weathering zones. For determination of variance adjustment factors, a semi-variogram model of composite gold grades was also developed for each of these datasets.

Modelled semi-variogram parameters for the Govisou resource estimate are provided in Table 14-21.

Table 14-21: Semi-variogram models applied to Govisou resource estimate

PERCENTILE	NUGGET	STRUCTURE 1 EXPONENTIAL		STRUCTURE 2 SPHERICAL		STRUCTURE 3 SPHERICAL	
		SILL	RANGE (X,Y,Z)	SILL	RANGE (X,Y,Z)	SILL	RANGE (X,Y,Z)
Laterite: Rotation Z+0, Y+0, X+0							
10%	0.19	0.67	18,19,4	0.13	82,83,9	0.01	166,370,32
20%	0.17	0.65	18,39,6	0.16	173,69,10.5	0.02	319,122,19
30%	0.17	0.62	17,44,5.5	0.13	226,88,13	0.08	300,93,19
40%	0.19	0.54	14,41,4	0.13	97,57,6.5	0.14	290,58,19
50%	0.20	0.59	14,49.5,3.5	0.07	176,51,4.5	0.14	628,56,42
60%	0.21	0.60	27,54.5,2.5	0.07	81,53,12	0.12	498,56,110
70%	0.22	0.65	36,30.5,4	0.02	62,79,12	0.11	376,88,230
75%	0.24	0.63	31,26,2.5	0.12	79,76,51	0.01	290,100,230
80%	0.25	0.63	26.5,17,2	0.10	73,61,8.5	0.02	133,95,14
85%	0.27	0.47	24,37,2.5	0.25	48,39,3	0.01	120,80,12
90%	0.29	0.56	17,20,2.5	0.13	51,52,3	0.02	149,101,6
95%	0.31	0.56	14.5,18,2	0.12	71,50,3.5	0.01	164,60,6
97%	0.34	0.29	15,12,4	0.36	31,20,4.5	0.01	46,60,6
99%	0.40	0.55	15,10,1.5	0.03	23,20,2	0.02	25,30,3
Au g/t	0.25	0.65	19,30,2.5	0.08	52,43,8.5	0.02	130,79,12
Weathered and fresh material below laterite: Rotation Z+0, Y-60, X+0							
10%	0.17	0.33	13,7.5,4	0.16	19,19,89	0.34	85,154,326
20%	0.15	0.34	16,16,6.5	0.15	76,18,151	0.36	97,190,173
30%	0.15	0.34	16,15,7.5	0.15	76,19,151	0.36	102,230,173
40%	0.16	0.30	22,11,6.5	0.15	53,31,100	0.39	101,165,180
50%	0.17	0.28	28,15,7	0.06	29,17,167	0.49	102,114,197
60%	0.18	0.28	19,15,7	0.06	21,19,135	0.48	118,118,242
70%	0.19	0.28	18,14,8.5	0.06	25,33,270	0.47	122,113,284
75%	0.20	0.28	20,20,10	0.06	21,32,254	0.46	120,101,265
80%	0.21	0.28	25,32,11	0.06	28,35,224	0.45	134,72,237
85%	0.22	0.27	26.5,18,13.5	0.06	27,42,150	0.45	117,58,151
90%	0.23	0.27	22,27,15.5	0.16	59,29,89	0.34	110,50,94
95%	0.25	0.27	28,22,8.5	0.16	29,23,48	0.32	99,50,46
97%	0.30	0.27	17,16,3	0.16	28,26,10	0.27	98,46,46
99%	0.40	0.52	21,19,3	0.03	65,23,4.5	0.05	77,30,30
Au g/t	0.20	0.33	15,29,8	0.11	72,41,46	0.36	100,44,60

14.7.1.4 Angovia 2 Mineral Resource Estimate

The MIK resource modelling included semi-variograms modelled for each indicator based on the mineralised south domain estimation dataset. For determination of variance adjustment factors, a semi-variogram model of composite gold grades was also developed for this dataset.

Modelled semi-variogram parameters for the Angovia 2 resource estimate are provided in Table 14-22.

Table 14-22: Semi-variogram models applied to Angovia 2 resource estimate

PERCENTILE	NUGGET	STRUCTURE 1 EXPONENTIAL		STRUCTURE 2 SPHERICAL		STRUCTURE 3 SPHERICAL	
		SILL	RANGE (X,Y,Z)	SILL	RANGE (X,Y,Z)	SILL	RANGE (X,Y,Z)
South Domain: Rotation Z+0, Y+0, X+50							
10%	0.29	0.36	35,20,8	0.20	40,25,16	0.15	76,56,42
20%	0.28	0.37	28,26,8.5	0.18	31,30,15	0.17	111,58,190
30%	0.28	0.37	32,27,8	0.18	40,31,17	0.17	126,60,230
40%	0.29	0.38	29,17,9	0.17	39,32,17	0.16	121,58,135
50%	0.30	0.38	31,17,8.5	0.17	43,28,21	0.15	101,70,125
60%	0.31	0.38	28,16,7.5	0.17	41,28,18	0.14	96,70,120
70%	0.32	0.39	28,16,7	0.17	43,28,17	0.12	88,68,100
75%	0.33	0.39	27,16,5.5	0.17	41,28,17	0.11	86,66,95
80%	0.34	0.38	21,16,4.5	0.19	41,32,17	0.09	82,66,95
85%	0.35	0.38	19,16,4	0.19	37,31,15	0.08	82,64,93
90%	0.37	0.40	18,15,3	0.18	36,29,14	0.05	82,62,50
95%	0.41	0.40	17,15,3.5	0.14	33,29,14	0.05	56,48,30
97%	0.45	0.40	16,14,3.5	0.10	30,28,9	0.05	35,35,21
99%	0.50	0.41	15,13,3	0.05	25,27,9	0.04	30,30,20
Au g/t	0.39	0.37	19,18,5.5	0.17	26,33,18	0.07	54,64,66

14.8 Block Model Parameters

Block models aligned with the national WGS84 UTM grid were created to encompass the full extent of the individual deposits that comprise the Yaouré Gold Mine Mineral Resources. Individual block model details and parameters for each of the individual resource estimates are provided in Table 14-23.

Table 14-23: Yaouré Gold Mine individual block model parameters

DEPOSIT/ESTIMATE	AXIS	EXTENT (m)		BLOCK SIZE (m)	SUB-CELL SIZE (m)
		MINIMUM	MAXIMUM		
Yaouré	Easting (X)	220,004	221,412	8.0	0.5
	Northing (Y)	775,897	778,105	16.0	1.0
	RL (Z)	850	1,380	5.0	0.625
	Rotation	-			
	Discretisation (XYZ)	3 × 5 × 3			
	Block Model File	BM_PMS_YAO_OP_RES_20230630.DM			
CMA underground	Easting (X)	220,460	222,730	10.0	0.625
	Northing (Y)	775,865	778,415	12.5	3.125
	RL (Z)	585	1,380	5.0	0.3125
	Rotation	-			
	Discretisation (XYZ)	3 × 5 × 3			
	Block Model File	BM_PMS_CMA_UG_RES_20230609.DM			
CMA open pit & CMA SW	Easting (X)	219,800	222,250	12.5	-
	Northing (Y)	775,497.5	778,447.5	25.0	-
	RL (Z)	690	1,400	5.0	-
	Rotation	-			
	Block Model File	Combined Yaoure Model3.DAT			
Angovia 2	Easting (X)	221,500	222,200	12.5	-
	Northing (Y)	776,122.5	776,622.5	25.0	-
	RL (Z)	1,160	1,360	5.0	-
	Rotation	-			
	Block Model File	202104 Angovia Model Full.DAT			
Govisou	Easting (X)	219,075.06	219,395.06	20.0	-
	Northing (Y)	777,450.435	777,830.435	20.0	-
	RL (Z)	1,060	1,270	5.0	-
	Rotation	135 (X), 045 (Y)			
	Block Model File	20220607 Govisou Model UTM.DAT			

14.9 Estimation

14.9.1.1 Yaouré Open Pit and CMA Underground Mineral Resource Estimates

The Yaouré open pit and CMA underground resource estimates used a combination of ordinary kriging (OK) and inverse distance weighting (IDW) estimation methods to estimate gold grades. Hard boundaries were used for the estimation of all domains in the resource models. Estimates were performed on a per-domain basis, over parent cell support.

Oriented search ellipsoids were used to define the local input data for estimation at each block. Search ellipsoid dimensions and anisotropy were based on orientations derived from semi-variogram analysis and reflect the strike and dip directions of each domain. Both the Yaouré open pit and CMA underground estimates employed dynamic anisotropy where applicable, aligning the rotation of the search ellipsoid to the local dip and dip direction of the mineralised lode for each block. Estimation and search parameters for each domain in each of the resource models are provided in Table 14-24.

A multiple pass strategy has been employed in each model with increasingly relaxed and expanded search parameters to ensure the majority of blocks within each domain were estimated.

Table 14-24: Yaouré open pit and CMA underground search and estimation parameters

DOMAIN	METHOD	POWER	PASS	ROTATIONS (°)			MAX. SAMPS. PER HOLE	ELLIPSOID DIMENSIONS (m)			MIN. SAMPS.	MAX SAMPS.	SECTORS
				DIP	DIP DIR.	PITCH		U	V	W			
1010	OK	-	1	Dynamic			4	95	45	20	8	24	4
			2				4	140	70	30	6	18	4
			3				-	200	120	40	2	8	-
1012	IDW	2	1	32	64	90	-	45	45	15	2	12	-
1013	IDW	2	1	20	84	90	-	45	45	15	2	12	-
1015	OK	-	1	Dynamic			4	120	70	20	4	16	4
			2				4	240	140	40	2	8	-
1020	OK	-	1	Dynamic			4	60	40	15	8	24	4
			2				4	120	80	30	6	18	4
			3				-	150	100	20	2	8	-
1022	IDW	2	1	24	100	125	-	45	45	15	2	12	-
1030	OK	-	1	22	50	47	3	70	70	6	4	24	-
			2				2	140	140	12	1	24	-
1040	OK	-	1	Dynamic			2	50	50	7	4	24	-
			2				2	50	50	7	1	24	-
1050	IDW	2	1	23	182	0	2	50	50	10	4	24	-
			2				2	50	50	10	1	12	-
1060	IDW	2	1	Dynamic			2	50	50	10	4	24	-
			2				2	50	50	10	1	12	-
1070	OK	-	1	Dynamic			4	60	40	15	8	24	4
			2				4	120	80	30	6	18	4
			3				-	150	100	20	2	8	-
2010	OK	-	1	Dynamic			4	90	60	15	8	24	4
			2				4	180	120	60	4	16	4
3010	OK	-	1	Dynamic			8	80	45	15	8	36	4
			2				8	140	70	30	6	24	4
			3				-	200	120	40	2	24	-
3020	OK	-	1	Dynamic			8	100	65	20	10	32	4
			2				8	150	95	30	10	24	4
			3				-	200	120	40	2	8	-
3030	OK	-	1	Dynamic			8	70	50	10	8	36	4
			2				8	140	70	30	6	24	4
			3				-	200	120	40	2	24	-
3040	OK	-	1	Dynamic			8	70	50	10	8	36	4
			2				8	140	70	30	6	24	4
			3				-	200	120	40	2	24	-
4010	OK	-	1	Dynamic			4	85	55	15	8	24	4
			2				4	140	70	30	6	18	4
			3				-	200	120	40	2	8	-
4011	IDW	2	1	44	86	167	3	40	25	15	6	16	-
4020	OK	-	1	Dynamic			12	90	60	25	8	36	4
			2				10	140	70	30	6	24	4
			3				-	200	120	40	2	12	-
4021	OK	-	1	Dynamic			6	25	15	5	8	24	4
			2				6	55	30	15	6	18	4
			3				-	100	60	20	2	8	-
4022	OK	-	1	Dynamic			4	25	15	5	8	18	4
			2				4	55	35	15	6	18	4
			3				-	100	60	20	2	8	-
4023	OK	-	1	Dynamic			8	15	15	5	8	24	4

DOMAIN	METHOD	POWER	PASS	ROTATIONS (°)			MAX. SAMPS. PER HOLE	ELLIPSOID DIMENSIONS (m)			MIN. SAMPS.	MAX SAMPS.	SECTORS
				DIP	DIP DIR.	PITCH		U	V	W			
			2				8	55	30	15	6	24	4
			3				-	110	60	25	2	12	-
4024	OK	-	1	Dynamic			10	45	25	10	8	40	4
			2				10	90	50	20	6	30	4
			3				-	200	120	40	2	16	-
4026	OK	-	1	Dynamic			8	30	25	5	8	24	4
			2				8	55	40	15	8	24	4
			3				-	110	80	30	2	12	-
4027	OK	-	1	Dynamic			8	35	20	7	8	24	4
			2				6	60	40	15	8	18	4
			3				-	120	80	30	2	12	-
4030	OK	-	1	Dynamic			8	35	25	7	12	32	-
			2				8	65	40	15	10	24	4
			3				-	110	80	30	6	16	-
4031	OK	-	1	Dynamic			12	30	20	7	14	32	4
			2				10	55	35	15	10	24	4
			3				-	110	70	30	6	16	-
4032	OK	-	1	Dynamic			10	50	30	10	8	36	-
			2				10	90	50	20	6	24	4
			3				-	180	100	40	4	16	-
4033	OK	-	1	Dynamic			6	25	15	5	8	24	4
			2				6	50	30	15	6	18	4
			3				-	100	60	30	4	12	-
4035	OK	-	1	Dynamic			12	55	30	10	8	32	4
			2				10	90	45	15	10	24	4
			3				-	180	90	30	6	16	-
4036	OK	-	1	Dynamic			12	50	30	10	8	32	4
			2				10	80	50	15	10	24	4
			3				-	180	100	30	6	16	-
4037	OK	-	1	Dynamic			12	50	30	10	8	32	4
			2				10	80	50	15	10	24	4
			3				-	160	100	30	6	16	-
4040	OK	-	1	Dynamic			12	65	35	10	8	24	4
			2				10	115	70	20	6	18	4
			3				-	230	140	40	4	12	-
4050	OK	-	1	Dynamic			6	35	15	8	8	32	-
			2				6	90	50	15	6	24	4
			3				-	150	90	30	4	12	-
4051	OK	-	1	Dynamic			8	35	25	10	8	24	4
			2				8	70	65	15	6	18	4
			3				-	140	130	30	4	12	-
4052	OK	-	1	Dynamic			10	55	40	10	8	36	4
			2				10	125	75	25	6	24	4
			3				-	250	150	50	4	16	-
4053	OK	-	1	Dynamic			10	45	45	10	8	36	4
			2				10	110	60	20	6	24	4
			3				-	220	120	40	4	16	-
4054	OK	-	1	Dynamic			8	35	35	10	8	24	4
			2				8	110	75	25	6	18	4
			3				-	220	150	50	4	12	-
4055	OK	-	1	Dynamic			8	40	40	10	8	24	4
			2				8	110	75	25	6	18	4
			3				-	220	150	50	4	12	-
4060	OK	-	1	Dynamic			8	50	30	10	8	32	-
			2				6	110	75	25	8	18	4

DOMAIN	METHOD	POWER	PASS	ROTATIONS (°)			MAX. SAMPS. PER HOLE	ELLIPSOID DIMENSIONS (m)			MIN. SAMPS.	MAX SAMPS.	SECTORS
				DIP	DIP DIR.	PITCH		U	V	W			
			3				-	220	150	50	6	12	-
4061	OK	-	1	Dynamic			6	40	35	10	10	24	4
			2				6	90	60	20	8	18	4
			3				-	180	120	40	4	12	-
4062	OK	-	1	Dynamic			6	40	30	10	8	24	-
			2				6	70	50	15	8	18	4
			3				-	140	100	30	4	12	-
5010	OK	-	1	Dynamic			6	45	30	10	8	24	4
			2				6	120	70	20	6	18	4
			3				-	240	140	40	4	10	-
5011	OK	-	1	Dynamic			8	30	30	10	8	24	4
			2				8	70	70	15	6	18	4
			3				-	140	140	30	4	12	-
5012	OK	-	1	Dynamic			8	35	25	10	8	24	4
			2				8	80	55	15	6	18	4
			3				-	160	110	30	4	12	-
5013	OK	-	1	Dynamic			10	35	30	10	6	24	-
			2				8	65	50	15	6	18	4
			3				-	130	100	30	4	12	-
7010	OK	-	1	0	340	116	8	35	35	10	8	24	4
			2				8	65	65	15	6	18	4
			3				-	130	130	30	4	12	-
8020	OK	-	1	28	72	30	4	65	35	10	8	24	4
			2				4	140	70	30	6	18	4
			3				-	200	120	40	2	8	-
8030	OK	-	1	28	72	30	4	65	35	10	8	24	4
			2				4	140	70	30	6	18	4
			3				-	200	120	40	2	8	-
8040	OK	-	1	42	92	155	4	80	50	10	8	24	4
			2				4	140	70	30	6	18	4
			3				-	200	120	40	2	8	-

Blocks not estimated were assigned a gold grade based on the rounded mean gold grade of the domain or subsequently set to a background gold grade of 0.01 g/t, as listed in Table 14-25.

Table 14-25: Assigned domain gold grades – Yaouré open pit and CMA underground resource estimates

DOMAIN	GOLD GRADE (g/t)	VALUE DEFINITION
101	0.01	Background – Detection Limit
102	0.01	Background – Detection Limit
103	0.01	Background – Detection Limit
1011	2.5	Rounded Mean
1021	2.6	Rounded Mean
1031	2.0	Rounded Mean
8010	0.01	Background – Detection Limit
8050	0.01	Background – Detection Limit

14.9.1.2 CMA Open Pit and CMA SW Mineral Resource Estimate

MPR estimated resources for the CMA open pit and CMA SW by multiple indicator kriging (MIK) with the application of a block support adjustment, a method that has been demonstrated to provide reliable estimates of recoverable open pit resources in gold deposits of diverse geological

styles. The estimation and search parameters for the CMA open pit and CMA SW resource model are provided in Table 14-26.

MPR applied progressively relaxed search passes for each domain estimated. The search orientations reflect the general orientation and drilling distribution of each domain and parameters represent a compromise between providing reasonably robust local estimates and estimating a reasonably large proportion of the potentially mineralised domain volumes.

In contrast to the other deposit areas, mineralisation in the CMA SW region varies in orientation, swinging from NW dipping in the south, to SW dipping in the north. For estimation of the CMA SW resource zone the search ellipsoids were aligned with local domain orientations by northing range (Table 14-26).

Table 14-26: CMA open pit and CMA SW resource model estimate search parameters

YAOURÉ ZONE			
ROTATION: Z+10, Y+30, X+0			
SEARCH PASS	RADII (XYZ m)	MIN. DATA	MIN OCTANTS
1	30 × 60 × 10	16	4
2	45 × 90 × 15	16	4
3	45 × 90 × 15	8	2
4	90 × 90 × 22.5	8	2
CMA SOUTH ZONE			
SEARCH PASS	RADII (XYZ m)	MIN. DATA	MIN OCTANTS
1	30 × 60 × 10	16	4
2	45 × 90 × 15	16	4
3	45 × 90 × 15	8	2
4	90 × 90 × 22.5	8	2
NORTHING RANGE		STRIKE/DIP	ROTATION
<776,172.5 mN		060°/30°E	Z-60°, Y+30°
776,172.5 mN to 776,472.5 mN		030°/40°E	Z-30°, Y+40°
776472.5 mN to 776,597.5 mN		000°/40°E	Z+0°, Y+40°
>776,597.5 mN		330°/50°E	Z+30°, Y+50°
CMA ZONE			
ROTATION: Z+10, Y+30, X+0			
SEARCH PASS	RADII (XYZ m)	MIN. DATA	MIN OCTANTS
1	30 × 30 ×10	16	4
2	30 × 60 × 10	16	4
3	45 × 90 × 15	16	4
4	45 × 90 × 15	8	2
5	90 × 90 × 22.5	8	2

The CMA open pit and CMA SW MIK estimate includes a variance adjustment to give estimates of recoverable resources at gold cut off grades. The variance adjustments were applied using the direct lognormal method and the adjustment factors listed in Table 14-27.

The variance adjustment factors were estimated on the basis of the variogram models for gold grades shown in Table 14-27 and mining selectivity of 4 m × 6 m × 2.5 m (east, north, vertical) with high quality GC sampling on a 5 m × 8 m × 1.25 m (east, north, vertical) pattern. The recoverable resource estimates can be reasonably expected to provide appropriately reliable estimates of potential mining outcomes at the assumed selectivity without application of additional mining dilution, or mining recovery factors.

Table 14-27: CMA open pit and CMA SW resource model variance adjustment parameters

DOMAIN	PANEL TO BLOCK ADJUSTMENT	INFORMATION EFFECT	TOTAL ADJUSTMENT
1,2,7,8	0.156	0.539	0.084
3,4	0.166	0.506	0.084
5	0.348	0.876	0.305
6	0.317	0.903	0.286
9	0.187	0.655	0.122
10	0.213	0.656	0.140

14.9.1.3 Govisou Mineral Resource Estimate

MPR estimated resources for Govisou by MIK with the application of a block support adjustment, a method that has been demonstrated to provide reliable estimates of recoverable open pit resources in gold deposits of diverse geological styles. The estimation and search parameters for the Govisou resource model are provided in Table 14-28.

MPR applied progressively relaxed search passes for each domain estimated. The search orientations reflect the general orientation and drilling distribution of each domain and parameters represent a compromise between providing reasonably robust local estimates and estimating a reasonably large proportion of the potentially mineralised domain volumes.

Table 14-28: Govisou resource model estimate search parameters

LATERITE				
ROTATION: Z+10, Y+00, X+0				
SEARCH PASS	RADII (XYZ m)	MIN. DATA	MIN. OCTANTS	MAX. DATA
1	30 × 30 × 5	16	4	48
2	45 × 45 × 7.5	16	4	48
3	45 × 45 × 7.5	8	2	48
WEATHERED AND FRESH MATERIAL BELOW LATERITE				
ROTATION: Z+0, Y-60, X+0				
SEARCH PASS	RADII (XYZ m)	MIN. DATA	MIN. OCTANTS	MAX. DATA
1	25 × 25 × 10	16	4	48
2	37.5 × 37.5 × 15	16	4	48
3	37.5 × 37.5 × 15	8	2	48

The MIK estimate includes a variance adjustment to give estimates of recoverable resources at gold cut off grades. The variance adjustments were applied using the direct lognormal method and the adjustment factors listed in Table 14-29.

The variance adjustment factors were estimated on the basis of the variogram models for gold grades shown in Table 14-29 and mining selectivity of 4 m × 6 m × 2.5 m (east, north, vertical) with high quality GC sampling on a 5 m × 8 m × 1.25 m (east, north, vertical) pattern. The recoverable resource estimates can be reasonably expected to provide appropriately reliable estimates of potential mining outcomes at the assumed selectivity without application of additional mining dilution, or mining recovery factors.

Table 14-29: Govisou resource model variance adjustment parameters

DOMAIN	PANEL TO BLOCK ADJUSTMENT	INFORMATION EFFECT	TOTAL ADJUSTMENT
Laterite	0.170	0.527	0.090
Weathered and fresh below laterite	0.365	0.879	0.319

14.9.1.4 Angovia 2 Mineral Resource Estimate

MPR estimated resources for Angovia 2 by MIK with the application of a block support adjustment, a method that has been demonstrated to provide reliable estimates of recoverable open pit resources in gold deposits of diverse geological styles. The estimation and search parameters for the Angovia 2 resource model are provided in Table 14-30.

MPR applied progressively relaxed search passes for each domain estimated. The search orientation was primarily selected on the basis of the drilling in the South domain area, rather than the vertical GC drill holes in the North domain, which is only a small proportion of the Angovia 2 resource estimate.

Table 14-30: Angovia 2 resource model estimate search parameters

SOUTH DOMAIN				
ROTATION: Z+0, Y+0, X+50				
SEARCH PASS	RADII (XYZ m)	MIN. DATA	MIN. OCTANTS	MAX. DATA
1	30 × 30 × 12	16	4	48
2	45 × 45 × 18	16	4	48
3	45 × 45 × 18	8	2	48

The MIK estimate includes a variance adjustment to give estimates of recoverable resources at gold cut off grades. The variance adjustments were applied using the direct lognormal method and the adjustment factors listed in Table 14-31.

The variance adjustment factors were estimated on the basis of the variogram models for gold grades shown in Table 14-31 and mining selectivity of 4 m × 6 m × 2.5 m (east, north, vertical) with high quality GC sampling on a 8 m × 5 m × 1.25 m (east, north, vertical) pattern. The recoverable resource estimates can be reasonably expected to provide appropriately reliable estimates of potential mining outcomes at the assumed selectivity without application of additional mining dilution, or mining recovery factors.

Table 14-31: Angovia 2 resource model variance adjustment parameters

DOMAIN	PANEL TO BLOCK ADJUSTMENT	INFORMATION EFFECT	TOTAL ADJUSTMENT
South	0.266	0.753	0.200
North	0.266	0.753	0.200

14.10 Validation

Initial validation of the Yaouré Gold Mine resource estimates was undertaken using a variety of methods including checks for un-estimated mineralisation blocks, incorrect or absent assignment of density values, and mineralised blocks or blocks with density values above topography.

Following these checks, swath plots were generated along the three principal axes to assess the representivity of estimated grade profiles in comparison to the input composite grades. Swath plots were generated on a per-mineralisation or domain basis. Swath plots indicate a suitable level of

adherence of the estimated gold grades to the expected values observed within the input composite data for each of the resource estimates.

14.10.1.1 Yaouré Open Pit and CMA Underground Mineral Resource Estimates

A selection of validation swath plots for the major domains hosting approximately 80% of the contained gold ounces for both the CMA underground and Yaouré open pit Mineral Resources are shown in Figure 14-14 to Figure 14-25.

The conformance of the gold grade estimates to the input composite gold grades per each of the major domains is considered reasonable and indicates no material concerns with the quality and robustness of the resource estimates.

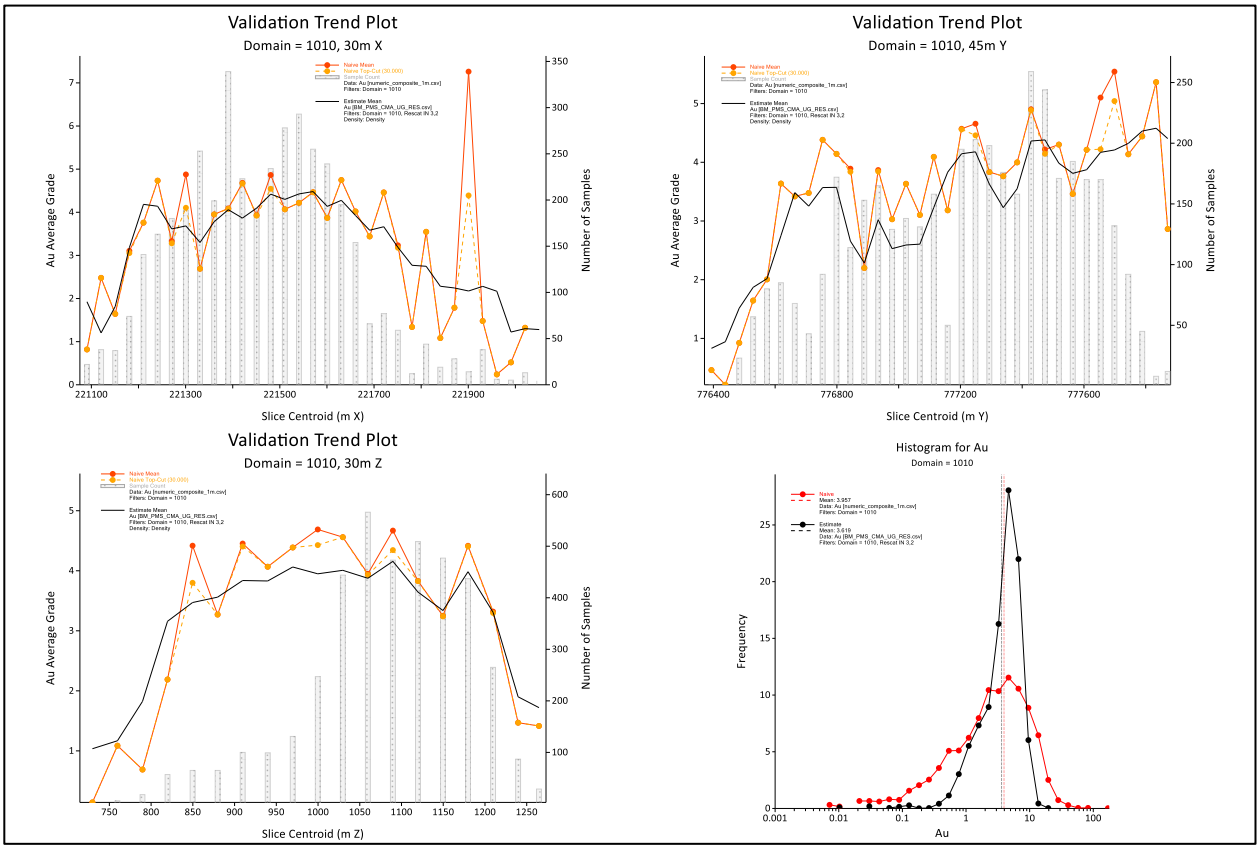


Figure 14-14: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 1010

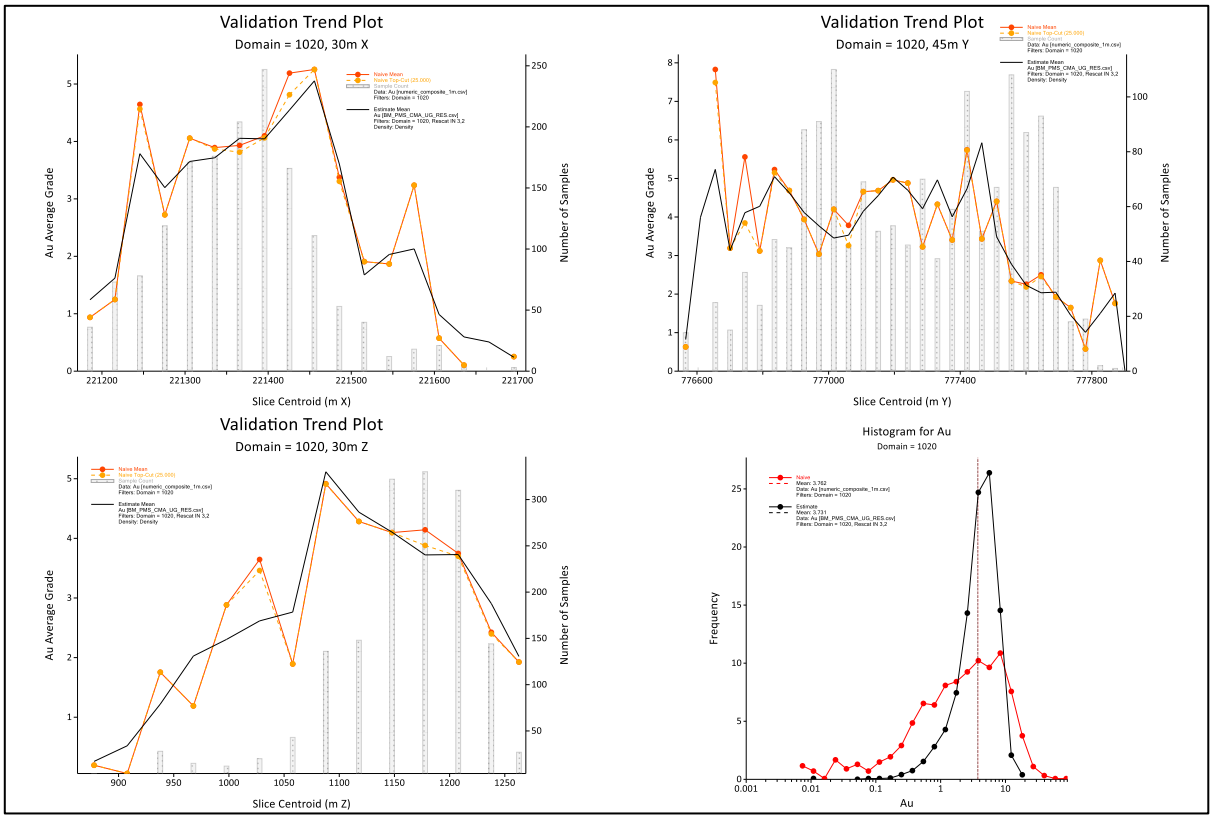


Figure 14-15: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 1020

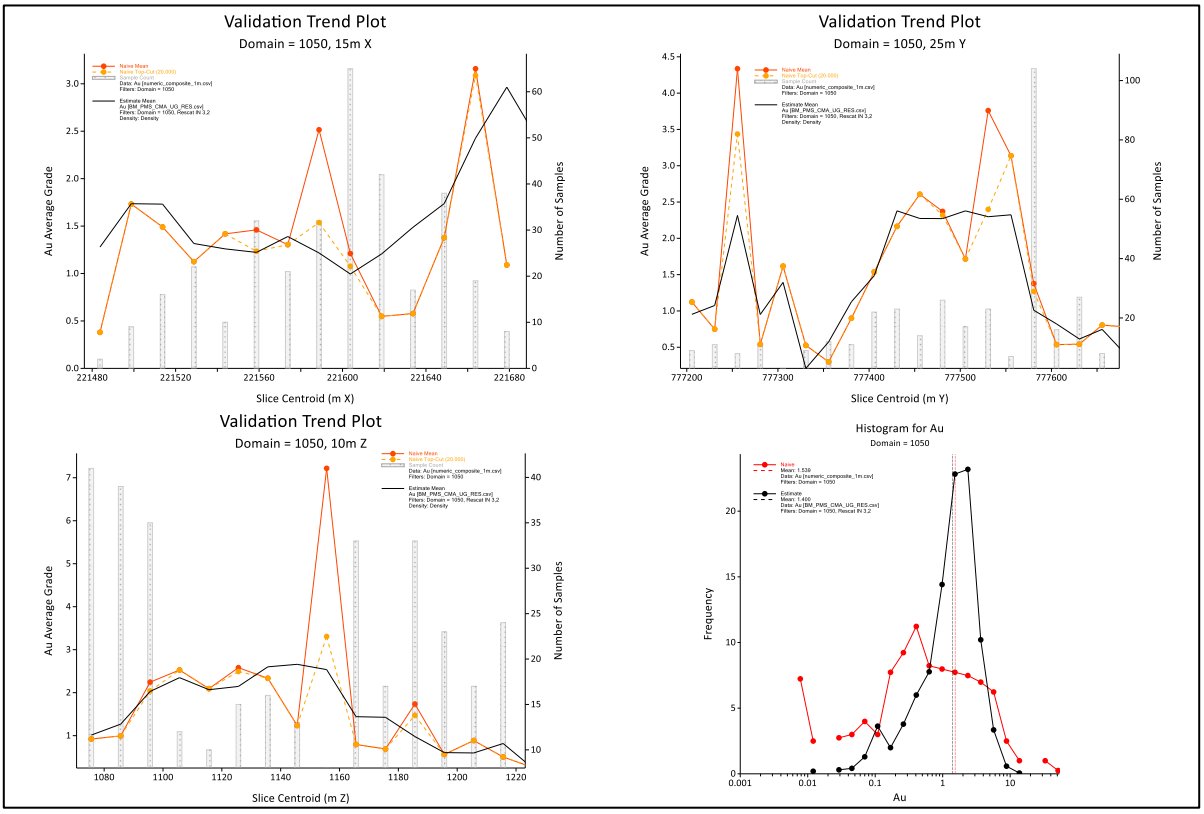


Figure 14-16: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 1050

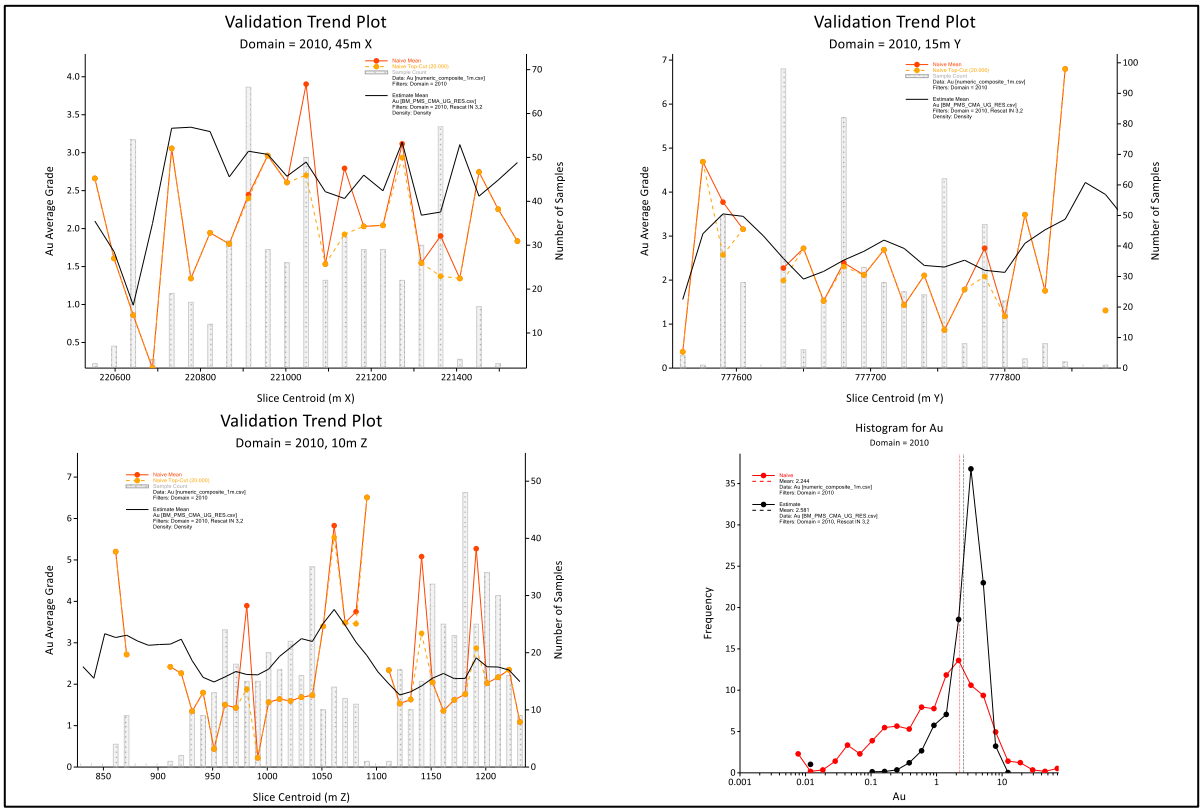


Figure 14-17: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 2010

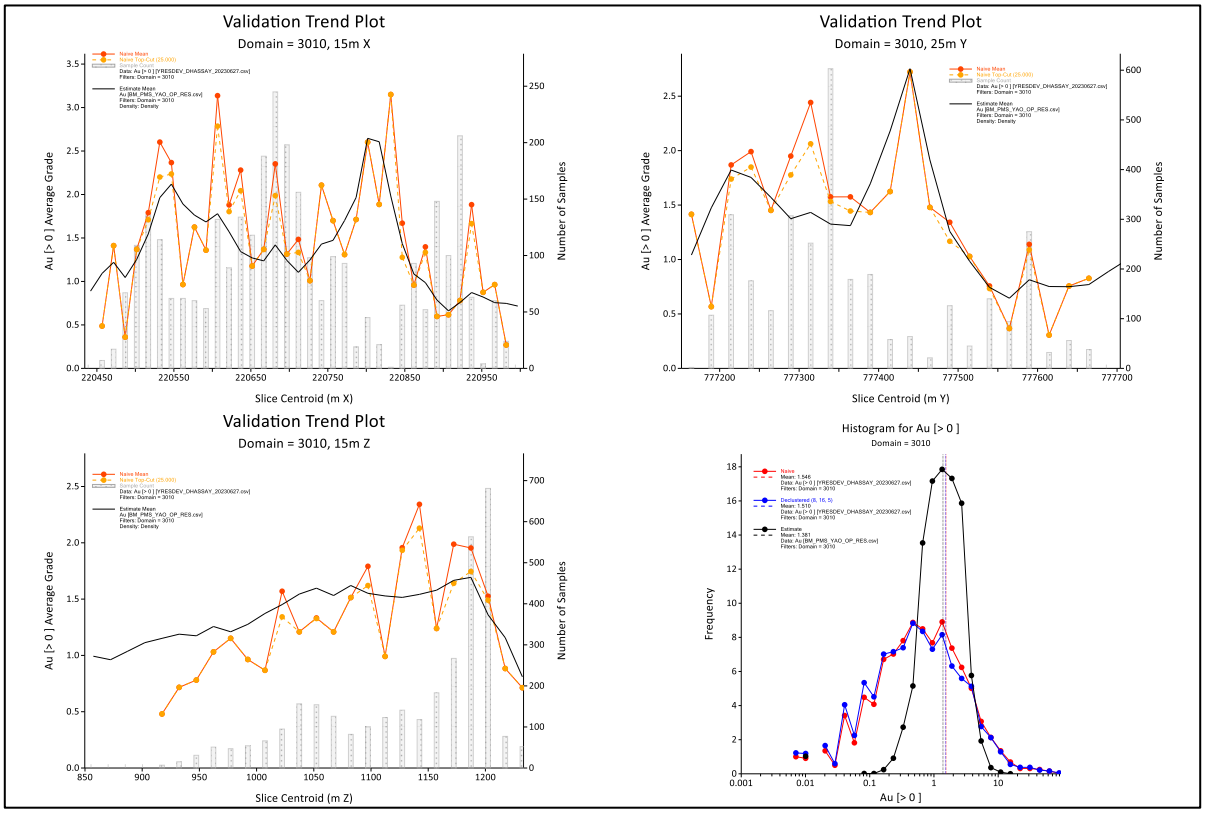


Figure 14-18: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 3010

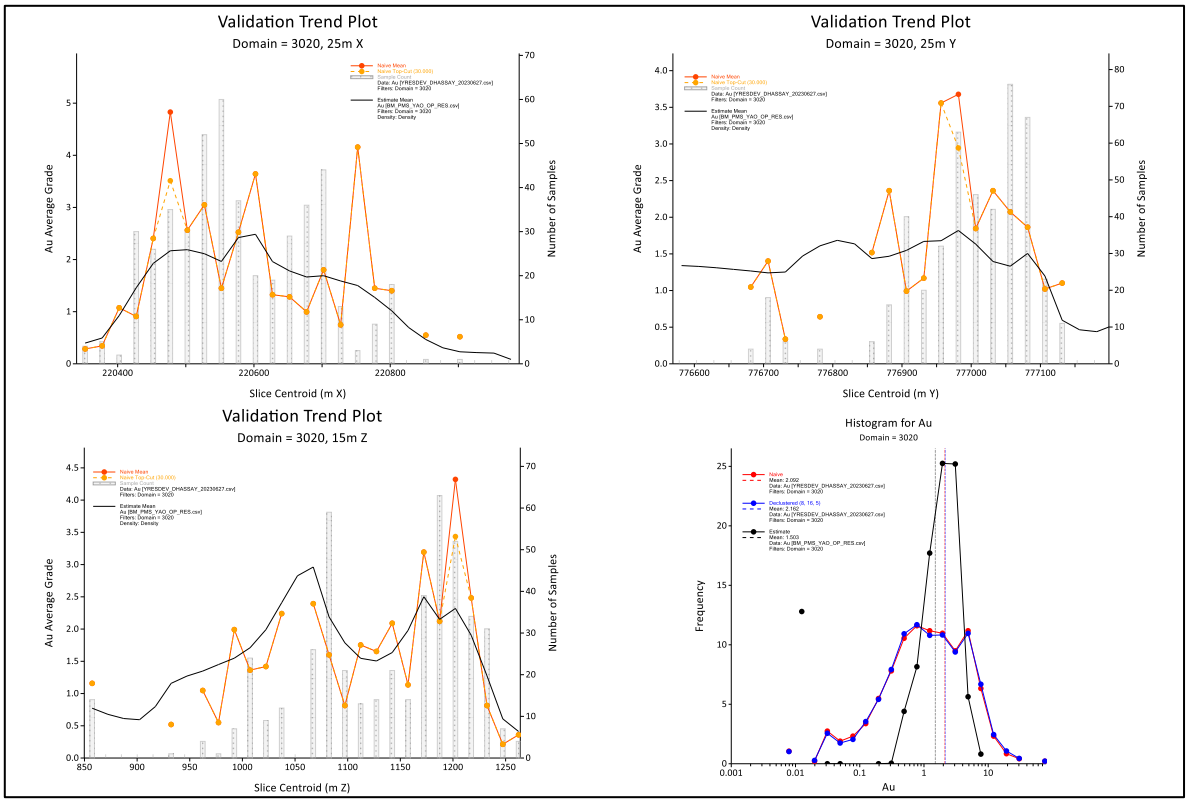


Figure 14-19: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 3020

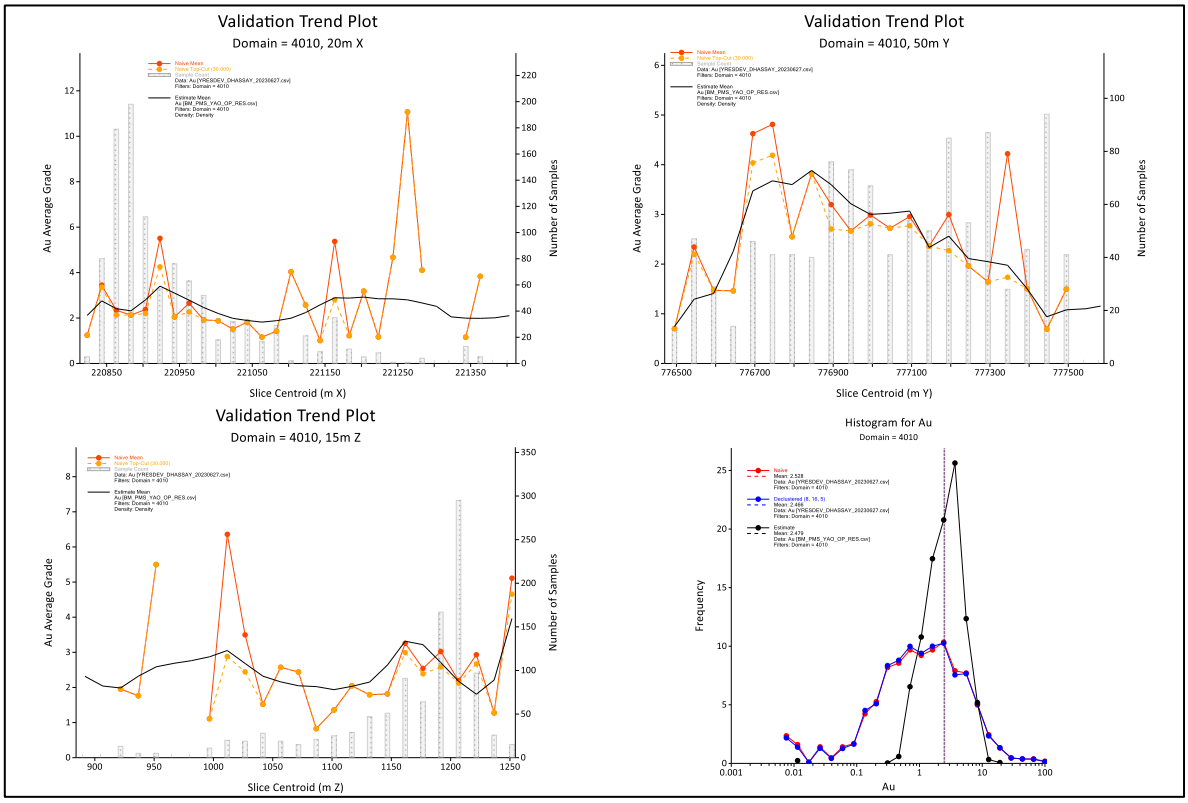


Figure 14-20: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 4010

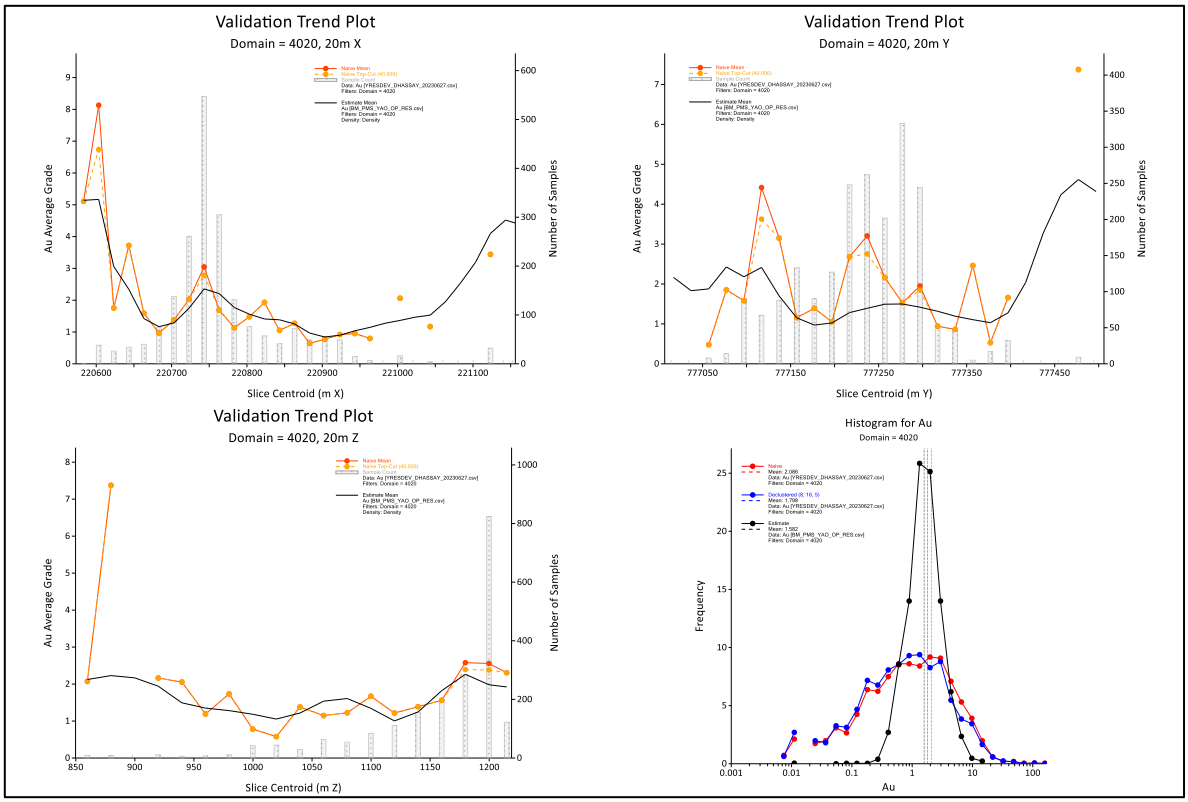


Figure 14-21: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 4020

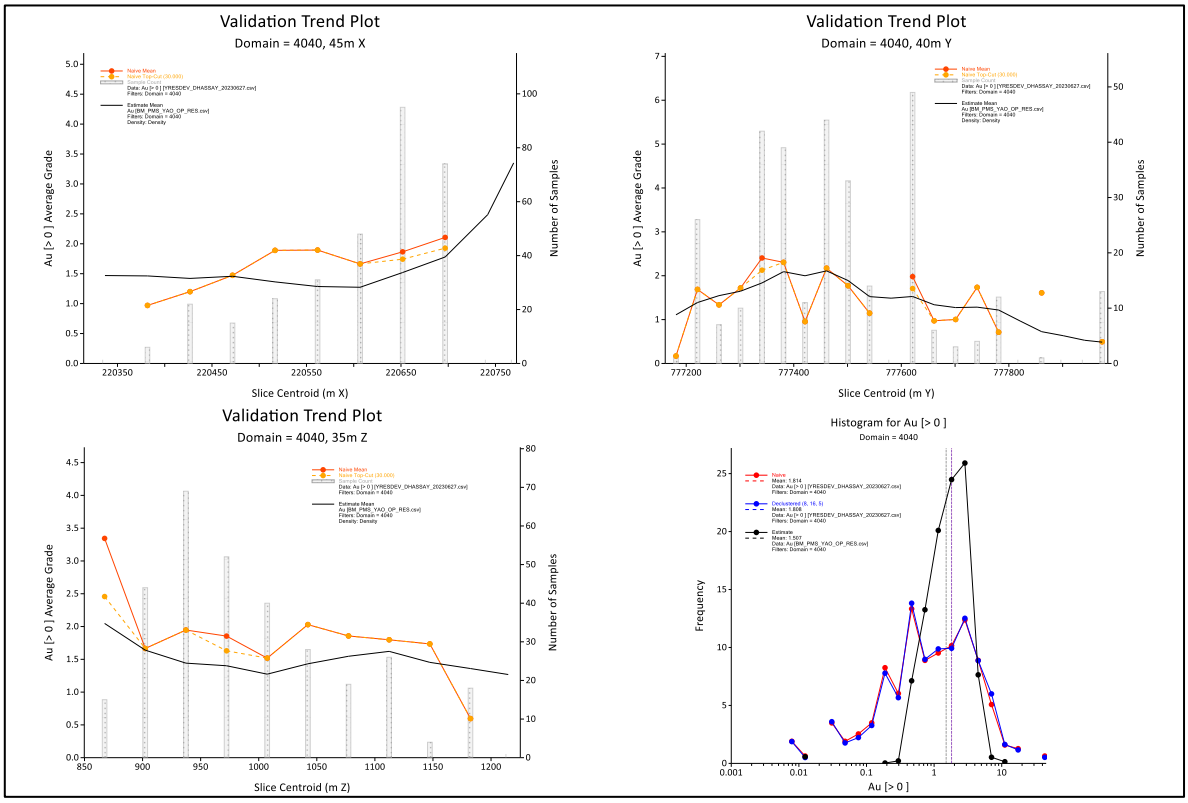


Figure 14-22: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 4040

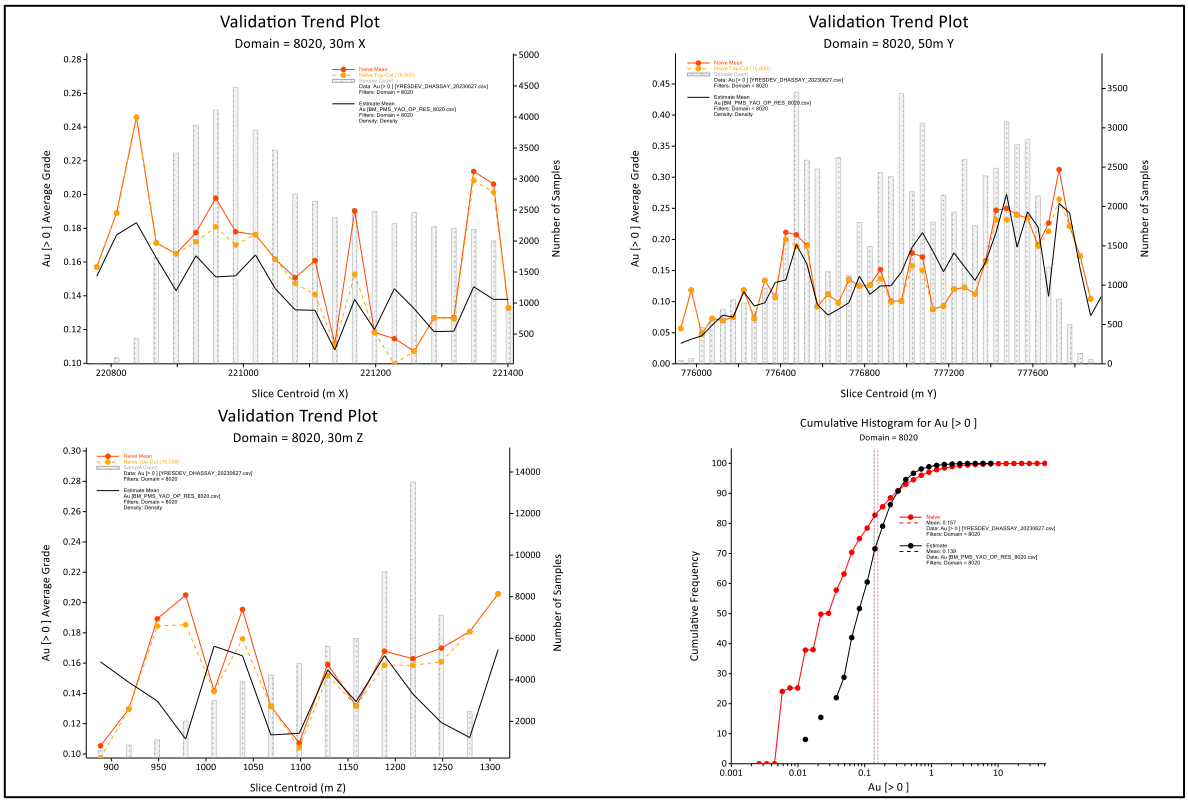


Figure 14-23: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 8020

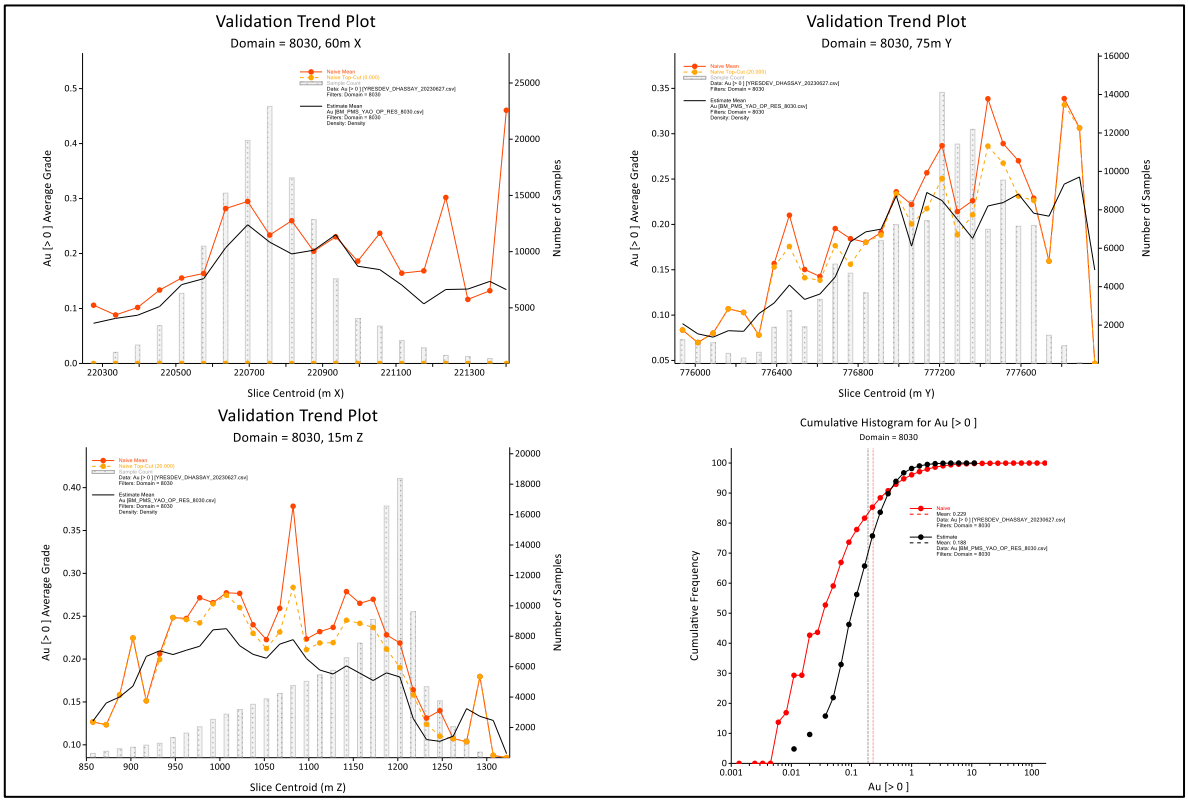


Figure 14-24: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 8030

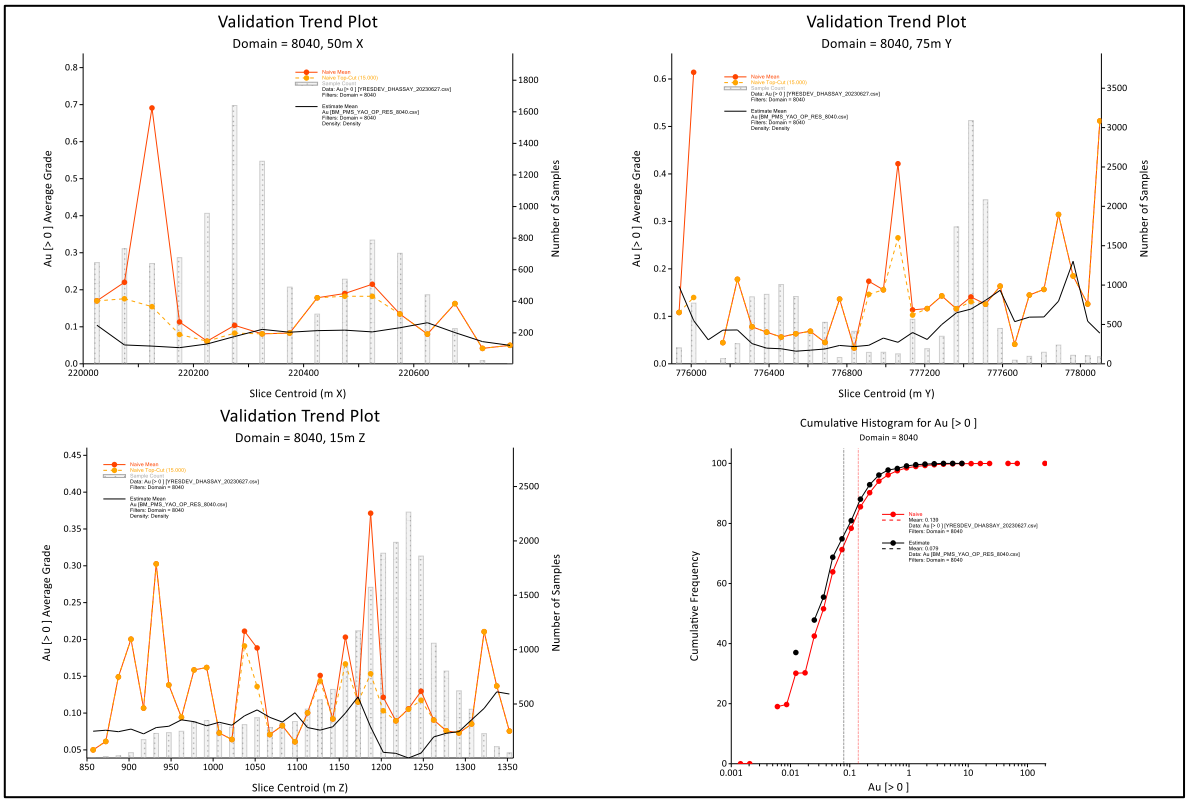


Figure 14-25: Easting, northing and elevation swath plots and histogram showing estimated gold grade versus composite gold grade for Domain 8040

14.10.1.2 CMA Open Pit and CMA SW Mineral Resource Estimate

Swath plots are provided for the CMA open pit (Figure 14-26) and CMA SW (Figure 14-27) resource model across the northing, easting and elevation axis.

The swath plots in Figure 14-26 and Figure 14-27 compare average estimated gold grades with average composite gold grades by resource model axis for the CMA domain (Domain 5) and CMA SW domain (Domain 6) respectively, which is the focus of the reported Mineral Resources. The swath plots include model estimates and composites subset to the volume represented by Indicated classified model blocks with composite gold grades cut by the 99.5th percentile of the combined CMA and CMA SW composite dataset.

The swath plots in Figure 14-26 and Figure 14-27 show that although the resource model estimate is more smoothed than the average composite gold grades, the estimated gold grade profile generally closely follows the trend of the composite mean gold grades with the exception of areas of limited sampling around the deposit margins and areas of variably spaced sampling.

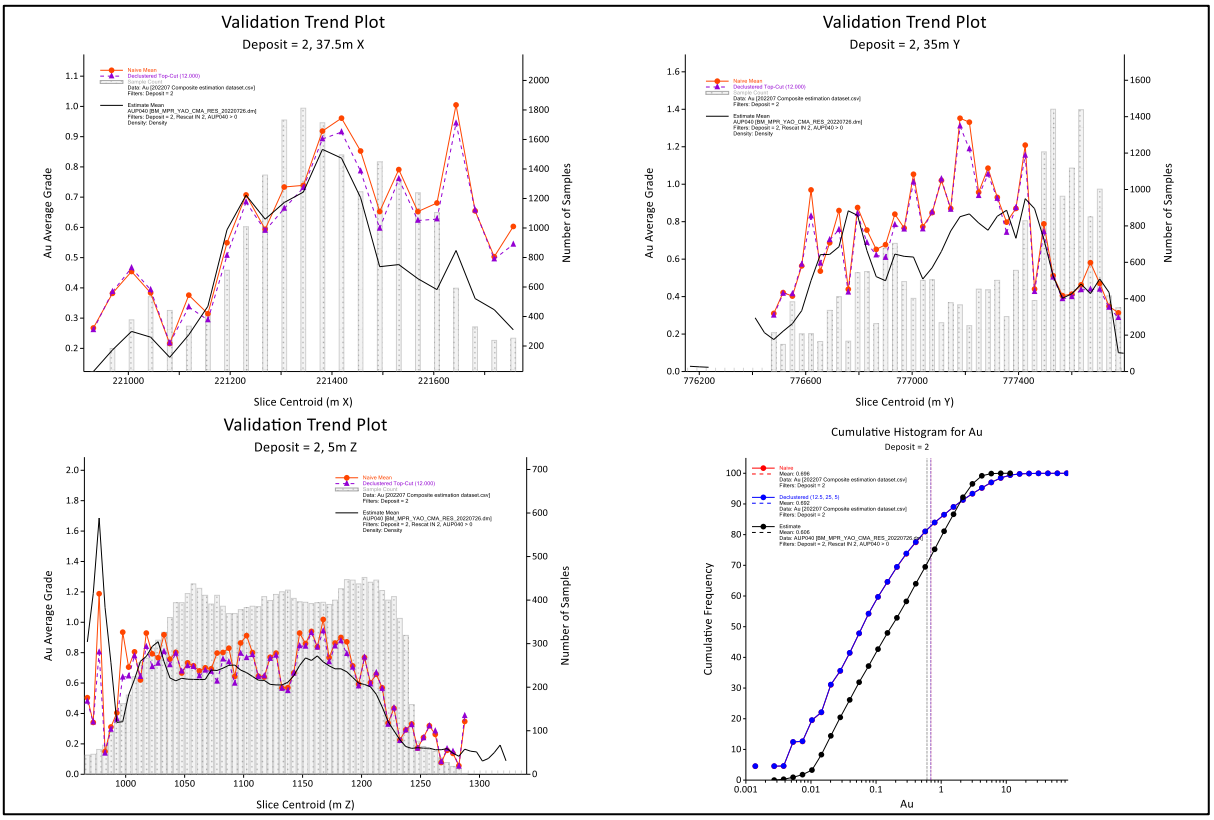


Figure 14-26: Easting, northing and elevation swath plots and histogram showing estimated gold grade for the Indicated classified 0.4 g/t recovery probability blocks versus composite gold grade for CMA Domain (5)

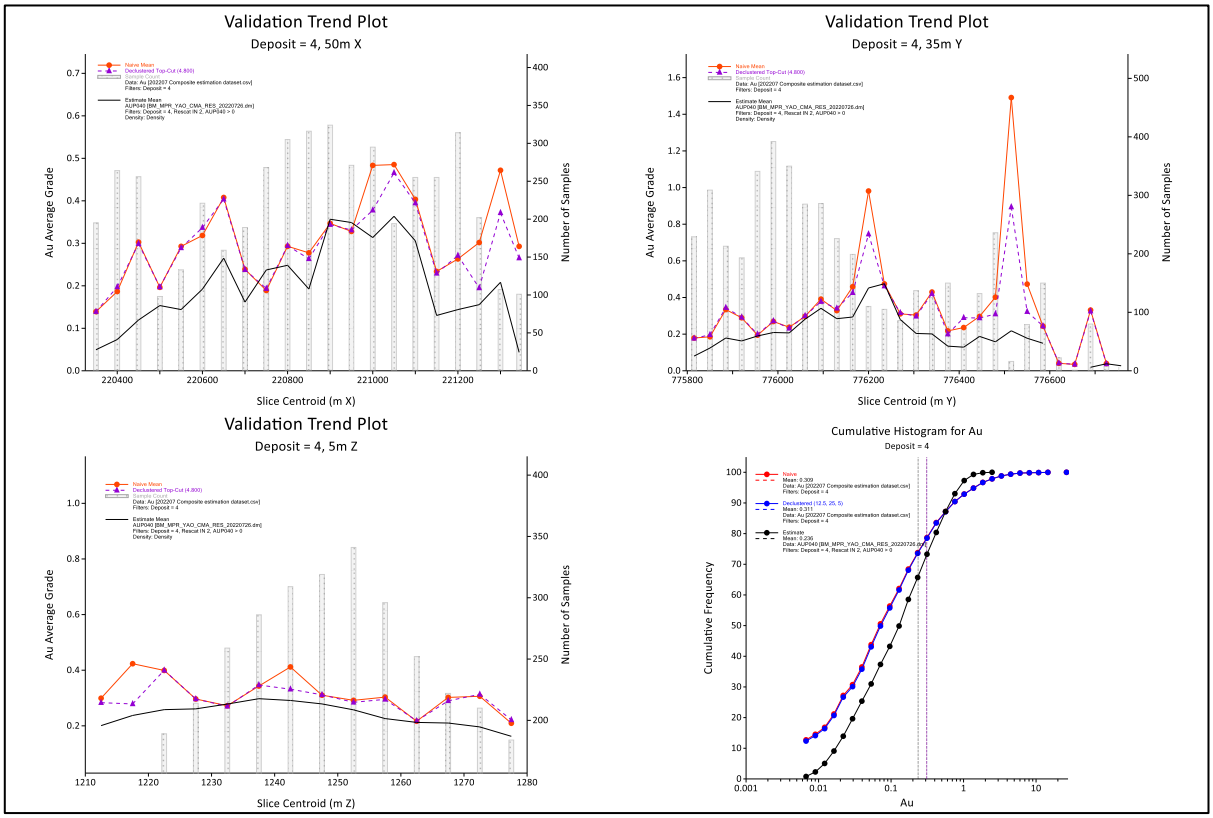


Figure 14-27: Easting, northing and elevation swath plots and histogram showing estimated gold grade for the Indicated classified 0.4 g/t recovery probability blocks versus composite gold grade for CMA SW Domain (6)

14.10.1.3 Govisou Mineral Resource Estimate

Swath plots are provided for the Govisou resource model across the northing, easting and elevation axis (Figure 14-28). The swath plots compare average estimated gold grades with average composite gold grades by resource model axis. The swath plots include model estimates and composites subset to the volume represented by Indicated classified model blocks with composite gold grades cut by the 99.5th percentile of the Govisou dataset.

The swath plots in Figure 14-28 show that although the resource model estimated gold grade profile generally closely follows the trend of the composite mean gold grades with the exception of areas of limited sampling around the deposit margins and areas of variably spaced sampling.

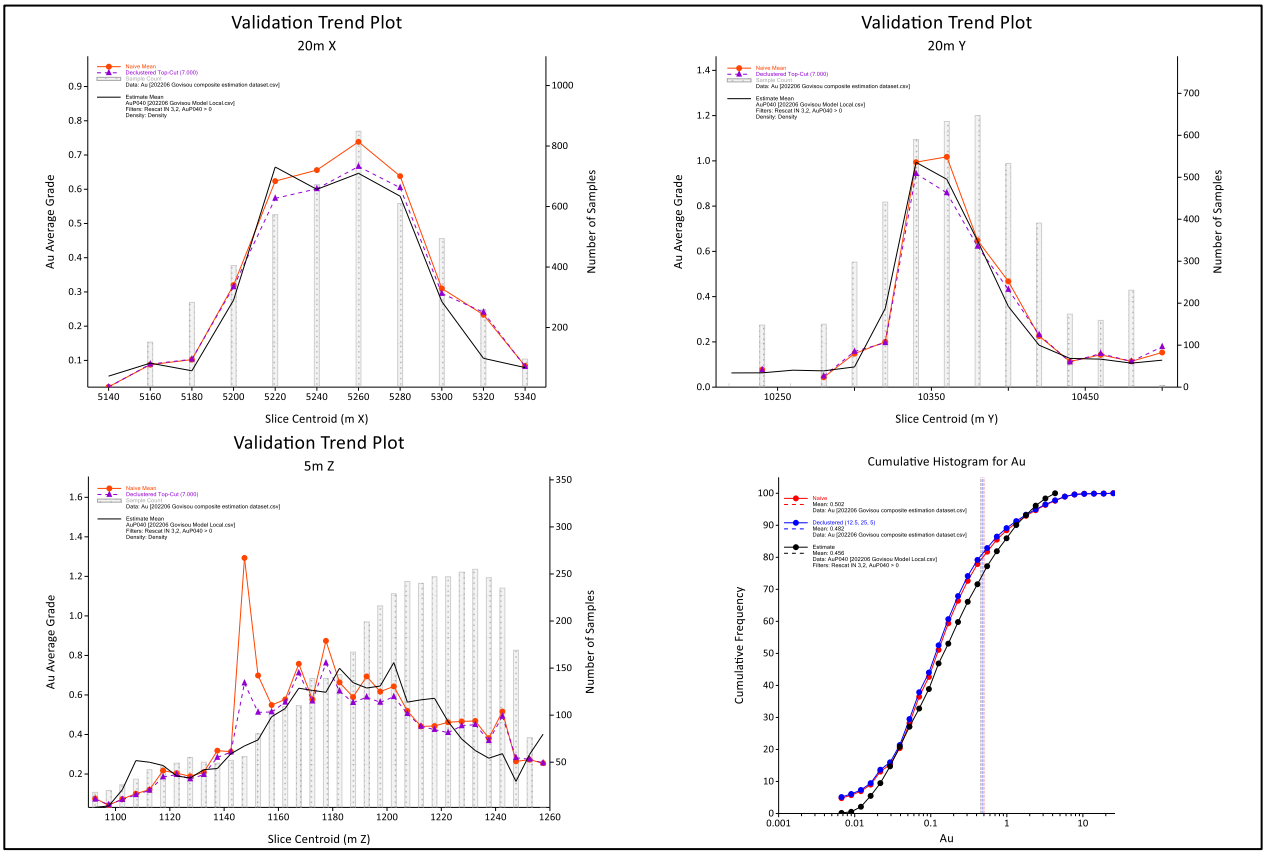


Figure 14-28: Easting, northing and elevation swath plots and histogram showing estimated gold grade for the Indicated and Inferred classified 0.4 g/t recovery probability blocks versus composite gold grade for Govisou mineralised Domain

14.10.1.4 Angovia 2 Mineral Resource Estimate

Swath plots are provided for the Angovia 2 resource model across the northing, easting and elevation axis (Figure 14-29). The swath plots compare average estimated gold grades with average composite gold grades by resource model axis. The swath plots include model estimates and composites subset to the volume represented by Indicated and Inferred classified model blocks with composite gold grades cut by the 99.5th percentile of the Angovia 2 dataset.

The swath plots in Figure 14-29 show that although the resource model estimate is more smoothed than the average composite gold grades, the estimated gold grade profile generally closely follows the trend of the composite mean gold grades with the exception of areas of limited sampling around the deposit margins and areas of variably spaced sampling.

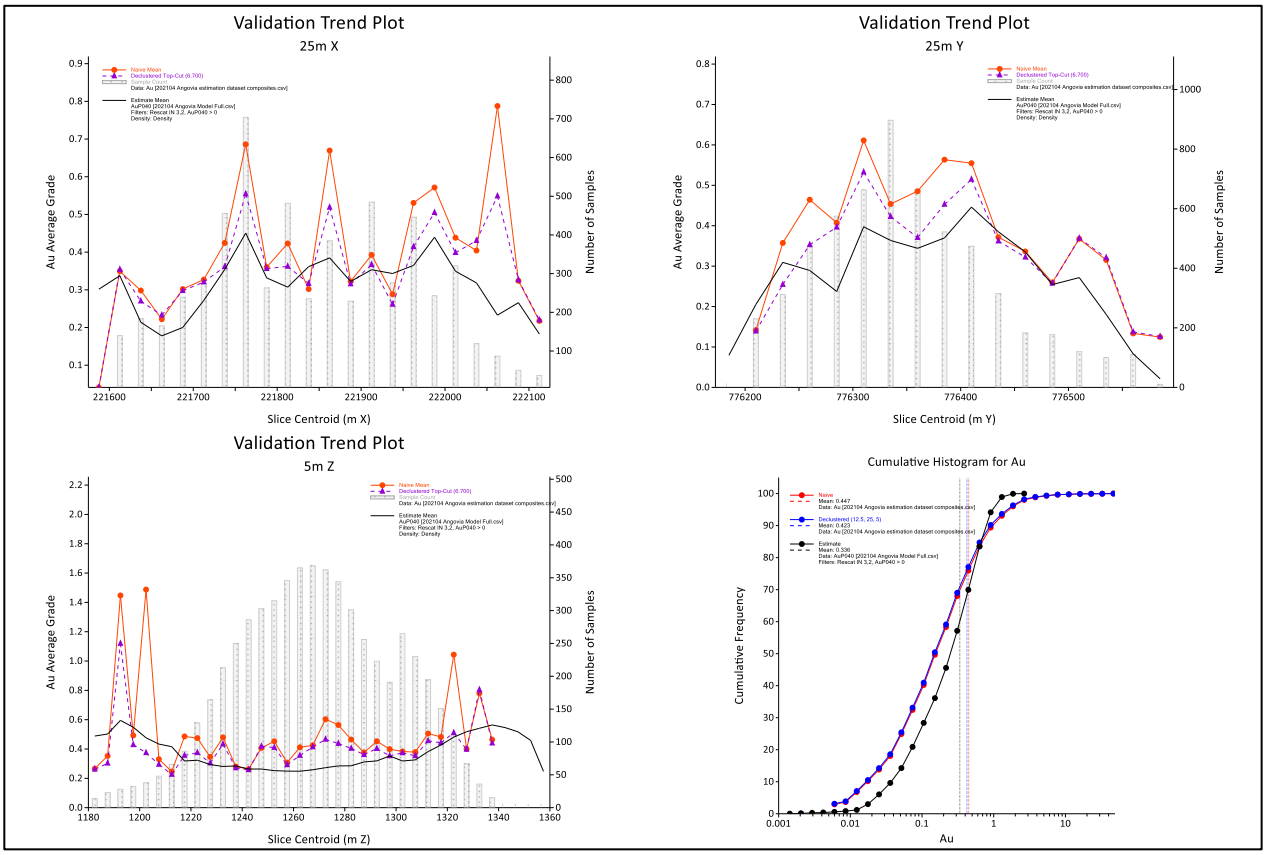


Figure 14-29: Easting, northing and elevation swath plots and histogram showing estimated gold grade for the Indicated and Inferred classified 0.4 g/t recovery probability blocks versus composite gold grade for Angovia 2 mineralised domain

14.11 Classification of Mineral Resources

The Yaouré Gold Mine Mineral Resource estimates have been classified in accordance with CIM Definition Standards.

Mineral Resources have been classified as Measured, Indicated, and Inferred via semi qualitative methods, after consideration of:

- Quality control and data collection procedures in place during collection of the input data used for estimation.
- Current geological understanding of the deposit.
- Volume of available input data.
- Search pass in which a block was estimated.
- Average distances from informing data to block estimates.

Mineral Resources that are not Mineral Reserves do not account for mineability, selectivity, mining loss and dilution and do not have demonstrated economic viability. These Mineral Resource estimates include Inferred Mineral Resources that are normally considered too speculative geologically to have economic considerations applied to them that would enable them to be categorised as Mineral Reserves. There is no certainty that these Inferred and Indicated Mineral Resources will be converted to Indicated and Measured Mineral Resource categories through further drilling, or into Mineral Reserves, once economic considerations are applied.

14.11.1.1 Yaouré Open Pit and CMA Underground Mineral Resource Estimates

The Yaouré open pit Mineral Resource is delineated by regular spaced drilling on an approximate 25 m × 25 m grid to a depth of between 200 m and 250 m below natural surface between 777,000 mN and 777,750 mN; and between 100 m to 150 m below natural surface between 776,500 mN and 777,000 mN. This drill spacing is considered sufficient to define Indicated Mineral Resources.

Partial coverage is achieved at an approximate 50 m × 50 m spacing to approximately 300 m and 350 m below natural surface between 777,000 mN and 777,750 mN; and between 150 m to 250 m below natural surface between 776,500 mN and 777,000 mN. This drill spacing is considered sufficient to define Inferred Mineral Resources.

In general, the Indicated Mineral Resources are confined to areas of approximately 25 m × 25 m drill coverage, with Inferred classified estimates in more broadly sampled mineralisation typically at a 50 m × 50 m drill coverage. Inferred Mineral Resources in places extend to a maximum of around 100 m from drilling.

The spatial distribution of the classified Mineral Resources for the Yaouré open pit are shown in Figure 14-30.

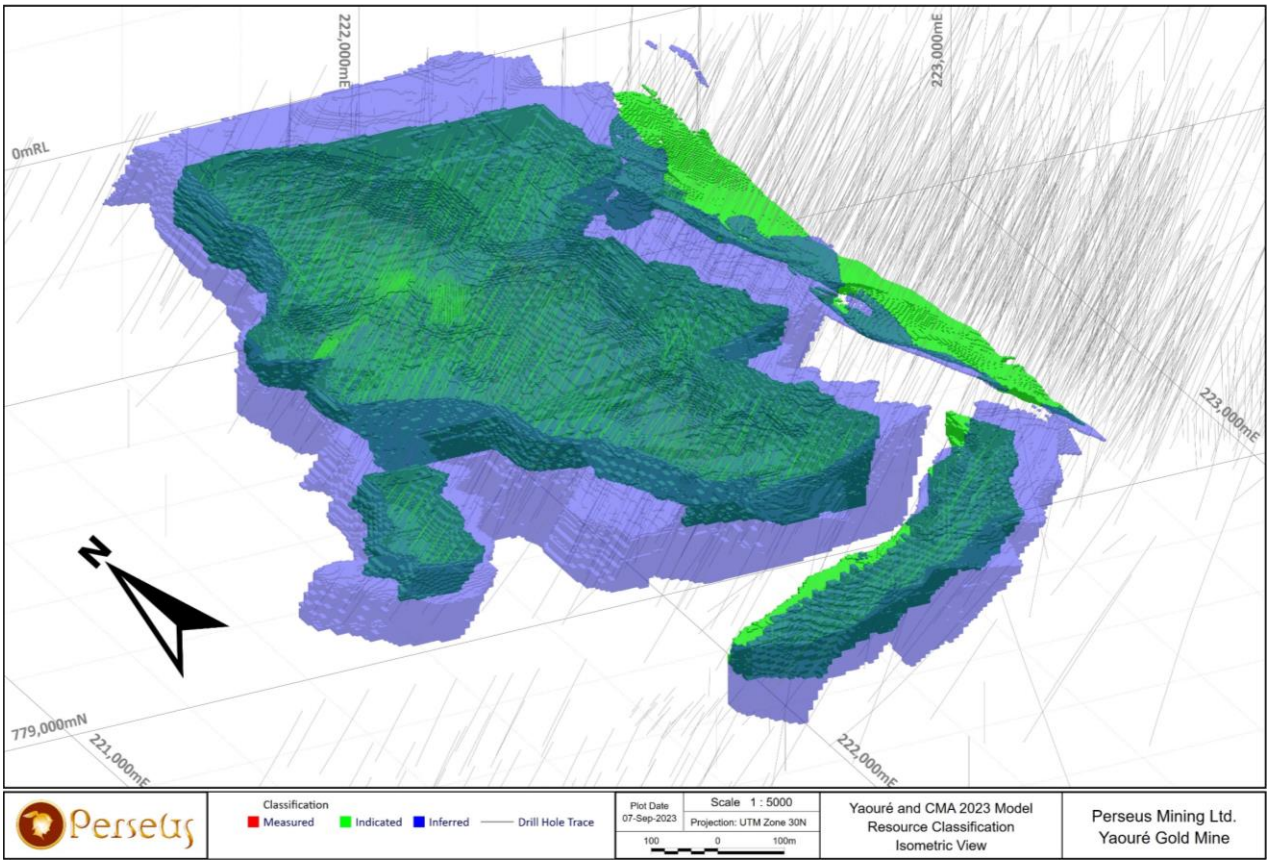


Figure 14-30: Mineral Resource classification for the Yaouré open pit Mineral Resource at June 30, 2023

The CMA underground Mineral Resource extends from the designed base of the CMA open pit to a maximum vertical depth of approximately 185 m for Indicated Resources and 350 m for Inferred Resources for the main CMA Lode (Figure 14-31). The corresponding down-dip extents beneath the CMA pit design base are approximately 400 m and 700 m. Resource classification of the CMA

underground Mineral Resource is on a domain-by-domain basis, with many of the smaller subsidiary modelled lodes/domains classified as only Inferred.

Indicated Mineral Resources are confined to areas of approximately 25 m up to 50 m drill hole spacing coverage, with classified Inferred estimates located in the more broadly sampled mineralisation areas with drill hole spacing coverage between approximately 50 m to 100 m. Inferred Mineral Resources generally extend to a maximum of around 50 m from drilling.

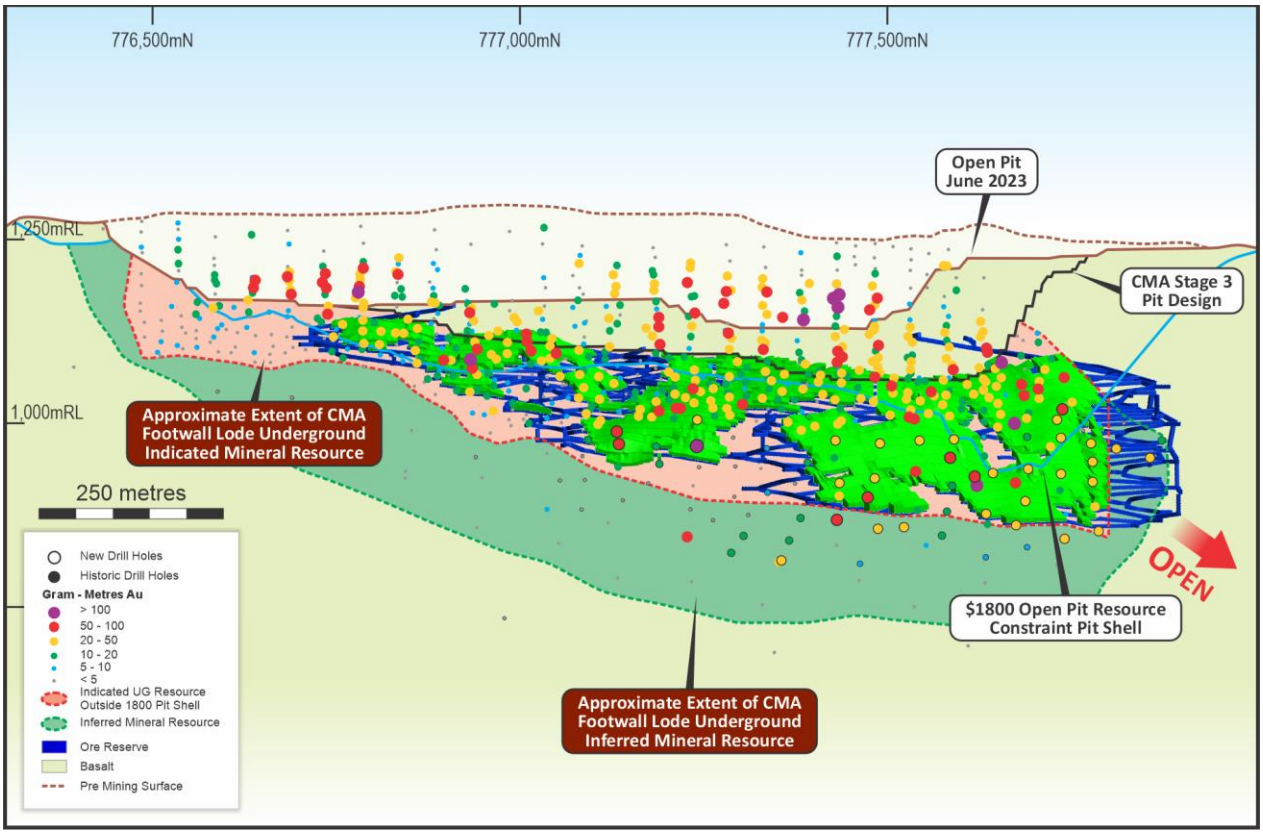


Figure 14-31: CMA underground Mineral Resource long section looking west, showing extents of CMA resource classification at June 30, 2023

14.11.1.2 CMA Open Pit and CMA SW Mineral Resource Estimate

The CMA open pit and CMA SW estimate is classified as Indicated and Inferred (Figure 14-32) on the basis of estimation search pass and cross-sectional polygons defining areas of reasonably consistent drill spacing. Resource classification also considered the quality of the informing geological, survey and assay data, and confidence in the geological and mineralisation models.

This approach assigns estimates based on drilling reasonably approximating 25 m × 50 m or closer spacing as Indicated, and estimates for more broadly sampled mineralisation to around 75 m from drilling as Inferred.

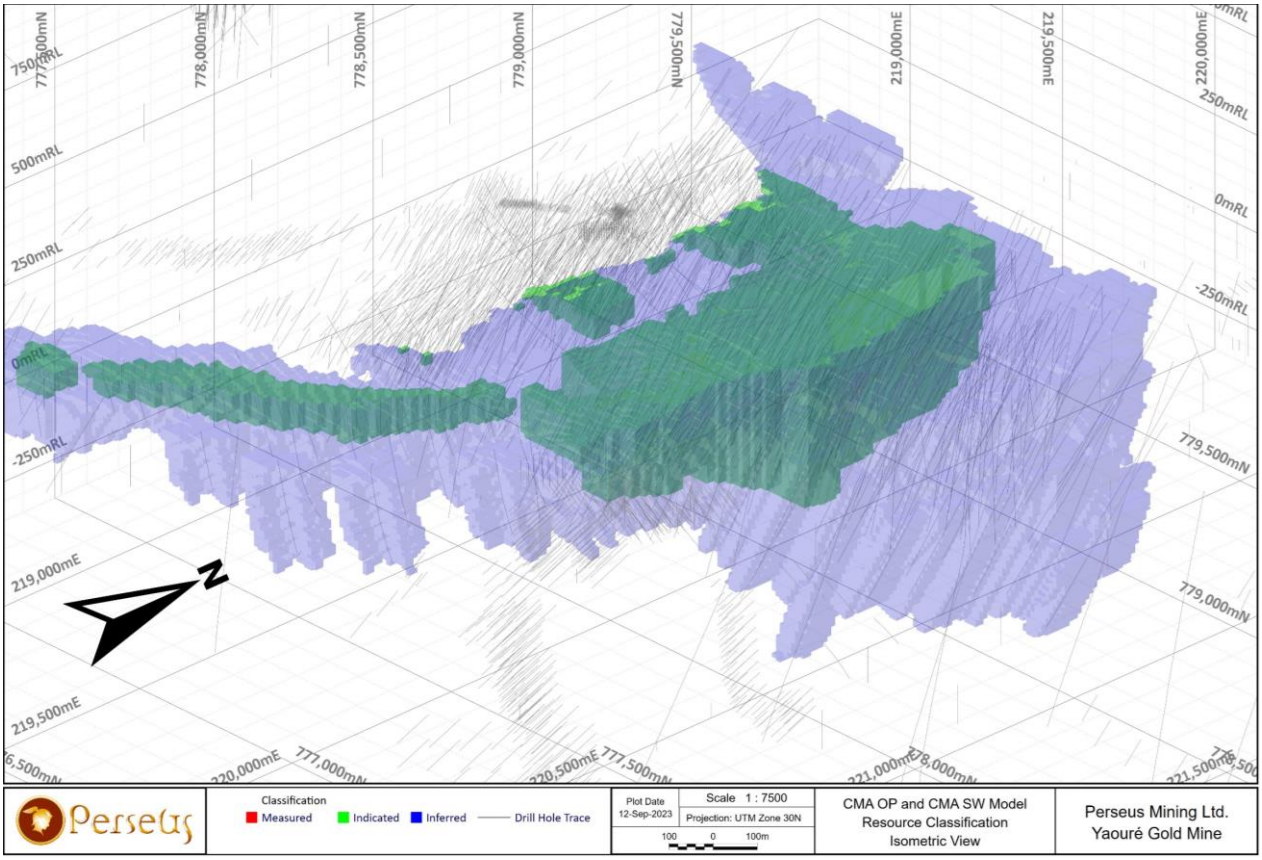


Figure 14-32: Mineral Resource classification for the CMA open pit and CMA SW Mineral Resource at June 30, 2023

14.11.1.3 Govisou Mineral Resource Estimate

The Govisou resource was classified as Indicated and Inferred Mineral Resources (Figure 14-33) on the following criteria:

- Panels informed by search pass 1 were initially classified as Indicated, and search pass 2 and 3 estimates were classified as Inferred.
- Selected blocks informed by search pass 2 were re-classified as Indicated. These blocks commonly outcrop and due to the Search 1 octant requirements are not informed by this search pass.
- Selected blocks informed by search pass 1 with areas of generally Inferred resources were re-classified as Inferred.

This approach gives a consistent distribution of contiguous resource categories and assigns estimates based on drilling spaced at around 20 m as Indicated and estimates for more broadly sampled mineralisation as Inferred. Inferred classified blocks in the resource generally extend to a maximum of around 25 m from drilling.

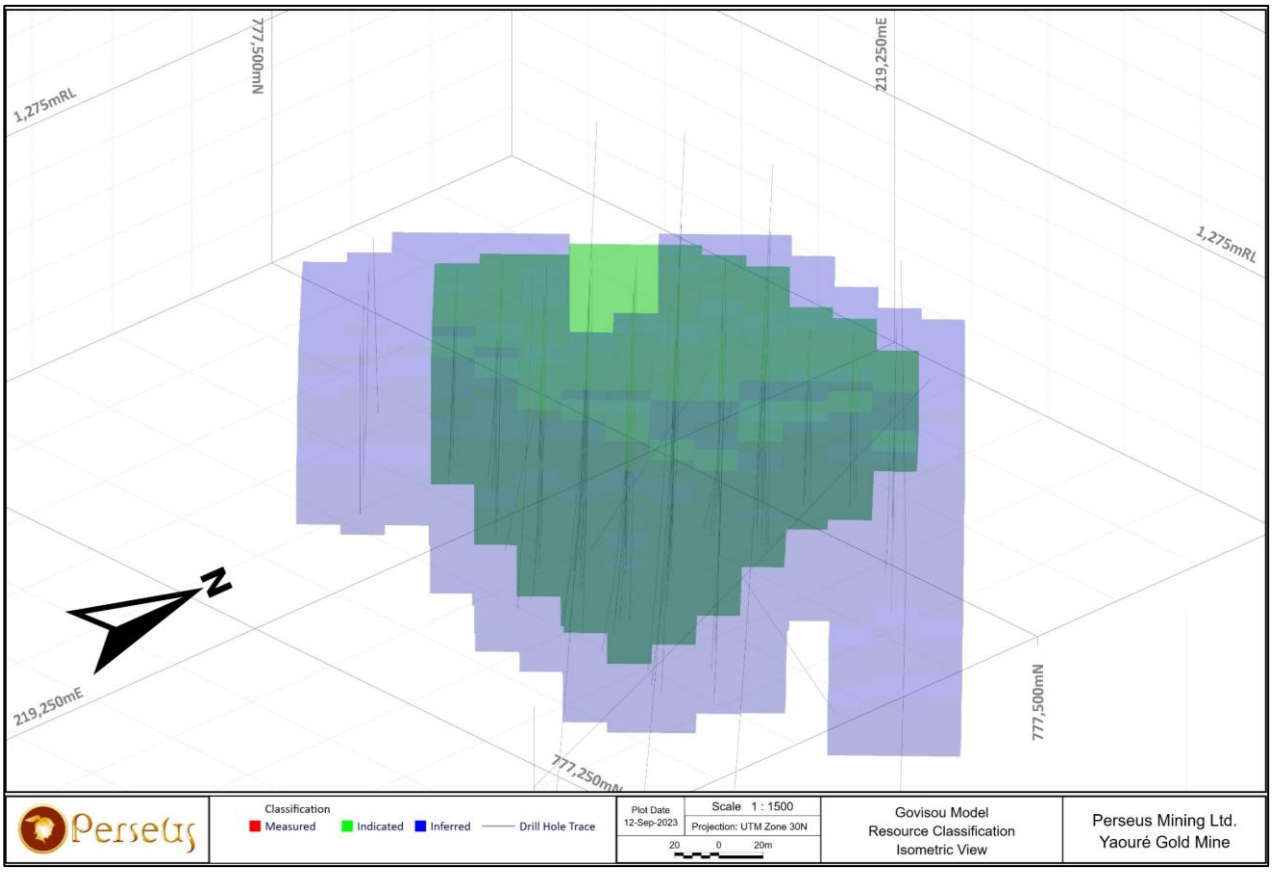


Figure 14-33: Mineral Resource classification for the Govisou Mineral Resource at June 30, 2023

14.11.1.4 Angovia 2 Mineral Resource Estimate

The Angovia 2 resource was classified as Indicated and Inferred Mineral Resource (Figure 14-34) through the following criteria:

- Model blocks were initially classified as Indicated and Inferred by estimation search pass. Panels informed by search pass 1 were classified as Indicated, and search pass 2 and 3 were classified as Inferred.
- Selected blocks informed by search pass 2 were re-classified as Indicated. For the South domain area, such blocks are commonly proximal to the as-mined surface, which due to the Search 1 octant requirements are not informed by this search pass. For the North domain area, these re-classified panels typically reflect the search ellipsoids being primarily selected on the basis of the South domain drilling distribution.

This approach assigns estimates based on drilling spaced at around 25 m or closer as Indicated and estimates for more broadly sampled mineralisation as Inferred. Inferred classified blocks in the resource generally extend to a maximum of around 25 m from drilling.

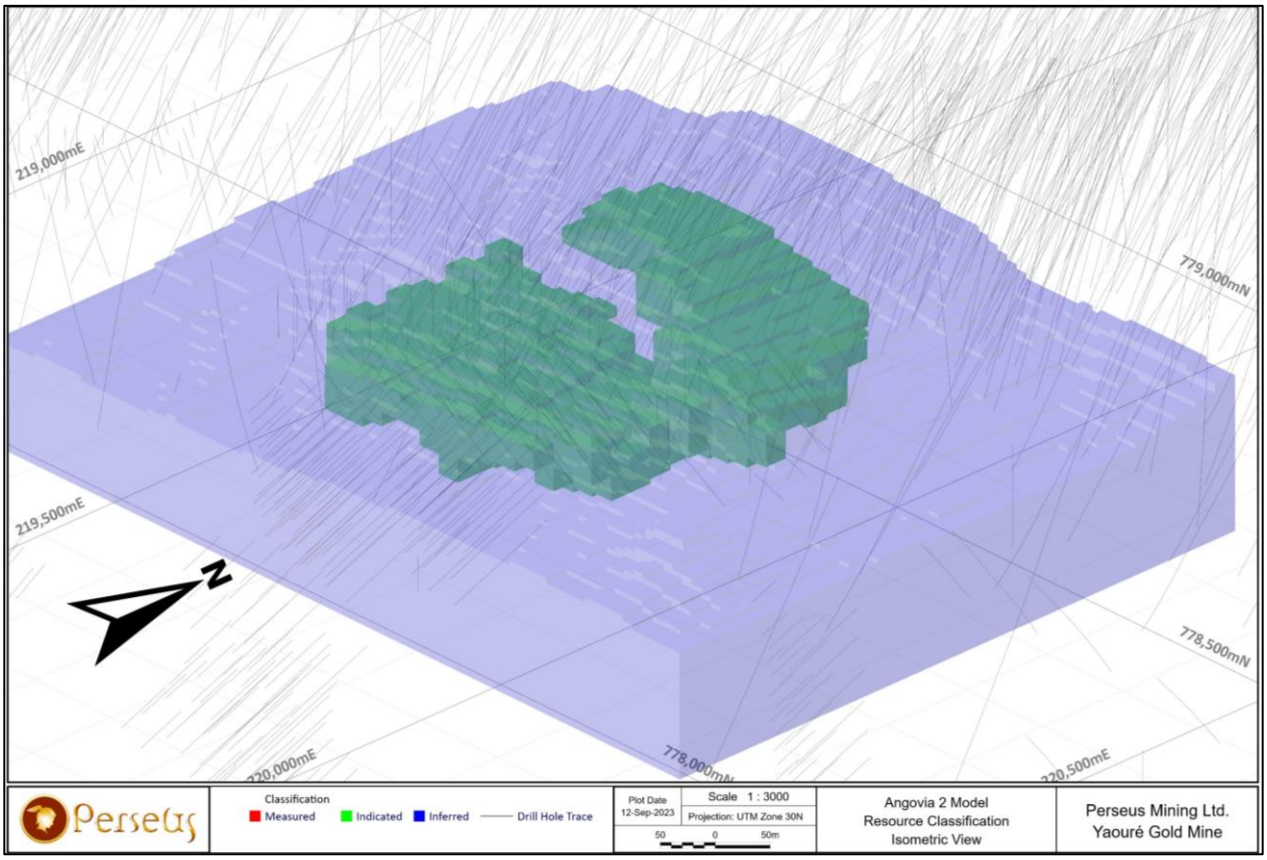


Figure 14-34: Mineral Resource classification for the Angovia 2 Mineral Resource at June 30, 2023

14.12 Reasonable Prospects of Eventual Economic Extraction

CIM Definition Standards require that resources have reasonable prospects for eventual economic extraction (RPEEE). This generally implies that the quantity and grade estimates meet certain economic thresholds and that the Mineral Resources are reported at an appropriate cut-off grade taking into account possible extraction scenarios and processing recoveries.

To assist in defining reasonable prospects of economic extraction, the Yaouré Gold Mine open pit Mineral Resources were subject to an optimisation process, whereby the in-ground value of each block was calculated using nominated values for gold price ($/oz), metal recoveries, mining dilution, mining costs, processing, and selling costs as detailed in Table 14-32. Ranges reflect different processing characteristics such as hardness and weathering conditions. These values were then used to generate a theoretical open pit via the Lersch-Grossman algorithm (a universally accepted methodology of open pit mine optimisation) using Surpac software.

The Yaouré Gold Mine underground Mineral Resource for the CMA deposit was estimated to have a break-even cut-off gold grade of 1.5 g/t based on the cost and revenue parameters in the CMA underground FS using a $1,800/oz gold price.

Table 14-32: RPEEE open pit shell optimisation summary parameters

Item		Parameter Values				
		CMA	CMA SW	Angovia 2	Govisou	Yaouré
Gold Price ($/oz)				1,800		
Mining Cost ($/t)				2.98 to 3.16		
Ore Processing Cost ($/t)				18.72 to 27.69		
Metallurgical Recovery		91.5-92.5%	89.5-93.4%	91.1-92.9%	91.0-91.9%	92.6-93.8%
Wall Angles	Weathered			33.5° to 44.2°		
	Transition			39.8° to 52.2°		
	Fresh			34.0° to 58.9°		

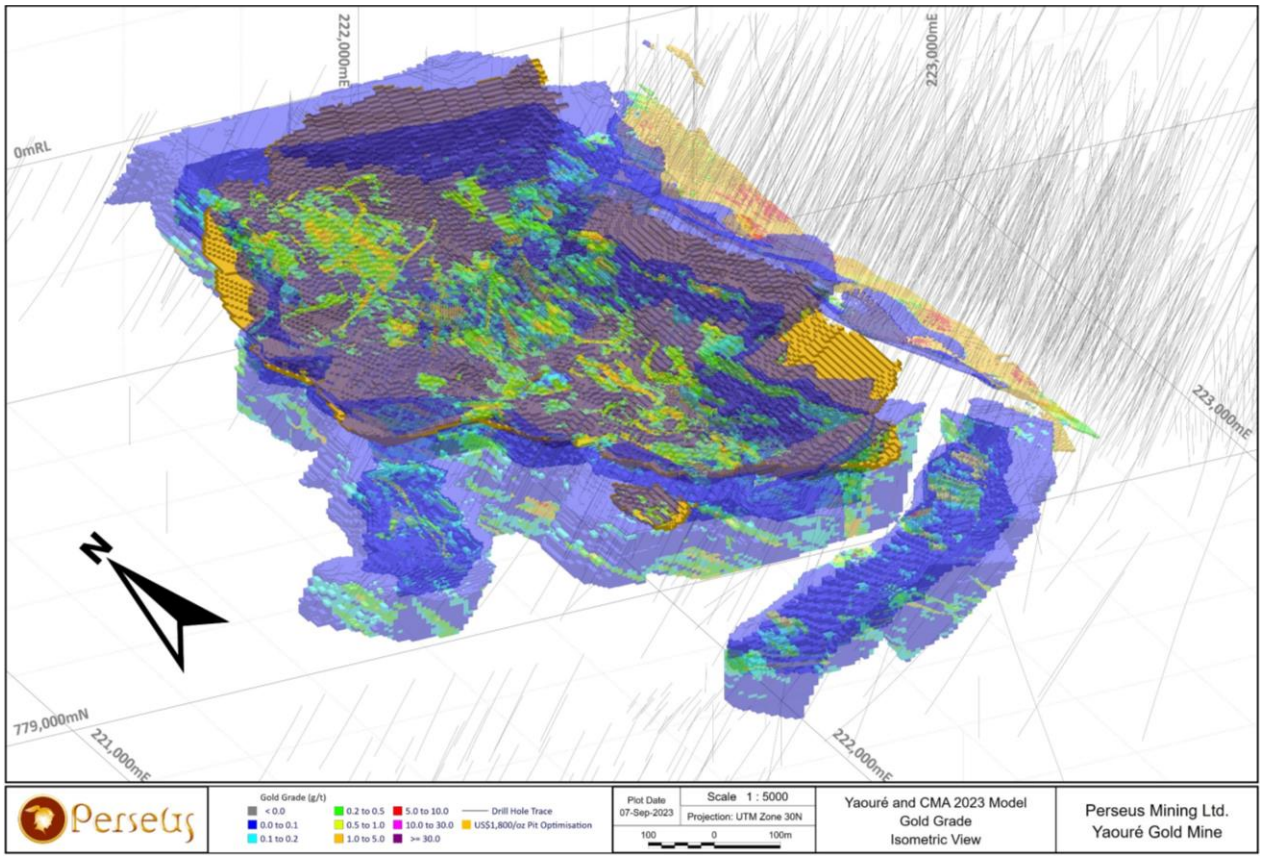


Figure 14-35: Yaouré open pit Mineral Resource estimate showing estimated gold grades and the RPEEE $1,800/oz pit optimisation shell

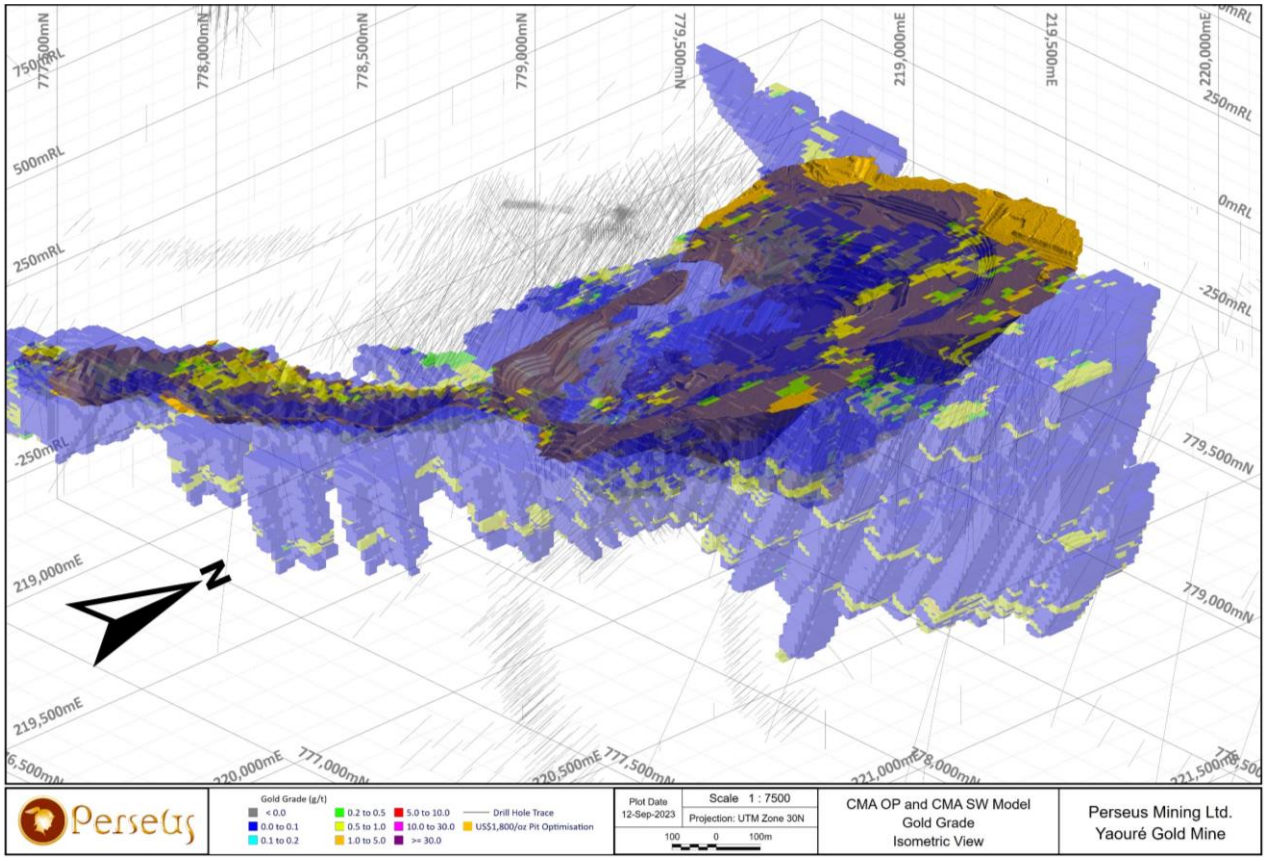


Figure 14-36: CMA open pit and CMA SW Mineral Resource estimate showing estimated gold grades and the RPEEE $1,800/oz pit optimisation shells

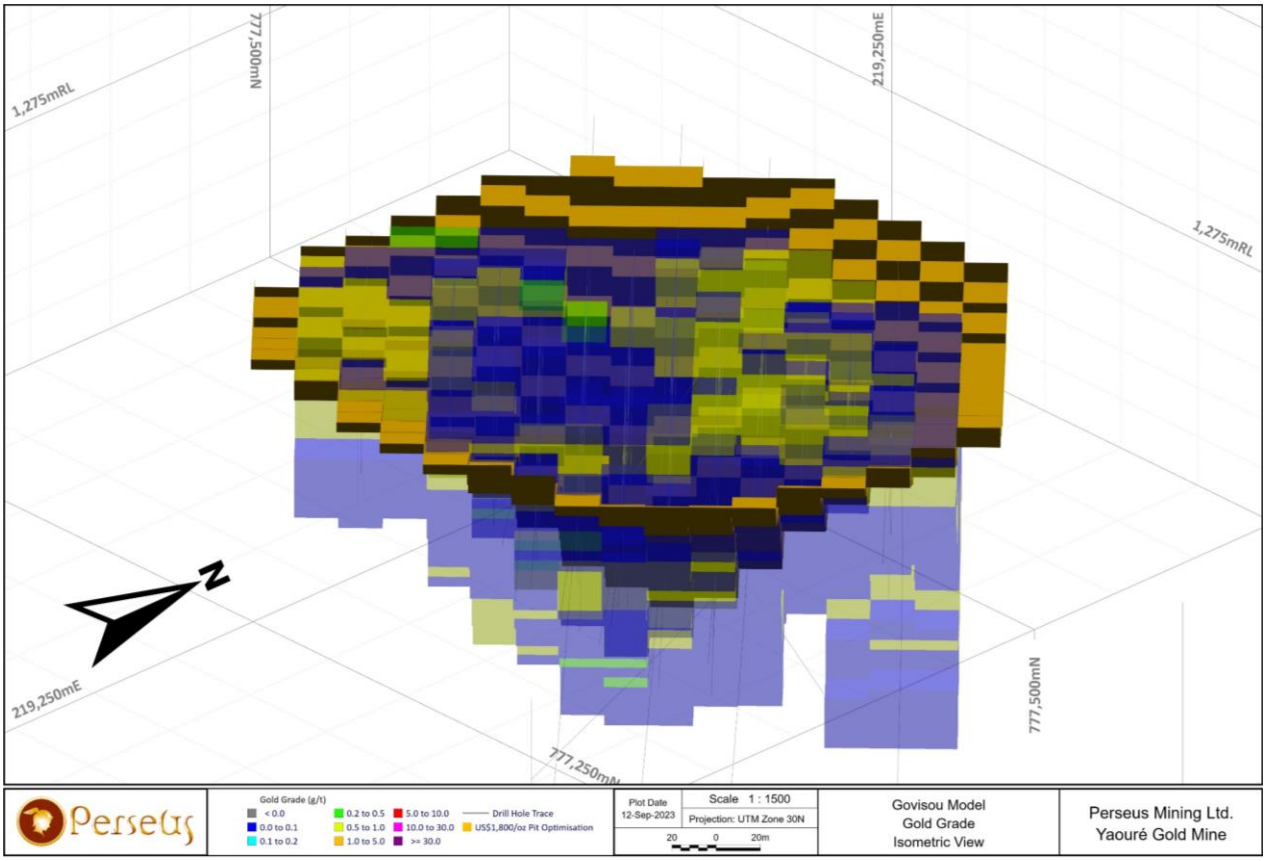


Figure 14-37: Govisou Mineral Resource estimate showing estimated gold grades and the RPEEE $1,800/oz pit optimisation shells

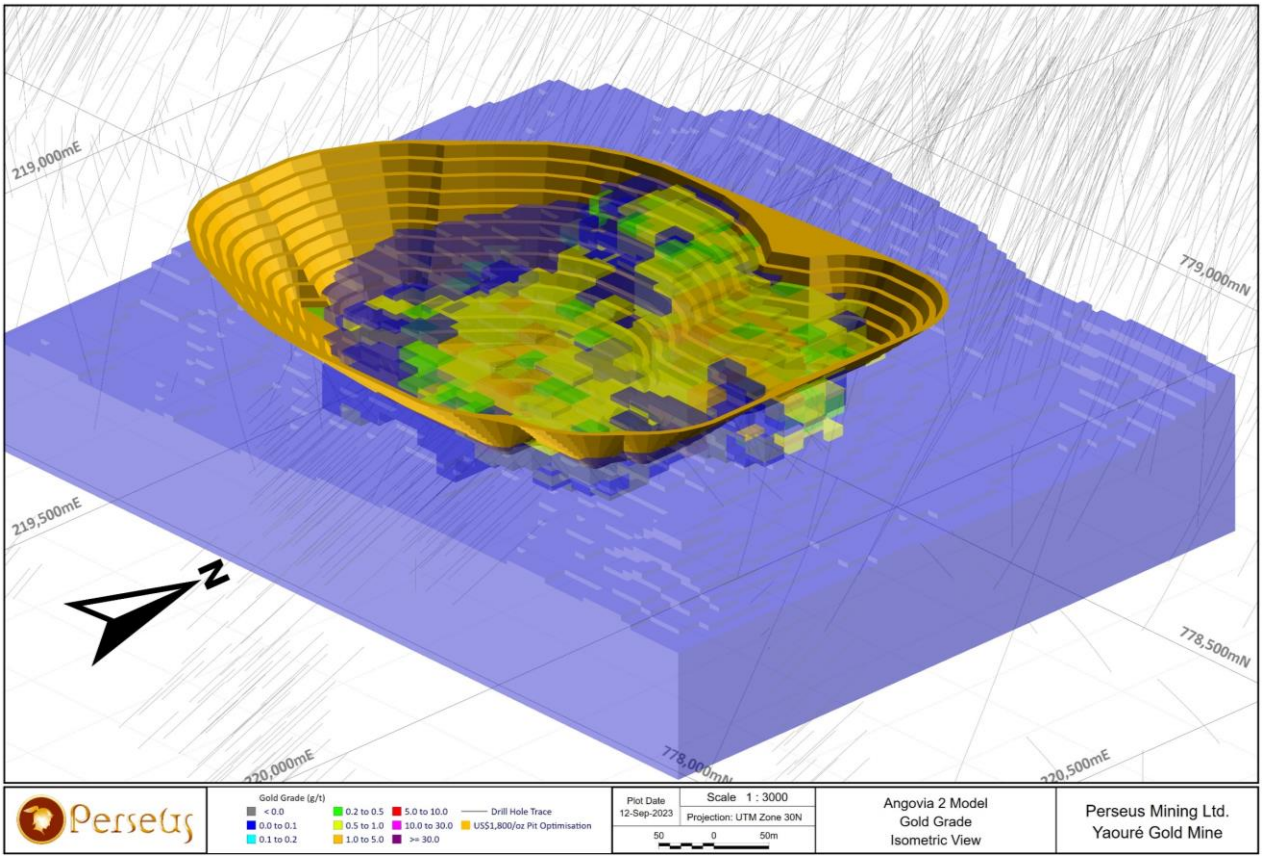


Figure 14-38: Angovia 2 Mineral Resource estimate showing estimated gold grades and the RPEEE $1,800/oz pit optimisation shells

14.13 Depletion for Mining

Each of the Yaouré Gold Mine Mineral Resource estimates was depleted for mining activities as at June 30, 2023 based on the surveyed mining surfaces. Mining depletion affects the CMA open pit Mineral Resource (Figure 14-39) where current open pit mining activities at the Yaouré Gold Mine are occurring.

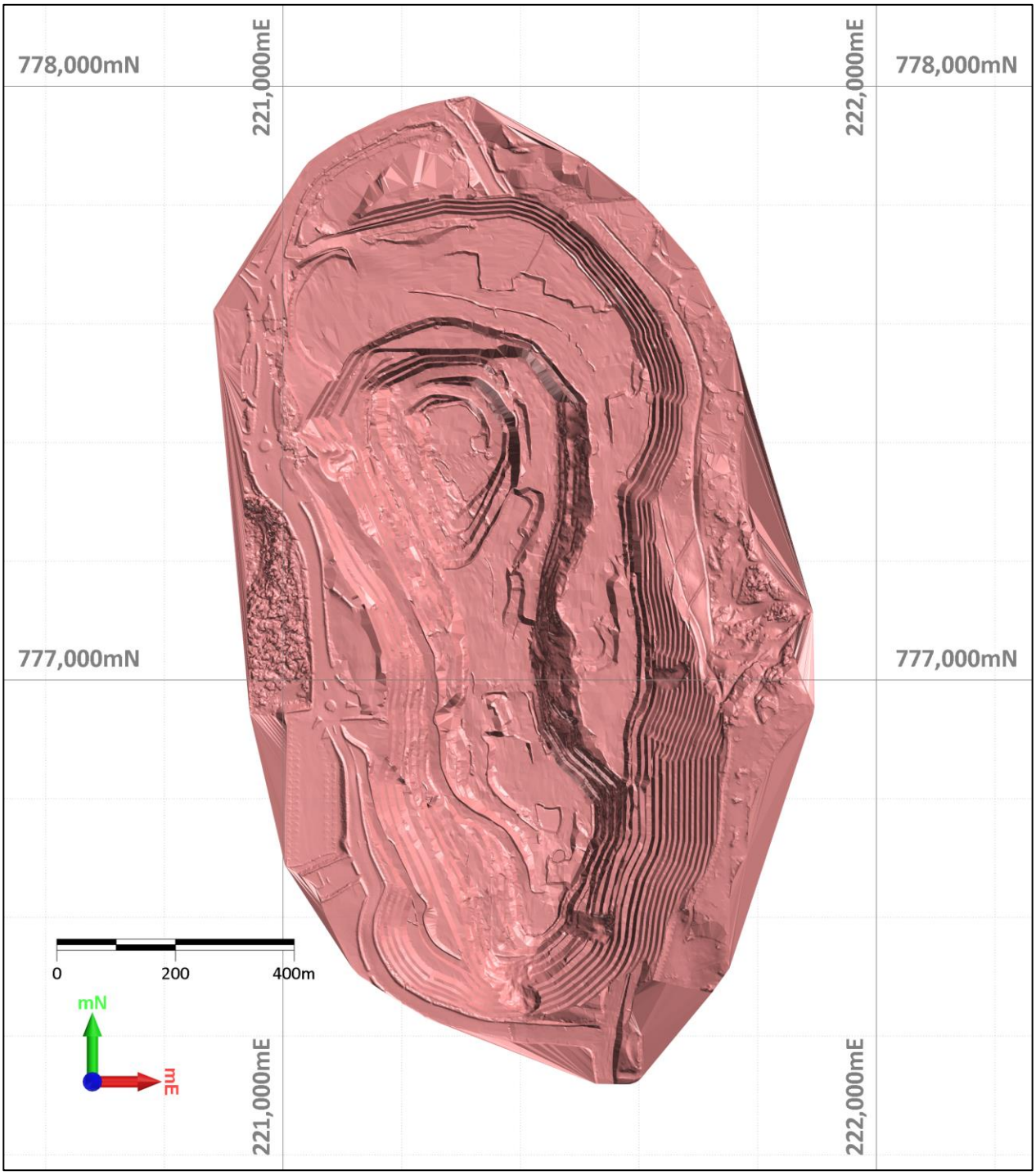


Figure 14-39: Surveyed mined surface for CMA open pit at June 30, 2023

14.14 Stockpiles and Heap Leach

14.14.1 Stockpiles

Mineral Resources contained in stockpiles are based on volume estimates from ground survey data. Loose bulk densities are derived over time by reconciliation of volumes mined (at in situ densities) compared to stockpile movements and calculated volumes. Estimates of stockpile grades are based

on predicted grades of mined material transferred onto stockpiles compared to material depleted by processing.

Closing Yaouré Gold Mine stockpiles at June 30, 2023 were estimated as shown in Table 14-33.

Table 14-33: Yaouré Gold Mine closing stockpile balances at June 30, 2023

MATERIAL	TONNES (kt)	GOLD GRADE (g/t)	GOLD METAL (koz)
Low grade	4,256	0.76	105
Medium grade	19	1.17	1
High grade	83	2.87	8
Crushed ore stockpile	82	2.39	6
Total	**4,441**	**0.84**	**119**

14.14.2 Heap Leach

Mining by CMA and Cluff Gold West Africa produced four heap leach pads. Cluff Gold West Africa removed material from one of the CMA pads (CMA3) and re-used the resulting surface as a heap leach pad for Yaouré ore (CMA3 Upper). The material removed from CMA3 forms a fifth heap designated as EGlobal (Figure 14-40). Power auger drilling undertaken by Amara through these dumps at generally 25 m × 25 m to 50 m × 50 m spacing and confirmatory twin hole diamond drilling shows elevated gold grades in these heaps.

Volumes of the heap leach pads have been defined by the triangulated LiDAR surface, and a surface representing the pre-mining topography produced by Perseus. In the area of the heap leach pads, the pre-mining topography reflects the elevations at which plastic heap liners were intersected in the auger sampling.

Available information indicates that, rather than continuous zones of higher and lower gold grades as might be expected for in-situ mineralisation, gold grades within the heaps are likely to be erratically distributed. Selective mining above cut-off grades is therefore not considered feasible.

An average gold grade was estimated for each heap component from the de-clustered average gold assay grades of auger samples inclusive of upper cuts selected for each volume. The uppercuts generally approximate the 97th percentile of each dataset and reduce average grades by around 7%. De-clustered grades were calculated from the average of ordinary kriged block models produced for each heap component from cut auger sample grades. The CMA3 heap was subdivided into upper and lower lifts for grade assignment.

A density of 1.4 t/m^3 was assigned to the heaps on the basis of 11 volumetric measurements from approximately 1 m to 1.5 m below surface.

All heap leach estimates are classified as Indicated reflecting the level of confidence in the sampling information and reasonably consistent drill spacing for each heap.

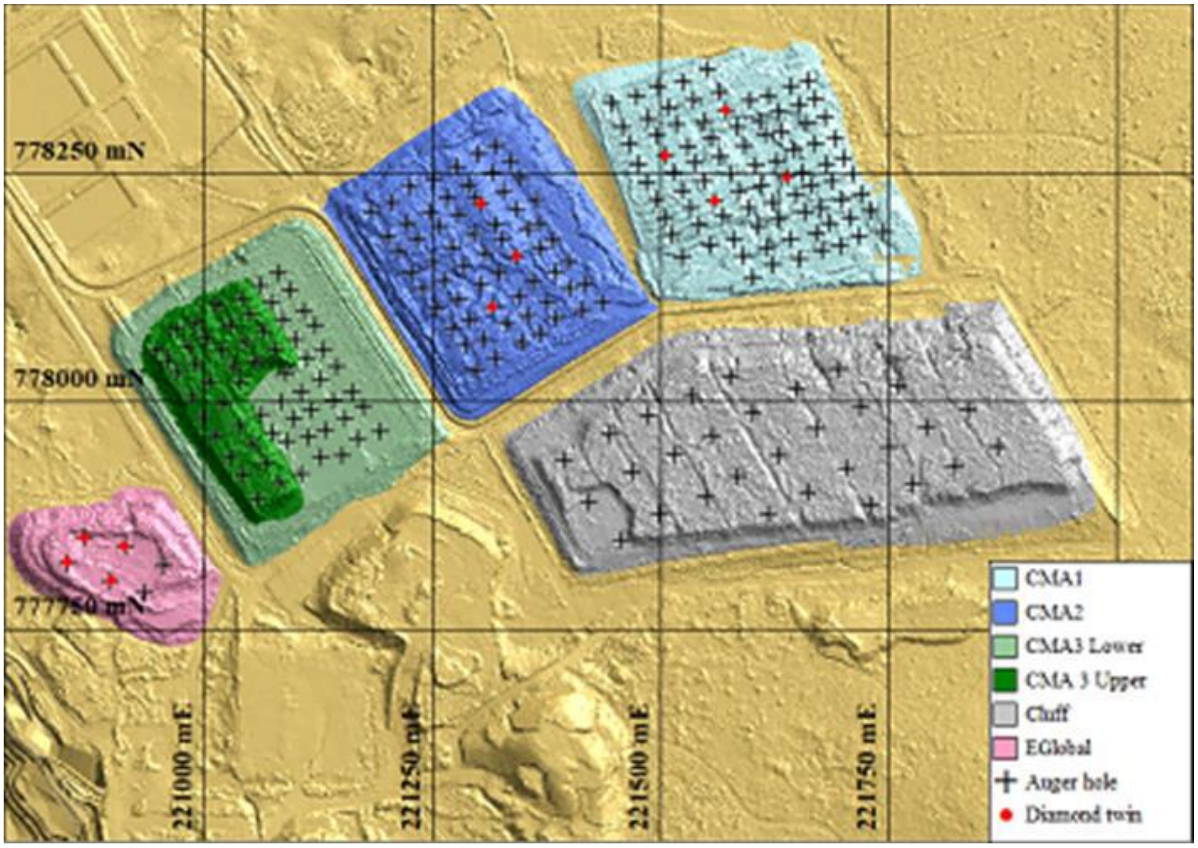


Figure 14-40: Heap leach components and drilling (Perseus, 2017)

14.15 Mineral Resource Statement

The consolidated statement of the Mineral Resources for the Yaouré Gold Mine is provided in Table 14-34 and Table 14-35.

The Yaouré Gold Mine Mineral Resources are reported in-situ and reflect global estimates for the Yaouré, CMA, CMA SW, Angovia 2 and Govisou deposits. Yaouré Gold Mine Stockpiles, including the remaining Heap Leach are reported current as at the June 30, 2023. All open-pit Mineral Resources are reported at a 0.4 g/t gold cut-off and underground Mineral Resources are reported at a 1.5 g/t gold cut-off. Open pit Mineral Resources are reported constrained to a $1,800/oz pit optimisation shell based on the parameters provided in Section 14.12. The reported CMA underground Mineral Resource encompasses the classified resources below the CMA stage 3 pit design (open pit Mineral Reserve) constrained to the unweathered rock.

Table 14-34: Yaouré Measured and Indicated Mineral Resource effective as at September 18, 2023 [9,10,11,12]

DEPOSIT	DEPOSIT TYPE	MEASURED			INDICATED			MEASURED & INDICATED		
		Mt	g/t Au	'000 oz Au	Mt	g/t Au	'000 oz Au	Mt	g/t Au	'000 oz Au
CMA[1,3,4, 6]	Open Pit	-	-	-	16.7	1.32	710	16.7	1.32	710
Yaouré[2,3,4, 6]	Open Pit	-	-	-	19.2	1.27	784	19.2	1.27	784
Satellite Deposits[5,6]	Open Pit	-	-	-	6.6	0.97	206	6.6	0.97	206
Sub Total		**-**	**-**	**-**	**42.6**	**1.24**	**1,700**	**42.6**	**1.24**	**1,700**
CMA[8]	Underground	-	-	-	7.3	4.17	976	7.3	4.17	976
Heap Leach[3,7]	Stockpile	-	-	-	0.4	0.61	8	0.4	0.61	8
Stockpiles	Stockpile	4.4	0.84	119	-	-	-	4.4	0.84	119
TOTAL		**4.4**	**0.84**	**119**	**50.3**	**1.66**	**2,684**	**54.7**	**1.59**	**2,804**

Table 14-35: Yaouré Inferred Mineral Resource effective as at September 18, 2023[9,10,11,12]

DEPOSIT	DEPOSIT TYPE	INFERRED		
		Mt	g/t Au	'000 oz Au
CMA [1,3,4, 6]	Open Pit	2.6	0.7	58
Yaouré[2,3,4,6]	Open Pit	3.0	1.3	124
Satellite Deposits[5,6]	Open Pit	1.3	0.8	34
CMA[8]	Underground	4.4	3.4	485
Total		**11.3**	**1.9**	**701**

Mineral Resources are prepared using the CIM Definition Standards and CIM Guidelines.

Notes for Table 14-34 and Table 14-35:

1. Based on June 2022 Mineral Resource estimate.
2. Based on June 2023 Mineral Resource estimate.
3. Depleted for previous mining and to June 30, 2023 mining surface.
4. 0.4 g/t gold cut-off applied to in situ open pit material.
5. Based on Angovia 2 April 2021, Govisou June 2022 and CMA SW August 2022 Mineral Resource models.
6. In situ open pit resources constrained to $1,800/oz pit shells.
7. Heap leach resources are stated at 0 g/t gold cut-off; only heap leach components with average grade above 0.4 g/t included.
8. June 2023 Mineral Resource estimate, below Stage 3 pit and above 1.5 g/t block grade cut-off.
9. Mineral Resources current as of June 30, 2023.
10. Rounding of numbers to appropriate precision may result in summary inconsistencies.
11. Mineral Resources are reported inclusive of Mineral Reserves.
12. The Yaouré Mineral Resources are reported on a 100% basis.

Reported Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. There is no guarantee that all or part, of a Mineral Resource will be converted into a Mineral Reserve.

14.16 Factors Affecting Mineral Resource Estimates

The Yaouré Gold Mine is a currently operating mine and Perseus is not aware of any known environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant issues that could potentially affect this Mineral Resource estimate. The reported Mineral Resource may be affected by future study assessments of mining, processing, environmental, permitting, taxation, socio-economic and other factors.

Additional technical factors which may affect the Mineral Resource estimate include:

- Metal price assumptions.

- Changes to the technical inputs used to estimate gold content (e.g., bulk densities, grade estimation strategies and interpolation methodologies).
- Changes to the geological interpretation (e.g., intrusive dykes and structural offsets such as faults and shear zones) and mineralisation (domain) geometry and continuity of mineralised zones and grade assumptions.
- Depletion due to previous mining activities.
- Changes to geotechnical and mining assumptions, including the minimum mining thickness; or the application of alternative mining methods.
- Changes to process plant recovery estimates.
- Changes to the assumptions used to calculate the gold cut-off grades.

15 Mineral Reserve Estimates

15.1 Introduction

The CMA underground Mineral Reserve is supported by the CMA underground FS which establishes the technical and economic viability of the CMA underground project. Studies include metallurgical, geotechnical and hydrogeological test work, as well as individual analysis and investigations in relation to mining ventilation, paste backfill, mining methods, and capital and operating cost estimates. Studies have been undertaken by Perseus technical staff and expert consultants.

Yaouré Gold Mine open pit Mineral Reserves are extensions to the existing mining operation, and are supported by additional test work and studies where necessary to demonstrate technical and economic viability. Such studies include additional geotechnical test work and metallurgical confirmatory test work and analysis.

All Mineral Reserves are reported in accordance with the CIM Definition Standards and are reported by category, deposit and type, above cut-off grades calculated after applying modifying factors. The classification categories of Proven and Probable Mineral Reserves under the CIM Definition Standards are equivalent to the JORC Code Proved Ore Reserves and Probable Ore Reserves respectively.

The QP is of the opinion that Mineral Reserves were estimated using industry-accepted practices and conform to the CIM Definition Standards and the JORC Code. Mineral Reserves stated in this report are based on open pit and underground mining methods. The Mineral Reserves are acceptable to support mine planning.

15.2 Mineral Reserve Statement

Mineral Resources are reported inclusive of Mineral Reserves (that is, Mineral Reserves are not additional to Mineral Resources). Mineral Reserves may be subdivided into Proven Mineral Reserves and Probable Mineral Reserves categories to reflect the confidence in the underlying Mineral Resource data and modifying factors applied during mine planning. The Yaouré Gold Mine estimate comprises Proven and Probable Mineral Reserves.

The Proven and Probable Mineral Reserves for Yaouré Gold Mine are supported by a FS and are estimated as 37.2 Mt, grading 1.73 g/t gold and containing 2.1 Moz of gold and are reported current as at June 30, 2023. Details of the estimate are shown in Table 15-1.

Table 15-1: Yaouré Mineral Reserves effective as at September 18, 2023 [1,2,3,4,5,6,7]

DEPOSIT	DEPOSIT TYPE	PROVEN			PROBABLE			PROVEN + PROBABLE		
		Mt	g/t Au	'000 oz Au	Mt	g/t Au	'000 oz Au	Mt	g/t Au	'000 oz Au
CMA[1,2]	Open Pit	-	-	-	11.9	1.81	692	11.9	1.81	692
Yaouré[2,3]	Open Pit	-	-	-	11.8	1.49	565	11.8	1.49	565
Satellite Deposits[2,3]	Open Pit	-	-	-	4.1	1.03	137	4.1	1.03	137
Sub-Total		**-**	**-**	**-**	**27.8**	**1.56**	**1,394**	**27.8**	**1.56**	**1,394**
CMA[4]	Underground	-	-	-	4.9	3.51	559	4.9	3.51	559
Stockpiles	Stockpile	4.4	0.84	119	-	-	-	4.4	0.84	119
TOTAL		**4.4**	**0.84**	**119**	**32.8**	**1.85**	**1,953**	**37.2**	**1.73**	**2,072**

Mineral Reserves are prepared using the CIM Definition Standards and CIM Guidelines.

Notes:

1. Based on depletion to June 30, 2023 mining surfaces.
2. Variable gold grade cut-offs for each material type, ranging from 0.35 g/t to 0.75 g/t.
3. Pit designs are based on $1,300/oz gold price for satellites and $1,500/oz for CMA and Yaouré open pits.
4. Based upon cut-off for development and stoping of 0.5 g/t and 2.5 g/t.
5. Inferred Mineral Resource is considered as waste for optimisation purposes.
6. Rounding of numbers to appropriate precision may have resulted in apparent inconsistencies.
7. The Yaouré Mineral Reserves are reported on a 100% basis.

There are no other environmental, legal, title, taxation, socioeconomic, marketing, political or other relevant factors known to the QP and not discussed in this report that would materially affect the estimation of Mineral Reserves.

15.3 Open Pit

15.3.1 Mineral Reserve Cut-off Grades

Cut-off grades for the Yaouré Gold Mine Mineral Reserve range from 0.3 g/t to 0.75 g/t depending upon material type (Table 15-2). Cut-off calculation revenues are estimated at a gold price of $1,500/oz. Cut-off grades are based on calculated grades and rounded up to the nearest 0.05 g/t.

Table 15-2: Yaouré Open Pit Mineral Reserve cut-off grades

DEPOSIT	CUT-OFF GRADE BY ORE TYPE (g/t Au)			
	OXIDE	TRANSITION	FRESH	FRESH GRANODIORITE
CMA	0.30	0.40	0.45	-
Yaouré	0.45	0.50	0.75	0.60
Satellite Deposits				
Angovia 2	0.40	0.45	0.65	-
Govisou	0.40	0.40	0.50	-
CMA Southwest	0.40	0.45	0.55	-

15.3.2 Mineral Reserve Dilution and Ore Loss

In any mining operation, a degree of ore loss and dilution can be expected. This has the effect of altering the ore tonnages and grades predicted in the geological model. Factors influencing ore loss and dilution include deposit geometry, mining method, mining equipment size, mining practices and grade control processes.

The Yaouré open pit Mineral Reserve is based upon a re-blocked version of the Yaouré open pit Mineral Resource model. The Mineral Reserve model has been re-blocked to 4.0 m × 4.0 m × 2.5 m block size, which introduces a dilution of 8% additional ore tonnes for 11% reduction in grade and mining recovery of 96% of ounces relative to the sub-blocked Mineral Resource model.

The CMA open pit and Satellite pits have an MIK block model, which provides a diluted estimate of grade and recovery. No additional dilution and ore loss has been added to the resource model for these pits.

15.3.3 Mineral Reserve Modifying Factors

15.3.3.1 Mining Lease and Physical Mining Constraints

Physical constraints are typically surface features that limit the allowable extent of mining. Examples include critical infrastructure, mining titles, property ownership and environmentally sensitive areas.

The current exploitation permit covers a sufficient surface extent and does not constrain the mining or dumping limits. The existing mining fence and the limit of currently compensated land will likely become a limitation on future pit expansions and dumping space. Costs for expanding the mine fence and compensating additional land have been estimated and are included in the Yaouré Gold Mine LOM plan.

For mining of Govisou pit, some compensation of housing in Angovia village may be required, depending upon the blasting radius required for safe blasting of fresh rock material, and depending upon a decision to mine this pit. An estimate of costs required for housing relocation and diversion of a perimeter road to outside of the blasting radius of Govisou have been included in Perseus cost estimates.

No geological constraints were applied to the pit optimisation, with Measured and Indicated Mineral Resources used to determine the pit limits.

15.3.3.2 Geological Block Model and Topography

Mineral Resource models used for the estimation of Mineral Reserves provide material classifications based upon rock type and weathering surface (oxide, transitional or fresh). Different pit slopes, production rates, mining costs, processing parameters (throughputs, costs and recoveries) are applied to open pit Mineral Reserves at Yaouré, based upon different material types. These varying cost and rates are based upon operational data and FS test work and studies.

15.3.3.3 Geotechnical Parameters

Geotechnical studies for the Yaouré Gold Mine open pits were initiated in the Amara PFS in May 2015 (Tetra Tech, 2015). The geotechnical component of that report was based upon geotechnical properties and assessments by MineNet (MineNet, 2015). Previous drilling, logging, mapping and geotechnical testing data up to the completion of the 2014 and 2015 drill programs were presented in this report.

Geotechnical studies for the Yaouré open pit Feasibility Study have been completed by Pitt & Sherry geotechnical consultants (Pitt & Sherry, 2017). The contents of that report are summarised herein.

The geotechnical database from which the geotechnical model has been derived has been quality controlled and is considered to be of quality commensurate with defining Mineral Reserves. The geotechnical database consists of:

- Geological logging database conducted by Perseus staff on drill core from predominantly 2014, 2015 and 2017 drill campaigns.
- Geotechnical logging data, including rock mass parameters and oriented structures, conducted by Perseus staff on drill core from predominantly 2014, 2015 and 2017 drill campaigns.
- Rock materials database derived from previous testing data and more focused testing as part of the 2017 drill campaign.

The geotechnical database has been supplemented by observations from existing pits, allowing partial development of a large-scale structure model and improved prediction of the performance of regolith (laterite/saprolite/saprock) material. The geotechnical drilling database has been interrogated by both Perseus staff (to update to current logging codes and some re-logging) and by Pitt & Sherry to remove any inconsistencies within the database. A materials testing database has been developed from previous soils and rock testing in addition to rock testing from the 2017 drill campaign, with all tests being conducted to appropriate international standards.

The geotechnical model is relatively simple and corresponds with the geological models developed by Perseus staff. The rock mass has been divided into three broad geotechnical domains: regolith (completely and partially weathered material), transition zone (fractured weathered material) and fresh rock (includes slightly weathered and fresh material). The regolith domain has been sub-divided by lithology (volcanoclastic and basalt/intrusive/granodiorite domains). The transition and fresh rock domains have been divided into basalt (includes some intrusives) and granodiorite (granodiorite is not significant in the CMA area).

The regolith domain is generally between 40 m and 60 m thick and comprises a thin laterite layer at the surface and variable thickness of saprolite and saprock below. Material strengths are generally low and rotational failure may be expected to be the controlling failure mechanism. The regolith domain is subdivided into basalt/granodiorite and volcanoclastics derived material. The volcanoclastics derived material is expected to perform slightly worse than weathered basalt/granodiorite.

The transition zone (weathered fractured material) is approximately 20 m thick and is located between the base of the regolith domain and top of the fresh rock. The stability of the transition zone is most likely to be controlled by planar sliding and wedge sliding failures from jointing.

The fresh rock domain comprises rock with a very strong to extremely strong UCS and is classified as a good to very good rock mass. Instability issues are expected to be governed by jointing within the rock mass leading to planar sliding and wedge-sliding failures. The fresh rock domain is divided into five wall orientation sub-domains for the CMA pit and four orientation sub-domains for the Yaouré mining area. Potential structural stability issues are expected in the South walls of both the Yaouré and CMA mining areas, slope angles have been reduced in these areas to remain within set probabilities of failure.

Determined slope parameters for exposures in rock are presented in Table 15-3, while slope parameters determined for regolith and fill exposures are presented in Table 15-4.

Table 15-3: Slope parameters for rock exposures

MINING AREA	MATERIAL	WALL	BENCH HEIGHT (m)	BATTER SLOPE ANGLE	BERM WIDTH (MAIN/INTERMEDIATE)	IRSA
CMA, CMA SW, Angovia 2, Govisou	Fresh rock	North (West)	20	80/80	7/1.5	58.9
		North (East)	20	80/80	7/1.5	58.9
		East	20	80/80	7.5/1.5	57.9
		South	10	55	5	39.8
	WF (Transition zone)	South	10	55	5	39.8
		West	10	75	6	49
		All other walls	10	80	6	52.2
Yaouré	Fresh Granodiorite	North	10	80	5	55.9
		East	10	80	5	55.9
		South	10	55	5	39.8
		West	10	80	5.5	54
	Fresh Basalt	North	10	80	5	55.9
		East	10	80	5.5	54
		South	10	65	5	47
		West	10	80	5	55.9
	WF - Granodiorite	South	10	55	5	39.8
	WF - Basalt	South	10	80	7	48.8
	WF - all other walls	All except South wall	10	80	6	52.2

Table 15-4: Slope parameters for regolith and fill material

LOCATION	WALL/MATERIAL	BENCH HEIGHT (m)	BATTER SLOPE ANGLE	BERM WIDTH (m)	IRSA
CMA Pit	East wall	5	45	3.5	31.0
All others	Slopes > 40 m	10	60	6	40.3
	Slopes < 40 m	10	60	4.5	44.2
	Volcaniclastic (all heights)	10	60	6	40.3
	Backfill	10	45	7	30.5

The initial pit optimisation used inter-ramp slope angles (IRSA) to model the slope angles, with an allowance made for expected ramp locations. Based on these results, the Mineral Reserve pit design (including ramps) was generated.

15.3.3.4 Metallurgical Factors

The Yaouré Gold Mine processing plant involves primary crushing, SABC comminution, gravity gold concentration and recovery, and hybrid leach/CIL cyanidation to extract gold. The technology used in the processing plant is well proven, and the plant has been operating successfully since late November 2020.

Gold recovery is a function of the metallurgical properties of different material types of ores in each deposit and is determined from metallurgical test work and/or plant operating data for each deposit and material type, as detailed in Section 13. Predicted gold recoveries by material type and deposit, and gold recoveries that have been used for mine design and optimisation, are summarised in Table 13-140. Gold recovery ranges from 91.0% to 93.4% for oxide ores, 91.9% to 94.5% for transition ores and 89.5% to 93.8% for fresh ores.

Average annual processing throughput rate of ore is dependent on deposit, rock type and weathering state. Predicted ore processing rates are summarised in Table 13-138. The weighted average throughput rate for all open pit materials is nominally 3.5 Mt/a.

15.3.3.5 Operating Costs

Open pit mining cost estimates for Mineral Reserves are based on contracted prices provided by the Spanish mining contractor, EPSA, which has been carrying out mining activities on site since mining operations started in the September 2020 quarter. Where LOM activities are within existing contracts, those rates have been used, otherwise current rates have been extrapolated to accommodate new waste dump and open pit material sources and destinations. EPSA currently performs the full range of mining, drilling and grade control services required at Yaouré. Explosive costs are based on the contracted prices provided by a subsidiary of the EPC Groupe, the existing explosives supplier at Yaouré. Average mining costs by pit area are presented in Table 15-5.

Table 15-5: Assumed average operating costs (open pit)

ITEM	UNITS	COST
CMA	$/t mined	3.41
Yaouré	$/t mined	3.21
Satellite Pits	$/t mined	3.78

15.3.3.6 Metal Selling Price, Royalties and Selling Costs

The gold selling price was based on the long-term consensus forecast available at the time of this Report, while the royalty rates and selling costs were supplied by Perseus (Table 15-6). The royalty to the government is 4.0%, based on the assumed Mineral Reserve Gold Price of $1,500/oz. An additional 0.5% of revenue is payable to the Community Development Fund. The selling costs are composed of gold transport and marketing costs.

Table 15-6: Metal Selling cost and gold price assumption

DESCRIPTION	UNITS	VALUE
Gold Price[1]	$/oz	1,500
Royalty	% of Revenue	4.0
Community Development Fund	% of Revenue	0.5
Selling Cost	$/oz sold	3.04

Notes:
1. $1,500/oz for CMA and Yaouré open pits, $1,300/oz for Satellite pits estimated in EOM June 2022.

15.4 Underground

The CMA underground Mineral Reserve is supported by the CMA underground FS, which establishes the technical and economic viability of the CMA underground project. Studies include metallurgical, geotechnical and hydrogeological test work, as well as individual analysis and investigations in relation to mining ventilation, capital development options (portal locations), open pit and underground geotechnical assessment and mining, processing and infrastructure capital and operating cost estimates. Studies have been undertaken by Perseus technical staff and expert consultants.

15.4.1 Mineral Reserve Cut-off Grades

Cut-off grades for the CMA underground Mineral Reserve range from 0.5 g/t for development ore to 2.5 g/t for production (stoping) ore. Cut-off calculation revenues are estimated at a gold price of $1,500/oz, and are inclusive of royalties, mining, processing, and G&A costs where relevant.

15.4.2 Mineral Reserve Dilution and Ore Loss

Dilution and ore loss for the CMA underground can be divided into the following categories: planned dilution, ore loss due to pillars, unplanned dilution, and unplanned ore loss.

15.4.2.1 Planned Dilution

Planned dilution for flat long hole open stoping is 34%. That is, 34% of the stope planned material is below the cut-off of 2.5 g/t. This represents a relatively high proportion of planned dilution for long hole stoping and reflects the flat footwall design for the stopes. The footwall of the flat longhole open stope is designed at a gradient of 1:6. This design is to accommodate trafficability by remote loaders to ensure planned mining recoveries are achievable.

The design shapes of stopes in the CMA underground FS and Mineral Reserves are based upon shapes generated by stope optimising software. Such software has limitations as to the complexity of the stope shape which may be able to be generated. Due to such limitations, it is expected that operational designs of stope shapes for CMA underground will be able to include additional complexity, which is very likely to reduce the planned dilution within stope shapes. Reducing planned dilution may be achieved by a detailed design of the stope footwall so that the entire width of the stope does not require a 1:6 gradient in order to recover the planned ore.

Notwithstanding the comments above, the estimation methodology is considered by the QP to be entirely appropriate for the purpose of this study and for estimating Mineral Reserves across the LOM. Any potential improvements during detailed design are considered an opportunity which Perseus may realise in the future.

A minimum mining width of 4.0 m is assumed for flat stoping types and 3.0 m for long hole (conventional) stoping to allow access to stopes by large, mechanised mining equipment.

15.4.2.2 Ore Loss Due to Pillars

Mining recovery (also referred to as an extraction ratio) due to pillars totals of 81% for CMA underground. The ore loss due to each pillar type is shown in Table 15-7. Ore loss is the inverse of mining recovery, that is, if 19% of ore is lost due to pillars, the recovery due to pillars is 81%.

Table 15-7: Ore Loss due to pillars by pillar type

PILLAR TYPE	ORE LOSS	TONNES
Vent Pillars	3%	189,536
Stope Pillars	15%	1,052,911
Crown Pillars	2%	128,139
Total Pillars	**19%**	**1,370,586**

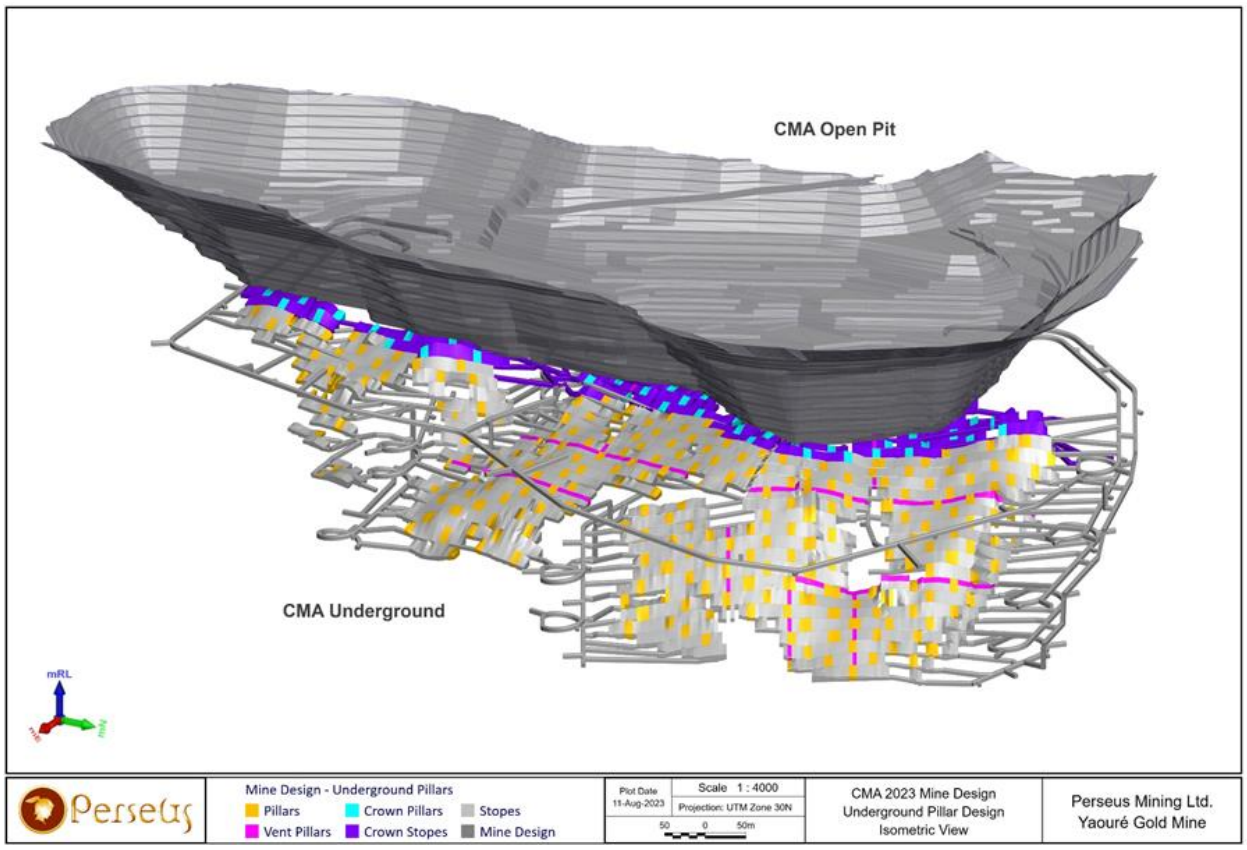


Figure 15-1: CMA underground design showing vent pillars (pink), stope pillars (yellow) and crown pillar (blue)

15.4.2.3 Unplanned Dilution

Unplanned dilution is applied additional to planned dilution (which is included within mining shapes). For CMA underground, the unplanned dilution is estimated to be 5% for all development and 10% for all production.

Table 15-8: CMA underground unplanned dilution and mining recovery assumptions for stopes

AREA	MINING METHOD	PLANNED DILUTION	MINING RECOVERY
CMA Main	Longhole stopes - Flat	10%	90%
CMA Northwest	Longhole stopes- Conventional	10%	70%
Crown Pillar	Flat and Conventional	10%	50%

15.4.2.4 Unplanned Ore Loss

Mining recoveries applied to flat longhole stoping across the whole of the mine (Table 15-8) are a mining recovery factor of 90% applied to flat longhole stopes, and 70% applied to conventional longhole stopes, except for within the crown pillar where a lower recovery factor of 50% is assumed.

Mining recovery for conventional longhole open stopes in the CMA northwest is 70%, due to the steeper minimum footwall angle of 40 degrees which will neither rill nor be trafficable by loaders. It is envisaged that for this small proportion of the orebody (2% of tonnes are from conventional longhole stopes), hydraulic or other assistance will be required to slough ore from the footwall.

15.4.3 Mineral Reserve Modifying Factors

15.4.3.1 Physical and Regulatory Constraints

There are currently no large-scale, mechanised underground mines in Côte d'Ivoire, and as such there are no specific underground mining regulations. Recent experience of other mining companies in neighbouring West African jurisdictions is that this does not preclude the development of underground projects.

Perseus will continue to engage with the Ivorian government in relation to permitting and future underground development at Yaouré, including the CMA underground.

15.4.3.2 Reserve Classification

Mineral Reserves have been classified based on the underlying Mineral Resources classifications. Mineral Reserves, based on Indicated Resources, have been classified as Probable Mineral Reserves.

The Mineral Reserve classification is considered appropriate given the Feasibility level study which supports the Mineral Reserve, based upon expert test work and analysis at the appropriate level of confidence.

Stope optimisations were only run on Indicated Mineral Resources. Inferred Mineral Resources were considered as waste for the purposes of optimisation.

In addition to the conversion of Indicated Mineral Resources, there are some development Mineral Reserves which are above the cut-off grade of 0.5 g/t, but below the Mineral Resource cut-off of 1.5 g/t. These ounces are not therefore a subset of the Mineral Resource. This material accounts for 5.5 kt or 200 oz (<0.04% gold ounces) which is included within the Mineral Reserve. This incidental mineralisation is not considered material to the CMA underground Mineral Reserve.

15.4.3.3 Geotechnical Parameters

Geotechnical investigations undertaken for the CMA underground FS included rock property test work, acoustic emission stress measurements, stope stability analysis, modelling of overall underground development stability (crown pillar, ventilation drive, standoff for capital development), underground ground support and portal stability analysis.

This work was undertaken by MineGeoTech Pty Ltd based in Western Australia (MineGeoTech Pty Ltd, 2023). The above analysis confirmed the technical viability of the portal location, mining layout, extraction methodology and mining rates. Key conclusions of the geotechnical assessment of the CMA underground project are that overstressing of development excavations is not considered at threat, and neither is mining induced seismicity. The proposed ground support scheme consisting of 2.4 m split-sets installed with weldmesh has been found to be adequate to contain the predicted distribution of potential key blocks determined by kinematic instability analysis.

15.4.3.4 Metallurgical Factors

The Yaouré Gold Mine processing plant involves primary crushing, SABC comminution, gravity gold concentration and recovery, and hybrid leach/CIL cyanidation to extract gold. The technology used in the processing plant is well proven, and the plant has been operating successfully since late November 2020.

Test work and analysis for the CMA underground has resulted in the generation of metallurgical processing recovery formulae, as presented in Section 13.10.1.3. The primary, and preferred, regression equation indicates that gold recovery is correlated to both gold head grade and sulfur

head grade. It is anticipated that the primary regression equation will be used in future iterations of CMA underground mine design as sulfur interval assays and block models are developed and understood. The secondary regression equation, correlated to gold grade and the spatial location of gold mineralisation, has been used in the interim for underground mine design and optimisation.

The secondary recovery formula has been incorporated into the mine schedule to apply recoveries based on gold grade and the spatial location of the relevant mining shape. The range of processing recoveries estimated by the recovery formula for the CMA underground Mineral Reserve ranges from 80.5% to 92.1% on a monthly basis. Based on technoeconomic analyses, the optimum recovery is achieved at a grind size P_{80} of 53 µm, which is finer than the target grind size P_{80} of 75 µm for open pit ore. CMA underground ore will be batch treated in the processing plant utilising the available installed ball mill power to achieve a finer grind. The average metallurgical processing recovery for the CMA underground Mineral Reserves is estimated to be 87.2%.

As noted in Table 13-138, the predicted throughput rate for CMA underground ore, at a target grind size P_{80} of 53 µm, is 394 t/h (equivalent annualised rate of 3.15 Mt/a).

15.4.3.5 Operating Costs

Costs for CMA underground Mineral Reserves include contractor pricing estimates, capital costs generated by Perseus based upon experience of project construction and operating in West Africa, and supplier cost quotes to Feasibility level. Where possible, known costs from the Yaouré Gold Mine were included in the CMA underground study, including for local labour, site-based costs and consumables common to the underground and existing open pit operations (such as diesel). All costs are calculated on a pre-tax basis.

Overall mining costs for the CMA underground are expected to be $56/t material mined, or $71/t ore mined, excluding sustaining capital of $13 M and project development capital estimated at $132 M. Project development capital is inclusive of capitalised pre-production operating costs up until commercial production rates of 50 kt per month are achieved and includes LOM capital development.

Processing and G&A costs are estimated to be $14.76/t ore and $7.26/t ore respectively. All costs are to a Feasibility level of accuracy. Processing and G&A costs are quoted to a higher level of precision as they are calculated from actual operating data, whereas underground costs are based upon a Feasibility level study.

15.5 Economic Modelling

An incremental net present value (NPV) has not been used to define economic viability of individual components of the Yaouré Gold Mine Mineral Reserves. They are incremental additions to the existing Yaouré Gold Mine operation, and in each case, to existing Mineral Reserves.

An updated operational LOM schedule for the Yaouré Gold Mine has been prepared inclusive of the additional Mineral Reserves contained herein. There is no material expansion of the current production rate since the 2017 Report (Perseus Mining Limited, 2017) was published.

15.6 Factors Affecting Mineral Reserve Estimates

The Yaouré Gold Mine is a currently operating mine and Perseus is not aware of any known environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant issues that could potentially affect this Mineral Reserve estimate. The reported Mineral

Reserve may be affected by future study assessments of mining, processing, environmental, permitting, taxation, socio-economic and other factors.

Additional technical factors which may affect the Mineral Reserve estimate include:

- Metal price assumptions.
- Changes to the technical inputs used to estimate gold content (e.g., bulk densities, grade estimation strategies and interpolation methodologies).
- Changes to the geological interpretation (e.g., intrusive dykes and structural offsets such as faults and shear zones) and mineralisation (domain) geometry and continuity of mineralised zones and grade assumptions.
- Depletion due to previous mining activities.
- Changes to geotechnical and mining assumptions, including the minimum mining thickness; or the application of alternative mining methods.
- Changes to process plant recovery estimates.
- Changes to the assumptions used to calculate the gold cut-off grades.

16 Mining Methods

The Yaouré LOM plan includes both open pit and underground mining methods. The two mining methodologies will be complementary at Yaouré, with neither method alone delivering the expected economic returns that are possible by concurrent underground and open pit mining. There is a risk that planning and operational competition between the two aspects of the mining business at Yaouré may lead to inefficiencies. The coordination and cooperation between the open pit and underground mining departments and contractor workforces will need to be proactively managed to ensure that operational synergies are optimised to deliver benefits for all stakeholders.

16.1 Open Pit

16.1.1 Introduction

The Yaouré Gold Mine open pits use a conventional hydraulic excavator and rigid off-highway rear dump truck fleet, with drill and blast where required in transitional and fresh rock material. Mining bench heights are 10 m with 2.5 m flitches for selective mining to minimise ore loss and waste rock dilution. Bulk waste mining is also completed on 10 m benches.

Trucks haul ore to surface ore stockpiles, with waste being hauled to, and disposed in, waste rock dumps. Stockpile rehandle is by front-end loader.

Drill and blast practices are employed to break competent rock. Drill and blast techniques, including pre-split and trim shots, are applied to minimise open pit wall damage, and blasting is configured to minimise ore loss and waste dilution.

16.1.2 Mining Method

The open pit mining operation has a current mining rate of approximately 30 Mt/a total material movement, and across the LOM, to deliver ore feed to support the target average processing rate of 3.5 Mt/a. Mining activities are by a mining contractor, whose activities include stripping free dig material such as topsoil, clays and highly weathered rock near surface. Fresh rock, which is the dominant material type, requires drilling and blasting, before being mined by the mining contractor.

To balance waste stripping and ore grades, the pits are mined to the ultimate boundary limit using cutbacks. Access to the pit is by 24 m wide haul roads and ramps, incorporating a 10% gradient, with windrows and drains. Single lane ramps are included as required towards the end of pit life to maximise ore recovery and minimise waste mining. Rock is hauled to the surface, with ore placed on stockpiles at the ROM pad and waste dumped to waste rock dumps.

Ore and waste in transition and fresh rock is drilled and blasted prior to excavation. The mine undertakes conventional drilling and blasting activities with pre-splitting in all transition and fresh rock to assure stable wall conditions.

Grade control is completed using RC drilling, with assays of the drill samples used to define the ore boundaries.

There are five open pits to be mined during the proposed LOM. These are the CMA, Yaouré, Angovia 2, Govisou and CMA SW pits. The CMA and Yaouré pits are the main open pits as measured by ore tonnes and contained gold ounces and will be mined in five cutbacks. All of the open pits at Yaouré will be mined using the same mining equipment and methods and the transition between various pits is therefore considered to be an extension of the existing mining operation, and therefore low risk from an execution perspective.

16.1.2.1 Site Layout and Pit Designs

The proposed site layout is shown in Figure 16-1.

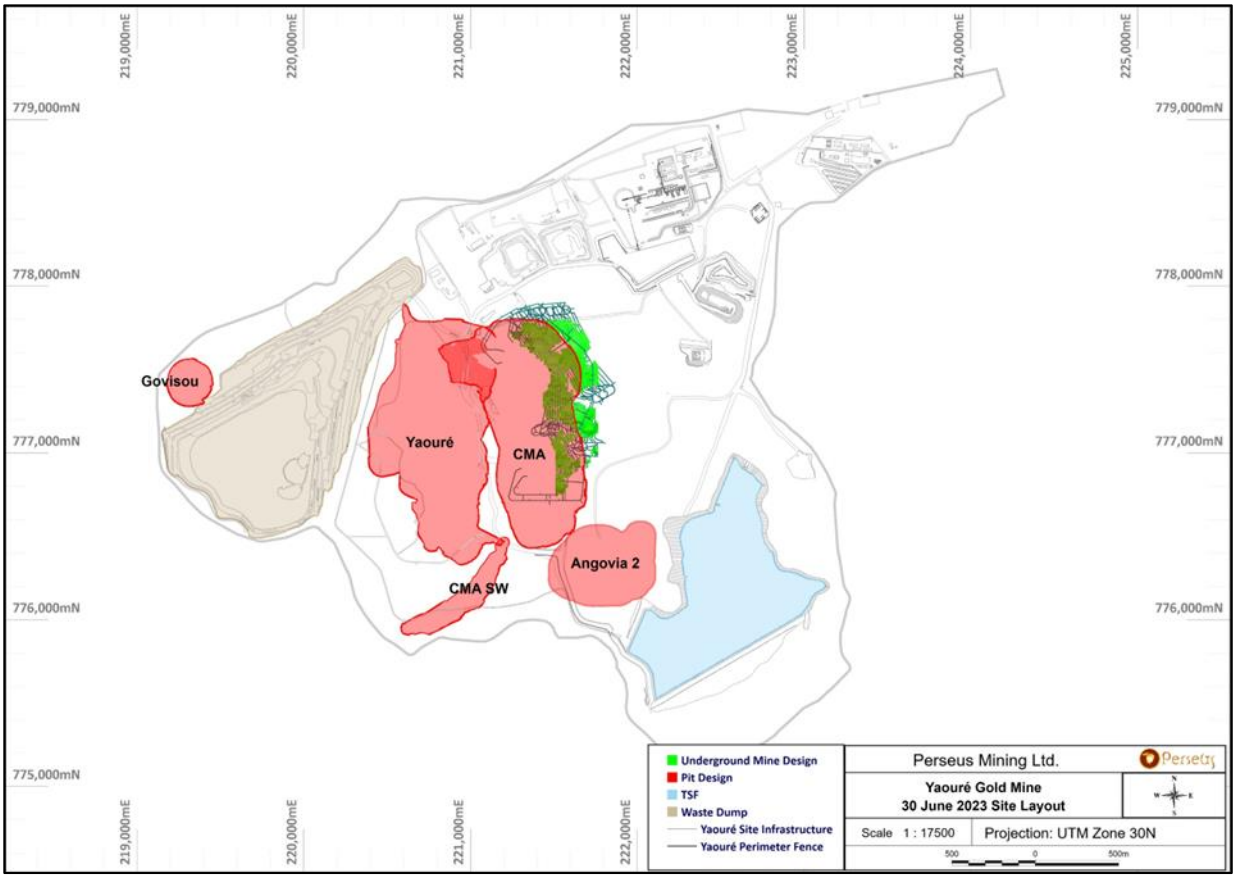


Figure 16-1: Yaouré Gold Mine site layout

Designs for each of the Yaouré Gold Mine pits, in plan and isometric view, are shown below in Figure 16-2 to Figure 16-11.

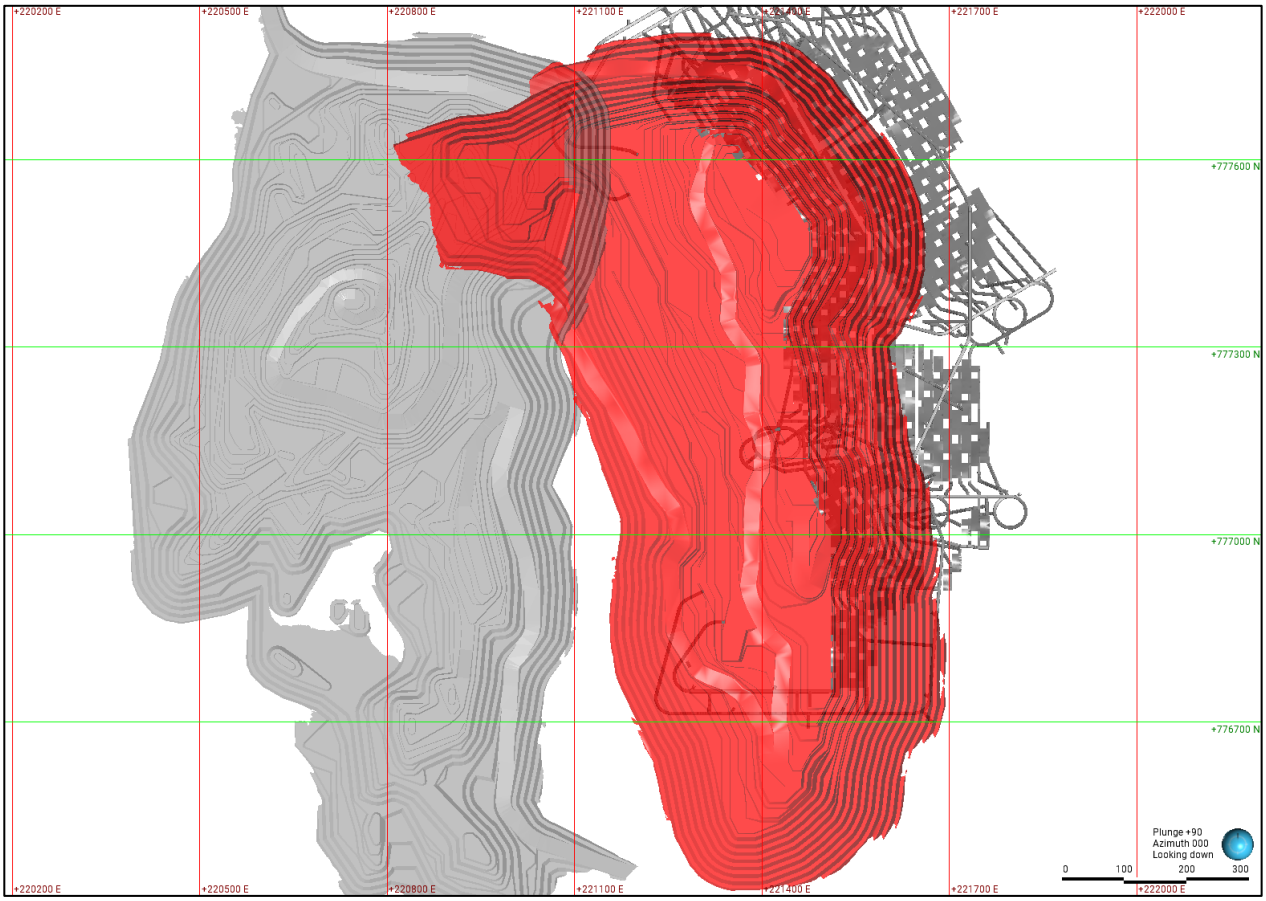


Figure 16-2: CMA pit design – plan view (Perseus, 2023)

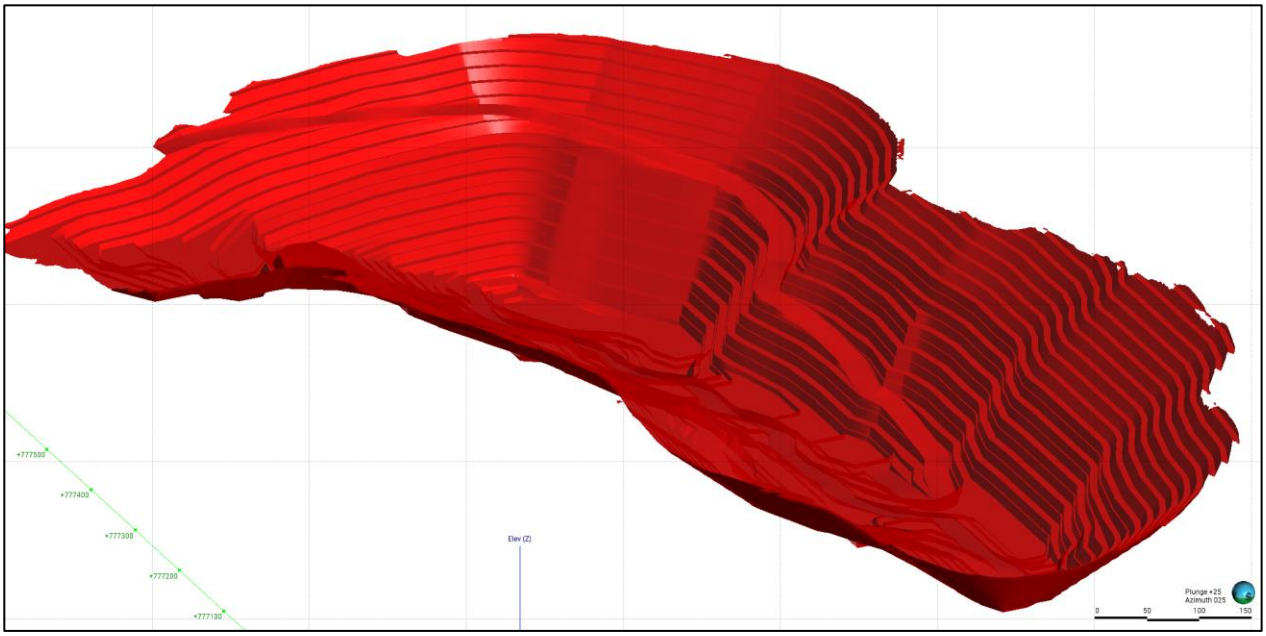


Figure 16-3: CMA pit design – oblique view looking northwest (Perseus, 2023)

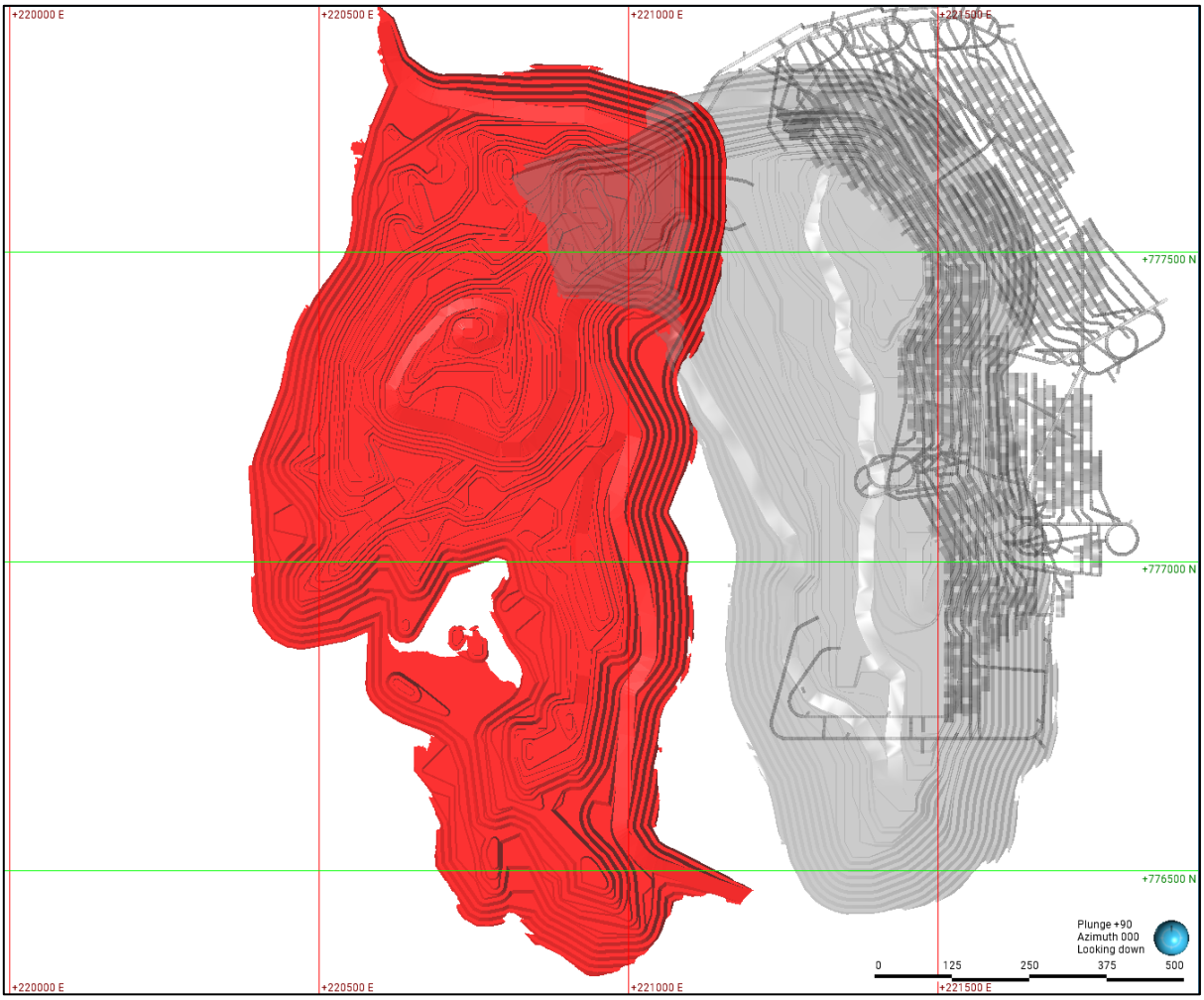


Figure 16-4: Yaouré pit design – plan view (Perseus, 2023)

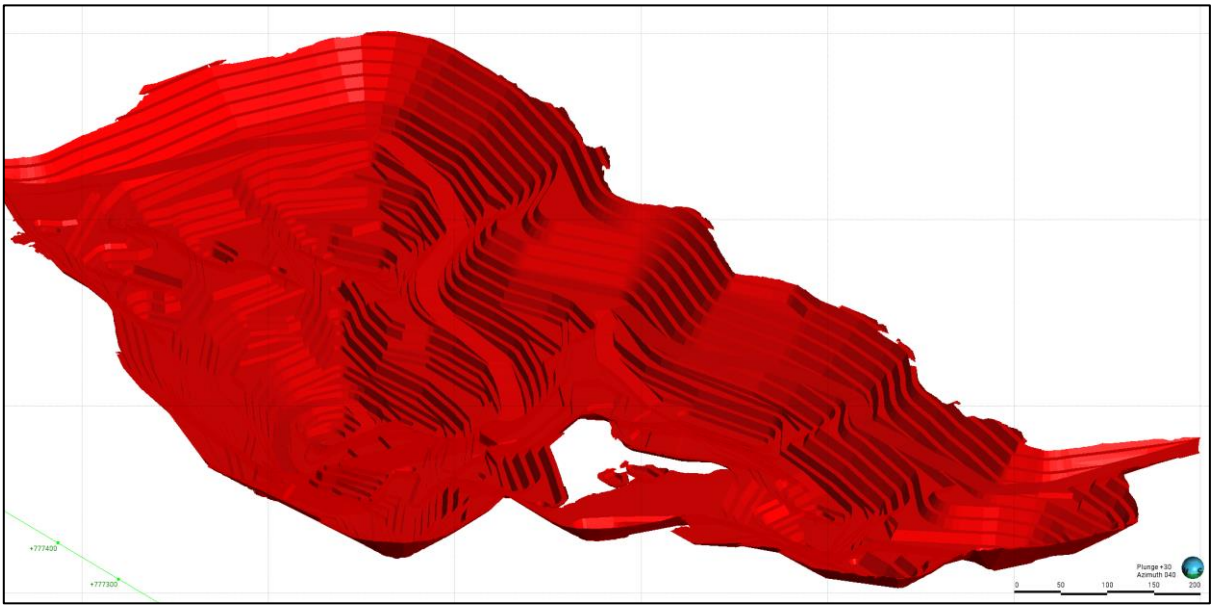


Figure 16-5: Yaouré pit design – oblique view looking northwest (Perseus, 2023)

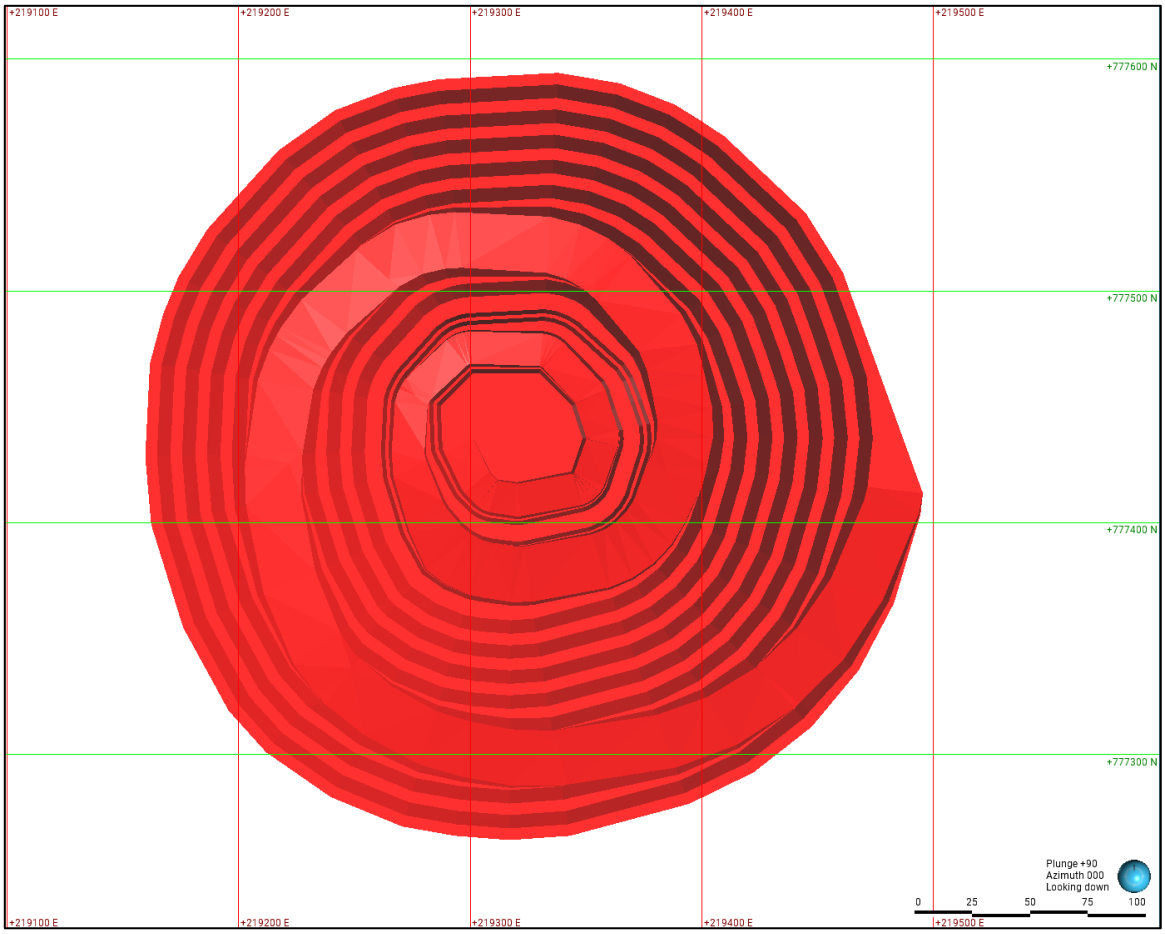


Figure 16-6: Govisou pit design – plan view (Perseus, 2023)

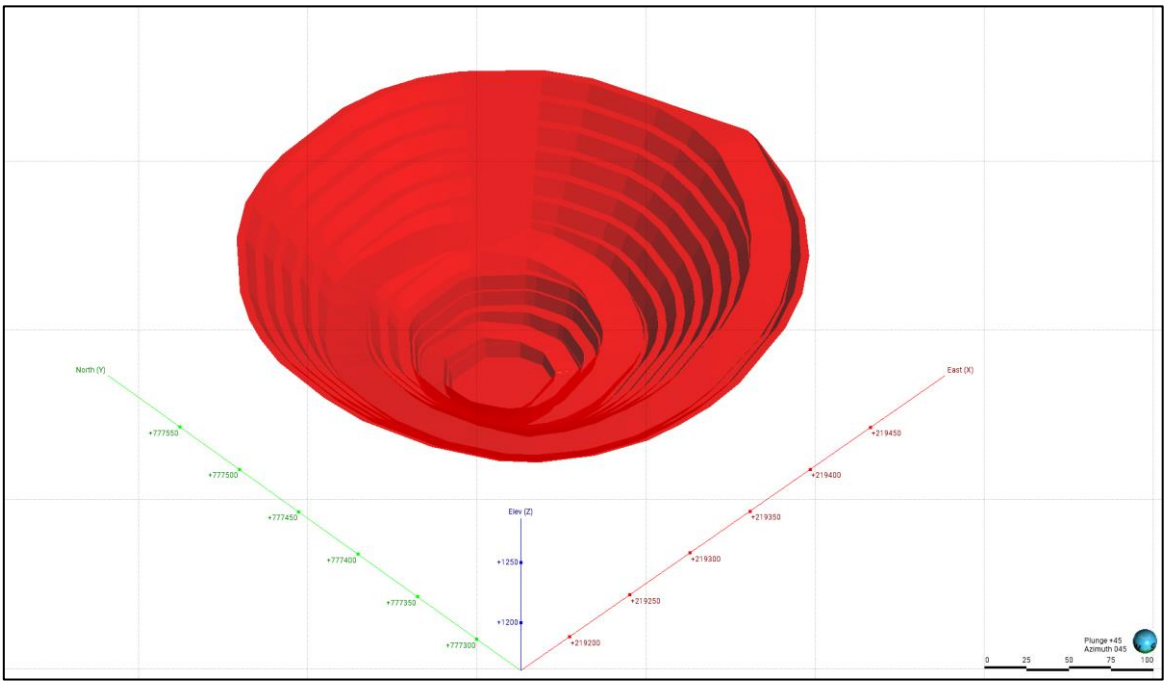


Figure 16-7: Govisou pit design – oblique view looking northwest (Perseus, 2023)

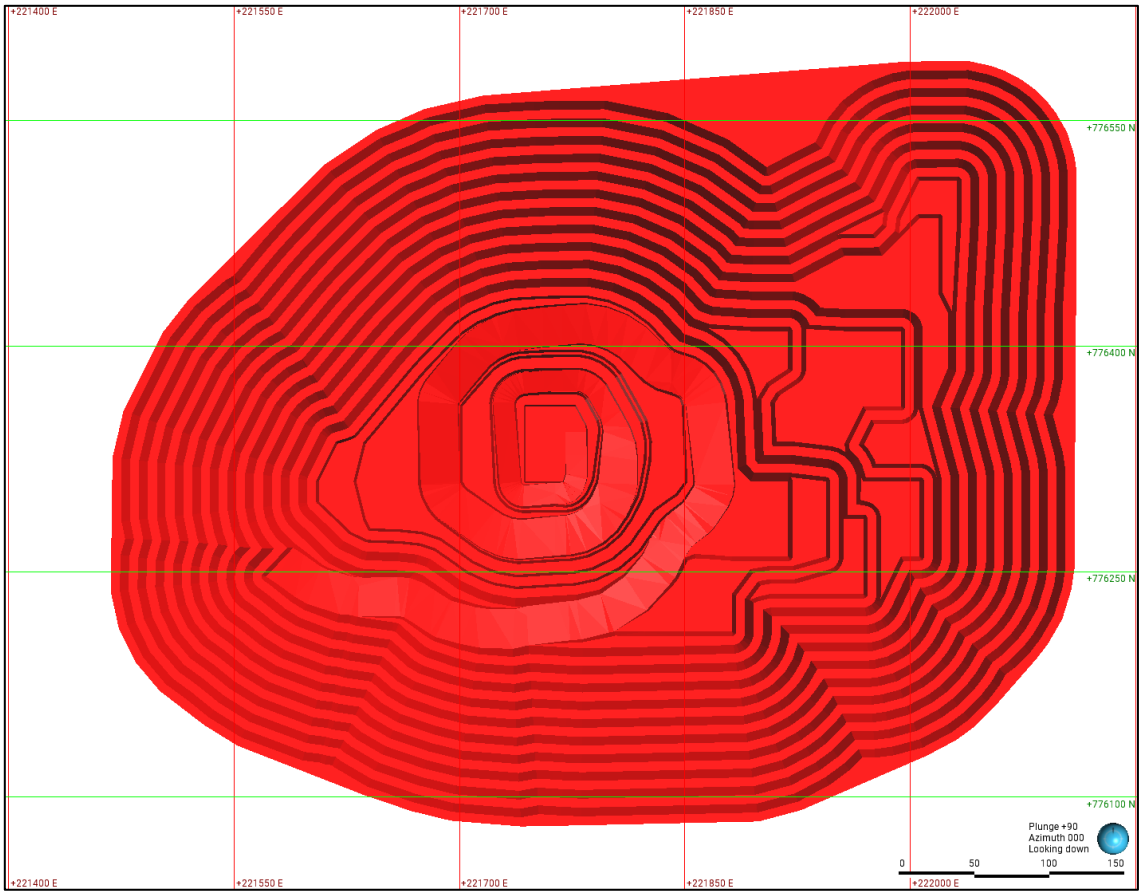


Figure 16-8: Angovia 2 pit design – plan view (Perseus, 2023)

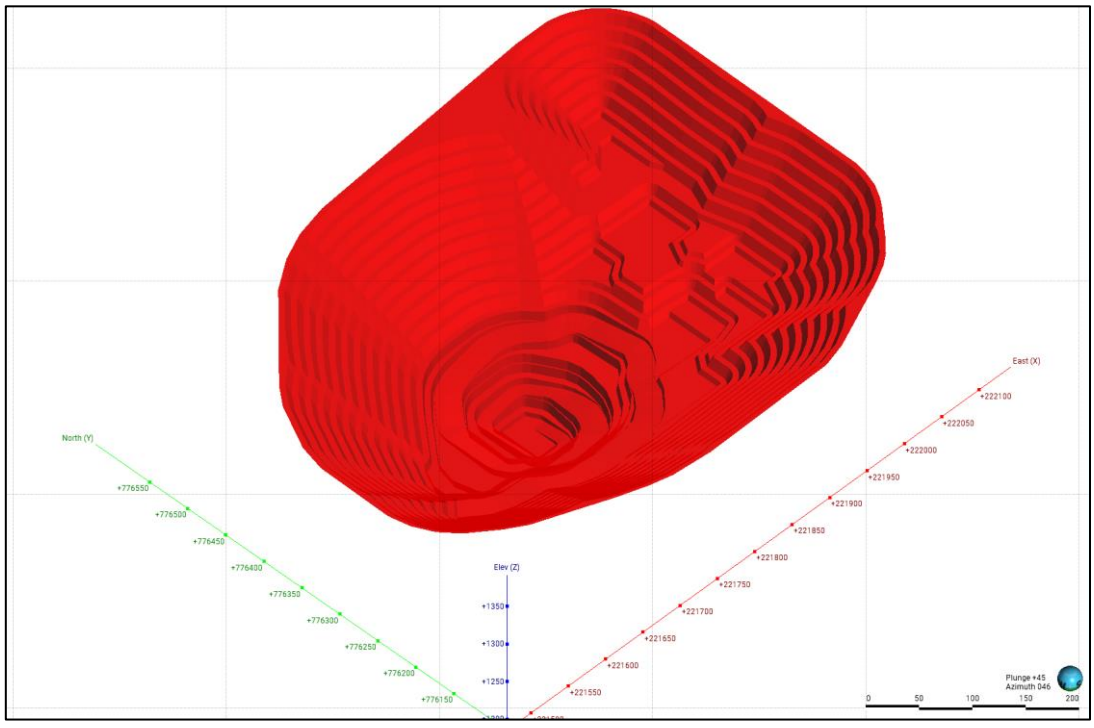


Figure 16-9: Angovia 2 pit design – oblique view looking northwest (Perseus, 2023)

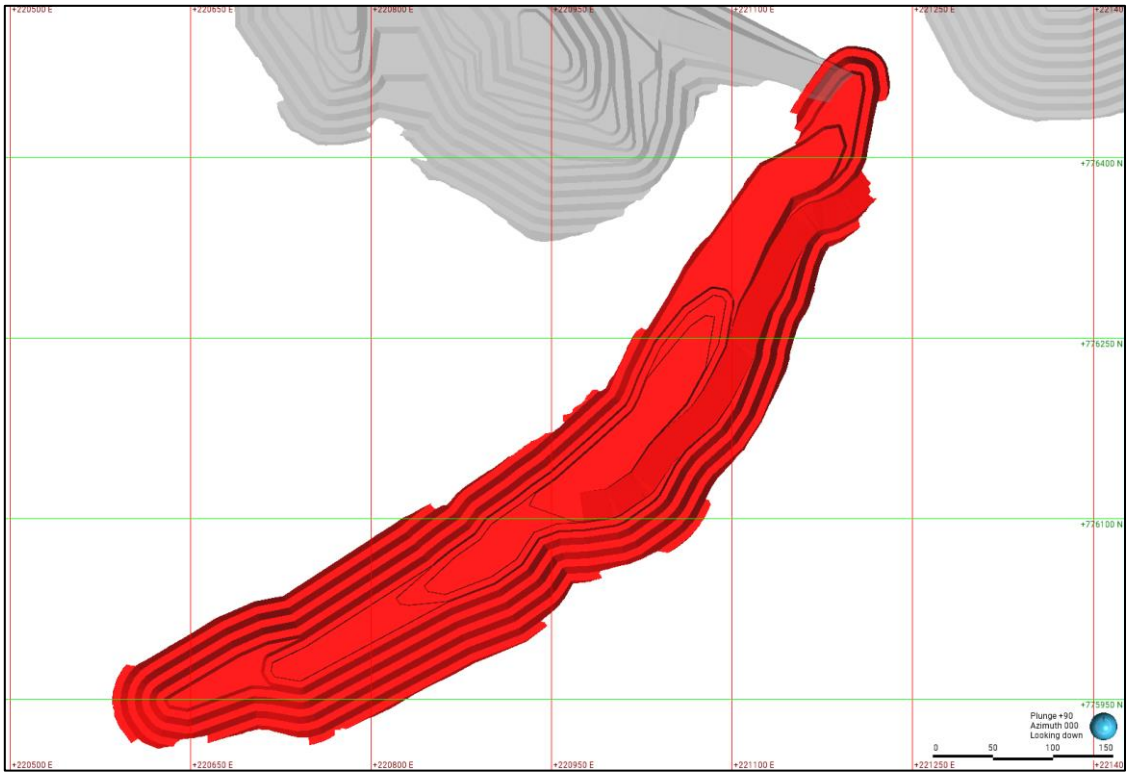


Figure 16-10: CMA Southwest pit design – plan view (Perseus, 2023)

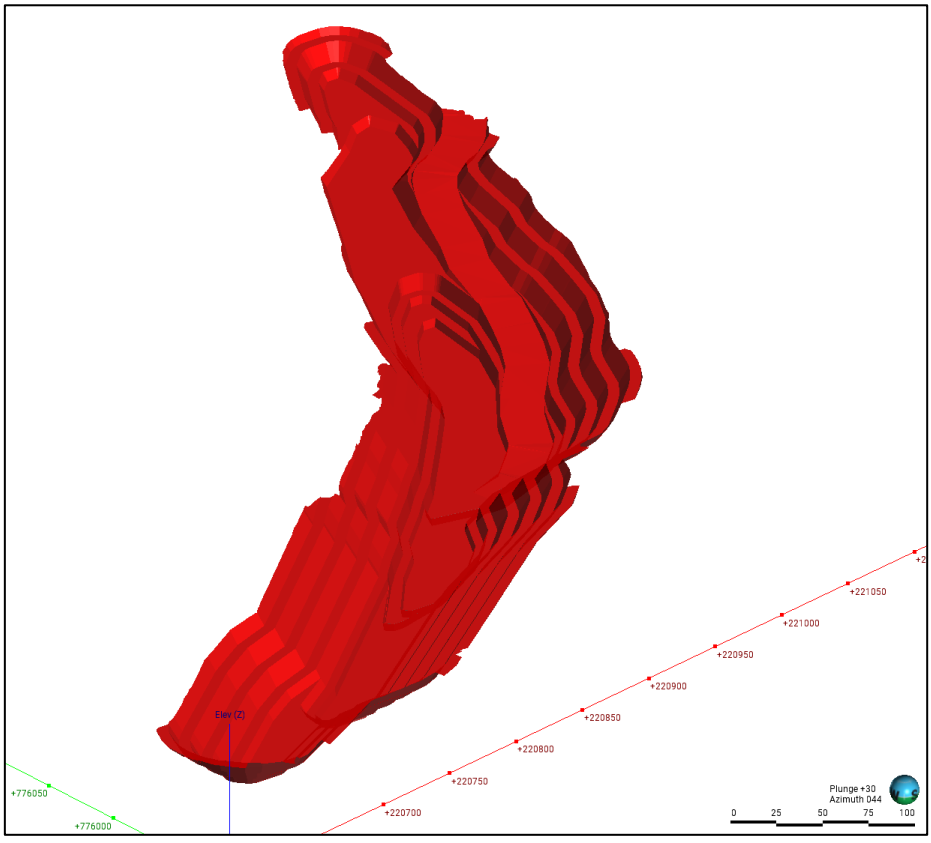


Figure 16-11: CMA Southwest pit design – oblique view looking northwest (Perseus, 2023)

16.1.2.2 Pit Design Parameters

The mine design parameters are shown in Table 16-1. As discussed in Section 15, bench heights, batter angles and berm widths vary by mineralisation location and by the degree of weathering.

Table 16-1: Mine design parameters

DESCRIPTION	UNIT	VALUE
Ore bench height	m	10
Flitch height	m	2.5
Height between berms	m	variable
Safety berm width	m	variable
Batter angle	degree	variable
Minimum mining width	m	40
Ramp gradient	%	10
Double lane ramp width	m	24
Single lane ramp width	m	14

16.1.2.3 Waste Dump Design Parameters

Yaouré Gold Mine consists of a large primary waste dump facility which is designed with 10 m bench heights and 15 m berms. Several smaller waste dumps are also planned to assist with other infrastructure access. For ease of rehabilitation, the waste dumps were designed to have an overall slope gradient of approximately 1:3.

Perseus has ongoing studies to update the Yaouré waste dump designs to incorporate open pit Mineral Reserves, however Perseus is not aware of any reason why such additional capacity will not be sufficiently available on site. Capacity on site is permitted for the required volumes of waste. Further details on the operational monitoring and closure plans for the waste rock dumps are provided in Section 20.4.

16.1.2.4 Geotechnical and Hydrological Parameters

Open pit geotechnical parameters are discussed in Section 15.

Surface water management at Yaouré is well understood and is controlled by a series of surface drains across the site. Open pit dewatering is managed by conventional in-pit sumps and pumps, and this approach is expected to be sufficient for open pit operations across the remaining LOM.

16.1.2.5 Drill and Blast Design

Drill and blast design and practices for open pit mining at Yaouré are reviewed and updated on a continuous basis in order to optimise overall value to the business from these activities. The current drill and blast patterns for the operational CMA open pit are listed in Table 16-2 below.

Table 16-2: Typical blast patterns

MATERIAL	SPACING (m)	BURDEN (m)	HEIGHT (m)	POWDER FACTOR (kg/bcm)
Transition Waste	6.2	5.4	10	0.55
Transition Ore	4.8	4.2	10	0.71
Fresh Waste	5.4	4.7	10	0.78
Fresh Ore	4.0	3.5	10	1.08

16.1.3 Open Pit Mining Operations

Spanish mining contractor EPSA is the mining contractor at the CMA and Yaouré pits. The mining contractor is responsible for:

- Clearing and grubbing
- Topsoil stockpiling
- Waste stripping
- Drilling and blasting
- Excavating and haulage of ore and waste
- Ore stockpile and waste dump management
- Ancillary services including dewatering, pumping and haul road construction/maintenance.

Grade control drilling is completed under a separate contract. Grade control samples are processed at the Yaouré site laboratory operated by commercial laboratory contractor, ALS.

Technical services and mine management activities, including mining geology, survey, mining engineering (design, scheduling, and drill and blast) are conducted by Perseus.

16.2 Underground

16.2.1 Introduction

Beyond the limit of the current CMA open pit Mineral Reserve, the CMA Mineral Resource has the potential to be exploited by underground mining. This potential has been identified and investigated over a series of studies from 2018 until 2023.

The open pit 2017 Yaouré Feasibility Study identified the potential for the CMA orebody to extend at depth. This was confirmed by a Concept Study, reported in November 2018, which evaluated the potential to mine the orebody using underground mining methods and produced a maiden Mineral Resource estimate for the CMA underground (Perseus Mining Limited, 2018).

The maiden underground Mineral Resource was followed by a PFS during 2022, which updated the Mineral Resource and included estimation of a maiden underground Mineral Reserve (Perseus Mining Limited, 2022). Since the PFS, additional resource definition drilling was undertaken during FY23, which has resulted in an increase to the Mineral Resource. A concurrent FS has resulted in the estimate of Mineral Reserves for the CMA underground which form part of the current LOM plan.

16.2.2 Site Layout

The CMA underground is an extension of the current orebody mined by the CMA open pit. The mined portion of the orebody and infrastructure to support operations is contained within the

current mining lease. The site layout at Yaouré Gold Mine, including the location of the CMA underground, is shown in Section 16.1.2.1.

16.2.3 Geotechnical

As described in Section 15.4.3.3, geotechnical assessments for the CMA underground FS were undertaken by MineGeoTech Pty Ltd (2023). The parameters derived from this work include the following key assumptions:

- Flat long hole stopes are spaced 10 m horizontally apart (wall to wall), which limits the length of production drillholes to a practical and achievable length of less than 16 m, depending upon the forward angle of the holes and the dip of the orebody.
- Conventional long hole stopes are nominally spaced 20 m vertically apart.
- Development ore drives are nominally 4.7 m wide by 5.0 m high, however both drive height and width can increase to accommodate the dimensions of the orebody.
- Orebody minimum mining width for flat open stopes is 4.0 m and 3.0 m for conventional open stopes.
- Pillar dimensions are 10 m by 10 m along strike and up dip of the orebody.
- Pillar spacing along strike allows for 40 m open stopes, which equates to 81% extraction ratio (mining recovery) due to pillars, inclusive of vent and crown pillars.
- Stope strike extents of 40 m are considered stable without the use of cable bolts for reinforcement, and are additionally a practical distance over which to successfully operate remote loaders to recover ore from flat open stopes.

No backfill is currently planned as part of the CMA underground. Based on studies during the PFS, the high recovery using pillars makes it difficult to economically justify the capital and operating costs (and scheduling delays) associated with backfill.

16.2.4 Hydrology and Hydrogeology

Hydrological and hydrogeological assessment has been completed to Feasibility level through a series of studies between 2017 and 2022 (CSA Global, 2022). Hydrogeological assessment included the development of a numerical groundwater model to predict groundwater inflows, assess dewatering requirements, develop an appropriate dewatering strategy, and estimate the potential impact of dewatering on surrounding groundwater levels, nearby village water supply wells, and river baseflows within the Project area.

The model predicted underground inflows could be managed via conventional helical flow pumps, staged through the underground mine to the base of pit and transferred to a sedimentation pond external to the pit. It assumes adequate controls to divert surface water flows from entering the pit.

Dewatering capital and operating costs were based on stationary underground dewatering system capable of 30 L/s located centrally and fed from smaller staged pumps up to 10 L/s. Mobile submersible face pumps would also contribute to the dewatering system.

Ongoing monitoring of bores in the vicinity of the CMA open pit will allow for tracking of the groundwater drawdown associated with the underground mine. The design of the underground dewatering system allows for modular additions to the dewatering capacity to mitigate risk of underestimation by the model.

16.2.5 Mining Method

The CMA underground will be mined by a combination of flat long hole open stoping and conventional long hole open stoping mining methods. These methods have been selected as the most cost effective and productive mining methods for the flat-dipping CMA orebody. The mining method is dependent upon the dip of the orebody, which ranges from 5 degrees to 20 degrees for the majority of flat long hole stoping and from 50 degrees up to 62 degrees for conventional long hole stoping. The mine design encompasses significant variability in plunge and dip across the deposit, for which a flexible mining method is required. Flat long hole stoping accounts for the majority of ore tonnes (98%), while conventional stoping applies only to the CMA northwest area of the mine (2% of ore tonnes).

Mining equipment will be mechanised, and equipment is planned to include electric-hydraulic drills for development and production, and rubber tyred loaders and trucks for load and haul activities. Production loading will incorporate tele-remote loading for non-entry mining stopes.

The CMA underground is based on a no backfill case for mining the CMA deposit. At this stage, a high recovery of the CMA orebody using pillars means that backfill is not part of the mine plan. If Mineral Reserves increase and the mine gets deeper, there may be a case in the future for implementation of a reticulated backfill system, such as paste fill.

Mining extraction ratios for CMA underground Mineral Reserves are dependent upon the dimensions and spacing of pillars throughout the orebody. The CMA Mineral Reserve assumes 40 m open stopes (along strike) and pillars of 10 m × 10 m, which combines with strategically placed vent pillars to provide an overall 81% extraction ratio (mining recovery).

16.2.6 Mine Design

Development design for CMA underground consists of two pairs of portals, and an extra single intake portal, making five development breakthroughs into the CMA open pit. The south and north portal pairs (one each of intake and exhaust, north and south) are to be established concurrently and both pairs are located on the west wall of the CMA open pit. Twin intake and exhaust portals are required to maintain ventilation quantities (total of 540 m^3/s) once full production rates of 720 kt/a are reached. The exhaust portals also function as emergency egress. Due to a relatively deep weathering profile at Yaouré and the availability of the CMA open pit void, lateral development in fresh rock material is more cost effective than vertical shafts. The CMA underground Mineral Reserve design is shown in Figure 16-12.

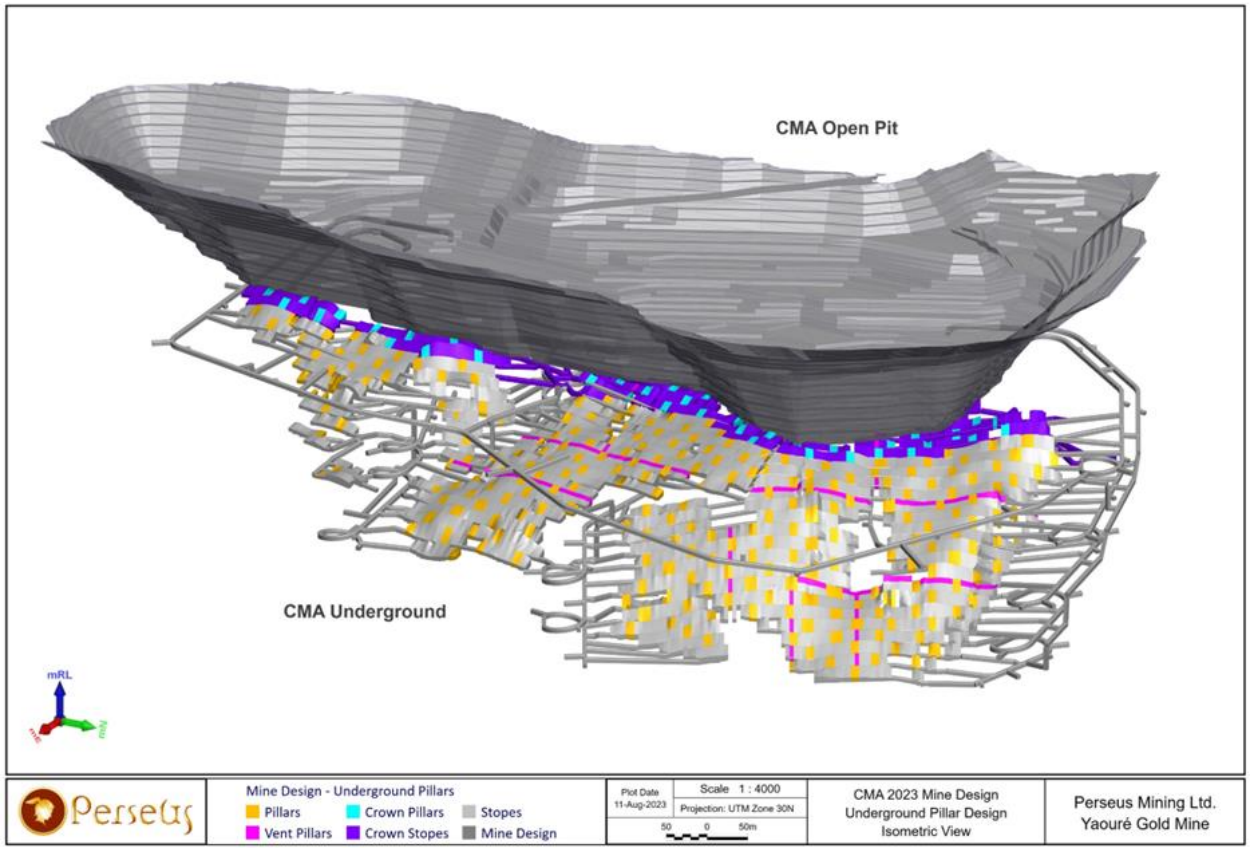


Figure 16-12: Isometric (inclined) view of CMA stage 3 open pit and CMA Underground Mineral Reserve showing pillar locations

Development ore drives are nominally 4.7 m wide by 5.0 m high, however both drive height and width can increase to accommodate the dimensions of the orebody.

Ore development drives can be very steep in places and are designed to follow the orebody on a pre-defined bearing, with variations in gradient taken under geological control to maintain the drive position within the orebody. Maximum development gradients are 1 m vertical for every 5.5 m of horizontal advance (1:5.5). Development rates have been reduced to as low as 40 m per month per heading to accommodate for slower advance in areas of steep development. Further engineering studies planned for FY24 to incorporate new ore will also reduce ore drive development gradients wherever practicable.

Production design for flat long hole open stopes include a footwall design slope of 1:6 to allow trafficability for remote loaders. Flat long hole stopes are spaced 10 m horizontally apart (wall to wall), which limits the length of production drillholes to a practical and achievable length of less than 16 m, depending upon the forward angle of the holes and the dip of the orebody. The slightly steeper dipping conventional long hole stopes (in the CMA northwest) are nominally spaced 20 m vertically apart and have a minimum footwall angle of 40 degrees.

Stope optimisations were only run on Indicated Mineral Resources. Inferred Mineral Resources were considered as waste for the purposes of optimisation. There are no Measured Mineral Resources for the CMA underground.

16.2.7 Mine Ventilation

Mine ventilation studies were undertaken to Feasibility level for the CMA underground by Ozvent Consulting Pty Ltd (Ozvent) (2023), with further confirmatory high level review by BBE Consulting (BBE Consulting, 2023).

The summary of the Ozvent Feasibility report includes the following points:

- A key design issue is the very hot and humid climate, and this will impact on underground working conditions. However, provided that the proposed ventilation system is competently managed and provided that adequate working in heat management procedures are professionally implemented, mine air cooling systems should not be necessary. This is mainly for two reasons, including the operation's shallow planned depth and its relatively low indicated rock temperatures.
- A conventional primary ventilation system is proposed, with two near-surface exhaust fan installations. Air flow would be drawn to the extremity of each of the three internal declines before being exhausted to surface via the primary fans (Figure 16-13). Examples for a similar installation are presented in Figure 16-14 and Figure 16-15.
- Because the stopes will not be backfilled, a proportion of the primary airflow will short circuit through the stope voids. This study includes several measures to limit the extent of the mine that is affected by short-circuiting. The main measures include dividing the stope voids into smaller compartments using ventilation pillars and ensuring that each drive access is permanently sealed as early in the schedule as practical.
- The main driver for estimating primary airflow requirements will be to ensure that diesel exhaust emissions are adequately diluted. For this report, the requirements set out in the Western Australian Work Health and Safety (Mines) Regulations 2022 (Government of Western Australia, Department of Justice, 2023)were used as a design basis. Other factors include the likely uneven distribution of mobile equipment between the three internal declines and the loss of primary air flow due to short circuiting through the stope voids. Accounting for these factors as well as for exhaust leakage and compression of airflow at depth, a conservative design primary airflow rate of 540 m^3/s (180 m^3/s for each of the three internal declines) was selected.

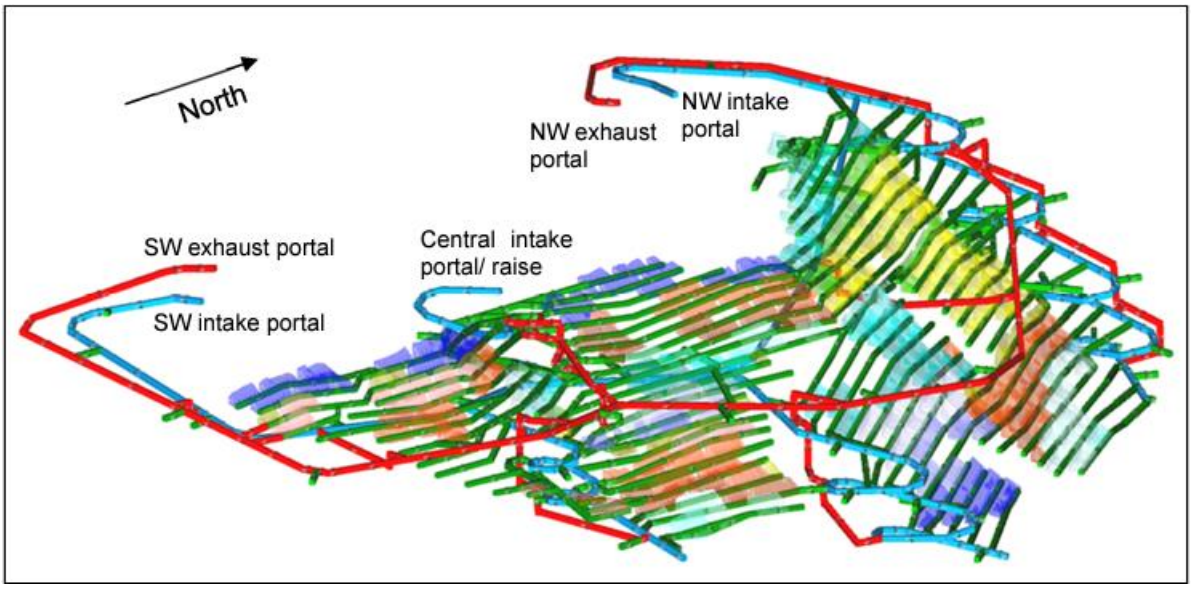


Figure 16-13: Feasibility Study mine design showing main airways



Figure 16-14: Example installation with 3 × Clemcorp CC1800 Fans and an escapeway man-door (note 4 fans are needed for CMA UG in each exhaust)



Figure 16-15: Side view of fans shown in Figure 16-14

16.2.8 Mine Schedule

A mine schedule for the CMA underground Mineral Reserve has been developed. The maximum production rate for the CMA underground is 720 kt/a (60 kt per month of ore). Based on current assumptions of development and production rates, the limiting constraints are the number of available headings. The mining sequence is a combination of top-down and bottom-up mining, providing flexibility for production to be maintained depending upon the available number of development headings and stoping areas. The annualised schedule is illustrated in Figure 16-16.

Key mining productivity constraints applied in the underground schedule include:

- Jumbo development rates of 250 m/month per machine and 750 m/month overall.
- Production drilling rates of 6,100 m/month per machine and 12,200 m/month overall.
- Production loading (bogging) capacity of:
    - Conventional rate 53,500 t/month (1,760 t/d)
    - Remote rate of 27,700 t/month (910 t/d).

Modifying factors are applied in the Deswik Scheduler software to generate a Mineral Reserve mine schedule which includes planned dilution, unplanned dilution, and mining recovery.

The underground mine at CMA cannot provide enough ore to fill the Yaouré processing facility by itself. A combined open pit and underground mining and processing schedule has thus been generated for the Yaouré LOM plan. The combined open pit and underground schedule is discussed further in Section 16.3.

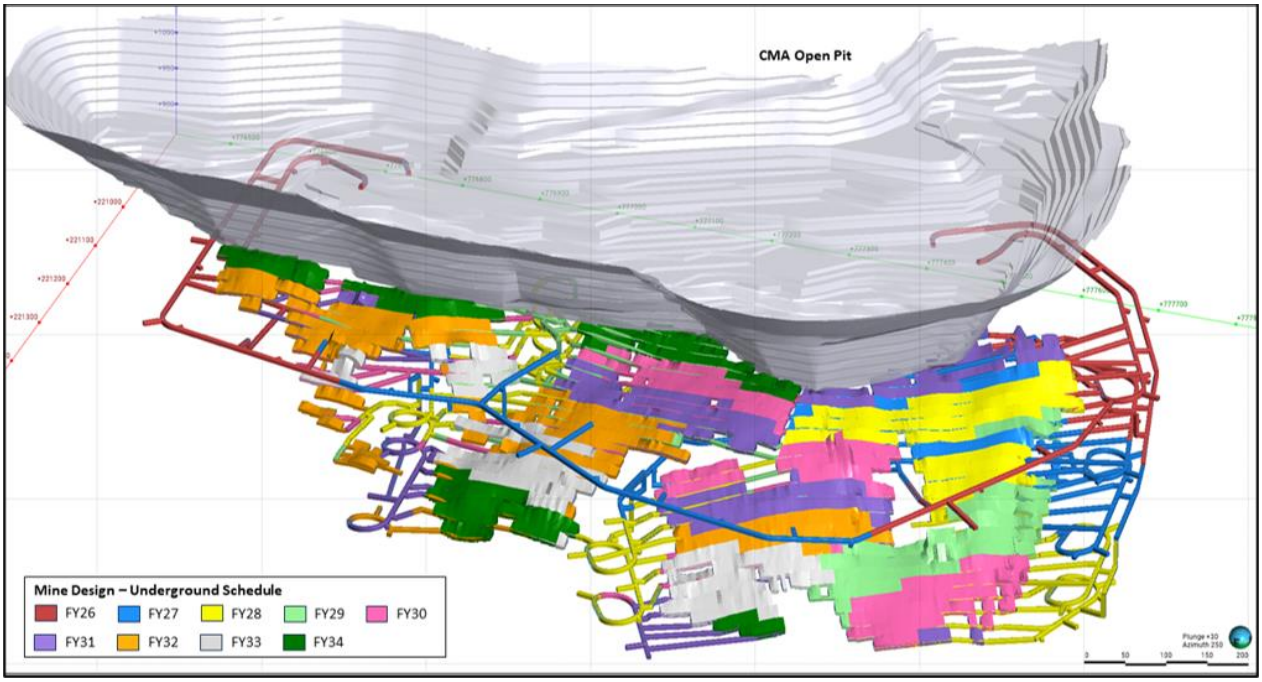


Figure 16-16: CMA underground mine, coloured by annual mining sequence (schedule)

16.2.9 Mining Equipment and Infrastructure

Contractor equipment proposed for CMA underground includes the following key mobile machinery:

- 3 × twin boom drill jumbos (Sandvik DD422i class).
- Articulated dump trucks (50 t class), ranging in number from 3 to 5 depending on combined development and production requirements.
- Underground loaders
  - Larger headings and truck loading (21 t class)
  - Ore drives and stope production (17 t class).
- Mobile charge up machine for both development and production charging.
- Integrated tool carriers.

Additional site infrastructure, and upgrades to existing site infrastructure, required for mining of the CMA underground orebody is discussed in Section 18.3.1. Costs for mining equipment and infrastructure required for the CMA underground mine have been accounted for in the CMA underground development capital estimate.

16.3 Combined Open Pit and Underground Mining Schedule

The key constraint for mining schedules at Yaouré, with respect to open pit mining are total material movement, and the vertical advance rate of individual open pit stages. Vertical advance rate at Yaouré open pits is limited to 80 m/a.

The life of the Yaouré Gold Mine inclusive of the underground at CMA has changed from planned cessation of processing in FY29 (2021 LOM) to an updated LOM extending to the end of FY35. An average of more than 200 koz/a is forecast to be produced over the first seven years of the LOM

until FY30 from combined open pit and underground operations. The LOM strategy is aimed at maximising the NPV of Yaouré Gold Mine by optimising the mining sequence, especially with respect to grade, cost, recovery and throughput.

Total mining movement rates planned for the Yaouré LOM range from 26 Mt/a to 38 Mt/a during years where there is ore production from the Yaouré open pit mines (Figure 16-17), and inclusive of underground production from FY26. This order of magnitude of mining rate has been achieved by the existing EPSA open pit fleet during the first two full years of production in FY22 and FY23. From FY30 onward, open pit mining ceases and is replaced by material reclaimed from stockpiles to supplement ore feed from underground mining to the processing plant.

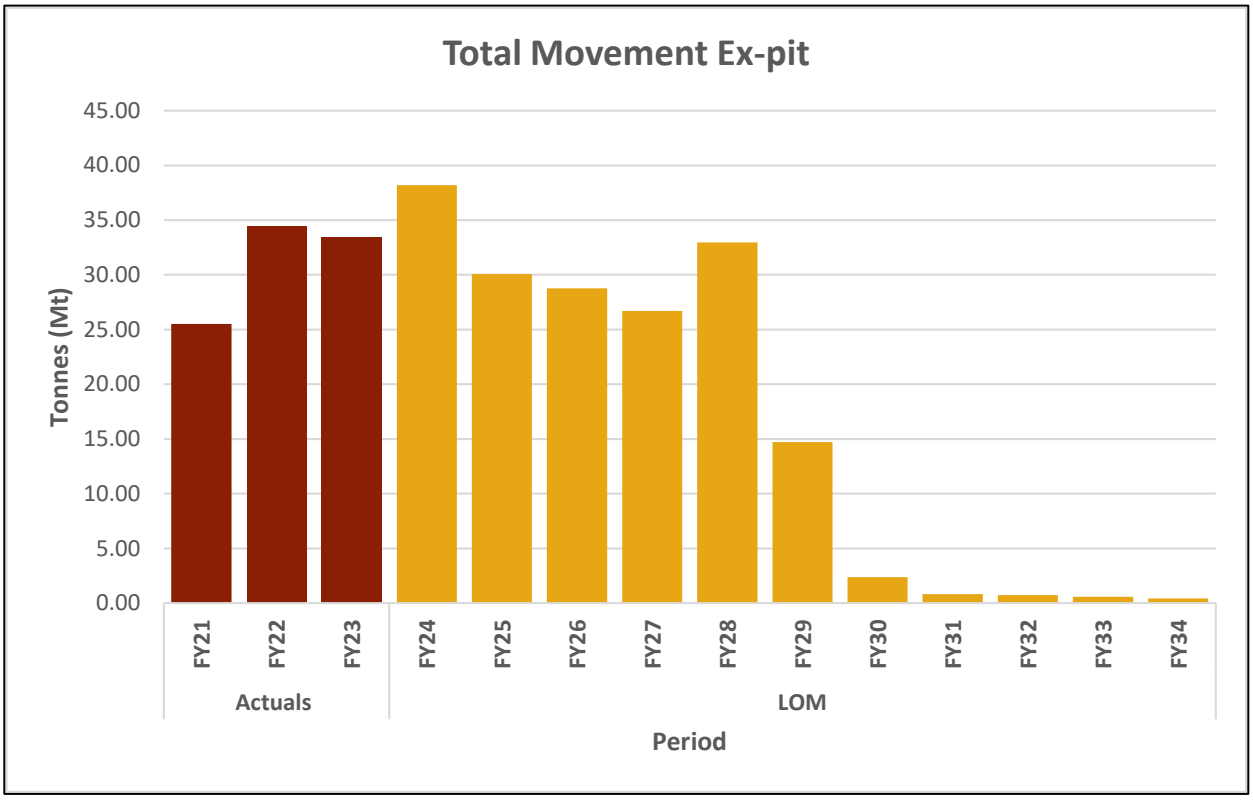


Figure 16-17: Yaouré Gold Mine total movement ex-pit by year

Total processing throughput rates planned for the Yaouré LOM range from 3.1 Mt/a to 3.8 Mt/a, as shown in Figure 16-18. Actual processing rates achieved in FY22 and FY23 are at the upper end of this range. Over the life of mine, lower planned throughput coincides with variable ore hardness across deposits, and the finer grind size required when batch processing CMA underground ore.

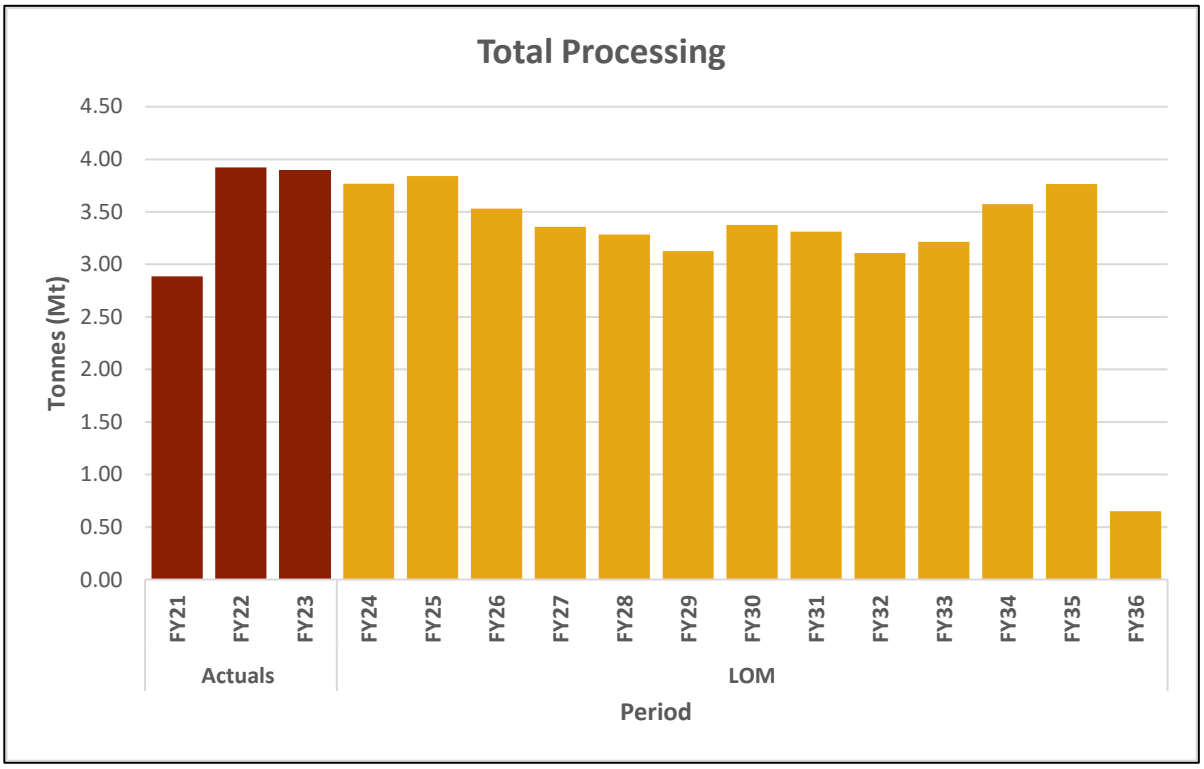


Figure 16-18: Yaouré Gold Mine total processing tonnes by year

The LOM schedule for Yaouré is based on Mineral Reserves with the inclusion of some additional marginal mineralised material stockpiled over the LOM. Mineral Reserves are estimated at a gold price of $1,500/oz, while the LOM revenue is evaluated at a gold price of $1,700/oz. Perseus's LOM does not include Inferred Mineral Resources as a component of the processing plant feed.

The 2023 Yaouré LOM plan has ore and waste being mined from five sources, including the CMA pit, Yaouré pit, CMA underground, Satellite Deposits, and stockpiles. Figure 16-19 shows the additional ounce production contribution by ore source relative to Perseus's previously published August 2021 LOM plan (Perseus Mining Limited, 2021). Figure 16-20 shows the annual ounce production profile by ore source, and the average annual grade to the mill.

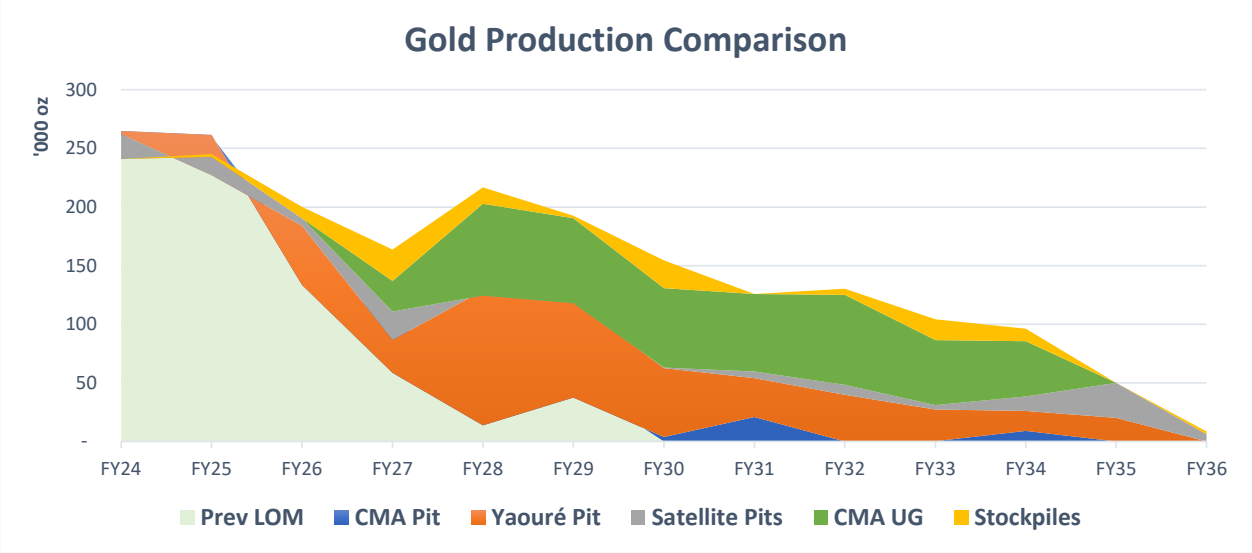


Figure 16-19: Yaouré Gold Mine additional ounce production contribution by ore source relative to August 2021 LOM plan

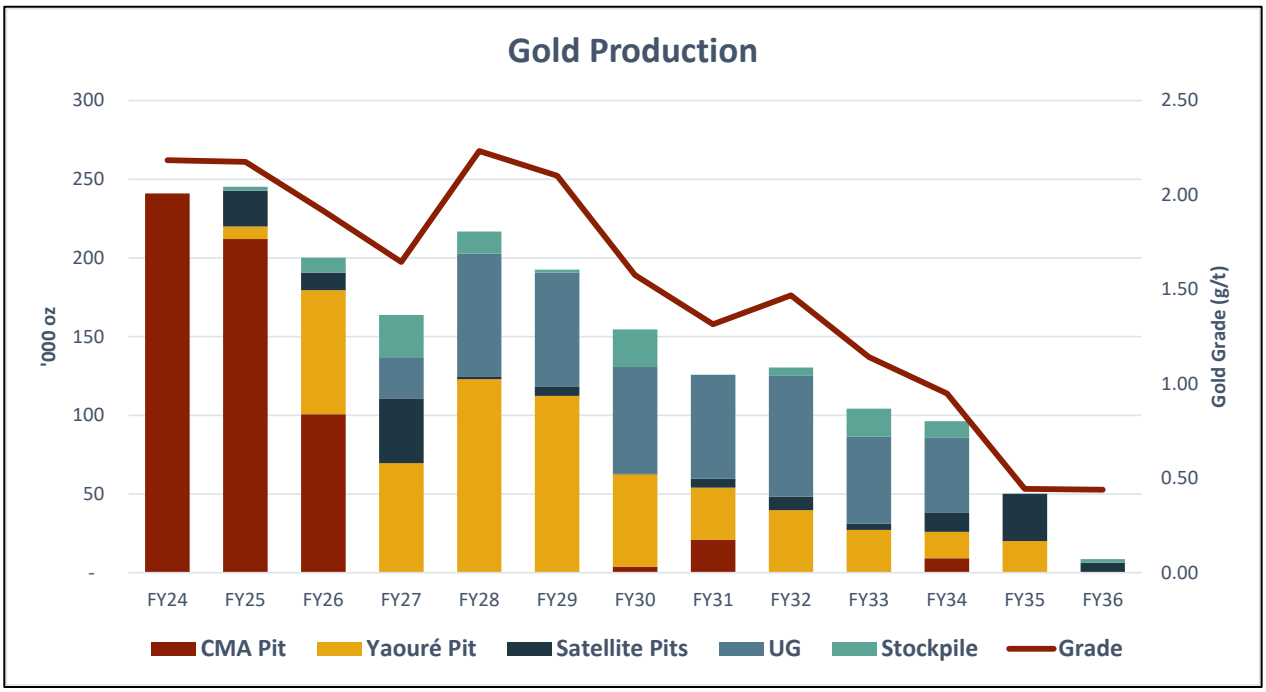


Figure 16-20: Yaouré Gold Mine annual ounce production profile by ore source and grade to mill

Open pit mining is projected to cease in FY30, and underground mining is planned to be completed in FY34. Processing is projected to continue until the end of FY35 or early in FY36. Resource definition drilling is underway to increase Mineral Resources and convert Mineral Reserves at the CMA underground and Yaouré open pit during FY24, which are expected to further extend the LOM plan.

Perseus expects to produce over 1 Moz of gold from Yaouré over the next five years. The overall LOM plan includes processing of 41.9 Mt of ore, at an average grade of 1.58 g/t gold, and average

metallurgical recovery of 90.8%. Gold production is expected to be 1,929 koz of gold at an all-in site cost of $1,116/oz.

17 Recovery Methods

17.1 Introduction

The Yaouré gold processing plant has been in operation since late November 2020. It was designed for a nominal 3.3 Mt/a capacity processing CMA pit fresh ore and 3.8 Mt/a on soft ores (at target grind size P_{80} of 75 µm), but it has exceeded nameplate by processing 3.9 Mt of an ore blend consisting of 91% fresh, 4% transition and 5% oxide in the financial year ending June 30, 2023. Since commissioning to the end of June 2023, the plant has treated a total of 9.4 Mt of ore at an average grade of 2.26 g/t to yield 634 koz of gold at an average recovery of 92.7%.

Section 17 of this report summarises key technical data for the recovery of gold from Yaouré Gold Mine ore deposits within the Yaouré processing plant facility. Section 17.2 summarises the development of design criteria for the Yaouré processing plant, based on findings from metallurgical test work, circuit modelling and design engineering. Section 17.3 presents a simplified version of the Yaouré processing plant flowsheet and highlights major equipment specifications. Section 17.4 describes the gold recovery process and the process flowsheet in greater detail by plant area. Section 17.5 summarises plant operating performance data, which confirms that the design criteria and process flowsheet selected align with the amenability and recoverability of gold from Yaouré property mineralisation under the operating conditions of the Yaouré processing plant. Section 17.6 cross-references the predicted metallurgical performance and reagent consumptions for Yaouré Gold Mine ore deposits discussed in Section 13.10 of this report. Sections 17.7 and 17.8 summarise power and water requirements for processing Yaouré Gold Mine ore deposits.

17.2 Design Criteria Development

The mineral processing and metallurgical testing programs, detailed in Section 13, have provided information about the physical characteristics and metallurgical response of the Yaouré Gold Mine ore deposits and ore types. Process design criteria were developed based on CMA fresh ore, as this was projected to be the major ore type processed over the LOM at the time of design (Perseus Mining Limited, 2017). The relative contributions of each material type and their proposed sequence of treatment over the LOM were considered during the sizing of the comminution circuit and subsequent modelling of plant throughput parameters.

An SABC comminution circuit (SAG milling in closed circuit with pebble crushing, and ball milling in closed circuit with hydrocyclones) was selected for the Yaouré processing plant and has the advantage of being able to accommodate the wide spectrum of material hardness and competency observed from test work. Grind sensitivity and subsequent variability test work suggests that all material types are grind sensitive with gold extraction increasing with fineness of grind. The technoeconomic grind optimisation evaluations identified that a grind size P_{80} of 75 µm is optimal for open pit ore, and a grind size P_{80} of 53 µm is optimal for underground ore. Diagnostic leach test work and mineralogical investigations indicate that most of the residual gold that is not recoverable by cyanide at the target grind size is fine grained and associated with pyrite for fresh ores, as well as with silicates and carbonates for oxidised ores. Even though additional gold may be liberated with finer grinding, the incremental quantity of gold that would be liberated does not justify the incremental cost.

Although the test work programs indicated that the gravity recovery stage added little or no improvement to the final gold extraction for most ore types, except from some oxide ores, a gravity circuit has been installed in the Yaouré process plant flowsheet for the following reasons:

- Variable head assays for samples indicate that coarse gold or spotty mineralisation is present across Yaouré Gold Mine ore deposits. This is best mitigated by inclusion of a gravity circuit, whereby potential spikes of high grade material presenting to the hybrid leach/CIL circuit are limited, allowing more consistent operation of the adsorption and elution circuits.
- Leach kinetics are improved, particularly at the start of the leach, by removing the gravity recoverable gold. This improves the carbon profile and promotes lower gold solution losses.
- Intensive cyanidation of the gravity concentrate has improved potential of leaching semi-refractory minerals that may be present.
- Removing gravity recoverable gold in a dedicated circuit reduces the amount of coarse gold that may accumulate in gravity traps across the comminution circuit, improving gold accountability and security outcomes.

Gravity/cyanidation variability test work across Yaouré Gold Mine ore deposits and ore types at their respective target grind sizes showed that 48 h gold extractions ranged between 61% and 99% gold across 131 tests, with an arithmetic mean of 92%. For CMA fresh ore, 48 h gold extractions ranged between 83% and 98% gold across 36 tests, with an arithmetic mean of 91%.

For the majority of samples, initial leaching rates were high with evidence of a generally small slow leaching fraction that continued to leach throughout the tests. Only a few oxide variability samples (<3%) had indications of minor preg-robbing behaviour; otherwise, no preg-robbing characteristics were observed from test work. Consequently, the plant design comprises a single direct leach stage ahead of a six-stage CIL circuit. Air addition was shown to promote leach kinetics across test work programs, so the leach and CIL tanks are fitted with air sparging. The hybrid leach/CIL circuit has been modelled to have a residence time range between 25 h and 46 h, with LOM residence time mostly falling between 25 h and 30 h. Leach/CIL residence time is ultimately dependent on the SG, hardness and competency of the dominant ore feeding the comminution circuit, as well as leach feed pulp density.

Oxide ore samples tested in thickening and settling rate tests had very fine as received particle size distributions and exhibited slower settling rates and lower underflow pulp densities, compared to fresh ore samples tested. Given the observed test work results, and early ore blends to the Yaouré process plant were oxide ore dominant, a pre-leach thickener was not included in the flow sheet. When processing ore blends dominated by CMA pit fresh ore at a target grind size P_{80} of 75 µm, there have been very few issues observed with achieving a steady state water balance and target comminution stream pulp densities. Hydrocyclone modelling, summarised in Section 13.10.1.2, indicates that achieving a steady state water balance and target comminution stream pulp densities when campaign treating CMA underground ore at a target grind size P_{80} of 53 µm is feasible. Given the similarities between CMA pit fresh ore and CMA underground ore, it is recommended that a multi-day plant trial is run on CMA pit fresh ore at a target grind size P_{80} of 53 µm to better understand the operational performance and constraints of running the plant under this configuration, using the outcomes to determine whether further plant modifications are required. In the case that controlling a water balance around the grinding circuit becomes challenging during the plant trial or campaign processing of CMA underground ore, it is anticipated that test work results from Section 13.9.7 can be used in trade-off studies considering the selection and installation of a pre-leach thickener to mitigate these effects.

No evidence of deleterious elements in the leach solution has been noted in test work or during operations, and leach, adsorption and desorption circuits have been observed to operate reliably. Cyanide detoxification of the tails stream is included in the Yaouré plant flowsheet to ensure that TSF supernatant concentrations achieve CN_{WAD} levels <50 mg/L, which aligns with industry

guidelines for TSFs such as Standard of Practice 4.4 of International Cyanide Management Institute's *Mining Operations Verification Protocol* (2021).

Table 17-1 summarises key process design and operating criteria for the Yaouré processing plant.

Table 17-1: Summary of key process design and operating criteria

CRITERIA	UNITS	VALUE	SOURCE
Plant throughput – oxide (design)	t/a	3,800,000	(Lycopodium, 2019)
Plant throughput – CMA fresh (design)	t/a	3,300,000	(Lycopodium, 2019)
Plant throughput – operations forecast	t/a	Refer to Table 13-138 for selected plant throughput at target grind size by ore type	
Head grade – design	g/t Au	3.44	Perseus
Gold recovery – design	%	93	Test work
Gold recovery – operations forecast	%	Refer to Table 13-140 for selected gold recovery at target grind size by ore type	
Crushing plant run time	%	80.0	(Lycopodium, 2019)
Grinding/process plant utilisation	%	91.3	(Lycopodium, 2019)
Grind size P_{80} – open pit ores	µm	75	Test work
Grind size P_{80} – CMA underground ore	µm	53	Test work
Number of leach tanks	-	1	(Lycopodium, 2019)
Leach tank volume	m^3/tank	3,250	(Lycopodium, 2019)
Number of CIL tanks	-	6	(Lycopodium, 2019)
CIL tank volume	m^3/tank	3,250	(Lycopodium, 2019)
Elution circuit type	-	Split AARL	(Lycopodium, 2019)
Elution circuit – mass of carbon batch	t	10.0	(Lycopodium, 2019)
Frequency of elution	strips/week	8	(Lycopodium, 2019)
TSF supernatant CN_{WAD} concentration	mg/L	<50	Perseus; (International Cyanide Management Institute, 2021)

There are no active plans to upgrade the Yaouré processing plant's ore treatment capacity.

17.3 Process Flowsheet

A simplified process flow diagram for the Yaouré plant is shown as Figure 17-1, and consists of the following unit processes:

- Primary crushing with a single toggle jaw crusher to produce a coarse crushed product
- A live stockpile from which ore is reclaimed to feed the milling circuit
- SAG milling in closed circuit with pebble crushing and ball milling in closed circuit with hydrocyclones (SABC comminution)
- Gravity concentration and removal of coarse gold from the circulating load within the milling circuit, and treatment of gravity concentrate by intensive cyanidation and electrowinning
- Hybrid leach/CIL cyanidation, comprising one leach stage followed by six stages of leaching with carbon present for gold adsorption
- Split AARL elution treating loaded carbon
- Electrowinning

- Carbon regeneration
- Smelting of electrowinning sludge, producing doré for sale
- SO_2/air cyanide destruction
- Tailings pumping to the TSF.

Section 17.4 describes the Yaouré gold recovery process and the process flowsheet in greater detail by plant area.

A summary of major equipment installed within the Yaouré processing plant is provided in Table 17-2. The unit operations and equipment selected are typical of the industry and are suitable for the required duty and projected mine life. The maintenance requirements and costs of the equipment installed are well understood.

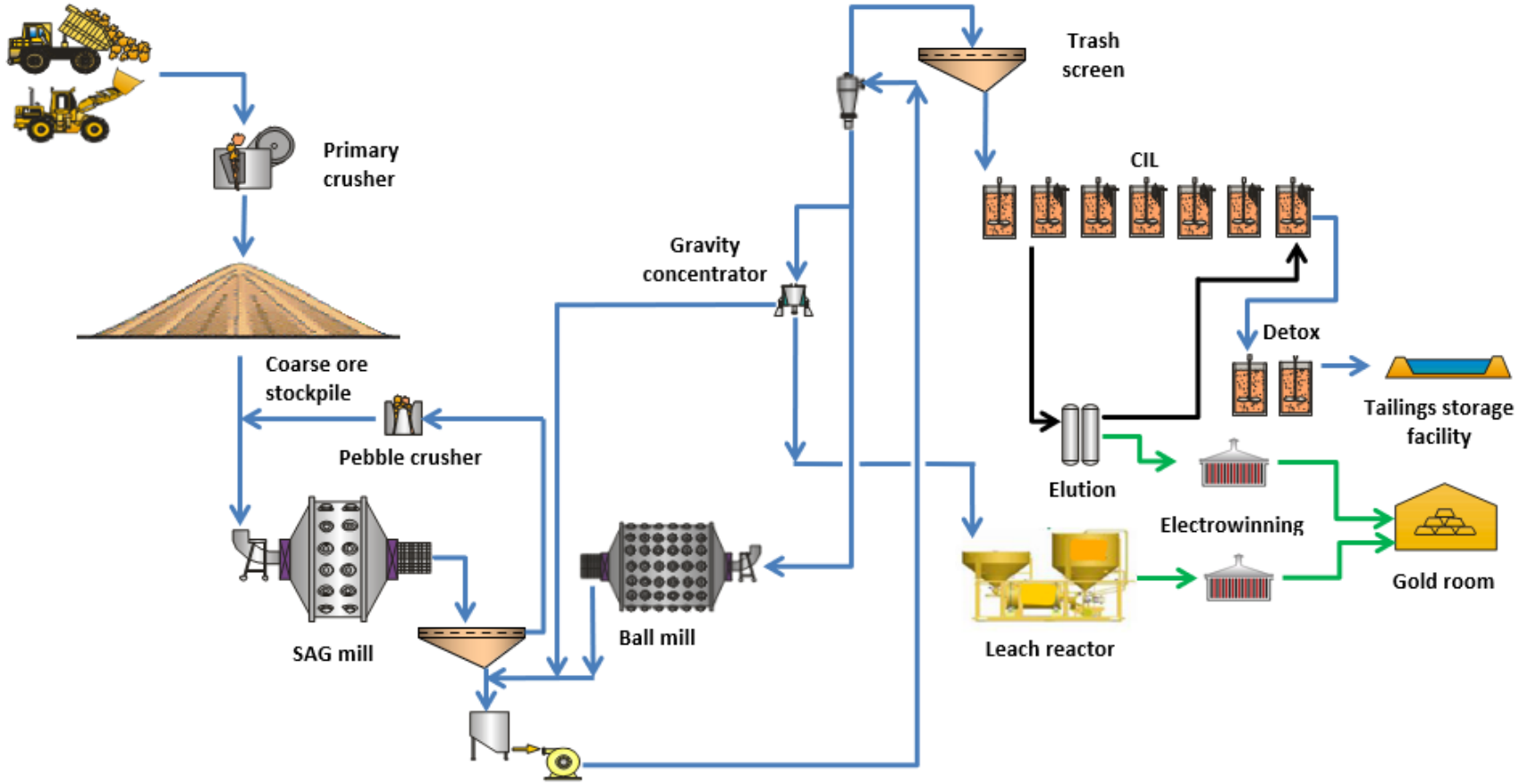


Figure 17-1: Simplified processing plant flowsheet

Table 17-2: Summary of major process equipment

DESCRIPTION	MANUFACTURER	MODEL/SIZE	QUANTITY INSTALLED
Primary crusher	Metso	Nordberg C160 jaw crusher, 250 kW motor	1
SAG mill	Outotec	8.5 m diameter inside shell × 4.35 m EGL, 6 MW motor	1
Pebble dewatering screen	Vibramech	Horizontal vibrating, 3.05 m wide × 6.1 m long, 15 mm slotted aperture (crossflow), 37 kW	1
Pebble crusher	Metso	Nordberg HP3 cone crusher, 250 kW motor	1
Ball mill	Outotec	6.1 m diameter inside shell × 9.05 m EGL, 6 MW motor	1
Hydrocyclone cluster	Weir	16-way cluster, fitted with 15 Cavex® 400CVD10 hydrocyclones	1
Gravity scalping screen	Vibramech	Horizontal vibrating, 1.83 m wide × 4.9 m long, 2.4 mm × 10-24 mm aperture (crossflow), 15 kW	1
Gravity concentrator	FLSmidth	Knelson concentrator KC-QS48	1
Intensive Leach Reactor	Gekko	ILR1000BA	1
Trash screen	Vibramech	Horizontal vibrating, 3.05 m wide × 7.32 m long, 0.7 mm × 18 mm aperture (parallel flow), 37 kW	1
Leach tank	N/A	3,250 m^3 live capacity, 15.76 m diameter × 17.4 m high	1
CIL tanks	N/A	3,250 m^3 live capacity, 15.76 m diameter × 17.4 m high	6
Leach/CIL tank agitators	Mixtec	Mixer series 4000, 132 kW	7
CIL interstage screens	Alloytech	2.4 m diameter, mechanically swept, 1.00 mm aperture wedgewire, 11 kW	6
Loaded carbon recovery screen	Vibramech	Horizontal vibrating, 1.52 m wide × 4.2 m long, 0.7 mm × 13 mm aperture (parallel flow), 7.4 kW	1
Acid wash column	Alloytech	Rubber lined mild steel, 10 t capacity, 24.2 m^3 total volume	1
Elution column	Alloytech	Stainless steel, 10 t capacity, 24.2 m^3 total volume	1
Carbon dewatering screen	Vibramech	Horizontal vibrating, 1.22 m wide × 2.44 m long, 0.83 mm × 18.5 mm aperture (parallel flow), 4.4 kW	1
Carbon regeneration kiln	Custom Furnaces	CRK 500 D horizontal kiln, 500 kg/h carbon treatment rate, direct diesel fired	1
Carbon sizing screen	Vibramech	Horizontal vibrating, 1.22 m wide × 2.44 m long, 1.0 mm × 18 mm aperture, 4.4 kW	1
Carbon safety screen	Vibramech	Horizontal vibrating, 3.05 m wide × 7.32 m long, 1.0 mm × 18 mm aperture (parallel flow), 37 kW	1
Electrowinning cell (ILR)	Alloytech/ Phasecon	Stainless steel, 11 × cathodes (1,000 mm × 1,000 mm); 2,500 A, 10 V rectifier	1
Electrowinning cell (elution)	Alloytech/ Phasecon	Stainless steel, 22 × cathodes (1,000 mm × 1,000 mm); 4,500 A, 10 V rectifier	2
Smelting furnace	Custom Furnaces	37 L capacity, direct diesel fired, electromechanical tilt, cascade moulds	1
Cyanide destruction tanks	N/A	700 m^3 live capacity, 9.6 m diameter × 10.5 m high	2
Cyanide destruction tank agitators	Mixtec	Mixer series 4000, 185 kW	2

17.4 Process and Plant Description

17.4.1 ROM Pad

The run-of-mine (ROM) pad is used to provide a buffer between the mine and the plant. ROM stockpiles allow blending of ore types and grounds to ensure a consistent feed type and feed rate to the plant. ROM ore can be loaded into the crushing circuit feed bin (ROM bin) either by direct tipping from the mining haul trucks or by reclaiming from ROM stockpiles by front end loader (FEL).

17.4.2 Crushing Circuit and Coarse Ore Stockpile

ROM ore is drawn from the ROM bin at a controlled rate by an apron feeder and discharged onto a vibrating grizzly feeder. The grizzly oversize reports to the jaw crusher for primary crushing. The jaw crusher product, together with the grizzly undersize, reports to the primary crusher discharge conveyor. Primary crushed ore from the primary crusher discharge conveyor reports directly to the coarse ore stockpile.

When CMA underground ore is processed, additional operational measures are required to mitigate the risk of damage to conveyor belts and blockage of transfer chutes associated with the higher volume of tramp metal that is anticipated to report to the process plant. The additional tramp metal that may accompany underground ore comes from ground support and mining activities in the underground mine, and includes items such as rock bolts, rock bolt plates, metal strapping, mesh, and drill rods.

A static magnet and metal detector are currently fitted to the primary crusher discharge conveyor, and it is recommended as a minimum that both are fully operational and optimised when processing CMA underground ore. Perseus is currently studying upgrading tramp removal systems, including installation of a cross-belt magnet at the primary crusher discharge conveyor and ROM pad-based tramp metal scalping and cleaning, in preparation for the future processing of CMA underground ore.

17.4.3 Grinding Circuit

Ore is withdrawn from the coarse ore stockpile by apron feeders and then fed via the SAG mill feed conveyor to the SAG mill. Quicklime and SAG mill grinding media are added to the SAG mill feed conveyor as required.

The grinding circuit consists of a SAG mill in closed circuit with a pebble crusher and a ball mill in closed circuit with hydrocyclones.

Ore feeding the SAG mill is slurrified with process water and subjected to primary grinding in the presence of SAG mill grinding media. Slurry discharging from the SAG mill is fed to a pebble dewatering screen. The oversize, consisting of pebbles and worn steel grinding media, discharges onto the pebble transfer conveyor. Worn grinding media are removed by a magnet and the scalped pebble stream is crushed in the pebble crusher, before reporting back to the SAG mill feed conveyor. The pebble dewatering screen undersize gravitates to the mill discharge hopper and is pumped to the hydrocyclone cluster for size classification.

The cyclone underflow (coarse material) reports to the ball mill feed chute for further grinding in the presence of ball mill grinding media. The cyclone overflow (product sized material) gravitates to the trash screen prior to leaching.

Modelling of the hydrocyclone cluster when campaign treating CMA underground ore at a finer target P_{80} of 53 µm (summarised in Section 13.10.1.2) indicates that operating the existing cluster

to achieve target cut size and target process stream pulp densities is achievable. In the case that controlling a water balance around the grinding circuit becomes challenging during plant trials or campaign processing of CMA underground ore, it is anticipated that test work results from Section 13.9.7 can be used in trade-off studies considering the selection and installation of a pre-leach thickener to mitigate these effects.

17.4.4 Gravity Gold Recovery Circuit

Feed for the gravity gold recovery circuit is taken from a split of the cyclone underflow slurry stream. The gravity gold recovery circuit consists of a screen, a centrifugal gravity concentrator and an intensive cyanidation reactor.

Gravity gold recovery circuit feed slurry gravitates to the gravity scalping screen to remove coarse (+2 mm) material and fragments of broken mill balls. Screen oversize is returned to the ball mill feed chute. Screen undersize gravitates to a 48 inch Knelson centrifugal gravity concentrator. The Knelson concentrator is operated as a semi-batch process with periodic discharge of coarse, high SG material (gravity concentrate) to the concentrate storage hopper ahead of the intensive leach reactor (ILR). The tails slurry from the centrifugal concentrator gravitates to the mill discharge hopper.

The ILR processes the concentrate once per day in a rotating drum leach vessel. Sodium cyanide and caustic soda are introduced into the slurry and the drum is rotated for up to 20 h to leach out gold. At the end of this time, the pregnant solution is separated from the solids and pumped to a dedicated ILR pregnant solution tank. ILR tails are pumped back to the mill discharge hopper for additional grinding to recover any remaining entrained gold.

17.4.5 Leach and Adsorption Circuit

The leach and adsorption circuit consists of one leach tank and six CIL adsorption tanks, all with identical live volumes, providing residence time mostly falling between 25 h and 30 h for modelled processing scenarios. The tanks are interconnected with launders and slurry flows by gravity through the tank train.

Cyclone overflow gravitates to the trash screen located in the CIL area for the removal of trash material and coarse particles. The underflow from the trash screen gravitates to the leach tank. Quicklime is added to the SAG mill feed conveyor to ensure that the slurry pH is suitable for cyanidation. Sodium cyanide solution is metered into the leach and CIL tanks. Air from dedicated blowers is sparged down the shafts of the leach and CIL tank agitators to provide sufficient oxygen for the leach reaction.

Barren activated carbon is added to the last CIL tank and advanced counter current to the slurry flow. Leached gold adsorbs onto the activated carbon across the train of CIL tanks. Loaded carbon is recovered from slurry in the first CIL tank via the loaded carbon recovery screen and reports to the acid wash column in the elution area.

Slurry from the last CIL tank (CIL tails) gravitates via the carbon safety screen to the cyanide destruction circuit.

17.4.6 Acid Wash, Elution and Carbon Regeneration

The following operations are carried out in the elution area:

- Acid washing of loaded carbon
- Desorption of gold from loaded carbon using split AARL elution

- Regeneration of barren carbon.

Loaded carbon is recovered from slurry in the first CIL tank via the loaded carbon recovery screen and reports to the acid wash column. The loaded carbon is washed with a dilute hydrochloric acid solution to remove inorganic contaminants prior to being rinsed with water.

The loaded carbon is then transferred in water to the elution column by eduction. The loaded carbon is eluted with a hot dilute cyanide/caustic solution followed by a hot water wash, which recovers the gold from the carbon into pregnant solution that reports to one of the pregnant solution tanks.

The barren carbon is then transferred in water to the carbon dewatering screen by eduction, where it is dewatered before reporting to the horizontal rotating regeneration kiln. The barren carbon is heated to 750°C in an oxygen deficient and steam rich atmosphere to remove organic contaminants prior to being cooled in the carbon quench hopper.

The regenerated carbon is then transferred back to the carbon sizing screen, where it is dewatered before reporting to the last CIL tank.

17.4.7 Gold Recovery

The following operations are carried out in the gold room area:

- Electrowinning of gold from ILR pregnant solution
- Electrowinning of gold from elution pregnant solution
- Smelting of electrowinning products.

Pregnant solution, recovered from the gravity circuit, is pumped from the ILR pregnant solution tank to the dedicated ILR electrowinning cell. Gold is recovered onto stainless steel cathodes and solution is circulated back to the ILR pregnant solution tank. Spent electrolyte is recycled to the head of the leach/CIL circuit.

Pregnant solution, recovered from the elution circuit, is pumped from one of the elution pregnant solution tanks to dedicated elution electrowinning cells. Gold is recovered onto stainless steel cathodes and solution is circulated back to the elution pregnant solution tank. Spent electrolyte is recycled to the head of the leach/CIL circuit.

Cathodes from the ILR electrowinning cell are treated separately from cathodes from the elution electrowinning cells to assist with metallurgical accounting. Gold is removed from the cathodes by high pressure spray wash water, with the gold sludge being filtered and dried prior to smelting with fluxes in a barring furnace to produce doré bars.

17.4.8 Cyanide Destruction Circuit and Tailings Disposal

Tailings slurry from the CIL circuit passes over the carbon safety screen to prevent coarse carbon from being lost to the TSF. The underflow gravitates to the cyanide detoxification circuit, which consists of two cyanide destruction tanks. Sodium metabisulfite (SMBS), copper sulfate and air are added to the tanks, as required, to reduce the weak acid dissociable (WAD) cyanide concentration in solution below target values.

Tailings slurry from the cyanide destruction circuit is then pumped to the TSF and deposited using peripheral discharge. Cyclic spigot deposition at various locations is used to allow consolidation and drying of deposited material into beaches and to direct supernatant water to a pond around the decant point. Process water is recovered from a decant tower and returned to the process water dam.

17.4.9 Reagents

All reagents used at Yaouré Gold Mine are widely available on the global market and into West Africa. Perseus has established supply contracts for key reagents and consumables, ensuring that supply is maintained over the projected LOM. All reagents are transported to site via road transport. Sufficient stocks of reagents are stored on site to ensure that supply interruptions do not restrict production. The following reagents are used in the process:

- Quicklime: quicklime powder is delivered to site in bulk tankers and pneumatically transferred into the lime silo. Quicklime is metered onto the SAG mill feed conveyor to control pH of leach slurry prior to cyanide addition. Bulk bags of quicklime are stored on site as an emergency supply.
- Cyanide: Sodium cyanide is delivered to site as dry briquettes in bulk bags. Cyanide is dissolved by mixing with water and transferred to a storage tank. Cyanide solution is metered to the ILR and the leach/CIL circuit to act as a gold lixiviant and to the elution circuit for the desorption of gold from loaded carbon.
- Caustic soda: Caustic soda (sodium hydroxide) is delivered to site as dry pearl pellets in bulk bags. Caustic soda is dissolved by mixing with filtered raw water and metered to the ILR for pH control and into the elution circuit for the desorption of gold from loaded carbon.
- Hydrochloric acid: Concentrated hydrochloric acid is delivered to site in drums. The acid is pumped to a mixing/storage tank and diluted with filtered raw water. The diluted acid is metered to the acid wash column for acid washing of the loaded carbon.
- Activated carbon: Activated carbon is delivered to site in bulk bags and is added to the carbon quench tank to top up the inventory of activated carbon within the CIL circuit.
- Sodium metabisulfite: Sodium metabisulfite powder is delivered to site in bulk bags. The sodium metabisulfite is dissolved by mixing with filtered raw water and transferred to a storage tank. Sodium metabisulfite solution is metered to the cyanide destruction circuit and is the chemical source of SO_2 required, in combination with air, to react with WAD cyanide species to reduce the TSF supernatant WAD cyanide solution concentrations below target levels.
- Copper sulfate: Copper sulfate pentahydrate is delivered to site as a powder in bulk bags. Copper sulphate is dissolved by mixing with filtered water. Copper sulfate solution is metered to the cyanide destruction circuit as a catalyst for the cyanide destruction reactions.
- Grinding Media: SAG and ball mill grinding media are delivered to site in drums. Media for the SAG mill is loaded on to the SAG mill feed conveyor via the emergency ore feed bin. Ball mill grinding media is loaded into ball loading kibbles and lifted to the ball mill feed chute.
- Fluxes: Sodium borate (borax), silica flour, sodium nitrate (nitre) and sodium carbonate (soda ash) are used as fluxes for gold smelting. The fluxes are delivered to site in 25 kg bags and mixed in small quantities with dried gold sludge prior to smelting.

Miscellaneous reagents such as antiscalants, sulfamic acid and hydrogen peroxide are also used in the processing plant in small quantities as required.

17.4.10 Process Plant Services

The following services are installed and are available at the Yaouré processing plant:

- Raw water: Raw water is extracted from the Bandama River and/or recovered from mine dewatering and is pumped to the plant raw water pond on an as required basis. Raw water is pumped to the processing plant for use.
- Process water: Process water is sourced from the TSF decant return water, with raw water make-up as required. TSF decant return water is pumped to the process water pond. The process water pond level is made up with raw water overflowing from the raw water pond. Process water is pumped to the milling circuit and throughout the processing plant for use.
- Filtered water: Raw water from the raw water pond is treated in the filtered water treatment plant and reports to the filtered water storage tank. Filtered water is pumped throughout the processing plant for use.
- Gland seal water: Filtered raw water from the filtered water storage tank is used as gland seal water and is pumped at the required pressures to gland service points.
- Fire water: Fire water for the processing plant is sourced from the raw water pond. The fire water suction from the raw water pond is at a lower level than the raw water supply suction to ensure a fire water reserve always remains in the pond. A backup diesel driven fire water pump is provided in addition to the electric fire water pump to ensure that fire water service is always available. A separate fire water system is installed at the accommodation camp.
- Potable water: A dedicated supply of bore water is treated in the modular potable water treatment plant (filtration, ultraviolet sterilisation and chlorination) and stored in the plant potable water storage tank. Potable water is distributed to the plant for use in site ablutions, safety showers and other potable water outlets, as well as to the site administration buildings and the mine services area for ablutions. Additional potable water treatment capacity is installed at the accommodation camp.
- Cooling water: Cooling water is pumped to the milling lubrication systems' heat exchangers from the cooling tower. The cooling tower operates in a closed loop and filtered water is used for volume make-up. Biocide and antiscalant are dosed to the cooling tower system as required.
- Sewage treatment: Effluent from all ablutions drain to sewerage headers. The sewerage system drains to a dedicated sewer pump station from where it discharges via a pressure main to a package sewage treatment plant system. Similar sewage treatment systems are installed at the mine services area and the accommodation camp.
- Low pressure air: Low pressure air is supplied by dedicated air blowers and is reticulated to the leach tank, CIL tanks and cyanide destruction tanks. For the leach tank and CIL tanks, low pressure air is sparged down the shafts of the leach and CIL tank agitators to provide sufficient oxygen for the leach reaction. For the cyanide destruction tanks, low pressure air is introduced into the tanks via sparges.
- Plant and instrument air: Plant and instrument air is supplied from air compressors and is filtered and dried before distribution.

17.5 Plant Operating Performance

The Yaouré Gold Mine processing plant has been in operation since late November 2020, treating predominantly heap leach dump residue material until April/May 2021 (~800 kt) and then switching predominantly to ex-pit ore from the CMA pit thereafter. Reconciled quarterly gold production and summary plant performance data until the end of June 2023 are provided in Table 17-3.

Table 17-3: Reconciled Yaouré Gold Mine quarterly plant production data – Project to end of June 2023

PARAMETER	UNIT	NOV-DEC 2020	JAN-MAR 2021	APR-JUN 2021	JUL-SEP 2021	OCT-DEC 2021	JAN-MAR 2022	APR-JUN 2022	JUL-SEP 2022	OCT-DEC 2022	JAN-MAR 2023	APR-JUN 2023	TOTAL
Tonnes milled	kt	122	625	837	914	946	1,025	1,036	980	1,002	962	955	9,406
Head grade	g/t Au	1.01	1.27	1.51	2.37	2.64	2.50	2.60	2.43	2.18	2.26	2.55	2.26
Gold recovery	%	67.7	86.7	92.1	92.7	93.6	93.5	93.7	93.1	93.2	92.4	92.4	92.7
Recovered gold	oz	2,687	22,095	37,343	64,558	75,189	76,921	81,149	71,469	65,351	64,753	72,367	633,884

17.5.1.1 Comminution Circuit Throughput

Figure 17-2 summarises comminution circuit throughput in the Yaouré process plant by month from July 2022 to August 2023 (trend line, plotted against the secondary vertical axis), as well as the plant ore feed blend by percent material type by month (oxide, including heap leach dump residue; transition; and fresh, plotted as stacked bars against the primary vertical axis).

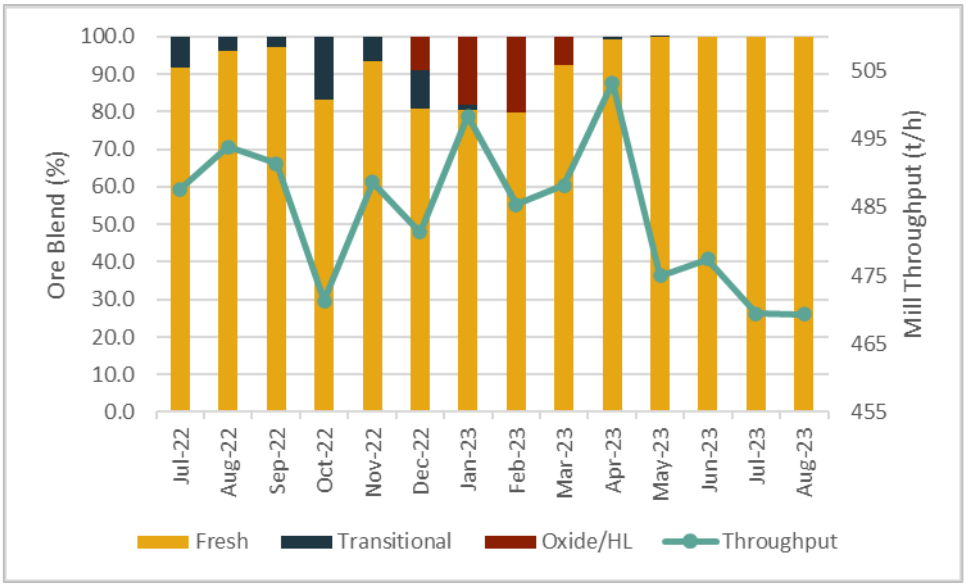


Figure 17-2: Yaouré process plant ore throughput rate with ore blend data for July 2022 to August 2023

In this data set, nine out of 14 months have a plant ore feed blend >90% CMA fresh ore. For the months that have a plant ore feed blend >90% CMA fresh ore, the comminution circuit throughput ranges between 469 t/h and 503 t/h, with an average of 484 t/h. During this period, the target grind size was P_{80} of 75 µm.

From July 1, 2022 to June 30, 2023, 3.9 Mt of an ore blend consisting of 91% fresh, 4% transition and 5% oxide was processed through the Yaouré plant. This exceeds the nameplate plant throughput of 3.3 Mt/a.

17.5.1.2 Comminution Circuit Classification

As a check to calibrate hydrocyclone modelling that was performed and summarised in Section 13.10.1.2, operating data were collected for the Yaouré comminution circuit hydrocyclone cluster. From January to August 2023, 11 to 13 cyclones out of 15 installed cyclones were typically in operation when the comminution circuit throughput was in close proximity to the average monthly throughput rates shown in Figure 17-2. During this period, the target grind size was P_{80} of 75 µm and the target cyclone overflow pulp density was 40.0% w/w solids.

The plant observations align with vendor modelling completed during the design phase of the Yaouré processing plant.

17.5.1.3 Gravity Gold Recovery

From January 2023 to June 2023, where ore feed is dominated by fresh ore (≥80% CMA fresh ore), measured plant gravity gold recovery ranged from 24.5% to 28.9%. The range observed for process plant gravity gold recovery during this period fell within the lowest decile of gravity gold recoveries observed in 36 laboratory scale gravity/cyanidation variability tests results for CMA fresh ore (presented in Section 13.2.4.14). Plant scale single stage centrifugal concentrator gravity gold recovery being lower than laboratory scale single stage centrifugal concentrator gravity gold recovery is a widely observed phenomenon. Laboratory scale tests recover a higher percentage of feed mass to concentrate compared to plant scale concentrators, hence gravity recoverable gold is typically overstated at laboratory scale. Furthermore, in the case of the Yaouré plant installation, liberated gold grains are captured from a continuous closed-circuit system that is not replicable under laboratory scale batch testing conditions.

17.5.1.4 Overall Plant Gold Recovery

Figure 17-3 summarises reconciled gold recovery (gravity + cyanidation) in the Yaouré process plant by month from January 2021 to June 2023 (trend line, plotted against the secondary vertical axis), as well as the plant ore feed blend by percent material type by month (oxide, including heap leach dump residue; transition; and fresh, plotted as stacked bars against the primary vertical axis).

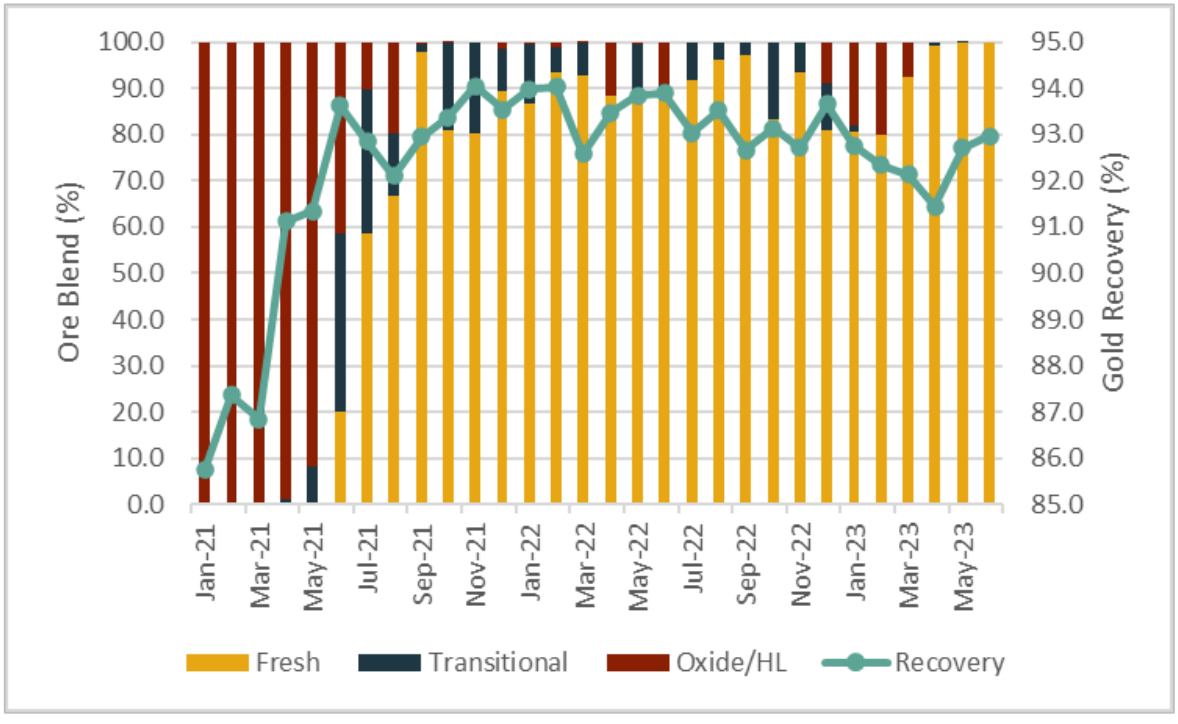


Figure 17-3: Yaouré process plant gold recovery with ore blend data for January 2021 to June 2023

From January 2021 to June 2021, where ore feed is dominated by fully and partially oxidised material (≥80% heap leach dump residue, CMA pit oxide ore and CMA transition ore), reconciled plant recovery ranged between 85.7% and 93.6%, with a weighted average of 90.0%. During this period, plant leach/adsorption residence time averaged 31.0 h, assuming an average leach/CIL pulp density of 40% w/w.

In comparing the plant performance to the performance predicted from test work, 21 gravity/cyanidation variability tests results were considered for CMA/Yaouré oxide, CMA/Yaouré transition and heap leach dump residue material (Section 13.4.4.4 and Section 13.5.4). Gold extraction data were interpolated for 31.0 h leach time and a gold solution loss of 0.01 g/m^3 applied. The mean of the predicted 31.0 h plant recovery results across CMA/Yaouré oxide, CMA/Yaouré transition and heap leach dump residue samples was 90.9%, closely approximating weighted average reconciled recovery in the Yaouré processing plant for January 2021 to June 2021.

From September 2021 to June 2023, where ore feed is dominated by fresh ore (≥80% CMA fresh ore), reconciled plant recovery ranged from 91.4% to 94.0%, with a weighted average of 93.2%. During this period, plant leach/adsorption residence time averaged 24.9 h, assuming an average leach/CIL pulp density of 40% w/w.

In comparing the plant performance to the performance predicted from test work, 36 gravity/cyanidation variability tests results were considered for CMA fresh ore (Section 13.2.4.14). Gold extraction data were interpolated for 24.9 h leach time and a gold solution loss of 0.0075 g/m^3 applied. The predicted 24.9 h plant recovery results ranged between 82.4% and 96.4%, with a mean of 89.4%. The weighted average reconciled recovery observed in the Yaouré processing plant when treating predominantly CMA fresh ore falls within the predicted range.

17.6 Predicted Metallurgical Performance

Section 13.10 discusses the parameters selected by Perseus for predicting the metallurgical performance when processing different Yaouré Gold Mine ore sources over the LOM. Parameters have been selected based on metallurgical test work, modelling and plant operating data.

17.7 Power Requirements

The plant site-wide electrical power requirement for the processing plant, mining and site infrastructure has been calculated based on equipment sizing and demand. The installed load, maximum demand and average demand for the operation, including the projected requirements for the future CMA underground mine and associated site infrastructure upgrades, are summarised in Table 17-4. There are no additional power requirements for the process plant to treat CMA underground ore.

Table 17-4: Installed and maximum electrical power demand

AREA	INSTALLED LOAD		MAXIMUM DEMAND		AVERAGE DEMAND
	(MW)	(MVA)	(MW)	(MVA)	(GWh/a)
Process plant	23.15	25.66	17.18	18.86	142.2
Site infrastructure (current)	1.93	2.33	1.50	1.81	10.3
Underground mine + upgrades to infrastructure	5.45	6.64	4.36	5.13	29.5
Total	30.53	34.63	23.04	25.80	182.0

Power supply to the Yaouré site is discussed in further detail in Section 18.5 and Section 18.6.

17.8 Water Requirements

The Yaouré processing plant uses water sourced from the Bandama River, surface run-off, ground water bores and pit dewatering. After the establishment of the CMA underground mine, dewatering

from the underground mine will also be recovered and available for ore processing. The Bandama River is the largest source of raw water during the life of the Yaouré Gold Mine operation.

Water is recycled from the TSF supernatant pond via the TSF decant and is the primary source of process water.

The processing plant water services are described in further detail in Section 17.4.10.

No additional processing water supply will be required for treating CMA underground ore.

River abstraction is required to make up the process water shortfall under average and 100-year dry climatic design conditions. As modelled by Knight Piésold Pty Ltd (Knight Piésold) (2017a), a critical supply rate of 139 L/s (3.6 Mm^3/a, or 1.1 m^3/t) from river abstraction is required to process 3.3 Mt/a of ore when mine dewatering sources are unavailable, to prevent process water shortfalls under design dry conditions (1 in 100 year recurrence interval, 12 month dry rainfall sequence). When mine dewatering is included in the water balance, the critical supply rate from river abstraction is reduced to 91 L/s (2.4 Mm^3/a, or 0.7 m^3/t) to process 3.3 Mt/a of ore under design dry conditions.

Under average climatic conditions, the raw water supply rate reduces to 123 L/s (3.2 Mm^3/a, or 1.0 m^3/t) to process 3.3 Mt/a of ore when mine dewatering sources are unavailable, and 76 L/s (2.0 Mm^3/a, or 0.6 m^3/t) to process 3.3 Mt/a of ore when mine dewatering sources are included in the water balance.

In consideration of variable water demands by ore type, downtime required for pump and pipeline maintenance, and higher than nameplate processing plant ore throughput, installed river abstraction pumping capacity is 250 L/s.

As of September 2023, the Yaouré pit is being used for excess raw water storage on site. As open pit mining activities transition to the Yaouré pit, it is anticipated that the ROMSE pit will be used for excess raw water storage.

Within the process plant, the process water pond has an installed capacity of 6,300 m^3 and the raw water pond has an installed capacity of 6,300 m^3.

Potable water treatment plants are supplied by dedicated ground water bores.

18 Project Infrastructure

Figure 18-1 shows the layout of Yaouré Gold Mine, highlighting key infrastructure including the processing plant and mining offices, ROM pad, explosives magazine, waste dump, TSF, accommodation camp, internal roads and perimeter fences.

Existing infrastructure, both external infrastructure that services the Yaouré Gold Mine and infrastructure internal to the mine site, is discussed in further detail in Section 18.

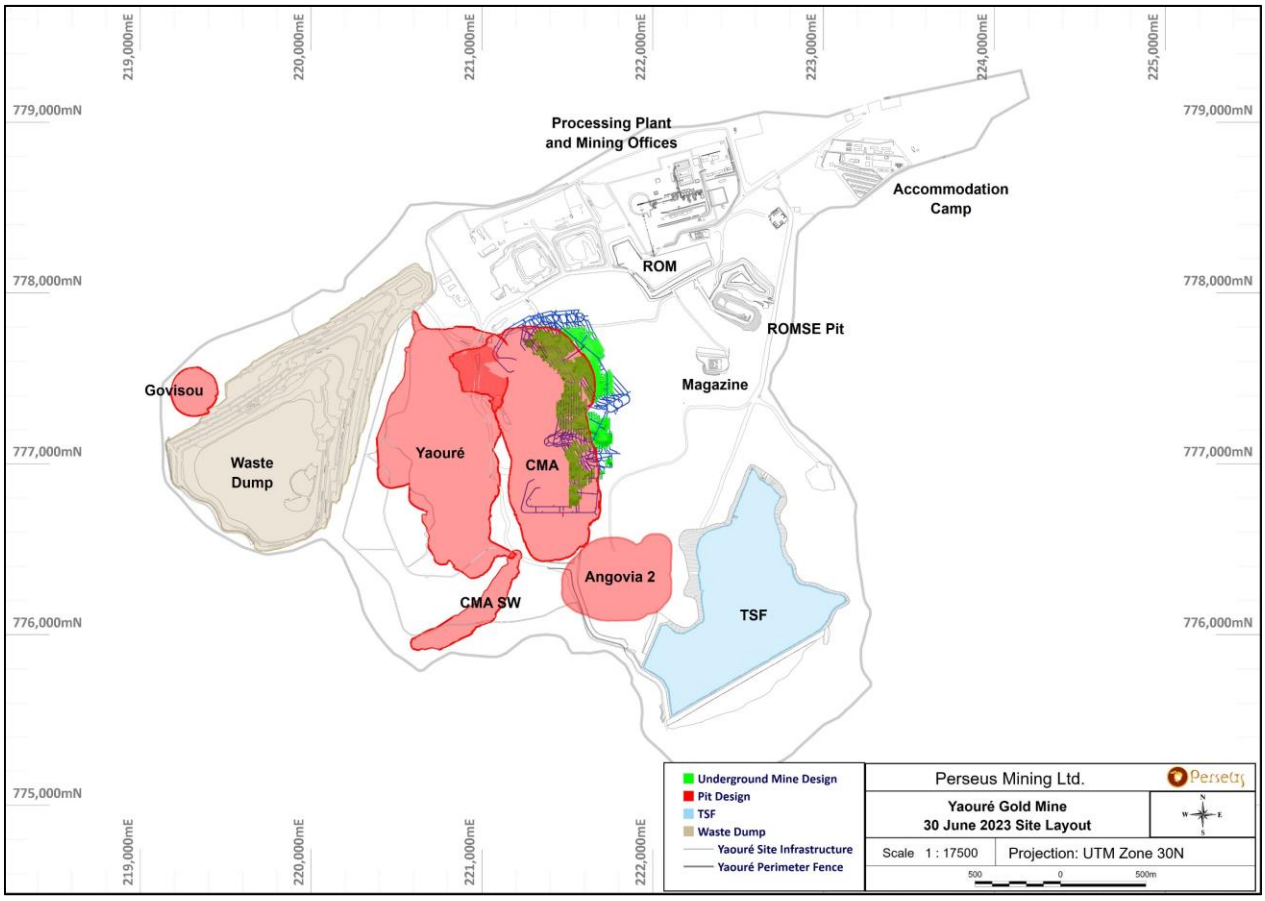


Figure 18-1: Yaouré Gold Mine site layout with key infrastructure

18.1 Roads

The main access route to site is via the 230 km multi-lane, modern motorway connecting Abidjan to Yamoussoukro. From Yamoussoukro, the site is accessed using a 25 km section of the A6 highway to Bouaflé, with the turn-off to Kossou at Toumbokro village, 28 km north-west of Yamoussoukro.

The site has a network of gravel roads that provide access to the accommodation camp, administration buildings, processing plant, TSF, pits, waste dumps, water bores, various water sources and miscellaneous infrastructure items.

18.2 Buildings

The site has a number of buildings, including the following facilities:

- Administration
- Mining services

- Warehouse
- Clinic and emergency services
- Light vehicle workshop
- Exploration office and core shed
- Staff mess
- Security gatehouse, with boom gate control
- Processing and maintenance offices
- Workshop
- Laboratory
- Various electrical switch room buildings.

18.3 Mine Services

The open pit mining contractor has been provided with a mine services area to enable mine fleet servicing and maintenance. Additional infrastructure installed on site that supports current mining operations includes waste rock dumps, a diesel fuel storage facility and an explosives magazine.

A similar area will be required for the underground mining contractor to service and maintain underground mining fleet and ancillary vehicles on the surface.

18.3.1 Additional Infrastructure for CMA Underground Project

To enable the future execution of the CMA underground project, the following additional infrastructure is required:

- Power line extension from existing 11 kV site network to CMA pit.
- Electrical infrastructure at CMA pit to support underground operations, including a new four tier 11 kV ring main unit (RMU), a new 2 MVA 11/1 kV transformer and a new four tier 1 kV switchboard.
- Reticulation of power from surface infrastructure to underground workings.
- Ventilation fans, as described in Section 16.2.7.
- Potable water supply to portal locations from existing site water systems, and reticulation of potable water underground.
- Desilting ponds for water recovered from underground mine dewatering activities. This will allow for heavy sediments to settle out and cleaner water returned to surface header tanks, ready for underground use or use elsewhere on site as required.
- Air supply to portal locations from standalone mine compressors, and reticulation of air underground.
- Supply of phone and IT network connection to surface support facilities and portal locations, with reticulation to the underground mine.
- Radio repeater and underground radio system (including hardware and licensing).
- Offices and change house for CMA underground owner operator team and underground mining contractors, including reticulation of power and potable water services.

- Mine services area, located on the surface, for use by the underground mining contractor, including workshops and warehouse. Reticulation of power, communications and potable water services is required, as well as standalone air compressors for workshops.
- Expansion of the accommodation camp including additional rooms, upgrade to sewage systems, potable water and power infrastructure.
- Additional mines rescue equipment to enable underground rescue capacity, including modifications to the ambulance and fire tender to meet specifications for underground use.

Project infrastructure for the CMA underground includes particular consideration to inclusion of infrastructure to support current and emerging technologies. The installation of an optic fibre backbone along with a leaky feeder, has been planned to facilitate the integration of the majority of off-the-shelf underground support systems for tele-remoting, and monitoring and control of pumps, fans and other fixed plant equipment. With a fibre optic system installed underground and connected to surface support facilities, flexibility is provided to add future capacity for a range of systems such as equipment, personnel and gas monitoring, Wi-Fi hubs, installation of underground offices, electronic tagboards and electronic reporting of production data.

18.4 Workforce Accommodation

Staff, contractors and visitors that require accommodation stay at the 517-bed on-site accommodation camp. 257 of these beds are in single occupancy rooms.

It is estimated that an additional 90 beds will be required for personnel associated with the CMA underground mine. Further upgrades to sewage systems, potable water and power infrastructure will be required to enable the additional growth to the accommodation camp.

18.5 Power Supply and Reticulation

Power supply to Yaouré Gold Mine is sourced from the national grid, and power outages from the grid are infrequent. The company La Société des Energies de Côte d'Ivoire (CI-Energies) own the National Interconnected Transmission System in Côte d'Ivoire and Compagnie Ivoirienne d'Electricité (CIE) manages the electricity generation and transmission network for the Government.

A fully operational 174 MW hydroelectric power station, powered by the Kossou dam, is situated 6 km from site. The hydroelectric power station is not in full time operation, only being used when the grid demand requires it. Power supply to site is sourced by a 6 km 225 kV overhead power line from the Kossou substation attached to the Kossou hydroelectric power station (Figure 18-2). An 11 kV feeder from the 225/11 kV substation supplies the plant main 11 kV switchboard, which then reticulates power to all locations on site, via a network of transmission lines and electrical switch rooms. Additions to the site electrical infrastructure network are required to enable the future execution of the CMA underground project. These are summarised in Section 18.3.1.



Figure 18-2: CIE hydroelectric power station infrastructure, Kossou

18.6 Emergency Power

An 18 MW diesel fired power station provides emergency and backup power across site in the event of an interruption to the national grid supply. The back up power infrastructure consists of 13 × 1.4 MW 400 V generators, 8 × 4 MW 0.4/11 kV transformers and dual 11 kV feeders from the diesel fired power station to the plant main 11 kV switchboard. This back up power generation infrastructure restores 11 kV distribution to the site in the event of an outage from the national grid connection.

18.7 Communications

The Yaouré Gold Mine leases are serviced by reliable mobile phone networks supplied by multiple carriers. A secure digital radio network has been established for Yaouré Gold Mine, with dedicated operational, security and emergency channels.

A local ground station is installed that provides global satellite voice and data connection.

Perseus prioritises the robustness of both internal and external communications capabilities and utilises enterprise-grade computing and networking infrastructure, including redundant fibre and radio connectivity to provide a reliable and scalable foundation to support operations.

While most back-office systems operate efficiently in the cloud, there is focus on securing multiple layers of physical and cyber defences to protect assets, systems, and data comprehensively. This strategic approach reflects Perseus's commitment to ensuring the safety, integrity and security of both internal operations and external interactions.

18.8 Water Supply

Site water infrastructure and requirements are discussed in Section 17.4.10 and Section 17.8. Additions to the site water infrastructure are required to enable the future execution of the CMA underground project. These are summarised in Section 18.3.1.

18.9 Tailings Storage Facility

The TSF, located approximately 2.5 km south of the process plant site, was commissioned in December 2020. The TSF consists of a single cell, valley storage formed by two multi-zoned earth-fill embankments (Main Embankment and West Saddle Embankment). A downstream structural fill buttress has been added to improve embankment stability. The TSF basin has been cleared, grubbed, topsoil stripped, and a 200 mm low permeability soil liner added over the entire TSF basin area. A 1.5 mm HDPE liner has been placed over the coil liner to further minimise seepage.

The facility is designed to be raised in stages over the mine life using downstream embankment construction techniques. Current designs allow for 32 Mt of tailings storage (Figure 18-3), with a facility footprint of approximately 162 ha. The embankments can be raised by a further 17 m, for a total of 64 Mt storage capacity without the main embankment encroaching on the existing power line and the downstream settlement of Kouakougnanou. The 64 Mt storage case exceeds current LOM storage requirements as of September 2023. An operation spillway is included at all stages of embankment raising.

Tailings slurry is pumped to the plant via a tailings delivery pipeline (500 mm steel pipeline, transitioning to a 560 mm HDPE pipeline) and a 560 mm HDPE tailings distribution pipeline and spigot system. Tailings slurry is discharged into the TSF by sub-aerial deposition methods, using a combination of spigots at regularly spaced intervals from the Main Embankment and the West Saddle Embankment. Supernatant water is removed from the TSF via submersible pumps located within decant a tower decant system. Supernatant solution recovered from the decant system is pumped back to the process plant via a 450 mm HDPE pipeline for re-use as process water.

The TSF design incorporates a basin partial underdrainage system to reduce pressure head acting on the liners, reduce seepage, increase tailings densities, and improve the geotechnical stability of the embankments. The underdrainage system comprises a network of finger and collector drains and an embankment upstream toe drain. The underdrainage systems drains by gravity to a collection sump located the lowest point of the basin. A ground water collection system is installed beneath the basin compacted soil liner. Solution recovered from the underdrainage and groundwater systems is released to the top of the tailings mass via a submersible pump.

At the end of the TSF operation, the overall slope profile of the TSF will be approximately 3.5H:1V. The downstream profile will be inherently stable under both normal and seismic loading conditions and allows for revegetation. Further details on the design, operational monitoring and auditing and closure plans for the TSF are provided in Section 20.4.

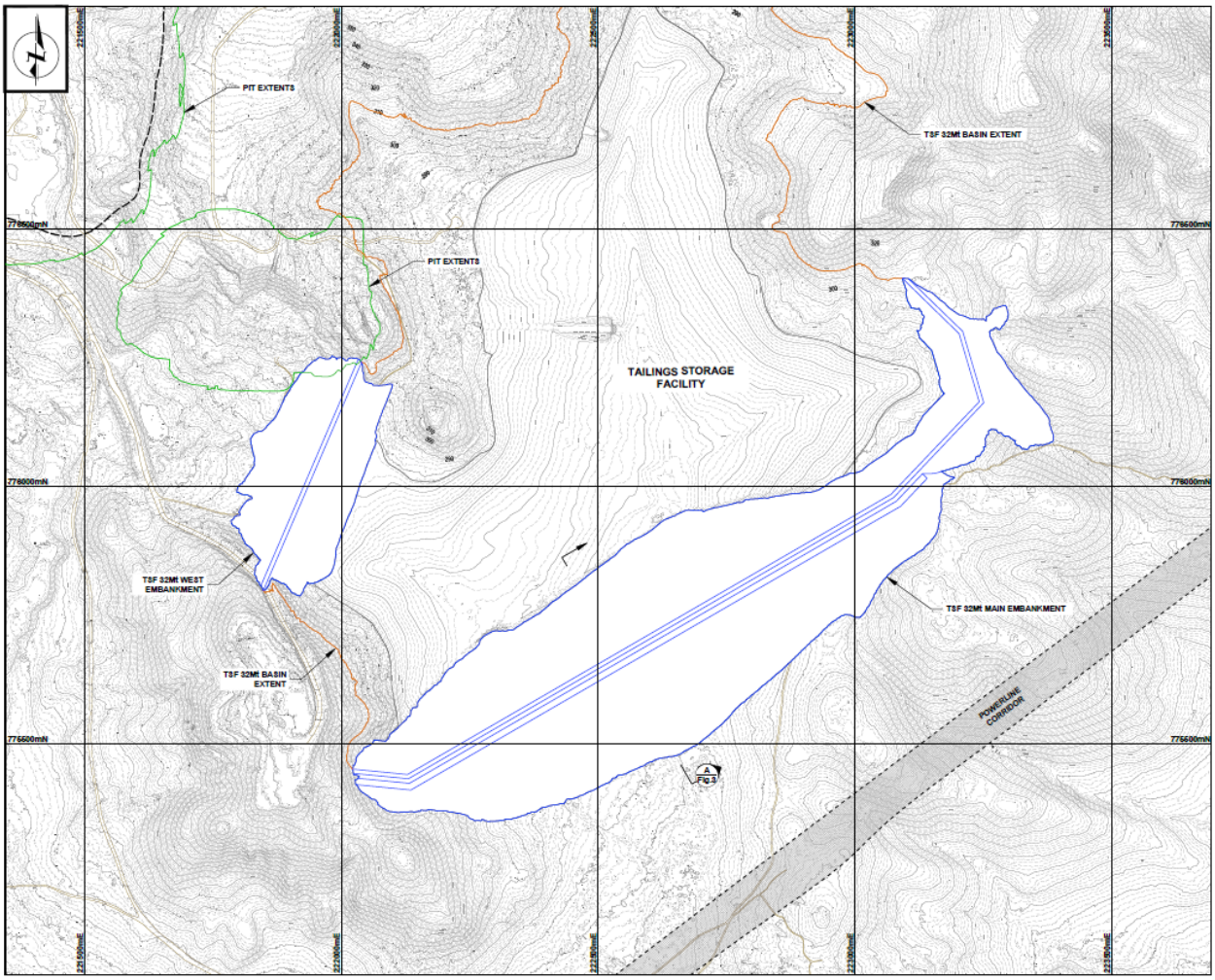


Figure 18-3: Conceptual 32 Mt tailings storage facility layout (Knight Piésold, 2023)

19 Market Studies and Contracts

19.1 Markets

Côte d'Ivoire permits export of gold bullion. Perseus has entered into a contract for refining doré produced at Yaouré. The refiner arranges transport for the doré bars to its refinery, where it refines the gold to the purity accepted in international markets (generally 99.8% to 99.95%). The refined gold is credited to the Company's gold account with its bank, to enable it to be sold on international markets or delivered into forward sales contracts. The refiner invoices Perseus for costs relating to transportation, insurance, refining and other charges.

Gold bullion is freely traded at prices that are widely known, and therefore prospects for sale of any production are virtually assured.

19.2 Gold Price

The gold price for cut-off calculations for Mineral Reserves is $1,500/oz. Financial evaluations of the mining schedule have been undertaken at $1,700/oz.

A gold price of $1,800/oz was used for shells to limit Mineral Resource estimates. Metal price assumptions for studies and financial analysis within Perseus are reviewed annually and are approved by the Technical Committee of the Perseus Board.

19.3 Bullion Transport

Gold doré from Yaouré is transported by a contracted security company from the Yaouré site.

19.4 Contracts

A large number of service and supply contracts are in place to support the current Yaouré mine operations. Several existing operational contracts are likely to also service the CMA underground operation, including:

- Explosives supply
- Electricity supply
- Fuel supply
- Camp catering and maintenance
- Hedging and forward sales agreements
- Doré refining.

The main additional contract required will be an underground mining operations contractor. The contracted services are provided on an arms-length basis and the terms of all contracts are considered to be within industry norms.

20 Environmental Studies, Permitting and Social or Community Impact

Yaouré Gold Mine has undergone extensive studies and reviews on its Environmental, Social and Community (ESC) impact during the Project development stages. The mine is now operational and as such, Perseus has defined obligations and commitments in relation to its ESC impact. Given the CMA underground mine is below the existing CMA open pit and within the current mining lease fence, the majority of the ESC areas are covered by existing work and processes.

The purpose of this section is to outline the current and proposed programs of work for the operation for the remainder of the Yaouré LOM, the majority of which are outlined in the Yaouré Environmental Management Plan (EMP).

20.1 Environmental Studies

The Environmental and Social Impact Assessment (ESIA) was done by Amec Foster Wheeler and 2D Consulting Afrique in 2015 (2015) to support Amara's application for an exploitation permit and was approved on August 29, 2016 by the Agence Nationale de l'Environnement (National Environment Agency or ANDE), in Arrêté No. 0074.

No additional work on the ESIA was required, allowing the operating permit to be issued to Perseus Yaouré SARL on April 24, 2019 for 11 years.

As required by law, the exploitation permit was transferred from Perseus Yaouré SARL to Perseus Mining Yaouré S.A. on August 8, 2019. This transfer had no effect on the content of the exploitation permit.

One environmental study has been undertaken for the CMA underground Feasibility Study. A hydrological and hydrogeological study was conducted by CSA Global (CSA Global, 2022), which updated the hydrogeological model initiated for the open pit Feasibility Study. More information on this study can be found in Section 16.2.4.

Monitoring has been conducted since Perseus started operation of the Yaouré Gold Mine. These are detailed in Sections 20.1.1 to 20.1.1.3 below.

20.1.1 Environmental Monitoring

Robust monitoring programs have been implemented at Yaouré, both on site and in the surrounding communities, especially in Angovia, Alahou-Bazi, Akakro and Kouakougnanou. After two years of measurement, it was noted that Akakro is not being impacted in terms of noise, blast vibration, or dust from the site operations due to its location relative to the Yaouré Mine. Monitoring is continuing in the villages of Angovia, Alahou-Bazi and Kouakougnanou. The monitoring programs are outlined below.

20.1.1.1 Air Quality

Comprehensive air quality and dust monitoring programs are in place. Particulate Matter PM10 and PM2.5 are measured in the communities around the mine (Angovia, Alahou-Bazi and Kouakougnanou).

If elevated levels of dust are recorded, it is typically around the drier months of the year, and results are comparable with other sub-Saharan regions during this season. This may be due to traffic using nearby unsealed roads.

Work is done to minimise dust impacting local communities. This includes:

- Dust suppression along the main roads to Angovia and Alahou Bazi villages.
- Dust suppression on the haul roads inside the fence.
- Dust suppression on the crusher and coarse ore stockpile inside the processing plant.
- Progressive rehabilitation of waste dumps to prevent dust movement into the communities.

20.1.1.2 Noise Level Monitoring

Noise level measurements are conducted on site and in three of the communities neighbouring the mine site (Angovia, Alahou-Bazi and Kouakougnanou). These measurements are undertaken daily by trained environmental staff and records captured in a database, against the limits defined by the applicable legislation. When the baseline noise measurements were done in 2015, they were in the range of 45-62 dB LAeq. Current noise level measurements are at a higher level, which is being mainly attributed to the increased population and corresponding activity growth in these communities. In the past two years, there has been two complaints regarding noise. After investigation, strong measures have been put in place at the source of noise generation and so far, no other complaints have been recorded as the noise level emitted from Perseus's mining activities does not exceed the limit defined by the legislation.

20.1.1.3 Blasting Vibration

In addition to dust and noise, the level of vibration from blasting activities is measured during each blast, with monitoring rotating through each of the villages.

All pit blasting is recorded for both ground vibration and blasting induced overpressures. These measurements are undertaken by trained environmental staff and records captured in a database.

A community blasting committee was established in May 2022 to provide oversight and engagement with the appropriate stakeholders. An independent expert consultant was engaged by Perseus to practically support the committee members on field data collection, analysis, and interpretation. The committee members received training on how to raise awareness and educate other community members about blasting activities, with a particular focus on conducting house inspections.

20.1.2 Water Management

20.1.2.1 Surface Water

A surface water management plan has been developed to minimise the inflow of surface water runoff to the pit and to protect mine infrastructure from the influences of flooding and excessive erosion from storm water runoff. Surface water management designs have also been developed to intercept and convey contact water generated from the mine area and waste dumps and appropriately treat this water via sedimentation basins prior to discharge to the downstream environment after verifying it meets discharge standards. The Mine Closure Plan accounts for post closure water management.

20.1.2.2 Groundwater

As part of the CMA underground FS, a hydrological and hydrogeological study was conducted by CSA Global (CSA Global, 2022), which updated the hydrogeological model initiated for the open pit Feasibility Study.

The CSA Global model indicated that due to mine dewatering (pits and underground), water levels in Angovia village may be impacted by 1-2.5 m by the end of the mine life (CSA Global, 2022). The current CSA Global hydrogeological model is limited by a lack of information on structures which may impact conductivity between the underground and the village. Any potential impact on village groundwater is dependent on hydraulic linkage between the village and mined strata. Given the limitations of available data, the most practical approach to predicting any potential impact is to monitor groundwater levels.

Monitoring boreholes in the vicinity of the underground mine and the village should be monitored as an early sign of changes to groundwater drawdown relating to mining activity. If any impacts are measured which indicate a likely future impact to either Perseus or other stakeholders, then mitigation measures such as extending boreholes or providing additional water sources should be implemented.

There are ten boreholes currently used to monitor groundwater levels and water quality, which is sufficient to cover the current needs of the Yaouré Gold Mine. The suitability of monitoring bores for the purpose of identifying and predicting groundwater impacts should be reviewed on an ongoing basis as mine plans change.

20.1.3 Biodiversity

In 2021, a study was commenced by university researchers from the University Jean Lorougnon Guédé in Daloa (Kpangui, 2021) on the initial state of aquatic fauna and microflora within the operating perimeter and areas of influence, namely the Bandama River and Lake Kossou.

The study identified seven types of vegetation: forest, savannah, stagnant water pond, fallow ground, teak field, cocoa field, and cashew nut field. Of the area assessed, 40% was classified as denuded surface, 25% as savannah, and 18% as fallow ground. In total, 278 plant species were recorded.

Measurements of heavy metals and cyanide levels in the Bandama River were recorded as below the Directives from the National Ivorian Centre on Pollution (CIAPOL). High levels of pH, low levels of oxygen, and high levels of sedimentation and turbidity were measured, which were attributed to artisanal mining.

The study identified 52 species of fish around the site. At the time of the survey, no fish have been recorded in the ponds constructed within the mine perimeter or in any other mine water bodies. The study also indicated that the lower numbers of fish recorded in Lake Kossou and the Bandama River were attributed to artisanal miners' practices, which include the use of chemicals and lead, as well as silting and eutrophication.

Survey of the land fauna identified 24 species of amphibians, six species of reptiles, 170 species of birds, and 19 species of mammals. There were eight species of birds identified that are endemic and two species of mammals which are protected by the International Union for the Conservation of Nature (Phataginus tricuspis and Cercopithecus lowei). Areas where these species were identified have been classified as protected areas and are carefully monitored by the environmental department. Another survey is planned for the period 2024/2025.

20.2 Traffic and Transportation

There have been significant increases in vehicular traffic on the roads leading to the mine. In addition to the traffic directly related to the mine operations increasing, there have been increases due to the influx of people to the nearby communities with the increasing prosperity and potential

opportunities. Since the construction of the mine, Perseus has been upgrading and maintaining all the roads that lead to the site for the safety of employees, contractors, visitors and community members. Perseus is significantly contributing to the government of Côte d'Ivoire to have the road from Toumbokro to Angovia sealed. The remaining roads from Angovia to the other villages are regularly upgraded with heavy mobile equipment that have been acquired by Perseus. Education campaigns are conducted in the community by the Perseus HSEC department with respect to the road regulations and road safety rules to prevent accidents with mobile equipment.

20.3 Soil and Land Capability

Mining activities can have a significant impact on the land capability and soil structures because of compaction, erosion and land disturbance.

During the construction and operation of the mine, actions were taken to control and maintain the land capability and soil structures. Topsoil was removed and is stored and utilised when areas are being rehabilitated after mining activities are completed. Trees from the onsite nursery are planted in these areas. Erosion prevention measures consist of progressive rehabilitation and grassing of disturbed areas to minimise wind generated dust particles, and planning drainage and channelling water in a controlled manner.

20.4 Waste Management

As part of the Yaouré DFS (Perseus Mining Limited, 2017), test work and analysis were undertaken to understand the geochemical characteristics of waste rock and tailings residues, including their influence on potential acid rock drainage (ARD). These studies determined that there were no materials with adverse concern outside of the TSF.

With the relatively shallow extent of the proposed underground, compared to the depth of the final CMA open pit, no significant change to host rock geology and geochemistry is expected. In terms of mining waste, it is therefore assumed that waste rock generated and hauled to the surface will be of similar nature and comingled with significantly more open pit material on waste rock dumps. In terms of process plant tailings, slurry effluent from the processing of CMA underground ore will report to the lined Yaouré TSF and will deposited along with tailings slurry from the processing of open pit ores. Details of waste rock dumps for Yaouré are provided in Section 16.1.2.3, and details of the Yaouré TSF are provided in Section 18.9.

Perseus has ongoing requirements to review and manage waste (rock and tailings) storage capacity and facilities across the LOM.

Regarding waste rock storage, Perseus has developed a waste dump plan with sufficient capacity to accommodate all waste rock from mining activities across the projected LOM within the current mine site footprint. The waste dump plan is regularly reviewed and updated to incorporate changes to Mineral Reserves. Operational monitoring of waste dumps performed by Perseus includes daily inspections for crest integrity, regular survey pickups to ensure the facilities are within designed footprints and heights, and inspection and maintenance of drainage control systems.

Regarding the TSF, design of the facility is by Knight Piésold. The original TSF construction and stage lifts are supervised by Knight Piésold, and the TSF and pipework systems are audited annually by Knight Piésold. Knight Piésold Pty Ltd is the Engineer of Record for the TSF. The TSF is designed, operated and audited in accordance with ANCOLD Guidelines (Australian National Committee on Large Dams, 2019) and cross-referenced to the relevant mining licence conditions and the GISTM (Global Tailings Review, 2020).

The current TSF design allows for 32 Mt of tailings storage, with conceptual designs confirming that 64 Mt storage capacity is achievable by raising TSF embankments by a further 17 m. The 64 Mt storage capacity exceeds current LOM storage requirements as of September 2023, and is located within the current mine site footprint. The TSF design is regularly reviewed and updated to incorporate changes to Mineral Reserves.

Operational monitoring of the TSF performed by Perseus includes TSF contour surveys, survey checks of TSF survey pins, and monitoring of TSF embankment piezometers, as well as daily monitoring of slurry deposition and supernatant pond characteristics, TSF freeboard, clarity of decant water, visual inspection of TSF pipelines and TSF embankment integrity, and checks for fauna on the TSF embankment walls and the beach and pond surfaces of the TSF.

Perseus regularly monitors and samples a network of groundwater bores and surface water sites around the waste rock dumps and TSF, and more broadly across site, as part of operational and environmental monitoring of these facilities.

Closure plans for the waste rock dumps and TSF are detailed in the Yaouré Mine Closure Plan. The TSF upper surface and starter wall will be covered with 200 mm of topsoil and vegetated. The waste dump side slopes will be shaped to a gradient of 18 degrees and will be covered with 200 mm of topsoil and vegetated. For a period of five years post closure, monitoring activities will include:

- monitoring and sampling a network of groundwater bores and surface water sites.
- vegetation monitoring.
- stability monitoring of waste rock dump and TSF landforms.

A Waste Management Plan has also been developed for non-rock type waste and covers waste types such as:

- Non-Hazardous
    - Biodegradable/organic waste
    - Paper and cardboard
    - Scrap metal
    - Other recyclables
    - Timber
    - Used tyres
- Hazardous
    - Hydrocarbons
    - Cyanide packaging
    - Batteries
    - Medical equipment.

A waste segregation management plan is also employed to encourage the active sorting of waste types. This ensures that waste is documented, tracked for reporting purposes, and provides insights into the various types of waste generated.

20.5 Emissions and Energy

Estimates of Scope 1 and 2 energy emissions for the LOM plan has been undertaken and compared to the FY23 actuals in Table 20-1. The LOM plan Scope 1 emissions average is lower due to a significant reduction of open pit movement from FY30 onwards, as ore will be sourced from stockpiles and underground.

Scope 2 emissions for the LOM plan increase by about 5% from FY23 to the new LOM average, reflective of an increase in unit power consumption for processing, which increases due to the increased competency and hardness of future ore sources, and the finer grind size required for recovering gold from CMA underground ore.

The reduction of total ounces produced from FY26 onwards causes the overall average emissions intensity to increase over the LOM plan when compared to FY23, that is, the intensity change is due to lower ounce production (lower head grades) towards the end of mine life.

Table 20-1: Energy emission predictions for LOM

EMISSIONS	FY23 ACTUALS	LOM PLAN AVERAGE (FY24-36)
Total Scope 1 Emissions (t CO_2e/a)	71,645	38,322
Total Scope 2 Emissions (t CO_2e/a)	65,861	68,944
Total Scope 1 and Scope 2 Emissions (t CO_2e/a)	137,506	107,265
Emissions Intensity (t CO_2e/oz gold produced)	0.52	0.72

20.6 Mine Rehabilitation and Closure

The Yaouré Gold Mine has a rehabilitation and closure estimate within the Mine Closure Plan which is updated each year. The last update to the closure estimate was done in June 2023 and is reported as $30.5 M. This cost includes $20 M allocated for infrastructure demolition, site rehabilitation, groundwater and surface water monitoring, vegetation monitoring and vegetation maintenance. A further $2.5 M is allocated for mining contractor demobilisation and $8 M for redundancy costs.

The additional surface disturbance areas from underground activities will be incorporated into the model. The additional land clearance is considered minimal compared to the existing surface disturbance and is within the perimeter fence.

A vegetation nursery has been developed on site which assists with progressive rehabilitation, as approved by the rehabilitation steering committee. In accordance with the provisions of Article 144 of the Mining Code, a reclamation bond equal to an agreed percentage of the estimated total cost of the rehabilitation and closure work for the site has been paid into an environmental rehabilitation escrow account following first commercial production. The amount can be reviewed every three years to capture any changes to the mine plan or completed rehabilitation. The actual percentage to be paid was determined during the Mining Convention negotiations and is captured in the Mining Convention. The annual Rehabilitation Plan and associated budget will also be communicated to the government.

20.7 Permitting Requirements

The company prepared an ESIA and an EMP in August 2016 and obtained an exploitation permit granted to Perseus Yaouré SARL on April 24, 2019 for 11 years. As required by law, the permit was transferred from Perseus Yaouré SARL to Perseus Mining Yaouré S.A. on August 8, 2019. This transfer had no effect on the content of the exploitation permit.

A description of the existing permits for the Yaouré Gold Mine is presented in Section 4.7. Some risk exists in relation to the need for additional approvals to be obtained pertaining to underground mining, and general approvals and amendments for permitting of underground related activities. Additional permits which may be required to support the commencement of underground operations are discussed below.

20.7.1 Explosives Storage and Use

The explosives storage and use permit to support open pit operations was granted on October 15, 2021 and is still active. A modification to the explosives permit may be required to incorporate additional blasting supplies required for the underground operation.

20.7.2 Emergency Plan Report

The current emergency management plan will require modification to incorporate additional hazards and emergency scenarios associated with underground mining operations.

20.7.3 Mining Convention

An addendum to the Mining Convention is required to include mining via underground operations on the CMA orebody. This amendment is being actively progressed through negotiations with the Government of Côte d'Ivoire.

20.8 Social Development

The Yaouré Gold Mine represents a large source of employment and economic opportunities for the region in which it operates. It now employs more than 1,200 employees and contractors and about 93% of them are Ivorian nationals, of which 48% come from the local communities. The proportion of nationals is expected to reduce slightly with commencement of the underground operations due to the need to recruit expatriate personnel with specialised skills and experience. Following this initial phase of the underground project, the proportion of nationals will return to ~90% with ongoing training and upskilling of underground personnel (Figure 20-1). The expected changes in the proportions of expatriate and national labour are important to communicate to the government and communities so that the path forward is well understood, and that any concerns regarding a short-term increase in expatriates can be mitigated.

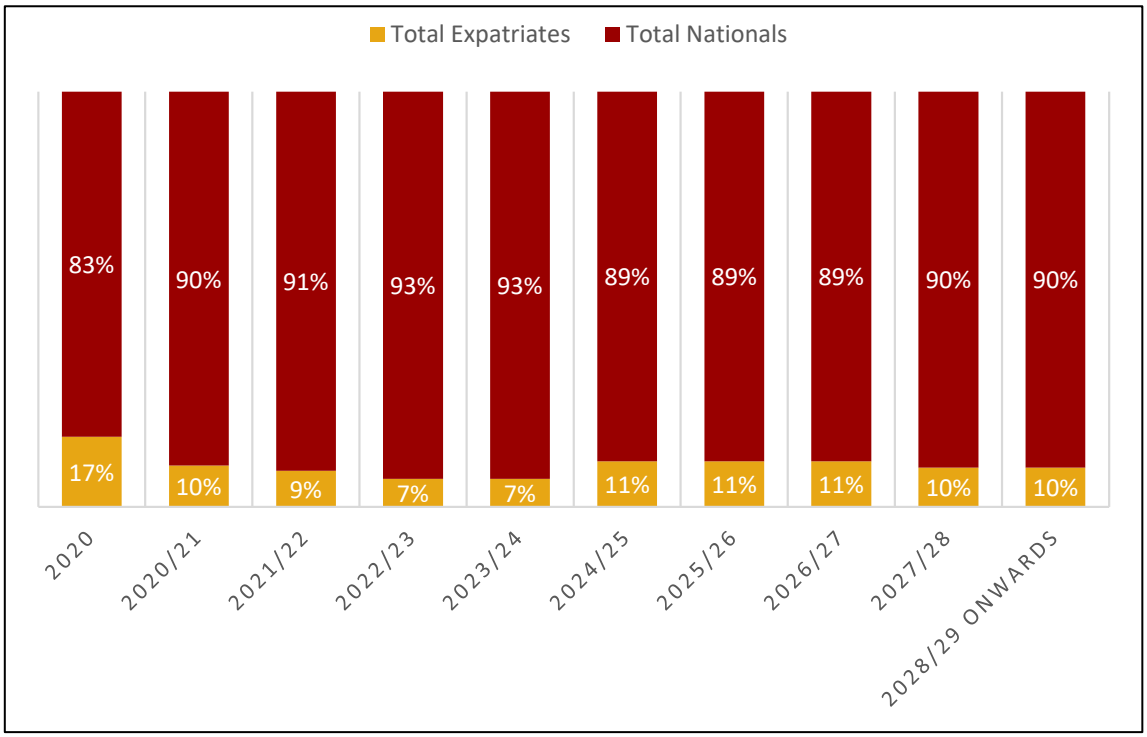


Figure 20-1: Proportions of national and expatriate personnel

Perseus is committed to maximising its contributions to host communities. Perseus's social performance policy is based on three pillars: local employment, providing skills-based training, and establishing local procurement programs, focusing on local supply chain development.

20.8.1 Social Development Aspects

A Social Impact Assessment during the open pit Yaouré FS identified a series of measures to avoid or minimise social impacts and risks associated with Yaouré operations and maximise social benefits. This section describes how Yaouré Gold Mine operationalises some of these key measures and manages its overall social performance.

The Yaouré Gold Mine recognises that social performance is an ongoing dynamic process that:

- is part of its overall mine management system.
- requires regular employee participation and community engagement.
- includes systematic planning and implementation activities.
- enables continuous improvement.

A social management plan has been developed and implemented to mitigate the impacts identified in the study and address key risks and opportunities. Areas of focus of the social management plan are discussed below.

20.8.1.1 Stakeholder Engagement Program

Perseus considers stakeholder engagement as a broad, inclusive and continuous process of building trust and relationships between the Project and its stakeholders.

The Yaouré Gold Mine has implemented the following measures:

- Engagement with national and regional authorities and local communities to encourage cooperation in the governance system. This will in turn maximise benefits for affected communities through induced economic growth and payment of royalties and taxes.
- Support for working groups within the stakeholder management governance structure (i.e., any local economic participation working group, local procurement working group) to facilitate a participatory approach to planning and decision making.

The above measures and ongoing collaboration with the various stakeholders have resulted in reaching a consensus on the definition of “local” and “regional” for employment and procurement planning purposes, as well as a number of other initiatives related to skills enhancement, apprenticeship programs, facilitation of local employment, and support for local businesses, including through regional financial and training service providers.

20.8.1.2 Livelihood Restoration Program

The acquisition of the Project footprint resulted in the economic displacement of a number of individuals, households and communities who relied on the assets contained within the footprint for their livelihoods, namely agricultural land, communal resource land and artisanal mining sites.

Perseus developed a Livelihood Restoration Framework Program (LRFP), which has helped to define the mechanism for acquiring land and managing the impacts of the resulting economic displacement, in line with IFC Performance Standard #5 (International Finance Corporation, 2012) and relevant Ivorian legislation and regulations.

The program includes:

- Analysing relevant international standards (IFC Performance Standard #5) and the Ivorian legal and institutional framework, identifying gaps between the two, and defining measures to fill the gaps.
- Preliminary assessment of displacement impacts associated with the acquisition of Project land.
- A description of Perseus's approach to managing these impacts through a thoughtfully planned and executed livelihood restoration process.
- Definition of a stakeholder engagement program specific to livelihood restoration that complements and dovetails with the Project-wide stakeholder engagement program described in the LRFP.
- Explanation of support programs potentially needed to supplement compensation entitlements, including a livelihood restoration and improvement program and a vulnerable persons' assistance program.
- Description of a grievance management system.
- The definition of a monitoring and evaluation program.
- Identification of the various stages, including the obligation to draw up a resettlement action plan for land acquisition activities undertaken.

20.8.2 Operation of the Social Development Program

20.8.2.1 Clearing Management

As part of the Social Development Program, a compensation process has been defined with the various stakeholders. The people affected and community representatives are involved at every stage of the process to ensure transparency and prevent any potential grievances.

The land and crop compensation methodology is implemented by Perseus according to the current laws and practices in Côte d'Ivoire. The crop compensation process is regulated by the Inter-ministerial decree N° 453/MINADER/MIS/MIRAH/MEF/MCLU/MMG/MEER/MPEER/SEPMBPE dated August 1, 2018, providing guidance on the compensation scale for crops.

The objective of Perseus's approach is to:

- Compensate the communities for the loss of their land and crops.
- Identify losses, costs, and payment methods for compensation.
- Conduct the process transparently and prior to impacts from operations.

The compensation process is managed with the support of an external expert and the Ivorian agriculture services. The process typically follows the below steps:

- Awareness campaign with leaders and the owners (landowners and farmers).
- Identification of the land and crop owners.
- Delimitation of the Project area and the boundaries of the plot.
- Crops inventory and cost evaluation.
- Validation and signature of the inventory form and the protocol agreement by the owners.
- Payment.

At this stage, 99% of crop owners have been compensated.

With respect to land compensation, although the mining regulation contains the formula to be used for land compensation, no specific rate is mandated by the Government. However, a prefectorial decree was signed by the Bouaflé Prefect, setting the compensation rate per hectare. On this basis, approximately two-thirds of the landowners were compensated. The remaining one-third are seeking a significantly larger compensation rate, and the administrative process prescribed by the Ivorian mining legislation to be followed if agreement cannot be reached has been initiated. This administrative process was suspended pending resolution of legal actions brought by the landowners being heard in parallel. If the administrative process is completed, Perseus does not expect any exposure over and beyond the expected and budgeted rate, which is the rate already agreed with the majority of landowners.

Additional details regarding this process are presented on page 152 of the Perseus 2023 Annual Report (Perseus Mining Limited, 2023).

20.8.2.2 Cultural Heritage and Sacred Sites

A cultural heritage and archaeological assessment was conducted as part of the Project ESIA within the framework of the Ivorian legislation on cultural heritage preservation and protection, and IFC Performance Standard #8 on Cultural Heritage (International Finance Corporation, 2012). This assessment identified several sacred graves and forest sites within the immediate Project area. In addition, Perseus undertook a consultative process to list all sacred sites (graves and forests) with the assistance of the communities to determine appropriate compensation.

As there is currently no legislation that guides the financial compensation linked to the removal or the moving of cultural sites, the current practice involves direct negotiation with communities and the relevant leaders.

In 2023, a survey was conducted to identify and describe the cultural heritage in the five surrounding villages. The main objective was to gain an in-depth assessment of the elements of tangible and intangible cultural heritage in these communities, as well as the practices and meanings associated with each of them. The results from this study assists Perseus in identifying and implementing appropriate measures for protection, preservation, and promotion.

A Cultural Heritage Management Plan has been developed, including a Chance Find Procedure, with its implementation being pursued.

20.8.2.3 Livelihood Restoration Activities

As part of its livelihood restoration programs, Yaouré Gold Mine signed a partnership agreement with the Agence Nationale d'Appui au Développement Rural (ANADER), the national agency supporting rural development. The aim of this partnership is to support several groups and producers in implementing economic activities in a number of agreed areas including:

- Market garden production.
- Livestock farming.
- Intensive rain-fed agriculture.

20.8.3 Community Training and Educational Support

Perseus has implemented a range of initiatives to provide training and livelihood opportunities to local communities to improve economic outcomes. These include, among others, heavy vehicle driver training, vehicle mechanics, and hygiene and waste management programs in local schools.

Further opportunities and partnerships with local universities and vocational training centres are considered on a case-by-case basis, in consultation with community representatives and local authorities.

In addition, in partnership with its contractors, Yaouré Gold Mine has contributed to the local community via construction and refurbishment of buildings, and the donation of equipment.

20.8.4 Management of the Local Mining Development Committee

As required under Ivorian legislation, a Local Mining Development Committee (CDLM) has been set up, with representatives from the Company, local authorities and the communities that are directly and indirectly impacted by the Yaouré mining operations.

This committee oversees the management of a fund, to which Yaouré Gold Mine contributes 0.5% of its revenue, in accordance with legislative requirements. The funds are then utilised for the implementation of projects identified by the communities, that range from infrastructure construction and refurbishment to income-generating initiatives, and education and training projects.

The Company also makes additional, voluntary contributions and donations to support the local communities including in cultural events, sporting activities, health and safety awareness and waste management.

20.8.5 Local Recruitment Plan

Perseus's recruitment policy is to give priority, on the basis of equal skills, to nationals from the mine's areas of influence. This policy also applies to subcontractors. Jobs are managed at a local level through a collaborative process with the Community Consultative Committee (CCC). Job offers are communicated widely through various channels to ensure transparency and equal access to opportunities.

20.8.6 Local Procurement Plan

Perseus works with local and regional authorities and businesses to design and implement a local procurement plan that maximises the local and regional content of the Project. The objectives are to:

- Develop partnerships with local and regional businesses, as well as chambers of commerce, to maximise the supply of locally produced or locally value-added products and services.
- Create a transparent and reliable supply system based on the principle of "local preference" while maintaining quality, safety, and cost efficiency.
- Strengthen the resilience of the Project supply chain.
- Support the sustainable growth of local/regional businesses and local/regional economic development.
- Discourage inward migration caused by commercial speculation through the development of local/regional businesses able to better meet the supply requirements of the Project.

20.8.7 Artisanal and Illegal Mining

Artisanal mining can have a negative social impact on the community structure. It has contributed to some of the demographic growth in the five villages surrounding the operation. The Government has provided support to reduce incursions onto the mine areas by illegal miners however this remains one of the main challenges for the Project.

21 Capital and Operating Costs

Capital and operating costs have been estimated for the Yaouré Gold Mine LOM plan, inclusive of the CMA underground FS.

21.1 Capital Cost Estimate

The overall capital cost of the Yaouré Gold Mine LOM plan is $289.4 M and includes CMA underground development capital of $131.7 M (Table 21-1) The costs are based on a combination of first principals estimates and quotes from suppliers/contractors.

Table 21-1: Yaouré LOM capital costs summary

CAPITAL ITEM	UNIT	VALUE
Sustaining Capital		
Mining open pit	$M	36.04
Mining underground	$M	12.53
Processing & Maintenance	$M	57.70
G&A	$M	10.86
SUBTOTAL	**$M**	**117.13**
Development & Rehabilitation Capital		
Rehabilitation & Demobilisation	$M	30.54
Development Community Road	$M	10.00
Development underground	$M	131.69
SUBTOTAL	**$M**	**172.23**
TOTAL CAPITAL	**$M**	**289.36**

A summary of major capital items estimated for the Yaouré LOM plan include the following:

- $132 M – CMA underground development works, including capitalised pre-production, underground mine establishment and ongoing development, infrastructure upgrades and process plant upgrades.
- $13 M – LOM sustaining capital for underground mining operation.
- $30 M – Rehabilitation updated for additional area disturbance and severance liability updated in line with extended operation.
- $35 M – TSF expansion and tails pipeline diversion and upgrade.
- $7 M – Land and crop compensation for expanded waste dump.
- $13 M – For land compensation, relocation, and housing.

21.2 Operating Cost Estimate

The operating cost estimate for the Yaouré Gold Mine LOM plan is summarised in Table 21-2.

Table 21-2: Operating cost summary

COST AREA	UNIT	OPEN PIT	UNDERGROUND	TOTAL
Mine	$/t mined	3.93	-	-
Mine	$/t ore	-	71.12*	-
Processing	$/t ore	-	-	13.23
G&A	$/t ore	-	-	7.05

*Excludes capitalised underground development costs

The underground mine operating costs are derived from Feasibility level cost modelling, while open pit operating costs are based upon current contract rates. Processing and G&A costs are quoted for the LOM average.

The processing costs are based on:

- FY24 budget reagent and consumable consumptions, based on ore type
- FY24 budget reagent and consumable pricing
- FY24 budget maintenance costs
- Power modelling by ore type to determine unit power required for processing (in kWh/t), and FY24 budget power supply cost
- FY24 budget labour schedule and costs.
- The G&A costs are based on FY23 budget Yaouré Gold Mine G&A cost.

The estimated operating costs for the LOM plan stated in Table 21-1 include:

- costs associated with the contract mining of ore and waste and its delivery to the process plant ROM bin and the placement of waste on the waste rock dump
- labour costs for supervision, management and reporting of on-site organisational, commercial, technical, environmental, security, training and occupational activities
- labour costs for operating and maintaining the mobile equipment, light vehicles, process plant and supporting infrastructure, as well as for monitoring of the environment
- all power, fuels, reagents, consumables and maintenance materials utilised in operating the mobile equipment, light vehicles, process plant and supporting infrastructure, as well as for monitoring of the environment
- operating costs of an on-site assay laboratory
- costs associated with G&A activities
- import duties on consumable unit costs.

21.3 Bullion Transport and Refining Costs

Bullion transport and refining costs are estimated at $3.04/oz and reflect current actual costs.

21.4 Royalties

The Government royalty for Mineral Reserves is a sliding scale between 3% and 6% of revenue, depending on gold price (Table 4-3). The gold price assumption for the Yaouré LOM is $1,700/oz. The associated royalty which has been assumed in the LOM plan is 5% of revenue, or $85/oz.

21.5 Community Development Fund

Contributions to the CDLM Community Development Fund have been included in updated LOM plan cost allowances, and are based on 0.5% of revenue.

21.6 Taxes

Taxes applicable to the Yaouré LOM plan are assumed to be:

- Income Tax (25%) applicable from January 1, 2026.
- Existing Yaouré VAT exemption applies to local and imported goods and services allocated exclusively to mining operations. If this does not apply, then VAT should be claimable on most purchases.
- No business licence (patentes) tax.

It has been assumed that the CMA underground will have customs duties exemptions, in line with the Mining Convention. This means that customs duty is not applicable on certain consumables and fuel and a 5% concessional duty rate applies to imported equipment, tools etc.

The LOM plan does not include additional tax imposts, such as withholding tax on dividends to be paid to shareholders.

22 Economic Analysis

Perseus, being a producing issuer, is not required to include information in this section as this Technical Report does not describe a material expansion of current production.

Perseus has performed an economic analysis related to the existing Yaouré Gold Mine for the current life of mine plan at the forecasted metal prices, production rates, metal recoveries, and capital and operating costs estimated in this Technical Report. Perseus confirms that the outcome is a positive cash flow that supports the Mineral Reserve estimate. Due to the nature of the mining business, these conditions can change significantly over relatively short periods of time. Consequently, actual results may be significantly more or less favourable.

23 Adjacent Properties

There are no known significant occurrences of gold mineralisation on tenements adjacent to those controlled by Perseus. The boundaries of Perseus's tenements do not constrain the Mineral Resources, Mineral Reserves or planned mining operations disclosed in this report.

24 Other Relevant Data and Information

There is no other material data or information pertaining to the Yaouré Gold Mine that has not been summarised and presented in the Report.

25 Interpretation and Conclusions

This Report summarises the results of an updated LOM plan to demonstrate the technical and economic viability of an extended mine life at the Yaouré Gold Mine, inclusive of a Feasibility level study on an underground mine on the CMA orebody.

25.1 Mineral Resources

Data that inform the resource estimate are considered to be representative and free of any biases or other factors that may materially impact the reliability of the sampling or significantly affect confidence in estimated resources. Checks to confirm the validity of the drilling database indicate that it forms a sufficiently reliable basis for resource estimation.

Drilling activities remain ongoing at the Yaouré Gold Mine with a focus on depth extensions at the CMA and Yaouré deposits; as well as early-stage exploration and resource definition drilling within the mine fence which may be incorporated into future Mineral Resource estimates.

These targets have the potential to increase the Mineral Resource base and enhance the potential economics of the Yaouré Gold Mine.

As noted in Section 14.16, the Yaouré Gold Mine Mineral Resource estimates could be affected by:

- Future, yet unknown environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant issues.
- Metal price assumptions.
- Changes to the technical inputs used to estimate gold content (e.g., bulk densities, grade estimation strategies and interpolation methodologies).
- Changes to the geological interpretation (e.g., intrusive dykes and structural offsets such as faults and shear zones) and mineralisation (domain) geometry and continuity of mineralised zones and grade.
- Depletion due to previous mining activities.
- Changes to geotechnical and mining assumptions, including the minimum mining thickness; or the application of alternative mining methods.
- Changes to process plant recovery estimates.
- Changes to the assumptions used to calculate the gold cut-off grades.

25.2 Mineral Reserves

Under the assumptions in this Report, the Yaouré Gold Mine shows a positive cash flow over the LOM and supports the Mineral Reserve estimates. The projected mine plan is achievable under the set of assumptions and parameters used.

25.3 Mining

25.3.1 Open Pit Mining

Open pit mining at Yaouré Gold Mine is well understood. The transition from mining of the CMA open pit to the Yaouré open pit is considered to be a low-risk activity, and the same equipment and processes will be utilised. Grade control for the Yaouré open pit will vary in spacing from the CMA

open pit, due to the nature of the orebody, which is more constrained and consists of multiple lenses with different orientations.

Estimates of open pit Mineral Reserves, and LOM parameters, costs and revenues are well known and can be considered robust and reliable predictors of the future mining performance at Yaouré.

25.3.2 Underground Mining

A FS has shown that the CMA underground is both technically and economically viable under the assumed study conditions.

Underground mining at Yaouré Gold Mine will involve the introduction of new skill sets, equipment and practices to the current mining on site. Nonetheless, the methods of underground mining and the mechanised equipment and process which are planned to be employed are well understood across the mining industry, and hence the Feasibility Study parameters, mining rates, recoveries and costs are expected to be both achievable and reliable.

The adaption of techniques and technologies which will be new to Côte d'Ivoire in order to establish an underground mining industry will require the import of new machinery, and, initially, the experienced expatriate labour from within West Africa and from around the world, to operate the machinery, and to begin to train local Ivorians. A transition plan to a local workforce with reduced expatriate presence is part of the CMA underground FS and the ramping up of local labour participation is built into the Yaouré LOM plan.

25.4 Metallurgy and Mineral Processing

The Yaouré gold processing plant has been in operation since late November 2020. Gold produced for the remaining LOM will come from open pit mining, underground mining and existing stockpiles. Processing activities at Yaouré will utilise the existing facility, consisting of primary crushing, SABC comminution, gravity gold concentration and recovery, cyanidation, elution, electrowinning, doré production by smelting, and SO_2/air destruction of WAD cyanide species in tailings slurry before deposition in the TSF. The Yaouré processing plant flow sheet is suitable for processing all future ore types with minimal equipment changes, based on metallurgical test work and/or operational experience, depending on the ore source.

The maintenance requirements and operating cost structure for the processing plant are well understood.

Predicted gold recovery across open pit ore types ranges from 91.0% to 93.4% for oxide ores, 91.9% to 94.5% for transition ores and 89.5% to 93.8% for fresh ores at a nominal residence time of 30 h. Predicted gold recovery for CMA underground ore ranges from 80.5% to 92.1% on a monthly basis, with an average of 87.2% for the CMA Underground Mineral Reserves.

Yaouré Gold Mine ores contain no known deleterious elements or minerals that could have a significant effect on potential economic recovery of gold in a hybrid leach/carbon-in-leach cyanidation process, based on metallurgical test work and/or operational experience.

25.5 Project Infrastructure

Project infrastructure is well established for the Yaouré Gold Mine. External roads provide good connection to major population centres, such as Abidjan and Yamoussoukro, as well as to local communities. A network of internal roads provides access to all major facilities and infrastructure across site.

Major established facilities include site administration, security gatehouse, clinic and emergency services, warehouse, workshops, processing plant, mine services area, exploration office, laboratory and a 517-bed on-site accommodation camp. Additional facilities and infrastructure upgrades are required in advance of mining the CMA underground orebody.

There is a reliable power supply to site that is sourced from the national grid. An 18 MW diesel fired power station provides emergency and backup power across site in the event of an interruption to the national grid supply. Reliable communications are also established, including access to commercial mobile phone networks, a secure digital radio network satellite-based voice and data connection.

Raw water for the site is sourced from the Bandama River, surface run-off, ground water bores and pit dewatering. Raw water from the Bandama River and mine dewatering are the main sources of process water top-up, providing sufficient water for operational activities. Modular potable water treatment plants located across site treat bore water to potable quality. Effluent from all ablutions drain to sewage treatment plant systems.

The TSF is a single cell, valley storage formed by two multi-zoned earth-fill embankments. The facility is designed to be raised in stages over the mine life using downstream embankment construction techniques. Current designs allow for 32 Mt of tailings storage, with a facility footprint of approximately 162 ha. The embankments can be raised by a further 17 m, for a total of 64 Mt storage capacity, which exceeds current LOM requirements as of September 2023.

25.6 Environment, Social Impact and Permitting

Environmental permitting for the Yaouré mine is up to date, and Perseus have a positive and constructive relationship with the Government, and with local communities. Ongoing renewal of licenses and agreements with the Ivorian Government and other stakeholders, including local communities, is well managed by the site-based community and environmental departments.

The majority of permits and licences needed for the Yaouré LOM plan are in place, with some additional changes needed for the introduction of underground mining, including an addendum to the Mining Convention.

25.7 CMA Underground Risk and Opportunity

The greatest opportunity and the greatest risks to the Yaouré Gold Mine LOM plan relate to the implementation of the CMA underground mine. The CMA underground mine represents a change in mining method and an application of different technology at Yaouré.

As part of the CMA underground FS, a risk register was developed by a multi-disciplinary team from across the Perseus business. The key risks identified for the implementation of the CMA underground are:

- Timing of Government regulations pertaining to underground mining, and general approvals and amendments for permitting of underground related activities.
- Communication of workforce expatriate content to local and national stakeholders in the early stages of the underground mine so that the temporary nature of the increased proportion of expatriates is understood and expectations managed with regard to local employment content.
- Interaction between technical works on the open pit and underground aspects of the business at Yaouré, including change management.

- Ongoing requirement to review and manage waste (rock and tailings) storage and monitor environmental and community impacts (dust, noise, groundwater levels) of the expanding mine.

The opportunities posed by the CMA underground mine include:

- Further drilling may lead to extension of the underground mine and therefore greater extraction and utilisation of the Mineral Resources at Yaouré than planned in this Report.
- Opportunities are likely to exist to refine production (stope) operation designs to reduce planned dilution. Stope optimiser shapes currently used for production evaluations have limited flexibility and it is expected to be able to improve on this with detailed manual designs.
- Open pit opportunities at Yaouré may also be extended based on planned drilling, further extending the mine life at Yaouré and allowing the underground mine to extend further.

25.8 CMA Underground Project Implementation

The overall management of the underground project will be under a dedicated project management team, who will be responsible for the detailed design and construction of the surface infrastructure and services that are the subject of the study, and a mining contractor to carry out the underground mining activities.

Tenders will be placed with reputable underground mining contractors who have the requisite skills and experience to develop and operate mechanised underground longhole stoping mining operations in Africa. The underground mining contractor will likely undertake supply of mobile equipment and personnel in order to undertake development and production operations for the CMA underground mine. Technical work and operations supervision will be undertaken by Perseus.

26 Recommendations

Based upon the work undertaken to develop this LOM plan for the Yaouré Gold Mine, a number of follow up action are recommended. These follow up actions and scopes of work are described in the sections below.

26.1 Mineral Resources

- Pursue the current planned drilling programs within the Yaouré Gold Mine area, which aim to add to reported Mineral Resources. The work program will involve additional drilling along strike and at depth targeting the CMA Zone, together with infill and extension drilling within and around the Yaouré pit. The works are estimated to be approximately $11.8 M. Approximately $5.1 M of this cost is contingent on results of the initial works.
- Monitor resource to mill reconciliation performance for each of the key production areas to identify areas of improvement in the Mineral Resource estimates to support improvements in short- and long-term planning assumptions. Costs for reconciliation monitoring are covered within the site operating cost budgets (referenced in Section 21.2).

26.2 Mineral Reserves

- If the definition of further Mineral Resources is achieved at Yaouré open pit and CMA underground, based on the drilling program discussed in Section 26.1, further studies should be conducted to determine if new Mineral Reserves can be estimated. Concurrently with resource definition drilling, extra programs should be conducted to gather samples for geotechnical and metallurgical test work and analysis to support expansion of Mineral Reserves. The work program is contingent on the quantum of any additions to the Mineral Resources, with an indicative budget of $0.9 M allocated on the assumption that all Mineral Resource programs are successful.

26.3 CMA Underground Project

- The capital cost of $132 M for underground development, referenced in Section 21.1, will progress engineering, design and execution and covers the following items:
    - Further refinement of the underground design and schedule, in order to optimise the production profile and to improve operating aspects of the underground design and schedule prior to start of mining.
    - Continued pre-operational engagement with potential contractors who are experienced in mechanised underground mining in Africa with longhole open stoping, in order to engineer solutions into the operational plan so far as practicable.
    - Selection and mobilisation of underground mining contractor that is experienced in mechanised underground mining in Africa with longhole open stoping.
    - Complete detailed designs of in-pit and surface infrastructure to support underground mining operations, including input from all stakeholders.
        - Refine mine ventilation design and select ventilation fans.
        - Design of mine services area, workshop, warehouse, offices and change house to support underground activities, including connection of services.

        - Finalise surface and underground electrical infrastructure and reticulation design.
        - Prioritise placing purchase orders for long-lead items (e.g., transformers, ventilation fans, compressors for mine air supply)
        - Develop traffic management plans for the mine services area, as part of the location detailed design, to separate pedestrians and heavy and light vehicles.
        - Develop traffic management plans for the interaction of the underground and open pit fleets, to ensure safe movement of all vehicles to and from the pits, dumps and other key infrastructure such as go lines, workshops and fuel facilities.
    - Execute installation and commissioning of in-pit and surface infrastructure to support underground mining operations
    - Continue engineering study for upgrading of tramp metal removal systems, and proceed with installing and commissioning selected upgrade options.
        - Over belt tramp metal removal systems should be designed to limit CV001 belt speed to ≤1.8 m/s, to allow for optimal performance of an engineered or vendor solution.
        - For the existing metal detector, engage vendor (Steinert) to see if unit can be retrofitted to allow for spray can module to be fitted (will allow for greater accuracy and less time in locating when metal is on belt that requires removal). Belt may not stop at sorting station if not operating at the design speed of 1.8 m/s – this provides extra contingency and allows for quicker restart.
    - Design and install upgrades for accommodation camp expansion, including additional rooms, upgrade to sewage systems, potable water and power infrastructure.
    - Specify, procure and commission additional mines rescue equipment to enable underground rescue capacity, including modifications to the ambulance and fire tender to meet specifications for underground use.
- The following items will be addressed within the site operating cost budgets, referenced in Section 21.2:
    - Update mining services contract if ROM scalping of tramp metal from CMA underground ore is required.
    - Given the identified relationship between sulfur grade and gold recovery for CMA underground ore, investigate inclusion of on-site sulfur analysis capability within laboratory services contract.
    - Install additional (sixteenth) cyclone to cyclone cluster to provide additional operational contingency (currently in stock in site warehouse).
    - Update processing plant operating procedures for treating underground ore, noting that magnet and metal detector will work optimally when CV001 belt speed is ≤1.8 m/s. CV001 VSD will have to be adjusted to meet this operational requirement when batch treating CMA underground ore.

- Given greater risk for belt damage when treating UG ore, due to the presence of a higher volume of tramp metal, consider reviewing (and increasing if required) stock of belt, accessories and capability for potential higher frequency repair to CV001.
- Monitoring boreholes in the vicinity of the underground mine to be monitored as an early sign of changes to groundwater drawdown relating to mining activity. If any impacts are measured which indicate a likely future impact to either Perseus or other stakeholders, then mitigation measures, such as extending boreholes or providing additional water sources, should be implemented.
- The suitability of monitoring bores for the purpose of identifying and predicting groundwater impacts should be reviewed on an ongoing basis as mine plans change.

26.4 Mineral Processing and Metallurgical Testing

- Conduct a multi-day plant trial on CMA pit fresh ore at a target grind size P_{80} of 53 µm to better understand the operational performance and constraints of running the plant under this configuration. Use the outcomes of the trial to inform decision making as to whether further plant modifications are required to mitigate water balance or material handling issues (e.g., installation of pre-leach thickener). Costs for a plant trial are covered within the site operating cost budgets (referenced in Section 21.2).
- Testing of a fresh batch of CMA SW variability samples across the weathering profile at standard Yaouré gravity/leach test conditions. An indicative budget for this test work program is $0.3 M.
- Test further variability samples from across the expanded 2023 Yaouré pit shell, and from other targets as they are developed. An indicative budget for test work within the Yaouré pit shell is $0.3 M-$0.4 M. Commitment of funds for metallurgical test work programs on other targets is contingent on assay results from drilling programs and geological modelling.

27 References

2D Consulting. (2014). *Audit Environnemental de Cessation d'Activités de la Mine d'Or de Yaouré.* Unpublished report to Amara Mining plc.

ALS. (2017). *Metallurgical Testwork conducted upon Yaouré Gold Ore Composites for Perseus Yaouré SARL, Report A17458 Part 1.* Unpublished report to Perseus Mining.

ALS. (2018). *Metallurgical Testwork conducted upon Yaouré Gold Ore Composites for Perseus Yaouré SARL, Report A17458 Part 2.* Unpublished report to Perseus Mining.

ALS. (2021a). *Metallurgical Testwork conducted upon Yaouré (Angovia-2) Gold Ore Composites for Perseus Mining Yaouré SARL, Report A21927.* Unpublished report to Perseus Mining.

ALS. (2021b). *Metallurgical Testwork conducted upon Yaouré (Govisou) Gold Ore Composites for Perseus Yaouré SARL, Report A22337.* Unpublished report to Perseus Mining.

ALS. (2022). *Metallurgical Testwork conducted upon CMA Underground Gold Ore Composite Samples for Perseus Mining Yaouré S.A., Report A23424.* Unpublished report to Perseus Mining.

ALS. (2023a). *Metallurgical Testwork conducted upon Yaouré CMA U/G Drill Core Samples for Perseus Mining Yaouré S.A., Report A24312.* Unpublished report to Perseus Mining.

ALS. (2023b). *CMA Underground Viscosity & Thickening Testwork, Report A25032.* Unpublished report to Perseus Mining.

Amec Foster Wheeler Earth and Environment UK Ltd. (2015). *Environmental and Social Impact Assessment Report, Yaouré Gold Projct, Côte d'Ivoire.* Unpublished report to Amara Mining plc.

Arnold, C. (2013). *Yaouré Gold Project, Côte d'Ivoire, Technical Report and Mineral Resource Estimates for Amara Mining plc.* Unpublished report by AMC Consultants Ltd (UK) to Amara Mining plc.

Australian National Committee on Large Dams. (2019). *Guidelines on Tailings Dams - Planning, Design, Construction, Operation and Closure, Rev 1.* Hobart: Australian National Committee on Large Dams.

BBE Consulting. (2023). *Yaouré Gold Mine - High-Level Ventilation Review.* Unpublished report to Perseus Mining.

Bond, W. (2013). *Final Summation Report for the Yaouré Project, New Logging System and Interpretations.* Unpublished report to Amara Mining plc.

Chauveau, J. P. (1978). Contribution a la geographie historique de l'or en pays baule (Côte d'Ivoire). *J. des Africanistes, 48, 1*, 15-70.

Chrysos Corporation. (2020). *Technical Note: TN-101, PhotonAssay Measurement Performance for Gold on Ore samples; Sample preparation and fire-assay comparisons; Revision 1.* Chrysos Corporation.

CIM. (2014). *CIM Standing Committee on Reserves Definitions - Definition Standards for Mineral Resources and Mineral Reserves.* Westmount, QC: The Canadian Institute of Mining, Metallurgy and Petroleum.

Couston, G. (2020). *Perseus Mining Limited, Yaouré Gold Project, 2020 VTEM Interpretation.* Unpublished report by Southern Geoscience Consultants to Perseus Mining.

CSA Global. (2022). *Yaouré CMA Underground - Hydrological and Hydrogeological Feasibiliy Study.* Unpublished report by CSA Global Consultants (Ireland) Limited to Perseus Mining.

Fraser, G. M. (1984). Aeration Design for Gold Leaching. *Gold (Mining, Metallurgy, and Geology) AusIMM Regional Conference.* Perth/Kalgoorlie: Australasian Institute of Mining and Metallurgy.

Gaston, J. (1913). Exploitation indigène de l'or en Côte d'Ivoire. *Bulletins et Mémoires de la Société d'anthropologie de Paris, VI° Série. Tome 4 fascicule 3-4*, 372-375.

Global Tailings Review. (2020). *Global Industry Standard on Tailings Management.* Global Tailings Review.

Government of Western Australia, Department of Justice. (2023, December 15). *Work Health and Safety (Mines) Regulations 2022*. Retrieved from Legislation Western Australia: https://www.legislation.wa.gov.au/legislation/statutes.nsf/law_s53266.html

Hunt-Davies, N. (2018). *Yaouré Gold Project, Côte d'Ivoire, CMA Underground Concept Study.* Unpublished report by In The Hills Pty Ltd to Perseus Mining.

International Cyanide Management Institute. (2021). *Mining Operations Verification Protocol.* Washington, DC: International Cyanide Management Institute.

International Finance Corporation. (2012). *Performance Standards on Environmental and Social Sustainability.* Washington, DC: International Finance Corporation.

Intertek Minerals Limited, Tarkwa. (2021). *Minerals Analytical Report - Job Code 1415.0/2109705.* Unpublished report to Perseus Mining.

Knight Piésold. (2017a). *Perseus Mining Limited Yaouré Gold Project, Geochemistry Report - Waste Rock and Tailings (Report No. PE301-00564/03).* Unpublished report to Perseus Mining.

Knight Piésold. (2017b). *Definitive Feasibility Study - Geotechnical, Tailings and Water Management Report (Report No. PE301-00564/03).* Unpublished report to Perseus Mining.

Knight Piésold. (2023). *Yaouré Gold Mine - TSF Life-of-Mine Review.* Unpublished report to Perseus Mining.

Kpangui, K. B. (2021). *Study report on the initial state of flora and vegetation at the Yaouré Gold Mine.* University Jean Lorougnon Guédé for Envinova Consultants, Unpublished report to Perseus Mining.

Lycopodium. (2019). *Perseus Yaouré SARL - Yaouré Gold Project - Process Design Criteria, Mass and Water Balances (2070-FPDC-001 Rev 1).* Unpublished report to Perseus Mining.

Lynch, A., Mainza, A., & Morrell, S. (2015). Ore Comminution Measurement Techniques. *Comminution Handbook, Spectrum 21, Chapter 4* (pp. 43-60). Melbourne: Australasian Institute of Mining and Metallurgy.

Mériaud, N. (2017). *The Yaouré gold mineralisation, Preliminary results on camp scale geology. PhD research annual progress report.* Unpublished report to Perseus Mining Limited and to Centre for Exploration Targeting, University of Western Australia.

Mériaud, N. (2020). *Litho-tectonic evolution and metallogeny of the Yaouré gold camp, Côte d'Ivoire West Africa; Integration into the southern West African craton evolution.* Unpublished report to Perseus Mining.

Metso Outotec. (2023). *Crushing and Screening Handbook* (seventh ed.). (I. Nieminen, Ed.) Tampere: Metso Outotec.

MineGeoTech Pty Ltd. (2023). *CMA Underground Geotechnical Study.* Unpublished report to Perseus Mining.

MineNet. (2015). *2015 Yaouré Project, open pit slope design, Geotechnical site investiagtion, analyis and design- Prefeasibility level study.* Unpublished report to Amara Mining plc.

Morrell, S. (2009). Predicting the overall specific energy requirement of crushing, high pressure grinding roll and tumbling milling circuits. *Minerals Engineering 22*, 544-549.

N'Guessan, A. (2014). *Alteration hydrothermale associee a la mineralization du gisement d'or du Yaouré (Bouaflé, Centre de la Côte d'Ivoire.* Abidjan, Côte d'Ivoire: MSc Thesis, Abidjan University, Unpublished.

Norgaard, S. (2019). Laboratory Test Work and Equipment. In R. Dunne (Ed.), *SME Mineral Processing & Extractive Metallurgy Handbook* (pp. 115-140). Englewood, CO: Society for Mining, Metallurgy, and Exploration.

Orway Mineral Consultants (WA) Pty Ltd. (2017). *Yaouré Project - Throughput Estimates - Individual Ore Types (Report 7748-03, Rev 0).* Unpublished report.

Ozvent Consulting Pty Ltd. (2023). *Yaouré FS Vent Design.* Unpublished report to Perseus Mining.

Parra-Avila, L. A. (2023). *Geochronological characterisation of deep intrusives associated with the Yaouré gold deposit, Côte d'Ivoire - Zircon U-Pb dating results.* Centre for Microscopy, Characterisation and Analysis, The University of Western Australia, Unpublished report to Perseus Mining.

Perseus Mining Limited. (2017). *Perseus Mining Limited, Technical Report, Yaouré Gold Project, Côte d'Ivoire.* Perseus Mining Limited, effective date November 3, 2017.

Perseus Mining Limited. (2018, November 5). *Perseus Mining Completes Scoping Study for Potential Underground Mine at Yaouré.* Retrieved from perseusmining.com: https://wcsecure.weblink.com.au/pdf/PRU/02044165.pdf

Perseus Mining Limited. (2019, August 28). *Perseus Mining Updates Mineral Resources & Ore Reserves.* Retrieved from perseusmining.com: https://wcsecure.weblink.com.au/pdf/PRU/02139266.pdf

Perseus Mining Limited. (2021, August 24). *Perseus Mining Updates Yaouré Life of Mine Plan.* Retrieved from perseusmining.com: https://wcsecure.weblink.com.au/pdf/PRU/02410596.pdf

Perseus Mining Limited. (2022, October 11). *Update to Perseus Mining Announces Maiden Underground Ore Reserve at Yaouré.* Retrieved from perseusmining.com: https://wcsecure.weblink.com.au/pdf/PRU/02580868.pdf

Perseus Mining Limited. (2023). *Annual Report.* Perth: Perseus Mining Limited.

Pitt & Sherry. (2017). *Yaouré Deposit, DFS Geotechnical Study.* Unpublished report to Perseus Mining.

Rossi, M. E., & Brown, P. (2015). *Yaouré Gold Project Côte D'Ivoire Technical Report And Mineral Resource Estimates For Amara Mining Côte D'Ivoire SARL.* Technical report with effective date December 20, 2015.

Rossi, M. E., Hallewell, M., & Brown, P. (2014). *The Yaouré Gold Project Côte d'Ivoire, Technical Report and Mineral Resource Estimates for Amara Mining plc.* Technical report with effective date January 22, 2014.

SGS Mineral Services UK Ltd. (2012a). *Scoping Metallurgical Report on a Gold Ore from Côte d'Ivoire - Project Number 10866-321.* Unpublished report to Cluff Gold plc.

SGS Mineral Services UK Ltd. (2012b). *Variability Cyanidation Report on a Gold Ore from Cote d'Ivoire, Project Number 10866-375.* Unpublished report to Amara Mining plc.

SGS Mineral Services UK Ltd. (2013a). *Phase Two Scoping Testwork on Yaoure Sulphide Ore - Project Number 10866-395.* Unpublished report to Amara Mining plc.

SGS Mineral Services UK Ltd. (2013b). *Further Metallurgical Testwork on Samples from the Yaouré Gold Deposit, Côte d'Ivoire – Project Number 10866-425.* Unpublished report to Amara Mining plc.

Sonnendrucker, P. (1968). *The Study of the Yaouré Auriferous Region.* Société d'Etat pour le Développement Minier de Côte d'Ivoire (SODEMI).

SRK Consulting. (2008). *Technical Review of the Angovia Gold Mine, Mount Yaouré, Côte d'Ivoire.* Unpublished report to Cluff Gold plc.

Tamlyn, P. (2016). *Prefeasibility Study of the Yaouré Gold Project, Côte d'Ivoire.* Unpublished report by NT Mining Consulting to Amara Mining plc, effective date February 26, 2016.

Tetra Tech. (2015). *Technical Report and Prefeasibility Study of the Yaouré Gold Project, Côte d'Ivoire, Report No. 1494400100-REP-0001-01.* Unpublished report to Amara Mining plc, effective date May 14, 2015.

Tourigny, G. (2022). *Petrographic description of twenty-one rock samples from the Yaouré gold project, Côte d'Ivoire.* Unpublished report to Perseus Mining.

Tourigny, G. (2023). *Petrographic description of thirteen rock samples from the Yaouré mine.* Unpublished report to Perseus Mining.

Townend, R. (2016). *Polished Thin Section Preparation and Petrographic/Mineragraphic Descriptions of 39 Drill Core Samples.* Unpublished report to Perseus Yaouré SARL.

Wardell Armstrong. (2015). *Pre-feasibility Testing on Samples from the Yaouré Gold Project, Côte d'Ivoire.* Unpublished report to Amara Mining plc.

Weir Minerals. (2016). *Cavex® Hydrocyclones.* Product Brochure. Retrieved August 11, 2023, from https://www.global.weir/globalassets/resources/product-pdfs/cavex/wmd0192-cavex-hydro-broch-a4-20161129-lores.pdf