Technical Report on the Agua Rica Integrated Project, Catamarca Province, Argentina Report for NI 43-101

Yamana Gold Inc.

SLR Project No: 233.03494.R000

Effective Date:
June 30, 2019

Signature Date:
August 31, 2022

Prepared By:

SLR Consulting (Canada) Ltd.
David J.F. Smith, CEng

Deswik Mining Consultants (Australia) Pty Ltd.
Giorgio de Tomi, FIMMM, CEng

Yamana Gold Inc.
Dominic Chartier, P.Geo.

Fluor Corporation
Kevin A. Dardis, FAusIMM (CP)

SRK Consulting (U.S.), Inc.
Berkley J. Tracy, PG, CPG, P.Geo

MM Consultores Limitada
Anthony (Tony) Maycock, P.Eng.

Technical Report on the Agua Rica Integrated Project, Catamarca Province, Argentina

SLR Project No: 233.03494.R000

Prepared by
SLR Consulting (Canada) Ltd.
55 University Ave., Suite 501
Toronto, ON M5J 2H7

for

Yamana Gold Inc.
Royal Bank Plaza, North Tower
200 Bay Street, Suite 2200
Toronto, Ontario M5J 2J3

Effective Date – June 30, 2019
Signature Date - August 31, 2022

Prepared by:
SLR Consulting (Canada) Ltd.:
David J.F. Smith, CEng

Yamana Gold Inc.:
Dominic Chartier, P.Geo.

SRK Consulting (U.S.), Inc.:
Berkley J. Tracy, PG, CPG, P.Geo.

Deswik Mining Consultants (Australia) Pty Ltd.:
Giorgio de Tomi, FIMMM, CEng

Fluor Corporation:
Kevin A. Dardis, FAusIMM (CP)

MM Consultores Limitada:
Anthony (Tony) Maycock, P.Eng.

Peer Reviewed by:
Deborah A. McCombe, P.Geo.

Approved by:

Project Manager
David J.F. Smith, CEng

Project Director
Deborah A. McCombe, P.Geo.

FINAL

Distribution: 1 copy – Yamana Gold Inc.
1 copy – SLR Consulting (Canada) Ltd.

CONTENTS

1.0 SUMMARY 1-1

1.1 Executive Summary 1-1
1.2 Economic Analysis 1-5
1.3 Technical Summary 1-14

2.0 INTRODUCTION 2-1

2.1 Sources of Information 2-2
2.2 List of Abbreviations 2-4

3.0 RELIANCE ON OTHER EXPERTS 3-1

4.0 PROPERTY DESCRIPTION AND LOCATION 4-1

4.1 Mineral Tenure 4-2
4.2 Underlying Agreements 4-8
4.3 Permits and Authorization 4-9
4.4 Environmental Considerations 4-10

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY 5-1

5.1 Accessibility 5-1
5.2 Physiography 5-1
5.3 Climate 5-2
5.4 Vegetation 5-3
5.5 Local Resources 5-3
5.6 Infrastructure 5-4

6.0 HISTORY 6-1

6.1 Property and Exploration History 6-1
6.2 Historical Resource Estimates 6-4
6.3 Past Production 6-5

7.0 GEOLOGICAL SETTING AND MINERALIZATION 7-1

7.1 Tectonic Context 7-1
7.2 Regional Geology 7-1
7.3 Local and Property Geology 7-5
7.4 Structural Setting 7-20
7.5 Veining and Alteration 7-20
7.6 Mineralization 7-25
7.7 Geological Interpretation and Cross-Sections 7-27

8.0 DEPOSIT TYPES 8-1

8.1	Agua Rica – Key Points	8-1
8.2	Porphyry Cu ± Mo ± Au Deposit Model	8-1
8.3	High Sulphidation Epithermal Deposit Model	8-4
8.4	Relationship between Porphyry and Epithermal Environments	8-5
9.0	**EXPLORATION**	**9-1**
9.1	BHP-Northern Orion Joint Venture (1994 to 2002)	9-1
9.2	Northern Orion (2002 to 2007)	9-2
9.3	Yamana (2007 to 2011)	9-2
9.4	Yamana-Alumbrera Joint Venture (2011 to 2014)	9-3
10.0	**DRILLING**	**10-1**
10.1	Cities Services Argentina (1972 to 1973)	10-3
10.2	BHP-Northern Orion Joint Venture (1994 to 2002)	10-3
10.3	Northern Orion (2002 to 2007)	10-4
10.4	Yamana (2007 to 2011)	10-4
10.5	Yamana-Alumbrera Joint Venture (2011 to 2014)	10-4
10.6	Down Hole Surveys	10-5
11.0	**SAMPLE PREPARATION, ANALYSES, AND SECURITY**	**11-1**
11.1	Sample Preparation, Analysis, and Security	11-1
11.2	Quality Assurance and Quality Control Programs	11-3
11.3	Density Determinations	11-5
12.0	**DATA VERIFICATION**	**12-1**
12.1	Data Verification by BHP-Northern Orion Joint Venture	12-1
12.2	Data Verification by Yamana-Alumbrera Joint Venture	12-1
12.3	Historical Verification	12-1
12.4	Qualified Person's Comment	12-2
13.0	**MINERAL PROCESSING AND METALLURGICAL TESTING**	**13-1**
13.1	Introduction	13-1
13.2	Historical Test Work	13-1
13.3	2012/13 Metallurgical Test Work	13-3
13.4	2019 Pre-Feasibility Study Review	13-8
13.5	Representativeness of the Samples	13-9
13.6	Deleterious Elements	13-11
13.7	Conclusions and Comments	13-12
14.0	**MINERAL RESOURCE ESTIMATE**	**14-1**
14.1	Resource Database	14-2
14.2	Geological Interpretation	14-3
14.3	Statistical Analysis	14-8

14.4 Trend Analysis 14-23
14.5 Bulk Density 14-38
14.6 Block Models 14-39
14.7 Block Model Validation 14-46
14.8 Classification 14-57
14.9 Cut-Off Value and Optimized Pit Shell Parameters 14-58
14.10 Qualified Person's Comment 14-58

15.0 MINERAL RESERVE ESTIMATE 15-1

15.1 Net Smelter Return 15-2
15.2 Mining, Processing, and General and Administration Assumptions 15-2
15.3 Cut-Off Value 15-4

16.0 MINING METHODS 16-1

16.1 Geotechnical Considerations 16-1
16.2 Open Pit Mine Design 16-3
16.3 Life of Mine Plan 16-13
16.4 Mine Equipment 16-20
16.5 Mine Labour 16-25
16.6 Groundwater Management Plan 16-29
16.7 Mine Dewatering Flow Estimation 16-32

17.0 RECOVERY METHODS 17-1

17.1 Overview 17-1
17.2 Process Design Basis 17-1
17.3 Plant Design 17-9
17.4 Arsenic Management 17-26
17.5 Power, Water, and Process Materials Requirements 17-26
17.6 Comments 17-27

18.0 PROJECT INFRASTRUCTURE 18-1

18.1 Site Layout 18-1
18.2 Campo Arenal Site 18-4
18.3 Alumbrera Site 18-5
18.4 Off-Site Facilities 18-7
18.5 Access Roads 18-10
18.6 Power Supply 18-11
18.7 Water Supply Systems 18-11
18.8 Wastewater Systems 18-12
18.9 Communication and Information Management Systems 18-13
18.10 Waste Rock Facility 18-13
18.11 Water Management 18-13

18.12 Waste Disposal Facilities 18-18

19.0 MARKET STUDIES AND CONTRACTS 19-1

19.1 Marketing Terms 19-1
19.2 Stream 19-2
19.3 Copper Concentrate 19-2
19.4 Molybdenum Concentrate 19-5

20.0 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT 20-1

20.1 Environmental Aspects 20-1
20.2 Environmental Permitting 20-2
20.3 Social Environment and Community Relations 20-3
20.4 Closure and Post-Closure 20-6

21.0 CAPITAL AND OPERATING COSTS 21-1

21.1 Capital Costs 21-1
21.2 Operating Costs 21-10

22.0 ECONOMIC ANALYSIS 22-1

22.1 Introduction 22-1
22.2 Economic Criteria 22-1
22.3 Taxation and Royalties 22-2
22.4 Cash Flow Analysis 22-8
22.5 Sensitivity Analysis 22-8

23.0 ADJACENT PROPERTIES 23-1

24.0 OTHER RELEVANT DATA AND INFORMATION 24-1

24.1 Project Execution Plan 24-1
24.2 Direct Workforce 24-7
24.3 Risk Assessment and Management 24-8

25.0 INTERPRETATION AND CONCLUSIONS 25-1

26.0 RECOMMENDATIONS 26-1

27.0 REFERENCES 27-1

28.0 DATE AND SIGNATURE PAGE 28-1

29.0 CERTIFICATE OF QUALIFIED PERSON 29-1

29.1 David J. F. Smith 29-1
29.2 Dominic Chartier 29-3
29.3 Berkley J. Tracy 29-4
29.4 Giorgio de Tomi 29-5

29.5 Kevin A. Dardis 29-6
29.6 Anthony (Tony) Maycock 29-7

TABLES

Table 1-1: Mineral Resource Estimate – June 30, 2019 1-3
Table 1-2: Mineral Reserve Estimate – June 30, 2019 1-3
Table 1-3: After-Tax Cash Flow Summary 1-8
Table 1-4: After-Tax NPV and IRR Sensitivity 1-13
Table 1-5: Initial Capital Estimate 1-22
Table 1-6: Sustaining Capital Estimate 1-22
Table 1-7: LOM Operating Cost per Tonne of Ore Processed 1-22
Table 2-1: Summary of QP Responsibilities 2-2
Table 4-1: Mineral Tenure Summary 4-2
Table 4-2: Lode Ore Type Claims 4-3
Table 4-3: Easement Rights Granted to Agua Rica 4-9
Table 6-1: Summary of Work History 1972 to 2014 6-1
Table 6-2: Summary of Historical Agua Rica Mineral Resources (1997 to 2012) 6-5
Table 9-1: Exploration Summary 9-1
Table 10-1: Summary of Drill Programs 10-1
Table 10-2: Summary of Reverse Circulation Drill Program 10-5
Table 13-1: Ball Mill, Rod Mill, and Abrasion Bond Indices 13-4
Table 13-2: Prediction for Recoveries and Concentrate Grades 13-6
Table 13-3: Distribution of Comminution Samples by Ore Type 13-10
Table 13-4: Main Ore Types 13-11
Table 13-5: Average of 2013 Flotation Results to Bulk Cu-Mo Concentrate – All Ore Types 13-12
Table 14-1: Mineral Resource Estimate – June 30, 2019 14-2
Table 14-2: Resource Database Summary 14-2
Table 14-3: Numeric Codes for Lithology 14-4
Table 14-4: Numeric Codes for Alteration 14-6
Table 14-5: Numeric Codes of Mineralized Zones 14-7
Table 14-6: Copper – Variogram Models for Each Estimation Domain 14-24
Table 14-7: Molybdenum – Variogram Models for Each Estimation Domain 14-27
Table 14-8: Gold – Variogram Models for Each Estimation Domain 14-30
Table 14-9: Arsenic – Variogram Models for Each Estimation Domain 14-32

Table 14-10: Bulk Densities 14-38
Table 14-11: Block Model Parameters 14-40
Table 14-12: Copper Estimation Parameters 14-42
Table 14-13: Molybdenum Estimation Parameters 14-43
Table 14-14: Gold Estimation Parameters 14-44
Table 14-15: Arsenic Estimation Parameters 14-45
Table 14-16: Agua Rica Classification Parameters 14-58
Table 15-1: Mineral Reserve Estimate – June 30, 2019 15-1
Table 15-2: NSR Assumptions 15-2
Table 15-3: Mining Cost Estimation – Fixed 15-2
Table 15-4: Mining Cost Estimation – Variable 15-3
Table 15-5: Processing Cost Estimation 15-4
Table 16-1: Geotechnical Parameters 16-1
Table 16-2: Agua Rica Open Pit Design Results 16-3
Table 16-3: Mining Phases 16-5
Table 16-4: LOM Mining Plan 16-13
Table 16-5: LOM Processing Plan 16-16
Table 16-6: Concentrate Production 16-19
Table 16-7: Contractor Mine Equipment 16-22
Table 16-8: Owner Mine Equipment 16-23
Table 16-9: Contractor Labour 16-25
Table 16-10: Primary Labour 16-27
Table 16-11: Average Surface Runoff Estimation per Period, L/s 16-32
Table 17-1: Process Design Criteria (Updated to 2019) 17-2
Table 17-2: Summary of the Ore Overland Conveyor System 17-12
Table 19-1: Treatment and Refining Terms 19-1
Table 21-1: Project Costs Developed and Sources 21-1
Table 21-2: Overall Capital Estimate 21-2
Table 21-3: Agua Rica Mine Site Facilities Capital Estimate 21-4
Table 21-4: Ore and Waste Rock Conveyance Tunnel Capital Estimate 21-4
Table 21-5: Agua Rica Site Infrastructure Capital Estimate 21-5
Table 21-6: Agua Rica Site Ore Handling – Ore Capital Estimate 21-5
Table 21-7: Alumbrera Site Facilities Capital Estimate 21-5
Table 21-8: Plant, Process, and Facilities Indirect Capital Cost Estimate 21-6

Table 21-9: Initial Mine Capital Estimate 21-7
Table 21-10: Owners' Cost Initial Capital Estimate 21-8
Table 21-11: Sustaining Capital Estimate 21-10
Table 21-12: LOM Operating Cost per Tonne of Ore Processed 21-11
Table 21-13: Mine Operating Cost by Activity 21-11
Table 21-14: Mine Cost per Tonne Moved 21-13
Table 21-15: Loading Cost Parameters 21-14
Table 21-16: Haulage Cost Parameters 21-14
Table 21-17: Drill Cost Parameters 21-15
Table 21-18: Blasting Cost Parameters 21-15
Table 21-19: Support Activities Cost Parameters 21-15
Table 21-20: Plant Operating Cost 21-16
Table 22-1: After-Tax Cash Flow Summary 22-4
Table 22-2: After-Tax NPV and IRR Sensitivity 22-9
Table 24-1: Distribution of Employees by Department during Operations 24-7
Table 24-2: Glencore Risk Assessment Calculator 24-8

FIGURES

Figure 1-1: After-Tax NPV Sensitivity Analysis 1-12
Figure 1-2: After-Tax IRR Sensitivity Analysis 1-14
Figure 4-1: Location Map of the Agua Rica Project 4-1
Figure 4-2: Mineral Concessions of the Agua Rica Project 4-5
Figure 7-1: Location of Farallón Negro Volcanic Complex 7-3
Figure 7-2: Regional Geology Map 7-4
Figure 7-3: Property Area Geology 7-8
Figure 7-4: Geological Map of the Agua Rica Deposit 7-9
Figure 7-5: Photographs of Main Lithologies 7-16
Figure 7-6: Lithology, 2,800 m 7-18
Figure 7-7: Lithology, 3,400 m 7-19
Figure 7-8: Examples of Alteration 7-23
Figure 7-9: Post-Mineralization Silicification and Decrease in Mineralized Veinlets 7-24
Figure 7-10: Schematic Cross-Section Showing Lithology and Types of Mineralization 7-30
Figure 7-11: Lithological Section on 6,969,130 N, Southern Sector 7-31
Figure 7-12: Lithological Section on 6,969,285 N, Central Sector 7-32

Figure 7-13: Lithological Section on 6,969,485 N, Northern Sector..7-33
Figure 8-1: Tectonic Setting for Magmatic Arcs 8-2
Figure 8-2: Idealized Porphyry Alteration (Left) and Mineralization (Right)...8-3
Figure 8-3: Schematic Setting for Porphyry-Epithermal Deposits...8-5
Figure 8-4: Schematic Depiction of Porphyry-Epithermal Alteration 8-6
Figure 10-1: Drilling Informing Mineral Resource Model...10-2
Figure 10-2: Differences Between Maximum and Minimum Values of Azimuth and Dip 10-6
Figure 13-1: Spatial Distribution of Comminution Samples 13-10
Figure 14-1: Lithology Model 14-5
Figure 14-2: Alteration Model 14-6
Figure 14-3: Mineralization Model...14-7
Figure 14-4: Descriptive Statistics and Box Plot for Copper by Lithology (Two Metre Sample Length) .14-8
Figure 14-5: Descriptive Statistics and Box Plot for Copper by Alteration Type (Two Metre Sample Length) 14-9
Figure 14-6: Descriptive Statistics and Box Plot for Copper by Mineralized Zone (Two Metre Sample Length) 14-10
Figure 14-7: Descriptive Statistics and Box Plot for Molybdenum by Lithology (Two Metre Sample Length) 14-11
Figure 14-8: Descriptive Statistics and Box Plot for Molybdenum by Alteration (Two Metre Sample Length) 14-12
Figure 14-9: Descriptive Statistics and Box Plot for Molybdenum by Mineralized Zone (Two Metre Sample Length) 14-13
Figure 14-10: Descriptive Statistics and Box Plot for Gold by Lithology (Two Metre Sample Length).... 14-14
Figure 14-11: Descriptive Statistics and Box Plot for Gold by Alteration Zone (Two Metre Sample Length) 14-15
Figure 14-12: Descriptive Statistics and Box Plot for Gold by Mineralized Zone (Two Metre Sample Length) 14-16
Figure 14-13: Descriptive Statistics and Box Plot for Arsenic by Lithology (Two Metre Sample Length) 14-17
Figure 14-14: Descriptive Statistics and Box Plot for Arsenic by Alteration (Two Metre Sample Length) 14-18
Figure 14-15: Descriptive Statistics and Box Plot for Arsenic by Mineralized Zone (Two Metre Sample Length) 14-19
Figure 14-16: Domain 3 Copper Variogram 14-26
Figure 14-17: Domain 3 Molybdenum Variogram 14-29
Figure 14-18: Domain 1 Gold Variogram 14-31

Figure 14-19: Domain 101 Arsenic Variogram 14-34
Figure 14-20: Contact Plots of Copper by Mineralization Domain 14-35
Figure 14-21: Contact Plots of Molybdenum by Mineralization Domain 14-36
Figure 14-22: Contact Plots of Gold by Mineralization Domain 14-37
Figure 14-23: SW-NE Copper Swath Plot 14-47
Figure 14-24: E-W Molybdenum Swath Plot 14-47
Figure 14-25: E-W Gold Swath Plot 14-48
Figure 14-26: N-S Arsenic Swath Plot 14-48
Figure 14-27: Estimated Copper in Block Model and Drilling -Cross Section and Plan View 14-49
Figure 14-28: Estimated Copper in Block Model and Drilling – Cross Sections 14-50
Figure 14-29: Estimated Gold in Block Model and Drilling – Cross Section and Plan View 14-51
Figure 14-30: Estimated Gold in Block Model and Drilling – Cross Sections 14-52
Figure 14-31: Estimated Molybdenum in Block Model and Drilling – Cross Section and Plan View 14-53
Figure 14-32: Estimated Molybdenum in Block Model and Drilling – Cross Sections 14-54
Figure 14-33: Estimated Arsenic in Block Model and Drilling – Cross Section and Plan View 14-55
Figure 14-34: Estimated Arsenic in Block Model and Drilling – Cross Sections 14-56
Figure 15-1: Mining Cost Estimation – WRF Top Down 15-3
Figure 16-1: Recommended Geotechnical Pits 16-2
Figure 16-2: Mining Equipment and Road Profile 16-3
Figure 16-3: Agua Rica Mine Design 16-4
Figure 16-4: Agua Rica Mine Phase 1 16-6
Figure 16-5: Agua Rica Mine Phase 2 16-7
Figure 16-6: Agua Rica Mine Phase 3 16-8
Figure 16-7: Agua Rica Mine Phase 4 16-9
Figure 16-8: Agua Rica Mine Phase 5 16-10
Figure 16-9: Agua Rica Mine Phase 6 16-11
Figure 16-10: Mining Phase Design – Base Case 16-12
Figure 16-11: Material Movement – By Origin/Destination 16-15
Figure 16-12: Mine Schedule – Benches by Phase 16-15
Figure 16-13: Plant Feed 16-16
Figure 16-14: Copper Concentrate Tonnes and Copper Grade 16-18
Figure 16-15: Copper Concentrate Tonnes and Arsenic Grade 16-18
Figure 16-16: Material Movement by Owner/Contractor 16-20
Figure 16-17: Contractor Mine Equipment 16-23

Figure 16-18: Owner Mine Equipment 16-24
Figure 16-19: Contractor Labour 16-27
Figure 16-20: Primary Labour 16-28
Figure 16-21: Final Pit Configuration Showing the Area Required for a Horizontal Drain 16-30
Figure 16-22: Typical Self-Prime Diesel Pump for Pit Sump 16-31
Figure 17-1: Block Flow Diagram – First Five Year Average 17-8
Figure 17-2: General Layout of Ore Crushing and Mine Services Area 17-10
Figure 17-3: Recommended Flotation Circuit – 2019 Review 17-18
Figure 17-4: Concentrate Production and Pipeline Capacity 17-22
Figure 18-1: General Arrangement – Primary Crushing and Mine Services 18-3
Figure 18-2: Layout of In-Pit Tailings Storage Facilities System 18-7
Figure 18-3: Alumbrera Concentrate Pipeline Route 18-8
Figure 18-4: Ship Loading Facility 18-9
Figure 18-5: West Access Route (Detail) 18-11
Figure 18-6: Schematic Section View of Diversion Channel and Intakes 18-15
Figure 18-7: Schematic Plan View of Diversion Channel and Intakes 18-16
Figure 19-1: Estimated Refined Copper Supply and Demand to 2030...19-3
Figure 21-1: Annual Sustaining Capital Cash Flow 21-9
Figure 21-2: Mine Operating Cost per Tonne...21-13
Figure 22-1: After-Tax NPV Sensitivity Analysis 22-8
Figure 22-2: After-Tax IRR Sensitivity Analysis 22-10
Figure 24-1: Areas of Responsibility Under Owner Organization for Execution Phase 24-1
Figure 24-2: EPCM/EPC Scope and Organization for the Execution Phase...24-2
Figure 24-3: Mine Organization Chart...24-6
Figure 24-4: Infrastructure Organization Chart..24-7

1.0 SUMMARY

1.1 Executive Summary

Roscoe Postle Associates Inc. (RPA), now part of SLR Consulting (Canada) Ltd. (SLR), was retained by Yamana Gold Inc. (Yamana) to compile a Technical Report on the Agua Rica Integrated Project (Agua Rica or the Project). Yamana and Fluor Corporation (Fluor) have prepared an initial phase (PFS-A) (Fluor, 2019) of a two phase Pre-Feasibility Study (PFS-A and PFS-B) for the Project. The purpose of this Technical Report is to disclose the results of PFS-A and to support the disclosure of the June 30, 2019 Agua Rica Mineral Resource and Mineral Reserve estimates. This Technical Report conforms to National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101).

In September 2019, RPA was acquired by SLR and for the purposes of this Technical Report all references to SLR include RPA. RPA originally issued this Technical Report to Yamana on October 31, 2019 (the 2019 Technical Report). The 2019 Technical Report was not released publicly as Yamana deemed the Project to be a non-material asset at the time. During 2022, sections of the 2019 Technical Report have been updated minimally for accuracy and completeness. No new material technical work has been completed on the Project and therefore the effective date of this Technical Report remains June 30, 2019.

This Technical Report was co-authored by RPA, Yamana, SRK Consulting (U.S.), Inc. (SRK), Deswik Mining Consultants (Australia) Pty Ltd. (Deswik), formerly MCB Serviços e Mineração Ltda., Fluor Corporation (Fluor), and MM Consultores Limitada (MM Consultores). All currency in this Technical Report is in US dollars (US$) unless otherwise noted.

Agua Rica is a large-scale porphyry copper, gold, silver, and molybdenum deposit located in the Catamarca Province in northwest Argentina, at an elevation of approximately 3,300 metres above sea level (masl).

In March 2019, Yamana, Glencore International AG (Glencore) and Goldcorp Inc. (Goldcorp) (collectively, the Parties or Owners) announced the signing of an integration agreement (the Integration Agreement) pursuant to which Agua Rica would be developed and operated using the existing infrastructure and facilities located at Alumbrera (the Integrated Project), 35 km west of the Project. The ownership of the Integrated Project, upon the consummation of the integration structure, was set forth at: Yamana 56.25%, Glencore 25.00%, and Goldcorp 18.75%. Following the Goldcorp-Newmont merger in April 2019, Goldcorp's interest is now held by Newmont Goldcorp Corporation (Newmont Goldcorp). The three parties also share ownership of Alumbrera, with Glencore as manager and 50% owner of the Alumbrera Project (Alumbrera) with Newmont Goldcorp owning 37.5% and Yamana owning the remaining 12.5%. Yamana owns 100% of the Agua Rica property and the combination 1:1 of the Agua Rica Project and Alumbrera Project results in the Agua Rica Integrated Project ownership structure indicated above.

The Integration Agreement provides the Parties with a path to a full integration of the Project and Alumbrera facilities, both technically and legally. Full integration is expected to occur by the filing of the FS and environmental impact assessment (EIA) or prior to if the Parties agree.

The objective of PFS-A was to define a project development case that is technically solid and provides financial returns that meet the Owners' thresholds. The current work has been developed at a pre-feasibility study (PFS) level, building upon a base of work completed in previous studies, primarily the Agua Rica 2013 feasibility study (2013 FS) and subsequent 2016 FS update. The Owners have continued to carry out ongoing value-seeking phases, including PFS-B, with the goal of reducing costs and schedule.

The Project is proposed to be developed and operated using the existing infrastructure and facilities of Minera Alumbrera Ltd. (MAA), located approximately 35 km west of the Agua Rica deposit. MAA concluded open pit mining in 2018 and its facilities are currently under care and maintenance. The Project will integrate and utilize the following MAA facilities: processing plant, fresh water wellfield at Campo Arenal, tailings dam, concentrate pipeline, filter plant, rail system from Tucumán province to Rosario port, and concentrate shipping facilities at Rosario port.

The mining operation at Agua Rica will be a conventional truck and shovel operation, producing an estimated 110,000 tonnes per day (tpd) or 40 million tonnes per year (Mtpa) of ore for the concentrator and 190,000 tpd (70 Mtpa) of waste. The operating life of mine (LOM) is approximately 28 years, after the completion of preproduction mining work which includes the pit construction and prestripping phase, haul road development and crusher platform excavation, and lasts approximately four years from full notice to proceed (FNTP).

Initial capital of $2,386 million for new construction, refurbishment of the MAA facilities, and preproduction mine development is expended over a four year period. The total LOM sustaining capital is estimated to be $1,537 million which will be expended during a 28 year period.

The LOM production cost is estimated to be $12.93/t of ore processed, excluding the cost of the capitalized prestripping.

The financial analysis indicates that the Project has an after-tax return of $8,902 million and a payback period of eight years (from notice to proceed). The net present value (NPV) at an 8% discount rate is $1,986 million and the after-tax internal rate of return (IRR) is 19.7%. The financial model is related to the base case mine plan of processing 40 Mtpa.

The Mineral Resource estimate, effective as of June 30 19, 2019 for Agua Rica, is summarized in Table 1-1 and is reported on a 100% basis. The Mineral Resources in Table 1-1 are exclusive of the Mineral Reserves.

The Agua Rica Mineral Resources stated in Table 1-1 are based on the Mineral Resource model prepared in December 2012, constrained by a 2019 updated optimized pit shell based on metal price assumptions of US$4.00/lb for Cu; US$1,600/oz for Au; US$24/oz for Ag; and US$11.00/lb for Mo. Open pit Mineral Resources are reported at a variable cut-off value that averages $8.42/t.

The Mineral Resource and Mineral Reserve estimates have been prepared in accordance with Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves dated May 10, 2014 (CIM (2014) definitions).

Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources will be converted into Mineral Reserves in the future. The responsible Qualified Person (QP) is not aware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant issues that would materially affect the Mineral Resource estimate.

Table 1-1: Mineral Resource Estimate – June 30, 2019
Yamana Gold Inc.– Agua Rica Integrated Project

Category	Tonnes (000 t)	Grade				Contained Metal			
		(% Cu)	(g/t Au)	(g/t Ag)	(% Mo)	(Mlb Cu)	(000 oz Au)	(000 oz Ag)	(Mlb Mo)
Measured	53,600	0.22	0.13	1.55	0.02	260	224	2,671	24
Indicated	206,300	0.30	0.11	1.86	0.03	1,364	730	12,337	136
M+I	**259,900**	**0.28**	**0.11**	**1.80**	**0.03**	**1,624**	**954**	**15,008**	**160**
Inferred	742,900	0.23	0.09	1.62	0.03	3,767	2,150	38,693	491

Notes:

1. The Mineral Resources have been validated by Berkley J. Tracy of SRK Consulting (U.S.), Inc., and a QP as defined by NI 43-101.
2. CIM (2014) definitions were followed for Mineral Resources.
3. Mineral Resources are reported exclusive of Mineral Reserves.
4. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
5. Mineral Resources are estimated using a variable metallurgical recovery. LOM average metallurgical recoveries of 86% Cu, 35% Au, 43% Ag, and 44% Mo were considered.
6. Mineral Resources are constrained by an optimized pit shell based on metal price assumptions of US$4.00/lb Cu, US$1,600/oz Au, US$24/oz Ag, and US$11/lb Mo. Open pit Mineral Resources are reported at a variable cut-off value which averages $8.42/t milled with overall slope angles varying from 39° to 45° depending on the geotechnical sector.
7. Numbers may not add due to rounding.

The Mineral Reserve estimate at June 30, 2019 for Agua Rica is summarized in Table 1-2 and is reported on a 100% basis. The responsible QP is not aware of any environmental, legal, title, taxation, socioeconomic, marketing, political or other relevant factors that would materially affect the estimation of Mineral Reserves that are not discussed in this Technical Report.

Table 1-2: Mineral Reserve Estimate – June 30, 2019
Yamana Gold Inc.– Agua Rica Integrated Project

Category	Tonnes (000 t)	Grade				Contained Metal			
		(% Cu)	(g/t Au)	(g/t Ag)	(% Mo)	(Mlb Cu)	(000 oz Au)	(000 oz Ag)	(Mlb Mo)
Proven	587,200	0.57	0.25	3.02	0.03	7,379	4,720	57,014	388
Probable	517,600	0.39	0.16	2.63	0.03	4,450	2,663	43,766	342
P+P	**1,104,800**	**0.49**	**0.21**	**2.84**	**0.03**	**11,829**	**7,382**	**100,781**	**731**

Notes:

1. The Mineral Reserves have been validated by Giorgio de Tomi of Deswik Mining Consultants (Australia) Pty Ltd. (Deswik), formerly MCB Serviços e Mineração Ltda, who is a QP as defined by NI 43-101.
2. CIM (2014) definitions were followed for Mineral Reserves.
3. Mineral Reserves are estimated using a variable metallurgical recovery. Average metallurgical recoveries of 86% Cu, 35% Au, 43% Ag, and 44% Mo were used.
4. Open pit Mineral Reserves are reported at a variable cut-off value averaging $8.42/t, based on metal price assumptions of US$3.00/lb Cu, US$1,250/oz Au, US$18/oz Ag, and US$11/lb Mo. A LOM average open pit costs of $1.72/t moved, processing and general and administrative (G&A) cost of $6.70/t of run of mine processed. The strip ratio of the mineral reserves is 1.7 with overall slope angles varying from 39° to 45° depending on the geotechnical sector.
5. Numbers may not add due to rounding.

1.1.1 Conclusions

Based on the Mineral Reserve estimate updated in June 2019, positive results achieved for PFS-A are as follows:

- Proven and Probable copper Mineral Reserves increased from year-end 2018 by 21% to 11.8 billion pounds, and gold Mineral Reserves increased by 12% to 7.4 million ounces.
- Initial capital cost estimate of $2.39 billion realizes significant synergies from using the infrastructure and facilities of Alumbrera.
- Annual production for the first 10 full years increased to 533 million pounds of copper equivalent production, including 107,000 ounces of gold and contributions of molybdenum and silver.
- Capital costs expected to fall well within the lower half of the cost curve, with cash costs decreased to US$1.29/lb Cu for the first 10 years of production, and all-in sustaining costs (AISC) decreased to US$1.52/lb Cu for the same period (non-GAAP financial measure).
- Project expected to generate strong economic returns, with NPV increased to $1.935 billion and increased after-tax IRR of 19.7%.
- Opportunities to further improve the economics will be evaluated in a subsequent FS. These opportunities include converting economic grade Inferred Mineral Resources within the pit and expanding throughput scenarios to increase metal production and returns.
- Several assumptions were made during the execution of the conceptual design of mining ancillary facilities, which need to be confirmed in more advanced stages of the Project with specific site investigations and lab testing.

1.1.2 Recommendations

It is recommended to continue into the FS to enhance the pre-feasibility phase in terms of value creation and risk mitigation including the following:

1. Develop full FS stage work plan, including tasks, schedule, and budget estimate.
2. Upgrade and advance mining ancillary facilities and associated water management structures to a PFS level.
3. Conduct alternative analysis for upstream water management systems.
4. Conduct further stability analysis for Alumbrera tailings storage facility (TSF) expansion .
5. Carry out a conceptual level evaluation (including mine plans) of the potential to mine additional Mineral Resources from the Alumbrera deposit including potential underground mine development and additional pushbacks in the open pit.
6. Conduct a trade-off study to determine the most effective and efficient Agua Rica loading and drilling equipment to be utilized for mining (Diesel/Hydraulic vs Electric). Complete assessment of all aspects – optimum match to operating requirements and project value.
7. Update risk register based on current project development scenario.
8. Conduct a throughput increase analysis by evaluating the maximum installed capacity of current facilities.
9. Obtain an independent view on current and future market conditions for sale of copper custom concentrates.

10. Review Project development schedule for alternatives and opportunities to improve schedule duration and critical paths.
11. Assess and select the best grinding circuit option for the Project.
12. Determine and define metallurgical test work program, including:
    - Test work purpose
    - Benefit/cost
    - Sample requirements
    - Drilling plan
    - Sample management
    - Schedule, etc.
13. Evaluate best approach to overall requirements of condemnation drilling for multiple purposes in different areas. Purposes include:
    - Metallurgical, geotechnical, hydrological, geo-hydrological, acid rock drainage (ARD) characterization, waste degradation (stability), etc.
14. Areas for additional drilling include:
    - Mine, ore stockpiles, infrastructure sites, tunnel, overland conveyor route, etc.
15. Conduct assessment of arsenic treatment alternatives, including alkaline sulphide leach, and roaster (conceptual, upside).
16. Conduct assessment of existing concentrate pipeline for current conditions and requirements to maintain. Conduct test work and analysis of Agua Rica concentrate (rheology, etc.) to determine estimated transport capacity of existing pipeline.
17. Develop full comprehensive water management plan to complete the Project. Include water treatment alternatives, water balance, etc.

A fully developed work plan and budget is required for the FS stage. This will include resources and input from the Project management team, Parties' team representatives, consultants, and engineering firms as required to develop a complete work program for the Project.

In addition to the study tasks listed, the following tasks will be required to complete the FS, including engineering design of layouts, drawings, and material take-offs to support a capital estimate update, report editing and compilation, project scheduling, etc.

1.2 Economic Analysis

1.2.1 Introduction

The financial evaluation presents the determination of the NPV, payback period (time in years to recapture the initial capital investment), and IRR for the Project. Annual cash flow projections were estimated over the LOM based on the estimates of sales revenue, capital expenditures, and production costs (Table 1-3). The sales revenue is based on the metal content of the concentrate produced. The estimates of capital and site production costs have been developed specifically for the Project and the detail of some of these costs has been presented in other sections of this Technical Report. The financial model information below is related to the base case scenario of 40 Mtpa.

1.2.2 Economic Criteria

1.2.2.1 Physicals

- 108,000 tpd mining from open pit (40 Mtpa).
- LOM Head Grade
    - 0.48% Cu
    - 0.21 g/t Au
    - 2.83 g/t Ag
    - 0.03% Mo
- Mill recovery averaging:
    - 86.0% Cu
    - 35.4% Au
    - 44.8% Ag
    - 43.7% Mo
- Average LOM annual concentrate production
    - Copper concentrate: 650,000 tpa
    - Molybdenum concentrate: 10,200 tpa

1.2.2.2 Revenue (100% Basis)

- Metal prices:
    - US$3.00/lb Cu
    - US$1,300/oz Au
    - US$18.00/oz Ag
    - US$11.00/lb Mo
- Average LOM NSR value: $28.66/t processed
- Revenue is recognized at the time of production

1.2.2.3 Costs (100% Basis)

- Pre-production period: 48 months
- Mine life: 28 years
- Pre-production capital: $2,386 million
- Sustaining capital: $1,537 million
- Average operating cost over the mine life is $12.93/t processed
- Closure and reclamation cost: $495 million
- NSR royalty: $1,382 million

- All-in Sustaining Cost (AISC) of US$1.52/lb Cu
- All-in Cost of US$1.73/lb Cu

1.2.3 Taxation and Royalties

RPA has relied on Yamana for guidance on applicable taxes, value added tax (VAT or IVA), royalties, and other government levies or interests, applicable to revenue or income from the Project.

For the fiscal years 2020 and onwards, taxes for corporations include a corporate tax rate of 25% and a dividend distribution withholding tax of 13%.

VAT is levied on the supply of goods and services subject to the tax, as well as on final imports of taxable goods and services into Argentina.

Exports of goods and services are zero-rated. This means VAT is not levied on the output, however, VAT paid on inputs may be recovered through tax refunds, which should be requested by the taxpayer.

The standard VAT rate is 21%. A reduced rate of 10.5% and an increased rate of 27% apply to specific activities.

An average rate of 16% is applied for VAT in the financial model over the total costs under the categories operating cost and capital. The distribution over the years of the VAT paid is assumed as a function of these expenditures.

In terms of VAT reimbursement related to the export of goods, it is assumed that that the sum of VAT recovered will match the sum of VAT paid at the end of the operation.

A fast VAT amortization was applied (tax benefit) in Year 1 and Year 2 of operations ($251 million VAT credit amortization).

No retention tax was applied in the model, as the Argentinian government has indicated that the retention tax will be eliminated in 2021 (prior to Agua Rica operations beginning).

A retention tax return (of retention taxes paid by Alumbrera) of $11.3 million was however projected from Year 2. This retention return was projected flat yearly during a period of 10 years.

The following royalties apply to the Project:

- Mining royalty (Boca de mina) of 2% of gross revenue.
- Fondo Fiduciario was estimated at 1.5% of gross revenue (an innovative initiative of the government of Argentina to eradicate poverty and alleviate unemployment which will be agreed as part of the provincial permitting process for the Project).
- Yacimientos Mineros Agua del Dionisio (YMAD), which is $0.145 per tonne processed as per a service agreement, as described in Section 4.

Table 1-3: After-Tax Cash Flow Summary
Yamana Gold Inc. - Agua Rica Integrated Project

	INPUTS	UNITS	Year TOTAL	2022 Year -4	2023 Year -3	2024 Year -2	2025 Year -1	2026 Year 1	2027 Year 2	2028 Year 3	2029 Year 4	2030 Year 5	2031 Year 6	2032 Year 7	2033 Year 8	2034 Year 9	2035 Year 10	2036 Year 11	2037 Year 12	2038 Year 13	2039 Year 14	2040 Year 15	2041 Year 16
MINING																							
Open Pit																							
Operating Days	365	days	10,220					365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365
Tonnes milled per day		tonnes / day	108,105					82,546	112,026	150,220	101,114	115,100	135,985	68,869	92,752	138,716	87,374	141,036	163,978	178,126	131,641	105,102	97,097
Tonnes moved per day		tonnes / day	297,246					437,472	443,892	442,049	367,537	334,278	392,271	356,431	351,525	377,594	345,493	339,172	351,992	345,251	344,532	321,466	454,185
Production		'000 tonnes	1,104,835					30,129	40,889	54,830	36,907	42,012	49,635	25,137	33,854	50,632	31,892	51,478	59,852	65,016	48,049	38,362	35,440
Waste	-	'000 tonnes	2,016,805		-	24,777	59,006	129,548	121,131	106,518	97,245	80,000	93,544	104,960	94,452	87,190	94,213	72,320	68,625	61,001	77,705	78,973	130,337
Total Moved		'000 tonnes	3,037,857					159,677	162,020	161,348	134,151	122,012	143,179	130,097	128,307	137,822	126,105	123,798	128,477	126,017	125,754	117,335	165,777
Stripping Ratio			1.83					4.30	2.96	1.94	2.63	1.90	1.88	4.18	2.79	1.72	2.95	1.40	1.15	0.94	1.62	2.06	3.68
PROCESSING																							
Mill Feed		'000 tonnes	1,104,835					28,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	39,938	40,000	40,000	40,000	40,000	40,000	40,000
Au Grade		g/t	0.21					0.41	0.31	0.19	0.16	0.21	0.26	0.23	0.23	0.26	0.20	0.23	0.22	0.16	0.10	0.13	0.14
Ag Grade		g/t	2.83					1.65	1.68	2.21	2.89	3.52	1.97	3.59	3.10	3.45	2.92	3.33	3.32	2.42	2.62	3.00	2.76
Cu Grade		%	0.48%					0.93%	0.80%	0.49%	0.62%	0.72%	0.68%	0.54%	0.40%	0.57%	0.38%	0.46%	0.40%	0.33%	0.40%	0.46%	0.45%
Mo Grade		%	0.03%					0.02%	0.02%	0.04%	0.05%	0.04%	0.03%	0.02%	0.02%	0.03%	0.03%	0.03%	0.02%	0.02%	0.05%	0.05%	0.04%
Contained Au		oz	7,338,381					366,401	401,175	247,745	208,070	268,658	336,350	298,211	293,974	340,363	254,674	291,006	281,122	210,658	130,170	172,665	185,677
Contained Ag		oz	100,686,751					1,489,529	2,166,807	2,843,951	3,716,895	4,524,428	2,537,514	4,614,722	3,991,350	4,436,315	3,752,503	4,287,986	4,275,082	3,108,883	3,368,804	3,861,378	3,546,354
Contained Cu		tonnes	5,324,697					259,892	318,789	194,023	248,970	286,736	272,417	216,473	158,390	229,623	152,341	184,131	158,154	130,324	159,605	184,770	179,079
Contained Mo		tonnes	324,905					5,355	7,158	15,011	19,686	15,230	10,146	7,452	8,278	13,710	11,817	10,789	8,399	8,934	21,440	21,721	14,633
Recovery																							
Copper Concentrate																							
Au Recovery		%	35.4%					37.9%	38.8%	30.2%	35.6%	38.4%	40.9%	33.9%	30.8%	34.3%	30.9%	33.4%	33.6%	34.8%	39.0%	37.3%	35.4%
Ag Recovery		%	44.8%					61.5%	56.7%	43.3%	39.7%	36.2%	49.5%	38.8%	32.7%	40.1%	37.9%	41.3%	41.2%	45.8%	45.8%	48.7%	46.1%
Cu Recovery		%	86.0%					89.4%	87.8%	83.1%	83.6%	83.6%	88.5%	83.0%	84.7%	85.7%	83.4%	85.2%	85.4%	85.3%	86.9%	86.0%	86.1%
Moly Concentrate																							
Mo Recovery		%	43.7%					52%	51%	37%	41%	35%	52%	33%	39%	43%	36%	40%	46%	50%	41%	34%	32%
Production																							
Copper Concentrate																							
Au		oz	2,602,871					138,730	155,792	74,929	74,156	103,109	137,581	101,129	90,446	116,605	78,584	97,054	94,428	73,354	50,802	64,464	65,770
Ag		oz	43,701,303					915,912	1,229,520	1,232,054	1,475,240	1,639,241	1,255,194	1,789,862	1,304,207	1,779,906	1,423,715	1,771,039	1,760,924	1,425,259	1,544,027	1,882,047	1,633,450
Cu		tonnes	4,588,785					232,335	279,927	161,253	208,166	239,753	241,154	179,771	134,121	196,883	127,071	156,813	135,066	111,193	138,715	158,935	154,098
Moly Concentrate																							
Mo		tonnes	142,593					2,764	3,668	5,560	8,050	5,281	5,256	2,476	3,248	5,877	4,226	4,350	3,841	4,454	8,766	7,414	4,685
Copper Concentrate		dmt	18,190,193					688,208	897,447	623,548	784,922	943,243	801,406	718,136	551,299	730,475	573,206	631,911	549,615	432,858	487,182	589,756	608,782
Au grade in concentrate		g/t	4.5					6.3	5.4	3.7	2.9	3.4	5.3	4.4	5.1	5.0	4.3	4.8	5.3	5.3	3.2	3.4	3.4
Ag grade in concentrate		g/t	74.7					41.4	42.6	61.5	58.5	54.1	48.7	77.5	73.6	75.8	77.3	87.2	99.7	102.4	98.6	99.3	83.5
Cu grade in concentrate		%	25.2%					33.8%	31.2%	25.9%	26.5%	25.4%	30.1%	25.0%	24.3%	27.0%	22.2%	24.8%	24.6%	25.7%	28.5%	26.9%	25.3%
As grade in concentrate		%	0.44%					0.09%	0.22%	0.50%	0.45%	0.28%	0.31%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.48%
Concentrate Moisture	9.5%																						
Copper Concentrate		wmt	20,099,661					760,450	991,654	689,004	867,317	1,042,258	885,532	793,520	609,170	807,155	633,377	698,244	607,309	478,296	538,323	651,664	672,688
Moly Concentrate		dmt	285,186					5,528	7,337	11,120	16,099	10,563	10,513	4,952	6,497	11,754	8,452	8,700	7,682	8,909	17,533	14,827	9,369
Mo grade in concentrate	50%	%	50%					50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Concentrate Moisture	2.0%																						
Moly Concentrate		wmt	291,006					5,641	7,486	11,347	16,428	10,779	10,727	5,053	6,629	11,994	8,624	8,878	7,839	9,090	17,890	15,130	9,560
Total Concentrate Tonnes		wmt	20,390,666					766,092	999,140	700,351	883,745	1,053,037	896,259	798,573	615,800	819,148	642,002	707,122	615,148	487,386	556,213	666,794	682,248
Total Recovered																							
Au		**oz**	**2,602,871**					**138,730**	**155,792**	**74,929**	**74,156**	**103,109**	**137,581**	**101,129**	**90,446**	**116,605**	**78,584**	**97,054**	**94,428**	**73,354**	**50,802**	**64,464**	**65,770**
Ag		**oz**	**43,701,303**					**915,912**	**1,229,520**	**1,232,054**	**1,475,240**	**1,639,241**	**1,255,194**	**1,789,862**	**1,304,207**	**1,779,906**	**1,423,715**	**1,771,039**	**1,760,924**	**1,425,259**	**1,544,027**	**1,882,047**	**1,633,450**
Cu		**tonnes**	**4,588,785**					**232,335**	**279,927**	**161,253**	**208,166**	**239,753**	**241,154**	**179,771**	**134,121**	**196,883**	**127,071**	**156,813**	**135,066**	**111,193**	**138,715**	**158,935**	**154,098**
Mo		**tonnes**	**142,592.8**					**2,764**	**3,668**	**5,560**	**8,050**	**5,281**	**5,256**	**2,476**	**3,248**	**5,877**	**4,226**	**4,350**	**3,841**	**4,454**	**8,766**	**7,414**	**4,685**
REVENUE																							
Metal Prices																							
Au	US$1,300 / oz Au	US$/oz Au	$ 1,300					$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300
Ag	US$18.00 / oz Ag	US$/oz Ag	$ 18.00					$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00
Cu	US$3.00 / lb Cu	US$/lb Cu	$ 3.00					$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00
Mo	US$11.00 / lb Mo	US$/lb Mo	$ 11.00					$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00
Copper Concentrate Payable %																							
Au		%	92.8%					94.0%	94.0%	92.0%	90.0%	92.0%	94.0%	92.0%	94.0%	92.0%	92.0%	92.0%	94.0%	94.0%	92.0%	92.0%	92.0%
Ag		%	90.0%					90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Cu		%	96.1%					96.5%	96.5%	96.0%	96.0%	96.0%	96.5%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.5%	96.0%	96.0%
Moly Concentrate Payable %																							
Mo		%	85.0%					85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Copper Concentrate Payable																							
Au		oz	2,415,815.13					130,406	146,444	68,935	66,740	94,860	129,326	93,039	85,019	107,277	72,297	89,289	88,762	68,953	46,738	59,307	60,508
Ag		oz	39,331,173					824,321	1,106,568	1,108,849	1,327,716	1,475,317	1,129,674	1,610,876	1,173,786	1,601,916	1,281,344	1,593,935	1,584,832	1,282,733	1,389,624	1,693,842	1,470,105
Cu		tonnes	4,410,619					224,204	270,130	154,803	199,840	230,163	232,714	172,581	128,756	189,008	121,989	150,541	129,664	106,746	133,860	152,578	147,934
Mo		tonnes	-					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Moly Concentrate Payable																							
Mo		tonnes	121,203.9					2,350	3,118	4,726	6,842	4,489	4,468	2,105	2,761	4,995	3,592	3,698	3,265	3,786	7,451	6,302	3,982
Gold Streaming Revenue																							
Stream Contracted Production	20%	oz	483,163	-	-	-	-	26,081	29,289	13,787	13,348	18,972	25,865	18,608	17,004	21,455	14,459	17,858	17,752	13,791	9,348	11,861	12,102
Stream Price	30%	USD/oz	$ 390	$ 0	$ 0	$ 0	$ 0	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390
Gold Stream Revenue Yamana		US$ '000	$ 188,434	$ 0	$ 0	$ 0	$ 0	$ 10,172	$ 11,423	$ 5,377	$ 5,206	$ 7,399	$ 10,087	$ 7,257	$ 6,632	$ 8,368	$ 5,639	$ 6,965	$ 6,923	$ 5,378	$ 3,646	$ 4,626	$ 4,720
Gold Revenue at Spot Price																							
Gold Production at Spot Price	80%	oz	1,932,652	-	-	-	-	104,325	117,155	55,148	53,392	75,888	103,461	74,431	68,016	85,821	57,838	71,432	71,010	55,162	37,391	47,445	48,406
Gold Spot Price		USD/oz	$ 1,300	$ 0	$ 0	$ 0	$ 0	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300
Gold Revenue at Spot Price		US$ '000	$ 2,512,448	$ 0	$ 0	$ 0	$ 0	$ 135,623	$ 152,302	$ 71,692	$ 69,410	$ 98,655	$ 134,499	$ 96,760	$ 88,420	$ 111,568	$ 75,189	$ 92,861	$ 92,312	$ 71,711	$ 48,608	$ 61,679	$ 62,928
All Metals Gross Revenue																							
Au Gross Revenue		US$ '000	$ 2,700,881					$ 145,794	$ 163,724	$ 77,069	$ 74,616	$ 106,054	$ 144,587	$ 104,017	$ 95,052	$ 119,935	$ 80,828	$ 99,826	$ 99,236	$ 77,089	$ 52,253	$ 66,305	$ 67,648
Ag Gross Revenue		US$ '000	$ 707,961					$ 14,838	$ 19,918	$ 19,959	$ 23,899	$ 26,556	$ 20,334	$ 28,996	$ 21,128	$ 28,834	$ 23,064	$ 28,691	$ 28,527	$ 23,089	$ 25,013	$ 30,489	$ 26,462
Cu Gross Revenue		US$ '000	$ 29,171,214					$ 1,482,851	$ 1,786,601	$ 1,023,843	$ 1,321,711	$ 1,522,263	$ 1,539,137	$ 1,141,424	$ 851,575	$ 1,250,071	$ 806,816	$ 995,657	$ 857,578	$ 706,000	$ 885,331	$ 1,009,129	$ 978,413
Mo Gross Revenue		US$ '000	$ 2,939,294					$ 56,979	$ 75,615	$ 114,610	$ 165,930	$ 108,868	$ 108,350	$ 51,038	$ 66,959	$ 121,141	$ 87,111	$ 89,668	$ 79,179	$ 91,817	$ 180,702	$ 152,820	$ 96,564
Total Gross Revenue		**US$ '000**	**$ 35,519,350**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 1,700,463**	**$ 2,045,859**	**$ 1,235,481**	**$ 1,586,156**	**$ 1,763,740**	**$ 1,812,408**	**$ 1,325,476**	**$ 1,034,714**	**$ 1,519,982**	**$ 997,819**	**$ 1,213,841**	**$ 1,064,520**	**$ 897,995**	**$ 1,143,300**	**$ 1,258,743**	**$ 1,169,087**
Treatment																							
Cu Concentrate	US$80.00 / dmt conc	US$ '000	$ 1,455,215					$ 55,057	$ 71,796	$ 49,884	$ 62,794	$ 75,459	$ 64,113	$ 57,451	$ 44,104	$ 58,438	$ 45,857	$ 50,553	$ 43,969	$ 34,629	$ 38,975	$ 47,180	$ 48,703
As Penalty	US$03.00 / dmt conc	US$ '000	$ 180,076					$ 0	$ 3,141	$ 7,483	$ 8,347	$ 5,021	$ 5,124	$ 8,618	$ 6,616	$ 8,766	$ 6,878	$ 7,583	$ 6,595	$ 5,194	$ 5,846	$ 7,077	$ 6,971
Mo Concentrate	US$00.00 / dmt conc	US$ '000	$ 0					$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Refining cost																							
Au	US$4.50 / oz Au	US$ '000	$ 10,871					$ 587	$ 659	$ 310	$ 300	$ 427	$ 582	$ 419	$ 383	$ 483	$ 325	$ 402	$ 399	$ 310	$ 210	$ 267	$ 272
Ag	US$0.40 / oz Ag	US$ '000	$ 15,732					$ 330	$ 443	$ 444	$ 531	$ 590	$ 452	$ 644	$ 470	$ 641	$ 513	$ 638	$ 634	$ 513	$ 556	$ 678	$ 588
Cu	US$0.08 / lb Cu	US$ '000	$ 807,063					$ 41,025	$ 49,429	$ 28,326	$ 36,567	$ 42,116	$ 42,582	$ 31,579	$ 23,560	$ 34,585	$ 22,322	$ 27,546	$ 23,726	$ 19,532	$ 24,494	$ 27,919	$ 27,069
Mo	US$0.00 / lb Mo	US$ '000	$ 0					$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Charges		US$ '000	$ 2,468,958	$ 0	$ 0	$ 0	$ 0	$ 96,998	$ 125,468	$ 86,446	$ 108,539	$ 123,613	$ 112,853	$ 98,711	$ 75,132	$ 102,912	$ 75,895	$ 86,721	$ 75,324	$ 60,179	$ 70,081	$ 83,121	$ 83,603
Net Smelter Return		**US$ '000**	**$ 33,050,393**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 1,603,464**	**$ 1,920,391**	**$ 1,149,035**	**$ 1,477,617**	**$ 1,640,127**	**$ 1,699,555**	**$ 1,226,765**	**$ 959,583**	**$ 1,417,070**	**$ 921,925**	**$ 1,127,119**	**$ 989,196**	**$ 837,816**	**$ 1,073,219**	**$ 1,175,622**	**$ 1,085,484**
Royalty NSR	Input Rate Into Proforma	US$ '000	$ 1,382,165	$ 0	$ 0	$ 0	$ 0	$ 59,516	$ 71,605	$ 43,242	$ 55,515	$ 67,541	$ 69,245	$ 52,202	$ 42,025	$ 59,010	$ 40,725	$ 48,295	$ 43,069	$ 37,240	$ 45,826	$ 49,866	$ 46,728
Net Revenue		**US$ '000**	**$ 31,668,227**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 1,543,948**	**$ 1,848,786**	**$ 1,105,793**	**$ 1,422,101**	**$ 1,572,586**	**$ 1,630,311**	**$ 1,174,563**	**$ 917,557**	**$ 1,358,060**	**$ 881,200**	**$ 1,078,825**	**$ 946,127**	**$ 800,576**	**$ 1,027,393**	**$ 1,125,756**	**$ 1,038,756**
Unit NSR		**US$/t milled**	**$ 28.66**					**$ 55.14**	**$ 46.22**	**$ 27.64**	**$ 35.55**	**$ 39.31**	**$ 40.76**	**$ 29.36**	**$ 22.94**	**$ 33.95**	**$ 22.06**	**$ 26.97**	**$ 23.65**	**$ 20.01**	**$ 25.68**	**$ 28.14**	**$ 25.97**
Other Income																							
Gold Stream Upfront Payment	$202,500	US$ '000	$ 202,500	$ 0	$ 50,625	$ 50,625	$ 101,250	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Revenue		**US$ '000**	**$ 31,870,727**	**$ 0**	**$ 50,625**	**$ 50,625**	**$ 101,250**	**$ 1,543,948**	**$ 1,848,786**	**$ 1,105,793**	**$ 1,422,101**	**$ 1,572,586**	**$ 1,630,311**	**$ 1,174,563**	**$ 917,557**	**$ 1,358,060**	**$ 881,200**	**$ 1,078,825**	**$ 946,127**	**$ 800,576**	**$ 1,027,393**	**$ 1,125,756**	**$ 1,038,756**

	INPUTS	UNITS	Year TOTAL	2022 Year -4	2023 Year -3	2024 Year -2	2025 Year -1	2026 Year 1	2027 Year 2	2028 Year 3	2029 Year 4	2030 Year 5	2031 Year 6	2032 Year 7	2033 Year 8	2034 Year 9	2035 Year 10	2036 Year 11	2037 Year 12	2038 Year 13	2039 Year 14	2040 Year 15	2041 Year 16
OPERATING COST																							
Mining (Open Pit)		US$/t moved	$ 1.81					$ 1.64	$ 1.82	$ 1.74	$ 1.50	$ 1.61	$ 2.16	$ 1.62	$ 1.76	$ 1.58	$ 1.46	$ 1.70	$ 1.60	$ 1.68	$ 1.39	$ 1.46	$ 1.72
Processing		US$/t milled	$ 5.53					$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53
Freight Cost to Port & Port Ops		US$/t milled	$ 0.54					$ 0.80	$ 0.73	$ 0.51	$ 0.64	$ 0.77	$ 0.65	$ 0.59	$ 0.45	$ 0.60	$ 0.47	$ 0.51	$ 0.45	$ 0.35	$ 0.40	$ 0.48	$ 0.50
Freight Cost to Asia		US$/t milled	$ 1.07					$ 1.60	$ 1.46	$ 1.01	$ 1.28	$ 1.53	$ 1.30	$ 1.17	$ 0.90	$ 1.19	$ 0.93	$ 1.03	$ 0.89	$ 0.70	$ 0.79	$ 0.96	$ 0.99
WRF Opex		US$/t milled	$ 0.06					$ 0.08	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06
G&A		US$/t milled	$ 0.87					$ 1.23	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86
Total Unit Operating Cost		**US$/t milled**	**$ 12.93**					**$ 18.58**	**$ 15.99**	**$ 14.99**	**$ 13.40**	**$ 13.67**	**$ 16.13**	**$ 13.48**	**$ 13.43**	**$ 13.68**	**$ 12.46**	**$ 13.27**	**$ 12.94**	**$ 12.79**	**$ 12.01**	**$ 12.18**	**$ 15.07**
Mining (Open Pit)		US$ '000	$ 5,378,748					$ 261,425	$ 294,195	$ 280,919	$ 201,387	$ 196,848	$ 309,201	$ 211,344	$ 225,383	$ 217,937	$ 184,129	$ 211,036	$ 206,168	$ 211,574	$ 174,996	$ 171,702	$ 285,306
Processing		US$ '000	$ 6,109,740					$ 154,840	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 220,856	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200
Freight Cost to Port & Port Ops	US$32.59 / dmt conc	US$ '000	$ 592,818					$ 22,429	$ 29,248	$ 20,321	$ 25,581	$ 30,740	$ 26,118	$ 23,404	$ 17,967	$ 23,806	$ 18,681	$ 20,594	$ 17,912	$ 14,107	$ 15,877	$ 19,220	$ 19,840
Freight Cost to Asia	US$65.00 / dmt conc	US$ '000	$ 1,182,363					$ 44,733	$ 58,334	$ 40,531	$ 51,020	$ 61,311	$ 52,091	$ 46,679	$ 35,834	$ 47,481	$ 37,258	$ 41,074	$ 35,725	$ 28,136	$ 31,667	$ 38,334	$ 39,571
WRF Opex		US$ '000	$ 65,965					$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356
G&A		US$ '000	$ 957,467					$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400
Total Operating Cost		**US$ '000**	**$ 14,287,100**					**$ 520,183**	**$ 639,733**	**$ 599,727**	**$ 535,943**	**$ 546,855**	**$ 645,366**	**$ 539,383**	**$ 537,140**	**$ 547,180**	**$ 497,680**	**$ 530,660**	**$ 517,760**	**$ 511,773**	**$ 480,496**	**$ 487,212**	**$ 602,672**
Operating Cashflow		**US$ '000**	**$ 17,583,627**	**$ 0**	**$ 50,625**	**$ 50,625**	**$ 101,250**	**$ 1,023,765**	**$ 1,209,053**	**$ 506,066**	**$ 886,158**	**$ 1,025,731**	**$ 984,944**	**$ 635,180**	**$ 380,418**	**$ 810,881**	**$ 383,520**	**$ 548,164**	**$ 428,367**	**$ 288,803**	**$ 546,897**	**$ 638,544**	**$ 436,083**
Corporate Overheads Costs		US$ '000	$ 95,747					$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440
CAPITAL COST																							
Direct Cost																							
Mining		US$ '000	$ 739,137	$ 204,551	$ 146,600	$ 161,621	$ 226,366	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Processing		US$ '000	$ 1,220,316	$ 0	$ 247,276	$ 501,183	$ 471,856	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Infrastructure		US$ '000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Tailings		US$ '000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Direct Cost		**US$ '000**	**$ 1,959,453**	**$ 204,551**	**$ 393,876**	**$ 662,804**	**$ 698,222**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Other Costs																							
EPCM / Owners / Indirect Cost		US$ '000	$ 96,000	$ 0	$ 30,000	$ 30,000	$ 36,000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Subtotal Costs		**US$ '000**	**$ 2,055,453**	**$ 204,551**	**$ 423,876**	**$ 692,804**	**$ 734,222**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Contingency		US$ '000	$ 330,923	$ 0	$ 0	$ 0	$ 0	$ 330,923	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Initial Capital Cost		**US$ '000**	**$ 2,386,376**	**$ 204,551**	**$ 423,876**	**$ 692,804**	**$ 734,222**	**$ 330,923**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Sustaining		US$ '000	$ 1,537,425	$ 0	$ 0	$ 0	$ 0	$ 471,767	$ 151,169	$ 68,665	$ 26,903	$ 4,739	$ 121,553	$ 67,787	$ 18,808	$ 19,693	$ 18,955	$ 210,503	$ 90,992	$ 5,658	$ 800	$ 34,619	$ 10,748
Working Capital		US$ '000	($ 0)	($ 33,905)	($ 36,354)	($ 40,415)	($ 2,704)	$ 107,229	$ 133,047	($ 47,393)	$ 32,920	$ 16,042	($ 14,618)	($ 28,547)	($ 13,005)	$ 36,059	($ 39,072)	($ 15,507)	$ 8,903	$ 2,181	$ 19,448	$ 2,479	($ 3,194)
Asset Sales		US$ '000	($ 60,018)	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Reclamation and closure		US$ '000	$ 495,184	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Capital Cost		**US$ '000**	**$ 4,358,967**	**$ 170,646**	**$ 387,522**	**$ 652,389**	**$ 731,518**	**$ 909,919**	**$ 284,216**	**$ 21,272**	**$ 59,823**	**$ 20,781**	**$ 106,935**	**$ 39,240**	**$ 5,803**	**$ 55,752**	**($ 20,117)**	**$ 194,997**	**$ 99,895**	**$ 7,839**	**$ 20,248**	**$ 37,098**	**$ 7,554**
PRE-TAX CASH FLOW																							
Net Pre-Tax Cashflow		US$ '000	$ 13,128,914	($ 170,646)	($ 336,897)	($ 601,764)	($ 630,268)	$ 110,406	$ 921,397	$ 481,353	$ 822,895	$ 1,001,510	$ 874,569	$ 592,501	$ 371,175	$ 751,688	$ 400,197	$ 349,728	$ 325,032	$ 277,524	$ 523,209	$ 598,007	$ 425,089
Cumulative Pre-Tax Cashflow		US$ '000		($ 170,646)	($ 507,543)	($ 1,109,307)	($ 1,739,575)	($ 1,629,169)	($ 707,772)	($ 226,419)	$ 596,476	$ 1,597,986	$ 2,472,556	$ 3,065,056	$ 3,436,231	$ 4,187,919	$ 4,588,116	$ 4,937,843	$ 5,262,875	$ 5,540,399	$ 6,063,608	$ 6,661,615	$ 7,086,704
Taxes		US$ '000	($ 4,220,280)	$ 0	$ 0	$ 0	$ 0	($ 255,081)	($ 226,170)	($ 48,707)	($ 143,058)	($ 246,982)	($ 214,629)	($ 98,602)	($ 16,030)	($ 165,072)	($ 16,248)	($ 47,008)	($ 112,386)	($ 82,484)	($ 175,336)	($ 203,030)	($ 138,538)
CAMYEN		US$ '000	($ 119,851)	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	($ 9,063)	($ 6,415)	($ 2,800)	($ 372)	($ 5,794)	($ 360)	$ 0	($ 3,146)	($ 2,899)	($ 6,289)	($ 6,842)	($ 4,818)
Retention Return		US$ '000	$ 113,333	$ 0	$ 11,333	$ 11,333	$ 11,333	$ 11,333	$ 11,333	$ 11,333	$ 11,333	$ 11,333	$ 11,333	$ 11,333	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
VAT Paid		US$ '000	($ 2,892,157)	$ 0	($ 62,004)	($ 104,382)	($ 117,043)	($ 229,367)	($ 148,382)	($ 99,910)	($ 95,873)	($ 91,372)	($ 120,919)	($ 93,130)	($ 87,421)	($ 97,019)	($ 76,960)	($ 116,656)	($ 99,375)	($ 83,688)	($ 80,669)	($ 84,440)	($ 98,187)
VAT Collected		US$ '000	$ 2,892,157	$ 0	$ 0	$ 0	$ 187,391	$ 229,769	$ 117,043	$ 229,367	$ 148,382	$ 99,910	$ 95,873	$ 91,372	$ 120,919	$ 93,130	$ 87,421	$ 97,019	$ 76,960	$ 116,656	$ 99,375	$ 83,688	$ 80,669
After-Tax Cashflow		US$ '000	$ 8,902,116	($ 170,646)	($ 387,567)	($ 694,813)	($ 548,587)	($ 132,940)	$ 675,220	$ 573,436	$ 743,680	$ 765,336	$ 639,813	$ 500,674	$ 388,270	$ 576,932	$ 394,050	$ 283,084	$ 187,085	$ 225,108	$ 360,289	$ 387,383	$ 264,217
Cumulative After-Tax Cashflow		US$ '000		($ 170,646)	($ 558,213)	($ 1,253,026)	($ 1,801,613)	($ 1,934,553)	($ 1,259,332)	($ 685,896)	$ 57,784	$ 823,120	$ 1,462,933	$ 1,963,608	$ 2,351,878	$ 2,928,810	$ 3,322,860	$ 3,605,943	$ 3,793,029	$ 4,018,137	$ 4,378,427	$ 4,765,810	$ 5,030,027
PROJECT ECONOMICS																							
Pre-Tax IRR		**%**	**25.7%**																				
Pre-tax NPV at 5% discounting	5.0%	US$ '000	$ 5,242,007																				
Pre-tax NPV at 8% discounting	**8.0%**	**US$ '000**	**$ 3,169,795**																				
Pre-tax NPV at 10% discounting	10.0%	US$ '000	$ 2,288,546																				
After-Tax IRR		**%**	**19.7%**																				
After-Tax NPV at 5% discounting	5.0%	US$ '000	$ 3,451,349																				
After-Tax NPV at 8% discounting	**8.0%**	**US$ '000**	**$ 1,986,521**																				
After-tax NPV at 10% discounting	10.0%	US$ '000	$ 1,357,510																				

	INPUTS	UNITS	TOTAL	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28
MINING															
Open Pit															
Operating Days	365	days	10,220	365	365	365	365	365	365	365	365	365	365	365	365
Tonnes milled per day		tonnes / day	108,105	117,293	144,751	137,405	134,534	123,514	118,881	111,718	111,055	112,580	233	13,300	-
Tonnes moved per day		tonnes / day	297,246	410,952	398,765	350,988	190,636	159,611	136,489	122,019	120,723	117,336	109,589	109,637	91,009
Production		'000 tonnes	1,104,835	42,812	52,834	50,153	49,105	45,083	43,392	40,777	40,535	41,092	85	4,855	-
Waste	-	'000 tonnes	2,016,805	107,186	92,715	77,958	20,477	13,175	6,427	3,760	3,529	1,736	39,915	35,163	33,218
Total Moved		'000 tonnes	3,037,857	149,998	145,549	128,111	69,582	58,258	49,818	44,537	44,064	42,828	40,000	40,018	33,218
Stripping Ratio			1.83	2.50	1.75	1.55	0.42	0.29	0.15	0.09	0.09	0.04	469.12	7.24	-
PROCESSING															
Mill Feed		'000 tonnes	1,104,835	40,000	40,000	40,000	40,000	40,000	41,275	40,777	40,535	41,092	40,000	40,000	33,218
Au Grade		g/t	0.21	0.16	0.21	0.25	0.22	0.15	0.17	0.18	0.16	0.15	0.15	0.28	0.36
Ag Grade		g/t	2.83	3.12	3.14	1.40	1.75	2.04	3.06	3.10	2.82	2.12	2.60	4.34	5.53
Cu Grade		%	0.48%	0.38%	0.42%	0.51%	0.48%	0.40%	0.42%	0.44%	0.48%	0.38%	0.25%	0.40%	0.45%
Mo Grade		%	0.03%	0.02%	0.02%	0.03%	0.04%	0.04%	0.04%	0.03%	0.03%	0.02%	0.02%	0.02%	0.01%
Contained Au		oz	7,338,381	199,662	268,829	319,331	277,280	196,907	219,873	230,139	211,638	195,964	191,626	358,952	381,263
Contained Ag		oz	100,686,751	4,018,090	4,036,406	1,803,696	2,250,906	2,617,578	4,055,463	4,065,617	3,680,189	2,795,875	3,349,978	5,581,206	5,909,244
Contained Cu		tonnes	5,324,697	152,044	169,336	203,819	190,264	160,910	173,687	177,423	194,409	157,328	101,355	159,902	150,500
Contained Mo		tonnes	324,905	9,770	8,492	11,945	14,069	15,978	14,661	10,259	11,597	9,123	7,912	6,626	4,715
Recovery															
Copper Concentrate															
Au Recovery		%	35.4%	33.4%	34.8%	43.6%	43.7%	41.3%	35.4%	31.7%	33.9%	35.3%	31.7%	31.4%	31.2%
Ag Recovery		%	44.8%	45.2%	42.5%	57.7%	59.9%	54.4%	46.6%	41.2%	42.9%	47.1%	35.5%	40.2%	40.8%
Cu Recovery		%	86.0%	86.4%	87.9%	90.7%	86.8%	86.2%	87.1%	87.6%	87.4%	86.9%	82.5%	86.0%	86.5%
Moly Concentrate															
Mo Recovery		%	43.7%	35%	51%	64%	60%	62%	55%	51%	49%	35%	43%	32%	25%
Production															
Copper Concentrate															
Au		oz	2,602,871	66,735	93,562	139,297	121,103	81,258	77,845	72,961	71,817	69,214	60,666	112,639	118,844
Ag		oz	43,701,303	1,815,890	1,715,422	1,041,138	1,348,184	1,423,930	1,888,003	1,673,281	1,576,963	1,316,095	1,189,621	2,241,893	2,409,287
Cu		tonnes	4,588,785	131,308	148,912	184,835	165,217	138,693	151,264	155,415	169,872	136,773	83,580	137,449	130,213
Moly Concentrate															
Mo		tonnes	142,593	3,422	4,364	7,589	8,492	9,910	8,110	5,280	5,705	3,160	3,365	2,095	1,184
Copper Concentrate		dmt	18,190,193	539,503	565,575	653,134	929,733	865,017	643,380	627,091	638,549	549,616	520,698	566,389	479,514
Au grade in concentrate		g/t	4.5	3.8	5.1	6.6	4.1	2.9	3.8	3.6	3.5	3.9	3.6	6.2	7.7
Ag grade in concentrate		g/t	74.7	104.7	94.3	49.6	45.1	51.2	91.3	83.0	76.8	74.5	71.1	123.1	156.3
Cu grade in concentrate		%	25.2%	24.3%	26.3%	28.3%	17.8%	16.0%	23.5%	24.8%	26.6%	24.9%	16.1%	24.3%	27.2%
As grade in concentrate		%	0.44%	0.50%	0.50%	0.09%	0.13%	0.19%	0.41%	0.37%	0.38%	0.34%	0.40%	1.22%	1.71%
Concentrate Moisture	9.5%														
Copper Concentrate		wmt	20,099,661	596,136	624,945	721,695	1,027,329	955,820	710,917	692,918	705,579	607,310	575,357	625,844	529,849
Moly Concentrate		dmt	285,186	6,844	8,728	15,178	16,985	19,819	16,221	10,560	11,410	6,320	6,730	4,189	2,367
Mo grade in concentrate	50%	%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Concentrate Moisture	2.0%														
Moly Concentrate		wmt	291,006	6,984	8,906	15,488	17,331	20,224	16,552	10,775	11,643	6,449	6,868	4,275	2,415
Total Concentrate Tonnes		wmt	20,390,666	603,119	633,850	737,183	1,044,661	976,043	727,469	703,693	717,223	613,759	582,224	630,119	532,265
Total Recovered															
Au		**oz**	**2,602,871**	**66,735**	**93,562**	**139,297**	**121,103**	**81,258**	**77,845**	**72,961**	**71,817**	**69,214**	**60,666**	**112,639**	**118,844**
Ag		**oz**	**43,701,303**	**1,815,890**	**1,715,422**	**1,041,138**	**1,348,184**	**1,423,930**	**1,888,003**	**1,673,281**	**1,576,963**	**1,316,095**	**1,189,621**	**2,241,893**	**2,409,287**
Cu		**tonnes**	**4,588,785**	**131,308**	**148,912**	**184,835**	**165,217**	**138,693**	**151,264**	**155,415**	**169,872**	**136,773**	**83,580**	**137,449**	**130,213**
Mo		**tonnes**	**142,592.8**	**3,422**	**4,364**	**7,589**	**8,492**	**9,910**	**8,110**	**5,280**	**5,705**	**3,160**	**3,365**	**2,095**	**1,184**
REVENUE															
Metal Prices															
Au	US$1,300 / oz Au	US$/oz Au	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300
Ag	US$18.00 / oz Ag	US$/oz Ag	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00
Cu	US$3.00 / lb Cu	US$/lb Cu	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00
Mo	US$11.00 / lb Mo	US$/lb Mo	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00
Copper Concentrate Payable %															
Au		%	92.8%	92.0%	94.0%	94.0%	92.0%	90.0%	92.0%	92.0%	92.0%	92.0%	92.0%	94.0%	95.0%
Ag		%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Cu		%	96.1%	96.0%	96.0%	96.5%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%
Moly Concentrate Payable %															
Mo		%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Copper Concentrate Payable															
Au		oz	2,415,815.13	61,397	87,948	130,939	111,415	73,132	71,617	67,124	66,071	63,677	55,813	105,880	112,902
Ag		oz	39,331,173	1,634,301	1,543,880	937,024	1,213,365	1,281,537	1,699,203	1,505,953	1,419,267	1,184,486	1,070,659	2,017,704	2,168,358
Cu		tonnes	4,410,619	126,055	142,955	178,366	158,608	133,145	145,213	149,198	163,077	131,302	80,237	131,951	125,004
Mo		tonnes	-	-	-	-	-	-	-	-	-	-	-	-	-
Moly Concentrate Payable															
Mo		tonnes	121,203.9	2,909	3,709	6,451	7,218	8,423	6,894	4,488	4,849	2,686	2,860	1,780	1,006
Gold Streaming Revenue															
Stream Contracted Production	20%	oz	483,163	12,279	17,590	26,188	22,283	14,626	14,323	13,425	13,214	12,735	11,163	21,176	22,580
Stream Price	30%	USD/oz	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390
Gold Stream Revenue Yamana		US$ '000	$ 188,434	$ 4,789	$ 6,860	$ 10,213	$ 8,690	$ 5,704	$ 5,586	$ 5,236	$ 5,154	$ 4,967	$ 4,353	$ 8,259	$ 8,806
Gold Revenue at Spot Price															
Gold Production at Spot Price	80%	oz	1,932,652	49,117	70,359	104,751	89,132	58,505	57,294	53,699	52,857	50,942	44,650	84,704	90,322
Gold Spot Price		USD/oz	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300
Gold Revenue at Spot Price		US$ '000	$ 2,512,448	$ 63,852	$ 91,466	$ 136,176	$ 115,872	$ 76,057	$ 74,482	$ 69,809	$ 68,714	$ 66,224	$ 58,045	$ 110,116	$ 117,418
All Metals Gross Revenue															
Au Gross Revenue		US$ '000	$ 2,700,881	$ 68,641	$ 98,326	$ 146,390	$ 124,562	$ 81,761	$ 80,068	$ 75,044	$ 73,868	$ 71,191	$ 62,399	$ 118,374	$ 126,224
Ag Gross Revenue		US$ '000	$ 707,961	$ 29,417	$ 27,790	$ 16,866	$ 21,841	$ 23,068	$ 30,586	$ 27,107	$ 25,547	$ 21,321	$ 19,272	$ 36,319	$ 39,030
Cu Gross Revenue		US$ '000	$ 29,171,214	$ 833,712	$ 945,486	$ 1,179,688	$ 1,049,011	$ 880,603	$ 960,419	$ 986,777	$ 1,078,568	$ 868,411	$ 530,676	$ 872,704	$ 826,759
Mo Gross Revenue		US$ '000	$ 2,939,294	$ 70,538	$ 89,952	$ 156,436	$ 175,054	$ 204,271	$ 167,179	$ 108,833	$ 117,602	$ 65,139	$ 69,365	$ 43,176	$ 24,396
Total Gross Revenue		**US$ '000**	**$ 35,519,350**	**$ 1,002,309**	**$ 1,161,554**	**$ 1,499,380**	**$ 1,370,468**	**$ 1,189,703**	**$ 1,238,252**	**$ 1,197,761**	**$ 1,295,584**	**$ 1,026,062**	**$ 681,712**	**$ 1,070,573**	**$ 1,016,410**
Treatment															
Cu Concentrate	US$80.00 / dmt conc	US$ '000	$ 1,455,215	$ 43,160	$ 45,246	$ 52,251	$ 74,379	$ 69,201	$ 51,470	$ 50,167	$ 51,084	$ 43,969	$ 41,656	$ 45,311	$ 38,361
As Penalty	US$03.00 / dmt conc	US$ '000	$ 180,076	$ 6,474	$ 6,787	$ 0	$ 0	$ 0	$ 5,914	$ 5,161	$ 5,452	$ 4,009	$ 4,684	$ 19,113	$ 23,222
Mo Concentrate	US$00.00 / dmt conc	US$ '000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Refining cost															
Au	US$4.50 / oz Au	US$ '000	$ 10,871	$ 276	$ 396	$ 589	$ 501	$ 329	$ 322	$ 302	$ 297	$ 287	$ 251	$ 476	$ 508
Ag	US$0.40 / oz Ag	US$ '000	$ 15,732	$ 654	$ 618	$ 375	$ 485	$ 513	$ 680	$ 602	$ 568	$ 474	$ 428	$ 807	$ 867
Cu	US$0.08 / lb Cu	US$ '000	$ 807,063	$ 23,066	$ 26,158	$ 32,638	$ 29,022	$ 24,363	$ 26,571	$ 27,301	$ 29,840	$ 24,026	$ 14,682	$ 24,145	$ 22,873
Mo	US$0.00 / lb Mo	US$ '000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Charges		US$ '000	$ 2,468,958	$ 73,630	$ 79,204	$ 85,852	$ 104,388	$ 94,406	$ 84,958	$ 83,533	$ 87,241	$ 72,764	$ 61,702	$ 89,852	$ 85,832
Net Smelter Return		**US$ '000**	**$ 33,050,393**	**$ 928,679**	**$ 1,082,350**	**$ 1,413,528**	**$ 1,266,080**	**$ 1,095,297**	**$ 1,153,294**	**$ 1,114,228**	**$ 1,208,343**	**$ 953,297**	**$ 620,011**	**$ 980,721**	**$ 930,578**
Royalty NSR	Input Rate Into Proforma	US$ '000	$ 1,382,165	$ 40,891	$ 46,465	$ 58,289	$ 53,777	$ 47,450	$ 49,334	$ 47,845	$ 51,233	$ 41,881	$ 29,670	$ 43,280	$ 40,400
Net Revenue		**US$ '000**	**$ 31,668,227**	**$ 887,787**	**$ 1,035,885**	**$ 1,355,239**	**$ 1,212,303**	**$ 1,047,847**	**$ 1,103,959**	**$ 1,066,383**	**$ 1,157,109**	**$ 911,416**	**$ 590,340**	**$ 937,440**	**$ 890,179**
Unit NSR		**US$/t milled**	**$ 28.66**	**$ 22.19**	**$ 25.90**	**$ 33.88**	**$ 30.31**	**$ 26.20**	**$ 26.75**	**$ 26.15**	**$ 28.55**	**$ 22.18**	**$ 14.76**	**$ 23.44**	**$ 26.80**
Other Income															
Gold Stream Upfront Payment	$202,500	US$ '000	$ 202,500	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Revenue		**US$ '000**	**$ 31,870,727**	**$ 887,787**	**$ 1,035,885**	**$ 1,355,239**	**$ 1,212,303**	**$ 1,047,847**	**$ 1,103,959**	**$ 1,066,383**	**$ 1,157,109**	**$ 911,416**	**$ 590,340**	**$ 937,440**	**$ 890,179**

	INPUTS	UNITS	Year TOTAL	2042 Year 17	2043 Year 18	2044 Year 19	2045 Year 20	2046 Year 21	2047 Year 22	2048 Year 23	2049 Year 24	2050 Year 25	2051 Year 26	2052 Year 27	2053 Year 28
OPERATING COST															
Mining (Open Pit)		US$/t moved	$ 1.81	$ 2.09	$ 2.16	$ 2.04	$ 1.97	$ 2.09	$ 2.16	$ 2.25	$ 2.28	$ 2.24	$ 1.29	$ 1.92	$ 1.64
Processing		US$/t milled	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53
Freight Cost to Port & Port Ops		US$/t milled	$ 0.54	$ 0.44	$ 0.46	$ 0.53	$ 0.76	$ 0.70	$ 0.51	$ 0.50	$ 0.51	$ 0.44	$ 0.42	$ 0.46	$ 0.47
Freight Cost to Asia		US$/t milled	$ 1.07	$ 0.88	$ 0.92	$ 1.06	$ 1.51	$ 1.41	$ 1.01	$ 1.00	$ 1.02	$ 0.87	$ 0.85	$ 0.92	$ 0.94
WRF Opex		US$/t milled	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.07
G&A		US$/t milled	$ 0.87	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.83	$ 0.84	$ 0.85	$ 0.84	$ 0.86	$ 0.86	$ 0.86
Total Unit Operating Cost		**US$/t milled**	**$ 12.93**	**$ 15.60**	**$ 15.70**	**$ 14.56**	**$ 12.14**	**$ 11.61**	**$ 10.55**	**$ 10.39**	**$ 10.45**	**$ 10.06**	**$ 9.01**	**$ 9.75**	**$ 9.52**
Mining (Open Pit)		US$ '000	$ 5,378,748	$ 313,402	$ 314,900	$ 260,905	$ 136,955	$ 121,917	$ 107,460	$ 100,317	$ 100,492	$ 95,834	$ 51,634	$ 76,782	$ 54,601
Processing		US$ '000	$ 6,109,740	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 228,253	$ 225,498	$ 224,159	$ 227,236	$ 221,200	$ 221,200	$ 183,697
Freight Cost to Port & Port Ops	US$32.59 / dmt conc	US$ '000	$ 592,818	$ 17,582	$ 18,432	$ 21,286	$ 30,300	$ 28,191	$ 20,968	$ 20,437	$ 20,810	$ 17,912	$ 16,970	$ 18,459	$ 15,627
Freight Cost to Asia	US$65.00 / dmt conc	US$ '000	$ 1,182,363	$ 35,068	$ 36,762	$ 42,454	$ 60,433	$ 56,226	$ 41,820	$ 40,761	$ 41,506	$ 35,725	$ 33,845	$ 36,815	$ 31,168
WRF Opex		US$ '000	$ 65,965	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356
G&A		US$ '000	$ 957,467	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 28,667
Total Operating Cost		**US$ '000**	**$ 14,287,100**	**$ 624,008**	**$ 628,050**	**$ 582,600**	**$ 485,643**	**$ 464,290**	**$ 435,257**	**$ 423,769**	**$ 423,722**	**$ 413,463**	**$ 360,404**	**$ 390,012**	**$ 316,117**
Operating Cashflow		**US$ '000**	**$ 17,583,627**	**$ 263,779**	**$ 407,835**	**$ 772,639**	**$ 726,660**	**$ 583,557**	**$ 668,703**	**$ 642,614**	**$ 733,387**	**$ 497,953**	**$ 229,936**	**$ 547,429**	**$ 574,062**
Corporate Overheads Costs		US$ '000	$ 95,747	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 2,867
CAPITAL COST															
Direct Cost															
Mining		US$ '000	$ 739,137	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Processing		US$ '000	$ 1,220,316	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Infrastructure		US$ '000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Tailings		US$ '000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Direct Cost		**US$ '000**	**$ 1,959,453**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Other Costs															
EPCM / Owners / Indirect Cost		US$ '000	$ 96,000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Subtotal Costs		**US$ '000**	**$ 2,055,453**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Contingency		US$ '000	$ 330,923	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Initial Capital Cost		**US$ '000**	**$ 2,386,376**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Sustaining		US$ '000	$ 1,537,425	$ 54,674	$ 23,687	$ 21,240	$ 2,005	$ 1,027	$ 6,152	$ 45,608	$ 22,573	$ 4,661	$ 5,312	$ 26,933	$ 195
Working Capital		US$ '000	($ 0)	($ 19,689)	$ 17,309	$ 26,654	($ 8,560)	($ 13,355)	$ 3,762	($ 9,628)	$ 11,275	($ 17,225)	($ 26,498)	$ 24,945	($ 72,586)
Asset Sales		US$ '000	($ 60,018)	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	($ 60,018)
Reclamation and closure		US$ '000	$ 495,184	$ 0	$ 0	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 315,184
Total Capital Cost		**US$ '000**	**$ 4,358,967**	**$ 34,985**	**$ 40,996**	**$ 67,894**	**$ 13,445**	**$ 7,672**	**$ 29,915**	**$ 55,979**	**$ 53,848**	**$ 7,436**	**($ 1,186)**	**$ 71,878**	**$ 182,775**
PRE-TAX CASH FLOW															
Net Pre-Tax Cashflow		US$ '000	$ 13,128,914	$ 225,355	$ 363,399	$ 701,305	$ 709,775	$ 572,445	$ 635,348	$ 583,194	$ 676,099	$ 487,078	$ 227,682	$ 472,111	$ 388,420
Cumulative Pre-Tax Cashflow		US$ '000		$ 7,312,059	$ 7,675,458	$ 8,376,762	$ 9,086,537	$ 9,658,982	$ 10,294,330	$ 10,877,524	$ 11,553,623	$ 12,040,701	$ 12,268,383	$ 12,740,493	$ 13,128,914
Taxes		US$ '000	($ 4,220,280)	($ 73,237)	($ 127,218)	($ 247,322)	($ 234,214)	($ 189,169)	($ 219,936)	($ 204,872)	($ 238,936)	($ 160,103)	($ 67,001)	($ 175,122)	($ 93,789)
CAMYEN		US$ '000	($ 119,851)	($ 1,904)	($ 4,251)	($ 8,666)	($ 8,429)	($ 6,895)	($ 7,997)	($ 6,948)	($ 8,462)	($ 5,815)	($ 2,410)	($ 6,108)	($ 3,170)
Retention Return		US$ '000	$ 113,333	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
VAT Paid		US$ '000	($ 2,892,157)	($ 105,989)	($ 107,598)	($ 101,429)	($ 77,205)	($ 72,864)	($ 71,778)	($ 74,110)	($ 73,762)	($ 64,694)	($ 54,825)	($ 71,253)	($ 29,852)
VAT Collected		US$ '000	$ 2,892,157	$ 84,440	$ 98,187	$ 105,989	$ 107,598	$ 101,429	$ 77,205	$ 72,864	$ 71,778	$ 74,110	$ 11,068	$ 2,001	$ 30,543
After-Tax Cashflow		US$ '000	$ 8,902,116	$ 128,664	$ 222,519	$ 449,877	$ 497,525	$ 404,946	$ 412,842	$ 370,129	$ 426,717	$ 330,575	$ 114,514	$ 221,628	$ 292,152
Cumulative After-Tax Cashflow		US$ '000		$ 5,158,691	$ 5,381,210	$ 5,831,087	$ 6,328,612	$ 6,733,558	$ 7,146,400	$ 7,516,529	$ 7,943,247	$ 8,273,822	$ 8,388,336	$ 8,609,964	$ 8,902,116
PROJECT ECONOMICS															
Pre-Tax IRR		**%**	**25.7%**												
Pre-tax NPV at 5% discounting	5.0%	US$ '000	$ 5,242,007												
Pre-tax NPV at 8% discounting	**8.0%**	**US$ '000**	**$ 3,169,795**												
Pre-tax NPV at 10% discounting	10.0%	US$ '000	$ 2,288,546												
After-Tax IRR		**%**	**19.7%**												
After-Tax NPV at 5% discounting	5.0%	US$ '000	$ 3,451,349												
After-Tax NPV at 8% discounting	**8.0%**	**US$ '000**	**$ 1,986,521**												
After-tax NPV at 10% discounting	10.0%	US$ '000	$ 1,357,510												

1.2.4 Cash Flow Analysis

The financial analysis indicates that the Project has a pre-tax net cash flow of $13,129 million and an after-tax net cash flow of $8,902 million with a payback period of eight years (from notice to proceed). The pre-tax NPV at an 8% discount rate is $3,170 million and the after-tax NPV at an 8% discount rate is $1,986 million. The pre-tax IRR is 25.7% and the after-tax IRR is 19.7%. The financial model is related to the base case mine plan of processing 40 Mtpa.

1.2.5 Sensitivity Analysis

Project risks can be identified in both economic and non-economic terms. Key economic risks were examined by running cash flow sensitivities:

- Metal prices
- Head grades
- Recoveries
- Operating costs
- Pre-production capital costs

After-tax NPV and IRR sensitivity over the base case have been calculated for -20% to +20% variations. The NPV and IRR sensitivities are shown in Figure 1-1 and Figure 1-2, respectively and in Table 1-4. The Project is most sensitive to metal prices followed by head grades, operating cost, capital cost, and metal recoveries.

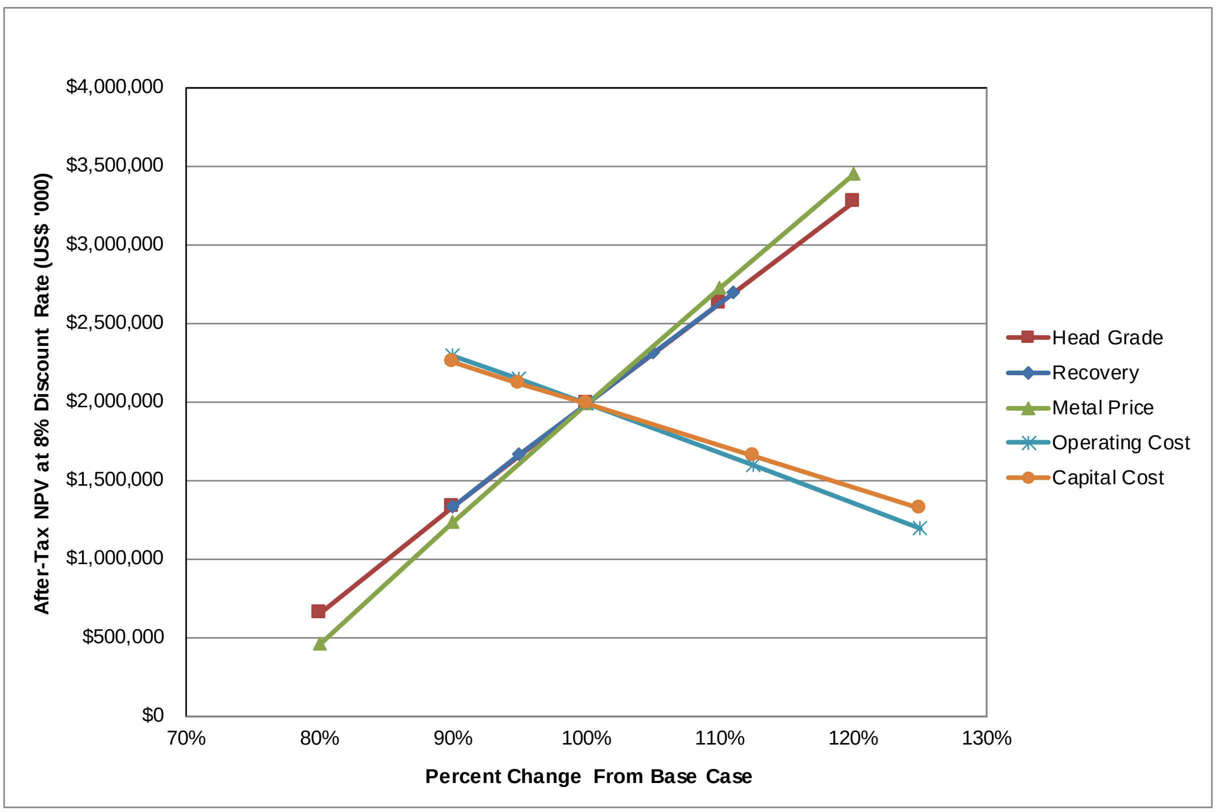


Figure 1-1: After-Tax NPV Sensitivity Analysis

Table 1-4: After-Tax NPV and IRR Sensitivity
Yamana Gold Inc. – Agua Rica Integrated Project

	Head Grade[1] (%Cu)	NPV at 8% (US$ 000)	IRR (%)
0.80	0.39	655,947	12.3
0.90	0.43	1,329,030	16.2
1.00	**0.48**	**1,986,521**	**19.7**
1.10	0.53	2,629,678	23.0
1.20	0.58	3,272,381	26.1
	Recovery[2] (%Cu)	**NPV at 8% (US$ 000)**	**IRR (%)**
0.90	77.4	1,329,030	16.2
0.95	81.7	1,662,878	18.0
1.00	**86.0**	**1,986,521**	**19.7**
1.05	90.3	2,309,418	21.4
1.11	95.5	2,6393,949	23.3
	Metal Price[3] (US$/lb Cu)	**NPV at 8% (US$ 000)**	**IRR (%)**
0.80	2.40	462,617	11.1
0.90	2.70	1,236,193	15.7
1.00	**3.00**	**1,986,521**	**19.7**
1.10	3.30	2,718,430	23.4
1.20	3.60	3,449,884	26.9
	Operating Costs (US$/t)	**NPV at 8% (US$ 000)**	**IRR (%)**
0.90	11.64	2,293.921	21.3
0.95	12.29	2,140,560	20.5
1.00	**12.93**	**1,986,521**	**19.7**
1.13	14.55	1,596,360	17.7
1.25	16.16	1,194,017	15.5
	Capital Costs (US$ 000)	**NPV at 8% (US$ 000)**	**IRR (%)**
0.90	3,923,070	2,251,602	22.6
0.95	4,141,019	2,119,478	21.1
1.00	**4,358,967**	**1,986,521**	**19.7**
1.13	4,903,838	1,654,130	16.8
1.25	5,448,709	1,321,739	14.4

Notes:

1. Copper head grade shown, however, sensitivity applies to all metals.
2. Copper recovery shown, however, sensitivity applies to all metals.
3. Copper price shown, however, sensitivity applies to all metals.

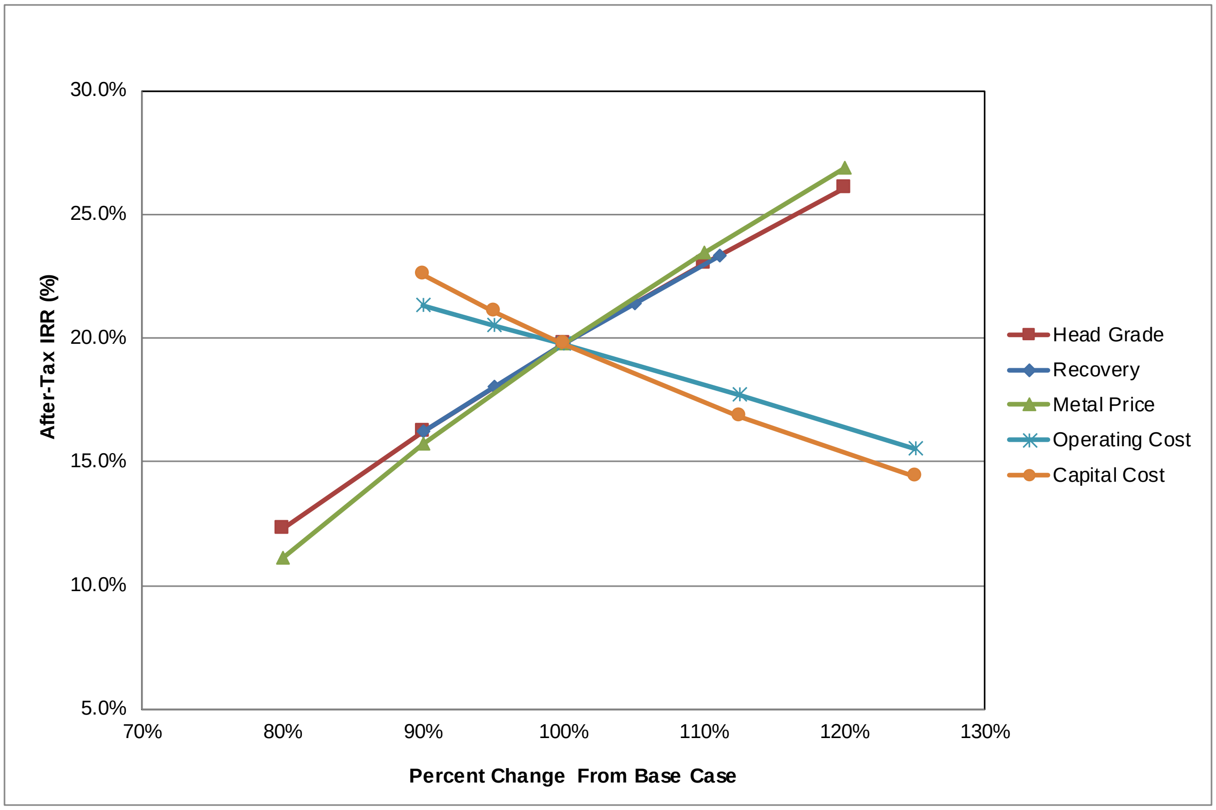


Figure 1-2: After-Tax IRR Sensitivity Analysis

1.3 Technical Summary

1.3.1 Property Description and Location

Agua Rica is a large-scale porphyry copper, gold, silver, and molybdenum deposit located in the Catamarca Province in northwest Argentina, at an elevation of approximately 3,300 masl. It is located by road approximately 25 km north from the town of Andalgalá and 250 km north-northwest from the city of Catamarca. The Agua Rica deposit is located at approximately 27.37° latitude south and 66.28° longitude west.

1.3.2 Mineral Tenure

Agua Rica is comprised of a single grouped mining concession (Grupo Minero) registered with the Judge of Mines of the Catamarca Province, file number 271/2008. The Grupo Minero is composed of lode ore (vein type) and disseminated ore type mining claims. There are 146 mining claims in total within the Grupo Minero totalling 16,854 ha.

1.3.3 Existing Infrastructure

The Project will integrate and utilize the following main Alumbrera facilities: processing plant, fresh water wellfield at Campo Arenal, tailings dam, concentrate pipeline, filter plant, rail system from Tucumán province to Rosario port, and concentrate shipping facilities at Rosario port.

1.3.4 History

In the early 1970s, Cities Services Argentina S.A. (Cities Services) examined the property (known at that time as Mi Vida) under agreement with Recursos Americanos Argentinos S.A (Recursos Americano). A small drilling program successfully intersected porphyry-style mineralization, however, little follow up work was carried out and in the late 1970s, the property reverted to its original Argentinean owner, Recursos Americanos.

In the early 1990s, Recursos Americanos optioned the property to BHP Minerals Inc. (BHP). Additionally, at that time Northern Orion Explorations Ltd. (Northern Orion) concluded an agreement with Recursos Americanos to acquire a majority share of its exploration holdings throughout Argentina, therefore becoming BHP's joint venture (JV) partner (BHP-Northern Orion JV) on Agua Rica.

In 2002, Northern Orion acquired full control of the property by purchasing BHP's remaining interest and in 2003 changed its name to Northern Orion Resources Inc. (Northern Orion or NNO).

In 2007, Yamana acquired all the outstanding securities of Northern Orion and in doing so acquired 100% of the Project.

In 2011, Yamana signed a four-year option agreement (Yamana-Alumbrera JV) with MAA, whose majority owner at that time was Xstrata (now Glencore).

In 2013, MAA conducted a feasibility study (2013 FS) for a project development scenario similar to the current development scope, the primary difference being that crushing and conveying of waste rock in the Campo Arenal basin via a second tunnel was the considered option for waste rock storage and management.

In 2014, the Yamana-Alumbrera JV agreement with MAA lapsed.

In 2016, a high level update of the capital estimate was completed based on the work of the 2013 FS. This update included the removal of the waste rock materials handling in Campo Arenal, with the assumption that waste rock would be hauled to a WRF near the mine pit area.

In March 2019, Yamana, Glencore and Goldcorp announced the signing of the Yamana- Alumbrera-Goldcorp Integration Agreement pursuant to which Agua Rica would be developed and operated using the existing infrastructure and facilities located at the Alumbrera mine, located 35 km west of the Project. The ownership of Agua Rica upon the consummation of the integration structure was: Yamana 56.25%, Glencore 25.00%, and Goldcorp 18.75%. Following the Goldcorp-Newmont merger in April 2019, Goldcorp's interest is now held by Newmont-Goldcorp.

1.3.5 Geology and Mineralization

Agua Rica is a large porphyry copper, gold, silver, and molybdenum mineral deposit, spatially associated with the coeval Farallón Negro Volcanic Complex, a deeply eroded remnant of a stratovolcano and small outlying intrusive and/or volcanic centres. Three major stages of alteration / mineralization are recognized at Agua Rica: early porphyry Cu-Mo-Au, later epithermal Cu-Au-Ag-As-Pb-Zn, and supergene Cu enrichment.

1.3.6 Exploration Status

From 1994 until late 1998, the BHP-Northern Orion JV carried out a series of field programs which included basic mapping, geochemical (rock chip) sampling, geophysics, and core drilling. In 1997, the BHP-Northern Orion JV completed an initial FS (the Initial FS) based on 103 drill holes and using an inverse distance squared (IDS) resource model. Two open pit scenarios, 60,000 tpd and 120,000 tpd, were investigated. In 1999, the BHP-Northern Orion JV halted all further field exploration activities at Agua Rica; environmental monitoring continued from that time until 2002.

In 1999, the BHP-Northern Orion JV halted all further field exploration activities at Agua Rica; environmental monitoring continued from that time until 2002.

In late 2004, Northern Orion commissioned Hatch Ltd. (Hatch) to prepare a detailed update of the Initial FS and a NI 43-101 technical report. This update focussed on the development of a mine and processing facility at Agua Rica, with production planned to commence approximately three years after Northern Orion obtained all necessary permits.

A detailed Environmental and Social Impact study (E&SIS) was completed in the fourth quarter of 2006 and presented to authorities in 2007. In mid-2007, the Project presented an environmental impact statement (Informe Impacto Ambiental or IIA), for the exploitation phase, to the authorities of the Catamarca Province and to the Ministry of Mines of the Catamarca Province. This was approved upon issuance of an IIA in March 2009. This approval has subsequently lapsed.

Since acquiring the property in 2007, Yamana has focussed on optimization studies, environmental baseline studies, and environmental monitoring. Various consultants released reports in 2011 on resources, mining, processing, infrastructure, and tailings disposal, including a Mineral Resource and Mineral Reserve statement for the Agua Rica deposit.

Under the 2011 Yamana-Alumbrera JV option agreement, MAA, in conjunction with Xstrata's Project Development group (PDSA), carried out a drilling program, a metallurgical test work program, and a FS that was completed in 2013. This study considered a treatment rate of 40 Mtpa (110,000 tpd). Additional work was also carried out on a new IIA, however, this was not submitted to the authorities.

Since termination of the Yamana-Alumbrera JV in 2014, subsequent work has been limited to ongoing environmental monitoring, social license enhancement and community engagement, and engineering studies.

1.3.7 Mineral Resources

The Mineral Resource estimate was prepared in accordance with CIM (2014) definitions and is reported in accordance with the NI 43-101 guidelines. In the opinion of the responsible QP, the Mineral Resource estimate reported herein is a reasonable representation of the Mineral Resources delineated at Agua Rica as of June 30, 2019.

The exploration and drilling information supporting the Mineral Resource model stems from work performed by the BHP-Northern Orion JV in the early 1990s to 2002; Northern Orion from 2002 to 2007; and MAA under an option agreement with Yamana between 2007 and 2014. The drilling database supporting the geological model consists of 90,000 m of drilling in 245 diamond core drill holes. From this dataset, four drill holes were removed for lack of sampling data, so a subset of 241 drill holes (86,000 m) was used for the Mineral Resource model.

The block grade interpolation and Mineral Resource estimate for Agua Rica was carried out by Xstrata's (now Glencore's) Santiago technical support team in December 2012 under the direction of Raul R. Roco, then a full-time employee of Xstrata. Subsequently, in 2018-2019 Yamana completed extensive validation of the resource modelling methodology and results. Yamana found that it was reasonably prepared, provided a good representation of the geological data, and is appropriate for the purpose of resource estimation at the current level of sampling.

The current QP for Mineral Resources visited the Project from April 26 through April 29, 2022 and reviewed the relevant Agua Rica files supporting the Mineral Resource estimate. Additionally, the QP reviewed and discussed QA/QC procedures and results with the personnel responsible for the sample databases. The SRK QP is satisfied that the documented exploration work carried out at the Project was conducted in a manner that is consistent with industry standard practices and is confident that the exploration sampling databases are sufficiently reliable to support a Mineral Resource estimate.

SRK reviewed and verified the geological interpretation and domaining strategy, estimation methodology, bulk density estimation, and classification criteria for the resource model, as documented from the historical information provided. Additionally, the Yamana validation work was reviewed by SRK. Upon completion of the audit review, the QP considers the Mineral Resource Statement presented in Table 1-1 to represent a reasonable estimate of the copper, gold, silver and molybdenum resources for the Agua Rica deposit as of the effective date of this Technical Report.

SRK has completed sufficient work that in the QP's opinion, while local variations in the block estimates are expected, the impact on the global Mineral Resources, as presented at the time of the effective date, are not considered to be material. Since the June 30, 2019 effective date of this Technical Report, SRK has presented Yamana with detailed recommendations for improving and continuing to develop the Mineral Resource estimate. These recommendations are being implemented and revisions to the 2019 technical work related to Mineral Resources will be disclosed in the future. SRK is relying upon Yamana to provide the QP with notice of any material changes, and is not aware of any other facts that may have materially impacted the Mineral Resource Statement. Additionally, the responsible QP is not aware of any mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Resource estimate.

1.3.8 Mineral Reserves

The Agua Rica Mineral Reserves are estimated using a variable metallurgical recovery. LOM average metallurgical recoveries of 86% Cu, 35% Au, 43% Ag, and 44% Mo were considered.

Open pit Mineral Reserves are reported at a variable cut-off value that averages $8.42/t. The cut-off value is based on metal assumptions of US$3.00/lb Cu, US$1,250/oz Au, US$18.00/oz Ag, and US$11.00/lb Mo, and a LOM average open pit cost of $1.72/t moved, processing and G&A cost of $6.70/t of ROM processed. The strip ratio of the Mineral Reserves is 1.7 with overall slope angles varying from 39° to 45° depending on the geotechnical sector.

Total Proven and Probable Mineral Reserves for Agua Rica are estimated at 1,104.8 Mt grading 0.49% Cu, 0.21 g/t Au, 2.84 g/t Ag, and 0.03% Mo (Table 1-2).

The responsible QP is not aware of any mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

1.3.9 Mining Method

The mining operation at Agua Rica will be a conventional truck and shovel operation, producing an estimated 110,000 tpd (40 Mtpa) of ore for the concentrator and 190,000 tpd (70 Mtpa) of waste. The operating LOM is approximately 28 years, after the completion of preproduction mining work which includes the pit construction and prestripping phase, haul road development and crusher platform excavation, and lasts approximately four years from full notice to proceed (FNTP).

The mining operation is based on large excavators with 42 m3 of bucket capacity (Komatsu PC8000) and 360 t haulage trucks (Liebherr T282). The minimum width for the pushback is 80 m. Agua Rica plans to use a two way ramp of 33 m width, based on the Liebherr T282 truck (nine metre width).

Piteau Associates Engineering Ltd. (Piteau) assessed the geotechnical parameters for the mine design in the 2013 FS using a 36 m final bench height. This study proposes an adjustment for a 30 m final bench (double 15 m operational bench), with the maintenance of the face and inter-ramp angles recommended by Piteau. The overall slope angle is the resulting slope angle with the addition of the extra width to accommodate pit ramps, switchbacks, drainage, and other recommended geotechnical structures.

The mining strategy includes the use of a mining contractor to develop the first two stages with the objective of minimizing the Project's initial capital cost, while the production stage will be carried out primarily by the Parties.

Due to the mountainous topography, the Agua Rica mine will require mine pioneering activities such as roads, dykes, and crushing pad to properly enable the mine commencing.

Prestripping of 83.8 Mt of overburden will be required. Prestripping is forecast to take place over a 24 month period after all required mine pioneering is completed.

A maximum of 165 Mtpa (108 Mtpa average) is planned to be mined from the Agua Rica deposit. A total of 40 Mtpa of plant feed is planned for the mine, with a ramp-up of 28 Mt for the first year. The average LOM strip ratio is 1.66.

Ore extracted from the mine will be transported from the open pit by truck to the primary crusher area and then conveyed through a tunnel and overland to the Alumbrera process plant. The crusher area includes one 1,600 mm x 2,900 mm primary ore crusher, a sacrificial conveyor, and a surge bin with feeders that discharge onto the ore conveyor.

The ore conveying system will extend 34.4 km (over six segments) to the Alumbrera process plant, where it will feed the existing stacker conveyor via a new transfer station. The existing surge pile and reclaim into the mill will remain unchanged.

The current LOM plan focusses on achieving consistent processing feed production rates, starting from the phases with higher unit profit with the objective of maximizing NPV. The mining strategy is also composed of a low grade stockpile and a high arsenic grade stockpile. The first has the objective of improving the Project's value with the application of a variable cut-off grade throughout the mine life while the second has the objective of limiting the 0.5% As grade threshold over the copper concentrate product.

1.3.10 Mineral Processing

The Alumbrera process plant and all supporting facilities were in continuous operation since its initial start up in 1997 until the open pit Mineral Reserves were depleted in 2017. The Alumbrera operation was shut down in October 2018 and placed under care and maintenance pending closure. The Alumbrera mine and concentrator processed a nominal 90,000 tpd of copper and molybdenum ore.

Alumbrera onsite facilities include the existing concentrator, which will process Agua Rica ore. This includes the grinding circuit, flotation circuit, molybdenum plant, and tailings system. The grinding circuit area extends from the reclaim system from the existing ore stockpile, through to the SAG and ball mills.

The Project is focussed on maintaining as much of the existing Alumbrera plant and supporting infrastructure as possible, for the purpose of processing Agua Rica ore. Relatively modest modifications to the Alumbrera circuit are needed to process the Agua Rica ore in order to produce copper and by-products concentrate.

The Agua Rica ore will be crushed at the new mine site and conveyed approximately 35 km west to the existing Alumbrera mill feed stockpile. The Alumbrera concentrator capacity will be increased from the current 90,000 tpd to a nominal throughput of 110,000 tpd (40 Mtpa).

The flotation area will be modified to suit the Agua Rica ore metallurgy, and includes existing and new flotation cells, regrind, concentrate thickening, and storage. The process plant also includes the existing molybdenum facility, including flotation, filtration, and concentrate loadout into containers for truck transport.

Copper concentrate produced from the Alumbrera plant will be pumped via an existing 317 km concentrate pipeline to the Tucumán filter plant. The filtered concentrate will be loaded into railcars and transported on an existing 830 km rail line to the existing concentrate loading facilities at Rosario port, approximately 290 km northwest of Buenos Aires.

The tailings during the initial seven years of mine operations will be stored in Alumbrera's existing TSF. Thereafter, Agua Rica tailings will be stored in Alumbrera's exhausted open pit mine in compliance with environmental regulations.

1.3.11 Project Infrastructure

The mine site area includes the mine equipment, mine dewatering system, infrastructure (including power supply and distribution), water management, fresh water supply, sewage systems, communications, and mine ancillary facilities. Mine ancillary facilities will augment the existing facilities at Alumbrera, and include primarily the truck shop, associated maintenance facilities and other mine operations support facilities at Agua Rica.

Water management will consist of a series of water diversion channels and a possible water treatment plant downstream of the entire operation should it be required. Non-contact water will bypass the operation via channels and pipes and will not be treated. The current PFS case is that contact water from the pit and the toe of the WRF will be pumped through the tunnel to Alumbrera and used as process water.

The truck shop will include 14 fully equipped bays, an attached warehouse, and technical services offices. Ancillary buildings and facilities will include the tire shop, truck wash, welding shop, fire station, medical centre, shift change restrooms, and a bus station. This will be on the same platform as the truck shop above the crusher area.

The mine operators, mine fleet maintenance, and technical services personnel will have a new camp in the Campo Arenal El Globo area. The camp will be similar to the existing operations camp at Alumbrera. The total capacity of the new camp will be approximately 1,300 beds (to be adjusted once mine design is completed).

To the extent practical, new facilities at the Agua Rica mine site will be minimized and the existing Alumbrera facilities will be used to support the new mine.

A 5.2 km tunnel will allow the ore conveyor to pass through the steep Sierra de Aconquija mountain range, which separates the mine from the Campo Arenal area where the existing Alumbrera facility is located.

Power for the Project will be supplied by the existing 220-kilovolt (kV) line at a tie-in point near conveyor transfer No. 3. From there, power will be stepped down to 33 kV and routed in two directions. It will be routed along the overland conveyor toward Alumbrera on a pole line, feeding each conveyor drive station. It will also be routed through the tunnel to the mine site feeding transformers on the crusher platform to supply mine services equipment and crushing and conveying facilities at the required voltages.

1.3.12 Market Studies

Agua Rica is expected to produce copper concentrates with payable gold and silver and molybdenum concentrates. The concentrate production is expected to be shipped to custom smelters and refineries. The concentrate treatment and metal refining terms are negotiable at the time of the agreement.

Overall, global market forecasts for copper concentrate are projecting a compound annual growth rate (CAGR) of 2% or higher.

The copper concentrate market is a global marketplace with two main market types: smelters and commodity traders. Commodity traders are a large secondary market with an excess of 17 Mt of copper concentrate traded annually. Commodity traders can provide better net terms than smelters. Additionally, commodity traders provide more flexibility as they can deliver to numerous locations. It is anticipated that the marketing strategy for Agua Rica would include sales to both markets.

Molybdenum demand has surged in line with China's rapid growth and consumption of raw materials. The majority of molybdenum consumption is in the alloy steels (30% of total demand) and stainless steel (28%) end-use sectors.

Major markets for molybdenum concentrate include Chile, Europe, United States and China. Agua Rica molybdenum concentrate is assumed to contain approximately 50% Mo and 1% Cu. Given the expected copper content, leaching prior to roasting would be required to convert it to molybdenum oxide. This is likely to result in the concentrate attracting a higher treatment fee, however, the concentrate would remain marketable in the main international concentrate markets.

1.3.13 Environmental, Permitting and Social Considerations

Extensive environmental studies and monitoring have been done for the Project throughout the years and throughout the evolution of the Project. Gaps in the baseline study will be resolved during the baseline data collection program of the Environmental and Social Impact Assessment expected to be submitted after completion of the FS..

The main environmental challenge for the site consists of water management and as a result Agua Rica will require adequate water management to ensure no impacts to downstream water sources or users.

The Project design follows environmental criteria and general guidelines to avoid or minimize possible effects on the environment. These guidelines consider the special and unique characteristics of the study area, environmental components of the area of influence, international best practices and local legislation.

In order to conduct further exploration or construction work at the site, IIAs must be submitted. The IIA covers all construction, operation, and closure activities of the Project. It will identify the potential impacts of the Project on its environment and include clear mitigation measures that must be implemented to avoid unwanted impacts. It also highlights the benefits that will be generated to the region as a result of direct and indirect employment, as well as local procurement. It provides practical and detailed environmental management plans that will be followed in the subsequent phases of the Project. An IIA for stand alone operations was approved in 2009, however, based on further developments, this approval was revoked. Given the Integrated Project presents a much smaller environmental footprint compared to the stand alone alternative and after extensive discussions with local authorities, it was agreed that a new IIA must be submitted in order to conduct mining activities at the Project.

Agua Rica has historically generated significant interest from local communities. The submission of the IIA in 2007 triggered a response from a group within the community, as they expressed concerns for impact to local water quality as well as other environmental concerns. Since then, Agua Rica and Alumbrera separately and now jointly, have enhanced their community and social engagement programs and the general initial community response to the Integrated Project, compared to the stand alone Project, has been very positive.

Obtaining a social license to operate is of utmost importance for any Project of this scale, and will require a specific focus. Furthermore, local regulation in Catamarca requires technical approval by the mining authority, which includes social participation and consultation process. The approach to reach this objective consists of:

- Performing a due diligence process of the social risks, with the focus on human rights.
- Designing a project that is technically sound which avoids environmental or social impacts on the local communities.
- Engaging with local communities in an honest and transparent manner, allowing for community concerns to be heard and addressed.
- Providing training, employment, and procurement opportunities to local communities to maximize the economic benefit to the local area.

A conceptual closure plan has been developed by Knight Piésold, which covers the Agua Rica pit, and other related infrastructure. The Alumbrera facilities such as the TSF and the pit, have detailed closure plans, which are updated on a regular basis as defined in local regulations.

1.3.14 Capital and Operating Cost Estimates

The estimated initial capital of $2,386 million for new construction, refurbishment of the Alumbrera facilities, and preproduction mine development will be expended over a four year period. The initial capital includes the Owners' costs and contingency, and an allowance for property purchase. The initial capital is expected to be mostly expended in the years prior to production with an amount be carried over into the first production year..

The initial capital estimate for the Project is shown in Table 1-5.

Table 1-5: Initial Capital Estimate
Yamana Gold Inc. – Agua Rica Integrated Project

Description[1]	US$ Million
Plant, Process, and Facilities Initial Capital	1,459.9
Mine Initial Capital	820.4
Owners' Initial Capital	106.0
Total	**2,386.3**

Note:

1. Includes direct costs, indirect costs, and contingency.

The sustaining capital estimate for the Project is shown in Table 1-6.

Table 1-6: Sustaining Capital Estimate
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$ Million
Mine Sustaining Capital	718.4
Plant Sustaining Capital	326.5
WRF Sustaining Capital	35.4
Plant Improvements	132.2
Mine Equipment	322.0
Total	**1,537.4**

The LOM production cost is estimated to be $12.93/t of ore processed, excluding the cost of the capitalized prestripping. The production cost includes mine operations, process plant operations, concentrate freight to port, ocean freight, WRF operation, and G&A cost. Table 1-7 shows the estimated operating cost by area per metric tonne of ore processed. In addition, LOM corporate overhead costs total $95.7 million. Treatment and refining charges (TC/RCs) are deducted from revenues.

Table 1-7: LOM Operating Cost per Tonne of Ore Processed
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$ Million	US$/t of Ore Processed
Mining	5,378.7	4.87
Plant, Pipeline and Filter Plant	6,109.7	5.53
Freight to Port and Port Operations	593.0	0.54
Ocean Freight	1,182.4	1.07
WRF	66.0	0.06
G&A and Corporate Overhead	957.5	0.87
Total Operating Cost	**14,287.3**	**12.93**

The operating cost expenditure was prepared by the Owners' team with inputs from various consultants.

1.3.15 Project Execution Plan

The execution plan for the Project has been updated from the 2013 FS and meets PFS level requirements.

The priorities for the Project are safety, quality, cost, and schedule.

For the execution phase (detailed engineering, procurement, construction), a Parties' team will manage the overall Project, including the early works program, mine development (including crusher platform earthworks), conveyor tunnel, mine facilities, infrastructure and services, offsite facilities, and Alumbrera concentrator modifications. The mine development and crusher platform will be directly managed by the Parties' mining team. A Project Director will manage the Parties' work and the overall Project.

An experienced Engineering, Procurement, Construction Management (EPCM) and/or Engineering, Procurement, Construction (EPC) company will be contracted to carry out most of the detailed design, procurement, contracts management, construction management, and project management. Specialist companies will be contracted to carry the design work in areas such as water management, waste rock deposition and tailings disposal. EPC packages will be considered. The permanent camp in the Agua Rica mine site will likely be an EPC package.

The EPCM/EPC Contractor will procure and award the equipment and materials purchases and subcontracts for its scope; the Parties' team will procure the remaining items for their scope and/or delegate this work to the engineering companies or the EPCM/EPC company.

All the sustainable development (SD) work and government relations will be managed by the Parties' team.

1.3.16 Project Risks

Risk assessment and management for the Project is based on the risk assessment carried out for the 2013 FS. That assessment resulted from a series of workshops held to identify potential risks. Risks were divided into the following main categories:

- Investment risk
- Business risk
- Project risk
- Economic and financial risk
- Schedule risk
- Human resources risk

Changes in the levels of risk in 2019 have been identified with some risks no longer applicable and some risks reduced. The main scope difference between the 2013 FS and the current study is the removal of waste crushing, conveying, and stacking. This has been replaced by truck hauling to the designated WRF area. This is evaluated as a new risk. The Project team also determined that the ore conveying system, tailings disposal, social responsibility, and environment should be re-evaluated.

Mitigation measures have reduced the risk exposure level of all 20 high risks. Eleven of the 20 high risks were reduced to moderate risks by mitigation actions. The high risks from 2013 and 2019 were consolidated into a new risk table. Initially, a total of 20 high risks were identified in the combined 2013 and 2019 risk assessment. After mitigation, nine high risks remained.

Risk identification, mitigation, and control will continue through to the completion of the Project. In the next stages of the Project, new risks will emerge, and these will be treated by applying the processes described previously.

Areas where new risks could emerge are the permitting process where the authorities could impose unexpected stringent conditions, land acquisitions (e.g. around the WRF) and granting (or renewal) of rights-of-way.

2.0 INTRODUCTION

Roscoe Postle Associates Inc. (RPA), now part of SLR Consulting (Canada) Ltd. (SLR), was retained by Yamana Gold Inc. (Yamana) to compile a Technical Report on the Agua Rica Integrated Project (Agua Rica or the Project). Yamana and Fluor Corporation (Fluor) have prepared an initial phase (PFS-A) (Fluor, 2019) of a two phase Pre-Feasibility Study (PFS-A and PFS-B) for the Project. The purpose of this Technical Report is to disclose the results of PFS-A and to support the disclosure of the June 30, 2019 Agua Rica Mineral Resource and Mineral Reserve estimates. This Technical Report conforms to National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101).

In September 2019, RPA was acquired by SLR and for the purposes of this Technical Report all references to SLR include RPA. RPA originally issued this Technical Report to Yamana on October 31, 2019 (the 2019 Technical Report). The 2019 Technical Report was not released publicly as Yamana deemed the Project to be a non-material asset at the time. During 2022, sections of the 2019 Technical Report have been updated minimally for accuracy and completeness. No new material technical work has been completed on the Project and therefore the effective date of this Technical Report remains June 30, 2019.

All currency in this Technical Report is in US dollars (US$) unless otherwise noted.

Agua Rica is a large-scale porphyry copper, gold, silver, and molybdenum deposit located in the Catamarca Province in northwest Argentina, at an elevation of approximately 3,300 metres above sea level (masl).

In March 2019, Yamana, Glencore International AG (Glencore), and Goldcorp Inc. (Goldcorp) (Collectively, the Parties or Owners) announced the signing of an integration agreement (the Integration Agreement) pursuant to which Agua Rica would be developed and operated using the existing infrastructure and facilities located at Alumbrera (the Integrated Project), 35 km west of the Project. The ownership of the Integrated Project, upon the consummation of the integration structure, was set forth as: Yamana 56.25%, Glencore 25.00%, and Goldcorp 18.75%. Following the Goldcorp-Newmont merger in April 2019, Goldcorp's interest is now held by Newmont Goldcorp Corporation (Newmont Goldcorp). The three parties also share ownership of Alumbrera, with Glencore as manager and 50% owner of the Alumbrera Project (Alumbrera) with Newmont Goldcorp owning 37.5% and Yamana owning the remaining 12.5%. Yamana owns 100% of the Agua Rica property and the combination 1:1 of the Agua Rica Project and Alumbrera Project results in the Agua Rica Integrated Project ownership structure indicated above.

The Integration Agreement provides the Parties with a path to a full integration of the Project and Alumbrera facilities, both technically and legally. Full integration is expected to occur by the filing of the FS and environmental impact assessment (EIA) or prior to if the Parties agree.

The objective of PFS-A was to define a project development case that is technically solid and provides financial returns that meet the Owners' thresholds. The current work has been developed at a pre-feasibility study (PFS) level, building upon a base of work completed in previous studies, primarily the Agua Rica 2013 feasibility study (2013 FS) and subsequent 2016 FS update. The Owners have continued to carry out ongoing value-seeking phases, including PFS-B, with the goal of reducing costs and schedule.

The Project is proposed to be developed and operated using the existing infrastructure and facilities of Minera Alumbrera Ltd. (MAA), located approximately 35 km west of the Agua Rica deposit. MAA concluded open pit mining in 2018 and its facilities are currently under care and maintenance. The Project will integrate and utilize the following MAA facilities: processing plant, fresh water wellfield at Campo Arenal, tailings dam, concentrate pipeline, filter plant, rail system from Tucumán province to Rosario port, and concentrate shipping facilities at Rosario port.

The mining operation at Agua Rica will be a conventional truck and shovel operation, producing an estimated 110,000 tonnes per day (tpd) or 40 million tonnes per year (Mtpa) of ore for the concentrator and 190,000 tpd (70 Mtpa) of waste. The operating life of mine (LOM) is approximately 28 years, after the completion of preproduction mining work which includes the pit construction and pre-stripping phase, haul road development and crusher platform excavation, and lasts approximately four years from full notice to proceed (FNTP).

2.1 Sources of Information

In preparation of this Technical Report, the Qualified Persons (QPs) reviewed technical documents and reports on Agua Rica supplied by Fluor and Yamana. This Technical Report was co-authored by a group of professionals from RPA, Yamana, SRK Consulting (U.S.), Inc. (SRK), Deswik Mining Consultants (Australia) Pty Ltd. (Deswik), formerly MCB Serviços e Mineração Ltda., Fluor Corporation (Fluor), and MM Consultores Limitada (MM Consultores).

The QPs for this Technical Report are David J. F. Smith, CEng, Principal Mining Engineer with RPA, Dominic Chartier, P.Geo., Director, Geology, Technical Services with Yamana, Berkley J. Tracy, PG, CPG, P.Geo., Principal Resource Geologist with SRK, Giorgio de Tomi, FIMMM, CEng, Mining Consultant with Deswik, Kevin A. Dardis, FAusIMM (CP), Senior Vice President with Fluor, and Anthony (Tony) Maycock, P.Eng., a Senior Consultant with MM Consultores.

Table 2-1 presents a summary of the QP responsibilities for this Technical Report.

Table 2-1: Summary of QP Responsibilities
Yamana Gold Inc.– Agua Rica Integrated Project

Qualified Person	Company	Title/Position	Section
David J.F. Smith, CEng	SLR Consulting (Canada) Ltd.	Principal Mining Engineer	1.2, 1.3.14, 2, 21, and 22
Dominic Chartier, P.Geo.	Yamana Gold Inc.	Director, Geology, Technical Services	1.3.1, 1.3.2, 1.3.3, 3 to 5, and 23
Berkley J. Tracy, PG, CPG, P.Geo.	SRK Consulting (U.S.), Inc.	Principal Resource Geologist	1.3.4, 1.3.5, 1.3.6, 1.3.7, 6 to 12, and 14
Giorgio de Tomi, FIMMM, CEng	Deswik Mining Consultants (Australia) Pty Ltd.	Mining Consultant	1.3.8, 1.3.9, 15, 16, and 18.10
Kevin A. Dardis, FAusIMM (CP)	Fluor Corporation	Senior Vice President	1.3.11, 1.3.15, 1.3.16, 18.1 to 18.9, 18.11, 18.12, and 24
Anthony (Tony) Maycock, P.Eng.	MM Consultores Limitada	Senior Consultant	1.3.10, 1.3.12, 1.3.13, 13, 17, 19, and 20
All			1.1, 25, 26, and 27

In accordance with NI 43-101 regulations, many of the QPs visited the Agua Rica property to assist in the development of PFS-A. Mr. Chartier visited the Agua Rica property from November 26 to November 29, 2019. Mr. de Tomi of Deswik visited the Agua Rica property between February 22 and 25, 2019. Mr. Tracy of SRK did not visit the Agua Rica property prior to the effective date of this Technical Report, however, did visit the Agua Rica property from April 26 to April 29, 2022. Mr. Dardis of Fluor visited the Agua Rica property between February 22 and 25, 2019. Mr. Maycock of MM Consultores visited the Agua Rica property on July 3, 2018 and the Alumbrera concentrator, filter plant, and port facilities over the period February 5 to 7, 2019.

The documentation reviewed, and other sources of information, are listed at the end of this Technical Report in Section 27 References.

2.2 List of Abbreviations

Units of measurement used in this Technical Report conform to the metric system. All currency in this Technical Report is US dollars (US$) unless otherwise noted.

µ	micron	kVA	kilovolt-amperes
µg	microgram	kW	kilowatt
a	annum	kWh	kilowatt-hour
A	ampere	L	litre
bbl	barrels	lb	pound
Btu	British thermal units	L/s	litres per second
°C	degree Celsius	m	metre
C$	Canadian dollars	M	mega (million); molar
cal	calorie	m^2	square metre
cfm	cubic feet per minute	m^3	cubic metre
cm	centimetre	MASL	metres above sea level
cm^2	square centimetre	m^3/h	cubic metres per hour
d	day	mi	mile
dia	diameter	min	minute
dmt	dry metric tonne	µm	micrometre
dwt	dead-weight ton	mm	millimetre
°F	degree Fahrenheit	mph	miles per hour
ft	foot	MVA	megavolt-amperes
ft^2	square foot	MW	megawatt
ft^3	cubic foot	MWh	megawatt-hour
ft/s	foot per second	oz	Troy ounce (31.1035g)
g	gram	oz/st, opt	ounce per short ton
G	giga (billion)	ppb	part per billion
Gal	Imperial gallon	ppm	part per million
g/L	gram per litre	psia	pound per square inch absolute
Gpm	Imperial gallons per minute	psig	pound per square inch gauge
g/t	gram per tonne	RL	relative elevation
gr/ft^3	grain per cubic foot	s	second
gr/m^3	grain per cubic metre	st	short ton
ha	hectare	stpa	short ton per year
hp	horsepower	stpd	short ton per day
hr	hour	t	metric tonne
Hz	hertz	tpa	metric tonne per year
in.	inch	tpd	metric tonne per day
in^2	square inch	US$	United States dollar
J	joule	USg	United States gallon
k	kilo (thousand)	USgpm	US gallon per minute
kcal	kilocalorie	V	volt
kg	kilogram	W	watt
km	kilometre	wmt	wet metric tonne
km^2	square kilometre	wt%	weight percent
km/h	kilometre per hour	yd^3	cubic yard
kPa	kilopascal	yr	year

3.0 RELIANCE ON OTHER EXPERTS

This Technical Report was co-authored by RPA, Yamana, SRK, Deswik, Fluor, and MM Consultores QPs. The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to the QPs at the time of preparation of this Technical Report; and
- Assumptions, conditions, and qualifications as set forth in this Technical Report.

The QP has relied on Yamana for guidance on applicable taxes, value added tax (VAT or IVA), royalties, and other government levies or interests, applicable to revenue or income from the Project in Section 22 of this Technical Report.

The QPs have not performed an independent verification of the land title and tenure information as summarized in Section 4 of this Technical Report. The legality of any underlying agreement(s) that may exist concerning the permits or other agreement(s) between third parties, as summarized in Section 4 of this Technical Report has been summarized from PFS-A. For this information, the QPs of this Technical Report have relied on information provided by the legal departments of Minera Agua Rica LLC (MAR) via email on August 19, 2019 .

The QP has relied upon a report provided by MAA and MAR entitled "Environmental Studies, Permitting, And Social Or Community Impact" and dated June 14, 2019, in Section 20 of this Technical Report.

Except for the purposes legislated under provincial securities laws, any use of this Technical Report by any third party is at that party's sole risk.

4.0 PROPERTY DESCRIPTION AND LOCATION

Agua Rica is a large scale porphyry copper, gold, silver, and molybdenum deposit located in the Catamarca Province in northwest Argentina, at an elevation of approximately 3,300 masl. It is located via road approximately 25 km north from the town of Andalgalá and 250 km north-northwest from the city of Catamarca (Figure 4-1). The Agua Rica deposit is located at approximately 27°22' S and 66°17' W.

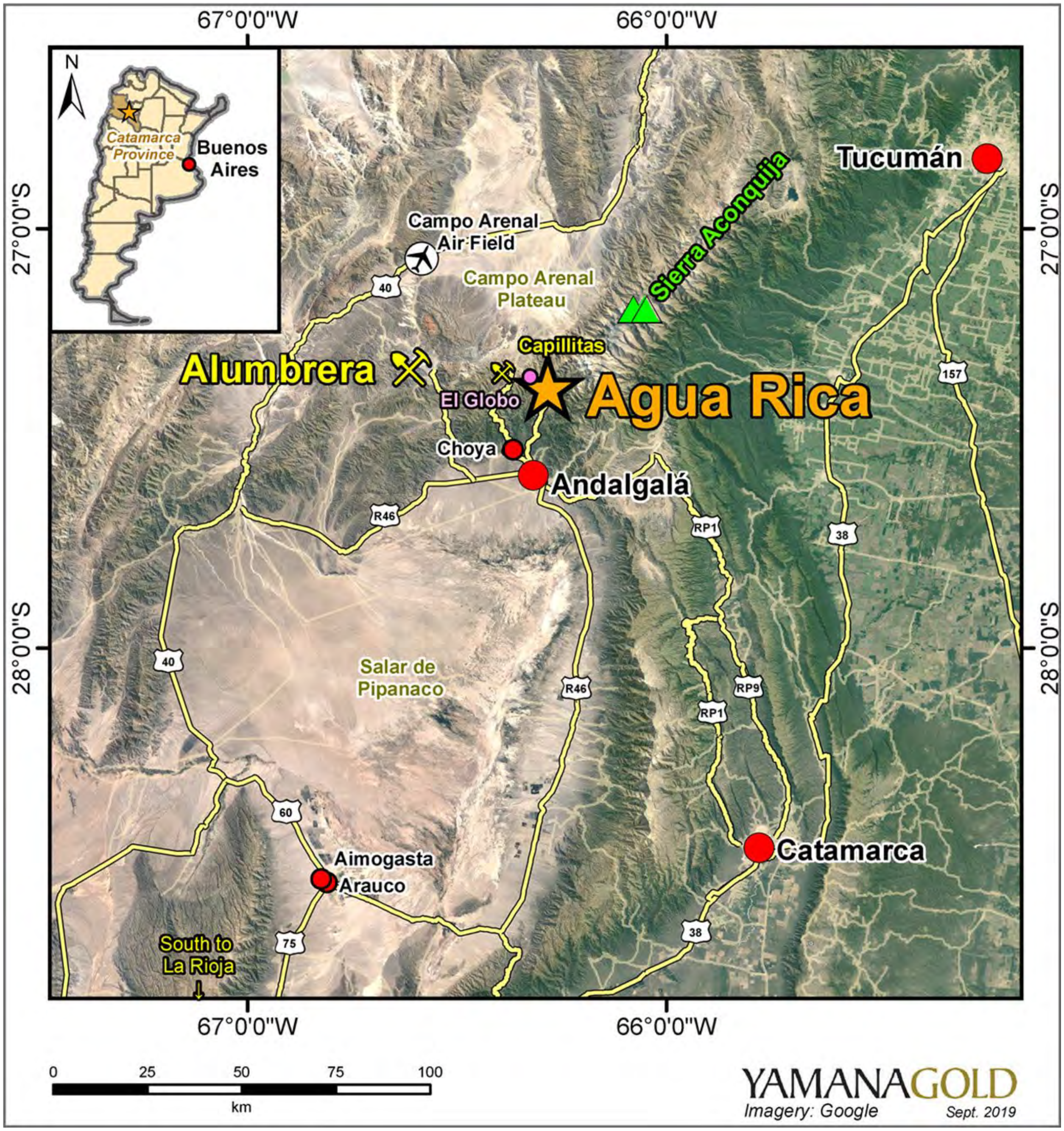


Figure 4-1: Location Map of the Agua Rica Project

4.1 Mineral Tenure

Under Argentinian law, mines are ore deposits originally owned by the national or provincial government that are granted through concession to private individuals or companies in units called “pertenencias” (mining claims).

MAR holds valid and marketable title to the deposit. As defined by the Mining Code, the Agua Rica deposit is for copper and gold which are substances classified as Category 1 (Substancias de Primera Categoría). The mining concessions of this category are granted by the state on the basis of claims filed by the interested party.

The owner of the mining concession has the right to develop all Category 1 minerals within the area of the mining concession.

Mining claims do not expire as long as payment of fees (canons) to the province are paid and certain obligations are fulfilled by the owner (investment plan). Canons payable per mine are calculated based on the mining claim type and the number of claims.

Agua Rica is comprised of a single grouped mining concession (Grupo Minero) registered with the Judge of Mines of the Catamarca Province, file number 271/2008. The Grupo Minero is composed of lode ore (vein type) and disseminated ore type mining claims. There are 146 mining claims in total within the Grupo Minero totalling 16,854 ha (Table 4-1 and Figure 4-2). MAR holds surface rights over the Grupo Minero area. 138 individual lode ore type claims are listed in Table 4-2. Resources and Reserves are within lode ore type claims.

Table 4-1: Mineral Tenure Summary
Yamana Gold Inc. – Agua Rica Integrated Project

Name	File Number	Type	Area (ha)
Agua Rica Lode Claims[1]	Various[1]	Lode	841
Capillita II	17/1998	Disseminated	2,678
Cerro Negro	148/1996	Disseminated	3,000
Cerro Negro Este	79/1995	Disseminated	776
El Candado	245/1994	Disseminated	2,769
El Candado Sur	80/1995	Disseminated	100
Melcho	239/1994	Disseminated	2,640
Portezuelo	244/1994	Disseminated	2,048
Quebrade Choya	31/1995	Disseminated	2,000
Total			**16,854**

Table 4-2: Lode Ore Type Claims
Yamana Gold Inc. – Agua Rica Integrated Project

Name	File Number	Name	File Number	Name	File Number
Mine Agua Rica	1077/1960	Estaca-Mina Mi Vida 4 B II	119/1993	Demasía Arica 53	102/1996
Estaca-Mina Agua Rica I	107/1993	Mine Mi Vida 5 B	34/1969	Demasía Arica 54	101/1996
Estaca-Mina Agua Rica II	105/1993	Estaca-Mina Mi Vida 5 B I	72/1971	Demasía Nueva Candado I	174/1998
Estaca-Mina Agua Rica III	104/1993	Estaca-Mina Mi Vida 5 B II	73/1971	Demasía Candado 84	83/1998
Estaca-Mina Agua Rica IV	103/1993	Estaca-Mina Mi Vida 5 B III	74/1971	Demasía Nueva Candado 87	86/1998
Estaca-Mina Agua Rica V	117/1993	Estaca-Mina Mi Vida 5 B IV	75/1971	Demasía Nueva Candado II	175/1998
Demasía Arica IX	64/1996	Estaca-Mina Mi Vida 5 B V	121/1993	Demasía Nueva Candado III	176/1998
Demasía Arica X	65/1996	Estaca-Mina Mi Vida 5 B VI	122/1993	Demasía Nueva Candado IV	177/1998
Demasía Arica XI	66/1996	Mine Mi Vida 6 B	35/1969	Demasía Candado 96	95/1998
Demasía Arica XII	67/1996	Mine Mi Vida 7 B	36/1969	Demasía Nueva Candado V	178/1998
Demasía Arica XIII	68/1996	Estaca-Mina Mi Vida 7 B 1	78/1971	Mine La Morenita	116/1993
Demasía Arica XIV	69/1996	Mine Mi Vida 8 B	37/1969	Mine Mi Vida 1 B	30/1969
Demasía Arica 15	79/1996	Estaca-Mina Mi Vida 8 B I	79/1971	Estaca-MiFtambona Mi Vida 1B I	123/1993
Demasía Arica 16	78/1996	Estaca-Mina Mi Vida 8 B II	108/1993	Estaca-Mina Mi Vida 1 B II	63/1971
Demasía Arica 17	80/1996	Estaca-Mina Mi Vida 8 B III	106/1993	Estaca-Mina Mi Vida 1 B III	64/1971
Demasía Arica 18	77/1996	Mine Mi Vida 9 B	38/1969	Mine Mi Vida 2 B	31/1969
Demasía Arica 19	76/1996	Estaca-Mina Mi Vida 9 B I	115/1993	Mine Mi Vida 3 B	32/1969
Demasía Arica 20	75/1996	Estaca-Mina Mi Vida 9 B III	110/1993	Estaca-Mina Mi Vida 3 B I	66/1971
Demasía Arica 21	74/1996	Estaca-Mina Mi Vida 9 B IV	109/1993	Estaca-Mina Mi Vida 3 B II	118/1993
Demasía Arica 22	73/1996	Estaca-Mina Mi Vida 9 B V	86/1971	Mine Mi Vida 4 B	33/1969
Demasía Arica 23	81/1996	Estaca-Mina Mi Vida 9 B VI	87/1971	Estaca-Mina Mi Vida 4 B I	120/1993
Demasía Arica 24	83/1996	Estaca-Mina Mi Vida 9 B VII	112/1993	Estaca-Mina Mi Vida 3 B III	68/1971
Demasía Arica 25	85/1996	Estaca-Mina Mi Vida 9 B VIII	102/1993	Estaca-Mina Mi Vida 9 B X	111/1993

Name	File Number	Name	File Number	Name	File Number
Demasía Arica 56	56/1996	Demasía Arica 26	86/1996	Estaca-Mina Mi Vida 9 B XI	92/1971
Demasía Arica 57	57/1996	Demasía Arica 27	87/1996	Estaca-Mina Mi Vida 9 B XII	114/1993
Demasía Arica 58	58/1996	Demasía Arica 28	88/1996	Estaca-Mina Mi Vida 9 B XIII	113/1993
Demasía Arica 59	59/1996	Demasía Arica 29	99/1996	Mine Mi Vida 10 B	39/1969
Demasía Arica 60	61/1996	Demasía Arica 30	97/1996	Mine Mi Vida 11 B	40/1969
Demasía Arica 61	62/1996	Demasía Arica 31	96/1996	Mine Mi Vida 12 B	43/1969
Demasía Arica 62	63/1996	Demasía Arica 32	84/1996	Mine Mi Vida 13	72/2001
Demasía Arica 63	60/1996	Demasía Arica 33	82/1996	Mine Mi Vida 13 B	44/1969
Demasía Arica 64	235/1996	Demasía Arica 34	93/1996	Mine Mi Vida 14 B	45/1969
Demasía Arica 65	237/1996	Demasía Arica 35	92/1996	Mine Mi Vida 15 B	46/1969
Demasía Arica 66	238/1996	Demasía Arica 36	90/1996	Mine Mi Vida 16 B	47/1969
Demasía Arica 67	239/1996	Demasía Arica 37	91/1996	Mine Mi Vida 17	73/2001
Demasía Arica 68	240/1996	Demasía Arica 39	98/1996	Mine Mi Vida 17 B	48/1969
Demasía Arica 69	241/1996	Demasía Arica 41	89/1996	Mine Mi Vida 18 B	49/1969
Demasía Arica 70	242/1996	Demasía Arica 42	94/1996	Mine Mi Vida 19 B	50/1969
Demasía Arica 71	243/1996	Demasía Arica 43	112/1996	Mine Mi Vida 20 B	52/1969
Demasía Arica 72	244/1996	Demasía Arica 44	111/1996	Mine Mi Vida 21 B	53/1969
Demasía Arica 73	245/1996	Demasía Arica 45	110/1996	Mine Mi Vida 22 B	54/1969
Demasía Arica 74	247/1996	Demasía Arica 46	109/1996	Mine Salvadora II	146/1998
Demasía Arica 75	236/1996	Demasía Arica 47	108/1996	Mine Silvia I	140/1996
Demasía Arica 76	246/1996	Demasía Arica 48	107/1996	Mine Silvia II	141/1996
Demasía Arica 77	248/1996	Demasía Arica 49	106/1996	Mine Silvia III	142/1996
Demasía Arica 78	249/1996	Demasía Arica 52	103/1996	Mine Silvia IV	143/1996

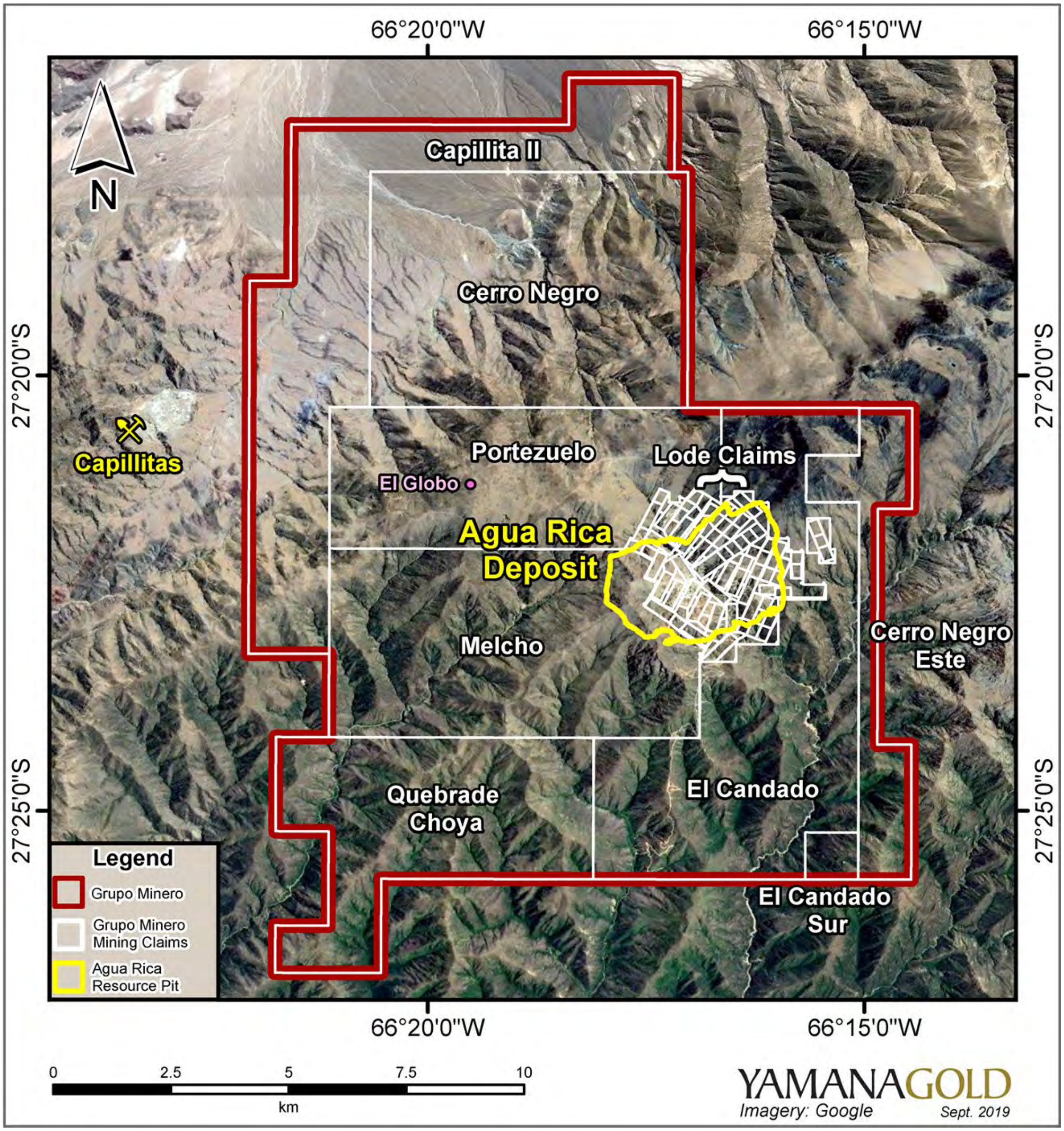


Figure 4-2: Mineral Concessions of the Agua Rica Project

4.1.1 Land and Mineral Ownership

4.1.1.1 MAR´s Surface Property in the Project Area

Minera Agua Rica holds surface rights over the land in which most of the mineral rights are located. This land is called “project property” and is described below.

4.1.1.2 Main Surface Property

Property 1 (21,345 ha) located in Andalgalá, San Fernando del Valle de Catamarca: This property was transferred to Minera Agua Rica by Agrovite S.A. on 21 March 2007 by Transfer Deed No. 48. This operation was recorded with the Cadastral Registry of San Fernando del Valle de Catamarca under Real Estate Registration Number 1687.

The property covers the Project on its north side (core and surrounding mines). The central and south zones have neither working mines nor easements.

4.1.1.3 Adjacent Surface Properties

Adjacent surface lands are described as follows:

- Property 2 (309,069.26 m2) located in Andalgalá, San Fernando del Valle de Catamarca: This property, known as Hanta Huasi, is urban and there are several installations and deposits on it. The property was transferred to MAR by Jorge Omar Yadón and Julio Cesar Yadón on January 12, 2006 by Transfer Deed No. 4. This operation was recorded with the Cadastral Registry of San Fernando del Valle de Catamarca under Real Estate Registration No. 7599.
- Property 3 (1,300 ha) located in Santa María, San Fernando del Valle de Catamarca: This property was transferred to MAR by Rosa Angelica Dulawa on December 13, 2005 by Transfer Deed No. 272. This operation was recorded with the Cadastral Registry of San Fernando del Valle de Catamarca under Real Estate Registration No. 1536.
- Property 4 (1,106 ha) located in Santa Maria, San Fernando del Valle de Catamarca: This property was transferred to Minera Agua Rica by Rosa Angélica Dulawa on December 13, 2005 by Transfer Deed No. 272. This operation was recorded with the Cadastral Registry of San Fernando del Valle de Catamarca under Real Estate Registration No. 2326.
- Property 5 (1,355 ha) located in Santa Maria, San Fernando del Valle de Catamarca: This property was transferred to Minera Agua Rica by BHP Minerals International Exploration Inc. on November 9, 2006 by transfer Deed No. 289. This operation was recorded with the Cadastral Registry of San Fernando del Valle de Catamarca under Real Estate Registration No. 2016.
- Properties 3, 4 and 5 are covered by easements for the use of water (File 358/97). The Famayfil mines are located in these properties as well.
- Property 6 (34 ha) located in Santa María, San Fernando del Valle de Catamarca: This property was transferred to Minera Agua Rica by BHP Minerals International Exploration Inc. on November 9, 2006 by Transfer Deed No. 289. This operation was recorded with the Cadastral Registry of San Fernando del Valle de Catamarca under Real Estate Registration No. 2016.
- Property 7 (3,398 ha), Río Blanco property, located in Minas Capillitas district, Andalgalá department: the possessory rights over this property were purchased and transferred to Minera Agua Rica on December 27, 2016. Title to the property is under discussion with a third party in the Courts of Catamarca.
- Property 8 (39,350 ha), Cazadero property, located in Andalgalá department. On December 28, 2017 purchased a 50% indivisible share of this property by Transfer Deed No. 412.

4.1.2 Mining Rights in Argentina

Mining activities in Argentina are governed by the National Mining Code and National Law No. 24.585 (Environmental Protection Law for Mining Activity). Legal provisions are included in Title 13, Article 2 of the Mining Code, which is enforced countrywide. The provisions of Law No. 24.585 are regulated in the Catamarca Province by Provincial Law 5,682, which appoints the local enforcement authority.

Mining activities in Catamarca Province are governed by the administrative procedures established by the Mining Code and Provincial Code of Mining Procedures.

The Mining Code governs the rights, obligations and procedures related to the acquisition, exploitation and use of minerals. The main principles of the Mining Code are as follows:

- Uniformly applicable throughout Argentina (all provinces).
- Clear and final title to mining concessions granted in perpetuity. The Mining Code regulates the possibility of acquiring in perpetuity the property of a mine subject to fulfilling certain requirements. Exploration rights are granted for a certain term but can be transformed into mines in order to receive the perpetuity effect.
- General prohibition against the state exploiting mines (concessions are granted to individuals or companies). According to the national constitution and Mining Code, the provinces are the original owners of the natural resources in their respective territories, however, such domain does not allow them to exploit mining properties. Therefore, provincial authorities grant exploration permits and mining concessions to individuals or companies.
- Priority of mining activity over surface activities (and owners) is recognized and established as a principle. For first and second category minerals, the surface land and minerals underground constitute two separate and different properties, and the mining concessionaire has certain facilitations and privileged treatment with respect to surface owners (this is ensured through automatic easements).

The Mining Code divides minerals into three categories:

- First category: This category includes precious metals, stones, and other valuable minerals such as potassium, gold, silver, and copper. The soil or surface is considered an accessory of the mine. This category of mine belongs exclusively to the province where the mine is located and can be exploited by private parties only by virtue of a legal concession granted by the competent authority. The Agua Rica deposit falls within this category.
- Second category: The Mining Code establishes a combined system for acquisition of these minerals:
    - Based on the importance: the concession of the mine is preferentially granted to the owner of the soil/surface, or
    - Based on the conditions of the mineral deposit: the mine is of common use.
- Third category: This category of mine belongs solely to the surface owner and cannot be exploited by anyone without the owner's consent, except for reasons of public benefit or interest. If these mines are declared of public interest, a concession can be granted over them to third parties, however, always giving preference to the surface owner if the owner matches the exploitation offered by the third party.

In accordance with the Mining Code, the development of mines, their exploration, concession, and further acts are deemed to be of public utility. The public utility is deemed in all matters that arise within the perimeter of the concession. Beyond this perimeter, public utility can be asserted before the Mining Authority by providing evidence of the immediate revenue that can result from development of the property. The Mining Code refers to the Mining Authority without identifying it, as it is for the provinces to determine the enforcement authority.

4.2 Underlying Agreements

4.2.1 Integration Agreement

In March 2019, Yamana, Glencore and Newmont Goldcorp entered into the Yamana-Alumbrera- Goldcorp JV which contemplates that Agua Rica will be developed and operated using the existing infrastructure and facilities of MAA.

The integrated Agua Rica Project generates significant synergies and lowers execution risk by bringing together the extensive Mineral Resource of Agua Rica with the existing infrastructure of Alumbrera. This integration creates a high quality and low-risk brownfield project that the Parties believe will bring significant value to shareholders, local communities, and other stakeholders. This unique opportunity will enhance Project economics while also reducing both the Project complexity and environmental footprint.

The Integration Agreement provides the Parties with a path to a full integration of the Project and Alumbrera facilities, both technically and legally. The ownership of the Parties upon the consummation of the integration structure is:

- Yamana: 56.25%
- Glencore: 25.00%
- Newmont Goldcorp: 18.75%

Full integration is expected to occur on or before the filing of the full feasibility study (FS), and an environmental impact assessment (EIA).

Upon signing the Integration Agreement the Parties established a Technical Committee with the primary focus to advance the Project, through its different stages, from PFS to FS, as well as advancing the permitting strategy.

MAR owned 100% by Yamana, is the legal and beneficial owner of the Project.

MAA is a joint venture (JV) operation between Glencore (manager and 50% owner), Newmont Goldcorp (37.5% owner), and Yamana (12.5% owner) that operates Alumbrera, which saw open pit mining conclude in 2018 and which is currently under care and maintenance. Yamana owns 100% of the Agua Rica property and the combination 1:1 of the Agua Rica Project and Alumbrera Project results in the Agua Rica Integrated Project ownership structure indicated above.

4.2.2 Service Agreement with YMAD

MAA and Yacimientos Mineros Agua del Dionisio (YMAD) executed an amendment to their Joint Venture agreement, known as a union transitoria empresas or UTE, for the exploitation of Alumbrera MAA-YMAD JV on September 20, 2019. YMAD is an entity composed by the Federal Government, Catamarca Province and Tucuman University. The updates of the JV agreement cover the main following points: (i) the amendment of the JV scope (among others) in order to process minerals from Agua Rica “Grupo Minero”,

(ii) the amendment of the mining lease of Alumbrera (to allow, among other things, the use of the tailings dam with minerals from Agua Rica), and (iii) the guidelines to process minerals from YMAD.

MAR would pay the MAA-YMAD JV a tolling fee per tonne of processed minerals. The price to be paid would be allocated as follows: 74% to MAA and 26% to YMAD.

4.2.3 Participation Agreement with CAMYEN

Agua Rica and Catamarca Minera y Energética Sociedad del Estado or Catamarca Mining and Energy State Society (CAMYEN) are parties to an agreement whereby CAMYEN has a participation right to receive a sum equivalent to 3% of the dividends payable by the ordinary shares held by Yamana, and MAR or the company that owns Agua Rica (the Reference Company), directly or through affiliates. If, in the future, new partners not affiliated with Yamana are incorporated into the Reference Company, the shares owned by those new partners will not be considered in the calculation of the participation right. As such, CAMYEN's right will be diluted pro-rata to the dilution of Yamana and its affiliates.

4.2.4 Stream

In 2015, Sandstorm and Yamana signed an agreement regarding payable gold of the Project. The agreement was considered as a stream. In this agreement, Sandstorm purchases 20% of the gold payables at 30% of its price in exchange for a contribution to the construction capital of the Project. As per the agreement, the advance contribution payment totals $202.5 million (estimated using a US$1,300/oz Au price), and is made in three installments, at completion of 25% of construction an initial $50.6 million payment, at 50% completion of construction, another $50.6 million, and at 80% of construction completion a final payment of $101.3 million.

Agua Rica capital and operating costs are based on the open pit mine plan presented in this section. The proposed strategy to minimize initial capital costs and maximize project value is based on contractor-based operation during the pre-production phase up to Year 3 of production. Primary equipment is planned to be purchased for the production phase to operate until the end of the mine life. The cost estimate has been completed at an accuracy of -25% to 25% and the exchange rate has been fixed at 50 Argentinean pesos per US dollar.

4.3 Permits and Authorization

4.3.1 Easements

Several easements have been granted to MAR as shown below in Table 4-3.

Table 4-3: Easement Rights Granted to Agua Rica
Yamana Gold Inc. – Agua Rica Integrated Project

	Easement Type and Purpose	File	Description	Current Status
1	Easement for use of land and mining road	File No. 185/1996	Survey approved	Granted
2	Easement for use of water Salar de Pipanaco	File No. 59/1998	Survey approved	Granted
3	Easement for use of water at Campo Arenal	File No. 358/1997	Survey pending	Granted
4	Easement for use of land and mining road	File No. 1458/2006	Survey pending	Granted

	Easement Type and Purpose	File	Description	Current Status
5	Easement for use of mining road	File No. 1466/2006	Survey pending	Granted
6	Easement of duct for use of land	File No. 94/2007	Survey pending	Granted

The Project will require, for its development, the use of the following mining easements granted for the development of the Alumbrera project (where ore processing will take place for the Project):

- Infrastructure easement,
- Slurry pipeline easement,
- Water pipeline and reservoir easement,
- Northern access road easement,
- Water easement,
- Access road and 33 kV line from mine site to Alumbrera airstrip at Campo Arenal,
- 33 kV line easement between El Bracho and filter plant, and
- Discharge pipeline easement.

The Project will also require the use of the 220 kV power line administrative easement granted by the National Secretary of Energy.

The scope of Alumbrera mining easements requires amendments to make them applicable to the Project.

4.4 Environmental Considerations

The current environmental liabilities related to Agua Rica are negligible. Project activities have been limited to prospecting, geophysical surveys, surface drilling, and environmental baseline studies. Though not on the Agua Rica property, environmental liabilities exist related to the existing Alumbrera infrastructure and facilities, to be used as part of the Integration Agreement. The Alumbrera infrastructure and facilities are managed by and have been permitted by MAA; including a comprehensive closure plan approved under applicable legislation that is currently in execution.

In March 2009, MAR's Environmental Impact Report (EIR) to advance the Project to an exploitation stage was approved by the Mining Office through Resolution No. 35/2009 (the resolution that approved the EIR is defined as the EIA). The 2009 EIA, however, is no longer valid. MAR is currently preparing two new EIRs in the short and long term. Further details on environmental studies, permitting, and social and community impacts can be found in Section 20 of this Technical Report.

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

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

The Project area is located in the Catamarca Province, accessible via road 25 km north of the town of Andalgalá. Major highways, including Routes 38, 157, and 9, connect the city of Catamarca (the capital of the Province) with other regional centres. Andalgalá, 250 km by road from Catamarca, is accessed by Federal Routes 60 and 40 and provincial roads that are in good condition. Roads in the Catamarca region, however, are generally in poor condition and deteriorate further during the summer rainy season. Access to towns in the mountains is often precarious and may be impeded by flood waters and heavy rains.

The most practical public airport with service to Buenos Aires is located in the city of La Rioja, a three hour drive from Andalgalá on well-maintained roads. San Fernando del Valle de Catamarca (or Catamarca) has a national airport (Felipe Varela), with regular flights to and from Buenos Aires Aeroparque (Jorge Newbery). The town of Andalgalá has an airstrip that used to offer weekly service but is not currently in use.

Private airstrips are present in the area, such as the one providing air access into the nearby Alumbrera mine. The area is also serviced by regular bus lines providing national, regional, and intercommunal services. Shuttle vans provide transport between rural towns.

Figure 4-1 shows the Project location with respect to the road network and nearby towns.

The existing road from Andalgalá to the Project, used during the exploration stage, is narrow and includes sharp curves and gradients up to 20%, particularly in the ten kilometre section close to Agua Rica. The conditions along this access road are considered unsafe for heavy trucks; any consideration for future use would need to be restricted to light vehicles under specific operating conditions.

A baseline survey of special (i.e., heavy and oversize) freight operations concluded that road sections between the Project and ports on the Atlantic Ocean and Paraná River (which is used as a shipping route), as well as to relevant Chilean ports, would be adequate for truck transport of concentrate, subject to the applicable safety precautions and standards.

A new access road is planned to connect Agua Rica to National Route 40 and to the city of Andalgalá. The mountain ranges around the Agua Rica site limit the options for access roads. The proposed road design standards are in line with freight requirements for the Project construction and operations stages. More details on the proposed roads are available in Section 18, Project Infrastructure.

5.2 Physiography

5.2.1 Physiography

The Project area is subdivided into two main physiographic units. The Sierras Pampeanas form a mountain chain located roughly 500 km east of the crest of the Andes. These mountains surround the Salar de Pipanaco and include Sierra del Aconquija, which hosts the Agua Rica deposit. Sierra del Aconquija is a northeast-southwest-oriented mountain chain that extends for approximately 100 km long by 40 km to 60 km wide. Summits reach 5,000 masl, water flows to the south and southwest.

The Agua Rica deposit area varies in elevation from approximately 3,000 masl to 4,000 masl. This is an area of extreme relief; slope angles are greater than 25° for more than 80% of the concession area and greater than 35° over 40% of the concession area. This presents significant challenges for access, road construction, and exploration.

The steep eastern slopes of the Sierras Pampeanas range from alpine environments at high elevation to dense subtropical forests at lower elevations where moisture from clouds is captured by vegetation. These eastern slopes are deeply incised. The western slopes are arid and rocky.

The second physiographic unit, north of the Project site, is the Campo Arenal plateau. This is a large, high, arid intermountain basin with shallow relief that lies in the rain shadow of Sierra de Aconquija. The basin is covered with broad, gently sloping alluvial fans deposited by ephemeral streams draining the bordering mountains. The basin drains towards the northwest into Río Nacimientos and to the north into Río Santa María. The aquifer is recharged from the south and southeast.

5.2.2 Seismicity

Northwestern Argentina, where Agua Rica is located, is considered a zone of moderate seismic hazard, with a mapped peak horizontal ground acceleration (PGA) of between 0.16 g and 0.24 g for the 1 in 475 year mean return period.

Earthquakes in the region tend to be confined to the area east of Agua Rica, most likely corresponding to the reverse faulting that coincides with Sierra de Aconquija.

5.3 Climate

Climate data in the Project area is available for Andalgalá (approximately 25 km south of the Project area at elevation 930 masl), Campo Arenal airfield (45 km northwest of the Project at elevation 2,300 masl), and El Globo, (five kilometres west northwest of the Project area at elevation 4,001 masl). The climate has little effect on the operating season and exploration and development activities can be carried out year-round.

5.3.1 Andalgalá, Minas, and Globo

The climate at Andalgalá is characterized by a warm and relatively wet season (December and January), a dry and cool season (June to August), and two shoulder seasons. Overall precipitation is much lower than evaporation, a consequence of the rain shadow effect of Sierra de Aconquija.

Most precipitation in the high elevations of the Sierras Pampeanas falls in the summer. Some of the precipitation in the mid to high mountain areas is in the form of a dense mist or “horizontal rain” and is captured by plants adapted to capturing water from the mist. The water balance at higher elevations is positive and sustains runoff and stream flow year round. Water balances in the foothills and the two desert basins on either side of the Sierras, however, are negative because the low rainfall, high insolation, and high temperatures result in more evaporation than precipitation. Any surface flows at low elevations are supported primarily by runoff from the high mountains.

Precipitation measurements at the Andalgalá, Andalgalá MAR, Minas, and Globo stations showed similar seasonal patterns of wet summer months and dry conditions (>10 mm) from May to September (winter).

The temperature differences between Andalgalá, Minas, and Globo correspond to a vertical gradient of about -0.5°C per 100 m, or half the adiabatic lapse rate in the free atmosphere, a value expected for vertical temperature gradients close to the earth’s surface.

Precipitation generally corresponds to only 23% (dry season) to 50% (wet season) of the evaporation rate, except at Minas, where precipitation exceeds open water evaporation in January and February. Overall, the large discrepancy between open water evaporation and precipitation demonstrates that conditions are generally dry at Andalgalá and at the Project site.

5.3.2 Campo Arenal

Campo Arenal is a high, arid, intermountain basin with shallow relief that lies in the rain shadow of Sierra de Aconquija, which blocks humid air masses brought by north-easterly winds. This rain-shadow effect and the high altitude of the basin (2,000 masl to 2,500 masl) determine the climate of Campo Arenal. According to the Köppen classification system, it is a cold midlatitude desert (code BWk), i.e., with annual precipitation less than half of potential evapotranspiration and mean annual temperature below 18ºC.

Campo Arenal is extremely dry. Precipitation ranges between 100 mm/year and 250 mm/year, most falling in summer (December to February) during the course of electrical storms. Frequent hailstorms in the high mountain areas cause road washouts due to landslides or high river flows (Fluor, 2013).

The variations in mean temperature between the four stations reflect their differences in elevation. The seasonal patterns recorded at the MAA airfield, Alumbrera, and the Metblanco stations were very similar, with mean monthly temperatures peaking at around 17°C in the summer and dropping to winter lows of approximately 10°C.

5.4 Vegetation

The Project area is covered by partially consolidated scree, poorly developed soils, less than one metre thick, and scrubby, sparse vegetation.

5.5 Local Resources

5.5.1 Andalgalá

The most important town in the department of Andalgalá, also called Andalgalá, is located about 260 km north of the provincial capital (Catamarca) and 25 km south of the Project site. In 2018, the population was estimated to be about 20,000 people.

The remainder of the department is predominantly rural, with transport, communications, and other infrastructure being limited, and frequently in poor condition.

Agua Rica's main office is located in Andalgalá and serves as the centre for operations, public relations, and contact with the community. The town of Andalgalá will also be a primary source of workers and services for the Project.

5.5.2 San Fernando del Valle de Catamarca (or Catamarca)

The industrial services available in Catamarca revolve around small or medium size companies capable of performing work such as earthworks, construction, personal transport, catering, security, and cleaning. Many of these companies were developed to align with the needs of Alumbrera and have performed well. The metal fabrication and logistics support would need to be sourced from other provinces. Agua Rica has another office in Catamarca that provides the Andalgalá office with legal and administrative support.

5.5.3 Tucumán

The capability of industry is generally much stronger in Tucumán than in Catamarca as a number of companies already provide services to Alumbrera, supplying various industrial parts, goods, and machinery with an acceptable timeframe. The metal fabrication in Tucumán is well developed for the mining industry.

5.5.4 La Rioja

The city of La Rioja is the capital of the province of Rioja; the city is the largest in the province with a population of 312,600 inhabitants in 2017. The city is served by the Capitán Vicente Almandos Almonacid airport with flights to Buenos Aires and Catamarca.

5.6 Infrastructure

5.6.1 Surface Rights

Agua Rica has sufficient surface rights for the mining operation.

5.6.2 Power

Agua Rica's power supply will be taken from a tap-off at tower 187/2 on Alumbrera's existing 220 kV line which runs from El Bracho to Alumbrera. From the tap-off, a new 220 kV line will be installed to feed the Agua Rica main substation. This substation will consist of a switch yard, two 220/23 kV-80 MVA transformers, a prefabricated electrical room, gas insulated switchgear (GIS), and auxiliary equipment. The GIS switchgear will feed unit substations in the plant areas and the mine. The power transformers will have N+1 topology, however, this will not apply to the unit substations.

The average power demand will be 45 MVA with an installed power of 66 MVA.

5.6.3 Water Supply

The fresh water supply will be pumped to the processing plant from boreholes in Campo Arenal where the Project has water rights.

5.6.4 Waste Rock Facility

The Waste rock facility (WRF) is planned to be constructed in a location proximal to where the open pit is located.

5.6.5 Tailings Management

The Project, as designed, will not require new facilities for the management of tailings. Tailings will be deposited in the Alumbrera tailings storage facility (TSF) for the first seven years of operation and will then subsequently be disposed of in the Alumbrera pit.

5.6.6 Water Management

The main objective of the surface water management plan consists of preventing contact water from entering the environment. Contact water is contained in ponds and recirculated to the plant for use within the process.

6.0 HISTORY

6.1 Property and Exploration History

Since the early 1900s, several small-scale artisanal mines around the Project have produced copper and rhodochrosite (an ornamental and semi-precious mineral), principally at the Capillitas Mine, located immediately to the west of the Project site. Activities at Agua Rica date back to the period from 1959 to 1965 when a restricted area known as Mi Vida was explored around Quebrada Minas and three small adits were driven.

Modern and systematic exploration work progressed through various phases. The main elements are summarized in Table 6-1 and are outlined below.

Table 6-1: Summary of Work History 1972 to 2014
Yamana Gold Inc. – Agua Rica Integrated Project

Item	1972: Recursos Americanos Argentinos-Cities Services	Early 1990s to 2002: (RAA) Northern Orion-BHP JV	2002 to 2007: Northern Orion	2007 to 2014: Yamana and Yamana-Alumbrera JV
Grassroots Exploration	-	✓	-	-
Exploration/Resource Definition Drilling	✓	✓	-	✓
Metallurgical Work	-	✓	✓	✓
Geotechnical Work	-	✓	✓	✓
Resource Estimation	-	✓	✓	✓
Environmental Work	-	✓	✓	✓
Results	Recognition of porphyry potential	Recognition of supergene and epithermal overprints.1997: Initial FS (103 ddh); resource updated in 1998 (150 ddh) and 1999 (176 ddh).	Updated FS and NI 43-101 Technical Report; pit, mine, and processing design; updated resource; Environmental and Social Impact Study (E&SIS)	Various optimization studies and reports including the 2013 FS and Mineral Resource and Mineral Reserve Statement.

6.1.1 Pre-2007

6.1.1.1 Cities Services Argentina – 1972 to 1973

The first modern systematic exploration work at Agua Rica occurred in the early 1970s when Cities Services Argentina S.A. (Cities Services) examined the property (known at that time as Mi Vida) under agreement with Recursos Americanos Argentinos S.A (Recursos Americanos).

Cities Services drilled 7,927 m in 38 drill holes of less than 200 m in length from low elevations, successfully intersecting porphyry-style mineralization. Owing to poor recovery and the small size of the core (BX and AX), however, the assay results from this drill campaign are not included in the Mineral Resource estimate discussed herein.

While Cities Services recognized the significant potential for porphyry style copper mineralization, other aspects such as the epithermal overprint carrying precious metals and the potential for supergene enrichment at higher elevations were not recognized. Little follow up work was carried out and in the late 1970s, the property reverted to its original Argentinean owner, Recursos Americanos.

6.1.1.2 BHP-Northern Orion Joint Venture – Early 1990s to 2002

In the early 1990s, Recursos Americanos optioned the property to BHP Minerals Inc. (BHP) with respective ownership subdivided as 30% Recursos Americanos and 70% BHP. Additionally, at that time Northern Orion Explorations Ltd. (Northern Orion) concluded an agreement with Recursos Americanos to acquire a majority share of its exploration holdings throughout Argentina, therefore becoming BHP's JV partner (BHP-Northern Orion JV) on Agua Rica.

From 1994 until late 1998, the BHP-Northern Orion JV carried out a series of field programs which included basic mapping, geochemical (rock chip) sampling, geophysics, and core drilling. From this work, zones of secondary enrichment and evidence of a post-porphyry epithermal stage of precious metals mineralization were recognized, further enhancing the economic potential of the property.

A major exploration program was initiated in 1994 and 1995 that included grassroots exploration, geophysics, and the drilling of 39 core drill holes. A second phase of drilling was conducted by the BHP-Northern Orion JV in 1996 with 64 vertical and inclined drill holes. Drilling continued in 1997 with a third phase of drilling that totalled 73 drill holes

In total, the BHP-Northern Orion JV drilled approximately 65,000 m. Later phases of the drilling included geotechnical boreholes specifically aimed at evaluating the ground conditions in anticipation of a future open pit operation.

In 1997, the BHP-Northern Orion JV completed an initial FS (the Initial FS) based on 103 drill holes and using an inverse distance squared (IDS) resource model. Two open pit scenarios, 60,000 tpd and 120,000 tpd, were investigated. Results from additional drilling in 1998 and in 1999 were incorporated into kriged resource models: the 1998 Mineral Resource model included the results from 150 drill holes, and the Mineral Resource model dated March 1999, using a combination of ordinary and indicator kriging, was informed by 176 drill holes.

In 1999, the BHP-Northern Orion JV halted all further field exploration activities at Agua Rica. Environmental monitoring continued until 2002.

6.1.1.3 Northern Orion – 2002 to 2007

In 2002, Northern Orion acquired full control of the property by purchasing BHP's remaining 70% interest and in 2003 changed its name to Northern Orion Resources Inc. (Northern Orion or NNO).

In late 2004, Northern Orion commissioned Hatch Ltd. (Hatch) to prepare a detailed update of the Initial FS (Updated FS) and a NI 43-101 Technical Report. This update focussed on the development of a mine and processing facility at Agua Rica, with production planned to commence approximately three years after Northern Orion obtained all necessary permits.

Northern Orion completed significant fieldwork to update the Initial FS. The work included the following elements:

- Geotechnical drilling.
- Collection of hydrogeological data.

- Collection of metallurgical test samples; drilling of five twinned drill holes.
- Drilling for water supply.
- Update of the previous block model and resource estimate.
- Additional baseline work to support the EIA.
- Development of pit outline, mine design, and process design.

A detailed E&SIS was completed in the fourth quarter of 2006 and presented to authorities in 2007.

In mid-2007, an environmental impact statement (Informe Impacto Ambiental or IIA), for the exploitation phase, to the authorities of the Catamarca Province and to the Ministry of Mines of the Catamarca Province. This was approved upon issuance of an IIA in March 2009. This approval has subsequently lapsed.

6.1.2 Post-2007

6.1.2.1 Yamana – 2007 to 2011

In 2007, Yamana acquired all the outstanding securities of Northern Orion and in doing so acquired 100% of the Project. Since then, Yamana has focussed on optimization studies, environmental baseline studies, and environmental monitoring; various consultants released reports in 2011 on resources, mining, processing, infrastructure, and tailings disposal, including a Mineral Resource and a Mineral Reserve statement for the Agua Rica deposit (Table 6-1).

6.1.2.2 Yamana-Alumbrera Joint Venture – 2011 to 2014

In 2011, Yamana signed a four-year option agreement (Yamana-Alumbrera JV) with MAA, whose majority owner at that time was Xstrata (now Glencore). Under the option agreement, MAA, in conjunction with Xstrata's Project Development group (PDSA), carried out a drilling program, a metallurgical test work program, and a FS that was completed in 2013 (the 2013 FS). This study considered a treatment rate of 40 Mtpa (110,000 tpd). Additional work was also carried out on a new IIA, however, this was not submitted to the authorities.

The fourth major phase of drilling on Agua Rica, consisting of 68 drill holes, was completed by Alumbrera in 2012. An additional 15 drill holes were drilled for geotechnical investigations.

In 2013, MAA completed the 2013 FS for a project development scenario similar to the current development scope, the primary difference being that crushing and conveying of waste rock in the Campo Arenal basin via a second tunnel was the considered option for waste rock storage and management.

In 2014, the Yamana-Alumbrera JV with MAA lapsed. No additional exploration work has taken place since then, other than ongoing environmental monitoring and studies.

In 2016, a high level update (2016 FS Update) of the capital estimate was completed based on the work of the 2013 FS. This update included the removal of the waste rock materials handling in Campo Arenal, with the assumption that waste rock would be hauled to a WRF near the mine pit area.

6.1.2.3 Yamana-Alumbrera-Goldcorp Integration Agreement – 2019 to present

In March 2019, Yamana, Glencore, and Goldcorp announced the signing of the Integration Agreement, pursuant to which Agua Rica would be developed and operated using the existing infrastructure and facilities located at the Alumbrera mine, located 35 km west of the Project. The ownership of Agua Rica upon the consummation of the integration structure was: Yamana 56.25%, Glencore 25.00%, and Goldcorp 18.75%. Following the Goldcorp- Newmont merger in April 2019, Goldcorp's interest is now held by Newmont Goldcorp.

6.2 Historical Resource Estimates

6.2.1 BHP-Northern Orion Joint Venture

Table 6-2 outlines the tonnes and grades estimated in the BHP-Northern Orion JV Initial FS completed in 1997 and updated in 1998 and 1999.

6.2.2 Yamana

In 2011, Yamana commissioned the Chilean company Metálica Consultores S.A. (Metálica, now Tetra Tech) to prepare a Mineral Resource and a Mineral Reserve statement for the Agua Rica deposit (Table 6-2).

6.2.3 Yamana-Alumbrera-Goldcorp Integration Agreement

In December 2012, MAA issued a new resource model which incorporated the results of the 2012 drilling campaign. This work was reported to Yamana in an internal FS prepared by MAA. The drilling database supporting the geological model consisted of 90,000 m of drilling in 245 core drill holes. From this dataset, four drill holes were removed for lack of sampling data, so a subset of 241 drill holes (86,000 m) was used for the Mineral Resource model. The geological modelling methodology was changed to reflect the implementation of implicit modelling to define lithological domains. Ore characterization was based on BHP's ore definition (May 1998), where 14 ore types were defined using geology, microscope mineralogy, ore grinding hardness, and product quality. The Mineral Resources were reported at a cut-off grade of 0.2% Cu inside a conceptual pit shell optimized using metal prices of US$2.71/lb for Cu, US$18.00/lb for Mo, and US$1,000/oz for Au.

Table 6-2: Summary of Historical Agua Rica Mineral Resources (1997 to 2012)
Yamana Gold Inc. – Agua Rica Integrated Project

Model	Date	Measured and Indicated Mineral Resources					Inferred Mineral Resources				
		Tonnes (Mt)	Grade				Tonnes (Mt)	Grade			
			(% Cu)	(% Mo)	(g/t Au)	(g/t Ag)		(% Cu)	(% Mo)	(g/t Au)	(g/t Ag)
BHP-NNO JV 103 holes	Feb 1997	1,450	0.44	0.028	0.19	3.00	217	0.44	0.028	0.19	3.00
BHP-NNO JV 150 holes	Jan 1998	1,329	0.46	0.032	0.19	2.19	385	0.32	0.031	0.11	2.51
BHP-NNO JV 176 holes	Mar 1999	932	0.48	0.030	0.19	3.10	362	0.48	0.030	0.19	3.10
Yamana (Metálica)	Dec 2011	1,110	0.47	0.032	0.21	3.38	642	0.34	0.034	0.12	2.33
Yamana-Alumbrera-Goldcorp	Dec 2012	1,128	0.50	0.031	0.20	2.78	290	0.30	0.031	0.10	1.90

Note:

1. Inclusive of Mineral Reserves where applicable.

These historical Mineral Resource estimates are treated as historical in nature; they are not current and should not be relied upon, as the QP has not done sufficient work to classify these historical estimates according to current standards.

These historical Mineral Resource estimates are superseded by the Mineral Resource and Mineral Reserve estimates outlined in sections 14 and 15 of this Technical Report.

6.3 Past Production

There has been no historical production or current production at Agua Rica.

7.0 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Tectonic Context

The Sierras Pampeanas of northwestern Argentina form the eastern-most mountain chain of the Andes. Near Agua Rica, these mountains are represented by the Sierra de Aconquija. These mountains correspond to a series of fault-bounded basement blocks that were uplifted along major reverse faults during the Andean Orogeny in the Neogene, in response to compression associated with the subduction of the oceanic Nazca plate beneath the western margin of the continental South American plate. These thrust-bound basement blocks are separated by intermountain basins which have accumulated thick sedimentary and evaporitic deposits since the middle Miocene.

Miocene–Quaternary arc volcanism produced large composite volcanoes and extensive ignimbrites and andesitic–dacitic lava flows, represented in the area by the 7 Ma Farallón Negro volcanic complex. These have been deeply eroded between the Miocene and the Pliocene.

Located at approximately 27° S latitude, the general Project area straddles the transition between two lithotectonic provinces, where the southern end of the Puna tectonic province (the extension of the Bolivian Altiplano) transitions to the south into the northern end of the Sierras Pampeanas. This corresponds to where the subducting Nazca plate transitions from an approximate dip of 30° to a near-horizontal (5° to 10°) dip further south. This transition zone is known to correspond to a copper-gold metallogenic trend that hosts large deposits such as La Candelaria, El Salvador, and La Coipa in Chile, and Baja de Alumbrera and Agua Rica in Argentina (Sasso, 1997).

The deformation associated with the basement uplifts propagated from west to east during the past 15 Ma continued between 2 Ma to 3 Ma (Allmendinger, 1986), and remains active in the present (Jordan et al., 1983).

7.2 Regional Geology

The Agua Rica deposit occurs at the southern end of Sierra de Aconquija where it is intruded by an outlier intrusion of the Farallón Negro Volcanic Complex. Sierra de Aconquija consists of Neoproterozoic metasedimentary and igneous basement rocks and coarse-grained Ordovician granitoids. It is bound on its western side by an active reverse fault. The predominant rock types consist of quartz phyllites, biotite-muscovite schists, and garnet-mica schists. These low to medium grade metamorphic rocks are intruded by Paleozoic arc-related granitoids. The age of the metamorphic basement is constrained by a few K/Ar dates, which yield minimum ages for the metamorphism of 580 Ma ± 20 Ma.

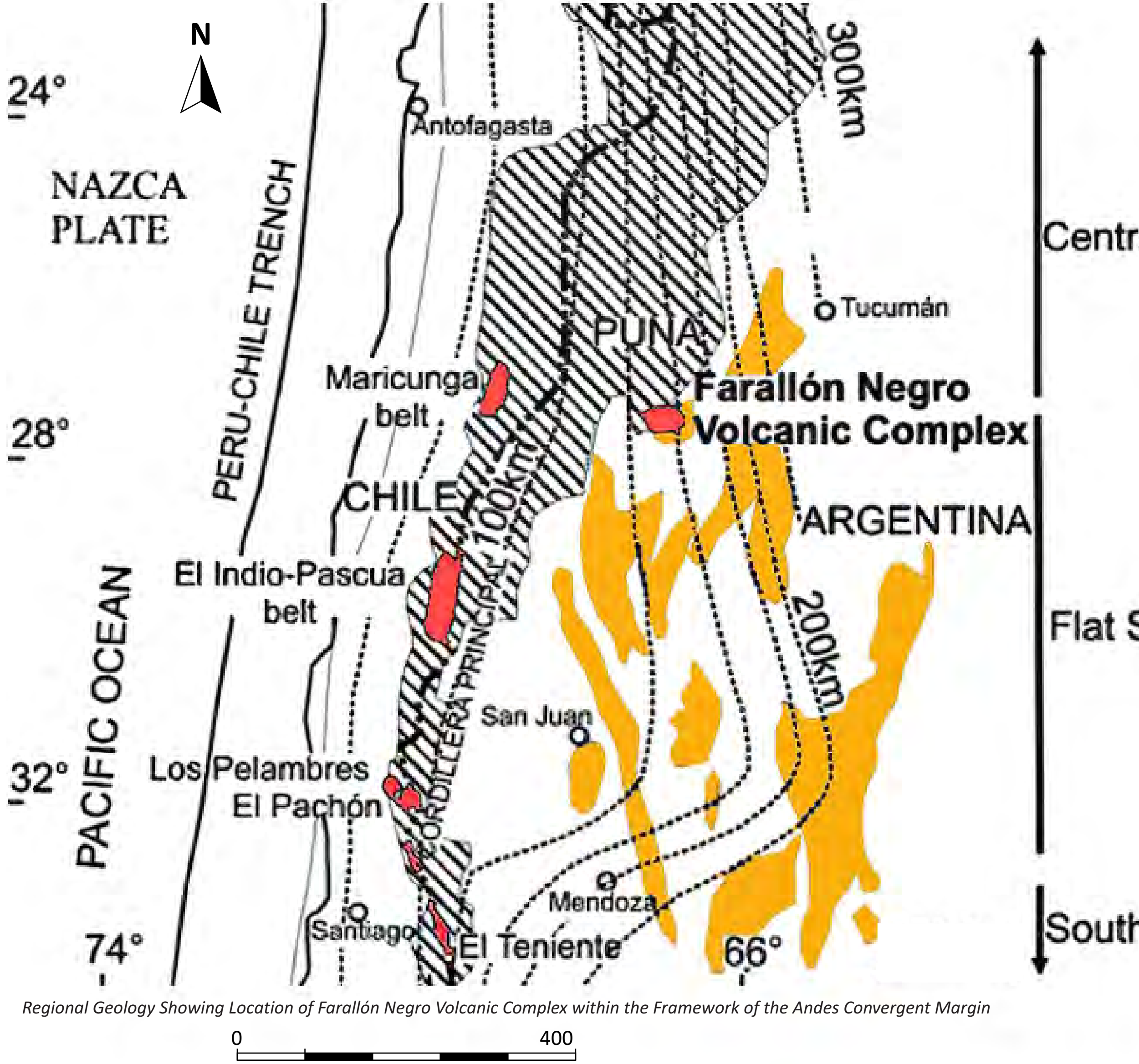
The Farallón Negro Volcanic Complex is located at the transition between the Puna and Sierras Pampeanas tectonic provinces. Covering approximately 700 km2, the volcanic complex ranges in age from 12.6 Ma to 5.5 Ma. Its early history was characterized by the eruption of calc-alkaline basalts, basaltic andesites, and dacites from several volcanic centres, possibly focussed by the intersections of regional structures. Later activity produced flows and breccias forming the main portion of a stratovolcano from 8.51 Ma to 7.49 Ma, with minor extrusion of pyroclastic rocks persisting to 6.72 Ma. This was accompanied by the emplacement of most of the Farallón Negro Intrusive Suite between 8.6 Ma and 6.8 Ma. Intrusive activity continued until 5.2 Ma when the emplacement of dacite and rhyolite dykes marked the terminal stage of magmatism. Porphyry copper-gold and epithermal silver-gold mineralization are interpreted by Sasso (1997) to be associated with this final stage.

The Farallón Negro Volcanic Complex is now deeply eroded to expose the remnant of a stratovolcano and small outlying magmatic centres, some without known remaining volcanic equivalents.

The Farallón Negro Volcanic Complex hosts several deposits and prospects, such as the giant Bajo de Alumbrera and Agua Rica copper-gold porphyry deposits, as well as the smaller Capillitas polymetallic vein and rhodochrosite deposit and the Farallón Negro-Alto silver-gold low sulphidation epithermal vein deposit. These deposits and their host volcanic/magmatic belt have been the subject of extensive studies and are well documented in scientific literature. They are associated with the trans-Andean WNW-trending Culampajá lineament, which suggests a correlation between lineaments and the distribution of volcanic centres and their associated hydrothermal systems (Chernicoff et al., 2002).

Structurally, the region is dominated by an array of NNE-trending, high to moderate reverse faults that extend for hundreds of kilometres along strike. These faults, locally offset by NW-trending structures, generally control the present-day geomorphology of the region. Rapid uplift of the basement blocks in the Miocene and Pliocene resulted in the formation of pediment surfaces and, eventually, in the exposure and local supergene alteration of hydrothermal centres.

The main elements of the regional geology showing the location of the Farallón Negro Volcanic Complex are illustrated in Figure 7-1 with additional details illustrated in Figure 7-2.



Regional Geology Showing Location of Farallón Negro Volcanic Complex within the Framework of the Andes Convergent Margin

Figure 7-1

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Location of the Farallón Negro Volcanic Complex

August 2022

Source: Modified from Franchini et al, 2011.

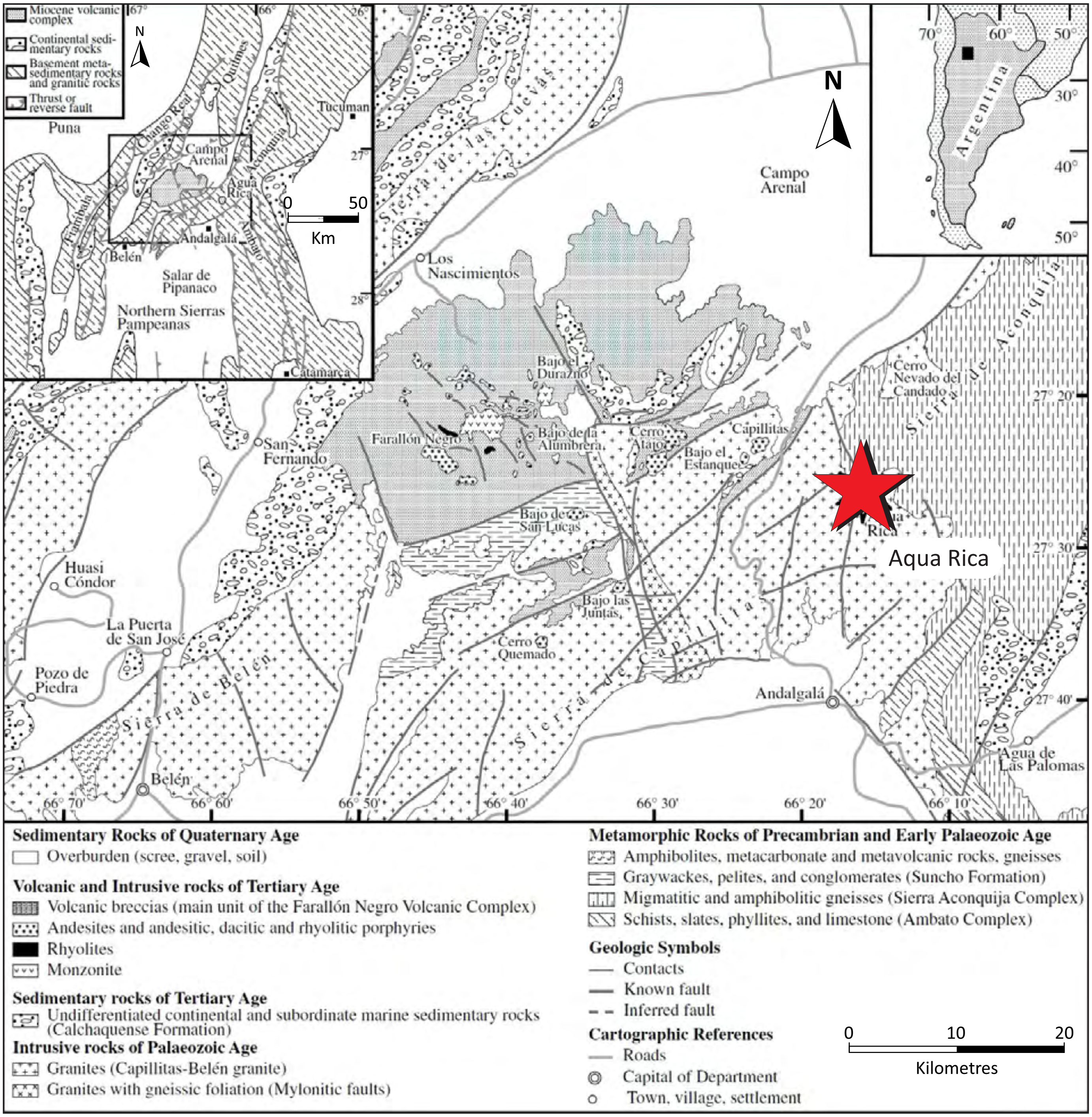


Figure 7-2

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Regional Geology Map

August 2022 ***Source: Landtwing et al., 2002 .***

7.3 Local and Property Geology

7.3.1 Property Geology Summary

The Agua Rica deposit occurs along the contact between Precambrian to lower Paleozoic rocks of the Sierra Aconquija Complex, which consists of fine to coarse metasedimentary rocks, and the coarse-grained K-feldspar-rich Ordovician Capillitas-Belén Granite.

These basement rocks are intruded by a series of multi-stage porphyry intrusions which are dated between 8.6 Ma and 5.87 Ma and are correlated with the Farallón Negro Volcanic complex. The nearby Bajo de Alumbrera deposit is also hosted by this volcanic complex. At Agua Rica, multi-stage emplacement of these intrusions into the Neoproterozoic basement rocks produced porphyry-style veining, mineralization, and alteration. This event was later overprinted by a polystage hydrothermal brecciation event associated with phyllic and advanced argillic alteration and high sulphidation epithermal assemblages. Magmatic hydrothermal activity concluded with the surface-venting of a barren phreatomagmatic diatreme which produced epiclastic sediments that filled the resulting crater. The diatreme was later intruded by a barren biotite porphyry. Finally, a stage of supergene alteration produced a leach cap and an enrichment blanket with enhanced copper and gold grades.

The various porphyry bodies correlated with the Farallón Negro Complex in the deposit area are pre-, syn- and post-mineralization in age. They are grouped as follows, based on lithology but also on alteration characteristics:

- The Melcho Intrusive Complex is an early weakly mineralized multiphase intrusion occupying the southern third of the Project area. It is subdivided in four subunits, all affected by propylitic and potassic alteration and locally overprinted by quartz-sericite alteration.
- The Seca Norte (Seca) and Trampeadero feldspar porphyry stocks were emplaced during a second stage of magmatism; they are the main hosts to porphyry mineralization. Inferred to have a dacitic composition, they occupy the central portion of the Project area and are separated by a large hydrothermal breccia pipe, which is also mineralized. The Seca Norte porphyry, on the west side, shows quartz-sericite alteration locally overprinting remnant potassic alteration. The Trampeadero porphyry forms the eastern part of the deposit where advanced argillic alteration is dominant.
- Distal porphyries containing traces of pyrite have been mapped around the margins of the mineralized system, although not in contact with the mineralized bodies, the timing relationships are unknown.
- A largely barren biotite porphyry is traced for 200 m. It contains xenoliths of metasedimentary rocks and of feldspar porphyry. It is a late-phase intrusion that post-dates the porphyry-style and epithermal mineralization.

Breccia bodies have been subdivided into the following units:

- Igneous breccia: weakly mineralized, this body is located the central part of the deposit. Characterized by a fine-grained porphyritic matrix, it interfingers with the base of the hydrothermal breccia and its emplacement is interpreted to span that of the hydrothermal breccias (i.e., a continuous suite of interfingering igneous and hydrothermal breccias). Both clasts and matrix can be mineralized with pyrite, covellite, enargite, and supergene chalcocite.
- Hydrothermal breccia: this is the most important breccia facies by volume. Overprinting the earlier intrusions and their porphyry-style mineralization and potassic alteration, this

hydrothermal breccia is coeval to the igneous breccia and is associated with advanced argillic alteration and the creation of a high sulphidation epithermal overprint. Devoid of layering, it is mostly clast-supported. Its matrix consists of varying amounts of fine-grained clastic particles cemented by hydrothermal minerals and it contains epithermal-stage minerals. This breccia is further subdivided into the following facies that show gradational contacts with one another:

- o Hydrothermal matrix facies (equivalent to Landtwig's Trampeadero hydrothermal breccia (2002)), where the matrix consists of hydrothermal minerals filling former open space. A subunit of this facies, known as the Hydrothermal Clay Matrix Facies (equivalent to Landtwing's Seca Norte hydrothermal breccia (2002)), is centred on Quebrada Minas. Its matrix consists of advanced argillic clays and it contains weak hypogene covellite mineralization.
- o Clastic matrix facies (equivalent to Agua Dulce hydrothermal breccia of Landtwing et al., 2002): a clast-supported breccia with mostly clasts of quartzitic metasedimentary rock in a matrix of rock flour with only minor infill by hydrothermal minerals.
- o Jigsaw Facies: a monomictic clast- to matrix-supported breccia where the matrix consists of clays, quartz, and sulphides.

- Crater infill or diatreme breccia: this polymictic breccia is interpreted to be produced by a surface-venting phreatomagmatic eruption. It is generally matrix-supported and grades downward into clast-supported breccia and further downwards into the igneous breccia. Some stratification is observed.
- Granite breccia: located in the centre of the Project area; all outcrops are argillized. The clasts are interpreted to be from a member of Capillitas-Belén suite.
- Talus breccia: clast-supported and poorly sorted, it is interpreted to represent epiclastic sediment shed into the crater formed by the phreatomagmatic eruption.

Irregular and randomly oriented sand and pebble dykes commonly occur at the margins of breccia bodies or at the contact between two breccia bodies. Cross-cutting relationships suggest that they may have formed throughout most of the hydrothermal history. The dykes are dominantly matrix-supported, with clast size varying from rock flour at the margins up to cobble size in their core. Some show phyllic and advanced argillic alteration, along with some occurrences of abundant covellite and pyrite in addition to chalcocite, while others are unaltered and unmineralized.

The Quaternary sequence includes three units:

- The Mi Vida conglomerate which contains clasts of all underlying units except for the Melcho intrusions. It also contains clasts of the ash fall tuff. Mineralization and all stages of alteration are evident in some clasts.
- A poorly consolidated sandy ash-full tuff that shows prominent bedding and crossbedding and has been dated at 0.52 Ma ±0.02 Ma (K-Ar age).
- Unsorted scree deposits.

The deposit is a very large low to medium grade porphyry Cu-Mo-Au system that produced porphyry-style stockwork veining, potassic and propylitic alteration, and disseminated Cu-Mo-Au mineralization as molybdenite, chalcopyrite ± bornite. This was later overprinted by strong advanced argillic alteration and a high sulphidation epithermal mineralization event associated with multiple hydrothermal brecciation events. The Seca Norte is the main host for the primary porphyry mineralization; the Trampeadero porphyries, the igneous breccia, and various facies of the hydrothermal breccias host the bulk of the epithermal mineralization. The metasedimentary wall rocks contain strong molybdenum mineralization as a halo around the main mineralizing porphyries as well as significant copper mineralization near their contact with the mineralized porphyry and hydrothermal breccia bodies.

A stage of supergene alteration produced a leach cap and an enrichment blanket where chalcocite and secondary covellite replaced the earlier covellite, pyrite, chalcopyrite, and bornite. All facies host the supergene mineralization.

The distribution of the main lithological units is outlined in Figure 7-3 and Figure 7-4, and in a section in Figure 7-10. Photographs of some of the main lithologies are illustrated in Figure 7-5. Figure 7-6 and Figure 7-7 show level plans through the deposit at 2800 m and 3400 m elevation, respectively. A detailed lithological description of the main units is listed below.

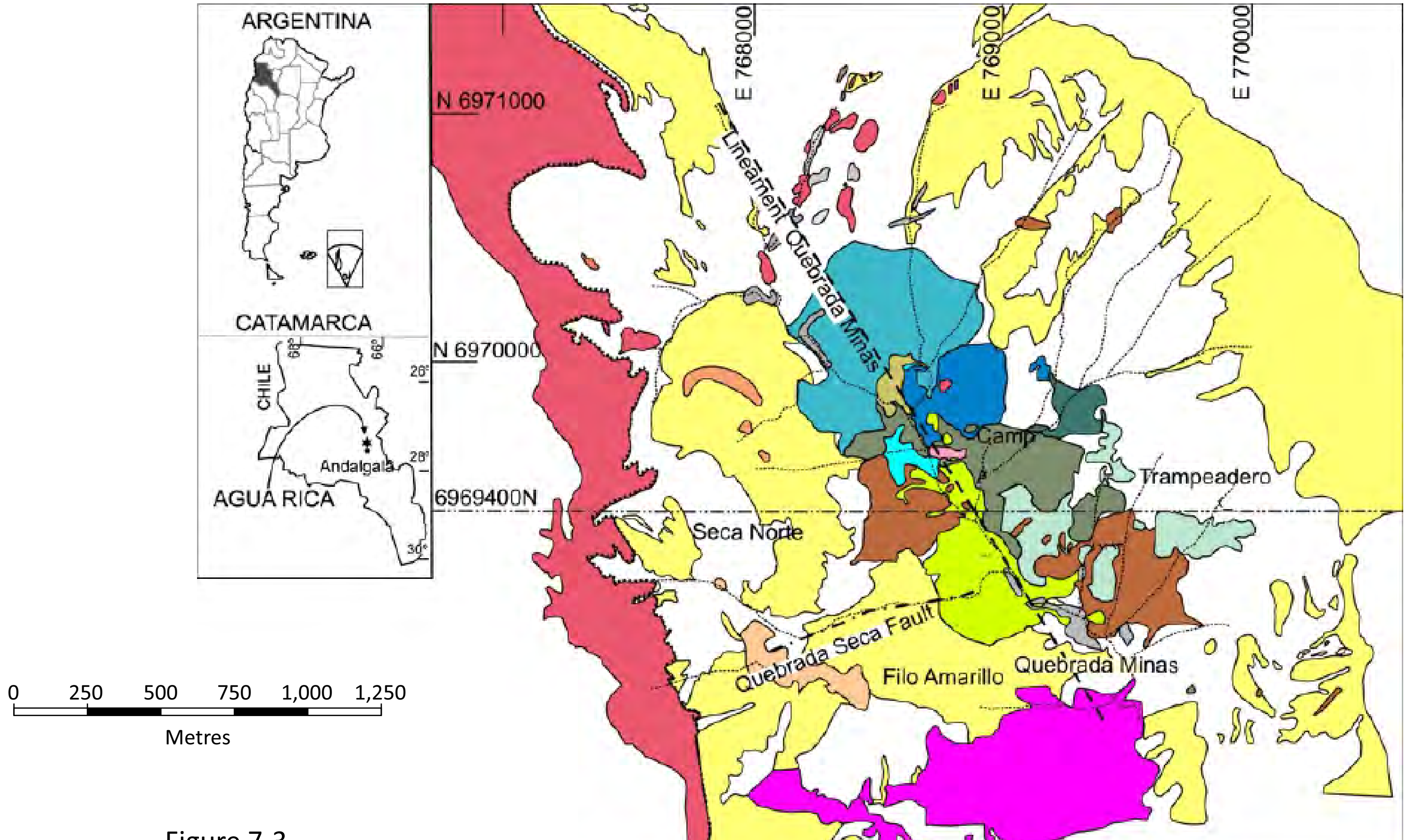


Figure 7-3

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Property Area Geology

Legend:

Drainage	Talus	Breccia Types (4 Ma?)	Biotite porphyry	Miocene Intrusives
Normal / reverse fault	Crater Infil I		Distal porphyries	
Structural lineaments	Agua dulce (hydrothermal)		Feldspar porphyries (6 Ma)	
Recent cover	Trampeadero (hydrothermal)		Melcho Intrusives (8.5 Ma)	
Mi vida conglomerate (0.5Ma)	Seca Norte (hydrothermal)		Granite	Paleozoic Basement (400 Ma)
	Igneous		Metasedimentary rocks	
	Granite			

August 2022

Source: Modified from Franchini et al., 2011.

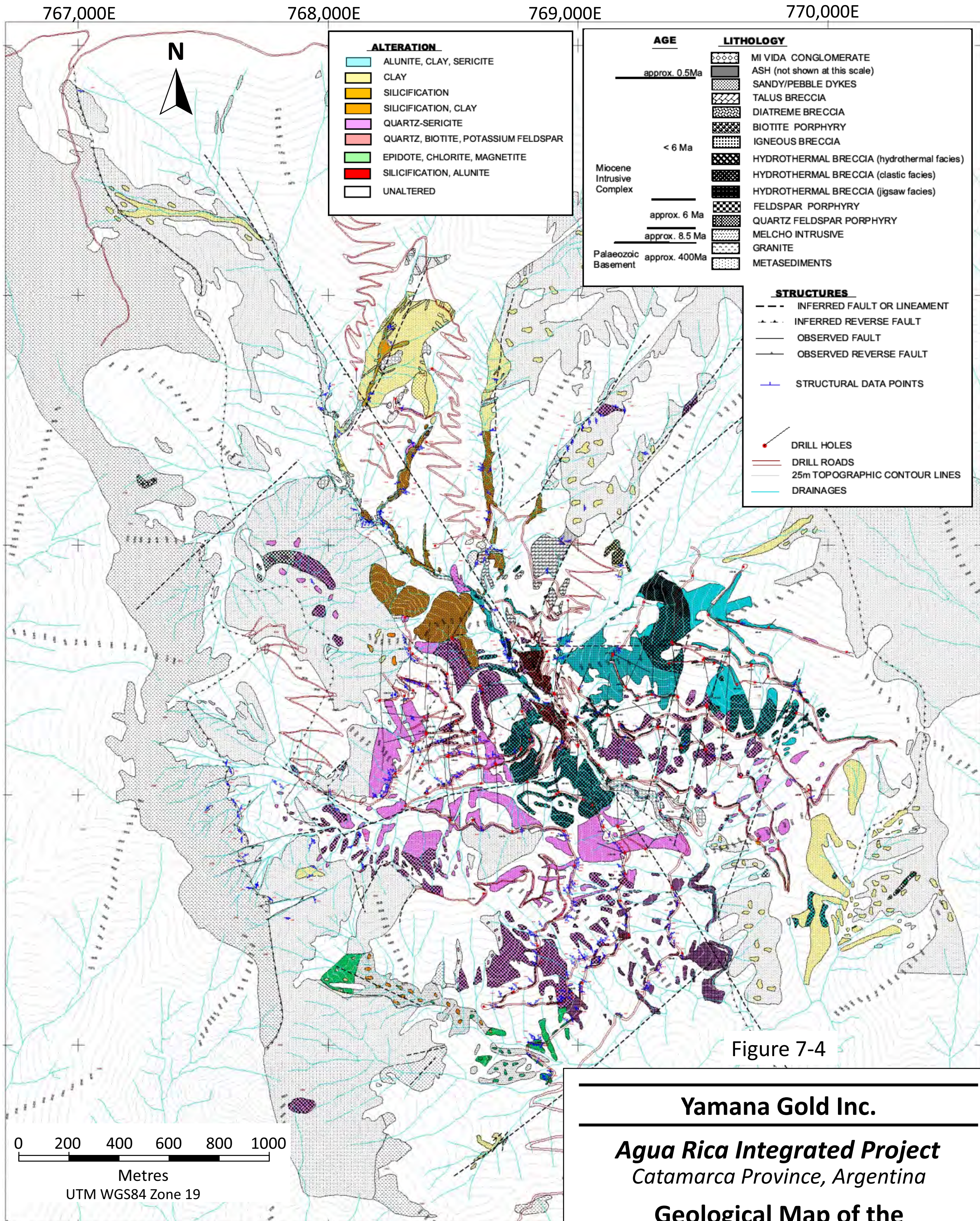


Figure 7-4

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Geological Map of the Aqua Rica Deposit

August 2022 ***Source: Minera Alumbrera, 2013.***

7.3.2 Lithology

This section describes the principal lithological and breccia units (Figure 7-3 and Figure 7-10); it borrows from the descriptions found in Landtwing et al., 2002.

7.3.2.1 Neoproterozoic Basement Rocks

The basement rocks and hosts to the volcanic complex consist of black to dark gray, fine to medium grained quartz arenites, subarkoses, graywackes, and siltstones that were regionally metamorphosed to greenschist facies and are considered to be Precambrian or Early Paleozoic (Figure 7-5). Locally, the metasedimentary rocks are cut by milky quartz veins of inferred metamorphic origin up to one metre in thickness. Texture and composition vary from fine-grained, foliated, crenulated, and schistose facies to massive quartz-rich metasedimentary rocks (Landtwing et al., 2002).

These rocks can be mineralized and/or altered as a halo or near the contact with the mineralized porphyries and the hydrothermal breccia bodies.

7.3.2.2 Ordovician Capillitas-Belén Granite

The Capillitas-Belén granite (Figure 7-5) intrudes the metasedimentary sequence as major plutons and associated pegmatites. It has been dated as Late Ordovician to Early Silurian (422.7 Ma ±6.1 Ma and 438.4 Ma ±6.3 Ma, a minimum K-Ar age of muscovite). Within the deposit area, Paleozoic granitoids are restricted to small outcrops cutting the metasedimentary rocks and occur from rafts to sand-sized clasts in most hydrothermal and diatreme breccias. Mainly composed of K-feldspar, plagioclase, quartz, biotite, muscovite, and tourmaline, it is inferred to be an S-type syenogranite (a granite with >65% of feldspars as K-feldspar). Textures vary from equigranular to porphyritic, with K-feldspar phenocrysts up to 15 cm in size. Schlieren and gneissic metasedimentary xenoliths are common as pebble to boulder size enclaves consisting of quartz, feldspar, muscovite, and abundant biotite; they commonly contain andalusite and cordierite. Pegmatites with coarse-grained porphyritic textures and large idiomorphic muscovite and K-feldspar crystals are also present, locally containing black tourmaline or green apatite crystals up to several centimetres in size.

7.3.2.3 Miocene Farallón Negro Volcanic/Intrusive Complex

This complex includes porphyry units that are pre-, syn-, and post-mineralization in age. The classification of these phases is not always strictly based on lithology as it is sometimes also influenced by styles and degrees of alteration.

Melcho Intrusive Complex: This early porphyry unit is exposed in the southern part of the deposit. It consists of porphyritic and equigranular medium to coarse-grained syenodiorite (or monzonite) (Figure 7-5). Emplacement has been dated at 8.56 Ma ±0.48 Ma (Ar-Ar age). It has been classified into four different types:

- Amphibole-feldspar porphyry: medium to coarse grained, equigranular to strongly porphyritic, composed of plagioclase (~25%), amphibole up to five millimetres in size (~10%), and K-feldspar (~10%) up to two centimetres in size. Locally very fresh, poikilitic with K-feldspar enclosing plagioclase and amphibole crystals.
- Fine-grained amphibole-quartz-plagioclase porphyry: possibly a contact facies of the amphibole-feldspar porphyry. It has an equigranular to weakly porphyritic texture with phenocrysts of plagioclase (~20%), quartz (~10%), and amphibole (~5%).

- Quartz-feldspar porphyry: medium to coarse grained, with moderate to strong porphyritic texture. Phenocrysts consist of plagioclase (~35%), quartz (10%-20%), and minor biotite and amphibole.
- Fine grained quartz-feldspar intrusion has a fine to medium grained equigranular texture, with plagioclase (20%–30%), quartz (10%–20%), and minor biotite and amphibole phenocrysts.

All of these units are variably altered to chlorite-epidote-pyrite±magnetite (propylitic alteration) and biotite-quartz-pyrite±chalcopyrite (potassic alteration) and are locally overprinted by strong quartz-sericite alteration. The two latter units cross cut the former two, are associated with porphyry style stockwork veining, potassic and propylitic alteration, and disseminated Cu-Mo-Au mineralization. They could possibly represent apophyses or time equivalents of the Seca Norte-Trampeadero feldspar porphyries.

Seca Norte and Trampeadero Feldspar Porphyries: These units host the porphyry style mineralization at Agua Rica. They form two irregular bodies inferred to have a dacitic to monzonitic composition. The Trampeadero feldspar porphyry forms the eastern portion of the deposit, where advanced argillic alteration is dominant but where lesser quartz-sericite alteration is also present (Figure 7-5). The Seca Norte feldspar porphyry forms the western portion and typically exhibits strong to intense texturally destructive quartz-sericite alteration, which in places can be seen to overprint biotite and magnetite/hematite alteration. Intrusive contacts are vertical to steeply dipping. The two units are distinguished mainly by the style and degree of quartz stockwork veining, alteration, and mineralization, rather than in their poorly preserved original magmatic character.

Two variants can be distinguished where alteration has not totally obliterated the igneous texture. The main phase in both bodies is a medium to coarse grained, moderately to strongly porphyritic feldspar porphyry. The main phenocryst phases are zoned plagioclase (~35%), biotite and amphibole (<5%), and minor small quartz phenocrysts (<5%) with local K-feldspar phenocrysts up to three centimetres in size. The groundmass consists of fine grained quartz and feldspar. The other phase is a fine grained, mafic feldspar porphyry which has a medium to fine grained, moderately porphyritic texture with plagioclase (~15%), amphibole (5%–10%), biotite (5%–10%), and quartz (<5%) phenocrysts. It may represent a finer grained and more mafic phase of the feldspar porphyry.

Distal porphyries: Several small bodies of feldspar porphyry containing traces of pyrite have been mapped around the margins of the mineralized system. Outcrops of this unit typically occur within a few hundred metres of the main mineralized porphyries but may be as far as one kilometre from known copper mineralization. Distal porphyries have not been mapped in contact with the main mineralized porphyries, and their age relations are unknown. They occur on the western edge of the Project area and on the northern and southeastern limits of the mineralized system.

Biotite porphyry: A dyke exposed next to the Agua Rica campsite has a width of several tens of metres and can be followed for 200 m. Contacts with the surrounding breccia bodies are vertical to subvertical. In places, the biotite porphyry has a chilled margin against the crater infill/diatreme breccia. Its texture varies from medium to coarse grained porphyritic, and it consists of millimetre sized plagioclase (30%), K-feldspar phenocrysts up to four centimetres in size (5%–10%), hypidiomorphic biotite plates up to seven millimetres (10%), and characteristic round quartz grains (<5%) in a pale gray, aphanitic groundmass. Locally, it contains pebble sized xenoliths of metasedimentary rocks and feldspar porphyry. The biotite porphyry is weakly overprinted by clay minerals and very minor pyrite but is totally barren of copper. Field relations show that this is a very late intrusive phase postdating porphyry style and high sulphidation epithermal mineralization.

7.3.2.4 Breccias

Igneous Breccia: the central portion of the deposit consists of irregular bodies of igneous breccia with a strongly porphyritic igneous matrix. Clasts of older igneous breccia indicate that the igneous breccia unit was formed during at least two pulses. Both clasts and matrix of this breccia are variably mineralized with pyrite, covellite, enargite, and supergene chalcocite. Identifying the igneous breccias in drill core is often difficult. Depending on alteration and the amount of brecciation, this unit can be confused with both the clastic facies of the hydrothermal breccias or with the Trampeadero porphyry. The igneous breccia is interpreted to have been emplaced before, during, and after the hydrothermal breccias, and has been postulated to be the source of heat for a phreatomagmatic eruption that led to the deposition of the diatreme breccias.

Igneous breccias contain 5% to 30% volume of poorly sorted, small to medium sized angular to subrounded matrix supported clasts (Figure 7-5). They also contain abundant clasts of metasedimentary rocks and feldspar porphyry. Clasts of milky vein quartz, granite, sand dykes, vuggy silica, chalcedony, and older igneous breccia are rarer. The igneous matrix consists of fine to medium grained small phenocrysts of (<2 mm) feldspar (25%–35%), amphibole (~5%), biotite (~5%), and rare quartz in an aphanitic pale gray groundmass. Stockwork style quartz veins cutting the matrix are absent. In the Trampeadero area, igneous breccia is exposed in the lower and central parts of the hydrothermal breccia columns, showing gradual and diffuse contacts with these probably coeval hydrothermal breccias. Here, the igneous breccia commonly shows pervasive advanced argillic alteration, with local zones of intense silicification and vuggy silica development. Clay minerals, sericite, and alunite replace feldspar phenocrysts and sulphides locally replace amphiboles.

Hydrothermal Breccia: this is volumetrically the most prominent breccia type of the Agua Rica deposit and is exposed over a vertical extent of several hundred metres. All textural variations exhibit the absence of any layering and a matrix consisting of variable amounts of silt to sand sized clastic material cemented by hydrothermal minerals. Epithermal stage minerals in the matrix indicate that the breccia is pre or syn-epithermal stage mineralization, resulting in higher levels of As, Pb, and Zn.

Contacts with the wall rocks vary from subvertical to subhorizontal but generally converge downward and flatten at lower elevations. The hydrothermal breccia is mainly clast supported with 60 vol % to 85 vol % clasts, 10 vol % to 30 vol % matrix, and 0 vol % to 10 vol % open space.

Generally, the lithologies of fragments closely reflect those of the closest wall rocks, although clast mixing can be seen away from contacts. Clasts of quartzitic metasedimentary rock and feldspar porphyry are dominant, indicating that the breccia is post porphyry stage. Schistose metasedimentary rock, milky white vein quartz, granite, other breccia types (igneous breccia, sand dykes, and older hydrothermal breccia), vuggy silica, and crystalline alunite vein material also occur as clasts. Most of the clasts are small to medium sized but boulder sized fragments and blocks also occur. Clasts are typically angular (especially those from metasedimentary rocks) to subrounded (especially those of feldspar porphyry and granite).

The hydrothermal breccia has been subdivided into three main facies that commonly show gradational contacts to adjacent facies:

- Hydrothermal Matrix Facies (corresponds to Landtwing's Trampeadero hydrothermal breccia (2002)): the matrix of this facies consists predominantly of hydrothermal minerals filling former open space. The hydrothermal infill varies depending on the dominant alteration assemblage and includes pyrophyllite, clay minerals (dickite and kaolinite), alunite, jarosite, quartz, sericite, native sulphur, pyrite, covellite, sphalerite, and/or galena (Figure 7-5). Textures vary from jigsaw breccia with angular clasts and only minor displacement of material against wall rock to strongly rotated and transported breccia clasts without preferred orientation. Centimetre to metre sized dykes of this breccia cut the metasedimentary rock or interfinger with igneous breccia. Clasts are small to medium sized.

- o Hydrothermal Clay Matrix Facies: is a sub-unit of the hydrothermal matrix facies where the matrix is dominantly composed of the advanced argillic clays, pyrophyllite, dickite, and kaolinite. This body is roughly centred on the Quebrada Minas; copper mineralization consists of weakly enriched hypogene covellite.

- Clastic Matrix Facies (corresponds to Landtwing's Agua Dulce hydrothermal breccia (2002)): the matrix of this facies consists predominantly of silt to sand sized clastic material (rock flour) with only minor infill by hydrothermal minerals. The unit is nearly monomictic with angular, medium sized clasts of quartzitic metasedimentary rock. Clasts of feldspar porphyry, igneous breccia, and granite rarely occur. With a matrix content of less than 25 vol %, the breccia is clast supported.
- Jigsaw facies: is a monomictic clast to matrix supported breccia. Clasts of metasediment or porphyry are angular, and can be reassembled, indicating little movement. The matrix is composed of sericite, clay, alunite, pyrophyllite, quartz, and sulphides.

Crater Infill Breccia (Diatreme Breccia): This breccia occupies a circular area 0.7 km by 1 km in diameter in the northern portion of the Agua Rica area. The crater infill breccia is exposed in outcrop and drill core over a depth interval of at least 700 m and has some of the characteristics of a breccia of phreatomagmatic origin (Sillitoe, 1985) generated by the interaction of magma and an external source of water. The contacts with the wall rocks (mainly basement) are steep, commonly sharp, and generally dip toward the centre of the circular body of the crater infill breccia. The topographically higher and more central parts of this breccia are stratified with normal graded and cross bedded layers, defining a basin structure. Inclination of bedding varies from about 70° to 30°, dipping and flattening toward the centre of the breccia body.

In the central to southern portion of the breccia body, west of Agua Rica camp, the crater infill breccia grades downward to an increasingly clast supported breccia and finally into igneous breccia, containing clasts of earlier igneous breccia with sulphides and advanced argillic or phyllic alteration. With the exception of these basal parts, most of the crater infill breccia is matrix supported with 40 vol % to 70 vol% clasts. The breccia is polymictic (Figure 7-5) with mainly clasts of quartzitic and schistose metasedimentary rock and feldspar porphyry, but milky white vein quartz, granite, pegmatite, igneous breccia, sand dykes, and vuggy silica clasts also occur, as well as rare clasts similar to the basal igneous breccia matrix. Some clasts of quarzitic metasedimentary rock, feldspar porphyry, and igneous breccia have undergone various stages of potassic, phyllic, and/or advanced argillic alteration. Some clasts are mineralized with disseminated pyrite, covellite, chalcocite, and molybdenite or are totally replaced by these sulphides. Some clasts of quartzitic metasedimentary rock and feldspar porphyry are cut by quartz stockwork veins.

The crater infill breccia has two interbedded subunits, a fine grained, well sorted, normal graded or cross bedded layer with small to medium sized clasts, and poorly to moderately sorted, unstratified zones with some boulder sized clasts. Accretionary lapilli and channel structures locally occur in the fine grained layers. Small and medium sized clasts are subrounded to well rounded and occur in both subunits. Larger angular to subrounded clasts, up to one metre in size, with possible impact depressions, occur locally in poorly sorted, unstratified zones. The matrix of both subunits is composed of clay minerals and subangular to well rounded clastic sand and silt grains of the same compositions as the clasts. In some outcrops, the matrix contains well rounded millimetre sized grains of pyrite. Locally the entire breccia is silicified, but alunite and covellite are absent from the matrix. Minor veinlets of fine grained, dusty chalcocite locally cut the clasts and the matrix.

Granite Breccia: Outcrops of granite breccia are concentrated in the centre of the Agua Rica prospect, within an area of about 100 m by 200 m, away from any known granite. The vertical extent of the breccia is unknown, and it is unclear if this breccia body forms an isolated block or is in contact with the underlying basement. The granite breccia is clast to matrix supported and contains 40 vol % to 70 vol % clasts. The breccia is monomictic and consists of more than 90 vol % granitic material. Most of the clasts consist of coarse grained Pabellón granite. Some clasts are pegmatitic, with centimetre to decimetre sized crystals of muscovite and black tourmaline. Rarely, clasts of quartz-feldspar-muscovite-biotite schists occur and are interpreted as schlieren and gneissic metasedimentary xenoliths in the granites. The clasts range from medium to large in size and are subrounded to well rounded. In some cases, the granite breccia shows jigsaw breccia textures; a few clasts show onion skin exfoliation with concentric fractures. The matrix consists of comminuted granitic material composed of millimetre to centimetre sized grains of biotite, muscovite, feldspar, quartz, and tourmaline, with some clay minerals. The granite breccia weathers to clay in all outcrops. In places, the matrix of the breccia contains millimetre sized, subrounded grains of pyrite, but the clasts are unmineralized.

Talus Breccia: This breccia occurs north of the Agua Rica camp, as a fan shaped deposit with a thickness of up to 50 m that overlies the crater infill breccia, the igneous breccia, the granite breccia, the hydrothermal breccia, and metasedimentary rocks. Contacts with the surrounding granite breccia, igneous breccia, crater infill breccia, and sand dykes range from low angle to vertical.

The talus breccia has 75 vol % to 95 vol % clasts and is invariably clast supported. It is essentially monomictic, with clasts of foliated and crenulated metasedimentary rock and minor milky white vein quartz clasts. Rare clasts of quartzitic metasedimentary rock occur next to the contact with the quartzitic wall rocks. The talus breccia is poorly sorted; clasts range in size between sand and boulder, but most are medium sized. All clasts are angular to subrounded, and characteristically slab to block shaped but locally jigsaw-like. The matrix is fine grained, brownish to greenish, consisting of silt, sand, and limonite variably cementing the breccia.

Clasts and matrix of the talus breccia generally are unmineralized with the exception of rare pyrite grains. Most of the outcrops are unaltered, but in some outcrops dark coloured patches overprint the matrix. These patches were shown by X-ray diffractometry to consist mainly of quartz and some biotite.

7.3.2.5 Sand and Pebble Dykes

Irregular dyke shaped sand and pebble dykes occur over the entire Agua Rica area and lack any preferred orientation. The sand dykes are typically several millimetres to several centimetres in width but locally attain several metres. Sand and pebble dykes commonly occur in contact zones between two different breccia types or between a breccia unit and its wall rock. Contacts with the surrounding rock are sharp, commonly vertical to subvertical, but locally moderately dipping. Intrusions of sand and pebble dykes commonly exhibit alteration halos in the surrounding rocks.

The sand and pebble dykes have a matrix content of 50 vol % to 95 vol % and are matrix supported. They are heterolithic, with clasts of metasedimentary rock, feldspar porphyry with or without quartz stockwork veins, granite, vuggy silica, and vein quartz (Figure 7-5). The clast size is relative to the width of the dykes. In sand dykes, clasts are sand to fine pebble sized; in pebble dykes clasts range in size up to cobbles. The clasts are predominantly rounded but in places are subrounded or angular. The matrix consists of silt and sand sized clastic grains (rock flour) and clay minerals. Some of the dykes are graded, with coarse clasts in the centre of the dyke and laminated rock flour at the margins.

Sand and pebble dykes must have been formed throughout most of the hydrothermal history at Agua Rica, by prolonged escape of volatiles along fractures, which has led to sorting and flow foliation on the margins. One dyke is cut by quartz stockwork veins of the type normally observed in the feldspar porphyries. Clasts of sand and pebble dykes occur in the igneous breccia, the hydrothermal breccia, and the crater infill breccia. Sand and pebble dykes also cut metasedimentary rocks, feldspar porphyries, igneous breccia, hydrothermal breccia, crater infill breccia, granite breccia, and even talus breccia. Alteration and mineralization of sand and pebble dykes varies widely. Some exhibit phyllic or advanced argillic alteration and may contain abundant covellite and pyrite, while others are unaltered and not mineralized. Due to their permeable matrix, they locally contain considerable chalcocite.

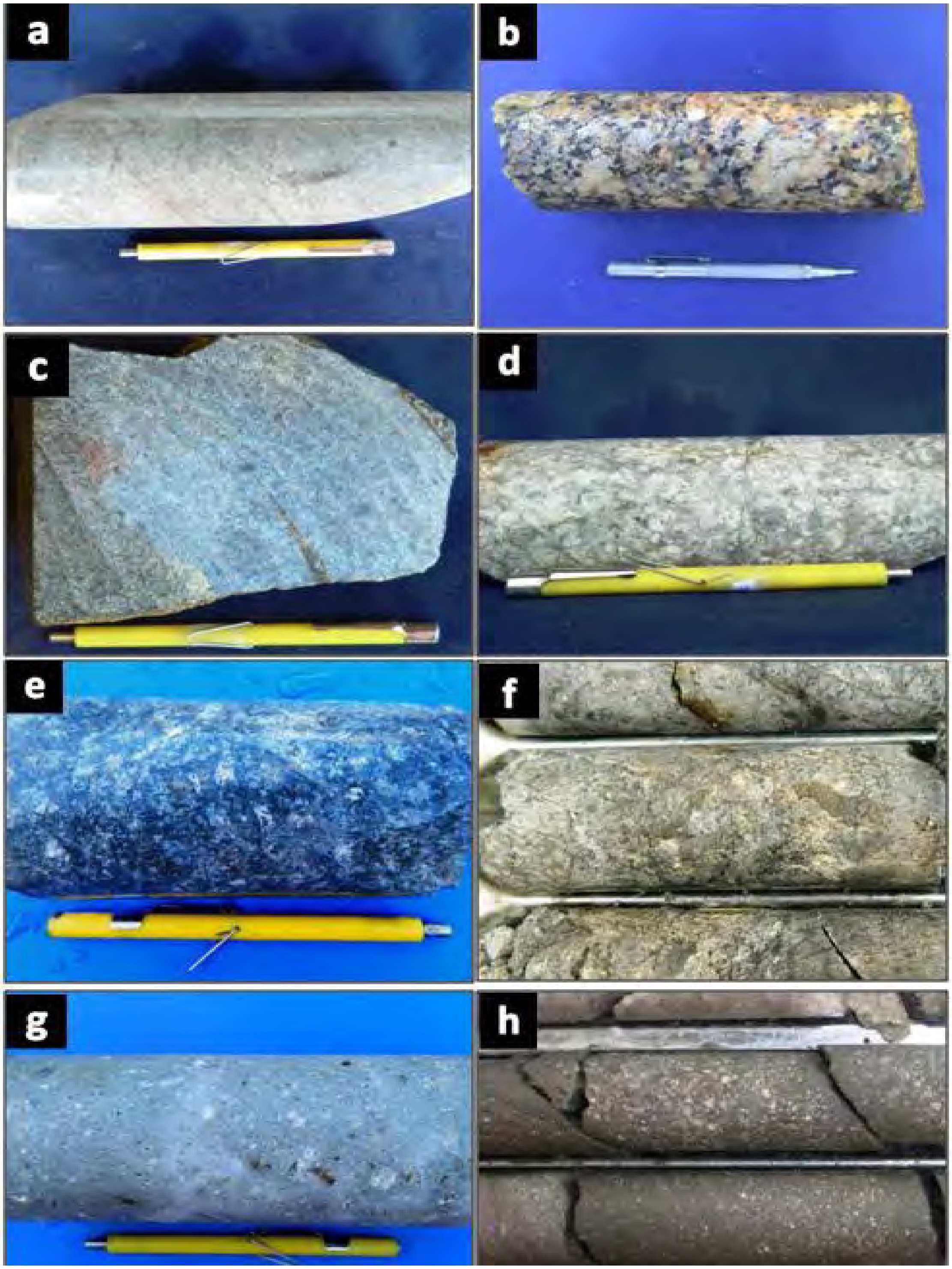
7.3.2.6 Quaternary Overburden

Mi Vida conglomerate: This unit is clast to matrix supported and contains 50 vol % to 75 vol % clasts. It is polymictic and poorly sorted, with clasts of all previously described rock units (except for the Melcho intrusions) in addition to fragments of biotite schist, ash fall tuff, and older Mi Vida conglomerate, indicating local redeposition. The size of the clasts ranges from sand to blocks of tens of metres. The clasts are angular to well rounded. The conglomerate shows a porosity of up to 20 vol %. The matrix consists of silt to coarse sand sized fragments and rusty red limonitic cement. The main components of the cement are goethite, hematite, and illite, as identified by X-ray diffractometry. The matrix of the Mi Vida conglomerate contains no sulphides, however, some of the clasts are altered and mineralized, exhibiting all alteration and mineralization stages.

The conglomerate was deposited on a paleorelief similar to the present day V-shaped valley topography, however perhaps less steep. The conglomerate rests on all previously described rock units with horizontal to slightly inclined contacts. The Mi Vida conglomerate reaches a maximum thickness of 50 m and occurs as irregular bodies in terraces both above and at the present day stream course, mainly along Quebrada Minas and Quebrada Yeguas.

Ash Fall Tuff: a sandy coarse crystal-lithic ash fall tuff was deposited on a paleorelief quite similar to the present day topography. The tuff occurs as clasts in the Mi Vida conglomerate and as an interbedded layer in the overburden. This ash layer is gray to brownish and whitish in colour and consists mainly of plagioclase, quartz, biotite, and magnetite. It commonly shows prominent bedding or cross bedding and is only weakly consolidated. In an outcrop next to the Agua Rica camp, the ash fall tuff is offset 50 cm by a recent fault. A sample of this outcrop has been dated at 0.52 Ma ±0.02 Ma (K-Ar age; Perelló et al., 1998).

Scree Deposits: Alluvial material comprising subrounded to subangular clasts of mainly metasediments, schists, gneisses, and migmatites provide a discontinuous cover to north and northwest sector of the Project.



(a) Metasediment with phyllic alteration, DDH GT-12-13, 296 m; (b) Capillitas granite, DDH GT-12-13, 8 m; (c) Melcho Intrusion, hand sample; (d) Trampeadero porphyry with phyllic alteration, DDH AR-238 96,5 m; (e) Mineralized igneous breccia with advanced argillic alteration, DDH AR-182, 299.5 m; (f) Hydrothermal breccia with advanced argillic alteration, DDH AR-202, 164.4 m; (g) Fine disseminated pyrite in polymictic diatreme breccia matrix, DDH GT-12-16, 96 m; (h) Fine disseminated pyrite in sand and pebble dyke matrix, DDH AR-182 17.5 m.

Figure 7-5: Photographs of Main Lithologies

7.3.2.7 Plan Views

Figure 7-6: Plan view of Lithology, 2,800 m:

- Almost all lithological units are found at this elevation. The small body of undifferentiated porphyry at the centre may be a large block within hydrothermal breccia.
- The chalcopyrite, bornite mineralization occurs only in Seca and is limited to the porphyry and the metasediments immediately adjacent to the porphyry. This is the only significant area of chalcopyrite mineralization. A period of hypogene leaching of chalcopyrite and redeposition of the copper as covellite is believed to account for the abundance of covellite.
- Contact relationships between porphyries and the intruded metasediments are not clear.

Figure 7-7: Plan view of Lithology, 3,400 m:

- Metasediments represent the most exposed lithological unit at this elevation.
- Small fragments of diatreme breccia, hydrothermal breccias and Seca porphyry begin to appear with a decrease of elevation.
- At this elevation, two bodies of hydrothermal breccia and the diatreme are mostly eroded away.

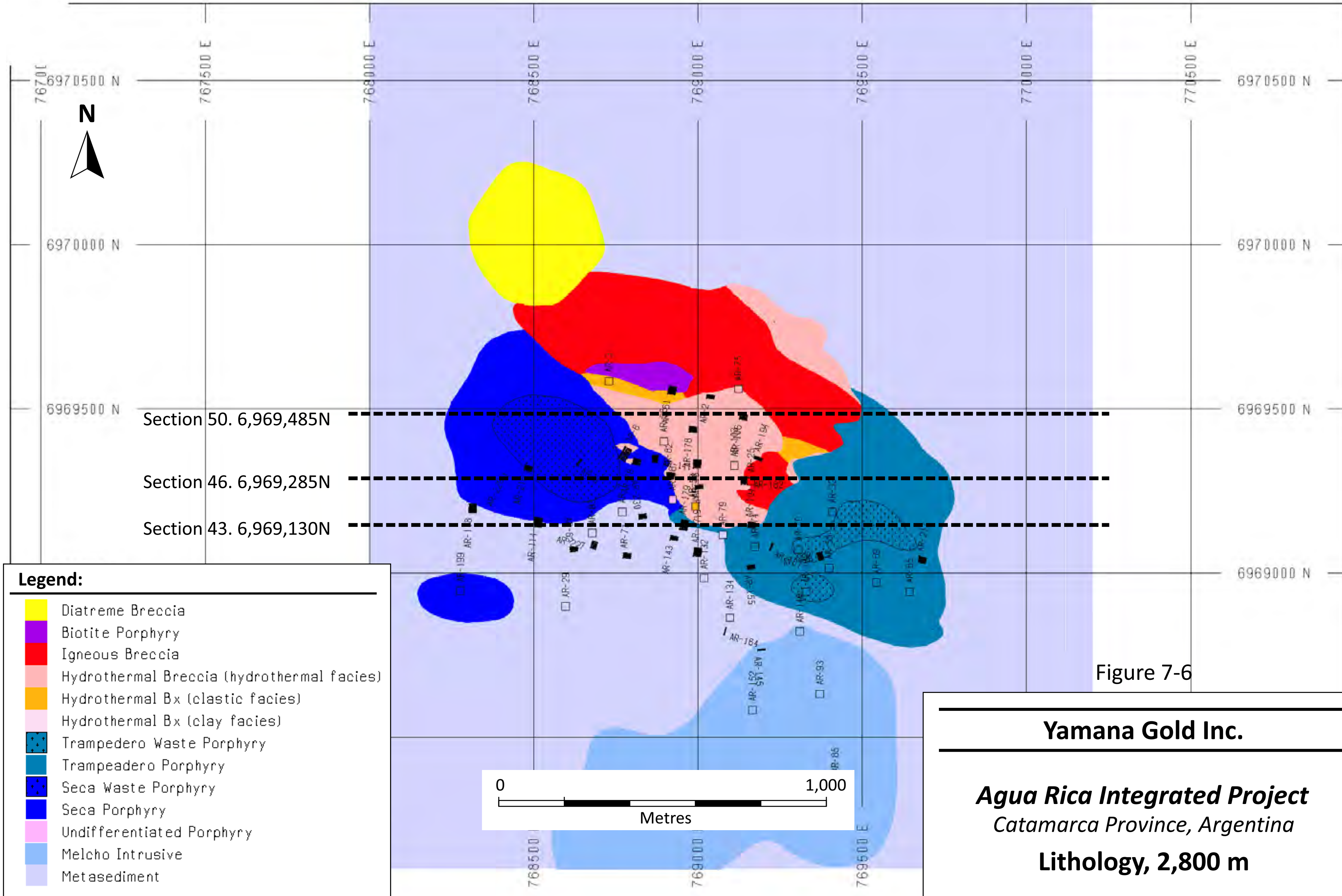


Figure 7-6

Yamana Gold Inc.

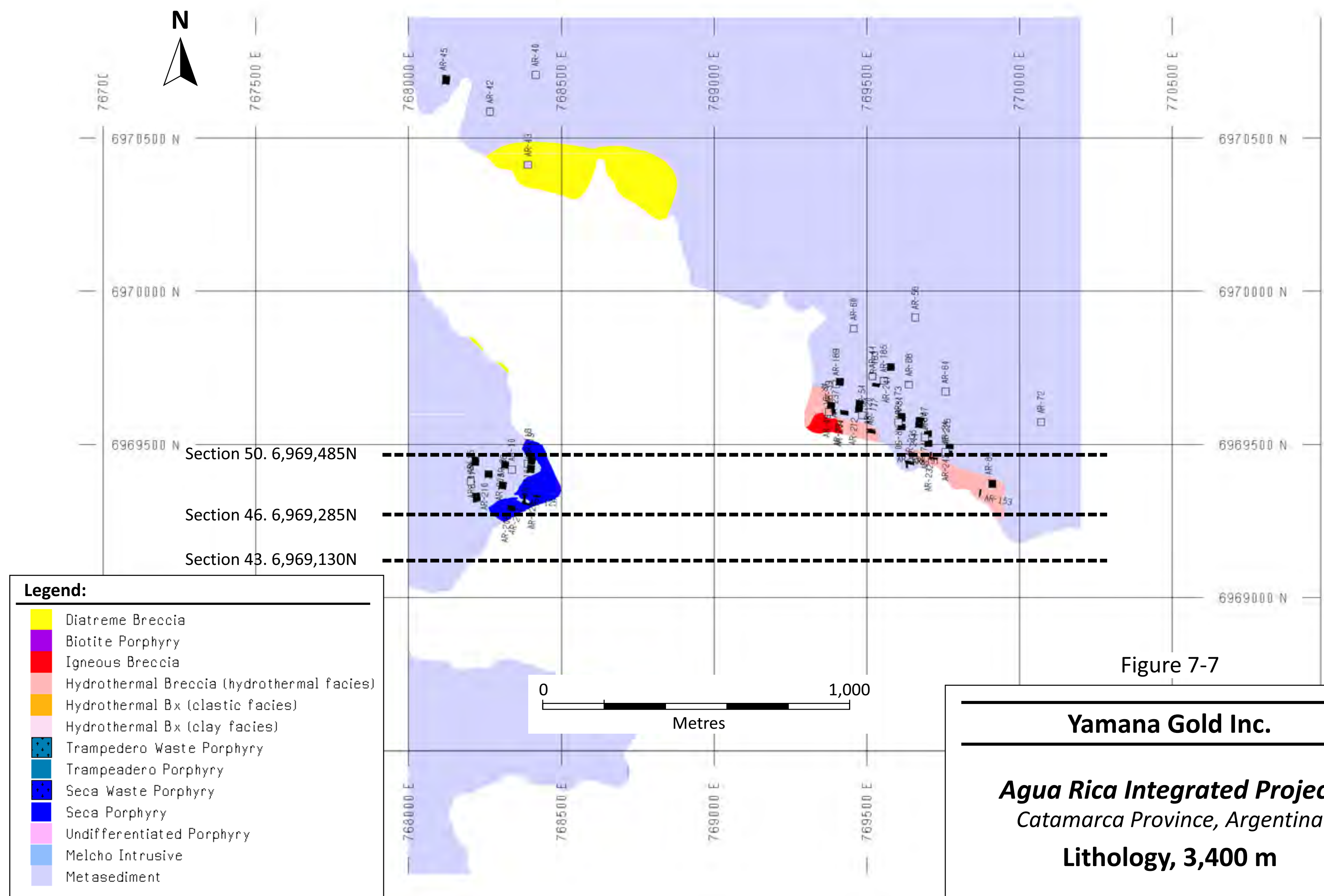
Agua Rica Integrated Project

Catamarca Province, Argentina

Lithology, 2,800 m

August 2022

Source: Minera Alumbrera, 2013.



August 2022

Source: Minera Alumbrera, 2013.

Figure 7-7

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Lithology, 3,400 m

7.4 Structural Setting

Structurally, the Project area is characterized by a number of lineaments and structures with dominant NW and NE directions. The most prominent structure is located along the relatively linear N30°W to N40°W trending Quebrada Minas valley.

Four distinct structural trends have been recognised at Agua Rica, as follows:

- The northwest striking Quebrada Minas structure lineament is thought to have controlled the emplacement of the various intrusions. It is also subparallel to the inferred fold axis in the metasedimentary rocks.
- Southwest to westerly dipping, low to moderate angle thrusts have locally put unaltered granite on top altered metasediment and structurally thickened the leached cap on the west side of the deposit. Thrust faulting may have been temporally associated with the telescoping of the system and subsequent thickening of the enrichment blanket.
- East-west striking, south-dipping normal faults were active both syn- and post-mineralization. Steeply dipping east-west structures like the Quebrada Seca structure have some control over both supergene and hypogene mineralization, as the Quebrada Seca fault offset previously leached material, and epithermal arsenic-rich fluids traveled along the same structure. The precise location of the Quebrada Seca fault is not clear east of the Minas structure, however, is obvious to the west.
    - The Agua Rica camp structure has the same orientation as the Quebrada Seca fault and may have controlled emplacement of the biotite porphyry.
- Late north-south-trending normal faults have focussed leaching and have resulted in pockets of deep leaching in the Trampeadero area; they may have offset the leached cap.

The net displacement and the sense of movement of faults is difficult to determine, but brittle syn- and post-alteration and mineralization faulting can be observed as fault breccias, pseudotachylite, zones of goethite, clay, native sulphur, and centimetre-wide veins containing pyrite, galena, covellite, and chalcocite.

7.5 Veining and Alteration

Alteration at Agua Rica is characterized by an early porphyry-stage system, with poorly preserved potassic and propylitic alteration, that was overprinted and mostly obliterated by an extended period of late-stage phyllic and advanced argillic alteration associated with multi-stage hydrothermal brecciation and epithermal mineralization.

7.5.1 Potassic Alteration

Potassic alteration is preserved in limited areas, and is assumed to have once been more extensive, as indicated by characteristic stockwork veining that can be mapped even in areas of pervasive advanced argillic overprint. Within the area of interest, remnants of potassic alteration and chalcopyrite ± bornite mineralization are present as patches in the Seca Norte and Trampeadero feldspar porphyries and as clasts in igneous breccia, hydrothermal breccia, crater infill breccia, and fault breccia.

Accompanying alteration in this stage includes potassic and propylitic alteration. This style of alteration is limited in its extent, as it has been strongly overprinted by later alteration events. Its original extent can be estimated by the extent of the quartz vein stockwork.

Potassic alteration consists of hydrothermal pale brown biotite, usually altered to chlorite or sericite. Minor K-feldspar may also be preserved. Rare magnetite-chalcopyrite veins in which magnetite has been partially altered to hematite are present in Seca Norte. Early, A-type (Gustafson and Hunt, 1975), irregular, discontinuous quartz ± pyrite ± chalcopyrite ± bornite stockwork veins are intensely developed in the Seca Norte feldspar porphyry but are weakly developed or absent in the Trampeadero feldspar porphyry. Crosscutting B-type (Gustafson and Hunt, 1975), straight, continuous quartz-molybdenite-pyrite veins with cockscomb-textured quartz are found throughout the Seca Norte and Trampeadero porphyries and in the metasedimentary rocks adjacent to the porphyries. Potassic alteration is best developed in the Melcho intrusions and in a small outcrop of breccia in the Melcho area with clasts showing pervasive quartz-biotite alteration. Low grade quartz-pyrite ± chalcopyrite ± molybdenite veins with selvages of biotite and rare K-feldspar occur in this zone. In the potassically altered areas of Melcho, amphibole is altered to biotite and pyrite.

7.5.2 Propylitic Alteration

Propylitic alteration commonly occurs distally to the Agua Rica complex, however, it is difficult to recognise due to the greenschist facies metamorphism of the surrounding metasedimentary rocks. Weak propylitic alteration is locally present around the margins of the phyllic alteration. In Melcho, propylitic alteration is indicated by alteration of amphiboles to chlorite + pyrite and the occurrence of clots of epidote.

7.5.3 Phyllic Alteration

Consisting primarily of quartz, sericite (fine-grained illite or white mica), and pyrite, phyllic alteration covers a large area and overprints, mostly destructively, the earlier potassic and propylitic alteration (Figure 7-8). In the Seca Norte feldspar porphyry, where A-type and B-type veins are abundant, fine-grained quartz and sericite with disseminated pyrite completely destroys the primary rock texture. Outside the Seca Norte porphyry, phyllic alteration is less intense and primary rock textures are usually preserved. In the Trampeadero feldspar porphyry and metasedimentary rocks, straight, continuous pyrite veins with quartz-sericite selvages are well developed. Locally, the quartz-sericite-pyrite veins coalesce into texturally destructive massive stockworks. Quartz-sericite-pyrite veins cut A-type and B-type quartz stockwork veins but do not cut hydrothermal breccia. Phyllic alteration also dominates in the Melcho area, while also affecting large portions of the northern section of the prospect, including the crater infill breccia.

7.5.4 Advanced Argillic Alteration

A large zone of advanced argillic alteration (Figure 7-10) is centrally located within a district-wide cloud of quartz- sericite (phyllic) alteration. Zones of advanced argillic alteration, with zones of vuggy silica and of massive silicification, are associated with the hydrothermal breccias. The advanced argillic alteration zone is defined by the presence of pyrophyllite and alunite. Other alteration minerals include quartz, kaolinite, dickite, diaspore, zunyite, topaz, rhodochrosite, and some sericite. Minerals of the advanced argillic alteration assemblage form most or all of the matrix of hydrothermal breccias (Figure 7-8), occur in veins without sulphides, and variably replace the groundmass and phenocrysts in the porphyries. Pervasive replacement of feldspar by alunite is especially well developed in the igneous breccia. Crystalline alunite veins cut the quartzitic metasedimentary unit as well as the feldspar porphyries and occur as clasts in the Seca Norte hydrothermal breccia. The advanced argillic assemblage is intimately associated with pyrite, covellite, enargite, sphalerite, galena, and minor molybdenite.

7.5.5 Supergene Alteration

Supergene alteration produced a well-developed copper enrichment blanket over the Seca Norte and Trampeadero feldspar porphyries. Chalcocite is the dominant supergene enrichment mineral at Trampeadero (Figure 7-8) and fine-grained covellite predominates at Seca Norte. Defining the limit of supergene enrichment is difficult in areas that have undergone advanced argillic overprint due to the presence of both fine-grained supergene and hypogene covellite. Enriched copper grades are typically twice and rarely three times as high as underlying primary grades.

Two types of supergene veins occur, (1) amorphous alunite and the chalcocite veins cut all lithologies except the Mi Vida conglomerate and (2) the ash-fall tuff. Chalcocite veins are generally one millimetre wide, discontinuous, and wispy. Amorphous alunite veins are soft and very fine grained, varying in colour from white to yellow and beige.

The leached capping mimics topography except for the structurally thickened area on the west side of Seca Norte, in a number of anomalously deeply leached areas in Trampeadero, and in local surface outcrops in Seca Norte and Trampeadero. The leached cap at Agua Rica is dominated by jarosite with lesser amounts of goethite and minor hematite. The lower boundary of supergene enrichment is subhorizontal and flatter than present valley topography.

7.5.6 Post-Mineral Silicification

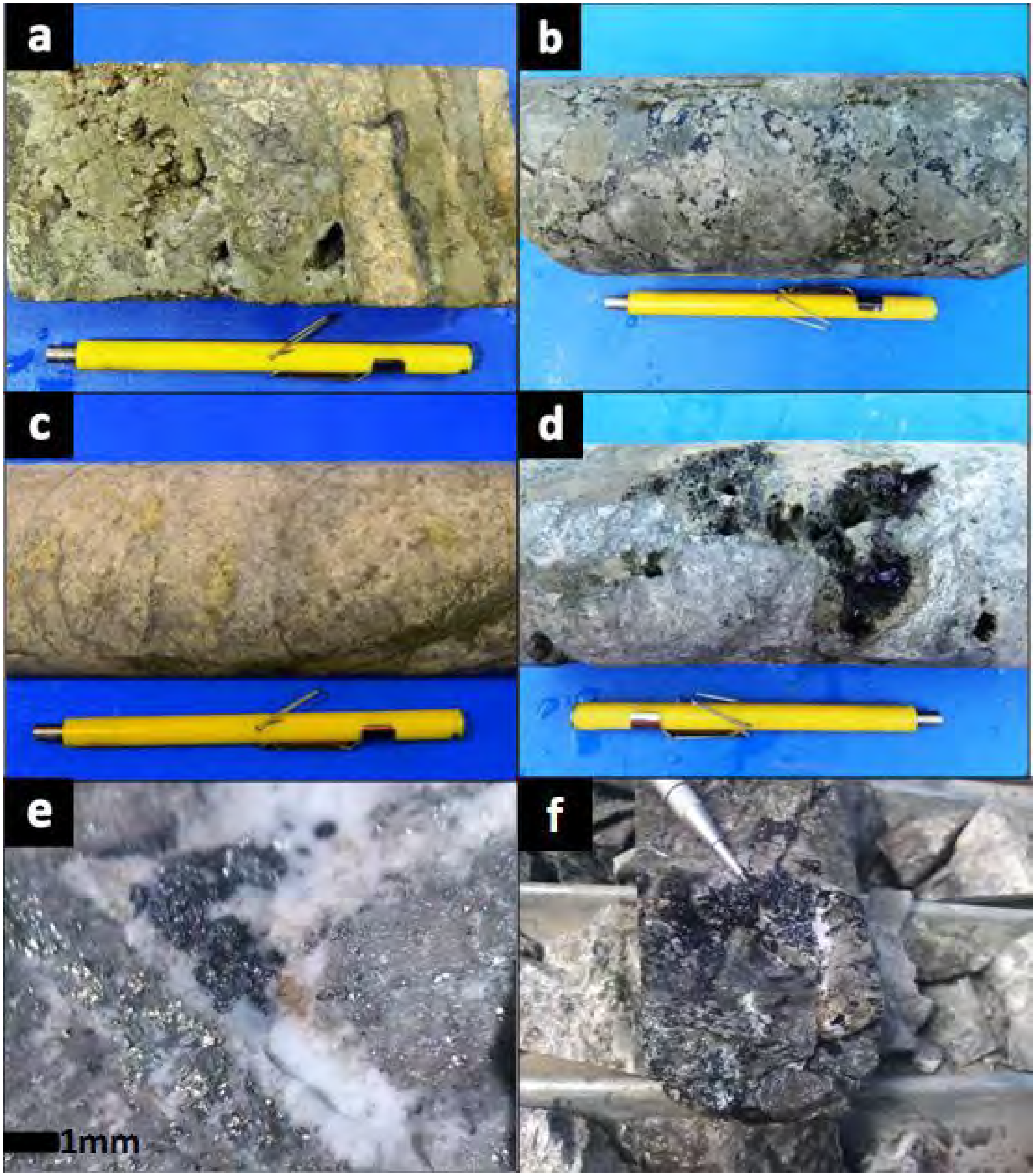
During the process of geological modelling in October 2012, the Alumbrera exploration geology department identified low grade and barren zones (<0.2% Cu) in the central areas of the Seca Porphyry (code 5) and Trampeadero Porphyry (code 6) lithological units. During a preliminary review of some drill holes drilled in 2012, it was found that the low grade and barren sectors corresponded to areas affected by silicification of variable intensity.

The geological evidence in the reviewed holes indicates the existence of a late silicification event that post-dates hydrothermal alteration and porphyry and epithermal mineralization; this had not been described in the historical geological reports. The presence of massive silica in Seca and Trampeadero (with very few sulphides), affects the rock with differing degrees of intensity. In some areas, veins cut the entire sequence of previous veinlets and capillaries veinlets. The more intense alteration creates a brecciated texture with the porphyry appearing as fragments. At its most intense, pervasive silicification obliterates the original rock texture and nearly occupies the entire rock mass.

The late silicification, however, is not the only process leading to a decrease in copper or gold grades in Seca and Trampeadero porphyries, as noted in drill holes AR-32, AR-55, AR-70, AR-96, and AR-238 where the silicification cannot be considered the cause of lower grades. The current interpretation is that there is a gradual decrease in the metal contents with increasing depth, resulting in a lower frequency of mineralized veinlets.

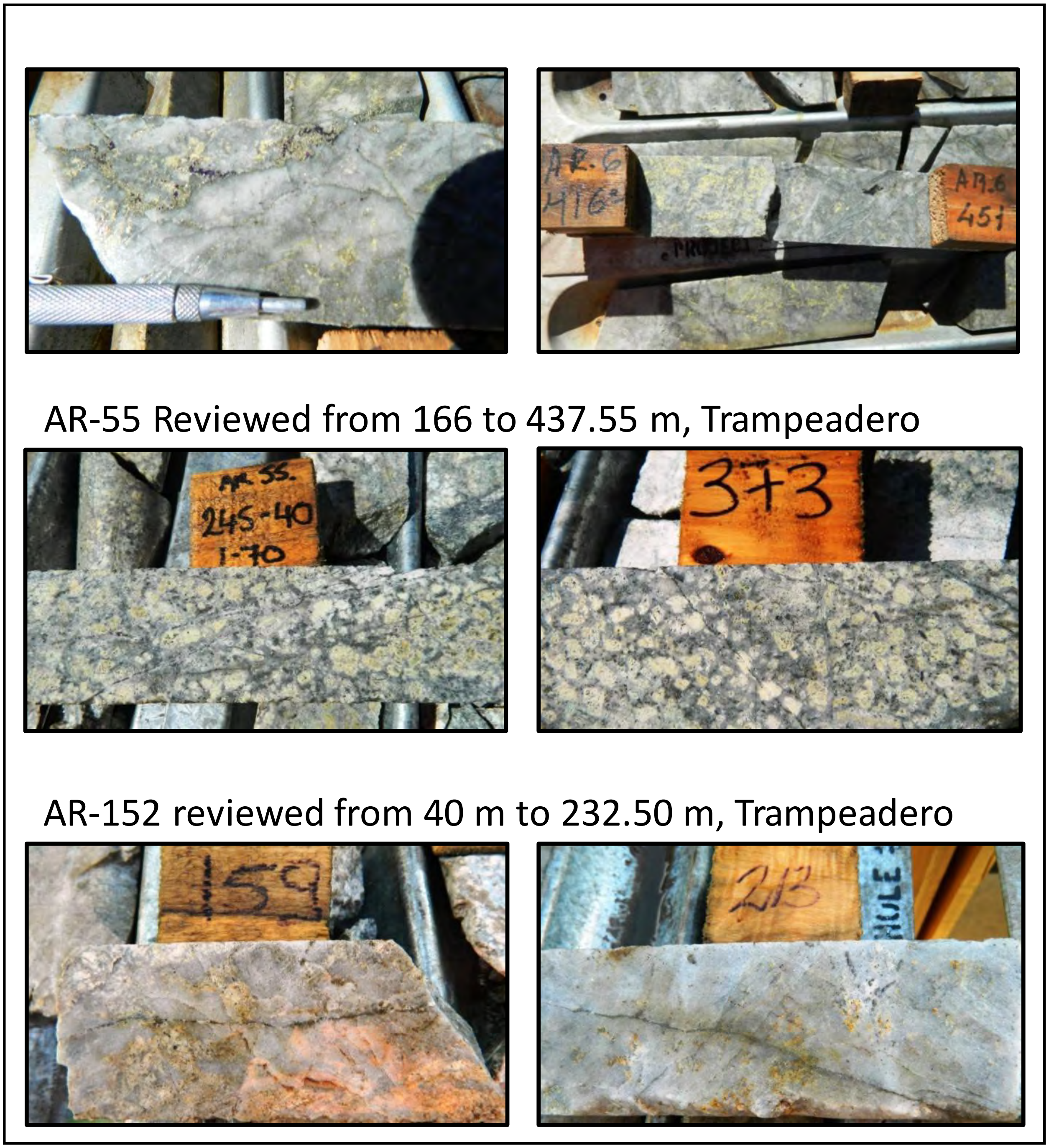
Silicification is better developed in the Seca Norte area and explains the lower grades and barren zones. In Trampeadero, while there is also silicification in some of the reviewed drill holes, they have a lesser impact on the decrease of the grade.

Figure 7-9 shows examples of post-mineralization silicification and decrease in mineralized veinlets with depth.



Notes: (a) Strong phyllic alteration and Qz+Py vein in Seca Porphyry, DDH AR-37, 28 m; (b) Advanced argillic alteration and coarse covellite mineralization in Hydrothermal Breccia, DDH AR-178, 259 m; (c) Advanced argillic alteration and fine chalcocite mineralization in Trampeadero Porphyry, DDH AR-16, 28 m; (d) Epithermal vein of Sph+Cv+Py in Hydrothermal Breccia, DDH AR-178, 142 m; (e) Advanced argillic alteration with pyrite and enargite vein in Hydrothermal Breccia, DDH AR-237, 142 m; (f) Advanced argillic alteration in Hydrothermal Breccia, with acid-leached cavities filled with epithermal vein of intergrown covellite, enargite, and trace pyrite, DDH AR-196, 144 m.

Figure 7-8: Examples of Alteration



Top: DDH AR-06: Grades decrease progressively from 415 m to a barren area with texturally destructive pervasive silicification from 450 m to 490 m, after which the intensity of silicification lessens and some relic porphyritic textures appear. LEFT: silicification increase with depth; RIGHT: detail of the covellite and pyrite capillary veinlets cut by a massive silica vein at 447 m. Middle: DDH AR-55: the frequency of veinlets gradually decreases with increasing depth, without variation of lithology or alteration. The copper-gold grades show a slight decrease from 280 m below surface, in coincidence with a gradual decrease in the abundance of the mineralized veinlets. Bottom: DDH AR-152: the copper-gold grades decrease abruptly from 146 m depth with the occurrence of massive silicification. The grades remain low until the end of the borehole. Images show two silicified intervals showing the increase in the intensity of the silicification with depth.

Figure 7-9: Post-Mineralization Silicification and Decrease in Mineralized Veinlets

7.6 Mineralization

Three major stages of alteration and polymetallic mineralization have been recognised at Agua Rica: early porphyry copper-molybdenum- gold (Cu-Mo-Au) associated with the emplacement of porphyritic intrusions, later overprinted by epithermal copper-gold-silver-arsenic-lead-zinc (Cu-Au-Ag-As-Pb-Zn) related to complex multi-stage hydrothermal brecciation; and supergene copper (Cu) enrichment. These are described in the subsections below.

7.6.1 Porphyry Stage

In a first pulse of Miocene magmatism, the emplacement of the Melcho intrusions in the southern portion of the Project area was accompanied by minor potassic and propylitic alteration and weak pyrite ± chalcopyrite ± molybdenite mineralization.

The subsequent intrusion of the Seca and Trampeadero feldspar porphyries resulted in the development of intense quartz stockwork veining, potassic alteration, and chalcopyrite-molybdenite mineralization with rare bornite and pyrrhotite. Remnants of this potassic alteration can be observed in patches in those two porphyries. Chalcopyrite and bornite are especially important at Seca Norte, however, are difficult to observe macroscopically. Rare magnetite-chalcopyrite veins in which magnetite has been partially altered to hematite are present in Seca Norte. Bornite is generally intergrown with and sometimes forms the cores of chalcopyrite grains and coincides with an area of higher primary copper grades.

Landtwing et al. (2002) note the following observations: “Early A-type (Gustafson and Hunt, 1975), irregular, discontinuous quartz ± pyrite ± chalcopyrite ± bornite stockwork veins are intensely developed in the Seca Norte feldspar porphyry but are weakly developed or absent in the Trampeadero feldspar porphyry. Crosscutting B-type (Gustafson and Hunt, 1975), straight, continuous quartz-molybdenite-pyrite veins with cockscomb-textured quartz are found throughout the Seca Norte and Trampeadero porphyries and in the metasedimentary rocks adjacent to the porphyries. Molybdenite and pyrite occur as centrelines and at the margins of these B-type veins. Molybdenite is also found as thin and discontinuous fracture fillings. Molybdenite was mainly deposited during this initial mineralization event and is only seen as veinlets within clasts in the hydrothermal breccias. Disseminated pyrite is common in the porphyries, but chalcopyrite and bornite are rarely recognizable in hand samples. An area of significant chalcopyrite and bornite occurs on the west side of the Seca Norte feldspar porphyry, where this initial phase of ore contains up to 0.8% Cu and 0.5 g/t Au. Elsewhere, chalcopyrite ± bornite ore contains about 0.3% Cu and 0.25 g/t Au.

7.6.2 Epithermal Stage

The emplacement of the hydrothermal breccias is associated with phyllic and advanced argillic alteration that carry precious metals and copper sulphosalts. The phyllic alteration assemblage, which is most intense in the Seca Norte porphyry and carries disseminated pyrite, destroys primary rock textures, including evidence of previous porphyry mineralization.

The central Quebrada Minas hydrothermal breccia body, which separates the Seca and Trampeadero porphyries, and the Trampeadero porphyry are most affected by the epithermal overprint. Mineralization is associated with an advanced argillic alteration assemblage that includes pyrophyllite and is characterized by zones of vuggy silica and massive silicification. The advanced argillic assemblage is intimately associated with pyrite, covellite, enargite, sphalerite, galena, and minor molybdenite. These sulphides occur in veins in the porphyries and metasedimentary rocks and as open-space fillings in the hydrothermal and igneous breccia.

Pyrite is the most abundant sulphide throughout the deposit, averaging 3% vol to 7% vol in the mineralized zones. Covellite is the dominant copper sulphide. Spectacular specimens of coarse-grained covellite occur as euhedral hexagonal plates up to 1 cm in veins and as cement or open-space filling in the hydrothermal and igneous breccias (Figure 7-8). Copper grades in areas with abundant, coarse-grained covellite exceed 2% Cu, whereas average disseminated copper grades throughout the Quebrada Minas breccia pipe are about 0.5% Cu (Landtwing et al., 2002).

Enargite and rare tennantite and tetrahedrite occur in association with galena, covellite and sphalerite in epithermal pyrite veins or in the matrix of hydrothermal breccias. Pyrite-covellite ± enargite mineralization is interpreted to represent the start of the epithermal stage of polymetallic mineralization, and two distinct stages are proposed as enargite is observed replacing covellite. High gold and silver grades show some spatial relationship to the hydrothermal breccia. Tagaki and Brimhall (1998) have described a very late stage of sphalerite-galena-anomalous enargite with pyrite, marcasite, and melnikovite, which contribute copper and gold at upper elevations of the Agua Rica polymetallic deposit.

Extensive reworking of earlier stage sulphides is observed. For example, central chalcopyrite- bornite has been converted to chalcopyrite-pyrite and to pyrite-bornite-chalcopyrite, and, except in the Seca Norte sector, in turn pervasively converted to pyrite-covellite. Strong advanced argillic alteration, which accompanies pyrite-covellite-enargite in upper parts of the porphyries and deeper in the breccias, is typically texture-destructive, making mapping difficult.

Lead and zinc largely occur concurrently, concentrated in the hydrothermal breccias, and correlate well with gold mineralization, and to a lesser extent, copper, and arsenic. These elements were added to the mineralized body after formation of the various breccias.

The epithermal stage of mineralization is an important contributor to the elevated gold grades credit of the deposit but has also added to the deleterious elements of the Agua Rica polymetallic deposit. Minerals introduced in this stage contain arsenic, lead, and zinc which may incur smelter penalties when processing the mineral concentrates. Comparison between geochemical data and logs show that enargite is the main source of arsenic, sphalerite is the main source of zinc, and galena is the main source of lead.

7.6.3 Supergene Stage

There is an immature supergene copper enrichment of hypogene chalcopyrite and covellite by supergene chalcocite and covellite, forming a well-developed blanket at Seca Norte and Trampeadero. Chalcocite typically forms discrete particles and rims around chalcopyrite and pyrite grains and is the dominant supergene enrichment mineral at Trampeadero and Filo Amarillo and is subordinate to supergene covellite at Seca Norte. Covellite is the dominant copper mineral at Agua Rica and differentiating between supergene and hypogene textures is difficult. Enriched copper grades are typically twice and rarely three times as high as underlying primary grades. If significant copper enrichment was ever developed over the Quebrada Minas hydrothermal breccia pipe, it has been removed during later erosion processes.

The leached capping mimics topography, except for the structurally thickened area on the west side of Seca Norte, in a number of anomalously deeply leached areas in Trampeadero, and in local surface outcrops in Seca Norte and Trampeadero. The leached capping at Agua Rica is dominated by jarosite with lesser amounts of goethite and minor hematite. The lower boundary of supergene enrichment is subhorizontal and flatter than present valley topography. No evidence for multiple episodes of enrichment has been observed. Chalcocite is the dominant supergene enrichment mineral at Trampeadero, but fine-grained covellite is the most common at Seca Norte.

7.7 Geological Interpretation and Cross-Sections

The Agua Rica intrusive complex contains porphyry units that are pre-, syn - and post-mineralization in age. The important distinction between porphyries that have been altered and mineralized by the early porphyry-copper stage and those intruded after this stage are as follows:

- The early stage is most clearly recognised by the presence of A and B quartz veins.
- The late porphyries lack quartz veins and are intimately associated with the hydrothermal breccias.

All intrusions and the breccias have been affected by late-stage advanced argillic alteration and associated high sulphidation mineralization. In terms of competency and early alteration/mineralization, both Seca and Trampeadero porphyries are similar, but the Trampeadero sector is more strongly affected by pervasive late-stage alteration/mineralization, and possibly more shattering, which might affect the continuity of grades.

The breccias are almost surely all formed by a similar mechanism (i.e., shattering and more or less fluidisation and comminution by meteoric water mixed with more or less magmatic fluid, pressurised and driven by contemporaneous igneous intrusion). There clearly were multiple pulses of breccia formation and late porphyry intrusion. All of these post-date quartz vein formations; they are pre-, syn- or post-dated by strong advanced-argillic alteration and high sulphidation mineralization.

The diatreme breccia was the last to be emplaced, except for minor pebble dykes. This post-dates almost all of the advanced argillic alteration and all but minor pyrite veining. Inward dipping bedding is typical of these and most volcanic diatreme, formed during fluidisation of the pipe and subsequent collapse.

The Agua Rica deposit is a large porphyry copper-gold-molybdenite deposit superseded by a high sulphidation gold-arsenic-lead-zinc epithermal mineralization event on top of which an immature supergene blanket has developed.

The transition from a deep porphyry environment to a near-surface venting environment is postulated to be caused by successive unroofing of the magmatic system (Landtwing et al., 2002).

The Agua Rica copper-gold porphyry deposit is a typical porphyry system with such characteristics as:

- Association of copper, gold, and molybdenum.
- Transposed remnants of A-type quartz, D-type sericite-bordered pyrite and anhydrite veinlets are recognizable in the biotite-rich gneiss and schist, which is interpreted as a former zone of biotitic alteration.
- The highest copper and gold values are found in biotite-rich metamorphic rocks containing disseminated chalcopyrite and magnetite, but little pyrite (a typical situation in porphyry copper-gold deposits).
- The hydrothermal alteration of pre-existing potassic (biotite), sericitic, propylitic, and argillic alterations are consistent with the alteration by younger copper-gold system.

7.7.1 Cross-Sections

The cross-section shown in Figure 7-10 is taken from Landtwing et al. (2002). It shows an east-west cross-section (which is located clearly on Figure 7-3) that displays the relationships between the lithologies, alteration, and mineralization types. According to this interpretation, mineralization is hosted primarily by the Seca and Trampeanos porphyries, the hydrothermal breccia, the igneous breccia, and also by the metasedimentary wall rocks. Early porphyry-style Cu-Mo-Au mineralization is overprinted by Cu-Au-Ag-Pb-Zn mineralization associated with but not restricted to the hydrothermal breccia and a zone of advanced argillic alteration; some phyllic alteration on the west side of the deposit is also strongly mineralized.

The primary porphyry-stage mineralization is associated with the Seca Norte porphyry. The bulk of the later epithermal mineralization coincides roughly with the envelope of advanced argillic alteration. A blanket of supergene enrichment of variable thickness covers the whole deposit and has been partially eroded. It is blanketed in turn by a leached cap; the contact appears offset or thickened along steep faults.

The following three cross-sections (Figure 7-11 to Figure 7-13) are actual sections of the deposit (not schematic representations) at a more detailed scale. They are oriented east–west and cut the deposit in the southern (6,969,130N), central (6,969,285N) and northern portion of the deposit (6,969,485N).

Figure 7-11, Lithological Section on Northing 6,969,130N, Southern Sector:

- The section cuts six lithological units: Hydrothermal Breccia, Hydrothermal Clay Matrix Facies, Seca and Trampeadero porphyries, Trampeadero Waste Porphyry, and metasediments.
- Metasediments surround other units and contain massive pyrite veins from phyllic alteration.
- Trampeadero Waste Porphyry is located within the lower part of the Trampeadero porphyry.
- The Hydrothermal Clay Matrix Facies Breccia and the Hydrothermal Matrix Facies Breccia with advanced argillic alteration occur in the central part of this section.
- The Seca porphyry is located on the west side of the section but does not outcrop.

Figure 7-12, Lithological Section on Northing 6,969,285N, Central Sector:

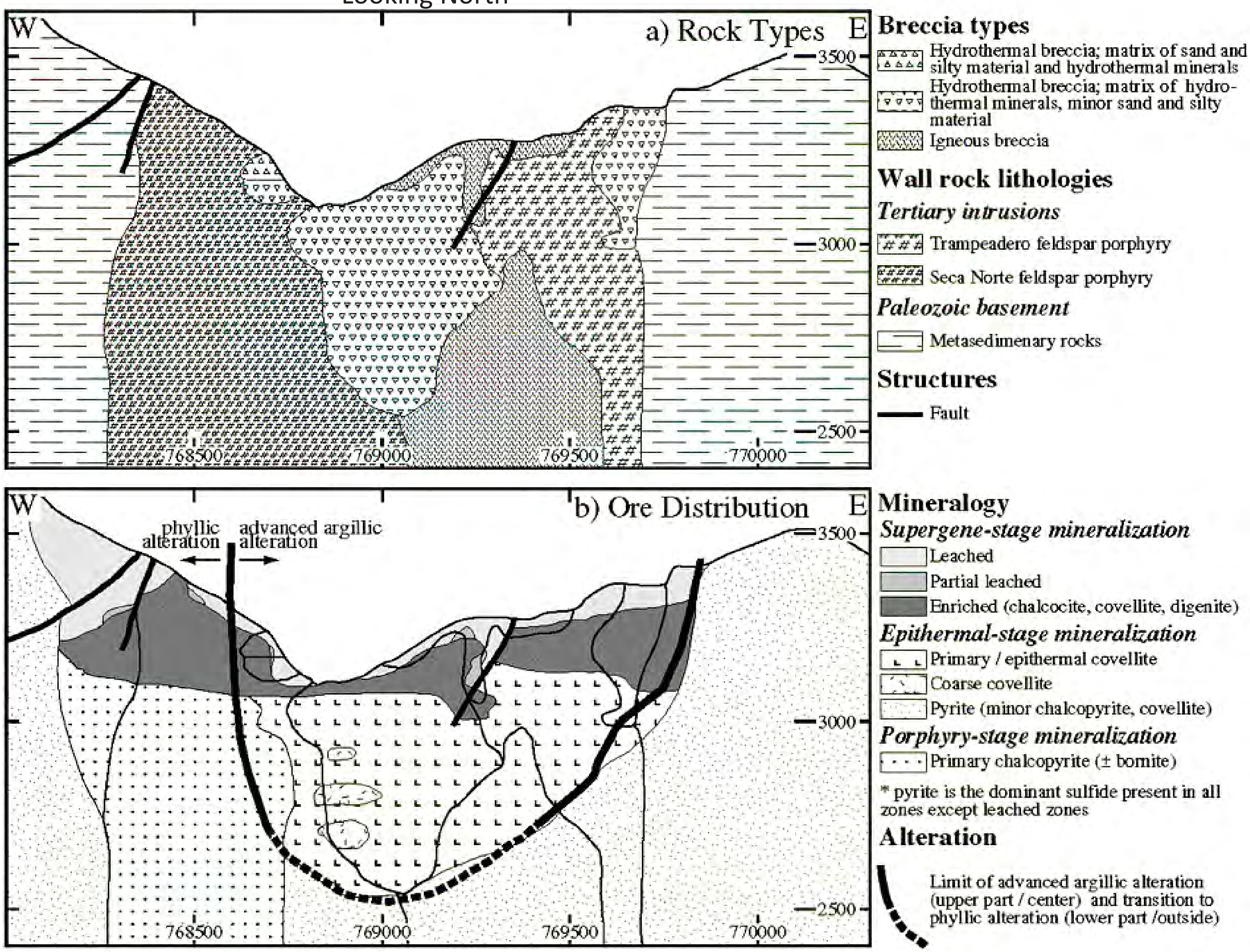
- The section cuts seven lithological units: Hydrothermal Breccia, Hydrothermal Clay Matrix Facies, Igneous Breccia, Seca and Trampeadero porphyries, Seca Waste Porphyry, and metasediments.
- The Seca Norte porphyry occupies the western portion and exhibits strong to intense texturally destructive quartz-sericite alteration, which in places overprints biotite and magnetite/hematite alteration.
- The Seca Waste Porphyry is within the Seca porphyry and is silicified by a late event.
- The Trampeadero Porphyry occupies the eastern part of the deposit; advanced argillic alteration is dominant with lesser amounts of quartz-sericite, also present at depth. Relict porphyry textures are common.
- The Hydrothermal Matrix Facies Breccia and Hydrothermal Clay Matrix Facies Breccia are in the central and eastern portion of this section.

Figure 7-13, Lithological Section on Northing 6,969,485N, Northern sector:

- The section cuts seven lithological units: Hydrothermal Matrix Facies Breccia, Hydrothermal Clastic Facies Breccia, Igneous Breccia, Seca and Trampeadero porphyries, Seca Waste Porphyry, and metasediments.
- Metasediments are the host rocks to the intrusive porphyry and breccias, and molybdenum mineralization forms a halo around the main mineralizing porphyries.
- The size of Trampeadero lithological unit decreases compared to the other sections. It is located on the east side but does not outcrop.

- The Seca porphyry occupies the western portion of the area and exhibits texturally destructive quartz-sericite alteration. The Seca Waste Porphyry is located inside the Seca lithological unit and is silicified by a late event.
- The Hydrothermal Clastic Matrix Facies Breccia and the Hydrothermal Matrix Breccia are in the central and eastern part of this section. The hydrothermal matrix is composed of quartz, clay, sericite, pyrite, alunite, covellite with occasional sphalerite.
- Igneous breccias have a strongly porphyritic igneous matrix. Cu, As, Pb, and Zn mineralization is locally present due to epithermal pyrite-covellite veins and supergene enrichment.

Looking North



East-west section of the Agua Rica deposit along 6,969,400N, showing the relationships between the three mineralizing units (Seca Norte feldspar porphyry, Trampeadero feldspar porphyry, and hydrothermal breccia), the ore distribution (primary porphyry and high sulphidation epithermal stage, and overlying supergene enrichment blanket), and the approximate transition from advanced argillic to phyllic alteration. Potassic alteration in the Seca Norte and Trampeadero areas is only preserved as remnants and was not included in this compilation but is closely associated with intense quartz stockwork veining which is well preserved and was systematically mapped. Relicts of potassic alteration with pale brown secondary biotite are best preserved in the deeper parts of the Seca Norte and Trampeadero feldspar porphyries (see also Perellé et al., 1998).

Figure 7-10

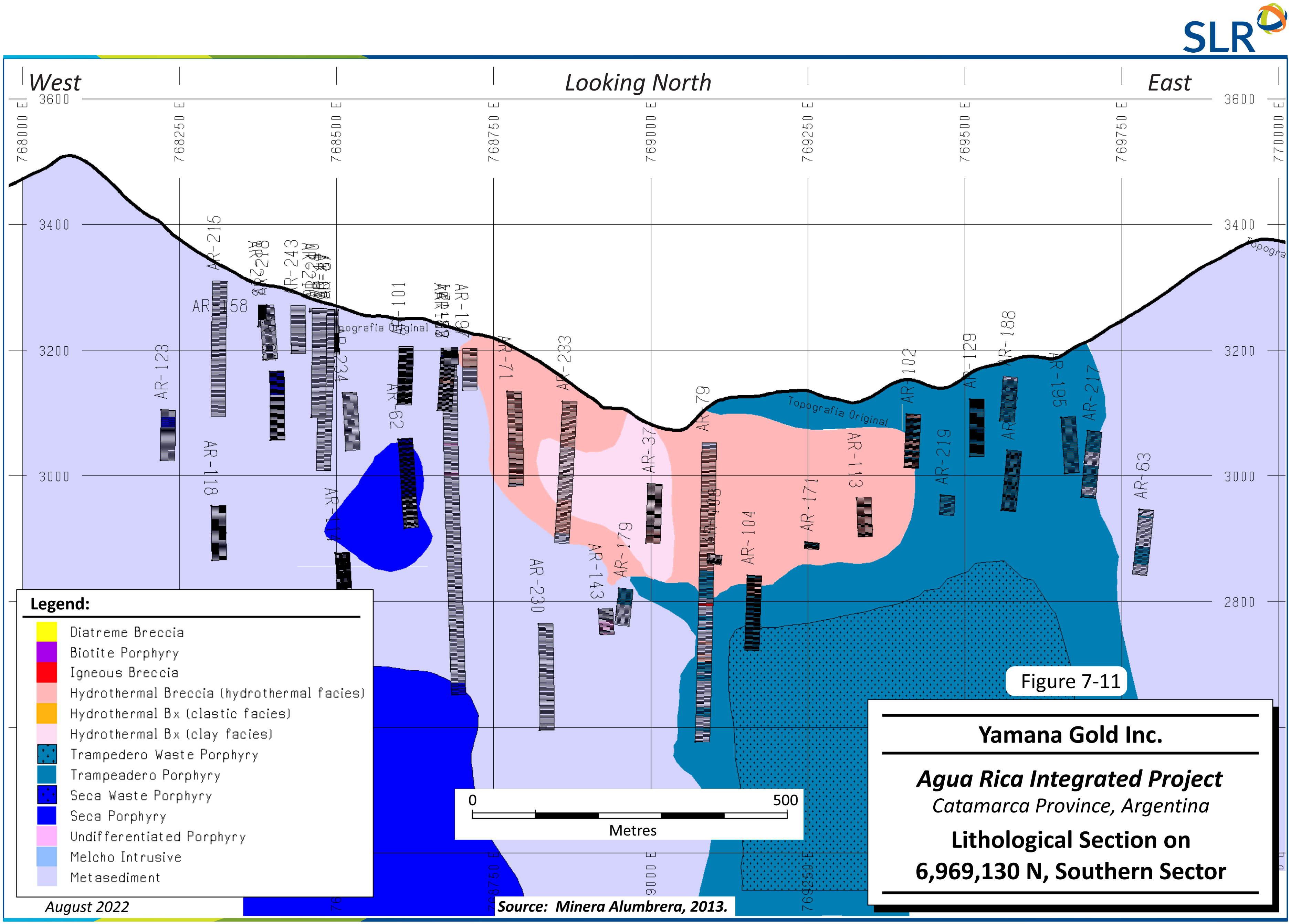
Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Schematic Cross-Section Showing Lithology and Types of Mineralization

August 2022 ***Source: Modified from Landtwing et al, 2002.***


West
Looking North
East
Legend:
Diatreme Breccia
Biotite Porphyry
Igneous Breccia
Hydrothermal Breccia (hydrothermal facies)
Hydrothermal Bx (clastic facies)
Hydrothermal Bx (clay facies)
Trampedero Waste Porphyry
Trampeadero Porphyry
Seca Waste Porphyry
Seca Porphyry
Undifferentiated Porphyry
Melcho Intrusive
Metasediment
0
500
Metres
Figure 7-11
Yamana Gold Inc.
Agua Rica Integrated Project
Catamarca Province, Argentina
Lithological Section on 6,969,130 N, Southern Sector
August 2022
Source: Minera Alumbrera, 2013.

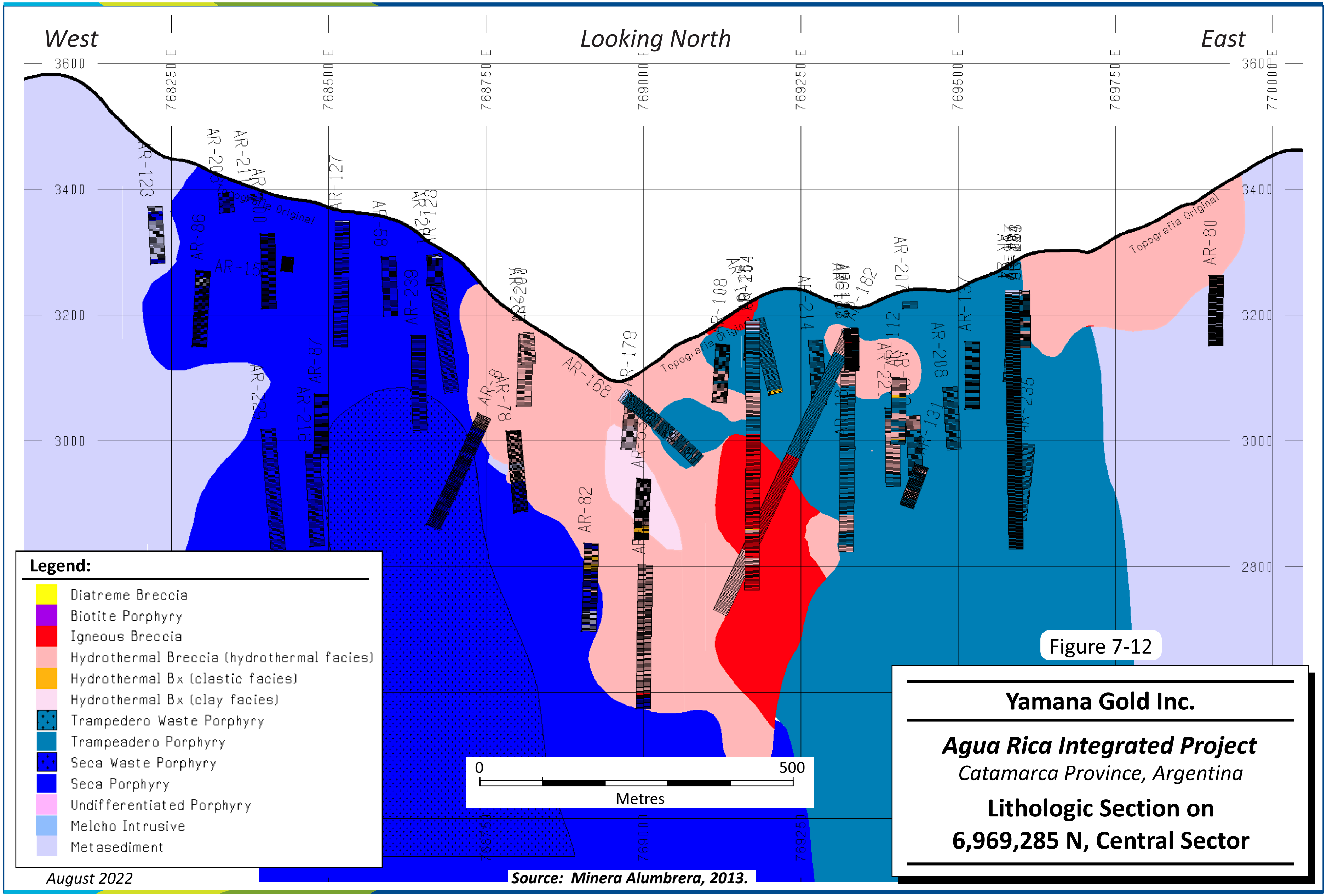


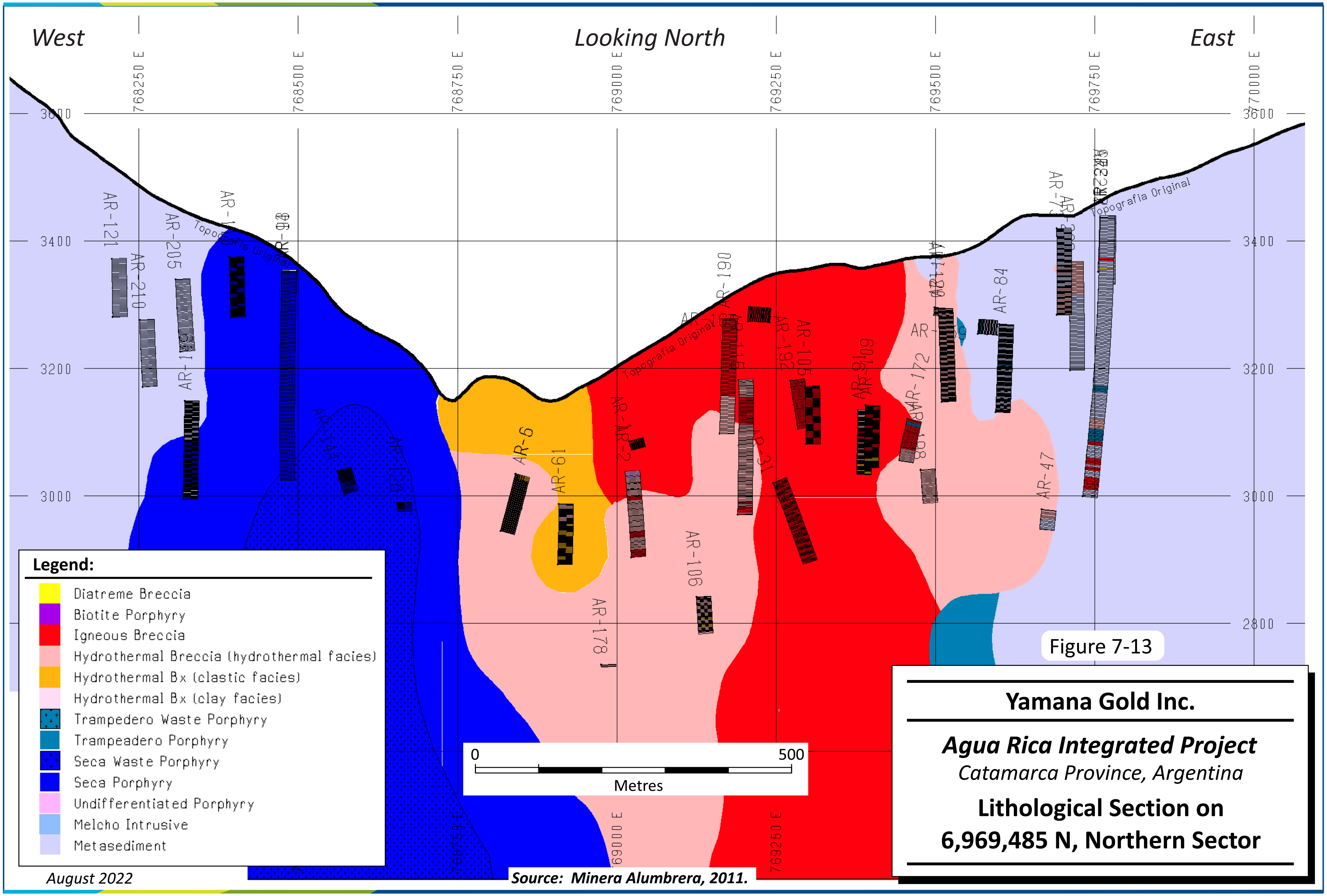
Figure 7-12

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Lithologic Section on 6,969,285 N, Central Sector


West
Looking North
East
768250 E
768500 E
768750 E
769000 E
769250 E
769500 E
769750 E
770000 E
3600
3400
3200
3000
2800
Topografia Original
AR-121
AR-205
AR-210
AR-190
AR-192
AR-105
AR-172
AR-84
AR-47
AR-6
AR-61
AR-106
AR-178
AR-31
Legend:
Diatreme Breccia
Biotite Porphyry
Igneous Breccia
Hydrothermal Breccia (hydrothermal facies)
Hydrothermal Bx (clastic facies)
Hydrothermal Bx (clay facies)
Trampedero Waste Porphyry
Trampeadero Porphyry
Seca Waste Porphyry
Seca Porphyry
Undifferentiated Porphyry
Melcho Intrusive
Metasediment
0
500
Metres
Figure 7-13
Yamana Gold Inc.
Agua Rica Integrated Project
Catamarca Province, Argentina
Lithological Section on
6,969,485 N, Northern Sector
August 2022
Source: Minera Alumbrera, 2011.

8.0 DEPOSIT TYPES

8.1 Agua Rica – Key Points

The Agua Rica deposit is interpreted as a substantial gold-rich porphyry copper-molybdenite deposit, formed by multistage porphyry intrusions of Miocene age. These porphyries, interpreted as intrusions distal to the Miocene Farallón Negro Volcanic Complex, are of calc-alkaline dacitic composition and result from arc magmatism produced by subduction below the continental western margin of South America. The principal volcanic centre hosts the giant Bajo de la Alumbrera porphyry Cu-Au-Mo deposit, now operating as MAA, 35 km to the west.

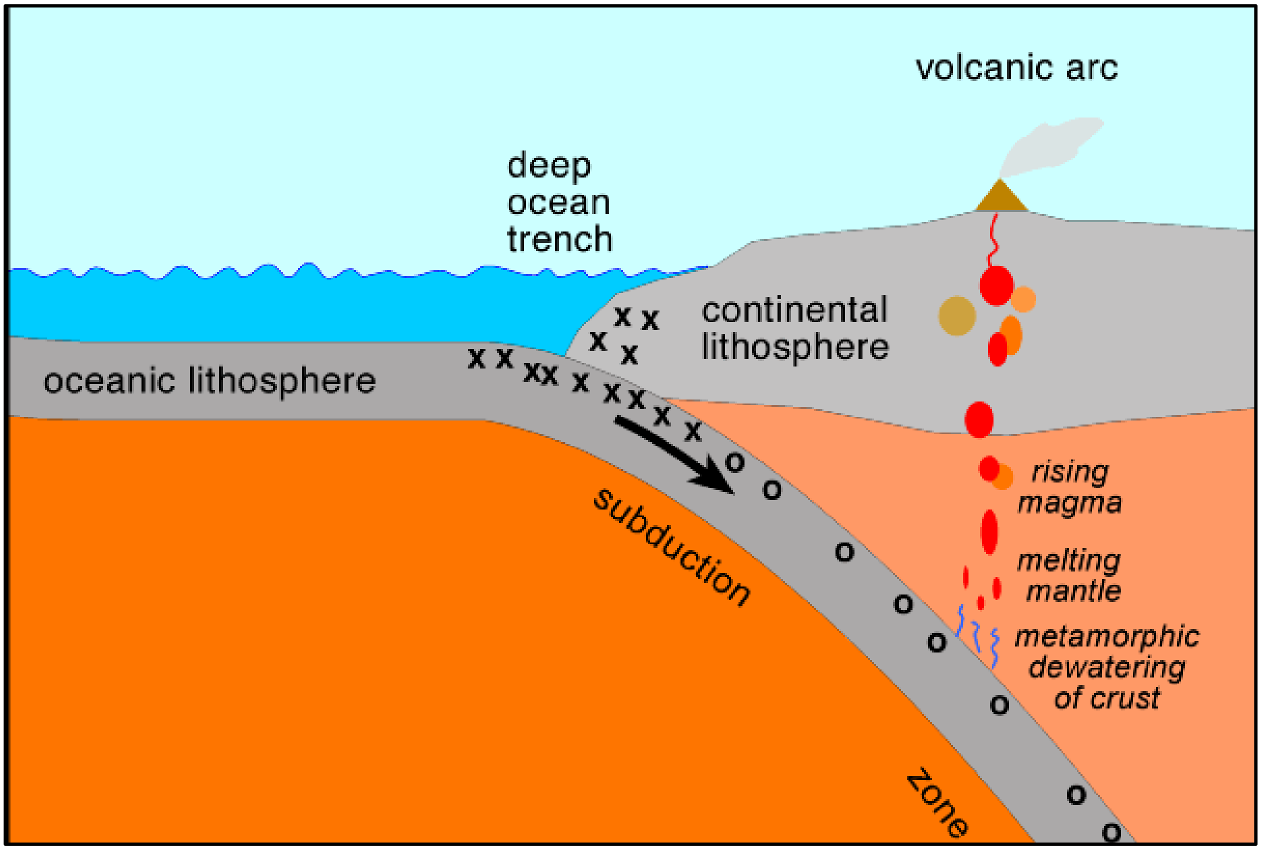
The emplacement of these intrusions produced porphyry-style veining (stockwork, A and B veins), vein and disseminated mineralization (chalcopyrite, molybdenite, pyrite, pyrrhotite, magnetite and bornite), and alteration (potassic and propylitic).

Continued hydrothermal activity produced various phases of hydrothermal breccias, accompanied by phyllic alteration, intense advanced argillic alteration (pyrophyllite and alunite), and the formation of a high sulphidation epithermal overprint (pyrite-covellite-enargite-galena-sphalerite, containing Cu-Au-Ag-Pb-Zn). This later epithermal mineralization partially replaced the earlier porphyry-style mineralization. A gradual unroofing of the magmatic and hydrothermal system is proposed to explain this juxtaposition of mineralizing environments that usually occur at very different depths.

A stage of supergene alteration, typical of porphyry copper environments in desert conditions, produced a leach cap and an enrichment blanket where chalcocite and secondary covellite replaced the earlier covellite, pyrite, chalcopyrite, and bornite, enhancing the underlying copper grades by two to locally three times.

8.2 Porphyry Cu ± Mo ± Au Deposit Model

The porphyry Cu-Mo (Au, Ag) model typically describes those deposits hosted in magmatic rocks of calc-alkaline affinity, commonly located at convergent plate boundaries in response to subduction and the resulting arc magmatism (Figure 8-1).



Source: Modified from McGill EPS Presentation

Figure 8-1: Tectonic Setting for Magmatic Arcs

Host intrusions are commonly porphyritic or coarse-grained phaneritic, with multiple emplacement of successive intrusive phases and various breccias. Zoned mineralization and alteration patterns can be complicated by overprinting relationships. Metals (Cu, Mo, Au, and Ag) are interpreted to have been derived from magmatic source rocks at considerable depth and focussed into intrusion apophyses as porphyry-copper occurrences (Corbett, 2009).

The British Columbia Geological Survey (BCGS) mineral deposit profile L04 offers the following capsule descriptions of typical deposits:

Mineralization is generally hosted in stockwork of quartz veinlets, quartz veins, closely spaced fractures, and breccias containing pyrite-chalcopyrite ± molybdenite, bornite and magnetite.

Pyrite is the predominant sulphide mineral. Ore minerals are chalcopyrite; molybdenite, lesser bornite and rare (primary) chalcocite. Subordinate minerals are tetrahedrite/tennantite, enargite and minor gold, electrum and arsenopyrite. In many deposits late veins commonly contain galena and sphalerite in a gangue of quartz, calcite, and barite.

[Alteration minerals consist of] quartz, sericite, biotite, K-feldspar, albite, anhydrite/gypsum, magnetite, actinolite, chlorite, epidote, calcite, clay minerals, tourmaline. Early formed alteration can be overprinted by younger assemblages. Central and early formed potassic zones (K-feldspar and biotite) commonly coincide with ore ... These older alteration assemblages … can be partially to completely overprinted by later biotite and K-feldspar and then phyllic (quartz-sericite-pyrite) alteration, less commonly argillic, and rarely, in the uppermost parts of some ore deposits, advanced argillic alteration (kaolinite-pyrophyllite).

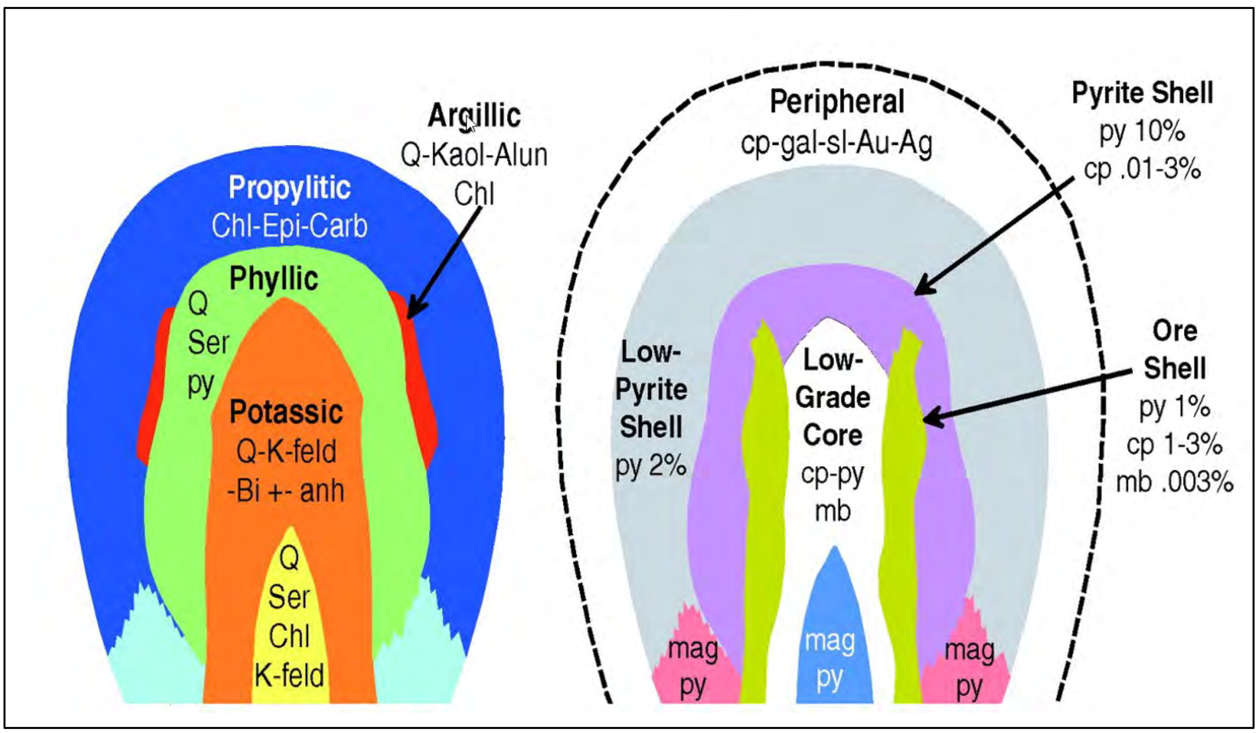
Classic deposits are stock related with multiple emplacements at shallow depth (one kilometre to two kilometres) of porphyritic intrusions. Numerous dykes and breccias of pre, intra, and post-mineralization age modify the stock geometry. Orebodies occur along margins and adjacent to intrusions as annular ore shells.

Lateral outward zoning of alteration and sulphide minerals from a weakly mineralized potassic/propylitic core is usual. Surrounding ore zones with potassic (commonly biotite-rich) or phyllic alteration contain molybdenite, chalcopyrite, then chalcopyrite and a generally widespread propylitic, barren pyritic aureole or 'halo' (Panteleyev, 1995).

Secondary (supergene) zones carry chalcocite, covellite and other Cu2S minerals (digenite, djurleite, etc.), chrysocolla, native copper and copper oxide, carbonate, and sulphate minerals. Oxidized and leached zones at surface are marked by ferruginous 'cappings' with supergene clay minerals, limonite (goethite, hematite, and jarosite) and residual quartz (Panteleyev, 1995).

Well-known examples of porphyry Cu-Mo (Au, Ag) deposits include Bajo del Alumbrera (hosted in the same magmatic complex, 35 km away), El Salvador (Chile), Bingham (Utah, USA), Casino (Yukon), and Huckleberry and Brenda (British Columbia). The median size for a porphyry Cu-Mo deposit is 500 Mt at 0.41% Cu, 0.016% 0.012 g/t Au, and 1.2 g/t Ag.

McGill University's Earth and Planetary Sciences Department published an online PowerPoint presentation (McGill EPS Presentation) that depicts idealized and simplified mineralization and alteration patterns of classic porphyry deposits (Figure 8-2).



Source: McGill EPS Presentation

Figure 8-2: Idealized Porphyry Alteration (Left) and Mineralization (Right)

8.3 High Sulphidation Epithermal Deposit Model

High sulphidation epithermal Au-Cu-Ag deposits occur in similar tectonic environments as porphyry Cu-Mo-Au deposits, in particular where stratovolcanoes and other volcanic edifices are formed above plutons in continental margin setting, however, also in extensional and transtensional oceanic arcs and back-arcs. They are hosted in subvolcanic to volcanic structures, such as volcanic and pyroclastic rocks or subvolcanic intrusion in flow dome complexes and calderas. They are postulated to overlie and be genetically related to porphyry-copper systems that are hosted in deeper underlying intrusions.

The deposits are commonly referred to as acid-sulphate type after the chemistry of the hydrothermal fluids, quartz-alunite, or kaolinite-alunite type after their alteration mineralogy, or "high sulphidation type" in reference to the oxidation state of the acid fluids responsible for alteration and mineralization.

The Cu-Au-Ag (As, Sb) mineralization forms veins and massive sulphide replacement pods and lenses, stockworks, and breccias. Host rock permeability and the geometry of ore-controlling structures shape the deposit. Multiple crosscutting composite veins are common.

High sulphidation epithermal Au-Cu-Ag deposits display characteristic textures, alteration, and mineralization zonation. These are summarized in BCGS Mineral Deposit Profile H04:

Texture/Structure: Vuggy 'slaggy' silica derived as a residual product of acid leaching is characteristic. Drusy cavities, banded veins, hydrothermal breccias, massive wall rock replacements with fine-grained quartz.

Ore mineralogy (Principal and subordinate): pyrite, enargite/luzonite, chalcocite, covellite, bornite, gold, electrum; chalcopyrite, sphalerite, tetrahedrite/tennantite, galena, marcasite, arsenopyrite, silver sulphosalts, tellurides. Two types of ore are commonly present: massive enargite-pyrite and/or quartz-alunite-gold.

Alteration mineralogy (Principal and subordinate): Quartz, kaolinite/dickite, alunite, barite, hematite; sericite/illite, amorphous clays and silica, pyrophyllite, andalusite, diaspore, corundum, tourmaline, dumortierite, topaz, zunyite, jarosite, Al-P sulphates …, and native sulphur...Quartz occurs as fine-grained replacements and, characteristically, as vuggy, residual silica in acid-leached rocks.

Weathering: Weathered rocks may contain abundant limonite (jarosite-goethite-hematite), generally in a groundmass of kaolinite and quartz. Fine-grained supergene alunite veins and nodules are common.

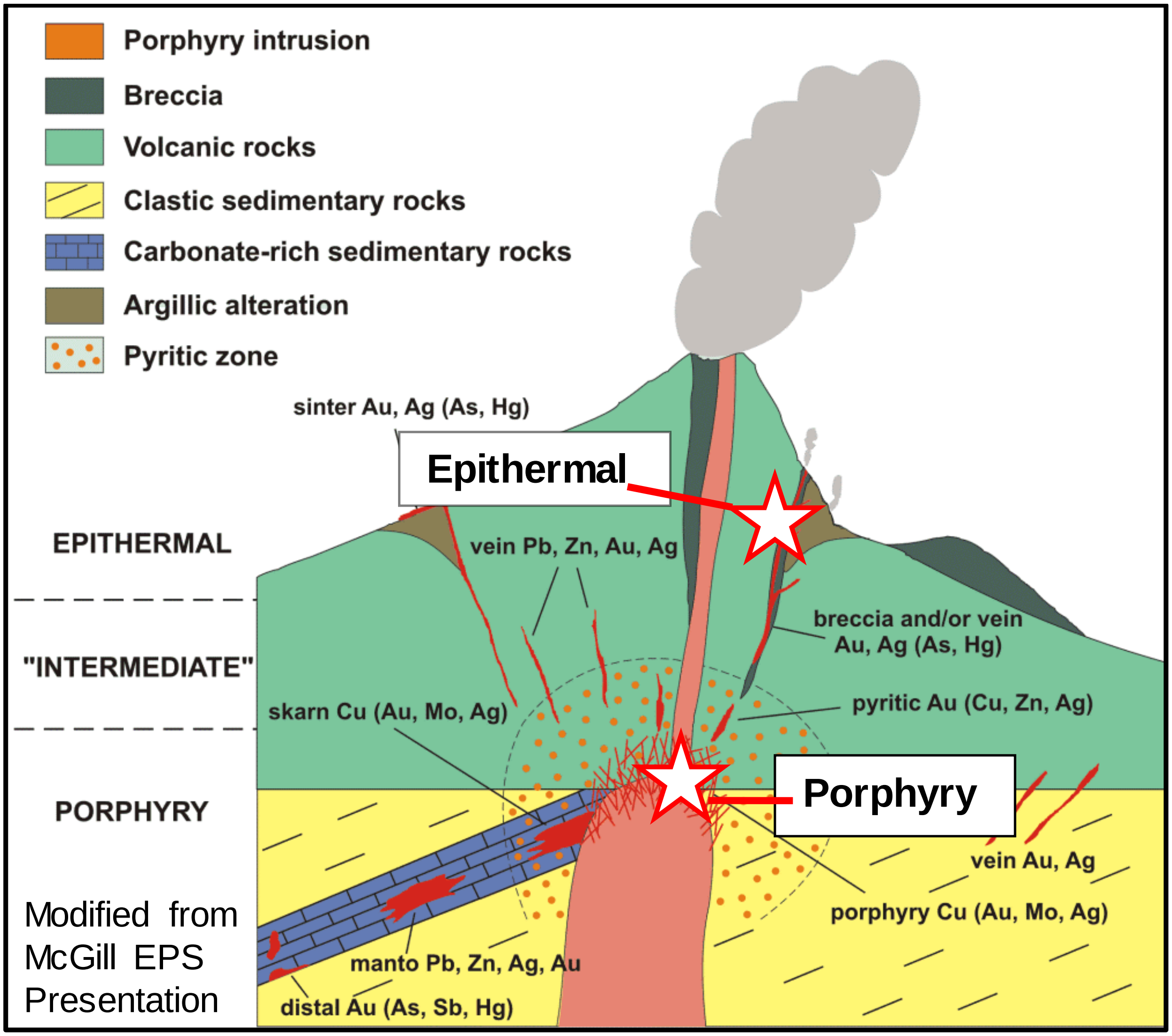
Ore controls: In volcanic edifices - caldera ring and radial fractures; fracture sets in resurgent domes and flow dome complexes, hydrothermal breccia pipes and diatremes. Faults and breccias in and around intrusive centres…The deposits occur over considerable depths, ranging from high temperature solfataras at paleosurface down into cupolas of intrusive bodies at depth. Multiple stages of mineralization are common (Panteleyev, 1996).

Well-known high sulphidation epithermal deposits include Yanacocha (Peru), Pueblo Viejo (Dominican Republic), Pascua/Lama/Veladero (Chile/Argentina) (each containing >40 million ounces (Moz) Au for the combined district); and El Indio (Chile) and Goldfield (US) (Thomsen, 2006).

8.4 Relationship between Porphyry and Epithermal Environments

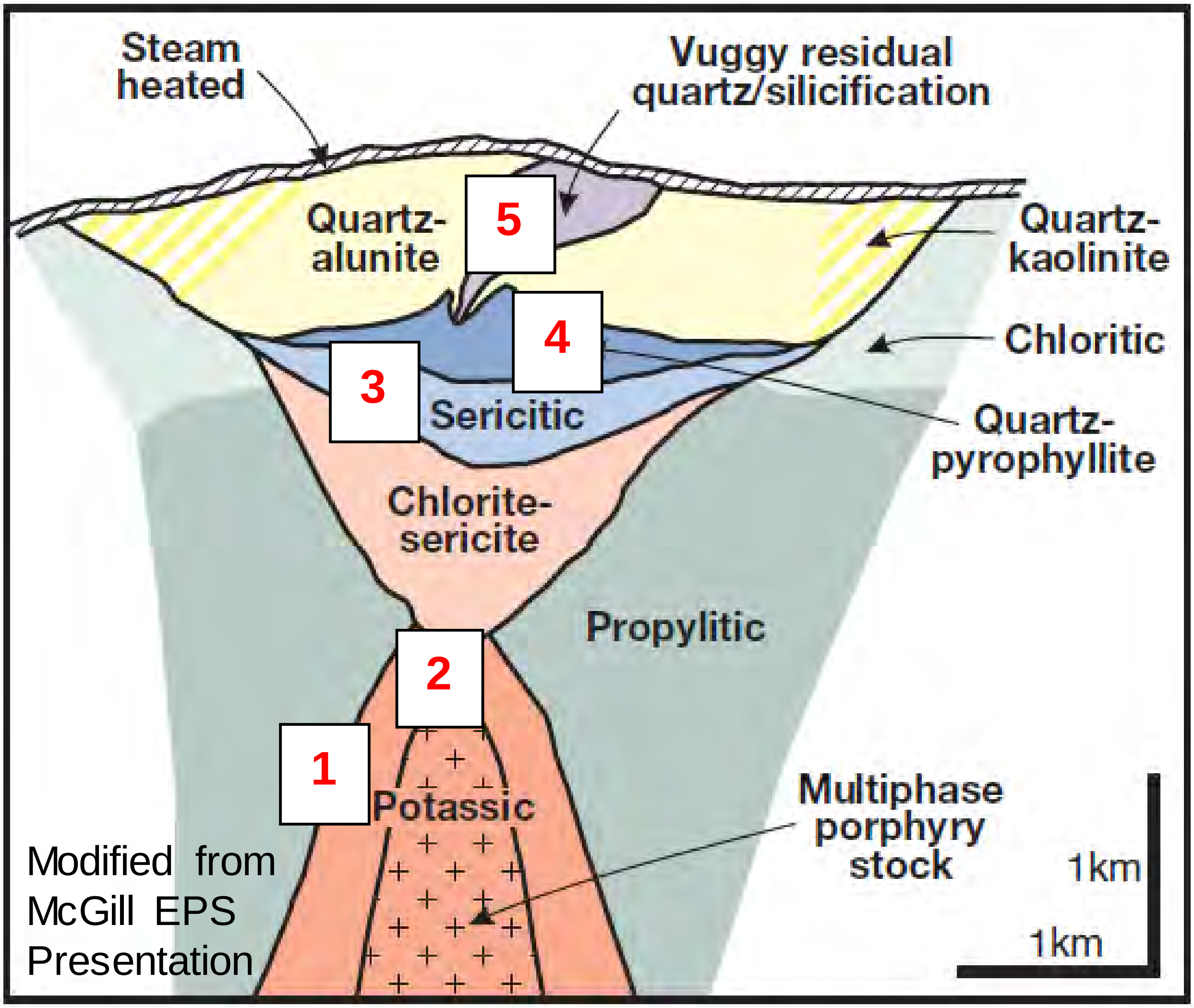
The two types of deposits lie along a continuous spectrum of magmatic and hydrothermal activity. Porphyry-related mineralization systems are interpreted to be derived from magmatic source rocks at considerable depth and focussed into intrusion apophyses where they form porphyry copper occurrences or migrated into higher crustal levels to form high and low sulphidation epithermal Au-Ag deposits in the upper one kilometre or so of the crust (Corbett, 2009).

Figure 8-3 and Figure 8-4, from the McGill EPS Presentation, illustrate simplified and idealized renderings of the relationship between the two types of deposits and their relative positions within the magmatic system.



Source: Modified from McGill EPS Presentation

Figure 8-3: Schematic Setting for Porphyry-Epithermal Deposits



Source: Modified from McGill EPS Presentation

Notes:

Numbers indicate equivalent stages documented at Agua Rica:

1. Early porphyry emplacement and weak potassic/propylitic alteration and mineralization (Melcho intrusions).
2. Main porphyry stage mineralization, potassic alteration (Seca Norte and Trampeadero porphyries).
3. Phyllic and advanced argillic alteration associated with hydrothermal breccias.
4. Strong advanced argillic alteration associated with hydrothermal breccias.
5. Post-mineral silicification(?)

Figure 8-4: Schematic Depiction of Porphyry-Epithermal Alteration

9.0 EXPLORATION

As no information is available for the exploration work done by Cities Services Argentina, aside from the 1972-73 drilling which is described in Section 10, this section describes the activities (other than exploration drilling) that were conducted between 1994 and 2014. Table 9-1 summarizes the activities which are then described in further detail below.

Table 9-1: Exploration Summary
Yamana Gold Inc.– Agua Rica Integrated Project

Owner/JV partner	Exploration Activity (other than exploration drilling)	Reports
1990s to 2002: BHP-Northern Orion JV	From 1994 until late 1998: basic and detailed mapping, geochemical (rock chip) sampling, geophysics, aerial photography, metallurgical test work, geotechnical drilling, and environmental monitoring.	1997: Initial FS (103 drill holes) 1998: Resource model (150 drill holes) 1999: Resource model (176 drill holes)
2002 to 2007: Northern Orion	Geotechnical drilling; collection of hydrogeological data and metallurgical test samples; additional baseline work to support the EIA; update of block model and resource estimate; pit, mine, and process design in order to develop cost and reserve estimates.	2004: Update of the Initial FS and NI-43-101 technical report; update of block model and resource estimate (176 drill holes) 2006: detailed E&SIS. 2007: IIA.
2007 to 2011: Yamana	Optimization studies, environmental baseline studies, and environmental monitoring.	2011: Various reports including a Mineral Resource and a Mineral Reserve statement
2011 to 2014 Yamana-Alumbrera JV	Metallurgical test work, geotechnical drilling (6,120.35 m in 15 drill holes) and environmental monitoring and studies.	2013: FS.

9.1 BHP-Northern Orion Joint Venture (1994 to 2002)

From 1994 until late 1998, the BHP-Northern Orion JV carried out a series of field programs; these included basic mapping, geochemical (rock chip) sampling, geophysics, and core drilling. From this work, zones of secondary enrichment and evidence of a post-porphyry epithermal stage of precious metals mineralization were recognized, further enhancing the economic potential of the property.

In 1994 and 1995, the BHP-Northern Orion JV conducted a major exploration program that included the following work:

- A first phase of drilling consisting of 14,802 m of core drilling in 39 drill holes with lengths of approximately 450 m.
- Detailed mapping and surface sampling.
- Aerial photography for the generation of accurate topographical data.
- Metallurgical test work at BHP’s (Reno, USA), Lakefield’s (Santiago, Chile), and Mintek SA’s (Mintek) (South Africa) laboratories.

- Geophysical investigations to locate sources of water supply for future mining and milling operations.
- Various work programs examining technical issues to support an Initial FS that was planned for 1997.

Further work by the BHP-Northern Orion JV consisted of two additional phases of exploration drilling in 1996 and in 1997. These later phases of drilling included geotechnical boreholes drilled specifically to evaluate the ground conditions for a future open pit operation.

In 1997, the BHP-Northern Orion JV completed the Initial FS based on a 103 drill holes and using an inverse distance squared resource model. Two open pit scenarios, 60,000 tpd and 120,000 tpd, were investigated. Results from additional drilling were incorporated into kriged Mineral Resource models: the 1998 Mineral Resource model included the results from 150 drill holes, and the Mineral Resource model dated March 1999, using a combination of ordinary and indicator kriging, was informed by 176 drill holes.

In 1999, the BHP-Northern Orion JV halted all further field exploration activities at Agua Rica and no additional work of any significance, other than ongoing environmental monitoring, took place from that time until 2002.

9.2 Northern Orion (2002 to 2007)

In late 2004, Northern Orion commissioned Hatch of Toronto, Canada, to prepare a detailed update of the Initial FS and a NI 43-101 technical report. This update focussed on the development of a mine and processing facility at Agua Rica, with production planned to commence approximately three years after Northern Orion obtained all necessary permits.

Northern Orion completed significant fieldwork to update the Initial FS. The work included:

- Drilling 20 drill holes in the mine area for geotechnical purposes, including for pit slope stability.
- Collecting hydrogeological data.
- Collecting metallurgical test samples, including drilling of five twinned drill holes.
- Drilling for water supply.
- Updating the block model and resource estimate using the full 176-drill hole database previously developed by the BHP-Northern Orion JV.
- Performing additional baseline work to support the EIA.
- Establishing an open pit outline along with mine design and process design in order to develop cost and reserve estimates.

A detailed E&SIS was completed in the fourth quarter of 2006 and presented to authorities in 2007.

In mid-2007, Agua Rica presented an IIA for the exploitation phase to the authorities of the Catamarca Province and to the Ministry of Mines of the Catamarca Province. This was approved upon issuance of an IIA in March 2009. This approval has subsequently lapsed.

9.3 Yamana (2007 to 2011)

After acquiring Agua Rica in 2007, Yamana focussed its efforts on optimization studies, environmental baseline studies and environmental monitoring. Various consultants released reports in 2011 on resources, mining, processing, infrastructure, and tailings disposal, including a Mineral Resource and Mineral Reserve statement for the Agua Rica deposit.

9.4 Yamana-Alumbrera Joint Venture (2011 to 2014)

Under the Yamana-Alumbrera JV, MAA, in conjunction with Xstrata's PDSA, carried out a drilling program, a metallurgical test work program, and completed in the 2013 FS. This study considered a treatment rate of 40 Mtpa (110,000 tpd). Work was also carried out on a new IIA although this was not submitted to the authorities.

A total of 6,120.35 m of drilling was completed in 15 drill holes dedicated to geotechnical investigations, these included pit wall stability and hydrogeological surveys.

A new topographic surface was created in 2012 based on a series of geodetic surveys performed on the Project. Most of the previous surveys were based on reference points in the Argentine local geodetic system (Campo Inchauspe'69 System) and were migrated to the WGS84 system. Surveying work was extensive and included the surveying of existing drill hole collars, as well as confirming their dip and azimuth.

Since termination of the Yamana-Alumbrera JV in 2014 through the effective date of this Technical Report, subsequent work has been limited to ongoing environmental monitoring, social license enhancement and community engagement, and engineering studies.

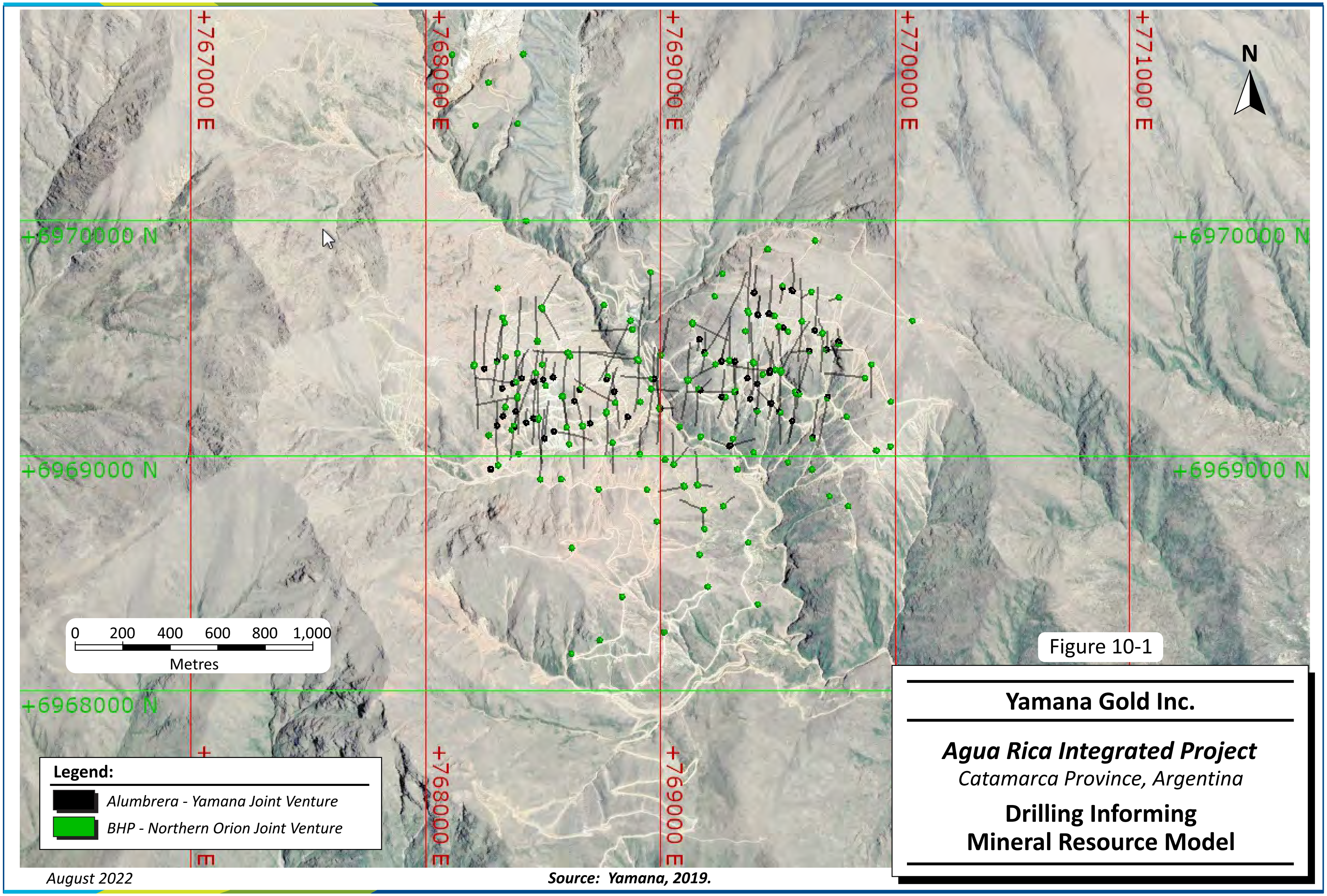
10.0 DRILLING

Several phases of drilling by different operators have been conducted on the Project; the first began in 1972 with the most recent being completed in 2012. The drilling and sampling programs tested the entire extent of known mineralization at Agua Rica both laterally and vertically and provided a reliable basis for understanding the distribution of mineralization and variations in lithology and alteration. In the central core of the deposit (Quebrada Minas), some deep holes reaching to more than 700 m below surface elevation were stopped before reaching the limits of the mineralization.

The various drill programs are summarized in Table 10-1 and Figure 10-1 and described in more detail in the following sections.

Table 10-1: Summary of Drill Programs
Yamana Gold Inc.– Agua Rica Integrated Project

Major Phases of Drilling	Year	Operator	Purpose	Core Diameter	No. Drill Holes	Total Metres
Phase 1	1972-73	Cities Services	Discovery	BX and AX	38	7,927
	1994-95	BHP-Northern Orion JV	Resource*	HXWL and NXWL	39	14,812
Phase 2	1996	BHP-Northern Orion JV	Resource*	HX and NX	64	26,795
Phase 3	1997-98	BHP-Northern Orion JV	Resource*	HX and NX	73	25,724
	2005-07	Northern Orion	Geotech.		20	15,348
			Twin holes for metallurgy		5	
Phase 4	2012	Alumbrera-Yamana JV	Resource*	HQ	69	22,348
			Geotech.	HQ3	15	6,120
			Hydrogeology	RC	7	1,003
			Geotech.	RC	3	150
	Total Drilling				333	120,217
	*Total Drilling Informing the Mineral Resource Model				245	89,679



+767000 E
+768000 E
+769000 E
+770000 E
+771000 E
N
+6970000 N
+6969000 N
+6968000 N
0 200 400 600 800 1,000
Metres
Legend:
Alumbrera - Yamana Joint Venture
BHP - Northern Orion Joint Venture
Figure 10-1
Yamana Gold Inc.
Agua Rica Integrated Project
Catamarca Province, Argentina
Drilling Informing
Mineral Resource Model
August 2022
Source: Yamana, 2019.

10.1 Cities Services Argentina (1972 to 1973)

Cities Services drilled 7,927 m in 38 drill holes of less than 200 m in length that were collared at low elevations in Quebrada Minas. The drilling was successful in intersecting porphyry-style mineralization, however, owing to poor recovery and the small sample support due to small core diameter of BX (42.0 mm) and AX (30.1 mm) core, the assay results from the Cities Services drilling are not included in any of the later Mineral Resource estimates.

10.2 BHP-Northern Orion Joint Venture (1994 to 2002)

A major exploration program was initiated in 1994 by the BHP-Northern Orion JV and concluded in 1998. Phase 1 of the drilling portion of the program, conducted in 1994-95, consisted of 14,802 m in 39 drill holes to depths of approximately 450 m, using HX (61.1 mm) and NX (54.7 mm) diameter diamond drill core. The drilling was contracted to Boyles Bros. Servicios Técnicos Geológicos S.A. (Boytec S.A.) and Subsidiaries.

The Phase 2 drilling program, conducted in 1996, totalled 26,795 m of HX and NX core in 64 vertical and inclined drill holes, measuring up to 700 m in length. The work was completed by several contractors, including Connors Drilling LLC, Perfoeste S.A., and Boytec S.A.

In 1997, the BHP-Northern Orion JV completed the Initial FS based on a database of 103 drill holes (Phase 1 + Phase 2). The Phase 3 drilling program, conducted in 1997-98, was the final phase of core drilling for the BHP-Northern Orion JV. The program totalled 25,724 m in 73 drill holes.

Three drill holes (AR-5, AR-175, and AR-176) were drilled for metallurgical samples and were not assayed. The later phases of drilling included boreholes dedicated to the geotechnical evaluation of the ground conditions for a future open pit operation.

The BHP-Northern Orion JV therefore drilled a cumulative total of 67,331 m. The Initial FS was updated in 1998, based on the results from 150 drill holes, and in May 1999 based on 176 drill holes (Phases 1 + 2+ 3).

The BHP-Northern Orion JV logging programs followed these general procedures:

- All core was routinely photographed before geological and geotechnical logging took place.
- The drill core was logged by qualified geologists who recorded an extensive set of observations and measurements; these included lithology, alteration mineralogy, sulphide/oxide mineralogy, sulphide content as percentages, structural features, veining, and iron oxide characteristics. The geologists also selected assay samples based on a general two metre sample length.
- Geotechnical data was collected by qualified technicians; observations included RQD and fracture frequency (FF) for each two metre core intervals.
- All data collected through the logging procedures was entered in digital format.

Core recovery was typically in the 80%-90% range for all BHP-Northern Orion JV drill programs, and all drill holes were surveyed by down-hole instruments.

10.3 Northern Orion (2002 to 2007)

In 2004, Northern Orion undertook significant fieldwork to update the Initial FS and produce a NI 43-101 report. Although no new exploration drilling took place during this program, Northern Orion drilled 15,348 m between 2005 and 2007 to evaluate geotechnical issues in the open pit area, exploration tunnel, and dump area, as well as for metallurgy and groundwater availability.

Five drill holes were twinned and assayed for metallurgical test purposes; assay data from the twin drill holes were used to supplement the block model. An additional 20 drill holes were drilled specifically for geotechnical purposes including pit wall stability investigations.

The geological model and interpretation previously developed by the BHP-Northern Orion JV was reviewed and accepted by Hatch as credible and adequate for the purposes of the updated FS released in 2006.

10.4 Yamana (2007 to 2011)

Yamana acquired Northern Orion and Agua Rica in 2007 and contracted Metálica to produce a Mineral Resource and Mineral Reserve statement which was released in December 2011. No drilling was conducted at Agua Rica during this period.

10.5 Yamana-Alumbrera Joint Venture (2011 to 2014)

10.5.1 Drilling Program

Following the formation of the Yamana-Alumbrera JV in 2011, a fourth major phase of drilling was conducted by MAA in 2012. The work was conducted by a combination of contractors that includes Major Drilling Group International Inc. and Boart Longyear Limited. The program consisted of infill drilling of 22,348 m drilled in 69 inclined drill holes of HQ (63.5 mm) diameter; drill holes measured up to 600 m in length. Of these 22,086.65 m, 5,060.50 m were drilled to provide metallurgical samples: 1,043.00 m for comminution composites (entire core) and 4,017.50 m for flotation composites (half core).

An additional 6,120.35 m of drilling was completed in 15 HQ3 (61.1 mm) diameter drill holes dedicated to geotechnical investigations, such as pit wall stability, the proposed crusher platform, and hydrogeological surveys.

All the drill core samples were logged on site by two teams of four geologists, following the same methodology and collecting the same information that was applied during the work by the BHP-Northern Orion JV. Core samples were sampled at two metre intervals. Drill core was split using a hydraulic guillotine, as the presence of fine-grained sooty chalcocite and copper oxides prevent the use of water for core sawing as some mineralization could be washed out and lead to sampling bias.

Additional geotechnical data was collected during this phase: the geological strength index (GSI) as well as point load testing were measured for use in later geotechnical studies. Density determinations were done every two metres using the water displacement method. Sample preparation was conducted once the geological and geotechnical logging and the extraction of metallurgical samples was completed.

All geological information was loaded in the general database using the acQuire data management software.

10.5.2 Historical Database

From October to December 2011, the historical Access database, that included the results from the 176 drill holes drilled by the BHP-Northern Orion JV, was audited and then migrated to the SQL-type acQuire data management software. The geological information was preserved in acQuire, including collars and survey data, lithology, mineralogy, mineral zones, hydrothermal alteration, and sample assay intervals.

10.5.3 Reverse Circulation Drilling

In addition to the core drilling program, a small reverse circulation (RC) drilling program was conducted in two proposed waste dump locations: El Melcho and Rio Blanco, as listed in Table 10-2.

Table 10-2: Summary of Reverse Circulation Drill Program
Yamana Gold Inc.– Agua Rica Integrated Project

	Melcho	Rio Blanco
Hydrogeological	301 m in two RC observation boreholes	702 m in five RC observation boreholes
Geotechnical	-	150 m in three RC holes for SPT tests

10.6 Down Hole Surveys

10.6.1 BHP- Northern Orion Joint Venture

Downhole surveys during the BHP-Northern Orion JV drilling programs were conducted using down hole camera instruments (BHP, 1999). The shots were taken on average every 50 m to 100 m. Due to the difference between grid north and true north being negligible at this latitude, no magnetic correction was made for the 176 drill holes. Eight drill holes had no survey readings, five of which were vertical. Three angled holes had no down-hole surveys, AR-1, AR-3, and AR-5.

10.6.2 Alumbrera-Yamana Joint Venture

During the 2012 infill drilling program carried out by MAA, the down hole surveys were conducted mainly with EZ-Trac and alternatively with Maxibor II instruments. In all cases, the surveys were done by MAA geologists and technicians. The boreholes were surveyed from the bottom to the top, with the multishot method every 15 m using the EZ-Trac and every three metres with the Maxibor II.

The surveys were downloaded using Imdex Limited's SProcess software and the readings were checked. Any readings showing a discrepancy in the magnetic reference were discarded. The files were then loaded on the acQuire database in the survey form every 15 m. Due to operational issues, angled drill holes AR-177, AR-178B, and AR-182 were not surveyed.

Figure 10-2 shows the down hole survey values for all the inclined 2012 drill holes. The azimuth statistics of vertical boreholes were not calculated.

The azimuth analysis indicates that 74% of the drill holes have less than 10° difference between maximum and minimum values. The dip analysis indicates that 88% of the drill holes have less than 3° difference between maximum and minimum values. These are acceptable values of drill hole deviation according to Alumbrera procedures. When the values are exceeded, these deviations may be caused by the depth and the structural condition of the rock mass, among other factors.

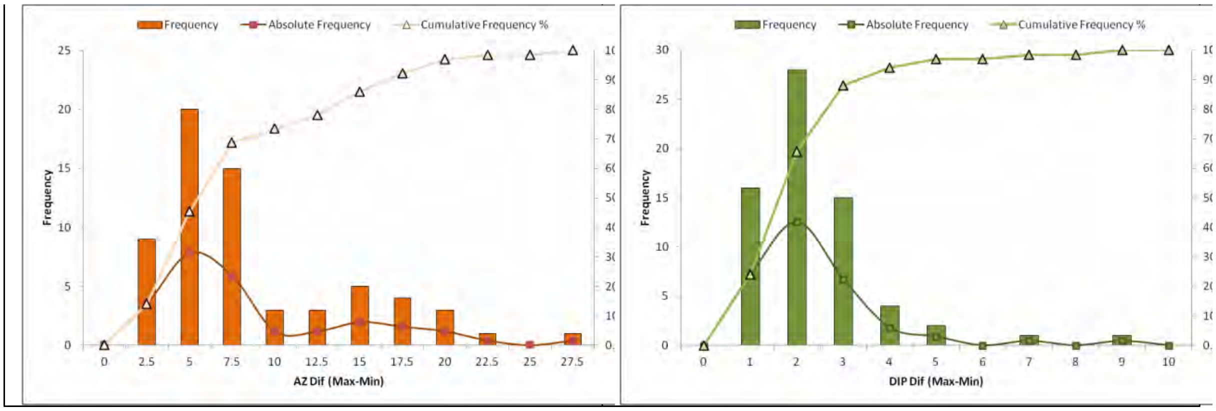


Figure 10-2: Differences Between Maximum and Minimum Values of Azimuth and Dip

11.0 SAMPLE PREPARATION, ANALYSES, AND SECURITY

Exploration drilling material to the Project was conducted in two separate periods, by different operators. This section outlines the sampling, preparation, and analytical methods followed by each one. Drilling by the BHP-Northern Orion JV (major drilling phases 1, 2, and 3) took place between 1994 and 1998. Drilling by the Alumbrera-Yamana JV (major drilling phase 4) took place in 2012. All programs included density determinations and the application of analytical quality control protocols.

11.1 Sample Preparation, Analysis, and Security

11.1.1 BHP-Northern Orion Joint Venture

The BHP-Northern Orion JV sampling programs followed these general procedures:

- The core was sampled in two metre intervals. These were split in half at site; one half was returned to the core box and the other placed in a sample bag (in later stages, the core was shipped to Andalgalá for sampling).
- All data collected through the logging procedures was entered in digital format.

Sample preparation and assaying were completed by Bondar-Clegg and Company Ltd. (Bondar Clegg) in Coquimbo, Chile, from 1994 to 1995 (drill holes AR-1 to AR-39), by SGS Argentina S.A. (SGS Argentina) in Mendoza, Argentina (sample preparation) and SGS Chile, Santiago, Chile (assaying) from 1996 to 1997 (drill holes AR-40 to AR-168), and by ALS Limited's (ALS) geochemical laboratory in Santiago, Chile (ALS Santiago) from 1997 to 1998 (drill holes AR-169 to AR-176). Laboratory certifications at the time of sampling, preparation, and analysis are undocumented, however, all three laboratories are industry-standard independent laboratories.

Three different sample preparation and analytical protocols were used by the BHP-Northern Orion JV:

- From 1994 to 1995 (drill holes AR-1 to AR-39):
  - Core sample preparation was done in a facility supervised by Bondar Clegg in Coquimbo, Chile. The entire two metre half-core samples were crushed to about 60% passing –8 mesh, with a further step of pulverising of a 1/8 or 1/16 split to 150 mesh (30 g).
  - Assaying was completed by Bondar Clegg in La Serena, Chile, using fire assaying for gold, and multi-acid digestion with atomic absorption analysis for silver, copper, lead, zinc, molybdenum, and arsenic.
- From 1996 to 1997 (drill holes AR-40 to AR-168):
  - Core samples were crushed and pulverized under the supervision of SGS Argentina. Sample preparation was carried out by jaw and roll crushing the entire half-core sample to -10 mesh, followed by taking a 1500g split and disc pulverising it to -35 mesh. A 250 g split of the -35 mesh sample was then taken and pulverised to 90% -150 mesh in a ring and puck mill.
  - Assaying was done by SGS Chile, using fire assaying for gold (50 g), and multi-acid digestion with atomic absorption analysis (30 g) for silver, copper, lead, zinc, molybdenum, arsenic, antimony, and iron.
- From 1997 to 1998 (drill holes AR-169 to AR-176):

- Core samples were crushed and pulverized by ALS' geochemical laboratory in Mendoza, Argentina. Sample preparation was carried out by jaw and roll crushing the entire half-core sample to -10 mesh, followed by taking a 1500 g split and pulverising it to -150 mesh.
- Assaying was done by ALS Santiago using fire assaying for gold (50 g), and multi-acid digestion with atomic absorption analysis (30 g) for silver, copper, lead, zinc, molybdenum, arsenic, antimony, and iron.

11.1.2 Alumbrera-Yamana Joint Venture

The Alumbrera-Yamana JV sampling was designed to maintain the standards and protocols applied by the BHP-Northern Orion JV. The core was sampled in two metre intervals. The geometallurgical core samples were also sampled at two metre intervals.

Drill core was split using a hydraulic guillotine, as the fine-grained sooty nature of chalcocite and of some copper oxides precluded the use of water for core sawing this could have caused mineralization to be washed away, potentially leading to sampling bias. The sample preparation was conducted once the geological and geotechnical logging was finished and once the selection of metallurgical samples was completed.

Phase 4 samples collected by the Alumbrera-Yamana JV (drill holes AR-177 through AR-244) were assayed at independent laboratories. Core samples were crushed under the supervision of Acme Analytical Laboratories (Chile) S.A. (Acme) in Mendoza, Argentina, to produce a pulp sub-sample at 50 mesh, and pulverized to 200 mesh. Assaying was carried out by Acme in Santiago, Chile using fire assaying for gold (50 g), and three-acid digestion with atomic absorption analysis for silver, copper, molybdenum, lead, zinc, arsenic, antimony, and iron. In addition, inductively coupled plasma mass spectrometry (ICP-MS) multi element analysis was performed by Acme in Vancouver, British Columbia, Canada. Umpire laboratory check assaying was performed by ALS La Serena (Chile) and ALS Lima (Peru). Laboratory certifications at the time of sampling, preparation, and analysis is undocumented, however both laboratories are industry-standard independent laboratories.

A total of 11,791 samples were generated including analytical quality control samples, with 10,318 original or primary samples collected from split HQ diameter (63.5 mm) drill cores. Seven shipments were sent between the months of July and October 2012. Each batch was composed of 29 primary samples and four analytical quality control samples (standards, blanks, and duplicates). In addition, sequential copper analysis for metallurgical purposes was performed on master samples (pulp) that were composited every 18 m.

In the independent commercial laboratory, one coarse duplicate and one pulp duplicate, selected at random, were incorporated into each batch. The aforementioned samples, in addition to five internal laboratory controls, formed the final batch of 40 samples that match Acme's analytical run. After analysis, the samples were returned in their entirety to Alumbrera (coarse reject, fine reject, and master fraction).

In the QP's opinion, the sample preparation, analysis, and security procedures at Agua Rica are adequate for an acceptable level of confidence in the analytical data used for the reporting of Mineral Resources as per CIM (2014).

11.2 Quality Assurance and Quality Control Programs

Quality control (QC) measures are established to ensure the reliability and trustworthiness of exploration data that is the foundation of Mineral Resources and mine planning. These measures include standardized field procedures and independent verifications of aspects such as drilling, surveying, sampling, assaying, data management, and database integrity. Appropriate documentation of quality control measures and regular analysis of quality control data are important as a safeguard for project data and form the basis for the quality assurance (QA) program implemented during exploration.

Internal and external laboratory control measures are implemented to monitor the precision and accuracy of the sampling, preparation, and assaying process. These analytical control measures are also important to identify and prevent sample mix-ups, and the intentional or unintended contamination of samples.

Typical assaying protocols involve regularly duplicating assays and inserting quality control samples to monitor the reliability of assaying results throughout the sampling and assaying process. Umpire laboratory check assaying, re-assaying a set number of sample coarse and pulp rejects at a secondary umpire laboratory, is normally performed as an additional test of the reliability of assaying results of the primary laboratory.

11.2.1 QA/QC Protocols by BHP-Northern Orion JV

The primary external analytical QC measure employed by the BHP-Northern Orion JV consisted of umpire laboratory check assays. Samples assayed by Bondar Clegg during the Phase 1 drilling campaign (drill holes AR-1 to AR-39) were check assayed by SGS Chile and samples assayed by SGS Chile during the Phase 2 drilling campaign (drill holes AR-40 to AR-168) were check assayed by Bondar Clegg. Samples were randomly selected at a rate of 5%.

In 1997, the same 5% of randomly selected samples, which had been assayed at both Bondar Clegg and SGS Chile, were sent to Acme in Vancouver, Canada, and Chemex Labs Ltd. (Chemex) in Mississauga, Canada for further check assay testing. As such, 5% of randomly chosen samples were assayed in four different laboratories. This involved further sample preparation in some cases, as the original sample pulps of 250g or 300g were insufficient for additional analyses. For these cases, -150 mesh pulps were prepared from remaining -10 mesh reject samples by the SGS sample preparation facility in Andalgalá, Argentina. In a few cases of very early drill holes, this involved the preparation of quartered core (by core saw) and new -10 mesh reject samples. Additional check assay samples were also chosen so that at least one check assay sample was included for each batch of samples submitted.

In June 1998, further check assaying was carried out by sending the same 1,700 samples which had been assayed at Bondar Clegg, SGS, Acme, and Chemex to ALS Santiago with the incorporation of standards. In this way, the check assay samples were now assayed at five different laboratories, and the presence of standards in the sample stream at ALS Santiago provided materials against which the accuracy of the data could be calibrated. These 11 standards were made from Agua Rica drill core and had previously been round robin assayed at 14 different laboratories in order to establish their elemental contents.

Due to the extensive umpire check assay program, a selective re-assaying program was conducted on segments of drill holes with significant discrepancies. A significant section of drill hole AR-51 which was originally assayed by SGS was found to have discrepancies between the laboratory assay results and the estimated copper grade from the geological core log. Whereas the laboratory was reporting assays in the order of hundreds of parts per million (ppm) copper, the geological core log indicated that the rock contained on the order of thousands of ppm copper. Re-assaying by Bondar Clegg (Coquimbo) confirmed that the primary laboratory had reported copper grades which were too low by an order of magnitude. SGS later re-assayed the same section of the drill hole and obtained similar results to Bondar Clegg.

Based on the check assays carried out at four different laboratories, individual check assay samples from the primary laboratories (Bondar Clegg and SGS) were identified which deviated significantly from the results of the other laboratories. Typically, a 20% deviation was taken to be significant. Where such deviations were encountered, the entire batch of samples was sent for re-assay. Some 987 samples were re-assayed for gold, 1,351 samples were re-assayed for copper, 1,041 samples were re-assayed for molybdenum, 509 samples were re-assayed for arsenic, and five samples were re-assayed for silver. Replacement percentages of all samples were 3.09% for gold, 4.22% for copper, 3.26% for molybdenum, 1.59% for arsenic, and 0.02% for silver (BHP, 1999).

11.2.2 QA/QC Protocols by Alumbrera-Yamana Joint Venture

Analytical QC samples were inserted on site; each sample batch was composed of 29 primary samples and four quality control samples. These included field duplicates, standards, and coarse blanks. Field duplicates were not prepared for the geometallurgical core samples due to the necessity of preserving as much mass as possible for metallurgical testing. The processes were carried out in line with the MAA standard procedures (MAA Management Manual QA/QC V3.R2).

A total of 1,473 control samples were incorporated in the process, which represents 12.5% of the total samples. The control samples were coded as follows:

- Samples Type 1: field duplicate (1/4 of core)
- Samples Type 4: standards
- Samples Type 6: coarse blanks (1/4 of core)

In the Acme laboratory, one coarse duplicate and one pulp duplicate, selected at random, were added to each batch. The aforementioned samples, plus five internal laboratory controls, formed the final batch of 40 samples that match the analytical run of Acme.

A total of 720 laboratory duplicate samples were generated at the Acme laboratory. These consisted of 360 duplicate samples of pulps (labelled DUPPU) and 360 duplicate samples of coarse rejects (labelled DUPCH).

The analytical QC program was evaluated by the MAA exploration geology department in 2012. The main conclusions are summarized below:

- The accuracy of Acme laboratory is acceptable for gold and copper. Failure of control samples were identified, but failure rates did not exceed 2% for any individual standard or blank.
- The validity of reference material results for molybdenum should be re-evaluated because the certified standards were designed for 4-acid digestion and not for the 3-acid digestion used in the 2012 drilling program. Molybdenum determination is usually done using 3-acid digestion.
- No contamination was identified in the blanks during preparation or chemical analysis.
- The precision of field duplicates, coarse rejects duplicates, and pulp duplicates for copper, gold, and molybdenum was analyzed. In all cases, the mean and the correlation coefficient were considered adequate.

Check assays carried out at ALS Patagonia S.A. to evaluate the performance of the Acme laboratory concluded that data obtained by Acme are reliable. Acceptable results were obtained for the main elements (gold, copper, molybdenum, and arsenic) analyzed by both laboratories.

The available QA/QC results documented by previous technical reports have been reviewed by the QP for Mineral Resources. In the QP's opinion, the QA/QC program as designed and implemented by Agua Rica is adequate for an acceptable level of confidence in the analytical data used for the reporting of Mineral Resources as per CIM (2014).

11.3 Density Determinations

A total of 13,842 density measurements have been taken from Agua Rica drill core: 3,525 determinations during the BHP-Northern Orion JV drill programs and more than 10,317 samples from the Alumbrera-Yamana JV drill program.

In general, density increases with increasing Fe, Cu, Zn, and Pb content, reflecting the sulphide content. Two different campaigns were carried out for density determination, as summarized below.

11.3.1 Bulk Density Determinations by BHP-Northern Orion Joint Venture

During the BHP-Norther Orion JV campaign, 3,525 density measurements were taken from Agua Rica drill core, up to drill hole AR-168. Most specific gravity measurements were taken at site on dry whole core using a simple geometric caliper method. A ten centimetre sample of whole drill core was taken every ten metres (drill core conditions permitting). Samples were sawn into regular cylinders, dried, measured, and weighted. A small number of samples (approximately 250) were also measured at CIMM Tecnologías y Servicios S.A. (CIMMM) laboratory in Santiago, Chile (now a part of SGS Chile) by two different methods, geometric and displacement of water following wax coating. CIMMM is an independent certified laboratory.

11.3.2 Bulk Density Determinations by Alumbrera-Yamana Joint Venture

During the 2012 Agua Rica infill drilling program, 10,317 density measurements were taken on site using the water displacement method, without wax coating. The procedure is described in the "Manual of Mapping, Logging and Determination of Geomechanical Rock Parameters" from the Alumbrera exploration geology department.

In line with the procedure for assay samples, density was calculated every two metres. Weights were obtained by weighing sections of half-core in air and then in water by using a scale using the following procedures:

- Weight in air: the half-core samples were placed in a scale pan and weighed on the scale. Best results were obtained by using between 2.5 kg to 3 kg of core pieces of similar size.
- Submerged weight: the same half core fragments used in the previous step are placed in a basket, submerged in water suspended to a scale, and weighed once stabilized.

For the overburden unit, a different methodology was used as this unit is usually not recoverable in core drilling. To assign a representative density, 34 samples were taken in areas where the Project roads intersect alluvial fill.

12.0 DATA VERIFICATION

12.1 Data Verification by BHP-Northern Orion Joint Venture

Based on available BHP-Northern Orion JV documentation, BHP applied QC procedures and took QA actions to provide adequate confidence in the data collection and processing (BHP, 1999). This includes umpire laboratory check assays, the primary external analytical QC measure employed by BHP-Northern Orion JV.

In 1997 and 1998, BHP-Northern Orion JV completed an umpire check assay program composed of approximately 1,700 samples, or 5% of the original samples. These samples were sent to four different laboratories. Based on the check assay results, full batches of specific drill holes were re-assayed due to significant discrepancies between the umpire laboratories and the primary laboratory (SGS and Bondar Clegg). Some 987 samples were re-assayed for gold (3.09% Au assays), 1,351 samples were re-assayed for copper (4.22% Cu assays), 1,041 samples were re-assayed for molybdenum (3.26% of molybdenum assays), 509 samples were re-assayed for arsenic (1.59% of arsenic assays), and five samples were re-assayed for silver (0.02% of silver assays).

In early 1998, Mineral Resources Development, Inc. (MRDI) was contracted by BHP to audit the sampling and assaying QA/QC procedures employed by the BHP-Northern Orion JV during its drilling programs at Agua Rica. Using the database prior to the re-assay program, MRDI identified a low bias in copper assaying at SGS Chile. In the QP's opinion, this historical issue was adequately addressed by the 1998 re-assay program, as detailed within internal technical documentation.

12.2 Data Verification by Yamana-Alumbrera Joint Venture

MAA employed QC procedures and took QA actions to provide adequate confidence in the data collection and processing. During drilling, experienced MAA geologists implemented industry standard measures designed to ensure the reliability and trustworthiness of the exploration data.

MAA included field duplicates, standards, and coarse blanks in their analytical QC program. The results were evaluated by the MAA exploration geology department in 2012. The MAA exploration geology department considered the database used for the geological and resource models was sufficiently reliable for Mineral Resource reporting.

12.3 Historical Verification

As part of the validation process for the 2019 RPA report, former Yamana geologist Felipe Machado de Araújo and external consultant Dr. Craig S. Bow visited the Project in 2018. The purpose of the site visit was to review available geological information including core and outcrops, review geological interpretations and modelling approach to determine if they met industry standard practice, and identify and review paper and electronic documentations available at site (Bow, 2018). The previous researchers reported that the drilling data, geological interpretations, and models were considered to meet or exceed industry standards.

12.4 Qualified Person's Comment

In accordance with NI 43-101 guidelines, Berkley J. Tracy, PG, CPG, P.Geo., SRK Principal Resource Geologist visited the Project from April 26 through April 29, 2022. During the site visit, the QP toured the property and reviewed general operations, typical drilling procedures, sampling practices, and available drill core. The QP was given full access to relevant data. Interviews were conducted with site personnel to understand the historical and current procedures used to collect, record, store, and analyse the exploration data.

The QP reviewed the relevant Agua Rica files supporting the Mineral Resource estimate. The drilling data (e.g., collar, survey, assay, and lithology data) were transferred as comma-separated value (.csv) files. The Agua Rica drillhole databases supplied to SRK for review had a cut-off date of June 30, 2019. Additionally, SRK reviewed and discussed quality assurance and quality control procedures (QA/QC) and results with the personnel responsible for the sample databases.

The QP is satisfied that the documented exploration work carried out at the Project was conducted in a manner that is consistent with industry standard practices and is confident that the exploration sampling databases are sufficiently reliable to support a Mineral Resource estimate. It is the opinion of the responsible QP that the previous geological interpretation, drilling database, and Mineral Resource model developed by Xstrata in 2012, based on BHP models developed in the late 1990s, meet or exceed industry standards and are of sufficient quality to support geological and Mineral Resource modelling work.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Introduction

Metallurgical test work was initiated by BHP on Agua Rica in 1996 and continued under the auspices of BHP, the BHP-Northern Orion JV and finally Northern Orion until 2006. Yamana purchased the property from Northern Orion in 2007 and conducted a test work program in 2010. Summaries of the results of these programs are provided in subsection 13.2 Historical Test Work.

Hatch completed an NI 43-101 Technical Report in December 2006 based on an Updated FS prepared for Northern Orion; a summary of the metallurgical section is also included in subsection 13.2.

In 2012, Xstrata (now Glencore) signed an option agreement with Yamana to study the use of the Alumbrera facilities to process the Agua Rica ore. As part of the agreement Xstrata carried out a metallurgical drilling campaign, a metallurgical test work program and a FS, which was completed in August 2013. The comminution program was directed by a specialist from Fluor and the flotation program was designed and supervised by the specialist process engineering firm, ProMet 101. A summary of the comminution and flotation results is provided in subsection 13.3 2012/13 Metallurgical Test Work.

In 2019, a review was conducted on the 2012/13 test work which was designed and supervised by ProMet 101 Consulting Limited (ProMet 101) and conducted by G&T Metallurgical Services Ltd. (now ALS) in Kamloops (ALS Kamloops). The 2019 review was conducted as part of a new PFS for the treatment of Agua Rica ore in the Alumbrera concentrator in order to confirm the Alumbrera grinding circuit capacity, and to identify potential efficiencies in the flotation circuit design based on new reviews of the mineralogy in various process streams. A Fluor specialist analyzed all comminution results, in addition to conducting an evaluation of the Alumbrera grinding circuit. Evaluation of the flotation results and flowsheet modification was conducted by ProMet 101.

The 2013 study manager responsible for Section 13 has reviewed the 2019 work presented in this document.

13.2 Historical Test Work

13.2.1 Comminution

The metallurgical comminution investigations conducted can be classified into three distinct groups:

- The BHP-Northern Orion JV test work reported in 1998
- The Northern Orion test work carried out in the mid 2000s
- The Yamana test work carried out in 2010

Fluor reviewed this work with the following conclusions:

- The SPi test results generated by BHP showed the average unconstrained Alumbrera circuit capacity for the 2013 26 year mine plan was 122,000 tpd. The SAG mills would limit the circuit capacity for 16 of the 26 years of planned operation.
- The ball milling circuit throughput calculations were based on the ball mill work index values of the six major ore types, determined from composite samples. The data showed that the Alumbrera circuit would be ball mill limited for 10 of the 26 years of operating life when grinding

to a final grind size of P_{80}= 150 µm; coarsening the grind size to P_{80}= 160 µm to 180 µm would allow higher throughputs of between 7,500 tpd to 14,000 tpd.

- Due to the small number of composite samples for the determination of ball mill work indices, and the lack of the Bond work indices for both the BHP (1997 – 1998) and the Yamana 2010 data sets, Fluor recommended that additional comminution test work be carried out testing each sample interval for the Bond work indices, SMC test parameters, and the SPi values.

13.2.2 Flotation

Several flotation test work programs have been completed as the Project has evolved. The following key tests have been identified:

- BHP Metallurgical Testing Report #5 - December 1997 – laboratory testing of five "bench" composites based on alteration type:
    - Highly variable results obtained – concentrate grades ranged from 4.3% Cu to 48.0% Cu at 6.1% to 90.0% recovery
    - Concerns identified with the high pyrite content, native sulphur, galena, and sphalerite, aging of samples and pulp chemistry
    - Locked cycle tests on composites showed copper recovery was 82.2% at a concentrate grade of 30.5% Cu; molybdenum recovery to the bulk Cu-Mo concentrate was 42.2% at 0.31% Mo
    - Gold recovery was reported to be around 55% with a significant quantity locked in silicates.
- BHP - Phase 1 Determination of Parameters Report #6 - April 1998:
    - Mineralogy identified primarily chalcocite and lesser amounts of chalcopyrite and bornite
    - Evaluated the effect of primary grind on recovery over the range P_{80} 70 µm to 150 µm
    - Investigation into the presence of oxidised copper affecting flotation
    - Identification of collector dosages found to be important; pyrite recovery and final concentrate grades were sensitive to collector dosages
    - Cyanide and CMC were used to depress pyrite and disperse clay respectively in some composites.
- January 1999 to April 1999 – Mintek:
    - Concentrates generated for molybdenum separation; molybdenum separation testing indicated 55% Mo grade at 52% recovery, however, 10 stages of cleaning required.
    - The key findings to produce a bulk Cu-Mo concentrate were:
        - Primary grind size ranging from P80 150 µm to 106 µm
        - Regrind P80 35 µm
        - Conventional reagents, lime, sodium silicate, and two to three stage cleaner flotation.
- Northern Orion - SGS Lakefield testing 2005:
    - Six main ore types tested and one miscellaneous composite
    - Generally lower grade samples (0.47% Cu) than previous programs

- o Focus was on the generation of parameters for a circuit modelling exercise.

13.2.3 Hatch NI 43-101 Technical Report - December 2006

Hatch reported the following for metallurgical performance in the 2006 Agua Rica NI 43-101 Technical Report:

- The deposit was divided into three main ore zones (Seca Norte, Quebrada Minas, and Trampeadero) with seven main ore types identified based on metallurgical characteristics. Of these ore types, two are clean (contain low levels of arsenic and/or zinc) and the other five are dirty. The metallurgical test work was carried out on composites and samples of the ore types.
- The test work data confirms that the Agua Rica ore is treatable using conventional grinding and flotation technology. The ore has a low average work index of 10.7 kWh/t. The ore mineralisation is relatively coarse grained and, therefore, requires a primary grind of P_{80} 150 µm to achieve acceptable recoveries. Fine regrinding of concentrates to P_{80} 45 µm is required to produce acceptable concentrate grades. Concentrate grades and metal recoveries vary by ore type. Arsenic contamination is anticipated to be problematic for some ore types, especially the dirty types. Zinc will be problematic on occasions, but in most years should be below penalty levels in the concentrate.

13.3 2012/13 Metallurgical Test Work

The following is a summary of the 2012/13 metallurgical test work program and results.

A metallurgical testing program was carried out to evaluate the potential for processing Agua Rica ores through the existing Alumbrera process facilities and to determine the modifications that would be required. The testing program focussed on grinding characterisation and the evaluation of flotation performance, and the metallurgical data produced by the test program was used for the process design. Ore samples were obtained from a resource and metallurgical drilling program in 2012.

The comminution test work program tested the samples for the complete suite of Bond Work indices. These parameters allowed Fluor to calculate the expected throughput rates in the Alumbrera grinding circuit. Additionally, the program generated a suite of comminution parameters that enabled the calculation of throughput rates using the SMC and SPI methods. These parameters were chosen to facilitate the alignment and pooling of the 2012 data with the data generated by previous testing programs.

Fluor determined the comminution characteristics of the Agua Rica samples and carried out capacity calculations for the Alumbrera concentrator when treating different rock types. The capacity calculations were based on a 92% mill utilisation rate.

For the comminution program a set of 71 new composite drill core samples from Agua Rica were selected and sent to ALS Kamloops. The samples were selected to represent the main lithologies and alteration zones of the ore deposit and the early years of production.

The Bond Ball and Rod milling results indicate that the softest ores are the Seca Porphyry ore types (SP) and the hardest ores are the Igneous Breccias (IBX). The data also shows that there is no size range that is harder or softer than the others. The relatively consistent Bond indices across the size ranges indicate that the ore will be amenable to SAG milling and will not produce a pebble build up inside the mill. The average RWi value was 10.8 kWh/t and the average Bwi value was 10.8 kWh/t. These values indicate that the Agua Rica ores are considered soft to moderate hardness ores.

Table 13-1 summarises the average and standard deviation values of the Bond Ball and Rod mill work indices the abrasion index.

Table 13-1: Ball Mill, Rod Mill, and Abrasion Bond Indices
Yamana Gold Inc.– Agua Rica Integrated Project

Ore Type	Bond Work Indices			
	Crusher (kWh/t)	Rod (kWh/t)	Ball (kWh/t)	Abrasion Index
Average All	10.6	10.8	10.8	0.11
Std Dev All	3.1	2.2	2.2	0.06
Average TP	12.4	11.4	10.8	0.09
Std Dev TP	3.2	1.6	2.5	0.06
Average SP	9.9	10	10.3	0.09
Std Dev SP	1.9	1.8	1.3	0.04
Average HBH	9.8	10.7	10.7	0.12
Std Dev HBH	4	1.7	1.4	0.05
Average IBX	12.8	12.2	12.2	0.16
Std Dev IBX	2.9	2.2	2.7	0.09
Average MET	9.6	10.7	10.7	0.11
Std Dev MET	2.1	2.9	2.9	0.04

The average Drop Weight test result is on the 26^{th} percentile in the SMC database, classifying the ore as soft to moderate hardness. The test results for the different size classes were consistent with the Bond test, i.e. there was no demonstrable trend between breakage energy requirements and mineral particle size.

The Spi results indicate that the softest ores are the Seca Porphyry ore types (SP) and the hardest ores are the Trampeadero Porphyry ores (TP) rather than the Igneous Breccias (IBX). The standard deviation for the Spi results was approximately 17 minutes, i.e. approximately 50% of the mean value. The Spi data shows a significantly higher degree of variability than either the Bond or SMC test results. The average Spi result was 35.4 minutes, indicating a soft to moderate ore hardness.

Fluor calculated the instantaneous SAG and ball mill throughput rates for each of the 71 samples to determine which circuit would be limiting to the throughput rate. Simple averaging of the 71 sample values gave an average SAG mill capacity of 132,000 tpd and an average ball mill capacity of 114,000 tpd when grinding to a P80 150 µm target.

The throughput rates were estimated using only the existing No. 1 and No. 2 grinding lines at Alumbrera. Line No.3 would be used only when necessary.

The total throughput was then limited to 121,000 tpd in accordance with the maximum permitted water consumption (800 L/s). This reduced the average throughput for the SAG mills to 116,000 tpd, and to 109,000 tpd for the ball mills. (Note: the water constraint is no longer applicable as additional water will be available from the Agua Rica mine water management system).

A block model was developed to predict grinding circuit throughput. This block model was used to estimate production in the mine plan.

A bulk flotation program was carried out to develop the process design basis using the existing Alumbrera grinding and flotation circuits and to characterise the variability of the ore deposit.

Products from the flotation testing program were selected for downstream testing programs such as rheology and settling testing of tailings and bulk concentrates. Additionally, geochemical characterisation of tailings and water quality assessments in concentrates were carried out for environmental purposes.

For the flotation testing program, a set of 350 drill core ore samples was sent to ALS Kamloops. These samples were collected from the main ore types, and approximately 60% of these samples represented ore to be treated during the payback period of the mine plan.

Mineralogical analysis indicated that about 90% of the total sulphide minerals present is pyrite. The average ratio of pyrite to copper sulphides was 11:1. The average pyrite content was 11% of the total sample mass with a maximum of 26%. This high pyrite content presents a significant challenge in achieving satisfactory copper concentrate grades

Secondary copper mineralisation was prevalent with the bulk of the copper in the form of chalcocite and covellite (0.8% to 1.6%). To a lesser degree, chalcopyrite (0% to 0.2%) and traces of bornite were identified. Arsenic was identified in variable quantities in the form of enargite (0% to 0.13%) that will report to the final concentrate. Variable amounts of sphalerite (0% to 0.6%) and galena (0% to 0.15%) were present in values that would also report to the final concentrates.

Liberation evaluations were carried out on samples ground to the flotation feed size distribution of P80 150 µm. On average, 30% of the copper sulphide particles were fully liberated and a further 21% associated in a binary form with pyrite. This relatively low association indicates that aggressive pyrite depression can be used in the rougher circuit without excessive losses due to copper sulphides being co-depressed to the rougher tailings.

The flotation testing initially used a three-stage cleaner circuit following a bulk regrind of the rougher concentrate. The initial results indicated that a circuit with two regrinding stages, where the second stage regrinding of the first cleaner concentrate with a more aggressive collector scheme, would improve copper recovery and reduce regrind power. The subsequent flow sheet used for the remainder of the test program and as the basis for design was derived from these initial results.

The reagent suite investigated for the flotation tests utilised commonly available reagents such as lime, fuel oil as a molybdenum collector, and Cytec 3477 as the copper-gold collector. MIBC was used as a frother, while cyanide and metabisulphide (MBS) were investigated as pyrite depressants. It was determined that the collector addition rates impacted selectivity, as pyrite flotation was one of the main concerns to improve the copper concentrate grade.

A primary grind of P80 150 µm was confirmed to provide sufficient liberation in the flotation feed, this is consistent with the findings of previous metallurgical test programs.

As copper sulphides are very fine grained, a fine regrind of P80 20 µm is required in the cleaning stages to achieve sufficient liberation for suitable concentrate grade control.

Flotation performance was highly sensitive to reagent additions as a result of the highly variable pyrite content. The use of pyrite-specific depressants such as cyanide achieved some improvements in concentrate grade; however, this was not investigated extensively due to environmental concerns.

Copper recovery to final concentrate was generally good; however, the bulk concentrate grade in the variability testing was highly variable, but slightly less variable with the ore type composites.

The molybdenum recovery to the bulk concentrate was highly variable with a low average recovery. There was no apparent reason for this performance from a liberation or reagent perspective.

A strong relationship between enargite content in the feed and the presence of arsenic in the concentrate was found. This resulted in high arsenic recoveries to final concentrate but with a significant range in arsenic grades. Arsenic bearing samples are located predominantly in the ore types EHB, HBC, MCC, PHB, and TEM.

The silver and gold recoveries obtained were lower than expected, with losses occurring to the rougher and cleaner tailings.

The depression of lead in the flotation circuit was good, while zinc depression was highly variable and dependant on feed grade. Any lead recovered to the bulk concentrate is detrimental to the Cu-Mo separation stage as the lead will report to the molybdenum concentrate.

Table 13-2 presents recoveries and grades of concentrate obtained from circuit modelling carried out by ProMet 101 based on locked cycle and variability testing results.

Table 13-2: Prediction for Recoveries and Concentrate Grades
Yamana Gold Inc.– Agua Rica Integrated Project

Ore type		Recoveries (%)					Grade on Bulk Concentrate (% or g/t)						
		Cu	Mo	Au	Ag	As	Cu	Mo	Au	Pb	Zn	Ag	As
All ore types	Average	86	53	38	49	64	28	0.8	5	0.2	1.7	82	0.62
	Percent, 75th	90	78	47	61	76	31	1.1	6	0.1	0.9	77	0.55
	Percent, 25%	84	30	29	39	55	24	0.2	3	0	0.1	30	0.11
	Max	94	91	64	90	92	44	6.3	12	6	42	820	6.67
	Min	50	5	5	3	13	3	0	0	0	0	9	0
SEP	Average	91	79	38	65	52	35	0.5	5	0	0.1	36	0.06
	Percent 75th	92	83	44	68	63	35	0.6	6	0	0.1	39	0.1
	Percent, 25%	88	73	33	56	47	35	0.3	3	0	0	32	0.02
	Max	94	87	48	90	71	35	1	12	0	0.1	54	0.14
	Min	87	55	20	52	18	35	0.2	3	0	0	14	0
SEM	Average	92	83	51	59	65	31	1.4	8	0	0.1	40	0.19
	Percent, 75th	93	88	57	70	82	31	1.6	9	0	0.1	48	0.27
	Percent, 25%	91	84	44	54	53	31	0.4	6	0	0	30	0.05
	Max	94	89	64	79	87	31	6.3	11	0.1	0.6	71	0.58
	Min	89	49	32	23	21	31	0.2	5	0	0	20	0.02
TEM	Average	85	41	30	46	76	31	1.3	4	0.6	2.7	114	1.13
	Percent, 75th	87	48	32	57	81	31	1.6	5	0.1	0.5	54	0.91
	Percent, 25%	84	37	26	40	75	31	0.9	4	0.1	0.1	36	0.23

Ore type		Recoveries (%)					Grade on Bulk Concentrate (% or g/t)						
		Cu	Mo	Au	Ag	As	Cu	Mo	Au	Pb	Zn	Ag	As
TEP	Max	92	50	47	67	82	31	2.8	8	6	26.2	820	6.67
	Min	76	17	20	22	51	31	0.3	1	0	0.1	23	0.07
	Average	78	41	37	41	57	24	0.5	4	0.2	1	81	0.6
	Percent, 75th	84	51	46	53	66	24	0.8	5	0.1	0.9	104	0.53
	Percent, 25%	76	33	27	28	53	24	0.2	2	0	0.2	27	0.19
PHB	Max	87	67	56	71	77	24	2.6	8	1.6	5.7	350	3.49
	Min	50	9	5	3	13	24	0	1	0	0.1	12	0.03
	Average	87	19	30	39	70	29	0.3	5	0.7	4	91	1.4
	Percent, 75th	90	23	33	50	83	29	0.3	7	0.5	6.9	136	1.95
	Percent, 25%	85	14	24	28	64	29	0.1	3	0.1	0.4	26	0.25
EHB	Max	92	33	55	66	91	29	1.4	8	4	14.3	248	6.13
	Min	81	5	15	16	31	29	0	2	0	0.1	10	0.05
	Average	86	55	46	49	70	26	1.2	4	0.2	3.7	95	0.58
	Percent, 75th	88	66	53	61	75	26	2.1	5	0.1	1.2	83	0.62
	Percent, 25%	85	44	41	41	68	26	0.2	2	0	0.4	25	0.18
TPM	Max	89	79	64	70	77	26	3.5	10	1.6	42	496	2.67
	Min	79	25	26	20	51	26	0	0	0	0.1	9	0.02
	Average	88	86	35	47	84	29	2	4	0	0.2	41	0.48
	Percent, 75th	91	90	38	56	88	29	2.5	4	0.1	0.2	50	0.72
	Percent, 25%	88	87	30	42	82	29	1.4	3	0	0.1	34	0.28
TPP	Max	93	91	44	59	92	29	3.3	6	0.1	0.9	55	0.75
	Min	75	65	29	27	71	29	1.1	1	0	0	28	0.2
	Average	85	31	38	45	55	22	0.2	3	0.1	1.4	90	0.24
	Percent, 75th	87	37	44	53	65	22	0.2	4	0.1	1.6	88	0.38
	Percent, 25%	84	26	36	37	54	22	0.1	2	0	0.2	33	0.12
HBC	Max	88	48	53	59	67	22	0.7	6	0.4	5.9	349	0.58
	Min	78	15	18	23	24	22	0	1	0	0.1	25	0.07
	Average	87	50	18	35	76	33	0.6	3	0.6	7	272	2.8
	Percent, 75th	87	56	19	37	77	34	0.8	3	0.8	8.9	298	3.4
	Percent, 25%	86	45	18	33	75	31	0.4	3	0.4	5.2	246	2.1
MCC	Max	87	61	20	39	79	35	1	4	1	10.7	325	4
	Min	86	40	17	31	73	30	0.2	3	0.2	3.3	220	1.5
	Average	84	37	45	42	73	26	0.2	2	0.1	0.9	45	0.4
	Percent, 75th	84	37	45	42	73	26	0.2	2	0.1	0.9	45	0.4
	Percent, 25%	84	37	45	42	73	26	0.2	2	0.1	0.9	45	0.4

Ore type		Recoveries (%)					Grade on Bulk Concentrate (% or g/t)						
		Cu	Mo	Au	Ag	As	Cu	Mo	Au	Pb	Zn	Ag	As
	Max	84	37	45	42	73	26	0.2	2	0.1	0.9	45	0.4
	Min	84	37	45	42	73	26	0.2	2	0.1	0.9	45	0.4
TPL	Average	86	35	31	41	44	31	0.8	9	0.1	0.4	383	0.1
	Percent, 75th	87	44	35	48	49	38	1	9	0.2	0.5	542	0.2
	Percent, 25%	85	26	27	34	39	25	0.5	9	0.1	0.2	225	0.1
	Max	88	53	39	55	54	44	1.3	9	0.2	0.7	700	0.2
	Min	84	16	23	26	34	18	0.2	9	0	0.1	67	0.1
SPP	Average	80	70	48	56	60	12	1	4	0.1	0.9	33	0.1
	Percent, 75th	84	71	49	56	64	17	1.5	5	0.1	1.1	40	0.2
	Percent, 25%	76	68	46	56	57	8	0.6	3	0.1	0.6	26	0.1
	Max	88	73	51	56	67	22	2	6	0.1	1.4	47	0.2
	Min	72	67	45	56	54	3	0.1	2	0.1	0.4	19	0

There was insufficient sample mass to carry out Cu-Mo separation testing. Hence, the risk exists that the relatively high pyrite content, ultra-fine copper mineralogy and presence of lead in the circuit could compromise adequate molybdenum-copper separation.

To achieve the expected flotation results, the flotation circuit design was based on the flowsheet developed during the flotation program. This design maximises the re-use of the existing equipment at Alumbrera while minimizing the need for modifications. A new second cleaner bank of six 70 cubic metre (m3) cells was required in addition to a 3,000 kW Isa mill for the second regrind stage.

Two stages of new scalping Jameson cells were to be added:

- To enable liberated material to be recovered from the rougher concentrate and the reground scavenger concentrate and be sent directly to the final concentrate,
- To avoid over regrinding that typically causes losses of molybdenite in cleaner circuits, and
- To save power.

13.4 2019 Pre-Feasibility Study Review

PFS-A did not involve any new metallurgical sampling or test work and was based entirely on the information available from the 2013 FS. Further process analysis and design development during PFS-A focussed on two main themes:

- Conduct a study to re-confirm the capacity of the Alumbrera grinding circuit and its ability to handle 110,000 tpd of Agua Rica ore feed (as is, or with modifications), and
- Revisit the metallurgical analysis and proposed process design for the flotation and regrind circuits and evaluate what could be done with existing equipment to process the desired throughput of 40 Mtpa or if not able to process the desired throughput with the existing equipment, establish what level of throughput could be sustained.

The grinding circuit performance and overall metallurgical performance to be achieved from the flotation circuits are closely linked. Thus, it is necessary to link the grinding circuit study with the metallurgy and process design review to in order to achieve the overall best economic solution for the Project.

As previously noted, the milling circuit design for the original 2013 FS was constrained to considering only the existing No. 1 and No. 2 grinding lines at Alumbrera, with the No. 3 grinding line providing contingency capacity only to be used when necessary. In contrast, PFS-A investigated how to maximise the use of all the available milling capacity at Alumbrera, with the objective of reducing to a minimum the additional investment required for treating ore from Agua Rica.

In order to achieve a 40 Mtpa plant throughput, the required primary milling rate of 110,000 tpd would correspond to a circuit design feed rate of 5,480 tph (i.e. 121,000 tpd of Agua Rica mill feed at an annual mill utilisation rate of 92%; this includes a design allowance of 10%). The regrind circuit must be capable of grinding the rougher concentrate to a product size of P80 20 µm; otherwise, the final copper concentrate grade will be significantly compromised.

The recommended upstream milling circuit consists of the existing Alumbrera core grinding circuit as used in the 2013 FS, with the inclusion of:

- The existing 6,500 HP SAG 3 mill (configured for operation as a ball mill) used in primary grinding to grind SAG mill discharge
- The existing 4,500 HP ball mill 12 to be used in re-grinding duty to assist the two existing regrind mills to grind the rougher concentrate

The circuit described is predicted to produce a flotation feed P80 129 µm with 50% probability.

A primary finding of PFS-A is that despite the improvements identified in liberation characteristics, and primary and regrind capacity, there is still insufficient regrind capacity and cleaning equipment in the existing Alumbrera concentrator to process 40 Mtpa and achieve suitable recovery and concentrate grades. Using the existing facilities, as is and with no modifications, would not provide the optimum economic outcome. Additional regrind capacity and cleaner flotation is required to achieve suitable recoveries and final concentrate grades.

13.5 Representativeness of the Samples

DJB Consultants Inc. selected 71 comminution samples, with selection criteria which focussed on the payback period and lithology distribution in LOM production, based on the mine plan updated in August 2011.

Each sample was selected as whole drill core to enable a total sample mass of the order of 100 kg to be obtained representing approximately 14 m continuous length of drill core. The selection process for the 71 comminution samples was focussed primarily on the first ten years of operation with 57 of the 71 samples corresponding to Years 1 to 5 of operation and 14 samples corresponding to Years 6 to 10. The distribution of samples by ore type is shown in Table 13-3 and the spatial distribution is shown in Figure 13-1.

Table 13-3: Distribution of Comminution Samples by Ore Type
Yamana Gold Inc.– Agua Rica Integrated Project

Lithology	Alteration	# Samples	Composite Name
HBH	Arg Adv	17	HBH-Arg Adv
IBX	Arg Adv	7	IBX-Arg Adv
MET	Phy	11	Not used
MET	Arg Adv	7	MET-Arg Adv
SP	Phy	17	Not used
TP	Arg Adv	10	TP-Arg Adv
TP	Phy	1	Not used
SP	Arg Adv	1	Not used

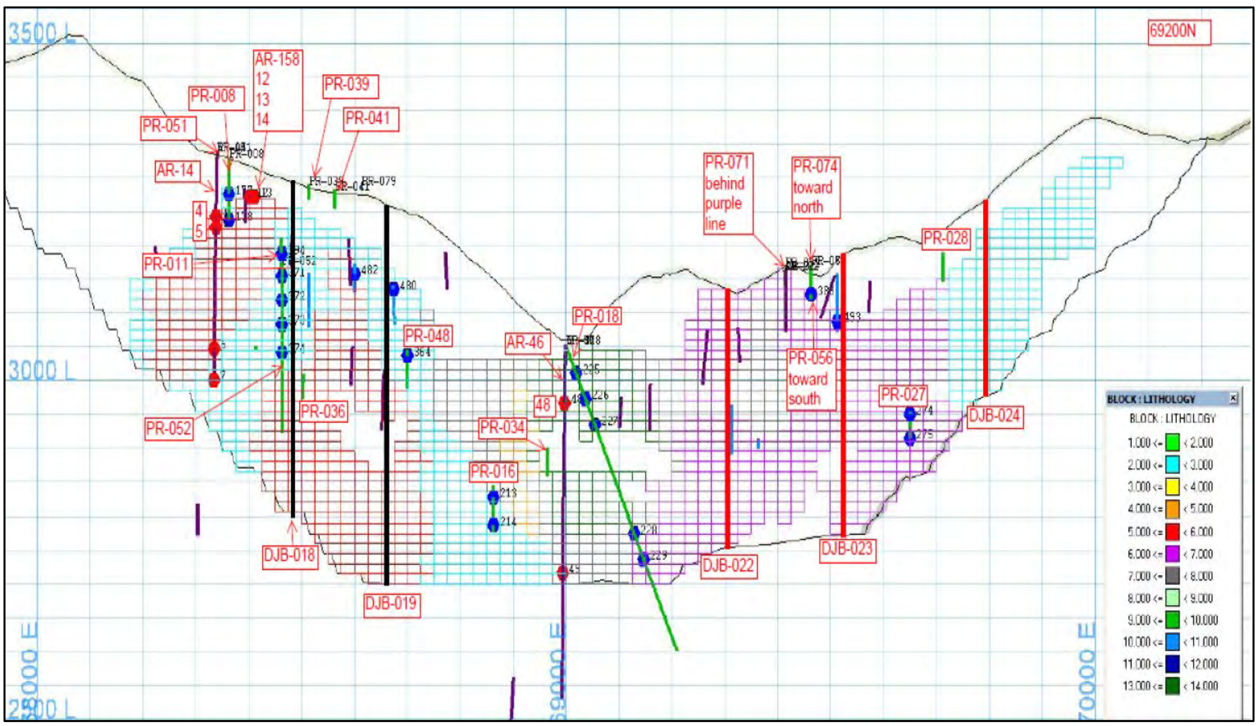


Figure 13-1: Spatial Distribution of Comminution Samples

Initial flotation testing was carried out on composites representing six of the main ore types. Variability testing was carried out on 126 samples representing the payback period and LOM in a ratio of 80:20. Final optimisation testing was carried on eight master composites representing the eight main ore types shown in Table 13-4 prepared from the 126 individual samples.

Table 13-4: Main Ore Types
Yamana Gold Inc.– Agua Rica Integrated Project

Ore Type Code	Ore Type
TEP	Trampeadero Enriched Porphyry
SEP	Seca Enriched Porphyry
TEM	Trampeadero Enriched Meta-sediments
SEM	Seca Enriched Meta-sediments
TPP	Trampeadero Primary Porphyry
PHB	Primary Hydrothermal Breccia
EHB	Enriched Hydrothermal Breccia
TPM	Trampeadero Primary Meta-sediments

The responsible QP considers that the comminution and flotation samples are highly representative of the payback period and reasonably representative of the first ten years of operation. More testing is recommended for later years.

13.6 Deleterious Elements

13.6.1 Lead and Zinc

The depression of lead from the flotation circuit was good; however, for zinc it was highly variable and dependant on feed grade. Any lead recovery to the bulk concentrate will be detrimental to the Cu-Mo separation stage as the lead is expected to report with the molybdenum. Studies of lead and zinc deportment in flotation are recommended in future studies, in particular in ore types TEM, TEP, PHP, EHP, TPP, and HBC.

13.6.2 Arsenic

The mine plan developed in 2013 showed that the arsenic level in concentrate exceeded 0.5% As in 11 of the 26 production years. Over the period 2005 to 2010 a number of studies were conducted to reduce the arsenic content in Agua Rica concentrate. A review of this work was carried out by MM Consultores (MMC) in 2019. The report concluded that fluid bed roasting to produce a saleable calcine and alkaline sulphide leaching produced the best net present values (NPVs) for the Project; however, two to three years would be required to produce an FS for either process due to the time required to produce concentrate for testing. It was recommended that concentrate blending should be considered.

MMC prepared a blending study report in 2019. The report was based on a mine plan that controlled the arsenic content in the feed to plant to enable concentrate to be produced at <0.5% As similar to other comparable operations in South America. This was achieved by stockpiling high arsenic content ore at the mine. MMC's report concluded that concentrate blending was feasible but that stockpiling and blending facilities would be required at the concentrator, filter plant, and port. Further studies were recommended in the next stage of work.

13.7 Conclusions and Comments

The 2013 FS showed that the existing Alumbrera grinding circuit is capable of processing 40 Mtpa (110,000 tpd) of Agua Rica ore to produce a flotation feed at a P80 150 µm. The throughput rates were estimated using only the existing No. 1 and No. 2 grinding lines at Alumbrera. The circuit is described in Section 17.

The PFS-A review studied the use of grinding line 3 with the 6,500 HP SAG mill 3 converted to a ball mill. This enables a flotation feed to be produced at a P80 130 µm, which lessens the load on the regrind circuit.

An average of the flotation results obtained in 2013 for all ore types is shown in Table 13-5.

The results show that reasonable copper recoveries and concentrate grades can be achieved although there is a high degree of variability attributable to differences between the ore types in regard to mineralogy, liberation size, and pyrite content. The average arsenic content in the concentrate is higher than typical smelter rejection limits.

Table 13-5: Average of 2013 Flotation Results to Bulk Cu-Mo Concentrate – All Ore Types
Yamana Gold Inc.– Agua Rica Integrated Project

Parameter	Cu	Mo	Au	Ag	As
Average Recovery (%)	86	53	38	49	64
75th Percentile (%)	90	78	47	61	76
25th Percentile (%)	84	30	29	39	55
Average concentrate grade (% or g/t)	28	0.8	5	82	0.62
75th Percentile (% or g/t)	31	1.1	6	77	0.55
25th Percentile (% or g/t)	24	0.2	3	30	0.11

A new metallurgical test work program is required to complete the work that could not be carried out in 2013. The key issues to study are:

- Cu-Mo separation
  - No work has been done on this since 1999; hence, a pilot plant campaign will be required to generate sufficient bulk Cu-Mo concentrate for separation testing.
- Copper concentrate testing
  - The pilot plant will generate sufficient copper concentrate for the following testing:
    - Thickening and filtration tests, and
    - Rheology tests to determine the capacity of the concentrate pipeline from Alumbrera to Tucumán.
- Regrind testing
  - Regrind signature plots are required on cleaner circuit streams to confirm the regrind power required.
- Coarse scavenger concentrate cleaning
  - This concept should be tested first at laboratory bench scale and then in the pilot plant.

- Mineralogical examinations
    - These should be carried out on all feed, intermediate products, concentrate, and tailings from the tests to obtain the maximum possible amount of information for circuit design. The deportment of gold should also be studied.

14.0 MINERAL RESOURCE ESTIMATE

The QP for this section of the study is Berkley J. Tracy, PG, CPG, P.Geo., SRK Principal Resource Geologist. SRK reviewed and verified the geological interpretation and domaining strategy, estimation methodology, bulk density estimation, and classification criteria for the resource model, as documented from the historical information provided. Upon completion of the audit review, the QP considers the Mineral Resource Statement summarized in Table 14-1 to represent a reasonable estimate of the copper, gold, silver and molybdenum resources for the Agua Rica deposit as of the effective date of this Technical Report.

SRK has completed sufficient work that in the QP's opinion, while local variations in the block estimates are expected, the impact on the global Mineral Resources, as presented at the time of the effective date, are not considered to be material. Since the June 30, 2019 effective date of this Technical Report, SRK has presented Yamana with detailed recommendations for improving and continuing to develop the Mineral Resource estimate. These recommendations are being implemented and revisions to the 2019 technical work related to Mineral Resources will be disclosed in the future. SRK is relying upon Yamana to provide the QP with notice of any material changes, and is not aware of any other facts that may have materially impacted the Mineral Resource statement.

The block grade interpolation and Mineral Resource estimate for Agua Rica was carried out by Xstrata's (now Glencore's) Santiago technical support team in December 2012 under the direction of Raul R. Roco, then a full-time employee of Xstrata (Xstrata Copper, 2012). Subsequently, in 2018-2019, Yamana completed extensive validation of the Mineral Resource modelling methodology and results. Yamana found that the model was reasonably prepared, provided a good representation of the geologic data, and was reliable for the purpose of Mineral Resource estimation.

The Mineral Resource estimate includes an update to the interpretation of the geological boundaries in compliance with the conceptual deposit interpretation generated by BHP and later updated by Xstrata in 2012. The models were validated by Yamana in 2019 and audited by SRK in 2022.

In 2012, the geological modelling methodology changed to reflect the implementation of Leapfrog Mining software to define lithological domains. Wall rocks were modelled as the complement of the mineralized units. Hydrothermal alteration was incorporated in the new geological model, striving to improve the grade estimation and geotechnical and geometallurgical approach.

The Agua Rica deposit is a large medium to low grade porphyry Cu-Mo system superseded by a high sulphidation Au-As-Pb-Zn epithermal mineral event on top of which an immature supergene blanket has been developed. In addition to the key economic variables, arsenic grades were interpolated in the current block model as an attempt to realistically address distribution of a potentially deleterious element across the Agua Rica deposit.

Mineral Resources reported are based on the Mineral Resource model prepared in December 2012, constrained by a 2019 updated optimized pit shell based on metal price assumptions of US$4.00/lb for Cu, US$1,600/oz, for Au, US$24/oz for Ag, and US$11/lb for Mo. Open pit Mineral Resources are reported at a variable cut-off value which averages $8.42/t milled. Numbers may not be exact as they are rounded for tabulation.

Yamana has summarized the Mineral Resources estimate in Table 14-1, with an effective date of June 30, 2019. This Mineral Resource estimate conforms to Canadian Institute of Mining, Metallurgy, and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves dated May 10, 2014

(CIM (2014) definitions). The Mineral Resources estimated in Table 14-1 are exclusive of the Mineral Reserves. Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources will be converted into Mineral Reserves in the future. The responsible QP is not aware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant issues that would materially affect the Mineral Resource estimate.

Table 14-1: Mineral Resource Estimate – June 30, 2019
Yamana Gold Inc.– Agua Rica Integrated Project

Category	Tonnes (000 t)	Grade				Contained Metal			
		(% Cu)	(g/t Au)	(g/t Ag)	(% Mo)	(Mlb Cu)	(000 oz Au)	(000 oz Ag)	(Mlb Mo)
Measured	53,600	0.22	0.13	1.55	0.02	260	224	2,671	24
Indicated	206,300	0.30	0.11	1.86	0.03	1,364	730	12,337	136
M+I	**259,900**	**0.28**	**0.11**	**1.80**	**0.03**	**1,624**	**954**	**15,008**	**160**
Inferred	742,900	0.23	0.09	1.62	0.03	3,767	2,150	38,693	491

Notes:

1. The Mineral Resources have been validated by Berkley J. Tracy of SRK Consulting (U.S.), Inc., and a Qualified Person (QP) as defined by NI 43-101.
2. CIM (2014) definitions were followed for Mineral Resources.
3. Mineral Resources are reported exclusive of Mineral Reserves.
4. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
5. Mineral Resources are estimated using a variable metallurgical recovery. LOM average metallurgical recoveries of 86% Cu, 35% Au, 43% Ag, and 44% Mo were considered.
6. Mineral Resources are constrained by an optimized pit shell based on metal price assumptions of US$4.00/lb Cu, US$1,600/oz Au, US$24/oz Ag, and US$11/lb Mo. Open pit Mineral Resources are reported at a variable cut-off value which averages $8.42/t milled with overall slope angles varying from 39° to 45° depending on the geotechnical sector.
7. Numbers may not add due to rounding.

14.1 Resource Database

The resource model was prepared by Xstrata for the Alumbrera-Yamana JV in December 2012 and all of the relevant files were transferred to Yamana for review and audit. Yamana was supplied with the drill hole database for Agua Rica in comma delimited format. The database included collar, downhole survey, assay, alteration, density, lithology, and geotechnical tables and is complete as of November 20, 2012 and contains 245 drill holes totaling 89,679 m of drilling. From this, a subset of 241 drill holes (four drill holes were removed for lack of sampling data) totalling 88,600 m of drilling was used for block grade interpolation. Table 14-2 provides a summary of the drill hole database.

Table 14-2: Resource Database Summary
Yamana Gold Inc.– Agua Rica Integrated Project

Table	Number of Records
Collar	245
Survey	2,702
Assay	43,298

Table	Number of Records
Lithology	44,568
Density	13,800

Yamana audited drill hole records to ensure that the grade, thickness, elevation, and mineralized zone used in preparing the current Mineral Resource estimate correspond to mineralization. Yamana's data verification procedures included the following:

- Checked for duplicate drill hole traces and twinned holes.
- Checked collar locations for zero/extreme values.
- Checked that drill hole collar coordinates and drill hole deviations were entered in the database, displayed in plan views and sections, and visually compared to relative locations of the holes.
- Checked for gaps and overlapping assay intervals.
- Checked for non-numeric data in assay tables.
- Checked for maximum depth inconsistencies.

The QP for Mineral Resources has reviewed the drilling data and considers the drillhole database to be adequate and sufficiently reliable for grade modelling and Mineral Resource estimation.

14.2 Geological Interpretation

The 3D geological modelling to delineate the principal lithology, mineralization, and alteration domains of the Project was updated by Xstrata (now Glencore), based on the previous model developed by BHP, with drilling completed in the 2012 campaign.

The models have been developed from drill core logging and geological interpretation in areas not covered by those datasets based on information collected from 1994 to 2012. For control purposes, NS and EW cross sections with spacing of 50 m were used. For appropriate surface connection, the models include a simplified surface geological map prepared by BHP. All models have been generated using Leapfrog Mining modelling software.

These models, in turn, were used, in conjunction with the drill hole sample assay grades, to delineate wireframes of the mineralized zones. The mineralized zones were then used for control during the subsequent grade modelling process.

14.2.1 Lithology Model

All of the solids comprising the lithological model (except granite) were constructed using the implicit modelling function of the Leapfrog Mining software using drill core data composited into 15 m intervals to ensure model integrity was not compromised by logged intervals less than 7.5 m in length, historic block models made by BHP, and NS and EW cross sections spaced on 50 m intervals. The granite was constructed using Vulcan software from two simplified surface geological maps prepared by BHP. In total, ten lithological solids have been defined. These are, in order from oldest to youngest:

1. Metasediment
2. Granite
3. Melcho Intrusive
4. Seca Porphyry – Trampeadero Porphyry

5. Igneous Breccia
6. Hydrothermal Breccia – Hydrothermal Bx (clay facies) – Clastic Hydrothermal Breccia
7. Seca-Waste and Trampeadero-Waste
8. Biotite Porphyry
9. Diatreme Breccia
10. Overburden

Numeric codes were assigned to the block model for Lithology, as presented in Table 14-3.

Table 14-3: Numeric Codes for Lithology
Yamana Gold Inc.– Agua Rica Integrated Project

Code	Description
1	Overburden
2	Metasediment
3	Melcho Intrusive
4	Undifferentiated Porphyry
5	Seca Porphyry
6	Trampeadero Porphyry
7	Hydrothermal Breccia
8	Clastic Hydrothermal Breccia
9	Igneous Breccia
10	Biotite Porphyry
11	Diatreme Breccia
12	Fault
13	Hydrothermal Bx (clay facies)
14	Pebble Dyke
15	Granite
16	Seca-Waste
17	Trampeadero-Waste
-1	Air

The distribution of the lithological solids is shown in Figure 14-1. All solids are displayed such that geologically older solids are not shown with the younger solids cross-cutting them. They are displayed this way to better illustrate the modelled geometries of each solid; however, in the block model flagging, each younger solid overprints any older solid that it intersects.

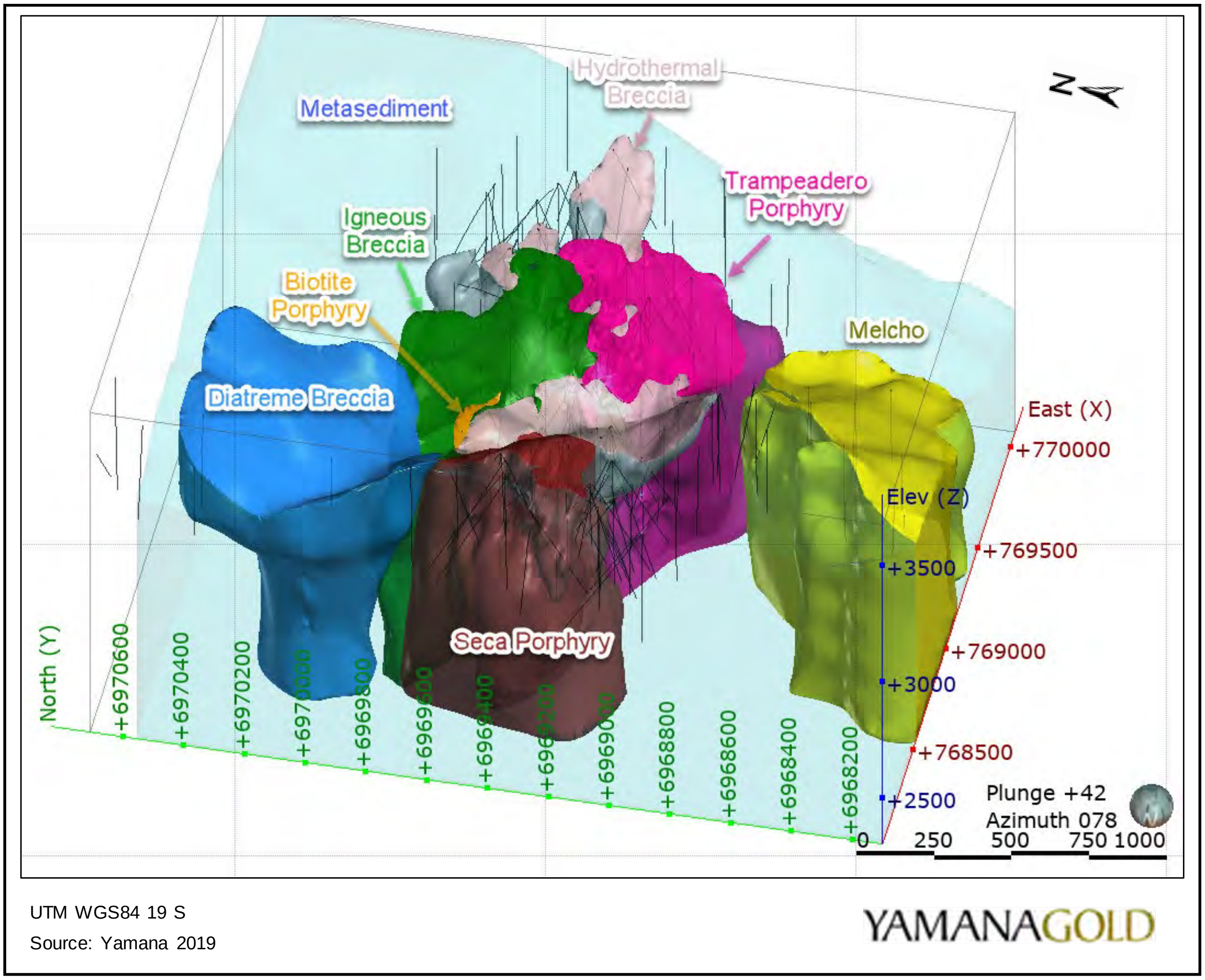


Figure 14-1: Lithology Model

14.2.2 Alteration Model

The alteration model describes the principle hydrothermal alteration zones in the Agua Rica deposit. The model has been developed from drill core logging, surface mapping, geological interpretation, and historical block models made by BHP. All the solids comprising the alteration model were constructed with Leapfrog Mining software utilizing drill core data composited into two metre intervals with a tolerance of 50% to ensure model integrity was not compromised by logged intervals less than one metre in length. Alteration solids were created using the same methodology as the lithological model. There are a total of five alteration zones of which two primary alteration types (Phyllic and Advance Argillic) make up the model (Figure 14-2). Numeric codes were assigned to each alteration as presented in Table 14-4.

Table 14-4: Numeric Codes for Alteration
Yamana Gold Inc.– Agua Rica Integrated Project

Code	Description
3	Phyllic
4	Advanced Argillic
10	No Alteration
12	Overburden
-1	Air

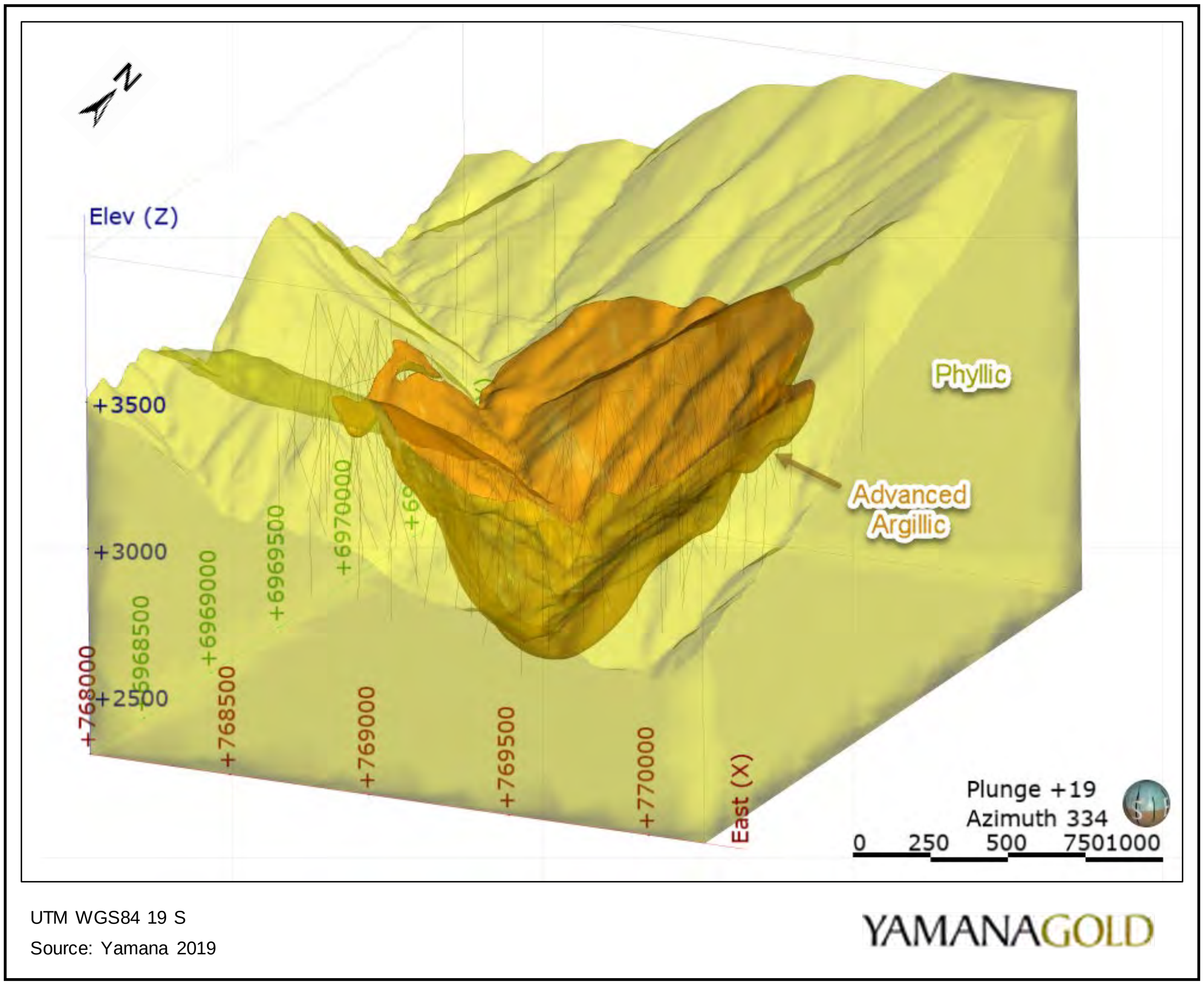


Figure 14-2: Alteration Model

14.2.3 Mineralized Zones Model

The mineralization zones model describes the principle mineralogical zones in the Agua Rica deposit. This model has been developed using the same information as the alteration and lithological model. All the solids comprising the mineralization model were constructed using Leapfrog Mining software with drill core data composited into 15 m intervals with a tolerance of 50%. Mineralization zone solids were created using the same methodology as the lithological model (Figure 14-3). Numeric codes were assigned to each mineralized zone, as presented in Table 14-5.

Table 14-5: Numeric Codes of Mineralized Zones
Yamana Gold Inc.– Agua Rica Integrated Project

Zone	Description
1	Leached
2	Partially Leached
6	Chalcocite (enriched)
7	Covellite
8	Pyrite
9	Chalcopyrite
10	No Mineralization
11	Coarse Covellite
12	Overburden
-1	Air

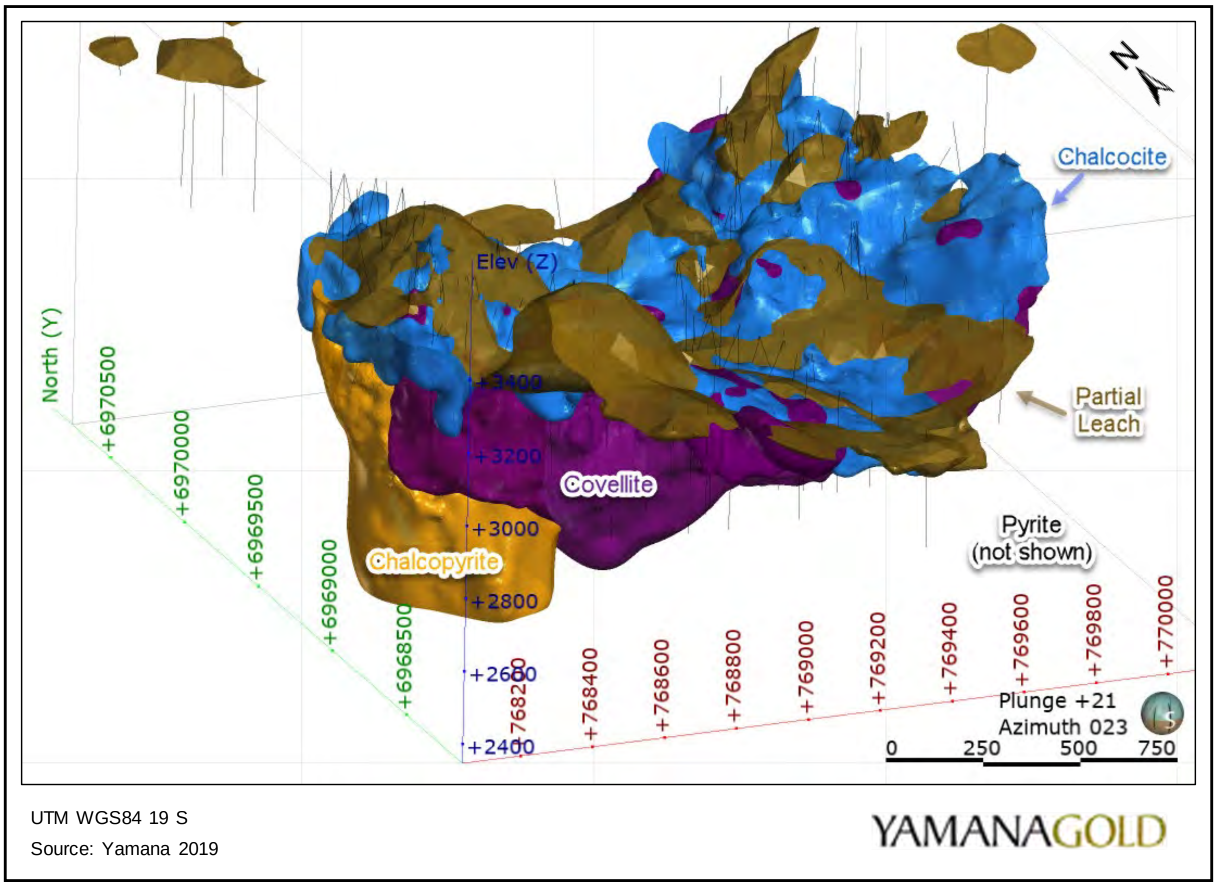
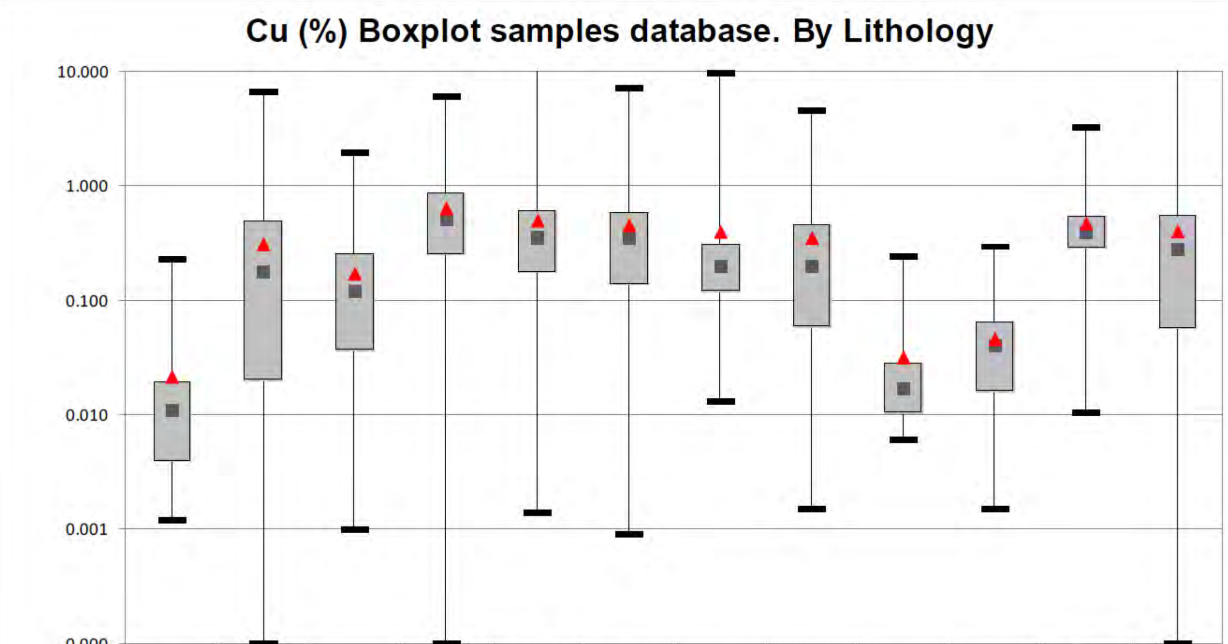


Figure 14-3: Mineralization Model

14.3 Statistical Analysis

Descriptive statistics provide a complete overview of the chemical behavior of the set of elements analyzed in this study. The basic descriptive statistics study has been completed on drill hole samples and grouped by the geological controls (alteration, mineral zones, and lithology). Figure 14-4 to Figure 14-15 present the number of samples, minimum, maximum, mean, and standard deviation by lithology, alteration, and mineral zones for each element.

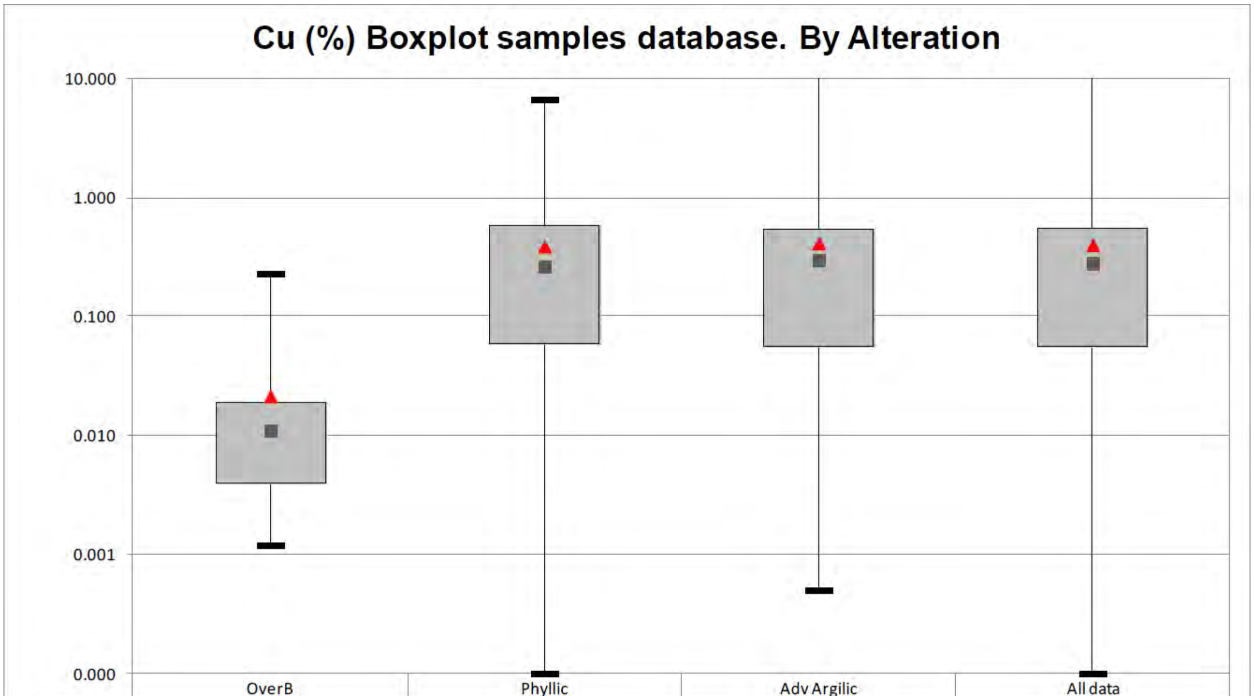
Descriptive statistics are presented through histograms, cumulative probability plots, boxplots, and quantile-quantile plots. These graphs and figures were calculated using the Supervisor software package, while Excel software was used to compile and show results.



	OverB	MetaSed	Melcho	Seca	Trampeadero	HydBrx	HydBrx Lit	IgBrx	Biot Porph	Diatreme	HydBrx Clay	All data
Q1	0.004	0.020	0.037	0.255	0.180	0.138	0.122	0.059	0.010	0.016	0.296	0.057
Min	0.001	0.000	0.001	0.000	0.001	0.001	0.013	0.002	0.006	0.002	0.010	0.000
Median	0.011	0.179	0.120	0.510	0.355	0.355	0.201	0.201	0.017	0.040	0.393	0.280
Mean	0.021	0.310	0.172	0.638	0.499	0.455	0.398	0.352	0.032	0.046	0.471	0.402
Max	0.231	6.694	1.961	6.110	17.200	7.276	9.817	4.636	0.243	0.297	3.300	17.200
Q3	0.019	0.490	0.253	0.869	0.602	0.581	0.306	0.454	0.028	0.065	0.531	0.557
NSamples	143	16046	1241	5715	6304	8254	611	2097	97	444	809	42915

Source: Xstrata, 2012

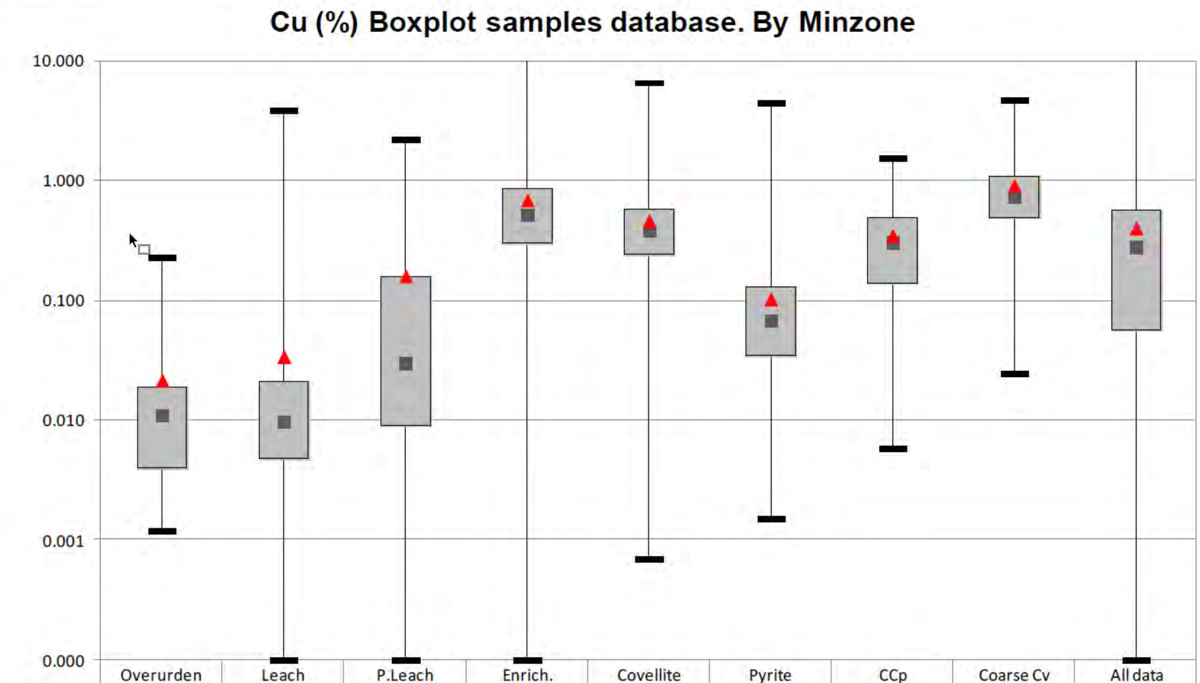
Figure 14-4: Descriptive Statistics and Box Plot for Copper by Lithology (Two Metre Sample Length)



	OverB	Phyllic	Adv Argilic	All data
Q1	0.004	0.060	0.056	0.057
Min	0.001	0.000	0.001	0.000
Median	0.011	0.264	0.297	0.280
Mean	0.021	0.392	0.415	0.402
Max	0.231	6.694	17.200	17.200
Q3	0.019	0.578	0.542	0.557
NSamples	143	21159	21613	42915

Source Xstrata, 2012

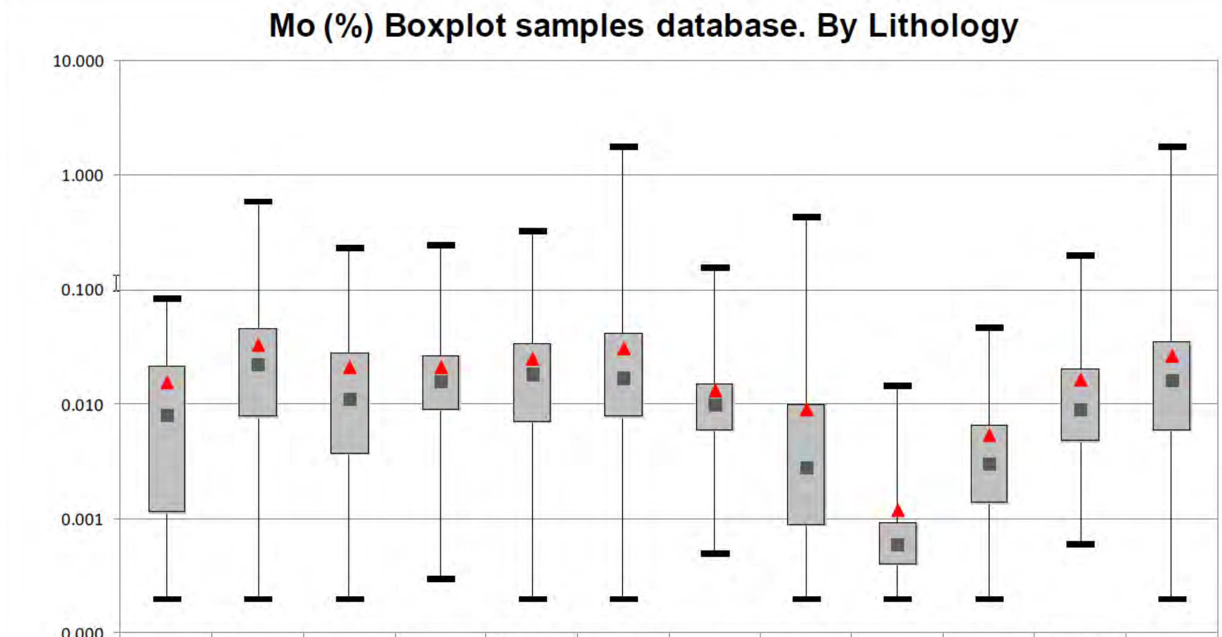
Figure 14-5: Descriptive Statistics and Box Plot for Copper by Alteration Type (Two Metre Sample Length)



	Overurden	Leach	P.Leach	Enrich.	Covellite	Pyrite	CCp	Coarse Cv	All data
Q1	0.004	0.005	0.009	0.301	0.242	0.034	0.140	0.494	0.057
Min	0.001	0.000	0.000	0.000	0.001	0.002	0.006	0.025	0.000
Median	0.011	0.010	0.030	0.522	0.385	0.068	0.306	0.732	0.280
Mean	0.021	0.034	0.160	0.691	0.462	0.103	0.349	0.914	0.402
Max	0.231	3.900	2.220	17.200	6.600	4.500	1.546	4.736	17.200
Q3	0.019	0.021	0.161	0.870	0.583	0.130	0.500	1.084	0.557
NSamples	143	7174	1894	12777	14094	4711	1845	277	42915

Source: Xstrata, 2012

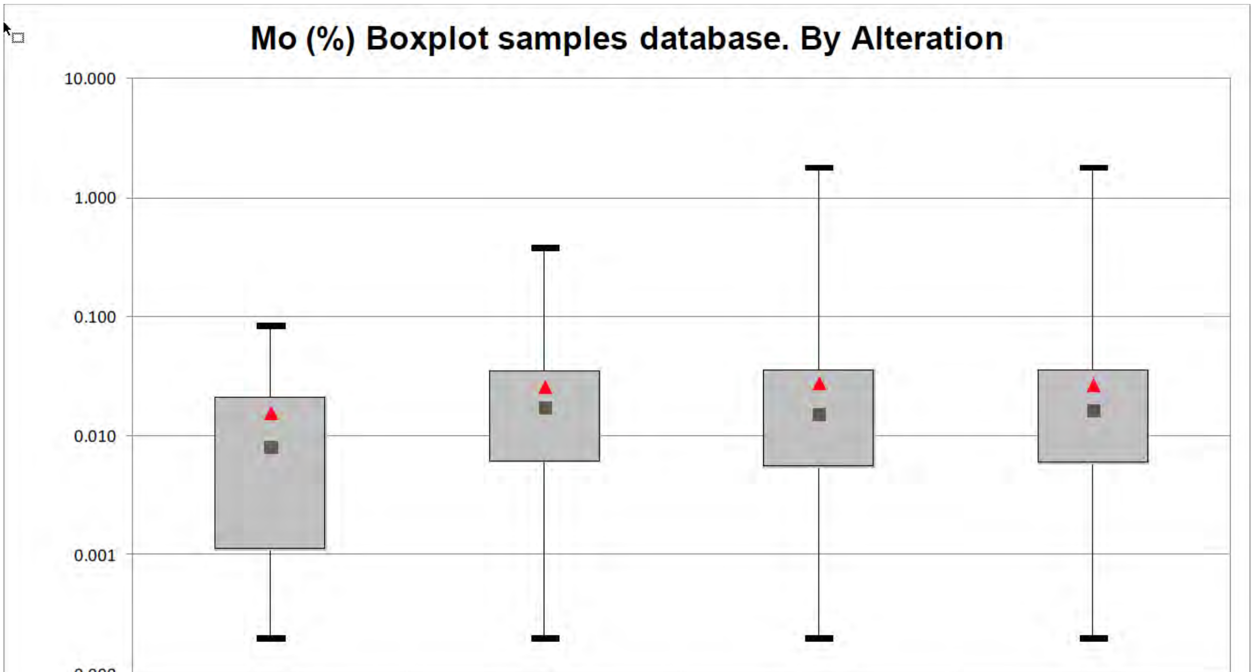
Figure 14-6: Descriptive Statistics and Box Plot for Copper by Mineralized Zone (Two Metre Sample Length)



	OverB	MetaSed	Melcho	Seca	Trampeadero	HydBrx	HydBrx Lit	IgBrx	Biot Porph	Diatreme	HydBrx Clay	All data
Q1	0.001	0.008	0.004	0.009	0.007	0.008	0.006	0.001	0.000	0.001	0.005	0.006
Min	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000
Median	0.008	0.022	0.011	0.016	0.018	0.017	0.010	0.003	0.001	0.003	0.009	0.016
Mean	0.016	0.033	0.021	0.021	0.025	0.031	0.013	0.009	0.001	0.005	0.016	0.027
Max	0.085	0.596	0.233	0.249	0.326	1.800	0.157	0.438	0.015	0.047	0.200	1.800
Q3	0.021	0.046	0.028	0.026	0.034	0.041	0.015	0.010	0.001	0.006	0.020	0.035
NSamples	143	16045	1240	5715	6303	8254	611	2097	97	444	809	42912

Source: Xstrata, 2012

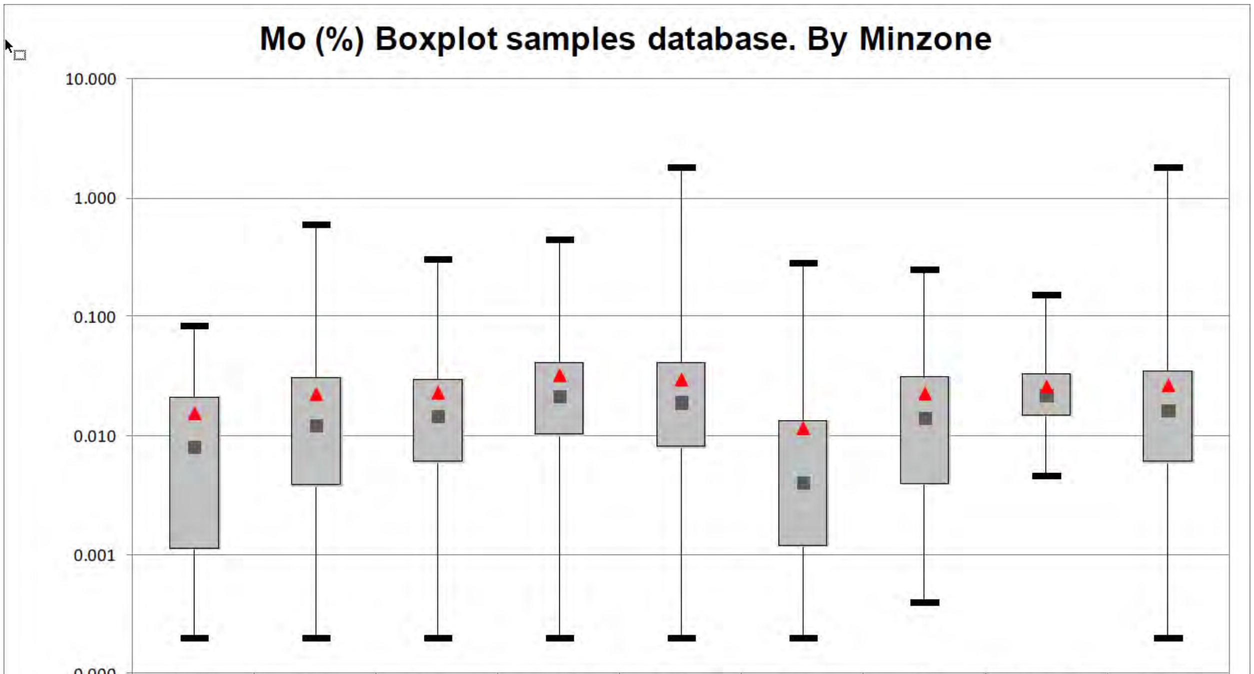
Figure 14-7: Descriptive Statistics and Box Plot for Molybdenum by Lithology (Two Metre Sample Length)



	OverB	Phyllic	Adv Argilic	All data
Q1	0.001	0.006	0.006	0.006
Min	0.000	0.000	0.000	0.000
Median	0.008	0.017	0.015	0.016
Mean	0.016	0.026	0.028	0.027
Max	0.085	0.380	1.800	1.800
Q3	0.021	0.035	0.036	0.035
NSamples	143	21155	21614	42912

Source: Xstrata, 2012

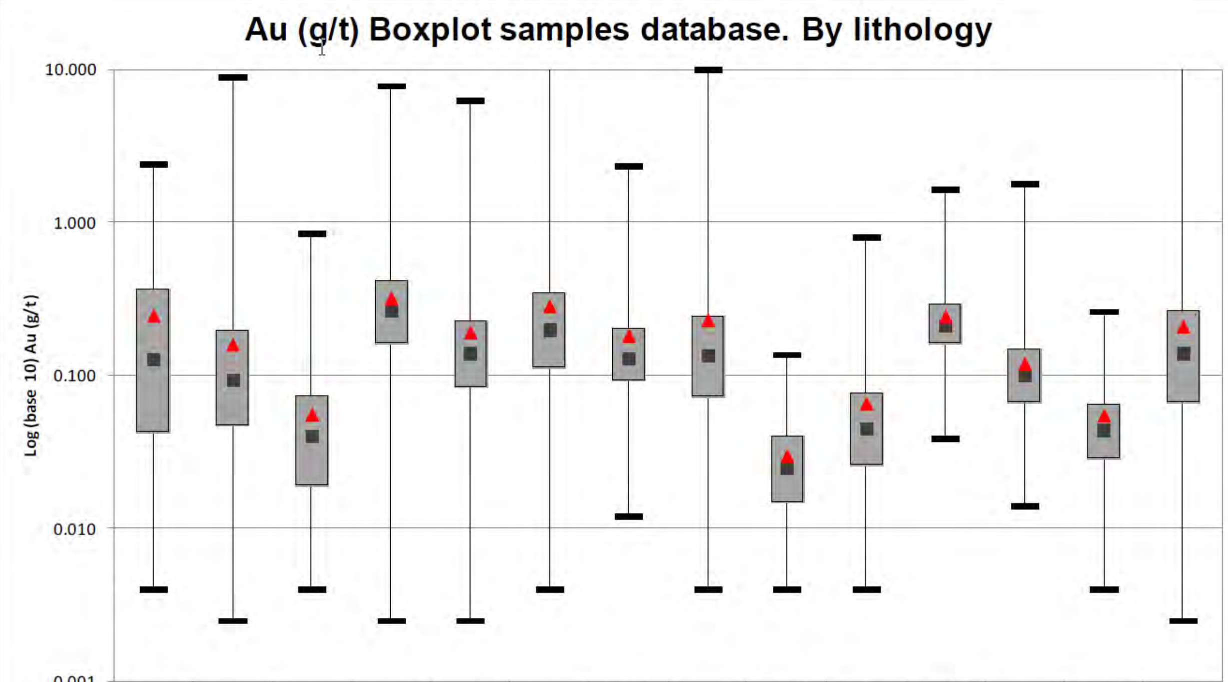
Figure 14-8: Descriptive Statistics and Box Plot for Molybdenum by Alteration (Two Metre Sample Length)



	OverB	Leach	P.Leach	Enrich.	Covellite	Pyrite	CCp	Coarse Cv	All data
Q1	0.001	0.004	0.006	0.010	0.008	0.001	0.004	0.015	0.006
Min	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000
Median	0.008	0.012	0.015	0.021	0.019	0.004	0.014	0.022	0.016
Mean	0.016	0.022	0.023	0.032	0.030	0.012	0.023	0.026	0.027
Max	0.085	0.596	0.305	0.448	1.800	0.285	0.249	0.154	1.800
Q3	0.021	0.030	0.030	0.041	0.040	0.014	0.031	0.033	0.035
NSamples	143	7172	1894	12781	14091	4709	1845	277	42912

Source: Xstrata, 2012

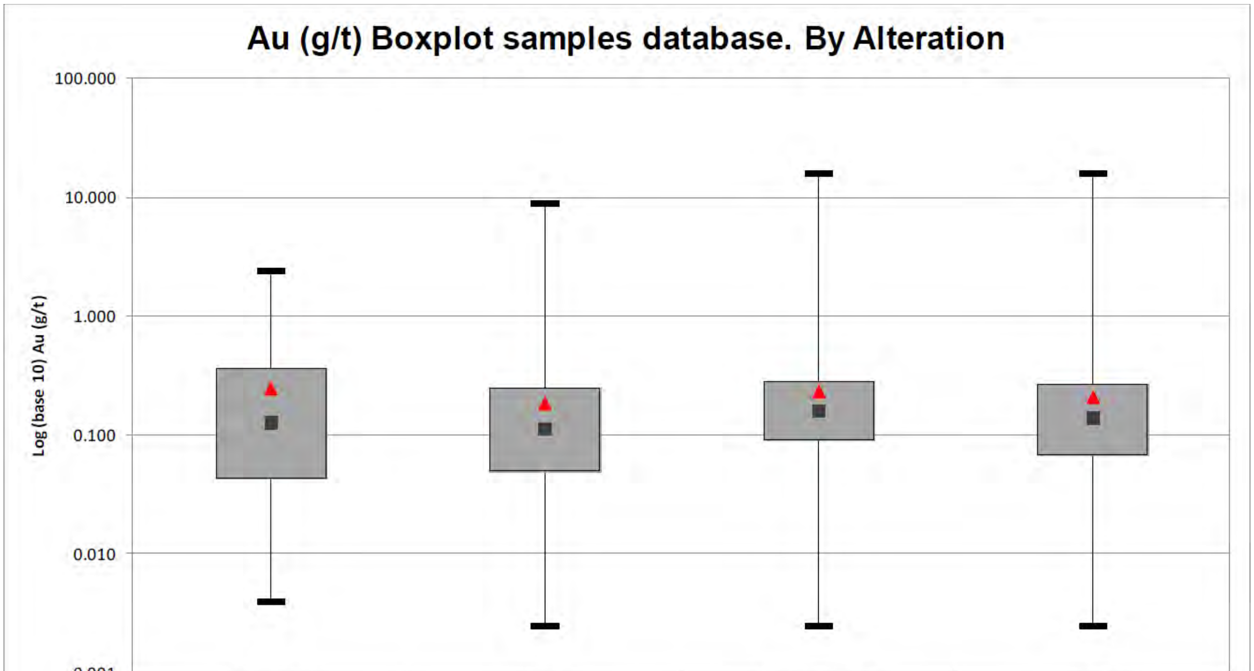
Figure 14-9: Descriptive Statistics and Box Plot for Molybdenum by Mineralized Zone (Two Metre Sample Length)



	OverB	Metased	Melcho	Seca	Trampead.	Hyd Brx	Hyd Brx Clastic	Igneous Breccia	Biotite Porph	Diatreme Brx	Hyd Brx Clay	Seca Waste	Trampead. Waste	All Data
Q1	0.043	0.047	0.019	0.164	0.085	0.112	0.093	0.073	0.015	0.026	0.163	0.068	0.029	0.068
Min	0.004	0.003	0.004	0.003	0.003	0.004	0.012	0.004	0.004	0.004	0.039	0.014	0.004	0.003
Median	0.128	0.094	0.040	0.265	0.140	0.199	0.129	0.135	0.025	0.045	0.211	0.101	0.044	0.140
Mean	0.247	0.160	0.056	0.319	0.192	0.285	0.182	0.231	0.030	0.066	0.243	0.120	0.055	0.209
Max	2.417	8.948	0.852	7.840	6.316	15.955	2.340	10.000	0.137	0.800	1.644	1.803	0.262	15.955
Q3	0.363	0.199	0.073	0.418	0.230	0.342	0.200	0.244	0.040	0.076	0.290	0.149	0.065	0.266
NSamples	143	16043	1240	5711	6303	8234	611	2097	97	444	809	736	418	42886

Source: Xstrata, 2012

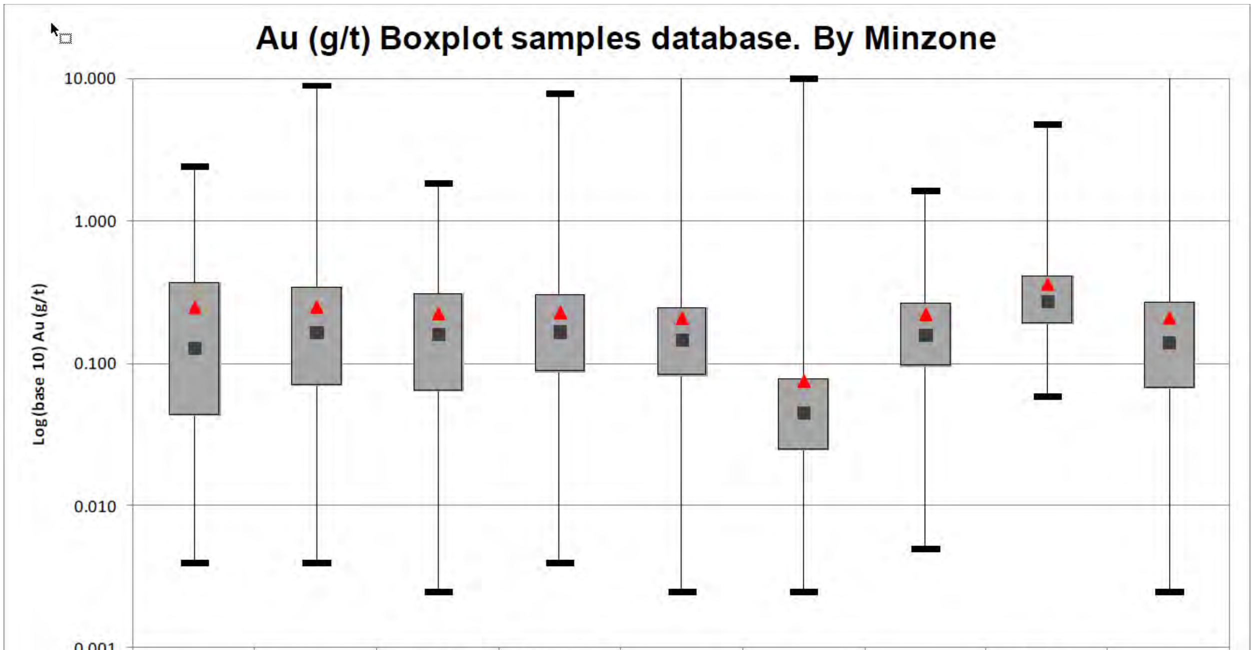
Figure 14-10: Descriptive Statistics and Box Plot for Gold by Lithology (Two Metre Sample Length)



	Overburden	Phyllic	Advanced Argillic	All data
Q1	0.043	0.050	0.092	0.068
Min	0.004	0.003	0.003	0.003
Median	0.128	0.113	0.161	0.140
Mean	0.247	0.185	0.233	0.209
Max	2.417	8.948	15.955	15.955
Q3	0.363	0.247	0.280	0.266
NSamples	143	21152	21591	42886

Source: Xstrata, 2012

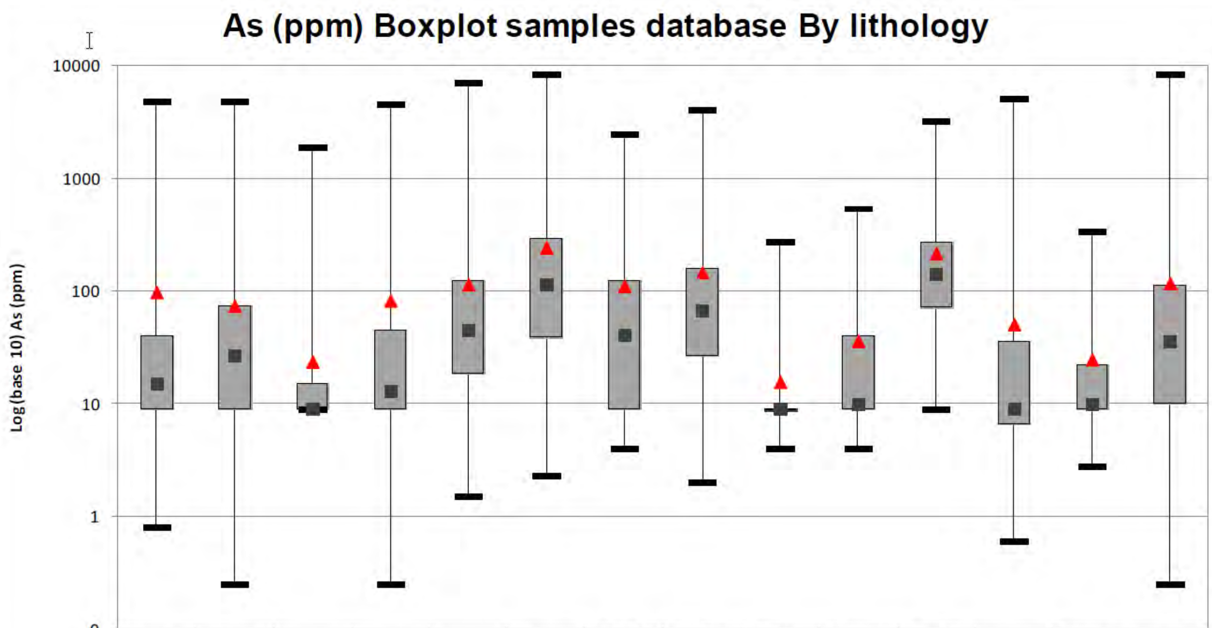
Figure 14-11: Descriptive Statistics and Box Plot for Gold by Alteration Zone (Two Metre Sample Length)



	Overburden	Leached	Partially Leached	Chalcocite (enriched)	Covellite	Pyrite	Chalcopyrite	Coarse Covellite	All Data
Q1	0.043	0.071	0.065	0.088	0.083	0.025	0.097	0.191	0.068
Min	0.004	0.004	0.003	0.004	0.003	0.003	0.005	0.059	0.003
Median	0.128	0.165	0.161	0.167	0.146	0.045	0.158	0.272	0.140
Mean	0.247	0.250	0.226	0.229	0.209	0.076	0.222	0.362	0.209
Max	2.417	8.948	1.836	7.840	15.955	10.000	1.633	4.779	15.955
Q3	0.363	0.343	0.310	0.301	0.247	0.077	0.262	0.407	0.266
NSamples	143	7172	1892	12757	14092	4708	1845	277	42886

Source: Xstrata, 2012

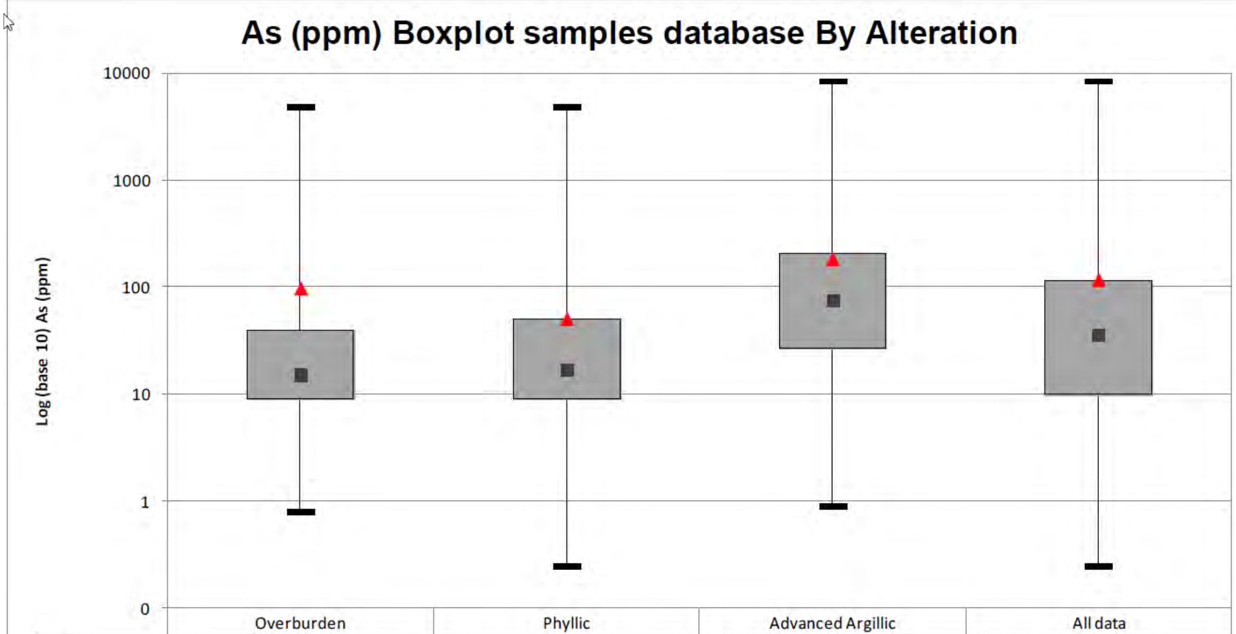
Figure 14-12: Descriptive Statistics and Box Plot for Gold by Mineralized Zone (Two Metre Sample Length)



	OverB	Metased	Melcho	Seca	Trampead.	Hyd Brx	Hyd Brx Clastic	Igneous Breccia	Biotite Porph	Diatreme Brx	Hyd Brx Clay	Seca Waste	Trampead. Waste	All Data
Q1	9	9	9	9	19	38	9	27	9	9	72	7	9	10
Min	0.80	0.25	9.00	0.25	1.50	2.30	4.00	2.00	4.00	4.00	9.00	0.60	2.80	0.25
Median	15	27	9	13	45	115	41	67	9	10	143	9	10	36
Mean	98	74	24	82	115	245	111	147	16	36	217	51	25	118
Max	4845	4850	1907	4597	7128	8500	2496	4107	273	542	3230	5100	341	8500
Q3	40	73	15	45	122	295	123	159	9	40	272	36	22	113
NSamples	143	16047	1241	5715	6305	8257	611	2097	97	444	809	736	418	42920
Standard Dev.	465	161	68	230	232	386	190	263	28	55	248	217	38	254
CV	4.74	2.17	2.89	2.79	2.02	1.58	1.71	1.79	1.80	1.52	1.14	4.28	1.53	2.15

Source: Xstrata, 2012

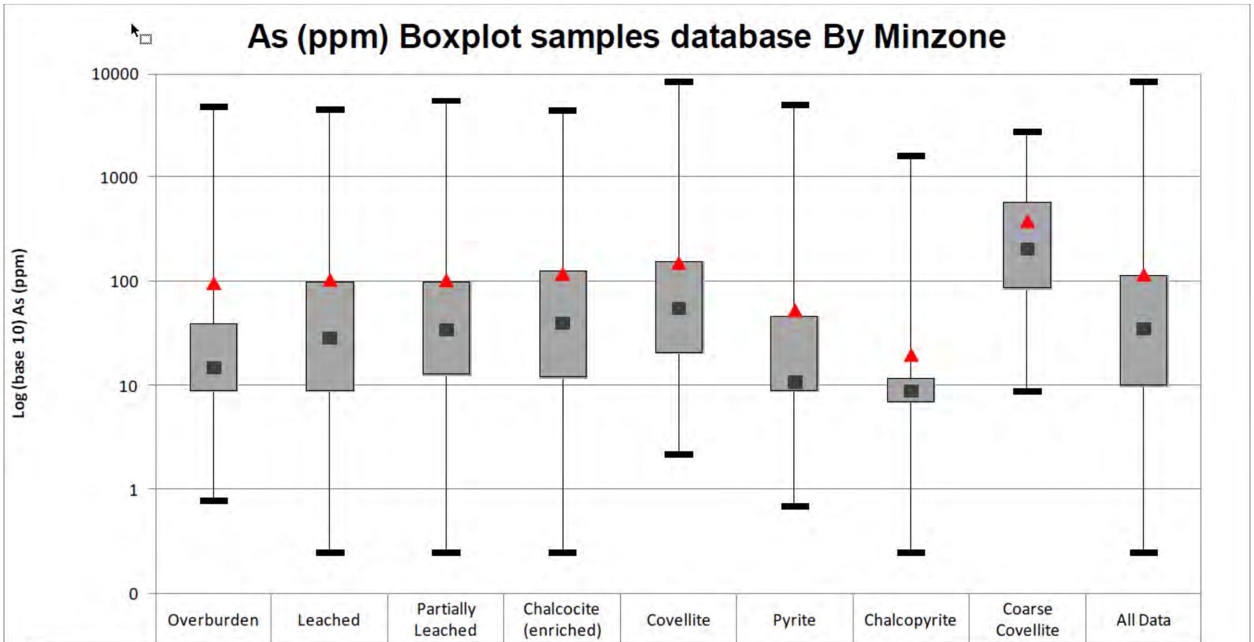
Figure 14-13: Descriptive Statistics and Box Plot for Arsenic by Lithology (Two Metre Sample Length)



	Overburden	Phyllic	Advanced Argillic	All data
Q1	9	9	27	10
Min	0.80	0.25	0.90	0.25
Median	15	17	75	36
Mean	98	51	184	118
Max	4845	4850	8500	8500
Q3	40	50	204	113
NSamples	143	21159	21618	42920
Standard Dev.	465	117	324	254
CV	4.74	2.31	1.76	2.15

Source: Xstrata, 2012

Figure 14-14: Descriptive Statistics and Box Plot for Arsenic by Alteration (Two Metre Sample Length)



	Overburden	Leached	Partially Leached	Chalcocite (enriched)	Covellite	Pyrite	Chalcopyrite	Coarse Covellite	All Data
Q1	9	9	13	12	21	9	7	88	10
− Min	0.80	0.25	0.25	0.25	2.20	0.70	0.25	9.00	0.25
■ Median	15	29	35	40	56	11	9	210	36
▲ Mean	98	105	105	121	153	54	20	387	118
− Max	4845	4597	5585	4502	8500	5100	1659	2795	8500
Q3	40	97	97	124	155	46	12	571	113
NSamples	143	7174	1894	12780	14096	4711	1845	277	42920
Standard Dev.	465	227	264	235	304	142	63	434	254
CV	4.74	2.16	2.52	1.95	1.99	2.64	3.16	1.12	2.15

Source: Xstrata, 2012

Figure 14-15: Descriptive Statistics and Box Plot for Arsenic by Mineralized Zone (Two Metre Sample Length)

14.3.1 Estimation Domains

14.3.1.1 Copper

The Agua Rica intrusive complex, like those in most porphyry copper districts, contains porphyry units that are pre-, syn-, and post-mineralization in age. The important distinction is between porphyries that have been altered and mineralized by the early porphyry copper stage and those intruded after this stage. All intrusives and hydrothermal breccias have been affected by late-stage advanced-argillic alteration and associated high sulphidation mineralization. A diatreme breccia was the last to be emplaced.

All these lithological units have a unique signature in terms of their copper metal content and copper spatial distribution. In parallel to this lithological control, copper mineralization is also associated with the mineralogical form that copper takes in different parts of the deposit. Three major stages of alteration/mineralization are clearly recognized at Agua Rica: early porphyry Cu-Mo-Au, later epithermal Cu-Au-Ag-As-Pb-Zn, and supergene Cu enrichment. As a result of uplifting and weathering, Agua Rica has evolved into a supergene enriched porphyry copper deposit. In addition, supergene leaching of the chalcopyrite/copper assemblage caused partial replacement with coatings of chalcocite and less covellite. An overprinting epithermal event carrying precious metals and copper sulphosalts is best observed in the central Quebrada Minas hydrothermal breccia body that separates the Seca and Trampeadero porphyries, and in the Trampeadero porphyry itself. The leached cap at Agua Rica is dominated by jarosite with lesser amounts of goethite and minor hematite.

The hydrothermal alteration model was used in the estimation process as a secondary input in the domain definition, with phyllic alteration, consisting mainly of quartz, sericite, and pyrite overprinting the potassic and propylitic alteration; while advance argillic alteration is predominantly defined by pyrophyllite and alunite and intimately associated with pyrite, covellite, enargite, sphalerite, galena, and minor molybdenite.

Xstrata divided the deposit into nine distinct copper estimation domains (numbered 1 through 9) that were believed to constitute reasonable separation of nearly stationary domains. Horizontally the mineralization distributions were controlled by the modelled mineralized zones while vertical contacts controlling copper grade distributions are provided predominantly by the modelled lithological units and in some cases by the alteration model. Copper estimation domain grouping was controlled by (i) geology – similarities or dissimilarities between geological features; (ii) the copper mean, variance, and cumulative distribution were used to combine units of similar sample distribution; and (iii) the number of samples was considered, particularly for units with scarce data.

14.3.1.2 Molybdenum

The estimation domains for molybdenum were defined based on geological-statistical criteria, considering, (i) spatial continuity, (ii) clear differentiation in statistical behavior, (iii) nearly stationary domains, and (iv) a reasonable number of samples to perform the subsequent variographical study and estimation.

Based on the criteria, Xstrata interpreted a clear control on the molybdenum spatial distribution associated with the lithology, with some lithological units exhibiting an additional secondary control due the mineralized zones. This geological behavior was observed in cross sections and plans where zones of higher Mo content are mainly emplaced in the peripheral contours of the porphyries, hydrothermal breccias, and igneous breccias, remaining predominately in the metasediments. At the Trampeadero sector, however, molybdenum seems to remain interchangeably between hydrothermal breccia and metasediments.

14.3.1.3 Gold

Gold distribution is highly variable throughout the Agua Rica deposit, with approximately 0.14 g/t Au to 0.33 g/t Au in mineralized units, and 0.06 g/t Au on average.

The leaching process does not remove gold from the leach cap which results in an in-situ enrichment of gold due to the depletion of sulphides from the original rocks. Therefore, gold values in some lithological units within specific mineralized and alteration zones present similar mean grade in the leached, partially leached, and mineralized areas. Within the pyrite mineralized zone, however, there is no significant gold content (i.e., very low mean grades).

The definition of gold estimation domains was based on lithology, alteration, and mineralized zones following the methodology previously described for copper. As a result of this analysis, Xstrata observed that the main control for the spatial distribution of gold is the alteration zones where the highest values are associated with advanced argillic alteration, with minor effect within the lithological and mineralized zones. Four estimation domains numbered 1 through 4 were defined for gold estimation.

14.3.1.4 Arsenic

At the Agua Rica deposit, the content of arsenic is mainly controlled by the alteration zones; similar to gold, higher arsenic values are associated with the advance argillic alteration while lower values are associated with phyllic alteration. In general, all lithological units are affected by this late stage alteration, nevertheless, the lithological units that have been altered and mineralized at the early porphyry copper stage are associated with lower arsenic content, (e.g. Seca porphyry with less than 70 ppm arsenic on average) while the lithologies intruded after this stage, such as the hydrothermal breccias and some areas within the Trampeadero porphyry, are associated with moderate to sporadically higher arsenic content (i.e., more than 150 ppm As on average).

Higher arsenic values within the porphyries and metasediments are associated with irregular epithermal veins of 0.5 cm to 2 cm in width with a mineral assemblage of enargite + covellite + pyrite + clay + sphalerite ± galena (enargite being the main source of arsenic). Within the hydrothermal breccias, disseminated arsenic formed by acid leaching occurs occasionally in the matrix and partially filling cavities.

The spatial distribution of arsenic is centred on the breccia bodies and exhibits the same west plunge as the copper and gold mineralization, with a north plunge component shared by gold, however, not as apparent with copper. Northeast stripes of arsenic suggest a structural control not shown by the other metals, suggesting enargite emplacement at a different time from most of the other metals.

This complex geological emplacement setting is reflected in the statistical distributions of arsenic. A very high positive skewness is observed resulting from anomalous values associated with irregular epithermal veins distributed across lithological domains. For example, the average of arsenic within the deposit is high (125 ppm As), in contrast, with the median value (39 ppm As) showing the effect of the sporadic high values (high coefficient of variation – 2.1).

According with the description, the definition of nearly stationary estimation domains for Arsenic using lithology or alteration units (or a combination between both) was not possible due to (i) the excessively high coefficients of variation, (ii) due to the presence of multiple statistical populations in each domain, and (iii) the sporadic occurrence of high values (i.e. high differences between mean and median). Therefore, Xstrata defined "grade based" domains by the implementation of a set of indicators, creating three main domains: low grade < 70 ppm As, medium grade 70 ppm As to 200 ppm As, and high grade > 200 ppm As. The thresholds were arbitrarily defined based on geo-metallurgical parameters as (i) the theoretical concentration rates, (ii) penalties for arsenic content in the final concentrate and (iii) the composition of the final mineral concentrate (concentration factor = 25-30, < 0.2% As in the final concentrate, no penalties/clean concentrate; < 0.5% As, medium penalties; >0.5% As, high penalties/dirty concentrate).

Once defined, the grade domains were subdivided by lithology and in some cases by alteration to define estimation domains. Seca and Trampeadero porphyries and the metasediments were split by phyllic/advanced argillic alteration. Finally, domains with similar statistical behavior and spatially correlated were grouped into estimation domains. In total Xstrata defined nine estimation domains: low grade (101, 102, 103), medium grade (201, 202, 203), and high grade (301, 302, 303).

14.3.2 High Grade Restrictions

The assay database was statistically examined for the presence of local high grade outliers which could potentially affect the accuracy of the Mineral Resource estimate. Where the assay distribution is skewed positively, erratic high grade assay values can have a disproportionate effect on the average grade of a deposit. A number of statistical analytical methods were employed to determine if capping is appropriate, including preparation of frequency histograms, probability plots, and swath plots.

Using these methods, Xstrata determined that high grade restrictions would not be applied directly to assays or composites, but rather by restricting the influence of high grade composites to the nearest block as described in Section 14.6.

14.3.3 Compositing

Mathematical compositing of samples into regular support is an important input to the variographic analysis and block grade interpolation process. The compositing process allows obtaining the average of the assay values at different lengths throughout a drill hole database. Some of the relevant aspects that need to be considered when deciding the appropriate composite length are (i) the spatial grade variability, (ii) number of resulting composites available for variography and interpolation on a domain basis, and (iii) the expected dilution resulting from combining samples into composites and its relationship with the assumed mining selectivity, selective mining unit (SMU).

The Agua Rica drilling information, logging, and chemical assays are stored in one master SQL type database, which includes regular samples and all the required geological information to support the resource estimation presented in this Technical Report (more than 98.9% of the samples in the final database have two metre lengths). For samples with lengths lower or higher than two metres, a study was carried out to evaluate any possible bias, finding that there is no bias between these samples and the grade content.

Several tests were made to assess the appropriate composite length by calculating different sets of composites of various lengths, effectively 2 m, 4 m, 6 m, and 18 m composites were calculated. The composite lengths, used during interpolation, were chosen considering the predominant sampling length, the minimum mining width, style of mineralization, and continuity of grade. Given this distribution, and considering the width of the mineralization, it was decided to use six metre composites for Cu, Mo, and Fe, and two metre composites for As, Au, Ag, Pb, and Zn. Composites less than half of the composite length (e.g., three metres, located at the bottom of the mineralized intercept, were added to the previous interval within the same estimation domain).

Raw composite files generated by Xstrata (now Glencore) in 2012 have not been located by Glencore or Alumbrera for the subsequent model reviews by Yamana and SRK.

14.4 Trend Analysis

14.4.1 Variography

Experimental variograms were calculated using the six metre and two metre composites for all estimated elements on a domain by domain basis. A semi-variogram model was fit for each experimental semi-variogram in the three main directions of anisotropy. When directional semi-variograms did not show structured patterns, omni horizontal semi-variograms were used in conjunction with a vertical semi-variogram, or in the worst case omnidirectional variograms were adopted. The nugget effect was obtained considering the downhole semi-variogram.

For a few domains it was not possible to find an adequate continuity model due to the scarce number of composites. In these domains, it was necessary to implement the inverse distance (ID) interpolation method. Variograms were used to support search ellipsoid anisotropy, linear trends observed in the data, and Mineral Resource classification decisions.

14.4.1.1 Copper

The general orientation of the mineralization is NE to NNE, coincident with the main estimation units (domains 2, 4, 5, 6, and 7). Domain 4 is rotated 315° with a range of 115 m for the first structure and 400 m for the second structure. The vertical continuity is also important coincident with the vertical development of the intrusive units and breccias. The vertical continuity for Domain 3 is 200 m and 360 m for first and second structure.

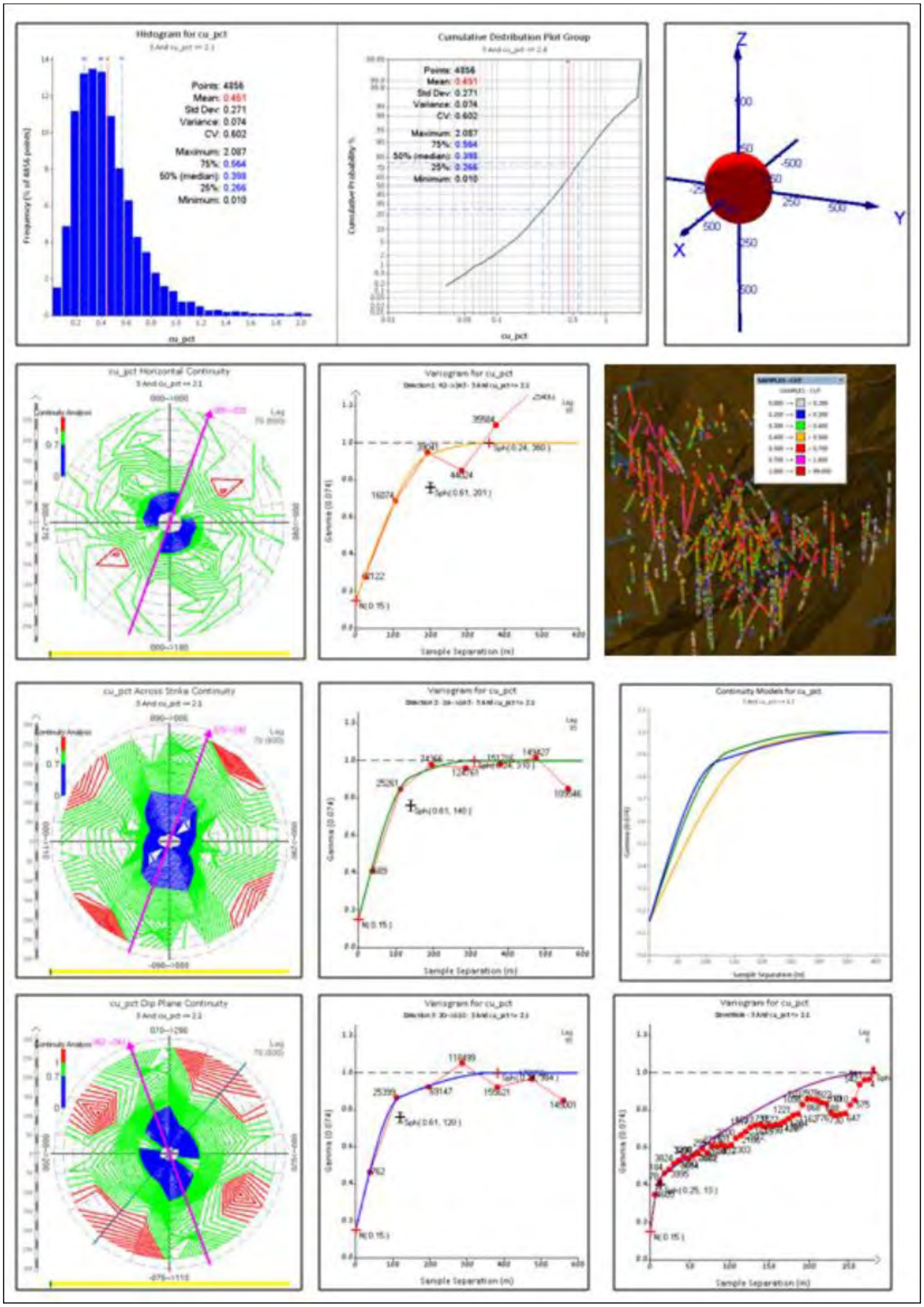
The example provided here corresponds to copper Domain 3 which is predominantly in chalcocite + covellite. Table 14-6 summarizes variogram models of copper. Figure 14-16 shows histogram, probabilistic plots, variogram maps, model variograms in the horizontal, across-strike, vertical, and dip planes, and the oriented ellipsoid for this domain. Weak to moderate anisotropies have been modelled for both structures particularly the first structure (61% of the variance) which is oriented NNE and shows a sub-vertical tendency preferential.

Table 14-6: Copper – Variogram Models for Each Estimation Domain
Yamana Gold Inc.– Agua Rica Integrated Project

				Structure 1					
				Search Eclipse			Search Radius		
ID	Model Type	Nugget	Sill Diff	Bearing Rot Z (°)	Plunge Rot Y (°)	Dip Rot X (°)	Major (m)	Semi (m)	Minor (m)
eu1_1	SPHE	-	-	-	-	-	-	-	-
eu1_2	SPHE	-	-	-	-	-	-	-	-
eu2_1	SPHE	0.1	0.58	315	0	0	33	33	33
eu2_2	SPHE	0.1	0.58	315	0	0	33	33	33
eu2_3	SPHE	0.1	0.58	315	0	0	33	33	33
eu3_1	SPHE	0.15	0.61	243	62	43	201	140	120
eu3_2	SPHE	0.15	0.61	243	62	43	201	140	120
eu3_3	SPHE	0.15	0.61	243	62	43	201	140	120
eu4_1	SPHE	0.1	0.38	315	45	0	115	46	35
eu4_2	SPHE	0.1	0.38	315	45	0	115	46	35
eu4_3	SPHE	0.1	0.38	315	45	0	115	46	35
eu4_4	SPHE	0.1	0.38	315	45	0	115	46	35
eu5_1	SPHE	0.17	0.39	60	60	-180	39	76	6
eu5_2	SPHE	0.17	0.39	60	60	-180	39	76	6
eu5_3	SPHE	0.17	0.39	60	60	-180	39	76	6
eu6_1	SPHE	0.16	0.26	315	0	0	16	16	16
eu6_2	SPHE	0.16	0.26	315	0	0	16	16	16
eu7_1	SPHE	0.23	0.14	315	0	0	29	29	29
eu7_2	SPHE	0.23	0.14	315	0	0	29	29	29
eu7_3	SPHE	0.23	0.14	315	0	0	29	29	29
eu8_1	SPHE	0.19	0.24	270	60	0	44	55	74
eu8_2	SPHE	0.19	0.24	270	60	0	44	55	74
eu8_3	SPHE	0.19	0.24	270	60	0	44	55	74
eu9_1	SPHE	0.22	0.48	320	0	0	70	70	70
eu9_2	SPHE	0.22	0.48	320	0	0	70	70	70
eu9_3	SPHE	0.22	0.48	320	0	0	70	70	70

Structure 2									
				Search Eclipse			Search Radius		
ID	Model Type	Nugget	Sill Diff	Bearing Rot Z (°)	Plunge Rot Y (°)	Dip Rot X (°)	Major (m)	Semi (m)	Minor (m)
eu2_1	SPHE	-	0.32	315	0	0	109	109	109
eu2_2	SPHE	-	0.32	315	0	0	109	109	109
eu2_3	SPHE	-	0.32	315	0	0	109	109	109
eu3_1	SPHE	-	0.24	243	62	43	360	310	384
eu3_2	SPHE	-	0.24	243	62	43	360	310	384
eu3_3	SPHE	-	0.24	243	62	43	360	310	384
eu4_1	SPHE	-	0.46	315	45	0	265	120	105
eu4_2	SPHE	-	0.46	315	45	0	265	120	105
eu4_3	SPHE	-	0.46	315	45	0	265	120	105
eu4_4	SPHE	-	0.46	315	45	0	265	120	105
eu5_1	SPHE	-	0.44	60	60	-180	256	275	63
eu5_2	SPHE	-	0.44	60	60	-180	256	275	63
eu5_3	SPHE	-	0.44	60	60	-180	256	275	63
eu6_1	SPHE	-	0.01	315	0	0	94	94	94
eu6_2	SPHE	-	0.01	315	0	0	94	94	94
eu7_1	SPHE	-	0.63	315	0	0	205	205	205
eu7_2	SPHE	-	0.63	315	0	0	205	205	205
eu7_3	SPHE	-	0.63	315	0	0	205	205	205
eu8_1	SPHE	-	0.57	270	60	0	440	200	225
eu8_2	SPHE	-	0.57	270	60	0	440	200	225
eu8_3	SPHE	-	0.57	270	60	0	440	200	225
eu9_1	SPHE	-	0.3	320	0	0	740	740	740
eu9_2	SPHE	-	0.3	320	0	0	740	740	740
eu9_3	SPHE	-	0.3	320	0	0	740	740	740

Source Xstrata, 2012



Source Xstrata, 2012.

Experimental variograms and models in the horizontal, across-strike vertical and dip planes, spatial distribution of composites and planes orientation

Figure 14-16: Domain 3 Copper Variogram

14.4.1.2 Molybdenum

The molybdenum modelling follows the trend of the geological concept applied to the Agua Rica deposit, according to which this variable appears in the early stages of mineralized porphyry and then was relocated by successive intrusion of igneous events. Thus, molybdenum is located predominantly in metasediments forming a unit in the periphery of the Trampeadero and Seca porphyry, and igneous and hydrothermal breccia.

In the Agua Rica deposit, the centre has a major continuity with an azimuth of 225°, an inclination of 70°, and a major range of 656 m. In the periphery, the metasediments units, the molybdenum concentration is higher. The trend identified here has a major axis with an azimuth of 67°, an inclination of 68 °, where it reaches a range of 130 m in a first structure.

The example provided here corresponds to molybdenum Domain 3. Table 14-7 summarizes variogram models of molybdenum. Figure 14-17 shows histogram, probabilistic plots, variogram maps, model variograms in the horizontal, across-strike, vertical, and dip planes, and the oriented ellipsoid for this domain.

It should be noted that the hydrothermal breccia unit has a different statistical and variographic tendency in both sides of Quebrada Mina, therefore is separated into two distinct domains.

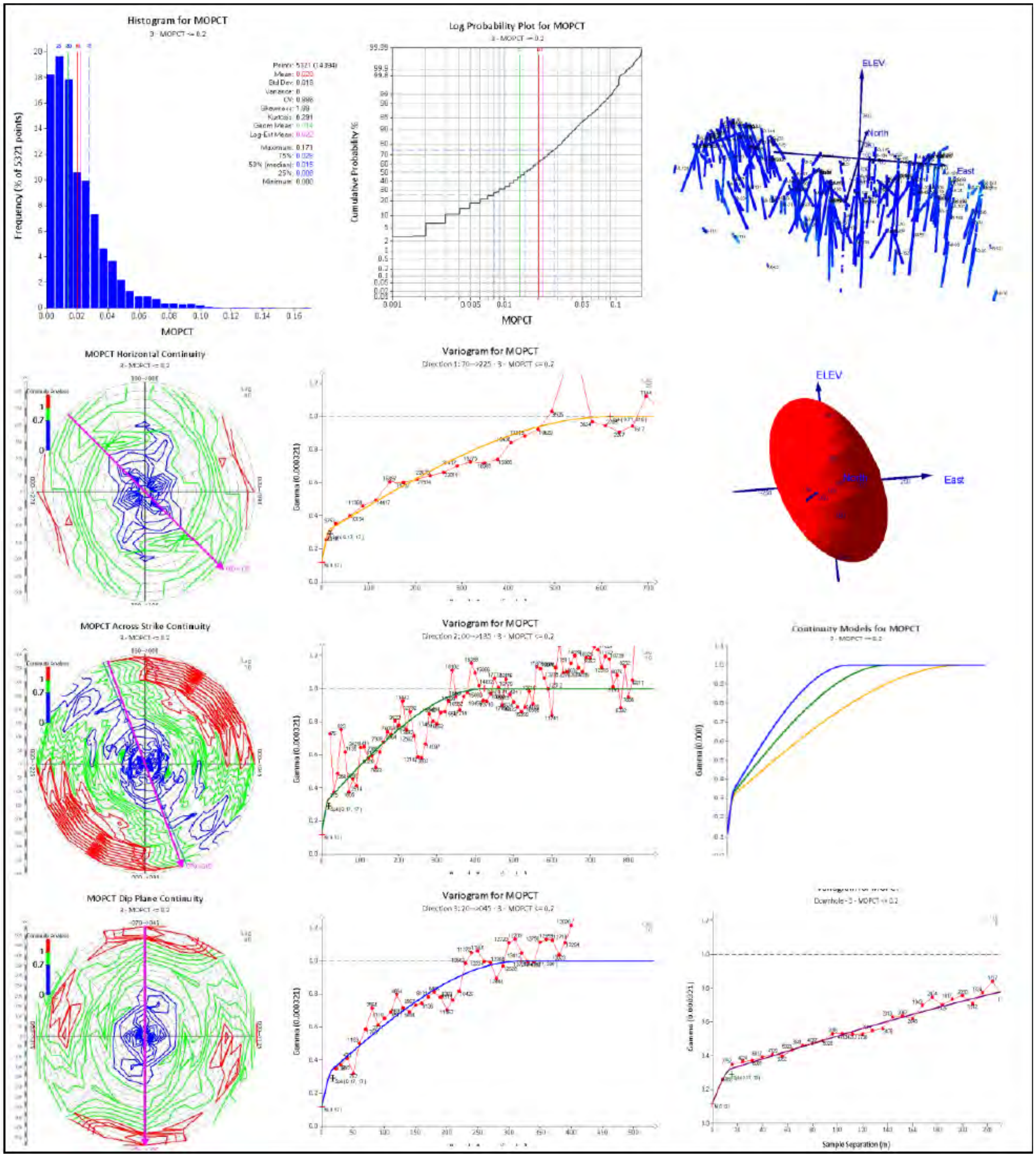
Table 14-7: Molybdenum – Variogram Models for Each Estimation Domain
Yamana Gold Inc.– Agua Rica Integrated Project

Structure 1									
				Search Eclipse			Search Radius		
ID	Model Type	Nugget	Sill Diff	Bearing Rot Z (°)	Plunge Rot Y (°)	Dip Rot X (°)	Major (m)	Semi (m)	Minor (m)
lix (1)	SPHR	0.1	0.29	319	0	18.1	59	-	-
py (2)	OMNI	0.14	0.86	0	0	0	531	-	-
porf+hybx (3)	SPHR	0.21	0.13	225	0	70	105	-	-
Hybx tramp (4)	SPHR	0.17	0.16	210	0	70	49	-	-
met (5)	SPHR	0.09	0.19	67	0	-68	130	-	-
Structure 2									
				Search Eclipse			Search Radius		
ID	Model Type	Nugget	Sill Diff	Bearing Rot Z (°)	Plunge Rot Y (°)	Dip Rot X (°)	Major (m)	Semi (m)	Minor (m)
lix (1)	SPHR	-	0.61	227	0	8	277	-	-
porf+hybx (3)	SPHR	-	0.66	135	0	0	515	-	-
Hybx tramp (4)	SPHR	-	0.67	120	0	0	300	-	-
met (5)	SPHR	-	0.72	313	0	-9	400	-	-

Structure 3

ID	Model Type	Nugget	Sill Diff	Search Eclipse Bearing Rot Z (°)	Search Eclipse Plunge Rot Y (°)	Search Eclipse Dip Rot X (°)	Search Radius Major (m)	Search Radius Semi (m)	Search Radius Minor (m)
lix (1)	SPHR	-	-	113	0	70	-	-	-
porf+hybx (3)	SPHR	-	-	45	0	20	-	-	-
Hybx tramp (4)	SPHR	-	-	30	0	20	-	-	-
met (5)	SPHR	-	-	40	0	20	-	-	-

Source Xstrata, 2012



Source: Xstrata, 2012

Experimental variograms and models in the horizontal, across-strike vertical and dip planes, spatial distribution of composites and planes orientation

Figure 14-17: Domain 3 Molybdenum Variogram

14.4.1.3 Gold

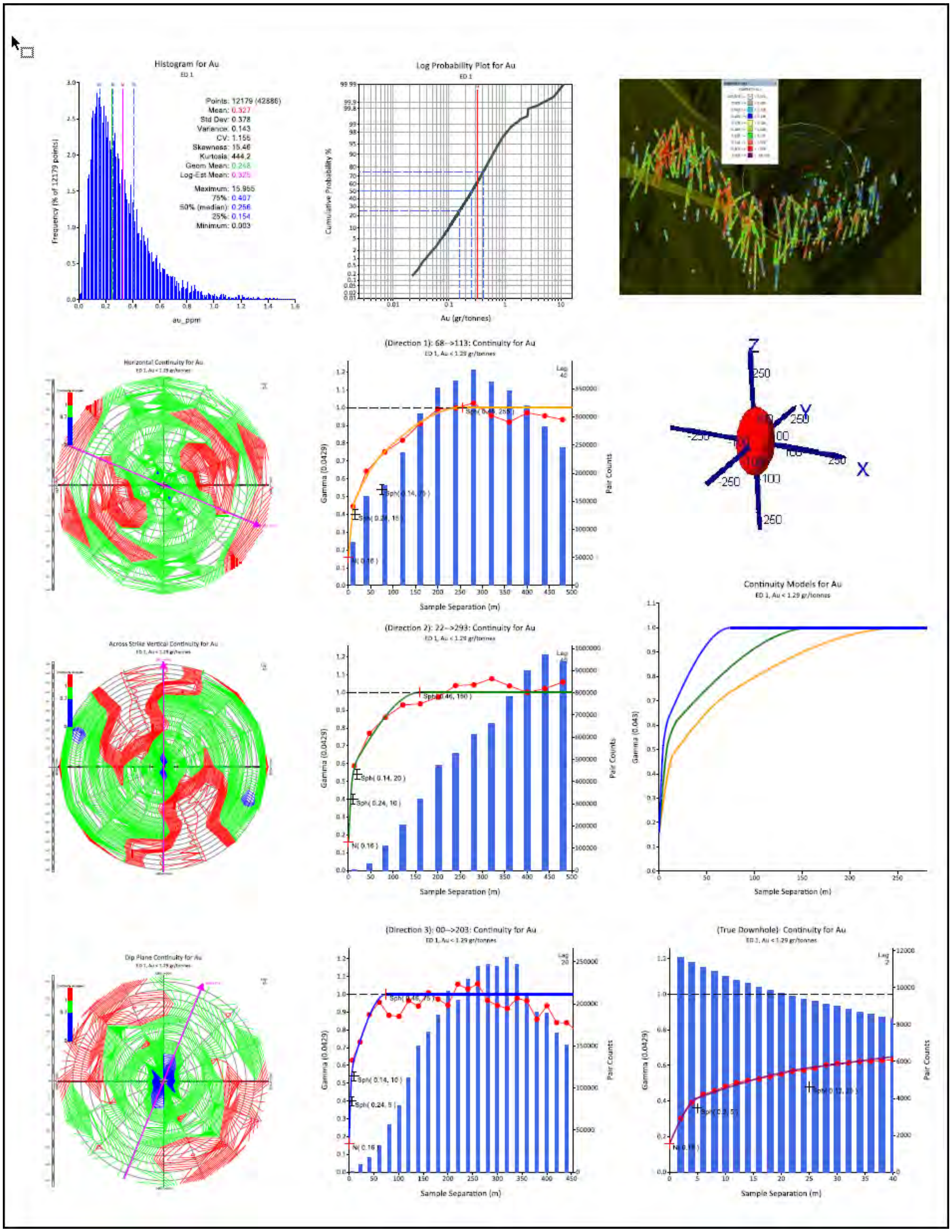
Variography analysis was performed in order to obtain estimation parameters for each estimation domain. The analysis involved a total of four domains (i.e. estimation Domains 1, 2, 3, and 4).

The example provided here corresponds to gold Domain 1 which is in a majority of hydrothermal breccia (hydrothermal facies), advanced argillic, covellite, or leached and Seca porphyry with all the mineralized zone containing less pyrite and chalcopyrite plus some other minor units. Table 14-8 summarizes the Au variogram models. Figure 14-18 shows the fan in the horizontal, across-strike, vertical, and dip planes as well as the interpreted variogram model for gold estimation Domain 1 and spatial distribution of samples and planes orientation.

Table 14-8: Gold – Variogram Models for Each Estimation Domain
Yamana Gold Inc.– Agua Rica Integrated Project

				Structure 1					
				Search Eclipse			Search Radius		
ID	Model Type	Nugget	Sill Diff	Bearing Rot Z (°)	Plunge Rot Y (°)	Dip Rot X (°)	Major (m)	Semi (m)	Minor (m)
ED1	SPHE	0.16	0.24	113	68	-90	15	10	5
ED2	SPHE	0.19	0.12	0	68	-90	10	15	15
ED3	SPHE	0.19	0.15	135	0	-90	30	5	5
ED4	SPHE	0.25	0.25	0	0	0	15	15	15
				Structure 2					
				Search Eclipse			**Search Radius**		
ID	**Model Type**	**Nugget**	**Sill Diff**	**Bearing Rot Z (°)**	**Plunge Rot Y (°)**	**Dip Rot X (°)**	**Major (m)**	**Semi (m)**	**Minor (m)**
ED1	SPHE		0.14	113	68	-90	75	20	10
ED2	SPHE		0.25	0	68	-90	160	16	130
ED3	SPHE		0.16	135	0	-90	150	90	7
ED4	SPHE		0.5	0	0	0	300	300	300
				Structure 3					
				Search Eclipse			**Search Radius**		
ID	**Model Type**	**Nugget**	**Sill Diff**	**Bearing Rot Z (°)**	**Plunge Rot Y (°)**	**Dip Rot X (°)**	**Major (m)**	**Semi (m)**	**Minor (m)**
ED1	SPHE		0.46	113	68	-90	256	160	75
ED2	SPHE		0.44	0	68	-90	220	240	145
ED3	SPHE		0.5	135	0	-90	350	260	187

Source Xstrata, 2012



Source: Xstrata, 2012

Fan in the horizontal, across-strike vertical and dip planes, interpreted variogram model for gold estimation Domain 1, spatial distribution of samples and planes orientation.

Figure 14-18: Domain 1 Gold Variogram

14.4.1.4 Arsenic

Variography analysis was performed in order to obtain estimation parameters for each grade/estimation domain. This analysis involved a total of 12 domains (i.e. low, medium, and high grade domains and nine estimation domains – 101, 102, 103, 201, 202, 203, 301, 302, and 303). For all domains, directional variograms and omni-directional variograms were calculated.

Table 14-9 summarizes the variographic parameters for As estimation. Figure 14-19 shows the fan in the horizontal, across-strike, vertical, and dip planes, the interpreted variogram model for arsenic estimation domain 101, and spatial distribution of samples and planes orientation.

Table 14-9: Arsenic – Variogram Models for Each Estimation Domain
Yamana Gold Inc.– Agua Rica Integrated Project

Structure 1									
				Search Eclipse			Search Radius		
ID	Model Type	Nugget	Sill Diff	Bearing Rot Z (°)	Plunge Rot Y (°)	Dip Rot X (°)	Major (m)	Semi (m)	Minor (m)
101	SPHE	0.15	0.36	113	0	112	40	25	40
102	SPHE	0.2	0.34	182	41	120	10	10	10
103	SPHE	0.3	0.17	0	0	0	5	5	5
201	SPHE	0.35	0.38	291	41	59	10	5	5
202	SPHE	0.35	0.48	109	59	-136	10	10	10
203	SPHE	0.35	0.4	225	67	0	5	5	5
301	SPHE	0.3	0.49	294	-41	-120	10	5	5
302	SPHE	0.15	0.34	0	0	0	60	60	60
303	SPHE	0.15	0.26	111	41	-120	30	70	70
As_Low_Grade	SPHE	0.15	0.27	0	0	0	15	15	15
As_Med_Grade	SPHE	0.15	0.53	0	0	0	15	10	10
As_High_Grade	SPHE	0.15	0.3	0	0	0	15	15	10

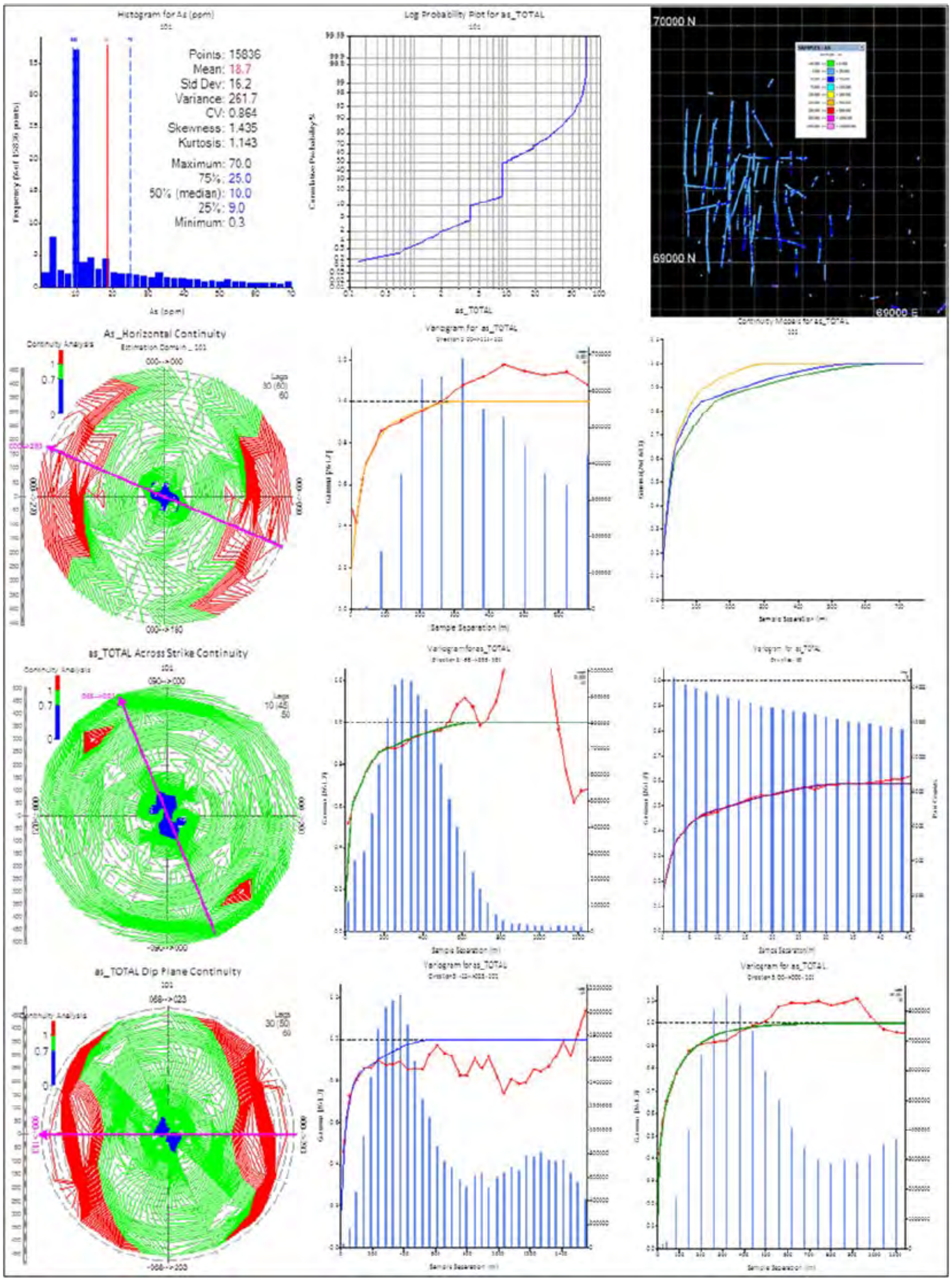
Structure 2

ID	Model Type	Nugget	Sill Diff	Search Eclipse Bearing Rot Z (°)	Search Eclipse Plunge Rot Y (°)	Search Eclipse Dip Rot X (°)	Search Radius Major (m)	Search Radius Semi (m)	Search Radius Minor (m)
101	SPHE	0.15	0.27	113	0	112	110	185	120
102	SPHE	0.2	0.22	182	41	120	55	55	55
103	SPHE	0.3	0.23	0	0	0	60	60	60
201	SPHE	0.35	0.1	291	41	59	30	9	15
202	SPHE	0.35	0.11	109	59	-136	50	45	35
203	SPHE	0.35	0.15	225	67	0	30	25	25
301	SPHE	0.3	0.08	294	-41	-120	110	15	15
302	SPHE	0.15	0.27	0	0	0	140	140	140
303	SPHE	0.15	0.3	111	41	-120	60	100	25
As_Low_Grade	SPHE	0.15	0.15	0	0	0	60	60	60
As_Med_Grade	SPHE	0.15	0.15	0	0	0	60	60	60
As_High_Grade	SPHE	0.15	0.29	0	0	0	75	75	75

Structure 3

ID	Model Type	Nugget	Sill Diff	Search Eclipse Bearing Rot Z (°)	Search Eclipse Plunge Rot Y (°)	Search Eclipse Dip Rot X (°)	Search Radius Major (m)	Search Radius Semi (m)	Search Radius Minor (m)
101	SPHE	0.15	0.23	113	0	112	320	700	600
102	SPHE	0.2	0.24	182	41	120	270	220	190
103	SPHE	0.3	0.3	0	0	0	220	220	220
201	SPHE	0.35	0.18	291	41	59	160	18	40
202	SPHE	0.35	0.06	109	59	-136	230	180	150
203	SPHE	0.35	0.1	225	67	0	80	70	40
301	SPHE	0.3	0.14	294	-41	-120	160	50	50
302	SPHE	0.15	0.24	0	0	0	240	240	240
303	SPHE	0.15	0.29	111	41	-120	160	160	45
As_Low_Grade	SPHE	0.15	0.43	0	0	0	440	440	440
As_Med_Grade	SPHE	0.15	0.17	0	0	0	140	140	140
As_High_Grade	SPHE	0.15	0.26	0	0	0	185	185	185

Source: Xstrata, 2012



Source: Xstrata, 2012

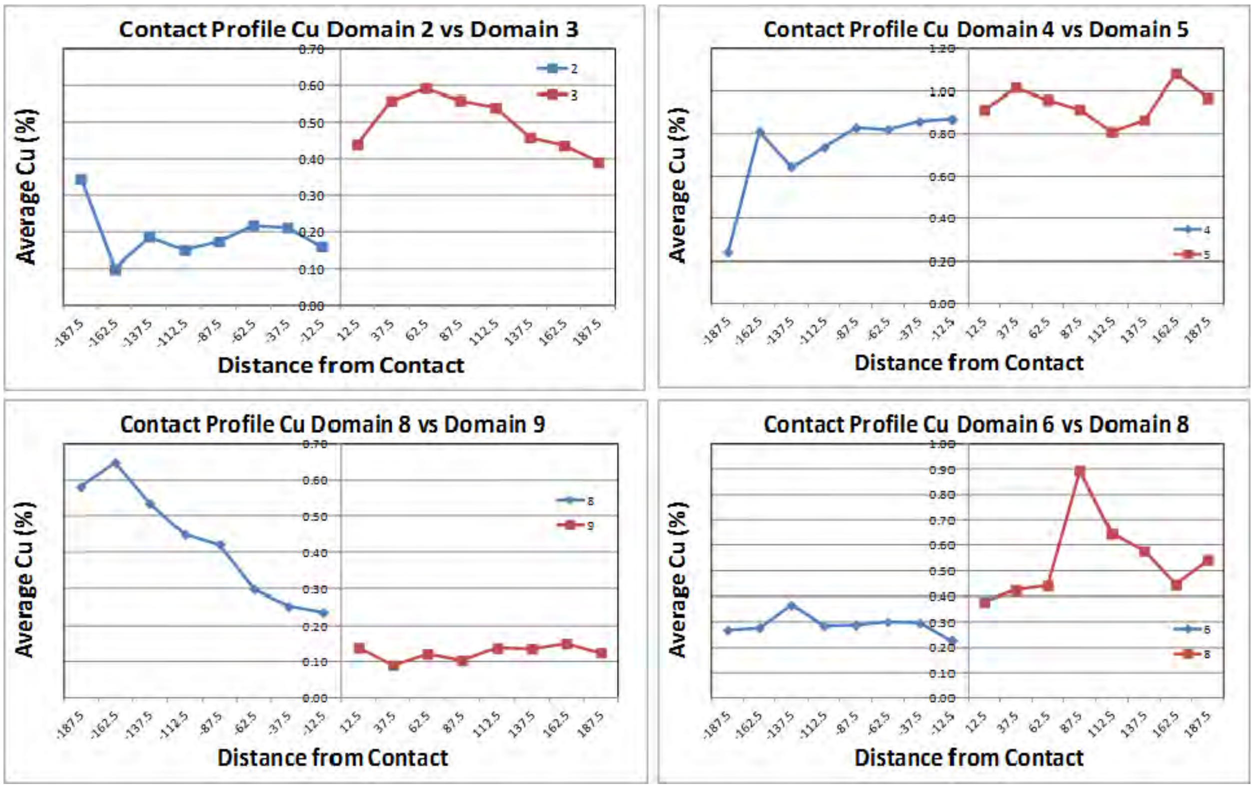
Map variograms in horizontal, across-strike and dip planes (figures at left). Directional variogram models (central figures). Downhole and omni-directional variograms (figures at right. Blue bars show number of pairs, red lines the experimental variograms and solid lines show the variogram model for each direction).

Figure 14-19: Domain 101 Arsenic Variogram

14.4.2 Contact Analysis

14.4.2.1 Copper

In general, hard boundaries have been defined for the interpolation strategy due to no transitional grade variation between adjacent domains. In specific domains, mainly low grade, it is possible to observe a degree of continuity in the grade across the contact. However, this effect occurs because they are low grade domains and therefore the copper values are quite similar, with very low variation or presence of high values. Contact profiles for various copper estimation domains are presented in Figure 14-20.

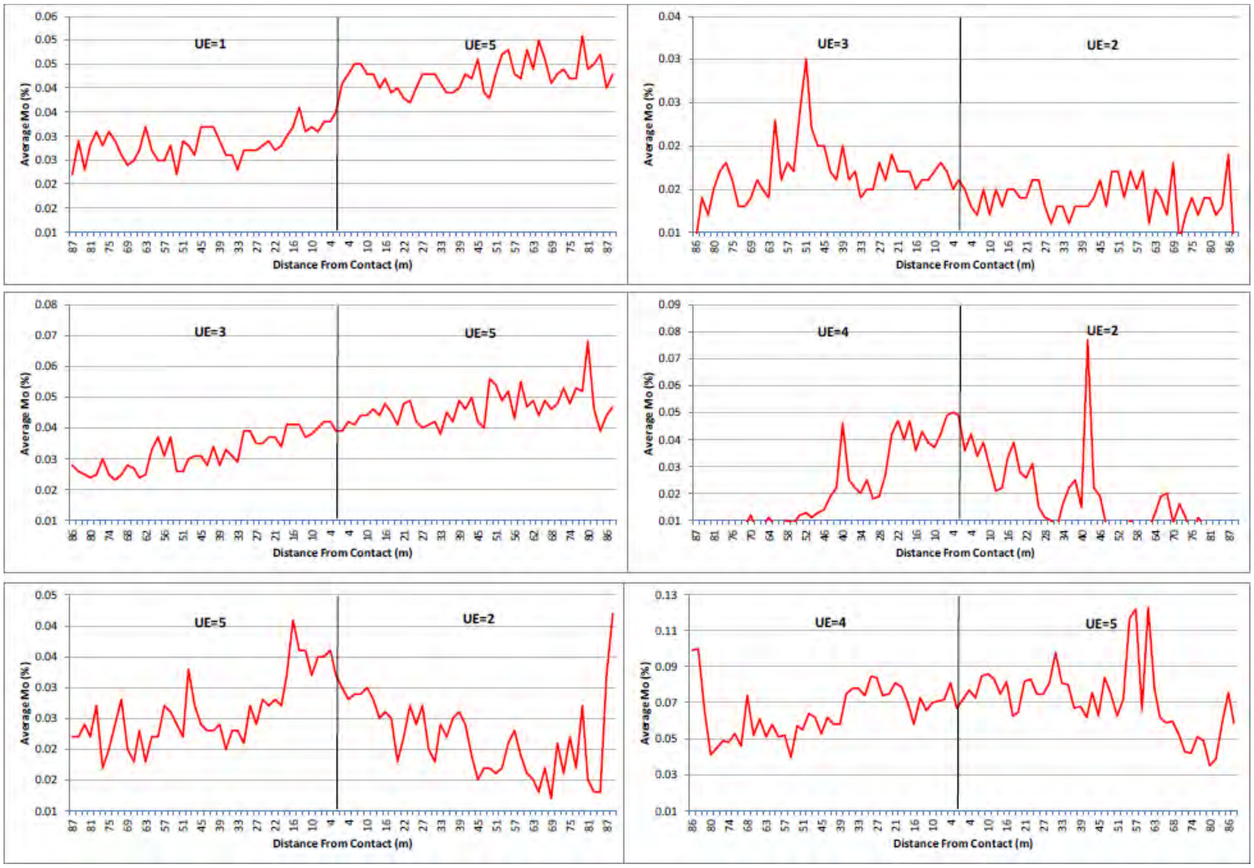


Source: Xstrata, 2012

Figure 14-20: Contact Plots of Copper by Mineralization Domain

14.4.2.2 Molybdenum

For the molybdenum interpolation process, hard boundaries were used for all estimation domains. However, the implementation of the lithological proportion within the blocks allows quantifying the impact of several contacts over the estimated grade at the block size. Contact profiles for molybdenum estimation domains are presented in Figure 14-21.

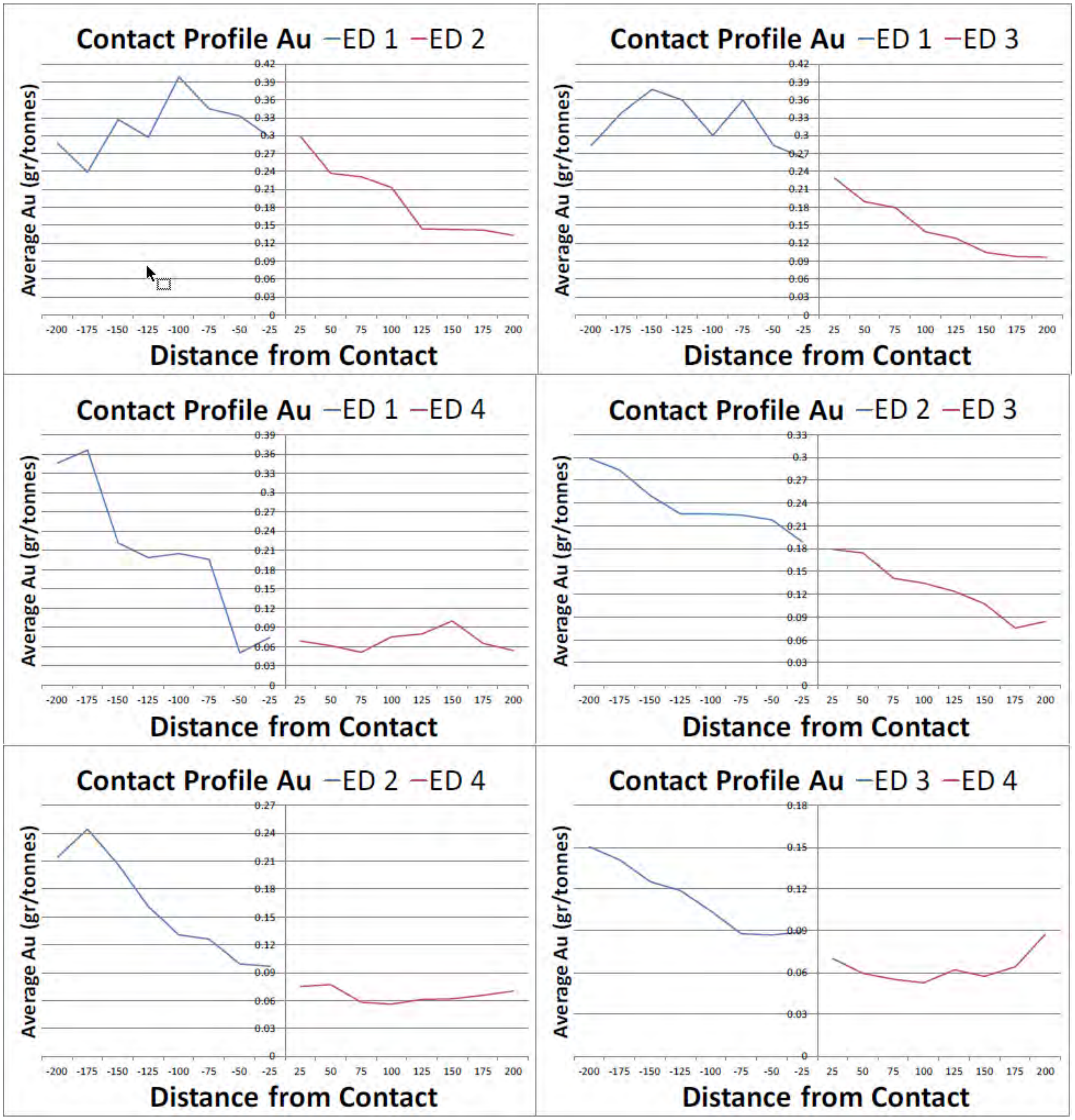


Source: Xstrata, 2012

Figure 14-21: Contact Plots of Molybdenum by Mineralization Domain

14.4.2.3 Gold

In general, soft boundaries have not been performed in the interpolation strategy due to there being no transitional grade variation between adjacent domains. Contact profiles for all gold estimation domains are presented in Figure 14-22. For gold, hard boundaries for all estimated domains were used. The only truly soft boundary was found between domains ED1 and ED2 and only in the first 25 m, in this case the use of soft boundaries does not improve the estimated grades.



Source: Xstrata, 2012

Figure 14-22: Contact Plots of Gold by Mineralization Domain

14.4.2.4 Arsenic

For arsenic, soft boundaries have not been used in the interpolation strategy due to the implementation of the indicator methodology that allows the calculation of the proportion of each grade domain into the block taking into consideration the transition between estimation domains.

14.5 Bulk Density

Tonnage factors for resource estimation were derived from calculating an average bulk density from the drill core data for each lithology and mineralized zone combination, applied as a global average to the block model.

A total of 13,842 density samples were collected through the various drilling campaigns, all of which were validated by alternative methodologies. The BHP-Northern Orion JV measured the density by the geometric method using intact HQ-size drill core every ten metre of core length on 3,525 samples. In 2012, Xstrata used the water displacement method, without wax, on representative hand samples or ten centimetre half-core sections every two metres of HQ-size core on 10,317 sample. Both density measurement methods were validated by using the water displacement method with wax-coating.

In general, density increases with increasing Fe, Cu, Zn, and Pb content, reflecting the sulphide content. To obtain the final average bulk density for each lithological domain, the density dataset was reviewed for the presence of outliers as the mean in particular is very sensitive to the presence of both low and high extreme values. In order to give more confidence to the calculation of the density mean and its dispersion extreme, values falling beyond two standard deviations were removed from the data set. The average bulk density calculated for each combination was assigned using a Vulcan script. Final density data are presented in Table 14-10.

Table 14-10: Bulk Densities
Yamana Gold Inc.– Agua Rica Integrated Project

Lithology Code	Mineralized Zone								
	1	2	6	7	8	9	11	12	Average
1	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43
2	2.46	2.48	2.63	2.59	2.69	2.56			2.57
3	2.32	2.45	2.50	2.45	2.62				2.47
5	2.41	2.40	2.61	2.60		2.61	2.72		2.56
6	2.42	2.47	2.62	2.64	2.49				2.53
7	2.49	2.46	2.64	2.69	2.72		2.70		2.62
8	2.31		2.52	2.58	2.67				2.52
9	2.42	2.48	2.68	2.69	2.55				2.56
10						2.46			2.46
11	2.35	2.46			2.50				2.44
13		2.58	2.70	2.72					2.67
16			2.81	2.72	2.79	2.65			2.74
17				2.63	2.61				2.62
Average	**2.40**	**2.47**	**2.61**	**2.61**	**2.61**	**2.54**	**2.62**	**2.43**	**2.55**

Source: Xstrata, 2012

14.6 Block Models

The block model was estimated using established geostatistical techniques following comprehensive statistical and exploratory data analysis (EDA). The evaluation of appropriate geological groupings for combination into statistical estimation populations was undertaken through the iterative statistical definition of estimation domains for each element to be interpolated. The main estimated variables are copper, molybdenum, gold, and arsenic. A series of low impact variables were estimated that were not considered in the financial analysis (Fe, Ag, Pb, and Zn).

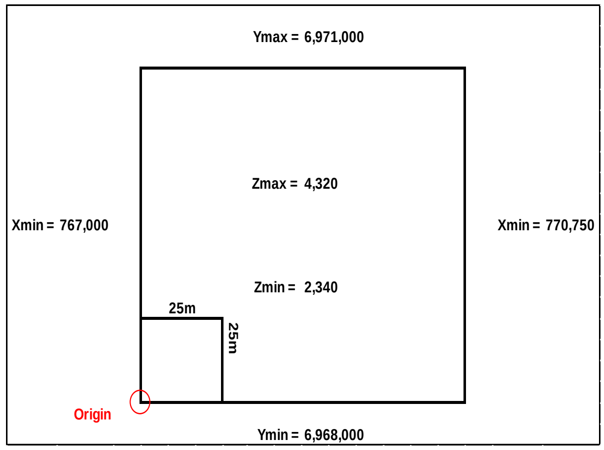
Sub-blocking was used to give a more accurate volume representation of the wireframes using a parent block size of 25 m (along strike) by 25 m (across strike) by 18 m (bench height) and sub-blocks that measured five metres (along strike) by five metres (across strike) by six metres (bench height). This size is adequate for the dimensions of the deposit and the expected mining method. The block model dimension ensures that any optimized pit limit would fall within this volume. The block dimension is identical to that to be employed in future mine planning and is also the current SMU for the projected operation.

Several Vulcan block models were set up for each estimated element including density and resources classification. All models have identical features in terms of block dimension and origin. These block models have all the required variables for proceeding with the interpolation process such as the proportion of each domain within the block and estimation domains coding, etc. Once the interpolation process of these different elements was completed, these models were combined into a single geological model with mineralized zone, alteration, and lithology. Proportions of each variable were stored within each block, then a Vulcan script was used to calculate the estimation domains according to each element to be interpolated.

The model origin for Agua Rica (lower-left corner at lowest elevation) is at UTM coordinates 767,000.0 mE, 6,968,000.0 mN and 2,340 m elevation. The models fully enclose the modelled resource wireframes and are oriented with an azimuth of 0.0°, dip of 0.0°, and a plunge of 0.0° so as to align with the overall strike of the mineralization within the given model area. A summary of the block model extents is provided in Table 14-11.

Table 14-11: Block Model Parameters
Yamana Gold Inc.– Agua Rica Integrated Project

Origin	Value
Xmin	767,000
Ymin	6,968,000
Zmin	2340
X Extents	3,750
Y Extents	3,000
Z Extents	1,980
Schema	Value
Parent	
DX	25
DY	25
DZ	18
NX	150
NY	120
NZ	110
Sub-Block	
DX	5
DY	5
DZ	6
NX	750
NY	600
NZ	330
Model Rotation	Value
Bearing	0
Plunge	0
Dip	0
Project Units	Metres
Coordinate System	WGS84 UTM Zone19S



14.6.1 Interpolation Parameters

OK was chosen as the interpolation algorithm for all of the elements with the exception of arsenic, for which it was necessary to apply non-lineal methods, in this case, indicator kriging.

For grade estimation of arsenic in Agua Rica, a hybrid indicator-ordinary kriging approach was adopted and was based upon using three grade indicators. Variogram models were derived for the indicators of the composite population. The composite population being used for the interpolation run was divided based upon the arsenic grade, creating three grade populations. Each grade population was divided into estimation domains according to its lithology, alteration, and statistical behavior and then was interpolated separately using OK. The indicators are then kriged and used to weight the OK grades within the block. The interpolated indicator value at a given cut-off represents the probability of the grade being above or below that cut-off, in this case the indicators were defined based on metallurgical factors. Therefore, multiplying the interpolated grades by the probability given by the indicator kriging and then adding the resultant numbers from each block gives a probability weighted grade estimate.

This method is not a true 'indicator' kriging method, however, it is a hybrid OK method using indicators to separate the high, medium, and low grade populations. This method attempts to address the proportion of high grade veins (associated with high content of enargite/arsenic) within the ore body in the absence of a deterministic model for such purpose, producing a more robust grade estimation than OK. Full indicator kriging would be considered to be preferable; however, it has not been implemented due to a lack of good quality data which prevents the creation of interpretable variograms for a sufficiently large number of percentile values (e.g. deciles). The best practice to improve the arsenic grades estimation is potentially the implementation of a structural model (deterministic model) that facilitates the definition of irregular epithermal veins and provides lithostructural control of arsenic distribution within the Agua Rica deposit.

Estimation was carried out using a three pass OK of 25 m x 25 m x 18 m blocks. Each pass reflected the various ranges established by the variogram models for each element and domain using the OK algorithm for most of the domains. IDS was used for some volumetrically minor zones which didn't have sufficient data to use OK reliably.

In general, the first pass was carried out based on the ranges obtained from the variograms, usually using the distance in which the variogram reached 60% of the variability. A second pass was designed considering the distance which the variogram would reach between 80%-90% of the variability. Finally, a third pass of estimation was done using large distances, in general, a bit larger than the total range observed in the variogram. In some cases, a fourth pass of estimation was necessary in order to assign grades to the blocks not estimated within the limit of the deposit.

All searches used oriented ellipsoids to reflect the anisotropies found on the semi-variogram models, however, in some cases where the omni-directional variograms were modelled, similar search distances were implemented for horizontal and cross strike planes. The maximum composite per drill hole and the maximum number of drill holes per octant options were also used, as appropriate.

Interpolation parameters for Cu, Mo, Au, and As are presented below. Details for each element and domain are shown in Table 14-12 to Table 14-15.

Table 14-12: Copper Estimation Parameters
Yamana Gold Inc.– Agua Rica Integrated Project

ID	Model Type	Search Eclipse Bearing Rot Z (°)	Search Eclipse Plunge Rot Y (°)	Search Eclipse Dip Rot X (°)	Search Radius Major (m)	Search Radius Semi (m)	Search Radius Minor (m)	Min Sample per Est	Max Sample per Est	High Yield Limit	Search Radius Major (m)	Search Radius Semi (m)	Search Radius Minor (m)	Max Sample per Est
eu1_1	ID	90	0	0	100	100	50	6	8	1.1	30	30	20	4
eu1_2	ID	90	0	0	500	500	500	10	14	1.1	30	30	20	
eu2_1	OK	315	0	0	80	80	80	6	10					7
eu2_2	OK	315	0	0	180	180	180	8	12	1.6	30	30	20	6
eu2_3	OK	315	0	0	500	500	500	14	24	1.6	30	30	20	
eu3_1	OK	243	62	43	80	60	50	8	12	0	0	0	0	5
eu3_2	OK	243	62	43	160	110	100	10	14	0	0	0	0	8
eu3_3	OK	243	62	43	540	500	580	6	24	2.1	30	30	20	
eu4_1	OK	315	45	0	120	70	60	10	15	2.8	12.5	12.5	9	5
eu4_2	OK	315	45	0	210	100	80	10	14	2.8	50	50	50	8
eu4_3	OK	315	45	0	550	500	500	12	24	2.8	50	50	50	
eu4_4	OK	315	45	0	550	500	500	12	30	2.8	50	50	50	8
eu5_1	OK	60	60	-180	50	70	40	12	22	2.8	15	15	15	6
eu5_2	OK	60	60	-180	130	140	90	10	16	4	50	50	50	6
eu5_3	OK	60	60	-180	500	550	450	12	24	3.3	30	30	30	
eu6_1	OK	315	0	0	120	120	120	6	14					
eu6_2	OK	315	0	0	400	400	400	6	22	0.77	20	20	20	5
eu7_1	OK	315	0	0	120	120	120	6	8					4
eu7_2	OK	315	0	0	160	160	160	8	10					8
eu7_3	OK	315	0	0	470	470	470	6	18	1.3	40	40	40	
eu8_1	OK	270	60	0	50	70	90	4	8	2.3	20	20	20	3
eu8_2	OK	270	60	0	200	100	110	10	14	2.3	50	50	50	6
eu8_3	OK	270	60	0	550	500	450	18	24	2.3	50	50	50	
eu9_1	OK	320	0	0	120	120	120	8	12	0.89	30	30	20	6
eu9_2	OK	320	0	0	300	300	300	10	14	0.89	30	30	20	
eu9_3	OK	320	0	0	670	670	670	8	24	0.89	30	30	20	

Table 14-13: Molybdenum Estimation Parameters
Yamana Gold Inc.– Agua Rica Integrated Project

ID	Model Type	Search Eclipse Bearing Rot Z (°)	Search Eclipse Plunge Rot Y (°)	Search Eclipse Dip Rot X (°)	Search Radius Major (m)	Search Radius Semi (m)	Search Radius Minor (m)	Min Sample per Est Semi	Max Sample per Est Major	High Yield Limit Semi	Search Radius Major (m)	Search Radius Semi (m)	Search Radius Minor (m)	Max Sample per Est
First Search														
1	OK	0	0	0	59	59	59	8	12	0.11	12.5	12.5	12.5	4
2	OK	0	0	0	142	142	142	8	12	0.07	12.5	12.5	12.5	4
3	OK	-135	70	0	84	84	84	8	12	0.12	12.5	12.5	12.5	4
4	OK	-150	70	0	49	69	69	8	12	0.18	12.5	12.5	12.5	4
5	OK	67.27	-67.73	25.51	104	56	56	8	12	0.14	12.5	12.5	12.5	4
Second Search														
1	OK	0	0	0	88.5	88.5	88.5	8	12	0.11	12.5	12.5	12.5	4
2	OK	0	0	0	212	212	212	8	18	0.07	12.5	12.5	12.5	4
3	OK	-135	70	0	262.4	206	124.4	8	18	0.12	12.5	12.5	12.5	4
4	OK	-150	70	0	186	120	90	8	12	0.18	12.5	12.5	12.5	4
5	OK	67.27	-67.73	25.51	292	160	100	8	12	0.14	12.5	12.5	12.5	4
Third Search														
1	OK	-40.6	18.1	8.7	177	177	177	8	12	0.11	12.5	12.5	12.5	
2	OK	0	0	0	531	531	531	8	18	0.07	12.5	12.5	12.5	
3	OK	-135	70	0	656	515	311	8	18	0.12	12.5	12.5	12.5	
4	OK	-150	70	0	465	300	150	8	12	0.18	12.5	12.5	12.5	
5	OK	62.27	-67.73	25.51	730	400	250	8	12	0.14	12.5	12.5	12.5	

Table 14-14: Gold Estimation Parameters
Yamana Gold Inc.– Agua Rica Integrated Project

		Search Eclipse			Search Radius						Search Radius			
ID	Model Type	Bearing Rot Z (°)	Plunge Rot Y (°)	Dip Rot X (°)	Major (m)	Semi (m)	Minor (m)	Min Sample per Est	Max Sample per Est	High Yield Limit	Major (m)	Semi (m)	Minor (m)	Max Sample per Est
ED1_1	OK	113	68	-90	90	70	50	9	14					7
ED1_2	OK	113	68	-90	180	110	80	9	16	1.29	12.5	12.5	12.5	6
ED1_3	OK	113	68	-90	310	190	90	10	36	1.29	12.5	12.5	12.5	
ED1_4	OK	113	68	-90	500	310	150	10	36	1.29	12.5	12.5	12.5	
ED2_1	OK	0	68	-90	90	40	60	9	14					7
ED2_2	OK	0	68	-90	130	140	100	9	16	1.09	12.5	12.5	12.5	6
ED2_3	OK	0	68	-90	260	290	170	10	36	1.09	12.5	12.5	12.5	
ED2_4	OK	0	68	-90	420	470	280	10	36	1.09	12.5	12.5	12.5	
ED3_1	OK	135	0	-90	140	100	70	9	14					7
ED3_2	OK	135	0	-90	190	160	130	9	16	0.95	12.5	12.5	12.5	6
ED3_3	OK	135	0	-90	420	310	220	10	36	0.95	12.5	12.5	12.5	
ED3_4	OK	135	0	-90	670	500	350	10	36	0.95	12.5	12.5	12.5	
ED4_1	OK	0	0	0	90	90	90	9	14					7
ED4_2	OK	0	0	0	180	180	180	9	16	0.29	12.5	12.5	12.5	6
ED4_3	OK	0	0	0	360	360	360	10	36	0.29	12.5	12.5	12.5	
ED4_4	OK	0	0	0	470	470	470	10	36	0.29	12.5	12.5	12.5	

Table 14-15: Arsenic Estimation Parameters
Yamana Gold Inc.– Agua Rica Integrated Project

ID	Model Type	Search Eclipse Bearing Rot Z (°)	Search Eclipse Plunge Rot Y (°)	Search Eclipse Dip Rot X (°)	Search Radius Major (m)	Search Radius Semi (m)	Search Radius Minor (m)	Min Sample per Est	Max Sample per Est	High Yield Limit	Search Radius Major (m)	Search Radius Sem (m)	Search Radius Minor (m)	Max Sample per Est
101_1	OK	113	0	112	60	40	60	8	12					6
101_2	OK	113	0	112	120	180	120	8	16					6
101_3	OK	113	0	112	320	420	360	8	24					8
102_1	OK	182	41	120	60	60	60	8	12					6
102_2	OK	182	41	120	120	120	120	8	16					6
102_3	OK	182	41	120	420	360	310	8	24					8
103_1	OK	0	0	0	60	60	60	8	12					6
103_2	OK	0	0	0	120	120	120	8	16					6
103_3	OK	0	0	0	360	360	360	8	24					8
201_1	OK	291	41	60	40	40	40	8	12					6
201_2	OK	291	41	60	60	60	60	8	16					6
201_3	OK	291	41	60	100	100	100	8	24					8
202_1	OK	109	59	-135	60	60	40	8	12					6
202_2	OK	109	59	-135	80	80	60	8	16					6
202_3	OK	109	59	-135	120	100	100	8	24					8
203_1	OK	225	67	0	40	40	40	8	12					6
203_2	OK	225	67	0	60	60	60	8	16					6
203_3	OK	225	67	0	90	90	80	8	24					8
301_1	OK	295	-41	-119	60	40	40	8	12	1800	12.5	12.5	5.9	6
301_2	OK	295	-41	-119	100	60	60	8	16	1800	12.5	12.5	5.9	6
301_3	OK	295	-41	-119	120	80	80	8	24	1800	12.5	12.5	5.9	8
302_1	OK	0	0	0	40	40	40	8	12	1600	12.5	12.5	5.9	6
302_2	OK	0	0	0	80	80	60	8	16	1600	12.5	12.5	5.9	6
302_3	OK	0	0	0	120	120	80	8	24	1600	12.5	12.5	5.9	8
303_1	OK	111	41	-119	40	40	40	8	12	1900	12.5	12.5	5.9	6
303_2	OK	111	41	-119	60	60	60	8	16	1900	12.5	12.5	5.9	6
303_3	OK	111	41	-119	80	80	80	8	24	1900	12.5	12.5	5.9	8
As_Low_ Grade	OK	0	0	0	400	400	300	12	24					10
As_Med_ Grade	OK	0	0	0	120	120	100	12	24					10
As_High_ Grade	OK	0	0	0	120	120	100	12	24	1600	12.5	12.5	5.9	10

The block grade dilution related to the geology boundaries was taken up in the final block grades by considering the proportion of each geological unit within each block. This approach accounts for grade dilution related to geological contacts and provides similar results to what is normally referred to as "partial block" grade interpolation. The proportion of each lithological, mineral, and alteration domain is stored on a block by block basis from the interpreted solids. For the interpolation of total grades, each domain had its own interpolated variable that was used to derive the final block grade by weighting the interpolated grades based on the proportions of each domain within the block. This approach was used for all of the interpolated elements. The final block grade for Total Copper (Tcu) at Agua Rica is calculated using the following equation:

$$Tcu\ (\%) = \sum_{i=0,N} L(i) * Cu(i) / \sum L(i)$$

where L(i) is the proportion of each domain within a particular block, Cu (i) is the estimated copper grade for each domain, and Tcu (%) is the final volume-weighted estimated copper grade.

The same methodology was used for the other elements with the exception of the final arsenic grades where the proportion of each domain (L(i)) is replaced by the interpolated value of the indicator for each grade domain. This methodology produces a Mineral Resource inventory that represents a reasonable expectation of what can be recovered during mining.

14.6.2 High Grade Restrictions

In order to reduce the influence of high grade composites outliers, grades greater than a designated threshold were restricted to estimation of the nearest block and excluded from the estimation of all other blocks within the search ellipse. The distance of influence of these values was set up according to the block size. The threshold grade levels were chosen from the basic statistics and from visual inspection of the apparent continuity of very high grades within each domain level based on the cumulative probability curves where the curve shows a significant slope change, normally close to the 98th-99th percentile, and based on its impact in the adjacent blocks.

14.7 Block Model Validation

The block grade models from each of the interpolated metals were systematically validated against their corresponding composite data set and nearest neighbour (NN) models in order to validate appropriate reproduction of the input data. Several means of validating the estimation results were established including:

- Drift analysis on 50 m (easting) by 50 m (northing) and 36 m (RL) sections and benches was made to validate, at this scale, the model reproduction of any data trends that might be present including composite grades versus OK and NN. Figure 14-23 to Figure 14-26 are examples of this analysis.
- Detailed visual inspection of block grade versus composite data. This was done both on sections and benches.
- Comparison of the resulting descriptive statistics of the block model versus the clustered and declustered composites.

14.7.1 Swath Plots

Figure 14-23 to Figure 14-26 are examples of the drift analysis validation.

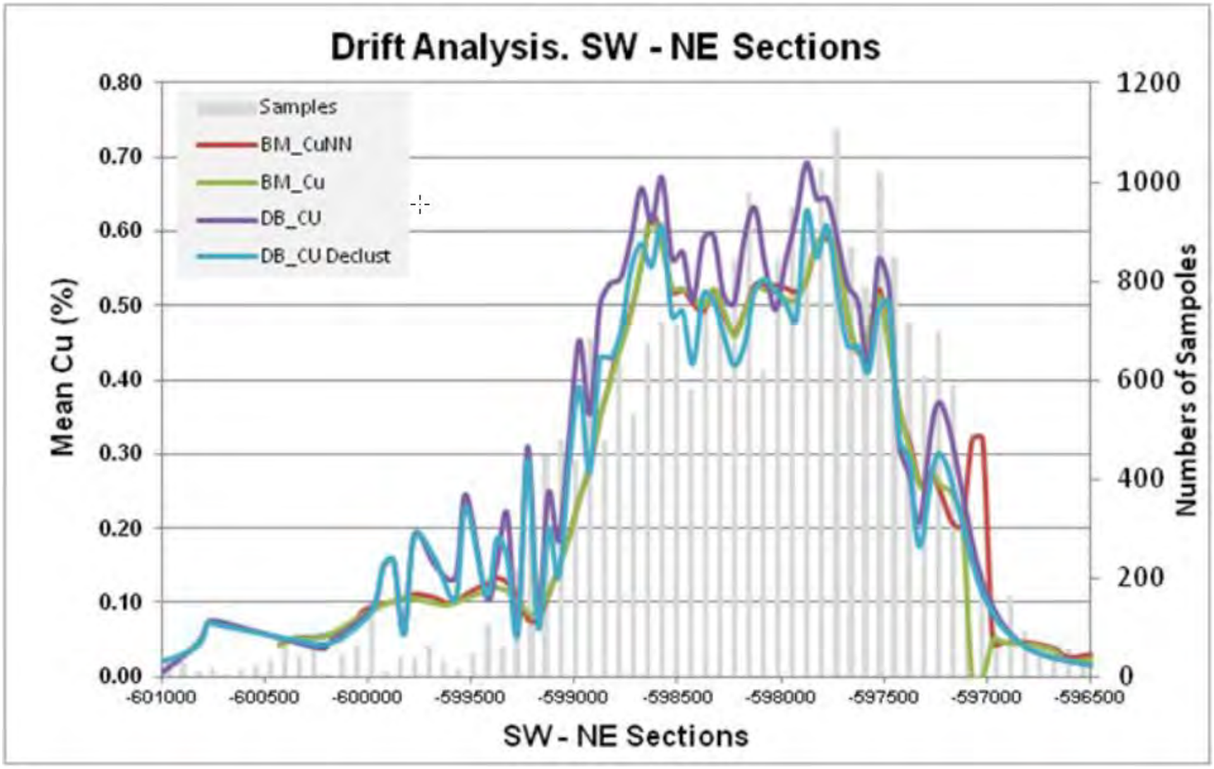


Figure 14-23: SW-NE Copper Swath Plot

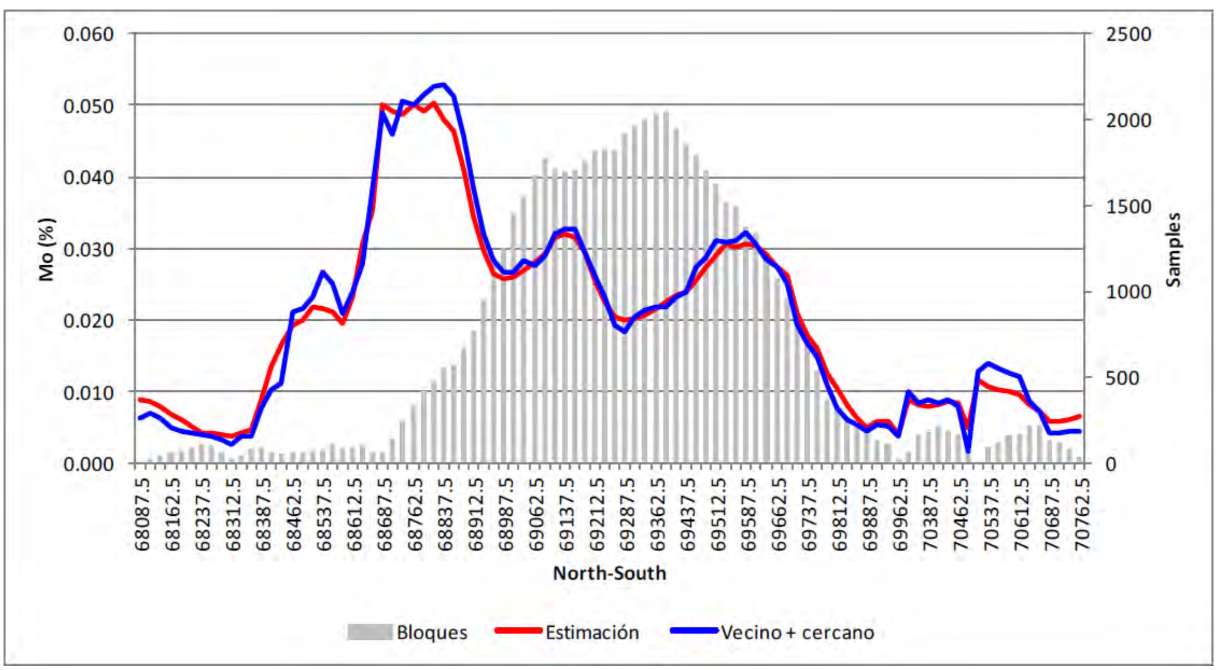


Figure 14-24: E-W Molybdenum Swath Plot

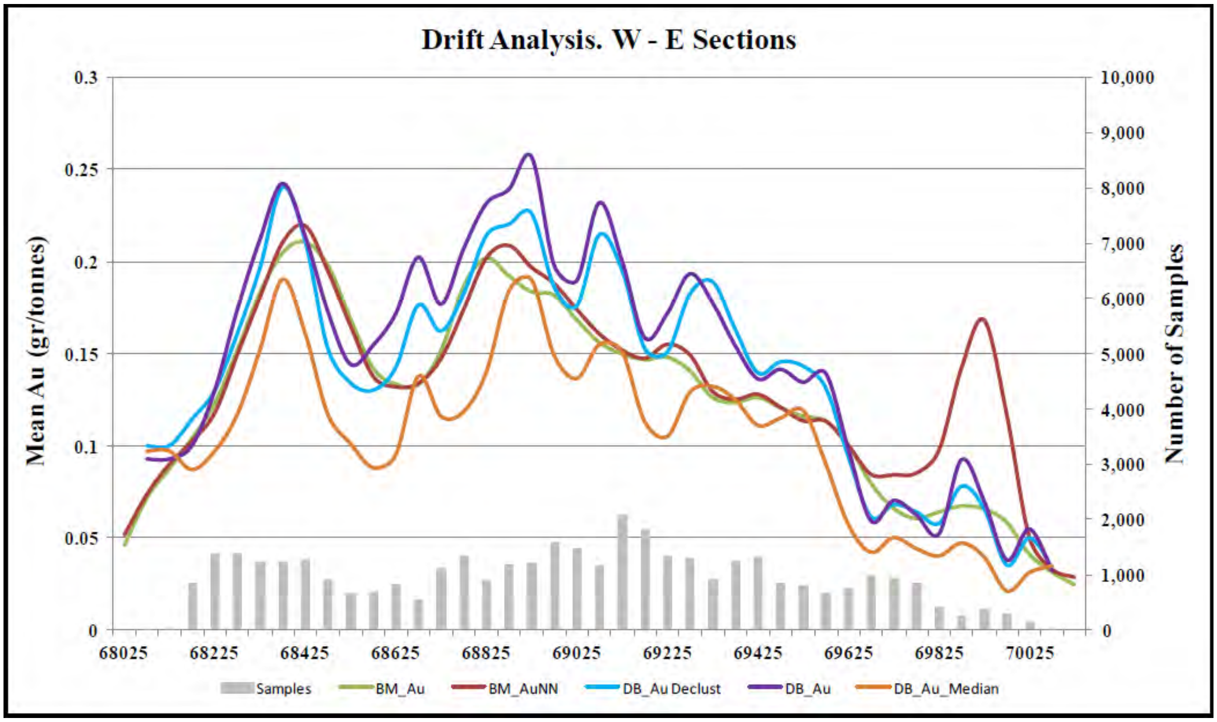


Figure 14-25: E-W Gold Swath Plot

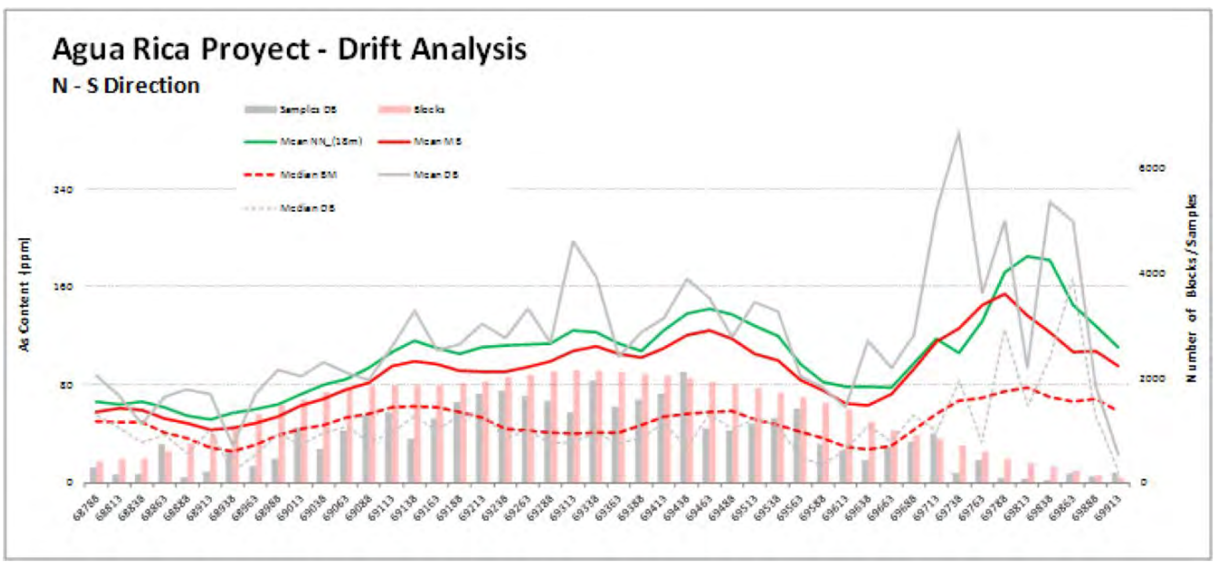


Figure 14-26: N-S Arsenic Swath Plot

14.7.2 Visual Inspection

Visual inspection of the block model results against the input data is a useful tool to detect any spatial artefacts that may come from the interpolation setup. The block model should honour the input data within reasonable limits (i.e., change of support). The composite data, block model, and geologic overlays were reviewed on the computer screen on both sections and plans. An adequate and accurate representation of the grade distribution, according with the drilling information, was found as a result of this inspection. Examples of plans and cross sections are provided in Figure 14-27 to Figure 14-34.

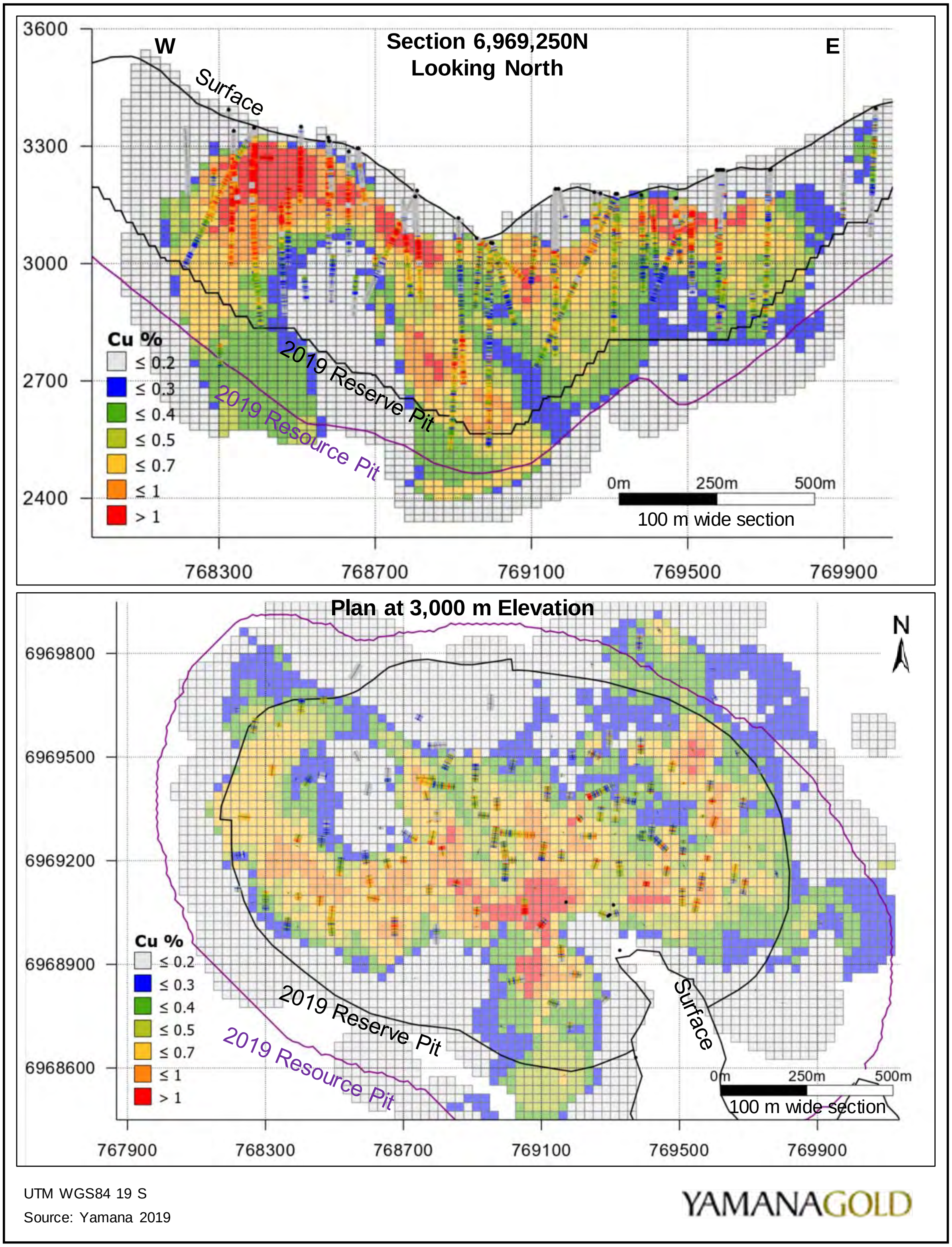


Figure 14-27: Estimated Copper in Block Model and Drilling -Cross Section and Plan View

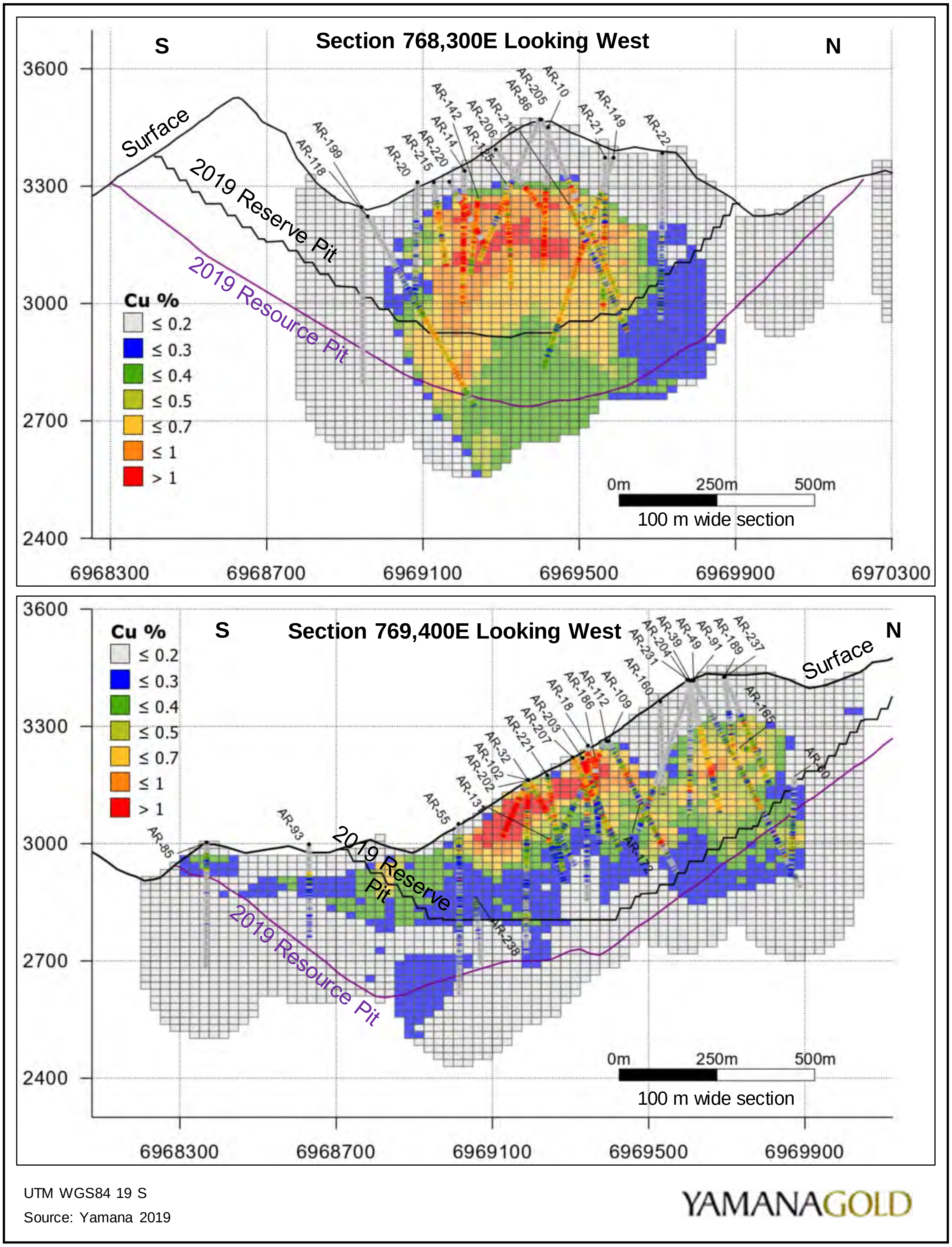


Figure 14-28: Estimated Copper in Block Model and Drilling – Cross Sections

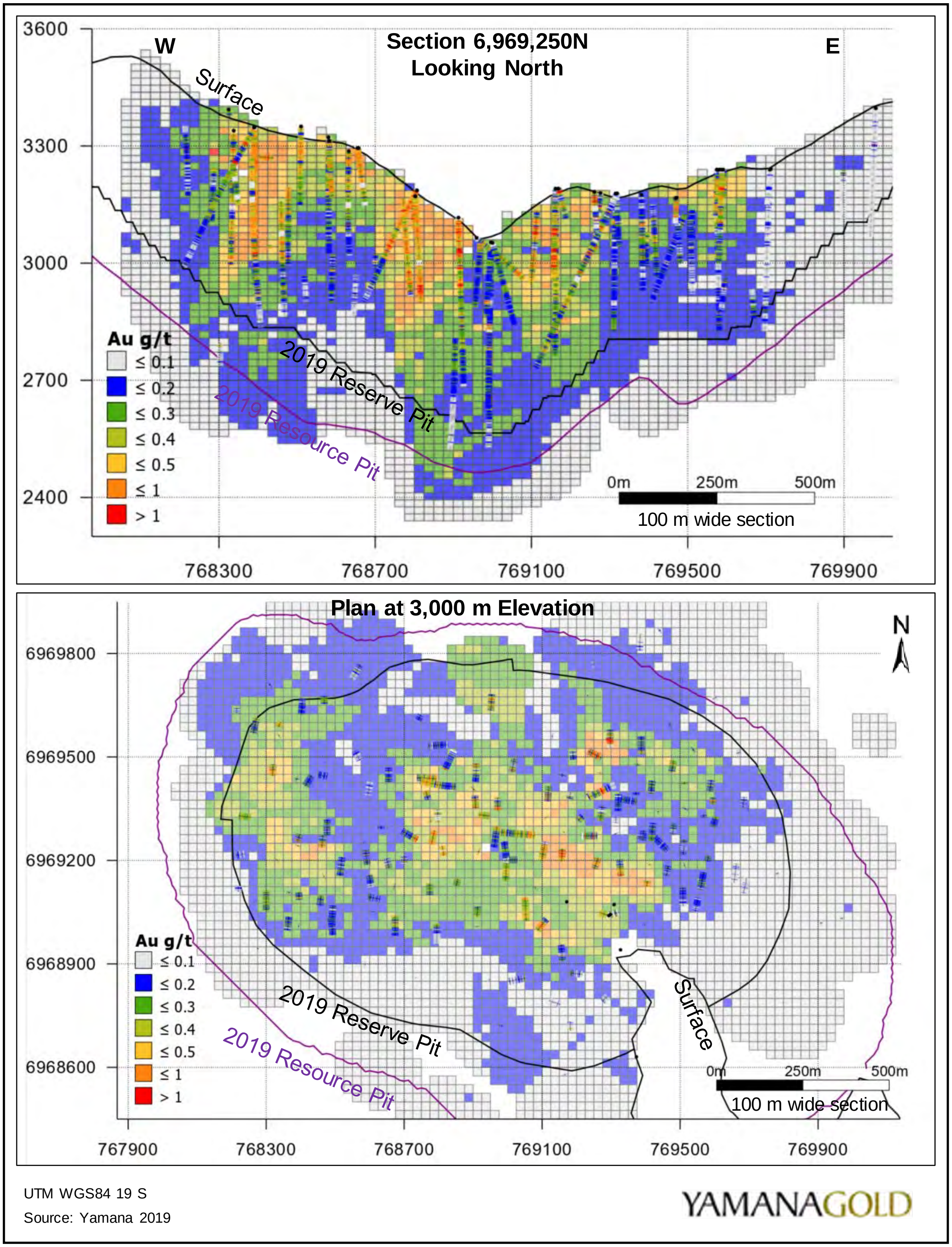


Figure 14-29: Estimated Gold in Block Model and Drilling – Cross Section and Plan View

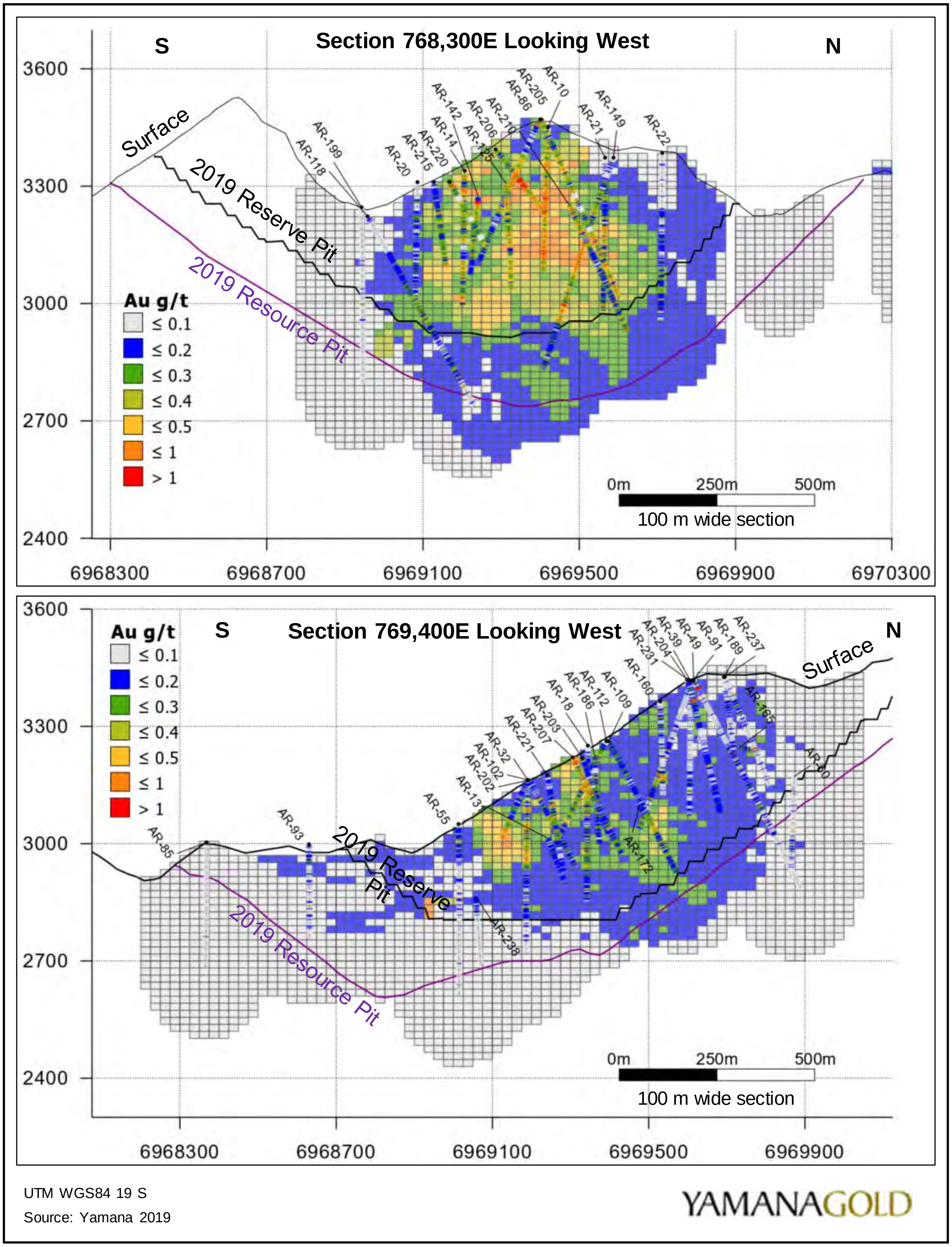


Figure 14-30: Estimated Gold in Block Model and Drilling – Cross Sections

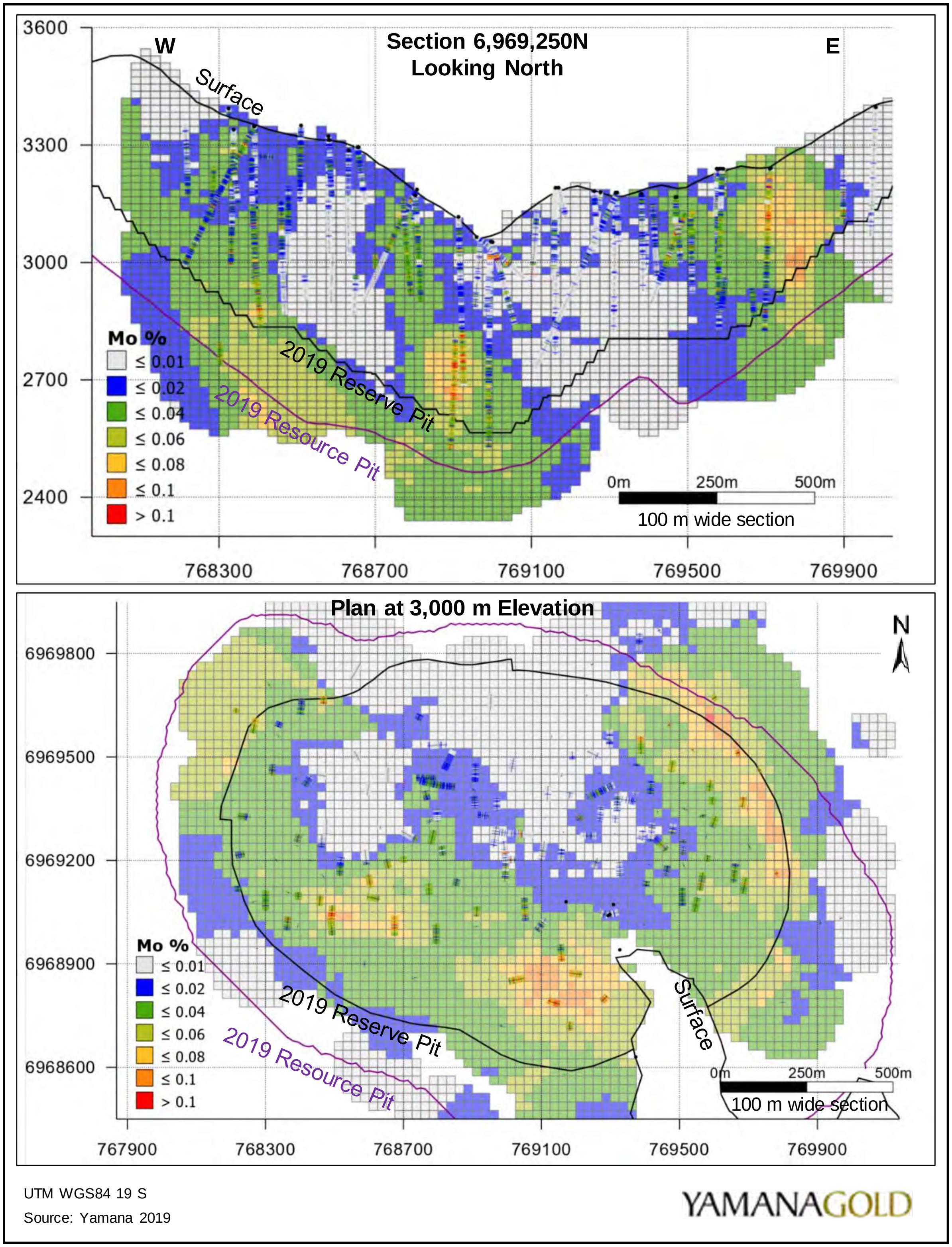


Figure 14-31: Estimated Molybdenum in Block Model and Drilling – Cross Section and Plan View

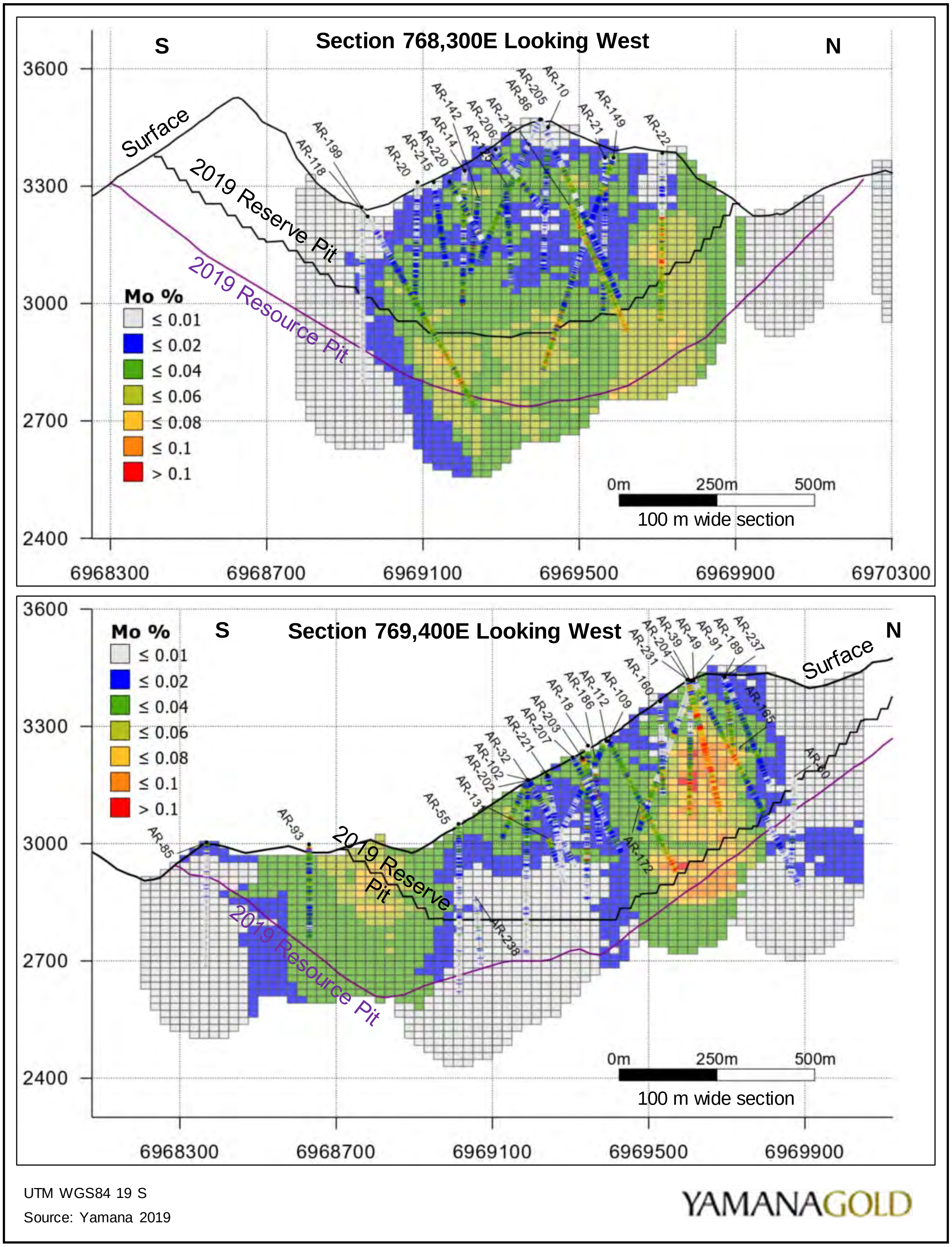


Figure 14-32: Estimated Molybdenum in Block Model and Drilling – Cross Sections

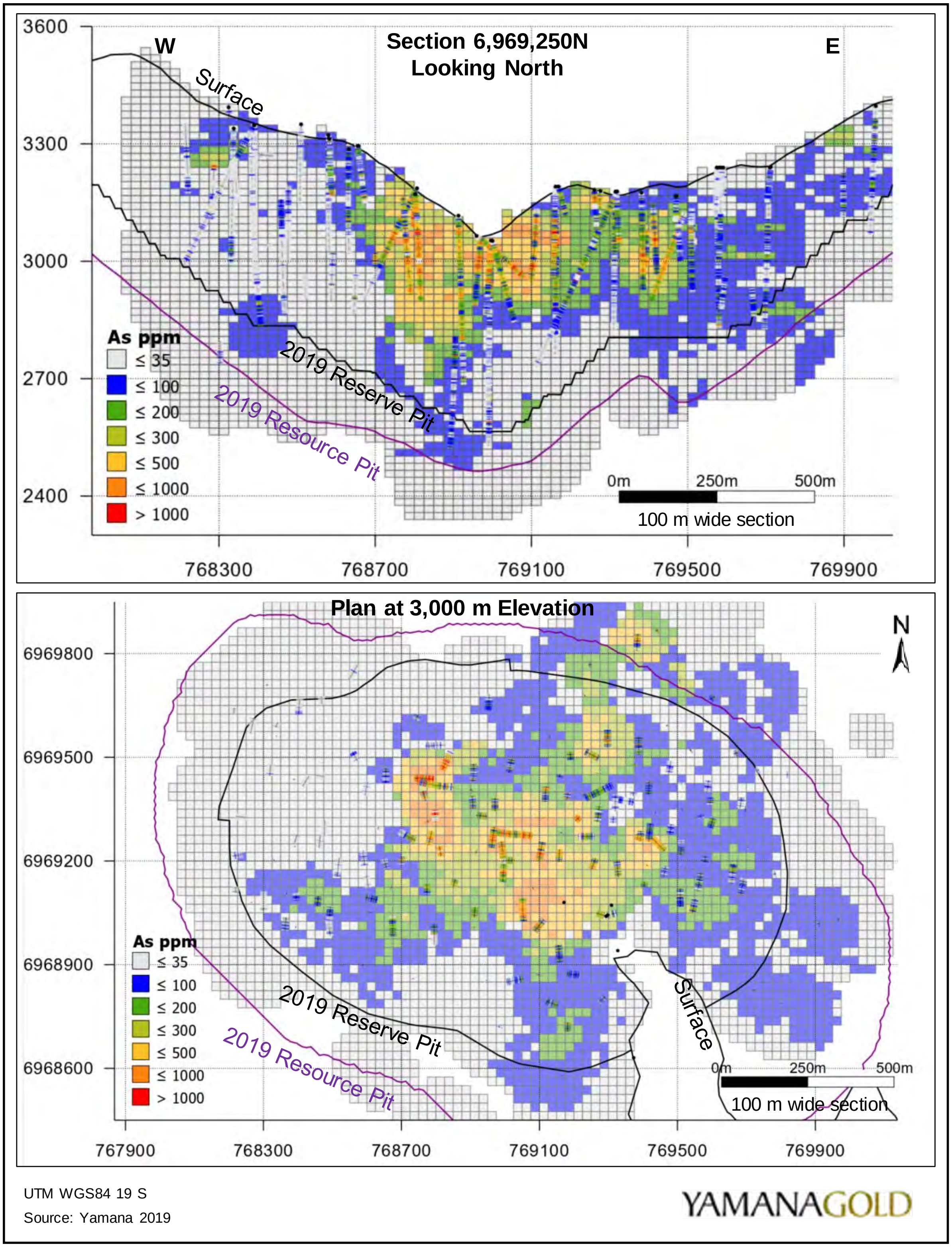
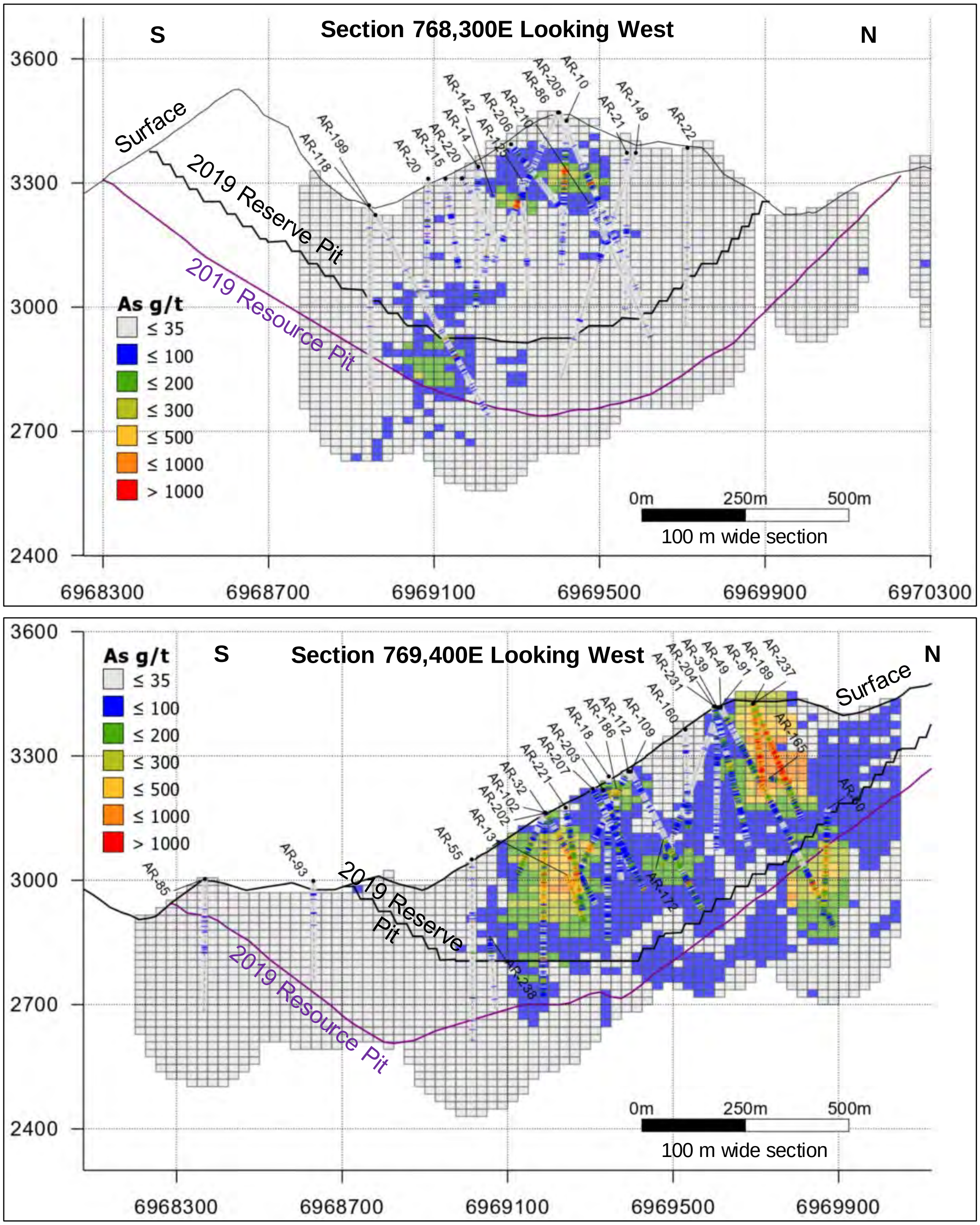


Figure 14-33: Estimated Arsenic in Block Model and Drilling – Cross Section and Plan View



UTM WGS84 19 S

Source: Yamana 2019

YAMANAGOLD

Figure 14-34: Estimated Arsenic in Block Model and Drilling – Cross Sections

14.8 Classification

Definitions for resource categories used in this Technical Report are consistent with CIM (2014) and adopted by NI 43-101 guidelines. In the CIM (2014) definitions, a Mineral Resource is defined as "a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction". Mineral Resources are classified into Measured, Indicated, and Inferred categories. A Mineral Reserve is defined as the "economically mineable part of a Measured and/or Indicated Mineral Resource" demonstrated by studies at Pre-Feasibility or Feasibility levels as appropriate. Mineral Reserves are classified into Proven and Probable categories.

For Agua Rica, the criteria implemented for Mineral Resource classification accounts for the deposit type, the perceived spatial variability, and the amount and quality of information available for the assessment of the relevant geological boundaries controlling copper grade distribution.

For simplicity, transparency, and reproducibility, it was decided to implement a method that was purely based on the assessment of how well informed the estimated blocks were. An important aspect of the criteria to separate measured and indicated blocks was an evaluation of how sensitive the pre-existing geological model was to the incorporation of new drill hole data.

If the thresholds between categories are established based on 1) industry standard practice in similar geological setting, 2) experience from similar deposits, 3) calibration using probabilistic approaches, and 4) geological judgment, then the results should provide a reasonable and defendable model of uncertainty.

The classification scheme was facilitated by the three pass OK methodology. As defined by the OK estimation parameters, each pass interpolated the block grade on the basis of distance and distribution of composites employed and may be considered an indicator of continuity. Resource classification employed the review of various OK run parameters including OK pass, distance to, and number of composites for each domain used in estimation. A global variogram was calculated and modelled for this purpose, using 70% to 80% of the variogram variance as an indicator of the range to be used on "Measured" Mineral Resources, while for "Indicated" Mineral Resources, 80% to 90% of the variogram variance defined the ranges on this category. All other material was classified as "Inferred".

14.8.1 Post-Processing for Smoothing Out Resource Classification Results

The classification approach described is useful to identify, on a block by block basis, the level of information associated with the block model at that scale. In some cases, however, results of areas where there coexist blocks of different categories resulting in a "salt & pepper" pattern not adequate for mine planning purposes. The concept of classifying resources must always be related to a minimum tonnes or volume, not block by block as this may mislead results when doing mine planning sequences.

A smoothing algorithm was applied to reduce the "mixing blocks" to reasonable levels. The algorithm was designed to calculate, on a block by block basis, a moving window where the number of blocks in each category within that window are counted, and finally assigning the final category to the majority. The final window size chosen is 30 m x 30 m x 20 m; this size was selected empirically by implementing various runs until the level of smoothing was considered adequate. This window size involves one surrounding block on each block face. The set of criteria used to classify resources are shown in Table 14-16.

Table 14-16: Agua Rica Classification Parameters
Yamana Gold Inc.– Agua Rica Integrated Project

Zone	Class	Search Radius Major (m)	Search Radius Semi (m)	Search Radius Minor (m)	Max. Theoretical Grid Major (m)	Max. Theoretical Grid Semi (m)	Max. Theoretical Grid Minor (m)
Supergene	Measured	70	60	60	100	80	90
	Indicated	110	100	120	150	140	170
	Inferred	180	160	200	260	230	280
Primary	Measured	90	70	100	130	100	140
	Indicated	120	100	130	170	140	180
	Inferred	180	160	210	260	220	300

Zone	Class	Bearing	Min Samples	Max Samples	Max per drill hole	Number of drill holes	Smooth (m)
Supergene	Measured	315	12	18	6	2	30x30x20
	Indicated	315	12	18	6	2	30x30x20
	Inferred	315	6	12	6	1	30x30x20
Primary	Measured	315	12	18	6	2	30x30x20
	Indicated	315	12	18	6	2	30x30x20
	Inferred	315	6	12	6	1	30x30x20

14.9 Cut-Off Value and Optimized Pit Shell Parameters

Yamana considers that the polymetallic Agua Rica deposit, consisting of a porphyry Cu-Mo system superseded by a high sulphidation Au-As-Pb-Zn epithermal mineralization event, and an immature supergene blanket, is amenable to open pit extraction. The Mineral Resource estimate stated herein are based on the Mineral Resource model prepared in December 2012, constrained by a 2019 updated optimized pit shell based on metal price assumptions of US$4.00/lb Cu, US$1,600/oz Au, US$24.00/oz Ag, and US$11.00/lb Mo. Open pit Mineral Resources are reported at a variable cut-off value which averages $8.42/t. The Mineral Resource estimate for the Agua Rica polymetallic deposit is presented in Table 14-1.

14.10 Qualified Person's Comment

From 2018 to 2019, Yamana completed extensive validation of the resource modelling methodology and results prepared by Xstrata from 2012 to 2013. As part of the validation process, Yamana geologist Felipe Machado de Araújo and external consultant Dr. Craig S. Bow visited the Project in order to review available geological information including core and outcrops, review geological interpretations and modelling approach to determine if they met industry standard practice, and identify and review paper and electronic documentations available at site (Bow, 2019).

The current QP for Mineral Resources visited the Project from April 26 through April 29, 2022 and reviewed the relevant Agua Rica files supporting the Mineral Resource estimate. Additionally, the QP reviewed and discussed QA/QC procedures and results with the personnel responsible for the sample databases. The SRK QP is satisfied that the documented exploration work carried out at the Project was conducted in a manner that is consistent with industry standard practices and is confident that the exploration sampling databases are sufficiently reliable to support a Mineral Resource estimate.

SRK reviewed and verified the geological interpretation and domaining strategy, estimation methodology, bulk density estimation, and classification criteria for the resource model, as documented from the historical information provided. Additionally, the Yamana validation work was reviewed by SRK. Upon completion of the audit review, the QP considers the Mineral Resource Statement presented in Table 14-1 to represent a reasonable estimate of the copper, gold, silver and molybdenum resources for the Agua Rica deposit as of the effective date of this Technical Report.

SRK has completed sufficient work that in the QP's opinion, while local variations in the block estimates are expected, the impact on the global Mineral Resources, as presented at the time of the effective date, are not considered to be material. Since the June 30, 2019 effective date of this Technical Report, SRK has presented Yamana with detailed recommendations for improving and continuing to develop the Mineral Resource estimate. These recommendations are being implemented and revisions to the 2019 technical work related to Mineral Resources will be disclosed in the future. SRK is relying upon Yamana to provide the QP with notice of any material changes, and is not aware of any other facts that may have materially impacted the Mineral Resource statement.

15.0 MINERAL RESERVE ESTIMATE

In the opinion of the responsible QP, the Mineral Resource estimates discussed in Section 14 were prepared using industry standard methods and provide an acceptable representation of the deposit. Measured and Indicated Mineral Resources were converted to Mineral Reserves within a final open pit design, based on a pit optimization shell. This Mineral Reserve estimate conforms to CIM (2014) definitions. The responsible QP is not aware of any environmental, legal, title, taxation, socioeconomic, marketing, political or other relevant factors that would materially affect the estimation of Mineral Reserves that are not discussed in this Technical Report.

The Mineral Reserve estimate for Agua Rica, with an effective date of June 30, 2019, are summarized in Table 15-1.

Table 15-1: Mineral Reserve Estimate – June 30, 2019
Yamana Gold Inc.– Agua Rica Integrated Project

Category	Tonnes (000 t)	Grade				Contained Metal			
		(% Cu)	(g/t Au)	(g/t Ag)	(% Mo)	(Mlb Cu)	(000 oz Au)	(000 oz Ag)	(Mlb Mo)
Proven	587,200	0.57	0.25	3.02	0.03	7,379	4,720	57,014	388
Probable	517,600	0.39	0.16	2.63	0.03	4,450	2,663	43,766	342
P+P	**1,104,800**	**0.49**	**0.21**	**2.84**	**0.03**	**11,829**	**7,382**	**100,781**	**731**

Notes:

1. The Mineral Reserves have been validated by Giorgio de Tomi of Deswik, who is a QP as defined by NI 43-101.
2. CIM (2014) definitions were followed for Mineral Reserves
3. Mineral Reserves are estimated using a variable metallurgical recovery. Average metallurgical recoveries of 86% Cu, 35% Au, 43% Ag, and 44% Mo were considered.
4. Open pit Mineral Reserves are reported at a variable cut-off value averaging $8.42/t, based on metal price assumptions of US$3.00/lb Cu, US$1,250/oz Au, US$18/oz Ag, and US$11/lb Mo. A LOM average open pit costs of $1.72/t moved, processing and G&A cost of $6.70/t of run of mine processed. The strip ratio of the Mineral Reserves is 1.7 with overall slope angles varying from 39° to 45° depending on the geotechnical sector.
5. Numbers may not add due to rounding.

The pit optimization was performed using Datamine NPV Scheduler software, based on the Lerchs-Grossman algorithm. The software generated a series of nested pit shells for the Agua Rica deposit based on a variety of revenue factors. The optimization parameters are described in this chapter.

15.1 Net Smelter Return

The net smelter return (NSR) is calculated for each block in the block model using the metal prices and offsite costs provided by Yamana, as described in Table 15-2.

Table 15-2: NSR Assumptions
Yamana Gold Inc.– Agua Rica Integrated Project

	Copper	Gold	Silver	Molybdenum
Sales Price	US$3.00/lb	US$1,250/oz.	US$18.00/oz.	US$11.00/lb
Metal Payable	96%	90%	90%	85%[1]
Refining Charges	US$0.08/lb	US$4.50/oz.	US$0.40/oz.	-

Notes:

1. Includes payables and deductions

Other information used in determining the NSR calculation is provided below:

- Treatment charges (TC): $83.00/dry metric tonne (dmt) of concentrate
- Transport cost to port: $50.00/dmt of concentrate
- Sea freight: $65.00/wet metric tonne (wmt) of concentrate
- Moisture content: 9.5% for copper concentrate and 2.0% for molybdenum concentrate
- Total mining royalties: 4.5% applied over revenues
- Arsenic penalties: $5.00/t of copper concentrate per 0.1% As, if the concentrate grade is above 0.2% As

15.2 Mining, Processing, and General and Administration Assumptions

Mining costs used in the pit optimization are based on historical Alumbrera mining costs and previous studies developed by Deswik. The costs have been estimated on a block by block basis using fixed and variable components as shown in Table 15-3 and Table 15-4.

Table 15-3: Mining Cost Estimation – Fixed
Yamana Gold Inc.– Agua Rica Integrated Project

Mining Cost Component	Value (US$/t)
General and Tech Services	0.08
Drilling	0.05
Blasting	0.35
Loading	0.11
Support	0.07
Maintenance (Labour)	0.04
Contingency	0.10
Total Fixed Unit Cost	**0.78**

The variable cost is dependent on the haulage distance to either the crushing platform for ore or the top of the WRF for waste. Haulage hourly costs are based on a 360 t truck and have been estimated for uphill and downhill conditions, with a total average cost of $491 per operating hour (op.h). Major cost components such as diesel, lubricants, maintenance, consumables, and labour cost have been estimated for the Liebherr T282 truck operation, as shown in Table 15-4. Labour cost is based on a 4.25 operators per piece of equipment.

Table 15-4: Mining Cost Estimation – Variable
Yamana Gold Inc.– Agua Rica Integrated Project

Mining Cost Component	Value (US$/op.h)
Diesel	185.6
Maintenance	180.0
Consumables	103.7
Labour	21.8
Total Hourly Cost	**491.1**

Additional costs of $0.17/t of material is estimated for ore re-handling while $0.15 /t has been added to the waste to support the top-down dumping method.

Haulage costs are estimated based on the elevation of each block using a reference elevation of 3,200 m for ore and 3,500 m for waste. Figure 15-1 summarizes the results below.

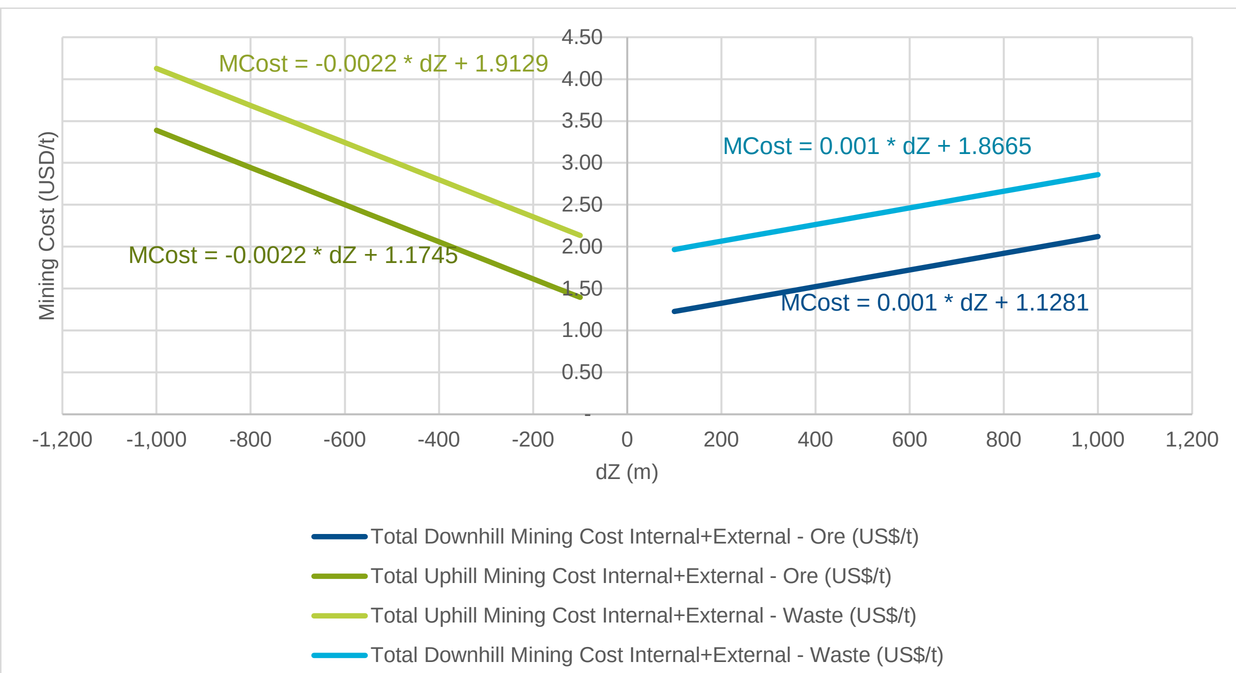


Figure 15-1: Mining Cost Estimation – WRF Top Down

Ore loss and dilution have been modeled into the block model using Deswik's Dig Optimizer tool, based on a 50 m by 50 m SMU size.

Processing operating costs used for pit optimization are based on the actual values from the Alumbrera operation, with additional costs for the conveyor from the Project, as shown in Table 15-5. The general and administration (G&A) cost is based on the Alumbrera operation at $34.4 million per year or $0.86/t of ore at 110,000 tpd.

Table 15-5: Processing Cost Estimation
Yamana Gold Inc.– Agua Rica Integrated Project

Processing Cost Component	Value (US$/t)
Processing Cost, incl. tailings	5.12
Overland Conveyor from AR	0.23
Pipeline + Filter Plant Cost	0.50
Total Processing Cost	**5.85**

15.3 Cut-Off Value

The cut-off value is applied against the NSR value on a block by block basis, calculated with the following formula:

Cut-off Value = Ore Mining Cost + Processing Cost + G&A Cost + Rehandle Cost – Waste Mining Cost

The cut-off value is calculated and applied on a block by block basis in order to optimize the material destination and maximize the Project value, and ranges from $5.40/t to $6.60/t.

Yamana and Deswik decided to base the ultimate Mineral Reserves pit design on the 100% revenue factor pit optimization shell, with the objective of improving value by using a low grade stockpile combined with a variable cut-off grade strategy.

16.0 MINING METHODS

Agua Rica Mineral Reserves are contained within a single open pit and are planned to be mined in phases over a mine life of 28 years. The pit is located in a valley, Quebrada Minas, flanked by mountainous terrain ranging in elevation between approximately 3,000 masl to 4,000 masl.

The Agua Rica deposit will be mined via a conventional high tonnage, truck and shovel open pit operation with ore being crushed at the new mine site and conveyed approximately 35 km west to the existing Alumbrera processing plant. The average LOM material moved is expected to be approximately 108 Mtpa, with an ore feed of 40 Mtpa and average LOM strip ratio of 1.66. Mine waste will be deposited in the Choya valley, adjacent to the Agua Rica, at WRF.

16.1 Geotechnical Considerations

Piteau Associates Engineering Ltd. (Piteau) assessed the geotechnical parameters for the mine design in the 2013 FS using a 36 m final bench height (Piteau, 2013). This study proposes an adjustment for a 30 m final bench (double 15 m operational bench), with the maintenance of the face and inter-ramp angles recommended by Piteau, 2013. The overall slope angle is the resulting slope angle with the addition of the extra width to accommodate pit ramps, switchbacks, drainage, and other recommended geotechnical structures. Table 16-1 lists the geotechnical parameters used in this study.

Table 16-1: Geotechnical Parameters
Yamana Gold Inc.– Agua Rica Integrated Project

Geotech Sector	Face Angle (°)	Berm Width (m)	Inter-Ramp Angle (°)	Overall Slope Angle (°)
I	70.0	21.4	42.9	38.9
II	65.0	15.0	46.0	39.1
III	60.0	13.7	44.0	37.6
IV	75.0	15.4	52.0	44.8
V	70.0	16.6	47.5	40.1
VI	75.0	16.3	51.0	42.7

Source: Feasibility Study, 2013

Figure 16-1 shows the geotechnical sectors defined by Piteau, 2013 and used in this analysis.

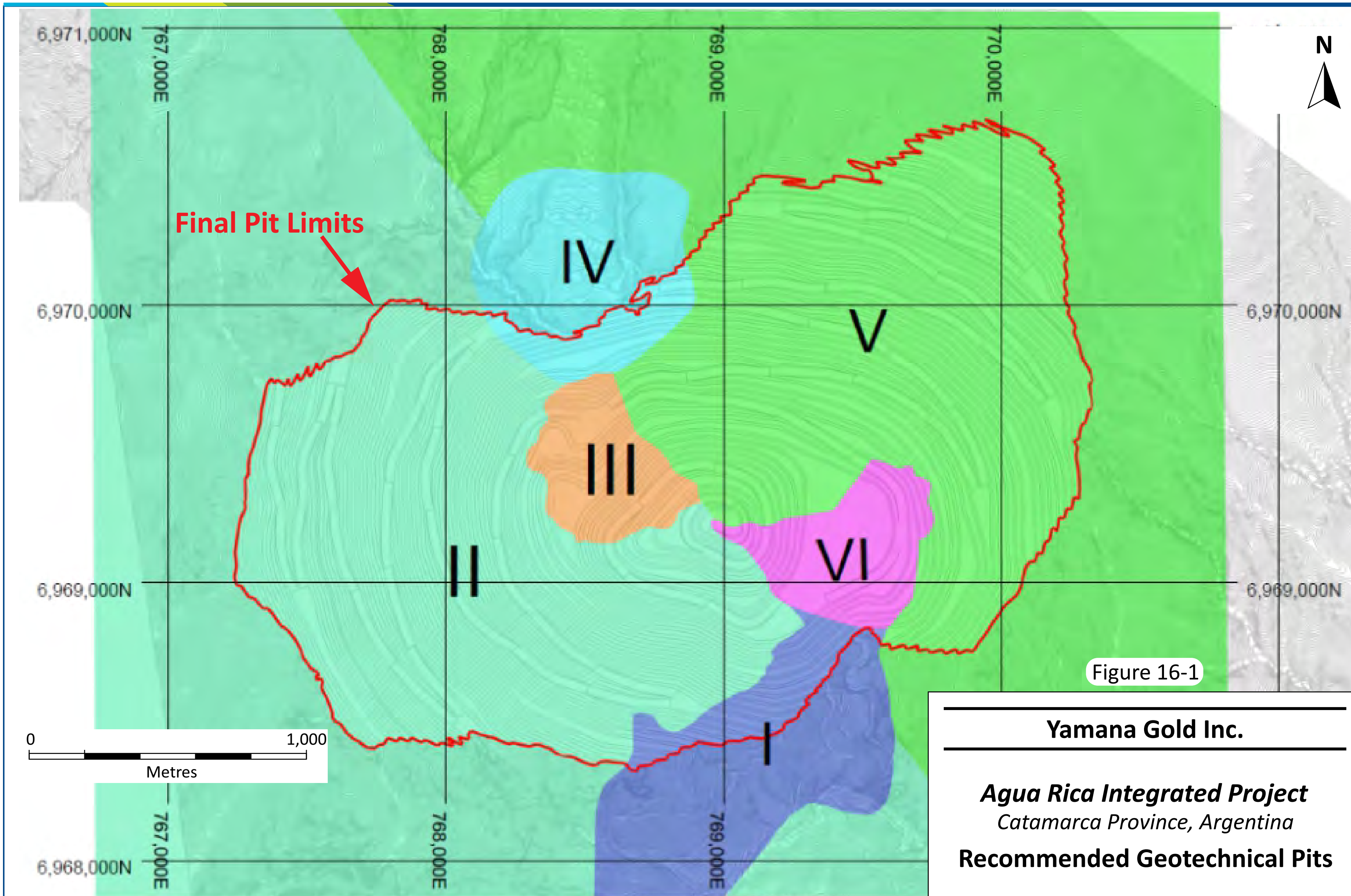


Figure 16-1

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Recommended Geotechnical Pits

August 2022

Source: Fluor, 2019.

16.1.1 Mining Equipment and Road Profile

The mining operation is based on large excavators with 42 m3 of bucket capacity (Komatsu PC8000 or similar) and 360 t haulage trucks (Liebherr T282 or similar). The minimum width for the pushback is 80 m.

PFS-A includes the use a two way ramp of 33 m width, based on the 360 t Liebherr T282 truck (nine metre width). Figure 16-2 shows the estimated mining road profile for the main production roads.

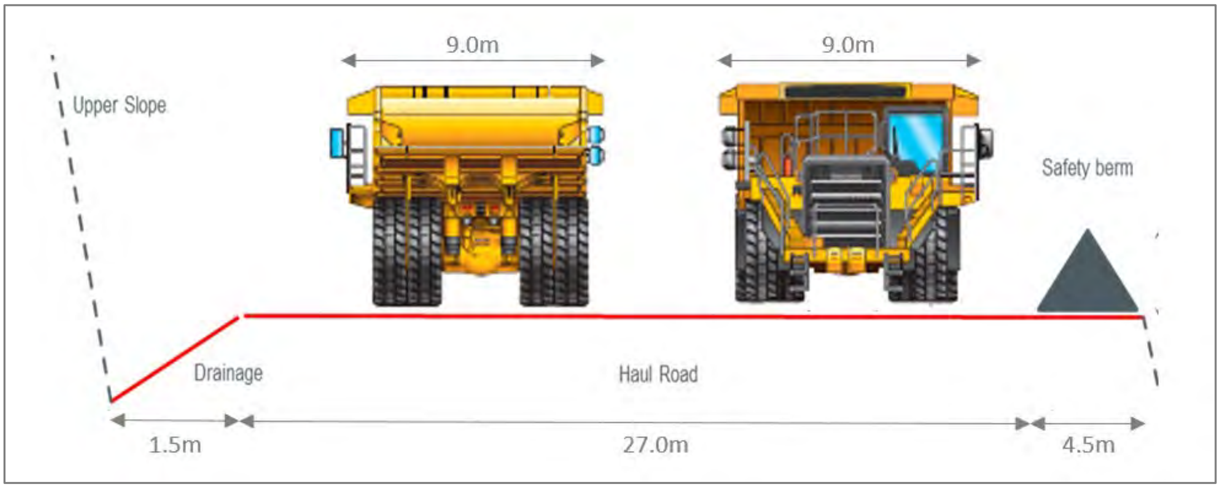


Figure 16-2: Mining Equipment and Road Profile

16.2 Open Pit Mine Design

The mine planning for Agua Rica has been performed using Deswik software. The pit shell limits and phasing are based on the shell analysis and physical constraints that are described in this Technical Report. The final mine design is shown in Figure 16-3.

Measured and Indicated Mineral Resource categories have been considered as ore in this Technical Report and total ore tonnes, grades, and copper concentrate details are presented in Table 16-2.

Table 16-2: Agua Rica Open Pit Design Results
Yamana Gold Inc.– Agua Rica Integrated Project

Description	Value
Ore Tonnes (Mt)	1,105
NSR (US$/t)	26.5
Cu (%)	0.48
Au (g/t)	0.21
Mo %	0.03
Ag (g/t)	2.83
As (ppm)	109.5
Waste Tonnes (Mt)	1,829
Strip Ratio	1.66

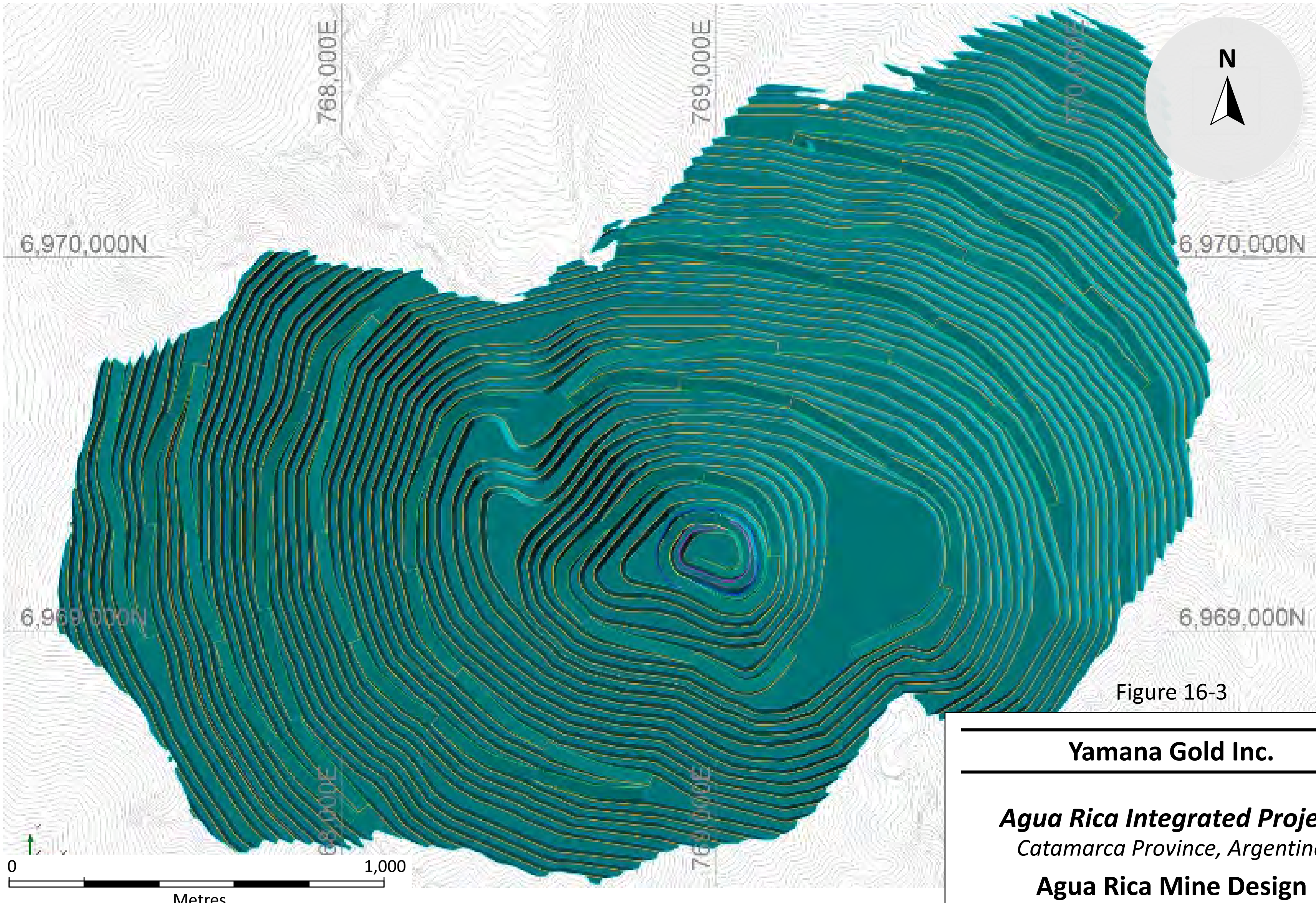


Figure 16-3

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Agua Rica Mine Design

August 2022

Source: Fluor, 2019.

16.2.1 Waste Rock Facility Design

A detailed report of the WRF design, conducted by Klohn Crippen Berger Ltd (KCB), is summarized in Section 18.12 of this Technical Report.

16.2.2 Mine Phasing

The pit is designed in phases using nested pit optimization shells as a guide to target higher value ore in the early years and defer waste movement, with the objectives of maximizing NPV and minimizing the initial capital and payback period. A total of six phases are designed with a mining width of 80 m to 150 m between phases. Plan views of the phases are shown in Figure 16-4 to Figure 16-10, and the Mineral Reserves within each phase are summarized in Table 16-3.

Table 16-3: Mining Phases
Yamana Gold Inc.– Agua Rica Integrated Project

Phase	1	2	3	4	5	6	Total
Ore Tonnes (Mt)	86.6	194.1	172.7	217.9	209.6	224	1,104.80
NSR (US$/t)	42.8	29.9	24.1	25.2	20.6	25.7	26.5
Cu (%)	0.79	0.59	0.44	0.45	0.37	0.44	0.48
Au (g/t)	0.35	0.21	0.27	0.21	0.12	0.18	0.21
Mo (%)	0.02	0.03	0.02	0.03	0.04	0.03	0.03
Ag (g/t)	1.73	3.61	3.57	3.35	2.53	1.8	2.83
As (g/t)	88.60	157.2	166.4	118.6	85.7	46	109.5
Waste Tonnes (Mt)	137.50	271.7	262.1	259.0	411.3	503.1	1,844.70
Strip Ratio	1.59	1.4	1.52	1.19	1.96	2.25	1.67

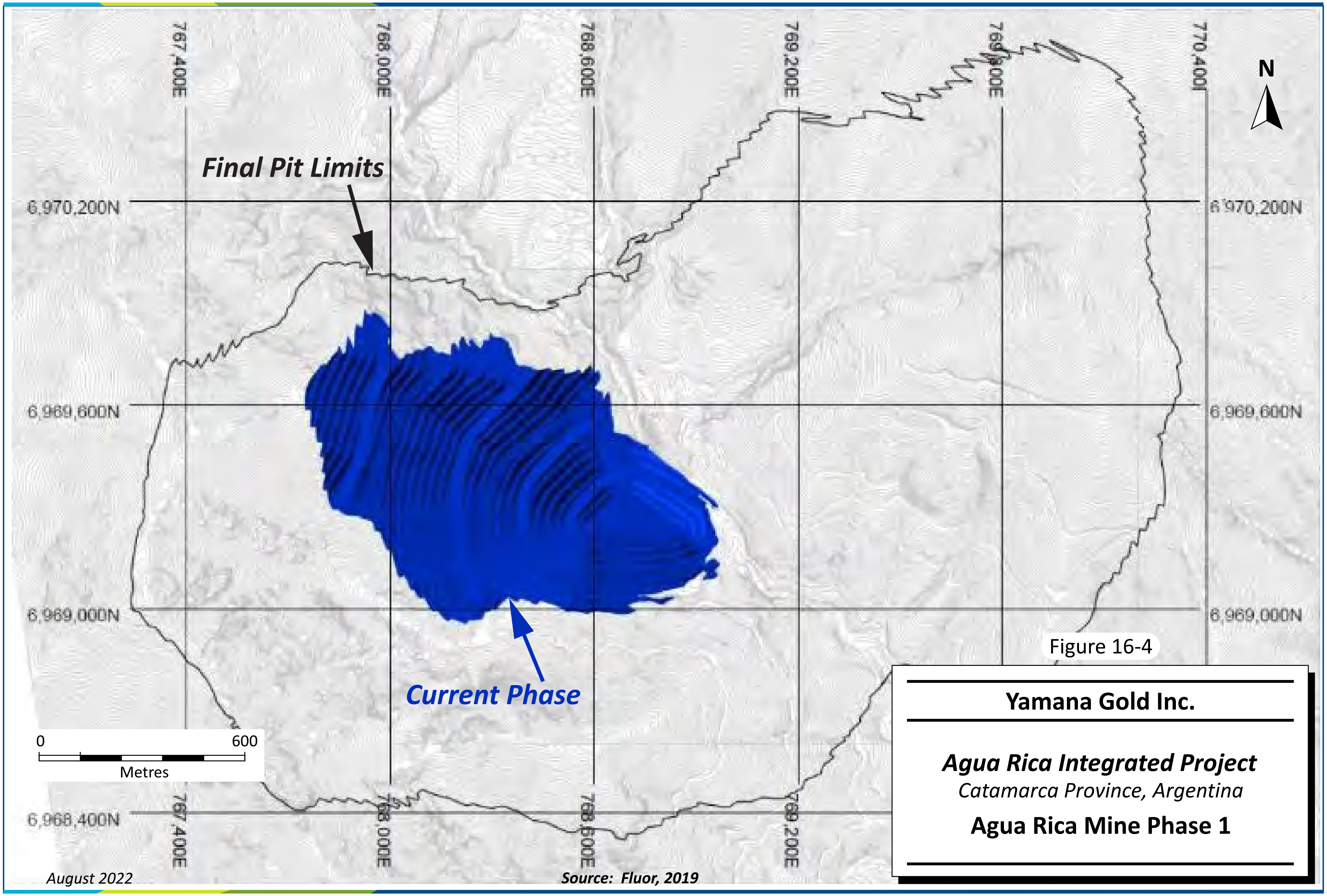


Figure 16-4

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Agua Rica Mine Phase 1

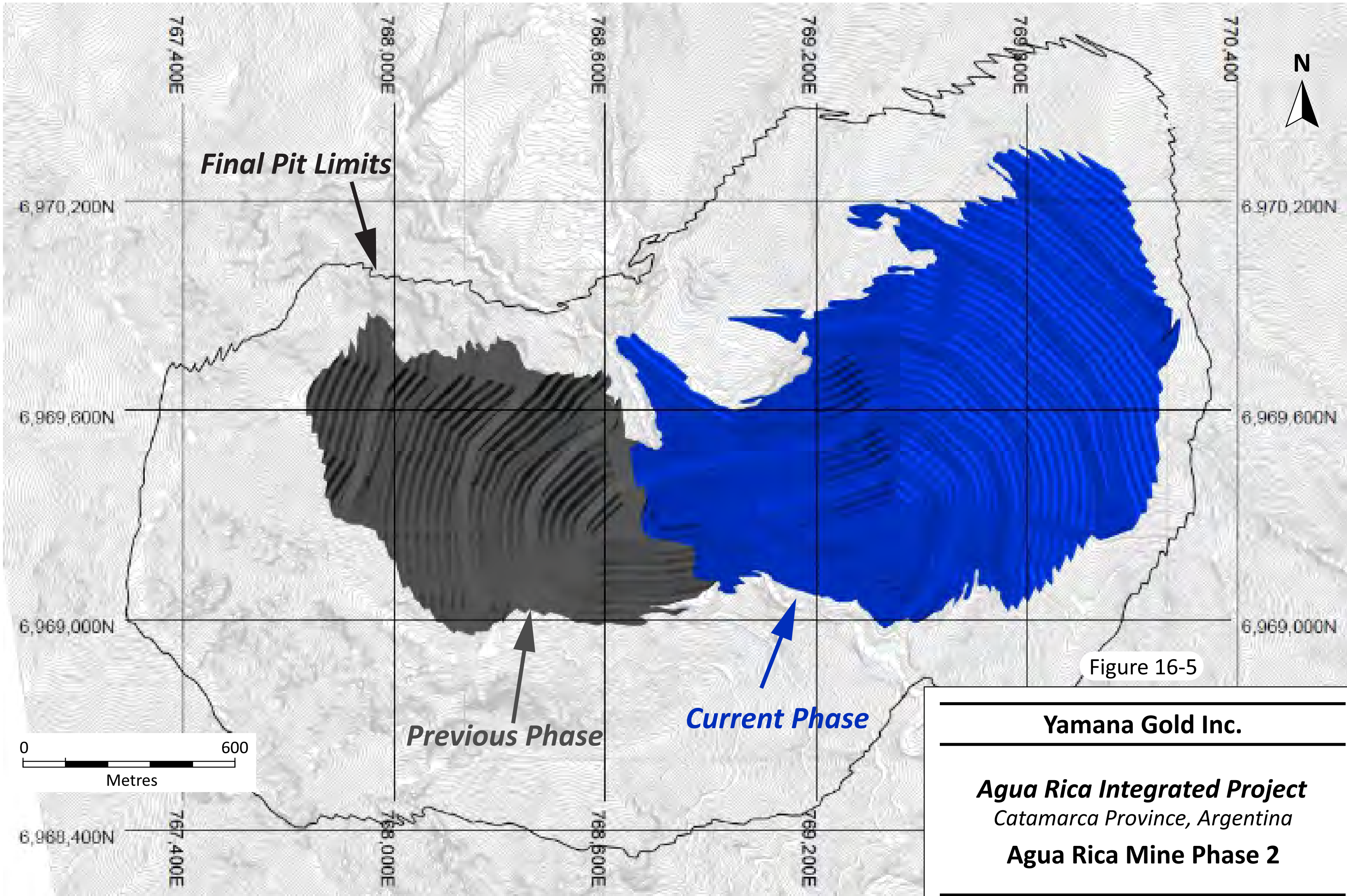


Figure 16-5

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Agua Rica Mine Phase 2

August 2022

Source: Fluor, 2019.

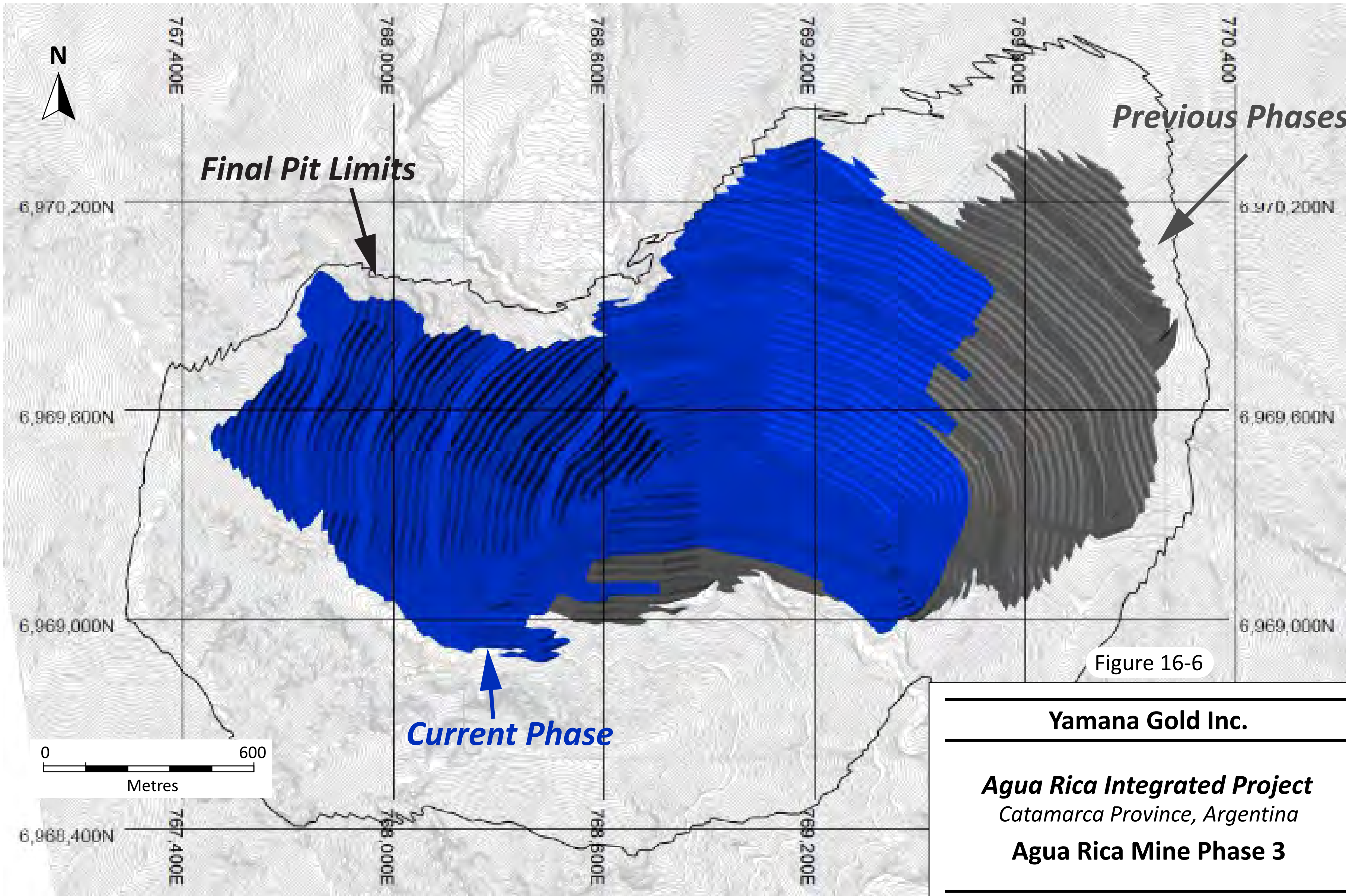


Figure 16-6

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Agua Rica Mine Phase 3

August 2022

Source: Fluor, 2019.

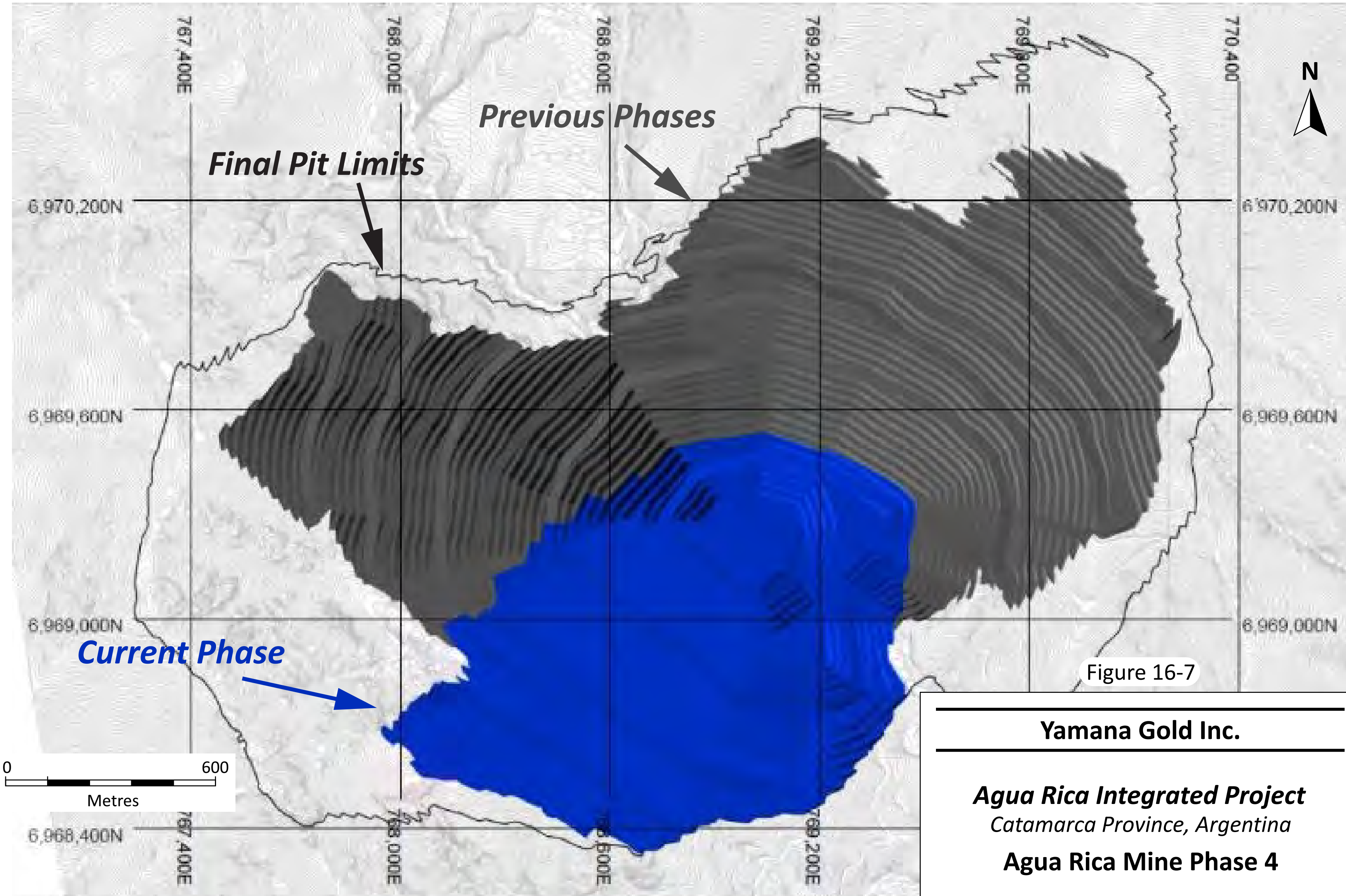


Figure 16-7

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Agua Rica Mine Phase 4

August 2022

Source: Fluor, 2019.

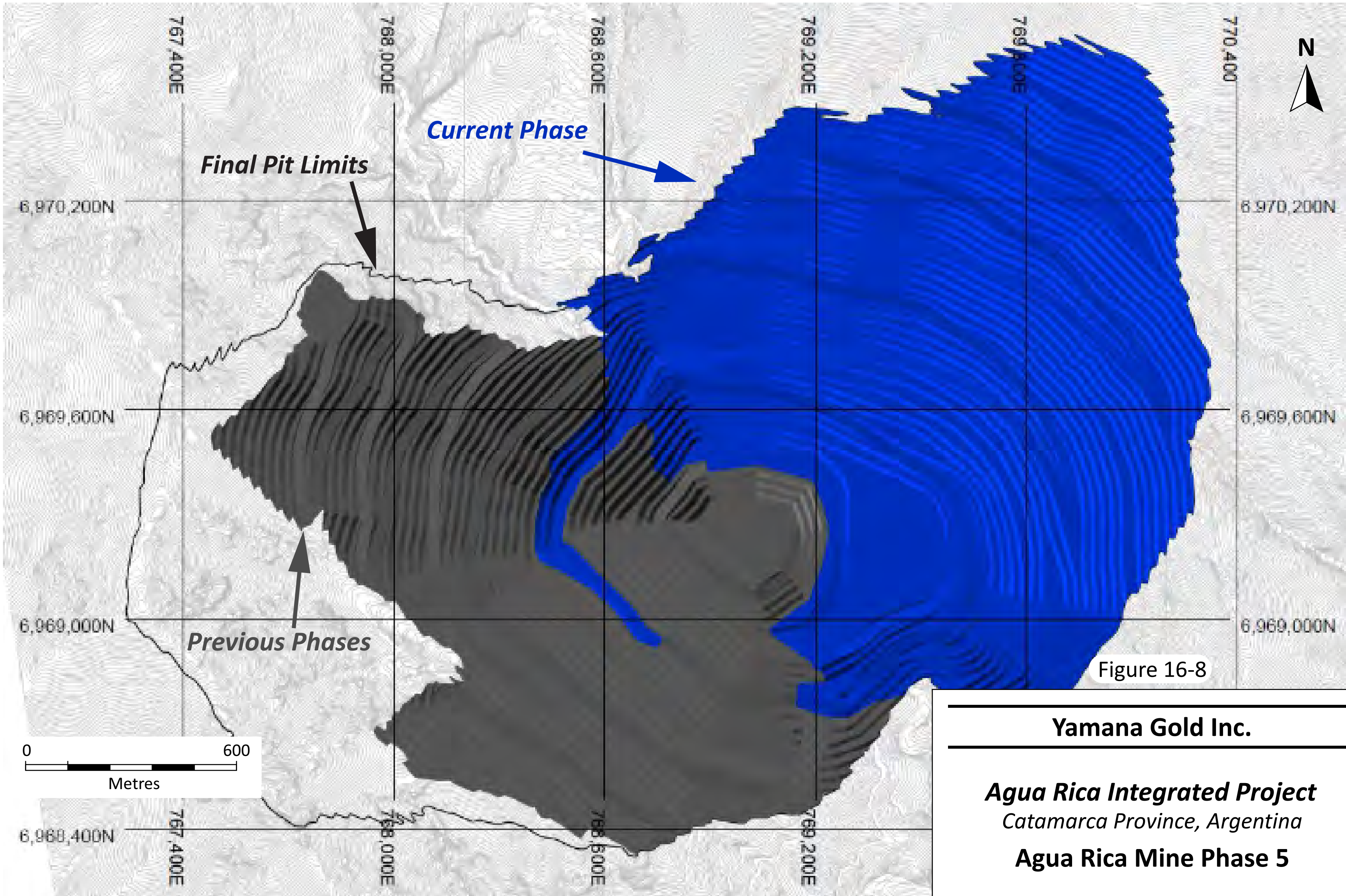


Figure 16-8

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Agua Rica Mine Phase 5

August 2022

Source: Fluor, 2019.

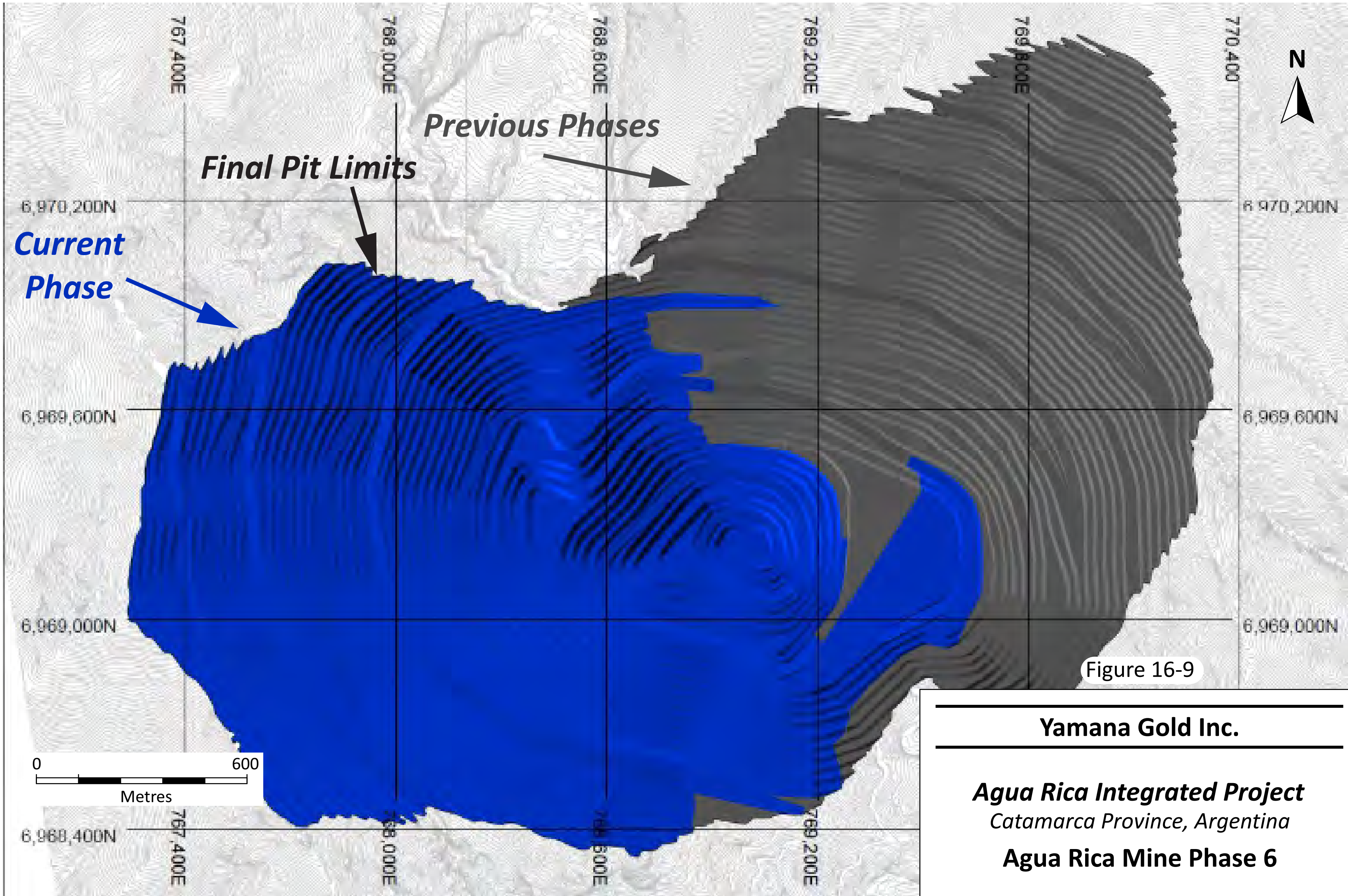


Figure 16-9

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Agua Rica Mine Phase 6

August 2022

Source: Fluor, 2019.

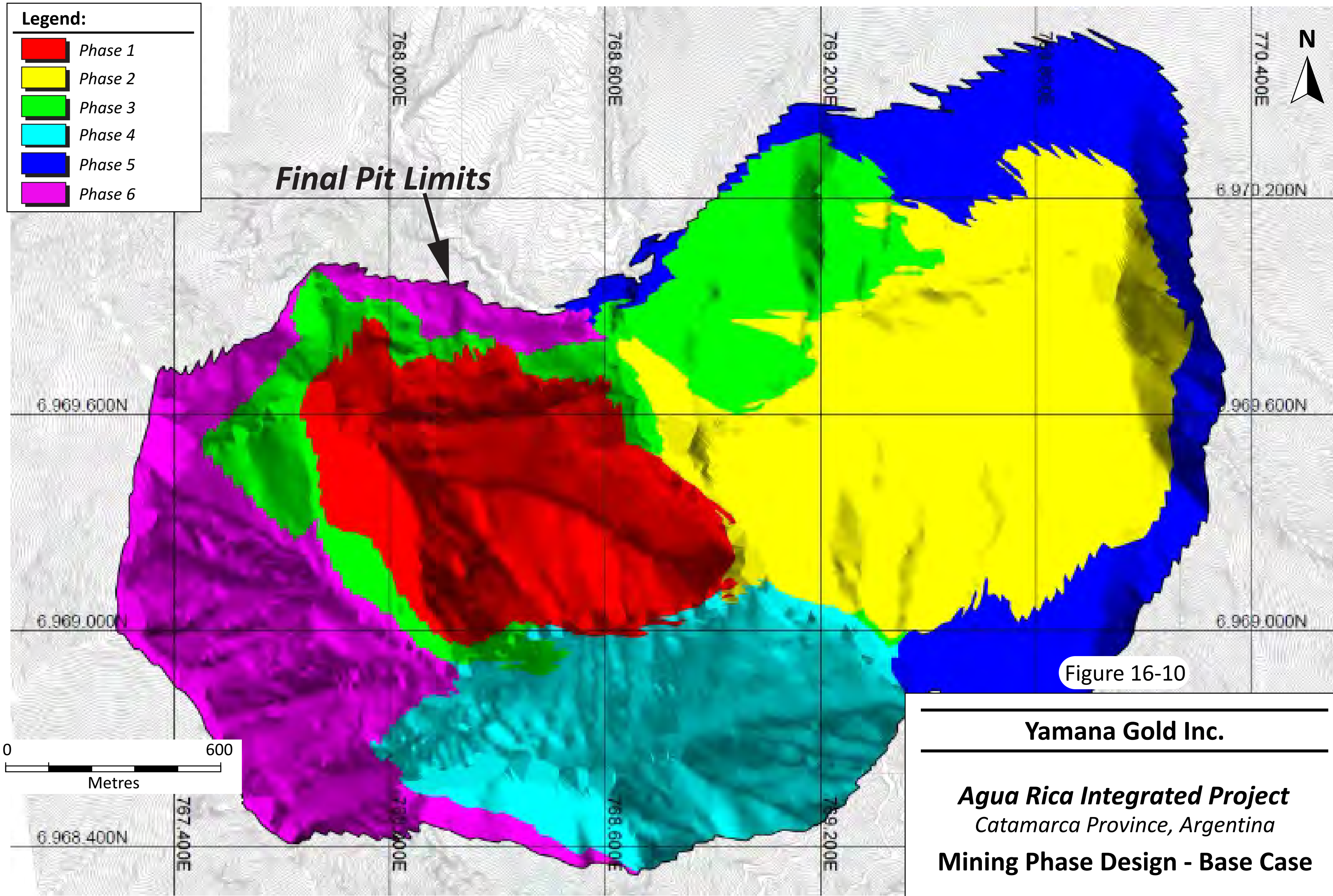


Figure 16-10

Yamana Gold Inc.

Agua Rica Integrated Project
Catamarca Province, Argentina
Mining Phase Design - Base Case

August 2022

Source: Fluor, 2019.

16.2.3 Stockpile Design

A stockpile for low grade ore is designed to the south-west of the pit to maximize the plant feed grade in the early years of the operation with an objective to maximize NPV. The low grade stockpile is designed with a 20 m lift height, 37° face angle, and 20 m berm width for a maximum capacity of 32 million cubic metres (Mm^3). The low grade stockpile will be completely reclaimed and processed over the life of the operation.

A separate stockpile for ore containing high levels of arsenic is planned to limit the average annual arsenic grade in the concentrate to below 0.5% As until the end of the mine life, when it can be reclaimed and processed. The stockpile is located approximately 15.6 km via haul road to the north-west of the pit. The designed high arsenic stockpile is designed using the same parameters as the low grade stockpile and has a maximum capacity of 34 Mm3.

16.3 Life of Mine Plan

The production schedule for the Agua Rica deposit was completed in Deswik.Sched and Deswik.Blend software programs, while incorporating the mine phases designed in Deswik.CAD.

Agua Rica is planned to produce a plant feed of 40 Mtpa over a mine life of 28 years, after a four year pre-production period. Average total material movement during the production period is 109 Mtpa, with a maximum movement of 165 Mt. The LOM mining plan is summarized in Table 16-4 and the material movement profile is shown in Figure 16-11.

Table 16-4: LOM Mining Plan
Yamana Gold Inc.– Agua Rica Integrated Project

Year	Pit to Plant (Mt)	Pit to Low Grade Stockpile (Mt)	Pit to Temp Stockpile (Mt)	Low Grade Stockpile to Plant (Mt)	Temp Stockpile to Plant (Mt)	Waste Movement (Mt)	Infrastructure Material Movement (Mt)
Y-3	-	-	-	-	-	-	25.5
Y-2	-	-	-	-	-	-	29.2
Y-1	-	-	-	-	-	24.8	13.2
Y0	-	-	-	-	-	59.0	11.0
Y01	28.0	2.1	-	-	-	129.5	-
Y02	38.9	2.0	-	1.1	-	120.0	-
Y03	33.4	6.7	14.8	6.6	-	99.9	-
Y04	36.8	0.2	-	3.1	0.2	94.0	-
Y05	40.0	2.0	-	-	-	80.0	-
Y06	36.5	13.2	-	-	3.5	90.0	-
Y07	25.0	0.0	0.1	11.0	4.0	90.0	-
Y08	31.5	2.2	0.1	4.4	4.1	86.0	-
Y09	40.0	7.3	3.3	-	-	87.2	-

Year	Pit to Plant (Mt)	Pit to Low Grade Stockpile (Mt)	Pit to Temp Stockpile (Mt)	Low Grade Stockpile to Plant (Mt)	Temp Stockpile to Plant (Mt)	Waste Movement (Mt)	Infrastructure Material Movement (Mt)
Y10	29.4	0.3	2.1	9.5	1.0	83.7	-
Y11	40.0	3.5	7.9	-	-	72.3	-
Y12	40.0	9.3	10.5	-	-	68.6	-
Y13	40.0	9.1	15.9	-	-	61.0	-
Y14	40.0	8.0	-	-	-	77.7	-
Y15	33.7	4.7	-	6.3	-	72.7	-
Y16	27.7	7.8	-	12.3	-	118.0	-
Y17	32.8	5.4	4.6	7.2	-	100.0	-
Y18	39.3	3.6	9.9	0.7	-	92.0	-
Y19	40.0	10.2	-	-	-	78.0	-
Y20	40.0	8.7	0.4	-	-	20.5	-
Y21	35.6	9.5	-	4.4	-	8.7	-
Y22	41.3	0.8	1.3	0.0	-	6.4	-
Y23	40.4	0.4	-	0.4	-	3.4	-
Y24	40.4	0.2	-	0.2	-	3.4	-
Y25	41.1	-	-	-	-	1.7	-
Y26	-	-	-	40.0	-	-	-
Y27	4.9	-	-	10.1	25.1	-	-
Y28	-	-	-	-	33.2	-	-
Total	**916.7**	**117.2**	**70.9**	**117.3**	**71.1**	**1,828.5**	**78.9**

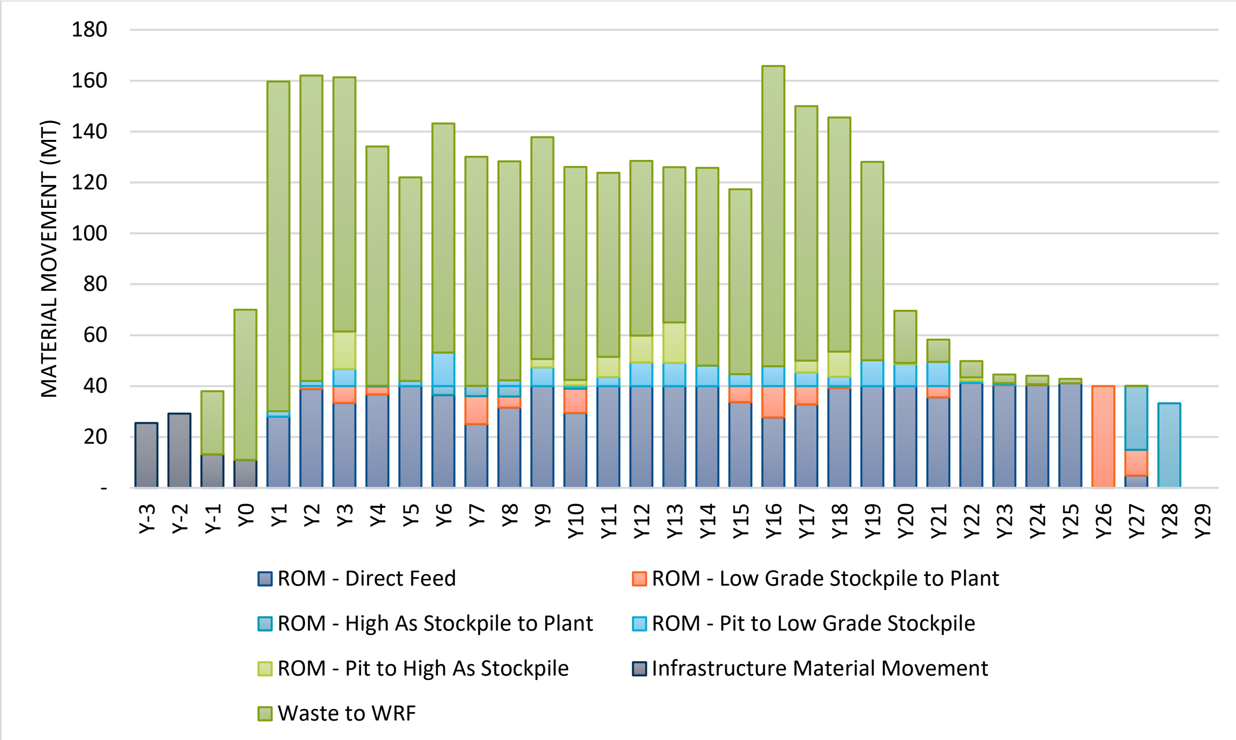


Figure 16-11: Material Movement – By Origin/Destination

The mining sequence is based on a maximum vertical advance rate of 12 benches per year per mine phase as shown in Figure 16-12.

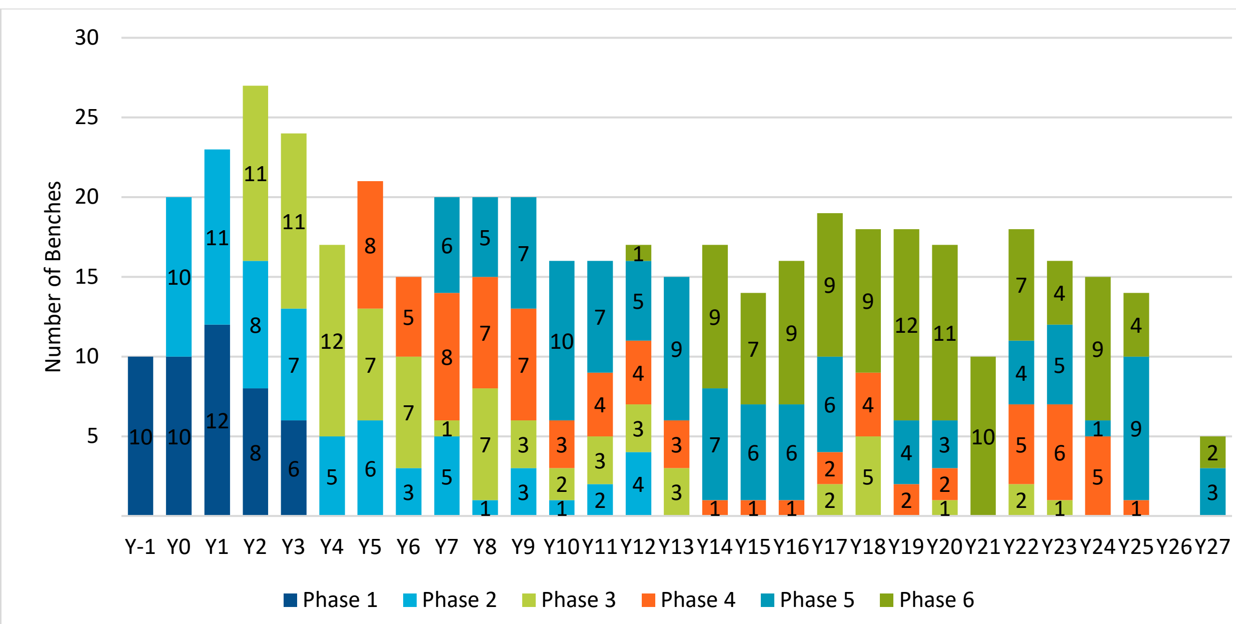


Figure 16-12: Mine Schedule – Benches by Phase

Plant throughput is planned at 40 Mtpa, or approximately 110,000 tpd, with a ramp-up of 28 Mt in Year 1. The LOM processing schedule is shown in Figure 16-13 and summarized in Table 16-5.

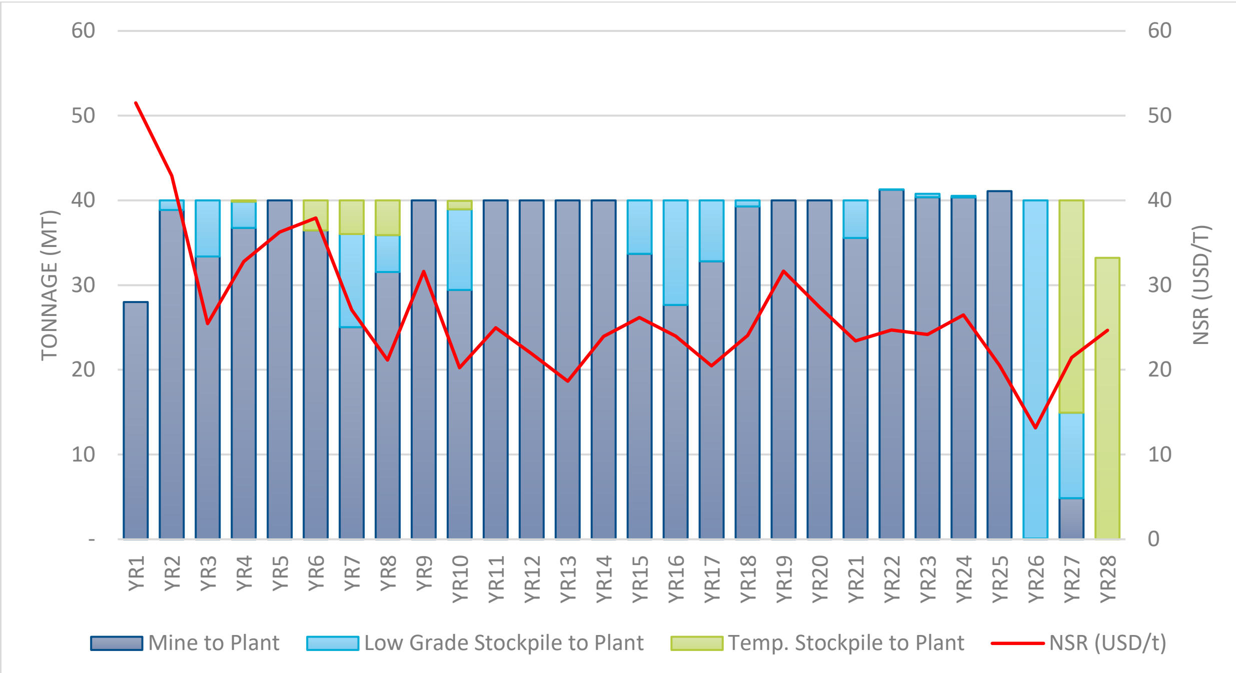


Figure 16-13: Plant Feed

Table 16-5 shows the plant feed by origin and the NSR and copper grades per year that are fed to the plant.

Table 16-5: LOM Processing Plan
Yamana Gold Inc.– Agua Rica Integrated Project

Year	Pit to Plant (000 t)	Stockpile to Plant (000 t)	Temp Stockpile to Plant (000 t)	Plant Feed NSR (US$/000 t)	Copper Grade (% Cu)	Moly. Grade (% Mo)	Gold Grade (g/t Au)	Silver Grade (g/t Ag)
Y01	28,000	-	-	51.5	0.93	0.02	0.41	1.65
Y02	38,869	1,131	-	42.9	0.80	0.02	0.31	1.68
Y03	33,378	6,622	-	25.5	0.49	0.04	0.19	2.21
Y04	36,755	3,094	151	32.8	0.62	0.05	0.16	2.89
Y05	40,000	-	-	36.2	0.72	0.04	0.21	3.52
Y06	36,456	-	3,544	37.9	0.68	0.03	0.26	1.97
Y07	25,040	10,990	3,970	27.1	0.54	0.02	0.23	3.59
Y08	31,548	4,352	4,100	21.2	0.40	0.02	0.23	3.10
Y09	40,000	-	-	31.6	0.57	0.03	0.26	3.45

Year	Pit to Plant (000 t)	Stockpile to Plant (000 t)	Temp Stockpile to Plant (000 t)	Plant Feed NSR (US$/000 t)	Copper Grade (% Cu)	Moly. Grade (% Mo)	Gold Grade (g/t Au)	Silver Grade (g/t Ag)
Y10	29,434	9,517	986	20.2	0.38	0.03	0.20	2.92
Y11	40,000	-	-	25.0	0.46	0.03	0.23	3.33
Y12	40,000	-	-	21.9	0.40	0.02	0.22	3.32
Y13	40,000	-	-	18.6	0.33	0.02	0.16	2.42
Y14	40,000	-	-	23.9	0.40	0.05	0.10	2.62
Y15	33,696	6,304	-	26.2	0.46	0.05	0.13	3.00
Y16	27,663	12,337	-	24.0	0.45	0.04	0.14	2.76
Y17	32,814	7,186	-	20.5	0.38	0.02	0.16	3.12
Y18	39,285	715	-	24.1	0.42	0.02	0.21	3.14
Y19	40,000	-	-	31.7	0.51	0.03	0.25	1.40
Y20	40,000	-	-	27.4	0.48	0.04	0.22	1.75
Y21	35,568	4,432	-	23.4	0.40	0.04	0.15	2.04
Y22	41,264	11	-	24.7	0.42	0.04	0.17	3.06
Y23	40,378	399	-	24.2	0.44	0.03	0.18	3.10
Y24	40,360	175	-	26.5	0.48	0.03	0.16	2.82
Y25	41,092	-	-	20.5	0.38	0.02	0.15	2.12
Y26	85	39,915	-	13.1	0.25	0.02	0.15	2.60
Y27	4,854	10,085	25,060	21.5	0.40	0.02	0.28	4.34
Y28	-	-	33,218	24.6	0.45	0.01	0.36	5.53

Copper concentrate tonnes and grades have been previously estimated on a block by block basis in the block model provided by Glencore. As a result of the mine schedule, concentrate production is estimated on an annual basis in Figure 16-14.

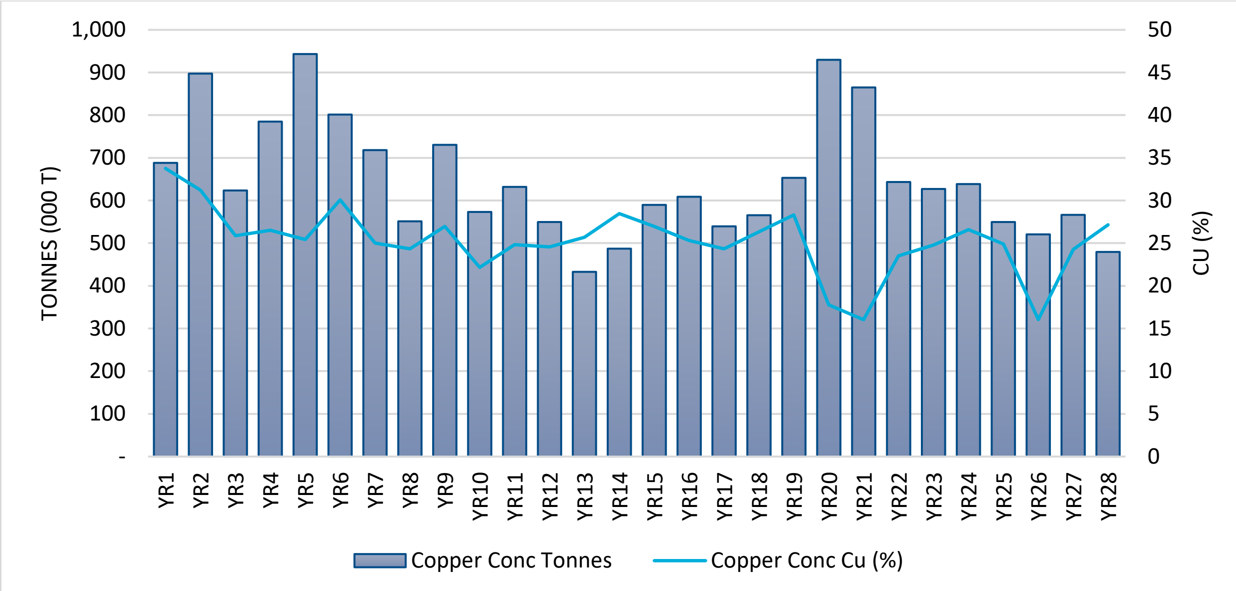


Figure 16-14: Copper Concentrate Tonnes and Copper Grade

A maximum arsenic grade in the concentrate is maintained at 0.5% As throughout the LOM, until the high arsenic grade stockpile is reclaimed in Years 27 and 28 (Figure 16-15).

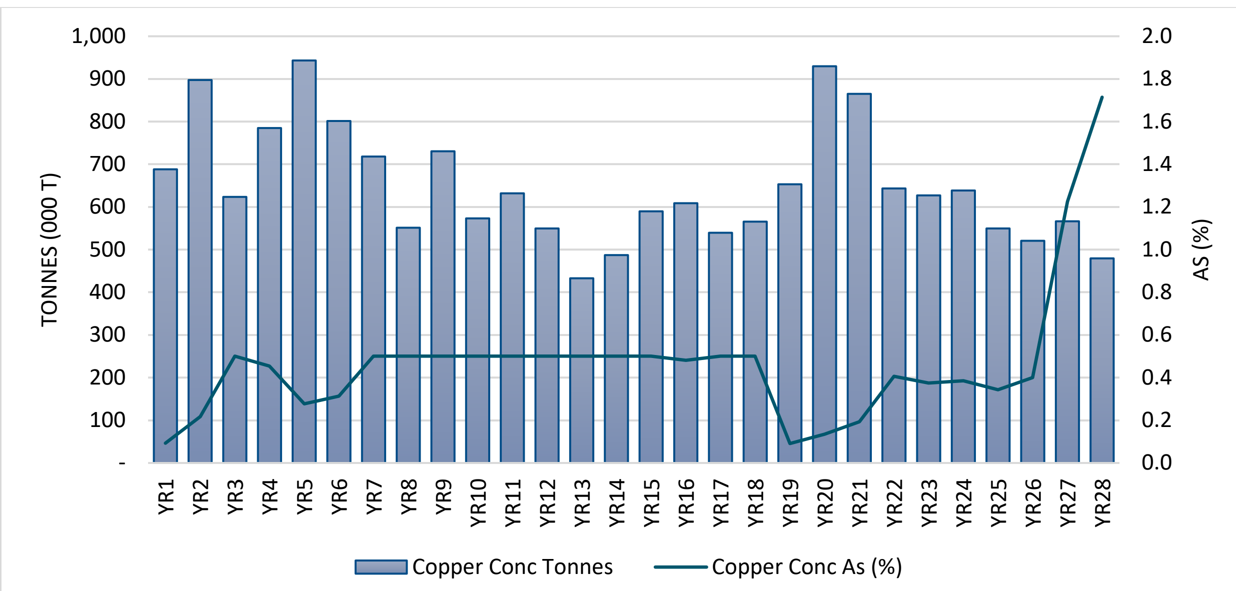


Figure 16-15: Copper Concentrate Tonnes and Arsenic Grade

Agua Rica is planned to produce copper and molybdenum concentrates at an average of 650 dry metric tonne per annum (dmtpa) and 10 dmtpa respectively over the LOM. LOM metal production based on the metallurgical recoveries assigned in the block model is summarized in Table 16-6.

Table 16-6: Concentrate Production
Yamana Gold Inc.– Agua Rica Integrated Project

Year	Copper Concentrate				Molybdenum Concentrate	
	Tonnes (000 t)	Production (000 lb Cu)	Production (000 oz Au)	Production (000 oz Ag)	Tonnes (000 t)	Production (000 lb Mo)
Y1	688.2	512,211.7	138.7	915.9	5.5	6,094.1
Y2	897.4	617,134.2	155.8	1,229.5	7.3	8,087.1
Y3	623.5	355,501.5	74.9	1,232.1	11.1	12,257.8
Y4	784.9	458,928.0	74.2	1,475.2	16.1	17,746.6
Y5	943.2	528,564.1	103.1	1,639.2	10.6	11,643.7
Y6	801.4	531,654.2	137.6	1,255.2	10.5	11,588.3
Y7	718.1	396,328.3	101.1	1,789.9	5.0	5,458.7
Y8	551.3	295,686.2	90.4	1,304.2	6.5	7,161.4
Y9	730.5	434,052.9	116.6	1,779.9	11.8	12,956.3
Y10	573.2	280,144.6	78.6	1,423.7	8.5	9,316.7
Y11	631.9	345,714.5	97.1	1,771.0	8.7	9,590.2
Y12	549.6	297,770.4	94.4	1,760.9	7.7	8,468.4
Y13	432.9	245,139.2	73.4	1,425.3	8.9	9,820.0
Y14	487.2	305,814.0	50.8	1,544.0	17.5	19,326.5
Y15	589.8	350,392.6	64.5	1,882.0	14.8	16,344.4
Y16	608.8	339,727.3	65.8	1,633.4	9.4	10,327.7
Y17	539.5	289,483.7	66.7	1,815.9	6.8	7,544.2
Y18	565.6	328,294.3	93.6	1,715.4	8.7	9,620.5
Y19	653.1	407,492.1	139.3	1,041.1	15.2	16,731.1
Y20	929.7	364,240.2	121.1	1,348.2	17.0	18,722.4
Y21	865.0	305,765.2	81.3	1,423.9	19.8	21,847.2
Y22	643.4	333,479.3	77.8	1,888.0	16.2	17,880.1
Y23	627.1	342,631.2	73.0	1,673.3	10.6	11,639.9
Y24	638.5	374,503.1	71.8	1,577.0	11.4	12,577.8
Y25	549.6	301,531.9	69.2	1,316.1	6.3	6,966.8
Y26	520.7	184,262.9	60.7	1,189.6	6.7	7,418.8
Y27	566.4	303,022.5	112.6	2,241.9	4.2	4,617.8
Y28	479.5	287,069.5	118.8	2,409.3	2.4	2,609.2

16.4 Mine Equipment

The open pit mine pioneering and prestripping activities for Agua Rica have been designed to be primarily undertaken by a contractor operated fleet. The mine pioneering stage requires flexible but productive mining trucks in order to move material from the development of haulage roads, earthmoving, and infrastructure construction. The articulated trucks with a 55 t payload (Volvo A60 or similar) paired with a 6 m3 bucket excavator (CAT 390 or similar) have been selected for pioneering earthworks.

Waste movement will increase in the prestripping stage, requiring increased truck payload. The off highway truck with 320 t payload capacity (Komatsu 930E or similar) has been selected to work with the 28 m3 bucket excavators (Komatsu PC 5500 or similar) in this stage.

At the operating stage, 400 t trucks (Liebherr T282 or similar) have been selected to be loaded by a 42 m3 bucket excavator (Komatsu PC8000 or similar) due to the large amount of material moved per year and haulage distances. Hydraulic excavators have been chosen to provide a higher degree of flexibility in comparison to electric shovels.

The split between owner and contractor material movement has been estimated with the objective of optimizing the Project value using mining contractors to develop the mine pioneering and prestripping stages to postpone mine equipment acquisition. The decision to use contractors to move waste from Years 16 to 19 also contributes to improved project value by avoiding unnecessary haulage equipment acquisition. Figure 16-16 below shows the mining strategy schedule.

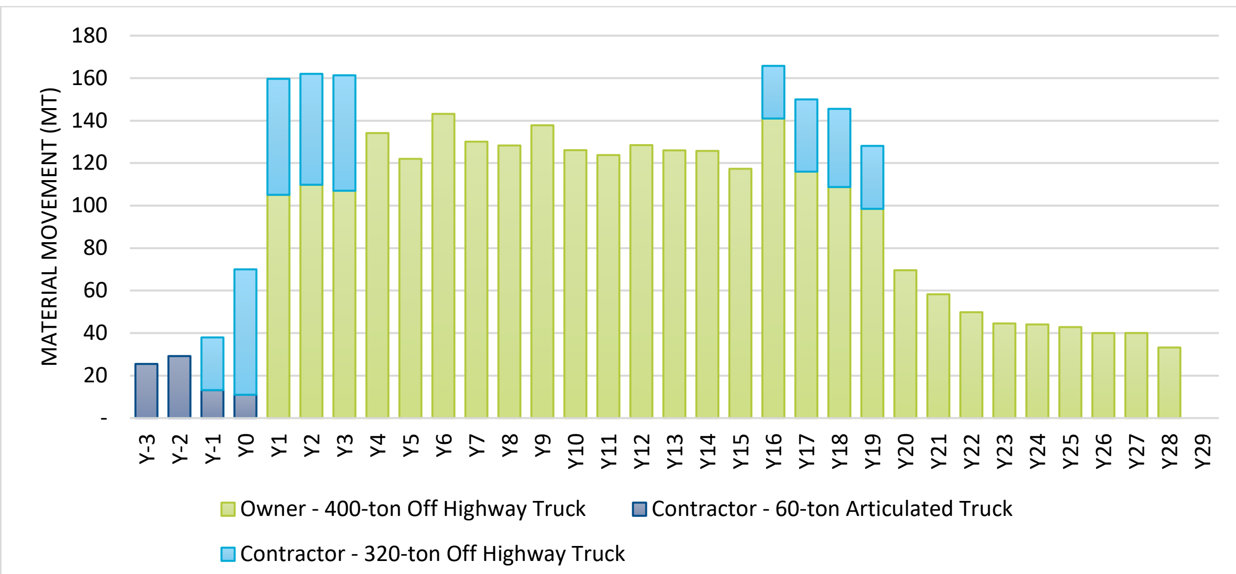


Figure 16-16: Material Movement by Owner/Contractor

The principal mine equipment to be used at Agua Rica is outlined below:

- Primary Wheel Loader
  - Front end wheel loaders (Komatsu L-2350 or similar) with a 38 m^3 bucket (high lift option) will allow rapid response over operational constraints and planning decisions and will also be used for stockpile reclaim.

- Primary Drill
    - The primary drill (Atlas Copco PV311 or similar) is planned to have a 969kW diesel engine power capacity and a maximum pull down force of 222 kN. The rotary drill has the option to drill with a drill hole diameter of 9 in. to 12 in.
- Second Drill
    - The secondary drill (Sandvik D45 or similar) is planned to have a 522 kW engine power capacity with 200 kN of maximum pull down force. The hole diameter works in an interval of 6 in. to 8 in.
- Explosives Truck
    - The use of explosives is planned but will not be handled by Yamana. The activities of loading, transportation, handling, and detonation will be the responsibility of the mining contractor and the costs appropriately included.
- Primary Track Dozer
    - The primary track dozer (CAT D11 Class or similar) is envisaged to be used to support both mining and infrastructure activities.
- Secondaries Track Dozer
    - A smaller dozer (CAT D9/D10 or similar) are planned to be used on general infrastructure actions such as road construction and maintenance.
- Wheel Dozer
    - The wheel dozer model that was selected (Wheel Dozer CAT 854 or similar) has an operating weight of 102 t and a 671 kW engine power capacity.
- Motor Grader
    - A 16 ft moldboard class motor grader (Motor Grader CAT 16M or similar) is planned to operate at the Project to assist with road access construction and maintenance work during the mine pioneering and prestripping stages. The motor grader is intended to work on the roads and waste dump as well as the stockpile area construction in concurrence with the track dozer and road roller for soil compaction. The engine power capacity is 259 kW and the operating weight is 33 t. A 24 ft moldboard class motor grader (CAT 24M or similar) is planned to be used primarily during the production stage.
- Road Roller
    - For road compacting, a road roller will be used. This piece of equipment is planned to be rented when required.
- Water Truck
    - Reliable water trucks are necessary to mitigate the social and environmental concerns associated with dust generation inherent with a road network of the scale being implemented at Agua Rica. The selected truck (Water Truck CAT777 or similar) is equipped with 75,700 L water tanks and will be utilized to handle the necessary dust suppression on the roads.

In conjunction with the principle equipment mentioned, the Project will rely on the support of other equipment such as:

- Fuel and Lubricant Truck
  - A fuel and lubricant truck are planned for refueling and lubrication of track mounted and sizable equipment in the mine. A large lubricant truck was selected (Truck CAT777 or similar) with a capacity of 75,700 L.
- Flatbed Truck with Crane
  - A flatbed truck with crane will be utilized for equipment and parts manipulation, as well as for maintenance and general handling of material around the Project. Its crane will be used in the maintenance workshop as well.
- Reverse Circulation Drill for Grade Control
  - Although the Project mineralization is considered to be disseminated, a grade control method will be applied in order to ensure that material being fed to the mill is of economic grade and to improve the accuracy and confidence level of the mined grades. A reverse circulation drill is intended to be used to perform grade control activities. The Atlas Copco ROC L8 drill (or similar) has been selected due to its reverse circulation system operating with a 4 in. to 6 in. hole diameter, and the down the hole hammer option.
- Mobile Light Tower and Generator
  - Safety measure for loading and dumping activities.
- Pump and Generator Set
  - Drainage of surface and groundwater.
- Light Vehicle and Bus
  - Light vehicles and busses will be utilized for labour mobility.

Table 16-7 and Figure 16-17 below present the mine equipment estimated for the contractor operation throughout the LOM.

Table 16-7: Contractor Mine Equipment
Yamana Gold Inc.– Agua Rica Integrated Project

Description	Equipment Type	Class/Model	Number of Units (Maximum)
Loading	Hydraulic Excavator	29 m³ / PC 5500	4
	Hydraulic Excavator	6 m³ / CAT 390	7
Hauling	Off Highway Truck	320 t / 930E	35
	Articulated Truck	60 t / A60H	45
Drilling	Rotary Drill	DTH Drill D45	6
Support	Wheel Dozer	CAT 854	2
	Motor Grader	16 ft. class	5

Description	Equipment Type	Class/Model	Number of Units (Maximum)
	Track Dozer	D9-class	1
	Track Dozer	D11-class	5
	Water Truck	75,700 L class	4
	Fuel and Lubricant Truck	Fuel and Lube Truck	3
	Flatbed Truck	Flatbed Truck with Crane	2
	Drill for Hydrostatic Control	-	1
	Road Roller	-	2
	Mobile Lightning Tower	-	15
Other Equipment	Bus for Labour Transport	-	10

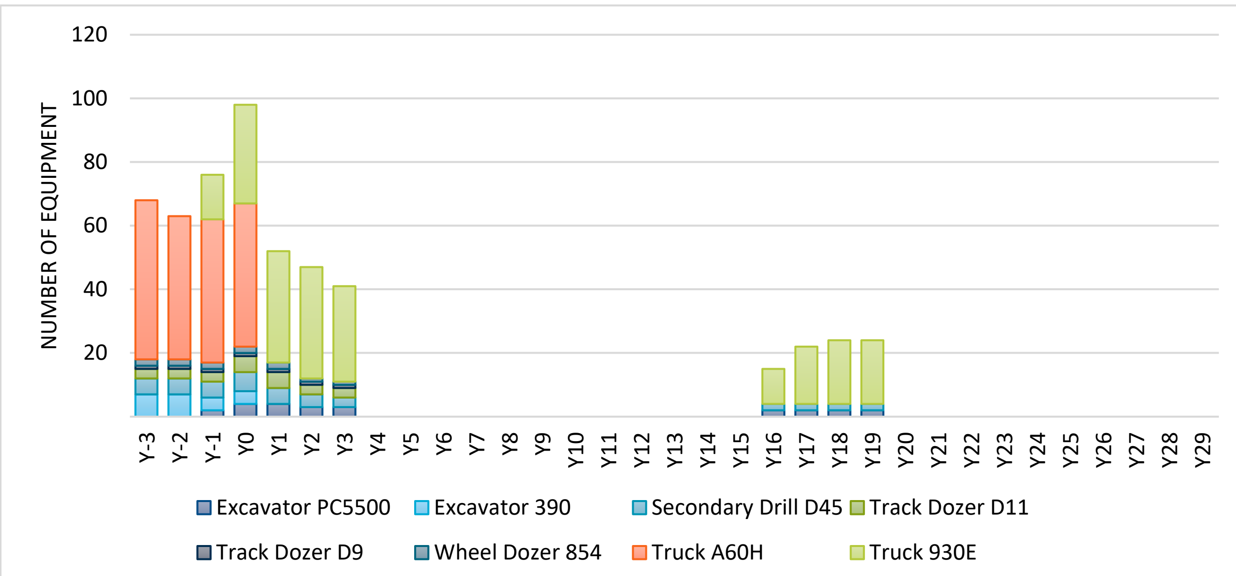


Figure 16-17: Contractor Mine Equipment

The mine production stage is planned to be undertaken by owner fleet, described in Table 16-8 and Figure 16-18.

Table 16-8: Owner Mine Equipment
Yamana Gold Inc.– Agua Rica Integrated Project

Description	Equipment Type	Class	Number of Units (Maximum)
Loading	Hydraulic Excavator	42 m^3 / PC8000	4
	Wheel Loader	38 m^3 / L2350	1
Hauling	Off Highway Truck	400 t / T284	55

Description	Equipment Type	Class	Number of Units (Maximum)
Drilling	Primary Drill	Rotary Drill / PV-311	5
	Secondary Drill	D45	2
Support	Wheel Dozer	CAT 854	3
	Motor Grader	24 ft. class	5
	Track Dozer	D10-class	1
	Track Dozer	D11-class	7
	Water Truck	75,700 L class	4
	Small Excavator	CAT 374	2
	Small Wheel Loader	CAT 980	1
	Fuel and Lubricant Truck	Fuel and Lube Truck	4
	Flatbed Truck	Flatbed Truck with Crane	2
	RC Drill	4 in. to 6 in. Drill / L8	5
Other Equipment	Mobile Lighting Tower		19
	Pump + Generator Set		2
	Light Vehicle		15
	Bus for Labour Transport		12

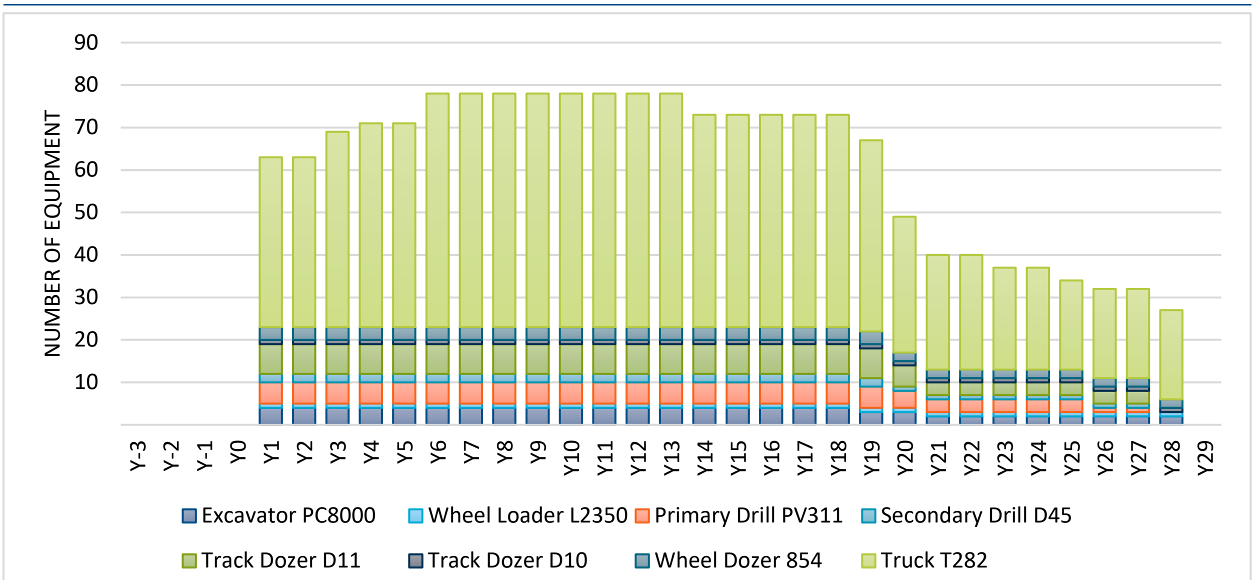


Figure 16-18: Owner Mine Equipment

The drill and blast requirements are summarized below:

- 100% blasted material (no free-dig material)
- The bench height is 15 m.

- Burden and spacing for ore material are estimated at 7.0 m x 8.1 m.
- Burden and spacing for waste material are estimated at 7.5 m x 8.6 m.
- Drill hole length of 16.5 m, including 1.5 m sub drill.
- Drill hole diameter for ore and waste material is 311 mm (12.25 in.), while the secondary drill has a 200 mm (8 in.) diameter.
- A powder factor of 0.46 kg/t was considered for ore material.
- A powder factor of 0.25 kg/t was considered for waste material.
- Estimated number of blasts will be two per day.

Based on the parameters mentioned, the average LOM production drilling is 1,600 m/year, with a maximum of 2,850 drilling metres in Year 1.

16.5 Mine Labour

The Agua Rica management structure is based on the MAA operation, customized and planned for the Project conditions. G&A labour have been defined by Deswik in agreement with Yamana while equipment operators vary with the number of operating equipment. Total operators have been calculated based on two 12 hour rosters, with 4.25 operators per machine, which includes absenteeism and vacations (one month per year). Equipment operation labour requirements are based on equipment hours, which are calculated from engineering estimates of productivities and activities, quantities of material moved, and equipment hourly operating rates.

Other technical staff has been estimated for the operations supervision, topography, geology, and mine planning to support the mine operations. The total mine labour estimated can be seen in Table 16-9 and Table 16-10, and in Figure 16-19 and Figure 16-20.

Table 16-9: Contractor Labour
Yamana Gold Inc.– Agua Rica Integrated Project

Year	Manpower Quantity per Activity							
	G&A and Tech Services	Loading	Hauling	Drilling	Blasting	Support	Maint.	Total
Y-3	23	21	137	14	10	51	54	310
Y-2	23	21	121	14	10	55	54	298
Y-1	23	13	158	14	14	55	62	339
Y0	23	21	204	22	14	67	72	423
Y1	23	13	83	18	14	59	42	252
Y2	23	13	100	14	14	51	40	255
Y3	23	13	92	10	14	51	35	238
Y4	-	-	-	-	-	-	-	-
Y5	-	-	-	-	-	-	-	-
Y6	-	-	-	-	-	-	-	-

Year	Manpower Quantity per Activity							
	G&A and Tech Services	Loading	Hauling	Drilling	Blasting	Support	Maint.	Total
Y7	-	-	-	-	-	-	-	-
Y8	-	-	-	-	-	-	-	-
Y9	-	-	-	-	-	-	-	-
Y10	-	-	-	-	-	-	-	-
Y11	-	-	-	-	-	-	-	-
Y12	-	-	-	-	-	-	-	-
Y13	-	-	-	-	-	-	-	-
Y14	-	-	-	-	-	5	-	5
Y15	-	-	-	-	-	5	-	5
Y16	23	5	30	10	10	15	16	109
Y17	23	9	50	6	10	15	19	132
Y18	23	9	59	10	10	15	24	150
Y19	23	9	42	6	10	15	24	129
Y20	-	-	-	-	-	5	-	5
Y21	-	-	-	-	-	5	-	5
Y22	-	-	-	-	-	5	-	5
Y23	-	-	-	-	-	5	-	5
Y24	-	-	-	-	-	5	-	5
Y25	-	-	-	-	-	5	-	5
Y26	-	-	-	-	-	5	-	5
Y27	-	-	-	-	-	5	-	5
Y28	-	-	-	-	-	-	-	-

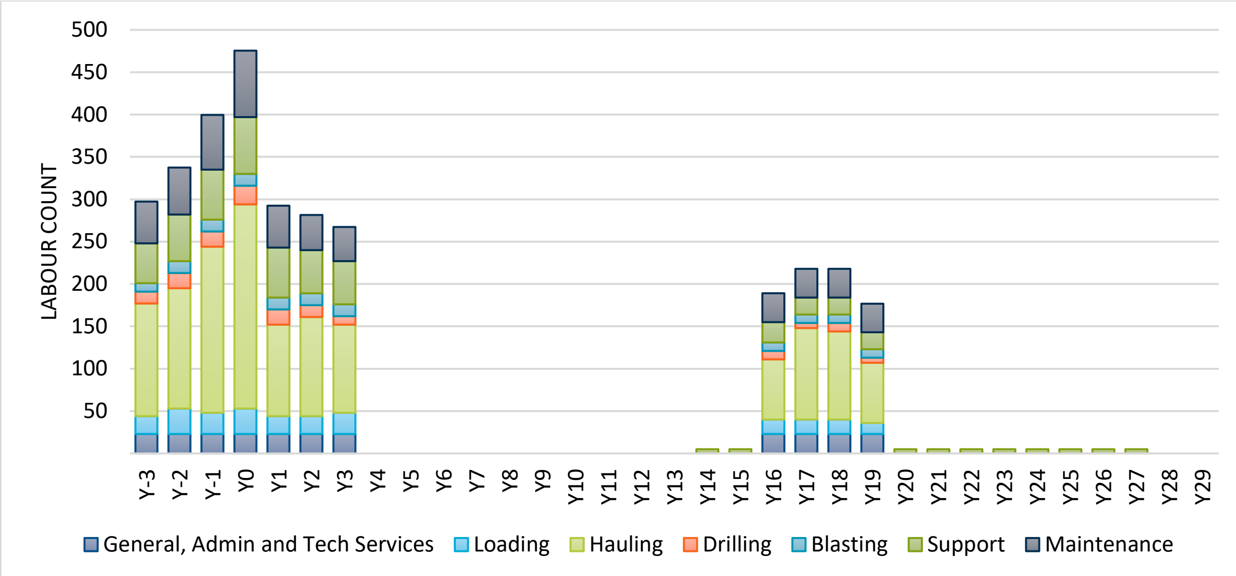


Figure 16-19: Contractor Labour

Table 16-10: Primary Labour
Yamana Gold Inc. – Agua Rica Integrated Project

	Manpower Quantity per Activity							
Year	G&A and Tech Services	Loading	Hauling	Drilling	Blasting	Support	Maint.	Total
Y-3	24	-	-	-	-	-	-	24
Y-2	24	-	-	-	-	-	-	24
Y-1	68	-	-	1	-	-	-	69
Y0	68	-	-	1	-	-	-	69
Y1	72	18	115	23	14	87	86	415
Y2	72	18	124	23	14	86	89	426
Y3	72	18	136	23	14	99	95	457
Y4	72	18	141	23	18	103	102	477
Y5	72	18	149	23	18	98	102	480
Y6	72	18	158	23	18	103	103	495
Y7	72	18	170	18	18	99	103	498
Y8	72	18	162	23	18	99	103	495
Y9	72	18	153	23	18	103	106	493
Y10	72	18	145	18	18	90	106	467
Y11	72	18	145	18	18	90	103	464

Year	G&A and Tech Services	Loading	Hauling	Drilling	Blasting	Support	Maint.	Total
	Manpower Quantity per Activity							
Y12	72	18	153	18	18	94	103	476
Y13	72	18	136	18	18	94	103	459
Y14	72	18	124	23	18	90	103	448
Y15	72	18	119	18	18	90	103	438
Y16	72	18	132	23	18	99	103	465
Y17	72	18	149	23	18	99	103	482
Y18	72	18	145	18	14	99	102	468
Y19	72	18	128	18	14	90	94	434
Y20	72	14	102	14	14	78	80	374
Y21	72	14	85	14	10	70	75	340
Y22	72	14	73	10	10	70	75	324
Y23	72	14	68	10	6	70	74	314
Y24	72	14	64	10	6	70	74	310
Y25	72	10	56	10	6	70	71	295
Y26	72	10	51	6	6	57	66	268
Y27	72	10	47	6	6	62	66	269
Y28	72	10	39	1	2	48	62	234

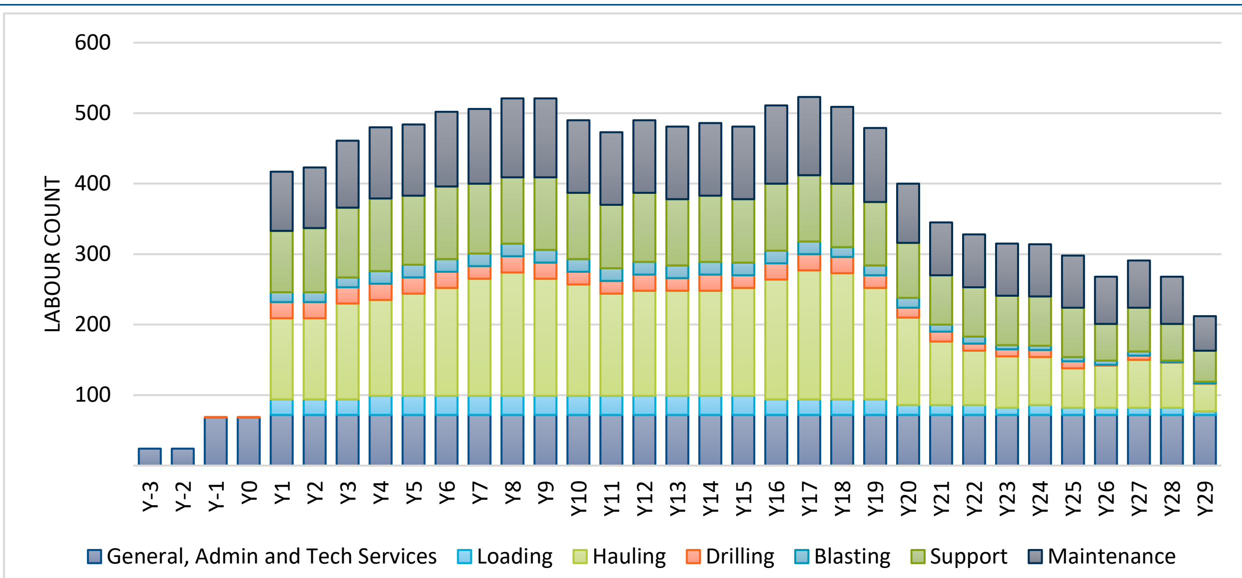


Figure 16-20: Primary Labour

16.6 Groundwater Management Plan

The Piteau, 2013 study indicated an aggressive groundwater management plan will be required to maintain stability of the overall slope in the proposed open pit at Agua Rica. To maintain an adequate factor of safety (FoS) in the pit slope design, a nominal 100 m of depressurization is required in relatively impermeable hydrogeological units such as hydrothermal breccias and intrusive rocks, and up to 200 m of depressurization is required in the metasedimentary rocks.

Achieving adequate depressurization of the pit walls is considered the primary objective for the groundwater management plan, however, dewatering beneath the pit floor would also improve the efficiency of the mine operation. The groundwater management plan for the Project therefore includes measures to depressurize the pit walls and to dewater the base of the pit.

The groundwater management plan includes the following components:

- Horizontal drain holes to depressurize pit walls.
- Sumps to remove groundwater from sinking cuts or the bottom pit bench.
- Trial dewatering wells to attempt to advance dewatering beneath the pit base.
- Groundwater monitoring wells to measure the performance of the depressurization/dewatering measures.

The following sections outline details of the recommended groundwater management plan.

16.6.1 Horizontal Drain Holes

The low hydraulic conductivity of the bedrock at Agua Rica and the expected slow rate of depressurization will require a comprehensive sub-horizontal drain hole drilling program be undertaken from Year 14 onwards of mine life, to achieve the depressurization targets for the open pit slopes. A high density of drain holes is anticipated to be necessary and would be achieved by constructing sub-horizontal drain holes at regular intervals along each pit bench, below the elevation where depressurization measures would be required. The extent of the area requiring drain holes is shown in plan on Figure 16-21. Drain hole installations would start in Year 14 and continue through to the end of mining.

For this design, drain hole quantities are based on drilling at 50 m centres along each bench, over the total area requiring dewatering on each pit phase. Drain hole depths are estimated to average 225 m based on the geotechnical requirements to achieve depressurization of between 100 m to 200 m depth from the pit face. Drain holes will be 125 mm in diameter and lined with 50 mm slotted PVC pipe.

A total of 2,191 drain holes with a cumulative length of 493,000 m of drilling have been estimated. Information regarding the natural pore pressure response to mining will only be available as mining progresses through the early stages. Assumptions built into the assessment for the projected drain hole quantities are based on the available data and experience from other active mining projects.

The 200 m horizontal depth of depressurization required in the metasediments is at the upper limit of what is achievable with drain holes. Where this depth of depressurization is not achieved with the proposed drain hole design, additional mitigation measures, such as longer drain holes, a greater density of drain holes, or applying a vacuum to the drain holes, may be necessary. Additional measures that may be required in these areas are assumed to be offset by reduced drain hole quantities in areas of the pit walls which may depressurize more readily than anticipated.

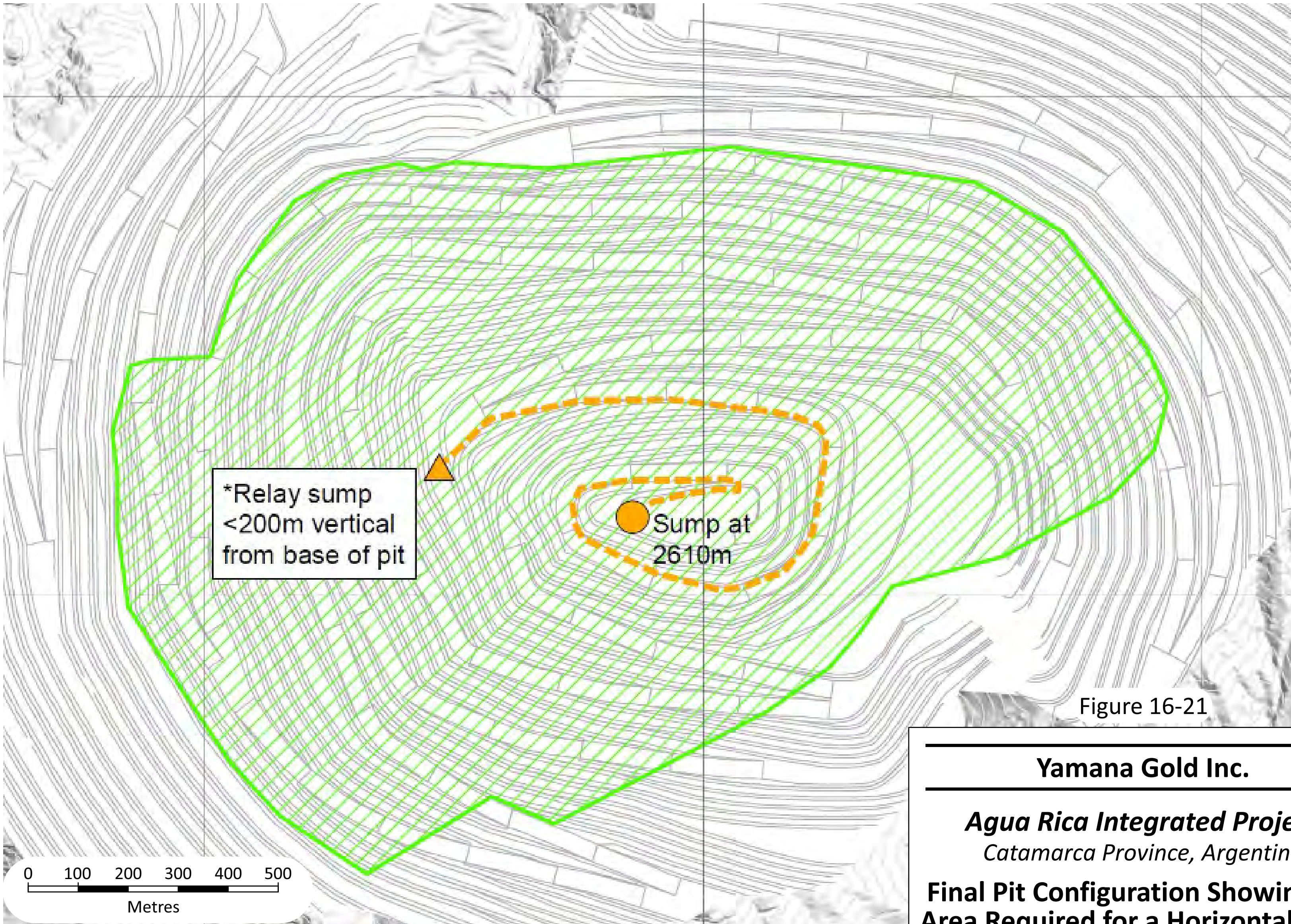


Figure 16-21

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Final Pit Configuration Showing the Area Required for a Horizontal Drain

August 2022

Source: Fluor, 2019.

Achieving adequate stability of the pit walls will require controlling pore pressures to the threshold incorporated in the stability analyses. It will therefore be important to develop an effective drain hole program for the Project. Well monitored drain hole trials should be conducted during the early months of Year 14, to evaluate drain hole performance and to optimize drain hole designs. Data from the proposed monitoring program and initial drain hole trials will identify areas where additional measures may be necessary, and those areas where depressurization may occur naturally, or with a reduced density of drain holes.

16.6.2 Sumps

The design assumes a sump pumping to an elevation that is a maximum of 200 m above the pit base. It would discharge into an effluent tank that would transfer this contact water by multi stage pumps to the crushing area, when necessary. The pit sump system will have to be re-established for each sinking cut. This pump is typically a self-priming diesel pump mounted over skids as shown in Figure 16-22.

In practice, it will not be possible to separate the surface runoff in the base of the pit from groundwater. Any water that cannot be diverted will have to be pumped from the sump at the base of the pit, or from diversion sumps on haul ramps.

Figure 16-22: Typical Self-Prime Diesel Pump for Pit Sump

16.6.3 Dewatering Wells

Dewatering wells to advance dewatering beneath the pit bottom are not expected to be effective for this project, due to the generally low hydraulic conductivity of the rock mass. There is one area of the pit, however, where permeable structures are interpreted to transect the rock mass, and it may be possible to exploit these with dewatering wells to advance dewatering beneath the base of the pit. Five trial wells are proposed for the initial years to determine if the rock mass can be dewatered below the centre of the Rio Minas valley. Five nominal 300 m deep wells are proposed and would be drilled from native ground near the Rio Minas. Two or three monitoring wells would be sited to assess the rate of dewatering on either side of the Rio Minas, beneath the pit areas.

If the initial wells are determined to be effective, additional wells would be designed for subsequent phases of the mine. Cost estimates assume that the dewatering well program would not be continued in subsequent phases.

16.7 Mine Dewatering Flow Estimation

Based on the average annual precipitation, the pit design, and the concept presented, Table 16-11 shows the surface runoff estimation per period for the Project.

Table 16-11: Average Surface Runoff Estimation per Period, L/s
Yamana Gold Inc.– Agua Rica Integrated Project

Year	SRD[1]	Pit Sump	No Contact
-1	157	-	53
0	158	-	51
1	158	-	51
2	158	-	51
3	143	16	51
4	135	23	51
9	44	119	50
14	41	123	50
19	39	123	50
Final Pit	39	125	50

Note:

1. Sediment Retention Dam (SRD)

Pumping water from bottom pit (sumps) can be reduced if it is used for road watering or an alternative to deviate the middle catchment water can be defined. Almost half of the contribution for the pit comes from the middle catchment.

Groundwater estimation inflow to the pit, based on Piteau, 2013, is between 40 L/s and 70 L/s, and a flow of 60 L/s was adopted for the groundwater dewatering design from Year 14 onwards. Groundwater inflows for the first years of operation would be less, and have been estimated to range between 15 L/s to 30 L/s

17.0 RECOVERY METHODS

17.1 Overview

The Alumbrera process plant and supporting facilities were in continuous operation since its initial start up in 1997 until the open pit Mineral Reserves were depleted in 2017. The Alumbrera operation was shut down in October 2018 and placed on care and maintenance pending closure. The Alumbrera mine and concentrator processed a nominal 90,000 tpd of copper and molybdenum ore.

The Project is focussed on maintaining as much of the Alumbrera process and supporting infrastructure as possible. The Agua Rica ore will be crushed at the new mine site and conveyed 35 km west to the existing Alumbrera mill feed stockpile. Nominal LOM for the Project is 28 years. The Alumbrera concentrator capacity will be increased from the current 90,000 tpd to a nominal throughput of 110,000 tpd (40 Mtpa).

The metallurgical plant and main production facilities include the following:

- Primary crushing, conveying, and stockpiling of ore
- Grinding
- Bulk Cu-Mo flotation and regrind
- Bulk concentrate thickening and storage
- Cu–Mo separation
- Copper concentrate thickening, pumping, filtration, storage, and transport
- Molybdenum concentrate thickening, and drying
- Tailings disposal

A full FS for the Project was developed in 2013. The work completed during 2019 and reported in this Technical Report is derived predominantly from the original 2013 FS report which was updated based on the results of investigations and trade off studies completed during 2019.

17.2 Process Design Basis

17.2.1 Process Design Criteria

The process design criteria define the process engineering and design specifications. In addition to covering the facilities listed earlier, the process design criteria include the following areas:

- Effluent treatment plant
- Reagents
- Plant services

The process design criteria for the process facilities in Table 17-1 are based on information received from Alumbrera. Where data were not available, criteria were developed from reasonable assumptions using data from previous and similar process applications. The criteria include the 2019 modifications.

17.2.2 Process Block Diagrams

The process block flow diagram developed in 2013 is shown in Figure 17-1. An important difference in the 2019 study is that waste will be trucked to a waste dump close to the mine rather than crushing and conveying to the site in the Campo Arenal area.

Table 17-1: Process Design Criteria (Updated to 2019)
Yamana Gold Inc. – Agua Rica Integrated Project

Criterion	Unit	Nominal	Design	Comments
Agua Rica Mine Pit (Ore Supply)				
Operating Days per Year	days/year	350		
Operating Hours per Day	hours/day	24		
Ore Processing Rate, dry	tpa	40,150,000		
Primary Crushing and Conveying				
Operating Days per Year	days/year	350		
Operating Hours per Day	hours/day	24		
Crusher Plant Operating Time	%	70		
Crusher Plant Operating Hours	hours/year	5,880		
Ore Conveyor Operating Time	%	90		
Ore Conveyor Operating Hours	hours	7,560		
Alumbrera Grinding and Flotation Plant				
Operating Days per Year	days/year	365		
Operating Hours per Day	hours/day	24		
Daily Ore Treatment, dry	tpd	110,000		
Plant Operating Time	%	92		
Plant Operating Hours	hours/year	8.059		
Ore Characteristics				
Head Grade – Avg. over LOM	% Cu	0.51		
Head Grade – Avg. over LOM	% Mo	0.032		
Head Grade – Avg. over LOM	% As	0.013		
Head Grade – Avg. over LOM	% Zn	0.075		
Head Grade – Avg. over LOM	% Pb	0.033		
Head Grade – Avg. over LOM	g/t Au	0.21		
Average Work Index	kWh/t	10.7		

Criterion	Unit	Nominal	Design	Comments
		Primary Crushing		
Throughput– Total dry tph	tph	6,828	7,852	
Throughput – Peak – Total	tph	9,000		High % run of mine (ROM) fines
Ore Delivery Conveyor				
Throughput – Total dry	dry tph	5,310	6,372	
Throughput – Peak – Total	dry tph	6,828		Matches crushing nominal capacity
		Ore Primary Crusher		
Number of Crushers	-	1		
Type	-	Gyratory		
Size inch	inch	63 x 114		
Capacity	dry tph	6,828	7,852	
Crusher Drive Motor	kW	750		
		Sacrificial Ore Conveyor & Ore Silo		
Number	-	1		
Design Factor	-	1.15		15% catch-up
Capacity, Dry	dry tph	6,828	7,852	
Capacity, Dry – Peak	dry tph	9,000		High % ROM fines – Peak
Belt Width	mm	2,134		
Belt Speed	m/s	4.0		
Ore silo, capacity	t	7,000		
		Ore Overland Conveyor System		
Number	-	6		
Design Factor	-	1.20		20% catch-up
Capacity	dry tph	5,310	6,372	
Capacity – Peak	dry tph	6,828		Matches crushing nominal capacity
Belt Width	mm	1,524		
Belt Speed	m/s	6.6		
		Existing COS Conveyor		
Number	-	1		
Capacity	dry tph	4,400	8,400	
Belt Width	mm	1,829		
Belt Speed	m/s	5.1		–

Criterion	Unit	Nominal	Design	Comments
		Grinding – General Operation		
Throughput, Dry	tpd	110,000	121.000	
Design Factor	-	1.10		
Hourly Throughput, Dry	tph	4,982	5,480	
Overall Plant Operating Time	%	92		
Ball Mill Circuit Product, P80	µm	150		From 2012 test work
BWI, Weighted Average (Year 1-5)	kWh/t	10.6		From 2012 test work
BWI – Maximum kWh/t	kWh/t	11.9		From 2012 test work
BWI – Minimum	kWh/t	9.4		From 2012 test work
SPI, Average (Year 1-5)	min	TBD	35.4	From 2012 test work
		Primary Grinding – SAG Mills (Existing)		
Number	-	2		SAG Mill No. 1 & No. 2
Diameter	m	10.9		
EGL	m	5.2		
Mill Motor Power (each)	kW	13,423		
		Pebble Crusher Circuit (Existing)		
Circuit Operating Time	%	92	92	
Pebble Production	% new feed		15	
Number	-	4		
Installed Motor Power – Each	kW	447		
		Secondary Grinding – Ball Mills (Existing)		
Number Installed	-	6		Ball Mill No.1 A/B, 2 A/B, 3B, SAG 3 converted to B/M
Mill Diameter x EGL	m	6.1 x 9.3		1A, 1B, 2A, 2B, 3B
Mill Motor Power	kW	5,968		
SAG 3 converted	kW	4,849		
Mill Diameter x EGL	m	10.98 x 5.18		
Mill Diameter x EGL	m	5.03 x 8.84		
		Rougher Flotation (Existing)		
Number of Banks	-	6		Mechanical
Cell Volume	m^3	100, 160		4 off 100 OK, 2 off 160 Wemco
Feed F80	µm	150		
Feed Solids Flow Rate	tph	4,982	5,480	
pH	-	9 to 10		

Criterion	Unit	Nominal	Design	Comments
		Rougher Scavenger Flotation (Existing)		
Number of Banks	-	6		Mechanical
Number of Cells or Banks	-	8 (OK) 6 (Wemco)		
Cell Volume	m^3	100, 160		100 (OK), 160 (Wemco)
Feed F 80	µm	130		
pH	-	9 to 10		
		Coarse Cleaner Flotation, Existing Cells		
Number of Banks	-	2		Outokumpu
Number of Cells per Bank	-	8		
Cell Volume	m^3	100		
		Rougher Concentrate Flash Cleaner, Jameson Flotation (New)		
Number of Cells	-	1		B5400/18 Jameson Cell
Cell Volume	m^3	4.0		
Cell Diameter	m	5.4		
		Existing Regrind Circuit Ball Mills		
Regrind Stream	Coarse Cleaner Concentrate, Jameson Tailings			
Number	-	3		Includes existing B/M 12
Motor Power (Each)	kW	3,357		
Diameter x EGL	m	5.03 x 8.84		
B/M 12, power	kW	3,357		
Diameter x EGL	m	5.03 x 8.84		
		New Regrind Mill		
Regrind Stream	Coarse Cleaner Concentrate, Jameson Tailings			
Number	-	1		
Motor Power (Estimated)	kW	3,000		IsaMill or equivalent
		Flash Scavenger Cleaner, Jameson (New)		
Number of Cells	-	2		B5400/18 Jameson Cell
Cell Volume	m^3	4.0		
Cell Diameter	m	5.4		
		First Cleaner Flotation (Existing)		
Number of Banks	-	1		Mechanical
Number of Cells per Bank	-	6		
Cell Volume	m^3	160		

Criterion	Unit	Nominal	Design	Comments
		First Cleaner – Scavenger Flotation (Existing)		
Number of Banks	-	1		Mechanical
Number of Cells per Bank	-	5		
Cell Volume	m^3	160		
		Second Cleaner Flotation (New)		
Number of Banks	-	1		Mechanical
Number of Cells per Bank	-	6		
Cell Volume	m^3	70		
		Third Cleaner Flotation (Existing)		
Number of Banks	-	1		Mechanical
Number of Cells per Bank	-	6		
Cell Volume	m^3	40		
		Bulk Concentrate Thickening		
Number	-	2		Can operate in series or parallel
Diameter	m	30		
Thickener Settling Rate	m^2/tpd		0.25	
Underflow Pulp Density	% w/w	50		
		Mo Rougher Flotation		
Number of Banks	-	2		Mechanical 1 existing
Number of Cells per Bank	-	12		12 cells existing
Cell Volume	m^3	8.5		
pH	-	9 to 11		
		Mo First Cleaner Flotation		
Number of Banks	-	2		Mechanical 1 existing
Number of Cells per Bank	-	3		3 cells existing
Cell Volume	m^3	8.5		
		Mo Second Cleaner Flotation		
Number of Banks	-	2		Mechanical 1 existing
Number of Cells per Bank	-	2		2 cells existing
Cell Volume	m^3	8.5		
		Mo Third Cleaner Flotation		
Number of Cells	-	4		Column 3 operating, 1 spare
Cell Volume	m^3	4.0		
Cell Diameter	m	0.8		
Cell Height	m	8.5		

Criterion	Unit	Nominal	Design	Comments
		Mo Fourth Cleaner Flotation		
Number of Cells	-	3		Column 2 operating, 1 spare
Cell Volume	m^3	4.0		
Cell Diameter	m	0.8		
Cell Height	m	8.5		
		Mo Regrind Circuit – Regrind Mill – New		
Regrind Stream		Mo Second Cleaner Concentrate		
Number	-	1		
Type	-	Ball Mill		
		Cu Concentrate Thickener (Existing)		
Number	-	2		
Diameter	m	30		
		Copper Concentrate Filtration – Existing – No changes anticipated		
		Mo Concentrate Thickening		
Number	-	1		1 existing (spare), 1 new
Diameter	m	15		
		Mo Concentrate Filtration		
Filter Type	-	Vacuum Disc		
Number	-	1		1 existing (spare), 1 new
		Mo Concentrate Drying		
Type	-	Screw-Type Dryer		Holo-Flite
Number	-	1		1 existing (spare), 1 new
Target Moisture	% w/w	3	5	

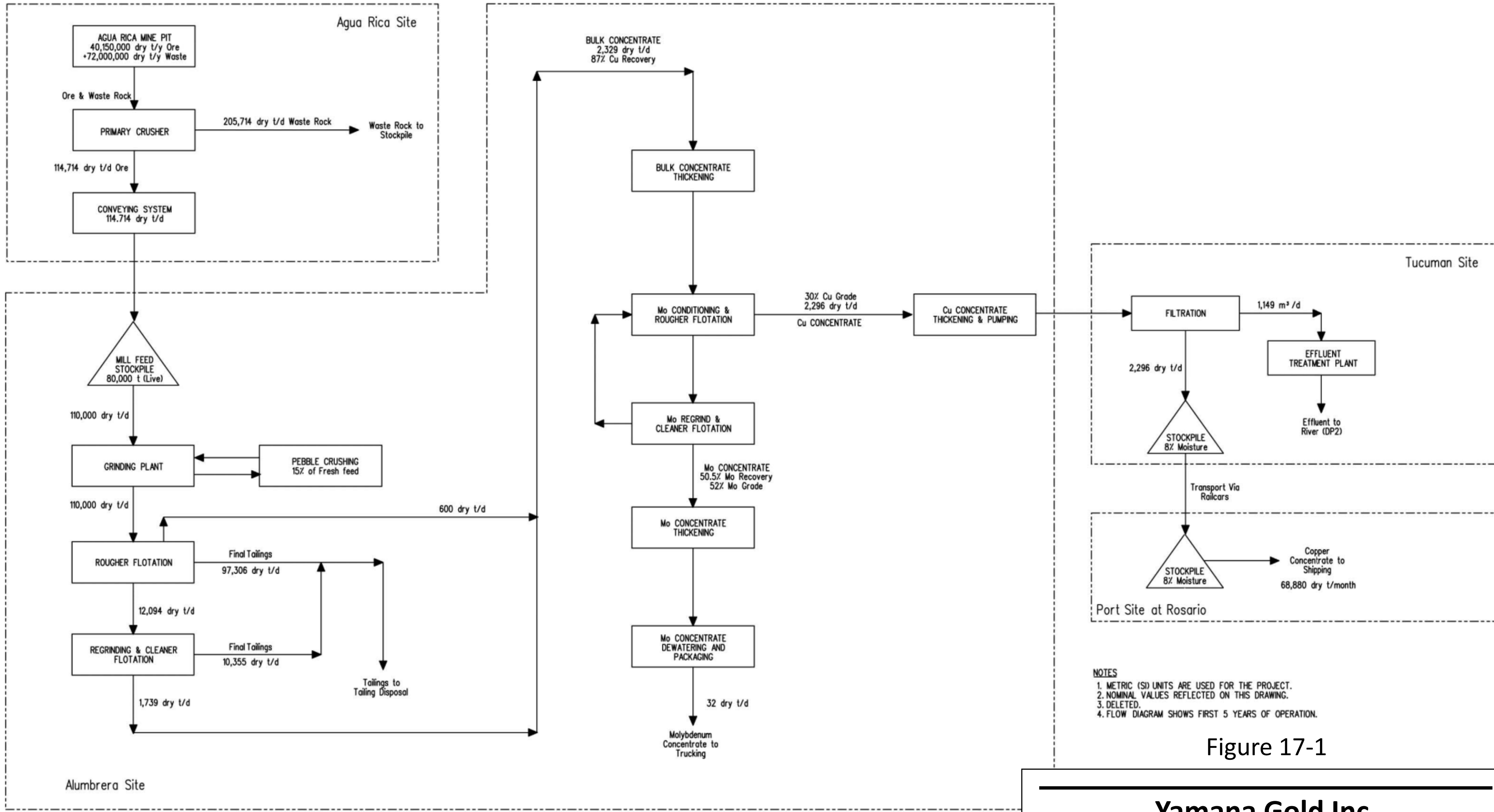


Figure 17-1

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Block Flow Diagram
First Five Year Average

August 2022

Source: Fluor, 2020.

17.2.3 Process Flow Diagrams

Process flow diagrams (PFDs) were generated for the process facilities. The 2013 PFDs still represent the underlying basis for the 2019 work.

17.3 Plant Design

17.3.1 Primary Crushing Area Location and Layout

A review of the primary crushing and mine services area location and layout was conducted in 2019 to determine if modifications were required to meet the operational requirements of the current Project.

The location and general layout designs of the 2013 FS (110,000 tpd Case) and 2018 Conceptual Study (50,000 tpd Case) were applied as a base to work from and apply required changes.

It is recommended that the general location of the platform, on which the primary ore crusher and mine services infrastructure is located, remains as in the previous studies, matched with the portal, and aligned with the ore conveyance tunnel to the El Globo area in the Campo Arenal Basin.

The general plan layout of the ore crushing, and mine services area is shown in Figure 17-2.

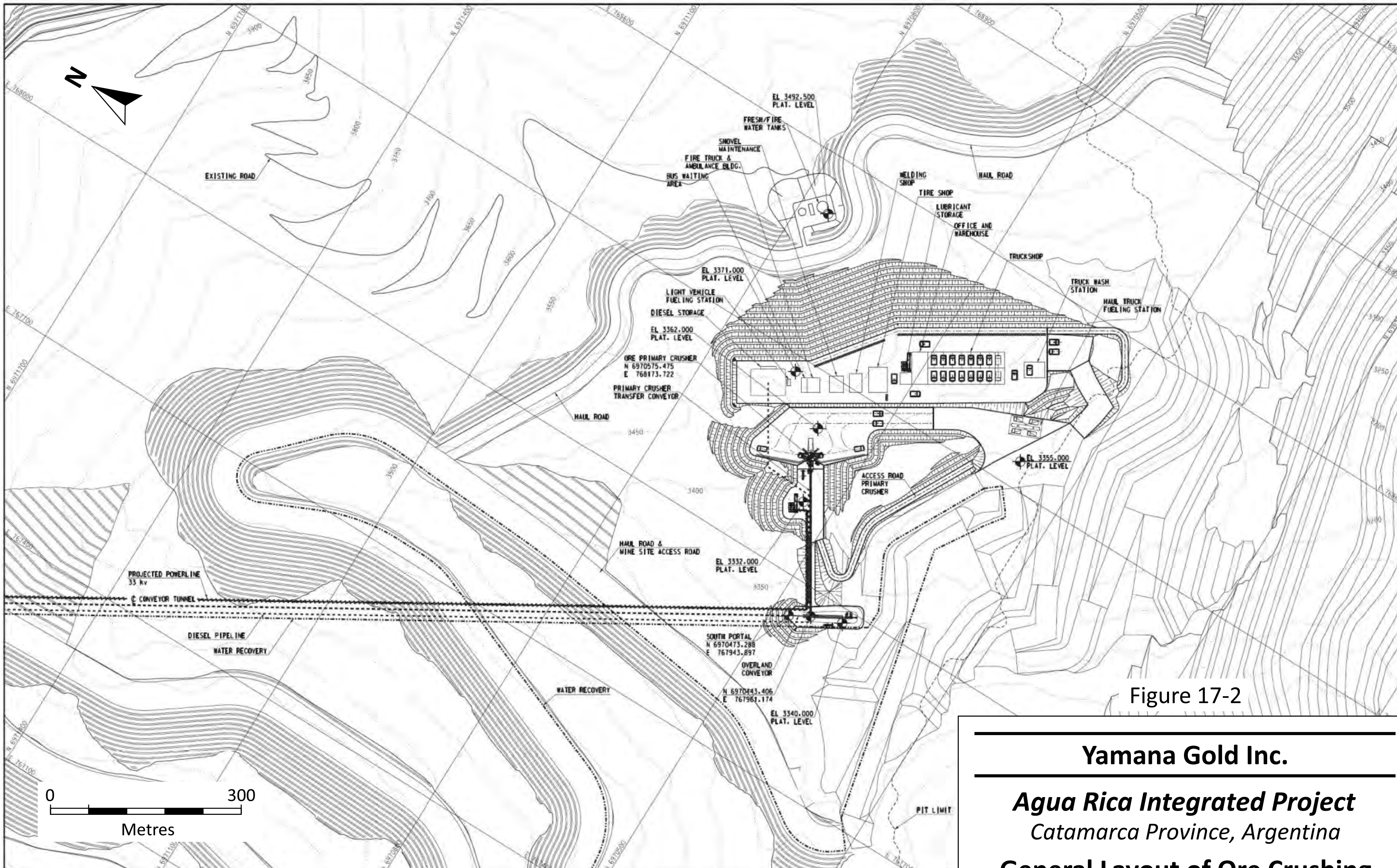


Figure 17-2

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

General Layout of Ore Crushing and Mine Services Area

August 2022

Source: Fluor, 2020.

17.3.2 Ore Crushing and Conveying to Alumbrera

17.3.2.1 Ore Crushing

The ore primary crushing plant will consist of a single 1,600 mm x 2,900 mm (63” x 114” or 60” x 113” depending on manufacturer) top service gyratory type crusher located within a fully buried concrete building. The crusher will have a design throughput of 7,852 tph (dry) and will be fed ROM material by 320 t haul trucks via one of two dump stations to a dump pocket located immediately above the crusher. The dump pocket will have a live capacity of 700 t, approximately two truckloads. A covered access ramp will be provided at the dump pocket, allowing for vehicles to operate on all sides of the crusher during normal operation. Additionally, it will also provide mobile equipment access to the pocket to excavate dead material, replace liners and other maintenance activities. A pedestal mounted hydraulic rock breaker will be used to break oversize lumps within the dump pocket. An operator cab will be positioned above the dump pocket.

The crusher is located near to the pit to minimize the truck haulage distance.

Primary crushed ore will be discharged into a surge pocket below the crusher before being reclaimed by a sacrificial ore conveyor. Spile bar frames will be installed at the conveyor loading area to block material flow during maintenance. The sacrificial ore conveyor will be sized for a capacity of 9,000 tph (dry) to handle the potential flush rate of fine material through the crusher. Ore will exit the primary crushing building through the crusher discharge tunnel and feed the ore surge bin. The conveyor will be equipped with a self-cleaning tramp metal magnet and belt scale.

The primary crushing plant will be equipped with a stationary jib crane positioned above a lifting well that passes through each floor level. In addition, maintenance hoists will be provided at the crusher motor and at the sacrificial ore conveyor tail pulley.

A 272 t capacity mobile crane will be used to service the primary crushing station, as well as the elevated equipment at the surge bin area.

17.3.2.2 Ore Surge Bin and Reclaim

The ore surge bin is located near the crusher on the alignment between the crusher and the south portal of the six kilometre ore conveyor tunnel.

The ore surge bin will have a live capacity of 7,000 t and provide approximately one hour of retention time. It is equipped with a bin vent dust collection system, overflow chute with bunker at grade and service openings with staging platforms at the bin floor level. During maintenance periods, these service openings provide entry for bobcats. A mobile excavator may also be used inside the bin for liner plate replacement activities.

The primary purpose of the surge bin is to provide a degree of operational isolation between the crusher and the 35 km overland conveyor system. The design criteria were based on a crusher utilization of 70% (16.8 h/day) compared with 90% (21.6 h/day) for the series of six overland conveyors and the existing stacking conveyor. A dynamic simulation of the materials handling system to evaluate system utilization and surge bin capacity has not yet been completed.

Ore will be reclaimed from the surge bin via two parallel variable frequency driven (VFD) apron feeders complete with dribble belts. Spile bar frames will be installed at the feeder openings to block material flow during maintenance.

Material from the apron feeders will be transferred onto the ore surge bin discharge conveyor en route to the ore overland conveyor system. The surge bin discharge conveyor will be equipped with a self-cleaning magnet followed by a metal detector to reduce the likelihood of tramp metal reaching the overland conveyors.

Conveyor belt reels will be provided to facilitate sacrificial conveyor belt replacement. The sacrificial conveyor drive stations, take-ups, surge bins, and reclaim equipment will be serviced by mobile cranes.

17.3.2.3 Ore Conveyor – Overland

The ore overland conveyor system consists of six conveyors traversing approximately 35 km of terrain from the proposed Agua Rica crushing area at Rio Minas, through six kilometres of tunnel, across the El Globo valley, intersecting Route 47, along the existing power line corridor through Campo Arenal, down the Escalares, around the northern edge of the Alumbrera tailings containment area, to the existing Alumbrera facility. The six conveyors will be 1,524 mm wide operating at 6.6 m/s and will carry a peak capacity of 6,828 tph (dry). This tonnage will be controlled via a feedback loop from a belt scale after the first overland conveyor loading point back to the surge bin apron feeders.

Table 17-2 summarises the characteristics of the six conveyors making up the conveyor system.

Various options were studied in 2013 during the design of the ore overland conveyor system. Prior to finalizing the overland conveyor, the routing was evaluated to minimize civil costs, provide equipment selection within current operating ratings, and provide standardization of components. In 2019 a conceptual design was carried out by Conveyor Dynamics Inc. for a conveyor system over the mountain to replace the tunnel. The technical and financial evaluations determined that the tunnel was the best option.

The final ore overland conveyor will discharge into a new feed chute installed partially along the existing Alumbrera stockpile feed conveyor. The existing Alumbrera primary crushing facility and crusher discharge conveyor upstream of the tie-in point will be decommissioned. The existing Alumbrera coarse ore stockpile, with a total capacity of 1 Mt will be maintained, without modification.

Table 17-2: Summary of the Ore Overland Conveyor System
Yamana Gold Inc. – Agua Rica Integrated Project

Parameter	Units	Conveyor 1	Conveyor 2	Conveyor 3	Conveyor 4	Conveyor 5	Conveyor 6
Length	m	7170	5220	5978	4589	5051	7324
Height	m	-300	-287	142	44	-261	-83
Belt Rating	N/mm	ST-6300	ST-6300	ST-5400	ST-5400	ST-5400	ST-5400
Motors at Head	kW	0	0	4 x 2000	3 x 2000	0	3 x 2000
Motors at Tail	kW	3 x 1600	3 x 1600	0	0	3 x 1600	1 x 2000
Total Power	kW	4800	4800	8,000	6000	4800	8000
Demand Power	kW	-916	-1765	6057	3893	-1570	3503
Total Power (kW)						9203	
Take-up Location		Head	Head	Tail	Tail	Head	Head
Take-up Tension	kN	220	430	235	250	280	630

Parameter	Units	Conveyor 1	Conveyor 2	Conveyor 3	Conveyor 4	Conveyor 5	Conveyor 6
Brakes at Head	kN-m	0	0	0	1 x 170	4 x 310	2 x 210
Brakes at Tail	kN-m	4 x 360	4 x 360	0	1 x 200	0	2 x 300
Backstops	kN-m	0	0	4 x 400	3 x 400	0	0
Belt width	mm	1524	1524	1524	1524	1524	1524
Belt speed	m/sec	6.6	6.6	6.6	6.6	6.6	6.6
Design/peak capacity	tph	6372/6828	6372/6828	6372/6828	6372/6828	6372/6828	6372/6828

Each overland conveyor will be equipped with belt turnover stations at the head and tail ends, which will invert the return side belt to reduce spillage and component wear. Maintenance hoists will be installed at each transfer station and drive station, and service winches will be installed at each take-up station.

The transfer stations between the overland conveyors will include rock boxes. These transfer chutes will be designed with sufficient volumes to contain surges resulting from differential conveyor stopping times. The loading areas will be designed to clear plugged chutes, should they occur, in a safe and efficient manner.

It should be noted that the conveying and stockpiling of waste in the El Globo area is no longer applicable.

17.3.3 Concentrator

The Alumbrera concentrator is fed primary crushed ore from the existing Alumbrera 1 Mt capacity stockpile by three reclaim lines, each fitted with three apron feeders and a single conveyor.

The original plant capacity was 80,000 tpd for the two initial grinding lines, consisting of two 10.97 m diameter x 5.14 m effective grinding length (EGL) SAG grinding mills and four ball mills. Subsequently, plant capacity was increased to 90,000 tpd through the addition of the third reclaim line and a third, smaller, SAG mill and two additional ball mills. The maximum continuous capacity of the plant was 105,000 tpd.

A visit was made by Project team members to the Alumbrera plant site early in the present PFS phase in order to assess the condition and capacity of the existing Alumbrera stockpile reclaim system and the plant feed conveyors. The visit confirmed that the existing installation is in generally good condition considering its history and will be adequate for the required Agua Rica process duties.

17.3.3.1 Grinding

17.3.3.1.1 Basis of 2013 Feasibility Study

The nominal capacity of the plant will be increased to 110,000 tpd when the Agua Rica ore is introduced. Although the capacity will be increased, the softer Agua Rica ore will require only the two original grinding SAG mills (SAG mills 1 and 2), and five of the large ball mills (1A, 1B, 2A, 2B, and 3A). Small SAG mill 3 and ball mill 12 will not be required to achieve the nominal throughput.

The original Alumbrera grinding circuit, which will continue to operate, consists of two parallel grinding lines. Each line is composed of one SAG mill, two ball mills, and classification systems operating with the existing pebble crushing circuit.

Oversize SAG mill discharge will feed the pebble circuit, which consists of four pebble crushers. The crushed pebbles will be recycled by conveyors to the SAG mill feed conveyors; oversize pebbles will be recycled to pebble crushing.

Discharge from each grinding circuit is collected in a common pump box. The original pump box has three outlets and three pumps. Two pumps from each pump box feed each of the four existing ball mill cyclopacs. The third pump in each box will feed the fifth ball mill (3B) and its cyclopac, which is located outside the main concentrator building.

Cyclone overflow from all cyclopacs will discharge into a common launder and flow by gravity to a rougher flotation feed distributor box. Cyclone underflow gravitates back to the ball mill feed chute, with ball mill discharge flowing into the cyclone feed pump box.

17.3.3.1.2 Additional Analysis for 2019 Pre-Feasibility Study

Part of the brief for PFS-A was to revisit the grinding circuit capacity and performance analysis from 2013, while also considering the potential for using all the available installed equipment in the existing Alumbrera plant, thus also including the small SAG mill 3 (converted to a ball mill). The ball mill 12 circuit will be re-piped as an additional regrind mill.

17.3.3.2 Bulk Flotation and Regrind

17.3.3.2.1 Basis of 2013 Feasibility Study

Bulk flotation feed will be delivered by launder from the overflows of each of the five cyclopacs to collect into a new distribution box that will split the slurry in a 67%:33% ratio to feed three banks of rougher flotation cells, each bank having two rows of mechanical cells.

The first two banks of rougher and rougher-scavenger flotation cells will reuse the existing four rows of eight 100 m3 self-aspired tank cells (total of 32 cells). The third bank of rougher and rougher-scavenger flotation cells will consist of two rows of ten 160 m3 self-aspirated mechanical tank cells, 18 of which are existing units.

The first two cells in each row will function as the rougher cells and the remaining cells per row will operate as the rougher-scavenger cells. Concentrate from the first two cells (rougher cells) will be primarily sent to new rougher Jameson flotation cells with the option of sending a portion of this stream directly to the existing regrind circuit. Tailings from the rougher cells will feed the rougher-scavenger cells. Rougher Jameson cells concentrate will be sent to the bulk thickeners, and tailings from the rougher Jameson cells will be routed to the existing regrind circuit. Concentrate from the rougher-scavenger cells will be sent to the existing regrind circuit and tailings will report to the tailing collection box.

Discharge from the existing regrind circuit will feed the bulk flotation cleaner circuit to produce a Cu-Mo bulk concentrate. The bulk flotation cleaner circuit consists of new cleaner Jameson flotation cells, first cleaner, and first cleaner scavenger flotation stages, a new regrind circuit, second cleaner flotation, and third cleaner flotation cells.

Existing regrind discharge will feed to two new cleaner Jameson cells operating in parallel. Cleaner Jameson cells concentrate will be sent to the bulk thickener. Tailings from the cleaner Jameson cells will be routed to the first cleaner flotation cells.

The existing row of eleven 160 m3 tank flotation cells will be reused as first cleaner and first cleaner scavenger flotation cells. The first six cells from this row will be set up as first cleaners. Tailings from the first cleaners will feed the last five cells, set up as the first cleaner scavenger cells. The fifth and sixth rougher cells will have the option to operate as first cleaner-scavenger cells. The first cleaner concentrate will be pumped to feed the new regrind circuit. Tailings from the first cleaner scavenger cells will report to the tailings collection box.

The new regrind circuit consists of a hydrocyclone classification system and a regrind mill. Concentrate from the first cleaner cells will be sent to the regrind cyclopac. Underflow from the regrind cyclopac will flow by gravity into the new regrind mill. The new regrind mill will operate in an open circuit with the regrind cyclopac. Overflow from the regrind cyclopac and regrind mill discharge will feed the second cleaner flotation circuit.

Second cleaner flotation consists of one row of six new 70 m3 tank flotation cells. Tailings from the second cleaner cells will be routed to first cleaner flotation feed, and concentrate will be pumped to feed the third cleaner flotation cells. The third cleaner flotation cells will consist of one row of existing six 40 m3 cells, the tailings will report back to the second cleaner flotation feed, and the concentrate will be routed to feed the bulk concentrate thickeners.

Concentrate from the third cleaner flotation cells will be the final bulk concentrate that is pumped into two existing high rate thickeners. The thickeners will operate in series with the option to operate in parallel. Thickener underflow will be stored as feed to the copper-molybdenum (Cu-Mo) separation circuit. Thickener overflow will be routed to a process water storage facility to be reused in the plant.

The existing Jameson flotation cells will not be removed nor required.

17.3.3.2.2 Additional Development During PFS-A.

The 2019 metallurgical analysis recommends an updated and more efficient design for the flotation and regrinding circuits than in the 2013 FS, considering a coarse cleaning concept that provides the same overall metallurgical recoveries as before, however, with one expanded regrind stage. Mineralogical analysis showed that the scavenger concentrate contained significant amounts of liberated pyrite, which could be rejected in coarse cleaning with adequate reagent and pH control as was successfully implemented at the Pinto Valley operation in Arizona, USA. It was conservatively estimated that 20% of the scavenger concentrate mass could be rejected with minimal loss of copper at the same time reducing the load on the regrind circuit. The flowsheet shown in Figure 17-3 is similar to the flowsheet designed in 2013 but with the addition of the coarse cleaner circuit and one stage of regrind to a P80 size of 20 µm. The 2013 circuit used the existing regrind mills to grind to a P80 size of about 40 µm and a second stage using a 3,000 kW IsaMill to grind to a P80 size of 20 µm.

The new circuit includes the following:

- Adding a new rougher concentrate flash cleaner flotation stage (single current-generation Jameson cell or equivalent).
- Reconfiguring two rows of eight existing Outotec 100 m^3 cells for coarse cleaner flotation duty.
- Adding a new concentrate scavenger concentrate flash flotation stage (single current-generation Jameson cell or equivalent.
- Adding a new second cleaner flotation row of six 70 m^3 cells, as per the 2013 FS.
- Adding additional regrind capacity (existing B/M 12 plus a new 3,000 kW mill) to operate in parallel with the existing regrind mills.

17.3.3.2.3 Final Circuit Configuration

The 2019 metallurgical analysis recommends an updated and more efficient design for the flotation and regrinding circuits than in the 2013 FS, considering a coarse cleaning concept that provides the same overall metallurgical recoveries as before, however, with one expanded regrind stage. Mineralogical analysis showed that the scavenger concentrate contained significant amounts of liberated pyrite, which could be rejected in coarse cleaning with adequate reagent and pH control as was successfully implemented at the Pinto Valley operation in Arizona, USA. It was conservatively estimated that 20% of the scavenger concentrate mass could be rejected with minimal loss of copper at the same time reducing the load on the regrind circuit. The flowsheet shown in Figure 17-3 is similar to the flowsheet designed in 2013 but with the addition of the coarse cleaner circuit and one stage of regrind to a P80 size of 20 µm. The 2013 circuit used the existing regrind mills to grind to a P80 size of about 40 µm and a second stage using a 3,000 kW IsaMill to grind to a P80 size of 20 µm.

17.3.3.3 Copper-Molybdenum Separation

17.3.3.3.1 Basis of 2013 Feasibility Study

Bulk concentrate from the stock tanks will feed the Cu-Mo Separation Circuit to produce copper concentrate and molybdenum concentrate products.

The existing molybdenum flotation circuit at the Alumbrera plant will remain as is. A parallel molybdenum flotation circuit, similar to the current design, will be added to the system.

Differential flotation will be used to separate copper and molybdenum concentrates in the Cu-Mo separation circuit (molybdenum flotation). The molybdenum flotation circuit will consist of bulk concentrate storage tanks that feed the molybdenum flotation conditioning tanks and molybdenum rougher cells, which will be followed by a four stage cleaning circuit that will include regrind. Mechanical flotation cells will be used for the rougher and first and second cleaner circuits, and column cells will be used for each of the third and fourth cleaner stages.

Bulk concentrate will feed two bulk concentrate conditioning tanks (one existing, one new), where the feed will be conditioned with sulphuric acid (H2SO4) and pumped to two flotation rougher conditioning tanks (one existing, one new) to be conditioned with sodium hydrosulphide (NaHS). Each flotation conditioning tank will feed two rows of molybdenum flotation (one existing, one new). Conditioned feed from each tank will be pumped to rougher flotation cells. Each row of roughers will consist of 12 mechanical cells arranged in triplets. Rougher flotation tailings will report to the copper concentrator thickener and rougher flotation concentrate will be routed to the molybdenum first cleaner flotation feed box.

Each of the two rows of molybdenum first cleaners will consist of three mechanical cells; one row is currently in place. Tailings from each row of the molybdenum first cleaner flotation cells will be routed to the rougher flotation feed. Molybdenum first cleaner flotation concentrate will be directed to the molybdenum second cleaner flotation cell feed box. Each row of molybdenum second cleaners will comprise of two mechanical cells. Molybdenum second cleaner concentrate from both rows will be combined in the molybdenum regrind feed tank, and tailings from each row will report to the molybdenum first cleaner feed box.

A new concentrate regrind system will be added, as the current Alumbrera molybdenum circuit does not include a regrind system. The new molybdenum regrind circuit will consist of a cyclone classification system and a ball mill. Combined second cleaner concentrate will be sent to the molybdenum regrind cyclopac. Underflow from the molybdenum regrind cyclopac will flow by gravity into a regrind mill feed launder prior to entering the molybdenum regrind mill. The new molybdenum regrind mill will operate in a closed circuit with the molybdenum regrind cyclopac. Overflow from the molybdenum regrind cyclopac will feed the two-stage molybdenum column flotation (third and fourth cleaners).

The molybdenum third cleaner feed tank will receive the overflow from the molybdenum regrind cyclopac. Feed to the molybdenum third cleaner cells will be pumped and distributed equally to three column cells, with one additional column cell as a standby spare. Concentrate from this stage will be routed to the molybdenum fourth cleaner feed tank, and tailings will collect in a tank prior to being split to each row of molybdenum second cleaner cells. Feed to the molybdenum fourth cleaner cells will be pumped and distributed equally to two column cells, with one additional cell as a standby spare. Tailings from the molybdenum fourth cleaner cells will be combined and routed to the molybdenum third cleaner feed tank, and concentrate will report to molybdenum concentrate thickening.

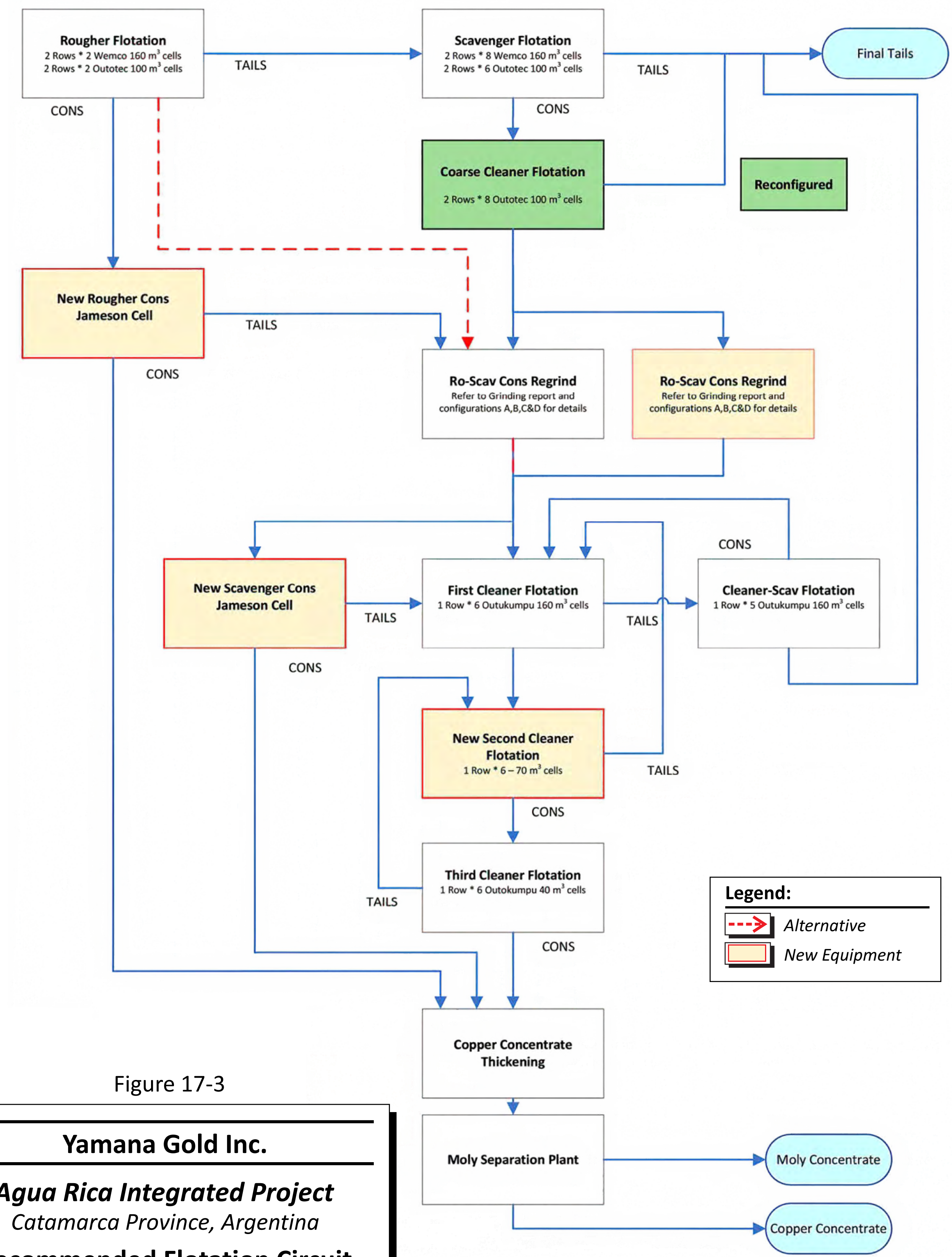


Figure 17-3

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Recommended Flotation Circuit 2019 Review

August 2022

Source: Fluor, 2019.

17.3.3.3.2 Additional Development During 2019 Pre-Feasibility Study

The Agua Rica ore types that will be treated at Alumbrera are considerably higher in molybdenum content than the Alumbrera ore; the capacity of the Cu-Mo section of the plant will have to be increased to accommodate the additional molybdenum concentrate production.

The 2013 FS considered this increase, where an expanded Cu-Mo section of the plant was planned to go into production in Year 4 of the Project based on the mine plan at that time.

A brief review of the molybdenum plant expansion requirements for the Project was carried out based on the new mine plans generated for the 40 Mtpa Base Case, to adjust the design and sustaining capital cost estimate from the 2013 basis.

17.3.3.3.3 Agua Rica Molybdenum Production – Comparison of 2013 and 2019 Mine Plans

The 40 Mtpa Base Case mine plan for Agua Rica considers an arsenic constraint in the plant feed that would maintain the arsenic content of the final concentrate to 0.5% As. There is also an unconstrained 40 Mtpa mine plan. An analysis compared the molybdenum concentrate production profiles based on these two 2019 mine plans with the corresponding information from 2013. There is no significant difference between the 2019 mine plans and the 2013 mine plan. Therefore, the 2013 concept for the molybdenum plant expansion would be carried forward into the current study, with adjustment of the capital costs to align with present day values. The molybdenum plant expansion will start production in production Year 4.

17.3.3.4 Molybdenum Concentrate Thickening, Filtration, Drying and Transport

The existing molybdenum thickening, filtration, and drying circuit at Alumbrera plant will require minimal modifications. A parallel circuit, similar to the current design, will be added to the system to meet the capacity requirement.

Concentrate from the final molybdenum flotation cleaner circuit will be flocculated and thickened in two high rate thickeners (one existing, one future) operating in parallel. Thickener underflow will be sent to the molybdenum filters, and thickener overflow from the thickener will be routed to a process water storage facility to be reused in the plant.

The molybdenum filters (one existing, one future) will be disc type filters that produce a filter cake that will be further dried in molybdenum dryers. Filtrate will be routed back into the molybdenum concentrate thickener feed box.

The molybdenum dryers (one existing, one future) will be screw type to produce a final molybdenum concentrate product that will be packaged and transported off site. Dryer discharge will be loaded onto new conveyors into a new storage bin.

The existing filter building will be extended to house the new filter and dryer, filtrate tank and air compressor in Year 3.

17.3.3.5 Copper Concentrate Thickening and Pumping

17.3.3.5.1 Basis of 2013 Feasibility Study

Copper concentrate will be transferred to two existing 30 m high rate thickeners that will operate in series, with the option of being routed to two new high rate thickeners if future test work indicates these are required. Copper concentrate will be flocculated and thickened prior to being stored in two agitated stock tanks. The stock tanks will feed the concentrate pipeline system that will transfer final copper concentrate to the filter plant in Tucumán. Copper concentrate thickener overflow will be pumped back to bulk flotation.

17.3.3.5.2 Additional Development during 2019 Pre-Feasibility Study

It is expected that there will be some years when the concentrate production may exceed the pipeline capacity. The proposed solution is to install a concentrate filter plant and storage facility at the Alumbrera mine site and to truck the excess concentrate either to Tucumán for loading on rail, or direct to the Rosario port, depending on the rail line capacity.

17.3.3.6 Lime Slaking

A new lime slaking package will be installed adjacent to the existing one. The existing lime silo will be maintained to convey lime to the existing and new lime slaking operations. Milk of lime from the new plant will be pumped to the existing lime storage tank.

17.3.3.7 Control System

17.3.3.7.1 Basis of 2013 Feasibility Study

The new distributed control system will be Foxboro I/A series system, which is compatible with the existing distributed control system (DCS) system at the Alumbrera concentrator. The new DCS system will be fully integrated with the existing DCS. All new major equipment, such as the primary crushing plant and the overland ore conveyor system, will have their own DCS-based control system.

17.3.3.7.2 Control Rooms

The primary crushing plant will have its own control room and the existing control room at the Alumbrera concentrator will be upgraded to include the additional flotation and regrind equipment operation.

17.3.4 Tailings Disposal and Water Reclaim

The tailings from Agua Rica ore processing at Alumbrera during the initial seven years of mine operations will be stored in Alumbrera's existing TSF. The dam walls will be raised to the economic design elevation considered in the 2013 design. Thereafter, Agua Rica tailings will be stored in Alumbrera's open pit which has the volume to contain the remaining LOM volume.

17.3.5 Concentrate Pumping and Pipeline

17.3.5.1.1 Basis of 2013 Feasibility Study

17.3.5.1.1.1 Slurry Pipeline

The existing Alumbrera pipeline will be used to transport Agua Rica concentrate from the plant site to the filter plant. Slurry with a maximum solids concentration of 64% will be pumped through the 317 km long concentrate pipeline from the Alumbrera mine site to the Tucumán filter plant .

The slurry pipeline operating records show that the pumping capacity is 2,600 tpd, with a peak of 2,900 tpd based on the maximum pressure recommended in the design guidelines. The maximum pumping rate is estimated to be 900,000 tonnes per year (tpa) of concentrate at an availability of 94%.

The outer diameter of the steel pipe is 175 mm and pipe thickness ranges from eight millimetres to ten millimetres, depending on the operational pressure. The pipe is lined internally with a six millimetre thick high density polyethylene (HDPE) lining. The pipeline includes a plastic three layer coating to prevent corrosion and external damage. There is also a cathode protection system to protect against corrosion.

The pipeline is buried 1.0 m to 1.5 m deep along most of the route, except for some areas where it is more than two metres deep. The pipeline passes over a maximum elevation of 2,550 m, and the maximum pressure reaches 4,000 psi. International consultants regularly visit the site to review slurry rheology, shear strength, specific gravity, and viscosity (these critical parameters are monitored on an ongoing basis).

17.3.5.2 Integrity Studies

Various studies have been carried out to determine whether the pipeline system can operate for another 30 years and to define what changes, if any, should be made to maintain the integrity of the system.

- Weir Minerals, manufacturer of the Geho TZPM800 positive displacement pumps, recommended upgrading some equipment to extend the projected life by ten years. Based on a budget prepared by Weir Minerals, the capital cost of the upgrade and subsequent replacement of pumps and ancillary equipment in Year 10 has been estimated.
- The integrity of the original pipeline, including the steel pipes and the HDPE lining, was examined. Some pipe sections were replaced during the 2006 to 2012 period. The lining was tested by the Argentine Scientific and Technical Research Agency (CONICET) at Universidad Nacional de Mar del Plata. Used and unused metal pipes were tested at the Córdoba branch of the Argentine Industrial Technology Agency (INTI). The tests of used and unused pipes showed similar results, with no significant alterations or differences identified. In conclusion, although liner performance must be monitored, no costs for liner or steel pipe replacement are required in the initial capital expenditure.
- To assess geotechnical risks over a 30 year period, BGC Engineering Inc. (BGC) identified the works required to mitigate geotechnical risks along the route. The recommendations included tunnels and horizontal directional drilling to avoid high risk areas.
- Two reports were prepared to assess hydrological risks at river crossings and along sections of the slurry pipeline route. It was concluded that erosion protection and improvement works are required at some river crossings.

- The state of the pump station generators and the condition of earthmoving equipment used for maintenance works on the right of way was examined. The total expenditure over the extended slurry pipeline life, including replacement and refurbishment, was estimated.

17.3.5.2.1.1 Additional Development during the 2019 Pre-Feasibility Study

Debottlenecking of the concentrate handling logistics is a key factor in de-risking the overall Project and it is very important to understand the potential range of the concentrate pipeline capacity, from an operational and cost perspective. A study was completed to address the concentrate pipeline capacity.

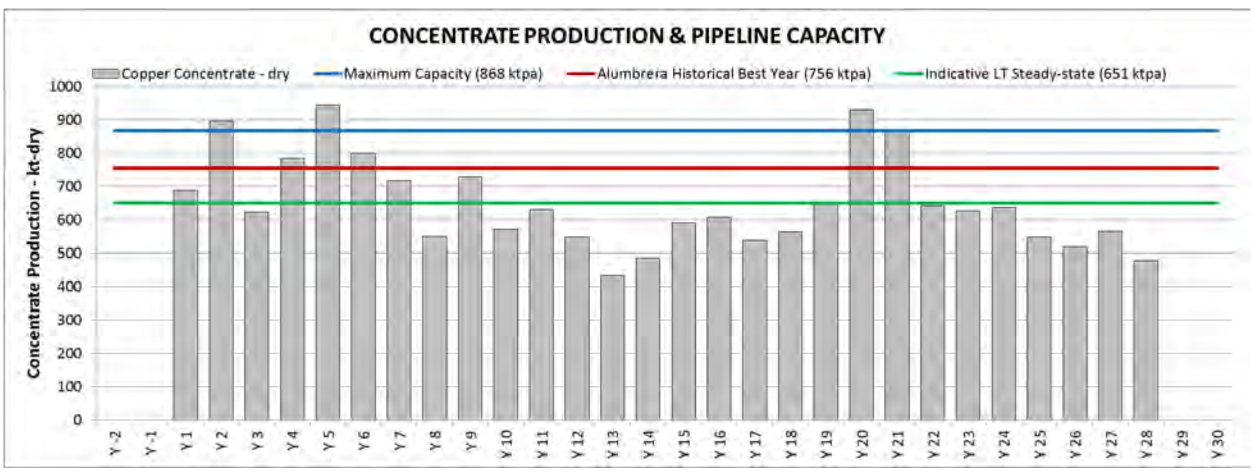
The operating records show that the best pipeline throughputs achieved during the past 21 years of operation are:

- Best month, December 2005, 80,364 t of concentrate (average 2,592 tpd).
- Best year, 2004, 756,000 t (average 2,071 tpd over 365 days).
- Best days, 2,700 to 2,800 t.

As a reference point, if the best monthly performance is extended to 12 months at 90% utilization, the annual capacity would be 868,000 t.

Figure 17-4 shows the historical pipeline performance data gathered during the site visit superimposed on the concentrate production data for the Agua Rica plant operation extracted from the current mine plan. It is also possible to infer a theoretical maximum capacity based on the best historical month of 80,364 t (dry) (Dec. 2005) extended over 12 months and with a 90% utilization factor applied to allow for maintenance and unplanned shutdowns (no shutdowns during the best historical month). This projects to 80,364 * 12 * 0.9 = 867,931 t annual theoretical maximum capacity.

Based on this information an indicative long term steady state annual capacity of 650,948 t may be estimated as a basis for design, equating to 75% of the theoretical maximum capacity or 86% of the best historical year capacity.



Base Case Mine Plan at 40 Mtpa – FLAT (May 13, 2019)

Figure 17-4: Concentrate Production and Pipeline Capacity

A pipeline design envelope was developed to determine the overall concentrate handling system logistics that would span the following limits.

- **Upper Limit:** To match "Best Historical Year" pipeline case = 756,000 t dry – the red line in Figure 17-4.
- **Lower Limit:** To match Indicative LT Steady-state (75% of Maximum Capacity or 86% of Best Historical Year) pipeline case = 650,948 t dry – the green line in Figure 17-4.

A Logistics Study carried out by Scan Global Logistics in 2019 (Fluor, 2019) showed that trucking of concentrate is feasible to debottleneck the pipeline and the rail transport from Tucumán to the port; however, the pipeline and rail system are significantly more economical.

A program is recommended in the next phase of work to generate sufficient concentrate to carry out rheological testing of Agua Rica concentrates and model the achievable pipeline capacity based on these.

17.3.6 Concentrate Filter Plant

17.3.6.1 Basis of 2013 Feasibility Study

The filter plant operation located in Tucumán includes:

- Dewatering
- Storage of dewatered concentrate
- Concentrate handling, loading and railroad dispatch
- Water treatment

17.3.6.1.1 Dewatering

Copper concentrate pulp at approximately 64% solids is pumped along a 317 km slurry pipeline from the concentrator plant in the Alumbrera mine site to the filter plant, where the concentrate is fed into a 2,000 m3 storage tank.

Concentrate is pumped using two centrifugal pumps from the storage tank to the filter room, which has three Larox vertical pressure filters each with 120 m2 filtration area. Each filter can dewater approximately 40 dry tph of copper concentrate depending on the slurry properties. The annual capacity, at 92% availability, is estimated at more than 950,000 dmt/m, which is more than the estimated Agua Rica peak output.

A potential impact to the filter plant, caused by the Agua Rica ore, may be due to altered chemistry of the filtrate water. Initial test work has shown this water may contain high levels of dissolved molybdenum. A new treatment plant has been included comprising coagulation and flocculation with ferric chloride and flocculent followed by Dissolved Air Flotation (DAF). DAF uses microbubbles to float the flocculated solids which will pass to a filter press. The filtrate and DAF underflow will pass to the existing downstream treatment circuit while the filtered solids will be mixed with the copper concentrate.

17.3.6.1.2 Storage

Up to 8,000 dry tonnes of dewatered concentrate at 7.5% to 8.5% moisture can be stockpiled at site prior to loading into railcars. An additional enclosed warehouse is available with approximately 10,000 dry tonnes storage capacity. A further 10,000 t can be stored at the paved yards at the filter plant (drainage collection systems and anchorage systems for the tarpaulins covering the concentrate stockpiles are available).

17.3.6.1.3 Railcar Loading and Dispatch

The filter plant rail yard is connected to the Nuevo Central Argentino (NCA) main railway line. A Cat 988 front end loader is used at the stockpile area to load concentrate into open top railcars. Loaded railcars pass over a weigh scale and covers are placed using a hoist. Concentrate is railed to the port facilities using four locomotives and 180 railcars, in 40 to 50 train car configurations. One full train is loaded and dispatched every two days.

17.3.6.2 Additional Development during 2019 Pre-Feasibility Study

17.3.6.2.1 Condition and Capacity of the Filter Plant

Visits were made to the filter plant and rail car loading system in Tucumán in February 2019 to assess the condition of the facilities and the capacities for the Project. Discussions were held with senior operating staff and data was collected for subsequent analysis. It was confirmed that the facilities are generally in good condition and adequate.

In March 2019, the study logistical consultant also visited the concentrate filter plant and rail loading installations as part of an independent evaluation of the copper concentrate logistics system. The logistical consultant recommended minor improvements to improve the train loading turn around and hence the overall cycle time of the operation.

The assessment concluded that the condition and capacity of Alumbrera's existing filter plant facility will be adequate for handling the quantity of concentrate that will arise from processing of the Agua Rica ores.

17.3.7 Rail and Port Facilities

Dewatered concentrate is loaded onto trains at the filter plant using front end loaders and transported to the port facilities.

17.3.7.1 Basis of 2013 Feasibility Study

NCA is the concessionaire operating the Tucumán-Rosario railway line, under a 30 year contract, with an option to renew it for an additional ten year term. NCA entered into a contract to operate MAA trains from the filter plant in Tucumán to the ship loading facility near Rosario (830 km). Rail operations are subject to several restrictions such as a maximum 20 t load per axle, established by the railway agency (locally known as CNRT).

The MAA standard rail configuration is 35 to 55 wagons per train. The trip from Tucumán to Rosario takes approximately 36 hours, however, can take longer depending on rail traffic. It is a single track railway and the journey is affected by traffic congestion and the lack of bypass zones to overtake slow moving trains.

MAA trains leave the filter plant for the port facilities every two days with each railcar loaded to a maximum of 56 t. The railcars are fitted with reinforced fibreglass removable covers for dust control.

The four GMD GP 40-2 locomotives (manufactured in the United States) are refurbished 3,000 hp diesel/electric units purchased in 1996, which are approximately 40 years old. A total of 165 railcars are normally used for three trains, with 16 standby wagons.

Trains are unloaded inside the unloading facility under a platform where a Caterpillar 330BL excavator removes the concentrate and dumps it into a hopper. A conveyor below the hopper transfers concentrate through an enclosed and elevated 120 m conveyor section to the concentrate storage facility. The standard unloading operation takes around eight minutes per car using a locomotive to move the wagons. Unloading a full train takes eight to nine hours plus manoeuvring time (two to four hours depending on maintenance requirements).

The A-frame steel concentrate storage facility has a 60,000 wmt capacity. The tripper conveyor is suspended from the roof to stockpile concentrate (typically 15 m high) along the facility.

Diesel powered front end loaders reclaim, and dump concentrate into three hoppers installed along the east wall of the storage facility. A reclaim conveyor below the hoppers, transfers concentrate to a weighing/sampling station. Once weighed, concentrate is discharged onto a 192 m long enclosed conveyor, which feeds a telescoping ship loading system (shuttle conveyor) that discharges concentrate directly into a ship moored at the dock.

The ship loader boom has a good slewing capability and can be extended to a distance of 45 m. The boom includes a shuttle conveyor equipped with a rotating distribution spout, which ensures the concentrate is evenly distributed in the ship's hold. The ship loader nominal rate is 1,250 tph.

The ship uses its own winches for warping (i.e. moving along the berth to position its hatches for loading). Repositioning of the vessel is required three to five times depending on the ship size. An independent programmable logic controller (PLC) system monitors the safety systems in the ship loader. Ships with a capacity of 15,000 dwt to 60,000 dwt are allowed at MAA's dedicated dock. Typically, a five metre distance is maintained between the ship and the dock.

17.3.7.2 Additional Development during 2019 Pre-Feasibility Study

During the course of the site visits made by members of the study team and by the study logistics consultant it became evident that some of the data and assumptions underlying the 2013 FS needed to be revisited and the implications reassessed. For example, it was found that railway round trip cycle times had deteriorated since 2013 and that at the port MAA no longer had contractual priority loading rights.

In general, the port facilities were observed to be clean and well maintained. There is potential for the existing onsite concentrate storage facilities to be expanded, either to deal with logistical constraints potentially associated with berth priority and demurrage or to facilitate concentrate blending for arsenic management. An assessment of the dust control systems was conducted. The dust control systems should be evaluated in more detail during the next project stage to address any potential dust generation arising from concentrate handling operations at the port.

17.3.8 Concentrate Logistics Study

17.3.8.1 Logistics Study Overview

In order to provide a full independent evaluation of the transport of the copper concentrate that will be produced when treating Agua Rica ores through the existing Alumbrera facilities Scan Global Logistics Chile S.A. (SGL) were commissioned to visit the facilities and evaluate the overall logistics platform. The analysis covered the following main elements.

- Concentrate pipeline from the mine site to the filter plant in Tucumán (315 km).
- Filter plant with loading installations and a rail manoeuvring yard.

- The rolling stock consisting of 181 wagons and four locomotives owned by MAA.
- The regional rail system operated by NCA, the current concessionaire.
- Export port with rail manoeuvring yard, discharge warehouse, conveyor belt to a storage warehouse, ship loader, dolphin berth for 200 m length overall (LOA) vessels, and a repair shop for locomotives and wagons.

17.3.8.2 Summary of Analysis and Conclusions

SGL analysed two scenarios, the expected steady state and peak concentrate pipeline capacity requirements. It was concluded that overall, the filter plant and port are not expected to constrain the concentrate handling. Bottlenecks were identified as arising from the concentrate pipeline and rail transport system, however, these can be overcome by trucking concentrate.

17.4 Arsenic Management

Many of the major smelters in the world will not accept copper concentrates with >0.5% As and several countries do not allow the import of such concentrates. This was identified as a major risk in the 2013 FS. Therefore, one of the goals for the PFS-A study was to eliminate this risk, by consistently producing a final concentrate having an arsenic level below 0.5% As. The arsenic issue was approached in two ways:

- Application of metallurgical processes for arsenic removal, and
- Restricted mine plan and concentrate blending.

17.4.1 Application of Metallurgical Processes

Many of the major smelters in the world will not accept copper concentrates with >0.5% As and several countries do not allow the import of such concentrates. This was identified as a major risk in the 2013 FS. Therefore, one of the goals for the PFS-A study was to eliminate this risk, by consistently producing a final concentrate having an arsenic level below 0.5% As.

The arsenic issue was approached in two ways:

- Application of metallurgical processes for arsenic removal, and
- Restricted mine plan and concentrate blending.

It is recommended that blending be carried forward as the base case for the next stage of work as this is a well proven practice in mines in Chile and elsewhere. Metallurgical process options can only be considered as a potential future opportunity.

17.5 Power, Water, and Process Materials Requirements

The power required for the Project will be supplied by Alumbrera's existing power line, while water for the plant will be supplied from sources outlined in Section 18.

Other services required for the process plant include compressed air, water, gland seal water, fire water process water, potable water, nitrogen, all of which are existing.

Reagents required for the plant operation include lime, primary collector 3418A, secondary collector 3477, and W34, molybdenum promoter (fuel oil), pyrite depressant, frother MIBC, gangue dispersant and depressant, flocculant, copper depressant (NaHS) (molybdenum Plant), molybdenum collector, collector (molybdenum Plant), frother (molybdenum Plant). Balls are required for the grinding circuit, ranging from

125 mm (5”) diameter for the SAG mill to 25 mm to 75 mm (1” to 1.5”) diameter for the concentrate regrinding mills.

17.6 Comments

Agua Rica ore will be primary crushed at the mine site and transported to the Alumbrera plant via a 35 km long conveyor system. This system uses conventional technology.

The Alumbrera comminution circuit is capable of processing 40 Mtpa (110,000 tpd) of Agua Rica ore compared to up to 105,000 tpd of Alumbrera ore. The Agua Rica ore is significantly softer than Alumbrera ore.

The Alumbrera flotation circuit requires reconfiguration and additional cleaning capacity to treat the complex Agua Rica ore. Additional regrind capacity is required to grind rougher cleaner tailings and scavenger cleaner tailings to a P80 20 µm.

An expansion to the existing molybdenum circuit is required to treat the higher molybdenum grade in the Agua Rica ore.

Existing downstream concentrate handling systems are generally adequate. Trucking may be required to handle excess concentrate in high production years.

A combination of mine planning and concentrate blending is recommended to deal with the issue of high arsenic levels in the concentrate.

18.0 PROJECT INFRASTRUCTURE

This section describes the infrastructure (existing and new) which will be provided to support the Project.

18.1 Site Layout

18.1.1 Integrated Project General Arrangement

The following are the major features and infrastructure required for the Project:

- Agua Rica Mine Site
    - Mine open pit including mine pioneering
    - Mine WRF
    - Mine ore stockpiles
    - Mine water management systems
    - Mine services and ore crushing platforms
    - Ore conveyance tunnel
- Ore overland conveyor system (Agua Rica to Alumbrera)
- Campo Arenal accommodations
- Alumbrera ore process facilities
- Alumbrera TSF
- Access roads
- Electrical power supply and distribution
- Diesel fuel storage and distribution

Descriptions of these features and infrastructure components are provided in the following sections.

18.1.2 Agua Rica Mine Site

The Agua Rica mine site will include the following installations and facilities:

- Mine Operations Features
    - Mine open pit
    - Mine haul roads
    - WRF
    - Stockpiles
- Mine Services Platform
    - Mine equipment maintenance facility
    - Equipment wash facility
    - Mine maintenance warehouse

- Tire shop
- Welding shop
- Shovel maintenance facility
- Mine operations office facility
- Mine support services

- Crushing Platform
  - Primary crushing station
  - Crushed ore storage bin
  - Ore reclaim feeders and discharge conveyor
- Ore Conveyance Tunnel
- Water management systems for contact and noncontact water
- Explosive storage facility
- Mine site security – Los Rosados

The general arrangement for the mine services and crushing platform site facilities are shown in Figure 18-1.

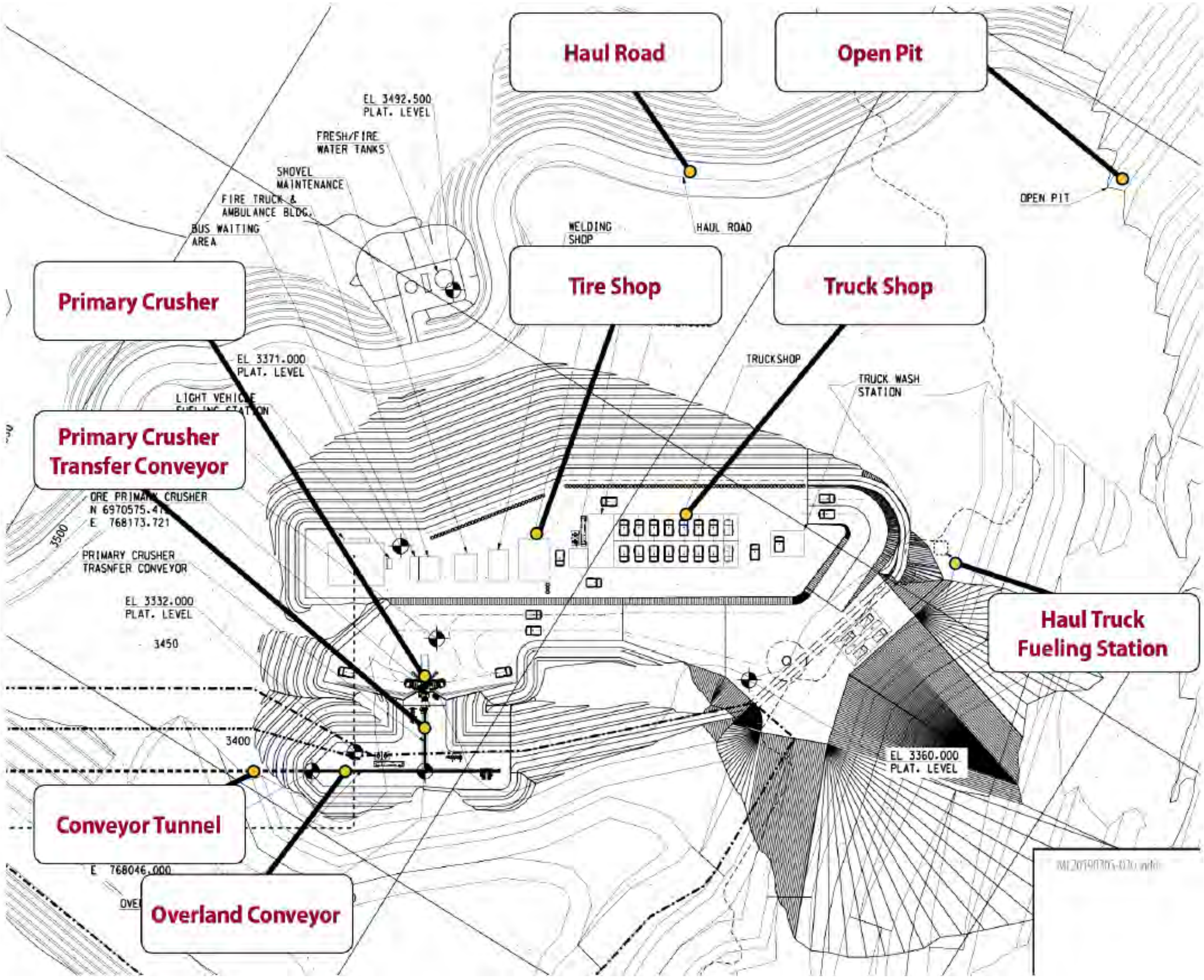


Figure 18-1: General Arrangement – Primary Crushing and Mine Services

18.1.2.1 Mine Services Platform

The mine services platform will host all key operations and maintenance services/infrastructure in an area close to the mine allowing efficient support to production operations. The platform will be positioned immediately to the northeast of the crushing station, at an elevation of 3,371 masl. The layout of the mine services platform is provided in Figure 18-1.

18.1.2.2 Crushing Platform

Ore from Agua Rica will be hauled from both the eastern and western sides of the pit to the primary crushing station, which will be located on a platform approximately 200 m long by 80 m wide, at an elevation of 3,362 masl. The station will house a single primary ore crusher that will be totally enclosed so that on the station platform level, only the dumping pockets and control rooms will be visible. A limited amount of space has been allowed at the northern end of the platform to allow the haul trucks to unload should the crusher not be available. The material will later be reclaimed and fed to the crusher by front end loaders.

18.1.2.3 Ore Conveyance Tunnel

A tunnel will be developed for the purpose of ore conveyance and personnel transport from the mine site passing through the Sierra del Aconquija and exiting at the Lower El Global drainage basin (approximately 3,105 masl) on the southern edge of the Campo Arenal basin. The 8 m wide by 5.6 m high tunnel will be approximately 5.2 km in length and will be constructed with a relatively uniform downhill gradient of 3.2%. Emergency refuges and services will be incorporated into the design and development of the tunnel.

The tunnel size will allow for the overland conveyor system and roadway to pass through the tunnel. The roadway will be able to accommodate small to medium sized vehicles for the transport of mine personnel to and from operations as well as conveyor maintenance vehicles. Some mine suppliers may also use the tunnel roadway for deliveries to the mine.

18.1.2.4 Explosives Storage Facility

Facilities for the safe storage and management of blasting bulk materials and supplies will be designed and located at a site which meets regulations and operational needs. The facilities will include an explosives preparation plant, powder magazines, and administrative services.

18.1.2.5 Mine Site Security – Los Rosados

The Los Rosados Security Station will monitor access into the Agua Rica mine operations site. The facility will have a control/access room with network access to the overall security control and fire alarm system, truck scale, dining area (four persons) and restrooms.

18.1.3 Overland Conveyor System

The overland conveyor system will transport the primary crushed ore from Agua Rica to the process facilities located at Alumbrera.

The conveyor system will begin from the ore storage bin located near the primary crushing platform and enter a tunnel passing through the Sierra del Aconquija. The conveyor will exit the tunnel at the Lower El Globo drainage basin on the southern edge of the Campo Arenal basin at an elevation of 3,105 masl. From there the conveyor will travel in a westerly direction to the Alumbrera operations site and discharge into a new feed chute installed partially along the existing stockpile feed conveyor at the facilities.

The overall length of the conveyor system is 35.3 km comprised of six conveyors, each being 1,524 mm wide and operated at a rate of 6.6 m/s.

18.2 Campo Arenal Site

18.2.1 Permanent Camp Accommodation

A permanent operating camp will be required to house the workers for the new open pit mine at Agua Rica.

The permanent operations camp site will be located at the southern edge of the Campo Arenal basin near the north portal of the ore conveyance tunnel (approximately 3.4 km). This site provides the area to construct the camp and associated facilities while meeting the criteria for employee comfort and access to the mine site. The site will be at least 1.5 km away from the ore overland conveyors; hence, the impact of dust, noise, and safety incidents will be limited.

Primary access for employees to the mine will be via the ore conveyance tunnel, with a travel time of approximately 30 minutes. An alternative access to the mine will be via the West Access road over the Sierra del Aconquija, a travel time of approximately 60 minutes.

Current estimates indicate the camp will require capacity to accommodate a workforce of 1,300 people. The camp is anticipated to utilize a multi-level modular design. During the construction phase, the Alumbrera camp facilities will be utilized to the extent possible, however, it is anticipated that additional capacity will be required. The future Agua Rica operations camp thus, will be partially used as a construction camp and building platforms, drinking water, electrical supply, and water treatment facilities will be installed to provide services to the camp from the outset.

18.2.2 Power Supply and Distribution

Electrical power will be supplied to Agua Rica from a connection to Alumbrera's existing El Bracho-Alumbrera 220 kV powerline near the Agua Rica mine operations camp. A transformer substation will be installed from which power will be distributed to the mine site, the facilities located in Campo Arenal, and to the drive stations of the overland ore conveyor system.

18.2.3 Fuel Storage and Distribution

A diesel fuel storage and tanker unloading facility will be installed in Campo Arenal near the West Access route. The fuel will then be pumped to the mine via a pipeline passing through the ore conveyance tunnel to tanks at the mine. This will facilitate a safe and efficient supply fuel distribution to the mine operations by eliminating the need for tanker trucks to travel the access route over the Sierra to the mine.

18.2.4 Campo Arenal Site Security – Capillitas Station

The Capillitas Security Station will be located near the Provincial Route 220 (RP220) and will control access installations in the Campo Arenal area such as the Agua Rica operations camp, the north portal of the ore conveyance tunnel and the overland conveyor corridor. The facility will include a control/access room with telephone and network access to the overall site security control and fire alarm system, truck scale, meeting room for site & safety inductions, and restrooms.

18.3 Alumbrera Site

18.3.1 Ore Process (Concentrator) Operations Facilities

Agua Rica ore will feed into the existing coarse ore conveyor leading to the 1.0 Mt capacity stockpile. Ore will then be fed into the grinding circuit via three reclaim lines with apron feeders and three reclaim conveyors.

The nominal capacity of the plant will be 110,000 tpd for the processing of Agua Rica ore.

The existing grinding circuit configuration will remain in place as the softer Agua Rica ore will only require the two original grinding SAG mills, five of the large available ball mills and the classification system operating with the existing pebble crushing circuit to achieve the nominal throughput.

The existing flotation plant and regrind mill equipment will remain in place. Increased flotation and regrind milling capacity will be added to ensure efficient recovery of metals to concentrates from the Agua Rica ore.

The current molybdenum flotation circuit will remain unchanged, however, a parallel flotation circuit, similar to the current design, will be added. The new molybdenum flotation circuit will consist of bulk concentrate storage tanks that will feed the molybdenum flotation conditioning tanks, rougher cells, four-stage cleaning cells, and regrind mill.

18.3.2 Alumbrera Operations Services

In addition to the Alumbrera ore process (concentrator) facilities, several other Alumbrera support facilities and services will be utilized to facilitate the integrated production operations. These include:

- Concentrator operations offices
- Metallurgical and chemical laboratory
- Geology offices and warehouse
- Ancillary and light vehicle maintenance shop
- Accommodations camp facilities
- Hospital and Emergency Medical Services

18.3.3 Tailings Disposal

Tailings from Agua Rica ore processing at Alumbrera during the initial seven years of mine operations will be stored in Alumbrera's existing tailings dam facilities. Thereafter, Agua Rica tailings will be stored in Alumbrera's exhausted open pit mine.

Additionally, should it become necessary, the El Durazno open pit has the capacity to receive an additional 60 million dry tonnes of tailings.

The total site wide capacity that is available at Alumbrera to store tailings from Agua Rica is approximately 1,045 million dry tonnes. Based on the study and updates, it is demonstrably feasible to store the tailings for the first seven years of Agua Rica operations.

Once the current remaining capacity in Alumbrera's existing tailings dam is exhausted, the tailings will be deposited into the Alumbrera mine pit, which is no longer operational. To achieve this, a tailings thickening system will be installed ahead of time.

MWH Global Inc. (MWH), now part of Stantec Engineering, completed the study and design work for the tailings distribution and thickening system based on the technical characteristics of the expected tailings material. In addition, the geological, geotechnical, hydrogeological, and hydrological background information provided by Alumbrera was reviewed to affirm that tailings storage at Alumbrera's pit was feasible.

The MWH study shows that tailings disposal is feasible in the Alumbrera pit and that the probability of contamination of aquifers is very low. High density deposition was selected to minimize the water entering the pit, and a return water collection system will be installed to avoid the formation of a large lagoon.

A two-stage thickening system with centrifugal pumps at the outlet of the concentrator and at the top of the pit was selected as shown in Figure 18-2. This system will consist of six thickeners, two installed at the outlet of the concentrator and the remaining four at the top of the Alumbrera open pit, with the intention of depositing approximately 736 million dry tonnes of thickened tailings.

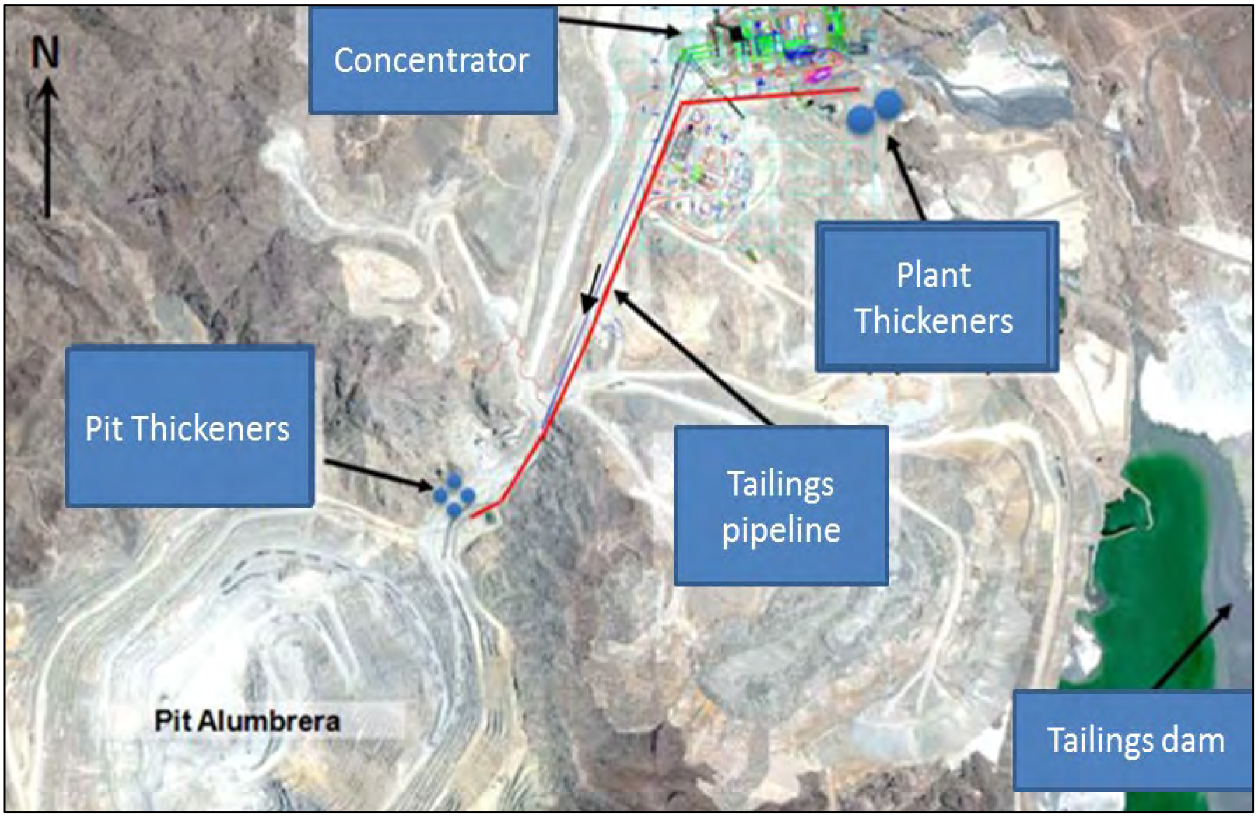


Figure 18-2: Layout of In-Pit Tailings Storage Facilities System

18.4 Off-Site Facilities

18.4.1 Concentrate Slurry Pipeline

The existing 317 km long Alumbrera concentrate pipeline will be used to transport Agua Rica concentrate from the Alumbrera plant site to the existing Alumbrera filter plant in Cruz Alta in the Tucumán province. The slurry pipeline route is shown in Figure 18-3.

The maximum pumping rate is estimated at 900,000 tpa of concentrate at an availability of 94%.

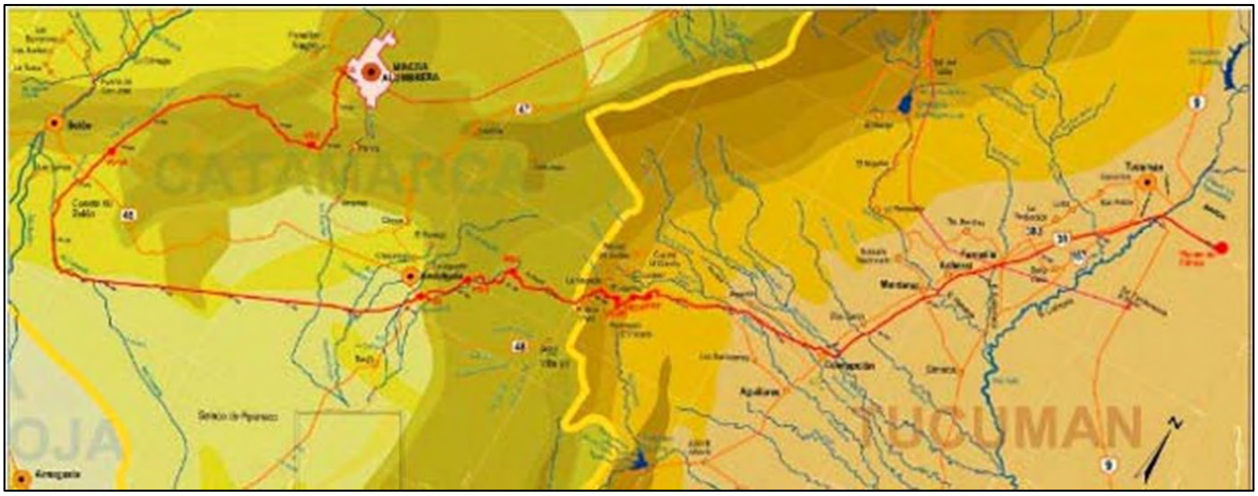


Figure 18-3: Alumbrera Concentrate Pipeline Route

18.4.2 Concentrate Filter Plant

The filter plant is located at kilometre 15 on Provincial Road 302, in Cruz del Norte in the Tucumán province. Filter plant operations include the following:

- Concentrate dewatering via vertical pressure filters
- Storage of dewatered concentrate
- Concentrate handling, loading, and railroad dispatch
- Water treatment

18.4.3 Rail Transport

Once concentrate is dewatered at the filter plant, the concentrate will be loaded onto trains using front end loaders and transported to port facilities.

The Tucumán-Rosario railway is operated under contract by NCA. Trains of 35 to 55 concentrate wagons travel the 830 km distance in approximately 36 hours, departing every two days, on average, from the filter plant.

Trains will be unloaded inside the unloading facility located at the port area.

18.4.4 Port and Ship Loading Facility

Once concentrate is unloaded from the rail wagons it will be transferred via conveyors to an existing covered storage facility. Concentrate remains in the storage facility until it is reclaimed and transferred via conveyors which feed a telescoping ship loading system that discharges concentrate directly onto shipping vessels. Figure 18-4 shows the ship loading facility at the port.

Figure 18-4: Ship Loading Facility

18.5 Access Roads

18.5.1 Existing Road Infrastructure

The federal and provincial roads network provides access to all Alumbrera facilities in Catamarca and Tucumán province as well as the Alumbrera port. These roads are in good condition and are utilized for regular and special operational supplies deliveries.

No improvement or infrastructure works is expected on these roads for the Project.

18.5.2 Agua Rica Site Access

The main surface access to Agua Rica (referred to as the West Access) starts at National Route 40 (RN40) near the Alumbrera airstrip heading in a southerly direction, passing through the Campo Arenal basin water wellfield and the El Cazadero private property right of way up to Provincial Route 47 (RP47) near the town of Capillitas. The route then follows RP220 to Portezuelo de Los Rosados (approximately 4,000 masl) at the crest of the Sierra del Aconquija above the Agua Rica deposit. From there the road descends along the Minas River drainage to the Agua Rica site. Figure 18-5 shows the segment of West Access Route along RP220 from RP47 to Portezuelo de Los Rosados.

Existing roads currently limit access to the site due to the road conditions in the steep mountainous terrain of the Sierra del Aconquija. Therefore, construction of new route segments will be required along with substantial upgrades of certain existing segments to enable transport of oversized and heavy loads required during the construction of the mine services, ore crushing, and material handling systems.

This route will also be utilized for the transport of operations supplies throughout the mine life which may be oversized or heavy such as mine haul truck tires, mine equipment components, and crushing/materials handling wear items.

Once the ore conveyance tunnel is established, access for light vehicle and bus transport through the tunnel will enable personnel and certain supplies to be transported from Campo Arenal to the mine. This will greatly reduce travel time for mine personnel as well as reduce safety risk exposure associated with transporting personnel over the Sierra.

Figure 18-5: West Access Route (Detail)

The road connects with the Agua Rica mine road at Portezuelo of Los Rosados and descends along the slope of the Minas River drainage to the mine site location.

18.6 Power Supply

Electrical power will be supplied to Agua Rica from a connection to Alumbrera's existing El Bracho-Alumbrera 220 kV powerline. At the connection location, approximately 16 km from Alumbrera, a main 220/33 kV transformer substation will be installed from which power will be distributed to the mine site, the facilities located in Campo Arenal, and to the drive stations of the overland ore conveyor system.

18.7 Water Supply Systems

18.7.1 Agua Rica Mine Site

Freshwater for the Agua Rica mine site and facilities will utilize water captured from diversion channels or an intake weir on the Agua Dulce River. The collected water will be passed through a filtration facility to remove silt before being pumped into the fresh/fire water head tank located above the mine services and primary crushing platforms.

A separate small stream of discharge water from the filtration/desilting facility will be directed to a domestic water treatment unit, where the water will be further treated and piped to the adjacent domestic water head tank. The domestic water will be supplied by another gravity piping system to various demand locations throughout the mine site.

Water collected in an SRD at the lower reaches of the Quebrada Minas catchment will provide water for use in dust control within the mine site. The water will be pumped to a head tank above the water filling station where the water trucks will be filled by gravity.

18.7.2 Campo Arenal Facilities

Freshwater requirements for facilities near the Campo Arenal basin such as the Agua Rica operations camp and Capillitas security station are estimated to be 200 m3/d. Water will be supplied from surface runoff collection intakes and treated to levels required for use.

18.7.3 Ore Process Operations

Water requirements for the processing of Agua Rica ore and other operational uses are expected to be met by the combination of the following:

- Contact water collected and transferred from the mine and WRF sites,
- Water recovered from the process TSF, and
- Freshwater from Alumbrera's existing well field located in the Campo Arenal basin.

The current existing freshwater system includes approximately 800 L/s installed capacity in line with the maximum flow rate under the water permit. The system is capable, if required, to meet the full water requirements for Agua Rica ore processing operations. Therefore, no expansion of the existing facilities will be required.

18.8 Wastewater Systems

18.8.1 Agua Rica Mine Site

Waste water digesters at the mine services, crusher, and security station restrooms will include concrete septic tanks designed to meet the requirements of the installed facilities. Treated effluents from mine services will be discharged into the truck wash effluent system, while treated effluents from the crusher and security station will be discharged into the site seepage system.

18.8.2 Campo Arenal Facilities

An aeration biological treatment plant will be installed in an area near the Agua Rica camp site. The facility will be designed to meet the requirements of the camp and associated facilities. The facility will be constructed of reinforced concrete and the plant design will include two operational lines to ensure operations during maintenance shutdowns. Effluent will be discharged into a seepage system.

18.8.3 Alumbrera Operations Site

The existing sewage treatment facility will be adequate for the operations life of the Project.

18.9 Communication and Information Management Systems

18.9.1 Communications Systems

A main communication link will connect the Agua Rica mine, overland conveyor drive stations and Alumbrera operations site. Communications will be through a redundant fiber optic link which will serve as a backbone and support all the communication needs for the operations from mine to tailings storage facilities.

Other communications systems which will exist include:

- Mine equipment dispatch system
- Mobile radio communication system
- Voice and data system and external link
- Closed circuit TV and local party/paging systems

18.9.2 Information Management Systems

The information management systems will utilize the communication network described. The operations control systems and data network will provide process data for operations management, regulatory reporting, production, and business planning.

18.10 Waste Rock Facility

KCB was retained by Yamana to develop the conceptual design of WRF with a total capacity of 2,200 Mt as a part of the Project. The mining operation at Agua Rica will produce an estimated 110,000 tpd (40 Mtpa) of ore to be processed at the Alumbrera processing plant and 190,000 tpd (70 Mtpa) of waste. The operational mine life is approximately 25 years, after the completion of the prestripping mining work.

18.11 Water Management

18.11.1 Introduction

The water management for the Project consists of the distinct areas as follows:

- Agua Rica mine site
- WRF
- Campo Arenal site
- Alumbrera operations site

18.11.2 Agua Rica Mine Site

An effective management plan for surface water and groundwater is likely to be critical for project permitting and ultimately for effective mine development. Within the Project footprint catchment areas, the central objective of the water management strategy will be to prevent mine contact waters from affecting natural waters.

18.11.2.1 Dewatering Infrastructure

18.11.2.1.1 Sediment Retention Dam

The SRD will be located in the lower reaches of Quebrada Minas and is intended to retain waters from the mine and Quebrada Minas, thereby preventing the release of potentially low quality waters to the Rio Candado.

The SRD will be constructed prior to the prestripping phase so that all contact waters are retained, including contact waters from the low-grade stockpile and the prestripping phases of the pit.

The SRD will have a maximum water storage volume of 3.8 Mm^3. Groundwater interception wells will be located down-gradient of the SRD. These will be installed to capture any seepage that migrates from the base of the SRD. The abstracted groundwater will be pumped back to ensure there is no down-gradient migration of mine waters to the Rio Candado. This will mean that there will be no net loss or gain of water as a result of groundwater seepage from the SRD reservoir.

A pumping system is projected for the water reservoir to pump the excess water to the crushing area. This is based on pumps mounted on a steel hull barge or pontoon that will pump this water to a water tank for further pumping with multi stage water pumps to the crushing area. From there, all contact water will be directed to Campo Arenal for further treatment.

18.11.2.1.2 Diversion Channel

A diversion channel will be constructed on the upper catchment to reduce the flow of water to the pit. A high flow of water is estimated during short periods of time, thus elevated instantaneous flows in the thalweg are anticipated. In order to reduce the flows on those diversion channels, the construction of intakes on the thalweg axis of the catchments as shown in Figure 18-6 and Figure 18-7 is required.

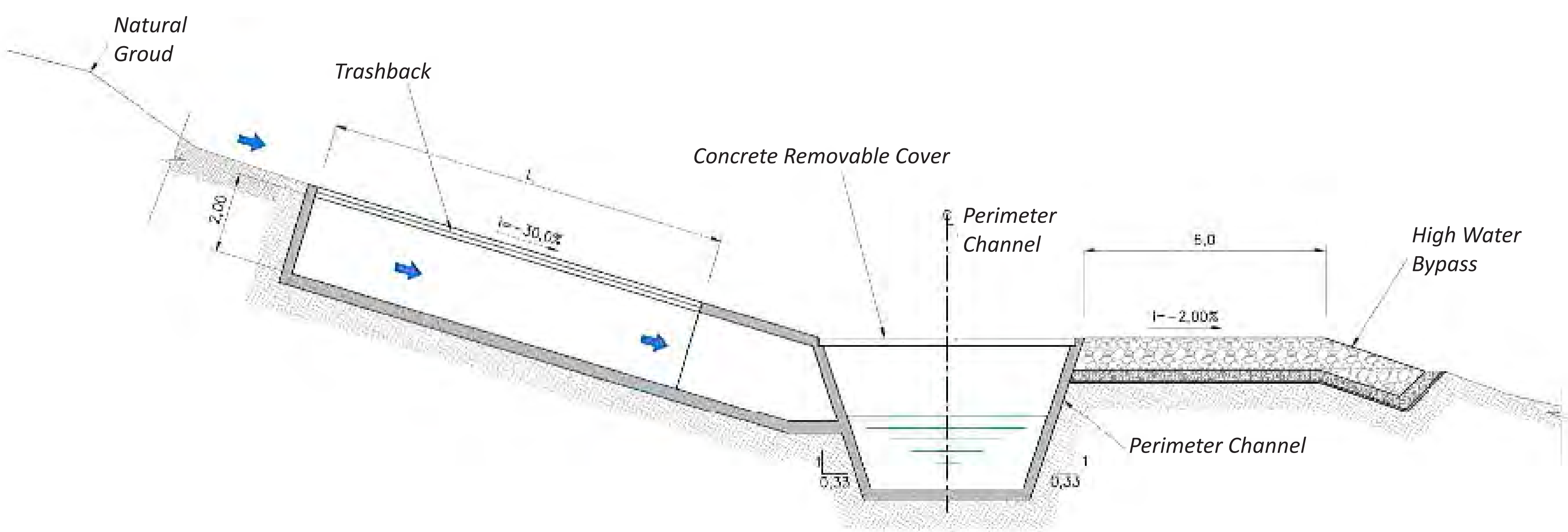


Figure 18-6

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Schematic Setion View of Diversion Channel and Intakes

August 2022

Source: Fluor, 2019.

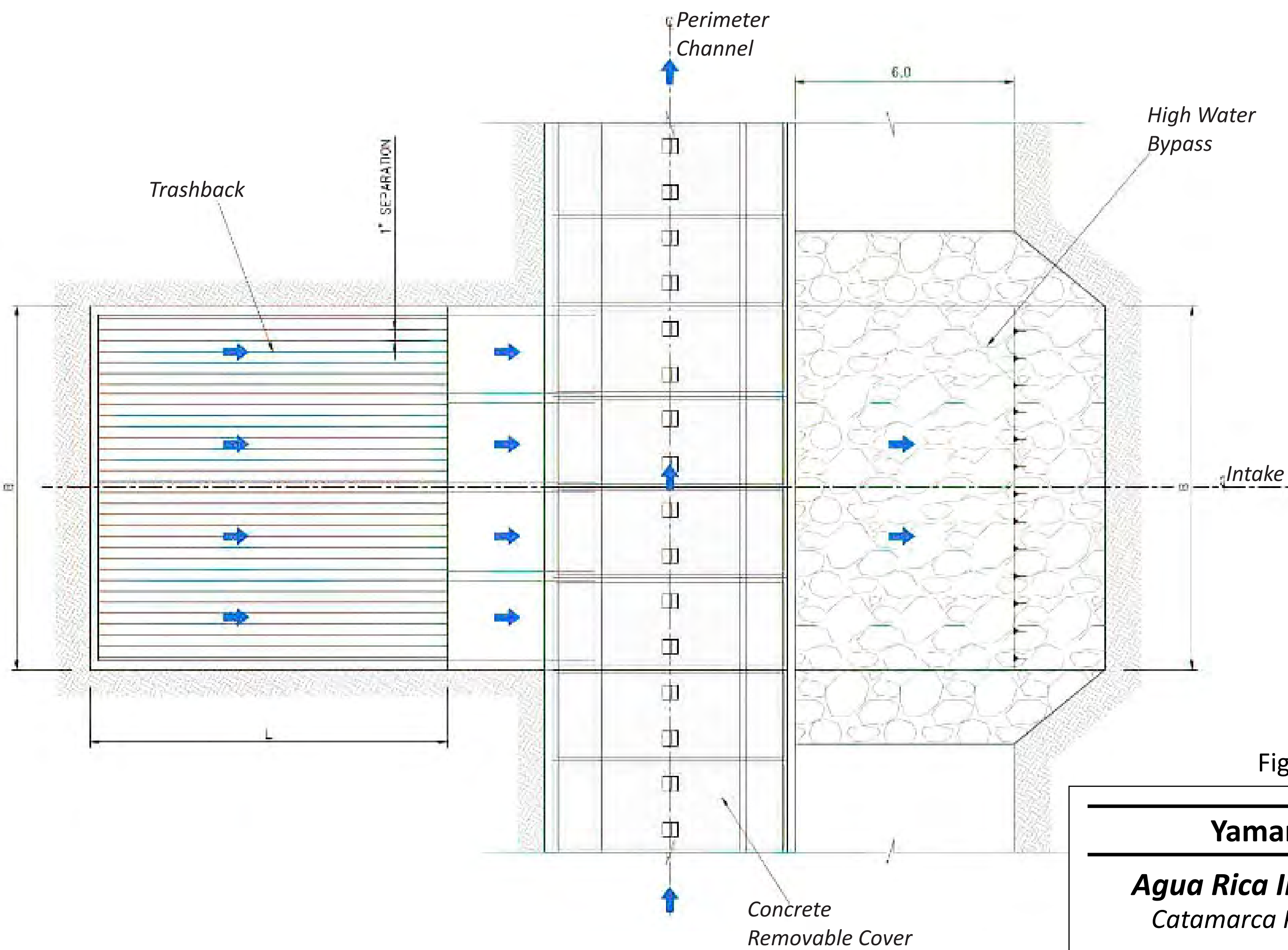


Figure 18-7

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Schematic Plan View of Diversion Channel and Intakes

August 2022

Source: Fluor, 2019.

18.11.2.2 Pre-Operational Period

The following will be conducted in the pre-operational period:

- Construction of an SRD in the lower reaches of the Quebrada Minas catchment.
- Construction of a diversion channel on the upstream catchment to divert noncontact water.
- Collection of runoff from the upper catchment area together with runoff from the prestripping area will be directed to the SRD.
- Installation of groundwater capture wells to intercept seepage from the SRD. This water will be pumped back to the reservoir.

18.11.2.3 Operations Period

- During prestripping, water from the upper catchment of Quebrada Minas from the pit and catchments will be retained in the SRD.
- The pit will be dewatered via sump pumps and dewatering wells.
- Groundwater will be collected by sub-horizontal drain holes to be drilled from Year 14 onwards.
- All contact water from the SRD and the pit will be pumped to a water tank located at the crushing area and from there be transferred via pipeline to Campo Arenal and onto Alumbrera for use in ore processing.
- Water levels in the SRD will be regulated by abstraction. Excess water will be used for dust suppression and for process make up.

18.11.2.4 Post Closure

- At mine closure, pit dewatering will cease, and a pit lake will form over several decades. Ultimately, the pit lake will discharge from a spill point corresponding to the natural base elevation of Quebrada Minas, with flow reporting to the SRD.
- Transfer of water from the upper catchment area of Quebrada Minas to Campo Arenal will cease at closure and surface water diversions will be removed.
- Regulation of the water balance in the SRD will cease. Water levels in the SRD will therefore rise and will in the long term freely discharge into Quebrada Minas.

18.11.3 Waste Rock Facility

A conceptual water management plan for the WRF to be located to the west of the mine was developed in combination with the overall design and development plan for the WRF.

18.11.3.1 Waste Rock Facility Conceptual Water Management Plan

The waste rock material is expected to be potentially acid generating (PAG); therefore, water in contact with this material is considered contact water and potentially acidic.

During operations, water from precipitation during wet climatic seasons will infiltrate through the waste rock and generate surface runoff, reporting downstream of the WRF. It is also expected that some water will infiltrate through the waste rock and into bedrock beneath the dump.

The main objective of the surface water management plan associated with the WRF is to fully contain contact water in an appropriate storage facility for subsequent conveyance to the Alumbrera operations facilities for use in ore processing. The water management strategy proposed is mainly based on diversion and collection structures.

The surface water management plan associated with the WRF consists of the following elements:

- Fully lined contact water collection dam with the primary function of fully containing contact water, avoiding any release downstream of this facility.
- Intermediate SRD.
- Noncontact diversion channel to minimize impact to downstream catchment areas.
- Monitoring wells/seepage control wells.
- Pumping and piping system to transport contact water to the ore processing facilities at Alumbrera.

The water management configuration includes the key water management structures considered at this level of design. These structures include:

- Contact water collection dam and seepage cut-off.
- Intermediate SRD.
- Additional water management structures.

18.11.4 Campo Arenal Site

In Campo Arenal, infrastructure and facilities to support the Project will include the overland ore conveyor to Alumbrera, mine operations camp, fuel storage tanks and distribution pipeline and internal access roads. The surface water management around these facilities will mainly consist of diversion channels, culverts, and similar installations to allow safe passage of the design storm flows.

18.11.5 Alumbrera Site

Water management for the Alumbrera operations site will continue to execute water management plans and procedures which are the same as currently in practice for the site.

18.12 Waste Disposal Facilities

Proper waste management is an important environmental issue during construction and operations. Waste management practices and plans will be put in place to meet regulatory and owner standards for the management of all materials in all forms, volumes, and toxicities. Materials will be sorted by type and where possible, be recycled or reused. Disposal to landfill will only be considered as a final option.

Hazardous waste will be identified and labelled according to its classification and type of risk, as established by regulations. A storage facility will be built near the permanent camp at Campo Arenal for temporary storage of hazardous waste prior to its transportation and deposition off-site by a certified company.

Domestic solid waste will be disposed of in Alumbrera engineered domestic waste facility/landfill site.

19.0 MARKET STUDIES AND CONTRACTS

The QP has relied on a report provided by Yamana and prepared by CRU for Yamana entitled "Copper Concentrates Market Review" dated December 16, 2019 for all matters related to copper and molybdenum supply and demand, price forecasts, treatment and refining charges, product specifications and markets, and sales contracts as discussed in this section of the Technical Report.

19.1 Marketing Terms

Agua Rica is expected to produce copper concentrates with payable gold and silver, and molybdenum concentrates. The concentrate production is expected to be shipped to custom smelters and refineries. The concentrate treatment and metal refining terms are negotiable at the time of the agreement.

The refining charges (RC) and payable metal calculated in the financial evaluation are shown in Table 19-1. The assumptions were generated by the Agua Rica technical committee for PFS-A.

Table 19-1: Treatment and Refining Terms
Yamana Gold Inc. – Agua Rica Integrated Project

Premise	Unit	Value
Payable Copper	Percentage (depending on percentage of Cu in concentrate): >27% = 96.5% <27% = 96%	96% to 96.5%
Payable Silver	Percentage	90%
Payable Gold	Percentage (depending on grams of Au in concentrate)[1]	90% to 97%
Payable Molybdenum	Percentage includes deductions	85%
Copper TC	US$ per dmt (dry metric tonnes) concentrate	$80/dmt
Copper RC	US$ per lb	$0.08/lb
Gold RC	US$ per oz	$4.50/oz
Silver RC	US$ per oz	$0.40/oz
Molybdenum RC	Included in Mo price assumption	N/A
As Penalties	US$ per dmt concentrate (for each 0.1% above 0.2%)	$3/dmt

Note:

1. If >15 grams = 97%; if between 15 grams and 10 grams = 96%; if between 10 grams and 7 grams = 95%; if between 7 grams and 5 grams = 94$; if between 5 grams and 3 grams = 92%; If <3 grams = 90%

Concentrate TCs are based on dry concentrate production and contracted unit TCs.

Payable metals were calculated based on contained (recovered) metals in the concentrates and payable metal percentages presented in Table 19-1.

Metal RCs are based on the payable metals contained in the concentrate and unit refining fee set for each metal. Molybdenum refining calculations are different from the other minerals as this charge has already been included in the price assumption.

In addition, treatment penalty charges have been calculated for the level of arsenic contained in the concentrate. This penalty was calculated as follows: per every 0.10% of As contained in the concentrate, the penalty is $3/dmt concentrate. This penalty is only paid when the levels exceed 0.20% As.

The responsible QP has reviewed the marketing terms and the results support the assumptions in this Technical Report.

19.2 Stream

In 2015, Sandstorm and Yamana signed an agreement regarding payable gold of the Project. The agreement was considered as a stream. In this agreement, Sandstorm purchases 20% of the gold payables at 30% of its price in exchange for a contribution to the construction capital of the Project. As per the agreement, the advance contribution payment totals $202.5 million (estimated using a US$1,300/oz Au price), and is made in three installments, at completion of 25% of construction an initial $50.6 million payment, at 50% completion of construction, another $50.6 million, and at 80% of construction completion a final payment of $101.3 million.

Agua Rica capital and operating costs are based on the open pit mine plan presented in this section. The proposed strategy to minimize initial capital costs and maximize project value is based on contractor-based operation during the pre-production phase up to Year 3 of production. Primary equipment is planned to be purchased for the production phase to operate until the end of the mine life. The cost estimate has been completed at an accuracy of -25% to 25% and the exchange rate has been fixed at 50 Argentinean pesos per US dollar.

19.3 Copper Concentrate

Beginning in 2000 and continuing through to 2017, China became an increasingly important factor in the demand for raw material feed in the form of copper concentrate and as a consumer of the refined metal. Copper concentrate imports to China have risen from practically zero in 2000 to 17.35 Mt in 2017. China now consumes 48% of the world’s refined copper, with Chinese smelting and refining capacity continuing to increase.

Overall, global market forecasts for copper concentrate are projecting a compound annual growth rate (CAGR) of 2% or higher.

Refined copper is a key determinant in the growth of developed and developing nations. Copper smelters are located in various regions, however, the majority are in Asia. All smelters are accessible from Argentina, however, logistic costs are a significant factor in determining which smelter location will result in the best long term offtake arrangements, and hence provide the best returns. Secondary considerations are the possibility of linking offtake agreements to financing arrangements and strategic diversification.

Geographic diversification provides some risk reduction in a marketing strategy, although other factors such as credit risk and performance risk must also be considered. It is expected that the emphasis for direct sales agreements will be placed on Asian smelters unless finance-linked contracts are available.

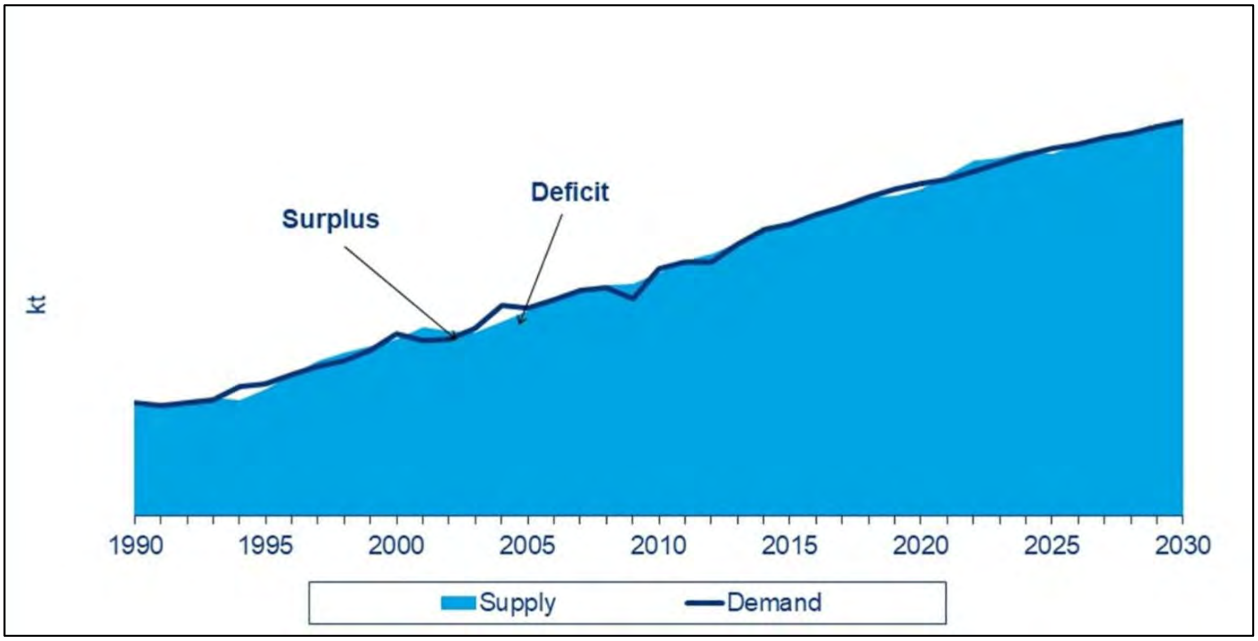
19.3.1 Supply/Demand and Copper Price

A shortage of copper is inevitable over the future years leading to 2030. Potential mine expansions will only cover the loss in production from maturing mines.

Growth in demand could subside for a period of time, however, it is considered unlikely even with the current tariff/trade disputes initiated by the current U.S. government. Substitution could occur to some degree (e.g. aluminium for medium voltage wiring).

Over the current period to 2030, a general annual supply gap is predicted. Given that deficits do not (and cannot) occur in commodity markets, prices will rise to incentivise projects to fill the gap. The estimated copper market balance to 2030 is shown in Figure 19-1.

It is difficult to project prices out to 2030 and beyond. A 14% drop in the copper price in the June 2018 – July 2018 period was not anticipated by the analysts. The price of US$3/lb for Cu used in the financial analysis is considered to be conservative.



Source: Wood Mackenzie, 2019

Figure 19-1: Estimated Refined Copper Supply and Demand to 2030

19.3.2 Treatment and Refining Charges

Treatment and refining charges (TC/RCs) reflect the general status of the supply/demand balance of copper concentrate. Traditionally, the annual benchmark terms have been the guideline for individual producers to establish terms with their smelting counterparties. This process is changing, and more producers are aligning with counterparties to establish terms on the basis of agreed value propositions.

For smelters, there is generally a preference for terms fixed for a period of a year to provide stability in their income stream. Many miners are willing to establish some or all of their terms on this basis. This practice, however, does not provide flexibility to pursue terms where more value can be added through value propositions. Thus, it is difficult to predict TC/RCs on a longer term basis.

Given that the analysis of concentrate supply/demand indicates a shortage of concentrate in the future, it is reasonable to forecast lower TC/RCs. While 2017 and 2018 benchmark TC/RCs were agreed at $82.25/t TC and 8.225 cents per pound RC, 2019 benchmark terms have been agreed at $80.80/8.08 cents, recognizing that concentrate is expected to move to a deficit. Potentially, a deficit of only 2 Mt could push TC/RCs well below the smelter breakeven point. If the deficit continues for an extended period of time, the result could be the closure of some higher cost smelters, which would lead to higher copper prices as well as higher TC/RCs as the market seeks an equilibrium state.

Longer term TC/RCs of $80/8.0 cents used in the financial analysis are considered reasonable, given that this provides smelters with an operating margin and reflects a market that will be in deficit for a period of time

19.3.3 Product Specifications and Markets

Arsenic penalties are expected to apply in years where the arsenic content exceeds 0.2% As (24 years out of 28 years mine life). In years where the arsenic content is above 0.5% As (last two years of production), Agua Rica's annual production of copper concentrate may not be fully marketable in the international marketplace. Potential buyers may be limited in processing and/or restricted in importing large quantities of copper concentrate with an arsenic content greater than 0.5% As. Zinc, lead, and cadmium penalties could apply, however, these are expected to be limited.

Elements attracting a credit are principally gold and silver, with platinum group metals specified if they are present in significant quantities (to be agreed upon with the customer). Payments are normally made if the amount contained in the concentrate exceeds a certain level, generally 1 g/dmt Au and 30 g/dmt Ag.

The copper concentrate market is a global marketplace with two main market types: smelters and commodity traders. Commodity traders are a large secondary market with an excess of 17 Mt of copper concentrate traded annually. Commodity traders can provide better net terms than smelters. Additionally, commodity traders provide more flexibility as they can deliver to numerous locations. It is anticipated that the marketing strategy for Agua Rica would include sales to both markets.

19.3.4 Contracts

Based on the specifications of the concentrate, it has been concluded that the copper concentrate would be considered marketable, subject to the arsenic content. The copper concentrate produced would be sold to third parties under long term contracts, with flexible quantity ranges determined by the marketing group, thus allowing for production variance and/or opportunities to participate in advantageous spot market sales.

Long term contracts often contain favourable commercial components such as options on the quotational periods and flexibility on freight/destination.

Copper concentrates when delivered to end users are sold based on a payment, which is the sum of the addition of all the component payable metals (copper, gold, silver, and sometimes platinum and palladium) less the sum of the TCs, less the sum of the RCs for copper, silver, and gold, and less the sum of any penalties and discounts. The amount of payable metal and TC/RCs vary from contract to contract.

Copper content is usually paid for at 96% to 96.5% of the full and final assayed quantity (after final assays are agreed upon), typically subject to a minimum deduction of one unit of copper. The price paid for the copper content is commonly an average price based on a quotation period of the London Metal Exchange (LME) quoted cash copper settlement price (i.e. the seller's price of copper at the midday close on the LME) on each day during the averaging period.

Copper concentrate long term contracts are highly sought after by smelters. Smelters, especially in China, have been operating at well below capacity. Over the last decade, spot TC/RCs for concentrate supply have been running at a discount of $15 to $20 to the long term contract rates. There is a trend in worldwide concentrates to a higher average arsenic content. This is partly a result of changes in large ore bodies currently being mined and results in many high arsenic mines continuing production (e.g. in Mexico, South America, Philippines, and Bulgaria), despite very high penalties for the arsenic content of the concentrates produced.

19.4 Molybdenum Concentrate

Molybdenum demand has surged in line with China's rapid growth and consumption of raw materials. The majority of molybdenum consumption is in the alloy steels (30% of total demand) and stainless steel (28%) end use sectors.

Major markets for molybdenum concentrate include Chile, Europe, United States, and China. Agua Rica molybdenum concentrate is assumed to contain approximately 50% Mo and 1% Cu. Given the expected copper content, leaching prior to roasting would be required to convert it to molybdenum oxide. This is likely to result in the concentrate attracting a higher treatment fee, however, the concentrate would remain marketable in the main international concentrate markets.

The Molymet roasting facility in Chile is the preferred option; this has significant freight savings over options in the United States, Europe, and China. Roasting capacity in the United States, although able to treat Agua Rica molybdenum concentrate, is essentially integrated with local sources of feed.

19.4.1 Demand and Molybdenum Price

Around 50% of world molybdenum supply is derived from primary producing molybdenum mines, the majority of which are in China. The remainder of molybdenum supply is produced from by-product and co-product mines, mainly located in United States and Chile. Historically, by-product mines accounted for the bulk of molybdenum supply, however, in recent years China has become a self-sufficient producer and Western primary mines have acted as swing production.

The majority of molybdenum consumption is in alloy steels. Stainless steel and molybdenum demand have surged in line with China's rapid growth and consumption of raw materials. Significant additions to steel capacity in China and elsewhere in the world have been a key driver of this growth. Molybdenum is used in super alloys, nickel base alloys, lubricants, chemicals, electronics, and many other applications. The rapid growth in the stainless steel market is the key driver for molybdenum demand growth.

Pricing is established through a process of negotiation between buyer and seller for a molybdenum concentrate conversion contract covering a certain time frame. The contract provides a framework covering a range of terms and conditions including base price, TC, metallurgical deductions, penalties for impurities or moisture, delivery terms, quotational periods for payable metals and payment terms. Base prices are typically based on published prices from Platts Metals Week, Ryan's Notes, and Metal Bulletin.

For the financial analysis, a molybdenum price of US$11/lb was assumed, including all TC, and 85% payable molybdenum. The income from molybdenum is approximately 8% of the total project income; hence, this is considered to be conservative.

19.4.2 Market

Surpluses are expected to persist as the macro-economic conditions in Europe and North America weigh on demand growth and new mine projects begin production. Chinese primary producers, who are the highest cost molybdenum producers, have at times been undisciplined at lower molybdenum prices in the short term, taking longer than expected to respond with reduced output. In the medium term, prices are expected to remain around the current molybdenum market price. In the longer term, Chinese primary mine production capacity is expected to decline; however, expected by-product production will more than offset this. Prices are expected to remain flat in the medium to long term.

Growth is expected from by-product production, particularly from Chilean copper deposits. U.S. and Peru by-product molybdenum production are also expected to grow significantly in the long term.

Molymet, a Chilean company that represents around 35% of total world molybdenum roasting capacity, has plants in Chile, Mexico, Belgium, and a JV in China. Molymet is the major non-integrated converter of molybdenum concentrate and has leach circuits and the ability to recover rhenium. Molymet is expected to continue to expand roasting capacity to maintain an estimated 35% to 40% global share of the molybdenum roasting market.

19.4.3 Treatment Charges Forecast

Market TC for roasting molybdenum concentrates are currently dictated by roaster utilization rates that are running close to 90%, and market dominance. Given that Molymet is expected to expand roasting capacity to maintain its dominant market share, they will continue to exert an influence on market TC. Any potential new entrants, re-starts, and/or expansions in the custom roasting market, such as the Altonorte facility, Kennecott's Magna facility, or Chinese facilities (Jinduicheng Molybdenum Co., Ltd., ChinaMoly), will promote greater competition for TC.

19.4.4 Contracts

It is expected that molybdenum concentrate will be considered marketable in the main international concentrate markets. It is also expected that due to copper content in the concentrate (approximately 1% Cu), the concentrate will require blending or leaching prior to roasting. This is likely to result in the concentrate attracting a higher TC.

TCs are often quoted as a percentage discount to the molybdenum price. High copper content within the feed would attract higher TC. Leaching may be required to remove the copper.

A metallurgical deduction on the payable molybdenum price is also commonly applied. This deduction accounts for the molybdenum grade and relative impurity levels in the concentrate in the conversion to molybdenum oxide. The Agua Rica molybdenum grade is expected to range from 48% Mo to 52% Mo (averaging 50% Mo). A typical metallurgical deduction of 0% to 3.5% is expected for concentrates containing above 50% Mo, and 2% to 5.5% for lower-grade concentrates that are greater than 43% Mo but less than 50% Mo.

20.0 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

20.1 Environmental Aspects

20.1.1 Environmental Baseline

Extensive environmental studies and monitoring have been done for the Project throughout the years and throughout the evolution of the Project. Based on the current Project layout, the area can be sectioned into three main zones: the Rio Minas and Rio Choya Valleys where the open pit, crusher, and other mine infrastructure are proposed, and the Alumbrera site where the TSF, open pit for tailings disposal and process plant are located.

Gaps in the baseline study will be resolved during the baseline data collection program of the Environmental and Social Impact Assessment expected to be submitted after completion of the FS.

Environmental Management Objectives

The Project design follows environmental criteria and general guidelines to avoid or minimize possible effects on the environment. These guidelines consider the special and unique characteristics of the study area, environmental components of the area of influence, international best practices and local legislation. In addition, they also follow mining industry best practices, international guidelines, and corporate policies.

The following environmental characteristics and objectives have been identified for the Project:

- Separate contact water from the non-contacted water, where feasible, and consider adequate handling of each of these waters to guarantee that the environment is not impacted, complying with regulations and international best practice.
- Control water overflowing from the ravines to avoid water quality damage in rivers located in the Project area of influence. The controlled discharge of any water will comply with Argentinean regulations.
- Minimize impact on irrigation water, water for consumption and water in the aquatic ecosystems.
- Avoid interference with archaeological sites and sensitive areas for terrestrial flora and fauna.
- Design Project facilities to international standards to minimize natural risks (seismic, foundation, hydrological, geochemical) within acceptable levels for the public and environment. Avoid locations in areas exposed to natural hazards or incorporate protection measures to avoid damage.
- Provide adequate handling of solid wastes following international practices and prohibiting final disposition of hazardous wastes onsite.
- Recover vegetal soil in intervened areas and define conservation and post-use measures.
- Obtain borrow material from quarries in areas already disturbed by the Project.
- Consider speed reduction, and installation of precaution signs and signs prohibiting hunting in stretches were fauna might cross the roads.

20.1.2 Waste Rock Management

A WRF is planned to be constructed in a secondary basin in the upper portion of the Choya Valley, This facility is described in Section 18.12 of this Technical Report.

20.1.3 Tailings Management

The Project, as designed, will not require new facilities for the management of tailings. Tailings will be deposited in the Alumbrera TSF for the first seven years of operation and will then subsequently be disposed of in the Alumbrera pit. Details of the tailings management are provided in Section 18.5.3 of this Technical Report.

20.1.4 Water Management

The primary objective of the surface water management plan consists of preventing contact water from entering the environment. Contact water is contained in ponds and recirculated to the plant for use within the process. Water management is described in Section 18.13 of this Technical Report.

20.2 Environmental Permitting

20.2.1 Exploration Environmental Permitting

In order to carry out any additional exploration activities at Agua Rica, an IIA must be submitted and approved by the Secretary of Mining in the Catamarca Province. This IIA report is currently being prepared and will include infill drilling, geotechnical drilling as well as condemnation drilling.

20.2.2 Environmental Impact Assessment

The IIA covers all construction, operation, and closure activities of the Project. This study assesses the potential impacts of the Project on its environment. It includes clear mitigation measures that must be implemented to avoid unwanted impacts. It also highlights the benefits that will be generated to the region as a result of direct and indirect employment, as well as local procurement. It provides practical and detailed environmental management plans that will be followed in the subsequent phases of the Project.

20.2.3 Additional Permits

In addition to obtaining the approvals for the IIA for exploration and the IIA for operation, approximately 175 permits will need to be acquired for construction and operation of the various components of the Project.

20.2.4 Closure Plan

The closure plan for the Project must be approved by the Secretary of Mining. It must be performed progressively during the mine's life. Facilities and work areas must be closed as soon as they cease to be in operation, and only the facilities and areas that cannot be closed during the commercial production will be subject to the final closure. The closure plan must include a work schedule and a budget, and the mine owner must provide the provincial government with financial guarantees to secure the plan's performance. The budget and guarantees must be updated every two years.

20.3 Social Environment and Community Relations

20.3.1 Background

Agua Rica has historically generated significant interest from local communities. The Project's direct area of influence is the Department of Andalgalá while the indirect area of influence includes the Departments of Belen and Santa Maria.

As previously mentioned, an IIA for operation of a stand alone project was submitted in 2007. The submission of the report triggered a strong response by the community, as they expressed concerns for impact to local water quality as well as other environmental concerns. This IIA was approved by the relevant authorities. Following this approval, an anti-mining group grew in the region and led protests in the community. As a result of these protests, a local judge revoked the approval of the IIA. Given the Integrated Project presents a much smaller environmental footprint compared to the stand alone alternative and after extensive discussions with local authorities, it was agreed that a new IIA must be submitted in order to conduct mining activities at the Project.

Over the years, the anti-mining protests have had decreasing interest, however, a small anti- mining group is still active in the community.

As MAR and MAA have enhanced their respective community engagement programs and have advanced the social licence programs for the Integrated Project, the initial community response to the new Project, has been positive, given its smaller environmental footprint, and re-use of existing infrastructure.

20.3.2 Community Engagement Objective and Strategy

Obtaining a social license to operate is of utmost importance for any Project of this scale, and will require a specific focus. Furthermore, local regulation in Catamarca requires technical approval by the mining authority, which includes social participation and consultation process.

The main objectives of the community engagement strategy are:

- Obtaining social license to operate.
- Obtaining political and administrative support.
- Support and influence local investment in order to improve infrastructure in the area of influence, on order to contain social risks and support pre-existing economic activities that would continue after the producing stage of the asset.

The approach to reach these objectives consists of:

- Performing a due diligence process of the social risks, with the focus on human rights.
- Designing a project that is technically sound which avoids environmental or social impacts on the local communities.
- Engaging with local communities in an honest and transparent manner, allowing for community concerns to be heard and addressed.
- Providing training, employment, and procurement opportunities to local communities to maximize the economic benefit to the local area.

A detailed strategy was developed by the local team supported by the Owners and consultants containing three main areas of work:

- **Regulatory / Expert Level**. Ongoing engagement, discussions with a multidisciplinary committee including local authorities, management and experts. Towards Sustainable Management (TSM) and EITI certifications. Advance training on Escazu implementation.
- **Community Level**. Virtual and in-person information sessions, participatory monitoring, information collection campaign, engagement with community actors and liaison with authorities.
- **Engagement Tools**. Deployment of the SLO Index, implementation of website for consultation and participation, perception studies, social media and traditional media monitoring.

Over these three streams of work, the framework designed is to use the Acknowledgement, Agency, Reciprocity and Clarity (AARC) due diligence framework approach to human rights, which strengthens acknowledgement of neighbours, leverage shared agency with the community, builds reciprocity with them, and ensures clarity on all communication and engagement. The AARC framework is the proposed manner to create engagement to communities, the Regulator and stakeholders.

20.3.2.1 Overarching Strategy

Integrate AARC best practices into the existing MARA stakeholder engagement approach in order to:

- Build alliances and improve and maintain overall trust (social license) with key stakeholders and communities of interest.
- Define and determinate a desired level of alignment with UN Business & Human Rights principles (Ruggie Principles of protect, respect, remedy) & IFC Performance Standards.
- Shift the overall spectrum of stakeholder support through predictable, well-structured interactions, in a framework aligned to local regulations/jurisprudence on HR and permitting laws.
- List and manage messaging by opposition stakeholders without ostracizing them.

20.3.2.2 Immediate Objectives

- Creation of spaces for co-agency and reciprocal problem solving are identified with stakeholders (and expectations managed) -this includes addressing IIA fieldwork and other planned activities. Determine participation of Authorities.
- Aspects of AARC (explicitly linked to Ruggie Principles) focused on key areas of immediate stakeholder interest: Water management, employment, community access to information.
- Trust and confidence with community increased through broadened and deepened dialogue processes that are experienced as productive and clear.

20.3.2.3 Intermediary Objectives

- Lift all legal measures against Project. Create a legal shield to prevent new measures during environmental and social impact assessment.
- Meaningful and enduring participatory and decision making structures based on AARC framework are co-designed with authorities and community. Develop different alternatives when possible to ensure access to common solutions.
- Areas are identified for reinforcing the AARC application between permitting processes (e.g. IIA fieldwork and regulator / expert engagement) and community engagement.

- Broader range of stakeholders (including passive supporters and neutrals) participate in dialogue on a range of key topics identified as priorities.
- Support for radical opposition groups is reduced.

20.3.2.4 Long term Objectives

- A clear and transparent participatory structure is established – viewed by supporters, neutrals, and passive opponents as a legitimate and trusted space to exercise agency and decision making on certain issues. The process should be driven by the Regulator.
- Community accepts leadership role in project promotion and participatory / decision-making structures.
- Productive, well-informed conversations can occur around more difficult project aspects (certain project design aspects).
- Project obtains a robust, institutionalized, and sustainable social license.
- Project meets established timelines (for regulatory approvals, IIA submission, etc.).

20.3.2.5 Other Tools

The Open Doors Program invites members of the community to visit the Project site and understand the existing conditions and the exploration work that has been completed. It particularly focusses on the water quality aspects of the Project, as this is an area of concern.

A social action plan aims to establish strong institutional relationship with provincial and municipal entities. Support is given to Brigada Solidaria, which is a non for profit organization providing labour and material for local community needs and social projects.

A series of local educational and sports activities are being carried out to promote healthy living as well as help promote mining related technical careers.

20.3.3 Community Concerns

Key opinions and concerns of the local communities in Catamarca regarding the Project are described below, sorted by relevance identified by the 2019 social baseline survey:

- Increase in Employment Level – The community has high expectations relating to high salaried positions for direct and indirect work during the construction stage and during operations. The community expects that almost all employees will be locals.
- Increase in Local Purchasing Level – Local suppliers are expecting an increase in the purchasing of goods and services from the Project.
- Environmental Contamination and Impact to Water Resources – A major concern for the local community consists of potential contamination of ground and surface water, as well as a reduction in availability of water resources for use by the community, specifically for agricultural uses.
- Environmental Safety and Chemical Accidents – The communities expressed their fear of accidents with hazardous substances, as well as infiltrations, human failure or other activities where hazardous substances may be spilled (chemicals).

- Transport of Hazardous Substances – The transport of hazardous substances is a source of concern, especially in areas where rivers are crossed or where they run alongside roads. This could impact activities conducted in the valley and may affect animals and the community.
- Increase in Traffic, Accidents, Noise and Dust – The traffic generated by the Project could produce an increase in accidents in localities, as well as in travel times and traffic jams. Another aspect of concern to communities is the increase in dust and noise emissions as well as increased vibrations, which may affect health and may alter current ways of life.
- Changes in Customs and Way of Life – Another area of local concern in safety relates to potential changes in lifestyles and customs in the community. It is known that when mining projects arrive, many workers arrive in the primary impact area. Of particular concern is the potential emergence of prostitution, unwanted pregnancies, alcoholism, and drug use.

The stated concerns will be partially addressed with project engineering, environmental and construction hiring and local procurement Health, Safety, Environment & Community (HSEC) policies and procedures following the AARC approach.

20.3.4 Indigenous Communities

According to the studies conducted in 2007, indigenous groups that will be affected by the Project were not identified in the core area of operations. According to the local team, however, self-declared native people (Diaguitas Calchaquíes) exist in the Project's area of influence and appear to be fully integrated within society and are not perceived as indigenous. They have, however, kept some ancestral traditions such as religious celebrations.

Argentina is supportive of 169 OIT Convention, hence the consultation process should be directed by the government as it is an obligation of government to comply with OIT 169 rules.

Further information will be collected in the next stages and in particular during the development of the IIA. Consultation with the indigenous people in the area of influence must be completed prior to the filing of the IIA despite not having a specific regulation regarding this at federal level or provincial level.

20.4 Closure and Post-Closure

A conceptual closure plan has been developed by Knight Piésold, which covers the Agua Rica pit, and other related infrastructure. The Alumbrera facilities such as the TSF and the pit, have detailed closure plans, which are updated on a regular basis as defined in local regulations.

Overarching closure objectives will be incorporated into the detailed closure plan and consist of:

- **Human health and safety:** Mine closure must ensure the remaining facilities in the Project area will not affect human health or degrade the environment. Impacts caused by the disposal of materials must be prevented, mitigated, or attenuated.
- **Physical stability:** Continued physical stability must be ensured, and areas altered by mining activity must be in stable condition upon project closure.
- **Geochemical stability:** Long term geochemical stability must be ensured to reduce the effects on the biological diversity and avoid jeopardizing public health and safety.
- **Use of streams:** Streams must not be affected as a consequence of mine closure.

One of the most important considerations for closure, particularly for this Project, is water management and water quality. It is likely that water quality at the Agua Rica pit, the Alumbrera pit, WRF, and the TSF will require treatment prior to discharge into local water bodies. Further water quality modelling will be conducted during the elaboration of the IIA for operation.

21.0 CAPITAL AND OPERATING COSTS

21.1 Capital Costs

21.1.1 Introduction

21.1.1.1 Previous Studies

Several development scenarios for the Project have been studied at different levels of detail over the past 20 years. These scenarios include stand-alone projects and integrated projects with Alumbrera operations. Mining alternatives have included both open pit and underground production methods ranging from 25,000 tpd of ore to 135,000 tpd of ore. The 2013 FS and subsequent 2016 FS Update involved the integration of Agua Rica with Alumbrera operations.

In 2013, Alumbrera conducted an FS for a project development scenario similar to the current development scope, the primary difference being that crushing and conveying of waste rock in the Campo Arenal basin via a second tunnel was the considered option for waste rock storage and management.

As part of the 2016 FS Update, a high level update of the capital cost estimate was completed based on the work of the 2013 FS. This update included the removal of the waste rock materials handling in Campo Arenal, with the assumption that waste rock would be hauled to the WRF near the mine pit area.

21.1.1.2 PFS-A Study Work

The PFS-A study focussed on an integrated project similar to the 2016 FS Update, with the exclusion of waste rock crushing and materials handling. The current scope incorporates study work around ore processing and concentrate logistics to ensure that the final concentrate can be delivered to the port using existing infrastructure systems and additional new systems (truck transportation for excess concentrate).

The 2013 FS has been applied as the primary basis of information and detail in combination with the work completed in the 2016 FS Update and new elements that have been incorporated for changes in the Project scope. These costs were built up to fulfil the needs of the base case mine plan (40 Mtpa) developed by Deswik.

The various Project capital and operating costs were estimated by the sources shown in Table 21-1.

Table 21-1: Project Costs Developed and Sources
Yamana Gold Inc. – Agua Rica Integrated Project

Project Cost Element	Source
Plant, Process and Facilities Initial Capital	Fluor
Mine Initial Capital	Deswik
WRF Initial Capital	KCB
Owner Initial Capital	The Parties
Mine Operations Sustaining Capital	Deswik
WRF Sustaining Capital	KCB

Project Cost Element	Source
Plant Sustaining Capital	2013 FS
Plant, Pipeline, and Filter Plant Operating Cost	Partially by MMC and partially based on Alumbrera 2016 costs
G&A Expenses and Overhead (OH) Costs	Based on Alumbrera 2016 costs

In summary, the basic methodology used to develop the current capital cost estimate included the following:

- Escalation and update of the 2013 FS base case direct cost estimate data to Q2 2019 terms, utilizing the same methods applied in the 2016 FS Update.
- New elements have been included for changes to the Project scope, while other elements that are no longer required in the Project scope have been removed.
- Indirect costs have been estimated as per 2016 applied percentage allowances.
- Contingency has been estimated on a deterministic basis, applying a percentage for each work breakdown structure (WBS) direct cost item, based on the confidence in the source of the cost input.

This estimate is considered to be at a PFS level, and in line with an Association for the Advancement of Cost Engineering International (AACEI) Class 4 estimate, for all items, with the exception of the WRF water management items that are at a scoping study level (AACEI Class 5). The overall final weighting of the estimate was closer to Class 4 than to Class 5 (83% Class 4 costs and 17% Class 5 costs).

21.1.2 Overall Capital Estimate

The overall capital estimate, consisting of initial capital and sustaining capital is shown in Table 21-2. RPA has reviewed the overall estimated capital costs and is of the opinion that they are reasonable.

Table 21-2: Overall Capital Estimate
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$ Million
Initial Plant, Process, and Facilities Capital	
Direct Cost	
Agua Rica Mine Site Facilities	84.7
Ore and Waste Rock Conveyance Tunnel	99.6
Agua Rica Site Infrastructure	277.4
Agua Rica Site Material Handling – Ore	415.5
Alumbrera Site Facilities	65.8
Plant, Process, and Facilities Indirect Cost	277.4
Contingency	239.6
Owners' Cost (Excluded)	–
Total Initial Plant, Process, and Facilities Capital	**1,459.9**

Description	US$ Million
Initial Mine Capital	
Mine Contractor	611.4
Other Mining	127.2
Mine Equipment	0.6
Contingency	81.3
Total Mine Initial Capital	**820.4**
Owners' Cost	106.0
Total Project Initial Capital	**2,386.3**
Sustaining Capital	
Mine Sustaining Capital	718.4
Plant Sustaining Capital	326.5
WRF Sustaining Capital	35.4
Plant Improvements	132.2
Mine Equipment	322
Total Sustaining Capital	**1,537.4**
Total Capital Expenditure	**3,923.7**

21.1.3 Initial Capital Estimate

The estimated initial capital of $2,386 million for new construction, refurbishment of the Alumbrera facilities, and preproduction mine development is expended over a four year period. The initial capital includes the Owners' costs and contingency, and an allowance for property purchase. The initial capital is expected to be mostly expended in the years prior to production with an amount be carried over into the first production year.

21.1.3.1 Alumbrera Plant, Process, and Facilities Initial Capital

The initial capital cost estimate for the plant, process, and Alumbrera facilities of the Project was prepared by Fluor based on the following:

- Information from the 2013 Alumbrera FS.
- New estimates carried out by Fluor.
- KCB information on the WRF water management facilities (under the WRF base case scenario).
- Contingency assigned depending on the reliability of the input information that forms the initial capital.

Allowance has been included for escalation from the 2013 base costs to 2019 with consideration of currency exchange rate, craft labour rates, Argentinean inflation, and plant equipment index. . Following completion of the initial capital estimate, a review was undertaken which resulted in part of the initial capital for the plant, process, and facilities being reclassified as sustaining capital in Year 1 of operations for financial modelling purposes.

The estimated Agua Rica mine site facilities initial capital is shown in Table 21-3.

Table 21-3: Agua Rica Mine Site Facilities Capital Estimate
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$ Million
Mine Site Power Supply and Distribution	2.0
Truck Shop	37.9
Fuel / Lube Storage	10.4
Tire Shop	4.0
Truck Wash	3.3
Welding Shop	2.2
Mine Office / Change House / Warehouse	8.2
Bus Shelter	0.2
Explosive Storage	4.2
Mine Emergency Facilities	0.9
Other Mine Facilities	5.2
Mine Yard Utilities	1.8
Sewage and Water Supply	1.0
Fire and Fresh Water Storage and Distribution	8.3
Mine Communication	0.6
Subtotal	**90.1**
Reclassified as Sustaining Capital	5.4
Total	**84.7**

The estimate capital for the ore conveyance tunnel was performed by Mas Errazuriz Ingeniería (a Chilean construction and services company, oriented to mining, hydroelectric, industrial, and infrastructure projects) under Fluor's supervision (Table 21-4). The tunnel is 5,357 m long and 8.0 m wide by 5.6 m high. The tunnel ventilation estimate was carried out by Fluor based on historical data.

Table 21-4: Ore and Waste Rock Conveyance Tunnel Capital Estimate
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$ Million
Waste/Ore Tunnel	90.0
Ore Tunnel Ventilation System	9.6
Total	**99.6**

A breakdown of capital costs for the Agua Rica site infrastructure is shown in Table 21-5.

Table 21-5: Agua Rica Site Infrastructure Capital Estimate
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$ Million
Mine Site Preparation	7.5
Mine Site Water Management	135.7
Contact Water Pipeline & Pumps from WRF to South Portal	16.8
Mine Contact Water Pipeline from South Portal to Alumbrera	26.7
West Access Road	18.6
Route 40 to Rout 47 Bypass Connector	12.1
Transmission Line and Substation	67.7
Permanent Camp Facilities – Campo Arenal	23.6
Diesel Fuel Distribution – Campo Arenal to Mine via Tunnel	2.7
Subtotal	**311.2**
Reclassified as Sustaining Capital	33.8
Total	**277.4**

The estimated cost for the Agua Rica site ore handling for ore is shown in Table 21-6.

Table 21-6: Agua Rica Site Ore Handling – Ore Capital Estimate
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$ Million
Access Road to North Portal	3.7
Ore Crusher	34.8
Sacrificial Ore Conveyor	9.8
Ore Surge Bin & Reclaim	20.4
Ore Conveyor-Overland	346.8
Total	**415.5**

The estimated cost for the Alumbrera site facilities is shown in Table 21-7.

Table 21-7: Alumbrera Site Facilities Capital Estimate
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$ Million
Earthmoving – Concentrator	1.5
Demolition	0.4
Coarse Ore Conveying	0.2
Grinding	9.6

Description	US$ Million
Flotation	28.1
Regrinding	17.4
Tailings Disposal Pipeline System	1.4
Concentrate Filter Plant – Alumbrera Operations Site	4.3
Concentrate Storage – Alumbrera Operations Site	3.3
Concentrate Pista	8.4
Concentrate Pipeline	3.6
Filter Plant Facilities and Operations – Tucumán	6.6
Port Facilities and Operations – Rosario	4.9
Railway Equipment	6.9
Concentrate Logistics Improvements	8.4
Concentrate Storage – Port	7.9
Subtotal	**113.1**
Reclassified as Sustaining Capital	47.3
Total	**65.8**

Table 21-8 shows the indirect capital cost estimate for the plant, process, and facilities.

Table 21-8: Plant, Process, and Facilities Indirect Capital Cost Estimate
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$ Million	% of Direct Cost
Temporary Construction Building & Facilities	3.6	0.4%
Temporary Construction Services	74.0	7.1%
Temporary Construction Equipment & Tools	22.8	2.2%
Construction Field Office Expenses	3.3	0.3%
Detail Engineering & Procurement	48.8	4.7%
Third Party Engineering Services	10.4	1.0%
Construction Management	66.3	6.4%
Third Party Construction Management Services	1.3	0.1%
Freight	49.5	4.8%
Vendor Reps.	6.8	0.7%
First -fill Materials	0.5	0.0%
Pre-Operational Testing	5.7	0.6%
Commissioning	1.2	0.1%
Spare Parts	8.7	0.8%

Description	US$ Million	% of Direct Cost
Subtotal	**302.9**	**29.2%**
Reclassified as Sustaining Capital	25.5	
Total	**277.4**	

The estimate for contingency was evaluated on a deterministic basis, applying a contingency percentage per WBS item based on the accuracy of the information included in the direct capital cost. The total contingency resulting from this exercise was $262.8 million, which represents 19.7% of the total direct plus indirect costs. Of this contingency amount, $23.2 million was reclassified as sustaining capital resulting a total contingency of $239.6 million.

21.1.3.2 Mine Initial Capital

Initial capital requirements are estimated at $820 million. This is comprised of the mine pioneering, earthworks, prestripping, purchase of initial mining equipment and contingency. All mining operations regarding mine pioneering and prestripping are expected to be executed by contractors and the cost estimation is based on the application of a Budget Difference Income (BDI) of 30% over estimated owner operating costs, with additional value to cover the contractor's equipment amortization.

The estimated mine initial capital costs for Agua Rica are summarized in Table 21-9.

Table 21-9: Initial Mine Capital Estimate
Yamana Gold Inc. – Agua Rica Integrated Project

Description	(US$ Million)
Mine Equipment	0.57
Initial Parts	0.01
Mine Pre-Production Labour & Related Costs	
Catering & Lodging	7.36
Travel-Descanso	3.41
Subtotal	**10.77**
Other Items	
Ongoing Resource, Infill, and Condemnation Drilling	13.10
Geotechnical and Geophysical	2.93
Technical Studies, Test Work, and Reports	2.70
Operations, Maintenance, Training Manuals	0.23
Consultants	3.00
Explosives Magazine Infrastructure/ANFO Stockpile	0.70
Dispatch System	3.10
Indirect Earthworks – Temp. Const. Build and Facilities	37.91
Indirect Earthworks – Temp. Const. Services	52.72

Description	(US$ Million)
Subtotal	**116.39**
Contractor Pioneering and Prestripping	
Contractor Mining Equipment Amortization	108.95
Pioneering Operating Cost	267.93
Prestripping Operating Cost	234.52
Subtotal	**611.40**
Total	**739.14**
Contingency	81.31
Total Initial Mine Capital Cost	**820.44**

Mining operations at Agua Rica will be a conventional truck and shovel operation, producing an estimated 110,000 tpd of ore and 182,000 tpd of waste. The operating LOM is approximately 28 years, commencing after the completion of the four year preproduction phase, which includes haul road construction and prestripping. Details on the mining plan are provided in Section 16 of this Technical Report.

The mine initial capital estimate was produced by Deswik and covers both the pioneering and prestripping phases. The construction costs for the WRF, in addition to the associated water management facilities costs, were developed by KCB. These are also included in the mine's initial capital.

The open pit mine pioneering and prestripping activities for Agua Rica were assumed to be primarily undertaken by a contractor operated fleet, with the objective of reducing the initial capital. The mining strategy is based on the application of three different haulage fleets, divided into the Owner and contractor based operations.

A maximum number of 45 articulated trucks is expected during the mine pioneering stage, while thirty five 320 t, off highway trucks are estimated for the prestripping mining stage. As for the off highway 400 t Parties trucks, a maximum number of 55 units is expected. Total mine labour reaches 687 personnel in Year 3, however, a total of 498 people is expected to be primarily contracted.

Contingency percentage applied for this mine initial capital is 11%.

21.1.3.3 Owner's Cost Initial Capital

Estimated initial capital details for the Owners' costs for the Project are provided in Table 21-10.

Table 21-10: Owners' Cost Initial Capital Estimate
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$ Million
Owners' Project team	22.2
Property Security	10.6
Environmental Expenses (including Disposal)	8.8
General Expenses	17.5
Camp Services	3.6

Description	US$ Million
Safety & Heath Expenses	8.4
IT Expenses	4.3
Community Programs	3.5
Agua Rica Services (M&C, Social, Media, CCRR)	11.0
Land Purchase	5.0
Pre-Operating and First Fills	11.2
Total	**106.0**

Note:

1. Estimate includes 11% contingency

21.1.4 Sustaining Capital Estimate

A schedule of capital during the production period was estimated and included in the financial analysis under the category of sustaining capital. The total LOM sustaining capital is estimated to be $1,537 million. This capital will be expended during a 28 year period:

- Mine sustaining capital was estimated by Deswik.
- WRF sustaining capital was estimated by KCB.
- Plant sustaining capital is the same as that in the 2013 FS (except for the closure of current tailings disposal facility of Alumbrera, which was categorized as reclamation costs).
- As stated previously, a part of the mine's initial capital and plant's initial capital were considered as sustaining capital (Year 1 of operations)

The estimated sustaining capital annual cash flow for the Project is shown in Figure 21-1.

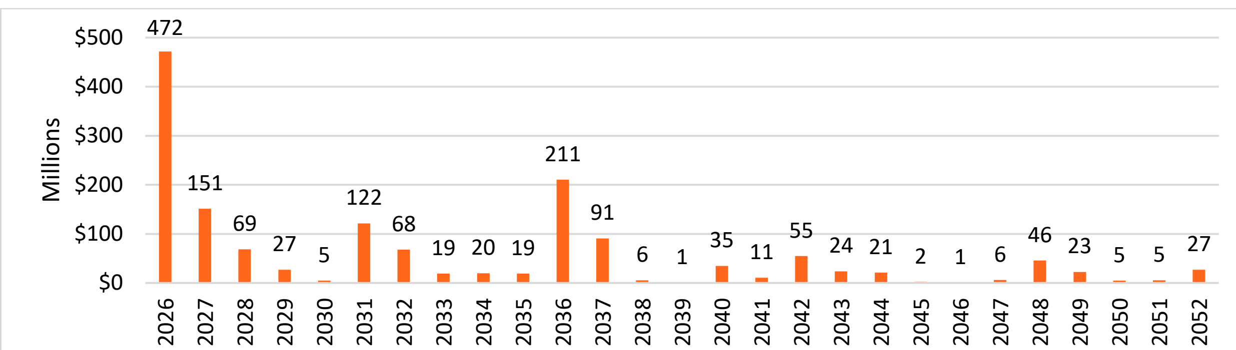


Figure 21-1: Annual Sustaining Capital Cash Flow

The sustaining capital estimate is shown in Table 21-11.

Table 21-11: Sustaining Capital Estimate
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$ Million
Mine Sustaining Capital	718.4
Plant Sustaining Capital	326.5
WRF Sustaining Capital	35.4
Plant Improvements	132.2
Mine Equipment	322.0
Total	**1,537.4**

21.1.5 Closure Costs

Total closure costs are expected to be $495.2 million which will be spent during the last ten years of the LOM.

21.1.6 Capital Cost Exclusions

The following items are specifically excluded from the capital cost estimate:

- Sunk costs, including studies
- Taxes and duties
- Fluctuation of currency exchange rates
- Forward escalation
- Cost of cash/financing
- Stay in business upgrade costs
- Third party cost studies
- Scope changes
- Archaeological work
- Force majeure

21.2 Operating Costs

The LOM production cost is estimated to be $12.93/t of ore processed, excluding the cost of the capitalized prestripping. The production cost includes mine operations, process plant operations, concentrate freight to port, ocean freight, WRF operation, and G&A cost. Table 21-12 shows the estimated operating cost by area per metric tonne of ore processed. In addition, LOM corporate overhead costs total $95.7 million. TC/RCs are deducted from revenues.

Table 21-12: LOM Operating Cost per Tonne of Ore Processed
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$ Million	US$/t of Ore Processed
Mining	5,378.7	4.87
Plant, Pipeline and Filter Plant	6,109.7	5.53
Freight to Port and Port Operations	593.0	0.54
Ocean Freight	1,182.4	1.07
WRF	66.0	0.06
G&A and Corporate Overhead	957.5	0.87
Total Operating Cost	**14,287.3**	**12.93**

The operating cost expenditure was prepared by the Owners' team with inputs from various consultants. RPA has reviewed the operating costs and is of the opinion that they are reasonable.

21.2.1 Mine Operating Costs

Mine operating costs have been estimated for Agua Rica for all activities based on the following cost categories: diesel and lubricants, maintenance parts and rebuild, consumables and wear parts, labour and explosives and its accessories. The cost estimates are built from a mix of first principles based on equipment requirements and factored rates from similar projects. Vendor quotations, guidance from Yamana, and Deswik's experience in other operations were all used to facilitate the estimate. Table 21-13 shows a summary of the mine operating costs for the Base Case. The mine cost is $4.87/t of ore processed or $1.72/t of material moved.

Table 21-13: Mine Operating Cost by Activity
Yamana Gold Inc. – Agua Rica Integrated Project

Period	Cost (US$ Million)							
	G&A and Tech Services	Loading	Hauling	Drilling	Blasting	Support	Maint. (Labour)	Total
Y1	7.39	27.03	142.94	10.65	47.92	22.01	3.50	261.43
Y2	5.61	27.20	173.28	10.66	50.25	23.54	3.65	294.20
Y3	6.17	26.56	170.19	9.22	44.84	20.37	3.57	280.92
Y4	5.08	19.94	110.97	8.14	37.80	16.72	2.74	201.39
Y5	4.15	18.48	106.49	7.89	36.70	20.39	2.74	196.85
Y6	4.22	34.17	192.10	15.05	42.24	18.66	2.77	309.20
Y7	4.00	19.35	129.22	6.97	31.90	17.15	2.77	211.34
Y8	4.08	19.04	141.70	7.58	34.63	15.60	2.77	225.38
Y9	4.20	22.73	122.37	8.43	40.81	16.57	2.84	217.94

Period	Cost (US$ Million)							
	G&A and Tech Services	Loading	Hauling	Drilling	Blasting	Support	Maint. (Labour)	Total
Y10	5.01	18.66	102.15	6.77	32.39	16.32	2.84	184.13
Y11	4.16	18.93	126.91	7.13	35.60	15.53	2.77	211.04
Y12	4.21	19.51	119.81	7.31	37.10	15.46	2.77	206.17
Y13	4.21	19.13	121.80	7.09	35.25	21.33	2.77	211.57
Y14	10.83	18.89	79.05	7.87	38.69	16.90	2.77	175.00
Y15	10.59	17.68	85.75	6.94	33.44	14.54	2.77	171.70
Y16	11.61	38.80	156.15	12.06	44.99	18.41	3.29	285.31
Y17	11.86	23.98	204.13	8.51	42.73	18.82	3.38	313.40
Y18	11.68	24.01	199.62	14.74	43.10	18.24	3.51	314.90
Y19	11.75	20.63	156.87	9.04	42.61	16.68	3.32	260.91
Y20	10.69	10.35	72.38	5.13	25.58	10.59	2.23	136.96
Y21	10.66	8.19	65.49	4.21	21.25	10.01	2.11	121.92
Y22	10.63	7.91	55.55	3.78	19.44	8.04	2.11	107.46
Y23	10.61	7.10	51.23	3.55	18.09	7.64	2.09	100.32
Y24	10.61	7.06	51.60	3.53	17.99	7.60	2.09	100.49
Y25	10.62	6.48	47.81	3.52	17.85	7.53	2.02	95.83
Y26	10.24	5.43	26.30	0.15	0.21	7.39	1.91	51.63
Y27	10.29	5.39	49.39	0.53	2.22	7.06	1.91	76.78
Y28	2.73	4.55	40.17	0.03	0.09	5.23	1.81	54.60
Total	**217.89**	**497.18**	**3101.42**	**196.48**	**875.71**	**414.33**	**75.82**	**5,378.77**
US$/t[1]	**0.20**	**0.45**	**2.81**	**0.18**	**0.79**	**0.38**	**0.07**	**4.87**

Note:

1. US$/t processed

Unit operating costs vary with total material movement over the LOM schedule, as shown in Figure 21-2. The LOM operating cost is $1.72/t of material moved.

Mine operating costs were prepared by Deswik. Mine operating costs have been estimated for Agua Rica for all activities based on the following cost categories:

- Diesel and lubricants
- Maintenance parts and rebuild
- Consumables and wear parts
- Labour and explosives

- Mine accessories

Diesel fuel pricing is estimated at $0.76/l as supplied by Yamana. The cost estimates are built from a mix of first principles based on equipment requirements and factored rates from similar projects. Vendor quotations, guidance from Yamana, and Deswik's experience with comparable operations were all used to facilitate the estimate.

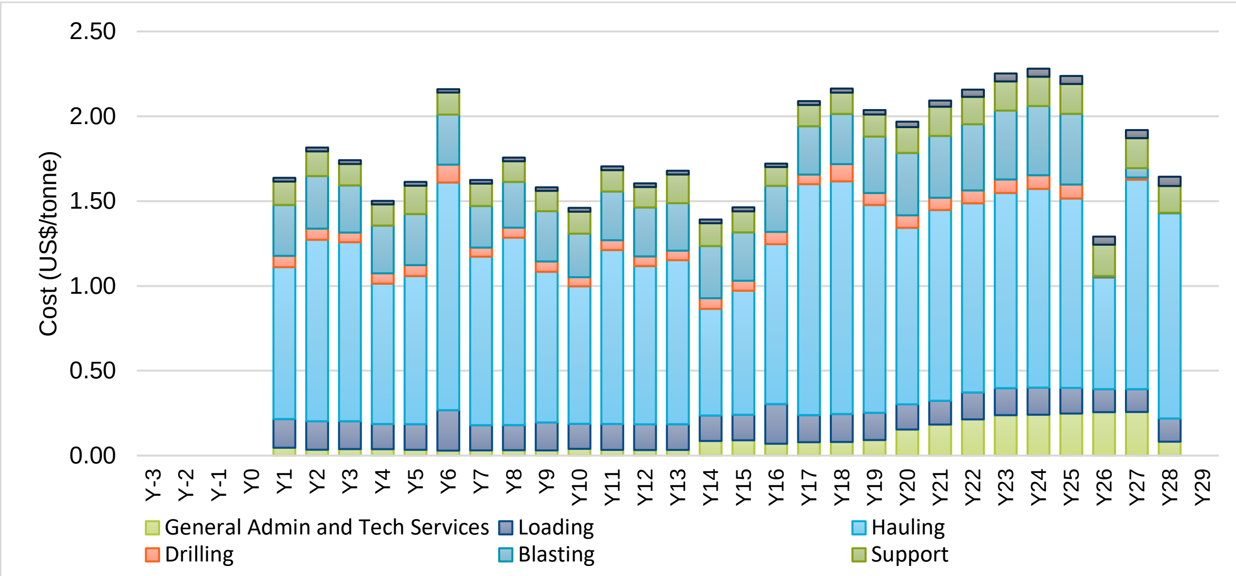


Figure 21-2: Mine Operating Cost per Tonne

Table 21-14 shows the LOM operating costs by activity.

Table 21-14: Mine Cost per Tonne Moved
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$/t Moved
General and Technical Services	0.07
Loading	0.16
Hauling	0.99
Drilling	0.06
Blasting	0.28
Support	0.13
Maintenance (Labour)	0.02
Total Fixed Unit Cost	**1.72**

21.2.1.1 Mining G&A and Technical Services

G&A and technical services activities are comprised of:

- Administration and technical services labour

- Laboratory costs and sample analysis
- Topography contractor
- Water management

Annual labour rates were supplied by Yamana and used to calculate total labour costs for each functional position. A total mining administration and technical services labour count of 72 people is estimated for the Project.

21.2.1.2 Loading Costs

Loading operating costs are comprised of excavation and loading activities and are derived from first principles. The primary excavator estimated for the Project is the Komatsu PC8000 (or similar) while a slightly smaller excavator (Komatsu PC5500 or similar) is planned for the prestripping stage. A suitable wheel loader (L-2350 or similar) for the 400 t truck is also planned to provide flexibility to the operation. The resulting operating costs were based on the hourly operating parameters and costs found in Table 21-15.

Table 21-15: Loading Cost Parameters
Yamana Gold Inc. – Agua Rica Integrated Project

Loading Equipment	Diesel Burn Rate (L/h)	Maintenance Parts (US$/h)	Consumables (US$/h)
Primary Excavator (PC8000 or similar)	570	280	98
Primary Excavator (PC5500 or similar)	340	150	62
Primary Wheel Loader (L-2350 or similar)	200	110	78

21.2.1.3 Haulage Costs

Haulage operating costs are comprised of material transport activities and are derived from first principles. The primary off-highway truck is the Liebherr T282 (or similar), while smaller trucks are planned for the prestripping and mine pioneering stages. The Komatsu 930E (or similar) has been selected for the prestripping while the Volvo A60 truck is suitable for the mine pioneering stage. The resulting operating costs were based on the hourly operating parameters and costs found in Table 21-16.

Table 21-16: Haulage Cost Parameters
Yamana Gold Inc. – Agua Rica Integrated Project

Off-Highway Truck	Diesel Burn Rate (L/h)	Maintenance Parts (US$/h)	Consumables (US$/h)
Primary Truck (T282 or similar)	232	140	72
Secondary Truck (930E or similar)	180	125	65
Articulated Truck for Mine Pioneering (A60 or similar)	60	33	26

21.2.1.4 Drill and Blast Costs

Drilling operating costs are comprised of rock drilling activities and are derived from first principles. The selected production drill (Atlas Copco PV-311 or similar) is suitable for both ore and waste material since it is possible to drill from 9.00 in. to 12.25 in. The resulting operating costs were based on the hourly operating parameters and costs found in Table 21-17. A smaller drill (Sandvik D45 or similar) is also required for the mine pioneering stage as well as for final bench trimming.

Table 21-17: Drill Cost Parameters
Yamana Gold Inc. – Agua Rica Integrated Project

Off-Highway Truck	Diesel Burn Rate (L/h)	Maintenance Parts (US$/h)	Consumables (US$/h)
Primary Drill (PV311 or similar)	175	55	55
Secondary Drill (D45 KS or similar)	58	28	22

Blasting activities are planned to be undertaken by contractors at an additional cost of 15% over the explosives and accessories cost. Unit costs for explosives and accessories are summarized in Table 21-18.

Table 21-18: Blasting Cost Parameters
Yamana Gold Inc. – Agua Rica Integrated Project

Item	Cost
Explosives (ANFO/Emulsion)	$0.90/kg
Detonating Cord	$0.74/m
Primer	$3.23/unit
Surface Delay	$1.62/unit

21.2.1.5 Support Activity Costs

Support activity costs are comprised of all activities related to supporting mining, including drill & blasting, loading, and haulage activities. These are derived from first principles. Operating hours are estimated for each piece of equipment based on support activities, the resulting operating costs are calculated based on hourly operating parameters shown in Table 21-19.

Table 21-19: Support Activities Cost Parameters
Yamana Gold Inc. – Agua Rica Integrated Project

Equipment	Diesel Burn Rate (L/h)	Maintenance Parts (US$/h)	Consumables (US$/h)
Track Dozer	D11 or similar	110	48
Track Dozer	D10 or similar	80	38
Track Dozer	D9 or similar	55	33
Wheel Dozer	CAT 854 or similar	80	32
Motor Grader	24M or similar	60	18

Equipment	Diesel Burn Rate (L/h)	Maintenance Parts (US$/h)	Consumables (US$/h)
Motor Grader	16M or similar	35	13
Water Truck	CAT777 or similar	55	33
Small Excavator	CAT374 or similar	38	9
Small Wheel Loader	CAT980 or similar	32	23
Fuel and Lube Truck	CAT777 or similar	55	33
Flatbed Truck with Crane	-	15	4
RC Drill	L8-25 or similar	40	9
4-Light Tower	-	2	1
Pumps and Genset	115 kW	11	1
Light Vehicle	Mitsubishi L200	6.5 km/liter	3

21.2.1.6 Maintenance Labour Costs

Maintenance labour costs are calculated based on the amount of operating equipment and its estimated availability. Annual labour rates were supplied by Yamana and used to calculate total labour costs for each functional position. A total maintenance labour count of 76 people is estimated for the Project.

21.2.1.7 Dewatering Costs

Quantities and costs have been estimated for each of the key structures that will be necessary for the dewatering plan and have been adapted from the Piteau study (Fluor, 2013).

21.2.2 Plant, Pipeline, and Filter Plant Operating Costs

The operating cost for the process plant, pipeline, and filter plant (including concentrate logistics) used in this study was prepared by MMC.

Table 21-20 shows the estimated cost and source of the plant operating cost by area per tonne of ore processed. The primary crushing and conveyor operating costs were based on MMC projections. Process plant, pipeline, and filter plant operating costs were based on Alumbrera 2016 costs.

Table 21-20: Plant Operating Cost
Yamana Gold Inc. – Agua Rica Integrated Project

Description	US$/t of Ore Processed
Primary Crusher and Conveying	0.65
Concentrator, Tailings Disposal Facility, Molybdenum Plant and Surface Water Management	4.49
Pipeline and Filter Plant	0.39
Total	**5.53**

21.2.3 General and Administrative

G&A costs are projected to be $34.4 million per year, which is an expenditure provided by MMC for 2016. An extra 10% of this 2016 figure ($3.4 million per year) was considered as corporate overheads.

G&A costs include all costs other than direct costs for the mining and processing of Agua Rica ore, and the transportation, storage, and ship loading of the copper concentrate at Rosario port. Rail freight is estimated to be $21/dmt of concentrate and port costs are estimated to be $13/dmt of concentrate.

G&A costs include:

- General management
- Administration and finance
- Human resources and logistics
- Corporate affairs
- Sustaining development

The G&A and corporate allowance cost per tonne processed is $0.87/t.

21.2.4 Maritime Freight Cost

The financial analysis is based on the premise that the concentrate will be exported to Asia with a freight cost assumption of $65/dmt.

21.2.5 WRF Water Management Operating Costs

The operating costs for the WRF were estimated by KCB based on the proposed WRF design. Major WRF items with a direct impact on the total operating cost were quantified (i.e. earthworks, water management infrastructure, etc.). The WRF operating costs were developed and assigned to two categories as follows:

- **WRF Operations (Mine):** The estimated operating cost associated with WRF operations is included in the mine operating costs.
- **WRF Water Management:** The operating cost associated with the WRF water management infrastructure is included in Other Costs. The unit rates for WRF water management were estimated by KCB to be $2.36 million per year based on previous experience with comparable projects in Peru, but were increased by 25% as a contingency.

22.0 ECONOMIC ANALYSIS

22.1 Introduction

The financial evaluation presents the determination of the NPV; payback period (time in years to recapture the initial capital investment); and internal rate of return (IRR) for the Project. Annual cash flow projections were estimated over the LOM based on the estimates of sales revenue, capital expenditures, and production costs (Table 22-1). The sales revenue is based on the metal content of the concentrate produced. The estimates of capital and site production costs have been developed specifically for the Project and the detail of some of these costs has been presented in other sections of this Technical Report. The financial model information below is related to the base case scenario of 40 Mtpa.

22.2 Economic Criteria

22.2.1 Physicals

- 108,000 tpd mining from open pit (40 Mtpa).
- LOM Head Grade
  - 0.48% Cu
  - 0.21 g/t Au
  - 2.83 g/t Ag
  - 0.03% Mo
- Mill recovery averaging:
  - 86.0% Cu
  - 35.4% Au
  - 44.8% Ag
  - 43.7% Mo
- Average LOM annual concentrate production
  - Copper concentrate: 650,000 tpa
  - Molybdenum concentrate: 10,200 tpa

22.2.2 Revenue (100% Basis)

- Metal prices:
  - US$3.00/lb Cu
  - US$1,300/oz Au
  - US$18.00/oz Ag
  - US$11.00/lb Mo
- Average LOM NSR value: $28.66/t processed

- Revenue is recognized at the time of production

22.2.3 Costs (100% Basis)

- Pre-production period: 48 months
- Mine life: 28 years
- Pre-production capital: $2,386 million
- Sustaining capital: $1,537 million
- Average operating cost over the mine life is $12.93/t processed
- Closure and reclamation cost: $495 million
- NSR royalty: $1,382 million
- All-in Sustaining Cost (AISC) of US$1.52/lb Cu
- All-in Cost of US$1.73/lb Cu

22.3 Taxation and Royalties

RPA has relied on Yamana for guidance on applicable taxes, value added tax (VAT or IVA), royalties, and other government levies or interests, applicable to revenue or income from the Project.

For the fiscal years 2020 and onwards, taxes for corporations include a corporate tax rate of 25% and a dividend distribution withholding tax of 13%.

VAT is levied on the supply of goods and services subject to the tax, as well as on final imports of taxable goods and services into Argentina.

Exports of goods and services are zero-rated. This means VAT is not levied on the output, however, VAT paid on inputs may be recovered through tax refunds, which should be requested by the taxpayer.

The standard VAT rate is 21%. A reduced rate of 10.5% and an increased rate of 27% apply to specific activities.

An average rate of 16% is applied for VAT in the financial model over the total costs under the categories operating cost and capital. The distribution over the years of the VAT paid is assumed as a function of these expenditures.

In terms of VAT reimbursement related to the export of goods, it is assumed that that the sum of VAT recovered will match the sum of VAT paid at the end of the operation.

A fast VAT amortization was applied (tax benefit) in Year 1 and Year 2 of operations ($251 million VAT credit amortization).

No retention tax was applied in the model, as the Argentinian government has indicated that the retention tax will be eliminated in 2021 (prior to Agua Rica operations beginning).

A retention tax return (of retention taxes paid by Alumbrera) of $11.3 million was however projected from Year 2. This retention return was projected flat yearly during a period of 10 years.

The following royalties apply to the Project:

- Mining royalty (Boca de mina) of 2% of gross revenue.

- Fondo Fiduciario was estimated at 1.5% of gross revenue (an innovative initiative of the government of Argentina to eradicate poverty and alleviate unemployment which will be agreed as part of the provincial permitting process for the Project).
- YMAD, which is $0.145 per tonne processed as per a service agreement, as described in Section 4.

Table 22-1: After-Tax Cash Flow Summary
Yamana Gold Inc. - Agua Rica Integrated Project

	INPUTS	UNITS	Year TOTAL	2022 Year -4	2023 Year -3	2024 Year -2	2025 Year -1	2026 Year 1	2027 Year 2	2028 Year 3	2029 Year 4	2030 Year 5	2031 Year 6	2032 Year 7	2033 Year 8	2034 Year 9	2035 Year 10	2036 Year 11	2037 Year 12	2038 Year 13	2039 Year 14	2040 Year 15	2041 Year 16
MINING																							
Open Pit																							
Operating Days	365	days	10,220					365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365
Tonnes milled per day		tonnes / day	108,105					82,546	112,026	150,220	101,114	115,100	135,985	68,869	92,752	138,716	87,374	141,036	163,978	178,126	131,641	105,102	97,097
Tonnes moved per day		tonnes / day	297,246					437,472	443,892	442,049	367,537	334,278	392,271	356,431	351,525	377,594	345,493	339,172	351,992	345,251	344,532	321,466	454,185
Production		'000 tonnes	1,104,835					30,129	40,889	54,830	36,907	42,012	49,635	25,137	33,854	50,632	31,892	51,478	59,852	65,016	48,049	38,362	35,440
Waste	-	'000 tonnes	2,016,805		-	24,777	59,006	129,548	121,131	106,518	97,245	80,000	93,544	104,960	94,452	87,190	94,213	72,320	68,625	61,001	77,705	78,973	130,337
Total Moved		'000 tonnes	3,037,857					159,677	162,020	161,348	134,151	122,012	143,179	130,097	128,307	137,822	126,105	123,798	128,477	126,017	125,754	117,335	165,777
Stripping Ratio			1.83					4.30	2.96	1.94	2.63	1.90	1.88	4.18	2.79	1.72	2.95	1.40	1.15	0.94	1.62	2.06	3.68
PROCESSING																							
Mill Feed		'000 tonnes	1,104,835					28,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	39,938	40,000	40,000	40,000	40,000	40,000	40,000
Au Grade		g/t	0.21					0.41	0.31	0.19	0.16	0.21	0.26	0.23	0.23	0.26	0.20	0.23	0.22	0.16	0.10	0.13	0.14
Ag Grade		g/t	2.83					1.65	1.68	2.21	2.89	3.52	1.97	3.59	3.10	3.45	2.92	3.33	3.32	2.42	2.62	3.00	2.76
Cu Grade		%	0.48%					0.93%	0.80%	0.49%	0.62%	0.72%	0.68%	0.54%	0.40%	0.57%	0.38%	0.46%	0.40%	0.33%	0.40%	0.46%	0.45%
Mo Grade		%	0.03%					0.02%	0.02%	0.04%	0.05%	0.04%	0.03%	0.02%	0.02%	0.03%	0.03%	0.03%	0.02%	0.02%	0.05%	0.05%	0.04%
Contained Au		oz	7,338,381					366,401	401,175	247,745	208,070	268,658	336,350	298,211	293,974	340,363	254,674	291,006	281,122	210,658	130,170	172,665	185,677
Contained Ag		oz	100,686,751					1,489,529	2,166,807	2,843,951	3,716,895	4,524,428	2,537,514	4,614,722	3,991,350	4,436,315	3,752,503	4,287,986	4,275,082	3,108,883	3,368,804	3,861,378	3,546,354
Contained Cu		tonnes	5,324,697					259,892	318,789	194,023	248,970	286,736	272,417	216,473	158,390	229,623	152,341	184,131	158,154	130,324	159,605	184,770	179,079
Contained Mo		tonnes	324,905					5,355	7,158	15,011	19,686	15,230	10,146	7,452	8,278	13,710	11,817	10,789	8,399	8,934	21,440	21,721	14,633
Recovery																							
Copper Concentrate																							
Au Recovery		%	35.4%					37.9%	38.8%	30.2%	35.6%	38.4%	40.9%	33.9%	30.8%	34.3%	30.9%	33.4%	33.6%	34.8%	39.0%	37.3%	35.4%
Ag Recovery		%	44.8%					61.5%	56.7%	43.3%	39.7%	36.2%	49.5%	38.8%	32.7%	40.1%	37.9%	41.3%	41.2%	45.8%	45.8%	48.7%	46.1%
Cu Recovery		%	86.0%					89.4%	87.8%	83.1%	83.6%	83.6%	88.5%	83.0%	84.7%	85.7%	83.4%	85.2%	85.4%	85.3%	86.9%	86.0%	86.1%
Moly Concentrate																							
Mo Recovery		%	43.7%					52%	51%	37%	41%	35%	52%	33%	39%	43%	36%	40%	46%	50%	41%	34%	32%
Production																							
Copper Concentrate																							
Au		oz	2,602,871					138,730	155,792	74,929	74,156	103,109	137,581	101,129	90,446	116,605	78,584	97,054	94,428	73,354	50,802	64,464	65,770
Ag		oz	43,701,303					915,912	1,229,520	1,232,054	1,475,240	1,639,241	1,255,194	1,789,862	1,304,207	1,779,906	1,423,715	1,771,039	1,760,924	1,425,259	1,544,027	1,882,047	1,633,450
Cu		tonnes	4,588,785					232,335	279,927	161,253	208,166	239,753	241,154	179,771	134,121	196,883	127,071	156,813	135,066	111,193	138,715	158,935	154,098
Moly Concentrate																							
Mo		tonnes	142,593					2,764	3,668	5,560	8,050	5,281	5,256	2,476	3,248	5,877	4,226	4,350	3,841	4,454	8,766	7,414	4,685
Copper Concentrate		dmt	18,190,193					688,208	897,447	623,548	784,922	943,243	801,406	718,136	551,299	730,475	573,206	631,911	549,615	432,858	487,182	589,756	608,782
Au grade in concentrate		g/t	4.5					6.3	5.4	3.7	2.9	3.4	5.3	4.4	5.1	5.0	4.3	4.8	5.3	5.3	3.2	3.4	3.4
Ag grade in concentrate		g/t	74.7					41.4	42.6	61.5	58.5	54.1	48.7	77.5	73.6	75.8	77.3	87.2	99.7	102.4	98.6	99.3	83.5
Cu grade in concentrate		%	25.2%					33.8%	31.2%	25.9%	26.5%	25.4%	30.1%	25.0%	24.3%	27.0%	22.2%	24.8%	24.6%	25.7%	28.5%	26.9%	25.3%
As grade in concentrate		%	0.44%					0.09%	0.22%	0.50%	0.45%	0.28%	0.31%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.48%
Concentrate Moisture	9.5%																						
Copper Concentrate		wmt	20,099,661					760,450	991,654	689,004	867,317	1,042,258	885,532	793,520	609,170	807,155	633,377	698,244	607,309	478,296	538,323	651,664	672,688
Moly Concentrate		dmt	285,186					5,528	7,337	11,120	16,099	10,563	10,513	4,952	6,497	11,754	8,452	8,700	7,682	8,909	17,533	14,827	9,369
Mo grade in concentrate	50%	%	50%					50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Concentrate Moisture	2.0%																						
Moly Concentrate		wmt	291,006					5,641	7,486	11,347	16,428	10,779	10,727	5,053	6,629	11,994	8,624	8,878	7,839	9,090	17,890	15,130	9,560
Total Concentrate Tonnes		wmt	20,390,666					766,092	999,140	700,351	883,745	1,053,037	896,259	798,573	615,800	819,148	642,002	707,122	615,148	487,386	556,213	666,794	682,248
Total Recovered																							
Au		**oz**	**2,602,871**					**138,730**	**155,792**	**74,929**	**74,156**	**103,109**	**137,581**	**101,129**	**90,446**	**116,605**	**78,584**	**97,054**	**94,428**	**73,354**	**50,802**	**64,464**	**65,770**
Ag		**oz**	**43,701,303**					**915,912**	**1,229,520**	**1,232,054**	**1,475,240**	**1,639,241**	**1,255,194**	**1,789,862**	**1,304,207**	**1,779,906**	**1,423,715**	**1,771,039**	**1,760,924**	**1,425,259**	**1,544,027**	**1,882,047**	**1,633,450**
Cu		**tonnes**	**4,588,785**					**232,335**	**279,927**	**161,253**	**208,166**	**239,753**	**241,154**	**179,771**	**134,121**	**196,883**	**127,071**	**156,813**	**135,066**	**111,193**	**138,715**	**158,935**	**154,098**
Mo		**tonnes**	**142,592.8**					**2,764**	**3,668**	**5,560**	**8,050**	**5,281**	**5,256**	**2,476**	**3,248**	**5,877**	**4,226**	**4,350**	**3,841**	**4,454**	**8,766**	**7,414**	**4,685**
REVENUE																							
Metal Prices																							
Au	US$1,300 / oz Au	US$/oz Au	$ 1,300					$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300
Ag	US$18.00 / oz Ag	US$/oz Ag	$ 18.00					$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00
Cu	US$3.00 / lb Cu	US$/lb Cu	$ 3.00					$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00
Mo	US$11.00 / lb Mo	US$/lb Mo	$ 11.00					$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00
Copper Concentrate Payable %																							
Au		%	92.8%					94.0%	94.0%	92.0%	90.0%	92.0%	94.0%	92.0%	94.0%	92.0%	92.0%	92.0%	94.0%	94.0%	92.0%	92.0%	92.0%
Ag		%	90.0%					90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Cu		%	96.1%					96.5%	96.5%	96.0%	96.0%	96.0%	96.5%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.5%	96.0%	96.0%
Moly Concentrate Payable %																							
Mo		%	85.0%					85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Copper Concentrate Payable																							
Au		oz	2,415,815.13					130,406	146,444	68,935	66,740	94,860	129,326	93,039	85,019	107,277	72,297	89,289	88,762	68,953	46,738	59,307	60,508
Ag		oz	39,331,173					824,321	1,106,568	1,108,849	1,327,716	1,475,317	1,129,674	1,610,876	1,173,786	1,601,916	1,281,344	1,593,935	1,584,832	1,282,733	1,389,624	1,693,842	1,470,105
Cu		tonnes	4,410,619					224,204	270,130	154,803	199,840	230,163	232,714	172,581	128,756	189,008	121,989	150,541	129,664	106,746	133,860	152,578	147,934
Mo		tonnes	-					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Moly Concentrate Payable																							
Mo		tonnes	121,203.9					2,350	3,118	4,726	6,842	4,489	4,468	2,105	2,761	4,995	3,592	3,698	3,265	3,786	7,451	6,302	3,982
Gold Streaming Revenue																							
Stream Contracted Production	20%	oz	483,163	-	-	-	-	26,081	29,289	13,787	13,348	18,972	25,865	18,608	17,004	21,455	14,459	17,858	17,752	13,791	9,348	11,861	12,102
Stream Price	30%	USD/oz	$ 390	$ 0	$ 0	$ 0	$ 0	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390
Gold Stream Revenue Yamana		US$ '000	$ 188,434	$ 0	$ 0	$ 0	$ 0	$ 10,172	$ 11,423	$ 5,377	$ 5,206	$ 7,399	$ 10,087	$ 7,257	$ 6,632	$ 8,368	$ 5,639	$ 6,965	$ 6,923	$ 5,378	$ 3,646	$ 4,626	$ 4,720
Gold Revenue at Spot Price																							
Gold Production at Spot Price	80%	oz	1,932,652	-	-	-	-	104,325	117,155	55,148	53,392	75,888	103,461	74,431	68,016	85,821	57,838	71,432	71,010	55,162	37,391	47,445	48,406
Gold Spot Price		USD/oz	$ 1,300	$ 0	$ 0	$ 0	$ 0	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300
Gold Revenue at Spot Price		US$ '000	$ 2,512,448	$ 0	$ 0	$ 0	$ 0	$ 135,623	$ 152,302	$ 71,692	$ 69,410	$ 98,655	$ 134,499	$ 96,760	$ 88,420	$ 111,568	$ 75,189	$ 92,861	$ 92,312	$ 71,711	$ 48,608	$ 61,679	$ 62,928
All Metals Gross Revenue																							
Au Gross Revenue		US$ '000	$ 2,700,881					$ 145,794	$ 163,724	$ 77,069	$ 74,616	$ 106,054	$ 144,587	$ 104,017	$ 95,052	$ 119,935	$ 80,828	$ 99,826	$ 99,236	$ 77,089	$ 52,253	$ 66,305	$ 67,648
Ag Gross Revenue		US$ '000	$ 707,961					$ 14,838	$ 19,918	$ 19,959	$ 23,899	$ 26,556	$ 20,334	$ 28,996	$ 21,128	$ 28,834	$ 23,064	$ 28,691	$ 28,527	$ 23,089	$ 25,013	$ 30,489	$ 26,462
Cu Gross Revenue		US$ '000	$ 29,171,214					$ 1,482,851	$ 1,786,601	$ 1,023,843	$ 1,321,711	$ 1,522,263	$ 1,539,137	$ 1,141,424	$ 851,575	$ 1,250,071	$ 806,816	$ 995,657	$ 857,578	$ 706,000	$ 885,331	$ 1,009,129	$ 978,413
Mo Gross Revenue		US$ '000	$ 2,939,294					$ 56,979	$ 75,615	$ 114,610	$ 165,930	$ 108,868	$ 108,350	$ 51,038	$ 66,959	$ 121,141	$ 87,111	$ 89,668	$ 79,179	$ 91,817	$ 180,702	$ 152,820	$ 96,564
Total Gross Revenue		**US$ '000**	**$ 35,519,350**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 1,700,463**	**$ 2,045,859**	**$ 1,235,481**	**$ 1,586,156**	**$ 1,763,740**	**$ 1,812,408**	**$ 1,325,476**	**$ 1,034,714**	**$ 1,519,982**	**$ 997,819**	**$ 1,213,841**	**$ 1,064,520**	**$ 897,995**	**$ 1,143,300**	**$ 1,258,743**	**$ 1,169,087**
Treatment																							
Cu Concentrate	US$80.00 / dmt conc	US$ '000	$ 1,455,215					$ 55,057	$ 71,796	$ 49,884	$ 62,794	$ 75,459	$ 64,113	$ 57,451	$ 44,104	$ 58,438	$ 45,857	$ 50,553	$ 43,969	$ 34,629	$ 38,975	$ 47,180	$ 48,703
As Penalty	US$03.00 / dmt conc	US$ '000	$ 180,076					$ 0	$ 3,141	$ 7,483	$ 8,347	$ 5,021	$ 5,124	$ 8,618	$ 6,616	$ 8,766	$ 6,878	$ 7,583	$ 6,595	$ 5,194	$ 5,846	$ 7,077	$ 6,971
Mo Concentrate	US$00.00 / dmt conc	US$ '000	$ 0					$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Refining cost																							
Au	US$4.50 / oz Au	US$ '000	$ 10,871					$ 587	$ 659	$ 310	$ 300	$ 427	$ 582	$ 419	$ 383	$ 483	$ 325	$ 402	$ 399	$ 310	$ 210	$ 267	$ 272
Ag	US$0.40 / oz Ag	US$ '000	$ 15,732					$ 330	$ 443	$ 444	$ 531	$ 590	$ 452	$ 644	$ 470	$ 641	$ 513	$ 638	$ 634	$ 513	$ 556	$ 678	$ 588
Cu	US$0.08 / lb Cu	US$ '000	$ 807,063					$ 41,025	$ 49,429	$ 28,326	$ 36,567	$ 42,116	$ 42,582	$ 31,579	$ 23,560	$ 34,585	$ 22,322	$ 27,546	$ 23,726	$ 19,532	$ 24,494	$ 27,919	$ 27,069
Mo	US$0.00 / lb Mo	US$ '000	$ 0					$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Charges		US$ '000	$ 2,468,958	$ 0	$ 0	$ 0	$ 0	$ 96,998	$ 125,468	$ 86,446	$ 108,539	$ 123,613	$ 112,853	$ 98,711	$ 75,132	$ 102,912	$ 75,895	$ 86,721	$ 75,324	$ 60,179	$ 70,081	$ 83,121	$ 83,603
Net Smelter Return		**US$ '000**	**$ 33,050,393**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 1,603,464**	**$ 1,920,391**	**$ 1,149,035**	**$ 1,477,617**	**$ 1,640,127**	**$ 1,699,555**	**$ 1,226,765**	**$ 959,583**	**$ 1,417,070**	**$ 921,925**	**$ 1,127,119**	**$ 989,196**	**$ 837,816**	**$ 1,073,219**	**$ 1,175,622**	**$ 1,085,484**
Royalty NSR	Input Rate Into Proforma	US$ '000	$ 1,382,165	$ 0	$ 0	$ 0	$ 0	$ 59,516	$ 71,605	$ 43,242	$ 55,515	$ 67,541	$ 69,245	$ 52,202	$ 42,025	$ 59,010	$ 40,725	$ 48,295	$ 43,069	$ 37,240	$ 45,826	$ 49,866	$ 46,728
Net Revenue		**US$ '000**	**$ 31,668,227**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 1,543,948**	**$ 1,848,786**	**$ 1,105,793**	**$ 1,422,101**	**$ 1,572,586**	**$ 1,630,311**	**$ 1,174,563**	**$ 917,557**	**$ 1,358,060**	**$ 881,200**	**$ 1,078,825**	**$ 946,127**	**$ 800,576**	**$ 1,027,393**	**$ 1,125,756**	**$ 1,038,756**
Unit NSR		**US$/t milled**	**$ 28.66**					**$ 55.14**	**$ 46.22**	**$ 27.64**	**$ 35.55**	**$ 39.31**	**$ 40.76**	**$ 29.36**	**$ 22.94**	**$ 33.95**	**$ 22.06**	**$ 26.97**	**$ 23.65**	**$ 20.01**	**$ 25.68**	**$ 28.14**	**$ 25.97**
Other Income																							
Gold Stream Upfront Payment	$202,500	US$ '000	$ 202,500	$ 0	$ 50,625	$ 50,625	$ 101,250	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Revenue		**US$ '000**	**$ 31,870,727**	**$ 0**	**$ 50,625**	**$ 50,625**	**$ 101,250**	**$ 1,543,948**	**$ 1,848,786**	**$ 1,105,793**	**$ 1,422,101**	**$ 1,572,586**	**$ 1,630,311**	**$ 1,174,563**	**$ 917,557**	**$ 1,358,060**	**$ 881,200**	**$ 1,078,825**	**$ 946,127**	**$ 800,576**	**$ 1,027,393**	**$ 1,125,756**	**$ 1,038,756**

	INPUTS	UNITS	Year TOTAL	2022 Year -4	2023 Year -3	2024 Year -2	2025 Year -1
OPERATING COST							
Mining (Open Pit)		US$/t moved	$ 1.81				
Processing		US$/t milled	$ 5.53				
Freight Cost to Port & Port Ops		US$/t milled	$ 0.54				
Freight Cost to Asia		US$/t milled	$ 1.07				
WRF Opex		US$/t milled	$ 0.06				
G&A		US$/t milled	$ 0.87				
Total Unit Operating Cost		**US$/t milled**	**$ 12.93**				
Mining (Open Pit)		US$ '000	$ 5,378,748				
Processing		US$ '000	$ 6,109,740				
Freight Cost to Port & Port Ops	US$32.59 / dmt conc	US$ '000	$ 592,818				
Freight Cost to Asia	US$65.00 / dmt conc	US$ '000	$ 1,182,363				
WRF Opex		US$ '000	$ 65,965				
G&A		US$ '000	$ 957,467				
Total Operating Cost		**US$ '000**	**$ 14,287,100**				
Operating Cashflow		**US$ '000**	**$ 17,583,627**	**$ 0**	**$ 50,625**	**$ 50,625**	**$ 101,250**
Corporate Overheads Costs		US$ '000	$ 95,747				
CAPITAL COST							
Direct Cost							
Mining		US$ '000	$ 739,137	$ 204,551	$ 146,600	$ 161,621	$ 226,366
Processing		US$ '000	$ 1,220,316	$ 0	$ 247,276	$ 501,183	$ 471,856
Infrastructure		US$ '000	$ 0	$ 0	$ 0	$ 0	$ 0
Tailings		US$ '000	$ 0	$ 0	$ 0	$ 0	$ 0
Total Direct Cost		**US$ '000**	**$ 1,959,453**	**$ 204,551**	**$ 393,876**	**$ 662,804**	**$ 698,222**
Other Costs							
EPCM / Owners / Indirect Cost		US$ '000	$ 96,000	$ 0	$ 30,000	$ 30,000	$ 36,000
Subtotal Costs		**US$ '000**	**$ 2,055,453**	**$ 204,551**	**$ 423,876**	**$ 692,804**	**$ 734,222**
Contingency		US$ '000	$ 330,923	$ 0	$ 0	$ 0	$ 0
Initial Capital Cost		**US$ '000**	**$ 2,386,376**	**$ 204,551**	**$ 423,876**	**$ 692,804**	**$ 734,222**
Sustaining		US$ '000	$ 1,537,425	$ 0	$ 0	$ 0	$ 0
Working Capital		US$ '000	($ 0)	($ 33,905)	($ 36,354)	($ 40,415)	($ 2,704)
Asset Sales		US$ '000	($ 60,018)	$ 0	$ 0	$ 0	$ 0
Reclamation and closure		US$ '000	$ 495,184	$ 0	$ 0	$ 0	$ 0
Total Capital Cost		**US$ '000**	**$ 4,358,967**	**$ 170,646**	**$ 387,522**	**$ 652,389**	**$ 731,518**
PRE-TAX CASH FLOW							
Net Pre-Tax Cashflow		US$ '000	$ 13,128,914	($ 170,646)	($ 336,897)	($ 601,764)	($ 630,268)
Cumulative Pre-Tax Cashflow		US$ '000		($ 170,646)	($ 507,543)	($ 1,109,307)	($ 1,739,575)
Taxes		US$ '000	($ 4,220,280)	$ 0	$ 0	$ 0	$ 0
CAMYEN		US$ '000	($ 119,851)	$ 0	$ 0	$ 0	$ 0
Retention Return		US$ '000	$ 113,333	$ 0	$ 11,333	$ 11,333	$ 11,333
VAT Paid		US$ '000	($ 2,892,157)	$ 0	($ 62,004)	($ 104,382)	($ 117,043)
VAT Collected		US$ '000	$ 2,892,157	$ 0	$ 0	$ 0	$ 187,391
After-Tax Cashflow		US$ '000	$ 8,902,116	($ 170,646)	($ 387,567)	($ 694,813)	($ 548,587)
Cumulative After-Tax Cashflow		US$ '000		($ 170,646)	($ 558,213)	($ 1,253,026)	($ 1,801,613)
PROJECT ECONOMICS							
Pre-Tax IRR		**%**	**25.7%**				
Pre-tax NPV at 5% discounting	5.0%	US$ '000	$ 5,242,007				
Pre-tax NPV at 8% discounting	**8.0%**	**US$ '000**	**$ 3,169,795**				
Pre-tax NPV at 10% discounting	10.0%	US$ '000	$ 2,288,546				
After-Tax IRR		**%**	**19.7%**				
After-Tax NPV at 5% discounting	5.0%	US$ '000	$ 3,451,349				
After-Tax NPV at 8% discounting	**8.0%**	**US$ '000**	**$ 1,986,521**				
After-tax NPV at 10% discounting	10.0%	US$ '000	$ 1,357,510				

	2026 Year 1	2027 Year 2	2028 Year 3	2029 Year 4	2030 Year 5	2031 Year 6	2032 Year 7	2033 Year 8
OPERATING COST								
Mining (Open Pit)	$ 1.64	$ 1.82	$ 1.74	$ 1.50	$ 1.61	$ 2.16	$ 1.62	$ 1.76
Processing	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53
Freight Cost to Port & Port Ops	$ 0.80	$ 0.73	$ 0.51	$ 0.64	$ 0.77	$ 0.65	$ 0.59	$ 0.45
Freight Cost to Asia	$ 1.60	$ 1.46	$ 1.01	$ 1.28	$ 1.53	$ 1.30	$ 1.17	$ 0.90
WRF Opex	$ 0.08	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06
G&A	$ 1.23	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86
Total Unit Operating Cost	**$ 18.58**	**$ 15.99**	**$ 14.99**	**$ 13.40**	**$ 13.67**	**$ 16.13**	**$ 13.48**	**$ 13.43**
Mining (Open Pit)	$ 261,425	$ 294,195	$ 280,919	$ 201,387	$ 196,848	$ 309,201	$ 211,344	$ 225,383
Processing	$ 154,840	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200
Freight Cost to Port & Port Ops	$ 22,429	$ 29,248	$ 20,321	$ 25,581	$ 30,740	$ 26,118	$ 23,404	$ 17,967
Freight Cost to Asia	$ 44,733	$ 58,334	$ 40,531	$ 51,020	$ 61,311	$ 52,091	$ 46,679	$ 35,834
WRF Opex	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356
G&A	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400
Total Operating Cost	**$ 520,183**	**$ 639,733**	**$ 599,727**	**$ 535,943**	**$ 546,855**	**$ 645,366**	**$ 539,383**	**$ 537,140**
Operating Cashflow	**$ 1,023,765**	**$ 1,209,053**	**$ 506,066**	**$ 886,158**	**$ 1,025,731**	**$ 984,944**	**$ 635,180**	**$ 380,418**
Corporate Overheads Costs	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440
CAPITAL COST								
Direct Cost								
Mining	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Processing	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Infrastructure	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Tailings	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Direct Cost	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Other Costs								
EPCM / Owners / Indirect Cost	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Subtotal Costs	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Contingency	$ 330,923	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Initial Capital Cost	**$ 330,923**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Sustaining	$ 471,767	$ 151,169	$ 68,665	$ 26,903	$ 4,739	$ 121,553	$ 67,787	$ 18,808
Working Capital	$ 107,229	$ 133,047	($ 47,393)	$ 32,920	$ 16,042	($ 14,618)	($ 28,547)	($ 13,005)
Asset Sales	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Reclamation and closure	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Capital Cost	**$ 909,919**	**$ 284,216**	**$ 21,272**	**$ 59,823**	**$ 20,781**	**$ 106,935**	**$ 39,240**	**$ 5,803**
PRE-TAX CASH FLOW								
Net Pre-Tax Cashflow	$ 110,406	$ 921,397	$ 481,353	$ 822,895	$ 1,001,510	$ 874,569	$ 592,501	$ 371,175
Cumulative Pre-Tax Cashflow	($ 1,629,169)	($ 707,772)	($ 226,419)	$ 596,476	$ 1,597,986	$ 2,472,556	$ 3,065,056	$ 3,436,231
Taxes	($ 255,081)	($ 226,170)	($ 48,707)	($ 143,058)	($ 246,982)	($ 214,629)	($ 98,602)	($ 16,030)
CAMYEN	$ 0	$ 0	$ 0	$ 0	($ 9,063)	($ 6,415)	($ 2,800)	($ 372)
Retention Return	$ 11,333	$ 11,333	$ 11,333	$ 11,333	$ 11,333	$ 11,333	$ 11,333	$ 0
VAT Paid	($ 229,367)	($ 148,382)	($ 99,910)	($ 95,873)	($ 91,372)	($ 120,919)	($ 93,130)	($ 87,421)
VAT Collected	$ 229,769	$ 117,043	$ 229,367	$ 148,382	$ 99,910	$ 95,873	$ 91,372	$ 120,919
After-Tax Cashflow	($ 132,940)	$ 675,220	$ 573,436	$ 743,680	$ 765,336	$ 639,813	$ 500,674	$ 388,270
Cumulative After-Tax Cashflow	($ 1,934,553)	($ 1,259,332)	($ 685,896)	$ 57,784	$ 823,120	$ 1,462,933	$ 1,963,608	$ 2,351,878

	2034 Year 9	2035 Year 10	2036 Year 11	2037 Year 12	2038 Year 13	2039 Year 14	2040 Year 15	2041 Year 16
OPERATING COST								
Mining (Open Pit)	$ 1.58	$ 1.46	$ 1.70	$ 1.60	$ 1.68	$ 1.39	$ 1.46	$ 1.72
Processing	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53
Freight Cost to Port & Port Ops	$ 0.60	$ 0.47	$ 0.51	$ 0.45	$ 0.35	$ 0.40	$ 0.48	$ 0.50
Freight Cost to Asia	$ 1.19	$ 0.93	$ 1.03	$ 0.89	$ 0.70	$ 0.79	$ 0.96	$ 0.99
WRF Opex	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06
G&A	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86
Total Unit Operating Cost	**$ 13.68**	**$ 12.46**	**$ 13.27**	**$ 12.94**	**$ 12.79**	**$ 12.01**	**$ 12.18**	**$ 15.07**
Mining (Open Pit)	$ 217,937	$ 184,129	$ 211,036	$ 206,168	$ 211,574	$ 174,996	$ 171,702	$ 285,306
Processing	$ 221,200	$ 220,856	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200
Freight Cost to Port & Port Ops	$ 23,806	$ 18,681	$ 20,594	$ 17,912	$ 14,107	$ 15,877	$ 19,220	$ 19,840
Freight Cost to Asia	$ 47,481	$ 37,258	$ 41,074	$ 35,725	$ 28,136	$ 31,667	$ 38,334	$ 39,571
WRF Opex	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356
G&A	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400
Total Operating Cost	**$ 547,180**	**$ 497,680**	**$ 530,660**	**$ 517,760**	**$ 511,773**	**$ 480,496**	**$ 487,212**	**$ 602,672**
Operating Cashflow	**$ 810,881**	**$ 383,520**	**$ 548,164**	**$ 428,367**	**$ 288,803**	**$ 546,897**	**$ 638,544**	**$ 436,083**
Corporate Overheads Costs	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440
CAPITAL COST								
Direct Cost								
Mining	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Processing	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Infrastructure	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Tailings	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Direct Cost	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Other Costs								
EPCM / Owners / Indirect Cost	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Subtotal Costs	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Contingency	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Initial Capital Cost	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Sustaining	$ 19,693	$ 18,955	$ 210,503	$ 90,992	$ 5,658	$ 800	$ 34,619	$ 10,748
Working Capital	$ 36,059	($ 39,072)	($ 15,507)	$ 8,903	$ 2,181	$ 19,448	$ 2,479	($ 3,194)
Asset Sales	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Reclamation and closure	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Capital Cost	**$ 55,752**	**($ 20,117)**	**$ 194,997**	**$ 99,895**	**$ 7,839**	**$ 20,248**	**$ 37,098**	**$ 7,554**
PRE-TAX CASH FLOW								
Net Pre-Tax Cashflow	$ 751,688	$ 400,197	$ 349,728	$ 325,032	$ 277,524	$ 523,209	$ 598,007	$ 425,089
Cumulative Pre-Tax Cashflow	$ 4,187,919	$ 4,588,116	$ 4,937,843	$ 5,262,875	$ 5,540,399	$ 6,063,608	$ 6,661,615	$ 7,086,704
Taxes	($ 165,072)	($ 16,248)	($ 47,008)	($ 112,386)	($ 82,484)	($ 175,336)	($ 203,030)	($ 138,538)
CAMYEN	($ 5,794)	($ 360)	$ 0	($ 3,146)	($ 2,899)	($ 6,289)	($ 6,842)	($ 4,818)
Retention Return	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
VAT Paid	($ 97,019)	($ 76,960)	($ 116,656)	($ 99,375)	($ 83,688)	($ 80,669)	($ 84,440)	($ 98,187)
VAT Collected	$ 93,130	$ 87,421	$ 97,019	$ 76,960	$ 116,656	$ 99,375	$ 83,688	$ 80,669
After-Tax Cashflow	$ 576,932	$ 394,050	$ 283,084	$ 187,085	$ 225,108	$ 360,289	$ 387,383	$ 264,217
Cumulative After-Tax Cashflow	$ 2,928,810	$ 3,322,860	$ 3,605,943	$ 3,793,029	$ 4,018,137	$ 4,378,427	$ 4,765,810	$ 5,030,027

	INPUTS	UNITS	TOTAL	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28
MINING															
Open Pit															
Operating Days	365	days	10,220	365	365	365	365	365	365	365	365	365	365	365	365
Tonnes milled per day		tonnes / day	108,105	117,293	144,751	137,405	134,534	123,514	118,881	111,718	111,055	112,580	233	13,300	-
Tonnes moved per day		tonnes / day	297,246	410,952	398,765	350,988	190,636	159,611	136,489	122,019	120,723	117,336	109,589	109,637	91,009
Production		'000 tonnes	1,104,835	42,812	52,834	50,153	49,105	45,083	43,392	40,777	40,535	41,092	85	4,855	-
Waste	-	'000 tonnes	2,016,805	107,186	92,715	77,958	20,477	13,175	6,427	3,760	3,529	1,736	39,915	35,163	33,218
Total Moved		'000 tonnes	3,037,857	149,998	145,549	128,111	69,582	58,258	49,818	44,537	44,064	42,828	40,000	40,018	33,218
Stripping Ratio			1.83	2.50	1.75	1.55	0.42	0.29	0.15	0.09	0.09	0.04	469.12	7.24	-
PROCESSING															
Mill Feed		'000 tonnes	1,104,835	40,000	40,000	40,000	40,000	40,000	41,275	40,777	40,535	41,092	40,000	40,000	33,218
Au Grade		g/t	0.21	0.16	0.21	0.25	0.22	0.15	0.17	0.18	0.16	0.15	0.15	0.28	0.36
Ag Grade		g/t	2.83	3.12	3.14	1.40	1.75	2.04	3.06	3.10	2.82	2.12	2.60	4.34	5.53
Cu Grade		%	0.48%	0.38%	0.42%	0.51%	0.48%	0.40%	0.42%	0.44%	0.48%	0.38%	0.25%	0.40%	0.45%
Mo Grade		%	0.03%	0.02%	0.02%	0.03%	0.04%	0.04%	0.04%	0.03%	0.03%	0.02%	0.02%	0.02%	0.01%
Contained Au		oz	7,338,381	199,662	268,829	319,331	277,280	196,907	219,873	230,139	211,638	195,964	191,626	358,952	381,263
Contained Ag		oz	100,686,751	4,018,090	4,036,406	1,803,696	2,250,906	2,617,578	4,055,463	4,065,617	3,680,189	2,795,875	3,349,978	5,581,206	5,909,244
Contained Cu		tonnes	5,324,697	152,044	169,336	203,819	190,264	160,910	173,687	177,423	194,409	157,328	101,355	159,902	150,500
Contained Mo		tonnes	324,905	9,770	8,492	11,945	14,069	15,978	14,661	10,259	11,597	9,123	7,912	6,626	4,715
Recovery															
Copper Concentrate															
Au Recovery		%	35.4%	33.4%	34.8%	43.6%	43.7%	41.3%	35.4%	31.7%	33.9%	35.3%	31.7%	31.4%	31.2%
Ag Recovery		%	44.8%	45.2%	42.5%	57.7%	59.9%	54.4%	46.6%	41.2%	42.9%	47.1%	35.5%	40.2%	40.8%
Cu Recovery		%	86.0%	86.4%	87.9%	90.7%	86.8%	86.2%	87.1%	87.6%	87.4%	86.9%	82.5%	86.0%	86.5%
Moly Concentrate															
Mo Recovery		%	43.7%	35%	51%	64%	60%	62%	55%	51%	49%	35%	43%	32%	25%
Production															
Copper Concentrate															
Au		oz	2,602,871	66,735	93,562	139,297	121,103	81,258	77,845	72,961	71,817	69,214	60,666	112,639	118,844
Ag		oz	43,701,303	1,815,890	1,715,422	1,041,138	1,348,184	1,423,930	1,888,003	1,673,281	1,576,963	1,316,095	1,189,621	2,241,893	2,409,287
Cu		tonnes	4,588,785	131,308	148,912	184,835	165,217	138,693	151,264	155,415	169,872	136,773	83,580	137,449	130,213
Moly Concentrate															
Mo		tonnes	142,593	3,422	4,364	7,589	8,492	9,910	8,110	5,280	5,705	3,160	3,365	2,095	1,184
Copper Concentrate		dmt	18,190,193	539,503	565,575	653,134	929,733	865,017	643,380	627,091	638,549	549,616	520,698	566,389	479,514
Au grade in concentrate		g/t	4.5	3.8	5.1	6.6	4.1	2.9	3.8	3.6	3.5	3.9	3.6	6.2	7.7
Ag grade in concentrate		g/t	74.7	104.7	94.3	49.6	45.1	51.2	91.3	83.0	76.8	74.5	71.1	123.1	156.3
Cu grade in concentrate		%	25.2%	24.3%	26.3%	28.3%	17.8%	16.0%	23.5%	24.8%	26.6%	24.9%	16.1%	24.3%	27.2%
As grade in concentrate		%	0.44%	0.50%	0.50%	0.09%	0.13%	0.19%	0.41%	0.37%	0.38%	0.34%	0.40%	1.22%	1.71%
Concentrate Moisture	9.5%														
Copper Concentrate		wmt	20,099,661	596,136	624,945	721,695	1,027,329	955,820	710,917	692,918	705,579	607,310	575,357	625,844	529,849
Moly Concentrate		dmt	285,186	6,844	8,728	15,178	16,985	19,819	16,221	10,560	11,410	6,320	6,730	4,189	2,367
Mo grade in concentrate	50%	%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Concentrate Moisture	2.0%														
Moly Concentrate		wmt	291,006	6,984	8,906	15,488	17,331	20,224	16,552	10,775	11,643	6,449	6,868	4,275	2,415
Total Concentrate Tonnes		wmt	20,390,666	603,119	633,850	737,183	1,044,661	976,043	727,469	703,693	717,223	613,759	582,224	630,119	532,265
Total Recovered															
Au		**oz**	**2,602,871**	**66,735**	**93,562**	**139,297**	**121,103**	**81,258**	**77,845**	**72,961**	**71,817**	**69,214**	**60,666**	**112,639**	**118,844**
Ag		**oz**	**43,701,303**	**1,815,890**	**1,715,422**	**1,041,138**	**1,348,184**	**1,423,930**	**1,888,003**	**1,673,281**	**1,576,963**	**1,316,095**	**1,189,621**	**2,241,893**	**2,409,287**
Cu		**tonnes**	**4,588,785**	**131,308**	**148,912**	**184,835**	**165,217**	**138,693**	**151,264**	**155,415**	**169,872**	**136,773**	**83,580**	**137,449**	**130,213**
Mo		**tonnes**	**142,592.8**	**3,422**	**4,364**	**7,589**	**8,492**	**9,910**	**8,110**	**5,280**	**5,705**	**3,160**	**3,365**	**2,095**	**1,184**
REVENUE															
Metal Prices															
Au	US$1,300 / oz Au	US$/oz Au	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300
Ag	US$18.00 / oz Ag	US$/oz Ag	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00	$ 18.00
Cu	US$3.00 / lb Cu	US$/lb Cu	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00
Mo	US$11.00 / lb Mo	US$/lb Mo	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00
Copper Concentrate Payable %															
Au		%	92.8%	92.0%	94.0%	94.0%	92.0%	90.0%	92.0%	92.0%	92.0%	92.0%	92.0%	94.0%	95.0%
Ag		%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Cu		%	96.1%	96.0%	96.0%	96.5%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%
Moly Concentrate Payable %															
Mo		%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Copper Concentrate Payable															
Au		oz	2,415,815.13	61,397	87,948	130,939	111,415	73,132	71,617	67,124	66,071	63,677	55,813	105,880	112,902
Ag		oz	39,331,173	1,634,301	1,543,880	937,024	1,213,365	1,281,537	1,699,203	1,505,953	1,419,267	1,184,486	1,070,659	2,017,704	2,168,358
Cu		tonnes	4,410,619	126,055	142,955	178,366	158,608	133,145	145,213	149,198	163,077	131,302	80,237	131,951	125,004
Mo		tonnes	-	-	-	-	-	-	-	-	-	-	-	-	-
Moly Concentrate Payable															
Mo		tonnes	121,203.9	2,909	3,709	6,451	7,218	8,423	6,894	4,488	4,849	2,686	2,860	1,780	1,006
Gold Streaming Revenue															
Stream Contracted Production	20%	oz	483,163	12,279	17,590	26,188	22,283	14,626	14,323	13,425	13,214	12,735	11,163	21,176	22,580
Stream Price	30%	USD/oz	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390
Gold Stream Revenue Yamana		US$ '000	$ 188,434	$ 4,789	$ 6,860	$ 10,213	$ 8,690	$ 5,704	$ 5,586	$ 5,236	$ 5,154	$ 4,967	$ 4,353	$ 8,259	$ 8,806
Gold Revenue at Spot Price															
Gold Production at Spot Price	80%	oz	1,932,652	49,117	70,359	104,751	89,132	58,505	57,294	53,699	52,857	50,942	44,650	84,704	90,322
Gold Spot Price		USD/oz	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300	$ 1,300
Gold Revenue at Spot Price		US$ '000	$ 2,512,448	$ 63,852	$ 91,466	$ 136,176	$ 115,872	$ 76,057	$ 74,482	$ 69,809	$ 68,714	$ 66,224	$ 58,045	$ 110,116	$ 117,418
All Metals Gross Revenue															
Au Gross Revenue		US$ '000	$ 2,700,881	$ 68,641	$ 98,326	$ 146,390	$ 124,562	$ 81,761	$ 80,068	$ 75,044	$ 73,868	$ 71,191	$ 62,399	$ 118,374	$ 126,224
Ag Gross Revenue		US$ '000	$ 707,961	$ 29,417	$ 27,790	$ 16,866	$ 21,841	$ 23,068	$ 30,586	$ 27,107	$ 25,547	$ 21,321	$ 19,272	$ 36,319	$ 39,030
Cu Gross Revenue		US$ '000	$ 29,171,214	$ 833,712	$ 945,486	$ 1,179,688	$ 1,049,011	$ 880,603	$ 960,419	$ 986,777	$ 1,078,568	$ 868,411	$ 530,676	$ 872,704	$ 826,759
Mo Gross Revenue		US$ '000	$ 2,939,294	$ 70,538	$ 89,952	$ 156,436	$ 175,054	$ 204,271	$ 167,179	$ 108,833	$ 117,602	$ 65,139	$ 69,365	$ 43,176	$ 24,396
Total Gross Revenue		**US$ '000**	**$ 35,519,350**	**$ 1,002,309**	**$ 1,161,554**	**$ 1,499,380**	**$ 1,370,468**	**$ 1,189,703**	**$ 1,238,252**	**$ 1,197,761**	**$ 1,295,584**	**$ 1,026,062**	**$ 681,712**	**$ 1,070,573**	**$ 1,016,410**
Treatment															
Cu Concentrate	US$80.00 / dmt conc	US$ '000	$ 1,455,215	$ 43,160	$ 45,246	$ 52,251	$ 74,379	$ 69,201	$ 51,470	$ 50,167	$ 51,084	$ 43,969	$ 41,656	$ 45,311	$ 38,361
As Penalty	US$03.00 / dmt conc	US$ '000	$ 180,076	$ 6,474	$ 6,787	$ 0	$ 0	$ 0	$ 5,914	$ 5,161	$ 5,452	$ 4,009	$ 4,684	$ 19,113	$ 23,222
Mo Concentrate	US$00.00 / dmt conc	US$ '000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Refining cost															
Au	US$4.50 / oz Au	US$ '000	$ 10,871	$ 276	$ 396	$ 589	$ 501	$ 329	$ 322	$ 302	$ 297	$ 287	$ 251	$ 476	$ 508
Ag	US$0.40 / oz Ag	US$ '000	$ 15,732	$ 654	$ 618	$ 375	$ 485	$ 513	$ 680	$ 602	$ 568	$ 474	$ 428	$ 807	$ 867
Cu	US$0.08 / lb Cu	US$ '000	$ 807,063	$ 23,066	$ 26,158	$ 32,638	$ 29,022	$ 24,363	$ 26,571	$ 27,301	$ 29,840	$ 24,026	$ 14,682	$ 24,145	$ 22,873
Mo	US$0.00 / lb Mo	US$ '000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Charges		US$ '000	$ 2,468,958	$ 73,630	$ 79,204	$ 85,852	$ 104,388	$ 94,406	$ 84,958	$ 83,533	$ 87,241	$ 72,764	$ 61,702	$ 89,852	$ 85,832
Net Smelter Return		**US$ '000**	**$ 33,050,393**	**$ 928,679**	**$ 1,082,350**	**$ 1,413,528**	**$ 1,266,080**	**$ 1,095,297**	**$ 1,153,294**	**$ 1,114,228**	**$ 1,208,343**	**$ 953,297**	**$ 620,011**	**$ 980,721**	**$ 930,578**
Royalty NSR	Input Rate Into Proforma	US$ '000	$ 1,382,165	$ 40,891	$ 46,465	$ 58,289	$ 53,777	$ 47,450	$ 49,334	$ 47,845	$ 51,233	$ 41,881	$ 29,670	$ 43,280	$ 40,400
Net Revenue		**US$ '000**	**$ 31,668,227**	**$ 887,787**	**$ 1,035,885**	**$ 1,355,239**	**$ 1,212,303**	**$ 1,047,847**	**$ 1,103,959**	**$ 1,066,383**	**$ 1,157,109**	**$ 911,416**	**$ 590,340**	**$ 937,440**	**$ 890,179**
Unit NSR		**US$/t milled**	**$ 28.66**	**$ 22.19**	**$ 25.90**	**$ 33.88**	**$ 30.31**	**$ 26.20**	**$ 26.75**	**$ 26.15**	**$ 28.55**	**$ 22.18**	**$ 14.76**	**$ 23.44**	**$ 26.80**
Other Income															
Gold Stream Upfront Payment	$202,500	US$ '000	$ 202,500	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Revenue		**US$ '000**	**$ 31,870,727**	**$ 887,787**	**$ 1,035,885**	**$ 1,355,239**	**$ 1,212,303**	**$ 1,047,847**	**$ 1,103,959**	**$ 1,066,383**	**$ 1,157,109**	**$ 911,416**	**$ 590,340**	**$ 937,440**	**$ 890,179**

	INPUTS	UNITS	Year TOTAL	2042 Year 17	2043 Year 18	2044 Year 19	2045 Year 20	2046 Year 21	2047 Year 22	2048 Year 23	2049 Year 24	2050 Year 25	2051 Year 26	2052 Year 27	2053 Year 28
OPERATING COST															
Mining (Open Pit)		US$/t moved	$ 1.81	$ 2.09	$ 2.16	$ 2.04	$ 1.97	$ 2.09	$ 2.16	$ 2.25	$ 2.28	$ 2.24	$ 1.29	$ 1.92	$ 1.64
Processing		US$/t milled	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53	$ 5.53
Freight Cost to Port & Port Ops		US$/t milled	$ 0.54	$ 0.44	$ 0.46	$ 0.53	$ 0.76	$ 0.70	$ 0.51	$ 0.50	$ 0.51	$ 0.44	$ 0.42	$ 0.46	$ 0.47
Freight Cost to Asia		US$/t milled	$ 1.07	$ 0.88	$ 0.92	$ 1.06	$ 1.51	$ 1.41	$ 1.01	$ 1.00	$ 1.02	$ 0.87	$ 0.85	$ 0.92	$ 0.94
WRF Opex		US$/t milled	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.06	$ 0.07
G&A		US$/t milled	$ 0.87	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.86	$ 0.83	$ 0.84	$ 0.85	$ 0.84	$ 0.86	$ 0.86	$ 0.86
Total Unit Operating Cost		**US$/t milled**	**$ 12.93**	**$ 15.60**	**$ 15.70**	**$ 14.56**	**$ 12.14**	**$ 11.61**	**$ 10.55**	**$ 10.39**	**$ 10.45**	**$ 10.06**	**$ 9.01**	**$ 9.75**	**$ 9.52**
Mining (Open Pit)		US$ '000	$ 5,378,748	$ 313,402	$ 314,900	$ 260,905	$ 136,955	$ 121,917	$ 107,460	$ 100,317	$ 100,492	$ 95,834	$ 51,634	$ 76,782	$ 54,601
Processing		US$ '000	$ 6,109,740	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 221,200	$ 228,253	$ 225,498	$ 224,159	$ 227,236	$ 221,200	$ 221,200	$ 183,697
Freight Cost to Port & Port Ops	US$32.59 / dmt conc	US$ '000	$ 592,818	$ 17,582	$ 18,432	$ 21,286	$ 30,300	$ 28,191	$ 20,968	$ 20,437	$ 20,810	$ 17,912	$ 16,970	$ 18,459	$ 15,627
Freight Cost to Asia	US$65.00 / dmt conc	US$ '000	$ 1,182,363	$ 35,068	$ 36,762	$ 42,454	$ 60,433	$ 56,226	$ 41,820	$ 40,761	$ 41,506	$ 35,725	$ 33,845	$ 36,815	$ 31,168
WRF Opex		US$ '000	$ 65,965	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356	$ 2,356
G&A		US$ '000	$ 957,467	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 34,400	$ 28,667
Total Operating Cost		**US$ '000**	**$ 14,287,100**	**$ 624,008**	**$ 628,050**	**$ 582,600**	**$ 485,643**	**$ 464,290**	**$ 435,257**	**$ 423,769**	**$ 423,722**	**$ 413,463**	**$ 360,404**	**$ 390,012**	**$ 316,117**
Operating Cashflow		**US$ '000**	**$ 17,583,627**	**$ 263,779**	**$ 407,835**	**$ 772,639**	**$ 726,660**	**$ 583,557**	**$ 668,703**	**$ 642,614**	**$ 733,387**	**$ 497,953**	**$ 229,936**	**$ 547,429**	**$ 574,062**
Corporate Overheads Costs		US$ '000	$ 95,747	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 3,440	$ 2,867
CAPITAL COST															
Direct Cost															
Mining		US$ '000	$ 739,137	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Processing		US$ '000	$ 1,220,316	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Infrastructure		US$ '000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Tailings		US$ '000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total Direct Cost		**US$ '000**	**$ 1,959,453**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Other Costs															
EPCM / Owners / Indirect Cost		US$ '000	$ 96,000	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Subtotal Costs		**US$ '000**	**$ 2,055,453**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Contingency		US$ '000	$ 330,923	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Initial Capital Cost		**US$ '000**	**$ 2,386,376**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Sustaining		US$ '000	$ 1,537,425	$ 54,674	$ 23,687	$ 21,240	$ 2,005	$ 1,027	$ 6,152	$ 45,608	$ 22,573	$ 4,661	$ 5,312	$ 26,933	$ 195
Working Capital		US$ '000	($ 0)	($ 19,689)	$ 17,309	$ 26,654	($ 8,560)	($ 13,355)	$ 3,762	($ 9,628)	$ 11,275	($ 17,225)	($ 26,498)	$ 24,945	($ 72,586)
Asset Sales		US$ '000	($ 60,018)	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	($ 60,018)
Reclamation and closure		US$ '000	$ 495,184	$ 0	$ 0	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 315,184
Total Capital Cost		**US$ '000**	**$ 4,358,967**	**$ 34,985**	**$ 40,996**	**$ 67,894**	**$ 13,445**	**$ 7,672**	**$ 29,915**	**$ 55,979**	**$ 53,848**	**$ 7,436**	**($ 1,186)**	**$ 71,878**	**$ 182,775**
PRE-TAX CASH FLOW															
Net Pre-Tax Cashflow		US$ '000	$ 13,128,914	$ 225,355	$ 363,399	$ 701,305	$ 709,775	$ 572,445	$ 635,348	$ 583,194	$ 676,099	$ 487,078	$ 227,682	$ 472,111	$ 388,420
Cumulative Pre-Tax Cashflow		US$ '000		$ 7,312,059	$ 7,675,458	$ 8,376,762	$ 9,086,537	$ 9,658,982	$ 10,294,330	$ 10,877,524	$ 11,553,623	$ 12,040,701	$ 12,268,383	$ 12,740,493	$ 13,128,914
Taxes		US$ '000	($ 4,220,280)	($ 73,237)	($ 127,218)	($ 247,322)	($ 234,214)	($ 189,169)	($ 219,936)	($ 204,872)	($ 238,936)	($ 160,103)	($ 67,001)	($ 175,122)	($ 93,789)
CAMYEN		US$ '000	($ 119,851)	($ 1,904)	($ 4,251)	($ 8,666)	($ 8,429)	($ 6,895)	($ 7,997)	($ 6,948)	($ 8,462)	($ 5,815)	($ 2,410)	($ 6,108)	($ 3,170)
Retention Return		US$ '000	$ 113,333	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
VAT Paid		US$ '000	($ 2,892,157)	($ 105,989)	($ 107,598)	($ 101,429)	($ 77,205)	($ 72,864)	($ 71,778)	($ 74,110)	($ 73,762)	($ 64,694)	($ 54,825)	($ 71,253)	($ 29,852)
VAT Collected		US$ '000	$ 2,892,157	$ 84,440	$ 98,187	$ 105,989	$ 107,598	$ 101,429	$ 77,205	$ 72,864	$ 71,778	$ 74,110	$ 11,068	$ 2,001	$ 30,543
After-Tax Cashflow		US$ '000	$ 8,902,116	$ 128,664	$ 222,519	$ 449,877	$ 497,525	$ 404,946	$ 412,842	$ 370,129	$ 426,717	$ 330,575	$ 114,514	$ 221,628	$ 292,152
Cumulative After-Tax Cashflow		US$ '000		$ 5,158,691	$ 5,381,210	$ 5,831,087	$ 6,328,612	$ 6,733,558	$ 7,146,400	$ 7,516,529	$ 7,943,247	$ 8,273,822	$ 8,388,336	$ 8,609,964	$ 8,902,116
PROJECT ECONOMICS															
Pre-Tax IRR		**%**	**25.7%**												
Pre-tax NPV at 5% discounting	5.0%	US$ '000	$ 5,242,007												
Pre-tax NPV at 8% discounting	**8.0%**	**US$ '000**	**$ 3,169,795**												
Pre-tax NPV at 10% discounting	10.0%	US$ '000	$ 2,288,546												
After-Tax IRR		**%**	**19.7%**												
After-Tax NPV at 5% discounting	5.0%	US$ '000	$ 3,451,349												
After-Tax NPV at 8% discounting	**8.0%**	**US$ '000**	**$ 1,986,521**												
After-tax NPV at 10% discounting	10.0%	US$ '000	$ 1,357,510												

22.4 Cash Flow Analysis

The financial analysis indicates that the Project has a pre-tax net cash flow of $13,129 million and an after-tax net cash flow of $8,902 million with a payback period of eight years (from notice to proceed). The pre-tax NPV at an 8% discount rate is $3,170 million and the after-tax NPV at an 8% discount rate is $1,986 million. The pre-tax IRR is 25.7% and the after-tax IRR is 19.7%. The financial model is related to the base case mine plan of processing 40 Mtpa.

22.5 Sensitivity Analysis

Project risks can be identified in both economic and non-economic terms. Key economic risks were examined by running cash flow sensitivities:

- Metal prices
- Head Grades
- Recoveries
- Operating costs
- Pre-production capital costs

After-tax NPV and IRR sensitivity over the base case have been calculated for -20% to +20% variations. The NPV and IRR sensitivities are shown in Figure 22-1 and Figure 22-2, respectively, and in Table 22-2. The Project is most sensitive to metal prices followed by head grades, operating cost, capital cost, and metal recoveries.

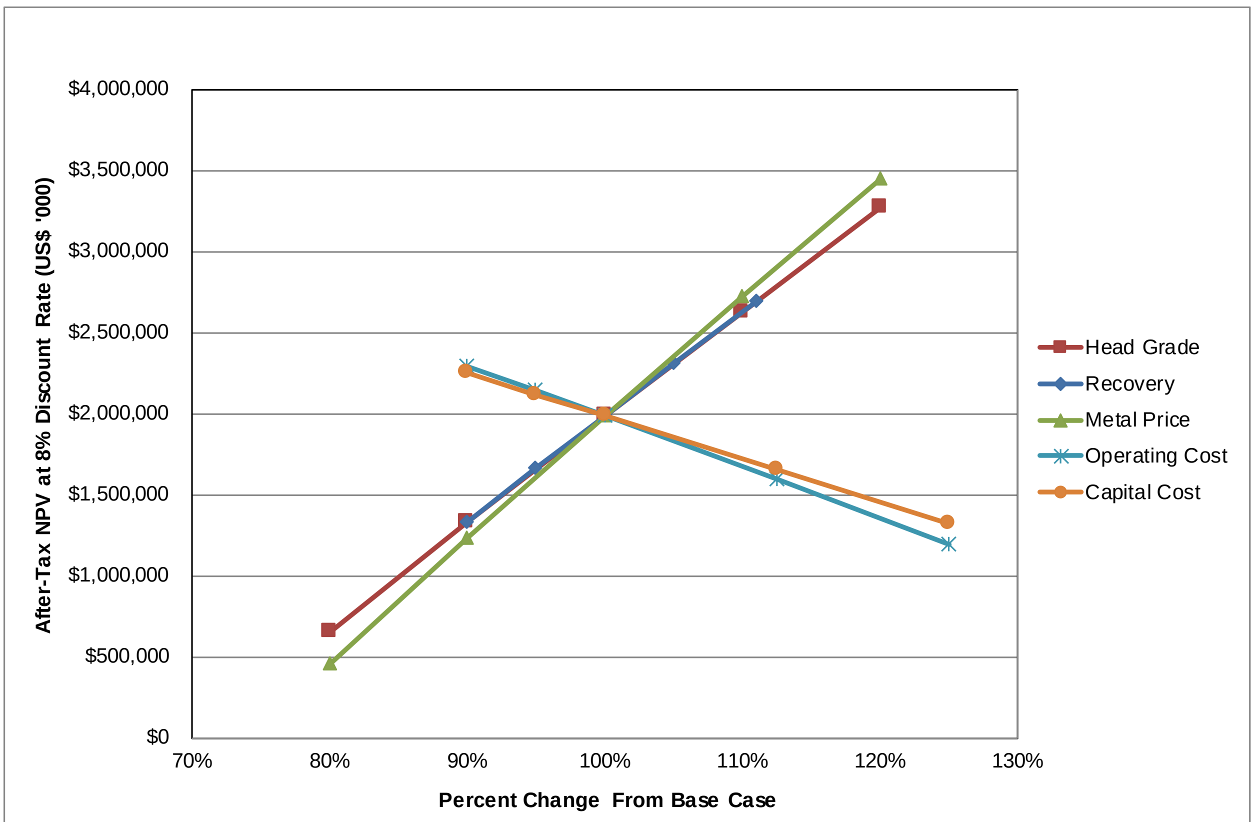


Figure 22-1: After-Tax NPV Sensitivity Analysis

Table 22-2: After-Tax NPV and IRR Sensitivity
Yamana Gold Inc. – Agua Rica Integrated Project

	Head Grade[1] (%Cu)	NPV at 8% (US$ 000)	IRR (%)
0.80	0.39	655,947	12.3
0.90	0.43	1,329,030	16.2
1.00	**0.48**	**1,986,521**	**19.7**
1.10	0.53	2,629,678	23.0
1.20	0.58	3,272,381	26.1
	Recovery[2] (%Cu)	**NPV at 8% (US$ 000)**	**IRR (%)**
0.90	77.4	1,329,030	16.2
0.95	81.7	1,662,878	18.0
1.00	**86.0**	**1,986,521**	**19.7**
1.05	90.3	2,309,418	21.4
1.11	95.5	2,6393,949	23.3
	Metal Price[3] (US$/lb Cu)	**NPV at 8% (US$ 000)**	**IRR (%)**
0.80	2.40	462,617	11.1
0.90	2.70	1,236,193	15.7
1.00	**3.00**	**1,986,521**	**19.7**
1.10	3.30	2,718,430	23.4
1.20	3.60	3,449,884	26.9
	Operating Costs (US$/t)	**NPV at 8% (US$ 000)**	**IRR (%)**
0.90	11.64	2,293.921	21.3
0.95	12.29	2,140,560	20.5
1.00	**12.93**	**1,986,521**	**19.7**
1.13	14.55	1,596,360	17.7
1.25	16.16	1,194,017	15.5
	Capital Costs (US$ 000)	**NPV at 8% (US$ 000)**	**IRR (%)**
0.90	3,923,070	2,251,602	22.6
0.95	4,141,019	2,119,478	21.1
1.00	**4,358,967**	**1,986,521**	**19.7**
1.13	4,903,838	1,654,130	16.8
1.25	5,448,709	1,321,739	14.4

Notes:

1. Copper head grade shown, however, sensitivity applies to all metals.
2. Copper recovery shown, however, sensitivity applies to all metals.
3. Copper price shown, however, sensitivity applies to all metals.

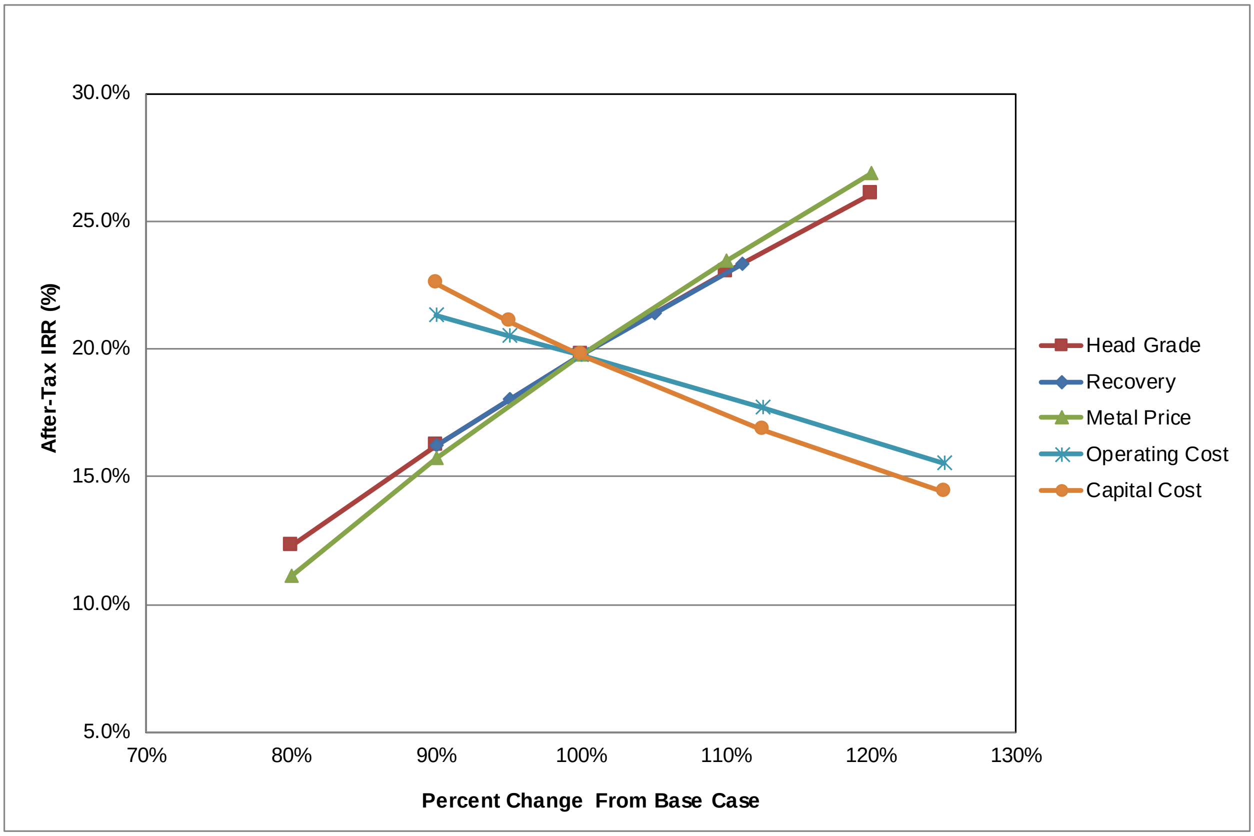


Figure 22-2: After-Tax IRR Sensitivity Analysis

23.0 ADJACENT PROPERTIES

There are no adjacent properties that are relevant to this Technical Report in terms of mineralization and Mineral Resources. The Project, however, will be developed and operated using the existing infrastructure and facilities of Alumbrera located approximately 35 km west of the Agua Rica Cu-Au-Ag-Mo deposit. Alumbrera concluded open pit mining in 2018. Upon formal integration, the remaining resources of the Alumbrera property will become part of the Integrated Project inventory and the local team expects to advance studies in order to assess the economic potential of these resources.

The following Alumbrera facilities are projected to integrate with Agua Rica: processing plant, tailings dam, concentrate pipeline, filter plant, rail system from Tucumán province to Rosario port, and concentrate shipping facilities at Rosario port.

The Project generates significant synergies and lowers execution risk by bringing together the extensive Mineral Resource of Agua Rica with the existing infrastructure of Alumbrera. The integration of the Agua Rica deposit and Alumbrera's existing infrastructure and facilities is expected to create a high quality and low risk brownfield project that will bring significant value to shareholders and local communities and stakeholders. This unique opportunity will enhance Project economics while also reducing both the Project complexity and environmental footprint.

24.0 OTHER RELEVANT DATA AND INFORMATION

No additional information or explanation is necessary to make this Technical Report understandable and not misleading.

24.1 Project Execution Plan

The project execution plan for the Project has been updated from the 2013 FS and meets PFS level requirements.

The priorities for the Project are safety, quality, cost, and schedule.

For the execution phase (detailed engineering, procurement, construction), a Parties' team will manage the overall Project, including the early works program, mine development (including crusher platform earthworks), conveyor tunnel, mine facilities, infrastructure and services, offsite facilities, and Alumbrera concentrator modifications. The mine development and crusher platform will be directly managed by the Parties' mining team. A Project Director will manage the Parties' work and the overall Project.

An experienced Engineering, Procurement, Construction Management (EPCM) And/or Engineering, Procurement, Construction (EPC) company will be contracted to carry out most of the detailed design, procurement, contracts management, construction management, and project management. Specialist companies will be contracted to carry the design work in areas such as water management, waste rock deposition and tailings disposal. EPC packages will be considered. The permanent camp at the Agua Rica mine site will likely be an EPC package.

The EPCM/EPC Contractor will procure and award the equipment and materials purchases and subcontracts for its scope; the Parties' team will procure the remaining items for their scope and/or delegate this work to the engineering companies or the EPCM/EPC company.

All the sustainable development work and government relations will be managed by the Owners' team.

The Owners' team responsibilities for the execution phase are shown in Figure 24-1, and the EPCM/EPC Contractor's responsibilities are shown in Figure 24-2.

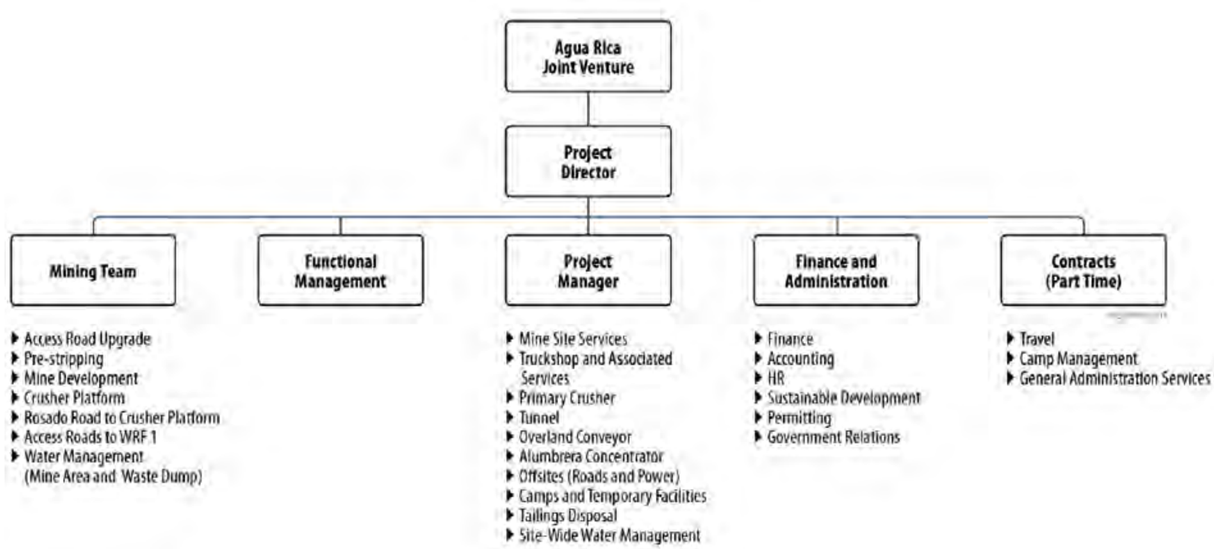


Figure 24-1: Areas of Responsibility Under Owner Organization for Execution Phase

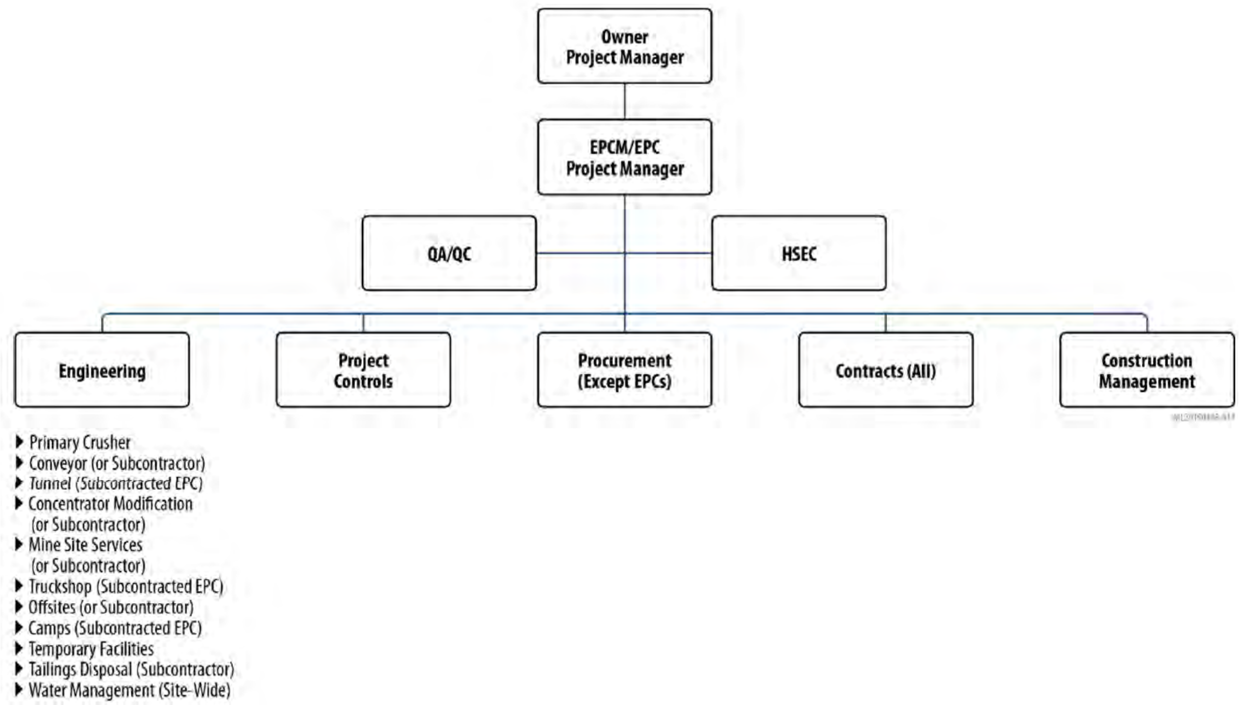


Figure 24-2: EPCM/EPC Scope and Organization for the Execution Phase

24.1.1 Engineering

Ongoing value-seeking phases, including PFS-B, will be completed with the goal of reducing costs and the schedule. In addition drilling and testing programs will be carried out, designed to provide information required for the FS and detailed engineering.

Key non-mine engineering activities include the design of the crushing and conveying system, water management system and concentrator modifications. Detailed engineering for these systems will commence immediately following full notice to proceed (FNTP).

Detail engineering activities are expected to be substantially complete in 12 to 14 months, however, final vendor drawing receipt will extend the total engineering duration to 20 months. Vendor drawings will be purchased early when necessary to improve the schedule.

The Parties will assemble a team of key discipline engineers led by an overall Engineering Manager to manage the engineering performed by the various companies. The Parties' engineers, depending on their responsibilities, may be located in one of the engineering company's offices or in one of the Project offices. The Parties' team will approve key documents according to an agreed document approval matrix.

Detailed engineering will be performed by the EPCM/EPC company and Argentinean companies where possible. Materials that can be sourced within Argentina will be purchased if they can be supplied at competitive prices.

The key crushing and conveying specialty design will be performed outside of Argentina in a centre with experience.

Other engineering work (access roads, power line, water management, buildings, services, and camps) will be awarded to qualified companies and will be performed in Argentina where possible.

24.1.2 Procurement

The EPCM/EPC Contractor's material management organization will be structured to purchase most of the equipment and materials required for the Project. The exceptions will include (1) major mining equipment and (2) equipment and materials included in the subcontracted EPC contracts. The EPCM/EPC Contractor will act as agent for the Parties.

A project freight forwarder with worldwide coverage and with strong project experience in Argentina will be appointed as early as possible in order to coordinate offshore and onshore logistics activities.

24.1.3 Construction and Contracts

Construction will be managed by the main EPCM/EPC Contractor and the third party EPC contractors.

Ongoing capital construction after project start-up will be managed by the Parties. This will include expansions to the existing TSF and future in-pit tailings deposition.

The mining work will be executed by a dedicated mining team under the Parties' management.

The majority of the early works program will be executed using engineering subcontracted to qualified Argentinean firms; construction will be performed by local contractors managed by the EPCM/EPC Contractor.

The EPCM/EPC Contractor will divide the work into work packages and will subcontract the work (as agent for the Parties) to Argentinean construction contractors such as Techint and Skanska. A preassembly and modularization facility will be established offsite to (1) reduce the number of site hours required at high elevation, (2) reduce the camp size, and (3) allow construction works to progress while minimizing travel to remote site locations. All construction labour will be housed in camps.

There are two principal construction sites: Agua Rica mine site and Alumbrera. The main EPCM/EPC Contractor will be responsible for both sites.

The contracting strategy is based on award of multiple subcontract packages to established contractors with the experience and resources to successfully execute the work.

The main construction contracts will be for the conveying tunnel, crushing and conveying system, power line, access roads, water management, mine buildings/facilities and camp. There will also be a large number of small contracts for items such as temporary facilities, construction services and site services, where smaller, local contractors will be preferred and encouraged to bid.

The control of construction progress will be the responsibility of the EPCM/EPC Contractor. A specialist quantity surveying company will be subcontracted to measure and report on installed quantities on a daily basis.

24.1.4 Pre-Commissioning and Commissioning

Early in the detailed engineering phase, operating systems and subsystems will be defined and integrated into the Project schedule. These will form the basis of planning, reviewing (including Hazop review) and, ultimately, pre-commissioning, turnover, and commissioning of the facilities.

The pre-commissioning activities for the crushing and materials handling systems and concentrator modifications will be performed by a team of specialists managed by the EPCM/EPC Contractor's Pre-commissioning Manager. Care and control of each subsystem will pass from construction to pre-commissioning when the defined components are installed, rotated if required, and determined to be complete under the subsystem's protocols.

Completion of pre-commissioning activities is reached when each of the components of the subsystem are mechanically and electrically checked; run-in, interlocks and safety systems certified as functional; and the subsystem punch list items signed off or deemed sufficient by the Parties' representatives. At this point, mechanical completion is reached, and the systems are turned over to the Parties' operations team, who will perform commissioning and ramp-up. The EPCM/EPC Contractor will maintain technical personnel on the Project, who will work under the direction of the Parties to assist in commissioning the systems.

Commissioning will be performed by the Parties' operations team supported by a small team of the EPCM/EPC Contractor's technical personnel. During commissioning, feed will be introduced to the system and ramp-up will begin.

Systems that can be isolated may be commissioned before the entire project has been completed. For example, the electrical transmission and sub-station systems could be energized and commissioned. The crushing line could be commissioned to deliver ore to the surge bin. The ore overland conveyor could be commissioned to deliver material to the existing concentrator coarse ore stockpile. Ore then could be passed through the concentrator.

24.1.5 Project Schedule

The overall schedule objective of the Project is to complete ramp-up to full design throughput during 2026 to process Agua Rica mine ore through the existing Alumbrera process plant. To achieve this objective, the Project will need to start EIA preparation involving all stakeholders in a baseline review. The Project will also need to continue with phased, limited releases of work until the anticipated completion of the FS.

The first phase is the FS, which extends from budget approval in 2020 to FNTP. The FS includes the development of two main work packages that are required to provide design information to support the FS work and obtain FNTP. These work packages are:

- Geology, metallurgical and geotechnical drilling, and investigations: The contract for drilling and investigations at site is scheduled to be awarded in late 2020. The laboratory analysis performed on the samples will cover the tunnel geotechnical characterization, mine area geotechnical characterization, waste dump WRF condemnation report, overall site geotechnical characterization, and metallurgical test work.
- Feasibility engineering design and studies: Feasibility engineering is scheduled to be awarded in 2020.

FNTP is conditioned by the FS stage gate review and EIA approval by the Argentinean authorities.

The Project includes a significant preproduction mining effort, which is the key driver influencing the front end of the overall construction schedule. Preproduction mining includes development of the haul roads, pit, and the crusher platform. The crusher platform is included within this work due to its extensive nature and immediate proximity to the pit and haul road development. Preproduction mining will be performed with mining equipment by a mass earthworks contractor in the first stage and by the Parties in the final prestripping stage.

The Parties will manage the early works program until the EPCM/EPC Contractor completes mobilization.

24.1.5.1 Critical Paths

The Project will continue with limited release of work until FNTP. The FS will integrate all studies, contract bidding processes, and permit approval processes that are required for the Parties' approval of the complete execution budget, FNTP. The execution phase will begin with no constraints on the budget to start detailed engineering, procurement, and mobilize contractors to start early works at the site. The Project critical paths are summarized below by phase.

Completion of PFSs is critical for budget approval of the FS. A delay in PFS completion and budget approval will directly impact the Project completion date.

24.1.6 Operations Plan

A total staff of 953 will be required for the Agua Rica operations phase, excluding contract workers.

The operations plan for Agua Rica is based on the operations plan recently used at Alumbrera. This approach will provide the Project with a successful operations model that will be customized for Agua Rica.

It is important to note that the Alumbrera operation is on standby. Open pit operations ceased in August 2018 and Alumbrera is currently performing progressive rehabilitation on the main waste dumps as well as a care and maintenance program for all infrastructure.

24.1.6.1 Organization

The organizational structure and support systems (e.g. leadership style) for the Project will be aligned with the Parties' principles and values and is expected to create its own culture.

The organizational structure is expected to be similar to the Alumbrera operating structure. The concentrator, filter plant, port operations, and general administration teams are to be managed using a structure that was proven effective at Alumbrera.

The mine and infrastructure management areas will be modified to reflect the differences in mining fleet size and operational requirements between the two operations. Figure 24-3 shows the proposed organization chart for the mining area (mine operations and maintenance).

Figure 24-4 shows the proposed organization chart for the infrastructure area. The major infrastructure organizational change from Alumbrera will be the addition of a management structure for the ore and waste overland conveyor systems. This new area will have a dedicated superintendent for operations and maintenance.

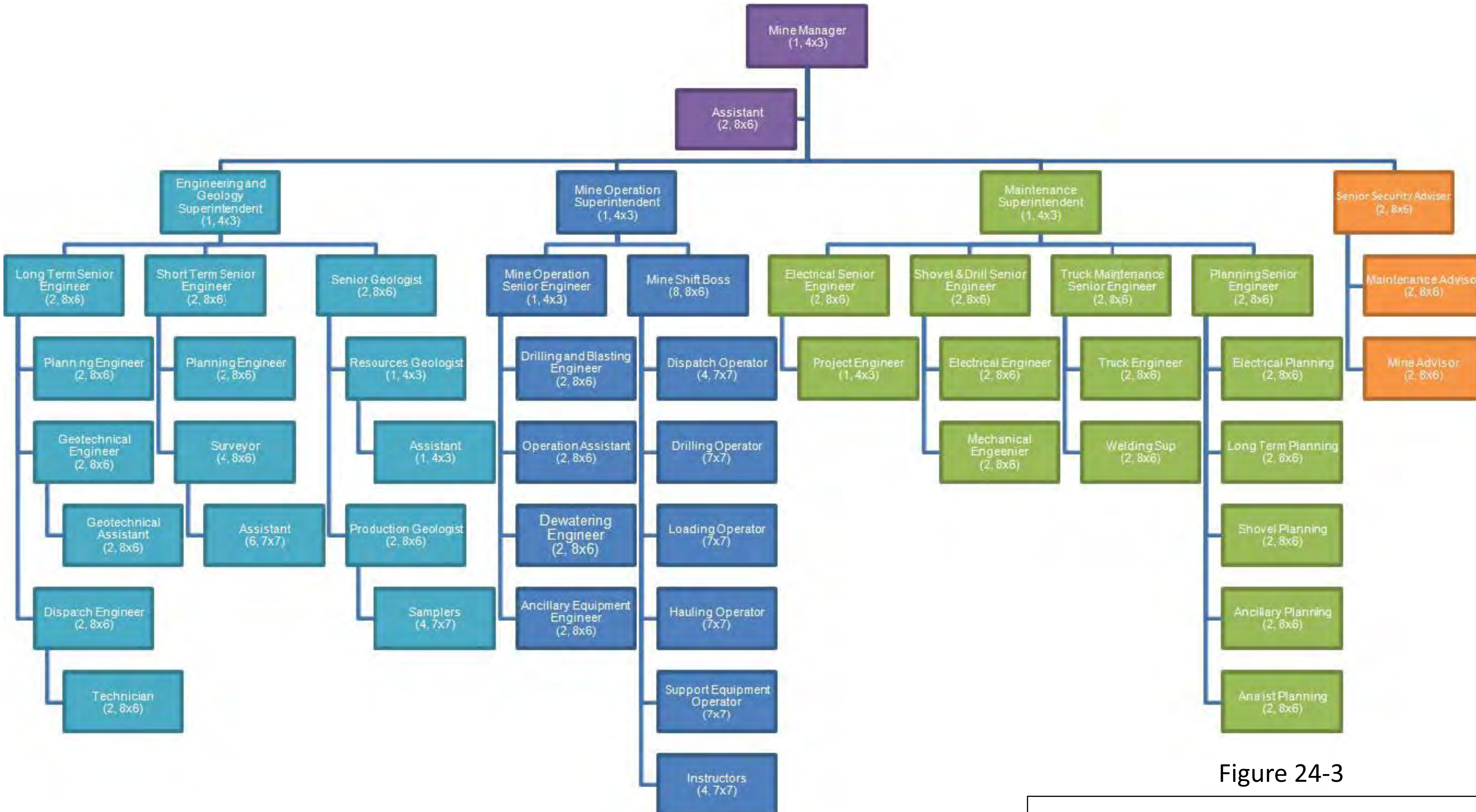


Figure 24-3

Yamana Gold Inc.

Agua Rica Integrated Project

Catamarca Province, Argentina

Mine Organization Chart

August 2022

Source: Fluor, 2020.

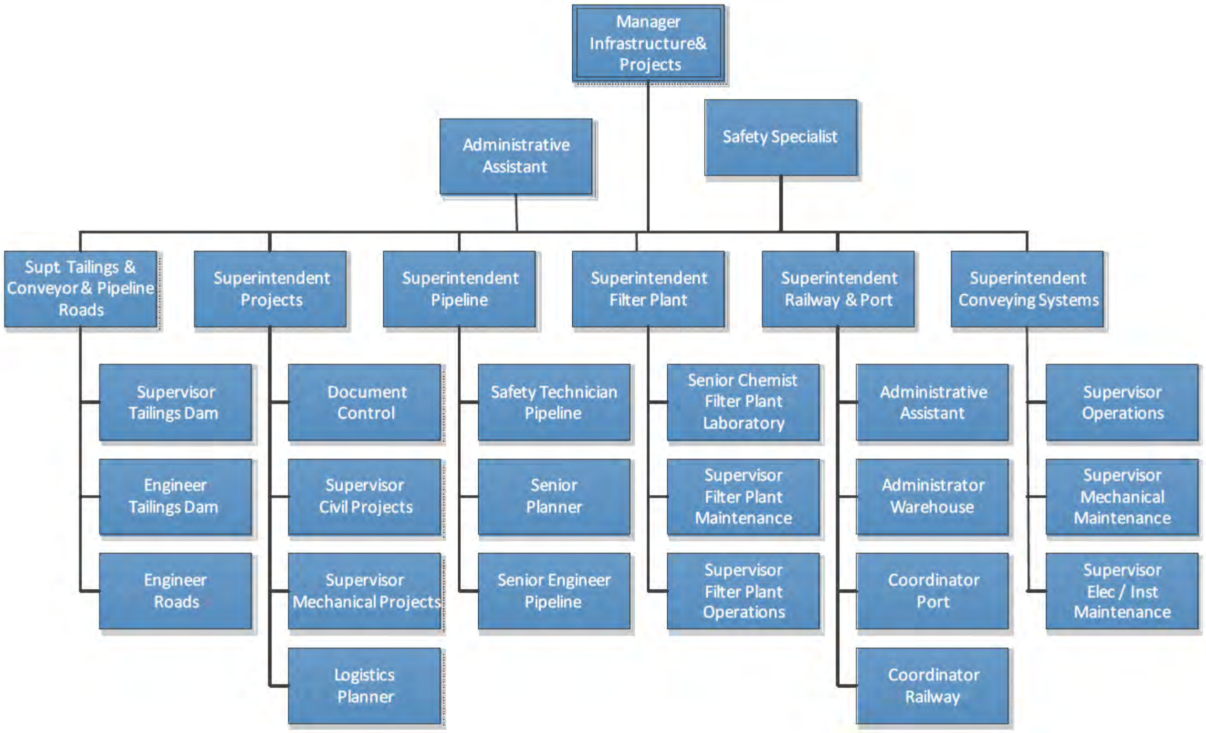


Figure 24-4: Infrastructure Organization Chart

24.2 Direct Workforce

Table 24-1 below outlines the estimated number of employees per department required during Agua Rica operations. Additional contractors outside of this structure will be utilized as required.

Table 24-1: Distribution of Employees by Department during Operations
Yamana Gold Inc. – Agua Rica Integrated Project

Department	Stratum				Shift Coverage
	4	3	2	1	
General Manager	1	0	0	1	0
Concentrator	0	1	5	119	205
Mine: Operations, Maintenance & Technical Services	0	1	3	81	498
Crushing and Conveying	0	0	1	12	180
Sustainable Development	0	1	4	20	0
Administration and Finance	0	1	5	43	0
Human Resources	0	1	4	45	3
Legal	0	0	1	5	0
Institutional Affairs	0	1	1	3	0

Department	Stratum				Shift Coverage
	4	3	2	1	
Agua Rica (Operations Phase)	0	1	1	5	0
Infrastructure and Projects	0	1	4	41	67
Agua Rica Integration	0	1	0	0	0
Subtotal (Excludes Other Contractors)	**1**	**9**	**29**	**375**	**953**

24.3 Risk Assessment and Management

Risk assessment and management for the Project is based on the risk assessment carried out for the 2013 FS. That assessment resulted from a series of workshops held to identify potential risks, which were evaluated using Glencore's risk assessment calculator shown in Table 24-2.

Table 24-2: Glencore Risk Assessment Calculator
Yamana Gold Inc. – Agua Rica Integrated Project

			Consequence				
			1	2	3	4	5
			Insignificant	Minor	Moderate	High	Catastrophic
Probability	A	Imminent	M11	M16	H20	H23	H25
	B	Probable	M7	M12	M17	H21	H24
	C	Possible	L4	M8	M13	H18	H22
	D	Improbable	L2	L5	M9	M14	H19
	E	Rare	L1	L3	M5	M10	M15

24.3.1 Major Risks Identified in 2013

Risks were divided into the following main categories:

- Investment risk
- Business risk
- Project risk
- Economic and financial risk
- Schedule risk
- Human resources risk

Each main category was divided into several sub-categories.

24.3.2 Risk Changes

A summary of the risk changes is as follows:

- Gap in copper production between the end of the Alumbrera LOM and Agua Rica start-up: This is no longer applicable.

- **High arsenic content in concentrate:** This issue remains at risk level H25 before mitigation, however, the mining team has produced a mine plan that limits the arsenic grade in the ore fed to the concentrator, to a level that limits the arsenic grade of the concentrate to <0.5% As. In addition, a concentrate blending plan will be implemented to smooth short term variations. The residual risk is now considered to be M13.
- **Early works completion:** The 2013 Agua Rica schedule included an early works program that commenced construction before the Parties' FNTP and required an early environmental permit. This item is no longer applicable. Permit delays are covered as a separate item.
- **Contractor aversion to working in Argentina:** This issue still carries risk, however, there are foreign contractors working in Argentina. It is considered that the mitigation measures proposed in 2013 are still applicable and will reduce the risk to M13.
- **Power line IIA approval and construction delays:** This issue is still a risk, however, the impact is greatly reduced as the mine plans to use hydraulic shovels. In addition, waste will now not be crushed and conveyed. These changes significantly lower the power demand. The 2013 mitigation measures are still applicable, and the residual risk is now estimated to be M8.

24.3.3 New Risks

The main scope difference between the 2013 Agua Rica study and the current study is the removal of waste crushing, conveying, and stacking. This has been replaced by truck hauling to the designated WRF area. This is evaluated as a new risk. The Project team also considered that the ore conveying system, tailings disposal, social responsibility, and environment should be re-evaluated.

New risks identified in 2019 are summarized in the list below:

- Schedule risks:
  - Construction of the WRF (new proposed WRF to be constructed in the adjacent drainage west of the mine)
- Project risks:
  - WRF design
  - WRF social and environmental acceptance
  - Expansion of existing Alumbrera tailings dam (potential rejection by the authorities and technical risks)
  - Use of Alumbrera open pit for tailings disposal rejected
  - Overland conveyor system failures
  - Social/community
  - Environmental (IIA/EIA) approval

The high risks from 2013 and 2019 were consolidated into a new risk table. Initially, a total of 20 high risks were identified in the combined 2013 and 2019 listing. After mitigation nine high risks remained.

24.3.4 Mitigation

Mitigation measures have reduced the risk exposure level of all 20 high risks. Eleven of the 20 high risks were reduced to moderate risks by mitigation actions.

24.3.5 Ongoing Risk Management Process

Risk identification, mitigation, and control will continue through to the completion of the Project. In the next stages of the Project, new risks will emerge, and these will be treated by applying the processes described previously.

Areas where new risks could emerge are the permitting process where the authorities could impose unexpected stringent conditions, land acquisitions (e.g. around the WRF) and granting (or renewal) of rights-of-way.

25.0 INTERPRETATION AND CONCLUSIONS

Based on the Mineral Reserve estimate updated in June 2019, positive results achieved for PFS-A are as follows:

- Proven and Probable copper Mineral Reserves increased from year-end 2018 by 21% to 11.8 billion pounds, and gold Mineral Reserves increased by 12% to 7.4 million ounces.
- Initial capital cost estimate of $2.39 billion realizes significant synergies from using the infrastructure and facilities of Alumbrera.
- Annual production for the first 10 full years increased to 533 million pounds of copper equivalent production, including 107,000 ounces of gold and contributions of molybdenum and silver.
- Capital costs expected to fall well within the lower half of the cost curve, with cash costs decreased to US$1.29/lb Cu for the first 10 years of production, and AISC decreased to US$1.52/lb Cu for the same period (non-GAAP financial measure).
- Project expected to generate strong economic returns, with NPV increased to $1.935 billion and increased after-tax IRR of 19.7%.
- Opportunities to further improve the economics will be evaluated in a subsequent FS. These opportunities include converting economic grade Inferred Mineral Resources within the pit and expanding throughput scenarios to increase metal production and returns.

Several assumptions were made during the execution of the conceptual design of mining ancillary facilities, which need to be confirmed in more advanced stages of the Project with specific site investigations and lab testing.

26.0 RECOMMENDATIONS

It is recommended to continue into the FS to enhance the pre-feasibility phase in terms of value creation and risk mitigation including the following:

1. Develop full FS stage work plan, including tasks, schedule, and budget estimate.
2. Upgrade and advance mining ancillary facilities and associated water management structures to a PFS level.
3. Conduct alternative analysis for upstream water management systems.
4. Conduct further stability analysis for Alumbrera tailings storage facility (TSF) expansion.
5. Carry out a conceptual level evaluation (including mine plans) of the potential to mine additional Mineral Resources from the Alumbrera deposit including potential underground mine development and additional pushbacks in the open pit.
6. Conduct a trade-off study to determine the most effective and efficient Agua Rica loading and drilling equipment to be utilized for mining (Diesel/Hydraulic vs Electric). Complete assessment of all aspects – optimum match to operating requirements and project value.
7. Update risk register based on current project development scenario.
8. Conduct a throughput increase analysis by evaluating the maximum installed capacityof current facilities.
9. Obtain an independent view on current and future market conditions for sale of coppercustom concentrates.
10. Review Project development schedule for alternatives and opportunities to improveschedule duration and critical paths.
11. Assess and select the best grinding circuit option for the Project.
12. Determine and define metallurgical test work program, including:
    - Test work purpose
    - Benefit/cost
    - Sample requirements
    - Drilling plan
    - Sample management
    - Schedule, etc.
13. Evaluate best approach to overall requirements of condemnation drilling for multiple purposes in different areas. Purposes include:
    - Metallurgical, geotechnical, hydrological, geo-hydrological, acid rock drainage (ARD) characterization, waste degradation (stability), etc.
14. Areas for additional drilling include:
    - Mine, ore stockpiles, infrastructure sites, tunnel, overland conveyor route, etc.
15. Conduct assessment of arsenic treatment alternatives, including alkaline sulphide leach, and roaster (conceptual, upside).

16. Conduct assessment of existing concentrate pipeline for current conditions and requirements to maintain. Conduct test work and analysis of Agua Rica concentrate (rheology, etc.) to determine estimated transport capacity of existing pipeline.
17. Develop full comprehensive water management plan to complete the Project. Include water treatment alternatives, water balance, etc.

A fully developed work plan and budget is required for the FS stage. This will include resources and input from the Project management team, Parties' team representatives, consultants, and engineering firms as required to develop a complete work program for the Project.

In addition to the study tasks listed, the following tasks will be required to complete the FS, including engineering design of layouts, drawings, and material take-offs to support a capital estimate update, report editing and compilation, project scheduling, etc.

27.0 REFERENCES

Allmendinger, R.W., 1986, Tectonic development, southeastern border of the Puna Plateau. Geol. Soc. Am. Bull. 97, 1070–1082.

BHP, 1999, Agua Rica Project; Geology and Mineral Resources Update. Prepared by Agua Rica Project Geological Staff. May 1999.

Bow, CS, 2018, Re: Initial Review of Historical Exploration Data: Agua Rica Cu-Mo-Au Deposit, Catamarca Province, Argentina. Internal Report Prepared for Yamana Gold. July, 2018

British Columbia Geological Survey (BCGS) website, Mineral Deposit Profiles, https://www2.gov.bc.ca/gov/content/industry/mineral-exploration-mining/british-columbia-geological-survey/publications/mineral-deposit-profiles, accessed September 2, 2019.

Canadian Institute of Mining, Metallurgy and Petroleum (CIM), 2014, CIM Definition Standards for Mineral Resources and Mineral Reserves, adopted by the CIM Council on May 10, 2014.

Chernicoff CJ, Richards JP, Zappettini EO, 2002, Crustal lineament control on magmatism and mineralization in northwestern Argentina: Geological, geophysical, and remote sensing evidence. Ore Geology Reviews. December 2002

Corbett G., 2009, Anatomy of porphyry-related Au-Cu-Ag-Mo mineralized systems: Some Exploration Implications. Australian Institute of Geoscientists North Queensland Exploration Conference June 2009, AIG Bulletin 49, pp. 33-46.

Cristallini, E. O., A. H. Comínguez, V. A. Ramos, and E. D. Mercerat, 2004, Basement double-wedge thrusting in the northern Sierras Pampeanas of Argentina (278S)—Constraints from deep seismic reflection, in K. R. McClay, ed., Thrust tectonics and hydrocarbon systems: AAPG Memoir 82, p. 65– 90.

Fluor, 2013, Agua Rica Project Feasibility Study Report, Internal report prepared for Minera Alumbrera, August 2013.

Fluor, 2019, Agua Rica Integrated Project Prefeasibility Study PFS-A Report, FLR-A7IP-PFS-0000-GR-RP-0001, August 2019.

Franchini M, Impiccini A, Lentz D, Ríos FJ, O'Leary S, Pons J, and Schalamuk AI, 2011, Porphyry to epithermal transition in the Agua Rica polymetallic deposit, Catamarca, Argentina: An integrated petrologic analysis of ore and alteration parageneses. Ore Geology Reviews 41 (2011) 49–74.

Gustafson and Hunt, 1975, The Porphyry Copper Deposit at El Salvador, Chile. Economic Geology and the Bulletin of the Society of Economic Geologists. V. 70, pp. 857-912.

Jordan, T.E., Bryan, L.I., Allmendinger, R.W., Brewer, J.A., Ramos, V.A., and Ando, C.J., 1983, Andean tectonics related to geometry of subducted Nasca plate: Geological Society of America Bulletin, v. 94, p. 341–361.

Landtwig MR, Dillenbeck ED, Keaje NH, Henrich CA, 2002, Evolution of the Breccia-Hosted Porphyry Cu-Mo-Au Deposit at Agua Rica, Argentina: Progressive Unroofing of a Magmatic Hydrothermal System. Economic Geology vol. 97(6): 1273-1292. https://doi.org/10.2113/gsecongeo.97.6.1273

McGill University. Department of Earth and Planetary Sciences (EPS). Porphyry Deposits. PowerPoint presentation accessed online on September 2, 2019 at http://eps.mcgill.ca/~courses/c452/Porphyry%20deposits.ppt

Minera Alumbrera website, http://www.alumbrera.com.ar/quienes-somos/acerca-de-minera-alumbrera/, accessed on September 2, 2019.

Panteleyev, A., 1995, Porphyry Cu+/-Mo+/-Au, in Selected British Columbia Mineral Deposit Profiles, Volume 1 – Metallics and Coal, Lefebure, D.V. and Ray, G.E., Editors, British Columbia Ministry of Employment and Investment, Open File 1995-20, pages 87-92.

Panteleyev, A., 1996, Epithermal Au-Ag-Cu: High Sulphidation, in Selected British Columbia Mineral Deposit Profiles, Volume 2 – Metallic Deposits, Lefebure, D.V. and Höy, T., Editors, British Columbia Ministry of Employment and Investment, Open File 1996-13, pages 37-39.

Perelló, J., Rojas, N., Devaux, C., Fava, L., Etchart, E., and Harman, P. 1998, Discovery of the Agua Rica porphyry Cu-Mo-Au deposit, Catamarca province, northwestern Argentina, Part II: Geology: Australian Mineral Foundation Symposium, Perth, Western Australia, 30 November and 1 December 1998, Proceedings, p. 117–132.

Piteau Associates Engineering Ltd., 2013.

Richardson T, Gilbert H, Anderson M, and Ridgway KD, 2012, Seismicity within the actively deforming Eastern Sierras Pampeanas, Argentina. Geophysical Journal International, Volume 188, Issue 2, February 2012, Pages 408–420, https://doi.org/10.1111/j.1365-246X.2011.05283.x

Sasso AM and Clark AH, 1998, The Farallón Negro Group, Northwest Argentina: Magmatic, Hydrothermal and Tectonic Evolution and Implications for Cu-Au Metallogeny in the Andean Back-arc. SEG Newsletter No. 34, July 1998.

Sasso AM, 1997, Geological Evolution and Metallogenetic Relationships of the Farallon Negro Volcanic Complex, NW Argentina, PhD thesis, Queens University, August 1997

Sillitoe, RH, 1985, Ore-related breccias in volcanoplutonic arcs: Economic Geology, v. 80, p. 1467–1514.

Takagi TK, and Brimhall GH, 1998, Effect of trace element content on the optical properties of enargites and their distribution in the Agua Rica copper deposit, Argentina [abs.]: Geological Society of America Abstracts with Programs, v. 30, p. 75.

Thomsen, MB., 2006, High Sulphidation Gold Deposits – A Summary DOI: 10.13140/RG.2.1.2302.1289, August 2015.

Xstrata Copper, 2012. Agua Rica Report, Section 9-Geology. Internal report prepared by Xstrata Copper Joint Ventures and Project Development Division, Santiago, December 2012.

28.0 DATE AND SIGNATURE PAGE

This report titled "Technical Report on the Agua Rica Integrated Project, Catamarca Province, Argentina" with an effective date of June 30, 2019 was prepared and signed by the following authors:

(Signed and Sealed) ***David J.F. Smith***

Dated at Toronto, ON
August 31, 2022

David J.F. Smith, CEng
SLR Consulting (Canada) Ltd.

(Signed and Sealed) ***Dominic Chartier***

Dated at Toronto, ON
August 31, 2022

Dominic Chartier, P.Geo
Yamana Gold Inc.

(Signed and Sealed) ***Berkley J. Tracy***

Dated at Denver, CO
August 31, 2022

Berkley J. Tracy, PG, CPG, P.Geo.
SRK Consulting (U.S.), Inc.

(Signed and Sealed) ***Giorgio de Tomi***

Dated at Belo Horizonte, MG Brazil
August 31, 2022

Giorgio de Tomi, FIMMM, CEng
Deswik Mining Consultants (Australia) Pty Ltd.

(Signed and Sealed) ***Kevin A. Dardis***

Dated at Santiago, Chile
August 31, 2022

Kevin A. Dardis, FAusIMM (CP)
Fluor Corporation

(Signed and Sealed) ***Anthony (Tony) Maycock***

Dated at Colina RM, Chile
August 31, 2022

Anthony (Tony) Maycock, P.Eng.
MM Consultores Limitada

29.0 CERTIFICATE OF QUALIFIED PERSON

29.1 David J. F. Smith

I, David J.F. Smith, CEng, as an author of this report entitled “Technical Report on the Agua Rica Integrated Project, Catamarca Province, Argentina” (the Technical Report) prepared for Yamana Gold Inc. (the Issuer) effective as of June 30, 2019 and dated August 31, 2022, do hereby certify that:

1. I am Principal Mining Engineer with SLR Consulting (Canada) Ltd. of Suite 501, 55 University Ave., Toronto, ON M5J 2H7.
2. I am a graduate of the University of Newcastle upon Tyne, United Kingdom with a BSc (Eng) in Mining Engineering.
3. I am registered as a Chartered Engineer in the UK with the Engineering Council and am a Fellow of Institute of Materials, Minerals and Mining (Membership #43860). I have worked as a mining engineer for a total of 40 years since my graduation. My relevant experience for the purpose of the Technical Report is:
    - Review and report as a mining consultant involved in numerous consulting and engineering assignments including project technical evaluations, technical report preparation for project financing and fund-raisings, IPOs, merger and acquisitions, due diligence reviews and engineering studies from scoping to basic engineering
    - Numerous consulting assignments on gold and base metal mine development projects and operating mines
    - Senior positions with a leading international mining and tunnelling contractor, managing international mine and tunnel construction projects as well as developing a successful engineering consulting business
    - Board director for an international mining consulting firm, responsible for leading the UK technical staff, and ensuring the technical quality of the firm’s consulting assignments across the consulting division
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
5. I have not visited the Agua Rica Project.
6. I am responsible for Sections 1.2, 1.3.14, 2, 21, and 22 and share responsibility with my co-authors for disclosure in Sections 1.1, 25, 26, and 27 of the Technical Report.
7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have had no prior involvement with the property that is the subject of the Technical Report.
9. I have read NI 43-101, and the sections of the Technical Report or which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.

10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated August 31, 2022,

(Signed and Sealed) *David J.F. Smith*

David J.F. Smith, CEng

29.2 Dominic Chartier

I, Dominic Chartier, P.Geo., as an author of this report entitled "Technical Report on the Agua Rica Integrated Project, Catamarca Province, Argentina" (the Technical Report) prepared for Yamana Gold Inc. (the Issuer) effective as of June 30, 2019 and dated August 31, 2022, do hereby certify that:

1. I am Director, Geology, Technical Services with Yamana Gold Inc. of 200 Bay Street, Suite 2200, Toronto, Ontario M5J 2J3.
2. I am a graduate of McGill University in Montreal, Quebec, with a B.Sc. in Earth and Planetary Sciences in 2002.
3. I am a Professional Geologist, registered with the Ordre des Géologues du Québec (OGQ #874) and the Association of Professional Geoscientists of Ontario (APGO #2775). I have worked as a geologist for a total of 17 years since my graduation. My relevant experience for the purpose of the Technical Report is my career as a geologist. I have created geological and ore deposit 3D models, analyzed the geostatistics and variography of ore deposits, completed National Instrument 43-101 compliant mineral resource estimations, evaluated the structural properties of ore deposits, reviewed analytical quality control sample results, and co-authored or contributed to numerous National Instrument 43-101 technical reports focussed on gold, base metal and precious metal projects in Canada, West Africa, and South America.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
5. I visited the Agua Rica Project from November 26 to November 29, 2019.
6. I am responsible for Sections 1.3.1, 1.3.2, 1.3.3, 3 to 5, and 23, and share responsibility with my co-authors for disclosure in Sections 1.1, 25, 26, and 27 of the Technical Report.
7. I am not independent of the Issuer, applying the test set out in Section 1.5 of NI 43-101 as I am an employee of the Issuer.
8. I am a full time employee of the Issuer.
9. I have read NI 43-101, and the sections of the Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated August 31, 2022,

(Signed and Sealed) ***Dominic Chartier***

Dominic Chartier, P.Geo

29.3 Berkley J. Tracy

I, Berkley J. Tracy, MSc Geology, PG, CPG, P.Geo., as an author of this report entitled “Technical Report on the Agua Rica Integrated Project, Catamarca Province, Argentina” (the Technical Report) prepared for Yamana Gold Inc. (the Issuer) effective as of June 30, 2019 and dated August 31, 2022, do hereby certify that:

1. I am a Principal Consultant of SRK Consulting (U.S.), Inc., 999 Seventeenth Street, Suite 400, Denver, CO, USA, 80202.
2. I graduated with a Bachelor of Science in Geology from The University of Georgia (UGA), Athens, Georgia in 1998. In addition, I obtained a Master of Science degree in Geology from UGA in 2001.
3. I am a Certified Professional Geologist (CPG #11901) with the American Institute of Professional Geologists (AIPG), a Professional Geoscientist (P.Geo. #3024) with Professional Geoscientists Ontario (PGO), and a licensed/registered Professional Geologist (PG) in several U.S. states (Georgia PG #1792, Alabama PG #1231, and South Carolina PG #2500). I have worked as a geologist for over 20 years since my graduation from university and have held professional registration as a geologist since 2005. My relevant experience includes base and precious metal exploration, resource geology, three-dimensional (3D) modeling, geostatistical estimation, due diligence reviews, independent audits, planning and supervising geologic logging, sampling, mapping, and feasibility projects, and managing large exploration programs leading to mine development. My geoscience background has been developed at multiple organizations spanning from major miners to small-cap explorers to mining, geotechnical engineering, and environmental consultancies.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
5. I did not visit the Agua Rica Project prior to the effective date of this Technical Report. I made a site visit from April 26 to April 29, 2022.
6. I am responsible for Sections 1.3.4, 1.3.5, 1.3.6, 1.3.7, 6 to 12, and 14, and share responsibility with my co-authors for disclosure in Sections 1.1, 25, 26, and 27 of the Technical Report.
7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have had no prior involvement with the property that is the subject of the Technical Report.
9. I have read NI 43-101, and the sections of the Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated August 31, 2022,

(Signed and Sealed) ***Berkley J. Tracy***

Berkley J. Tracy, PG, CPG, P.Geo.

29.4 Giorgio de Tomi

I, Giorgio de Tomi, FIMMM, CEng, as an author of this report entitled "Technical Report on the Agua Rica Integrated Project, Catamarca Province, Argentina" (the Technical Report) prepared for Yamana Gold Inc. (the Issuer) effective as of June 30, 2019 and dated August 31, 2022, do hereby certify that:

1. I am a Mining Consultant with Deswik Mining Consultants (Australia) Pty Ltd.of Rua Antônio de Albuquerque, 330. 7º Andar – Funcionários, Belo Horizonte, MG Brazil.
2. I have obtained a mining engineering degree from the University of São Paulo (Brazil) in 1983, with a PhD degree in 1995 from the Imperial College (UK) and an MSc degree in 1989 from Southern Illinois University (USA).
3. I am registered Fellow of the Institute of Materials, Minerals & Mining (UK) with membership no. 461723 and Chartered Engineer with the Engineering Council of the UK. I have worked as a mining engineer for a total of 35 years since my graduation. My relevant experience for the purpose of the Technical Report is as a Mining Engineering Consultant and as the Head of the Universidade de São Paulo Centre for Responsible Mining.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
5. I visited the Agua Rica property between February 22 and 25, 2019.
6. I am responsible for Sections 1.3.8, 1.3.9, 15, 16, and 18.10 and share responsibility with my co-authors for disclosure in Sections 1.1, 25, 26, and 27 of the Technical Report.
7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have had no prior involvement with the property that is the subject of the Technical Report.
9. I have read NI 43-101, and the sections of the Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated August 31, 2022,

(Signed and Sealed) ***Giorgio de Tomi***

Giorgio de Tomi, FIMMM, CEng

29.5 Kevin A. Dardis

I, Kevin A. Dardis, FAusIMM (CP), as an author of this report entitled “Technical Report on the Agua Rica Integrated Project, Catamarca Province, Argentina” (the Technical Report) prepared for Yamana Gold Inc. (the Issuer) effective as of June 30, 2019 and dated August 31, 2022, do hereby certify that:

1. I am employed as a Senior Vice President with Fluor Corporation in its Mining & Metals business line. My direct employing entity is Fluor Australia Pty Ltd at 168 St Georges Terrace, Perth, Australia
2. I am a graduate of the University of the Witwatersrand, South Africa with degrees in Chemical Engineering – B.Sc. (Eng) in 1974 and Ph.D. in 1981.
3. I am a Fellow of the Australasian Institute of Mining and Metallurgy (Chartered Professional - Management) . I have practiced my profession for 45 years since graduation. I have been directly involved in mineral processing plant operations, design and commissioning, feasibility studies and general management for large mining projects and associated infrastructure. I have worked in Australia, Canada, South Africa, Chile, Peru, Indonesia and Zimbabwe.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
5. I visited the Agua Rica mine site on July 3, 2018.
6. I am responsible for Sections 1.3.11, 1.3.15, 1.3.16, 18.1 to 18.9, 18.11, 18.12, and 24 and share responsibility with my co-authors for disclosure in Sections 1.1, 25, 26, and 27 of the Technical Report.
7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have been involved on the Agua Rica project in the past, during the 2016 conceptual study level development of capital costs for alternative throughput cases and design concepts.
9. I have read NI 43-101 and the sections of the Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated August 31, 2022,

(Signed and Sealed) ***Kevin A. Dardis***

Kevin A. Dardis, FAusIMM (CP)

29.6 Anthony (Tony) Maycock

I, Anthony (Tony) Maycock, P.Eng., as an author of this report entitled "Technical Report on the Agua Rica Integrated Project, Catamarca Province, Argentina" (the Technical Report) prepared for Yamana Gold Inc. (the Issuer) effective as of June 30, 2019 and dated August 31, 2022, do hereby certify that:

1. I am employed as a Senior Consultant with MM Consultores Limitada of El Chagual 2010, Las Brisas de Chicureo, Colina RM, Chile.
2. I am a graduate of the University of London, England in 1969 with a Bachelor of Science (Honour) degree.
3. I am registered as a Professional Engineer in the Province of British Columbia (Reg.#13275). I have practiced my profession for 50 years since graduation. I have been directly involved in mineral processing plant operations, design and commissioning and project management for large mining projects and associated infrastructure. I have worked in Zambia, Canada, USA, Chile, Argentina, Peru, and Brazil.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
5. I visited the Agua Rica mine site on 3 July 2018. I visited the Alumbrera concentrator, filter plant, and port facilities over the period 5 to 7 February 2019.
6. I am responsible for Sections 1.3.10, 1.3.12, 1.3.13, 13, 17, 19, and 20 and share responsibility with my co-authors for disclosure in Sections 1.1, 25, 26, and 27 of the Technical Report.
7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have been involved on the Agua Rica project in the past including the 2013 feasibility study as a lead consultant.
9. I have read NI 43-101, and the sections of the Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated August 31, 2022,

(Signed and Sealed) ***Anthony (Tony) Maycock***

Anthony (Tony) Maycock, P.Eng.