CSA Global
Mining Industry Consultants

NI 43-101 Technical Report

Mineral Resource and Mineral Reserve Update for the Youga and Ouaré Projects

CSA Global Report № R168.2017
19 June 2017

www.csaglobal.com

Report prepared for

Client Name	Burkina Mining Company S.A, Avesoro Resources Inc.
Project Name/Job Code	Youga Project – AVSCPR02
Contact Name	Serhan Umerhan
Contact Title	CEO
Office Address	S08 BP 11197, Ouagadougoy 08, Burkina Faso

Report issued by

CSA Global Office	CSA Global (UK) Ltd (UK Office) Suite 2, First Floor, Springfield House, Springfield Road Horsham, West Sussex RH12 2RG UNITED KINGDOM T +44 1403 255 969 F +44 1403 240 896 E csauk@csaglobal.com
Division	Corporate

Report information

File name	R168.2017 AVSCPR02_ Youga_Ouare_NI43-101_TR_250617_FINAL
Last edited	25/06/2017 12:09:00
Report Status	Final

Author and Reviewer Signatures

Coordinating Author	David Williams, B.Sc. (Hons), MAIG	Signature:	"signed and sealed"
Contributing Author	Matthew Randall, B.Sc. (Hons), PhD, FIMMM	Signature:	"signed and sealed"
Contributing Author	Simon S. Meik, B.Sc., PhD, FIMMM	Signature:	"signed and sealed"
Contributing Author	Galen White B.Sc. (Hons), FAusIMM, FGS	Signature:	"signed and sealed"
Contributing Author	Malcolm Titley B.Sc., MAIG, MAusIMM	Signature:	"signed and sealed"
Contributing Author	David Muir B.Sc. (Hons), MAIG	Signature:	"signed and sealed"
Contributing Author	Sue Struthers B.Sc. (Hons), M.Sc, PhD.	Signature:	"signed and sealed"
Peer Reviewer	Galen White B.Sc. (Hons), FAusIMM, FGS	Signature:	"signed and sealed"
CSA Global Authorisation	Galen White B.Sc. (Hons), FAusIMM, FGS	Signature:	Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication.

Certificates

Certificate of Qualified Person – David Williams

As a Qualified Person of this Technical Report covering the Properties named as Youga and Ouaré, Burkina Faso, I, David Williams do hereby certify that:

1. I am a Principal Resource Geologist with CSA Global, and carried out this assignment for CSA Global Pty Ltd, Level 2, 201 Leichhardt Street, Spring Hill, Queensland, 4000; telephone +61 7 3106 1200; email: david.williams@csaglobal.com.
2. The Technical Report to which this certificate applies is titled "NI43-101 Technical Report, Mineral Resource and Mineral Reserve Updates for the Youga and Ouaré Projects" and is dated 19 June 2017.
3. I hold a B.Sc. (Hons) and am a registered Fellow in good standing of the Australian Institute of Geosciences, MAIG, 4176. I am familiar with NI 43-101 and, by reason of education, experience in exploration, evaluation and mining of mesozonal gold lode deposits, and professional registration; I fulfil the requirements of a Qualified Person as defined in NI 43-101. My experience includes 27 years in mine geology and Mineral Resource estimation.
4. I visited the projects that are the subject of this Technical Report, between 26 January and 02 February 2017 for a combined total of 6 days.
5. I am responsible for the following sections of this Technical Report; Sections 2.4.1, 2.4.2, 4, 5, 6, 7, 8, 9, 10.1 – 10.3, 10.5 – 10.11 and 12.
6. I am independent of the issuer as described in Section 1.5 of NI 43-101.
7. I have not had prior involvement with the property that is the subject of this Technical Report.
8. I have read NI 43-101 and the parts of the Technical Report I am responsible for have been prepared in compliance with N1 43-101.
9. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 19th day of June, 2017.

"signed and sealed"

David Williams, B. Sc. (Hons)
Principal Resource Geologist
CSA Global Pty Ltd

Certificate of Qualified Person – Dr Matthew Randall

As a Qualified Person of this Technical Report covering the Properties named as Youga and Ouaré of Burkina Faso, I, Matthew Randall do hereby certify that:

1. I am an Associate Consultant Mining Engineer to CSA Global (UK) Ltd, and carried out this assignment for CSA Global (UK) Ltd, Suite 2, First Floor, Springfield House, Springfield Road, Horsham, West Sussex, RH12 2RG, UK, +44 1403 255 969, axevalleymining@gmail.com.
2. The Technical Report to which this certificate applies is titled "NI43-101 Technical Report, Mineral Resource and Mineral Reserve update for the Youga and Ouaré Projects and is dated 19 June 2017.
3. I hold a Hons BSc in Mining Engineering and a PhD in Rock Mechanics and am a registered Fellow in good standing of the Institute of Materials, Minerals and Mining (IMMM). I am familiar with NI 43-101 and, by reason of education, experience in exploration, evaluation and mining of gold, and professional registration; I fulfil the requirements of a Qualified Person as defined in NI 43-101. My experience includes 10+ years in gold.
4. I visited the projects that are the subject of this Technical Report, between 26 January 2017 and 2 February 2017 for a combined total of six days on site.
5. I am responsible for the following sections of this Technical Report; Sections 2.4.3, 15, 16, 21.1 and 22.
6. I am independent of the issuer as described in Section 1.5 of NI 43-101.
7. I have not had prior involvement with the property that is the subject of this Technical Report.
8. I have read NI 43-101 and the parts of the Technical Report I am responsible for have been prepared in compliance with N1 43-101.
9. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 19th day of June, 2017.

"signed and sealed"

Dr Matthew Randall
Associate Consultant Mining Engineer
CSA Global (UK) Ltd

Certificate of Qualified Person – Simon S. Meik

As a Qualified Person of this Technical Report covering the Properties named as Youga and Ouaré of Burkina Faso, I, Simon Meik do hereby certify that:

1. I am a Mineral Processing Consultant to CSA Global (UK) Ltd, and carried out this assignment for CSA Global (UK) Ltd, Suite 2, First Floor, Springfield House, Springfield Road, Horsham, West Sussex, RH12 2RG, UK, +44 1403 255 969, simon.s.meik@gmail.com.
2. The Technical Report to which this certificate applies is titled "NI43-101 Technical Report, Mineral Resource and Mineral Reserve update for the Youga and Ouaré Projects" and is dated 19 June 2017.
3. I hold a BSc degree and PhD in Minerals Engineering from the University of Birmingham, UK. I am a Chartered Professional Member of the Australasian Institute of Mining and Metallurgy (FAusIMM (CP), Membership Number 106146). I am familiar with NI 43-101 and, by reason of education, and 40 years' experience I fulfil the requirements of a Qualified Person as defined in NI 43-101 for the evaluation of the project under consideration. My experience includes most aspects of study/ project/plant operations management in many aspects of small and large mineral processing plants.
4. I have not visited the projects that are the subject of this Technical Report.
5. I am responsible for the following sections of this Technical Report; Sections 13, 17 and 21.2.
6. I am independent of the issuer as described in Section 1.5 of NI 43-101.
7. I have not had prior involvement with the property that is the subject of this Technical Report.
8. I have read NI 43-101 and the parts of the Technical Report I am responsible for have been prepared in compliance with N1 43-101.
9. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 19th day of June, 2017.

"signed and sealed"

Simon Meik, BSc (Hons), PhD, FAusIMM (CP)
Associate Mineral Processing Consultant
CSA Global (UK) Ltd

Certificate of Qualified Person – Galen White

As a Qualified Person of this Technical Report covering the Properties named as Youga and Ouaré of Burkina Faso, I, Galen White do hereby certify that:

1. I am a Director and Principal Consultant of CSA Global (UK) Ltd, and carried out this assignment for CSA Global (UK) Ltd, Springfield House, Springfield Road, Horsham, West Sussex, RH12 2RG, UK; telephone: +44 1403 255 969; email: galen.white@csaglobal.com.
2. The Technical Report to which this certificate applies is titled "NI43-101 Technical Report, Mineral Resource and Mineral Reserve Update for the Youga and Ouaré Projects" and is dated 19 June 2017.
3. I hold a BSc (Hons) degree in Geology from the University of Portsmouth, England and am a registered Fellow in good standing of the Australasian institute of Mining and Metallurgy (Membership Number: 226041). I am familiar with NI 43-101 and, by reason of education, experience in exploration, evaluation and mining of shear-hosted vein gold deposits, and professional registration; I fulfil the requirements of a Qualified Person as defined in NI 43-101. My experience includes 19 years in mineral exploration, mining and resource development with the last 10 years in technical consulting.
4. I have not visited the projects that are the subject of this Technical Report.
5. I am responsible for the following sections of this Technical Report; Sections 1, 2.1 – 2.3, 3, 10.4, 18, 19, 20, 23, 24, 25, 26 and 27.
6. I am independent of the issuer as described in Section 1.5 of NI 43-101.
7. I have not had prior involvement with the property that is the subject of this Technical Report.
8. I have read NI 43-101 and the parts of the Technical Report I am responsible for have been prepared in compliance with N1 43-101.
9. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 19th day of June, 2017.

"signed and sealed"

Galen White, BSc (Hons), FAusIMM, FGS
Principal Consultant
CSA Global (UK) Ltd

Certificate of Qualified Person – David Muir

As a Qualified Person of this Technical Report covering the Properties named as Youga and Ouaré of Burkina Faso, I, David Muir do hereby certify that:

1. I am a Senior Data Geologist of CSA Global (UK) Ltd, and carried out this assignment for CSA Global (UK) Ltd, First Floor, Suite 2, Springfield House, Springfield Road, Horsham, West Sussex, RH12 2RG; telephone: + 44 (0) 1403 255 969; email: david.muir@csaglobal.com.
2. The Technical Report to which this certificate applies is titled "NI43-101 Technical Report, Mineral Resource and Mineral Reserve update for the Youga and Ouaré Projects" and is dated 19 June 2017.
3. I hold a BSc (Hons) degree in Geology from the University of Natal, Durban, South Africa and am a registered Member in good standing of the Australian Institute of Geoscientists (Membership Number: 9102). I am familiar with NI 43-101 and, by reason of education, experience in exploration, evaluation and data management, and professional registration; I fulfil the requirements of a Qualified Person as defined in NI 43-101. My experience includes nine continuous years in the exploration and mining industry.
4. I have not visited the projects that are the subject of this Technical Report.
5. I am responsible for the following sections of this Technical Report; Section 11.
6. I am independent of the issuer as described in Section 1.5 of NI 43-101.
7. I have not had prior involvement with the property that is the subject of this Technical Report.
8. I have read NI 43-101 and the parts of the Technical Report I am responsible for have been prepared in compliance with N1 43-101.
9. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 19th day of June, 2017.

"signed and sealed"

David Muir, BSc. (Hons), MAIG, FGS
Senior Data Geologist
CSA Global (UK) Ltd

Certificate of Qualified Person – Malcolm Titley

As a Qualified Person of this Technical Report covering the Properties named as Youga and Ouaré, Burkina Faso, I, Malcolm Titley do hereby certify that:

1) I am a Principal Consultant of CSA Global (UK) Ltd, and carried out this assignment for CSA Global (UK) Ltd, Suite 2, First Floor, Springfield House, Springfield Road, Horsham, West Sussex, RH12 2RG, UK, +44 1403 255 969, malcolm.titley@csaglobal.com.
2) The Technical Report to which this certificate applies is titled "NI43-101 Technical Report, Mineral Resource and Reserve update for the Youga and Ouaré Projects" and is dated 19 June 2017.
3) I hold a BSc degree in Geology and Chemistry from the University of Cape Town (1979) and am a registered Member in good standing of the Australian Institute of Geologists (AIG Membership Number 2546). I am familiar with NI 43-101 and, by reason of education, experience in the exploration, evaluation and mining of vein hosted mineral deposits in Europe, Australia and Africa, and professional registration; I fulfil the requirements of a Qualified Person as defined in NI 43-101. My experience includes over 30 years in mining and resource evaluation.
4) I have not visited the projects that are the subject of this Technical Report.
5) I am responsible for the following sections of this Technical Report; Section 14.
6) I am independent of the issuer as described in Section 1.5 of NI 43-101.
7) I have not had prior involvement with the property that is the subject of this Technical Report.
8) I have read NI 43-101 and the parts of the Technical Report I am responsible for have been prepared in compliance with N1 43-101.
9) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 19th day of June, 2017.

"signed and sealed"

Malcolm Titley, BSc, MAIG, MAusIMM
Principal Consultant
CSA Global (UK) Ltd.

Purpose of this document

This report was prepared exclusively for Burkina Mining Company S.A. and Avesoro Resources Inc. ("the client") by CSA Global (UK) Ltd ("CSA Global"). The quality of the information, conclusions and estimates contained in this Report are consistent with the level of work carried out by CSA Global to date on the assignment, in accordance with the assignment specification agreed between CSA Global and the Client and in accordance with the requirements of NI43-101 Technical Reporting.

Notice to Third Parties

CSA Global has prepared this Report having regard for the particular needs and interests of our client, and in accordance with their instructions. This report is not designed for any other person's particular needs or interests. Third party needs and interests may be distinctly different to the needs of Burkina Mining Co. and Avesoro Resources Inc's needs and interests, and the Report may not be sufficient not fir or appropriate for the purposes of a Third Party, other than its prescription as it relates to NI43-101 Technical Reporting.

Results are estimates and subject to change

The interpretations and conclusions reached in this Report are based on current scientific understanding and the best evidence available to the authors at the time of writing. It is the nature of all scientific conclusions that they are founded on an assessment of probabilities and, however high these probabilities may be, they make no claim for absolute certainty.

The ability of any person to achieve forward-looking production and economic targets is dependent on numerous factors that are beyond CSA Global's control and that CSA Global cannot anticipate. These factors include, but are not limited to, site specific mining and geological conditions, management and personnel capabilities, availability of funding to properly operate and capitalise the operation, variations in cost elements and market conditions, developing and operating the mine in an efficient manner, unforeseen changes in legislation and new industry developments. Any of these factors may substantially alter the performance of any mining operations.

Element of Risk

The interpretations and conclusions reached in this report are based on current geological theory and the best evidence available to the author at the time of writing. It is the nature of all scientific conclusions that they are founded on an assessment of probabilities and, however high these probabilities may be, they make no claim for absolute certainty. Any economic decisions which might be taken on the basis of interpretations or conclusions contained in this report will therefore carry and element of risk.

Glossary

%	percent
°	degrees (in Radians)
°C	degrees Celsius
2D	two-dimensional
3D	three-dimensional
A$	Australian Dollar
AAS	Atomic Absorption Spectroscopy
ABA	acid-base account
AMEC	AMEC International
ARD	acid rock drainage
Ashanti	Ashanti Goldfields Company Limited
Au	gold
BCEAO	Central Bank of West African State
BD	bulk density
BDL	below detection limit
BMC	Burkina Mining Company S.A.
CAPEX	capital expenditure
CIL	carbon-in-leach
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
cm	centimetre
CRM	Certified Reference Material
CSA Global	CSA Global (UK) Ltd
CSV	comma separated values
Cu	copper
CV	Coefficient of variation
DA	dynamic anisotropy
DBA	database administrator
DD	diamond drillhole
DGPS	differential global positioning satellite
DH	drillhole
E	East
Echo Bay	Echo Bay Mines Limited
EIA	Environmental Impact Assessment
EM	electromagnetic (survey)
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment

ESMP	Environmental and Social Management Plan
Etruscan	Etruscan Resources Burkina Faso SA
FA	fire assay
FEL	front-end loader
FET	full-time employees
g	gram
g/t	grams per tonne
GMR	Golden Rim Resources Ltd
Golder	Golder Associates
GPS	Global Positioning Device
HARD	half absolute relative difference
HR	Human Resources
HSE	Health, Safety and Environment
ICP	inductively coupled plasma
IDW	Inverse Distance Weighting
IGR	International Gold Resources Inc.
Incanore	Incanore Resources Ltd
IP	induced polarisation
IRR	internal rate of return
ITS	Inchcape Testing Services
JORC	Australasian Joint Ore Reserves Committee Code
KE	kriging efficiency
kg	kilograms
km	kilometre
km^2	square kilometres
KNA	kriging neighbourhood analysis
KP	Knight Piésold
kt	thousand tonnes
LG	Lerch Grossman
LOM	life of mine
m	metre
Ma	million years
MCC	motor control centre
mE, mN, mRL	metres east, north and relative level
mm	millimetre
MNG	MNG Gold Exploration Ltd
MNG	MNG Orko Madencilik A.Ş
Moz	million ounces

MRE	Mineral Resource estimate
Mt	million tonnes
Mt/a	million tonnes per annum
N	north
NAF	non-acid forming
NI 43-101	National Instrument 43-101 for the Standards of Disclosure for Mineral Projects within Canada
NPV	net present value
NSR	net smelter return
NVPS	NPV Scheduler
OK	ordinary kriging
OSA	overall slope angle
oz	troy ounce, 31.1034768 g
PIE	Preliminary Internal Estimate
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
pXRF	portable x-ray fluorescence
QAQC	quality assurance/quality control
QP	Qualified Person
Q-Q	quantile-quantile
RAB	rotary air blast (drillhole)
RAP	Resettlement Action Plan
RC	reverse circulation (drillhole)
RC-DD	reverse circulation with diamond tail (drillhole)
RMS	root mean squared
ROM	run of mine
RQD	rock quality designation
S	South
SCR	Solid Core Recovery
SD	standard deviation
SG	specific gravity
SQL	Structured Query Language (Database)
t/a	tonnes per annum
t/h	tonnes per hour
t/m^3	tonnes per cubic metre
TR	trench
TSF	tailings storage facility

US$	US dollar
UTM	Universal Mercator Project
VOIP	voice over internet protocol
VSAT	very small aperture terminal
W	west
WA	Wardell Armstrong
WGS1984	World Geodetic System 1984
XRD	x-ray diffraction
XRF	x-ray fluorescence

1 Summary

1.1 Overview

The Burkina Mining Company (''BMC'') commissioned CSA Global (UK) Ltd (CSA Global) to assist them with evaluating the Youga and Ouaré Projects and to complete the required technical evaluations, verification and review works to facilitate disclosure of an update to the Mineral Resource and Mineral Reserves inventory for the Project and to provide independent comment in relation to exploration potential in the near-mine environment. BMC is a subsidiary of Cayman Burkina Mines Ltd, a wholly owned subsidiary of Avesoro Jersey Ltd, itself a subsidiary of Avesoro Holdings Ltd.

In addition, and following the estimation of Mineral Resources and Mineral Reserves, CSA Global was commissioned to produce a Life-of-Mine (''LOM'') Schedule and prepare a financial model for the Project.

All technical works have been undertaken in under the guidelines of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves, Definitions and Guidelines prepared by the CIM Standing Committee on Reserve Definitions and adopted by CIM Council, and disclosed within the context of the Canadian Securities Administrators National Instrument 43-101 (''NI 43-101'').

The Project includes a significant number of near-mine satellite prospects which have been the subject of various levels of exploration activity ranging from early-stage evaluation (surface works and defined anomalies), advanced exploration (drilling), resource development and mining.

Mineral Resources have been estimated for 10 deposits at Youga - Main Pit, Zergoré, NTV, A2NE, East Pit, West Pit 1, West Pit 2, West Pit 3, West Pit 4, Leduc - and one deposit at Ouaré (Ouaré).

1.2 Sources of Information

Many technical reports have been used to support the findings documented here. These are listed in Section 3 and References.

Licence and tenure documents and exploration and resource data were provided and reviewed; however, no legal due diligence has been undertaken by CSA Global to independently verify the status of the Project licences.

Mr David Williams (Qualified Person for Mineral Resources) and Dr Matthew Randall (Qualified Person for Mineral Reserves) visited the Youga and Ouaré Projects during the period 28th January to 1st February 2017.

1.3 Property Location, Description and Geology

The Youga and Ouaré Properties are all situated in the province of Boulgou, Burkina Faso, West Africa, approximately 180 km south-east of the capital city Ouagadougou, adjacent to the Ghanaian border. The licences are separated by the Nakambé River.

The Youga Exploitation Permit covers an area of 29 km^2, and was granted to Burkina Mining Company S.A. by Decree no.2003-186\PRES\PM\MCE on April 8th, 2003 and is valid for 20 years with five-year renewal periods.

An Exploitation Permit for Ouaré is currently not granted. However, BMC have reported that there is no known impediment to the issuing of an Exploitation Permit for the Ouaré resource area should BMC apply. BMC applied for an exceptional renewal of the Bitou Sud and Nord permits which was rejected. The Company is currently in the process of re-applying for new licence permits over these areas.

All resource and exploration data is projected in WGS1984, Universal Mercator Project (UTM) Zone 30 North.

The Youga Mine site is located within the catchment area of the Nakambé River. The area is typified by undulating terrain with several ranges of moderately sloped hills that rise about 100 m above the surrounding land. Population density is low and scattered with severely limited infrastructure, social structures and services.

The mining industry in Burkina Faso is active, and has been expanding as new mines are opened. There are an increasing number of local mining personnel available, as well as expatriate mine workers and professionals from neighbouring countries. Except for Ouaré, for which an Exploitation Permit has not yet been granted, there is sufficiency of surface rights for mining operations, potential tailings storage areas, potential waste disposal areas, heap leach pad areas, and potential processing plant sites.

The Tarkwaian outlier, which hosts most the Youga gold deposits is comprised of a succession of arkosic sandstones consisting of quartz and feldspar in roughly equal proportions. The Zergoré sequence is an inlier within the Birimian, located east of the Tarkwaian domain and is characterised by rocks that are predominantly pelitic in composition with variably sized arenitic and silty intercalations. The Youga volcanogenic schists are representative of the area south and to the west of the Tarkwaian Basin, more commonly exposed in the Songo and Zerbogo II licences.

Ouaré is located within a Birimian package of volcanogenic schists dominated by an intermediate to mafic volcanic unit dominantly composed of basalt with associated andesite, gabbro and dolerite; a gabbro unit associated with diorite, basalt, amphibolite and andesite; a felsic unit composed of quartz-feldspar porphyritic rocks associated with tonalite, granite and quartz diorite intrusions. These rocks (100 m to 500 m wide, west to east trending) occur in the central part of the mapped area; orthogneiss, mylonitic, granitic to dioritic, in the northern portion of the mapped area, and; a granodiorite unit with tonalite and quartz diorite in the southern portion.

Within the Youga deposit there are two distinct styles of mineralisation; the moderately to weakly silicified arkose with quartz stockwork veining and pyrite is the predominant sulphide which generally grades between 0.5 and 2 g/t and the intensely silicified arkose with abundant quartz veins and more diverse sulphides which generally grades >3 g/t.

At the Ouaré Main zone, mineralisation occurs as quartz veins within shear zones at the contacts between felsic and mafic volcanics. Orpailleur workings have been developed along mineralised structures in two orientations: 090° and 315°. The 090° portion of these workings have multiple parallel quartz veins along shears in an interpreted dilation zone. The 315° portion is interpreted as a 100 m wide deformation zone, terminating the 090° trend.

The gold mineralisation appears to preferentially follow the lithologic contacts between felsic volcanics and mafic volcanics, particularly within a shear zone of inter-layered quartz-feldspar porphyritic and intermediate to mafic volcanic rocks. Gold mineralisation appears to be confined to a major 090° trending deformation corridor of dextral strike slip.

1.4 Project History and Exploration

MNG acquired the Projects from Endeavour Mining Corporation (Endeavour) in April 2016. The Youga and Ouaré Properties are located within a greenstone belt found on the south-eastern margin of the Archean-Proterozoic Man Shield (also known as the Leo Shield) which forms the southern half of the West African craton. The Project has had many owners since 1991, when Incanore was awarded the Youga Exploration Permit.

Extensive exploration was undertaken during Endeavour's evaluation of the Youga and Ouaré project areas between 2003 to 2016 (known as Etruscan until 2010).

Both permits were extensively covered with soil geochemistry during Endeavour's management of the projects, initially the regional (800 m x 100 m) and semi-regional (200 m x 100 m) scale sampling was followed by detailed (100 m x 25 m) sampling over selected areas in Youga and Ouaré.

In May 2004, Fugro Airborne Surveys (Pty) Ltd. completed a detailed aeromagnetic and radiometric data survey for Endeavour, over the Youga permits along flight lines (145°) spaced at 50 m, with a tie-line spacing of 500 m. This survey was superseded in 2016, when MNG undertook a detailed ground magnetic survey, totalling 1,591 km and covering 87 km^2.

During 2004 and 2005 Sagax Afrique S.A. completed a gradient Induced Polarization ("IP") survey on behalf of Endeavour, which covered a large part of the Youga Exploitation permit and the northern part of the Bitou 2 permit, over the area surrounding the Ouaré deposit. The survey was completed at a line spacing of 100 m, at various line orientations, and with sampling intervals of 25 m.

Significant trenching has been completed on the Youga and Ouaré projects, most of it pre-dating MNG's ownership. There are 871 trenches for a total of 59,574 m in the Youga database and 67 trenches (7,556 m) in the Ouaré database.

1.5 Drilling

Drilling has been undertaken by various companies prior to MNG acquiring the Youga and Ouaré Projects from Endeavour in April 2016. A significant amount of drilling has been completed across the projects with the database containing the following:

- 500 Diamond Core holes for 61,731 m.
- 11,184 RC drill holes for 381,451 m (includes GC drilling).
- 855 Trenches for 57,637 m.

MNG have completed 158 drill holes (12,027 m) and 28 trenches (5,678 m) at Youga and 12 RC drill holes (1,098 m) at Ouaré since the acquisition of the project. Drill hole collars were surveyed using a differential GPS and all project location data were collected in WGS 84, UTM Zone 30 North. Downhole surveying has been undertaken using a digital Reflex Ez-shot camera. Core recovery, rock quality designation (RQD) and solid core recovery (SCR) is logged in the exploration camp with a mean recovery of >94%.

1.6 Sample Preparation, Analysis and Security

Sampling of RC chips is at 1 m sample intervals and the entire sample was transported under supervision to a central sample processing site where they were weighed and split through a riffle splitter to obtain a sub-sample of approximately 2 kg. Wet samples were collected at the drilling rig in their entirety and were sun-dried before being riffle-split. To ensure drill-site quality control, a trained technician and/or a geologist is permanently on site during all reverse circulation drilling.

Diamond core was placed into plastic core-boxes at the drill site by the contract drillers who also inserted plastic blocks, indicating the meterage, into the core boxes at the end of each run (normally every 3 m). Geologists and geotechnicians collected measurements of all geotechnical details, core recovery, geological logging as well as photographing the core. Samples were usually collected over 1 m intervals, but ranged in length from 0.5 to 1.5 m due to geological contacts. At least two hanging wall and footwall samples were collected before and after the possible mineralized zone. Care was taken to consistently collect assay-samples from one side of the core.

Each sample was bagged and assigned a unique sample number (sample ID) and stored at the secured core shed at Youga Mine site until sufficient samples had been collected to send to the assay laboratory. Samples were delivered directly to the laboratory by the MNG driver.

ALS Youga has been used as the primary laboratory for the grade control drilling since it was established in 2007. The assay method is a 50g fire assay with over limit results assayed using a gravimetric finish. The lower detection limit is 0.01 ppm Au.

ALS Ouagadougou has been used to analyse the A2NE diamond drill holes for holes YNE-16-038 to YNE-16-066. The sample is crushed to 70% less than 2 mm in size, riffle split, and pulverized to better than 85% passing 75 microns. The primary gold assay method is a 50 g fire assay with an atomic absorption finish (lower detection limit of 0.005 ppm Au). Over limit results are assayed using a gravimetric finish.

Endeavour and MNG implemented quality assurance and quality control (QAQC) procedures to monitor the accuracy and precision of the analytical and assay data received from all laboratories during the exploration programs. In addition to the QAQC procedures put in place by Endeavour and MNG, the assay laboratories also included internal QC samples.

CSA Global separately reviewed the RC and diamond drilling gold blank, CRM and duplicate results. QAQC procedures appear adequate, but it is unclear whether they are always implemented. Numerous failures of CRMs and blanks were noted as well as apparent misidentification of these samples. Most of the project areas had unacceptably high failure rates in CRMs and blanks, although CRM results were generally accurate (but imprecise).

Data management requires improvement. There are numerous examples of duplicated data in the databases, as well as apparent misidentified QC records. These issues decrease confidence in the input data used for the Mineral Resource Estimation work.

1.7 Data Verification

Verifications undertaken included the following:

CSA Global loaded the Burkina Mining Company excel exploration and drill data into a Structured Query Language (SQL) relational database, which is an industry standard for exploration project databases. Minor validation issues were noted and resolved during the above process and a validated database provided for downstream work.

- Where laboratory assay certificates were provided, a random selection were checked against the database data. certificates with no differences noted between the hard copy and the database assay results. No significant issues or differences were noted (120 drill holes were verified at Youga). At Ouaré, gold values from SGS PDF assay certificates for 2012 drilling (14 RC and 7 DD drill holes) were checked against the database. No issues were noted, although assay certificates were only provided for the 2012 drill campaign and no check was undertaken for any of the other drill campaigns.
- Mr David Williams (Qualified Person for Mineral Resources) and Dr Matthew Randall (Qualified Person for Mineral Reserves) visited the Youga and Ouaré Projects during the period 28th January to 1st February 2017 for the purposes of inspection, ground truthing, review of activities, procedural review and information data collection and collation and to satisfy NI 43-101 “personal inspection” requirements.
- CSA Global ground truthed all exploration target and mined deposits at Youga and Ouaré, inspecting open pits, drill collar locations (where preserved) and having geological discussions with the client representative.
- Due to very few drill collars having been preserved at the Youga Project due to active mining, only a single drill collar was verified was at West Pit 4. Five collars were verified at Ouaré.

- RC data was verified at each deposit using diamond data as a benchmark.
- Limited recovery data was available for two deposits at the Youga Project – NTV and A2NE, while none was available at the Ouaré Project. Core sample recovery averaged 92% at NTV and 97% at A2NE. Core recovery was significantly lower in weathered material; however, this has generally been mined off and makes up a minor proportion of the Mineral Resources there.

Data verification limitations noted include the following:

- A relational geological database is not in use, instead data were provided in various Access databases and Excel sheets. An industry standard database should be implemented which can serve as a single point of truth for the project data as well as being secure and have automated backups.
- ALS Youga gold assay results for the period 2010 to 2016 and SGS assay certificates for the 2012 Ouaré drilling were randomly verified against the database assay results. No other assay certificates were provided so no check of other results could be made.
- Numerous failures in the QAQC including apparent misidentified CRMs and blanks decreases confidence in the input data used for the Mineral Resource Estimation work.
- Many drill hole collars at Youga have been destroyed due to ongoing mining. The only collar verified was at West Pit 4 where no mining has taken place yet.
- No sample weight data were captured in the database for Youga or Ouaré samples. Therefore, no review of recovery versus grade could be made for any of the RC samples.

1.8 Mineral Processing and Metallurgical Testing

The diminishing ore grades at the current Youga operation will be upgraded by supplementing the feed material with additional material from the Satellite zones around the mine, and a substantial quantity of material from the Ouaré mine which will be trucked 44 km and blended at the site.

- The current mine plan has Ouaré ore sources at similar grades to the current mine material and will comprise of 34%, 73% and 53% of the feed material to the Youga mill for the years 2018, 2019 and 2020 respectively.
- To achieve the same recovery as that in the current plant, a finer grind than is currently being achieved (P80 of ~75 microns) will be required. The average hardness of the samples tested is below those of the current ores being treated.
- Gold recoveries from the Ouaré ores will range from 86 to 96%, with the unweighted average being between 89 and 91%. 89% has been used for the financial modelling.
- Performance of the Satellite ores, including the zone A2NE which has provided much of the ore feed since October 2016, and Zergoré zones will comprise a significant proportion of the feed material going forward was also positive. The samples tested were lower in hardness than currently being treated, and also showed an improvement in Au recovery with a finer grind. Recovery of 86% was achieved at a grind size of 106 microns (the current plant average size), increasing to 94% at a grind size of 75 microns.

1.9 Mineral Resource Statement

CSA Global considers that data collection techniques are consistent with industry good practice and suitable for use in the preparation of a Mineral Resource estimate (MRE) to be reported in accordance with NI 43-101. QC data supports the integrity of the analytical data which has been utilised.

- 3D block models representing the mineralisation have been created for each deposit by CSA Global, in collaboration with BMC geologists, using Datamine™ software. High-quality RC and DD samples were used to estimate grades into blocks using OK. The block models were validated visually and statistically.

- The total drilling available for the geological models and MRE updates were 3,320 holes and trenches for 256,635 m. Grade control data was included to interpret mineralisation wireframes, but were excluded from the grade estimation, with the exception of West Pit 1, where there was insufficient exploration/resource development drilling to support the MRE.
- 52,179 samples in 327 domains in 11 deposits were flagged within the mineralised volumes and composited downhole to 1 m lengths (Zergoré, NTV, A2NE, East Pit, West Pits 2, 3 and 4) and 2 m lengths (Main Pit, West Pit 1 and Ouaré). The resultant 42,985 composite samples were used in the estimates.
- Density data available for review by CSA Global was limited to Main Pit, A2NE, West Pit 4 and Ouaré. The data was flagged by the modelled weathering profiles and reviewed by weathering domain. The BD values applied to the remaining Project MRE's have been informed by review of previous technical reports (AMEC, 2013a&b; Endeavour, 2015), inspection of DD core photos, and communication with site. The values used for non-fresh material have been informed by experience of other deposits in the region, given that samples measured in these materials are generally competent and tend to be overstated in the density measurements provided.
- Following contact analysis, a decision was made to use hard boundaries between mineralisation domains and soft boundaries across weathering zones for all geostatistical analysis and estimation. Variograms were modelled using normal score transform for the largest domains in each deposit for Au using composited data, with outliers excluded where appropriate. The variogram model was back transformed prior to use in Kriging.
- Grade was estimated into parent blocks using OK, controlled by dynamic anisotropy (DA).
- Grade estimates were validated against drill data. There is good correlation between the input composites and output model for the estimated Au grade. Generally, the model grade trends follow the pattern of the drill samples grades, with acceptable levels of smoothing of the higher and lower grades.
- The MRE's at Youga and Ouaré satisfy the requirements for Indicated and Inferred Mineral Resource categories as embodied in the NI 43-101 Canadian National Instrument for the reporting of Mineral Resources and Reserves.
- The MRE indicates reasonable prospects for economic extraction, supported by resource shells produced in NPV Scheduler (''NPVS'') using a US$1,500 Au prices and basic assumptions regarding costs.
- The MRE for Youga and Ouaré reports 15.60 Mt at 1.40 g/t for 703,600 ounces of Au of Indicated Mineral Resources and 12.9 Mt at 1.5 g/t Au for 639,000 ounces of Au of Inferred Mineral Resource. Mineral Resources are reported at a cut-off grade of 0.55 g/t Au.

Table 1: Youga and Ouaré Gold Deposits – Mineral Resource Estimate, reported at a 0.55 g/t Au cut-off, 28th February 2017

Mineral Resource Estimate for the Youga and Ouaré Gold Projects, Burkina Faso, as at 28th February 2017						
Deposit	**Indicated**			**Inferred**		
	Tonnes Mt	**Au Grade g/t**	**Au Metal Koz**	**Tonnes Mt**	**Au Grade g/t**	**Au Metal Koz**
Main Pit	2.96	1.53	145.6	0.8	1.4	36
Zergoré	2.57	1.20	99.1	1.0	1.2	39
NTV	1.88	1.10	66.6	1.5	1.3	61
A2NE	0.86	1.98	54.7	0.5	1.8	29
East Pit	0.68	1.55	33.8	0.0	1.2	2
West Pit 3	0.64	1.53	31.5	0.2	1.2	7
West Pit 2	0.57	1.46	26.8	0.2	1.5	8
West Pit 4	0.34	1.53	16.6	0.4	0.9	13
West Pit 1	-	-	-	0.1	1.6	5
LeDuc	-	-	-	1.0	1.0	34
Ouaré	5.10	1.39	228.3	7.2	1.8	406
Total	**15.6**	**1.40**	**703**	**12.9**	**1.57**	**640**

Notes:
1. Reporting cut-off is 0.55 g/t Au for all deposits.
2. The Mineral Resource Estimate has been depleted for mining up to 28th February 2017. The effective date of the Mineral Resource is February 28th, 2017.
3. Figures have been rounded to the appropriate level of precision for the reporting of Resources.
4. Due to rounding, some columns or rows may not compute exactly as shown.
5. The Mineral Resources are stated as in situ dry tonnes. All figures are in metric tonnes.
6. The Mineral Resource has been classified under the guidelines of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves, Definitions and Guidelines prepared by the CIM Standing Committee on Reserve Definitions and adopted by CIM Council, and procedures for classifying the reported Mineral Resources were undertaken within the context of the Canadian Securities Administrators National Instrument 43-101 (NI 43-101).
7. The model is reported above a surface based on the NPVS shell from a US$1,500 gold price pit optimisation run to support assumptions relating to reasonable prospects of eventual economic extraction.
8. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. The estimate of Mineral Resources may be materially affected by environmental, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues.
9. Mineral Resources have been reported inclusive of Mineral Reserves, where applicable.
10. No Mineral Reserves have been estimated for the Ouaré, West Pit 1 and LeDuc deposits.

1.10 Mineral Reserves

The Mineral Reserves for Youga and Ouaré are supported by a Life of Mine (LOM) plan, which was developed using the following key parameters:

- The Overall Slope Angle (OSA) for the open pit was set to 38 degrees for the weathered material (Regolith and Oxide) and 45 degrees for the Transition and Fresh material.
- The pit limit design and Reserve estimate are based on a metal price of 1,250 US$/Troy Oz. A deduction of 4% was made to account for Royalty payments.
- The waste and ore-based costs applied for pit optimization and mine planning were based on a combination of a Mine Cost model developed by CSA Global and the 2017 Budget costs supplied by MNG. The assumed mining cost was US$2.0/t with an additional appropriate incremental haulage cost per bench. The total ore-based costs (including processing and G&A) are US$22.0/t ore.
- Ouaré ore-based costs include an additional $4.0/t overland ore haulage cost from Ouaré to the processing plant at Youga.
- A series of pit shells were determined by varying the Price Factor in steps of 2% up to a maximum of 100%. The pit limit was selected at a Price Factor of 100% in order to maximise the Reserve and a set of pushbacks were constructed based on the shells.
- Modifying factors of 90% mining recovery (i.e. 10% ore loss) and 10% waste dilution were included in the estimate of the Mineral Reserves.
- The Mineral Reserve for Youga and Ouaré (Table 2) were converted from the Mineral Resource and are classified as Probable based on a Resource Classification of Indicated. Inferred and Unclassified Resources have been excluded from the conversion of Resources to Reserves.

Table 2: Youga and Ouaré Converted Mineral Reserves

Ore Reserve Estimated for the Youga and Ouare Gold Projects, Burkina Faso, as at 28th February 2017

Deposit	Cut-off Grade	Proved			Probable		
		Tonnes Mt	Au Grade g/t	Au Metal Koz	Tonnes Mt	Au Grade g/t	Au Metal Koz
Main Pit	0.70				1.3	1.63	66.6
Zergore	0.70				1.5	1.22	57.1
NTV	0.70				1.2	1.07	41.6
A2NE	0.70				0.6	2.18	38.7
East Pit	0.70				0.5	1.47	22.4
West Pit 2	0.70				0.4	1.34	15.8
West Pit 3	0.70				0.4	1.61	20.2
West Pit 4	0.70				0.3	1.53	12.9
Ouare	0.82				2.6	1.67	141.4
LG Stockpiles					0.4	1.32	17.7
Total					**9.0**	**1.49**	**434.4**

Notes
1. Reporting cut-off grade varies for each deposit as shown
2. The Ore Reserve has been depleted for mining up to 28th February 2017
3. Figures have been rounded to the appropriate level of precision for reporting
4. Due to rounding, some columns or rows may not compute exactly as shown
5. The Ore Reserves are stated as in situ dry metric tonnes
6. The Ore Reserves were prepared under the guidelines of the CIM, for reporting under NI43-101
7. The Ore Reserve is reported at a US$ 1,250 gold price
8. Modifying factors of 90% mining recovery and 10% waste dilution have been applied
9. Probable Reserves were derived from Indicated Resources
10. Ore Reserves are inclusive of Mineral Resources

Factors that may affect the assumptions in this report are:

- Commodity price and exchange rate assumptions are important factors that affect revenue and costs.
- Changes in Process cost, Mining cost or slope angle (± 2 degrees) generally have a relatively small impact (< 5%) on the estimate of contained metal and confirm that the pit limits are not as sensitive to these parameters as they are to price.
- The mine plan has been limited by an assumed annual Mill throughput of 1.1 Mtpa. No bulk metallurgical tests have, to date, been carried out.
- If certain delivered blends of rock types have lower throughputs than currently modelled, this would increase the processing cost, which would in turn increase the mill cut-off grade. If all other things held constant, this would tend to reduce the tonnage of the Mineral Reserve and the amount of contained metal.
- If the currently planned water management methods prove to be inadequate, additional sumps and pump systems may be required which would add to the capital and operating costs.
- Transport of ore between Ouaré and the process plant at Youga is a key part of the plan and relies on the efficient planning of the transport route, good road maintenance and proactive management of community relations.

1.11 Mining Methods

The proposed method of mining for Youga and Ouaré is a conventional open pit method using drilling and blasting, loading with hydraulic excavators, and hauling with articulated dump trucks (ADT). Consideration of underground mining has not been necessary at this stage of the Project.

- The optimal mine production rate is constrained primarily by the capacity of the plant at Youga. Provision is made for the addition of an oxygen plant in January 2018, which will increase the plant throughput by 8% to 1.2 Mtpa.
- Mining rates vary over the life of the mine, depending on the stripping ratio for the individual deposits or pits. The cut-off grade applied to each pit depends mainly on the location and ore transport cost. Other costs (Processing, G&A etc.) were constant across all deposits.
- Datamine's pit "optimisation" software (NPV Scheduler) was used to determine pit limits, using the industry standard Lerchs-Grossman algorithm.
- At Youga and Ouaré there is limited opportunity to create pushbacks or stages within a final pit limit and it has generally only been possible to divide the individual deposits into sub pits that may or may not be contiguous.
- The price used in this study was US$ 1,250 /tr Oz, which was agreed with Avesoro as an appropriate price to be used for determining the Mineral Reserves. A near linear relationship between contained metal and price meant that the optimal pit limit coincided with the pit limit at a Price or Revenue Factor of 1.0.
- The Ore Reserves for the selected optimised pits are shown in Table 3, with a Reserve of 8.7 Mt @ 1.5 g/t Au. The contained gold was estimated to be more than 423,000 tr Oz with an average strip ratio of 4.8:1.

Table 3: Ore Reserve for the Optimised Pits (as at 28th February 2017)

Ore Reserves as at 28th February 2017 (After Modifying Factors[1])	Cut-off (g/t Au)	Waste[3] (tonnes)	Ore (tonnes)	(g/t)	Contained (Troy Oz)	Strip Ratio
A2NE/W	0.70	3,690,630	560,000	2.2	39,738	6.6
East Pit	0.70	2,314,444	524,288	1.5	24,855	4.4
West Pit 2&3	0.70	4,838,743	787,978	1.5	37,639	6.1
West Pit 4	0.70	777,393	257,921	1.6	12,871	3.0
Main Pit	0.69	11,437,557	1,191,669	1.7	63,701	9.6
NTV	0.70	3,551,510	1,255,515	1.1	43,636	2.8
Zergore	0.70	4,280,410	1,461,547	1.2	58,424	2.9
Ouare	0.81	11,150,277	2,666,845	1.7	142,175	4.2
Total		**42,040,964**	**8,705,763**	**1.5**	**423,038**	**4.8**

- The total Ore Reserve was 9.0 Mt @ 1.49 g/t Au, which includes 0.4 Mt @ 1.32 g/t Au of stockpiled material. The total contained gold is 434.4 tr Oz.
- It was noted that a 10% change in process or mining cost, or a 2-degree change in the overall slope angle, all have a similar impact of approximately 5% change in the contained metal. It was concluded that the Ore Reserve is not particularly sensitive to these parameters.
- Price is the main driver for the majority of the deposits and a 10% change in price resulted in a 13% change in contained metal which supports selecting the pit at a Price Factor of 1.0.
- The cut-off grade was calculated for each deposit and for the majority of the deposits was set to 0.7 g/t Au. The exception being Ouaré where the cut-off was set to 0.82 g/t Au due to the additional cost of transporting the ore to the ROM pad.
- It is assumed that all material above the cut-off grade will be transported to the ROM pad at Youga where the blend will be determined by the number of FEL loads from each ROM stockpile (HG, MG, LG and LLG).
- Marginal material at Youga between 0.5 g/t Au and the cut-off is stockpiled separately as a Resource that could be converted to a Reserve in the future, should it become economic to process.
- Marginal material at Ouaré (between 0.5 and 0.82 g/t Au) is stockpiled separately near to the pits. This material is a potential Resource should the economics improve and it would be advisable to segregate this stockpile into a high and a low grade portion.
- The level of geotechnical data in the design is limited, however some experience through the mining undertaken to date has been gained, which allows for a basic understanding of the risk associated with the slope design.
- It is concluded that additional work is required to improve the accuracy of the estimates and to improve the reliability of the mine design criteria. The geotechnical parameters also need to be updated with data from ongoing exploration drilling and face mapping.
- It is proposed that the final pit wall is double benched to 10 m, which will provide a catch bench every 10 m that will have sufficient capacity to contain localised slope failures.
- The Ouaré project will be managed alongside the existing projects at Balogo and Youga as these projects share a lot of the same infrastructure and therefore it makes sense to standardise the fleet across all operations.

- A bench height of 5 m has been selected to ensure selective mining of the ore. The bench will be blasted on 5 m intervals and loaded on two flitches of 2.5 m. This is the practice at Youga where it works well for the given rock types and distribution of ore.
- The minimum mining floor width has been designed at 35 m to allow for the turning radius of the trucks (SAE turning radius of 8.7 m).
- A mining recovery and waste dilution of 90% and 10% respectively have been assumed.
- Considerable care needs to be taken with the blasting to minimise movement and as a consequence the blast design assumes choke blasting with a relatively low powder factor of 0.29 Kg/m^3.
- The pit limit generated by NPVS is based on an overall slope angle that includes the provision for safety berms and ramps. However, the exact location of the ramps was unknown at the time of optimisation and consequently there will be minor differences between the pit limit generated by NPVS and the subsequent engineered pit designs.
- The waste dump capacities are based on a swell factor of 30% and no allowance for backfilling of the pits has been made.
- The Mining sequence for Youga commenced at A2N East in March 2017 and mining of the adjoining A2NW pit commences in May 2017. The remaining pits at Youga, and the satellite deposit of Ouaré, are sequenced in order of profitability so as to maximise early cashflow.
  - The earliest production from Ouaré has been set to May 2018 due to the need to develop this project. This includes building a 44 km access road and constructing a bridge over the Nakambe River.
  - Production rates form individual pits are constrained by access space and bench sinking rate. Typically, the bench sinking rate is limited to 10 m/month.
  - No more than three active pits should be operational at any one time. This is a function of the available equipment and limits on logistics of running multiple pits.
  - If possible a deposit is mined out before moving to the next one. This allows the pit to be closed and rehabilitation to proceed as the project continues.
  - Where two pits of a single deposit are joined then some pre-stripping may have to be done to develop a common access ramp. For example, this occurs with Main and East Pits.
- To transport ore from Ouaré to Youga up to 30 Volvo trucks (40 t capacity) on 2 shifts per day, with each truck completing two trips per shift, or four trips per day, have been assumed. With an 80% availability, this translates into a capacity of 120,000 tonnes/month.
- The combined stockpile level for Youga and Ouaré is kept at between 200,000 and 400,000 tonnes between March 2017 and December 2019.
- The support equipment consists of drills, dozers, graders, Front End Loaders (FEL), light vehicles and other service equipment such as a fuel truck and service truck. The explosive truck is included with the blasting contract service.

1.12 Recovery Methods

The processing facility at Youga comprises of a three-stage crushing, and single stage ball milling circuit; a gravity section; a single stage cyanide leach and a five-stage carbon-in-leach circuit (CIL).

- January to May (2017) plant performance has processed ~520,000 tonnes of ore, producing ~39,000 oz of gold from a head grade of 2.6 g/t Au, and an average recovery of 90.6%. Comparative performance for the first quarter with lower feed grades was ~318,000 tonnes of ore, and produced ~17,000 oz from a head grade of 1.84 g/t and a combined recovery of 89.8%.

- One of the zones tested as part of the 2012 program was A2N, which is the current majority ore source at the operation. This has been running since October 2016, and is due to be processed for another quarter. The predicted mill performance for these samples was an average combined recovery of 90.6% from an average head grade of 1.86 g/t, which corresponds almost exactly to the actual first quarter performance.
- Circuit simulations with a simple mill model (calibrated to actual mill performance results) show that the Ouaré material should on average be able to be processed at the required average throughput (148 t/h) at the required grind size P80 of 75 microns to achieve the predicted recoveries for Ouaré ores. A range of 89 to 91% is predicted, subject to consistently achieving the required grind size (80% passing 75 microns).

1.13 Project Infrastructure

The mine has been operating since 2008 and was taken over by Avesoro Holdings in February 2016. Shortly after the acquisition, the mining contract was terminated and following a period of processing ore from existing stockpiles, MNG subsequently restarted the mining operation under its own control in October 2016. Under the management of Endeavour the mine operations were run by a mining contractor, PW Mining International Ltd (PW), but since the takeover by MNG in 2016 the mine has been run by the owner. This has not substantially changed the operation other than to introduce new mining equipment.

The one area of change is that the Ouaré deposit has been included in the Reserves for Youga and is treated as a satellite deposit that will be run from Youga. Consequently, the facilities at Ouaré will be kept to a minimum.

1.14 Market Studies

Gold is freely traded commodity and as such there’s been no market study made nor is one proposed.

The plant at Youga currently produces Dore bars that are sold to independent refineries under normal commercial conditions. Ore from Ouaré is trucked to Youga plant. The gold is collected from site and is transported to Ouagadougou, from where it is flown to Europe for further refining. The funds flow back into Burkina.

1.15 Environmental Studies, Permitting and Social or Community Impact

1.15.1 Youga Project

Current Condition and Status

The current condition and status of the Youga Project site is derived from the Wardell Armstrong (WA) site visit and report, 2016 and is summarised below:

- Mining has terminated in Main Pit, East Pit, West 1, 2a, 2b, 3 Pits, NTV 1, 2, 3 and 4 Pits, and Zergoré B and C Pits; with most pits being flooded.
- Open pit closure and rehabilitation will continue to comprise either backfilling with waste rock or flooding. Backfilled pits are to be returned to farming or cultivation land use, while flooded pits may be used as water-storage facilities with off-take for irrigation and farming.
- The Youga waste rock dumps are spread out across the site, with each pit area having dedicated waste rock dumps (WRDs). All dumps are below 45 m in height and are generally in good condition with no apparent stability concerns and some vegetation regrowth.
- The Tailings Storage Facility (TSF) is situated 500 m from the processing plant and contains tailing slurry, domestic wastewater and surface run-off. It appears to be reaching maximum capacity with

<1 m freeboard, therefore the mine plans to construct an additional 3 m lift to increase the capacity of the TSF for continued operations.

- The water management system on the Youga site includes a water tower and pumping station on the Nakambé River, pipelines from the river and pits to the process plant; and a sump facility at the receiving point of the pipeline.
- The mine infrastructure includes process plant and mine offices; stores and warehouse, garage, contractor workshops, fuel farm, and generator sets. The Project is served by approximately 10 km of roads of which the majority are in good condition and suitable for both mine and civilian traffic. Many local people use the mine roads outside the restricted areas.

Environmental and Social Impact Assessment

The original Youga Environmental Impact Assessment (EIA) report was prepared with local consultancy Société de Conseil et de Réalisation pour la Gestion de l'Environnement (Socrege) which resulted in the granting of an Exploitation Permit in April 2003. An updated EIA study for the Youga Project was undertaken by SGS in 2005 due to changes from the original mining plan and associated EIA upon which the permit was granted.

- Youga environmental baseline studies assessed the climate, air quality, surface and groundwater hydrology, ecological, land and socio-economic characteristics.
- Description of rainfall and other climate parameters were based on data obtained from the closest national meteorological stations covering a 40-year period and was sufficient to determine likely site conditions for planning and impact mitigation.
- Detailed soil and vegetation studies show that flora diversity is considered relatively rich, but is under pressure from population demands. Fauna surveys are less well detailed. Human activity including agriculture, grazing livestock, gold washing and hunting has impacted the area ecology.
- The main agricultural and other land uses were surveyed and include cultivated annual crops; fallow land; animal husbandry and pasture; savannah woodland; artisanal gold washing; mine exploration areas, access roads and accommodation camp; and villages and scattered small hamlets.
- In 2005 the population of the area was estimated at 6,200 with socio-political relations between the various communities still largely administered by traditional authorities. The economy of the district is dominated by agriculture followed by livestock, and since 1993, artisanal mining. There is strong emigration of young people away from the area in search of employment and other opportunities. Prior to mining the economic development of the area was severely hampered by restricted road networks, poor spatial distribution of very limited social infrastructure and the lack of skilled workforce.

Impact Assessment and Mitigations

The Youga EIA identified impacts for both construction and operational phases of the Project. Impacts of enforced relocation and loss of land and crops were identified as significant, with preliminary surveys showing up to 4 hamlets needing resettlement and approximately 100 ha of farms requiring compensation. Appropriate compensation was acknowledged as critical to mitigate local socio-economic risk and confrontation. The EIA also identified many potential positive impacts of the project relating to employment, economic opportunities and social/infrastructure benefits for local communities and to national and regional government through payments of royalties and taxes.

The EIA incorporated a preliminary Environmental Management Plan (EMP) which included Waste Management; Community Relations and compensation; a basic monitoring programme; Reclamation Closure and Decommissioning plan; Emergency Response Plan; and provisions for environmental and social auditing and review. Total social expenditure for the years 2013-2015 was USD$1,134,635, considerably more than the projected annual budget in the 2005 EIA EMP.

Environmental and Social Management Plan

The operational working Environmental and Social Management Plan (ESMP), circa 2011, covers the general requirements for Project E&S management. Most of these management activities are also contained in the more recent 2015/16 environmental management system, developed after Project acquisition. Social/community management measures for on-going stakeholder consultation, compensation and influx issues are also recorded in the 2015 'Respect to Commitment' document.

- No budget is given for these current management plans, but CSA Global believe that for a project of this size, a minimum of US$100,000 per annum should be allowed for ESMP implementation, with community assistance and on-going compensation and resettlement costs additional to this.

Stakeholder Engagement

As part of the EIA studies, stakeholder engagement included meetings with local representatives (governmental and traditional) for project disclosure and to gain information about the views of local communities. No major objections to the proposed development were received from any of the government officials, chiefs or villagers interviewed. Compensation issues remain the main area of contention at the Project.

Closure and Rehabilitation

The 2005 EIA included a preliminary Closure Plan for the Project where closure and rehabilitation costs were calculated in some detail, giving a total of US$1,495,733, including post-closure monitoring. According to the National Mining Code, any holder of a mining license must make deposits in a fiduciary account to cover the costs of rehabilitation. The EIA Closure Plan proposed accrual of the estimated cost for reclamation and decommissioning on a yearly basis to reflect the mining schedule.

The Closure Plan has subsequently been revised and updated during operations. The 2016 WA review of Youga Closure included visual assessments of the open pits, WRDs, TSF and site infrastructure which suggest that closure activities so far have been effective. However, the review also recommends significantly more investment in social and community capacity building in preparation for post-closure. The report provides an updated estimate of scheduling and costs for proposed future rehabilitation works, with total costs given as US$ 3,768,000 which CSA Global believe is realistic.

1.15.2 Ouaré Project

Socrege was contracted to undertake an initial Environmental and social review of the project area in 2012 as a precursor to developing an ESIA study. Much of the review was desktop based research, using available data from nearby meteorological stations and government records:

- There is much detail on the rural activities in the area and land-use conflicts between agricultural, pastoral and artisanal mining activities.
- The area is heavily impacted by 15 years of intense artisanal mining, with rapid deforestation along the river banks, multiple excavations (some to considerable depth) and significant siltation and contamination of local rivers and streams, particularly the Ouaré River.
- The report also provides recommendations for stakeholder engagement, additional studies and Project impact assessment and provides a good basis for ESIA scoping studies.

A preliminary feasibility study was undertaken on the proposed Ouaré project in early 2017 by HCG Cement and Mineral Processing Technologies. This cursory report, of only 68 pages, has no specific environmental content, but refers to the previous Socrege scoping baseline:

- No details are provided on the planned WRD.
- The ore is to be stockpiled at site and hauled to Youga for processing which will require construction of a new 44 km road and a new 100 m bridge crossing the Nouaho River. It is understood that the government is to build the road from Ouaré to the Nakambé River, with Avesoro required to construct the bridge and the further 11 – 14 km of road to Youga. The haul road and bridge will require a separate ESIA study with investigation of ambient conditions, consultation with route communities and impact assessment.

1.15.3 CSA Global Recommendations

There are some gaps and deficiencies in investigations, impact assessments and mitigation and management measures, which are highlighted below. The most significant gap is the apparent lack of E&S work on the haul routes from Ouaré to Youga. This requires urgent work to describe ambient conditions, identify potential impacts and engage with affected communities - together with completion of the Ouaré ESIA - to develop suitable E&S management plans prior to start-up of haulage.

Required work to address gaps in the Project E&S work include:

- Urgently undertake full ESIA studies on the Ouaré component of the Project, building on the Socrege review.
- Undertake EISA studies on the haul route from Ouaré to Youga, including baseline data collection, stakeholder consultation, impact assessment and mitigations.
- Establish site meteorological stations at Youga and Ouaré (as required).
- Install permanent flow gauges at Project streams and depth rods at ponds/dams.
- Undertake more detailed faunal biodiversity studies at Youga to determine the most appropriate measures to avoid and/or offset for Project impacts.
- Implement and publicise a formal Grievance Mechanism for Youga and Ouaré.
- Undertake geochemical testing, including metal leaching tests on ore material and tailings from Youga; representative WRD material and ore from Balogo; and from Ouaré as required.
- Define and implement ecological and social monitoring at Youga.
- Develop and disclose an appropriate procedure for evaluating post start-up demands for compensation at Youga (for expanding Project area).
- Assess impacts on- and from- artisanal mining in the Youga area (and Ouaré in particular) and establish dialogue to reduce environmental impacts and conflicts.

1.16 Capital and Operating Costs

It is assumed that there is no need for additional capital spend on the mining fleet at Youga/Ouaré in 2017. By July 2018, the load and haul fleet is expected to increase to 5 hydraulic excavators and 17 haul trucks. There is a similar increase in the drill requirements and the ancillary equipment to support the load and haul fleet. A large part of the increase in equipment requirements is met by transferring the fleet from the Balogo Project at Netiana to Ouaré. This means that the capital spend is limited to US$5.27 million in 2018 and there is a sustaining capital is US$ 1.12 million for the remaining life of the mine.

Other capital costs included in the financial analysis are:

- To accommodate the increase in the Reserves to 9 Mt the tailing storage facility needs to be extended with a capital expenditure of US$2 million. There is also an expenditure of US$4.8 million to extend the dumps, which is spread over the life of the mine and can be treated as either a capital or an operating cost.

- The capitalised environmental and social expenditures are estimated at US$9.66 million and are spread across the mine life.
- There is a capital allowance of US$1.7 million in 2018 to build the road from Ouaré to Youga so that ore can be transported from Ouaré to the plant at Youga. This capital includes provision for the construction of a bridge over the Nakambe river.

The mine operating costs were estimated from first principles from the required mine equipment to support the schedule. A breakdown of the costs for 2017 to 2024 are shown in Table 4.

Table 4: Summary of Mine Operating Costs for the Youga and Ouaré Projects

	Units	Total	2017	2018	2019	2020	2021	2022	2023	2024
Operating Costs - Category	**(USD/t)**	**1.62**	**1.79**	**1.23**	**1.20**	**1.58**	**2.05**	**2.11**	**1.72**	**1.72**
Labour	(USD/t)	**0.30**	0.41	0.22	0.21	0.34	0.54	0.56	0.21	0.21
Overhaul	(USD/t)	**0.08**	0.08	0.07	0.07	0.08	0.09	0.10	0.09	0.09
Maintenance	(USD/t)	**0.12**	0.12	0.10	0.10	0.11	0.14	0.14	0.14	0.14
Fuel	(USD/t)	**0.70**	0.69	0.51	0.50	0.64	0.83	0.85	0.84	0.84
Lubricants	(USD/t)	**0.08**	0.08	0.06	0.06	0.07	0.09	0.09	0.09	0.09
Tires	(USD/t)	**0.03**	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Wear Parts	(USD/t)	**0.08**	0.08	0.06	0.06	0.08	0.10	0.10	0.10	0.10
Explosives	(USD/t)	**0.22**	0.30	0.18	0.19	0.22	0.23	0.24	0.22	0.22
Miscellaneous	(USD/t)	**0.01**	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01

The Miscellaneous category includes the annual fixed costs for provision of contract services to supply fuel and explosives.

A summary of the operating costs is given in Table 5.

Table 5: Summary of Operating Costs for the Youga and Ouaré Projects

Cost Area	Units	2017	LOM
Mining Cost	US$/t mined	1.79	1.61
Ore Transport	US$/t ore	Varies	Varies
Processing (variable)	US$/t ore	17.58	17.58
G&A	KUS$/annum	6,908	6,908

Note: The ore transport cost is from the pit exit (or ROM pad in the case of Ouaré) to the ROM pad at Youga. For Ouaré the transport cost over the 44 km route is 4.05 US$/t ore. For Youga the transport cost varies between 0.06 US$/t ore to 0.56 US$/t ore, depending on haul distance to the ROM Pad.

1.17 Economic Analysis

This Economic Analysis of the Youga and Ouaré Projects project is based on the Mineral Reserves presented in Section 16. The analysis is based on discounted cash flow approach. Results are expressed as pre-tax and pre-financing terms. However, the analysis takes into account 4% royalty paid on revenue and 1.8% royalty on revenue paid to Endeavour Mining. No inflation or escalation of revenue or costs has been incorporated into the base case economic model. Project expenditures prior to March 2017 are considered as sunk costs and are excluded from the cash flow model.

The model is developed in US Dollars at current prices and does not include considerations for exchange rate fluctuations.

With revenue based on a gold price of US$1,250 / ounce, the following pre-tax economic indicators were calculated as:

- Net cash flow of US$85.0 million.

- NPV at 6% discount rate of US$68.9 million.
- NPV at 8% discount rate of US$64.6 million.

IRR and payback period assessments are not applicable to the project as its cash flow positive from year one. Due to lower grades the project shows high sensitivity to gold price and cost and recovery variations in stress scenarios

- NPV at 8% discount rate with project mining costs 10% higher than the base case and gold price at US$1000/ounce is at US$ -10.4 million.
- NPV at 8% discount rate with processing recoveries for Youga and Ouaré ores at 4% lower than the base case and gold price at US$1000/ounce is at US$-13.8 million.

1.18 Hydrology

CSA Global undertook a review of the available hydrological and hydrogeological aspects of the Youga and Ouaré deposit to evaluate the level of understanding of the hydrology and hydrogeology at each of the two sites and to identify any potential mine water management issues and risks at each site.

1.18.1 Youga Project

According to the Youga Gold Project Updated Environmental Impact Assessment (2005), the rocks are low yielding and not ideally suited to exploitation using boreholes. There are likely to be two main aquifer units within the mine; a shallow weathered aquifer and a fractured bedrock aquifer. No groundwater level data are provided and therefore it is not currently possible to infer groundwater flow direction at the Youga Mine site.

- Potential issues concerning water management and pit stability were raised in technical site visit reports. Measures to counteract these concerns were detailed, but it is not clear if these measures were successful in effectively managing the effect of surface water and groundwater ingress on pit stability.
- Pit dewatering is achieved utilising in-pit sumps. It is reported that the quantity of water pumped from the pits is recorded on a daily basis and that water quality is monitored daily and monthly.
- Process water is recycled from the TSF lagoon where it is pumped to the plant process water tank and then subsequently on to the process plant as a water supply.
- Raw water is pumped from the Nakambé River, stored in a de-sanding holding tank and then pumped to the raw water pond. Potable water is supplied from the raw water pond, and is treated through a filtration and sterilization system.
- Surface water quality is measured at upstream and downstream points on the Zera River and at the Gossé Stream. Surface water on site was found to be unsuitable for human consumption owing to extensive microbial contamination.
- A detailed Environmental Management Plan is provided in “Youga Mine Environmental Management Plan” which sets out actions, reporting procedures and corrective actions.

1.18.2 Ouaré Project

The FS indicates that there is limited groundwater use within the Ouaré Project Area. It contains a short section on potential aquifers in the area, but no site-specific hydrogeological investigation data were provided, except for limited groundwater quality data. Groundwater in the area is reported to be calcium magnesium bicarbonate type with low conductivity and low turbidity. Microbial contamination of groundwater is reported in the project area.

As the ore will be transported to Youga, the processing water requirements for the Ouaré site are likely to be minimal. A water supply strategy for the Ouaré Project, including water supply options and their potential yields, quality and long-term sustainability have not been provided for review.

Three open pits, with depths up to 130m, are proposed for the Ouaré Mine. A specific water management plan, including both groundwater and surface water management, is not provided for the Ouaré site.

1.19 Conclusions

1.19.1 Geology and Data

The Youga Gold Project straddles an outlier of epiclastic Tarkwaian sediments that unconformably overly Upper Birimian Series volcanics, volcaniclastics and sediments of the Bole-Navrongo Belt, which extends across northwestern Ghana into southern Burkina Faso. The Tarkwaian outlier at Youga is dominated by a succession of arkosic sandstones, comprised of quartz and feldspar in roughly equal proportions. The arkoses are intercalated with thin subordinate polymitic matrix supported conglomerate horizons manifest as chlorite schists, often accompanied by carbonate alteration.

Mineralisation is preferentially developed within the arkosic sequences. Structural controls to mineralisation may superficially relate to a dextral dilatational jog in a major 070º structure represented by the A2 West 2, 3 & 4 mineralised zones, continuing on the same orientation to the northeast as a structure defined by intense carbonate alteration developed within Birimian phyllites to the east of the A2 Main-A2 East deposits. The sulphide content is extremely low (usually <1%), comprising pyrite, pyrrhotite, arsenopyrite and trace galena. The style of mineralisation is distinctly brittle in character, represented by irregular fracturing, quartz veining and occasional brecciation.

At the Ouaré Main zone, mineralization occurs as quartz veins within shear zones at the contacts between felsic and mafic volcanics. Orpailleur workings have been developed along mineralized structures in two orientations: 090° and 315°. The 090° portion of these workings has multiple parallel quartz veins along shears in an interpreted dilation zone. The 315° portion is interpreted as a 100 m wide deformation zone, terminating the 090° trend.

CSA Global concludes that the sampling quality and methods and survey procedures appear to be appropriate and representative. There is intrinsic sample bias and/or potential for contamination associated with soil, grab and auger sampling, however these datasets have not been used in the estimation of resources and are for indicative/exploration purposes only.

QAQC procedures appear adequate, but it is unclear whether they are always implemented. Numerous failures of CRMs and blanks were noted as well as apparent misidentification of these samples. Most of the project areas had unacceptably high failure rates in CRMs and blanks, although CRM results were generally accurate (but imprecise).

CSA Global considers the drill hole data for the Youga and Ouaré projects to be sufficiently reliable for Mineral Resource estimation and associated downstream work. A centralised database should be implemented which can serve as a single point of truth for the project data.

1.19.1 Mineral Resources

Mineral Resources for ten deposits at Youga and Ouaré have been updated. These are Main Pit, East Pit, West Pit 1, 2 and 3, NTV, Zergoré, A2NE, Leduc, Ouaré. A new deposit, West Pit 4, located to the north of West Pit 3, has been discovered and drilled out and a maiden resource for West Pit 4 has been estimated.

Data verification included spot checks on three drill hole collars during a site visit, verification of core, review of core photos for several drill holes and review of core recovery. These checks support the use of the data for Mineral Resource and Mineral Reserve work.

The Mineral Resources have been classified as Indicated Mineral Resources and Inferred Mineral Resources according to the "CIM Definition Standards for Mineral Resources and Mineral Reserves" (May 2014).

For reporting purposes, the resources have been constrained within US$1500 pit shells using reasonable assumptions to support the criteria that Mineral Resources must have the potential for eventual economic extraction.

The MRE for Youga and Ouaré reports 15.60 Mt at 1.40 g/t for 703,600 ounces of Au of Indicated Mineral Resources and 12.9 Mt at 1.5 g/t Au for 639,000 ounces of Au of Inferred Mineral Resource. Mineral Resources are reported at a cut-off grade of 0.55 g/t Au.

1.19.2 Mineral Reserves

Mineral Reserves are classified as Probable based on a Resource Classification of Indicated. Inferred and Unclassified Resources have been excluded from the conversion of Resources to Reserves. The QPs are of the opinion that potential modifying factors have been adequately accounted for using the assumptions in this report, and therefore the Mineral Resources within the mine plan can be converted to Mineral Reserves.

- Changes in Process cost, Mining cost or slope angle (± 2 degrees) generally have a relatively small impact (approximately 5%) on the estimate of contained metal and confirm that the pit limits are not as sensitive to these parameters as they are to price.
- Effective surface and groundwater management is important to the safety and productivity of the mining operation. Although this is only really an issue during the rainy season, if the currently planned water management methods prove to be inadequate, additional sumps and pump systems may be required.
- Transport of ore between the Ouaré project and the process plant at Youga is a key part of the plan and relies on the efficient planning of the transport route, good road maintenance and proactive management of community relations.

1.19.3 Recovery Methods

Preliminary circuit simulations with a simple mill model (calibrated to actual mill performance results) show that the Ouaré material should on average be able to be processed at the required average throughput (148 t/h) at the required grind size P_{80} of 75 microns to achieve the recoveries predicted from the testwork for Ouaré ores. A range of 89 to 91% is predicted, subject to consistently achieving the required grind size (80% passing 75 microns).

1.19.4 Mining Methods

The proposed method of mining for Youga and Ouaré is a conventional open pit method using drilling and blasting, loading with hydraulic excavators, and hauling with articulated dump trucks (ADT). Consideration of underground mining has not been necessary at this stage of the Project.

- The optimal mine production rate is primarily constrained by the capacity limit of the plant at Youga.
- The cut-off grade applied to each pit depends mainly on its location and ore transport costs. Other costs (Processing, G&A etc.) were constant across all deposits.
- It was noted that a 10% change in process or mining cost, or a 2-degree change in the overall slope angle, all have a minor impact (approximately 5%) on the contained metal. It was therefore concluded that the Ore Reserve was not particularly sensitive to these parameters.
- Price is the main driver for most of the deposits and a 10% change in price resulted in a 13% change in contained metal. This is consistent with the charts of cumulative contained metal versus price

where there is a near linear relationship for most deposits, which supports the notion of selecting the pit at a Price Factor of 1.0.

- The cut-off grade for the majority of the deposits could be set to 0.7 g/t Au, the exception being Ouaré where the cut-off was set to 0.82 g/t Au due to the additional cost of transporting the ore to the ROM pad.
- A detailed quantification of the rock mass properties could not be found in the documentation provided. Therefore, the slope design parameters have been estimated with a high factor of safety for this rock type.
- Netiana has a significant impact on the overall feed grade to the plant due to the high grade of the starter pit. The overall mine development strategy therefore prioritises feed from Netiana so as to maximise cashflow in the early periods.
- There is a significant increase in the number of haul trucks required at Youga and Ouaré in 2018. This is offset by transferring equipment from Balogo to Ouaré once the Netiana pit is depleted.

1.19.5 Environmental Studies, permitting and Social or Community Impact

There has been a considerable amount of environmental and social work undertaken on the Youga Project and EIA reports are of reasonable content and quality. Baseline data collection has been detailed and comprehensive and impact assessment and mitigations appropriate. While not to Standard Operating Procedure detail, the ESMPs are at an adequate level for implementation.

- The Youga operation received environmental permitting and an exploitation mining license and has been active for over 10 years. While this review cannot comment on operational environmental and social performance, the current condition and status of the Youga site; apparent lack of environmental penalties or social conflict; and proposed continuation of activities imply that there have not been any significant non-compliance or grievance issues.
- However, on-going community complaints about compensation and water resources suggest that there is room for improvements on some issues, and the current operation can address these with increased SE, community consultation and demonstrated transparency.
- Inclusion of the Ouaré deposit in the Youga Project has a good (if now 5 years old) scoping baseline data resource to initiate ESIA studies, and can learn from experiences at Youga.

1.19.6 Capital and Operating Costs

The capital spend on mining fleet is limited to US$5.38 million in 2018 and there is a sustaining capital is US$ 1.12 million for the remaining life of the mine. The capital expenditure relating to the Tailings Storage Facility is expected to be US$2 million, and a further $4.8 million to extend the dumps, which is spread over the life of mine and can be treated as a capital or an operating cost. The capitalised environmental and social expenditures are estimated at US$9.7 million and are spread across the mine life. An additional capital allowance of $US1.7 million in 2018 is estimated to build a road from Ouaré to Youga, including a bridge over the Nakambe river.

1.19.7 Economic Analysis

In the base case the project shows positive NPV of US$75 million at 6% discount rate and US$69.9 million at 8% discount rate. However due to lower grade it shows high sensitivity to recovery and cost variations with NPV in negative in stress scenarios tested.

1.19.8 Hydrology

Based on the information provided for review, there appears to be a good understanding of most operational water management issues at the Youga Mine site. However, additional assessments and site specific investigations would improve future operational water management including:

- Long term prediction of dewatering and depressurisation requirements.
- Long term water supply security.
- Optimisation of overall site water management.
- Assessment of potential impacts from mine water management on the environment.

Extremely limited hydrological and hydrogeological assessments have been completed for the Feasibility Study for the Ouaré Project and significant uncertainty remains with respect to water management for the project. Additional site-specific assessments are recommended in order to ensure that the water management aspects of the project are fully understood and appropriate surface water and groundwater management strategies are developed and costed.

1.20 Recommendations

1.20.1 Geology and Mineral Resources

During drilling, it is recommended that BMC ensure QAQC procedures are followed in light of several QAQC failures in the results reviewed by CSA Global. The use of a relational database is recommended to ensure there is a single source of reliable, verified data.

A sound geological and structural model should form the basis of any future Mineral Resource Estimate, so that faulting and other mineralisation controls are integrated in the model.

Additional dry bulk density data should be collected routinely during grade control and/or mine production and reviewed to build up a useful bulk density database of values that can be used to improve the confidence of the tonnage factors for the MRE. The methodology and measurements should be verified and standardised.

The current level of understanding of the Au distribution and geological controls are sufficient for mine planning purposes. CSA Global recommends that instead of additional infill drilling to upgrade Indicated Mineral Resources to Measured Mineral Resources, grade control drilling should be sufficient to delineated blast and dig lines during open cast mining.

The resource is open down dip. CSA Global recommends additional drilling for resource delineation with depth to allow Inferred Mineral Resources to be considered for an Indicated Mineral Resources classification level. A drill spacing of about 25 m Z (down dip) is recommended to allow the classification of Indicated Mineral Resources.

1.20.2 Mineral Reserves

The mill throughput process is dependent on the ore type. This is particularly relevant to the new deposits such as Netiana and Ouaré, as bulk metallurgical tests have not been carried out yet. It is recommended that bulk metallurgical tests are undertaken on the various ore types.

Detailed reconciliation of ore production is required to confirm the modifying factors that should be used for each individual deposit. Currently global factors are used and this may have an adverse or a beneficial impact on the Reserves. This needs to be established to improve the accuracy of the estimate.

There is a significant amount of Inferred material (approximately 1.5 Mt) within the pit limits for the Ore Reserves and further drilling is required to convert this into a Reserve. The priority is Ouaré where the Inferred Mineral Resource is around 892 Kt.

1.20.3 Mining Methods

CSA Global recommends the following:

- To improve the reliability of the mine design criteria, additional geotechnical parameters will have to be collated from exploration drilling and face mapping. These parameters must then be used in a logical methodology to establish stable slope angles.
- CSA Global consider the pit design parameters a reasonable assumption at this stage. However, these parameters should be reviewed prior to mining.
- Considerable care needs to be taken with the blasting to minimise movement and as a consequence the blast design assumes choke blasting with a relatively low powder factor of 0.29 Kg/m^3.
- No more than 3 active pits should be operational at any one time. This is a function of the available equipment and limits on logistics of running multiple pits.
- If possible a deposit should be mined out before moving to the next one. This allows the pit to be closed and rehabilitation to proceed as the project continues.

1.20.4 Environmental Studies, Permitting and Social or Community Impact

There are some gaps and deficiencies in investigations, impact assessments and mitigation and management measures, which are highlighted below. The most significant gap is the apparent lack of E&S work on the haul routes from Ouaré to Youga. This requires urgent work to describe ambient conditions, identify potential impacts and engage with affected communities - together with completion of the Ouaré ESIA - to develop suitable E&S management plans prior to start-up of haulage.

Required work to address gaps in the Project E&S work include:

- Urgently undertake full ESIA studies on the Ouaré component of the Project, building on the Socrege review.
- Undertake EISA studies on the haul route from Ouaré to Youga, including baseline data collection, stakeholder consultation, impact assessment and mitigations.
- Establish site meteorological stations at Youga and Ouaré (as required).
- Install permanent flow gauges at Project streams and depth rods at ponds/dams.
- Undertake more detailed faunal biodiversity studies at Youga to determine the most appropriate measures to avoid and/or offset for Project impacts.
- Implement and publicise a formal Grievance Mechanism for Youga and Ouaré.
- Undertake geochemical testing, including metal leaching tests on ore material and tailings from Youga; representative WRD material and ore from Balogo; and from Ouaré as required.
- Define and implement ecological and social monitoring at Youga.
- Develop and disclose an appropriate procedure for evaluating post start-up demands for compensation at Youga (for expanding Project area).
- Assess impacts on- and from- artisanal mining in the Youga area (and Ouaré in particular) and establish dialogue to reduce environmental impacts and conflicts.

1.20.5 Hydrology

Youga Recommendations

Additional studies are recommended to improve the level of understanding relating to the hydrology and hydrogeology at Youga. This additional information would also increase the confidence with regards predictions for mine water management at Youga. More specifically; CSA Global recommends the following:

- Additional site investigations to improve the hydrological and hydrogeological understanding for the site.
- An integrated surface water management plan should be developed for the Youga Mine site to optimise surface water management systems, minimise pit dewatering pumping requirements, enhance pit wall stability, maintain safe working conditions and minimise potential surface water related impacts on the environment.
- Operational groundwater management strategies for the entire Youga Mine site should be reviewed and where possible integrated to optimise water use and management across the mine.

Ouaré Recommendations

- Hydrological and hydrogeological site investigations should be completed to improve the hydrological and hydrogeological understanding for the site.
- A water monitoring programme should be developed in order to ensure that the programme enables the water management issues for the entire site to be fully evaluated.
- An assessment of pit inflows and dewatering requirements should be completed and an appropriate dewatering and depressurisation strategy developed.
- A surface water management plan should be developed for the proposed Ouaré Mine site to minimise pit dewatering pumping requirements, enhance pit wall stability, maintain safe working conditions and minimise potential surface water related impacts on the environment.
- An assessment of potential water supply options and their long-term water supply security should be completed to ensure a sustainable water supply is available to meet local requirements for the life of the mine.
- An assessment of the potential impacts of mine water management on the environment should be completed.

Contents

Figures

Tables

2 Introduction

2.1 Background

The Burkina Mining Company S.A. (BMC) is a subsidiary of Etruscan Resources Burkina Faso SA ("Etruscan"; previously part of Endeavour Mining), a wholly-owned subsidiary of MNG Gold Exploration Ltd (MNG).

The BMC commissioned CSA Global (UK) Ltd (CSA Global) to assist them with evaluating the Youga and Ouaré Projects (collectively referred to as the "Project") and to complete the required technical evaluations, verification and review works to facilitate disclosure of an update to the Mineral Resource and Mineral Reserves inventory for the Project and to provide independent comment as regards exploration potential in the near-mine environment.

In addition, and following the estimation of Mineral Resources and Mineral Reserves, CSA Global were commissioned to produce a Life-of-Mine Schedule and prepare a financial model for the Project.

All technical works have been undertaken under the guidelines of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves, Definitions and Guidelines prepared by the CIM Standing Committee on Reserve Definitions and adopted by CIM Council, and disclosed within the context of the Canadian Securities Administrators National Instrument 43-101 (NI 43-101).

The Project includes a significant number of near-mine satellite prospects which have been the subject of various levels of exploration activity ranging from early-stage evaluation (surface works and defined anomalies), advanced exploration (drilling), resource development and mining.

2.2 Disclaimers

2.2.1 Independence

Neither CSA Global, nor the authors of this report, have any material present or contingent interest in the outcome of this report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence in the preparation of this report. The report has been prepared in return for professional fees based upon agreed commercial rates and the payment of these fees is in no way contingent on the results of this report. No member or employee of CSA Global is, or is intended to be, a director, officer or other direct employee of the Client. No member or employee of CSA Global has, or has had, any shareholding in the Client. There is no formal agreement between CSA Global and the Client as to CSA Global providing further work for the Client.

2.2.2 Notice to Third Parties

CSA Global has prepared this report having regard to the particular needs and interests of our client, and in accordance with their instructions and in compliance with NI 43-101 Technical Reporting. This report is not designed for any other person's particular needs or interests. Third party needs and interests may be distinctly different to the Client's needs and interests, and the report may not be sufficient, fit or appropriate for the purpose of the third party, other than its prescription in relating to NI 43-101.

2.2.3 *Results are Estimates and Subject to Change*

The ability of any person to achieve forward-looking production and economic targets is dependent on numerous factors that are beyond CSA Global's control and that CSA Global cannot anticipate. These factors include, but are not limited to, site-specific mining and geological conditions, management and personnel capabilities, availability of funding to properly operate and capitalise the operation, variations in cost elements and market conditions, developing and operating the mine in an efficient manner, unforeseen changes in legislation and new industry developments. Any of these factors may substantially alter the performance of any mining operation.

2.2.4 *Element of Risk*

The interpretations and conclusions reached in this report are based on current geological theory and the best evidence available to the author at the time of writing. It is the nature of all scientific conclusions that they are founded on an assessment of probabilities and, however high these probabilities might be, they make no claim for absolute certainty. Any economic decisions which might be taken on the basis of interpretations or conclusions contained in this report will therefore carry an element of risk.

2.3 Sources of Information

Several reports were reviewed during the compilation of this report. The relevant Qualified Persons take responsibility for the content of their sections and believe the data review to be accurate and complete in all material aspects.

2.3.1 *Exploration and Resources*

Sections 6, 7, 8, 10 and 11 of this NI 43-101 report are largely reliant on:

- Endeavour (2015) Technical Report (Mineral Resource and Mineral Reserve Update for the Youga Gold Mine, Burkina Faso, West Africa).

Licence and tenure documents and Exploration and Resource Data were provided by Gokhan Kellecioglu to a CSA Global via a CSA-MNG shared data room in February 2017.

Exploration, drill, sampling, assay and quality assurance/quality control (QAQC) data was loaded to Structured Query Language (SQL) and validated by Dave Muir (Data Management Geologist – CSA Global) prior to evaluation and estimation of the Mineral Resources and Reserves. See Sections 11 and 12 for further detail.

2.3.2 *Environmental*

Environmental data and reports on which the report is reliant include:

- SGS, 2005; Youga Gold Project Updated Environmental Impact Assessment, SGS Environment, February 2005
- Youga EMP (version 1), date unclear but pre-2012.
- Socrege, 2012. Ouaré Preliminary E&S Assessment Report, Socrege, November 2012.
- Socrege, 2016; ETUDE D'IMPACT ENVIRONNEMENTAL ET SOCIAL DU PROJET DE REHABILITATION DE LA ROUTE DE TRANSPORT DU MINERAI DE NETIANA A YOUGA, April 2016.
- Socrege, 2017; EIES on Balogo-Youga Ore Transport Route, Socrege, April 2017.
- Wardell Armstrong, 2016; Review of Mine Closure, Youga Mine, Burkina Faso, November 2016.

Other relevant documents also sighted:

- Copy of Youga Mining Permit, 2003.

- Signed Company Environmental Policy, January 2017.
- Youga EMP, 2016.
- Youga 'Respect to Commitments' (Social Mitigations), 2015.
- Youga Environmental Program Organisation, 2016.

2.3.3 Hydrogeology

Hydrogeological and geotechnical data on which this report is reliant include:

- Burkina Mining Company, Water Management System, BMC YOUGA MINE, June 2016.
- Burkina Mining Company; Youga Mine Environmental Management Plan, Revision 01.
- Burkina Mining Company, 2016; Youga Mine Environmental Management Plan, Revision 002, June 2016.
- Endeavour, 2015; Technical Report Mineral Resource and Mineral Reserve Update for the Youga Gold Mine Burkina Faso West Africa, Endeavour Mining Corporation, March 2015.
- HCG Cement & Mineral Processing Technologies, 2017; Ouaré Project Feasibility Study, May 2017.
- SGS, 2005; Youga Gold Project Updated Environmental Impact Assessment, SGS Environment, February 2005.
- SRK Consulting (South Africa) Ltd, 2010; Youga Gold Mine, Burkina Faso: Mining Geotechnics Site Visit 19 to 25 August 2010.
- SRK Consulting (South Africa) Ltd, 2013; Youga Gold Mine, Burkina Faso: Technical Site Visit Report 27 to 30 August 2013, August 2013.
- Wardell Armstrong, 2016; Review of Mine Closure, Youga Mine, Burkina Faso, November 2016.

2.3.4 Metallurgy

- AMEC, 2012; Youga Gold Mine Satellite Deposits and Ouaré Gold Project, Burkina Faso, West Africa Deposit; Metallurgical Testwork Report, July 2012.
- HCG Cement and Mineral Processing Technologies, 2016; Feasibility Study for the Balogo Project in Burkina Faso, Prepared for MNG Gold, 20 March 2016.
- Micon International Ltd, 2013; Technical Report and Preliminary Economic Assessment on the Ouaré Gold Deposit, Burkina Faso, West Africa, March 2013.
- Client Communication - Excel Document Describing – Flowsheet; Operating Data – including schematic flowsheet, historical operating data, annual performance summary, and process unit operating costs for 2016 ($/t).
- Client Communication – 2017 Mill Operations Data – by email, tbc.

2.3.5 Geotechnical

- Endeavour, 2015; Technical Report Mineral Resource and Mineral Reserve Update for the Youga Gold Mine Burkina Faso West Africa, Endeavour Mining Corporation, March 2015.
- Golder Associates Inc, 2005; Feasibility-Level Pit slope design study, 23 Feb 2005.
- SRK Consulting Ltd., 2014; 20140806_Youga_Site_Visit_Report_Final, 6 Aug 2014.
- SRK Consulting (South Africa) Ltd, 2010; Youga Gold Mine, Burkina Faso: Mining Geotechnics Site Visit 19 to 25 August 2010, August 2010.
- SRK Consulting Ltd., 2011; Youga Gold Mine Draft Site Report, 26 July 2011.
- Wardell Armstrong, 2016; Review of Mine Closure, Youga Mine, Burkina Faso, November 2016.

2.3.6 Reserves

Mining, recovery, infrastructure and economic parameters on which this report is reliant include:

- Burkina Mining Company S.A, 2016; Youga Gold Mine Tailings Options Study, LO301-00192/09, issued by Knight Piesold, April 2016.
- Endeavour, 2015; Technical Report Mineral Resource and Mineral Reserve Update for the Youga Gold Mine Burkina Faso West Africa, Endeavour Mining Corporation, March 2015.
- SRK Consulting (South Africa) Ltd, 2013; Youga Gold Mine, Burkina Faso: Technical Site Visit Report – 27 to 30 August 2013, August 2013.
- Wardell Armstrong, 2016; Review of Mine Closure, Youga Mine, Burkina Faso, November 2016.
- Plant Presentation, Avesoro, Burkina Mining Company, Internal Powerpoint presentation provided by MNG. January 2017.
- Burkina 2017 Budget, Internal Memo issued by MNG, 26th January 2017
- LGSP survey records End of Month, December2016. Internal document issued by MNG

2.4 Site Inspections

2.4.1 Overview

CSA Global visited the Youga and Ouaré Projects during the period 28 January 2017 to 1 February 2017.

This visit was required for the purposes of inspection, ground truthing, review of activities, procedural review and information data collection and collation and to satisfy NI 43-101 “personal inspection” requirements. Mining operations are current at Youga (A2NE deposit) with several other deposits due to come on line within the coming weeks and months.

Qualified Persons Mr David Williams and Dr Matthew Randall carried out the site inspection on behalf of CSA Global.

2.4.2 Geology – David Williams

The following items were inspected or discussions held with Avesoro’s representatives:

- Discussions with staff on geological setting of the projects
- Ground truthing the deposit locations for each project
- Inspecting mining operations and grade control procedures in A2NE pit
- Verifying selected drillhole collar locations for each deposit (if not rehabilitated) with survey coordinates in drill database
- Inspecting drill core at each project
- Discussing drilling and sampling procedures at each project
- Reviewing database management system for storage of drillhole data, and QAQC protocols
- Inspecting general infrastructure (access roads, facilities, power, water)
- Forming an opinion for “social license to mine”, with respect to local villages and displacement of some population.

The Senior Mine Geologist (Stephen Affram) and the site based Project/Resource Geologist (Armel Ouedrago) were both employed by the previous holder of the licences, Endeavor for more than five years and both know the geology of the Project very well. They clearly communicated to CSA Global the geological controls to mineralisation at each deposit visited.

CSA Global sighted drill collars, inspected drill core, viewed open pits (active and completed) and viewed a gold pour of over 60 kg gold. Meetings were held with key geological staff discussing project geology and data acquisition and storage.

The following risks were noted during the visit, and recommendations made:

- A study be made comparing the grade control and resource definition (reverse circulation (RC), diamond) sampling methods from A2NE deposit to see if grade control samples can be used in the grade interpolation
- Avesoro commit time and funds to the refurbishment of the Youga core storage facility, or relocation of core trays to a more suitable location, to preserve the geological information stored in the drill core
- Avesoro use quantile-quantile plots and "Half Absolute Relative Difference" (HARD) plots to monitor the performance of the field duplicates against the original sample
- Avesoro review their manual handling and lifting procedures with regard to handling of core trays at their core storage facilities
- Avesoro survey the locations of artisanal mine shafts and attempt to get depth measurements, from which they may be able to construct a model of underground voids.

2.4.3 Mining – Matthew Randall

The operation at Youga is well run and is achieving its target production of 1 million tonnes per annum (Mtpa). The transition from contractor mining by PW Mining in April 2016 to owner mining in October 2016 seems to have been achieved without too many issues.

The operation was restarted by MNG with a new fleet of equipment and consequently it is too early to comment on the effectiveness of the maintenance program. This should be looked at carefully as the equipment is being maintained by MNG and there may be a skills issue with the local workforce.

The ability to meet the production targets will be dependent on a number of factors:

- Controlling mining recovery and waste dilution.
- Optimising the cut-off grade for each deposit.
- Matching the truck fleet to the variable haul requirements.
- Blending to grade and to rock type (fresh, transition and oxide).
- Timely development of A2N-mid and Balogo in the short term (2017).
- Development of new deposits such as WP4 and Ouaré in the medium term.
- Redevelopment of WP2, WP3, Zergoré, NTV, East and Main in the longer term.

There is clearly potential to expand the existing reserves as a result of the ongoing exploration program. This is focussed on expansion of existing pits and development of new pits.

There is the potential to assist MNG with several operational aspects, such as:

- Improved cost modelling, particularly the mine.
- Haul route studies to refine the inputs to the models.
- Advice on fleet management to improve accountability.
- Reconciliation studies to refine the modifying factors.
- Assistance with optimisation, design and evaluation of the new pits.
- Design and evaluation of the underground options.

3 Reliance on other Experts

CSA Global has not reviewed the status of the tenure or joint venture agreements pertaining to the Youga and Ouaré Projects and has relied on information provided by BMC regarding the legal title to the mineral concessions. Assessment and reporting of these aspects relies on information provided by BMC, and has not been independently verified by CSA Global.

In addition to this; no warranty or guarantee, be it express or implied, is made by CSA Global or the Author with respect to the completeness or accuracy of the legal aspects of the Balogo Project. Neither CSA Global nor the author accepts any responsibility or liability in any way whatsoever to any person or entity in respect to these parts of this document, or any errors in or omissions from it, whether arising from negligence or any other basis in law whatsoever.

4 Property Description and Location

4.1 Property Location and Description

The Youga and Ouaré properties are all situated in the province of Boulgou, Burkina Faso, West Africa, approximately 180 km southeast of the capital city Ouagadougou (Figure 1), adjacent the Ghanaian border. The licences are separated by the Nakambé River.

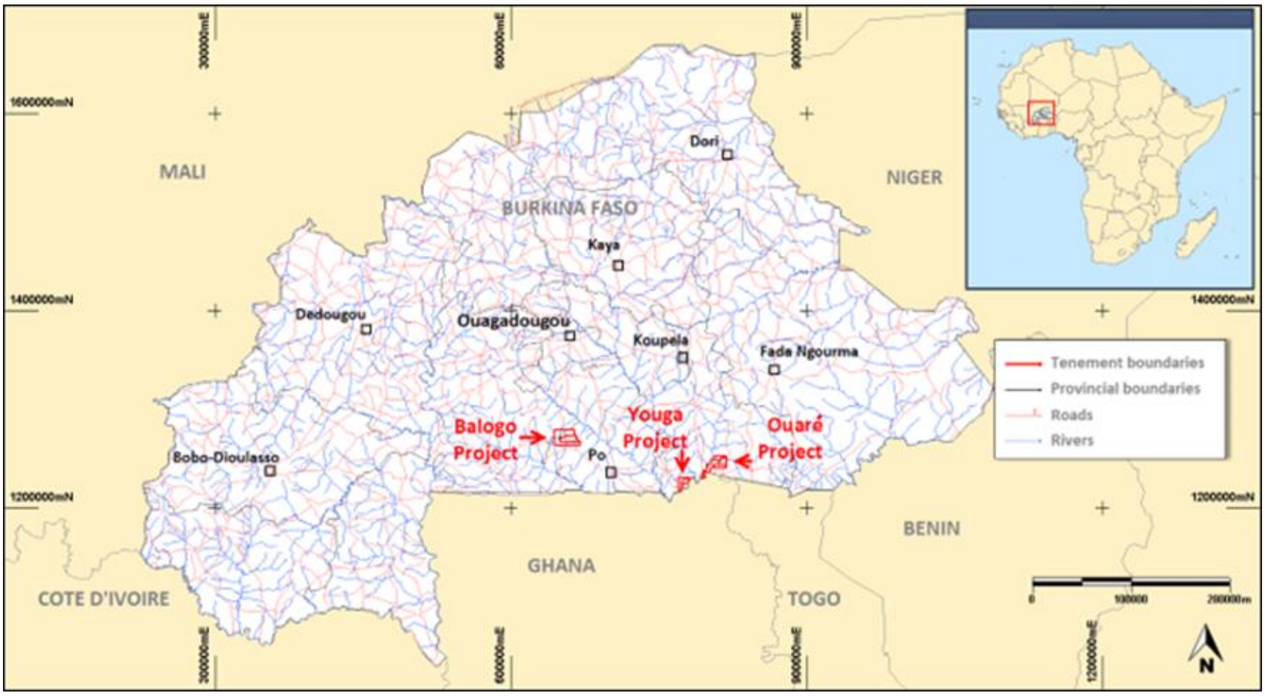


Figure 1: Location map – Youga and Ouaré projects, Burkina Faso, West Africa

4.2 Mineral Tenure and Surface Rights

The Youga Property consists of one Exploitation Permit (Youga), and two Exploration Permits (Songo and Zerbogo II). The Ouaré Project is comprised of four Exploration Permits (Bitou 2, Bitou Sud, Bitou Nord and Bitou Est), all situated in the province of Boulgou, Burkina Faso, West Africa, approximately 180 km southeast of the capital city Ouagadougou (Figure 1), adjacent the Ghanaian border.

The Youga Exploitation Permit covers an area of 29 km^2, and was granted to BMC by Decree no. 2003-186\PRES\PM\MCE on 8 April 2003 and is valid for 20 years with five-year renewal periods. See Figure 2 and details are tabulated in Table 6, Table 7 and Table 8.

An Exploitation Permit for Ouaré is currently not granted. However, BMC has reported that there is no known impediment to the issuing of an Exploitation Permit for the Ouaré resource area should BMC apply.

BMC is in the process of applying for an exceptional renewal of the Bitou Sud and Bitou Nord permits. The Company expects the exceptional renewal will be granted.

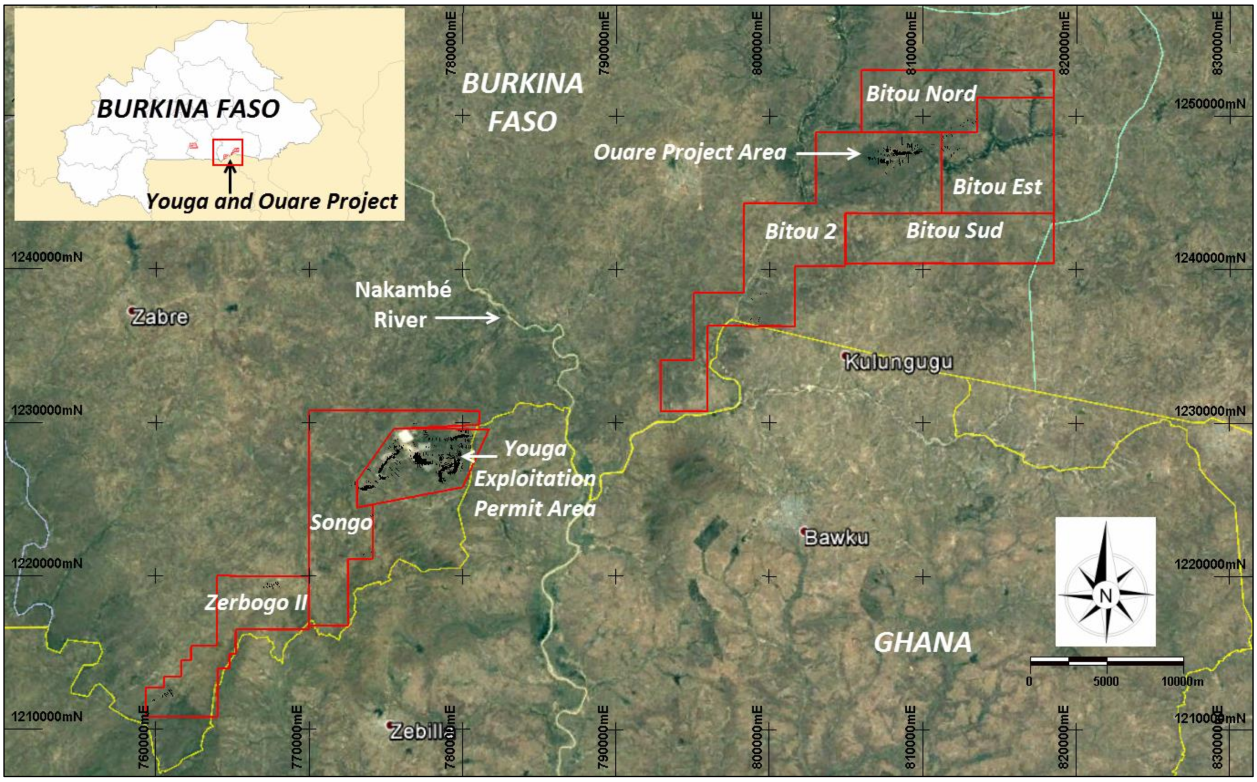


Figure 2: Youga and Ouaré tenement corners (note that Bitou Nord and Bitou Sud are the subject of pending permitting)

Table 6: Youga and Ouaré licence details

Name	km²	Licence ID	Status	Type	Date granted	Expiry date	Holder
Zerbogo II	39	BFZERB	Active	Exploration	09/06/2009	09/06/2018	ERBE
Songo	58	BFSONG	Active	Exploration	09/06/2009	09/06/2018	ERBE
Bitou Est	34	BFBE	Active	Exploration	07/04/2009	07/04/2018	ERBE
Bitou 2	101	BFBIT	Active	Exploration	21/11/2006	21/11/2018	ERBF
Bitou Sud*	44	BFBS	pending	Exploration	19/10/2004	19/10/2016	ERBF
Bitou Nord*	40	BFBN	pending	Exploration	19/10/2004	19/10/2016	ERBF
Youga	29	Youga	Active	Exploitation	08/04/2003	08/04/2023	BMC

Table 7: Exploration permit details: Youga and Ouaré (WGS1984, UTM Zone 30N)

Licence	Corner	Easting	Northing
Songo	A	769980	1216956
	B	769980	1230981
	C	781061	1230981
	D	781061	1230076
	E	775485	1229792
	F	773114	1226428
	G	773114	1224676
	H	774133	1224848
	I	774133	1221306
	J	772513	1221306
	K	772513	1216956
Zerbogo II	A	762300	1215656
	B	763980	1215656
	C	763980	1220211
	D	769980	1220211
	E	769980	1216712
	F	765211	1216712
	G	765211	1215106
	H	764801	1215106
	I	764801	1214186
	J	764026	1214186
	K	764026	1211008
	L	759350	1211008
	M	759350	1212950
	N	760550	1212950
	O	760550	1213650
	P	761650	1213650
	Q	761650	1214700
	R	762300	1214700

Licence	Corner	Easting	Northing
Bitou 2	A	811200	1248945
	B	811200	1243672
	C	804913	1243672
	D	804913	1240211
	E	801664	1240211
	F	801664	1236312
	G	795959	1236312
	H	795959	1230748
	I	792891	1230748
	J	792891	1234100
	K	795074	1234100
	L	795074	1238472
	M	798316	1238472
	N	798316	1244313
	O	803025	1244313
	P	803025	1248945
Bitou Sud (pending)	A	804973	1243248
	B	818543	1243248
	C	818543	1239988
	D	804973	1239988
Bitou Nord (pending)	A	806001	1252588
	B	818543	1252588
	C	818543	1250788
	D	813520	1250788
	E	813520	1248521
	F	806001	1248521
Bitou Est	A	811200	1248945
	B	813520	1248945
	C	813520	1251212
	D	816385	1251212
	E	816385	1243672
	F	811200	1243672

Table 8: Exploitation Permit details: Youga

Licence	Corner	Easting	Northing
Youga	A	779981	1225995
	B	773114	1224676
	C	773114	1226429
	D	775485	1229792
	E	781709	1229792

4.3 Datum and Projection

All resource and exploration data is projected in WGS1984, Universal Mercator Project (UTM) Zone 30 North.

4.4 Royalties

At present the Burkina Faso government gross revenue royalty for gold projects is 4%.

The government of Burkina Faso would receive a 10% free-carried interest in any operating company created to exploit the Ouaré deposit. The proceeds of production would be subject to a net smelter return (NSR) royalty of 3% if the price of gold is less than US$1,000/ounce (oz), 4% if the price of gold is between US$1,000 and US$1,300/oz, and 5% if the price of gold is more than US$1,300/oz. This royalty is levied by the government of Burkina Faso and is payable within 60 days from the date of signing the weighing and packing statement.

To make an application for an exploitation permit for the Ouaré gold deposit both a feasibility study and an environmental impact assessment, or a statement, are required.

Section 78 of the Mining Code of Burkina Faso provides that a mining permit holder must open a trust account at the Central Bank of West African State (BCEAO) or in a commercial bank in Burkina Faso, to deposit funds to implement the environmental preservation and rehabilitation program the permit holder has adopted. The account is in the name of the permit holder but the funds are held in trust and all withdrawals are subject to prior approval by the Minister of Economy and Finance of Burkina Faso. BMC has opened such an account and has been funding it on a yearly basis in accordance with the legislation.

In addition, a 1.8% (minus withholding tax of 6.25%) net smelter return (NSR) is payable to Endeavour Mining on revenues derived from mining at Youga and Ouaré, on a quarterly basis. The Company has the right to a buyback option and may exercise this right at an applicable price.

CSA Global is not aware of any other back-in rights, payments, or other agreements and encumbrances to which the property is subject.

4.5 Permitting

Exploration Permits in Burkina Faso are applied for using "paper-staking", providing the latitude and longitude of the vertices of the individual permits to the Ministry of Mines for approval. The Ministry includes the property coordinates in the granted approval. Mineral title regulations in Burkina Faso provide for a renewal of all Exploration Permits after three years and a second renewal after an additional three years, at which time a 25% reduction in the size of the property is required.

Application for an Exploitation Permit requires that:

- The Exploration Permits involved are in good standing
- A feasibility study has been submitted, containing development and exploitation plans for the deposit
- An environmental impact assessment or a statement that includes the results of public enquiry has been submitted, outlining the negative and positive impacts of development, and including a plan for remedial or mitigating actions and an environmental monitoring plan.

Exploitation Permits for large mines are issued for 20 years and are valid as of the date of the decree. They are renewable by right of law for additional terms of five consecutive years until depletion of the deposit. Unless otherwise authorised, the holder of an Exploitation Permit must commence development and production work within a maximum period of two years, starting from the first day of validity of the permit.

4.6 Liabilities

BMC currently has all required permits for exploitation of the current Mineral Resources and Mineral Reserves of the Youga Gold Mine; however, require an Exploitation Licence for Reserves at Ouaré to be mined. The application for an Exploitation Licence around Ouaré is reported by BMC as in progress, and BMC report that there are no known reasons for this licence to not be granted.

The Environmental and Social Impact Assessment (ESIA) submission for the original Youga Project was obviously sufficient for National Burkina Faso requirements as the Youga operation received environmental permitting and exploitation mining licence and has been active for over 10 years. While this review cannot comment on operational environmental and social performance, given that no operational or monitoring reports have been seen, the current condition and status of the Youga site; apparent lack of environmental penalties or social conflict; and proposed continuation of activities imply that there have not been any significant non-compliance or grievance issues.

The most notable environmental/social liabilities are in respect to areas where the potential impacts have not yet been adequately assessed, namely the potential geochemical-, artisanal mining- and immigration risks; from insufficient monitoring plans; and from underestimated compensation, closure and social costs

A portion of the Bitou 2 Exploration Permit, which holds the Ouaré gold deposit, is located within a pastoral reserve which has been set aside for the use of indigenous nomads (Fulany people).

5 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1 Accessibility

The Youga and Ouaré projects are in southern Burkina Faso, in the "Centre-Sud" region. Road links to Ouagadougou are good for most the distance.

Youga is approximately 190 km from Ouagadougou by road and a journey time of 3.5 hours via the paved N5 highway south towards Po for 70 km, then southeast for 23 km on the paved road N17 reaching Manga, then continuing in the same direction for approximately 100 km via Zabre on a well-maintained gravel road (Figure 3).

The Ouaré exploration camp is approximately 280 km from Ouagadougou by road and a journey time of approximately 3 hours via the paved N4 highway east to Koupela (150 km), then south for 130 km on the paved N16, continuing through Bittou village (Figure 3) followed by 11 km east on a poorly-maintained gravel road with two undeveloped river crossings that cannot currently be traversed during periods of heavy rain.

A network of bush roads provides vehicle access within the Youga Exploitation Permit and surrounding Exploration Permits during the dry season. Portions of the properties are not easily accessible during the wet season due to the inundation of the roads and a lack of bridges over seasonal water courses.

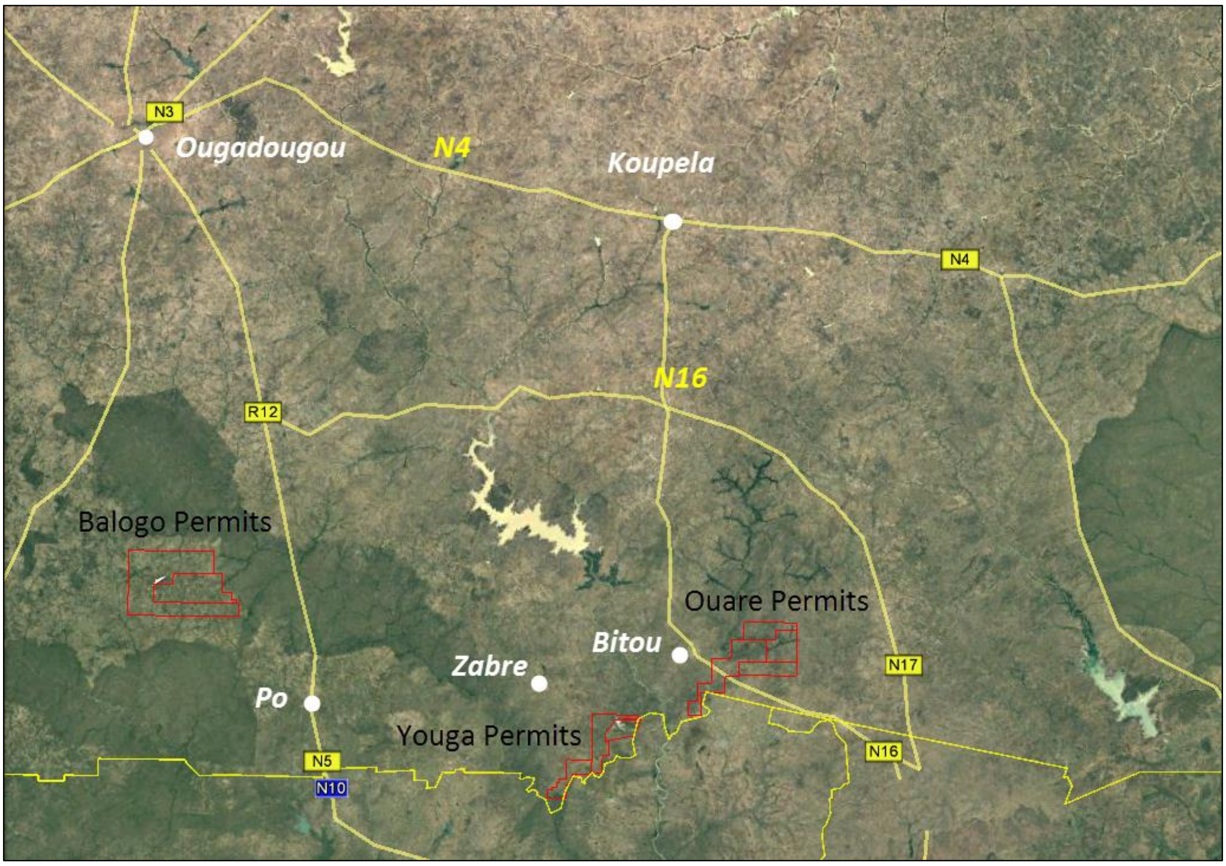
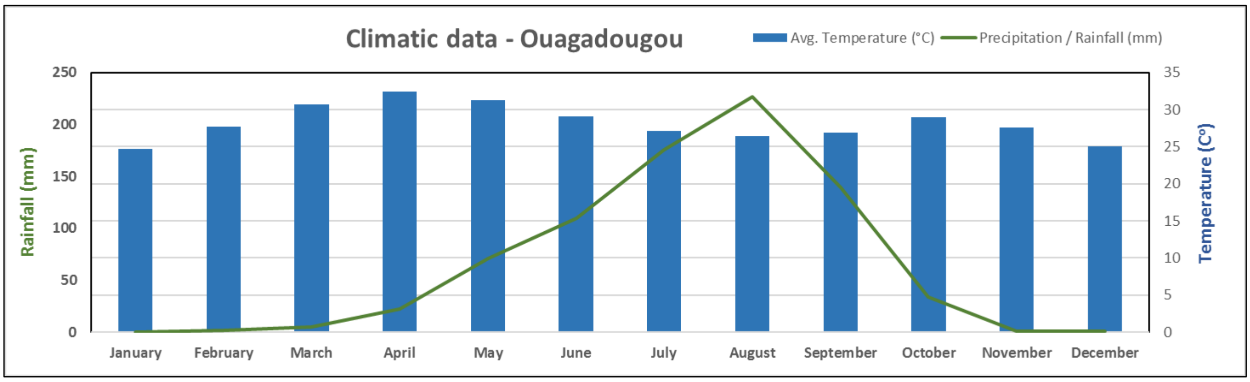


Figure 3: Road access to Youga and Ouaré permits

5.2 Climate

The Project area is located within the Sudanese climatic type of southern Burkina Faso but influenced by the south Sudano-Sahelian zone, where annual evaporation exceeds rainfall. The wet season runs from May to October, bringing around 900 mm rainfall on south and south-westerly winds, while the dry season from November to March, is associated with dusty north and northeast "Harmattan" winds. Annual evaporation is around 2,870 mm. Highest temperatures occur at the end of the dry season with mean monthly maxima exceeding 39°C (Figure 4).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average temperature (°C)	24.7	27.7	30.7	32.4	31.3	29.1	27.1	26.4	26.9	29	27.6	25.1
Rainfall (mm)	0	2	5	22	71	110	176	227	139	34	1	1

Figure 4: Climatic data for Ouagadougou 190 km from Youga

Source: https://en.climate-data.org

No meteorological station or rain gauge is currently in operation at the Youga site. Data from four meteorological stations proximal to the Youga site was used to extrapolate the likely pattern of on-site rainfall. Seasonal rainfall patterns for three of the four meteorological stations are provided in Table 9. Seasonal rainfall data from the Gon-Boussougou rainfall station was not presented.

Table 9: Seasonal rainfall patterns (mm) proximal to the Youga mine site

Station name	AAR*	AAR*	AAR*	AAR*	AAR*
	Pre-wet season	Wet season	Post-wet season	Dry season	Total
Pô	31.8	859.7	21.6	16.8	929.9
Tiébélé	34.2	879.4	11.4	22.1	947.1
Zabré	11.1	854.5	16.1	11.2	892.9

Based upon best available meteorological data, the rainy (humid) season lasts for approximately 170 days, with 80% of annual rainfall occurring during this period. Yearly rainfall at the Youga site is estimated at approximately 900 mm from 1961 to 1998, with on average 60 days of rain.

Average annual potential evapo-transpiration from 1988 to 1991 significantly exceeds rainfall reported as 1,858 mm.

Air temperature and relative humidity at the Youga site were estimated based upon data from the Pô synoptic station. Over the period 1978 to 1997, mean annual minimum and maximum temperatures were 21.9°C and 34.3°C, respectively. Over the period 1983 to 1998, mean annual minimum and maximum humidity ranged from 35 to 68%, with lowest values recorded in January, February and March.

5.3 Physiography

The Youga mine site is located within the catchment area of the Nakambé River. There are two main rivers in the vicinity of the Youga mine site; the Zéra River and the Gossé Stream.

The Zéra River flows across the mine area from south to north, then from west to east. Several small tributaries, draining the northern and southern parts of the mine area, flow into the Zéra before joining the Nakambé in Ghana. The Gossé Stream is about 5 km long and joins the Zéra downstream of the mine area. With the exception of the Gossé Stream, which is spring-fed, all of the surface water bodies in the vicinity of the Youga mine site are ephemeral.

The area is typified by undulating terrain with several ranges of moderately sloped hills that rise about 100 m above the surrounding land.

This part of Burkina Faso is entirely rural with savannah woodland cover but with rapidly expanding agricultural cultivation and pastoralist activities, as well as artisanal mining and felling for firewood and charcoal, causing significant deforestation. On areas of transported black soil or alluvial flats, crops such as maize, millet, sesame, cotton and sorghum are grown.

There is minimal native wildlife remaining in the area, believed to be due to subsistence hunting.

5.4 Local Resources

Population density is low and scattered with severely limited infrastructure, social structures and services.

Resources and amenities are limited in the region immediately surrounding the Youga and Ouaré projects, with subsistence farming being the main enterprise. However, Ouagadougou, located 120 km to the north is the administrative, communications, cultural and economic centre of the nation and has a population of approximately 1.5 million, an international airport and supports a wealth of modern industries.

The mining industry in Burkina Faso is active, and has been expanding as new mines are opened. There are an increasing number of local mining personnel available, as well as expatriate mine workers and professionals from neighbouring countries

5.5 Infrastructure

Burkina Faso’s total annual power generation is 700 million kWh (2009), most of which is generated for use within the major cities of Ouagadougou and Bobo Dioulasso. There is no Burkinabe national power grid in the Youga area; however, the village of Mogandé, located 10 km south-southwest of Ouaré, is connected to the grid. A 10 MVA powerline is now in operation supplying grid-power to Youga from Ghana.

Plant water is supplied to the mine via an 11 km long pipeline from the Nakambé River to the northeast of the mine.

There is no landline telephone service to the area, but there is an adequate cell service (including data transmission) within the area of the mine. A satellite system providing access to the internet, and voice communications, has been installed for the plant and administration offices.

Facilities and infrastructure at Youga consists of:

- Ten open pits consisting of A2NE, A2NW, Main, East, West 1, 2 and 3, Zergoré (2 pits) and NTV (1 pit).
- Four waste rock dumps.
- Stockpiles (ROM and Marginal).
- Fleet of mobile mining equipment.
- An explosives storage site with magazines, and a fuel storage facility.

- A 1.0 Mt/a gold ore processing plant and associated tailings storage facility (TSF).
- A maintenance shop and warehouse.
- An assay laboratory.
- Two administration buildings.
- A diesel generating station for back-up site electrical power.
- An 11 km water pipeline to the plant.
- A camp complete with kitchen and catering facilities.
- Security building and personnel.

With the exception of Ouaré, for which an Exploitation Permit has not yet been granted, there is sufficiency of surface rights for mining operations, potential tailings storage areas, potential waste disposal areas, heap leach pad areas, and potential processing plant sites.

Facilities at Ouaré are limited, and include an exploration camp, including kitchen, offices and sample yard.

6 History

This section has been modified from Endeavour (2015). The Qualified Persons take responsibility for the content of this section and believe it is accurate and complete in all material aspects. For this report, all work completed by either Etruscan or Endeavour is collectively referred to as Endeavour.

6.1 History Overview, Prior Ownership and Historical Exploration

The Youga Project has experienced several acquisitions, option agreements and joint ventures. For clarity, these are listed below in chronological order:

- **1991**: Incanore Resources Ltd (Incanore) was awarded the Youga Exploration Permit.
- **1994**: Youga Project was optioned to International Gold Resources Inc. (IGR).
- **1995**: Echo Bay Mines Limited (Echo Bay) entered an agreement with IGR for a 50% interest.
- **1999**: Ashanti Goldfields Company Limited (Ashanti) purchased IGR and the project became a 50/50 joint venture (with Echo Bay) with Ashanti as the operator. Ashanti incorporated the following projects into the joint venture:
  - 1997: Ashanti obtained the Bitou Exploration Permit
  - 1998: Ashanti was granted the Bitou Est Exploration Permit.
- **1999**: Ashanti completed a feasibility study on the Youga Gold Deposit.
- **2003**: Etruscan reached an agreement to acquire the Youga Project.
- **2006**: Feasibility study for Youga Project completed by Etruscan.
- **2008**: Commercial production began.
- **2009**: Feasibility study for Ouaré Project completed by Etruscan.
- **2010**: Endeavour purchased Etruscan and Etruscan's name was changed to Endeavour Resources Inc. For this report, all work completed by either Etruscan or Endeavour is collectively referred to as Endeavour.
- **2011**: Mineral Resource estimate (MRE) update by Endeavour.
- **2015**: MRE update by Endeavour, effective 31 December 2014 (Endeavour, 2015).
- **2016**: MNG finalises their acquisition of the Youga and Ouaré from Endeavour in April 2016.

Exploration completed by Incanore, IGR and Ashanti/Echo Bay is tabulated below (Table 10).

Table 10: Incanore, IGR and Ashanti exploration activities – 1991 to 1999

Date	Operator	Type of work	Description
Early 1994	Incanore	Soil geochemistry, geological mapping/prospecting	1,263 samples, 500 m x 500 m grid, inductively coupled plasma (ICP), 1:50,000 scale
1995	Incanore	Trenching	52 trenches for 8,000 m
1996	IGR	Mapping, trenching and RC drilling	1:2,000 scale, 9 holes, 254 m, 135 samples
1997 to 1999	Ashanti/Echo Bay	Regional study, induced polarisation (IP) survey, petrology trenching, RC and diamond drillhole (DD) drilling	22,550 soil samples, 140 trenches for 25,870.5 m, 52 holes for 5,379 m of RC drilling and 100 holes 16,743.4 m DD drilling
1999	Ashanti	Ashanti feasibility study	

Source: Endeavour, 2016

6.2 Historical Mineral Resources and Mineral Reserves

The most recent Mineral Resource estimation (Table 11) for the Youga deposits was completed by Endeavour, effective 31 December 2014. The Mineral Resource estimate for Ouaré was completed by AMEC International (AMEC), effective 6 August 2012. The Youga mine end-2014 key modifying parameters upon which the Mineral Reserve estimates were reliant are summarised in Table 12.

Table 11: Youga and Ouaré Mineral Resources at a 0.5 g/t cut-off, effective 31 December 2014

Deposit	Mineral Resources (including Mineral Reserves)											
	Measured			Indicated			Measured + Indicated			Inferred		
	kt	g/t	koz	kt	g/t	koz	kt	g/t	koz	kt	g/t	koz
A2 Main	432.4	2.36	32.8	513.3	2.24	37.0	945.7	2.29	69.8	81.5	2.23	5.8
A2 East	223.0	1.87	13.4	108.6	1.52	5.3	331.6	1.76	18.7	3.8	1.08	0.1
A2W Z1	24.0	2.08	2.0	25.0	1.45	1.0	49.0	1.90	3.0	6.0	2.00	0.4
A2W Z2	186.4	1.93	11.6	411.0	2.07	27.4	597.4	2.03	38.9	19.5	1.83	1.1
A2WZ3	133.6	2.45	10.5	87.9	3.31	9.4	221.5	2.79	19.9	44.0	2.53	3.6
Zergoré	1,700.3	1.63	89.3	1,480.8	1.43	67.9	3,181.1	1.54	157.2	969.7	1.60	49.9
NTV	1,605.1	1.13	58.3	596.0	1.20	23.0	2,201.1	1.15	81.3	219.4	1.26	8.9
A2NE	23.4	2.78	2.1	1,105.8	1.54	54.7	1,129.2	1.57	56.8	636.0	1.64	33.5
LeDuc	-	-	-	-	-	-	-	-	-	221.7	1.56	11.1
Ouaré	1,071.6	1.14	39.4	5,368.2	1.55	268.2	6,439.8	1.49	307.7	571.3	1.49	27.4
Stockpile	1,919.3	0.94	58.2	-	-	-	-	-	-	-	-	-
Total	**7,319.4**	**1.35**	**317.2**	**9,696.4**	**1.58**	**493.7**	**17,015.8**	**1.48**	**811.9**	**2,772.5**	**1.59**	**141.5**

Source: Endeavour, 2015

Table 12: 2014 Reserve Key Modifying Parameters, 2014

Applied Modifying Parameters	End 2014
New optimisation	Yes
Gold price	US$1,250/oz
Royalty	4%
Process cost (US$/t milled)	24.3
Process recovery	92%
Mining cost	PW new contract (May 2014)
Mining dilution	7%
Mining recovery factor	97%
Pit slopes degrees	46° to 55°
G&A cost (US$/t milled)	9.6
Other processing cost (US$/t milled)	3.5
Average cut-off grade applied across all pits	1.1 g/t

Source: Endeavour 2015

Table 13: Estimated Mineral Reserves at Youga as at 31 December 2014

Deposit	Mineral Reserves								
	Proven			Probable			Total		
	kt	Au (g/t)	koz	kt	Au (g/t)	k oz	kt	Au (g/t)	koz
A2 Main	92	2.50	7.4				92	2.50	7.4
A2 West 3	4	3.15	0.4	6	2.65	0.6	10	2.83	1
A2 West 2	209	2.27	15.2	220	2.20	15.6	430	2.23	30.8
Zergoré	808	2.07	53.8	277	1.95	17.4	1,085	2.04	71.2
A2NE	13	3.81	1.6	281	2.39	21.6	294	2.45	23.2
NTV	641	1.27	26.5	180	1.37	7.9	821	1.30	34.4
Total pits	**1,767**	**1.85**	**104.9**	**966**	**2.03**	**63.0**	**2,733**	**1.91**	**167.9**
Stockpiles	777	1.35	33.6	-		-	777	1.35	33.6
Youga Total	**2,544**	**1.69**	**139**	**966**	**2.03**	**63.0**	**3,510**	**1.79**	**202**

Source: Endeavour, 2015

6.3 Historical Production

Gold production as at 31 December 2014 is listed below in Table 14.

Table 14: Historical production at Youga, 2008 to end of 2014

Production (year)	Ore milled (t)	Gold produced (oz)
2008	663,334	45,264
2009	871,740	65,648
2010	891,202	82,405
2011	940,168	87,264
2012	1,012,829	91,031
2013	1,005,876	89,448
2014	990,852	76,561
Total	**6,376,001**	**537,621**

Source: Endeavour, 2015

7 Geological Setting and Mineralisation

This section has been modified from Endeavour (2015). The Qualified Persons take responsibility for the content of this section and believe it is accurate and complete in all material aspects.

7.1 Regional Geology

The geology of Burkina Faso can be subdivided into three major litho-tectonic domains:

- Lower Proterozoic (Birimian) basement underlying most of the country
- Neoproterozoic sedimentary cover developed along the western, northern, and south-eastern portions of the country
- Cenozoic belts located in small inliers in the north-western and extreme eastern regions of the country.

The principal gold producing areas of Burkina Faso are associated with Lower Proterozoic (Birimian) volcano-sedimentary units arranged in elongated “greenstone” belts across the West African Craton.

The Youga and Ouaré properties are located within a greenstone belt found on the south-eastern margin of the Archean-Proterozoic Man Shield (also known as the Leo Shield) which forms the southern half of the West African Craton.

The Youga and Ouaré Exploitation and Exploration Permits cover the northeast extension of the Youga Greenstone Belt (known as the Bole-Navrongo Belt in Ghana) that trends from Bole, in western Ghana, beyond the village of Bittou, in southern Burkina Faso, for approximately 400 km.

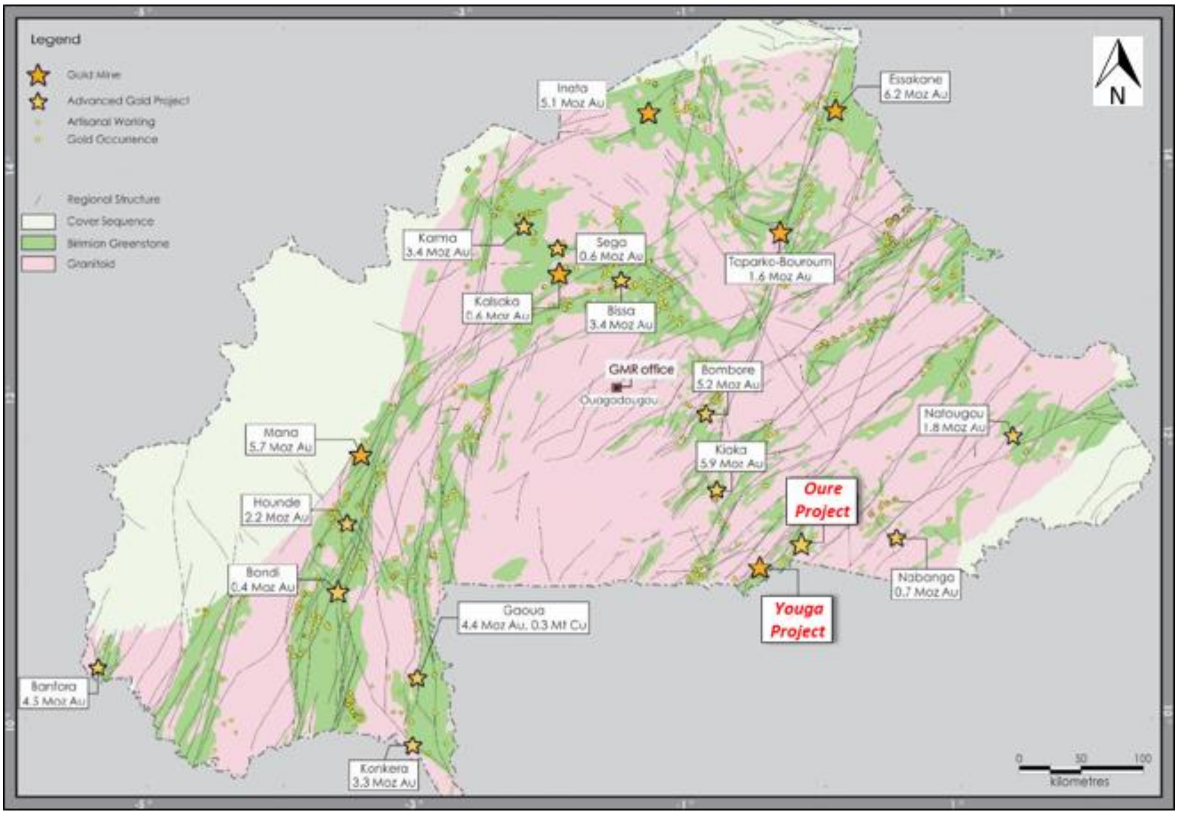


Figure 5: Distribution of Lower Proterozoic Birimian greenstone belts across Burkina Faso. The location of the Youga and Ouaré projects are annotated (Ounces as at 2015)

Source: GMR, 2015

7.2 Local Geology

Locally, the Youga Greenstone Belt is composed of weakly to moderately metamorphosed, lower Birimian mafic-volcanic flows, syn- to post- Birimian intermediate to felsic intrusions and subordinate Tarkwaian sediments comprised of arkosic sandstones. The belt is bounded by older Liberian basement rocks comprised of high metamorphic grade assemblages and related intrusives. Northwest trending, gabbro/dolerite dykes cross-cut all lithologies (Figure 6).

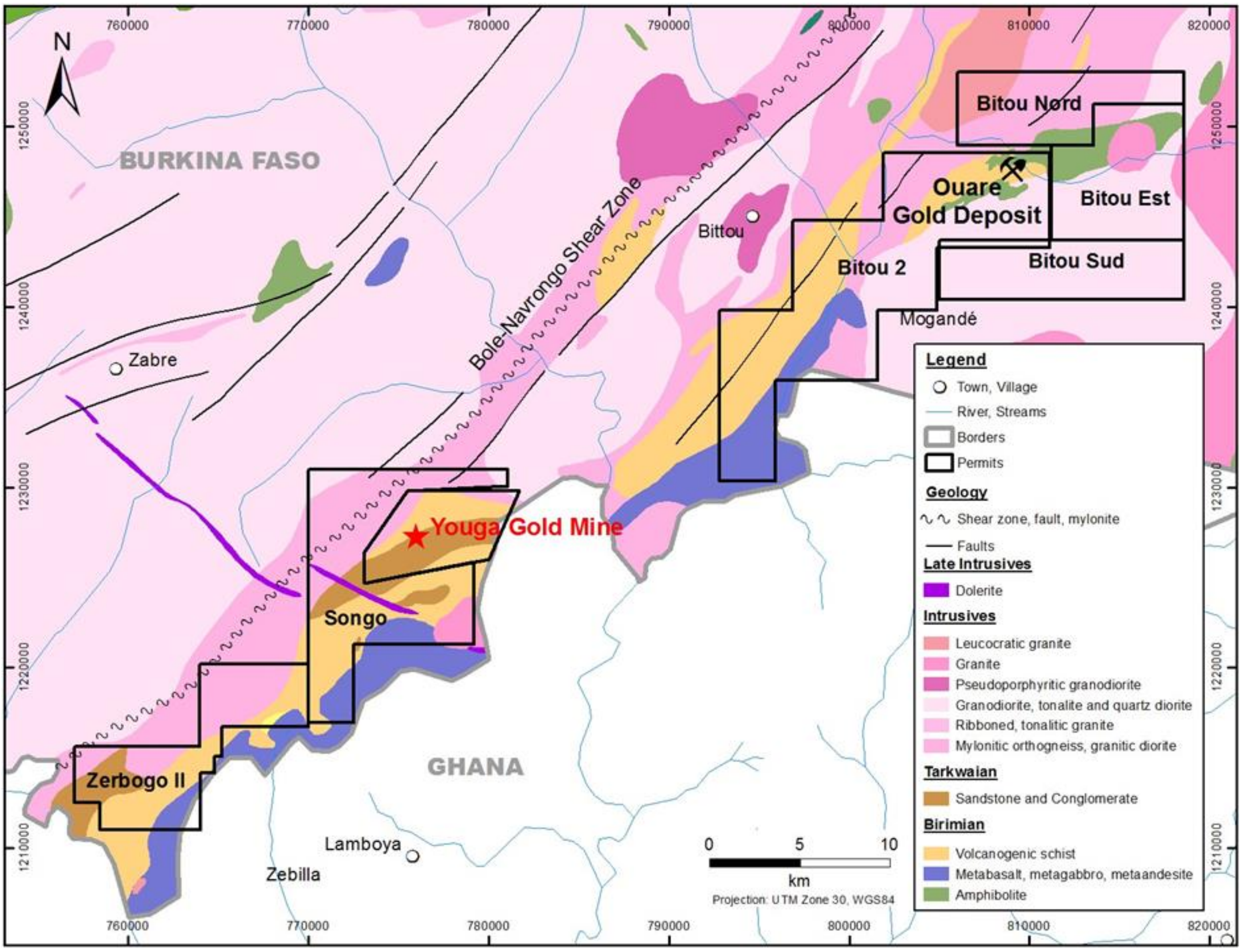


Figure 6: Youga Greenstone Belt geology and structure

Source: Endeavour, 2015

7.3 Project Geology

7.3.1 Youga Geology

The Tarkwaian outlier, which hosts most the Youga gold deposits (Figure 7), is comprised of a succession of arkosic sandstones consisting of quartz and feldspar in roughly equal proportions.

Bands and lamellae of detrital magnetite are evident, particularly at or near the lower contact of coarse units; otherwise no distinctive bedding is evident. The arkoses are intercalated with thin subordinate chlorite schists. The chlorite schists have been identified in mapping by various geologists as volcanic horizons, mafic dykes and as fine-grained sediments; definitive confirmation for the provenance of these units has yet to be undertaken, and they are typically un-mineralised.

Conglomerates occur in very different settings within the arkosic sequences, and their components have extremely variable size and composition. Pebble composition within the boulder conglomerate is mostly (if not exclusively) granitoid, with quartzite being the rare exception. The strongly rounded shape of granitoid pebbles is most probably related to weathering before transport and deposition, rather than a long transport distance being the predominant factor.

The Zergoré sequence is an inlier within the Birimian, located east of the Tarkwaian domain (Figure 7), and is characterised by rocks that are predominantly pelitic in composition with variably sized arenitic and silty intercalations. The sequence is characterised by sedimentary structures such as slumping and "rip-up" clasts within the matrix-supported conglomerate units. The Zergoré unit may be considered as a faulted segment of the lowermost part of the Tarkwaian basin, or an individual small Tarkwaian basin formed to the east of the main basin.

The Youga volcanogenic schists are representative of the area south and to the west of the Tarkwaian Basin, more commonly exposed in the Songo and Zerbogo II licences. These sequences are composed of andesites, volcanoclastics, poorly bedded pelitic sequences and minor intercalated cherty layers. Abutting these units to the south are packages of more mafic metabasalt and metagabbroic units (Figure 6).

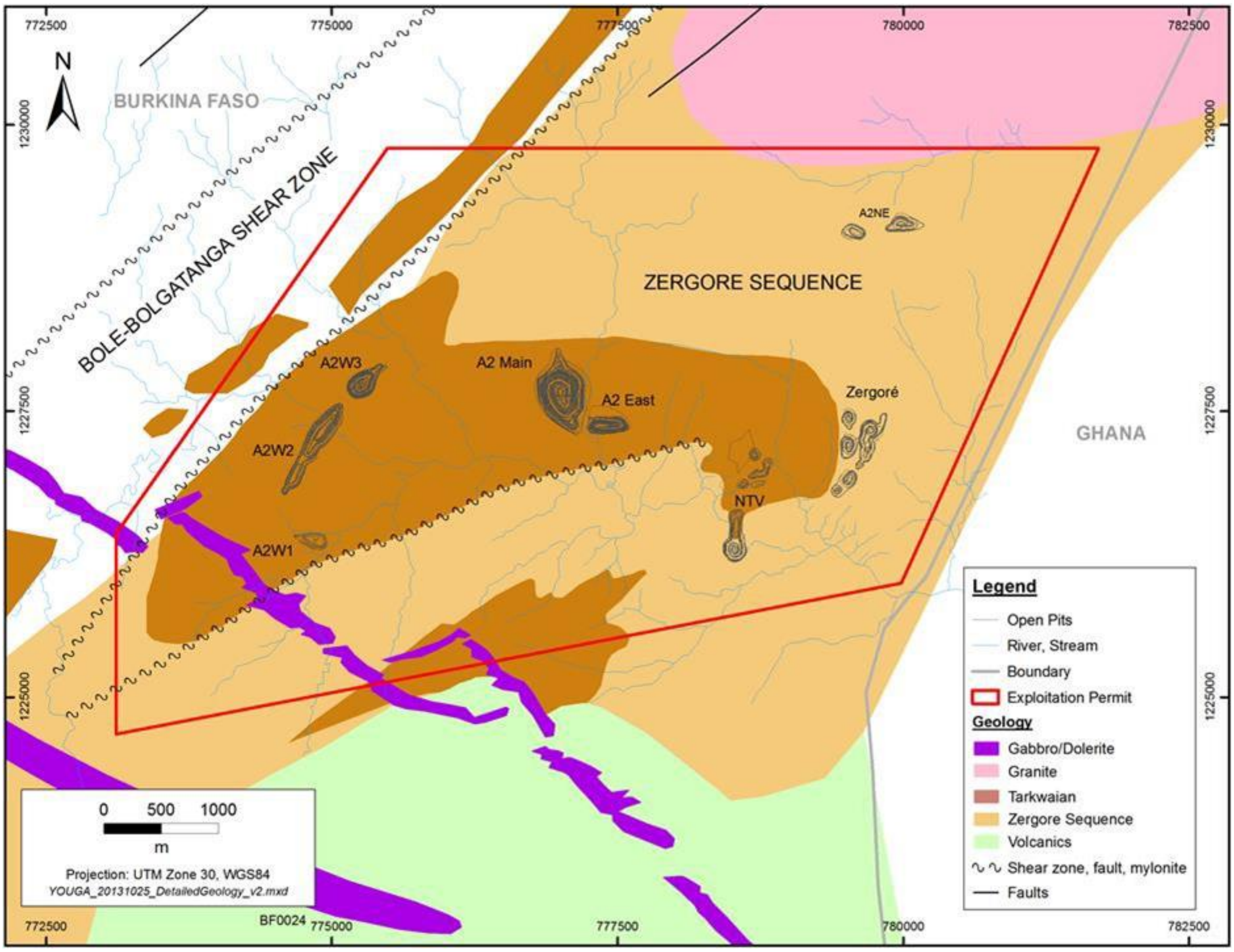


Figure 7: Youga permit geology and structure

Source: Endeavour, 2015

7.3.2 Ouaré Geology

Ouaré is located within a Birimian package of volcanogenic schists dominated by:

- An intermediate to mafic volcanic unit dominantly composed of basalt with associated andesite, gabbro and dolerite.
- A gabbro unit associated with diorite, basalt, amphibolite and andesite.

- A felsic unit composed of quartz-feldspar porphyritic rocks associated with tonalite, granite and quartz diorite intrusions. These rocks (100 m to 500 m wide, west to east trending) occur in the central part of the mapped area.
- Orthogneiss, mylonitic, granitic to dioritic, in the northern portion of the mapped area.
- A granodiorite unit with tonalite and quartz diorite in the southern portion (Figure 8).

Minor mafic dykes have been observed, as well as mylonites composed of quartz sericite schist and chloritic schist along faults.

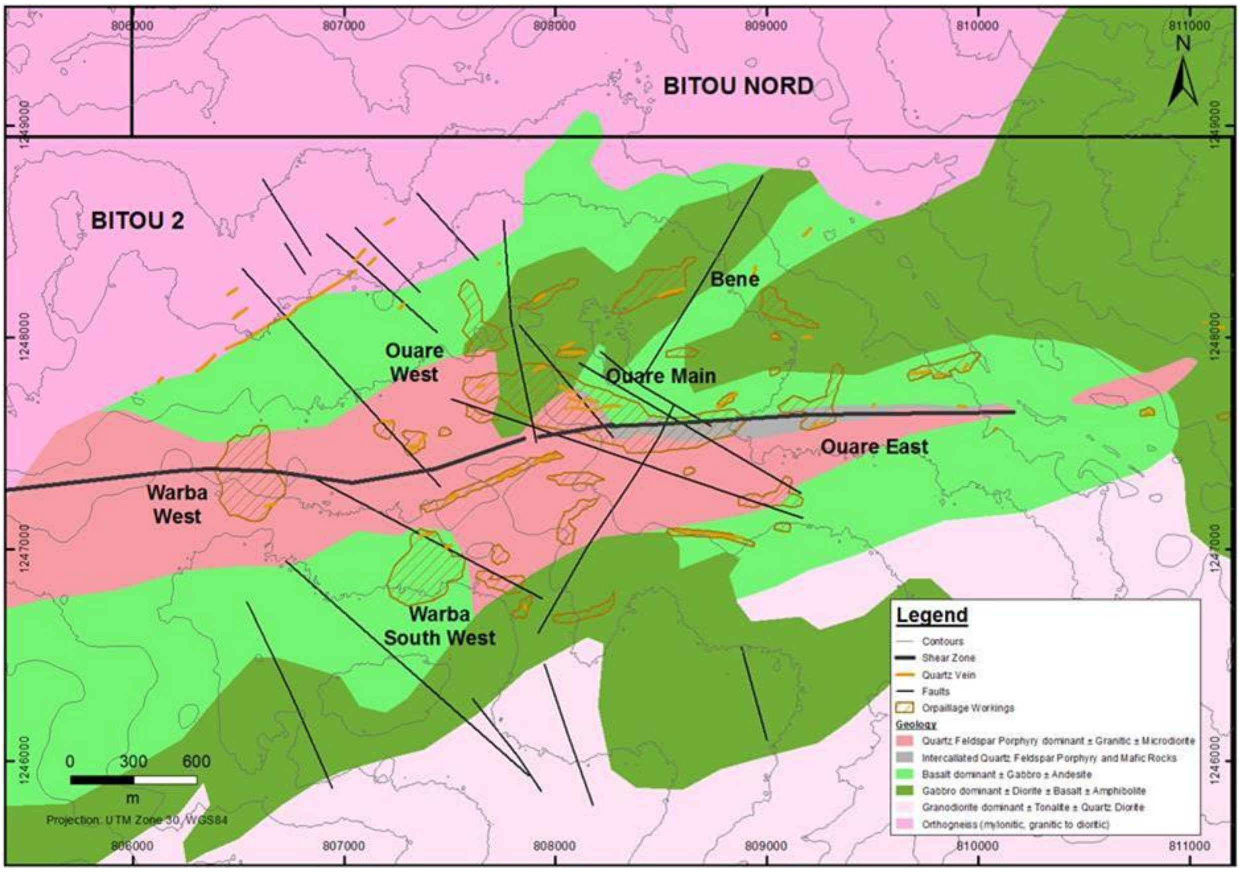


Figure 8: Ouaré deposit geology and structure

Source: Endeavour, 2015

7.4 Structure

7.4.1 Regional Structure

The Youga Greenstone Belt is bounded to the north by the Bole-Navrongo shear zone, which consists of a northeast-southwest trending deformation corridor that can be traced for more than 100 km.

7.4.2 Youga Structure

Mineralisation is almost exclusively associated with brittle deformation within the more competent arkosic sequences, with the strongly chloritised conglomerates absorbing strain in a more ductile manner.

Where the two lithologies are intercalated, as within the **A2NE** deposit, the arkosic units are strongly mineralised while the adjacent chlorite schists are effectively barren (although exceptions to this are reported). Figure 9 shows the arkosic unit and chloritic schist in a pit face in A2NE Pit, where ore was mined with a ROM grade of 3.5 g/t Au.

Figure 9: Arkosic unit (brown) within chloritic schist (grey), A2NE pit, 205 bench

In contrast, the most significant feature of the **Zergoré** unit is the widespread development of quartz veins at various scales, and the extreme folding with an apparent single axial planar schistosity. Kinking is widespread and is at the origin of the complex structural pattern. Figure 10 depicts drill core from Zergoré, showing intense structural deformation.

Figure 10: Drill core (YZ-11-39) from Zergoré, showing intense structural deformation

Source: BMC

The known orientations of the mineral deposits are described in Table 15 below. The project locations are presented in Figure 20.

Table 15: Youga mineral deposit known orientations

Deposit	Strike	Dip
Main Pit	NW-SE	50-75
East Pit	E-W	45
WP1	E-W	0-90
WP2	NE-SW	75
WP3	NE-SW	75
A2NE	E-W	75
Zergoré	NNE-SSW	55-75

7.4.3 Ouaré Structure

Two principal generations of structures, D1 and D2, were recognised:

- D1 is the earlier compressional strain event, forming a weak foliation, S1. S1 is oriented N300° to N315°, dipping towards the northeast and is presumed to be axial planar to an early F1 fold system.
- D2 represents the principal compressional deformation and produces a prominent regional S2 schistosity, the associated F2 fold set and the L2 mineral lineation. S2 schistosity varies in orientation from N205° to N110° and is moderately to steeply dipping towards the northwest. Fold hinges plunge moderately (40° to 45°) towards the northeast, sub-parallel to the L2 lineation.

The known orientations of the mineralised zones at Ouaré are summarised in Table 6 below.

Table 16: Ouaré mineral deposit known dimensions and orientations

Deposit	Strike	Dip
Ouaré Main	E-W	50-75
Ouaré Main NW	NW-SE	60-70
Ouaré East	E-W	50-75

7.5 Alteration

7.5.1 Regional Alteration

Regionally, rocks have been overprinted by amphibolite grade metamorphism, possibly related to contact metamorphism. The metamorphic minerals are typically aligned along a pervasive foliation fabric. A weak retrograde alteration (calcite+/-chlorite-muscovite) overprints most of the rocks.

7.5.2 Youga Alteration

The arkosic sequences are substantially modified by alteration, principally comprising; carbonate, sericite, haematite, chlorite, possibly albite and silica. Pervasive silicification and intense haematite developments are intimately associated with zones of quartz stockwork veining, intense fracturing, sulphide development and gold mineralisation.

The sulphide content is extremely low (generally <1%), comprised predominately of pyrite with trace amounts of arsenopyrite, chalcopyrite, pyrrhotite and galena. Fine euhedral pyrite is broadly disseminated throughout the arkosic lithologies, particularly within zones of mineralization and intense silicification, where it also selectively replaces the detrital magnetite laminae. Pyrrhotite, arsenopyrite and galena are more intimately associated with higher-grade mineralisation, particularly within zones of more intense quartz veining and silicification.

7.5.3 Ouaré Alteration

The lithologies are substantially modified by alteration, principally comprising carbonate, sericite, haematite, chlorite, possibly albite and silica. Pervasive silicification and quartz veining are intimately associated with gold mineralisation.

The sulphide content is moderate (generally 2% to 5%), and comprised predominately of pyrite with trace amounts of chalcopyrite, pyrrhotite and sphalerite. Fine euhedral pyrite is broadly disseminated throughout the lithologies, particularly within zones of mineralisation and intense silicification. Chalcopyrite and pyrrhotite are more selectively associated with higher-grade mineralisation, particularly within zones of more intense quartz veining and silicification.

7.6 Mineralisation Styles and Character

7.6.1 Youga Mineralisation

Within the **Youga deposit** there are two distinct styles of mineralisation:

- Moderately to weakly silicified arkose with quartz stockwork veining and pyrite is the predominant sulphide which generally grades between 0.5 g/t and 2 g/t.
- Intensely silicified arkose with abundant quartz veins and more diverse sulphides which generally grades >3 g/t.

Main Pit appears to represent a point at which a shear has refracted through a more competent arkosic sequence. The style of mineralisation is distinctly brittle in character, represented by irregular fracturing, quartz veining and occasional brecciation. The related A2 East mineralisation almost certainly reflects the same structure, but is developed within a conformable (070/45°N) setting within thin arkose units sandwiched between more ductile chlorite schist (conglomerate) horizons. Dominantly ductile deformation within the chlorite schist units has created more brittle fracturing and quartz veining of the adjacent arkose.

West Pit 1 and 2 superficially appear to be relatively straight forward. The deposits are aligned along a northeast trending, steeply southeast dipping structure that marks the approximate north-western extent of the Tarkwaian inlier. This orientation is also consistent with the immediately adjacent north-western margin of the Upper Birimian Bole-Navrongo Belt at this point.

Mineralisation associated with the **West Pit 2 and 3** deposits appears to be broadly conformable with both the regional fabric and lithology, confined to one or more arkosic units sandwiched between conglomerate lenses (chlorite schist units) like the **East Pit** deposit. There is, however, some evidence that the mineralisation (and therefore possibly structure) mildly transgresses lithology, with sporadic mineralisation developed within the chlorite schists themselves.

NTV is a similar style of mineralisation **Main** and **East Pit** and strongly related to pervasive silicification, quartz veining and sulphidation (mainly pyrite) of the arkose host rock, although the mineralisation is not as developed within these deposits. The Nanga deposit is a well-defined zone, steeply dipping to the east. The Tail deposit is less well constrained, trends east-west and dips shallowly to the north, while the Village target dips even more shallowly.

Zergoré mineralisation occurs off the eastern flank of the Tarkwaian basin and is structurally complex. Gold is hosted within sericitic and chloritic schists with only minor intercalations of arkose which are tightly folded along a roughly north-south hinge with steeply dipping limbs. Gold mineralisation is associated with quartz-veining and sulphidation (mainly pyrite) along numerous zones.

A2NE mineralisation also occurs off the Tarkwaian basin, has similar host rocks with similar alteration but is much less structurally complex than Zergoré. The A2NE deposit consists of several steeply, north dipping zones along an east-west trend (Figure 9 and Figure 11).

7.6.2 Ouaré Mineralisation

The Ouaré mineralisation is on the Bitou 2 Exploration Permit and has been delineated in three zones, along a strike length of 2 km.

At the **Ouaré** Main zone, mineralisation occurs as quartz veins within shear zones at the contacts between felsic and mafic volcanics. Orpailleur workings have been developed along mineralised structures in two orientations: 090° and 315°. The 090° portion of these workings have multiple parallel quartz veins along shears in an interpreted dilation zone. The 315° portion is interpreted as a 100 m wide deformation zone, terminating the 090° trend.

The gold mineralisation appears to preferentially follow the lithologic contacts between felsic volcanics and mafic volcanics, particularly within a shear zone of inter-layered quartz-feldspar porphyritic and intermediate to mafic volcanic rocks. Gold mineralisation appears to be confined to a major 090° trending deformation corridor of dextral strike slip. Figure 12 shows mineralised core from Ouaré.

Figure 11: Mineralised core at A2NE, core shown averaging 3.7 g/t, highest grade is in the first 3 m of the lower core tray including 21 g/t between 32.15 m and 32.5 m

Source: BMC

Figure 12: Mineralised core from Ouaré, averaging at approximate 4.5 g/t, increasing in grade towards the lower core tray, including 8.4 g/t between 74 m and 78 m

Source: BMC

8 Deposit Types

8.1 Deposit Style

The Youga and Ouaré gold deposits can be described as epigenetic, mesothermal ("lode") gold deposits, demonstrating a strong structural control. Gold mineralisation is intimately associated with pervasive silicification, quartz veining and sulphidation (predominantly pyrite), although sulphide content is extremely low (generally <1%).

The majority of the Youga gold deposits are hosted within the Tarkwaian sandstones, while Ouaré is hosted along the sheared contact between mafic volcanics to the north and quartz-feldspar porphyritic rocks to the south.

8.2 Exploration Concept

CSA Global notes that surface geochemical data accompanied by geophysical surveys and followed by trenching and drill testing has been successful at identifying, evaluating and developing the Mineral Resources at Youga and Ouaré. There remain several exploration targets within the Youga and Ouaré licences that appear to have significant potential. However, there also appears to be a general insufficiency of data (e.g. surface mapping, structural mapping, downhole structural data, sectional interpretations etc.) to constrain the structural and mineralisation model at a local scale. This inhibits the effective estimation of the Mineral Resource at these exploration targets.

9 Exploration

This section relating to pre-MNG exploration has been modified from Endeavour (2015). The Qualified Persons take responsibility for the content of this section and believe it is accurate and complete in all material aspects.

9.1 Overview

Extensive exploration was undertaken during Endeavour's evaluation of the Youga and Ouaré project areas between 2003 and 2016 (known as Etruscan until 2010). MNG have conducted exploration since ownership of the projects were transferred to them in 2016.

Geochemical data, used in conjunction with the available geophysical survey and geological mapping, was used in the delineation of gold mineralisation targets within the mine area for advancement. The higher order geochemical anomalies were trenched and drilled by Endeavour, but potential exists to identify additional gold mineralisation either proximal to the currently defined deposits, by additional drilling of known mineralised structures both along strike and down dip/plunge, or by advancing lower order targets in the work carried out by Endeavour.

Consultants and contractors were engaged by Endeavour for various exploration activities including; geophysical surveys, structural mapping, drilling, and assaying. Table 17 summarises the contractors and consultants engaged by Endeavour in their managed exploration programs.

Sampling quality and methods and survey procedures appear to be appropriate and representative. There is intrinsic sample bias and/or potential for contamination associated with soil, grab and auger sampling; however, these datasets have not been used in the estimation of Mineral Resources and are for indicative and/or exploration purposes.

MNG undertook a ground magnetic survey at Youga, followed up by trenching and minor grab sampling. At Ouaré, 222 soil samples have been taken, an auger programme drilled and a ground magnetic survey completed by MNG.

Table 17: Summary of contractors and consultants engaged by Endeavour

Activity	Consultant
Airborne geophysics	Fugro Airborne Surveys (Pty) Ltd Terrascan Airborne
Ground geophysics	Sagax Afrique S.A.
Geophysical interpretation	Bob Gillick
Structural mapping	EcoTerra NPA Fugro Ltd. SRK Consulting (Canada) Inc.
Geology	D. R. Duncan & Associates Ltd. Taiga Consultants Ltd.
Petrography	P. M. Nude Panterra Geoservices Inc.
Analytical laboratories	ALS Bamako (formerly Abilab) SGS Ouagadougou
RC drilling	Boart Longyear Inc. West African Drilling Services Forages Technic-Eau Foraco Burkina Faso
Diamond drilling	Boart Longyear Inc. West African Drilling Services African Mining Services Foraco Burkina Faso
Downhole wireline logging	LIM Logging
Database review and Resource estimation	RSG Global (now Coffey) AMEC International
Geotechnical	Golder Associates Inc. SRK Consulting (South Africa) Inc.
Mineral Reserve Estimation	MDM Ferroman SEMS Exploration MICON International Limited

9.2 Soil Geochemistry

Both permits were extensively covered with soil geochemistry during Endeavour's management of the projects. Initially the regional (800 m x 100 m) and semi-regional (200 m x 100 m) scale sampling was followed by detailed (100 m x 25 m) sampling over selected areas in Youga (Figure 13) and Ouaré (Figure 14). MNG completed a soil sampling programme of 222 samples on the Bitou Sud exploration permit in June 2016.

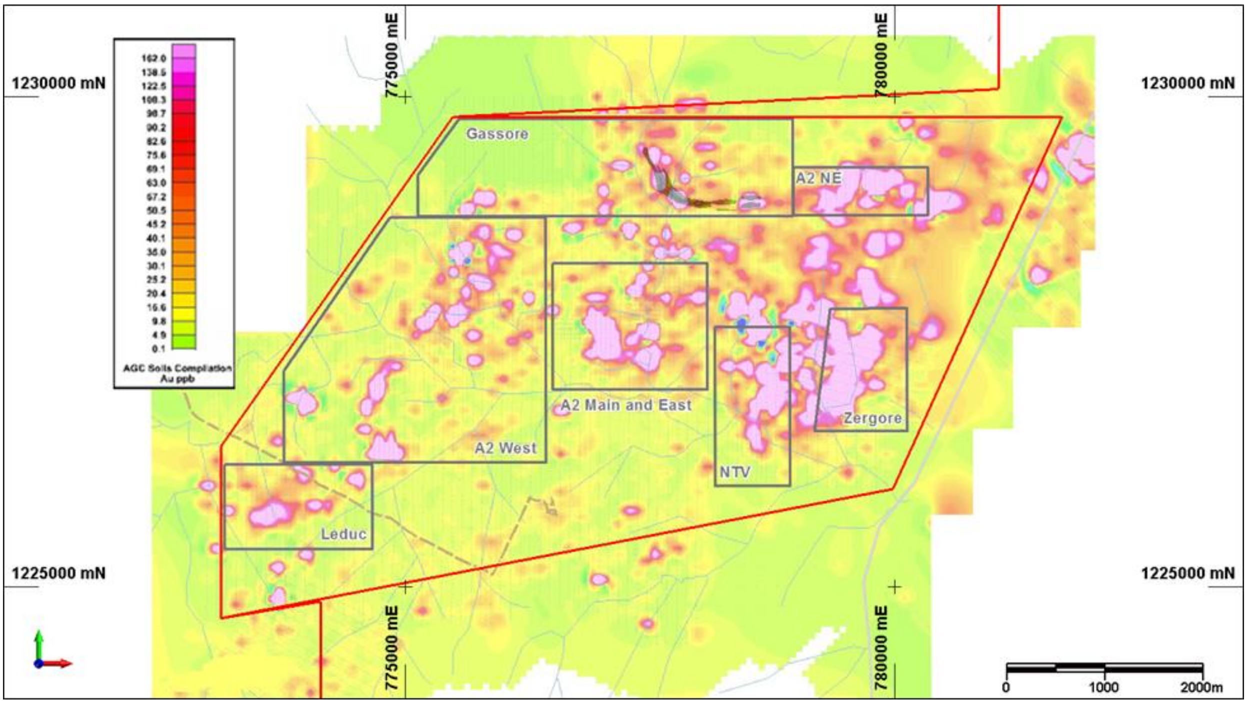


Figure 13: Regional soil geochemical survey over the Youga Exploitation Permit (Au in ppb), Endeavour (2015)

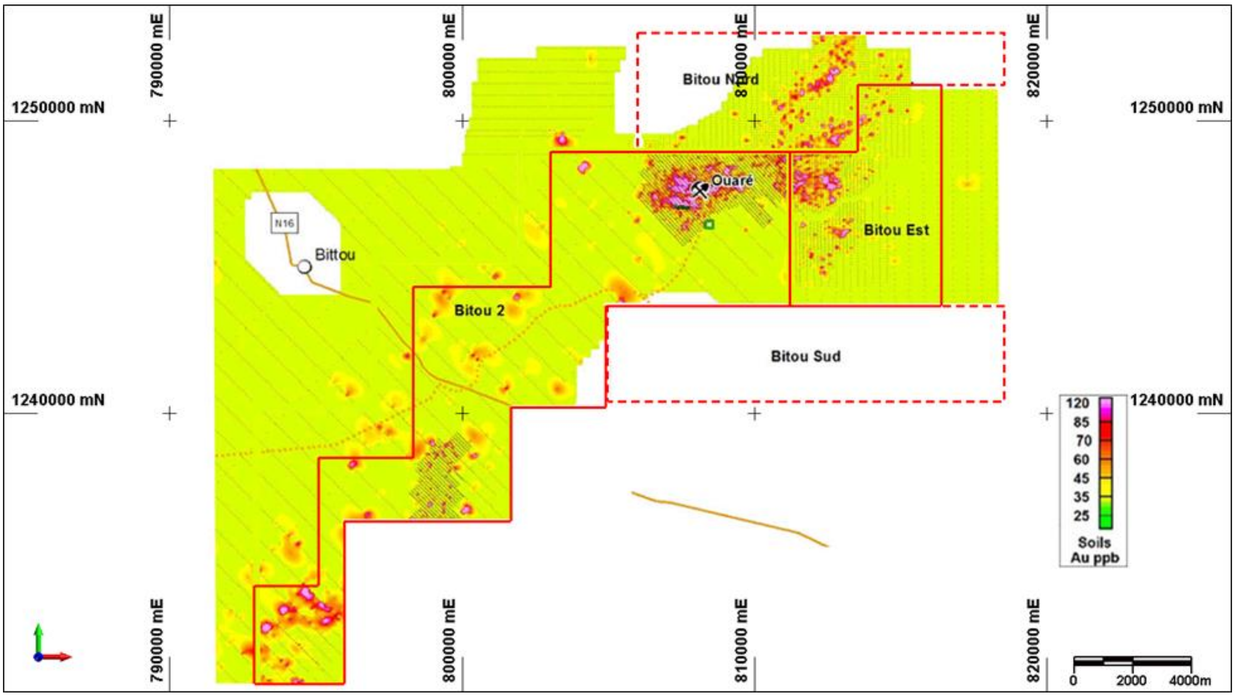


Figure 14: Regional soil geochemical survey over the Ouaré Exploration Permits (Au in ppb). Permits shown with dashed red lines have been re-applied for (MNG, 2015).

9.3 Magnetic and Radiometrics Surveys

In May 2004, Fugro Airborne Surveys (Pty) Ltd completed a detailed aeromagnetic and radiometric data survey for Endeavour, over the Youga permits along flight lines (145°) spaced at 50 m, with a tie-line spacing of 500 m (Figure 15).

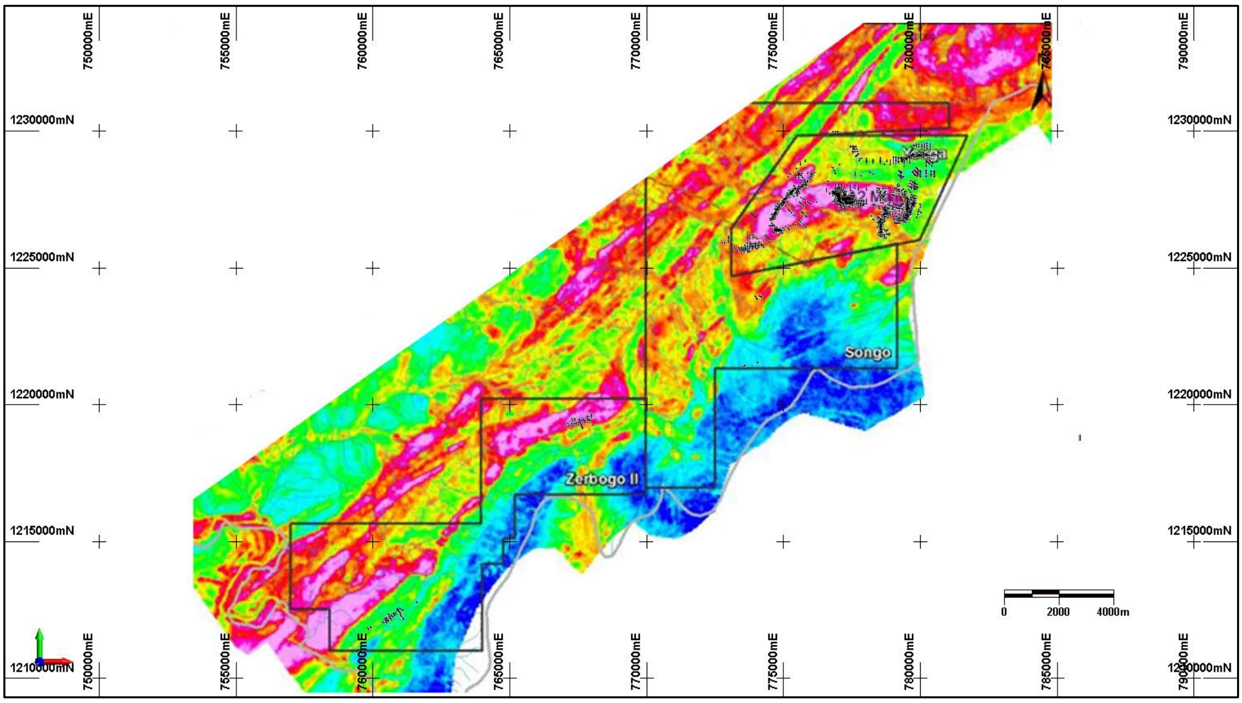


Figure 15: Reduced to Pole aeromagnetic survey at Youga (old licences are outlined in black), (Endeavour, 2015)

This survey was superseded in 2016, when MNG undertook a detailed ground magnetic survey, totalling 1,591 km and covering 87 km^2 (Figure 16).

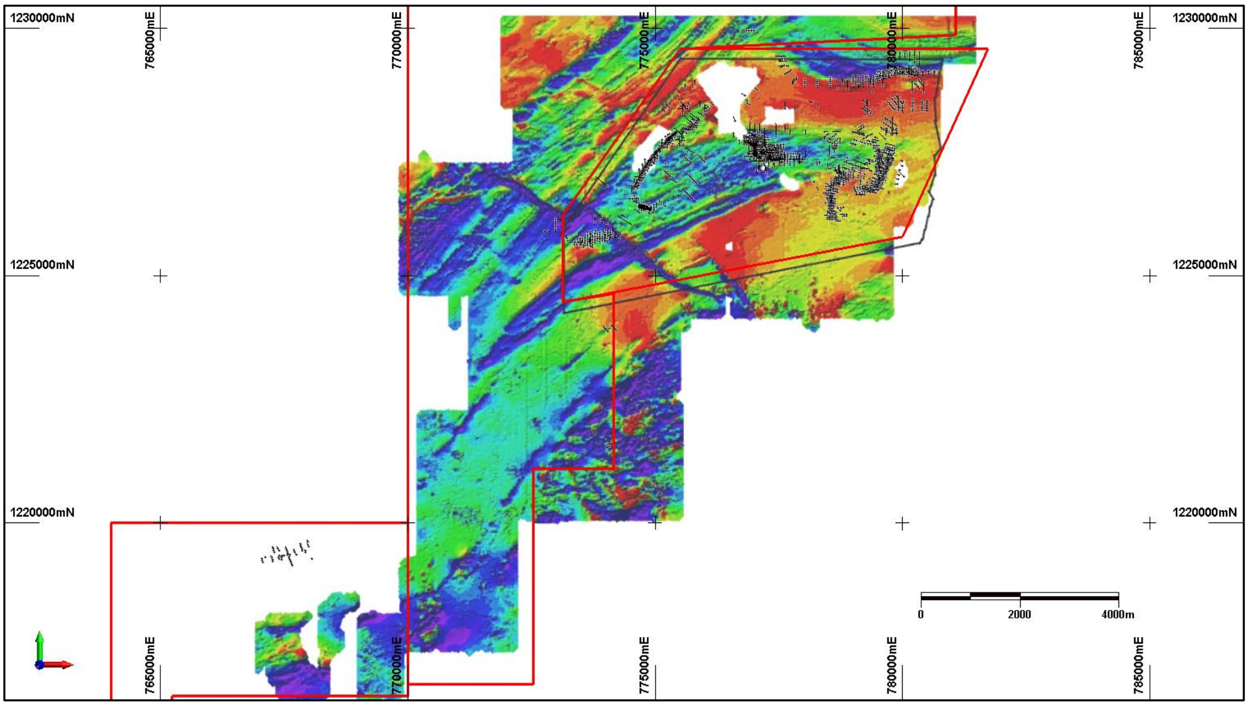


Figure 16: 2016 ground magnetic survey, reverse TMI (current licences outlined in red), (Endeavour, 2015)

MNG commenced a ground magnetic survey at Ouaré in March 2017 and at the time of reporting, this information is not available to CSA Global for review.

9.4 Induced Polarisation

During 2004 and 2005, Sagax Afrique S.A. completed a gradient IP survey on behalf of Endeavour, which covered a large part of the Youga Exploitation Permit (Figure 17) and the northern part of the Bitou 2 permit (Figure 18), over the area surrounding the Ouaré deposit. The survey was completed at a line spacing of 100 m, at various line orientations, and with sampling intervals of 25 m.

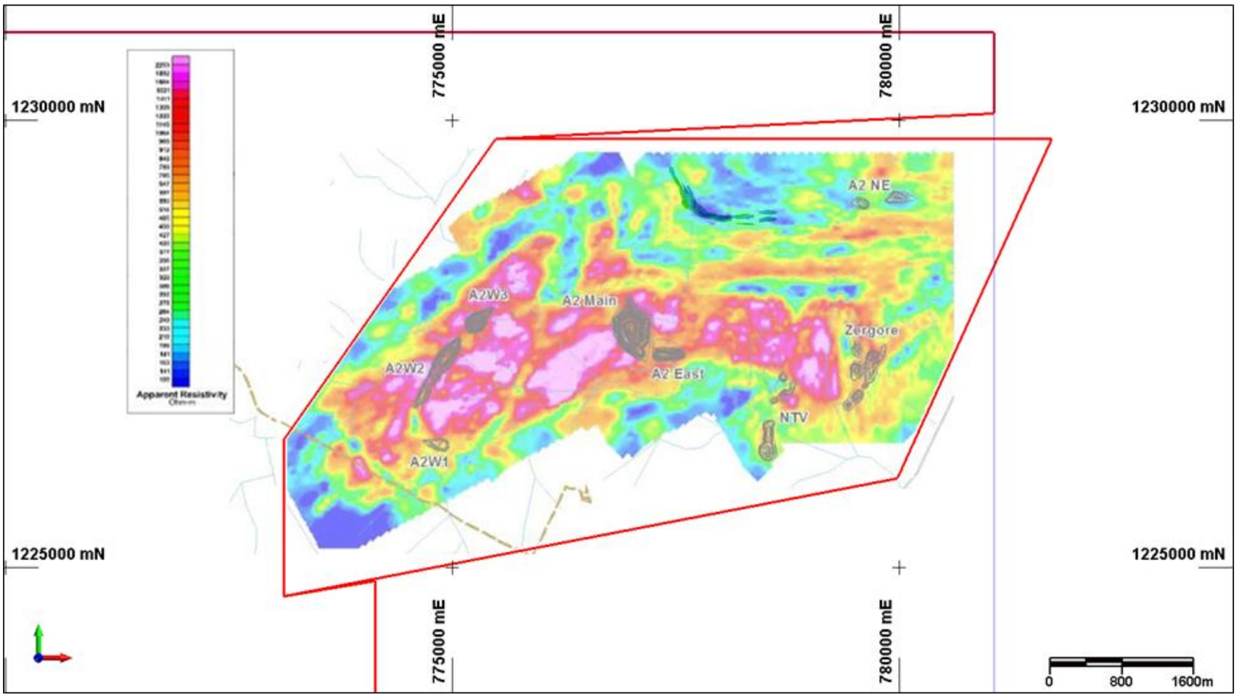


Figure 17: Apparent resistivity from the 2004-2005 gradient array IP survey at Youga, (Endeavour, 2015)

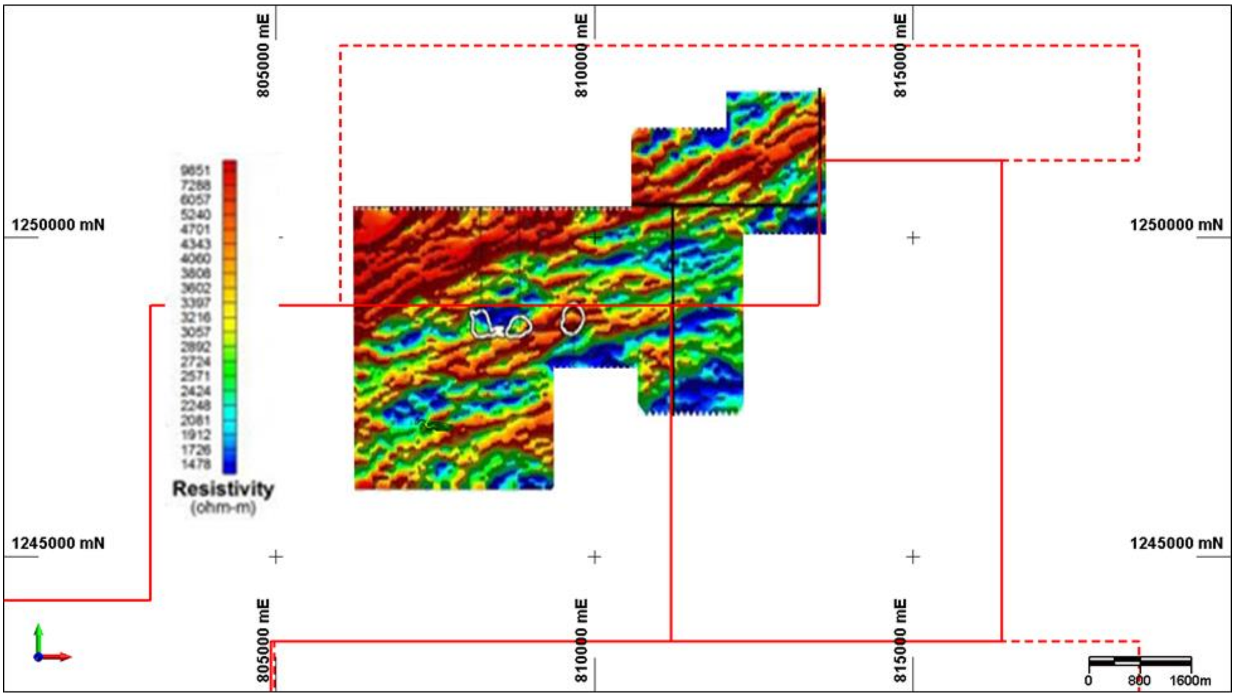


Figure 18: Apparent resistivity from the 2004-2005 gradient array IP survey at Ouaré. Outdated licences outlined in black, current licences in red (dashed have been reapplied for). (Endeavour, 2015)

9.5 Auger Geochemistry

MNG completed an auger drill programme on the Bitou Nord permit in June 2016. A total of 1,386 holes were augered, with an average depth of 2.4 m for a total of 3,386 m.

9.6 Trenching

A significant number of trenches have been excavated across the Youga and Ouaré Projects. There are 871 trenches with a total of 59,574 m in the Youga database and 67 trenches (7,556 m) in the Ouaré database. Most of these trenches were excavated prior to MNG's ownership of the project, with only MNG-T001 to MNG-T008 (711 m) being completed by MNG. Trenches were channel sampled at either 1 m or 2 m intervals.

MNG excavated trenches in WP3E (5 trenches), Gassore East (8 trenches), Gassore West (4 trenches) and Waste Dump East (4 trenches) in 2017. The trench data were not included in the database handed to CSA Global and therefore their results are not included in this data review.

10 Drilling

10.1 Overview

Data reported here is a compilation of drilling completed at both the Youga and the Ouaré projects. The Youga Project has experienced several acquisitions, option agreements and joint ventures as detailed in Section 6. In summary:

- 1991 to 1999: Exploration works were restricted to Youga and undertaken by Incanore, IGR and Echo Bay
- 1999 to 2003: Exploration works included Ouaré and were operated by Ashanti
- 2003 to 2016: Exploration works were undertaken by Endeavour (known as Etruscan until 2010) following their acquisition of both projects
- 2016 to present: MNG owns and operates the Youga and Ouaré projects.

MNG finalised their acquisition of the Youga and Ouaré from Endeavour in April 2016. Discussion and review of the data has for the purposes of clarity been presented separately under separate subheadings, chapters and tables.

10.2 Drilling Summary

10.2.1 Youga Project Drilling Summary

Trenches, rotary air blast (RAB), RC and diamond drilling were completed during the various exploration stages carried out by IGR, Ashanti/Echo Bay, Etruscan and Endeavour.

Drill data collection procedures can be subdivided into three distinct periods of exploration:

- Pre-2000: Relates to data collected as part of Incanore's and IGR's exploration management and programs executed under the management of the Echo Bay and Ashanti joint venture
- 2003 to April 2016: Relates to data collected under work programs managed by Endeavour
- April 2016 to present: Relates to data collected under MNG management.

Exploration activities and data collection methodologies applied during the initial period are based on information compiled in Ashanti's 1999 databases and discussed in the Ashanti feasibility study completed in 1999 (Lycopodium, 1999). Activities during 2003 to April 2016 are based on information from the 2015 Endeavour Technical Report. Post April 2016 activities are based on information provided by MNG and on the Qualified Person's site visit.

Figure 19 below depicts the Exploration and Youga Exploitation Permit areas in red and the Project areas in blue. The Project areas are shown in more detail in Figure 20, Figure 21 and Figure 22.

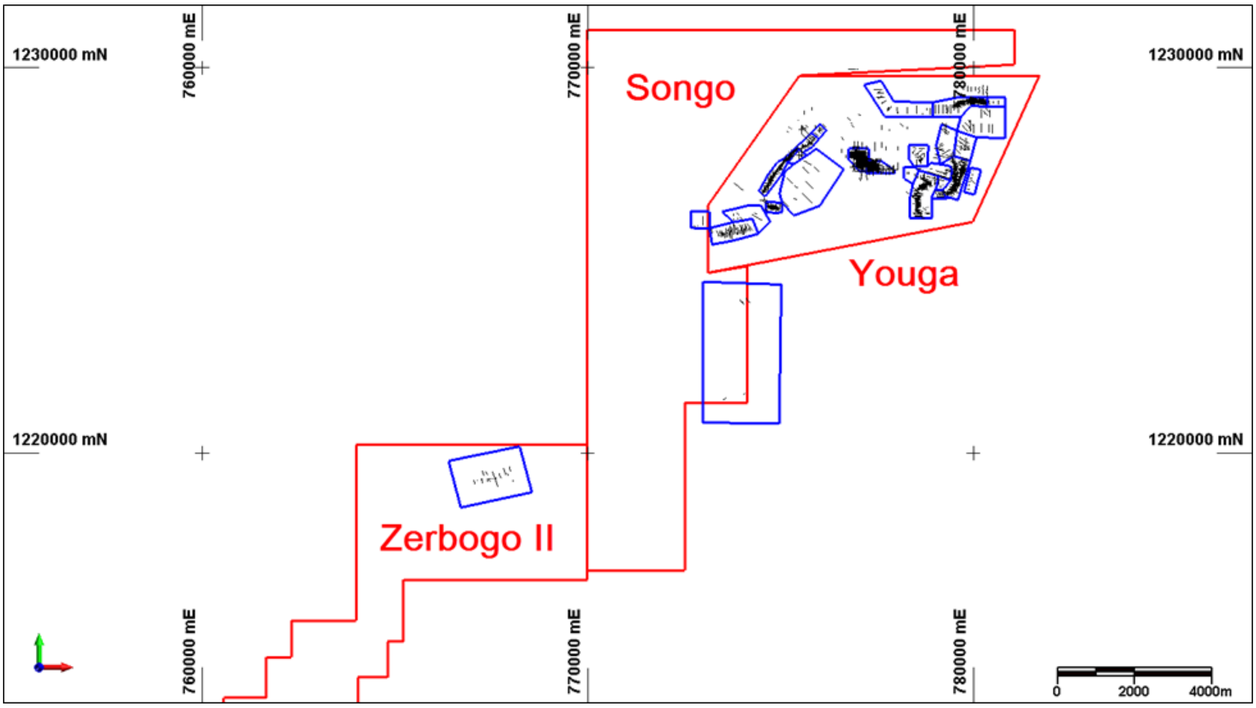


Figure 19: Permit areas (red) and Project areas in blue (CSA Global, 2017)

Table 18 summarises the drilling by exploration phase as at 31 December 2014 (excluding grade control drilling and RAB).

Table 18: Summary of Youga drilling statistics

Company	Diamond		RC		Trench	
	No. of holes	Metres	No. of holes	Metres	No.	Metres
Ashanti/Echo Bay	129	20,048	298	18,219	210	30,554
Endeavour	355	43,738	1,133	101,077	86	5,266
Total	**484**	**63,786**	**1,431**	**119,296**	**296**	**35,820**

Note: Drill totals include exploration/resource drilling only and do not include grade control holes.
Source: 2014 Endeavour Report

Table 19 lists the drilling completed by MNG as at May 2017, per project area and hole type. A total of 12,027 metres of drilling (excluding trenches) have been completed by MNG since April 2016. However, many of these data have not been included in the data transfer to CSA Global as they were drilled after the cut-off date. Only the A2NE holes were include in the data transfer (RC holes are sterilization drill holes).

Table 19: Summary of Youga drilling statistics completed by MNG

Project area	Diamond		RC	
	No. of holes	Metres	No. of holes	Metres
A2NE	67	3,716	16	1,766
WP5	34	2,789		
WP3	14	977		
Gassore	27	2,779		
Total	**142**	**10,261**	**16**	**1,766**

Drillhole codes and descriptions are listed in Table 20 below.

Table 20: Youga drillhole types

Code	Hole type
BH	Blast hole
BHGC	Blast hole (grade control)
DD	Diamond drillhole
GT	Geotechnical
MET	Metallurgical
OTR	Other
RC	Reverse circulation
RCDD	RC pre-collar, diamond tail
RPL	Ripline
TR	Trench

Table 21 lists the drilling by project area and by hole type, including grade control drillholes. No date or company data were provided with the export and therefore this table has not been subdivided by exploration phase. RAB hole data were not included in the database. A significant amount of drilling has been completed across the projects:

- 500 DD holes for 61,731 m.
- 11,184 RC drill holes for 381,451 m (includes GC drilling).
- 855 Trenches for 57,637 m.

In general, drillhole spacing varies between 18 m and 25 m x 25 m within resource areas.

Figure 20 shows a plan view of the drilling completed on the Youga Project area. Figure 21 and Figure 22 show the project areas in more detail (excluding Songo and Zerbogo).

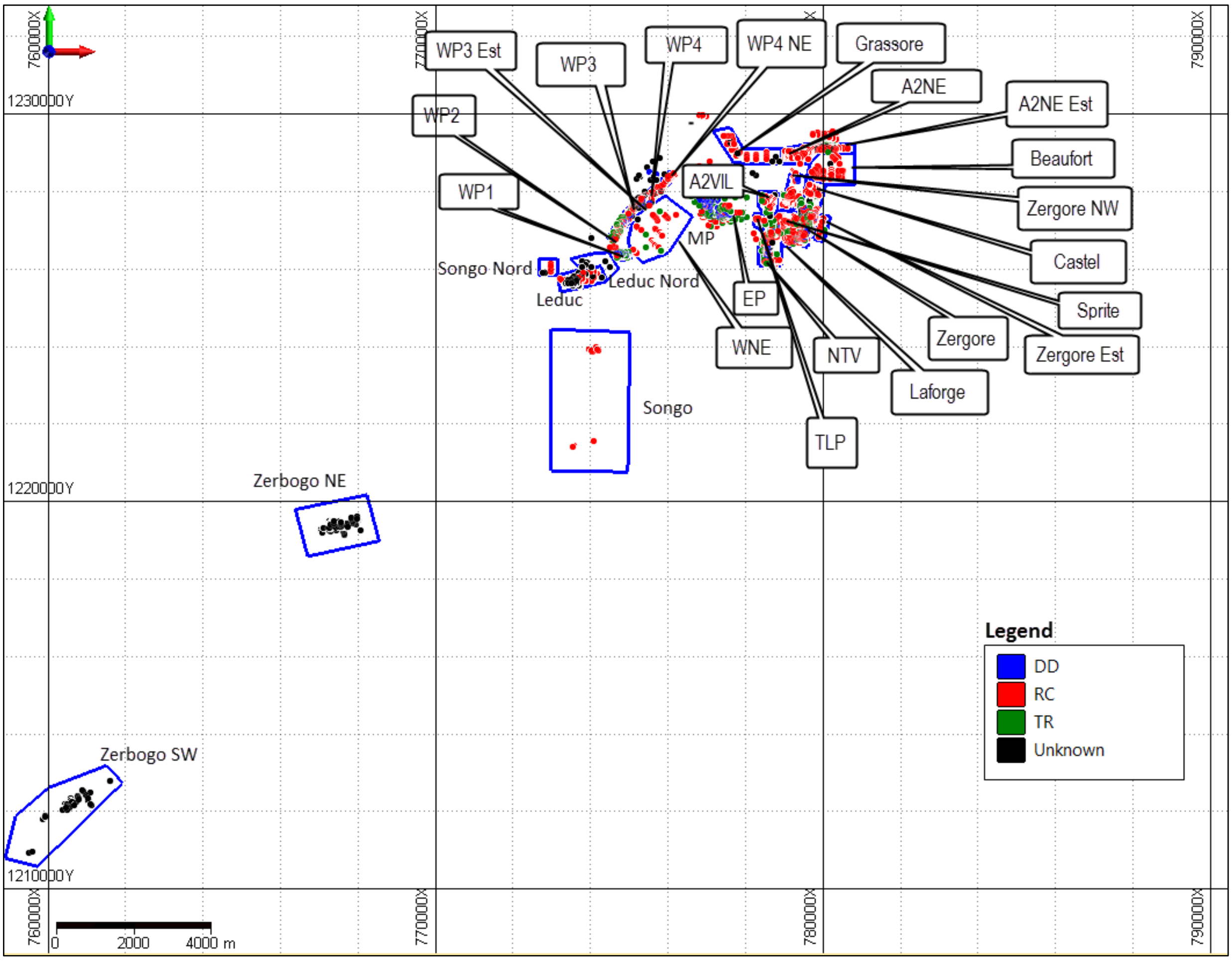


Figure 20: Youga drilling (project area and drill type)

Table 21: Summary of Youga drilling statistics by project

Project	DD		RC		TR		RCDD		BH		BHGC		GT/MET		OTR		RPL	
	Count	Total (m)	Count	Total (m)	Count	Total (m)	Count	Total (m)	Count	Total (m)	Count	Total (m)	Count	Total (m)	Count	Total (m)	Count	Total (m)
A2NE	67	3,716	269	21,301	220	18,850												
A2NE EST			8	800														
A2VIL			23	1,709	11	1,006												
Beaufort			76	4,677	1	230												
Castel			24	2,400	5	975												
EP	53	6,643	1,595	50,460	166	5,991	7	1,533										
Gassore			36	3,604	6	616												
La Forge			22	1,844	1	196												
Leduc			72	7,408	8	1,500												
Leduc Nord					7	775												
MP	157	29,760	4,855	130,146	186	8,609	8	2,287					1	379				
NTV	45	4,582	397	22,157	39	3,052												
Songo			9	769														
Songo Nord			5	407	2	80												
Sprite			26	2,236	7	748												
TLP Est			14	428	1	75												
TLP Ouest			6	465	1	70												
WNE			31	2,497	4	532												
WP1	43	2,468	848	21,420	15	1,942												
WP2	9	820	932	27,002	41	2,907			198	1,980							4	54
WP3	15	1,521	764	22,007	36	642									10	600	5	100
WP3 Est	2	259	6	745	2	26									4	850		
WP4			99	5,096	15	1,342									2	524		
WP4-NE			12	1,180											2	250		
Zerbogo NE			10	765	7	157												
Zerbogo SW			32	2,127	7	1,165												
Zergoré EST			6	600	1	154												
Zergoré NW	2	294	52	3,385	9	867												
Zergoré (ZGP)	107	11,668	955	43,816	57	5,130			257	2,549	175	1,750	2	180			85	3,456
Total	**500**	**61,731**	**11,184**	**381,451**	**855**	**57,637**	**15**	**3,820**	**455**	**4,529**	**175**	**1,750**	**3**	**559**	**18**	**2,224**	**94**	**3,610**

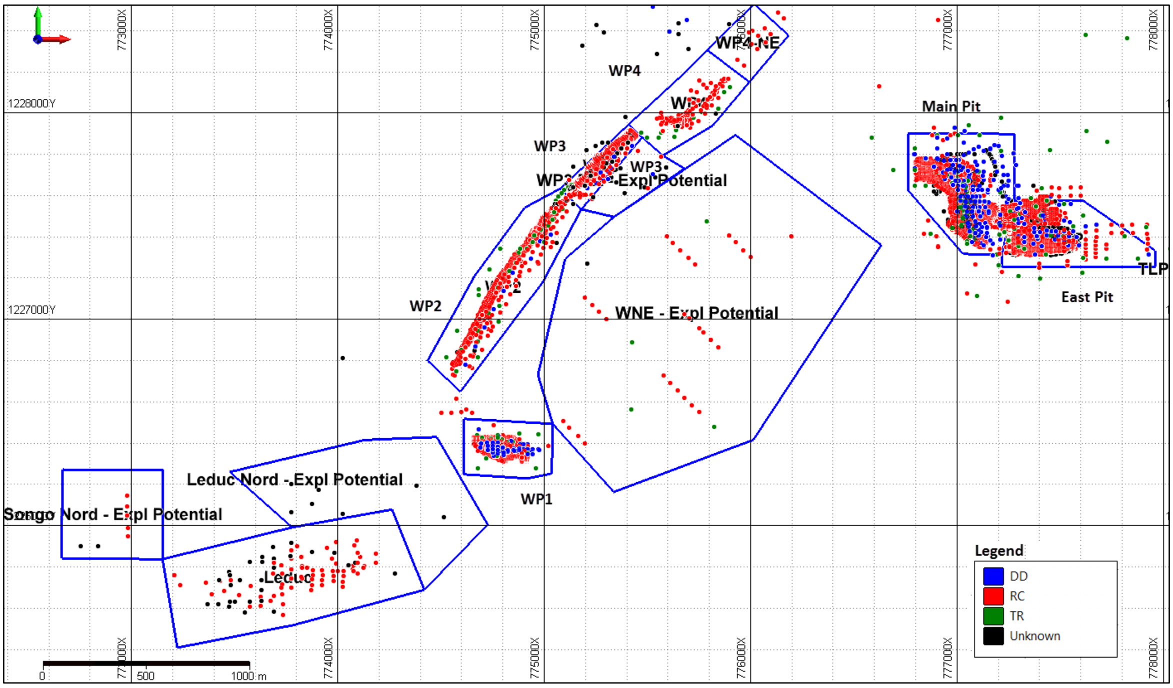


Figure 21: Youga drilling – project area and drill type (West Pits, Leduc, Main Pit and East Pit)

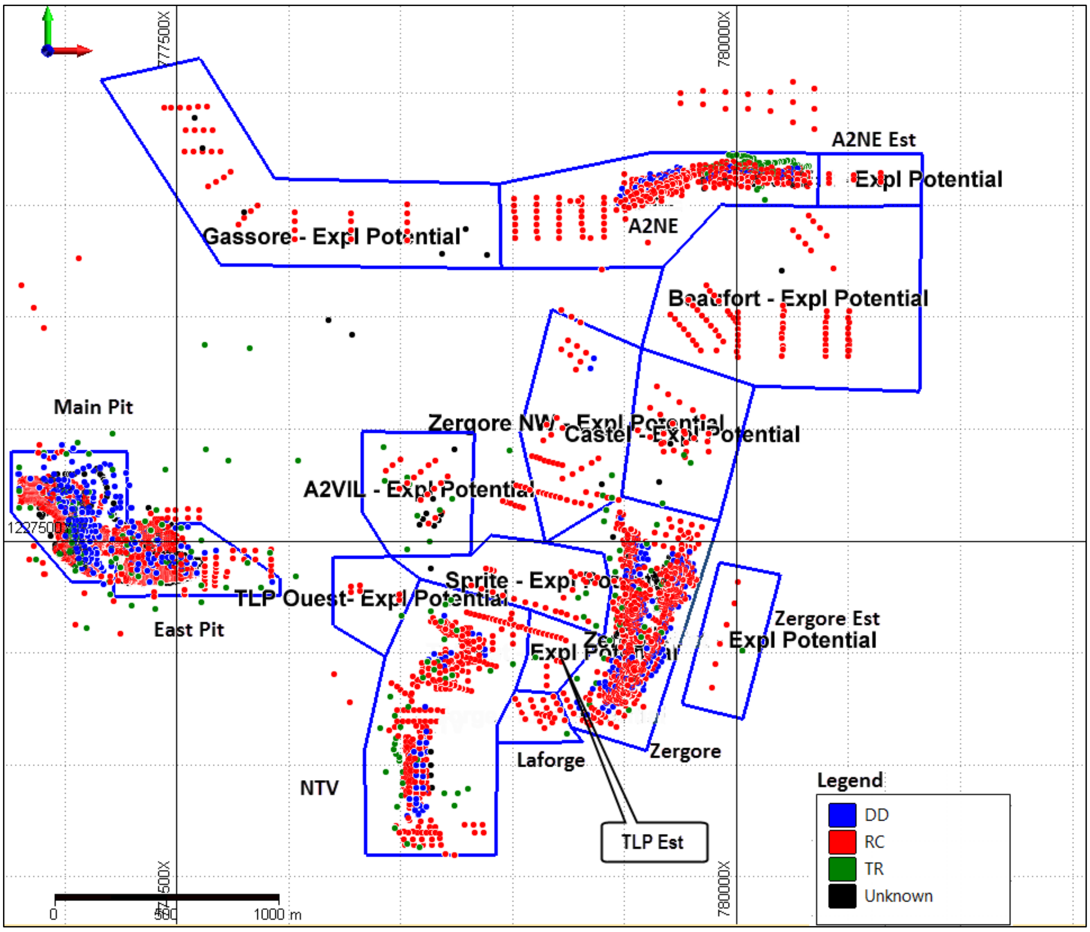


Figure 22: Youga drilling – project area and drill type (MP, EP, Zergoré, A2NE, TLP, NTV, Laforge, Castel, Sprite, Beaufort and Gassore)

The drilling at Youga was targeted normal to the plane of the principal mineralised orientation ensuring the optimum angle of intersection (Table 22). Scissor holes, drilled back in the opposite sense, have also been completed on each deposit to ensure the proper orientation.

Table 22: Youga mineralisation and drilling orientation by zone

Domain	Mineralisation		Drilling	
	Strike	Dip	Azimuth	Dip
A2 Main	N-S	Moderate to Steep E	270°	-45° to -50°
A2 East	E-W	Moderate to Steep N	180°	-45° to -50°
A2 West Zone 1	E-W	Shallow to Moderate N	Vertical, 180° and 270°	-40° to -50°
A2 West Zones 2 and 3	NNE-SSW	Steep SE	300° and 310°	-40° to -50°
Nanga	N-S	Steep E	270°	-50°
Tail	E-W	Shallow to Moderate N	180°, 105° and 285°	-50°
A2NE	E-W	Steep N	180°	-50° to -55°
Zergoré S and NE	NNE-SSW	Near Vertical	280° and 300°	-45° to -55°
Zergoré NW	NNW-SSE	Near Vertical	280° and 300°	-45° to -55°

Source: Endeavour 2015 Report

10.2.2 Ouaré Project Drilling Summary

Drilling on the Ouaré Exploration Permits can be separated into campaigns (by ownership) and by project area. Figure 23 below depicts the Exploration Permits in red and the Project Areas in blue. The dashed red lines show permits which have lapsed, but have been reapplied for. Drill holes are depicted by black dots.

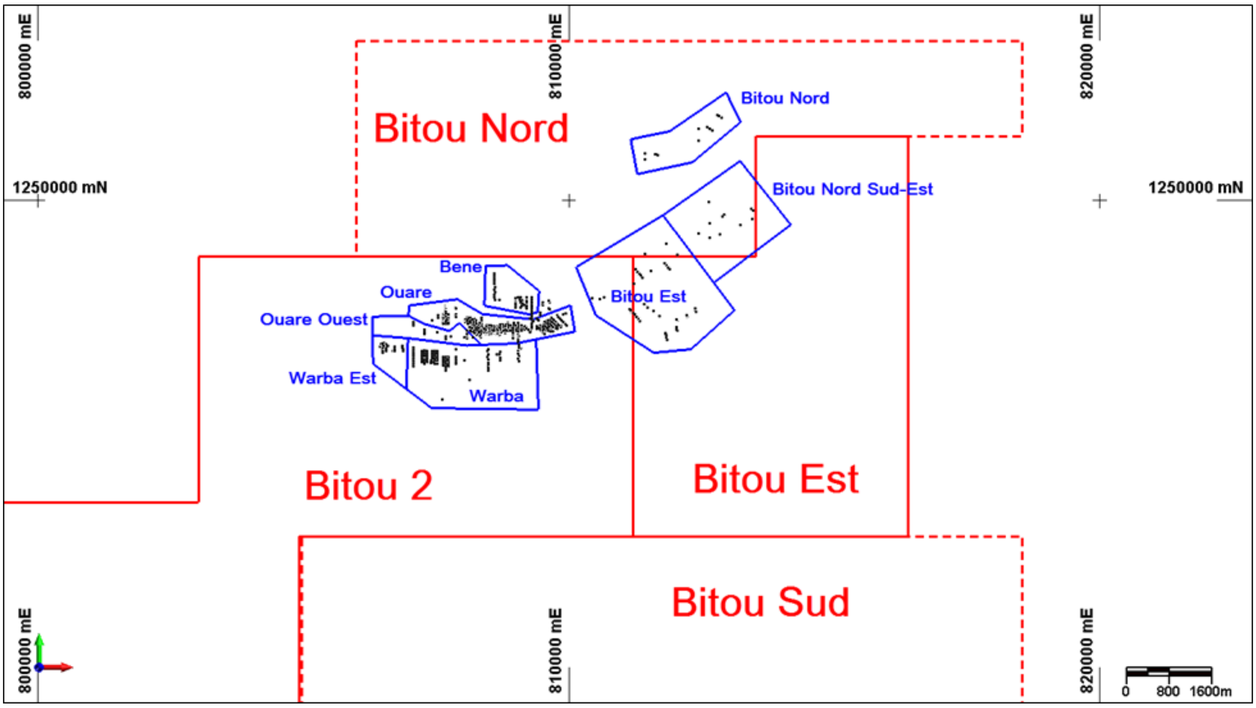


Figure 23: Ouaré licence areas (in red) and Project areas in blue. Dashed red lines depict licences that have lapsed and have been reapplied for (CSA Global, 2017)

Table 23 summarises the drilling completed on the Ouaré deposits by campaign, the upper records are those from the 2014 Endeavour report, the lowermost records are data not included in that report.

- Ashanti/Echo Bay and Endeavour/Etruscan. Only RC drilling was completed during the exploration stages carried out by Ashanti/Echo Bay, while Etruscan delineated an initial resource with RC drilling.

- Endeavour then undertook a resource definition drilling program which included RC and core drilling.
- MNG took over the project in April 2016 but have not undertaken any drilling to support Mineral Resource estimates. MNG drilled twelve RC drill holes (1,098 m) targeting historical soil anomalies in Bitou Nord.

Exploration activities and data collection methodologies applied during the initial period are based on information compiled in Ashanti's 1999 databases and discussed in the Ashanti feasibility study completed in 1999 (Lycopodium, 1999). Activities during the Endeavour-managed period are based on information from the 2014 Endeavour Technical Report.

Table 23: Summary of Ouaré drilling statistics

Company	Diamond		RC		Trench	
	No. of holes	Metres	No. of holes	Metres	No.	Metres
Ashanti/Echo	0	0	18	1,762	45	6,524
Etruscan	0	0	232	19,512	0	0
Endeavour	56	6,975	257	26,723	0	0
Subtotal (in 2014 Report)	**56**	**6,975**	**507**	**47,997**	**45**	**6,524**
Unknown	0	0	0	0	3	350
Etruscan	0	0	34	1,127	19	682
Endeavour	0	0	26	2,644	0	0
TOTAL	**56**	**6,975**	**567**	**51,769**	**67**	**7,556**

Source: 2015 Endeavour Technical Report

Note that MNG drilled 12 RC drill holes in Bitou Nord which aren't included in the above table.

Table 24 lists the drilling by project area.

Table 24: Summary of Ouaré drilling statistics by project area

Project	DD		RC		TR	
	Count	Total (m)	Count	Total (m)	Count	Total (m)
BENE			45	3,798	2	357
Bitou Nord Sud Est			3	309	10	423
Bitou-Est			48	2,536	9	706
Bitou Nord			9	926	6	160
Ouaré	55	6,855	310	29,765	15	2,669
Ouaré Ouest			12	1,016	4	760
Ouaré Sud Ouest					10	851
Warba	1	120	116	11,133	7	1,120
Warba Est			24	2,287	4	511
Total	**56**	**6,975**	**567**	**51,769**	**67**	**7,556**

Figure 24 and Figure 25 (excludes Ouaré Sud Ouest) below depict the Ouaré project areas and drilling completed on them.

Figure 24: Ouaré drilling (project area and drill type)

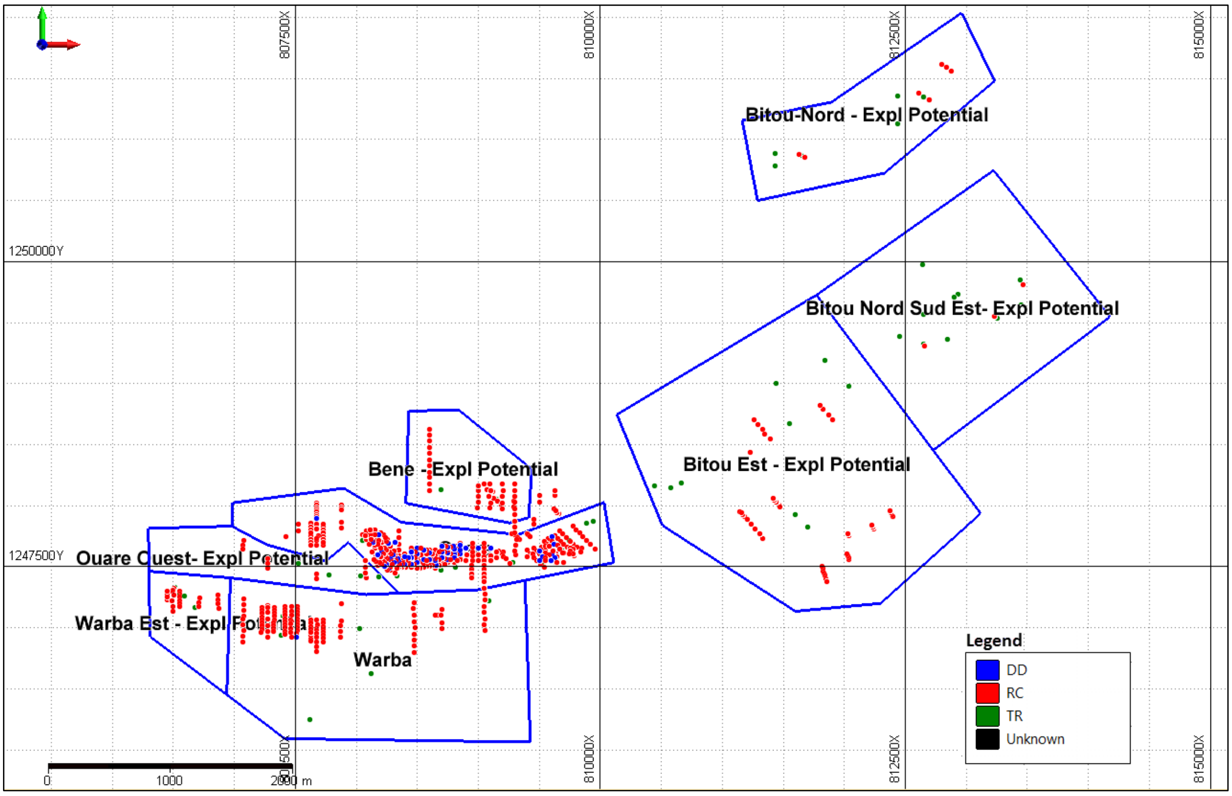


Figure 25: Ouaré drilling excluding Ouaré Sud Ouest (project area and drill type)

The drilling at Ouaré was targeted normal to the plane of the principal, mineralised structures to ensure the optimum angle of intersection (Table 25). Scissor holes, drilled back in the opposite sense, have also been completed on each deposit to ensure that drilling was completed in the proper orientation.

Table 25: Ouaré mineralisation and drilling orientation by zone

Domain	Mineralisation		Drilling	
	Strike	Dip	Azimuth	Dip
Ouaré Central	E-W	Moderate to Steep N	180°	-45° to -55°
Ouaré West	SE-NW	Moderate to Steep N	220°	-45° to -55°
Ouaré East	E-W	Steeply N	0 and 315°	-45° to -55°

Source: Endeavour 2015 Report

The Mineral Resources defined at Ouaré are hosted within three zones (Central, West and East) along a structural corridor which runs roughly east-west; however, the orientation of the mineralisation does vary along the strike.

10.3 Significant Intercepts

Several exploration areas have been drilled and trench tested at the Youga and Ouaré licences (drilling is tabulated in Table 11 for Youga and Table 24 for Ouaré). Significant intercepts (1 g/t over 5 m) are tabulated in Table 26 for Ouaré and Table 27 for Youga. The orientation of mineralisation relatively to the drill angle for these areas remains unconstrained and so their true thickness is undetermined.

The location of the exploration areas are provided in Figure 21 and Figure 22 for Youga, and Figure 24 and Figure 25 for Ouaré.

Exploration Targets (potential/conceptual tonnage and grades, expressed as ranges, for further exploration as per Clause 2.3/2 Rules and Policies for NI 43-101) for Warba, Gassore and Zerbogo South

West were generated and reported in Section 0. There has been insufficient exploration to define a Mineral Resource in these areas and it remains uncertain if further exploration will result in the target being delineated as a Mineral Resource.

Table 26: Significant intercepts (1 g/t over 5 m) for exploration target areas at Ouaré

Prospect	Hole ID	Hole type	From (m)	To (m)	Interval width	Grade	Intercept description
BENE	BITRC-08-085	RC	22	32	10	4.61	10.00 m at 4.61 ppm
	BITRC-12-449	RC	4	10	6	8.32	6.00 m at 8.32 ppm
	BITRC-12-459	RC	59	64	5	1.93	5.00 m at 1.93 ppm
	BITRC-12-483	RC	46	51	5	7.61	5.00 m at 7.61 ppm
BITOU-NORD	BNTR-08-017	TR	32	38	6	7.15	6.00 m at 7.15 ppm
Warba	BITRC-10-169	RC	22	30	8	1.48	8.00 m at 1.48 ppm
	BITRC-10-213	RC	26	32	6	3.73	6.00 m at 3.73 ppm
	BITRC-10-220	RC	78	84	6	7.48	6.00 m at 7.48 ppm
	BITRC-10-220	RC	88	96	8	1.42	8.00 m at 1.42 ppm
	BITRC-11-341	RC	5	10	5	1.18	5.00 m at 1.18 ppm
	BITRC-11-341	RC	65	70	5	3.02	5.00 m at 3.02 ppm
	BITRC-11-354	RC	51	64	13	1.38	13.00 m at 1.38 ppm
	BITRC-11-362	RC	31	37	6	3.67	6.00 m at 3.67 ppm
	BITRC-11-364	RC	22	28	6	4.66	6.00 m at 4.66 ppm
WARBA EST	BITRC-10-151	RC	12	20	8	1.91	8.00 m at 1.91 ppm
	BITRC-10-301	RC	30	36	6	9.09	6.00 m at 9.09 ppm
	BITRC-10-302	RC	42	54	12	16.36	12.00 m at 16.36 ppm
	BITRC-12-406	RC	19	24	5	3.05	5.00 m at 3.05 ppm
	BITRC-12-406	RC	51	59	8	11.31	8.00 m at 11.31 ppm
	BITRC-12-408	RC	0	7	7	1.99	7.00 m at 1.99 ppm
	BITRC-12-408	RC	49	55	6	1.68	6.00 m at 1.68 ppm
	TR-42	TR	28.874	34.847	5.97	1.59	5.97 m at 1.59 ppm

Table 27: Significant intercepts (1 g/t over 5 m) for exploration target areas at Youga

Prospect	Hole ID	Hole type	From (m)	To (m)	Interval width	Grade	Intercept description
A2VIL	A2-00-T129	TR	72	104	32	6.69	32.00 m at 6.69 ppm
	A2-00-T138	TR	10	16	6	2.55	6.00 m at 2.55 ppm
	RC-05-266	RC	41	53	12	1.2	12.00 m at 1.20 ppm
	YARC-100	RC	1	8	7	1.92	7.00 m at 1.92 ppm
Gassore	YGRC-015	RC	58	63	5	4.14	5.00 m at 4.14 ppm
	YGRC-018	RC	52	57	5	3.04	5.00 m at 3.04 ppm
	YGRC-033	RC	63	70	7	2.59	7.00 m at 2.59 ppm
	YGRC-033	RC	90	100	10	1.03	10.00 m at 1.03 ppm
La Forge	YLFRC-006	RC	41	46	5	2.46	5.00 m at 2.46 ppm
	YLFRC-014	RC	9	14	5	2.07	5.00 m at 2.07 ppm
LEDUC NORD	A2-98-T83B	TR	69.05	77.06	8.01	2.74	8.01 m at 2.74 ppm
SONGO NORD	SONRC-12-009	RC	12	17	5	1.52	5.00 m at 1.52 ppm
SPRITE	A2V-05-T197	TR	16	30	14	3.55	14.00 m at 3.55 ppm
	I-95-ZT11	TR	76	86	10	2.02	10.00 m at 2.02 ppm
	YSRC006	RC	39	44	5	2.46	5.00 m at 2.46 ppm
	YSRC013	RC	90	95	5	2.07	5.00 m at 2.07 ppm
TLP EST	RCY96-101	RC	0	6	6	2.84	6.00 m at 2.84 ppm
WP3 EST	A2-97-T52	OTR	94	106	12	2.26	12.00 m at 2.26 ppm
	A2-97-T53	OTR	96	106	10	2.31	10.00 m at 2.31 ppm
	A2-98-T64	OTR	236	242	6	1.01	6.00 m at 1.01 ppm
	A2-98-T65	OTR	156	164	8	2.35	8.00 m at 2.35 ppm
	A2W-04-62	DD	108.77	118	9.23	2.9	9.23 m at 2.90 ppm
	A2W-04-62	DD	122.45	131.8	9.35	1.31	9.35 m at 1.31 ppm
	WP3_ADGC_32	RC	109	115	6	1.55	6.00 m at 1.55 ppm
	WP3_ADGC_32	RC	119	126	7	1.13	7.00 m at 1.13 ppm
WP4-NE	A2-98-T73	OTR	86	94	8	1.82	8.00 m at 1.82 ppm
	RC-05-349	RC	13	20	7	1.18	7.00 m at 1.18 ppm
	RC-05-349	RC	24	29	5	1.2	5.00 m at 1.20 ppm
	RC-05-349	RC	44	49	5	1.01	5.00 m at 1.01 ppm
	RC-05-349	RC	74	81	7	1.98	7.00 m at 1.98 ppm
	YARC-036	RC	57	65	8	1.51	8.00 m at 1.51 ppm
ZERBOGO NE	ZD-05-07		13	18	5	1.06	5.00 m at 1.06 ppm
	ZERBRC-12-043	RC	8	22	14	1.35	14.00 m at 1.35 ppm
ZERBOGO SW	RCZ-96-04	RC	20	28	8	1.63	8.00 m at 1.63 ppm
	ZERBRC-12-045	RC	40	46	6	1.87	6.00 m at 1.87 ppm
ZERGORE EST	ZGP_ST_03	RC	72	82	10	1.58	10.00 m at 1.58 ppm
ZERGORE NW	I-94-ZT32A	TR	68.09	74	5.91	1.54	5.91 m at 1.54 ppm
	I-95-ZT32A	TR	68	74	6	1.54	6.00 m at 1.54 ppm
	I-95-ZT36	TR	138.08	148.16	10.08	2.54	10.08 m at 2.54 ppm
	I-95-ZT36	TR	186.46	202.59	16.13	2.6	16.13 m at 2.60 ppm
	YZ-12-96	DD	70	75	5	2.88	5.00 m at 2.88 ppm
	YZRC-230	RC	15	25	10	4.49	10.00 m at 4.49 ppm

10.4 Exploration Targets

Several exploration areas (other than those from which Mineral Resource have been reported) were drilled and trench tested at the Youga and Ouaré licences (see Table 11 and Figure 21 to Figure 22 for Youga and Table 24 and Figure 24 to Figure 25 for Ouaré).

At Warba, Gassore and Zerbogo South West, CSA Global believed there to be sufficient continuity of mineralisation between drill fences to generate "Exploration Targets". Exploration Targets are defined as potential tonnage and grades, expressed as ranges, as per Clause 2.3/2 within the Rules and Policies for NI 43-101. CSA Global states that there has been insufficient exploration to define a Mineral Resource in these areas and highlights that it remains uncertain if further exploration will result in their being delineated as a Mineral Resource. Thus, the reported tonnages and grades below are entirely conceptual in nature.

Exploration Targets were determined by creating mineralisation envelopes around a combination of 0.25 g/t and 0.5 g/t COMPSE intercepts following a similar strategy to the modelling undertaken for Mineral Resources. Wireframing was completed in Micromine with solids were cut to topography. Tonnages are reported as a range using a 2.4 and 2.74 t/m^3 (approximate Oxide and Fresh bulk densities used in the reporting of Mineral Resources in Section 14). Length-weighted mean grades were determined for each area by flagging assays within the models, applying top cuts, and de-clustering using the nominal drill spacing. Results are provided in Table 28.

Table 28: Exploration Targets for Youga and Ouaré

Exploration Target	Tonnage Range (Kt)	Grade Range (Au g/t)
Warba	1,500 to 2,300	1.0 to 1.5
Gassore	2,500 to 4,000	1.0 to 1.5
Zerbogo SW	800 to 1,500	1.2 to 1.8

Note: Grades and tonnes are rounded to reflect that they are estimates

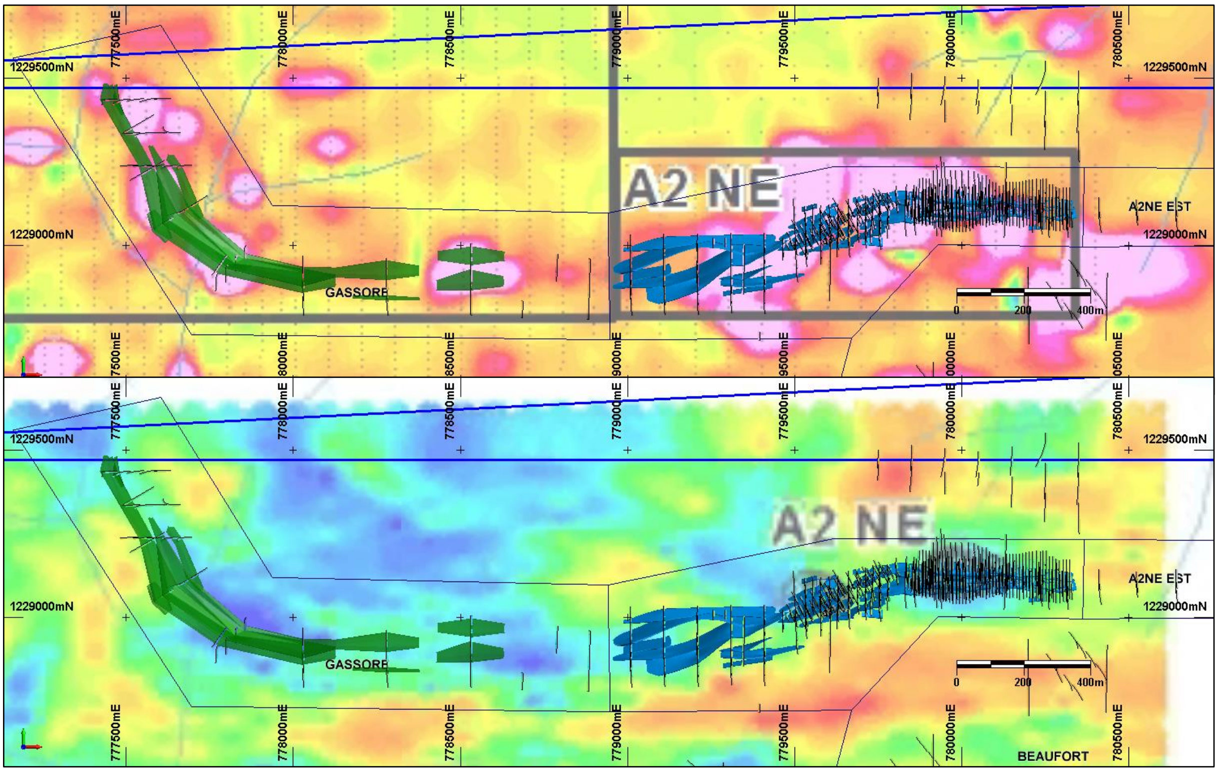


Figure 26: Example of Exploration Target 3D model at Gassore, overlain on (top) Au in soils and (bottom) IP survey results. A2NE Mineral Resource models shown in blue, Gassore Exploration Target in green.

10.5 Drilling Procedure

Endeavour DD holes were typically collared using HQ bits and reduced to NQ bits once competent rock was encountered, usually at depths less than 25 m downhole. MNG drillholes were all drilled at HQ diameter with no reduction in hole diameter down the hole. Where ground was soft or loose, casing was inserted into the drillholes.

MNG drilling was undertaken by the Faso Drilling Company, which is a subsidiary of MNG, using a PD500 drill rig (http://www.mbef.com.tr/urunler/pd500).

Endeavour RC drilling procedures have been continued to be employed by MNG. Drilling is normally done on 20 m bench heights at an angle of inclination of ≥50°. Drillhole diameters are below 5-1/8" and RC drilling and sampling are stopped during heavy rainfall to avoid wet samples.

10.6 Logging

The 2014 Endeavour Technical Report noted that the most important geological factors identified from the Youga and Ouaré deposits included; host rock, silicification, quartz-veining and pyrite content. Endeavour standardised geological logging of these features by implementing standardised coding. Logging was performed on paper log sheets and data entry and monitoring procedures were implemented to minimise data problems. All DD core was photographed and the photos were maintained with the geological database.

All historical (i.e. pre-Endeavour) diamond drill core and RC chips (where possible) from Mineral Resource areas were re-logged by Endeavour using Endeavour coding.

MNG has continued to use Endeavour's lithological codes, with some modifications and additions. The logging team record lithology and mineralisation indicators such as silicification, alteration, quartz-veining, sulphide content, etc. Geologists use laptops to capture logging data in Microsoft (MS) Excel spreadsheets; no paper log sheets are used. All DD core was photographed and the photos were maintained with the geological database.

10.7 Collar Surveying

All drill collars completed during the Ashanti/Echo Bay and Endeavour work programs were surveyed using a combination of total-station survey and Differential Global Positioning Satellite (DGPS) techniques by qualified surveyors and utilised control points.

The MNG procedure for drillhole collar surveying are summarised below:

- Universal Transverse Mercator (UTM) projection, WGS84 datum UTM Zone 30 Northern Hemisphere is used for any readings undertaken in the field.
- Triangulation points were surveyed by an outside consultancy company at the beginning of the project. Additional triangulation points have been generated from the original control points by the project survey team using total station devices (Sokkia SET530 and Leica TS12+).
- Leica GS16 and GS10 DGPS units are used to survey collars with an acceptable maximum difference of 5 cm for real time mode and RTK mode. If the surveying team cannot get within a 5 cm accuracy threshold, the base station is moved. DGPS units retrieve data from GPS and GLONASS satellites.
- In flat terrain, data is collected from measuring points which are a maximum of 5 m apart. If the ground is undulating, measuring points are a maximum of 1 m apart.

10.8 Downhole Surveying

Ashanti/Echo Bay surveyed downhole deviation using Sperry Sun single shot downhole cameras at intervals ranging from 20 m to 126 m and corrected for magnetic declination. Drilling completed by Endeavour were downhole surveyed using a Flexit© downhole instrument at a minimum of every 30 m and measured relative to magnetic north.

MNG drillholes were downhole surveyed by the drilling company (which is a subsidiary of MNG) using a Reflex Ez-Trac downhole instrument, starting at a depth of 6 m and every 50 m thereafter. Readings are relative to magnetic north.

10.9 Reliability and Recovery

The sample recovery of the drilling completed prior to Endeavour involvement for both Youga and Ouaré has not been recorded in the database, although Ashanti reported sample recovery for both the RC and diamond drilling to be high (Lycopodium, 1999).

As per the 2014 Endeavour technical report, for drilling that was managed by Endeavour, recovery was routinely calculated and captured in the database:

- Youga had an average core recovery near 95% and RC recoveries estimated near 79%. Acceptable recovery was achieved for all programs of drilling completed.
- Ouaré had an average core recovery near 95% and RC recoveries estimated near 80%. Acceptable recovery was achieved for all programs of drilling completed.

MNG procedures state that Core Recovery, Rock Quality Designation (RQD) and Solid Core Recovery (SCR) are measured, included on the log sheet and captured in a MS Excel file. RQD is defined as the sum of core greater than 10 cm divided by the drilling interval. SCR is defined as the sum of lengths of solid core (representing a complete cylinder) divided by the interval length.

The database provided by Avesoro only included 242 recovery records from pre MNG drilling (which averaged 88% recovery) and 3,261 MNG recovery records. Therefore, most of the drillholes do not have any recovery data, with all recovery data from the Youga Project, with no data from the Ouaré Project. Core recovery (based on 3,503 samples) averages 94% for all samples. RQDs average 38% for all samples and SCR average 51% for all samples (Table 29).

Table 29: Core Recovery, RQD and SCR data (Youga)

Project	Count	Mean recovery (%)	Mean RQD (%)	Mean SCR (%)
A2NE (MNG)	1,988	94	21	37
Kabola North (MNG)	1,273	94	65	72
NTV (pre-MNG)	242	88	42	56
Total	**3,503**	**94**	**38**	**51**

No sample weight data were captured in the database for Youga or Ouaré samples. Therefore, no review of recovery versus grade could be made for any of the RC samples or for the majority of the diamond core samples.

10.10 Drill Site Security and Drill Core Handling

The Endeavour drilling procedures were as follows: All diamond drill core from the Youga and Ouaré deposits was sampled by splitting/cutting the core and sampling half of the material. The remaining half was stored at the secured core yards at the Youga and Bitou exploration camps.

Diamond drill core is placed in core trays next to the drill rig during the drilling operation and collected twice a day by an MNG driver who transports them to the secured core shed at Youga mine. Core shed access is restricted to the exploration team, drill crew and mine geologists and there is 24/7 security at the gate and the core shed is surrounded by a fence.

10.11 Drilling Results

A significant quantity of drilling has been completed and as these are advanced properties, no significant drilling intersects have been included in this report.

11 Sample Preparation, Analysis and Security

11.1 Sampling

11.1.1 Trench Sampling

The Endeavour trenching completed at Youga and Ouaré generally consisted of manually excavated trenches to bedrock (saprolite), usually less than 2 m in depth. Trenches were mapped in detail prior to sampling continuous channels at 1 m or 2 m intervals.

MNG used an excavator to open trenches in Youga. A field technician is tasked with supervising the trenching and ensuring that the excavator digs until bedrock is reached. The trench wall is logged by a geologist who uses the same logging criteria as used for drill core logging and records lithology, quartz veins, possible mineralised zones, level of oxidation, etc. The sampling intervals are marked by a geologist on one side of the trench in a continuous channel at 1 m or 2 m intervals. Experienced field technicians collect the samples under supervision of a geologist. The trenching team takes all the samples with them and stores them in the secured core shed at the Youga mine site until they are despatched to the laboratory.

11.1.2 Reverse Circulation Drill Sampling

Endeavour RC samples were collected over 1 m intervals in a large plastic bag directly from the cyclone. The entire sample was weighed then split in a three-tier riffle splitter to reduce to approximately 2 kg. The splitter and boxes were cleaned with compressed air between samples. If the sample was wet, the entire sample was placed in a large rice bag and allowed to dry in the sun before the sample was weighed and split down.

Procedures completed at the drill rig included:

- The geotechnician recorded the sample number, the weight of the total sample and whether water was present
- The geologist logged characteristics of the chips on a log sheet
- Either an A3 size chip board was completed by gluing powder and washed chips from each sample interval, or a subsample of chips was placed in partitioned chip trays.

The approximately 2 kg subsamples were placed in plastic bags and sealed with a numbered sample tag enclosed. A second 2 kg subsample was split off and retained on site as a reference sample.

MNG grade control samples are 2 m composite samples, riffle split in the field to provide samples of approximately 3 kg to 5 kg in weight for laboratory analysis. Wet samples are bagged in their entirety and air-dried before splitting.

Procedures completed at the drill rig included:

- Sampling is usually done under the supervision of one geologist, one geotechnician and three samplers.
- The weight of the entire sample is sometimes recorded.
- Samplers collect all material returned from the cyclone in a large (+25 kg) plastic bag or in rubber buckets.
- The sample is then split down using a riffle splitter until a sample weight between 3 kg and 5 kg is achieved.

- Sample number-tags are stapled at the opening of each sample bag.
- Field duplicates are made by simply spitting off an additional sample.
- All materials (splitter, containers, etc.) are cleaned thoroughly between samples with compressed air attached to the compressor of the drilling machine.
- Cyclones are also opened and cleaned before each new drillhole.
- RC cuttings are washed and sample chips placed in chip boxes. RC cuttings are logged in appropriate detail including identification of lithology, structure, alteration and other notable characteristics by the grade control geologist.

11.1.3 Diamond Drill Sampling

Endeavour procedures were to place diamond core into treated, wooden core boxes at the drill site by the contract drillers. The drillers also inserted wooden blocks, indicating the meterage, into the core boxes at the end of each run (normally every 3 m).

Geologists and geotechnicians collected measurements of all geotechnical details, core recovery, geological logging as well as photographing the core. Where possible, samples were routinely collected over 1 m intervals, but ranged in length from 0.5 m to 1.5 m due to respecting geological contacts. Care was taken to consistently collect assay samples from one side of the core.

Each core box was labelled with aluminium tape indicating the hole number, box number, and the hole length at the beginning and end of the core contained within the box. The labelled core boxes were stored under cover in steel racks in the core facility.

MNG procedures are as follows: Diamond core was placed into plastic core boxes at the drill site by the contract drillers who also inserted plastic blocks, indicating the meterage, into the core boxes at the end of each run (normally every 3 m).

Geologists and geotechnicians collected measurements of all geotechnical details, core recovery, geological logging as well as photographing the core. Samples were usually collected over 1 m intervals, but ranged in length from 0.5 to 1.5 m due to geological contacts. At least two hangingwall and footwall samples were collected before and after the possible mineralized zone. Care was taken to consistently collect assay samples from one side of the core.

Each core box was labelled with permanent marker indicating the hole number, box number, and the hole length at the beginning and end of the core contained within the box. The labelled core boxes were stored at the secured core shed in Youga mine site.

11.2 Sample Handling and Security

Endeavour procedures are as follows: Trench and RC samples were collected in the field and diamond core samples collected in the core logging area, bagged immediately in plastic sample bags, labelled with the sample number on the outside of the bag and stapled shut with a sample tag inside. Samples were stored at the exploration camp until enough samples had been collected to send to the assay laboratory. Samples were delivered directly to the laboratory by Endeavour personnel or received directly by laboratory staff at the exploration camp.

After the samples were received at the laboratory, all further sample preparation and analysis were conducted by laboratory personnel who were independent of Endeavour. No employee, officer, director or associate of Endeavour was involved in sample preparation or analysis after submission to the laboratory.

MNG procedures are similar to the Endeavour procedures. Trench and RC samples were collected in the field and diamond core samples collected in the core logging area, bagged immediately in plastic sample bags, labelled with the sample number on the outside of the bag and stapled shut with a sample tag inside. Samples were stored at the secured core shed at Youga mine site until sufficient samples had been collected to send to the assay laboratory. Samples were delivered directly to the laboratory by the MNG driver.

After the samples were received at the laboratory, all further sample preparation and analysis were conducted by laboratory personnel who were independent of MNG. No employee, officer, director or associate of MNG was involved in sample preparation or analysis after submission to the laboratory.

11.3 Dry Bulk Density Determinations

The Endeavour 2014 Technical Report describes the bulk density determinations undertaken by Ashanti, Etruscan and Endeavour. Samples were collected from hangingwall, footwall and mineralised horizons and at depths greater than 10 m below the surface (predominantly in un-weathered rock).

The Ashanti bulk density ("SG") determinations (described as specific gravity) were reportedly undertaken by SGS in Ghana applying the "Archimedes" method (water displacement). The Ashanti SG determinations were completed on half drill core samples submitted to SGS for gold assay. Two measurements were made and averaged for each sample.

The Etruscan bulk density determinations were completed by SGS in Tarkwa using billets of half-core selected from reference material at Youga. The SGS determination methodology included weighing the core in air on receipt, drying billets for 6 hours at 100°C to 150°C, weighing the samples dry to record the moisture content, coating the samples in paraffin, weighing again to determine the weight of paraffin, weighing in water, then determining the bulk density, having allowed for the density of the paraffin.

Recent bulk density determinations for Endeavour were completed by SGS Ouagadougou, Burkina Faso. The only difference in the determination technique from that described above was the use of hairspray to seal samples, instead of wax.

MNG bulk density measurements are taken using the "Archimedes" method (water displacement). Procedures state that one sample (5 cm to 15 cm in length) be taken every metre in mineralised zones and every 5 m outside of these zones. Samples are placed on aluminium foil on baking trays and dried for 3 hours at 200°C. Samples were weighed, wax coated, weighed again to account for the weight of the wax, weighed in water, and the bulk density determined. Water is changed every 50 samples, unless it becomes muddy, where it would be changed immediately.

Table 30 below lists the number of density measurements in the database for each project area. Note that the Youga projects lack density data.

Table 30: Count of density data in the Avesoro database for Youga (A2NE and MP) and Ouaré (including Warba)

Project area	Density measurements (count)
A2NE	759
MP	136
Ouaré	918
Warba	29
Total	**1,842**

11.4 Sample Analysis

11.4.1 Pre-MNG Samples

Ashanti utilised Inchcape Testing Services (ITS) Ouagadougou in Burkina Faso as the primary assay facility for processing samples. In addition, the SGS facility at Tarkwa in Ghana was utilised for assaying of selected diamond core and trench samples. Sample preparation was completed on the entire submitted sample, including crushing and pulverisation to a targeted 95% passing 75 µm. A 50 g subsample was analysed by fire assay (FA) with an atomic absorption spectroscopy (AAS) finish. The lower detection limit was stated as 0.005 ppm Au.

Originally, Endeavour used SGS Tarkwa to complete sample preparation and FA analyses on all RC and core sampling as above, but with a reported lower detection limit of 0.01 ppm Au. Abilab/ALS Ouagadougou was also used periodically for some earlier stage drill programs, with a reported lower detection limit of 0.01 ppm Au. More recent sample preparation and FA analyses was completed by the SGS laboratory in Ouagadougou, Burkina Faso.

QAQC results were monitored on a batch-by-batch basis and any batch with more than two sample failures was re-assayed.

External check (umpire) assaying was undertaken at SGS Lakefield, Toronto (Canada) and ALS Johannesburg (South Africa) using a combination of 50 g FA with ICP-OES finish, and a gravimetric fire assay of samples above 2 ppm gold.

ITS, SGS, Abilab/ALS are all internationally recognised laboratories and the local laboratories are operated as subsidiaries of the parent company and are subject to internal quality control programs and protocols in accordance with the operating practices of the parent laboratory.

11.4.2 MNG Samples

ALS Youga has been used as the primary laboratory for the grade control drilling since it was established in 2007. The assay method is a 50 g FA with over limit results assayed using a gravimetric finish. The lower detection limit is 0.01 ppm Au.

ALS Ouagadougou has been used to analyse the A2NE diamond drillholes for holes YNE-16-038 to YNE-16-066. The preparation method is ALS's PREP31B which is to crush the sample to 70% less than 2 mm in size, riffle split off 1 kg, and pulverise the split to better than 85% passing 75 microns. The primary gold assay method is a 50 g FA with an atomic absorption finish (lower detection limit of 0.005 ppm Au). Over limit results are assayed using a gravimetric finish.

11.5 QAQC Procedures

Endeavour and MNG implemented QAQC procedures to monitor the accuracy and precision of the analytical and assay data received from all laboratories during the exploration programs. In addition to the QAQC procedures put in place by Endeavour and MNG, the assay laboratories also included internal QC samples. Endeavour's procedures included:

- Standards (independently submitted commercial reference standards)
- Blanks (previously assayed material returning less than detection assays)
- Field duplicates (second sample collected in the field from the same source)
- External check (umpire) assaying (second assay of prepared pulp at an external internationally accredited laboratory).

No information is available regarding the pre-Endeavour QAQC procedures.

The MNG QAQC procedures include the following:

- Daily monitoring of field splitter condition and continuous monitoring of splitter cleanliness
- Random spot checking of pre- and post-split sample weights and labels
- Daily monitoring of all laboratory measuring apparatus, especially those used for weighing and measuring volumes of liquid (i.e. aliqouts of acid and water)
- Systematic routines for checking and renewing control standards used to calibrate the AAS units
- Cleanliness of the laboratory to minimise contamination through dust
- Setting limits on standards
- Systematic storage, documentation and back-up of all data
- Monthly QAQC meeting with Laboratory Manager
- Monthly, unannounced, laboratory audits take place to check on the above
- Internal standards (entered by the laboratory)
- External standards (submitted by the client)
- Internal and external duplicates
- Internal repeats (samples selected from the same pulp bag)
- Blanks (internal and external)
- Inter – laboratory cross checks
- Sieving tests on pulverised material
- Monthly QC reports.

11.5.1 Certified Reference Material

Certified reference materials (CRMs) are included with the primary samples to monitor assay accuracy and are homogenous pulp material with certified concentrations and expected standard deviations of the elements of interest.

Endeavour purchased commercially available certified reference material (CRM) from Rocklabs, New Zealand and inserted one CRM in every batch of 20 samples. MNG insert four CRMs per batch of 100 samples in resource drilling and two CRMs per 100 samples for sterilisation drilling.

Table 31 below lists the CRMs used at Youga with their expected values and permitted minimum and maximum values. Table 32 lists the CRMs used at Ouaré.

Table 31: Youga CRMs with gold expected values and permitted minimum and maximum values

CRM	Unit	Expected value	Expected SD	Minimum (-3SD)	Maximum (+3SD)
HiSiLK2	ppm	3.474	0.087	3.213	3.735
HiSiLK4	ppm	3.463	0.090	3.193	3.733
HiSiLP1	ppm	12.050	0.330	11.060	13.040
OxE56	ppm	0.611	0.015	0.566	0.656
OxE74	ppm	0.615	0.017	0.564	0.666
OxF100	ppm	0.804	0.019	0.747	0.861
OxG83	ppm	1.002	0.027	0.921	1.083
OxI67	ppm	1.817	0.062	1.631	2.003
Oxi96	ppm	1.802	0.039	1.685	1.919
OxK69	ppm	3.583	0.086	3.325	3.841
OxK79	ppm	3.532	0.078	3.298	3.766
OxK94	ppm	3.562	0.042	3.436	3.688
OxL63	ppm	5.865	0.141	5.442	6.288
SE44	ppm	0.606	0.017	0.555	0.657
SE68	ppm	0.599	0.013	0.560	0.638
SF67	ppm	0.835	0.021	0.772	0.898
SF85	ppm	0.848	0.018	0.794	0.902
SH35	ppm	1.323	0.044	1.191	1.455
SH41	ppm	1.344	0.041	1.221	1.467
SH69	ppm	1.346	0.026	1.268	1.424
SH82	ppm	1.333			
Si42	ppm	1.761	0.054	1.599	1.923
Si54	ppm	1.780	0.034	1.678	1.882
SJ39	ppm	2.641	0.083	2.392	2.890
SJ53	ppm	2.637	0.048	2.493	2.781
Sk43	ppm	4.086	0.093	3.807	4.365
Sk52	ppm	4.107	0.088	3.843	4.371
SK62	ppm	4.075	0.140	3.655	4.495
SK78	ppm	4.134	0.138	3.720	4.548
SL51	ppm	5.909	0.136	5.501	6.317

Table 32: Ouaré CRMs with gold expected values and permitted minimum and maximum values

CRM	Unit	Expected value	Expected SD	Minimum (-3SD)	Maximum (+3SD)
OXE101	ppm	0.607	0.016	0.559	0.655
OxE56	ppm	0.611	0.015	0.566	0.656
OxE74	ppm	0.615	0.017	0.564	0.666
OXE86	ppm	0.613	0.021	0.550	0.676
OXF100	ppm	0.804	0.019	0.747	0.861
OxF65	ppm	0.805	0.034	0.703	0.907
OxF85	ppm	0.805	0.025	0.730	0.880
Oxi96	ppm	1.802	0.039	1.685	1.919
OxK69	ppm	3.583	0.086	3.325	3.841
OxK94	ppm	3.562	0.042	3.436	3.688
SF45	ppm	0.848	0.028	0.764	0.932
SH35	ppm	1.323	0.044	1.191	1.455
SH41	ppm	1.344	0.041	1.221	1.467
SH55	ppm	1.375	0.045	1.240	1.510
Si42	ppm	1.761	0.054	1.599	1.923
Si54	ppm	1.780	0.034	1.678	1.882
SJ39	ppm	2.641	0.083	2.392	2.89
SJ53	ppm	2.637	0.048	2.493	2.781
SK33	ppm	4.041	0.103	3.732	4.35
SK43	ppm	4.086	0.093	3.807	4.365
SK62	ppm	4.075	0.140	3.655	4.495

11.5.2 Blanks

Coarse blanks are used to monitor potential contamination and undergo the same sample preparation process as the primary samples. Blanks should have negligible concentrations of the elements of interest.

Endeavour inserted one blank sample (<5 ppb gold) in every batch of 20 samples. MNG insert two blanks per batch of 100 samples for both resource development and sterilisation drilling. They are inserted as the last sample of every odd numbered RC hole drilled.

No detail is available regarding the blank material used prior to MNG taking over the projects and whether it is a coarse or pulp blank for either Youga or Ouaré. The Youga assay QAQC procedures state that blanks have been prepared on site from waste drilling which have been assayed to determine the grade.

11.5.3 Duplicates

Duplicate samples are used to measure precision (i.e. repeatability of results).

Field Duplicates

Endeavour included a field duplicate per 20 primary samples. Duplicate RC samples, weighing 2 kg, were produced at the rig; core samples were randomly divided into two samples from one assay interval.

MNG RC field duplicates are collected by riffle splitting the representative samples and are taken on every even numbered RC drillhole. They are inserted as the last sample taken on the RC hole.

The MNG procedure states that a minimum of 4% of the samples will have duplicates (either quarter-core or rejects), but based on the number of diamond duplicate results in the database, this procedure doesn't appear to have been followed.

External Check Samples (Umpires)

The Endeavour 2014 report references external (umpire) assaying undertaken at Lakefield Toronto, Canada and at ALS Johannesburg, South Africa. However, no external check data were included in the database. The MNG procedures do not reference external check samples.

11.5.4 QAQC Failures and Resolution

Endeavour Samples

The Endeavour QAQC procedure was as follows: Results from the quality control samples were monitored as assay batches were received and where results were outside acceptable limits the entire batch was re-assayed. Pass/Fail thresholds for standards were derived directly from the statistical analysis for each standard provided by Rocklabs and are continually updated based on incoming results. A blank was deemed to have failed if they return assay values greater than 0.05 ppm gold. The threshold for duplicate failures was determined based on two calculations:

- The absolute difference between the original and duplicate assays exceeds 0.1 ppm Au.
- The relative difference between the original and duplicate assays exceeds 35%. Relative difference is defined as the absolute difference between the two assays, divided by their arithmetic mean value.

MNG Samples

The Youga assay QAQC procedures state that QC reports are produced monthly. Pass and failure criteria include the following:

- Duplicate samples with a relative difference of 50% or more
- Correlation coefficient of regression and between sample duplicate assay values should be $R \geq 0.8$
- Failure criteria for CRMs are based on values outside of three standard deviation of the expected value or an absolute bias greater than 5%
- Blanks are expected to have gold values within three times the lower detection limit (i.e. 0.03 ppm).

11.6 QAQC Review – CSA Global

CSA Global used QAQC Reporter (QAQCR) to review the Ouaré gold blank and CRM results, and MS Excel to analyse the Youga blanks and CRMs as well as the duplicate results for each project area.

Numerous failures and instances of apparent misidentified/mislabelled CRMs and blanks were noted which reduces confidence in the overall data management. Table 33 below summarises the number of samples and number of blanks and CRMs reviewed, per project area containing a Mineral Resource. Failure criteria used were a limit of 0.1 ppm Au for the blanks (nominal ten times detection limit) and CRM results outside of three standard deviations from the expected value. The table contains all failures, including the apparent mislabelled or misidentified blanks and CRMs.

Table 33: CRM and blank results showing percentages and failures (Youga and Ouaré)

Area	Samples	% QC	Blanks	Failures	%	CRMs	Failures	%
A2NE	25,239	3%	86	0	0%	655	65	10%
WP4	2,648	9%	129	2	2%	121	21	17%
WP3	18,386	3%	305	8	3%	305	32	10%
Zergoré	44,182	2%	271	7	3%	486	42	9%
Ouaré	46,347	9%	1,607	61	4%	2,581	125	5%
Main Pit	93,427	3%	1,398	41	3%	1,555	146	9%
East Pit	35,411	3%	659	13	2%	552	16	3%
NTV	23,340	1%	61	1	2%	121	17	14%
WP2	18,521	6%	231	16	7%	863	206	24%
WP1	12,374	3%	203	3	1%	216	28	13%
Leduc	7,353	6%	229	0	0%	230	1	0%

Apart from Leduc, all areas have unacceptable high failure rates of blanks and CRMs. In addition, in most cases the proportion of QC material is lower than it should be.

11.6.1 Cross Contamination

Two types of blanks have been used at Youga; a coarse blank (CB) and a blank. No further information is available regarding the blank material used or whether the blank is a coarse or pulp blank. Failure percentages ranged from 0% (A2NE and Leduc) to 7% of blanks failing at WP2. Figure 27 below shows the CB plots for the A2NE (no failures) and WP2 (61 failures) blank results. Overall, the Youga blank failure rate is unacceptably high, but this includes apparent misidentified CRMs as well as uncertainty regarding the type of blank material used (i.e. certified or not).

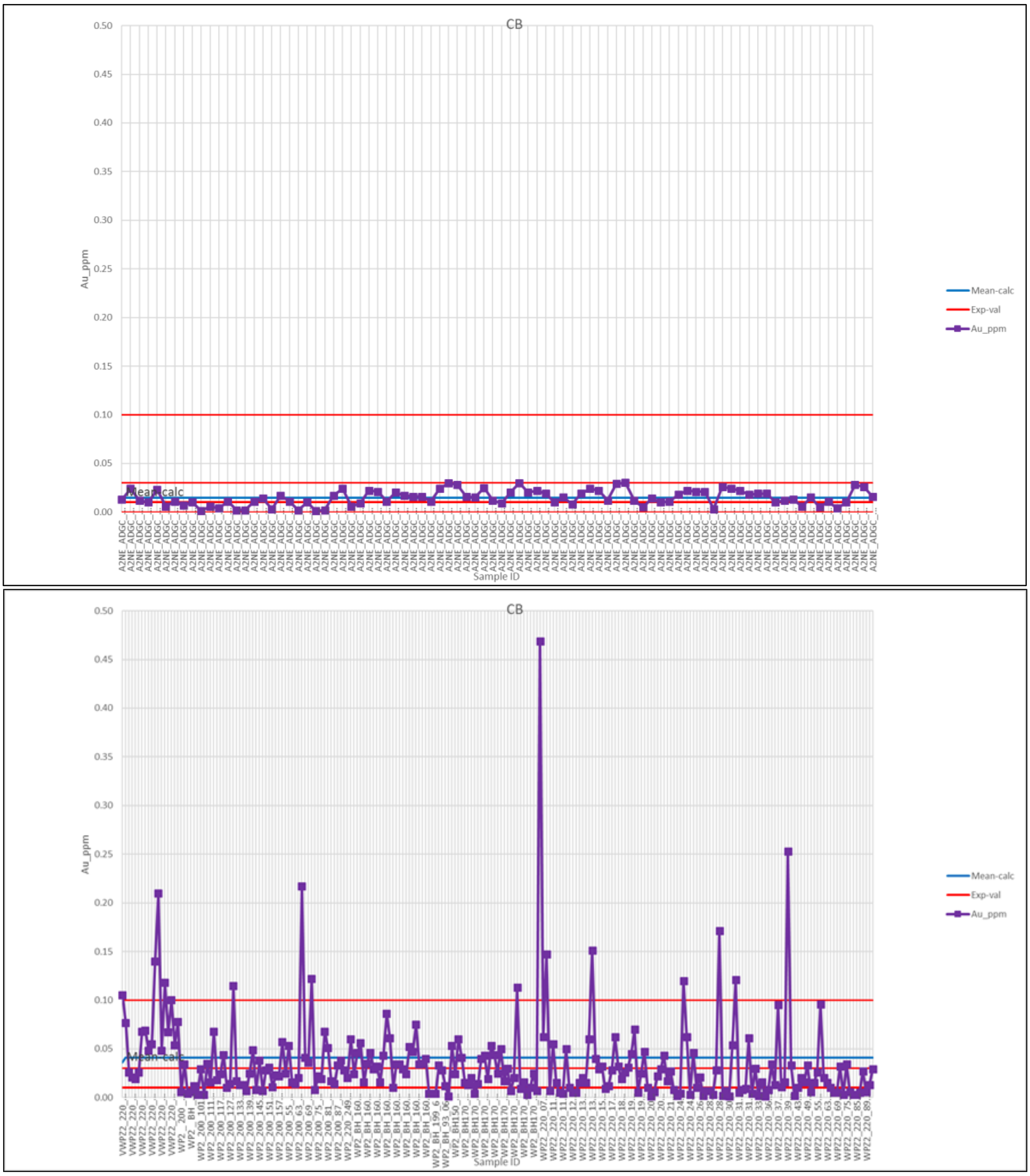


Figure 27: Youga Coarse Blank (CB) results from A2NE and WP2

Only one type of blank (blank) was used at Ouaré and 4% of the Ouaré blanks returned values greater than 0.01 ppm gold (including two apparent misidentified CRMs). Seven of the 2012 RC drillholes had multiple instances of failed blanks (≥4) which could imply contamination of these samples (Table 34).

Table 34: Ouaré 2012 RC drillholes and number of failed blanks (≥4 instances)

Hole ID	Count
BITRC-12-438	7
BITRC-12-440	6
BITRC-12-410	5
BITRC-12-411	5
BITRC-12-437	5
BITRC-12-409	4
BITRC-12-439	4

11.6.2 Assay Accuracy

CRM control charts were plotted and failures and biases calculated and tabulated below (Table 35 to Table 45). Any CRM that had an assayed value outside of three standard deviations of the expected value is deemed to have failed and any CRM with a mean grade outside 5% of the expected value has also exceeded permitted tolerances. Absolute biases greater than 5% have been highlighted in red.

Many apparent misidentified (mislabelled) CRMs and blanks (example in Figure 28) were noted as well as numerous failures. Clearly misidentified CRMs have been filtered out of the summary statistics in the A2NE, WP2, Leduc and Ouaré tables. The proportion of apparent misidentified QC samples decreases the confidence in the data management and database.

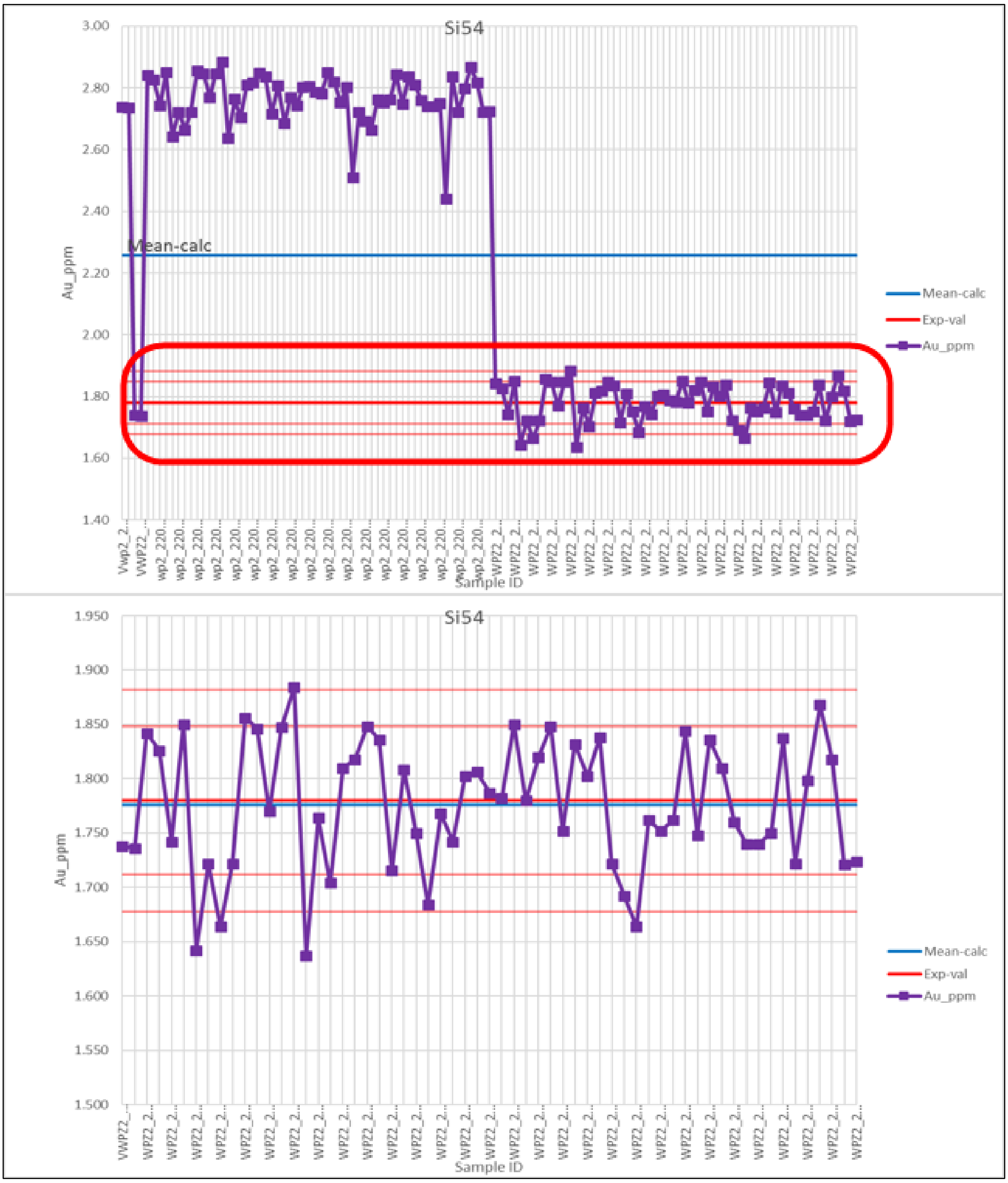


Figure 28: Results of CRM Si54 (from WP2) showing two populations of data (probable misidentified CRM SJ53). Lower plot has the population of high grade outliers removed and shows red circled results.

However, some CRMs consistently performed poorly compared to others; SH69, OxK94 and OxL63 were the worst performing CRMs with the most failures. Failures in these CRMs could be due to an issue with the CRM instead of with the assay laboratory (results of SH69, showing numerous failures and poor precision are depicted in Figure 29).

Figure 29: Results of CRM SH69 showing multiple failures (poor precision) at five project areas

Summary statistics for the 10 Youga MRE Estimate project areas are tabulated in the tables below (CRMs with less than five instances or with no expected value have been ignored). In most cases the accuracy was acceptable with absolute biases usually ≤5%. However, the number of failures is unacceptably high (i.e. precision issue with results). Figure 30 below shows an example of a CRM (SJ53) from Main Pit which is accurate (0% bias), but has multiple failures.

Table 35: A2NE CRM results

Au standard(s)				No. of samples	Calculated values			
Standard code	Method	Expected value	Expected SD		Mean Au	SD	CV	Mean bias
HiSiLK2	UN_UN	3.474	0.087	61	3.465	0.084	0.024	0%
HiSiLK4*	UN_UN	3.463	0.09	155	3.395	1.858	0.547	-2%
HiSiLP1	UN_UN	12.05	0.33	88	12.256	0.879	0.072	2%
Oxi96	UN_UN	1.802	0.039	66	1.839	0.058	0.032	2%
SF67	UN_UN	0.835	0.021	52	0.824	0.026	0.031	-1%
SF85	UN_UN	0.848	0.018	42	0.823	0.018	0.022	-3%
SH69	UN_UN	1.346	0.026	37	1.502	0.126	0.084	12%
SH82	UN_UN	1.333		121	1.312	0.048	0.037	-2%
Si42	UN_UN	1.761	0.054	31	1.778	0.08	0.045	1%

** Shows results with apparent misidentified CRMs filtered out*

Table 36: WP4 CRM results

Au standard(s)				No. of samples	Calculated values			
Standard code	Method	Expected value	Expected SD		Mean Au	SD	CV	Mean bias
HiSiLK2	UN_UN	3.474	0.087	19	3.438	0.098	0.029	-1%
SE68	UN_UN	0.599	0.013	18	0.621	0.026	0.041	4%
SF67	UN_UN	0.835	0.021	22	0.832	0.031	0.037	0%
SH69	UN_UN	1.346	0.026	53	1.349	0.076	0.057	0%
Si42	UN_UN	1.761	0.054	5	1.724	0.076	0.044	-2%

Table 37: WP3 CRM results

Au standard(s)				No. of samples	Calculated values			
Standard code	Method	Expected value	Expected SD		Mean Au	SD	CV	Mean bias
OxF100	UN_UN	0.804	0.019	25	0.808	0.01	0.013	1%
OxL63	UN_UN	5.865	0.141	63	5.516	0.391	0.071	-6%
SF67	UN_UN	0.835	0.021	20	0.818	0.013	0.016	-2%
SH41	UN_UN	1.344	0.041	5	1.349	0.028	0.021	0%
SH69	UN_UN	1.346	0.026	23	1.334	0.042	0.032	-1%
Si54	UN_UN	1.78	0.034	37	1.785	0.047	0.027	0%
SJ39	UN_UN	2.641	0.083	59	2.515	0.123	0.049	-5%
SJ53	UN_UN	2.637	0.048	60	2.63	0.034	0.013	0%
SK78	UN_UN	4.134	0.138	6	4.006	0.043	0.011	-3%

Table 38: Zergoré CRM results

Au standard(s)				No. of samples	Calculated values			
Standard code	Method	Expected value	Expected SD		Mean Au	SD	CV	Mean bias
HiSiLP1	UN_UN	12.05	0.33	11	9.528	1.349	0.142	-21%
SE68	UN_UN	0.599	0.013	75	0.608	0.017	0.028	2%
SF67	UN_UN	0.835	0.021	66	0.825	0.028	0.034	-1%
SH69	UN_UN	1.346	0.026	230	1.373	0.1	0.073	2%
Si42	UN_UN	1.761	0.054	15	1.813	0.088	0.049	3%
SK78	UN_UN	4.134	0.138	87	3.988	0.089	0.022	-4%

Table 39: Main Pit CRM results

Au standard(s)				No. of samples	Calculated values			
Standard code	Method	Expected value	Expected SD		Mean Au	SD	CV	Mean bias
OxE56	UN_UN	0.611	0.015	17	0.61	0.032	0.052	0%
OxF100	UN_UN	0.804	0.019	39	0.811	0.019	0.024	1%
OxK69	UN_UN	3.583	0.086	23	3.896	0.331	0.085	9%
OxK79	UN_UN	3.532	0.078	20	3.665	0.069	0.019	4%
OxK94	UN_UN	3.562	0.042	90	3.57	0.091	0.026	0%
OxL63	UN_UN	5.865	0.141	45	5.77	0.372	0.065	-2%
SE44	UN_UN	0.606	0.017	119	0.619	0.013	0.021	2%
SE68	UN_UN	0.599	0.013	91	0.577	0.085	0.148	-4%
SH35	UN_UN	1.323	0.044	62	1.287	0.188	0.146	-3%
SH41	UN_UN	1.344	0.041	24	1.37	0.026	0.019	2%
SH69	UN_UN	1.346	0.026	61	1.359	0.048	0.035	1%
Si42	UN_UN	1.761	0.054	48	1.724	0.326	0.189	-2%
Si54	UN_UN	1.78	0.034	31	1.793	0.055	0.03	1%
SJ39	UN_UN	2.641	0.083	61	2.524	0.1	0.04	-4%
SJ53	UN_UN	2.637	0.048	48	2.632	0.064	0.024	0%
Sk43	UN_UN	4.086	0.093	31	3.749	0.647	0.173	-8%
SK52	UN_UN	4.107	0.088	51	4.041	0.119	0.029	-2%
SK62	UN_UN	4.075	0.14	61	4.036	0.087	0.022	-1%
SK78	UN_UN	4.134	0.138	48	4.036	0.082	0.02	-2%

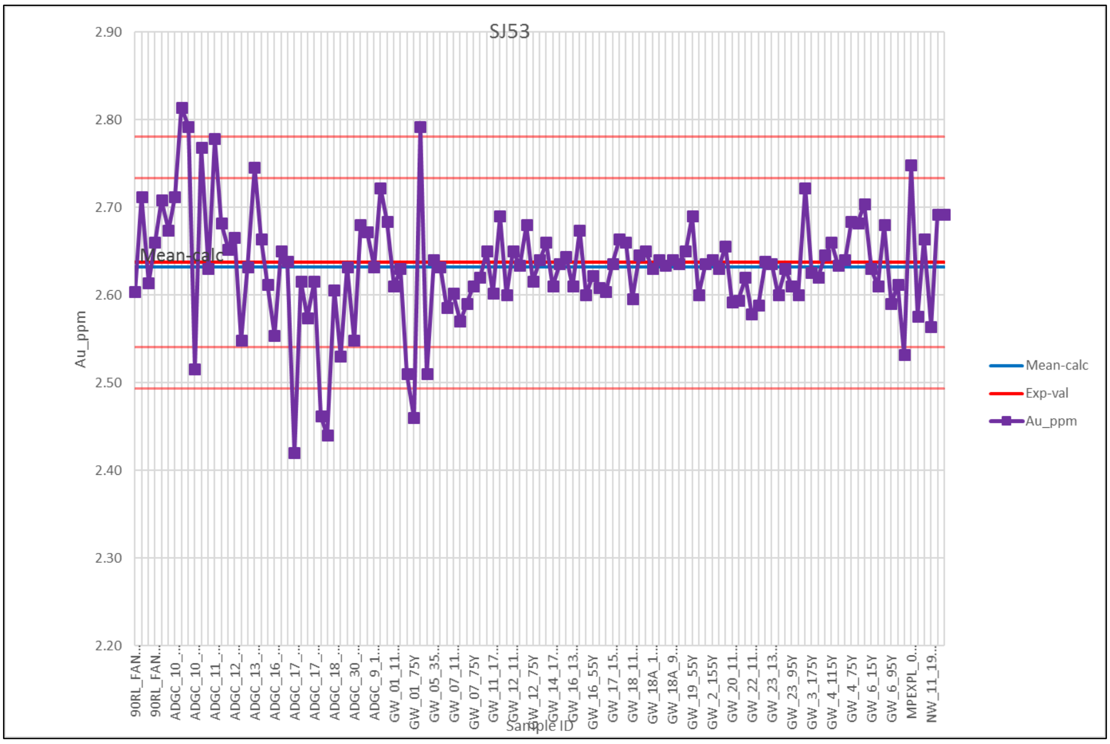


Figure 30: Results of Main Pit CRM SJ53 showing multiple failures (poor precision) but accurate results

Table 40: East Pit CRM results

Au standard(s)				No. of samples	Calculated values			
Standard code	Method	Expected value	Expected SD		Mean Au	SD	CV	Mean bias
OxE74	UN_UN	0.615	0.017	81	0.619	0.021	0.033	1%
OxF100	UN_UN	0.804	0.019	72	0.811	0.011	0.013	1%
Oxi67	UN_UN	1.817	0.062	80	1.813	0.101	0.056	0%
OxK79	UN_UN	3.532	0.078	12	3.479	0.605	0.174	-2%
OxK94	UN_UN	3.562	0.042	17	3.606	0.063	0.018	1%
SE44	UN_UN	0.606	0.017	54	0.625	0.022	0.035	3%
SE68	UN_UN	0.599	0.013	33	0.609	0.012	0.02	2%
SH41	UN_UN	1.344	0.041	89	1.372	0.035	0.026	2%
SH69	UN_UN	1.346	0.026	38	1.354	0.121	0.089	1%
Si42	UN_UN	1.761	0.054	7	1.765	0.078	0.044	0%
Si54	UN_UN	1.78	0.034	17	1.792	0.022	0.012	1%
SJ53	UN_UN	2.637	0.048	6	2.605	0.018	0.007	-1%
SK62	UN_UN	4.075	0.14	44	4.005	0.032	0.008	-2%

Table 41: NTV CRM results

Au standard(s)				No. of samples	Calculated values			
Standard code	Method	Expected value	Expected SD		Mean Au	SD	CV	Mean bias
SE68	UN_UN	0.599	0.013	16	0.617	0.02	0.032	3%
SF67	UN_UN	0.835	0.021	41	0.852	0.027	0.032	2%
SH69	UN_UN	1.346	0.026	63	1.358	0.065	0.048	1%

Table 42: WP2 CRM results

Au standard(s)				No. of samples	Calculated values			
Standard code	Method	Expected value	Expected SD		Mean Au	SD	CV	Mean bias
OxK79*	UN_UN	3.532	0.078	51	3.605	0.079	0.022	2%
OxK94	UN_UN	3.562	0.042	17	3.544	0.15	0.042	-1%
SE44	UN_UN	0.606	0.017	39	0.619	0.016	0.026	2%
SF67	UN_UN	0.835	0.021	23	0.83	0.032	0.039	-1%
SH41	UN_UN	1.344	0.041	20	1.36	0.03	0.022	1%
SH69	UN_UN	1.346	0.026	45	1.351	0.05	0.037	0%
Si54*	UN_UN	1.78	0.034	61	1.776	0.06	0.034	0%
SJ53*	UN_UN	2.637	0.048	48	2.637	0.069	0.026	0%
SK52*	UN_UN	4.107	0.088	31	3.965	0.078	0.02	-3%
SK78	UN_UN	4.134	0.138	24	3.965	0.078	0.02	-4%

** Shows results with apparent misidentified CRMs filtered out*

Table 43: WP1 CRM results

Au standard(s)				No. of samples	Calculated values			
Standard code	Method	Expected value	Expected SD		Mean Au	SD	CV	Mean bias
OxE56	UN_UN	0.611	0.015	75	0.616	0.03	0.048	1%
OxL63	UN_UN	5.865	0.141	18	5.792	0.386	0.067	-1%
SH35	UN_UN	1.323	0.044	77	1.324	0.078	0.059	0%
SJ39	UN_UN	2.641	0.083	46	2.52	0.141	0.056	-5%

Table 44: Leduc CRM results

Au standard(s)				No. of samples	Calculated values			
Standard code	Method	Expected value	Expected SD		Mean Au	SD	CV	Mean bias
OxE74*	UN_UN	0.615	0.017	37	0.606	0.013	0.022	-1%
OxG83	UN_UN	1.002	0.027	32	1.013	0.02	0.02	1%
OxI67	UN_UN	1.817	0.062	66	1.821	0.036	0.02	0%
OxK79	UN_UN	3.532	0.078	20	3.558	0.041	0.012	1%
SK52	UN_UN	4.107	0.088	46	4.03	0.082	0.02	-2%
SL51	UN_UN	5.909	0.136	28	5.898	0.08	0.014	0%

** Shows results with apparent misidentified CRMs filtered out*

Table 45 below lists the Ouaré Project CRMs and their expected values, mean assay values and biases. The Ouaré CRM results are accurate with a maximum absolute bias of 4% (once apparent misidentified CRMs were removed), but not always precise with numerous failures.

Table 45: Ouaré CRM results

Au standard(s)				No. of samples	Calculated values			
Standard code	Method	Expected value	Expected SD		Mean Au	SD	CV	Mean bias
OxE101	UN_UN	0.607	0.016	131	0.610	0.014	0.023	1%
OxE56*	UN_UN	0.611	0.015	55	0.614	0.030	0.049	0%
OxE74*	UN_UN	0.615	0.017	102	0.622	0.030	0.048	1%
OxE86	UN_UN	0.613	0.021	111	0.622	0.116	0.187	1%
OxF100	UN_UN	0.804	0.019	75	0.814	0.015	0.019	1%
OxF65	UN_UN	0.805	0.034	26	0.798	0.040	0.051	-1%
OxF85	UN_UN	0.805	0.025	93	0.818	0.020	0.025	2%
Oxi96	UN_UN	1.802	0.039	123	1.805	0.033	0.018	0%
OxK69	UN_UN	3.583	0.086	206	3.591	0.107	0.030	0%
OxK94	UN_UN	3.562	0.042	211	3.542	0.067	0.019	-1%
SF45	UN_UN	0.848	0.028	99	0.813	0.067	0.082	-4%
SH35*	UN_UN	1.323	0.044	134	1.333	0.035	0.026	1%
SH41	UN_UN	1.344	0.041	226	1.298	0.158	0.122	-3%
SH55	UN_UN	1.375	0.045	87	1.339	0.029	0.021	-3%
Si42	UN_UN	1.761	0.054	272	1.785	0.081	0.046	1%
Si54	UN_UN	1.780	0.034	17	1.819	0.038	0.021	2%
SJ39	UN_UN	2.641	0.083	54	2.624	0.090	0.034	-1%
SJ53*	UN_UN	2.637	0.048	187	2.600	0.056	0.022	-1%
SK33	UN_UN	4.041	0.103	55	3.955	0.503	0.127	-2%
SK43	UN_UN	4.086	0.093	78	3.994	0.085	0.021	-2%
SK62*	UN_UN	4.075	0.140	198	4.011	0.063	0.016	-2%

** Shows results with apparent misidentified CRMs filtered out*

11.6.3 Precision

Precision error can be estimated by measuring the precision error at each stage of the sampling and assay process. Field duplicates contain all sources of error (sampling error, sample reduction error and analytical error), laboratory duplicates contain sample reduction error and analytical error, pulp duplicates contain analytical error only. Field duplicate data, laboratory coarse duplicates (AuS) and laboratory pulp splits (AuR) were reviewed where available.

Data were assessed using coefficients of variation (CV = std dev/average – also known as relative standard deviation) calculated from individual duplicate pairs and averaged using the RMS (root mean squared) approach. This approach is recommended by Stanley and Lawie (2007) and Abzalov (2008) as a way of defining a fundamental measure of data precision using duplicate paired data.

Precision errors (CV_{AVR}(%)) were calculated for duplicates with mean values ≥10 times the analytical detection limit and compared to acceptable limits. Acceptable and best practice limits are obtained from Abzalov's 2008 paper, "Quality Control of Assay Data: A Review of Procedures for Measuring and Monitoring Precision and Accuracy". Scatter plots, relative difference plots and Q-Q plots were produced.

Mean grades for the original and duplicate populations and relative bias were calculated. Any absolute bias greater than 5% has been highlighted in red. These biases are often disproportionally affected by one or two high grade outlier pairs. In other words, if these high-grade outliers are removed, many of the biases are also removed or reduced.

Results are listed in the tables below. Table 46 lists the results for the Youga duplicates and Table 47 for the Ouaré duplicates. Due to the quantity of data and paucity of metadata, the Youga duplicates have been analysed globally per mineral resource area (i.e. not grouped by year or sample type). The Ouaré duplicates have been reviewed by sample type and by year.

Table 46: Youga gold duplicate biases and precision errors (red highlights show failures)

Area	Duplicate type	Pairs (total)	Mean Au (original)	Mean Au (duplicate)	Bias	Count of pairs (>10 x DL)	$CV_{(AVR)}$% Best Practice	$CV_{(AVR)}$% Acceptable Practice	$CV_{(AVR)}$ %
A2NE	FD	387	0.894	0.854	-4%	104	20	40	64
	AuS	1024	2.515	2.527	0%	365	20	40	24
	AuR	1768	0.518	0.508	-1%	544	10	20	18
WP4	FD	96	0.705	0.56	-21%	98	20	40	40
	AuS	250	0.994	0.97	-2%	94	20	40	9
	AuR	264	0.574	0.581	1%	141	10	20	7
WP3	FD	86	0.597	0.562	-6%	48	20	40	25
	AuS	616	1.748	1.671	-4%	409	20	40	5
	AuR	1,156	1.635	1.62	-1%	804	10	20	5
Zergoré	FD	187	0.532	0.65	22%	104	20	40	48
	AuS	894	2.385	2.332	-2%	511	20	40	11
	AuR	1,530	0.85	0.826	-3%	808	10	20	11
Main Pit	FD	443	1.451	1.422	-2%	264	20	40	37
	AuS	3,132	3.344	3.229	-3%	1,724	20	40	9
	AuR	5,619	1.32	1.319	0%	2,947	10	20	9
East Pit	FD	145	0.613	0.547	-11%	89	20	40	49
	AuS	872	0.734	0.72	-2%	474	20	40	9
	AuR	1,499	0.736	0.734	0%	818	10	20	9
NTV	FD	0					20	40	
	AuS	104	1.655	1.583	-4%	86	20	40	15
	AuR	182	0.929	0.906	-2%	151	10	20	7
WP2	FD	79	1.565	1.68	7%	59	20	40	47
	AuS	645	1.65	1.619	-2%	376	20	40	6
	AuR	1,086	1.085	1.071	8%	613	10	20	8
WP1	FD	69	0.987	1.125	14%	34	20	40	29
	AuS	188	0.463	0.469	1%	61	20	40	17
	AuR	605	0.997	0.991	-1%	295	10	20	9
Leduc	FD	229	0.199	0.199	0%	84	20	40	15
	AuS	0					20	40	
	AuR	0					10	20	

Results of the Youga gold duplicate pair comparison are summarised below:

- No external check (umpire) data available.
- The proportion of field duplicate pairs is low.
- A2NE: Field duplicate repeatability poor ($CV_{(AVR)}$ 64%), but no significant bias.
- WP4: Acceptable repeatability for field duplicates, but bias to original samples (21%). If two higher grade sample pairs removed then bias drops to 1% to duplicates.
- WP3: Acceptable repeatability for field duplicates, no significant bias (6% to original samples but if one higher grade sample pair is removed then bias drops to 1%).
- Zergoré: Field duplicates have poor repeatability ($CV_{(AVR)}$ 48%) and bias (22% to duplicates). Bias drops to 6% if two outliers removed.
- Main Pit: Acceptable repeatability and no significant bias.
- East Pit: Field duplicates have poor repeatability ($CV_{(AVR)}$ 49%) and bias (11% to original samples).
- NTV: No field duplicate data.
- WP2: Field duplicates have poor repeatability ($CV_{(AVR)}$ 47%) and bias (7% to duplicate samples).
- WP1: Field duplicates have acceptable repeatability ($CV_{(AVR)}$ 47%) and bias (14% to original samples).
- Leduc: Field duplicates precise with no bias.

Table 47: Ouaré gold duplicate biases and precision errors (red highlights show failures)

Duplicate type	Pairs (total)	Mean Au (original)	Mean Au (duplicate)	Bias	Count of pairs (>10 x DL)	$CV_{(AVR)}$% Best Practice	$CV_{(AVR)}$% Acceptable Practice	$CV_{(AVR)}$ %
FDup DD 2011	4				2	20	40	
FDup DD 2012	246	0.512	0.387	-24%	100	20	40	42
FDup RC 2008	204	0.361	0.424	18%	93	20	40	31
FDup RC 2010	335	0.287	0.275	-4%	119	20	40	26
FDup RC 2011	744	0.419	0.413	-2%	379	20	40	13
FDup RC 2012	776	0.267	0.257	-4%	188	20	40	21
LabChck	177	0.379	0.263	-31%	70	10	20	42

Results of the Ouaré gold duplicate pair comparison are summarised below:

- No external check (umpire) data available
- The proportion of field duplicate pairs is low
- RC pairs have acceptable repeatability (maximum for nuggety gold should be 40%)
- DD duplicate pairs have marginal repeatability
- Biases noted, but often disproportionally affected by one or two high grade outlier pairs
- Lab checks have 31% bias, but if two high grade pairs removed this improves to 5% to original samples (with a RMS RSD of 39%).

11.7 Adequacy of Sampling, QAQC and Data Management

QAQC procedures appear adequate, but it is unclear whether they are always implemented. Numerous failures of CRMs and blanks were noted as well as apparent misidentification of these samples. Most of the project areas had unacceptably high failure rates in CRMs and blanks, although CRM results were generally accurate (but imprecise).

Data management requires improvement. There are numerous examples of duplicated data in the databases, as well as apparent misidentified QC records and missing data. These issues decrease confidence in the input data used for the Mineral Resource estimation work. Avesoro would benefit from implementing a comprehensive data management system including the use of a relational geological database such as acQuire or DataShed to ensure validation of data and to serve as a single point of truth for all the project data. Laboratory QC results should be routinely reviewed and captured in the database and external check samples (umpires) should be sent to an accredited laboratory. CRMs must be included with these samples.

12 Data Verification

12.1 Database Verification

BMC provided CSA Global with data in MS Excel spreadsheets and MS Access databases which were loaded into a SQL relational database, which is an industry standard for exploration project databases. The database schema used was the Maxwell DataShed format; which contains validation constraints and triggers, ensuring that data loaded meets standard validation rules. Validation issues were noted and resolved where possible during the above process and a validated database provided for downstream work. Issues noted included:

- 122 drillholes in the database with duplicated coordinates, dips and azimuths
- 114 drillholes with no samples
- 14,830 samples with no assay results
- 5,584 drillholes with no geology data.

CSA Global recommend Avesoro implement a relational geological database such as acQuire or DataShed to host the project data, as is in place at other projects owned by Avesoro Holdings subsidiaries, e.g. New Liberty, Liberia.

Where laboratory assay certificates were provided, a random selection were checked against the database data.

- Youga Projects: Gold results from 20 MS Excel laboratory assay certificates (ALS Youga) for the period 2010 to 2016 were checked against the database assay values. No significant issues or differences were noted (120 drillholes were verified).
- Ouaré Project: Gold values from SGS PDF assay certificates for 2012 drilling (14 RC and seven DD drill holes) were checked against the database. No issues were noted, although assay certificates were only provided for the 2012 drill campaign and no check was undertaken for any of the other drill campaigns.
- Ouaré Project: ActLabs and ALS certificates were also provided for pulp duplicates. Assumed to be external check assays, but no associated sample data provided.

12.2 Site Visit Verification

12.2.1 Geology and Mineral Resources

It is noted that very few drill collars have been preserved at the Youga Project, and the only collars CSA Global could verify were at West Pit 4 (presented in Table 48).

Table 48: GPS and database collar surveys verified during the site visit (WGS1984, Zone 30N)

Deposit	Collar	GPS E	GPS N	Database E	Database N	Waypoint
West Pit 4	WP4-ADGC18	775,611	1,227,961	775,609.18	1,227,959.59	4
Ouaré	BITRC11-227	808,375	1,247,499	808375.31	1247498.85	21
	BITRC-11-299	808,427	1,247,548	808427.31	1247547.89	23
	BITRC08-034	808,554	1,247,510	808552.854	1247511.776	24
	BITDDH-11-023	808,702	1,247,575	808700.8	1247575.71	25
	BITDDH-11-024	808,702	1,247,621	808702.14	1247621.18	26

CSA Global ground truthed all exploration target and mined deposits at Youga and Ouaré, inspecting open pits, drill collar locations (where preserved) and having geological discussions with the client representative.

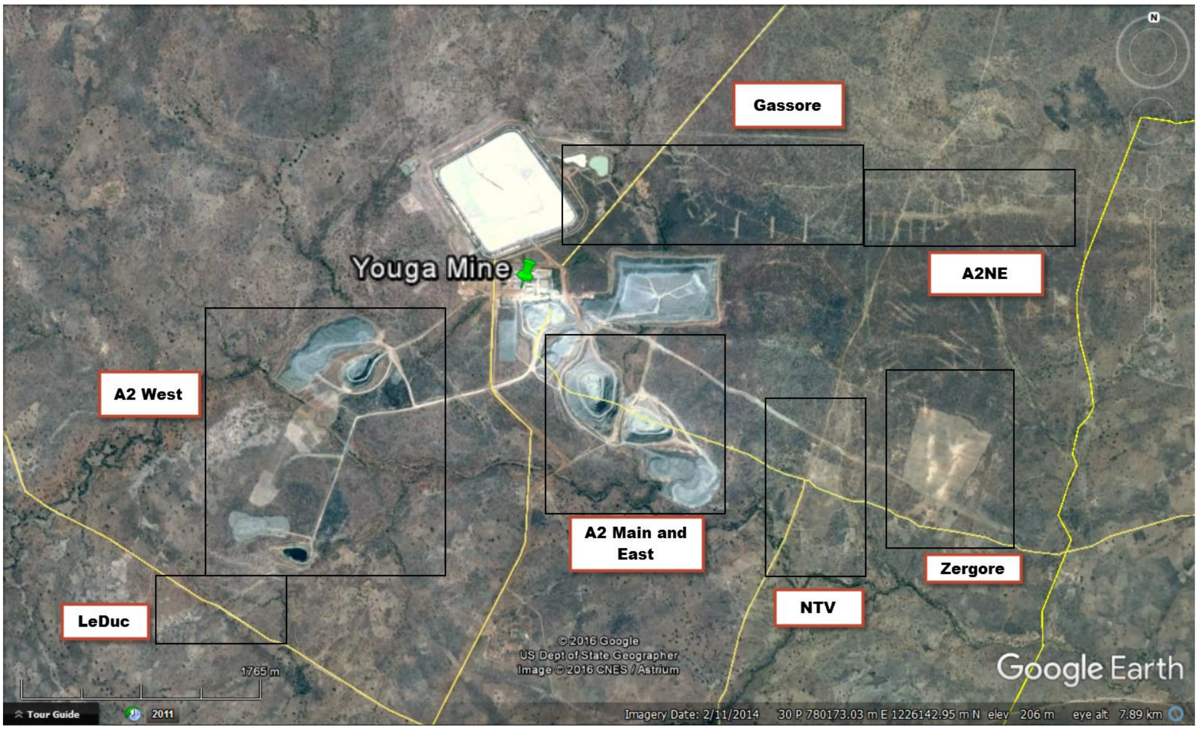


Figure 31: Location of Youga deposits (Google Earth image date November 2014)

Source: CSA Global, 2014

12.2.2 Mining and Mineral Reserves

The Mineral Reserve estimate is based on the Mineral Resource models created by CSA Global. Where possible these were compared to previous estimates prepared by MNG, to ensure that they were similar and to highlight and explain any significant differences.

The stockpile reserves, as at 28th February 2017, were supplied by MNG and were verified during the site visit.

12.3 Verification of RC Drilling

Drillhole samples flagged within the modelled mineralisation volumes (Section 14.4) at the Youga and Ouaré deposits, were used to compare Au (g/t) assays from RC and DD data. The results are shown in Figure 32 to Figure 40.

To ensure sample population are comparable, the drill data have been composited to the same sample length and top cut, within each respective deposit.

Generally, the RC and DD mean assay values and grade distributions are comparable above the 0.25 g/t Au cut-off of interest. This was the cut-off used for mineralisation modelling. Both RC and DD datasets are acceptable for use in the MRE and there is no obvious bias.

There was no DD drilling at West Pit 4 available for analysis or use in the MRE.

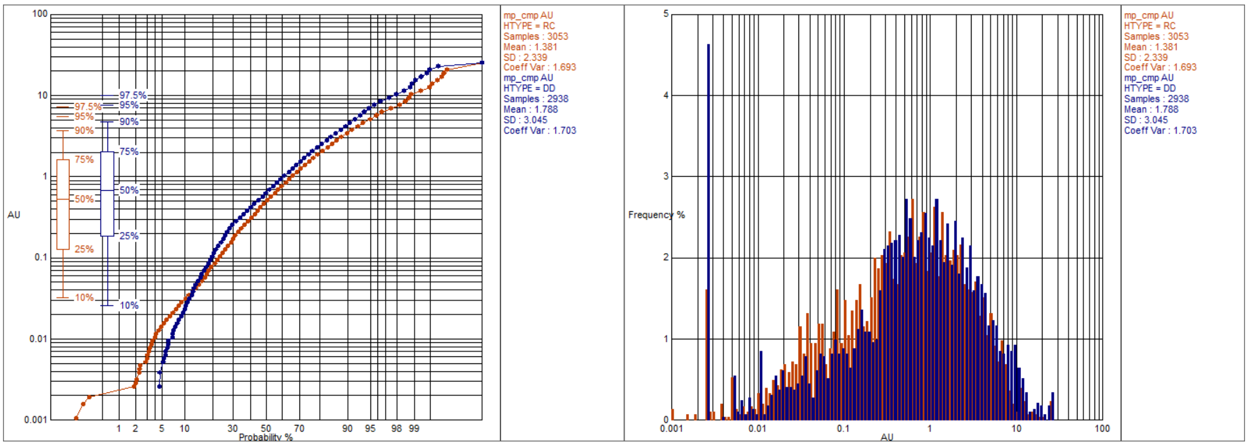


Figure 32: Main Pit RC (red) vs. DD (blue) – Log probability and log histogram plots

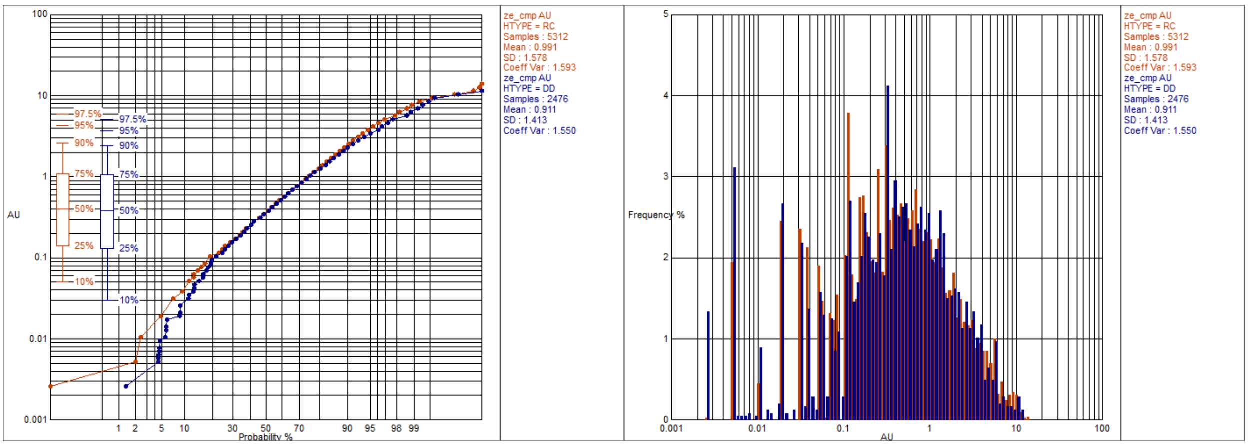


Figure 33: Zergoré RC (red) vs. DD (blue) – Log probability and log histogram plots

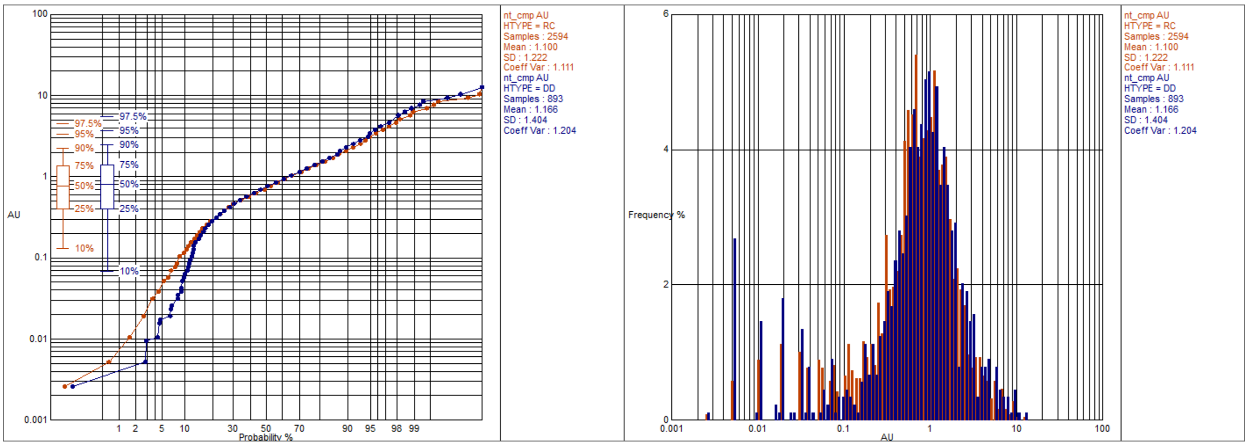


Figure 34: NTV RC (red) vs. DD (blue) – Log probability and log histogram plots

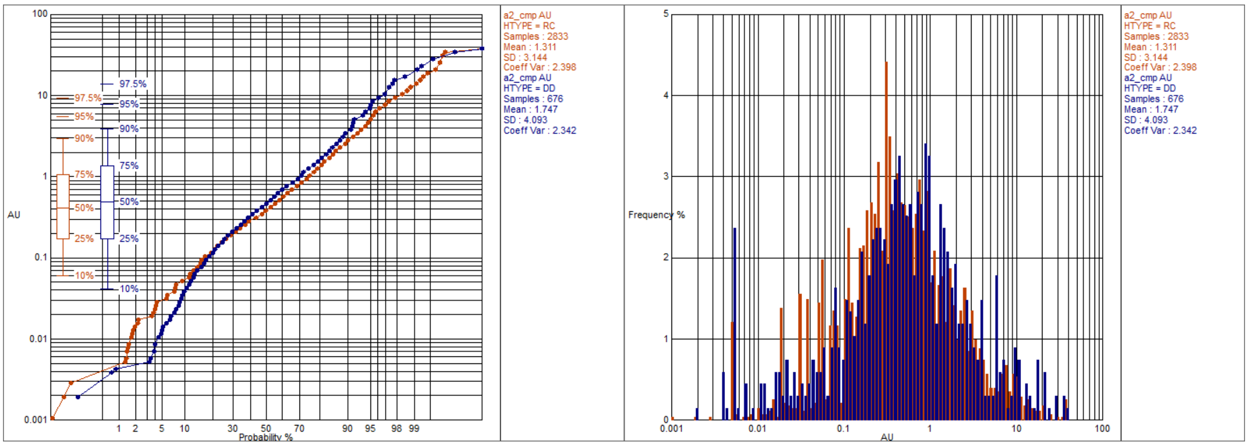


Figure 35: A2NE RC (red) vs. DD (blue) – Log probability and log histogram plots

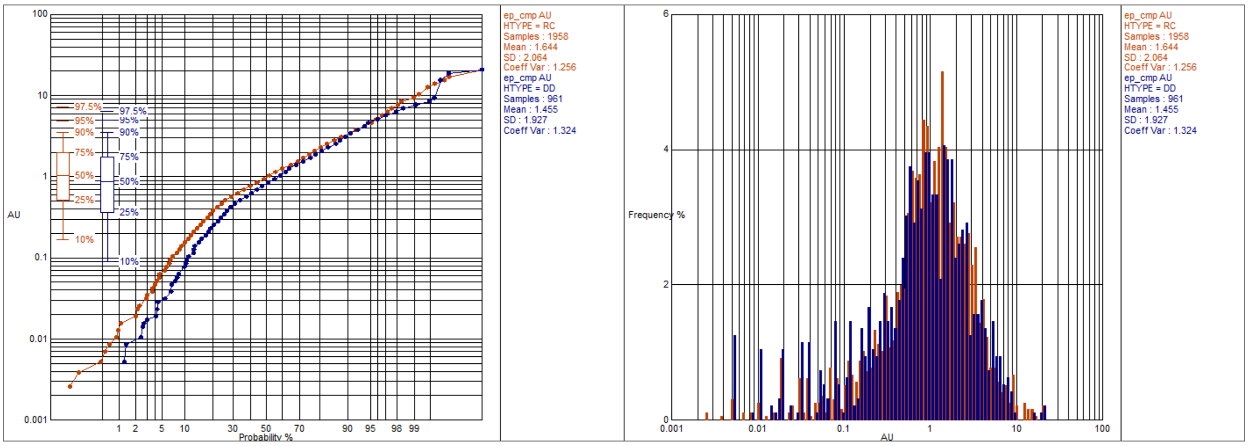


Figure 36: East Pit RC (red) vs. DD (blue) – Log probability and log histogram plots

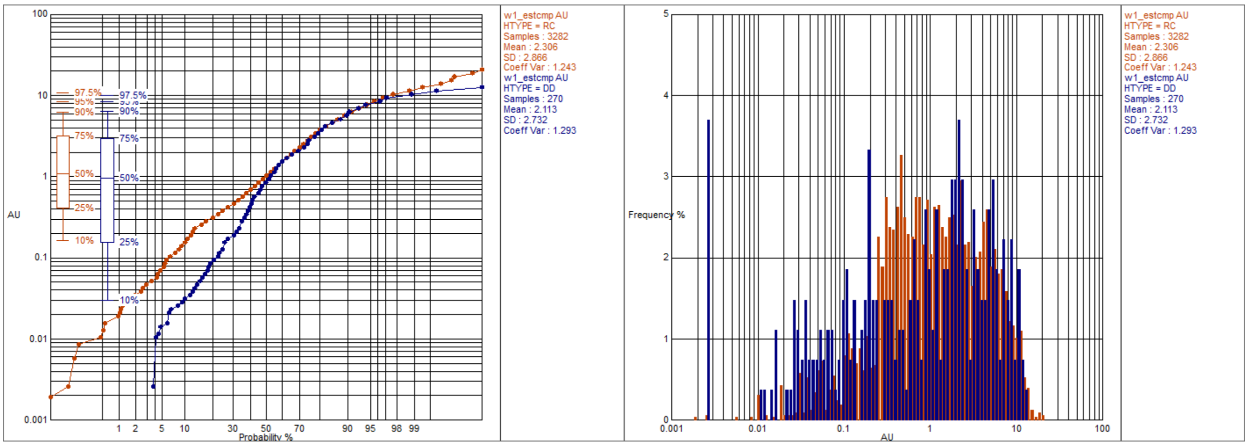


Figure 37: West Pit 1 RC (red) vs. DD (blue) – Log probability and log histogram plots

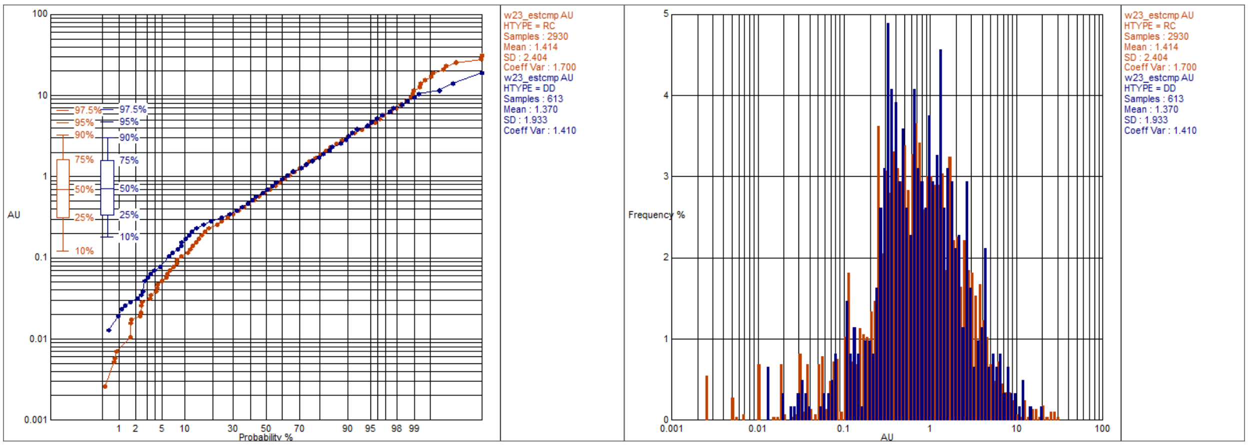


Figure 38: West Pit 2 and 3 RC (red) vs. DD (blue) – Log probability and log histogram plots

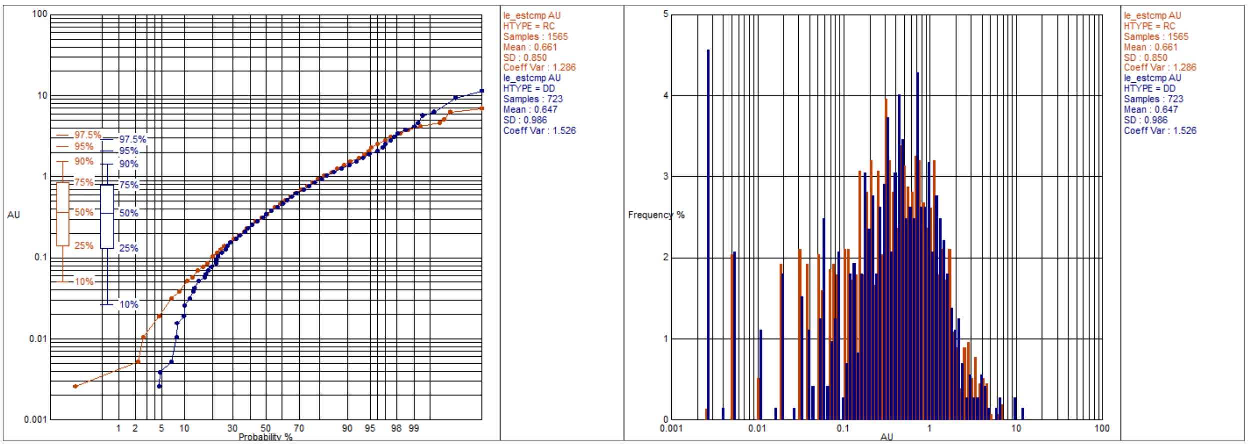


Figure 39: LeDuc RC (red) vs. DD (blue) – Log probability and log histogram plots

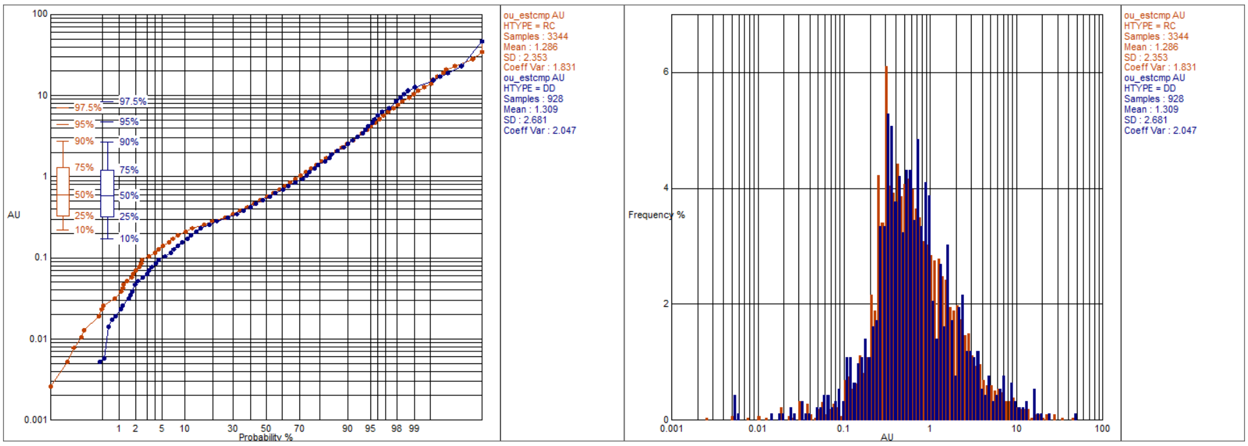


Figure 40: Ouaré RC (red) vs. DD (blue) – Log probability and log histogram plots

12.4 Drill Sample Recovery and Quality

The sample recovery of the drilling completed prior to Endeavour involvement for both Youga and Ouaré has not been recorded in the database, although Ashanti reported sample recovery for both the RC and diamond drilling to be high (Lycopodium, 1999).

As per the 2014 Endeavour technical report, for drilling that was managed by Endeavour, recovery was routinely calculated and captured in the database:

- Youga had an average core recovery near 95% and RC recoveries estimated near 79%. Acceptable recovery was achieved for all programs of drilling completed.
- Ouaré had an average core recovery near 95% and RC recoveries estimated near 80%. Acceptable recovery was achieved for all programs of drilling completed.

The database provided only included recovery records from the Youga Project, with no data from the Ouaré Project.

There were 242 samples from NTV (Figure 41) and 1,648 samples from A2NE (Figure 42) available for review of the core sample recovery. Sample recoveries increase with rock competency/reduced weathering. Within NTV, core sample recovery was good in fresh rock averaging 92%. Core recovery from the moderate to highly weathered saprolite averaged 70%. The overburden/laterite showed lower core recovery at 58%. Within A2NE, core sample recovery in DD was very good in fresh rock averaging 97%. Core recovery from the moderate to highly weathered saprolite averaged 93%, with much lower core recovery in the overburden/laterite at 54%.

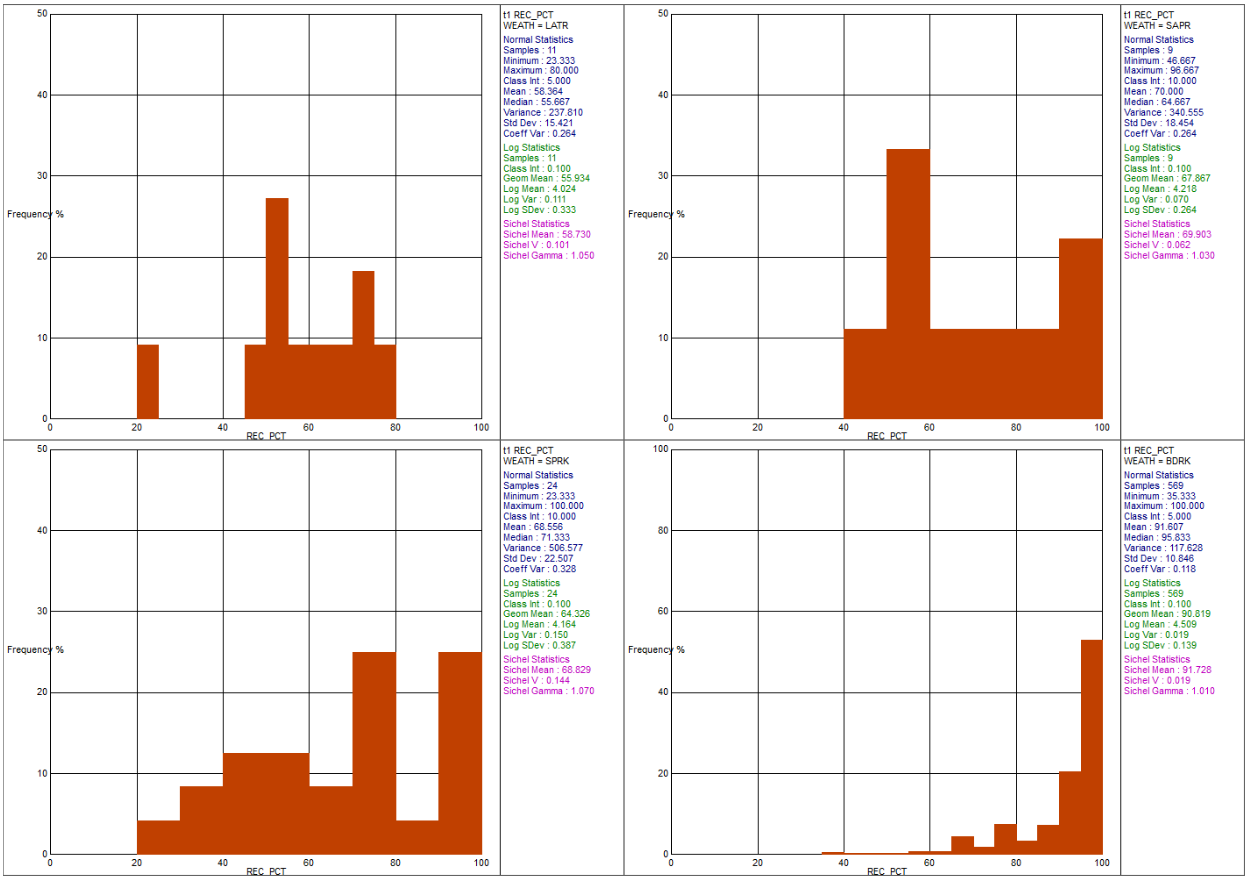


Figure 41: NTV histogram plots – DD percentage core recovery

Clockwise from top left: Laterite, Saprolite, Saprock and Bedrock

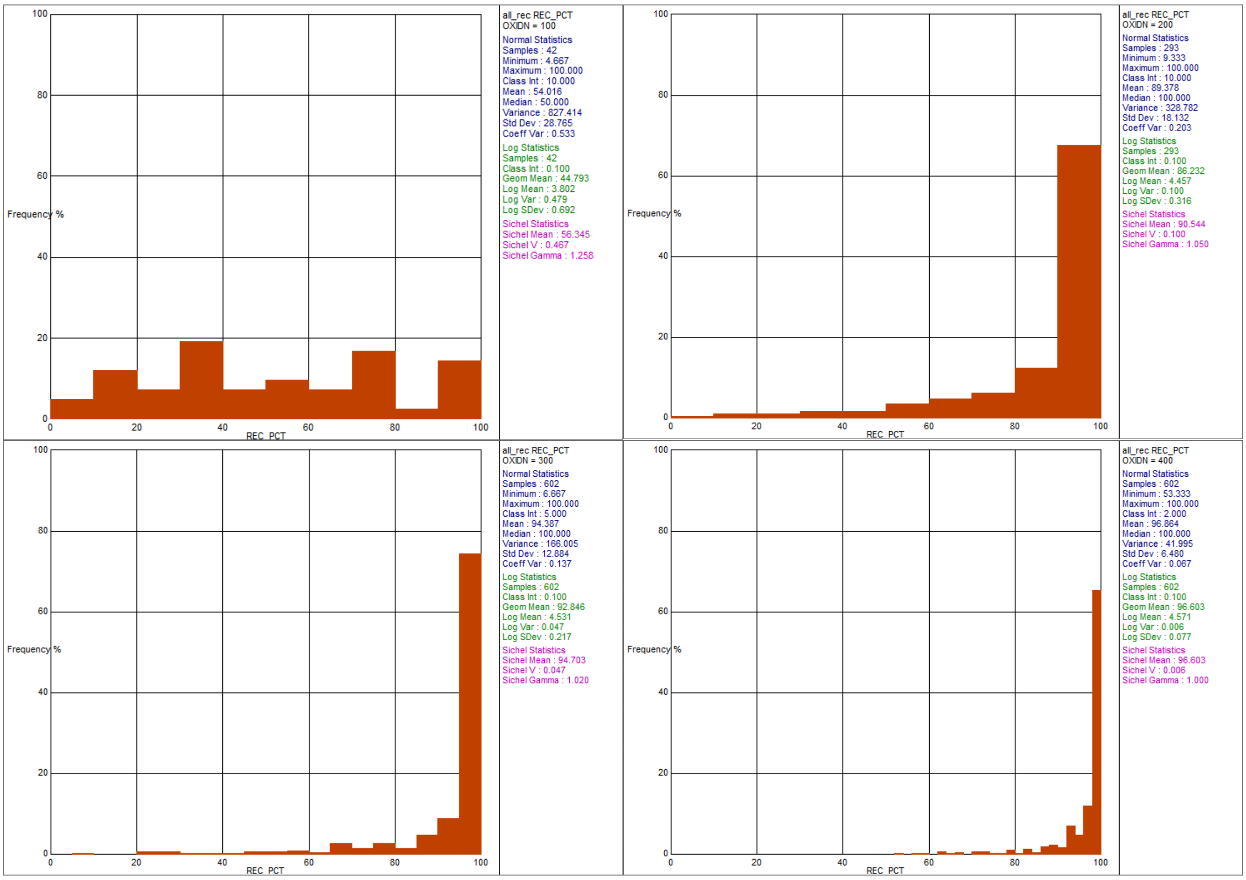


Figure 42: A2NE histogram plots – DD percentage core recovery

Clockwise from top left: Overburden, Oxide Rock, Transitional Rock and Fresh Rock

Both the NTV and A2NE deposits have been mined. Most of the MRE for these deposits are within Transitional and Fresh Rock, 99% at NTV and 93% at A2NE. Therefore, the poor recoveries are not considered material.

The percentage DD core recovery against the Au grade was graphically reviewed for both the NTV (Figure 43) and A2NE (Figure 44) deposits. No relationship was evident.

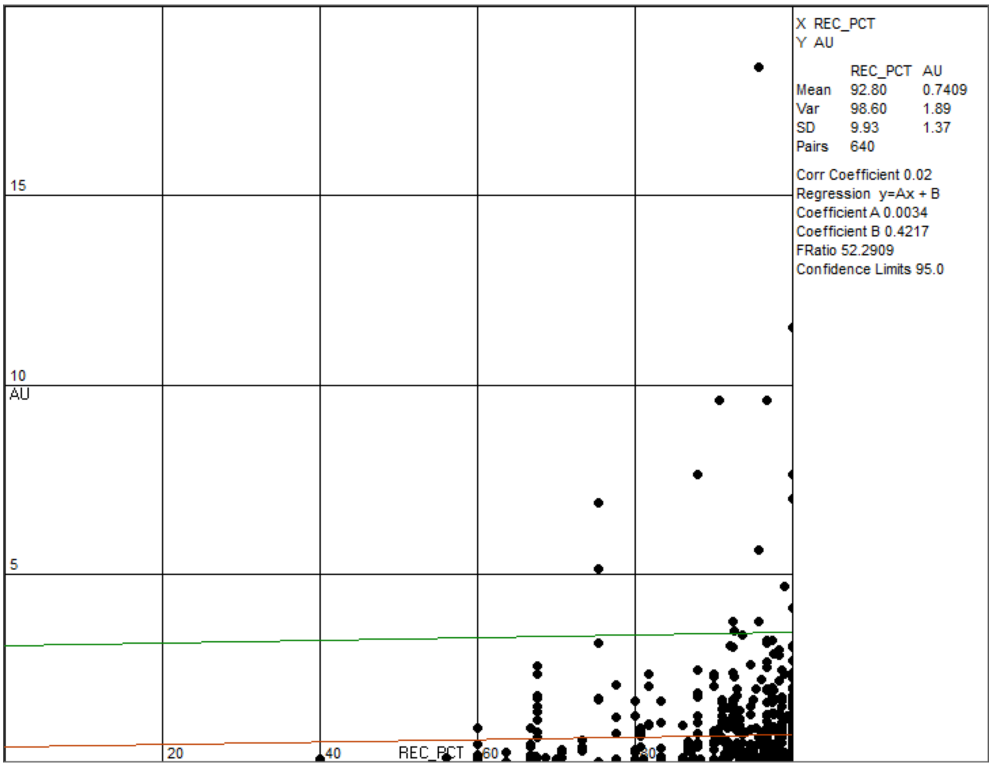


Figure 43: NTV correlation plot – percentage core recovery vs. Au g/t

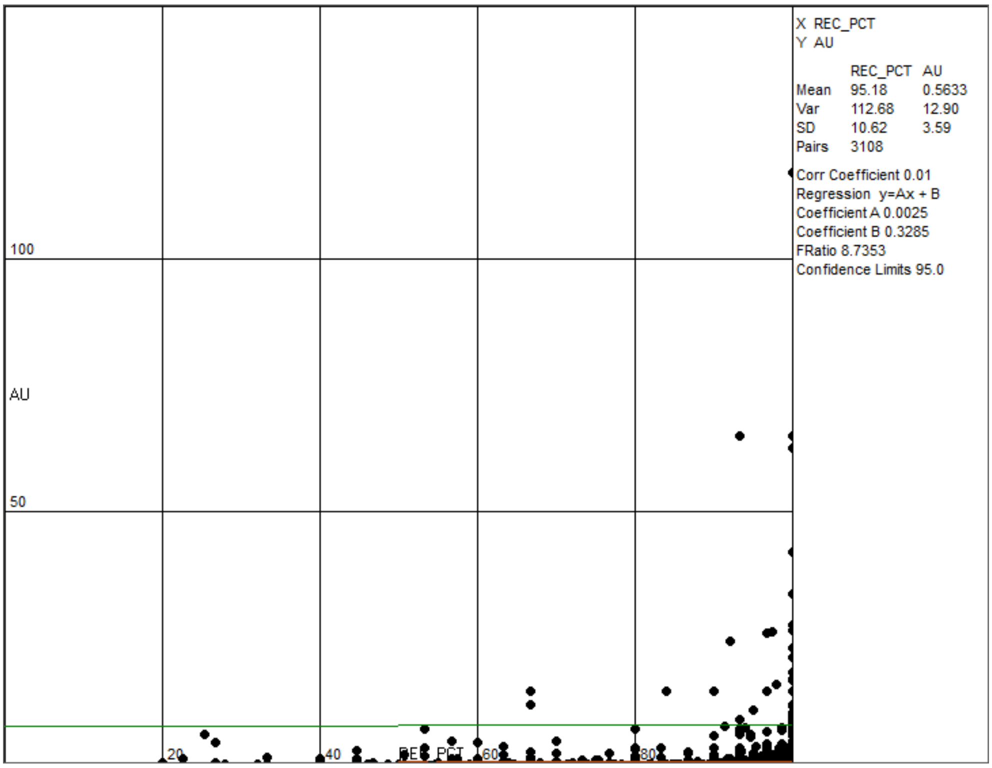


Figure 44: A2NE correlation plot – percentage core recovery vs. Au g/t

12.5 Data Verification Limitations

Limitations noted include the following:

- A relational geological database is not in use, instead data were provided in various MS Access databases and MS Excel sheets. An industry standard database should be implemented which can serve as a single point of truth for the project data as well as being secure and have automated backups.
- ALS Youga gold assay results for the period 2010 to 2016 and SGS assay certificates for the 2012 Ouaré drilling were randomly verified against the database assay results. No other assay certificates were provided so no check of other results could be made.
- Numerous failures in the QAQC including apparent misidentified CRMs and blanks decreases confidence in the input data used for the Mineral Resource estimation work.
- Many drill hole collars at Youga have been destroyed due to ongoing mining. The only collar verified was at West Pit 4 where no mining has taken place yet.
- No sample weight data were captured in the database for Youga or Ouaré samples. Therefore, no review of recovery versus grade could be made for any of the RC samples.

12.6 Conclusions

Subject to the limitations listed above, and based on the outcomes of the above data verification undertaken, as well as discussions with site geologists; CSA Global considers the drillhole data for the Youga and Ouaré project to be sufficiently reliable for Mineral Resource estimation and associated downstream work.

13 Mineral Processing and Metallurgical Testing

13.1 Introduction

The project is planning to upgrade the diminishing ore grades at the current Youga operation by supplementing the feed material with material from nearby satellite deposits, and the Ouaré deposit. Ore from this source will be trucked 44 km from a new mining operation, and dumped at the site. The mill feed to the operation is scheduled to average 1.18 Mt/year, of which material from Ouaré will comprise the proportions of 34% in 2018, 73% in 2019, and 53% in 2020. Altogether, 2.6 Mt will be treated at Youga over the scheduled mine life to 2025.

13.2 Youga Processing Plant

13.2.1 Youga Ore Characteristics

Eight Youga core samples and three composite pit samples were tested at Mintek (1999 and 2004), and three core samples at Hazen Research at a previous date (Ref. HGC Cement and Mineral Processing Technologies – Section 15.4). These reported:

- An average Bond Ball Mill Work Index of 15. 9, with a range of 17.1 to 19.4 kWh/t
- Potential gravity circuit recoveries of 40 - 50%.
- Leach Extractions ranged from 88 to 96% on 10 samples of gravity tailing, after 24 hours and at low CN consumptions (<0.04kg/t).
- The mineralogical report indicated the gold occurrence as both coarse and fine liberated particles between 40 and 100 microns in size, and as fine inclusions (1 – 12 microns) in pyrite.

This was the basis of design for the Youga process plant, which commenced operation in 2008. The flowsheet comprises of a three-stage crushing, and single stage ball milling circuit; a gravity section recovering between 25 and 33% of the gold present, from a portion of the current cyclone underflow recycle stream; the cyclone overflow reports to a single stage cyanide leach and five stage integral carbon-in-leach circuit (CIL). Loaded carbon is removed from the first CIL tank and the gold recovered in a 'Zadra' elution system with gold recovery by electrowining, while the leached product from the CIL circuit is pumped to the tailings management facility (TMF).

Production highlights for the operation since commencement of production in 2008 are shown in Table 49, with the year to date results shown in Table 50 below:

Table 49: Youga Mine Operation - Production History (Client Communication).

Year	Tonnes Milled	Head Grade, g/t	Au Recovery	Oz Produced
2008	663,334	2.37	92.80%	45,264
2009	871,740	2.64	91.60%	65,648
2010	891,202	3.10	93.60%	82,405
2011	940,168	3.18	93.80%	87,266
2012	1,012,829	2.92	93.60%	89,022
2013	1,005,876	2.99	92.40%	89,448
2014	990,852	2.67	91.00%	76,561
2015	1,058,326	2.20	89.80%	68,407
2016	1,119,197	1.39	88.50%	44,403

The operating performance since production start-up has confirmed the pre-production recovery assumptions (both gravity and leach extractions). The reduction in production in 2015/16 was due to the significant decrease in milled head grade, which was partially offset by an increase in plant throughput.

Table 50: Youga Mine Operation – 2017 YTD Production History (Client Communication).

Year	Tonnes Milled	Head Grade, g/t	Au Recovery, %	Oz Produced
January	110,895	1.68	90.1	5,399
February	100,466	1.88	90.0	5,404
March	106,499	1.98	90.2	6,114
April	102,148	2.81	92.6	8,548
May	99,554	4.71	91.4	13,773
2017 (YTD)	519,562	2.58	90.7	39,238

The effect of head grade on production is clearly shown in Table 50, as the average head grade treated has increased on a monthly basis.

13.3 Testwork on Ouaré and Satellite Samples (AMEC 2012, Micon 2013)

Whole core drill samples (23), two each from Ouaré East, Ouaré Central and Ouaré West (designated CW); samples from six satellite zones, together with a Youga plant sample, were tested at SGS Vancouver to compare responses of each to the current operating Youga processing flowsheet.

13.3.1 Ouaré Ore Characteristics

Standard comminution tests were completed on the more competent (geologically described as "Fresh") samples present, with both Bond Rod and Ball Mill Indexes being measured.

Table 51: Ouaré Samples – Comminution Test results, July 2012

Ouaré Sample Nos	Rod Mill Index	Hardness Percentile	Ball Mill Index	Hardness Percentile
East 1	19.1	88	18.4	93
East 2	18.2	83	22.2	97
Central 2	19.6	91	16.6	87
West 2	20.3	94	11.1	57
Youga Plant	16.8	73	15.7	84

While the results of the Rod Mill determinations are not generally used for single stage ball milling circuits, they give an indication of the grinding characteristics at the coarser end of the size ranges (10 to 1 mm). Comparing the actual measurements to the actual plant sample at the time indicates that the Ouaré samples tested are significantly harder (with the exception of the Ball Mill Index of West 2) for both measurements, which is clearly confirmed with their relative positions in the 'hardness' profile.

Standard Gravity tests were completed on the samples ground to an 80 percent passing size (P80) of 150 microns, and subsequent leach tests completed on the gravity tails. In addition, the gravity tails were ground to a P80 size of 75 microns to compare the effects of leaching at a finer grind size. The results summarised in Table 52 and Table 53.

Table 52: Ouaré Samples - Gravity Test results, July 2012

Sample	Head Grade	Conc Grade	Au Recovery
Ouaré	Au g/t	Au, g/t	%
East 1	1.74	195	8.4
East 2	4.68	767	12.3
Central 1	4.38	832	8.1
Central 2	4.40	79	1.9
C W 1	1.67	501	36.6
C W 2	2.06	162	7.4
Youga Plant	4.68	849	16.8

Table 53: Ouaré Samples - Leach Test results, July 2012

Ouaré Sample Nos	Au Extraction %	CN Consumption kg/t	Lime Consumption, kg/t
East 1	79.1	0.54	0.39
East 2	77.9	0.55	0.44
Central 1	81.5	0.30	0.7
Central 2	74.9	0.45	0.32
CW 1	90.1	0.22	0.35
CW 2	75.5	0.63	0.2
Youga Plant	84.8	0.30	0.24

The report made the comment that leaching was substantially complete for all the samples tested after 10 hours, with the exceptions of Central 2, which took 20 hours, and East where the extraction continued to increase slowly after the initial 10-hour period. The benefits of a finer primary grind are also clear with the recommendation that this should be the target grind for the leach circuit.

The leach results were based on the original gravity grind size of 80 percent passing 150 microns. Additional work was performed on each of the samples at 80 percent passing 75 microns to compare the effects of leaching at a finer grind size. The effects are shown in Table 54 below.

Table 54: Ouaré Samples, overall Au Recovery Projection. July 2012

Ouaré	Calc. Head	Residue Assays	Au Extraction, %	
Sample No.	Au g/t	Au, g/t	P80 - 75	P80 - 150
East 1	1.74	0.18	89.7	82.5
East 2	4.68	0.39	91.7	82.4
Central 1	4.38	0.45	89.7	84.5
Central 2	4.4	0.61	86.1	77
CW 1	1.67	0.06	96.1	92.5
CW 2	2.06	0.27	86.9	70.6
Youga Plant	4.87	0.28	94.3	88.5

As can be seen the finer grind significantly improves the leach performance, and the 75-micron grind should be the target when treating the Ouaré ores in the future.

13.3.2 Satellite Deposits - Ore Characteristics

Standard comminution tests were completed on the more competent (geologically described as "Fresh") samples present, with both Bond Rod and Ball Mill Indexes being measured.

Table 55: Satellite Samples – Comminution Test results, July 2012

Satellite Sample Nos	Rod Mill Index	Hardness Percentile	Ball Mill Index	Hardness Percentile
A2N4	14.6	54	11.2	59
Nanga 2	16.1	67	12.3	69
Nanga 3	19.4	89	15.7	84
Tail 2	16.9	73	15.4	82
Tail 3	16.9	73	17.1	89
Zegore N 3	15.2	59	10.8	56
Zegore S 3	16.5	70	12.3	67
Youga Plant	16.8	73	15.7	84

While the results of the Rod Mill determinations are not generally used for single stage ball milling circuits, they give an indication of the grinding characteristics at the coarser end of the size ranges (10 to 1 mm). Comparing the actual measurements to the those recorded for the plant sample at the time indicates that the Satellite deposit samples show generally lower, or equivalent numbers for both measurements, which is also confirmed with their relative positions in the 'hardness' profile. One Ball Mill Index sample ('Tail 3'), was harder than the plant sample at the time. These results confirm that for the ores tested, there should be no bottlenecks in achieving the required mill throughputs.

Standard Gravity tests were completed on the samples ground to an 80 percent passing size (P80) of 150 microns, and subsequent leach tests completed on the gravity tails. The gravity recovery results are summarised in Table 56 and Table 57. Note that no results are recorded for Zergoré S 1 due to sample contamination during the testing procedures.

Table 56: Satellite Samples - Gravity Test results, July 2012

Satellite Sample Nos	Calc. Head Grade Au, g/t	Conc. Grade, Au, g/t	Au Recovery, %
A2N_1	2.37	176	18.1
A2N_2	2.89	197	12.3
A2N_3	0.25	41.9	28.1
A2N_4	0.1	6.16	11.9
Nanga 1	1.68	314	18.8
Nanga 2	2.14	329	18.7
Nanga 3	1.47	192	16.6
Tail 1	0.79	163	13.9
Tail 2	0.51	100	20.3
Tail 3	0.69	155	27.1
Zegore N 1	0.4	382	27.4
Zegore N 2	3.63	1047	26.8
Zegore N 3	2.24	943	32.2
Zegore S 2	2.72	359	0.45
Zegore S 3	0.61	102	0.26
Youga Plant	4.87	849	16.8

The results show the potential of good recovery by gravity for the ore types tested, with the exception for the samples recorded from Zergoré South.

Table 57: Satellite Samples - Leach Test results on Gravity Tail (P80 – 150 microns), July 2012

Satellite Sample Nos	Au Extraction %	CN Consumption kg/t	Lime Consumption, kg/t
A2N_1	92.3	0.06	1.5
A2N_2	91.5	0.19	0.85
A2N_3	87.2	0.11	0.92
A2N_4	71.7	0.04	0.44
Nanga 1	90.5	0.2	0.58
Nanga 2	84.6	0.5	0.62
Nanga 3	62.5	0.36	0.59
Tail 1	95.6	0.3	0.89
Tail 2	83.6	0.35	0.47
Tail 3	85.3	0.27	0.39
Zegore N 1	91.9	0.23	0.08
Zegore N 2	85.4	0.46	0.32
Zegore N 3	81.5	0.55	0.35
Zegore S 2	75.6	0.3	0.45
Zegore S 3	92.1	0.3	0.26
Youga Plant	84.8	0.3	0.24

The leach results were based on the original gravity grind size of 80 percent passing 150 microns. Additional work was performed on three of the samples at 80 percent passing 75 microns to compare the effects of leaching at a finer grind size. The comparison is shown in Table 58 below.

Table 58: Satellite Samples, Overall Au Recovery Projection. July 2012

Satellite	Calc. Head	Residue Assays	Au Extraction, %	
Sample No.	Au g/t	Au, g/t	P80 - 75	P80 - 150
Nanga N 3	1.47	0.12	91.8	63.3
Zegore N 2	3.63	0.20	94.5	89.3
Zegore S 2	2.72	0.28	89.7	80.5
Youga Plant	4.87	0.28	94.3	88.5

As can be seen the finer grind improves the leach performance, and the 75-micron grind should be the target when treating the Satellite ores in the future.

14 Mineral Resource Estimates

14.1 Introduction

CSA Global was engaged by BMC in January 2017 to update the MRE for the Youga Gold Mine (Youga) and the associated satellite deposit, Ouaré. The Youga and Ouaré deposits are based in Burkina Faso, West Africa.

Table 59 presents the updated MRE for the Youga and Ouaré gold projects as at 28 February 2017. The MRE compiled by CSA Global has been classified and is reported as Indicated and Inferred Mineral Resources based on CIM guidelines and NI 43-101 Technical Reporting requirements.

Table 59: Mineral Resource estimate for the Youga and Ouaré Gold Projects, Burkina Faso, as at 28 February 2017

Deposit	Indicated				Inferred		
	Tonnes Mt	Au Grade g/t	Au Metal Koz	% Metal	Tonnes Mt	Au Grade g/t	Au Metal Koz
Main Pit	2.96	1.53	145.6	21%	0.8	1.4	36
Zergoré	2.57	1.20	99.1	14%	1.0	1.2	39
NTV	1.88	1.10	66.6	9%	1.5	1.3	61
A2NE	0.86	1.98	54.7	8%	0.5	1.8	29
East Pit	0.68	1.55	33.8	5%	0.0	1.2	2
West Pit 3	0.64	1.53	31.5	4%	0.2	1.2	7
West Pit 2	0.57	1.46	26.8	4%	0.2	1.5	8
West Pit 4	0.34	1.53	16.6	2%	0.4	0.9	13
West Pit 1	-	-	-		0.1	1.6	5
Leduc	-	-	-		1.0	1.0	34
Ouaré	5.10	1.39	228.3	32%	7.2	1.8	406
Total	**15.60**	**1.40**	**703.0**		**12.9**	**1.5**	**639**

Notes:
1. Reporting cut-off is 0.55 g/t Au for all deposits.
2. The Mineral Resource Estimate has been depleted for mining up to 28th February 2017. The effective date of the Mineral Resource is February 28th, 2017.
3. Figures have been rounded to the appropriate level of precision for the reporting of Resources.
4. Due to rounding, some columns or rows may not compute exactly as shown.
5. The Mineral Resources are stated as in situ dry tonnes. All figures are in metric tonnes.
6. The Mineral Resource has been classified under the guidelines of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves, Definitions and Guidelines prepared by the CIM Standing Committee on Reserve Definitions and adopted by CIM Council, and procedures for classifying the reported Mineral Resources were undertaken within the context of the Canadian Securities Administrators National Instrument 43-101 (NI 43-101).
7. The model is reported above a surface based on the NPVS shell from a US$1,500 gold price pit optimisation run to support assumptions relating to reasonable prospects of eventual economic extraction.
8. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. The estimate of Mineral Resources may be materially affected by environmental, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues.
9. Mineral Resources have been reported inclusive of Mineral Reserves, where applicable.
10. No Mineral Reserves have been estimated for the Ouare, West Pit 1 and Leduc deposits.

14.2 Drilling Database

14.2.1 Data Summary

CSA Global was initially provided with two Access Databases and various MS Excel files for the Youga and Ouaré Projects. These data files contained, depending on deposit, variable degrees of collar, downhole survey, lithology, weathering, oxidation, recovery, specific gravity (SG) and assay data. This information was exported in comma-separated values (CSV) format. A summary of the available drill data per deposit received as at 2 February 2017 is shown in Table 60. The drill data was imported into SQL and Datamine StudioRM™ software for validation.

Table 60: Youga and Ouaré databases – summary of data entries as at 2 February 2017

Deposit	Collars	Assays	Surveys	Lithology	Weathering	Oxidation	Recovery	SG
Main Pit	5,190	96,169	11,845	53,011	17,517	17,523	-	136
Zergoré	1,713	50,090	4,826	11,536	8,137	8,137	-	-
NTV	484	26,945	1,844	17,188	15,479	15,478	242	-
A2NE	555	34,972	2,081	19,390	19,359	17,829	1,648	759
East Pit	1,780	35,501	4,642	19,925	11,978	11,982	-	-
West Pit 1	906	14,224	1,884	4,923	1,524	1,527	-	-
West Pit 2/3	2,005	33,026	4,641	5,574	2,616	2,615	-	-
West Pit 4	127	5,612	439	295	295	295	-	450
LeDuc	101	9,932	835	8,489	8,471	8,476	-	-
Ouaré	387	30,917	1,177	25,600	22,635	22,692	-	918

A summary of the drilling data as used for estimation within each deposit is shown in Table 61.

Table 61: Youga and Ouaré databases – summary of drilling as used for estimation as at 2 February 2017

Deposit		RC	RCDD	DD	TR	GT	Absent	Total
Main Pit	Number of holes	166	8	137	45	1	-	**357**
	Metres	15,630	2,287	24,949	5,902	379	-	**49,147**
Zergoré	Number of holes	311	-	107	-	-	-	**418**
	Metres	23,445	-	11,668	-	-	-	**35,113**
NTV	Number of holes	221	-	50	39	-	-	**310**
	Metres	18,378	-	5,377	3,052	-	-	**26,806**
A2NE	Number of holes	264	-	67	-	-	-	**331**
	Metres	20,874	-	3,716	-	-	-	**24,590**
East Pit	Number of holes	109	6	51	-	-	-	**166**
	Metres	10,376	983	6,171	-	-	-	**17,530**
West Pit 1	Number of holes	848	-	43	15	-	-	**906**
	Metres	21,420	-	2,468	1,942	-	-	**25,830**
West Pit 2/3	Number of holes	148	-	23	43	-	3	**217**
	Metres	11,482	-	2,281	3,439	-	263	**17,465**
West Pit 4	Number of holes	109	-	-	18	-	-	**127**
	Metres	6,071	-	-	2,016	-	-	**8,087**
LeDuc	Number of holes	72	-	21	8	-	-	**101**
	Metres	7,408	-	2,592	1,500	-	-	**11,500**
Ouaré	Number of holes	313	-	55	19	-	-	**387**
	Metres	30,283	-	6,855	3,429	-	-	**40,567**

RC – reverse circulation hole; RCDD – reverse circulation with diamond drill tail hole; DD – diamond drillhole; TR – trench; GT – geotechnical hole; Absent – based on review these are RC exploration holes

14.2.2 Location of MRE Data Points

All drill collars completed during the Ashanti/Echo Bay and Endeavour work programs were surveyed using a combination of total-station survey and DGPS techniques by qualified surveyors and utilised control points.

Ashanti/Echo Bay surveyed down-hole deviation using Sperry Sun single shot downhole cameras at intervals ranging from 20 m to 126 m and corrected for magnetic declination. Drilling completed by Endeavour were downhole surveyed using a Flexit© downhole instrument at a minimum of every 30 m and measured relative to magnetic north.

Location plans for drillholes used in the MRE, coloured by drillhole type ("HTYPE") are presented in Figure 45 to Figure 54.

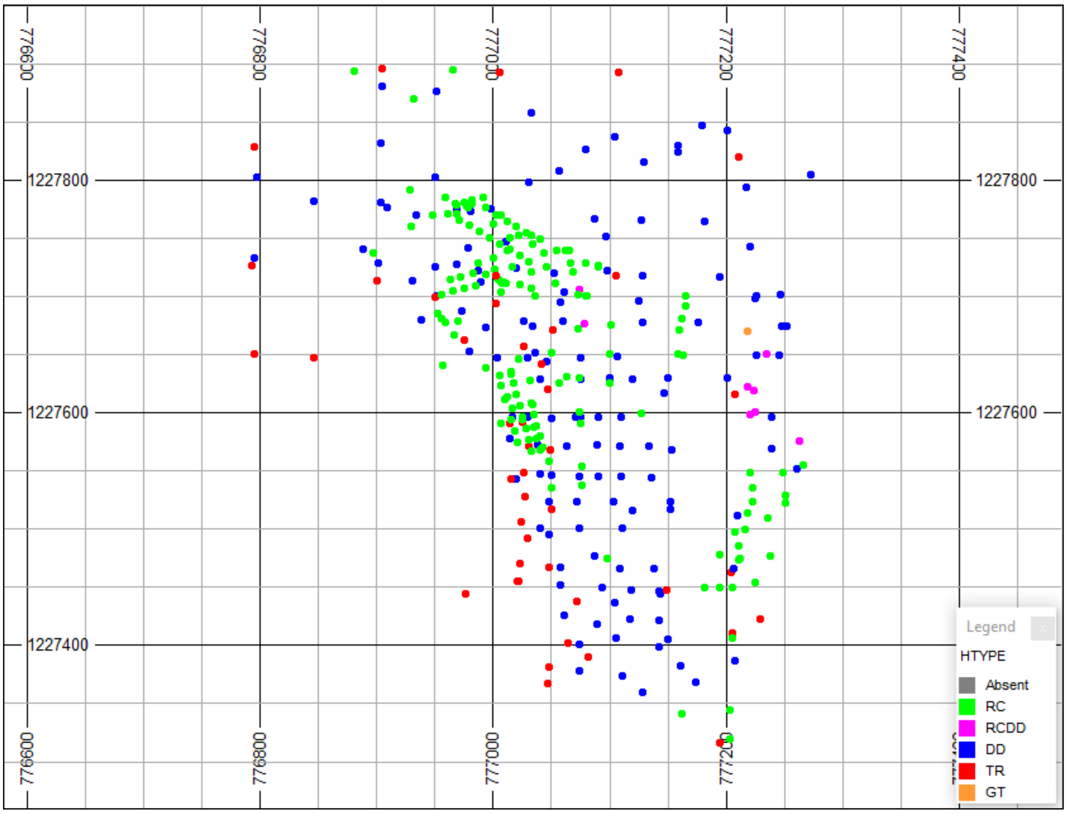


Figure 45: Plan view – Main Pit MRE drillhole locations

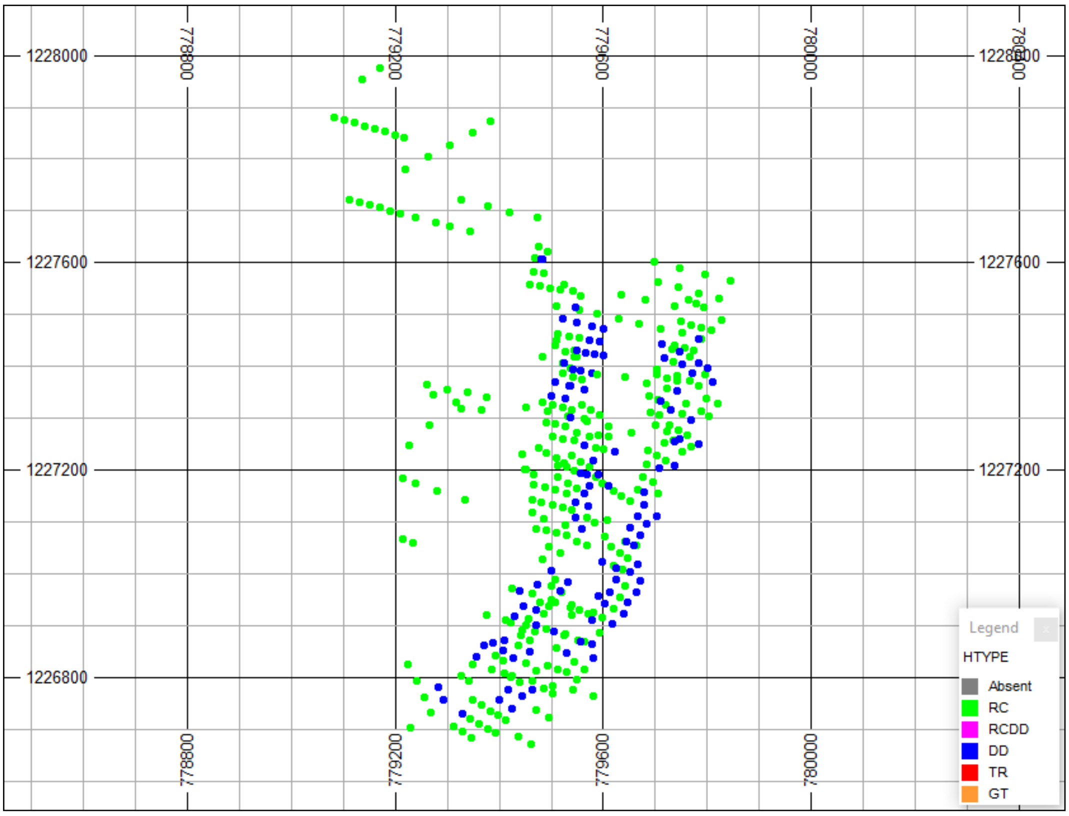


Figure 46: Plan view – Zergoré MRE drillhole locations

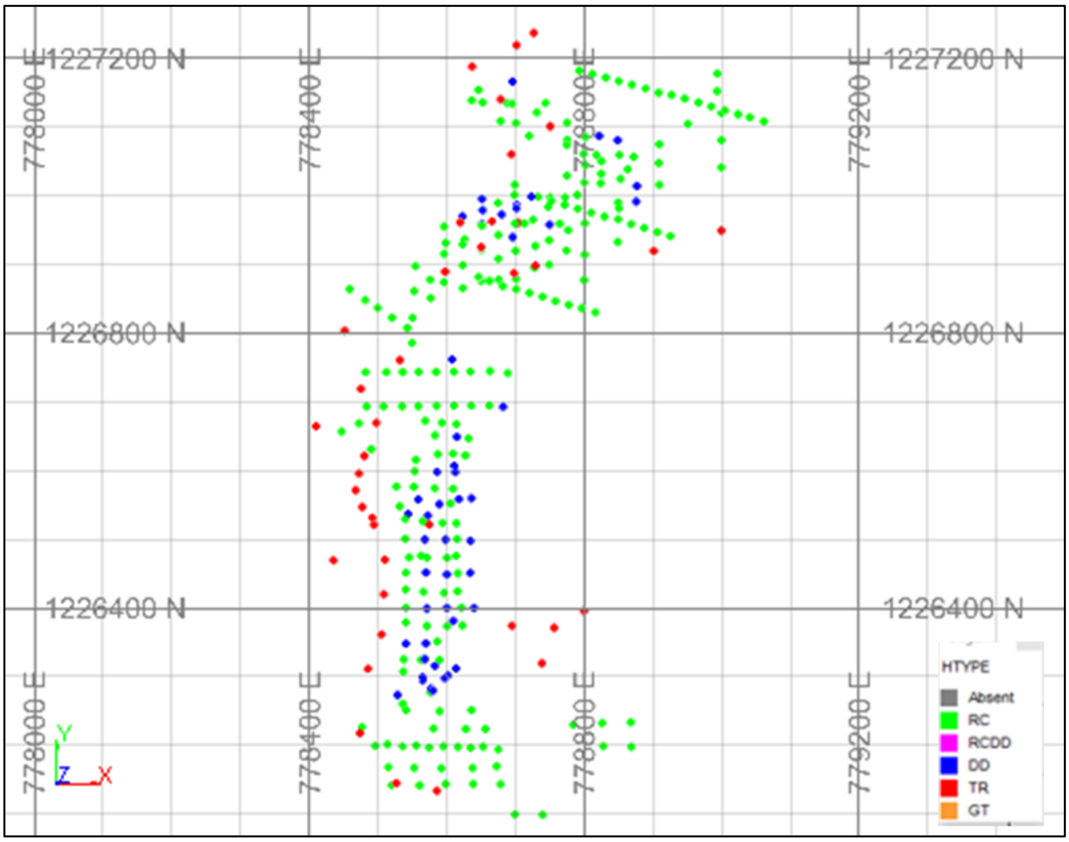


Figure 47: Plan view – NTV MRE drillhole locations

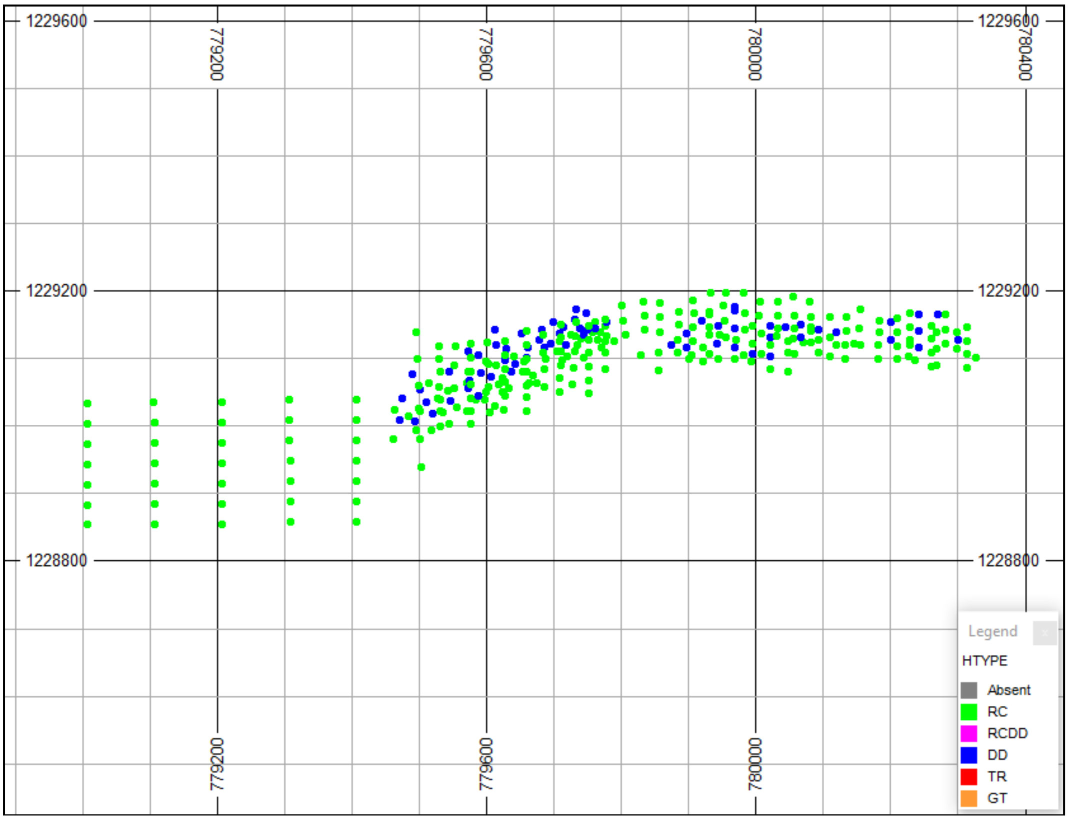


Figure 48: Plan view – A2NE MRE drillhole locations

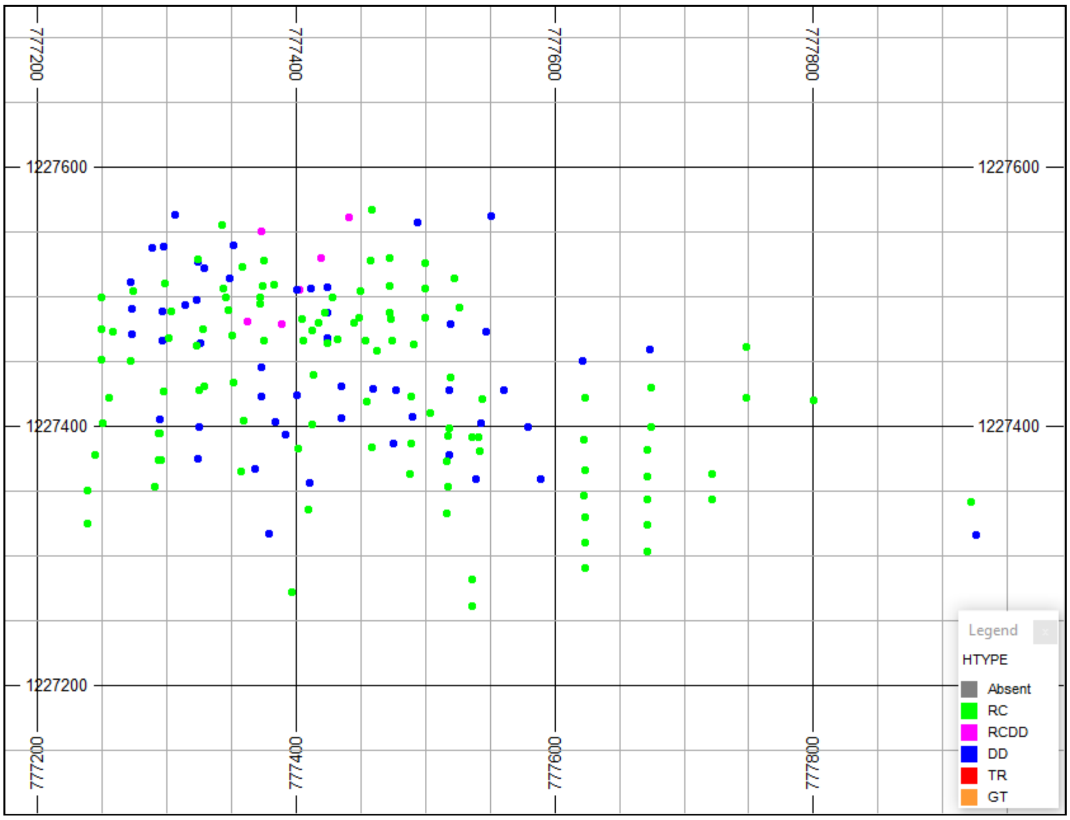


Figure 49 Plan view – East Pit MRE drillhole locations

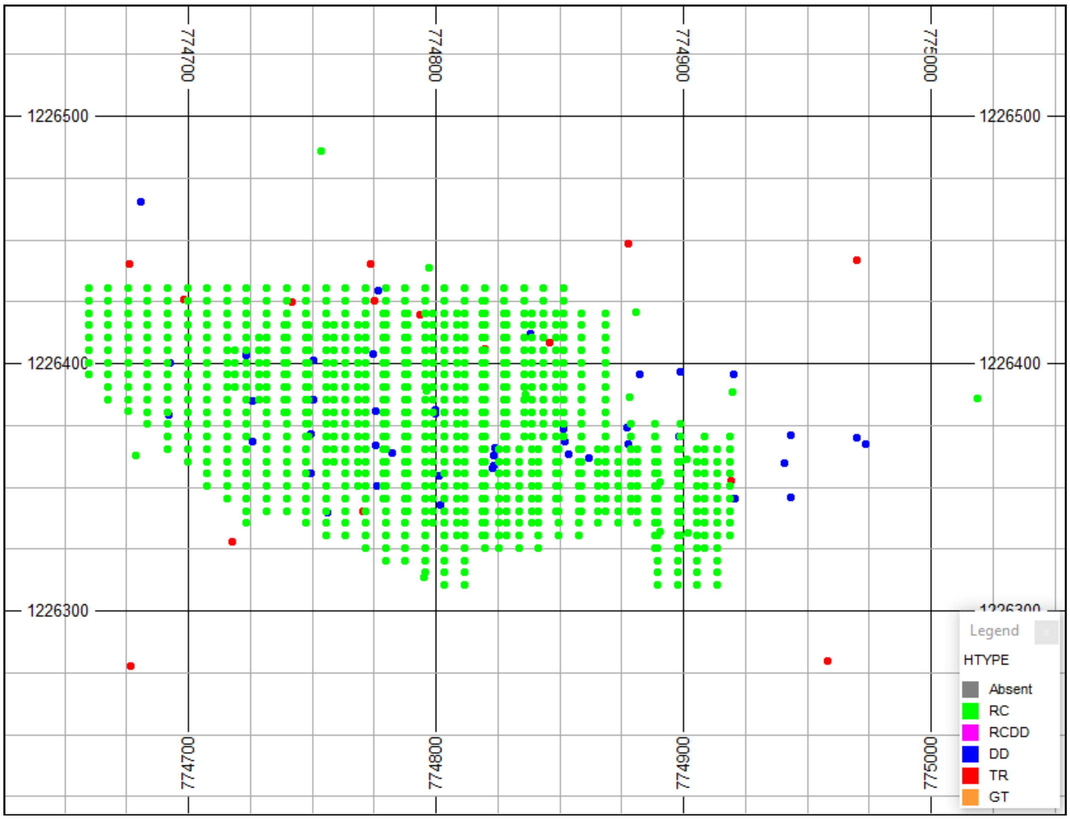


Figure 50 Plan view – West Pit 1 MRE drillhole locations

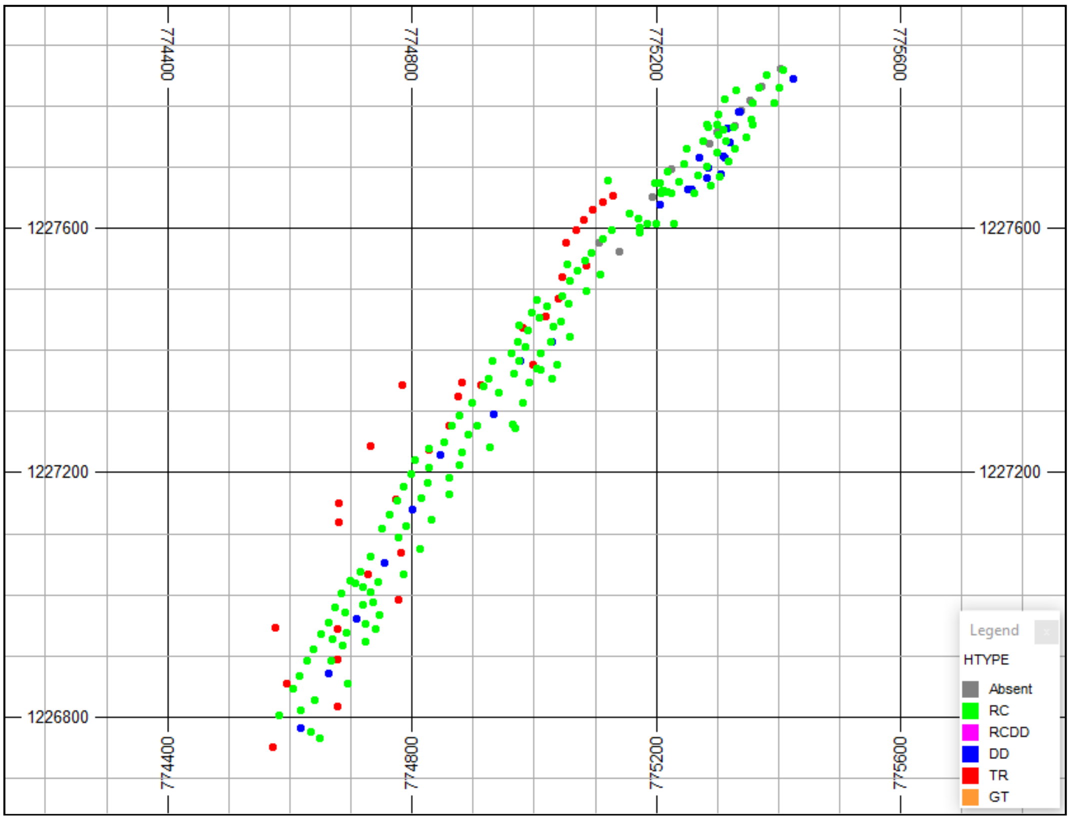


Figure 51: Plan view – West Pits 2 and 3 MRE drillhole locations

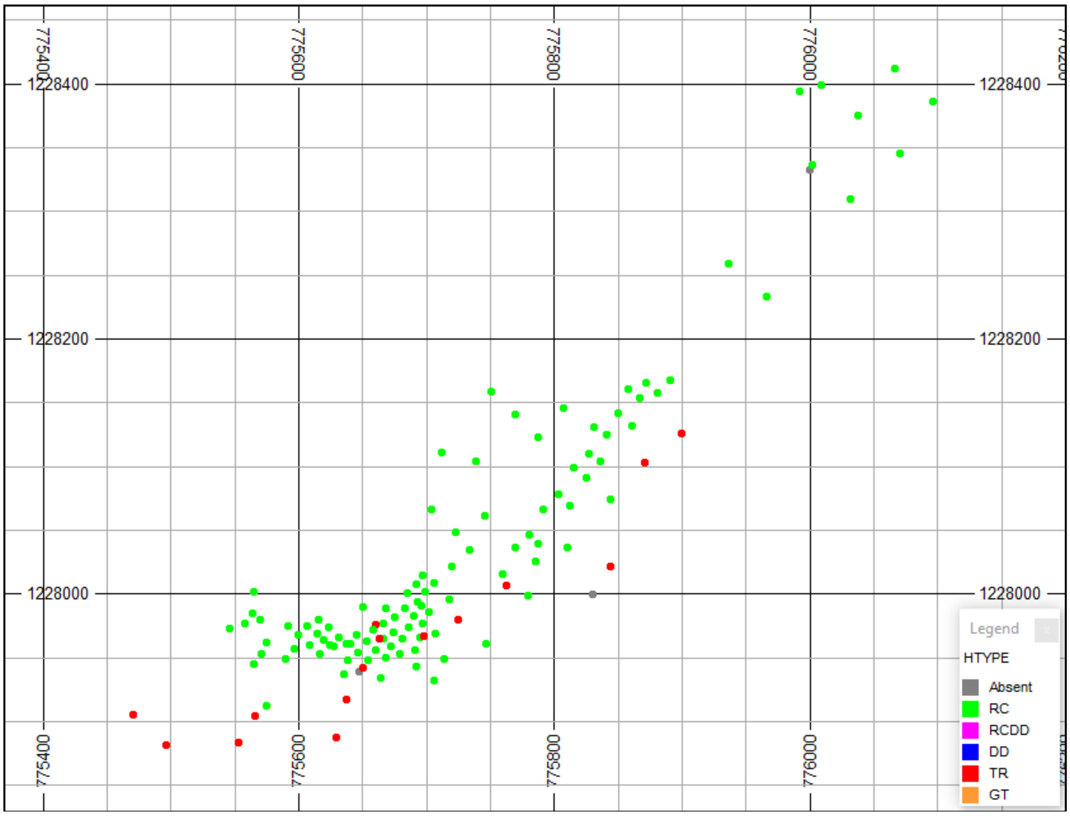


Figure 52: Plan view – West Pit 4 MRE drillhole locations

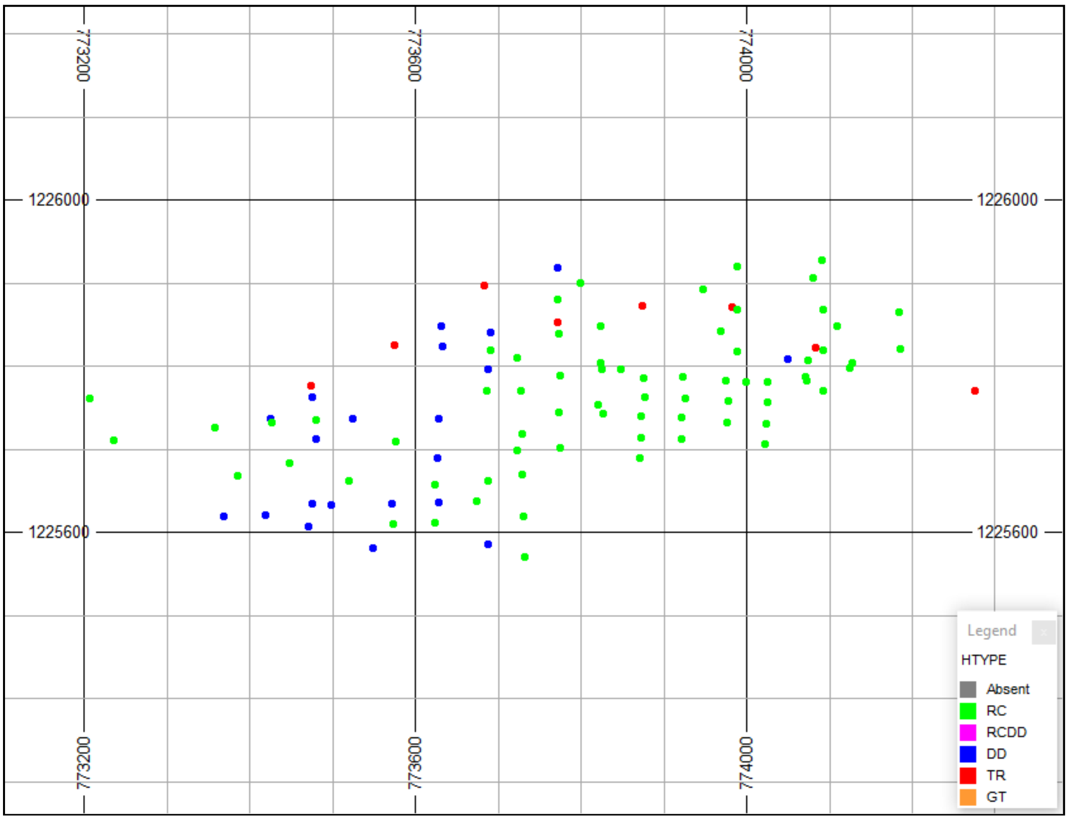


Figure 53: Plan view – LeDuc MRE drillhole locations

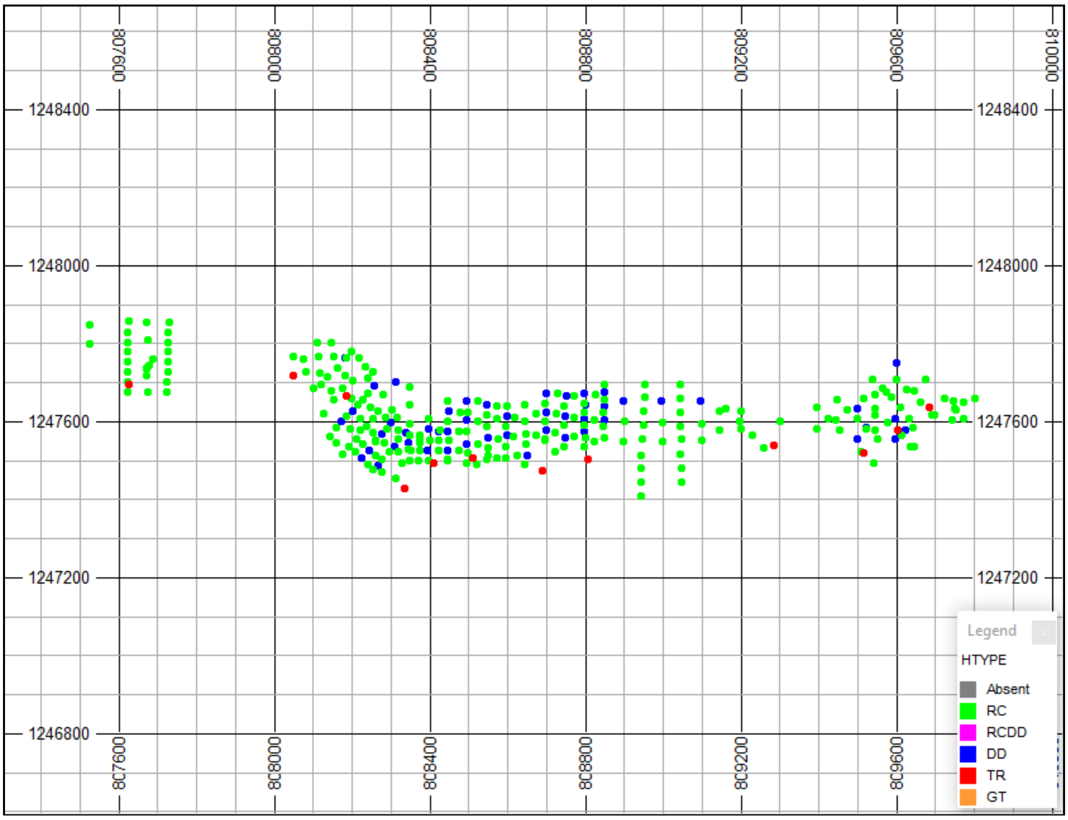


Figure 54: Plan view – Ouaré MRE drillhole locations

14.2.3 Data Spacing and Orientation in Relation of Geological Structure

Drilling within resource areas have been completed on sections which are generally between 18 m and 25 m x 25 m apart. The drilling at Youga and Ouaré was targeted normal to the plane of the principal mineralised orientation ensuring the optimum angle of intersection. Scissor holes, drilled back in the opposite sense, have also been completed on each deposit to ensure the proper orientation.

14.2.4 Data Load and Data Excluded

A relational geological database is not in use, instead data were provided in various MS Access databases and MS Excel sheets. The drilling database used for the current MRE was closed on 9 February 2017.

Data was loaded into a SQL database which has constraints and triggers, ensuring that only validated data was included in the database. During the validation process issues were highlighted and corrected where possible. Exports of the clean, verified data were provided to the resource geologists in CSV format for the MRE.

The absent assay values were left as absent during the data load, as these are assumed to be lost or missing samples. The negative Au values were set to half the detection limit to a value of 0.0025 g/t Au.

Following de-surveying, missing intervals were identified in the assays, as summarised in Table 62. These gaps were also set to half the detection limit to a value of 0.0025 g/t Au.

Table 62: Youga and Ouaré databases – summary of missing intervals

Deposit	No. of missing intervals	Total missing interval length (m)
Main Pit	461	7,928.55
Zergoré	252	2,199.90
NTV	100	945.00
A2NE	161	643.50
East Pit	183	2,004.44
West Pit 1	48	421.66
West Pit 2 and 3	136	2,021.83
West Pit 4	76	1,951.60
LeDuc	61	631.59
Ouaré	88	170.21

The appropriateness of data to be used in the MRE were reviewed per deposit. A summary of drill data removed prior to estimation is shown in Table 63 below.

Table 63: Youga and Ouaré deposits – summary of drill data removed prior to estimation

Deposit	Phase	HTYPE								Total
		RC	DD	TR	GT	BH	MET	RPL	Absent	
Main Pit	EXPL	-	14	-	-	-	-	-	-	4,832
	ADGC	20	-	-	-	-	-	-	-	
	GC	4,651	-	-	-	-	-	-	-	
	FM	-	-	-	-	-	-	-	136	
	Weep	10	-	-	-	-	-	-	-	
	Absent	-	-	-	-	-	-	-	1	
Zergoré	EXPL	13	2	35	-	-	2	-	-	1,295
	GC	688	-	-	-	432	-	85	-	
	FM	-	-	-	-	-	-	19	8	
	Absent	-	-	-	-	-	-	-	11	
NTV	GC	174	-	-	-	-	-	-	-	174
A2NE	EXPL	7	-	-	-	-	-	-	-	224
	GC	-	-	203	-	-	-	-	-	
	FM	-	-	-	-	-	-	-	14	
East Pit	EXPL	-	-	21	-	-	-	-	-	1,614
	GC	1,457	-	-	-	-	-	-	-	
	FM	-	-	-	-	-	-	-	136	
West Pit 2/3	ADGC	15	1	-	-	-	-	-	-	1,788
	BHGC	198	-	-	-	-	-	-	-	
	FM	-	-	-	-	-	-	-	35	
	GC	-	1,522	-	-	-	-	9	-	
	GCC	-	7	-	-	-	-	-	-	
	RPL	-	1	-	-	-	-	-	-	

EXPL – exploration; ADGC – advanced grade control; GC – grade control; FM – face mapping sampling; Weep – dewatering Holes; RC – reverse circulation hole; DD – diamond drillhole; TR – trench; GT – geotechnical hole; BH – blast hole; MET – metallurgical hole; RPL – rip line

Drillholes have been excluded from the MRE where there is potential bias in sample data, e.g. the high-grade bias in face mapping (FM) chip samples relative to RC and DD samples. Drillholes have also been rejected where they have been drilled down the orebody, do not contain any assays, or contain spurious survey records.

Sometimes, drillholes were coded GC, but in fact were resource development holes. These were identified by stepping through sections and identifying those holes that were drilled at a coarser drill spacing than the main GC programs, generally coinciding with depths >45 m.

Trench (TR) sample data, rip line (RPL) sample data and blast hole (BH) samples were mostly excluded from the MRE due to the lack of validation of the sampling technique. Further exclusions include all grade control (GC) holes with a grid spacing of 5 m x 5 m, geotechnical (GT) holes and metallurgical (MET) holes.

In cases where trenches have been included in the MRE, these have been reviewed for any potential bias when compared against the other drillhole types, whereby no bias was found. In the case of West Pit 1, GC data was included due to the limited exploration drilling between the existing pit and the preliminary resource shell. The lack of exploration drilling is a reason for only Inferred Mineral Resources being defined at West Pit 1.

All subsequent data analysis, statistics and estimation are limited to the validated and selected datasets as used in the MRE.

14.3 Density

The in-situ dry bulk density (BD) determinations undertaken by Ashanti, Etruscan and Endeavour are described the 2015 Technical Report (Endeavour, 2015). Samples were collected at depths greater than 10 m below the surface (predominantly in un-weathered rock) from hangingwall, footwall and mineralised horizons.

The Ashanti bulk density determinations, described as specific gravity (SG), were reportedly undertaken by SGS in Ghana applying the "Archimedes" method (water displacement). The density is calculated with the following formula:

$$\text{Density} = \frac{\text{Weight in air}}{\text{Weight in air} - \text{Weight in water}}$$

The Ashanti SG determinations were completed on half drill core samples submitted to SGS for Au assay. Two measurements were made and averaged for each sample. Recent bulk density determinations for Endeavour were completed by SGS Ouagadougou, Burkina Faso.

AMEC completed MREs for Zergoré and NTV during 2012. Available SG data at that time was reviewed according to sample locations within the modelled and logged weathering profiles (AMEC, 2013a and 2013b). The results from the AMEC review are shown in Table 64.

Table 64: Zergoré and NTV – specific gravity as per AMEC (2013a and 2013b)

Deposit	Weathering profile	No. of samples	Minimum	Maximum	Average	SG assigned to MRE (2012)
Zergoré	Overburden/Laterite	-	-	-	-	1.80
	Saprolite	77	1.85	2.82	2.67	2.67
	Saprock	140	2.39	2.90	2.67	2.67
	Bedrock	1,396	2.32	2.98	2.75	2.74
NTV	Overburden/Laterite	2	2.71	2.80	2.76	1.80
	Saprolite	1	2.60	2.60	2.60	2.57
	Saprock	3	2.71	2.85	2.79	2.67
	Bedrock	194	2.42	2.88	2.71	2.70

The BD values as reported by the Endeavour Technical Report (Endeavour, 2015) are presented in Table 65.

Table 65: In-situ dry bulk densities as per Endeavour (2015)

Deposit	In-situ dry bulk density determinations					
	Ashanti	Average SG	Endeavour	Average SG	Total	Average SG
Main Pit/East Pit	159	2.71	436	2.73	595	2.72
Zergoré			1,854	2.71	1,854	2.71
NTV			200	2.71	200	2.71
A2NE			427	2.68	427	2.68
West Pits 1-4			286	2.72	286	2.72
Ouaré			945	2.74	945	2.74

Density data available for review by CSA Global was limited to Main Pit, A2NE, West Pit 4 and Ouaré. The data was flagged by the modelled weathering profiles and reviewed by weathering domain (Figure 55 to Figure 58).

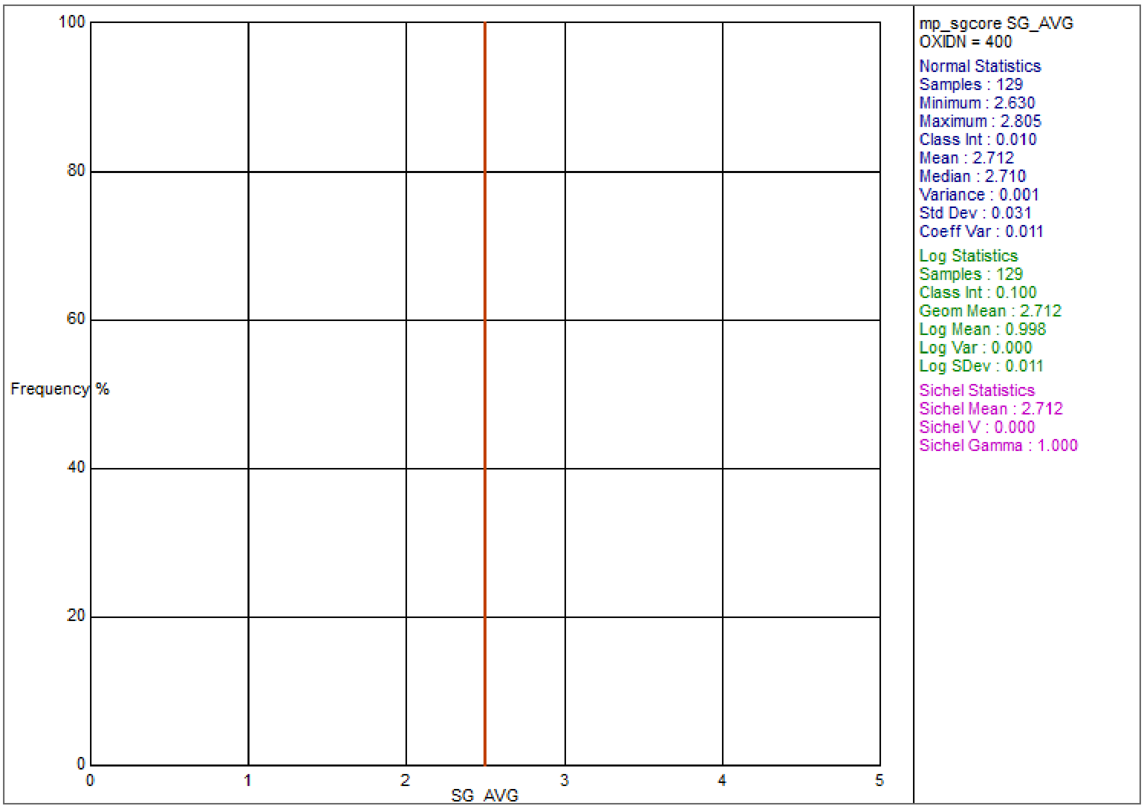


Figure 55: Main Pit – histogram plot of uncut in-situ dry bulk density per weathering profile (OXIDN400 = Fresh)

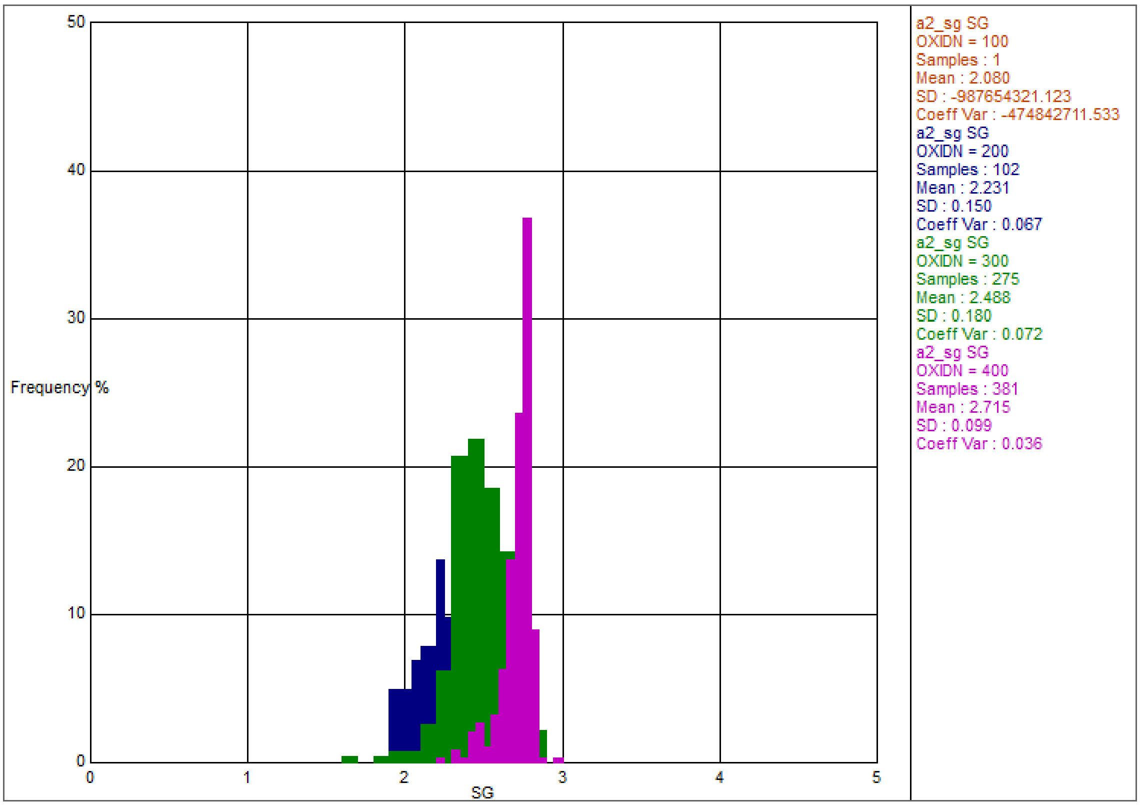


Figure 56: A2NE – histogram plot of uncut in-situ dry bulk density per weathering profile (OXIDN100 = Overburden; OXIDN200 = Oxide; OXIDN300 = Transitional; OXIDN400 = Fresh)

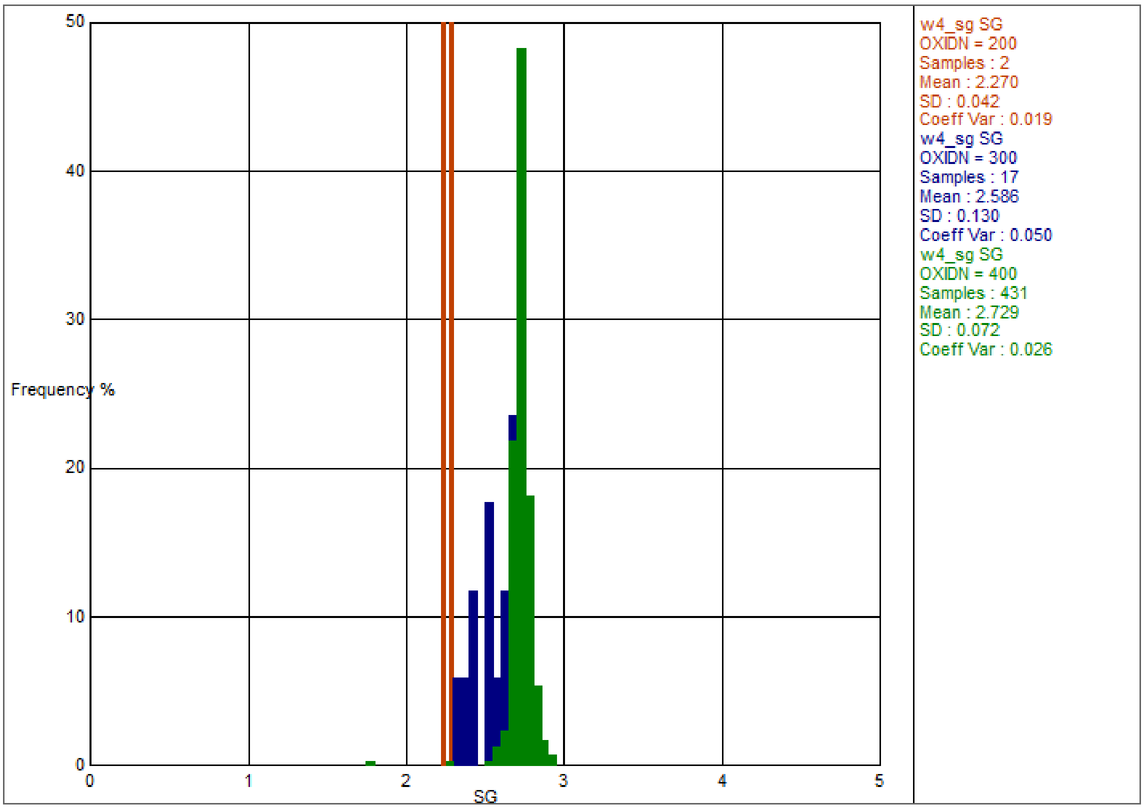


Figure 57: West Pit 4 – histogram plot of uncut in-situ dry bulk density per weathering profile (OXIDN200 = Oxide; OXIDN300 = Transitional; OXIDN400 = Fresh)

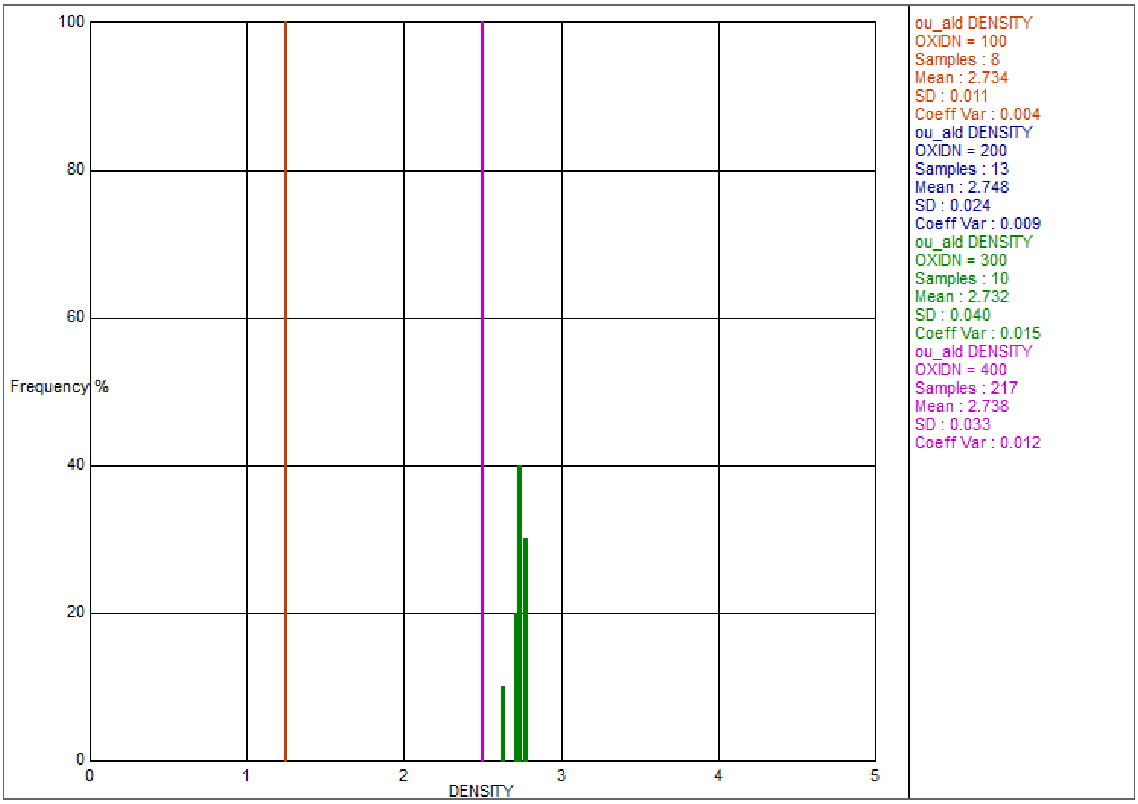


Figure 58: Ouaré – histogram plot of uncut in-situ dry bulk density per weathering profile (OXIDN100 = Overburden; OXIDN200 = Oxide; OXIDN300 = Transitional; OXIDN400 = Fresh)

Following statistical analysis, identified outliers were removed and the average BD applied per weathering profile within the Main Pit, A2NE, West Pit 4 and Ouaré MREs (Table 66). The BD values applied to the remaining Youga Project MREs (Table 66) have been informed by review of the Youga technical reports (AMEC, 2013a and 2013b; Endeavour, 2015), inspection of DD core photos, communication with site and considering Main Pit, A2NE and West Pit 4 density review results. The values used for non-fresh material have been informed by experience of other deposits in the region, given that samples measured in these materials are generally competent and tend to be overstated in the density measurements provided.

Table 66: Youga and Ouaré projects – MRE in-situ dry bulk densities applied following CSA Global review

Deposit	Weathering profile	In-situ dry bulk density (t/m³)
Main Pit	Overburden	-
	Oxide	2.00
	Transitional	2.20
	Fresh	2.72
Zergoré	Overburden	1.80
	Oxide	2.19
	Transitional	2.46
	Fresh	2.71
NTV	Overburden	2.08
	Oxide	2.23
	Transitional	2.46
	Fresh	2.70
A2NE	Overburden	2.08
	Oxide	2.23
	Transitional	2.46
	Fresh	2.74
East Pit	Overburden	-
	Oxide	2.00
	Transitional	2.20
	Fresh	2.72
West Pit 1	Overburden	2.00
	Oxide	2.00
	Transitional	2.40
	Fresh	2.70
West Pit 2 and 3	Overburden	-
	Oxide	2.00
	Transitional	-
	Fresh	2.70
West Pit 4	Overburden	1.80
	Oxide	2.24
	Transitional	2.46
	Fresh	2.72
LeDuc	Overburden	2.20
	Oxide	2.20
	Transitional	2.40
	Fresh	2.70
Ouaré	Overburden	2.00
	Oxide	2.20
	Transitional	2.40
	Fresh	2.74

Additional dry bulk density data should be collected routinely during grade control and/or mine production and reviewed to build up a useful bulk density database of values that can be used to improve the confidence of the tonnage factors for the MRE. The methodology and measurements should be verified and standardised.

14.4 Geological and Mineralisation Modelling

Geotechnical logging has recorded lithology, weathering and oxidation.

CSA Global and Avesoro geologists created weathering and mineralisation surfaces and volumes through cross sectional interpretations using Datamine StudioRM™, Micromine™ and Leapfrog™ software. These interpretations were based on logged weathering state and chemical Au assays. The weathering codes used for the construction of the weathering surfaces are shown in Table 67. No lithological surfaces or volumes were modelled.

Table 67: Youga and Ouaré databases – logged weathering codes

Weathering	Description
OVBD/SOIL	Overburden/Soil
LATR	Laterite
SAPR/SAP	Saprolite
TRAN	Transitional
SPRK	Saprock
BDRK	Bedrock

A numeric weathering/oxidation code was applied to the drillhole data and MRE blocks, depending on the weathering profile, as defined in Table 68.

Table 68: Youga and Ouaré projects – MRE Weathering/Oxidation codes

OXIDN	Description
100	Overburden/Regolith
200	Oxide
300	Transitional
400	Fresh/Sulphide

Depending on the deposit, the modelled weathering profiles comprise a bottom of overburden (“bovb”) surface, a bottom of oxidation (“boco”) surface and a top of fresh (“tofr”) surface. Example vertical sections of the weathering profiles per deposit are shown in Figure 59 to Figure 68.

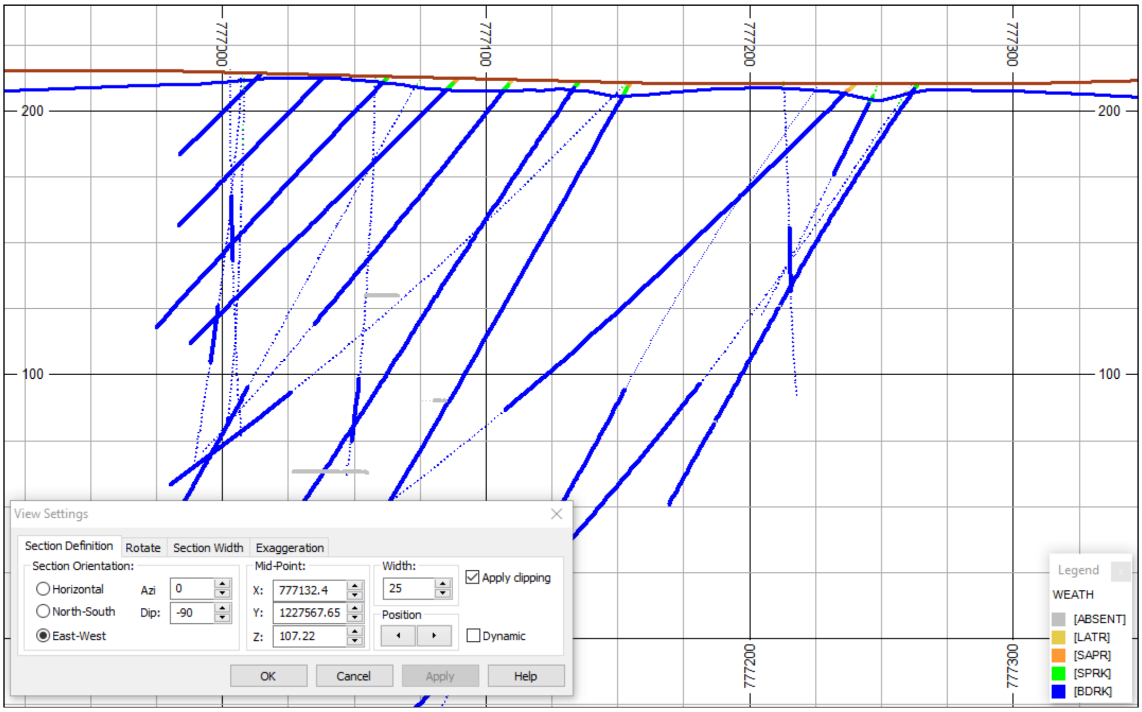


Figure 59: Main Pit – section view of the weathering profiles and drillholes

Section lines: Topography (brown); TOFR (blue)

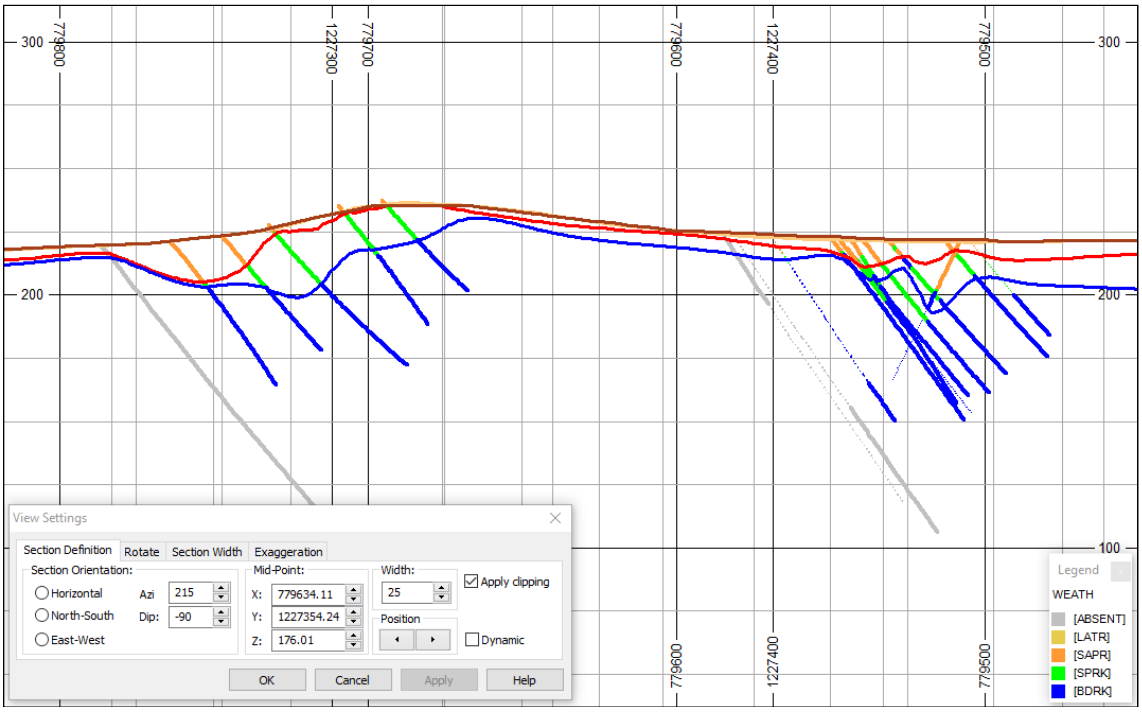


Figure 60: Zergoré – section view of the weathering profiles and drillholes

Section lines: Topography (brown); BOVB (orange); BOCO (red); TOFR (blue)

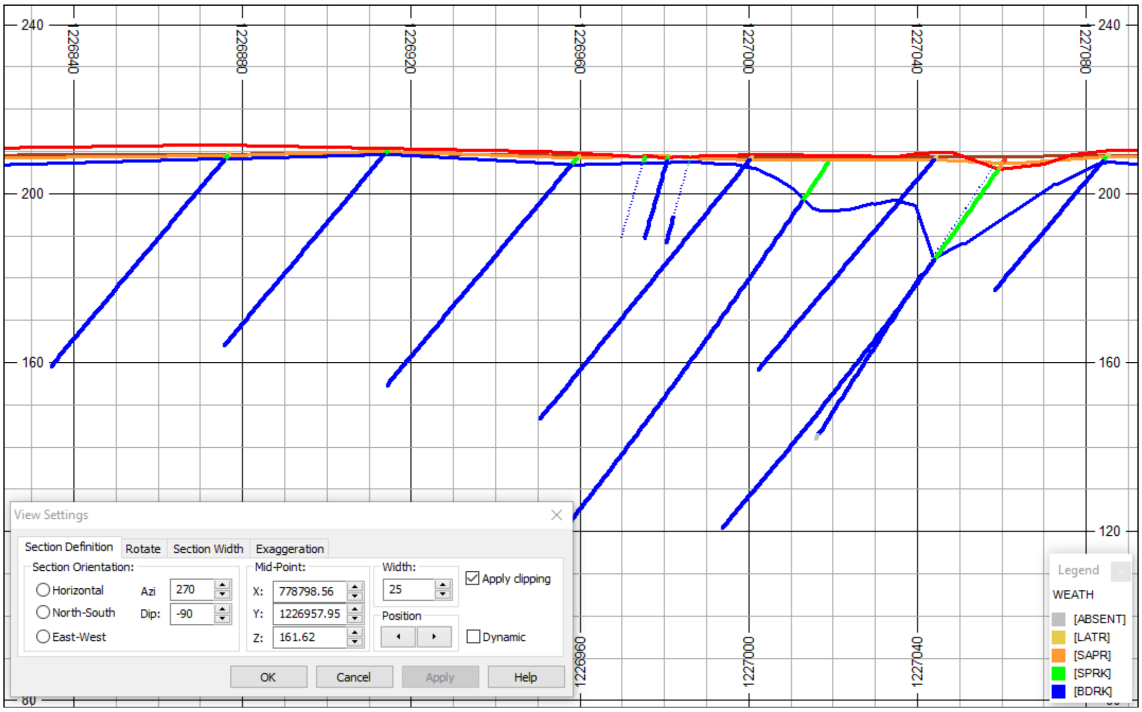


Figure 61: NTV – section view of the weathering profiles and drillholes

Section lines: Topography (brown); BOVB (orange); BOCO (red); TOFR (blue)

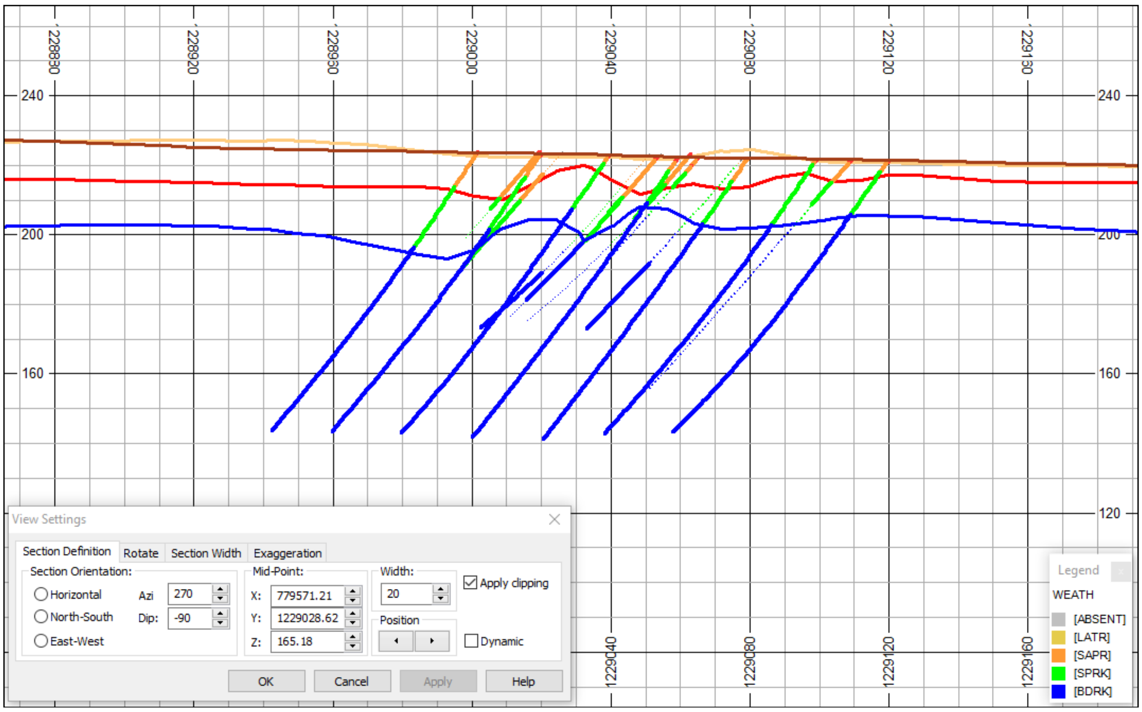


Figure 62: A2NE – section view of the weathering profiles and drillholes

Section lines: Topography (brown); BOVB (orange); BOCO (red); TOFR (blue)

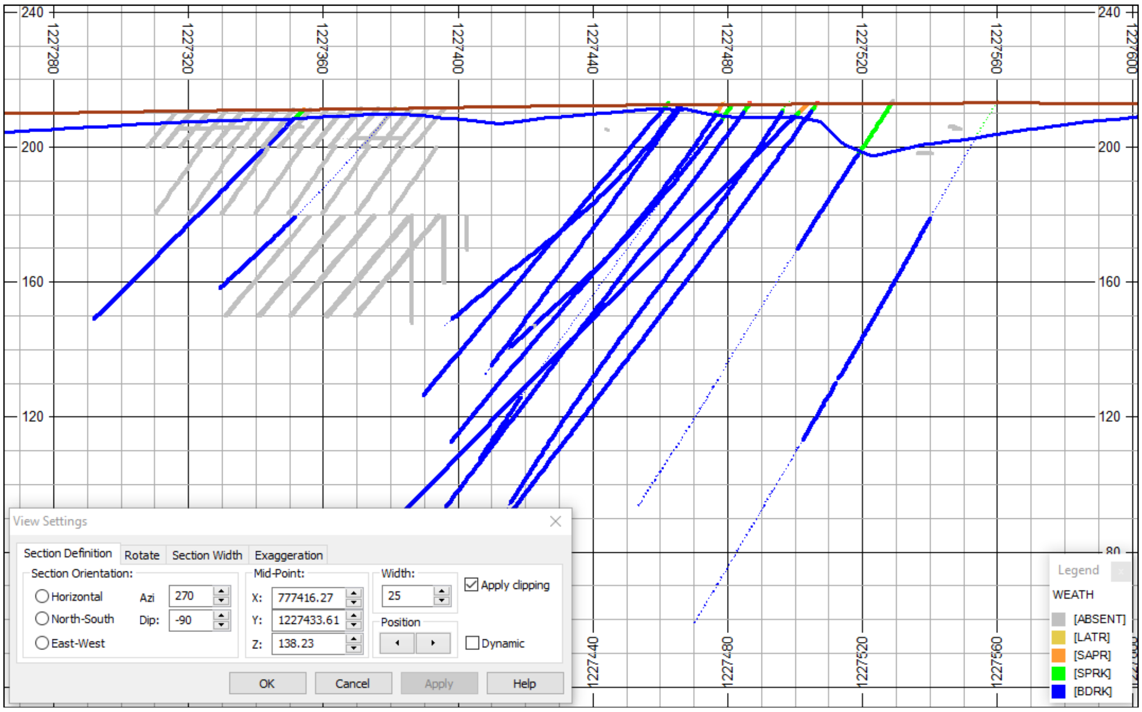


Figure 63: East Pit – section view of the weathering profiles and drillholes

Section lines: Topography (brown); TOFR (blue)

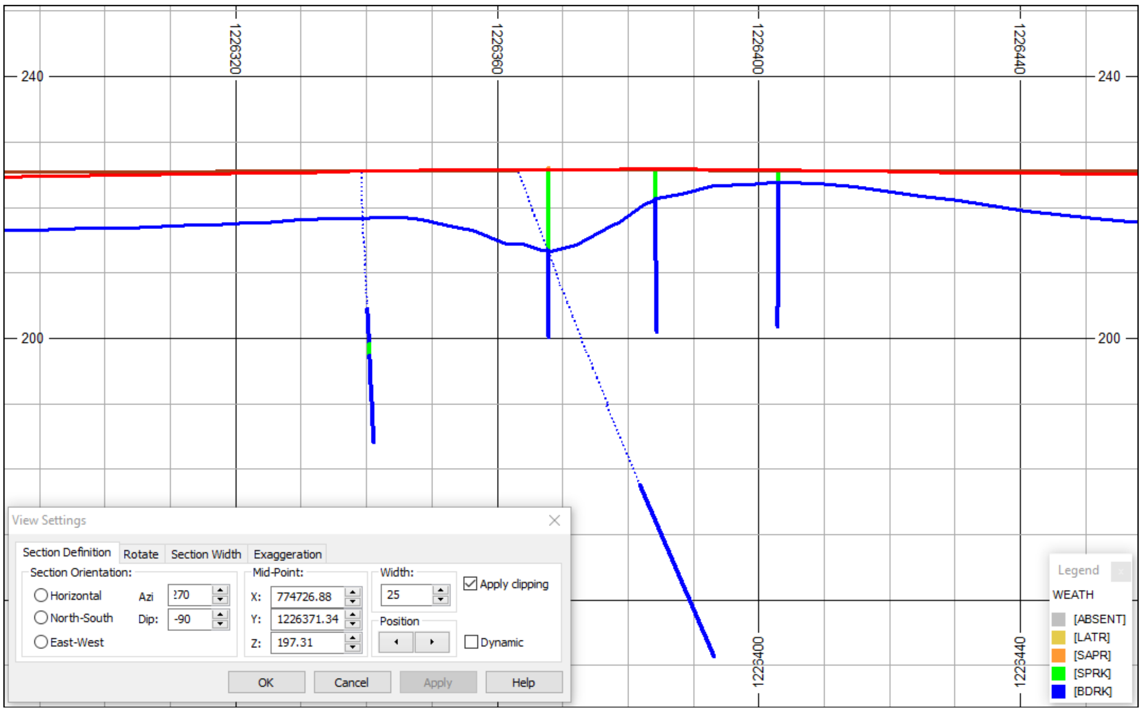


Figure 64: West Pit 1 – section view of the weathering profiles and drillholes

Section lines: Topography (brown); BOCO (red); TOFR (blue)

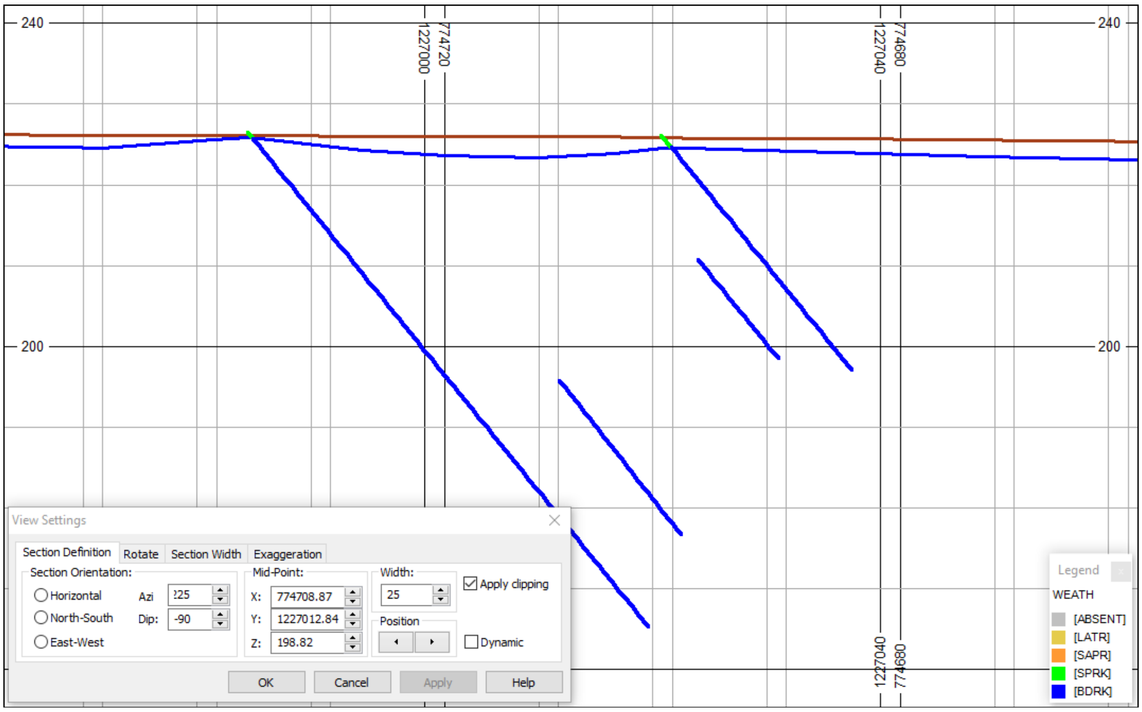


Figure 65: West Pit 2 and 3 – section view of the weathering profiles and drillholes

Section lines: Topography (brown); TOFR (blue)

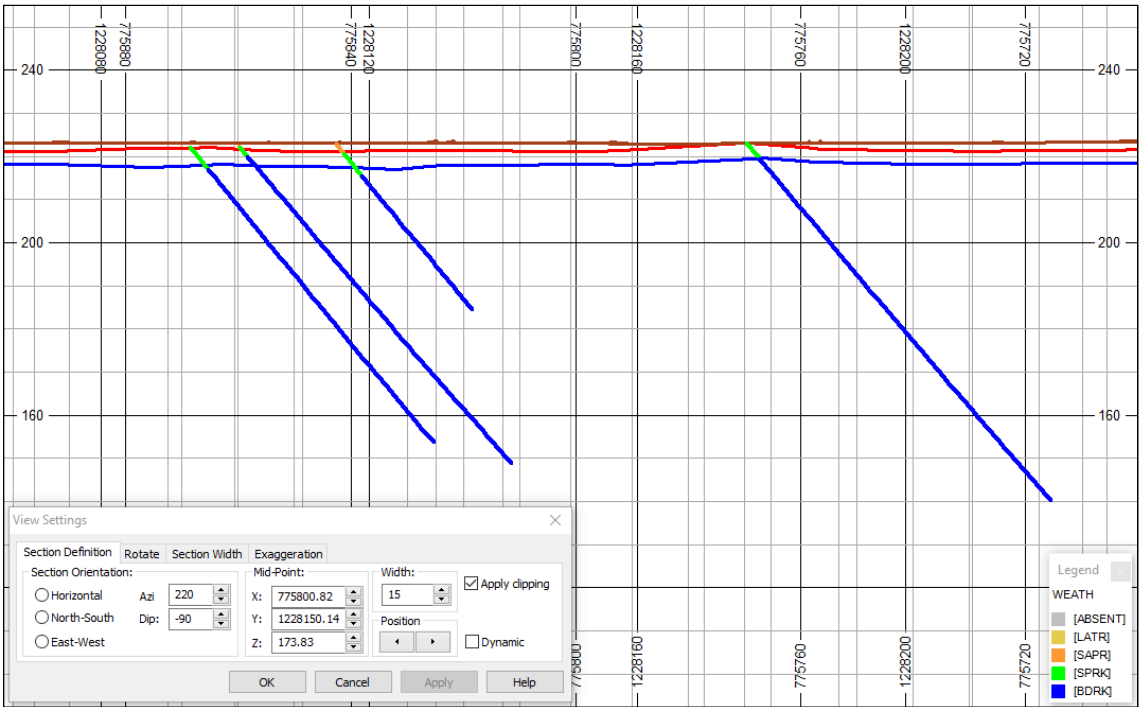


Figure 66: West Pit 4 – section view of the weathering profiles and drillholes

Section lines: Topography (brown); BOCO (red); TOFR (blue)

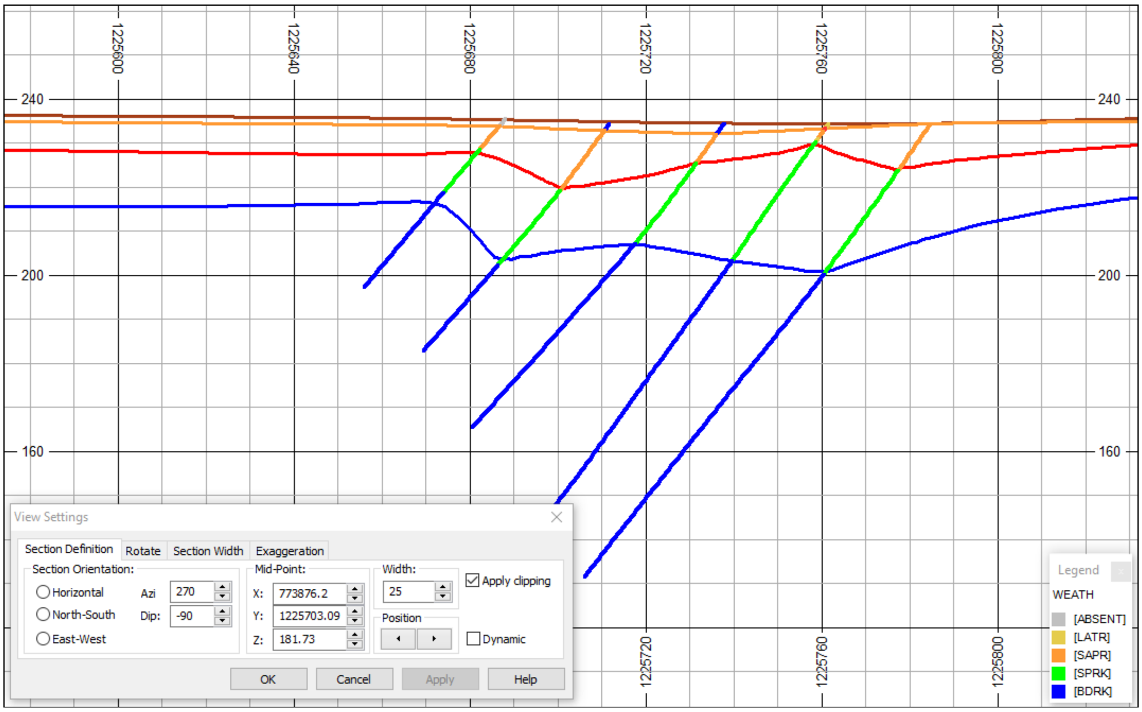


Figure 67: LeDuc – section view of the weathering profiles and drillholes

Section lines: Topography (brown); BOVB (orange); BOCO (red); TOFR (blue)

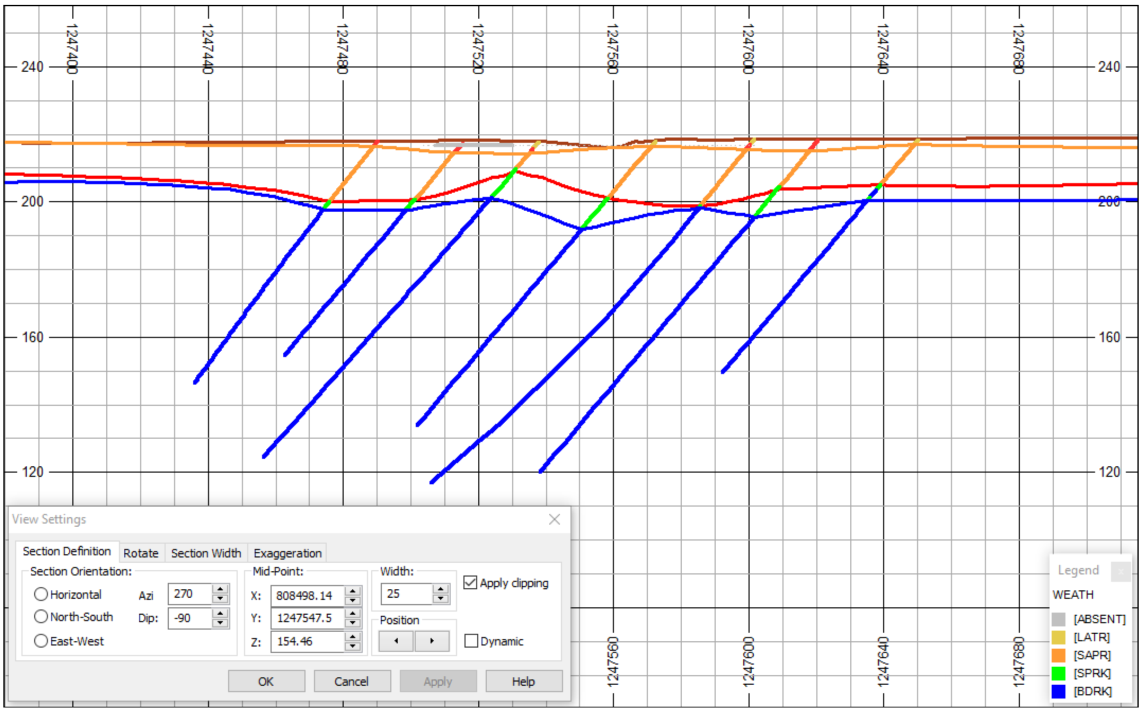


Figure 68: Ouaré – section view of the weathering profiles and drillholes

Section lines: Topography (brown); BOVB (orange); BOCO (red); TOFR (blue)

CSA Global reviewed the grade continuity at various cut-offs by creating mineable intercepts, generated using Datamine's CompSE grade compositing function. This generates grade composites on the basis of a minimum grade (0.1, 0.2, 0.25, 0.3, 0.5, 1.0 and 2.0 g/t Au) and a minimum true thickness (2 m). This is useful in assessing the reasonableness of blocks above cut-offs. The results show good grade continuity at a cut-off of 0.25 g/t with a minimum true thickness of 2 m for Main Pit, A2NE, West Pits 1, 2, 3 and 4, LeDuc and Ouaré. Zergoré shows reasonable grade continuity at a cut-off of 0.25 g/t, down to 0.1 g/t in some instances, with a minimum true thickness of 2 m. The grade continuity at East Pit and NTV are well behaved at a cut-off of 0.5 g/t with a minimum true thickness of 2 m.

All available drillhole and sampling data was used to inform the grade modelling (DD, RC, TR, FM), with close spaced GC data used for rough trend visualisation only. In the case of Main Pit, mineralisation that did not extend below the current pit surface was ignored.

Figure 69 to Figure 79 show examples of cross sections with interpreted mineralisation for the Youga and Ouaré deposits. The current mined surfaces are shown for Main Pit, Zergoré, NTV, A2NE, East Pit and West Pits 1, 2 and 3. There has been no mining to date at West Pit 4, LeDuc and Ouaré. However, in the case of Ouaré, artisanal shafts and small pits pepper the corridor of mineralisation. There is no information with regards to either their quantity or spatial extends. CSA Global recommends that these artisanal mining volumes be surveyed and that the Ouaré MRE be depleted accordingly.

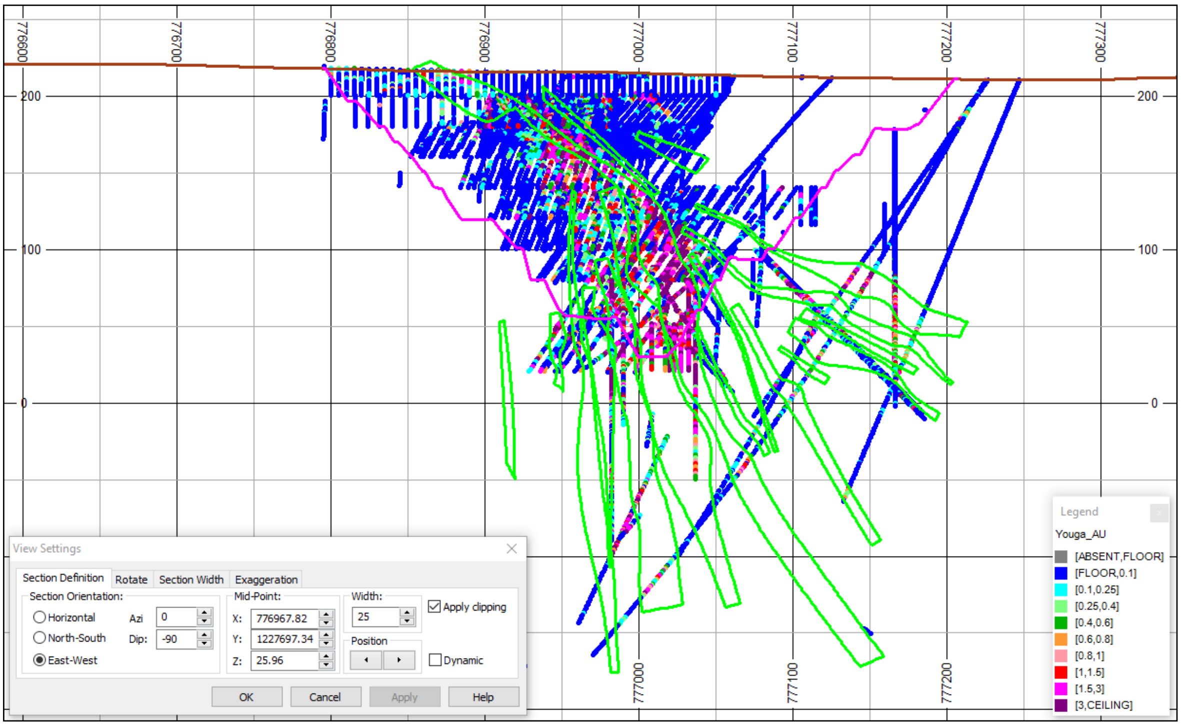


Figure 69: Section view of the Main Pit mineralisation and drillholes

Section lines: Topography (brown); Mineralisation (green); Mined surface February 2015 (pink)

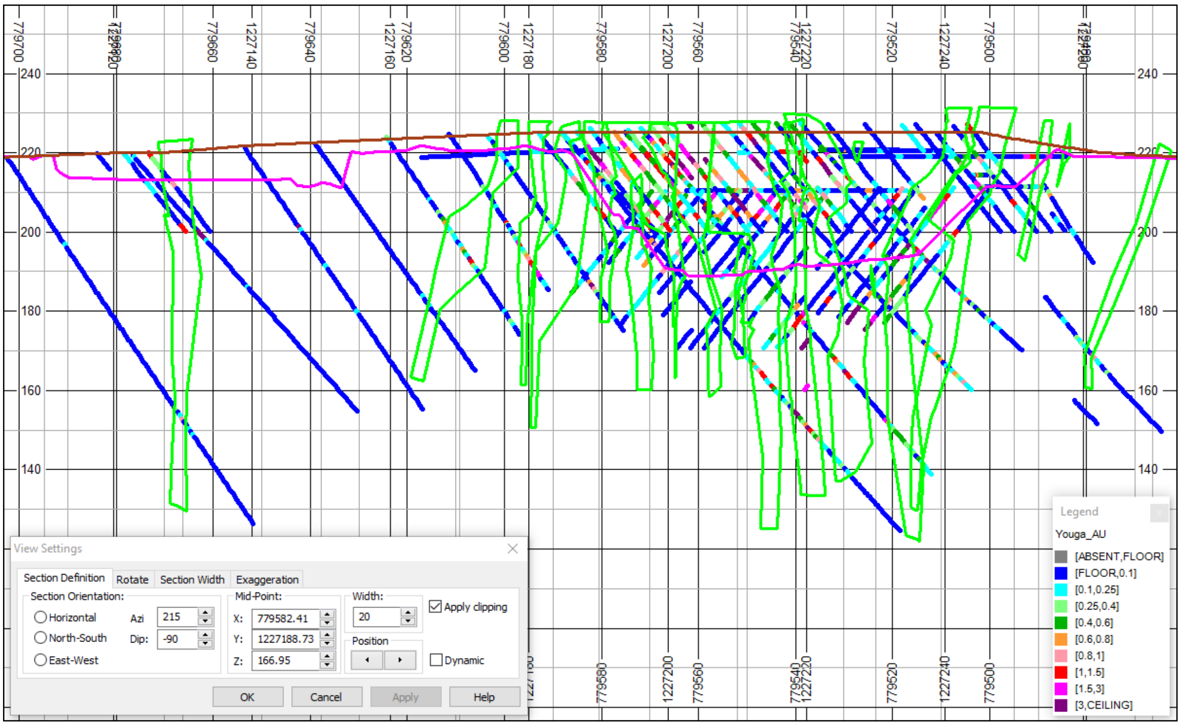


Figure 70: Section view of the Zergoré mineralisation and drillholes

Section lines: Topography (brown); Mineralisation (green); Mined surface April 2016 (pink)

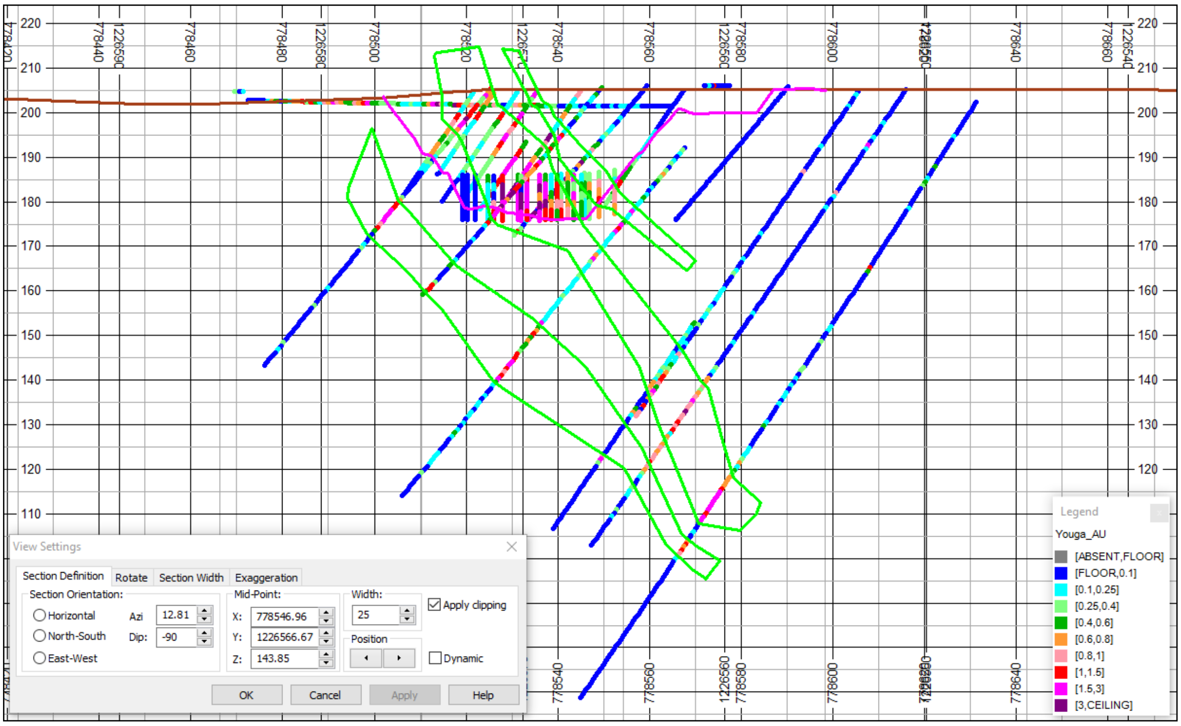


Figure 71: Section view of the NTV mineralisation and drillholes

Section lines: Topography (brown); Mineralisation (green); Mined surface April 2016 (pink)

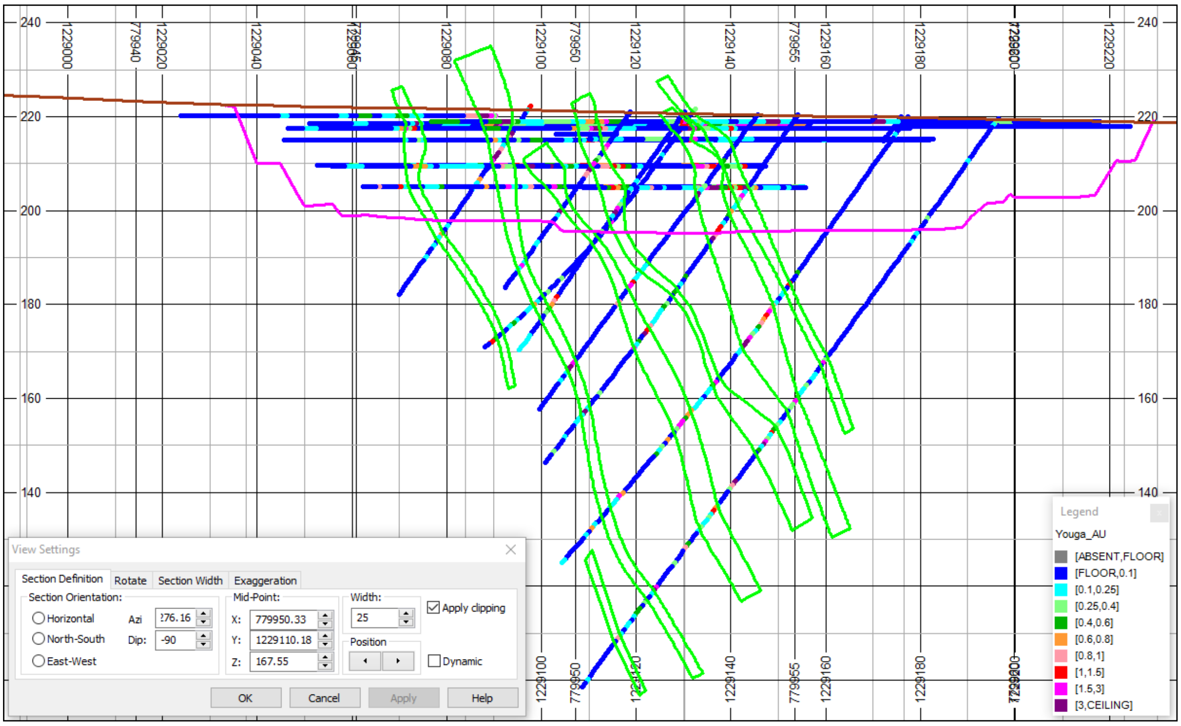


Figure 72: Section view of the A2NE mineralisation and drillholes

Section lines: Topography (brown); Mineralisation (green); Mined surface February 2017 (pink)

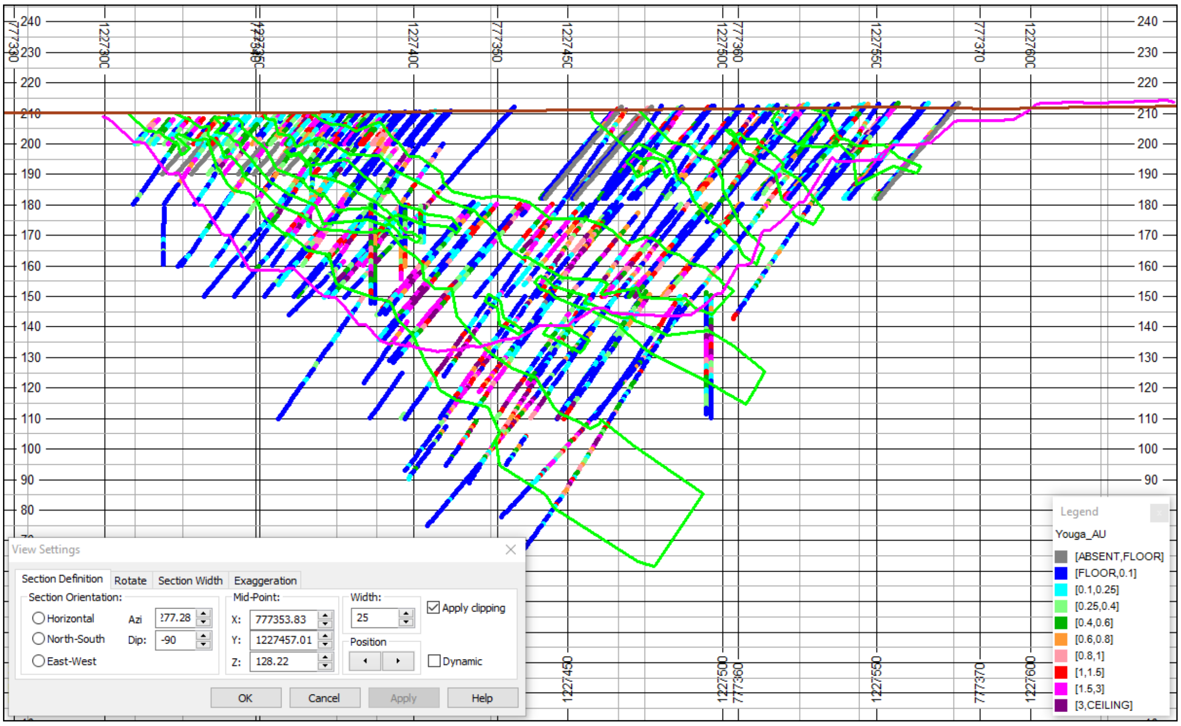


Figure 73: Section view of the East Pit mineralisation and drillholes

Section lines: Topography (brown); Mineralisation (green); Mined surface June 2014 (pink)

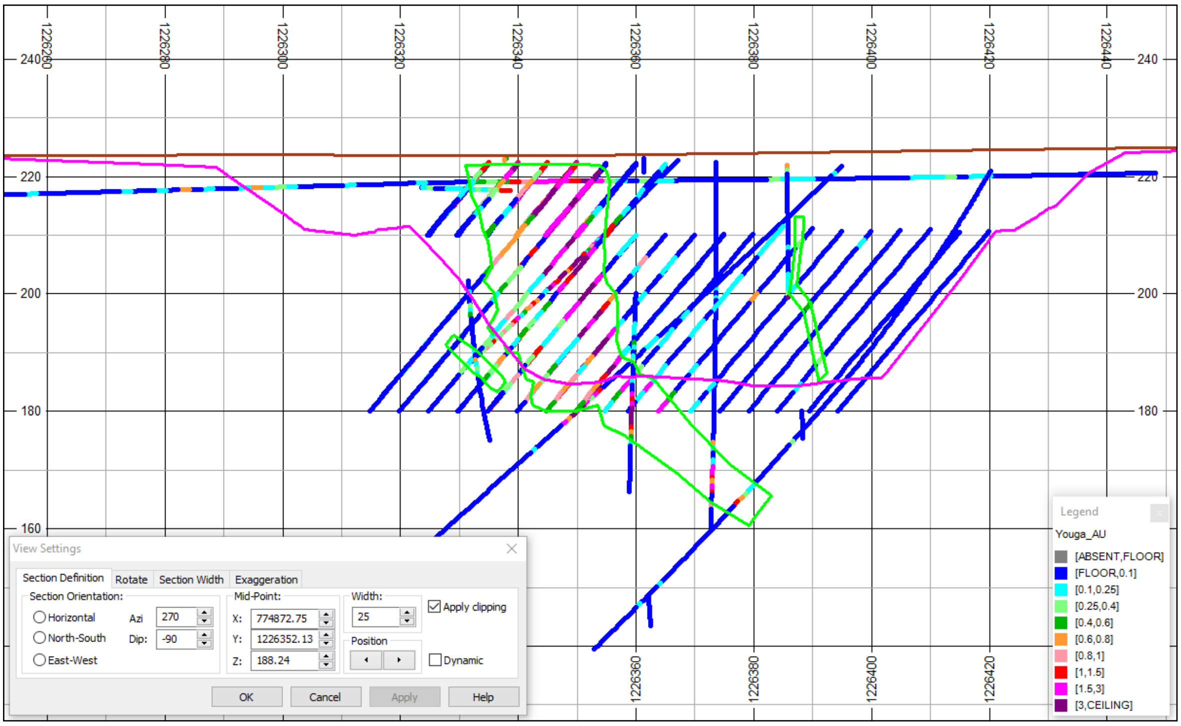


Figure 74: Section view of the West Pit 1 mineralisation and drillholes

Section lines: Topography (brown); Mineralisation (green); Mined surface March 2016 (pink)

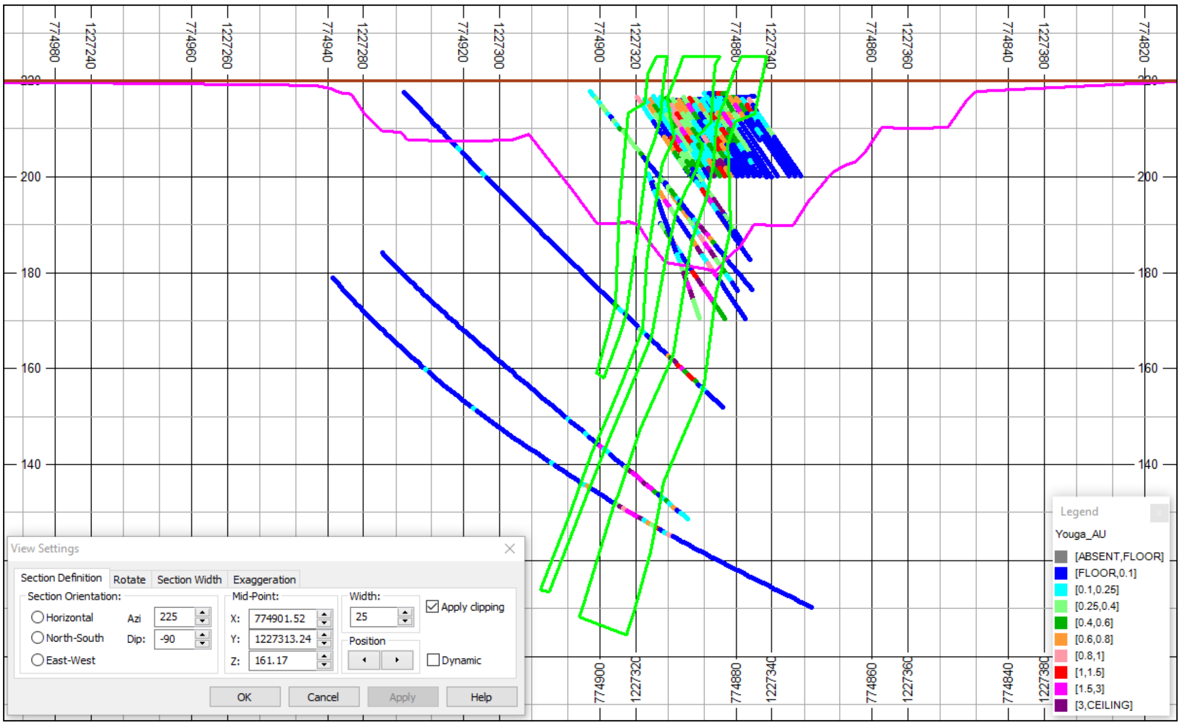


Figure 75: Section view of the West Pit 2 mineralisation and drillholes

Section lines: Topography (brown); Mineralisation (green); Mined surface March 2016 (pink)

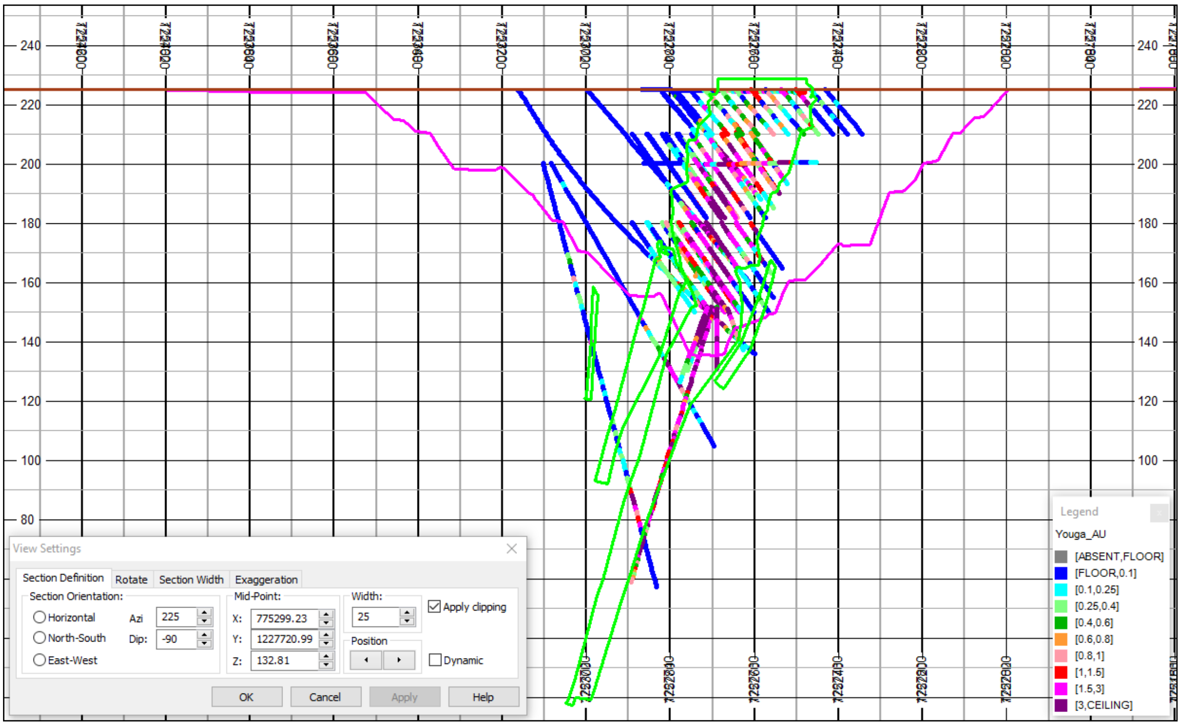


Figure 76: Section view of the West Pit 3 mineralisation and drillholes

Section lines: Topography (brown); Mineralisation (green); Mined surface March 2016 (pink)

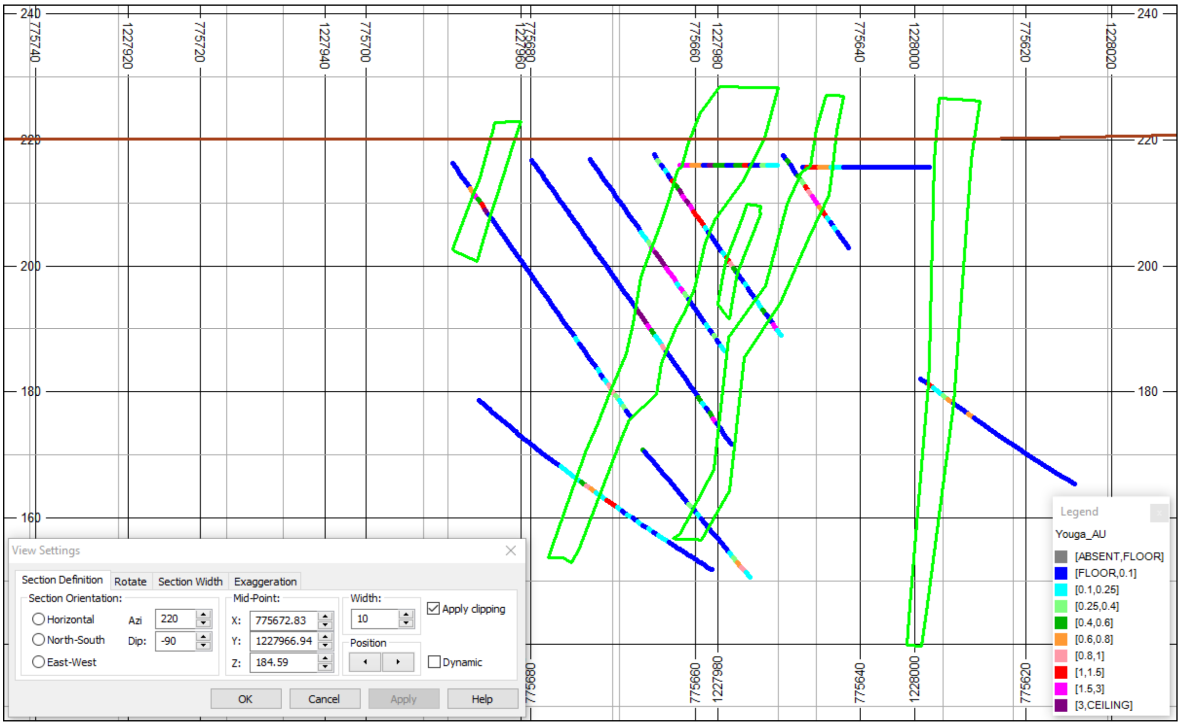


Figure 77: Section view of the West Pit 4 mineralisation and drillholes

Section lines: Topography (brown); Mineralisation (green); No mining to date.

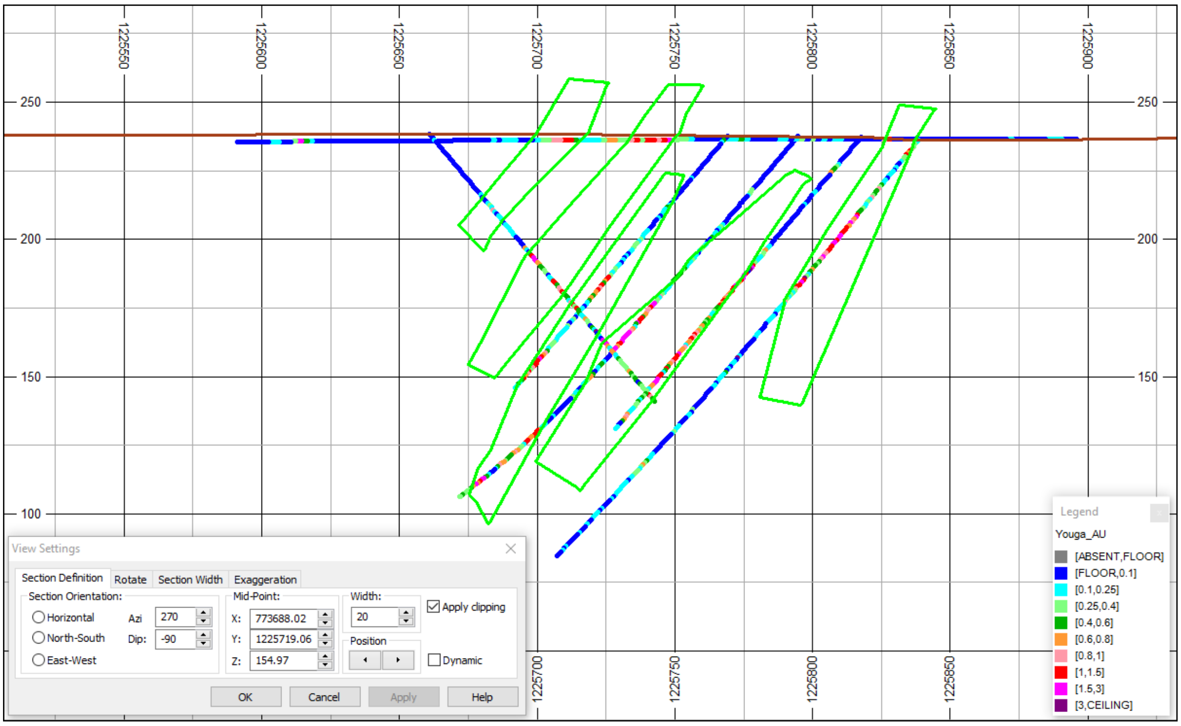


Figure 78: Section view of the LeDuc mineralisation and drillholes

Section lines: Topography (brown); Mineralisation (green); No mining to date.

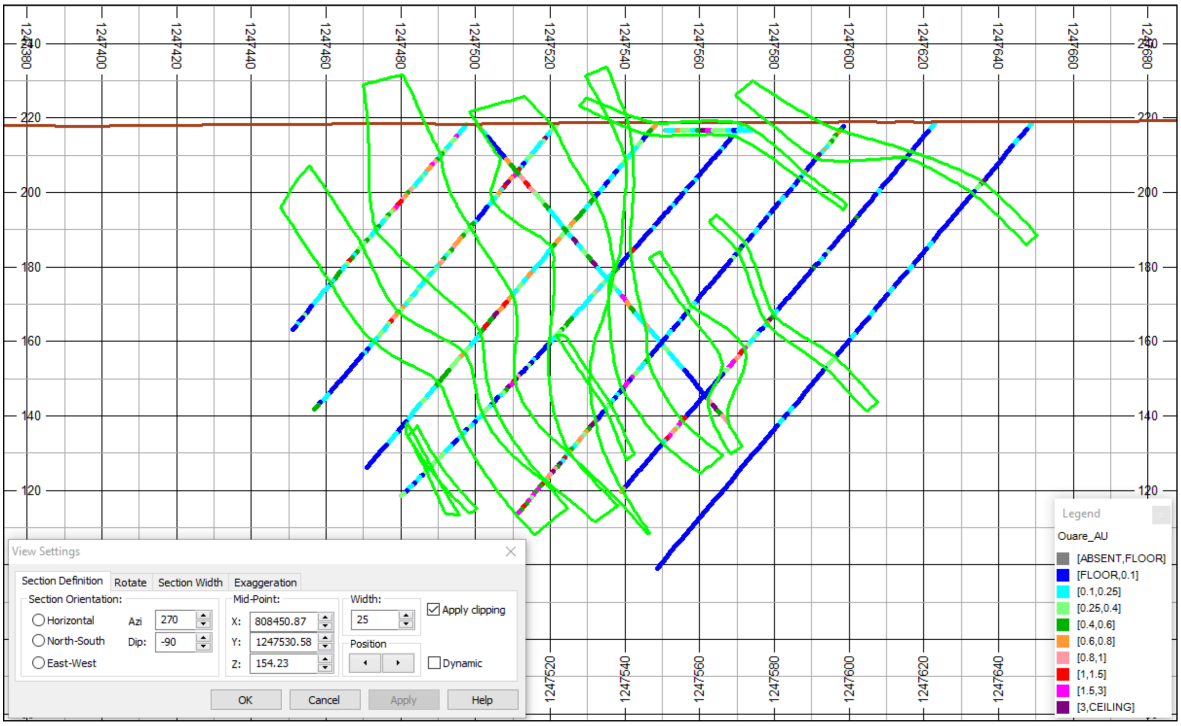


Figure 79: Section view of the Ouaré mineralisation and drillholes (local grid)

Section lines: Topography (brown); Mineralisation (green); Artisanal mining - No mined volumes currently available.

14.5 Statistical Analysis

Before undertaking the estimate, the data was first analysed to understand how the estimate should be accomplished. Drillhole samples were statistically reviewed, and variograms were calculated to determine spatial continuity for Au.

The statistical analysis was carried out by CSA Global using Datamine StudioRM™, Supervisor v8.4™ and GeoAccess Professional™ software packages.

14.5.1 Boundary Analysis

Boundaries are either classified as "hard" or "soft". Where hard boundaries are abrupt, they generally represent a sharp geological contact such as the edge of a quartz vein on its host rocks and where the boundary marks the margin of metal grade. A soft boundary is a gradational one, and represents a gradual reduction in grade, for example as one would find in the alteration zone of a copper porphyry system.

It is important to understand the nature of the boundaries between domains. If domain boundaries are gradational, then data from the adjacent domains should be used during estimation (soft boundary). If there are distinct grade boundaries, then estimation should be restricted to only use the data within that domain (hard boundary).

Contact analysis for Au g/t between the modelled mineralisation and waste were carried out to assess the nature of the domain boundaries by graphing the average grade with increasing distance from the domain boundary. The average grades can be calculated by incrementally expanding the wireframes or manually by coding the samples based on distance from the domain contact, as was done in this instance. The contact analysis results for the Youga and Ouaré deposits are shown in Figure 80 to Figure 89. Based on the results of the boundary analysis between mineralisation and waste, the boundary was interpreted to be hard for all the deposits.

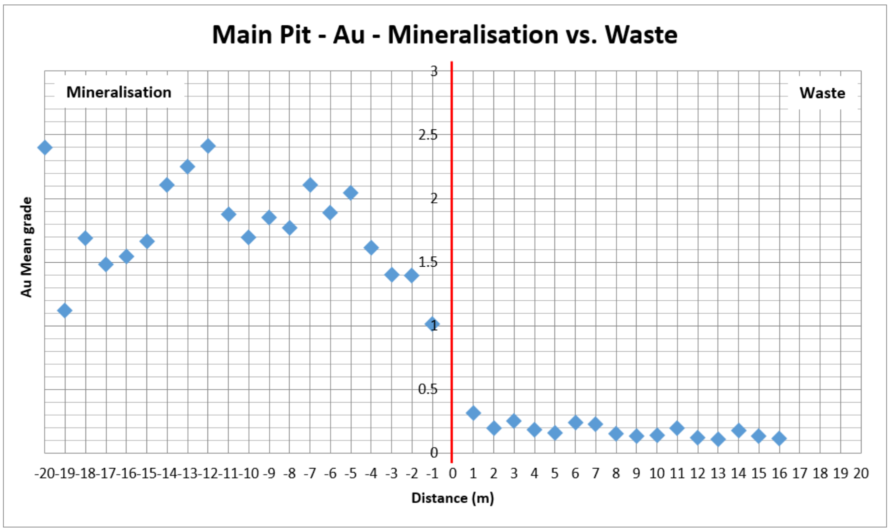


Figure 80: Mineralised boundary test graph for Main Pit – Au g/t mineralisation vs. waste

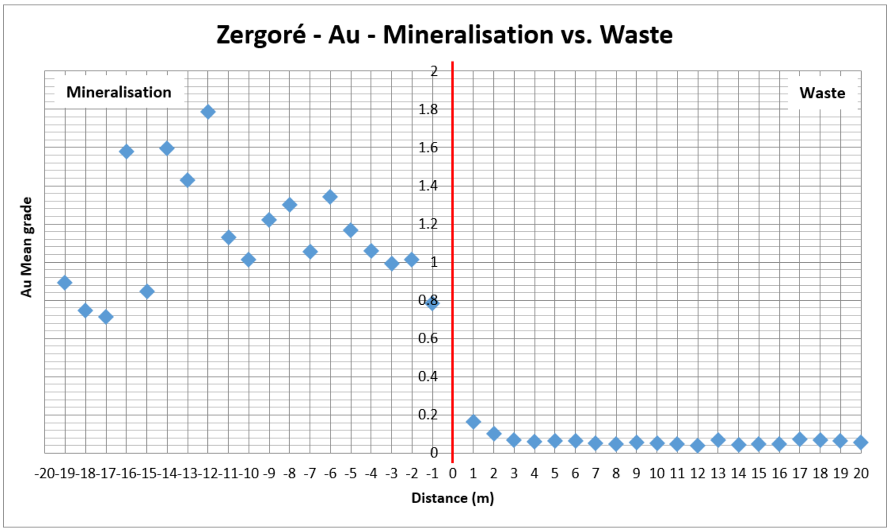


Figure 81: Mineralised boundary test graph for Zergoré – Au g/t mineralisation vs. waste

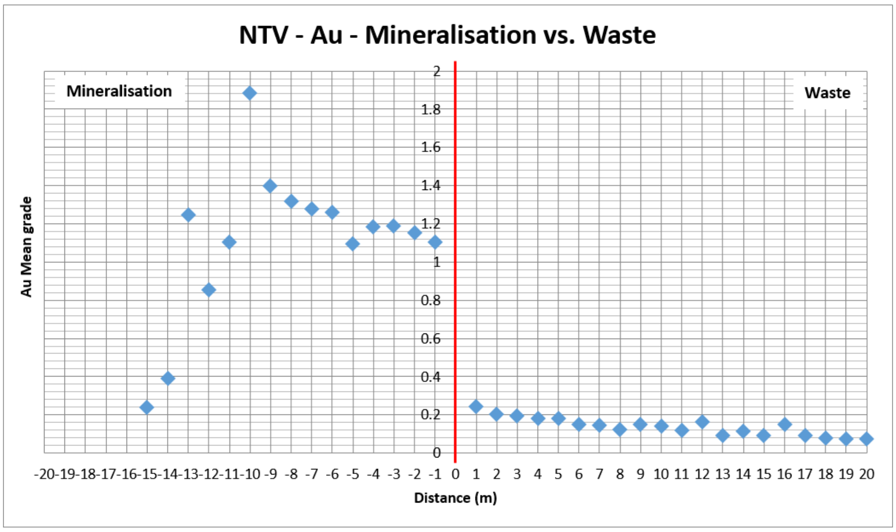


Figure 82: Mineralised boundary test graph for NTV – Au g/t mineralisation vs. waste

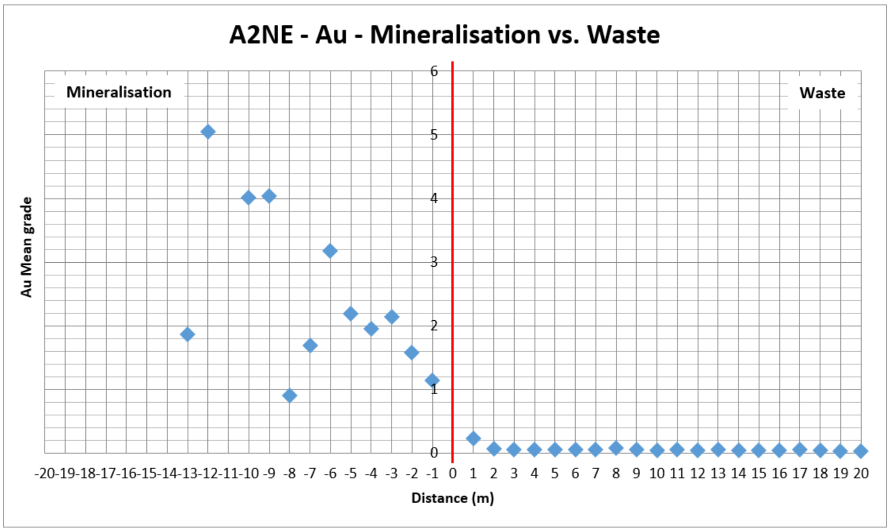


Figure 83: Mineralised boundary test graph for A2NE – Au g/t mineralisation vs. waste

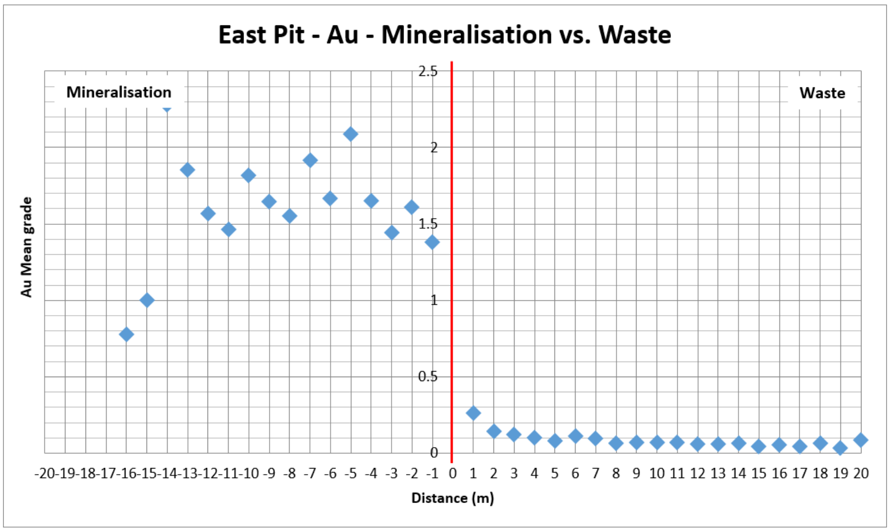


Figure 84: Mineralised boundary test graph for East Pit – Au g/t mineralisation vs. waste

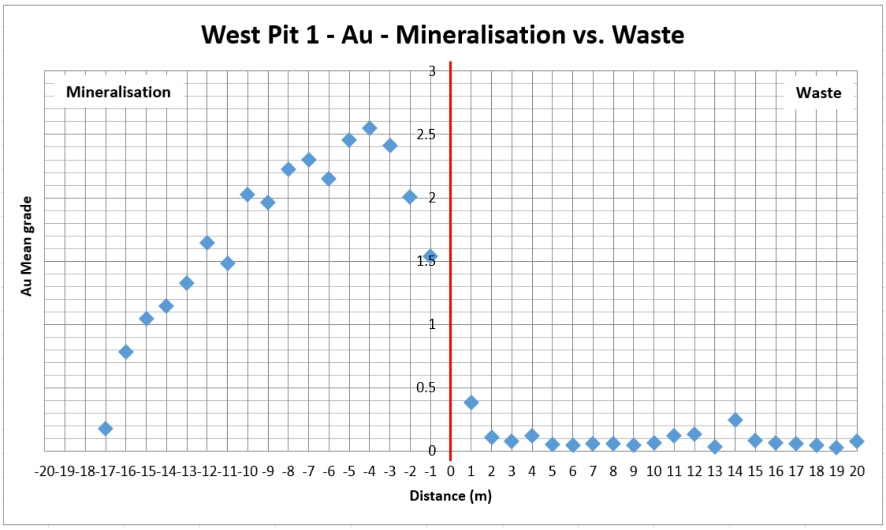


Figure 85: Mineralised boundary test graph for West Pit 1 – Au g/t mineralisation vs. waste

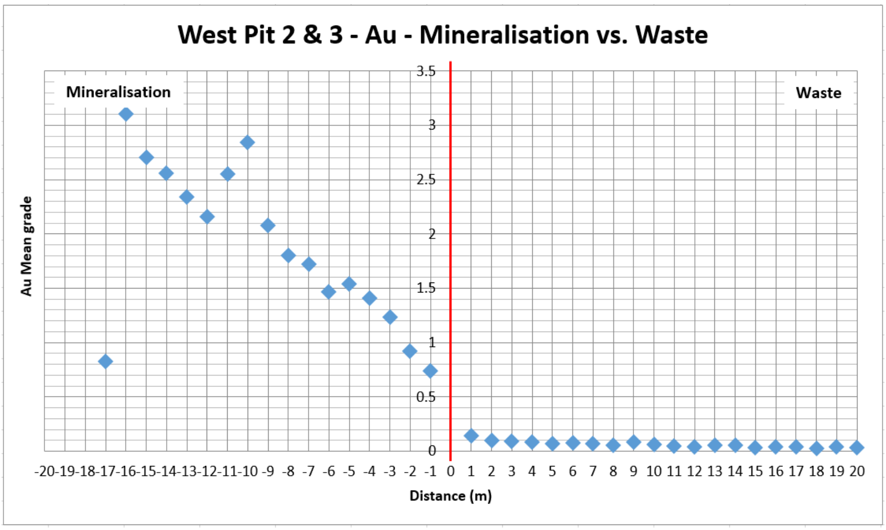


Figure 86: Mineralised boundary test graph for West Pit 2 and 3 – Au g/t mineralisation vs. waste

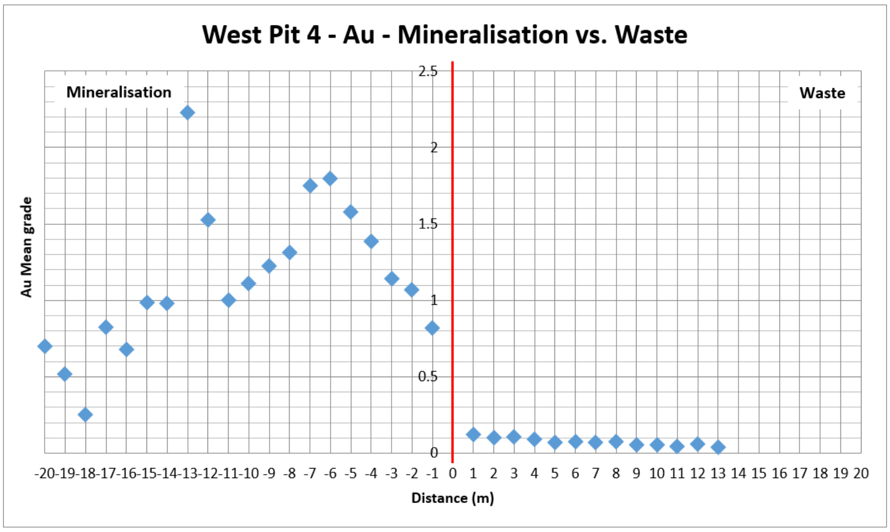


Figure 87: Mineralised boundary test graph for West Pit 4 – Au g/t mineralisation vs. waste

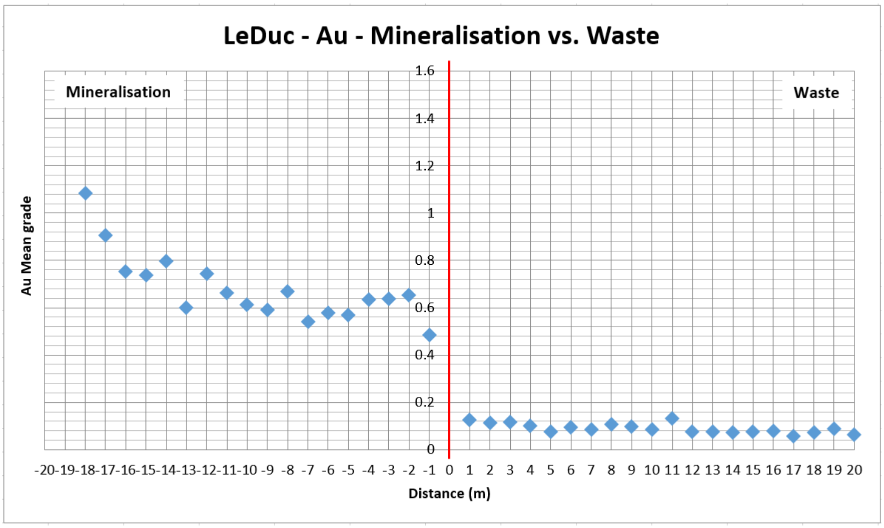


Figure 88: Mineralised boundary test graph for LeDuc – Au g/t mineralisation vs. waste

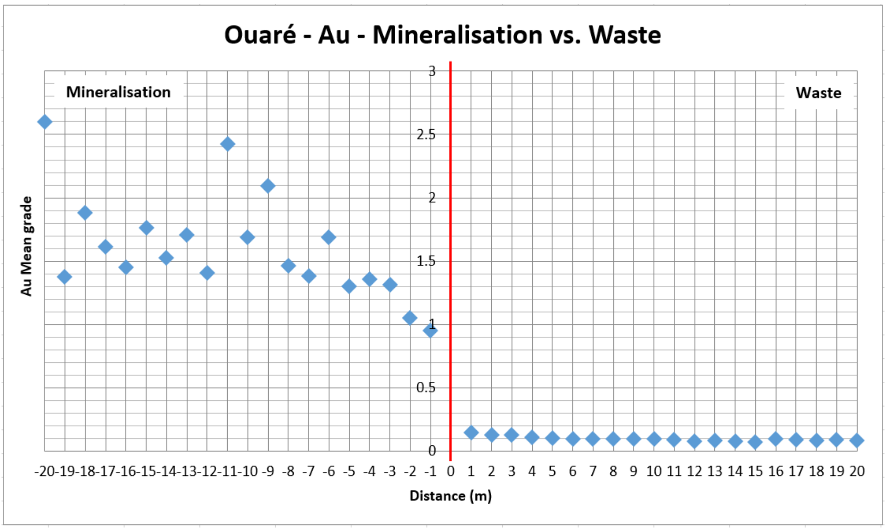


Figure 89: Mineralised boundary test graph for Ouaré – Au g/t mineralisation vs. waste

Additional contact analysis was carried out to assess the nature of the domain boundaries within the mineralised volumes between the weathering profiles. Based on the results of the boundary analysis for these profiles, the boundaries were interpreted to be soft.

14.5.2 Naïve Statistics

Drillhole coding is a standard procedure which ensures that the correct samples are used in statistical and geostatistical analyses, and grade interpolation. Within each of the Youga and Ouaré deposits, the mineralised envelopes were used to select drillhole samples. The samples were coded by geological domain and oxidation state.

A summary of the domain codes, used to distinguish the data during geostatistical analysis and estimation, is shown in Table 69 below.

Table 69: Youga and Ouaré deposits – data field flagging and description

Field	Code	Description
OXIDN	100	Overburden/Regolith
	200	Oxide
	300	Transitional
	400	Fresh
MINZON	Main Pit: 1 to 31 Zergoré: 1 to 78 NTV: 1, 3, 5 to 10, 21 to 29, 33 A2NE: 10 to 44 East Pit: 1 to 25 West Pit 1: 101 to 103 West Pit 2: 101 to 129 West Pit 3: 201 to 218 West Pit 4: 1 to 21 LeDuc: 101 to 111 Ouaré: 101 to 163	Mineralised
	99 – Main Pit, Zergoré, NTV, A2NE, East Pit, West Pit 4 999 – West Pits 1, 2 and 3, LeDuc, Ouaré	Waste

The mineralised domains were combined into a single domain per deposit and compared to the associated waste domains, as shown in Figure 90 to Figure 100. There are some isolated high values within the waste domains, however, the sample populations are clearly distinct from the mineralised domains.

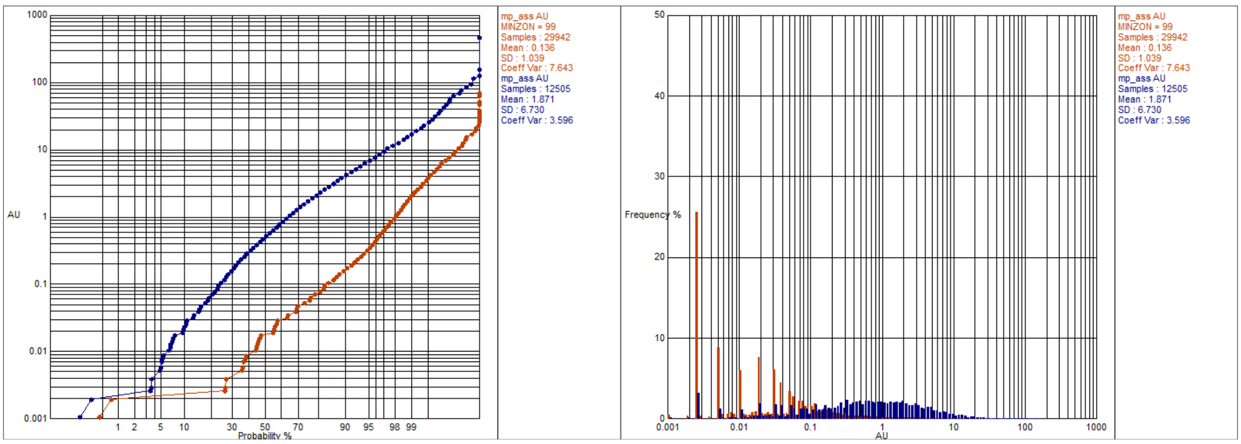


Figure 90: Main Pit – log probability (left) and log histogram (right) overlays of mineralisation (blue) vs. waste (red)

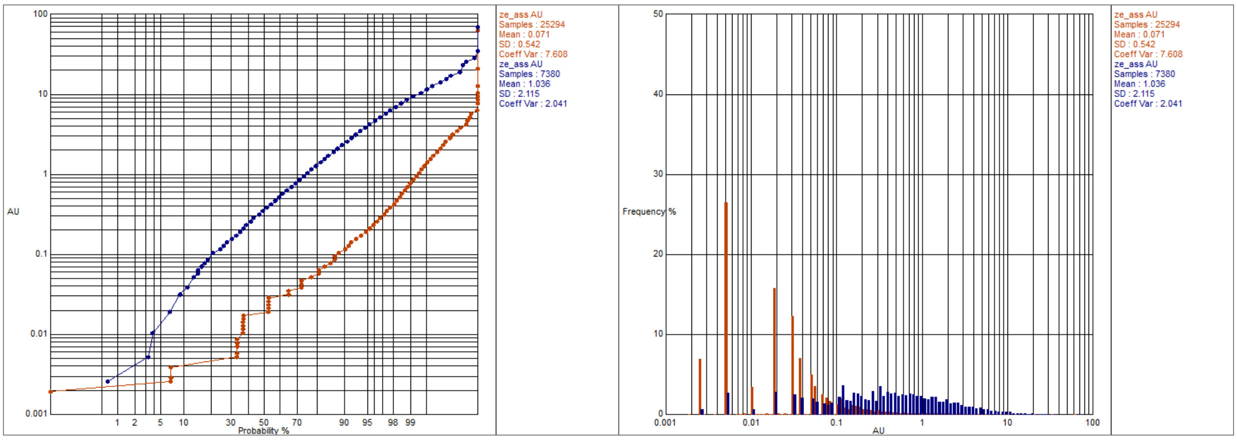


Figure 91: Zergoré – log probability (left) and log histogram (right) overlays of mineralisation (blue) vs. waste (red)

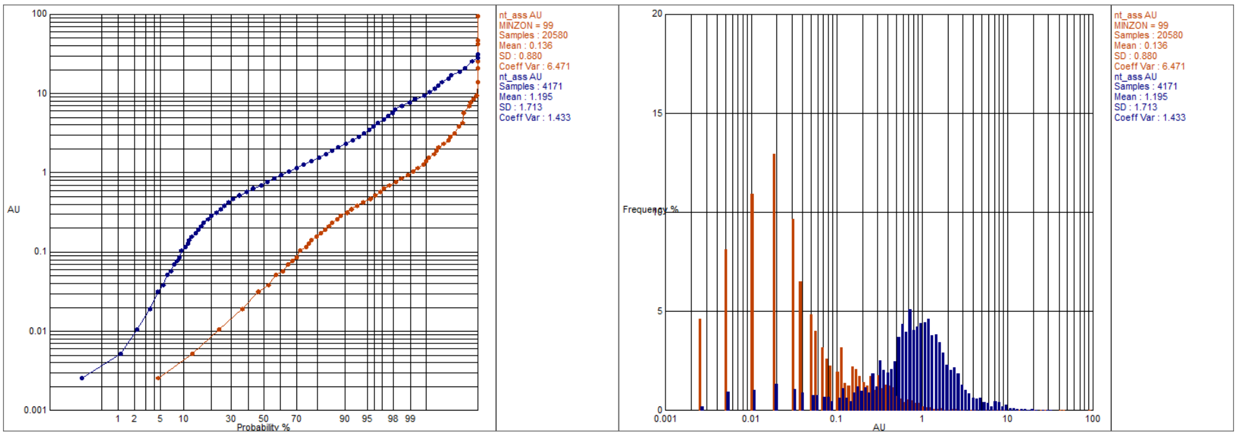


Figure 92: NTV – log probability (left) and log histogram (right) overlays of mineralisation (blue) vs. waste (red)

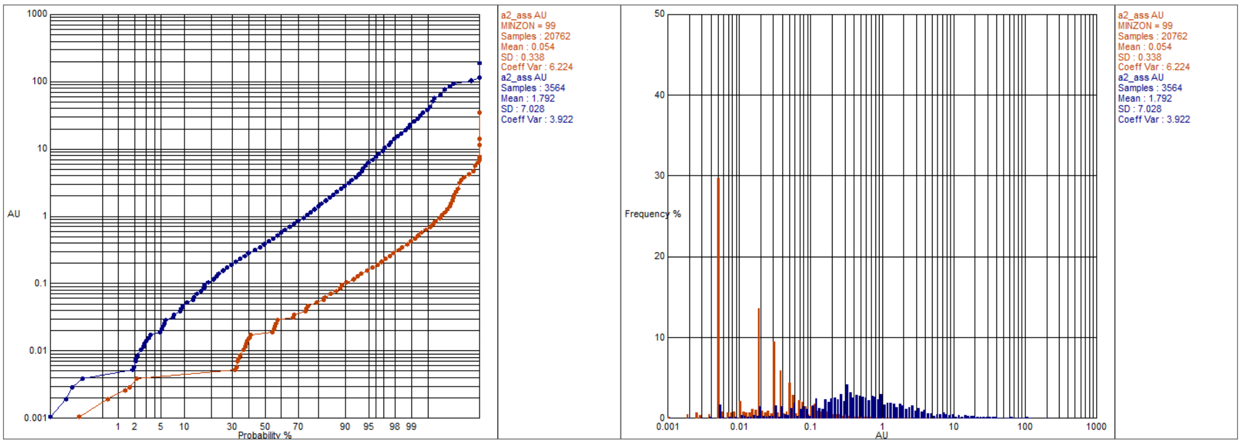


Figure 93: A2NE – log probability (left) and log histogram (right) overlays of mineralisation (blue) vs. waste (red)

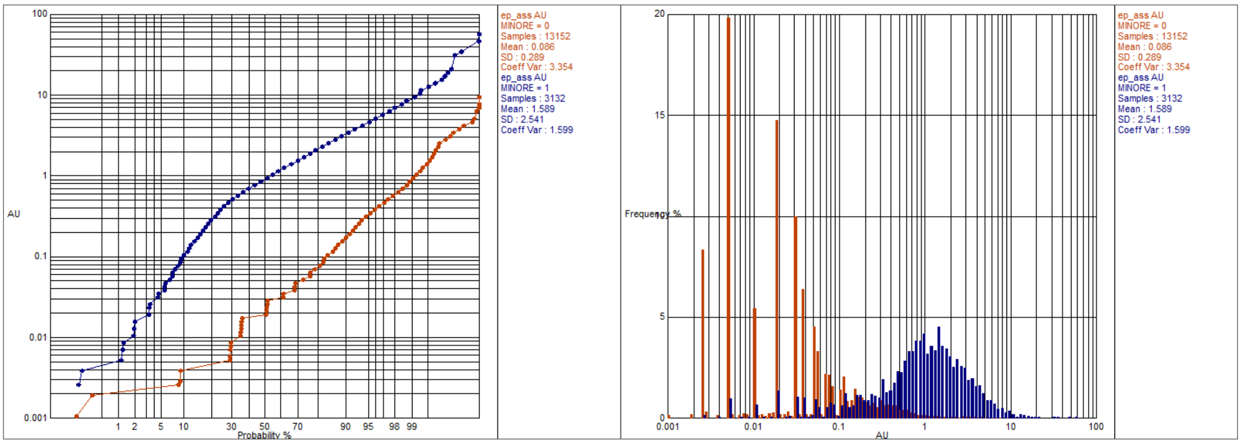


Figure 94: East Pit – log probability (left) and log histogram (right) overlays of mineralisation (blue) vs. waste (red)

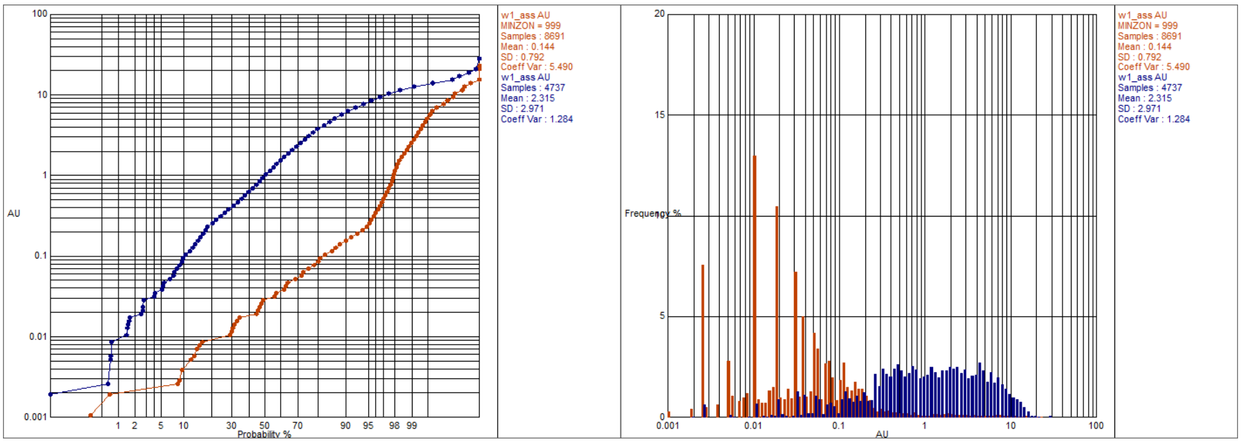


Figure 95: West Pit 1 – log probability (left) and log histogram (right) overlays of mineralisation (blue) vs. waste (red)

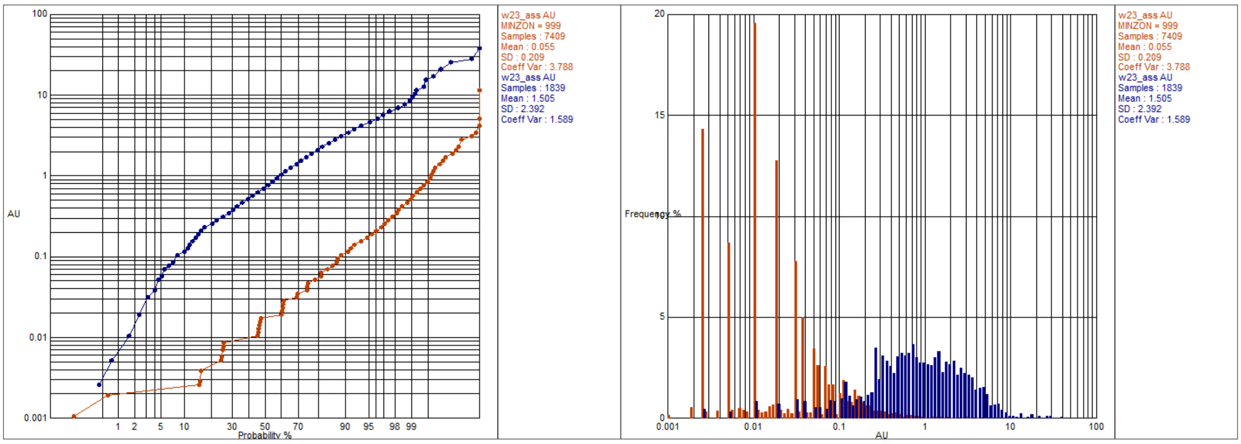


Figure 96: West Pit 2 – log probability (left) and log histogram (right) overlays of mineralisation (blue) vs. waste (red)

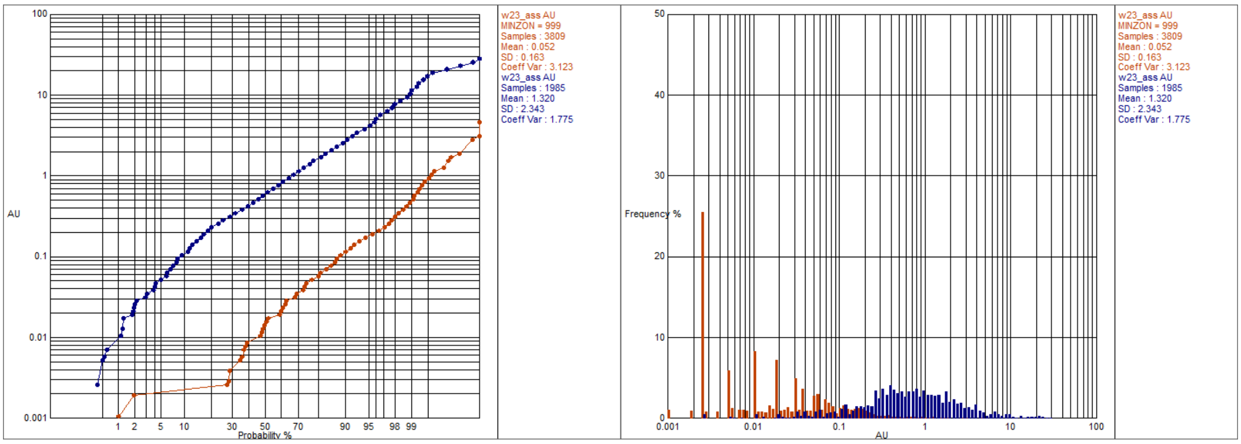


Figure 97: West Pit 3 – log probability (left) and log histogram (right) overlays of mineralisation (blue) vs. waste (red)

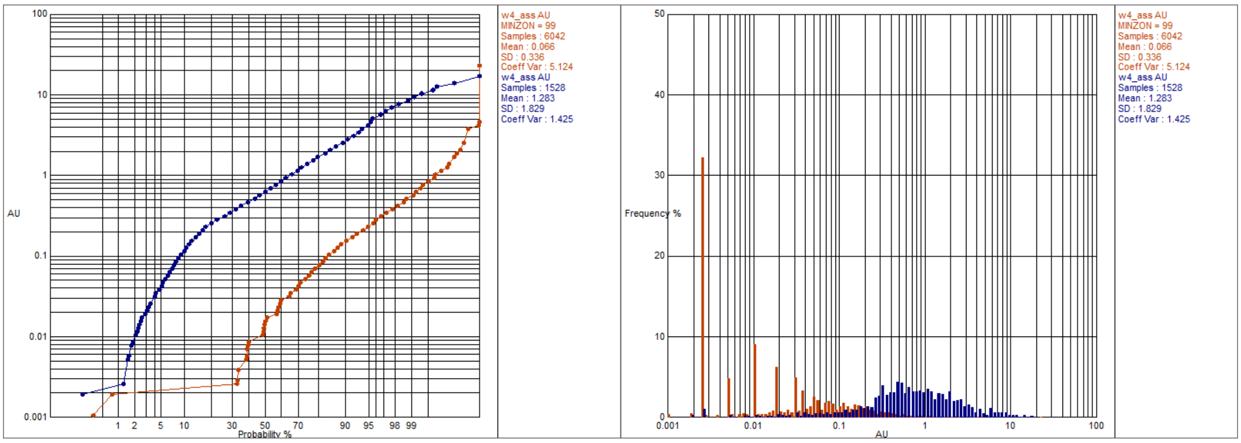


Figure 98: West Pit 4 – log probability (left) and log histogram (right) overlays of mineralisation (blue) vs. waste (red)

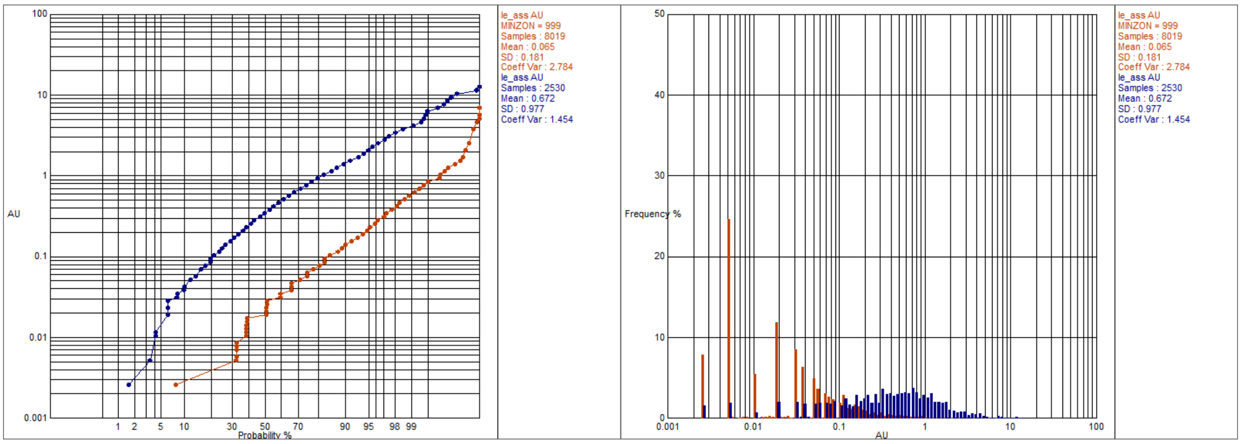


Figure 99: LeDuc – log probability (left) and log histogram (right) overlays of mineralisation (blue) vs. waste (red)

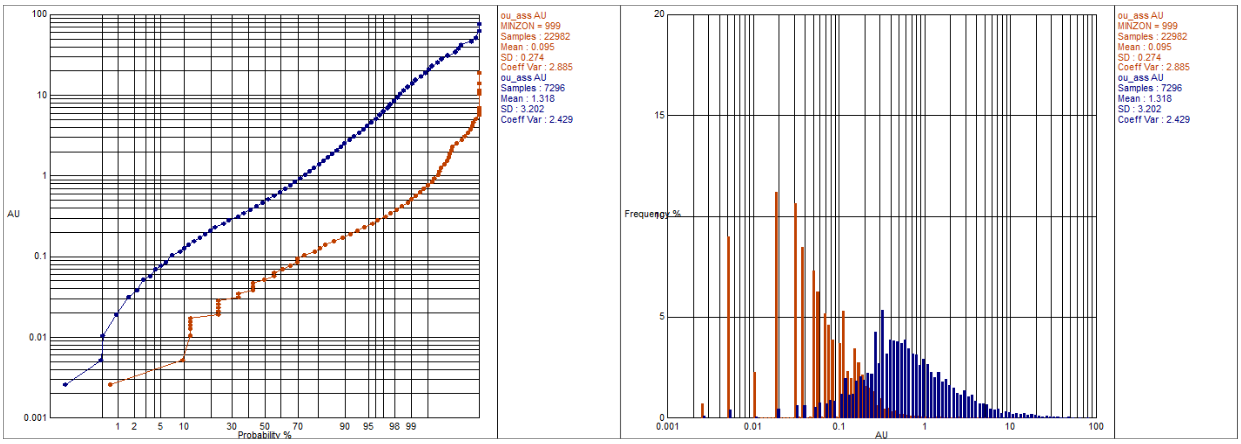


Figure 100: Ouaré – log probability (left) and log histogram (right) overlays of mineralisation (blue) vs. waste (red)

The Youga and Ouaré deposits naïve statistics, per MINZON, are given in Table 70. Based on visual review and geostatistical analysis, each individual MINZON per deposit show different grade populations and was estimated with hard boundaries against one another.

Table 70: Youga and Ouaré deposits – naïve statistics per MINZON

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
Main Pit	1	555	0.00	22.74	1.47	2.85	1.94
	2	5,376	0.00	133.20	2.46	5.65	2.30
	3	366	0.00	68.00	1.76	4.58	2.61
	4	141	0.01	27.74	1.19	2.98	2.50
	5	1,997	0.00	151.00	1.25	4.29	3.42
	6	119	0.00	3.28	0.55	0.61	1.10
	7	38	0.00	3.35	0.53	0.62	1.17
	8	307	0.01	24.40	0.73	1.60	2.21
	9	209	0.00	7.00	0.60	0.98	1.64
	10	192	0.00	6.49	0.60	0.88	1.47
	11	352	0.00	5.16	0.45	0.68	1.50
	12	79	0.01	4.70	0.61	0.82	1.34
	13	225	0.00	15.90	1.73	2.56	1.48
	14	170	0.00	10.66	0.77	1.50	1.96
	15	36	0.01	3.57	0.47	0.76	1.61
	16	36	0.02	24.90	1.46	3.81	2.60
	17	146	0.01	6.11	0.42	0.82	1.95
	18	266	0.00	36.30	1.29	3.22	2.50
	19	117	0.00	91.00	1.71	8.30	4.85
	20	108	0.00	13.23	0.87	1.73	1.98
	21	234	0.00	25.28	0.93	2.68	2.87
	22	238	0.00	13.70	0.80	1.72	2.15
	23	266	0.00	7.90	0.65	0.99	1.53
	24	371	0.00	484.00	2.16	19.17	8.88
	25	71	0.03	5.24	0.73	0.84	1.15
	26	37	0.04	6.95	0.95	1.28	1.34
	27	113	0.00	28.25	1.74	3.63	2.09
	28	28	0.01	7.48	1.15	1.94	1.68
	29	113	0.00	5.01	0.58	0.99	1.71
	30	25	0.00	1.74	0.47	0.46	0.97
	31	149	0.00	3.56	0.33	0.38	1.14
	99	29,942	0.00	66.80	0.14	1.04	7.64
Zergoré	1	341	0.01	15.00	0.99	1.51	1.53

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
	2	256	0.01	14.40	1.43	2.15	1.50
	3	176	0.01	5.47	0.74	1.04	1.41
	4	278	0.00	9.79	0.75	1.24	1.66
	5	106	0.01	2.87	0.47	0.59	1.26
	6	39	0.00	7.85	0.84	1.62	1.93
	7	9	0.23	13.10	2.18	4.16	1.91
	8	172	0.00	11.50	0.72	1.41	1.96
	9	61	0.02	1.75	0.41	0.38	0.93
	10	57	0.12	19.30	1.24	2.72	2.19
	11	27	0.02	6.03	1.22	1.56	1.28
	12	24	0.06	3.28	0.57	0.67	1.17
	13	161	0.00	6.82	0.52	0.80	1.55
	14	25	0.05	1.85	0.36	0.43	1.20
	15	319	0.00	15.50	0.91	1.86	2.03
	16	182	0.01	15.30	1.35	2.46	1.82
	17	16	0.01	1.49	0.28	0.38	1.34
	18	267	0.01	13.40	0.88	1.81	2.07
	19	5	0.12	0.93	0.49	0.34	0.69
	20	38	0.02	1.85	0.39	0.42	1.09
	21	7	0.03	1.20	0.29	0.41	1.40
	22	13	0.00	1.98	0.34	0.64	1.90
	23	189	0.01	35.90	1.08	3.18	2.95
	24	36	0.05	4.34	0.54	0.80	1.48
	25	150	0.00	6.04	0.54	0.90	1.68
	26	158	0.00	8.96	0.90	1.46	1.63
	27	86	0.01	7.86	0.96	1.81	1.88
	28	38	0.01	5.20	0.75	0.96	1.28
	29	41	0.03	2.48	0.50	0.57	1.15
	30	16	0.07	2.18	0.45	0.61	1.36
	31	28	0.09	4.09	0.42	0.77	1.83
	32	9	0.10	2.20	0.63	0.68	1.07
	33	6	0.08	0.74	0.34	0.31	0.91
	34	2	0.24	1.35	0.80	0.79	0.99
	35	4	0.36	0.69	0.54	0.16	0.30
	36	8	0.06	6.07	1.03	2.06	2.00
	37	27	0.04	4.79	0.59	0.92	1.57
	38	16	0.03	5.51	1.45	1.81	1.24
	39	4	0.09	0.39	0.21	0.13	0.64
	40	6	0.78	2.81	1.84	0.87	0.47
	41	8	0.04	1.81	0.60	0.61	1.01
	42	8	0.03	1.92	0.35	0.64	1.85
	43	12	0.03	1.52	0.38	0.39	1.04
	44	4	0.04	0.83	0.46	0.36	0.78
	45	5	0.26	6.99	3.07	3.20	1.04
	46	46	0.01	13.80	1.31	2.96	2.27
	47	15	0.02	2.56	0.68	0.83	1.21
	48	15	0.09	8.20	2.09	2.95	1.41
	49	62	0.01	18.90	1.29	2.68	2.08
	50	16	0.01	4.22	0.52	1.04	1.98
	51	34	0.01	12.40	1.05	2.21	2.12
	52	146	0.00	23.80	1.47	2.92	1.99
	53	39	0.02	2.45	0.58	0.53	0.92
	54	15	0.03	3.36	0.90	0.92	1.03
	55	43	0.00	72.90	2.48	11.12	4.49

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
	56	23	0.01	3.80	0.58	0.93	1.59
	57	3	0.10	0.40	0.28	0.16	0.57
	58	36	0.01	1.36	0.36	0.39	1.10
	59	26	0.01	8.10	1.20	2.25	1.87
	60	4	0.10	0.61	0.36	0.25	0.71
	61	14	0.02	3.02	0.54	0.81	1.50
	62	5	0.40	4.94	1.62	1.87	1.15
	63	8	0.10	1.17	0.45	0.46	1.01
	64	29	0.03	28.20	3.60	6.93	1.93
	65	85	0.03	17.80	1.75	2.72	1.55
	66	64	0.02	9.57	1.31	2.15	1.63
	67	32	0.03	9.16	1.35	2.24	1.66
	68	39	0.01	7.42	1.19	1.83	1.54
	69	158	0.01	18.90	1.88	3.40	1.81
	70	504	0.00	16.80	1.32	2.15	1.63
	71	574	0.00	11.10	0.92	1.46	1.58
	72	89	0.07	9.82	1.72	2.36	1.37
	73	758	0.00	28.20	1.18	1.88	1.60
	74	460	0.00	34.00	1.05	2.16	2.05
	75	452	0.01	16.20	0.84	1.43	1.70
	76	93	0.01	8.11	1.34	1.62	1.21
	77	26	0.01	4.27	0.90	0.98	1.09
	78	27	0.03	2.45	0.60	0.67	1.12
	99	25,294	0.00	64.70	0.07	0.54	7.61
NTV	1	785	0.01	28.80	1.37	1.81	785
	3	24	0.38	8.10	1.74	1.70	24
	5	18	0.07	6.28	2.04	1.91	18
	6	45	0.01	31.30	3.00	5.85	45
	7	97	0.01	9.37	1.56	2.22	97
	8	54	0.01	2.40	0.64	0.57	54
	9	1,003	0.00	18.40	1.22	1.40	1,003
	10	322	0.01	10.90	1.20	1.54	322
	21	219	0.01	14.80	1.29	1.91	219
	22	76	0.14	7.23	1.49	1.43	76
	23	264	0.01	11.22	1.11	1.13	264
	24	17	0.05	3.77	1.29	1.02	17
	25	261	0.01	19.50	0.98	1.51	261
	26	535	0.00	15.70	0.82	1.27	535
	27	145	0.01	10.34	0.72	1.18	145
	28	57	0.01	4.43	0.69	0.66	57
	29	47	0.17	8.46	1.16	1.42	47
	33	202	0.00	26.30	1.47	3.10	202
	99	20,580	0.00	90.80	0.14	0.87	20,580
A2NE	10	479	0.01	65.10	1.67	5.29	3.17
	11	187	0.01	13.40	0.75	1.45	1.94
	12	447	0.01	104.00	2.31	6.81	2.95
	13	376	0.00	13.00	0.77	1.55	2.01
	14	373	0.00	30.50	0.96	2.54	2.64
	15	199	0.01	49.60	0.83	3.65	4.42
	16	16	0.02	2.02	0.78	0.57	0.73
	17	465	0.01	81.00	1.32	4.95	3.74
	18	39	0.02	16.70	1.76	3.05	1.73
	19	28	0.03	2.49	0.57	0.57	0.99
	20	24	0.02	8.43	0.95	1.76	1.86

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
	21	89	0.00	43.90	2.89	6.29	2.18
	22	46	0.02	19.10	1.50	2.99	1.99
	23	355	0.01	192.00	5.39	16.64	3.09
	24	147	0.00	91.90	2.20	9.77	4.45
	25	24	0.02	6.17	0.70	1.39	1.99
	26	51	0.02	28.80	2.42	5.07	2.09
	27	54	0.02	3.05	0.71	0.73	1.03
	28	35	0.01	1.97	0.38	0.45	1.16
	29	15	0.03	2.50	0.48	0.60	1.27
	30	15	0.12	5.30	1.16	1.56	1.35
	31	6	0.04	3.10	0.88	1.15	1.31
	32	5	0.17	11.00	2.94	4.65	1.58
	33	9	0.07	1.00	0.45	0.37	0.81
	34	27	0.01	3.32	0.51	0.70	1.39
	35	6	0.14	1.25	0.51	0.48	0.95
	36	8	0.01	4.35	1.12	1.42	1.27
	37	5	0.01	5.81	1.51	2.44	1.62
	38	4	0.01	1.87	0.95	0.85	0.89
	39	4	0.10	2.05	1.06	1.04	0.98
	40	4	0.18	2.97	1.28	1.31	1.03
	41	4	0.11	1.28	0.49	0.55	1.11
	42	8	0.01	3.09	0.74	1.07	1.44
	43	6	0.02	0.96	0.37	0.44	1.21
	44	4	0.51	2.59	1.49	0.96	0.64
	99	20,762	0.00	33.80	0.05	0.34	6.22
East Pit	1	1,226	0.00	56.90	1.80	3.09	1.72
	2	492	0.01	16.11	1.46	1.75	1.20
	3	387	0.01	20.50	1.63	2.04	1.25
	4	407	0.00	19.50	1.54	2.19	1.42
	5	44	0.01	9.08	1.25	1.74	1.40
	6	25	0.01	7.26	1.78	1.69	0.95
	7	88	0.01	48.30	1.51	5.14	3.41
	8	81	0.01	5.94	1.39	1.41	1.01
	9	4	0.01	1.01	0.30	0.48	1.59
	10	64	0.01	4.56	0.76	0.84	1.10
	11	59	0.02	9.10	1.36	1.57	1.16
	12	17	0.07	1.61	0.58	0.41	0.71
	13	3	0.13	1.23	0.79	0.58	0.74
	14	46	0.04	2.81	1.13	0.82	0.72
	15	15	0.02	2.01	0.86	0.60	0.70
	16	21	0.27	2.86	0.98	0.67	0.68
	17	6	0.59	2.55	1.34	0.69	0.52
	18	22	0.01	2.13	0.64	0.52	0.81
	19	71	0.04	12.65	1.46	1.81	1.24
	20	21	0.00	6.55	2.47	1.75	0.71
	21	3	0.62	1.52	0.98	0.48	0.49
	22	5	0.49	1.04	0.68	0.24	0.35
	23	2	0.47	0.58	0.53	0.08	0.15
	24	6	0.15	2.84	0.77	1.04	1.35
	25	17	0.02	4.24	1.46	1.17	0.80
	99	13,152	0.00	9.18	0.09	0.29	3.35
West Pit 1	101	4,564	0.00	29.20	2.36	3.00	1.27
	102	127	0.01	4.81	0.77	0.90	1.17
	103	46	0.00	7.40	1.76	2.07	1.17

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
	999	8,691	0.00	22.50	0.14	0.79	5.49
West Pit 2	101	2	0.10	0.16	0.13	0.04	0.33
	103	4	0.21	0.35	0.29	0.07	0.24
	104	13	0.03	1.54	0.53	0.41	0.77
	105	7	0.05	1.00	0.49	0.35	0.70
	106	40	0.02	5.46	1.06	1.28	1.20
	108	6	0.10	1.55	0.57	0.53	0.92
	109	2	0.08	0.12	0.10	0.03	0.28
	110	3	0.01	0.27	0.12	0.13	1.08
	111	8	0.15	2.36	0.85	0.73	0.86
	112	6	0.57	2.20	1.32	0.62	0.47
	114	17	0.22	2.04	0.54	0.48	0.88
	115	22	0.00	1.87	0.45	0.54	1.19
	116	4	0.01	2.09	0.76	0.93	1.22
	117	1	0.29	0.29	0.29	-	-
	118	5	0.02	1.24	0.46	0.50	1.08
	119	25	0.02	3.08	0.76	0.75	0.99
	120	7	0.04	1.19	0.33	0.41	1.24
	121	7	0.05	1.03	0.38	0.38	0.99
	122	7	0.04	0.52	0.22	0.17	0.76
	123	4	0.04	0.73	0.36	0.33	0.91
	124	162	0.00	17.30	1.14	1.73	1.52
	125	5	0.11	0.78	0.38	0.25	0.65
	126	4	0.07	0.56	0.36	0.21	0.58
	128	2,742	0.00	38.84	1.74	2.64	1.51
	129	107	0.01	3.23	0.61	0.67	1.10
	999	7,409	0.00	11.00	0.06	0.21	3.79
West Pit 3	201	93	0.02	7.06	1.19	1.41	1.19
	202	7	0.10	3.79	1.72	1.54	0.89
	203	103	0.00	9.05	0.93	1.36	1.46
	204	11	0.01	2.63	0.55	0.78	1.41
	205	13	0.06	0.70	0.37	0.18	0.48
	206	18	0.01	1.06	0.32	0.22	0.68
	207	7	0.02	1.23	0.49	0.40	0.82
	208	27	0.00	3.29	0.42	0.68	1.61
	210	31	0.01	1.44	0.31	0.37	1.21
	211	122	0.01	3.13	0.39	0.44	1.14
	212	13	0.16	1.38	0.44	0.39	0.88
	213	3	0.30	0.42	0.35	0.06	0.17
	214	2	0.02	1.69	0.86	1.18	1.38
	215	4	0.56	3.55	1.73	1.33	0.77
	216	8	0.21	1.44	0.64	0.43	0.68
	217	18	0.01	0.77	0.35	0.24	0.70
	218	1,671	0.00	29.10	1.46	2.49	1.70
	999	3,809	0.00	4.84	0.05	0.16	3.12
West Pit 4	1	1,129	0.00	16.41	1.44	2.01	1.40
	2	86	0.01	10.61	0.81	1.38	1.70
	3	18	0.00	5.26	0.46	1.22	2.64
	4	17	0.00	1.92	0.70	0.66	0.94
	5	19	0.00	3.35	0.75	0.86	1.14
	6	9	0.01	0.94	0.33	0.27	0.80
	7	2	0.43	2.49	1.46	1.46	1.00
	8	2	0.08	0.64	0.36	0.40	1.10
	9	55	0.04	5.65	1.03	1.06	1.04

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
	10	17	0.12	1.90	0.84	0.46	0.54
	11	27	0.02	2.52	1.03	0.86	0.83
	12	2	0.59	0.92	0.76	0.23	0.31
	13	58	0.02	3.59	0.82	0.77	0.94
	14	15	0.01	6.00	0.94	1.44	1.54
	15	14	0.06	2.16	0.59	0.57	0.98
	16	3	0.23	0.80	0.43	0.32	0.76
	17	34	0.00	5.94	0.99	1.34	1.36
	18	4	0.02	1.79	1.06	0.80	0.76
	19	7	0.04	3.00	1.06	1.09	1.03
	20	3	0.43	1.28	0.84	0.43	0.51
	21	7	0.41	4.19	1.57	1.48	0.94
	99	6,042	0.00	22.69	0.07	0.34	5.12
LeDuc	101	244	0.00	3.05	0.51	0.55	1.08
	102	64	0.01	2.85	0.44	0.55	1.26
	103	224	0.01	4.42	0.68	0.75	1.11
	104	809	0.00	12.50	0.71	1.23	1.73
	105	285	0.01	4.12	0.46	0.47	1.02
	106	409	0.00	3.79	0.73	0.65	0.89
	107	172	0.01	6.79	0.43	0.78	1.80
	108	37	0.04	1.50	0.46	0.41	0.89
	109	58	0.01	7.28	1.26	1.44	1.14
	110	135	0.01	7.12	0.98	1.56	1.59
	111	93	0.03	4.62	1.04	1.09	1.05
	999	8,019	0.00	6.78	0.07	0.18	2.78
Ouaré	101	759	0.00	74.20	2.52	5.49	2.18
	102	243	0.01	27.70	1.47	2.79	1.90
	103	511	0.01	48.10	1.10	2.85	2.61
	104	75	0.10	12.60	0.75	1.80	2.41
	105	65	0.08	24.40	1.01	3.02	2.99
	106	18	0.14	10.40	1.33	2.55	1.92
	107	93	0.01	4.80	0.62	0.88	1.42
	108	50	0.01	11.70	1.15	2.01	1.75
	109	32	0.02	41.60	2.46	7.39	3.01
	110	12	0.02	3.49	0.56	1.03	1.84
	111	24	0.00	1.24	0.43	0.31	0.72
	112	14	0.16	1.77	0.51	0.41	0.80
	113	85	0.05	17.80	1.40	2.77	1.98
	114	111	0.07	14.60	1.03	1.86	1.81
	115	28	0.02	1.85	0.63	0.47	0.75
	116	366	0.01	64.60	1.14	4.18	3.66
	117	278	0.02	33.50	1.25	3.83	3.08
	118	35	0.05	2.73	0.63	0.62	0.98
	119	16	0.05	2.51	0.88	0.68	0.78
	120	1,090	0.00	61.20	1.26	2.65	2.11
	121	667	0.00	18.75	1.05	1.58	1.51
	122	221	0.03	38.80	1.83	3.61	1.97
	123	530	0.01	26.10	1.17	2.23	1.90
	124	143	0.03	53.40	1.75	4.91	2.81
	125	108	0.06	35.90	1.79	4.32	2.42
	126	197	0.02	6.15	0.60	0.79	1.31
	127	105	0.06	6.13	1.02	1.23	1.21
	128	48	0.02	7.93	0.87	1.53	1.77
	129	88	0.09	11.30	0.75	1.31	1.74

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
	130	79	0.01	4.72	0.96	1.07	1.11
	131	286	0.03	16.70	0.71	1.27	1.79
	132	80	0.03	33.90	2.11	4.81	2.28
	133	65	0.01	32.50	1.41	4.06	2.89
	134	133	0.02	23.30	2.41	3.83	1.59
	135	130	0.01	13.70	1.20	2.32	1.94
	136	13	0.10	1.85	0.52	0.48	0.93
	137	23	0.01	2.39	0.83	0.63	0.76
	138	21	0.14	8.68	0.80	1.81	2.26
	139	38	0.08	18.90	0.99	3.01	3.05
	140	5	0.26	1.38	0.74	0.48	0.65
	141	6	0.25	4.17	0.97	1.57	1.63
	142	40	0.00	6.55	1.38	1.41	1.03
	143	58	0.03	15.20	1.17	2.42	2.08
	144	13	0.22	4.21	1.02	1.09	1.07
	145	14	0.10	1.36	0.47	0.41	0.87
	146	26	0.01	19.90	2.24	4.94	2.21
	147	22	0.14	3.01	0.87	0.74	0.85
	148	25	0.14	31.00	1.93	6.10	3.16
	149	4	0.11	0.72	0.49	0.26	0.54
	150	21	0.12	2.04	0.64	0.57	0.88
	151	15	0.07	2.50	0.73	0.67	0.92
	152	22	0.04	2.61	0.79	0.75	0.95
	153	27	0.04	4.01	0.63	0.83	1.32
	154	19	0.06	1.90	0.64	0.45	0.70
	155	10	0.06	2.67	0.80	0.75	0.94
	156	19	0.11	0.77	0.38	0.15	0.40
	157	12	0.21	4.37	0.70	1.16	1.67
	158	12	0.06	5.20	0.80	1.41	1.75
	159	10	0.08	0.95	0.40	0.26	0.64
	160	11	0.29	2.22	0.59	0.57	0.96
	161	20	0.21	1.31	0.44	0.29	0.67
	162	3	0.28	0.33	0.31	0.03	0.08
	163	2	0.26	0.27	0.27	0.01	0.03
	999	22,982	0.00	19.80	0.10	0.27	2.89

14.5.3 Compositing

Sampling was undertaken at varying sampling lengths within the Youga and Ouaré deposits. CSA Global reviewed all sample lengths within the modelled mineralisation envelopes per deposit. The dominant as well as the mean sample length within these mineralisation envelopes per deposit was selected for compositing.

Within Zergoré, NTV, A2NE, East Pit, West Pits 2, 3 and 4 and LeDuc compositing to 1 m was selected as the most appropriate for use in estimation (Figure 101 to Figure 107).

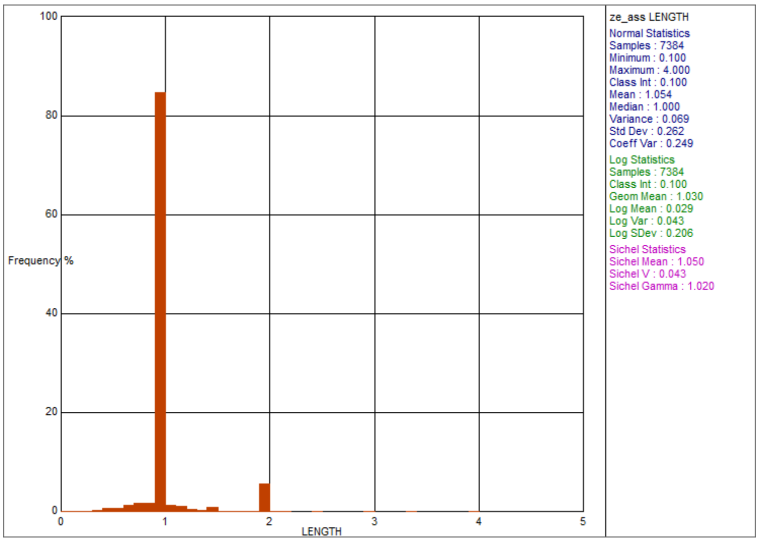


Figure 101: Zergoré – histogram sample lengths for mineralised domains

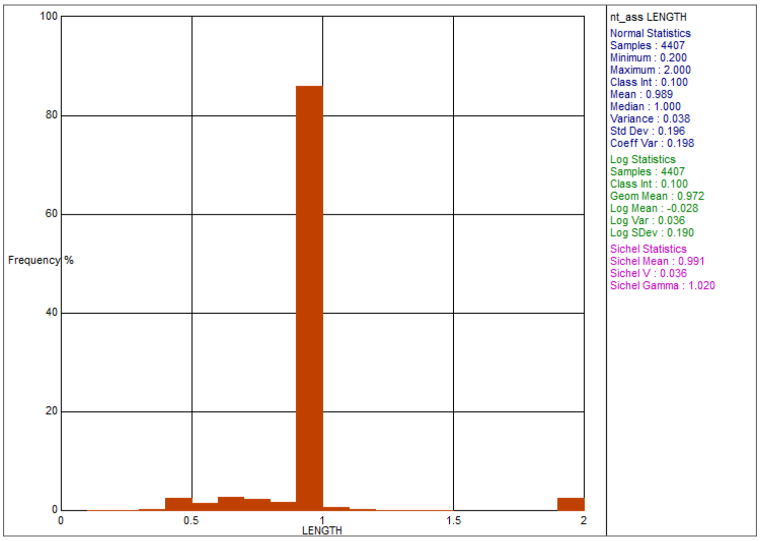


Figure 102: NTV – histogram sample lengths for mineralised domains

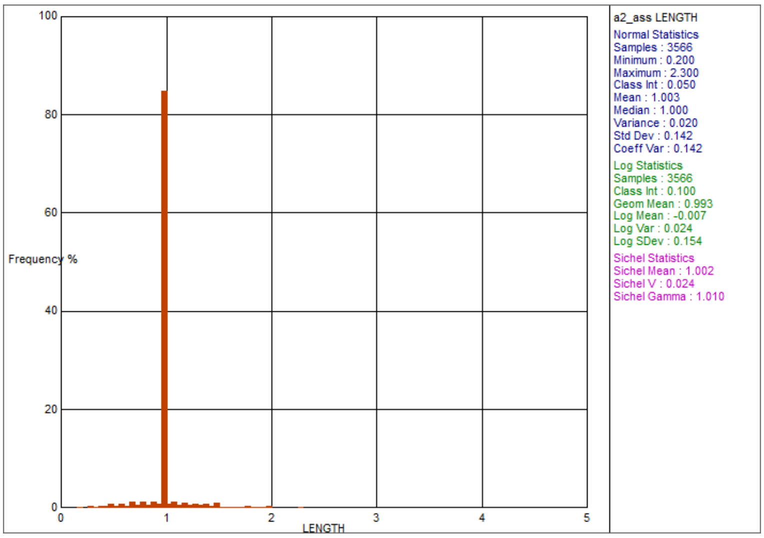


Figure 103: A2NE – histogram sample lengths for mineralised domains

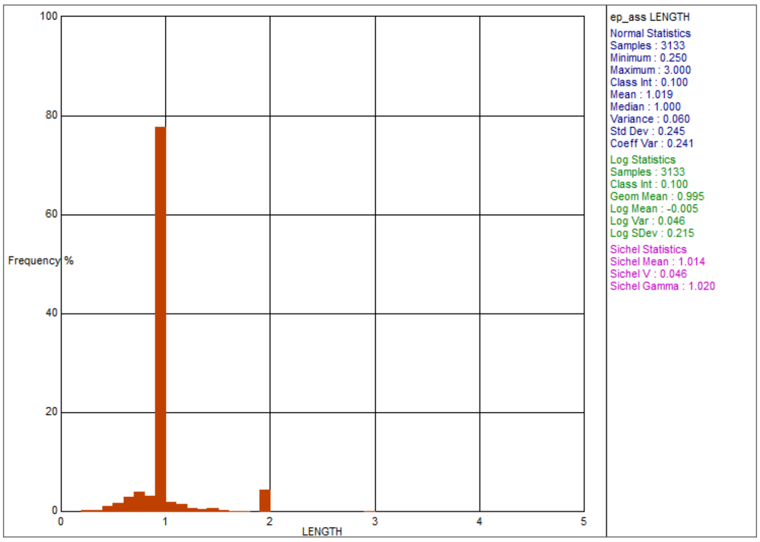


Figure 104: East Pit – histogram sample lengths for mineralised domains

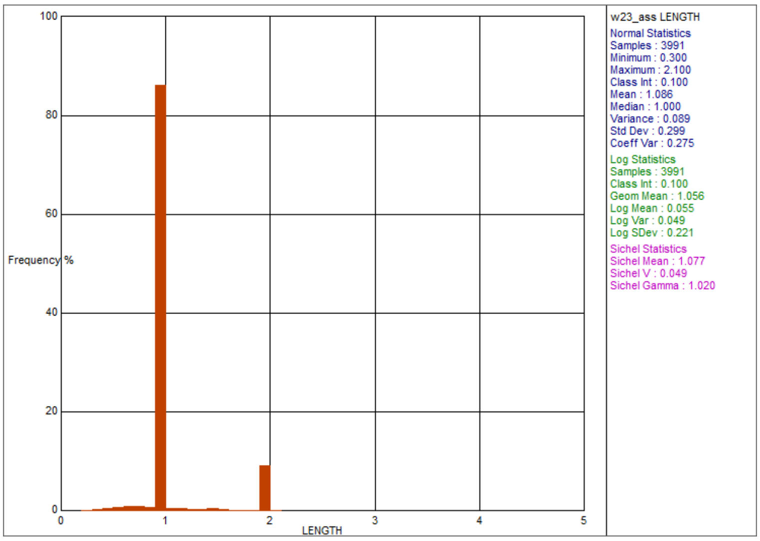


Figure 105: West Pit 2 and 3 – histogram sample lengths for mineralised domains

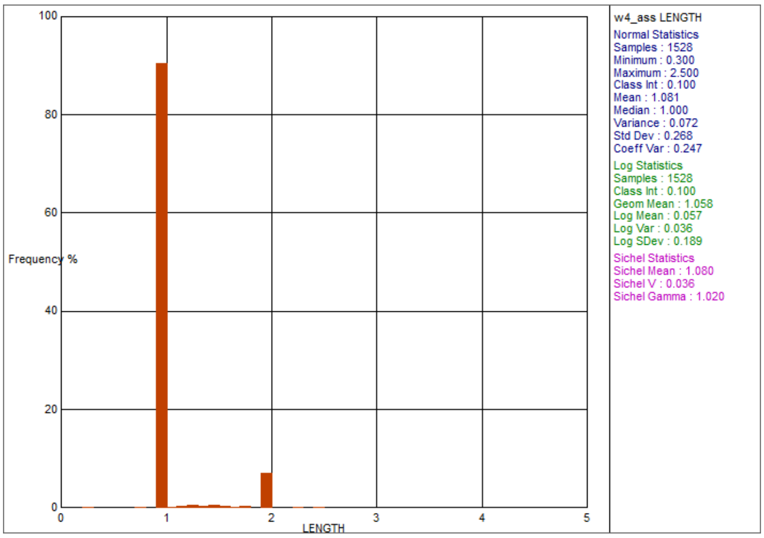


Figure 106: West Pit 4 – histogram sample lengths for mineralised domains

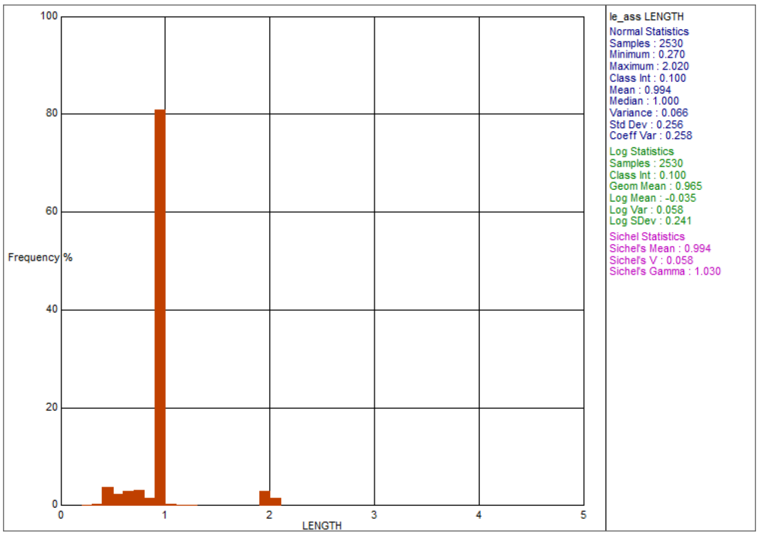


Figure 107: LeDuc – histogram sample lengths for mineralised domains

Within Main Pit, West Pit 1 and Ouaré, 2 m was selected as the most appropriate compositing length for use in the estimation (Figure 108 to Figure 110).

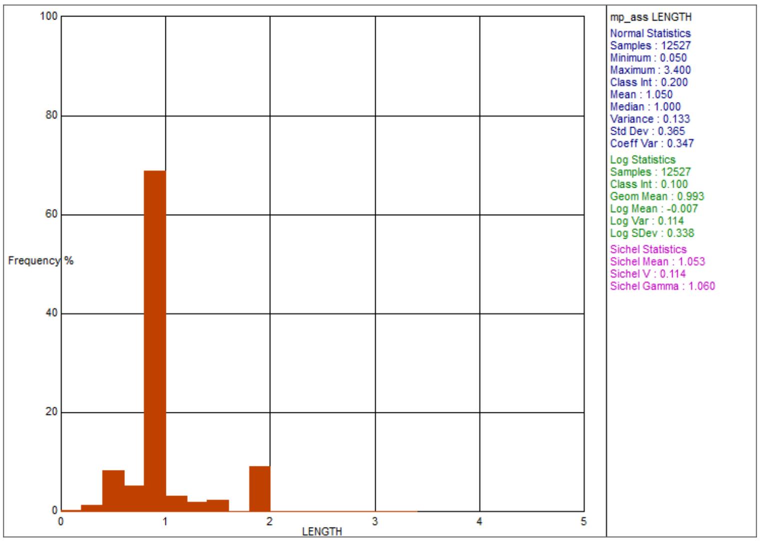


Figure 108: Main Pit – histogram sample lengths for mineralised domains

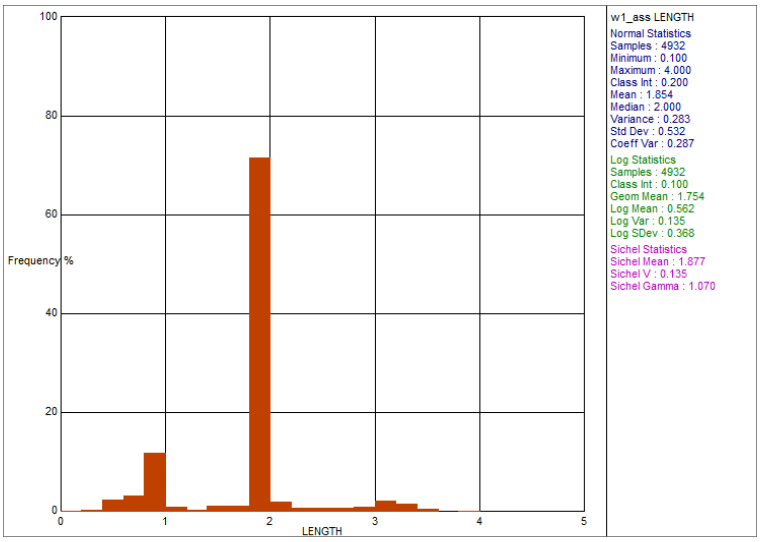


Figure 109: West Pit 1 – histogram sample lengths for mineralised domains

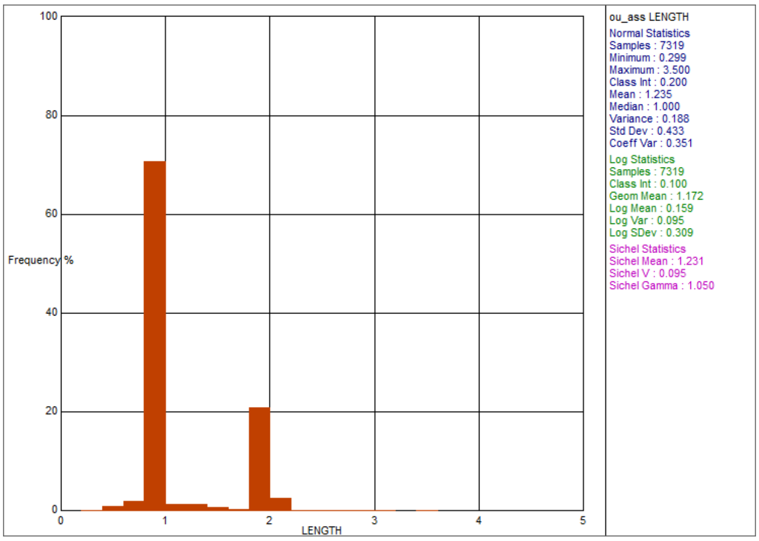


Figure 110: Ouaré – histogram sample lengths for mineralised domains

During the compositing process in Datamine™, the MODE parameter was set to either 0 or 1, depending on the deposit style. For Zergoré, East Pit and West Pit 4 the default setting of MODE = 0 was applied. The maximum composite length was defined by the set INTERVAL parameter (1 m) and the minimum composite length by the MINCOMP parameter (0.5 m). It is thus possible for part or all of one or more samples to be excluded from the composite. Following compositing, the proportion of residuals for Zergoré, East Pit and West Pit 4 were found to be <1%. These residuals were excluded from the geostatistical analysis and the estimate. This will limit any potential bias in the sample support during kriging.

For Main Pit, West Pits 1, 2 and 3, A2NE, NTV, LeDuc and Ouaré, MODE = 1 was used. This allows the process to force all samples to be included in one of the composites by adjusting the composite length, while keeping it as close as possible to the INTERVAL (1 m or 2 m). The maximum possible composite length will then be 1.5*INTERVAL (1.5 m or 3 m). The MODE = 1 setting was used for these deposits due to the narrow nature of the grade envelopes with depth. It thus reduces the proportion of residual samples that would have been excluded from the estimate if forced to a single rigid interval composite length.

Assays that fall within the modelled mineralisation envelopes were downhole composited, either to 1 m or 2 m depending on the deposit, prior to statistical review, top-cutting, variography and grade estimation.

The descriptive analyses for the estimation domains, per deposit, is shown in Table 71.

Table 71: Youga and Ouaré deposits – composite statistics per MINZON

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
Main Pit	1	288	0.00	19.21	1.46	2.55	1.75
	2	2,772	0.00	70.17	2.46	4.30	1.75
	3	173	0.00	34.32	1.74	3.51	2.02
	4	80	0.02	10.40	1.13	1.86	1.65
	5	1,129	0.00	39.36	1.27	2.63	2.08
	6	79	0.00	3.28	0.56	0.54	0.97
	7	31	0.04	3.35	0.53	0.61	1.14
	8	156	0.01	12.34	0.72	1.19	1.66
	9	114	0.00	4.17	0.59	0.81	1.37
	10	103	0.00	3.85	0.60	0.74	1.23
	11	188	0.00	2.93	0.45	0.57	1.27
	12	44	0.01	2.88	0.62	0.68	1.10
	13	118	0.00	14.82	1.69	2.26	1.34
	14	85	0.00	9.61	0.73	1.34	1.83
	15	19	0.01	2.61	0.49	0.66	1.36
	16	22	0.02	11.85	1.41	2.54	1.81
	17	89	0.01	3.34	0.42	0.70	1.67
	18	156	0.00	17.44	1.27	2.61	2.05
	19	67	0.00	56.30	1.75	6.95	3.98
	20	60	0.00	6.36	0.86	1.33	1.55
	21	139	0.00	20.65	0.91	2.36	2.60
	22	142	0.00	9.49	0.79	1.46	1.84
	23	149	0.00	5.75	0.70	0.98	1.39
	24	187	0.00	144.62	2.23	11.01	4.95
	25	61	0.02	11.86	1.24	1.91	1.55
	26	18	0.15	4.80	0.94	1.06	1.13
	27	61	0.00	15.66	1.71	2.87	1.68
	28	14	0.02	5.90	1.15	1.88	1.63
	29	62	0.00	2.54	0.59	0.75	1.28
	30	13	0.00	1.12	0.48	0.33	0.70
	31	106	0.00	1.74	0.33	0.33	0.99
Zergoré	1	356	0.01	15.00	0.99	1.48	1.49
	2	262	0.01	14.40	1.41	2.12	1.50
	3	186	0.01	5.47	0.73	0.99	1.36
	4	296	0.01	9.79	0.73	1.15	1.59
	5	110	0.01	2.87	0.48	0.58	1.22
	6	39	0.00	7.85	0.84	1.62	1.93
	7	9	0.23	13.10	2.18	4.16	1.91
	8	176	0.01	11.50	0.72	1.39	1.94
	9	72	0.02	1.64	0.44	0.39	0.90
	10	57	0.12	17.00	1.14	2.31	2.04
	11	27	0.02	6.03	1.22	1.56	1.28
	12	24	0.06	3.28	0.57	0.67	1.17
	13	163	0.00	6.82	0.51	0.80	1.56
	14	25	0.05	1.85	0.36	0.43	1.20
	15	337	0.01	15.50	0.94	1.87	1.98
	16	192	0.01	11.99	1.35	2.35	1.74
	17	16	0.01	1.49	0.28	0.38	1.34
	18	288	0.01	13.40	0.86	1.73	2.00
	19	5	0.12	0.93	0.49	0.34	0.69
	20	39	0.02	1.85	0.38	0.42	1.10

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
	21	7	0.07	1.20	0.29	0.41	1.41
	22	14	0.00	1.98	0.32	0.59	1.87
	23	200	0.01	23.33	1.09	2.73	2.51
	24	42	0.05	4.34	0.56	0.76	1.36
	25	157	0.00	5.70	0.52	0.83	1.60
	26	175	0.00	8.96	0.88	1.40	1.60
	27	92	0.01	7.86	0.91	1.76	1.93
	28	43	0.01	5.20	0.71	0.93	1.31
	29	40	0.04	2.20	0.50	0.54	1.09
	30	15	0.07	2.18	0.42	0.58	1.39
	31	28	0.09	4.09	0.42	0.77	1.83
	32	11	0.10	2.20	0.56	0.63	1.14
	33	6	0.08	0.74	0.34	0.31	0.91
	34	2	0.24	1.35	0.80	0.79	0.99
	35	4	0.36	0.69	0.54	0.16	0.30
	36	8	0.06	6.07	1.03	2.06	2.00
	37	27	0.04	4.79	0.59	0.92	1.57
	38	16	0.03	5.51	1.45	1.81	1.24
	39	4	0.09	0.39	0.21	0.13	0.64
	40	6	0.78	2.81	1.84	0.87	0.47
	41	8	0.04	1.81	0.60	0.61	1.01
	42	8	0.03	1.92	0.35	0.64	1.85
	43	12	0.03	1.52	0.38	0.39	1.04
	44	8	0.04	0.83	0.46	0.33	0.73
	45	5	0.26	6.99	3.07	3.20	1.04
	46	46	0.01	13.80	1.31	2.96	2.27
	47	15	0.02	2.56	0.68	0.83	1.21
	48	15	0.09	8.20	2.09	2.95	1.41
	49	66	0.01	18.90	1.30	2.63	2.02
	50	19	0.01	4.22	0.44	0.96	2.19
	51	34	0.01	12.40	1.05	2.21	2.12
	52	152	0.01	23.80	1.45	2.84	1.96
	53	43	0.02	2.45	0.55	0.52	0.95
	54	17	0.03	3.36	0.83	0.89	1.08
	55	47	0.00	72.90	2.34	10.63	4.54
	56	26	0.01	3.80	0.59	0.88	1.49
	57	5	0.10	0.40	0.31	0.12	0.40
	58	36	0.01	1.36	0.35	0.38	1.06
	59	30	0.01	8.10	1.07	2.12	1.99
	60	4	0.10	0.61	0.36	0.25	0.71
	61	14	0.02	3.02	0.54	0.81	1.50
	62	10	0.40	4.94	1.62	1.76	1.09
	63	11	0.10	1.17	0.55	0.48	0.87
	64	31	0.03	28.20	3.52	6.72	1.91
	65	108	0.03	17.80	1.71	2.55	1.50
	66	63	0.02	9.57	1.30	2.12	1.63
	67	37	0.03	9.16	1.22	2.11	1.72
	68	47	0.01	7.42	1.41	1.92	1.36
	69	172	0.01	18.90	2.21	3.57	1.61
	70	535	0.00	16.80	1.30	2.08	1.60
	71	590	0.00	11.10	0.92	1.45	1.58
	72	88	0.07	8.85	1.67	2.21	1.33
	73	793	0.00	25.43	1.17	1.80	1.53
	74	483	0.00	34.00	1.05	2.11	2.01

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
	75	481	0.01	16.20	0.84	1.40	1.66
	76	93	0.01	8.11	1.34	1.62	1.21
	77	37	0.26	4.27	0.92	1.01	1.09
	78	27	0.05	2.41	0.57	0.63	1.10
NTV	1	743	0.01	9.00	1.32	1.31	0.99
	3	22	0.38	8.10	1.74	1.71	0.98
	5	18	0.07	6.28	2.04	1.91	0.94
	6	43	0.01	13.00	2.57	3.54	1.38
	7	91	0.01	9.37	1.57	2.18	1.39
	8	52	0.01	2.40	0.63	0.56	0.89
	9	967	0.00	10.00	1.21	1.25	1.04
	10	310	0.01	7.00	1.15	1.24	1.08
	21	216	0.01	6.00	1.18	1.36	1.16
	22	76	0.14	6.54	1.49	1.41	0.94
	23	303	0.01	4.00	1.06	0.85	0.80
	24	17	0.05	3.77	1.29	1.02	0.79
	25	258	0.01	4.00	0.89	0.86	0.96
	26	550	0.00	5.50	0.79	1.02	1.29
	27	148	0.01	3.50	0.65	0.78	1.20
	28	60	0.01	4.43	0.69	0.66	0.95
	29	46	0.17	4.50	1.08	1.01	0.93
	33	212	0.00	7.00	1.23	1.76	1.43
A2NE	10	482	0.01	64.04	1.72	5.20	3.03
	11	189	0.01	13.40	0.74	1.43	1.94
	12	450	0.01	102.48	2.22	6.44	2.90
	13	380	0.00	13.00	0.76	1.46	1.92
	14	379	0.00	30.50	0.96	2.53	2.63
	15	199	0.01	49.60	0.83	3.65	4.42
	16	16	0.02	2.02	0.78	0.57	0.73
	17	460	0.01	55.64	1.30	4.47	3.45
	18	39	0.02	16.70	1.76	3.05	1.73
	19	28	0.03	2.49	0.57	0.57	0.99
	20	24	0.02	8.43	0.95	1.76	1.86
	21	92	0.00	43.90	2.91	6.13	2.11
	22	46	0.02	19.10	1.50	2.99	1.99
	23	353	0.01	107.00	4.61	11.83	2.57
	24	148	0.00	91.90	2.20	9.73	4.42
	25	24	0.02	6.17	0.70	1.39	1.99
	26	55	0.02	28.80	2.34	4.89	2.09
	27	54	0.02	3.05	0.71	0.73	1.03
	28	35	0.01	1.97	0.38	0.45	1.16
	29	15	0.03	2.50	0.48	0.60	1.27
	30	15	0.12	5.30	1.16	1.56	1.35
	31	6	0.04	3.10	0.88	1.15	1.31
	32	5	0.17	11.00	2.94	4.65	1.58
	33	9	0.07	1.00	0.45	0.37	0.81
	34	28	0.01	3.16	0.48	0.67	1.40
	35	6	0.14	1.25	0.51	0.48	0.95
	36	9	0.01	4.35	1.01	1.36	1.35
	37	6	0.01	5.81	2.22	2.80	1.26
	38	4	0.08	1.87	0.97	0.82	0.85
	39	4	0.10	2.05	1.06	1.04	0.98
	40	4	0.18	2.97	1.28	1.31	1.03
	41	4	0.11	1.28	0.49	0.55	1.11

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
	42	9	0.01	3.09	0.72	1.00	1.39
	43	6	0.05	0.96	0.42	0.41	0.99
	44	4	0.51	2.59	1.49	0.96	0.64
East Pit	1	1,265	0.00	56.90	1.79	3.02	1.69
	2	511	0.01	16.11	1.51	1.84	1.22
	3	384	0.01	20.50	1.62	2.05	1.26
	4	411	0.00	19.50	1.57	2.13	1.36
	5	54	0.01	9.08	1.55	2.10	1.35
	6	23	0.28	5.38	1.70	1.43	0.84
	7	85	0.01	36.40	1.38	3.97	2.87
	8	80	0.01	5.94	1.37	1.39	1.01
	9	5	0.01	1.01	0.36	0.43	1.21
	10	64	0.01	4.56	0.76	0.84	1.10
	11	59	0.02	9.10	1.36	1.57	1.16
	12	17	0.07	1.61	0.58	0.41	0.71
	13	3	0.13	1.23	0.79	0.58	0.74
	14	46	0.04	2.81	1.13	0.82	0.72
	15	15	0.02	2.01	0.86	0.60	0.70
	16	21	0.27	2.86	0.98	0.67	0.68
	17	6	0.59	2.55	1.34	0.69	0.52
	18	22	0.01	2.13	0.64	0.52	0.81
	19	72	0.04	12.65	1.45	1.80	1.24
	20	21	0.00	6.55	2.47	1.75	0.71
	21	3	0.62	1.52	0.98	0.48	0.49
	22	5	0.49	1.04	0.68	0.24	0.35
	23	2	0.47	0.58	0.53	0.08	0.15
	24	4	0.18	1.50	0.66	0.59	0.89
	25	17	0.02	4.24	1.46	1.17	0.80
West Pit 1	101	4,236	0.00	27.48	2.40	2.92	1.22
	102	124	0.01	4.81	0.79	0.91	1.15
	103	38	0.00	7.10	1.67	1.88	1.13
West Pit 2	101	4	0.10	0.16	0.13	0.04	0.27
	103	4	0.21	0.35	0.29	0.07	0.24
	104	13	0.03	1.54	0.53	0.41	0.77
	105	7	0.05	1.00	0.49	0.35	0.70
	106	38	0.02	4.31	1.01	1.16	1.15
	108	9	0.10	1.55	0.50	0.45	0.91
	109	2	0.08	0.12	0.10	0.03	0.28
	110	6	0.01	0.27	0.12	0.12	0.97
	111	8	0.15	2.36	0.85	0.73	0.86
	112	6	0.57	2.20	1.32	0.62	0.47
	114	25	0.22	2.04	0.60	0.53	0.88
	115	25	0.00	1.87	0.47	0.51	1.08
	116	6	0.01	2.09	0.90	0.95	1.06
	117	1	0.29	0.29	0.29	-	-
	118	5	0.02	1.24	0.46	0.50	1.08
	119	24	0.02	3.08	0.78	0.75	0.96
	120	7	0.04	1.19	0.33	0.41	1.24
	121	8	0.05	1.03	0.34	0.34	1.01
	122	8	0.04	0.52	0.22	0.15	0.70
	123	4	0.04	0.73	0.36	0.33	0.91
	124	168	0.01	10.11	1.10	1.35	1.22
	125	7	0.11	0.78	0.45	0.25	0.56
	126	4	0.07	0.56	0.36	0.21	0.58

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
	128	1,485	0.00	38.84	1.73	2.59	1.50
	129	113	0.01	3.23	0.58	0.65	1.13
West Pit 3	201	95	0.02	7.06	1.19	1.40	1.18
	202	8	0.10	3.79	1.54	1.51	0.98
	203	116	0.00	9.05	1.03	1.48	1.44
	204	11	0.01	2.63	0.55	0.78	1.41
	205	13	0.06	0.70	0.37	0.18	0.48
	206	18	0.01	1.06	0.32	0.22	0.68
	207	7	0.02	1.23	0.49	0.40	0.82
	208	30	0.00	3.29	0.45	0.65	1.45
	210	35	0.01	1.44	0.33	0.37	1.12
	211	153	0.01	3.13	0.40	0.42	1.07
	212	13	0.16	1.38	0.44	0.39	0.88
	213	6	0.30	0.42	0.35	0.05	0.15
	214	4	0.02	1.69	0.86	0.97	1.13
	215	5	0.56	3.55	1.49	1.26	0.85
	216	8	0.21	1.44	0.64	0.43	0.68
	217	20	0.01	0.77	0.34	0.23	0.68
	218	1,806	0.00	29.10	1.46	2.40	1.65
West Pit 4	1	1,220	0.00	16.41	1.42	1.98	1.40
	2	92	0.01	10.61	0.82	1.35	1.65
	3	19	0.00	4.35	0.46	1.00	2.19
	4	17	0.00	1.92	0.70	0.66	0.94
	5	20	0.00	3.35	0.75	0.84	1.12
	6	10	0.01	0.94	0.31	0.26	0.84
	7	2	0.43	2.49	1.46	1.46	1.00
	8	2	0.08	0.64	0.36	0.40	1.10
	9	55	0.04	5.65	1.03	1.06	1.04
	10	17	0.12	1.90	0.84	0.46	0.54
	11	27	0.02	2.52	1.03	0.86	0.83
	12	2	0.59	0.92	0.76	0.23	0.31
	13	74	0.02	3.59	0.84	0.74	0.88
	14	15	0.01	6.00	0.94	1.44	1.54
	15	18	0.06	2.16	0.54	0.53	0.98
	16	3	0.23	0.80	0.43	0.32	0.76
	17	34	0.00	5.94	0.99	1.34	1.36
	18	4	0.02	1.79	1.06	0.80	0.76
	19	7	0.04	3.00	1.06	1.09	1.03
	20	3	0.43	1.28	0.84	0.43	0.51
	21	14	0.41	4.19	1.57	1.42	0.90
LeDuc	101	253	0.02	3.05	0.49	0.54	1.09
	102	75	0.01	2.85	0.43	0.52	1.22
	103	230	0.01	4.42	0.67	0.74	1.11
	104	762	0.00	11.36	0.67	1.01	1.50
	105	278	0.01	4.12	0.46	0.45	0.97
	106	388	0.00	3.62	0.72	0.61	0.85
	107	183	0.01	6.79	0.47	0.90	1.92
	108	37	0.04	1.50	0.46	0.41	0.89
	109	58	0.01	7.28	1.26	1.44	1.14
	110	149	0.01	7.12	0.94	1.50	1.59
	111	101	0.03	4.62	1.05	1.09	1.04
Ouaré	101	515	0.01	46.45	2.49	4.72	1.90
	102	171	0.01	13.91	1.41	2.04	1.45
	103	335	0.01	48.10	1.19	3.17	2.66

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
	104	49	0.11	5.19	0.71	0.95	1.34
	105	45	0.16	12.52	0.91	1.85	2.04
	106	13	0.22	4.08	1.18	1.26	1.06
	107	65	0.01	4.47	0.59	0.69	1.18
	108	33	0.01	5.87	1.14	1.26	1.10
	109	21	0.02	41.60	3.35	9.04	2.70
	110	9	0.03	3.49	0.60	1.11	1.84
	111	16	0.00	1.16	0.43	0.26	0.61
	112	9	0.25	1.06	0.53	0.27	0.51
	113	65	0.07	11.41	1.32	2.27	1.72
	114	68	0.11	14.60	1.11	1.95	1.75
	115	17	0.03	1.56	0.66	0.40	0.62
	116	232	0.01	35.20	1.12	3.18	2.86
	117	174	0.03	26.50	1.15	3.01	2.62
	118	20	0.10	1.60	0.63	0.49	0.77
	119	11	0.11	1.95	0.87	0.54	0.62
	120	687	0.01	45.65	1.22	2.26	1.85
	121	396	0.00	18.75	1.07	1.56	1.46
	122	121	0.07	19.56	1.79	2.77	1.55
	123	320	0.02	21.75	1.12	2.01	1.80
	124	82	0.10	27.48	1.82	3.58	1.97
	125	67	0.21	27.85	1.68	3.65	2.17
	126	123	0.02	4.56	0.62	0.69	1.11
	127	63	0.14	4.26	1.05	1.06	1.01
	128	28	0.03	4.70	0.87	1.22	1.39
	129	51	0.18	4.46	0.76	0.91	1.20
	130	43	0.01	4.32	0.97	0.89	0.92
	131	172	0.10	8.50	0.69	0.87	1.27
	132	46	0.04	18.49	2.08	3.78	1.82
	133	50	0.03	32.50	1.51	4.54	3.00
	134	104	0.02	15.39	2.04	2.67	1.31
	135	94	0.03	12.50	1.30	2.31	1.77
	136	13	0.10	1.85	0.52	0.48	0.93
	137	17	0.02	2.18	0.81	0.60	0.75
	138	17	0.17	8.68	0.90	2.01	2.23
	139	23	0.19	11.59	0.97	2.33	2.40
	140	5	0.26	1.38	0.74	0.48	0.65
	141	6	0.25	4.17	0.97	1.57	1.63
	142	24	0.21	5.84	1.36	1.20	0.88
	143	32	0.11	7.69	1.13	1.59	1.40
	144	8	0.36	4.21	1.18	1.26	1.07
	145	8	0.10	1.26	0.44	0.38	0.85
	146	15	0.29	14.23	2.16	3.69	1.71
	147	16	0.20	3.01	0.91	0.76	0.83
	148	15	0.23	21.06	2.11	5.29	2.51
	149	2	0.42	0.57	0.49	0.11	0.22
	150	12	0.13	1.20	0.64	0.34	0.53
	151	9	0.26	1.29	0.68	0.37	0.54
	152	13	0.10	2.59	0.78	0.64	0.83
	153	18	0.07	4.01	0.73	0.95	1.31
	154	12	0.29	1.42	0.66	0.31	0.47
	155	8	0.29	2.67	0.86	0.78	0.90
	156	14	0.11	0.61	0.36	0.13	0.35
	157	10	0.22	4.37	0.78	1.27	1.64

Deposit	MINZON	# Samples	Minimum	Maximum	Mean	Std. Dev.	CV
	158	8	0.25	2.13	0.79	0.83	1.05
	159	6	0.29	0.60	0.40	0.11	0.27
	160	6	0.31	1.38	0.57	0.43	0.75
	161	15	0.21	1.04	0.42	0.26	0.60
	162	3	0.28	0.33	0.31	0.03	0.08
	163	2	0.26	0.27	0.27	0.01	0.03

14.5.4 Top-Cut Analysis

Grade cutting (top cutting) is generally applied to data used for grade estimation in order to reduce the local high grading effect of anomalous high-grade samples in the grade estimate. In cases where individual samples would unduly influence the values of surrounding model cells, without the support of other high-grade samples, top cuts are applied. These top cuts are quantified according to the statistical distribution of the sample population.

Cutting strategy was applied based on the following:

1. Skewness of the data.
2. Probability plots.
3. Spatial position of extreme grades.

Histograms and probability plots were reviewed for Au per deposit within each individual estimation domain, where there were sufficient numbers of samples to draw meaningful conclusions, to determine the top cut. For smaller domains, these were combined and a global top cut was applied. The uncut and top-cut statistics are shown in Table 72.

Table 72: Youga and Ouaré deposits – top-cut statistics per MINZON

Deposit	MINZON	Top cut	No. of samples	No. of samples cut	Uncut mean	Cut mean	%Metal cut	Uncut Std. Dev.	Cut Std. Dev.	Uncut CV	Cut CV
Main Pit	1	11.00	288	6	1.46	1.38	-5%	2.55	2.16	1.75	1.56
	2	25.00	2,772	17	2.46	2.37	-3%	4.30	3.53	1.75	1.49
	3	9.00	173	5	1.74	1.49	-14%	3.51	2.05	2.02	1.38
	4	5.00	80	4	1.13	0.98	-13%	1.86	1.28	1.65	1.30
	5	12.00	1,129	8	1.27	1.18	-7%	2.63	1.84	2.08	1.56
	6	2.00	79	2	0.56	0.54	-3%	0.54	0.47	0.97	0.87
	7	1.50	31	1	0.53	0.47	-11%	0.61	0.36	1.14	0.77
	8	5.00	156	1	0.72	0.67	-7%	1.19	0.82	1.66	1.22
	9	3.00	114	2	0.59	0.58	-2%	0.81	0.75	1.37	1.30
	10	-	103	0	0.60	0.60	-1%	0.74	0.74	1.23	1.23
	11	-	188	0	0.45	0.45	0%	0.57	0.57	1.27	1.27
	12	-	44	0	0.62	0.62	1%	0.68	0.68	1.10	1.10
	13	10.00	118	1	1.69	1.65	-2%	2.26	2.06	1.34	1.25
	14	5.00	85	1	0.73	0.68	-7%	1.34	1.03	1.83	1.52
	15	-	19	0	0.49	0.49	1%	0.66	0.66	1.36	1.36
	16	5.00	22	1	1.41	1.09	-22%	2.54	1.33	1.81	1.21
	17	-	89	0	0.42	0.42	0%	0.70	0.70	1.67	1.67
	18	10.00	156	4	1.27	1.18	-7%	2.61	2.15	2.05	1.83
	19	10.00	67	1	1.75	1.06	-39%	6.95	1.95	3.98	1.85
	20	4.00	60	2	0.86	0.79	-8%	1.33	1.09	1.55	1.37
	21	5.00	139	3	0.91	0.70	-23%	2.36	1.21	2.60	1.73
	22	-	142	0	0.79	0.79	0%	1.46	1.46	1.84	1.84
	23	3.50	149	3	0.70	0.66	-6%	0.98	0.80	1.39	1.21
	24	11.00	187	3	2.23	1.31	-41%	11.01	1.96	4.95	1.50

Deposit	MINZON	Top cut	No. of samples	No. of samples cut	Uncut mean	Cut mean	%Metal cut	Uncut Std. Dev.	Cut Std. Dev.	Uncut CV	Cut CV
	25	-	61	0	1.24	1.24	0%	1.91	1.91	1.55	1.55
	26	-	18	0	0.94	0.94	0%	1.06	1.06	1.13	1.13
	27	-	61	0	1.71	1.71	0%	2.87	2.87	1.68	1.68
	28	-	14	0	1.15	1.15	0%	1.88	1.88	1.63	1.63
	29	-	62	0	0.59	0.59	0%	0.75	0.75	1.28	1.28
	30	-	13	0	0.48	0.48	0%	0.33	0.33	0.70	0.70
	31	-	106	0	0.33	0.33	0%	0.33	0.33	0.99	0.99
Zergoré	1	6.00	356	4	0.99	0.94	-5%	1.48	1.17	1.49	1.25
	2	10.00	262	2	1.41	1.39	-1%	2.12	2.01	1.50	1.45
	3	-	186	0	0.73	0.73	0%	0.99	0.99	1.36	1.36
	4	6.00	296	3	0.73	0.70	-4%	1.15	0.98	1.59	1.41
	5	-	110	0	0.48	0.48	0%	0.58	0.58	1.22	1.22
	6	5.00	39	2	0.84	0.76	-9%	1.62	1.32	1.93	1.73
	7	3.00	9	1	2.18	1.05	-52%	4.16	1.01	1.91	0.96
	8	4.00	176	3	0.72	0.63	-13%	1.39	0.86	1.94	1.37
	9	-	72	0	0.44	0.44	0%	0.39	0.39	0.90	0.90
	10	4.00	57	1	1.14	0.91	-20%	2.31	0.97	2.04	1.07
	11	-	27	0	1.22	1.22	0%	1.56	1.56	1.28	1.28
	12	-	24	0	0.57	0.57	0%	0.67	0.67	1.17	1.17
	13	4.00	163	1	0.51	0.49	-3%	0.80	0.68	1.56	1.38
	14	-	25	0	0.36	0.36	0%	0.43	0.43	1.20	1.20
	15	10.00	337	4	0.94	0.90	-5%	1.87	1.58	1.98	1.76
	16	-	192	0	1.35	1.35	0%	2.35	2.35	1.74	1.74
	17	-	16	0	0.28	0.28	0%	0.38	0.38	1.34	1.34
	18	7.00	288	5	0.86	0.78	-9%	1.73	1.26	2.00	1.61
	19	-	5	0	0.49	0.49	0%	0.34	0.34	0.69	0.69
	20	-	39	0	0.38	0.38	0%	0.42	0.42	1.10	1.10
	21	-	7	0	0.29	0.29	0%	0.41	0.41	1.41	1.41
	22	-	14	0	0.32	0.32	0%	0.59	0.59	1.87	1.87
	23	10.00	200	3	1.09	0.94	-13%	2.73	1.81	2.51	1.92
	24	2.00	42	1	0.56	0.51	-10%	0.76	0.53	1.36	1.04
	25	4.00	154	2	0.52	0.51	-2%	0.83	0.77	1.60	1.52
	26	3.00	175	14	0.88	0.73	-17%	1.40	0.88	1.60	1.22
	27	3.00	92	6	0.91	0.64	-29%	1.76	0.86	1.93	1.33
	28	3.00	43	1	0.71	0.66	-7%	0.93	0.71	1.31	1.08
	29	-	40	0	0.50	0.50	0%	0.54	0.54	1.09	1.09
	30	-	15	0	0.42	0.42	0%	0.58	0.58	1.39	1.39
	31	2.00	28	1	0.42	0.35	-18%	0.77	0.43	1.83	1.23
	32	-	11	0	0.56	0.56	0%	0.63	0.63	1.14	1.14
	33	-	6	0	0.34	0.34	0%	0.31	0.31	0.91	0.91
	34	-	2	0	0.80	0.80	0%	0.79	0.79	0.99	0.99
	35	-	4	0	0.54	0.54	0%	0.16	0.16	0.30	0.30
	36	1.00	8	1	1.03	0.39	-62%	2.06	0.37	2.00	0.93
	37	2.00	27	1	0.59	0.48	-18%	0.92	0.48	1.57	1.00
	38	-	16	0	1.45	1.45	0%	1.81	1.81	1.24	1.24
	39	-	4	0	0.21	0.21	0%	0.13	0.13	0.64	0.64
	40	-	6	0	1.84	1.84	0%	0.87	0.87	0.47	0.47
	41	-	8	0	0.60	0.60	0%	0.61	0.61	1.01	1.01
	42	-	8	0	0.35	0.35	0%	0.64	0.64	1.85	1.85
	43	-	12	0	0.38	0.38	0%	0.39	0.39	1.04	1.04
	44	-	8	0	0.46	0.46	0%	0.33	0.33	0.73	0.73
	45	-	5	0	3.07	3.07	0%	3.20	3.20	1.04	1.04

Deposit	MINZON	Top cut	No. of samples	No. of samples cut	Uncut mean	Cut mean	%Metal cut	Uncut Std. Dev.	Cut Std. Dev.	Uncut CV	Cut CV
	46	3.00	46	3	1.31	0.72	-45%	2.96	0.97	2.27	1.34
	47	-	15	0	0.68	0.68	0%	0.83	0.83	1.21	1.21
	48	-	15	0	2.09	2.09	0%	2.95	2.95	1.41	1.41
	49	6.00	66	2	1.30	1.11	-15%	2.63	1.56	2.02	1.41
	50	1.00	19	1	0.44	0.27	-39%	0.96	0.33	2.19	1.23
	51	4.00	34	1	1.05	0.80	-24%	2.21	1.09	2.12	1.36
	52	9.00	152	3	1.45	1.31	-10%	2.84	2.06	1.96	1.57
	53	-	43	0	0.55	0.55	0%	0.52	0.52	0.95	0.95
	54	-	17	0	0.83	0.83	0%	0.89	0.89	1.08	1.08
	55	6.00	47	3	2.34	0.89	-62%	10.63	1.62	4.54	1.81
	56	-	26	0	0.59	0.59	0%	0.88	0.88	1.49	1.49
	57	-	5	0	0.31	0.31	0%	0.12	0.12	0.40	0.40
	58	-	36	0	0.35	0.35	0%	0.38	0.38	1.06	1.06
	59	-	30	0	1.07	1.07	0%	2.12	2.12	1.99	1.99
	60	-	4	0	0.36	0.36	0%	0.25	0.25	0.71	0.71
	61	-	14	0	0.54	0.54	0%	0.81	0.81	1.50	1.50
	62	-	10	0	1.62	1.62	0%	1.76	1.76	1.09	1.09
	63	-	11	0	0.55	0.55	0%	0.48	0.48	0.87	0.87
	64	11.00	31	3	3.52	2.49	-29%	6.72	3.46	1.91	1.39
	65	10.00	108	2	1.71	1.63	-4%	2.55	2.16	1.50	1.32
	66	-	63	0	1.30	1.30	0%	2.12	2.12	1.63	1.63
	67	3.00	37	3	1.22	0.84	-31%	2.11	0.92	1.72	1.09
	68	-	47	0	1.41	1.41	0%	1.92	1.92	1.36	1.36
	69	14.00	172	2	2.21	2.16	-2%	3.57	3.36	1.61	1.56
	70	6.00	535	21	1.30	1.18	-10%	2.08	1.55	1.60	1.32
	71	9.00	590	3	0.92	0.91	-1%	1.45	1.38	1.58	1.52
	72	-	88	0	1.67	1.67	0%	2.21	2.21	1.33	1.33
	73	9.00	793	4	1.17	1.14	-3%	1.80	1.50	1.53	1.32
	74	12.00	483	2	1.05	1.00	-5%	2.11	1.51	2.01	1.51
	75	6.00	480	4	0.84	0.80	-5%	1.40	1.11	1.66	1.39
	76	-	93	0	1.34	1.34	0%	1.62	1.62	1.21	1.21
	77	-	37	0	0.92	0.92	0%	1.01	1.01	1.09	1.09
	78	-	27	0	0.57	0.57	0%	0.63	0.63	1.10	1.10
NTV	1	9.00	743	6	1.37	1.32	-4%	1.76	1.31	1.28	0.99
	3	-	22	0	1.74	1.74	0%	1.71	1.71	0.98	0.98
	5	-	18	0	2.04	2.04	0%	1.91	1.91	0.94	0.94
	6	13.00	43	1	3.00	2.57	-14%	5.42	3.54	1.81	1.38
	7	-	91	0	1.57	1.57	0%	2.18	2.18	1.39	1.39
	8	-	52	0	0.63	0.63	0%	0.56	0.56	0.89	0.89
	9	10.00	966	3	1.22	1.21	-1%	1.34	1.25	1.10	1.04
	10	7.00	310	5	1.20	1.15	-4%	1.51	1.24	1.26	1.08
	21	6.00	216	6	1.28	1.18	-8%	1.90	1.36	1.48	1.16
	22	-	76	0	1.49	1.49	0%	1.41	1.41	0.94	0.94
	23	4.00	303	7	1.12	1.06	-5%	1.13	0.85	1.01	0.80
	24	-	17	0	1.29	1.29	0%	1.02	1.02	0.79	0.79
	25	4.00	258	5	0.98	0.89	-9%	1.51	0.86	1.54	0.96
	26	5.50	550	6	0.82	0.79	-4%	1.27	1.02	1.54	1.29
	27	3.50	148	3	0.72	0.65	-10%	1.18	0.78	1.64	1.20
	28	-	60	0	0.69	0.69	0%	0.66	0.66	0.95	0.95
	29	4.50	46	1	1.17	1.08	-8%	1.40	1.01	1.20	0.93
	33	7.00	212	11	1.47	1.23	-16%	3.08	1.76	2.09	1.43
A2NE	10	20.00	474	4	1.56	1.41	-9%	4.34	3.00	2.79	2.12

Deposit	MINZON	Top cut	No. of samples	No. of samples cut	Uncut mean	Cut mean	%Metal cut	Uncut Std. Dev.	Cut Std. Dev.	Uncut CV	Cut CV
	11	5.00	188	2	0.74	0.67	-9%	1.44	1.00	1.94	1.49
	12	40.00	438	2	2.24	2.08	-7%	6.52	4.58	2.91	2.21
	13	-	366	0	0.75	0.75	0%	1.43	1.43	1.92	1.92
	14	9.00	366	5	0.96	0.83	-14%	2.57	1.48	2.67	1.78
	15	8.00	196	2	0.84	0.63	-25%	3.68	1.24	4.39	1.99
	16	-	16	0	0.78	0.78	0%	0.57	0.57	0.73	0.73
	17	10.00	454	7	1.31	0.94	-28%	4.50	1.62	3.45	1.72
	18	8.00	39	1	1.76	1.54	-13%	3.05	2.10	1.73	1.37
	19	-	28	0	0.57	0.57	0%	0.57	0.57	0.99	0.99
	20	3.00	24	1	0.95	0.72	-24%	1.76	0.90	1.86	1.24
	21	10.00	85	7	3.03	2.16	-29%	6.37	2.97	2.10	1.37
	22	8.00	46	1	1.50	1.26	-16%	2.99	1.72	1.99	1.36
	23	40.00	342	4	4.27	3.71	-13%	11.08	7.17	2.60	1.94
	24	12.00	148	3	2.20	1.24	-44%	9.73	2.37	4.42	1.91
	25	3.00	24	1	0.70	0.57	-19%	1.39	0.92	1.99	1.62
	26	8.00	54	3	2.35	1.68	-29%	4.94	2.35	2.10	1.40
	27	-	54	0	0.71	0.71	0%	0.73	0.73	1.03	1.03
	28	-	35	0	0.38	0.38	0%	0.45	0.45	1.16	1.16
	29	-	15	0	0.48	0.48	0%	0.60	0.60	1.27	1.27
	30	-	15	0	1.16	1.16	0%	1.56	1.56	1.35	1.35
	31	-	6	0	0.88	0.88	0%	1.15	1.15	1.31	1.31
	32	3.00	5	1	2.94	1.34	-54%	4.65	1.48	1.58	1.10
	33	-	9	0	0.45	0.45	0%	0.37	0.37	0.81	0.81
	34	-	28	0	0.48	0.48	0%	0.67	0.67	1.40	1.40
	35	-	6	0	0.51	0.51	0%	0.48	0.48	0.95	0.95
	36	-	9	0	1.01	1.01	0%	1.36	1.36	1.35	1.35
	37	-	6	0	2.22	2.22	0%	2.80	2.80	1.26	1.26
	38	-	4	0	0.97	0.97	0%	0.82	0.82	0.85	0.85
	39	-	4	0	1.06	1.06	0%	1.04	1.04	0.98	0.98
	40	-	4	0	1.28	1.28	0%	1.31	1.31	1.03	1.03
	41	-	4	0	0.49	0.49	0%	0.55	0.55	1.11	1.11
	42	-	7	0	0.81	0.81	0%	1.12	1.12	1.38	1.38
	43	-	6	0	0.42	0.42	0%	0.41	0.41	0.99	0.99
	44	-	4	0	1.49	1.49	0%	0.96	0.96	0.64	0.64
East Pit	1	20.50	1,265	4	1.79	1.72	-4%	3.02	2.13	1.69	1.23
	2	-	511	0	1.51	1.51	0%	1.84	1.84	1.22	1.22
	3	-	384	0	1.62	1.62	0%	2.05	2.05	1.26	1.26
	4	-	411	0	1.57	1.57	0%	2.13	2.13	1.36	1.36
	5	-	54	0	1.55	1.55	0%	2.10	2.10	1.35	1.35
	6	-	23	0	1.70	1.70	0%	1.43	1.43	0.84	0.84
	7	20.50	85	1	1.38	1.20	-14%	3.97	2.34	2.87	1.95
	8	-	80	0	1.37	1.37	0%	1.39	1.39	1.01	1.01
	9	-	5	0	0.36	0.36	0%	0.43	0.43	1.21	1.21
	10	-	64	0	0.76	0.76	0%	0.84	0.84	1.10	1.10
	11	-	59	0	1.36	1.36	0%	1.57	1.57	1.16	1.16
	12	-	17	0	0.58	0.58	0%	0.41	0.41	0.71	0.71
	13	-	3	0	0.79	0.79	0%	0.58	0.58	0.74	0.74
	14	-	46	0	1.13	1.13	0%	0.82	0.82	0.72	0.72
	15	-	15	0	0.86	0.86	0%	0.60	0.60	0.70	0.70
	16	-	21	0	0.98	0.98	0%	0.67	0.67	0.68	0.68
	17	-	6	0	1.34	1.34	0%	0.69	0.69	0.52	0.52
	18	-	22	0	0.64	0.64	0%	0.52	0.52	0.81	0.81

Deposit	MINZON	Top cut	No. of samples	No. of samples cut	Uncut mean	Cut mean	%Metal cut	Uncut Std. Dev.	Cut Std. Dev.	Uncut CV	Cut CV
	19	-	72	0	1.45	1.45	0%	1.80	1.80	1.24	1.24
	20	-	21	0	2.47	2.47	0%	1.75	1.75	0.71	0.71
	21	-	3	0	0.98	0.98	0%	0.48	0.48	0.49	0.49
	22	-	5	0	0.68	0.68	0%	0.24	0.24	0.35	0.35
	23	-	2	0	0.53	0.53	0%	0.08	0.08	0.15	0.15
	24	-	4	0	0.66	0.66	0%	0.59	0.59	0.89	0.89
	25	-	17	0	1.46	1.46	0%	1.17	1.17	0.80	0.80
West Pit 1	101	20.00	4,236	2	2.40	2.39	0%	2.92	2.89	1.22	1.21
	102	-	124	0	0.79	0.79	0%	0.91	0.91	1.15	1.15
	103	-	38	0	1.67	1.67	0%	1.88	1.88	1.13	1.13
West Pit 2	101	-	4	0	0.13	0.13	0%	0.04	0.04	0.27	0.27
	103	-	4	0	0.29	0.29	0%	0.07	0.07	0.24	0.24
	104	-	13	0	0.53	0.53	0%	0.41	0.41	0.77	0.77
	105	-	7	0	0.49	0.49	0%	0.35	0.35	0.70	0.70
	106	-	38	0	1.01	1.01	0%	1.16	1.16	1.15	1.15
	108	-	6	0	0.67	0.67	0%	0.47	0.47	0.71	0.71
	109	-	2	0	0.10	0.10	0%	0.03	0.03	0.28	0.28
	110	-	6	0	0.12	0.12	0%	0.12	0.12	0.97	0.97
	111	-	8	0	0.85	0.85	0%	0.73	0.73	0.86	0.86
	112	-	6	0	1.32	1.32	0%	0.62	0.62	0.47	0.47
	114	-	25	0	0.60	0.60	0%	0.53	0.53	0.88	0.88
	115	-	23	0	0.46	0.46	0%	0.51	0.51	1.11	1.11
	116	-	6	0	0.90	0.90	0%	0.95	0.95	1.06	1.06
	117	-	1	0	0.29	0.29	0%	-	-	-	-
	118	-	5	0	0.46	0.46	0%	0.50	0.50	1.08	1.08
	119	-	24	0	0.78	0.78	0%	0.75	0.75	0.96	0.96
	120	-	7	0	0.33	0.33	0%	0.41	0.41	1.24	1.24
	121	-	6	0	0.33	0.33	0%	0.35	0.35	1.07	1.07
	122	-	8	0	0.22	0.22	0%	0.15	0.15	0.70	0.70
	123	-	4	0	0.36	0.36	0%	0.33	0.33	0.91	0.91
	124	-	168	0	1.10	1.10	0%	1.35	1.35	1.22	1.22
	125	-	7	0	0.45	0.45	0%	0.25	0.25	0.56	0.56
	126	-	4	0	0.36	0.36	0%	0.21	0.21	0.58	0.58
	128	30.00	1,485	1	1.73	1.73	0%	2.59	2.51	1.50	1.46
	129	-	113	0	0.58	0.58	0%	0.65	0.65	1.13	1.13
West Pit 3	201	-	95	0	1.19	1.19	0%	1.40	1.40	1.18	1.18
	202	-	8	0	1.54	1.54	0%	1.51	1.51	0.98	0.98
	203	-	114	0	1.04	1.04	0%	1.49	1.49	1.43	1.43
	204	-	11	0	0.55	0.55	0%	0.78	0.78	1.41	1.41
	205	-	13	0	0.37	0.37	0%	0.18	0.18	0.48	0.48
	206	-	18	0	0.32	0.32	0%	0.22	0.22	0.68	0.68
	207	-	7	0	0.49	0.49	0%	0.40	0.40	0.82	0.82
	208	-	28	0	0.41	0.41	0%	0.66	0.66	1.60	1.60
	210	-	35	0	0.33	0.33	0%	0.37	0.37	1.12	1.12
	211	-	153	0	0.40	0.40	0%	0.42	0.42	1.07	1.07
	212	-	13	0	0.44	0.44	0%	0.39	0.39	0.88	0.88
	213	-	6	0	0.35	0.35	0%	0.05	0.05	0.15	0.15
	214	-	4	0	0.86	0.86	0%	0.97	0.97	1.13	1.13
	215	-	5	0	1.49	1.49	0%	1.26	1.26	0.85	0.85
	216	-	8	0	0.64	0.64	0%	0.43	0.43	0.68	0.68
	217	-	20	0	0.34	0.34	0%	0.23	0.23	0.68	0.68
	218	-	1,806	0	1.46	1.46	0%	2.40	2.40	1.65	1.65

Deposit	MINZON	Top cut	No. of samples	No. of samples cut	Uncut mean	Cut mean	%Metal cut	Uncut Std. Dev.	Cut Std. Dev.	Uncut CV	Cut CV
West Pit 4	1	15.00	1,220	2	1.42	1.41	0%	1.98	1.96	1.40	1.39
	2	5.00	92	2	0.82	0.75	-8%	1.35	0.94	1.65	1.26
	3	2.00	19	1	0.46	0.33	-27%	1.00	0.53	2.19	1.58
	4	-	17	0	0.70	0.70	0%	0.66	0.66	0.94	0.94
	5	2.00	20	1	0.75	0.68	-9%	0.84	0.65	1.12	0.96
	6	-	10	0	0.31	0.31	0%	0.26	0.26	0.84	0.84
	7	-	2	0	1.46	1.46	0%	1.46	1.46	1.00	1.00
	8	-	2	0	0.36	0.36	0%	0.40	0.40	1.10	1.10
	9	3.00	55	3	1.03	0.93	-9%	1.06	0.75	1.04	0.80
	10	-	17	0	0.84	0.84	0%	0.46	0.46	0.54	0.54
	11	-	27	0	1.03	1.03	0%	0.86	0.86	0.83	0.83
	12	-	2	0	0.76	0.76	0%	0.23	0.23	0.31	0.31
	13	-	74	0	0.84	0.84	0%	0.74	0.74	0.88	0.88
	14	2.00	15	1	0.94	0.67	-28%	1.44	0.51	1.54	0.76
	15	-	18	0	0.54	0.54	0%	0.53	0.53	0.98	0.98
	16	-	3	0	0.43	0.43	0%	0.32	0.32	0.76	0.76
	17	4.00	34	1	0.99	0.93	-6%	1.34	1.15	1.36	1.24
	18	-	4	0	1.06	1.06	0%	0.80	0.80	0.76	0.76
	19	-	7	0	1.06	1.06	0%	1.09	1.09	1.03	1.03
	20	-	3	0	0.84	0.84	0%	0.43	0.43	0.51	0.51
	21	-	14	0	1.57	1.57	0%	1.42	1.42	0.90	0.90
LeDuc	101	-	253	0	0.49	0.49	0%	0.54	0.54	1.09	1.09
	102	-	75	0	0.43	0.43	0%	0.52	0.52	1.22	1.22
	103	-	230	0	0.67	0.67	0%	0.74	0.74	1.11	1.11
	104	-	762	0	0.67	0.67	0%	1.01	1.01	1.50	1.50
	105	2.00	278	1	0.46	0.46	-2%	0.45	0.40	0.97	0.88
	106	-	388	0	0.72	0.72	0%	0.61	0.61	0.85	0.85
	107	3.60	183	2	0.47	0.43	-8%	0.90	0.69	1.92	1.59
	108	-	37	0	0.46	0.46	0%	0.41	0.41	0.89	0.89
	109	-	58	0	1.26	1.26	0%	1.44	1.44	1.14	1.14
	110	-	149	0	0.94	0.94	0%	1.50	1.50	1.59	1.59
	111	-	101	0	1.05	1.05	0%	1.09	1.09	1.04	1.04
Ouaré	101	-	514	0	2.49	2.49	0%	4.72	4.72	1.90	1.90
	102	-	170	0	1.42	1.42	0%	2.05	2.05	1.45	1.45
	103	11.00	334	2	1.20	1.04	-13%	3.17	1.49	2.65	1.43
	104	24.00	49	0	0.71	0.71	0%	0.95	0.95	1.34	1.34
	105	24.00	45	0	0.91	0.91	0%	1.85	1.85	2.04	2.04
	106	24.00	13	0	1.18	1.18	0%	1.26	1.26	1.06	1.06
	107	24.00	65	0	0.59	0.59	0%	0.69	0.69	1.18	1.18
	108	24.00	33	0	1.14	1.14	0%	1.26	1.26	1.10	1.10
	109	24.00	21	1	3.35	2.51	-25%	9.04	5.40	2.70	2.15
	110	24.00	9	0	0.60	0.60	0%	1.11	1.11	1.84	1.84
	111	24.00	14	0	0.49	0.49	0%	0.22	0.22	0.45	0.45
	112	24.00	9	0	0.53	0.53	0%	0.27	0.27	0.51	0.51
	113	24.00	64	0	1.34	1.34	0%	2.28	2.28	1.71	1.71
	114	-	68	0	1.11	1.11	0%	1.95	1.95	1.75	1.75
	115	24.00	17	0	0.66	0.66	0%	0.40	0.40	0.62	0.62
	116	10.00	231	2	1.12	0.92	-17%	3.19	2.49	2.86	2.38
	117	6.00	172	4	1.16	0.86	-26%	3.03	1.18	2.62	1.38
	118	24.00	20	0	0.63	0.63	0%	0.49	0.49	0.77	0.77
	119	24.00	11	0	0.87	0.87	0%	0.54	0.54	0.62	0.62
	120	19.00	686	1	1.23	1.19	-3%	2.26	1.64	1.84	1.38

Deposit	MINZON	Top cut	No. of samples	No. of samples cut	Uncut mean	Cut mean	%Metal cut	Uncut Std. Dev.	Cut Std. Dev.	Uncut CV	Cut CV
	121	10.00	396	1	1.07	1.05	-2%	1.56	1.36	1.46	1.30
	122	-	121	0	1.79	1.79	0%	2.77	2.77	1.55	1.55
	123	9.00	320	3	1.12	1.04	-7%	2.01	1.43	1.80	1.38
	124	-	81	0	1.84	1.84	0%	3.60	3.60	1.96	1.96
	125	7.00	66	2	1.70	1.33	-22%	3.67	1.56	2.16	1.17
	126	-	123	0	0.62	0.62	0%	0.69	0.69	1.11	1.11
	127	-	62	0	1.06	1.06	0%	1.06	1.06	1.00	1.00
	128	24.00	28	0	0.87	0.87	0%	1.22	1.22	1.39	1.39
	129	24.00	51	0	0.76	0.76	0%	0.91	0.91	1.20	1.20
	130	24.00	43	0	0.97	0.97	0%	0.89	0.89	0.92	0.92
	131	2.90	172	3	0.69	0.63	-8%	0.87	0.55	1.27	0.87
	132	24.00	46	0	2.08	2.08	0%	3.78	3.78	1.82	1.82
	133	24.00	50	1	1.51	1.34	-11%	4.54	3.37	3.00	2.51
	134	-	104	0	2.04	2.04	0%	2.67	2.67	1.31	1.31
	135	-	94	0	1.30	1.30	0%	2.31	2.31	1.77	1.77
	136	24.00	13	0	0.52	0.52	0%	0.48	0.48	0.93	0.93
	137	24.00	17	0	0.81	0.81	0%	0.60	0.60	0.75	0.75
	138	24.00	17	0	0.90	0.90	0%	2.01	2.01	2.23	2.23
	139	24.00	21	0	1.02	1.02	0%	2.44	2.44	2.39	2.39
	140	24.00	5	0	0.74	0.74	0%	0.48	0.48	0.65	0.65
	141	24.00	6	0	0.97	0.97	0%	1.57	1.57	1.63	1.63
	142	24.00	24	0	1.36	1.36	0%	1.20	1.20	0.88	0.88
	143	24.00	32	0	1.13	1.13	0%	1.59	1.59	1.40	1.40
	144	24.00	7	0	1.30	1.30	0%	1.31	1.31	1.01	1.01
	145	24.00	7	0	0.49	0.49	0%	0.38	0.38	0.77	0.77
	146	24.00	15	0	2.16	2.16	0%	3.69	3.69	1.71	1.71
	147	24.00	16	0	0.91	0.91	0%	0.76	0.76	0.83	0.83
	148	24.00	15	0	2.11	2.11	0%	5.29	5.29	2.51	2.51
	149	24.00	2	0	0.49	0.49	0%	0.11	0.11	0.22	0.22
	150	24.00	12	0	0.64	0.64	0%	0.34	0.34	0.53	0.53
	151	24.00	9	0	0.68	0.68	0%	0.37	0.37	0.54	0.54
	152	24.00	13	0	0.78	0.78	0%	0.64	0.64	0.83	0.83
	153	24.00	18	0	0.73	0.73	0%	0.95	0.95	1.31	1.31
	154	24.00	12	0	0.66	0.66	0%	0.31	0.31	0.47	0.47
	155	24.00	7	0	0.93	0.93	0%	0.82	0.82	0.88	0.88
	156	24.00	14	0	0.36	0.36	0%	0.13	0.13	0.35	0.35
	157	24.00	10	0	0.78	0.78	0%	1.27	1.27	1.64	1.64
	158	24.00	8	0	0.79	0.79	0%	0.83	0.83	1.05	1.05
	159	24.00	6	0	0.40	0.40	0%	0.11	0.11	0.27	0.27
	160	24.00	6	0	0.57	0.57	0%	0.43	0.43	0.75	0.75
	161	24.00	15	0	0.42	0.42	0%	0.26	0.26	0.60	0.60
	162	24.00	3	0	0.31	0.31	0%	0.03	0.03	0.08	0.08
	163	24.00	2	0	0.27	0.27	0%	0.01	0.01	0.03	0.03

14.5.5 Variography

The variograms were modelled for Au on 1m composites within the Zergoré, NTV, A2NE, East Pit, West Pits 2, 3 and 4 and LeDuc estimation domains. Within Main Pit, West Pit 1 and Ouaré estimation domains the Au variograms were modelled on 2 m composites. Variography was done on the largest estimation domains per deposit. The resultant variograms were assigned to the minor domains based on spatial location and orientation of the minor domains relative to the main domains.

Nuggets were obtained from the downhole variograms, where the lag was set equal to the composite length of 1 m or 2 m. Normal scores transform was used for modelling the variograms.

The semi-variograms were well structured, with moderate to high nuggets and moderate to long ranges. The variograms were back transformed prior to estimation and are presented in Figure 111 to Figure 130. The variogram parameters are detailed in Table 73.

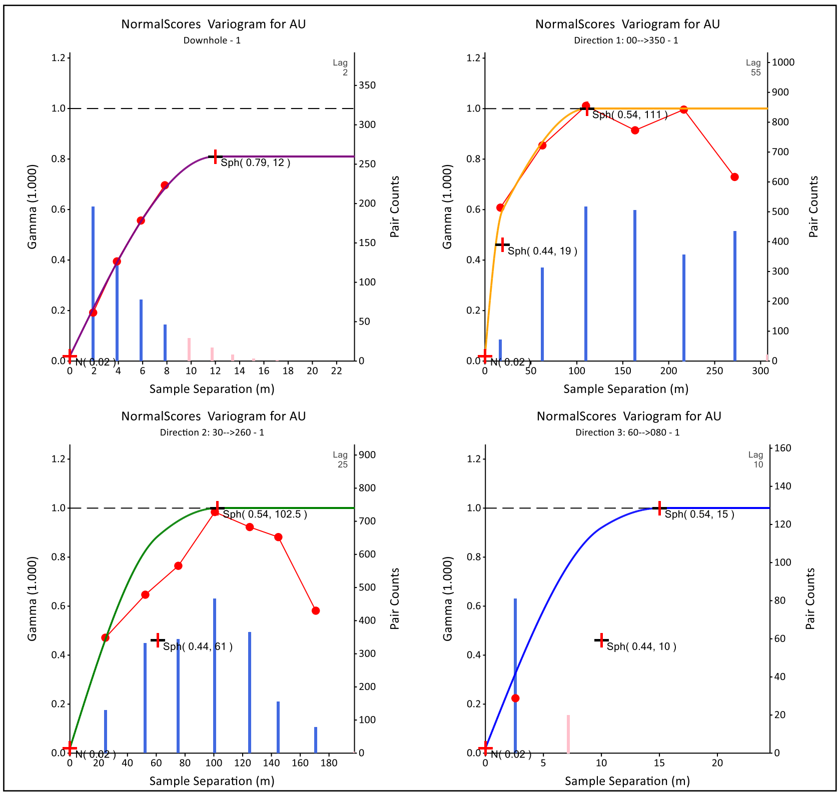


Figure 111: Main Pit – variogram (VREFNUM=1) modelled on MINZON=1

Used for Au g/t estimation within MINZONs 1, 13-15, 17, 20, 30

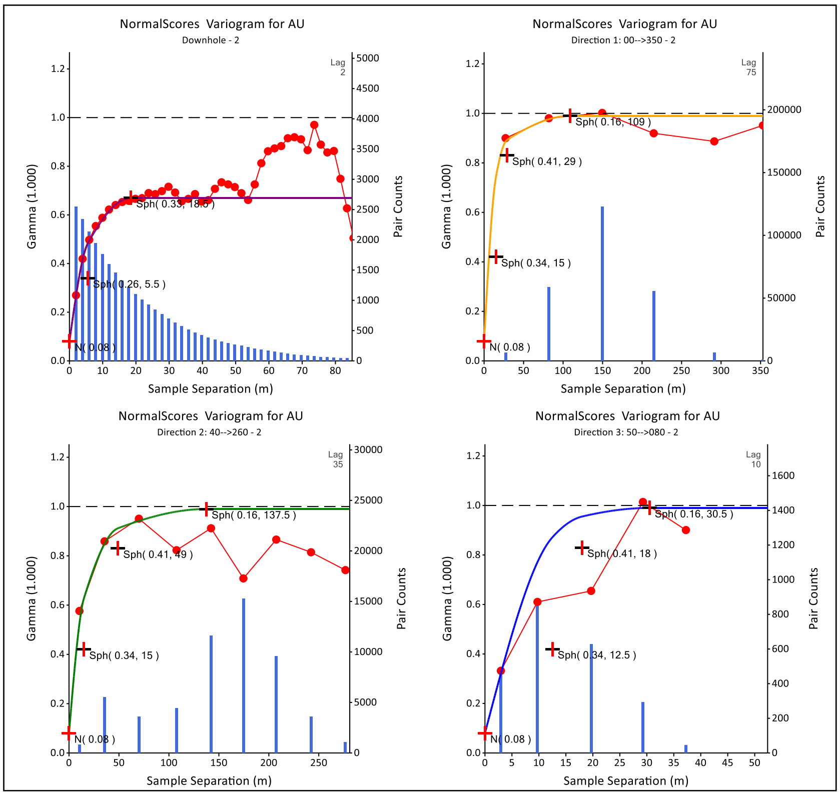


Figure 112: Main Pit – variogram (VREFNUM=2) modelled on MINZON=2

Used for Au g/t estimation within MINZONs 2, 3, 18, 19, 21, 23, 28, 29

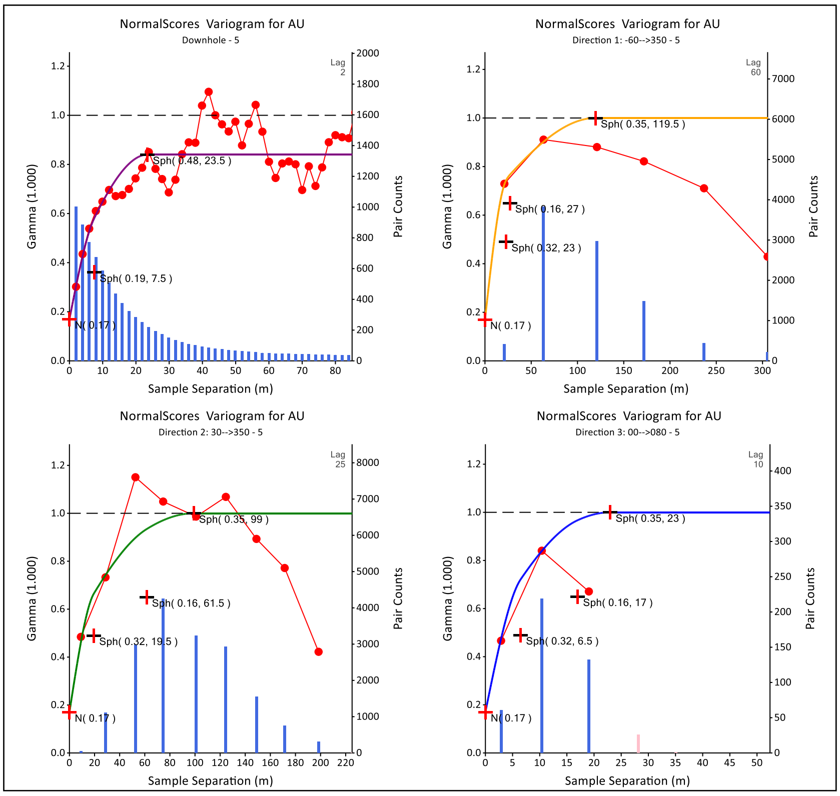


Figure 113: Main Pit – variogram (VREFNUM=5) modelled on MINZON=5

Used for Au g/t estimation within MINZONs 4-7, 16, 24, 27, 31

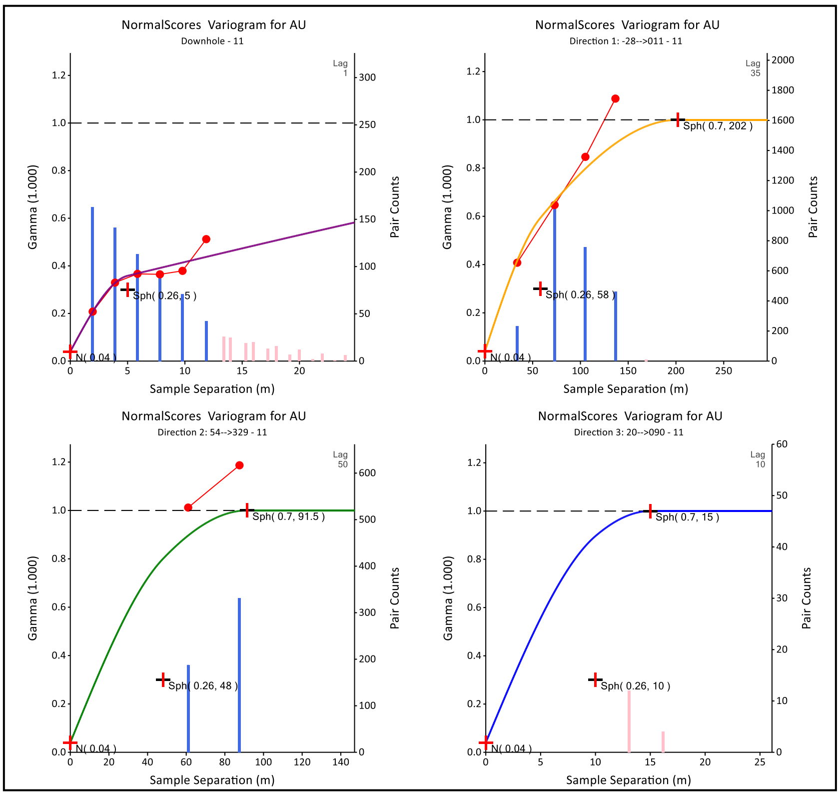


Figure 114: Main Pit – variogram (VREFNUM=11) modelled on MINZON=11

Used for Au g/t estimation within MINZONs 8-12

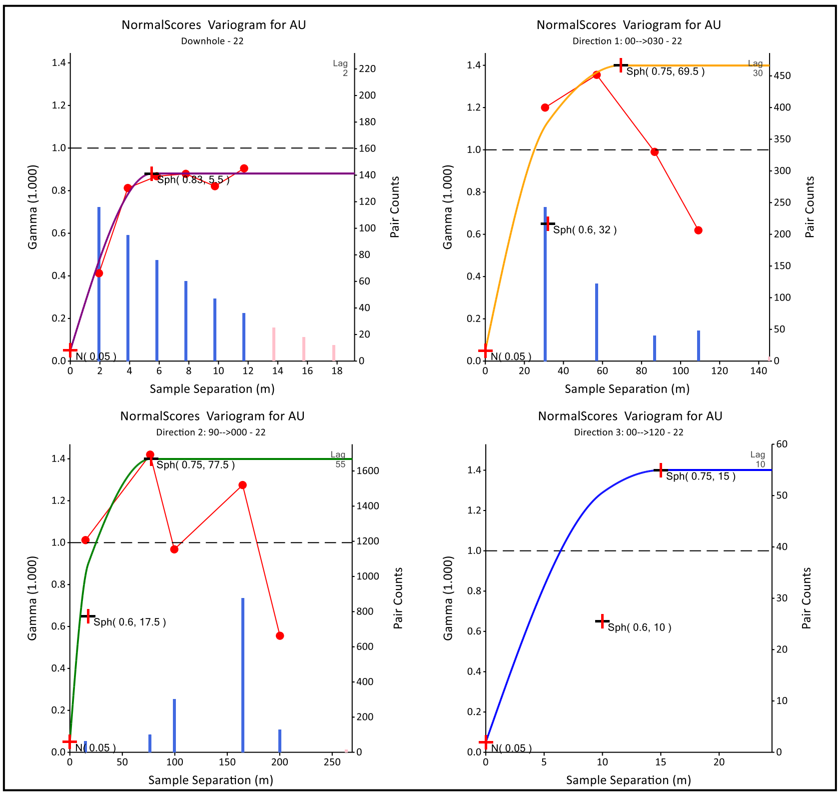


Figure 115: Main Pit – variogram (VREFNUM=22) modelled on MINZON=22

Used for Au g/t estimation within MINZONs 22, 25, 26

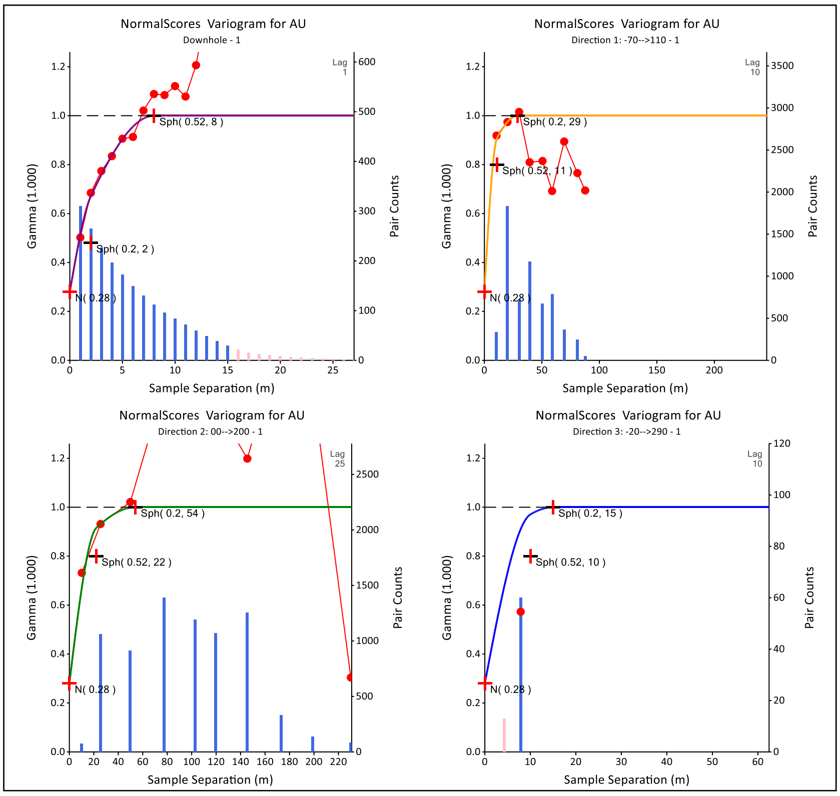


Figure 116: Zergoré – variogram (VREFNUM=1) modelled on MINZON=1

Used for Au g/t estimation within MINZONs 1-44

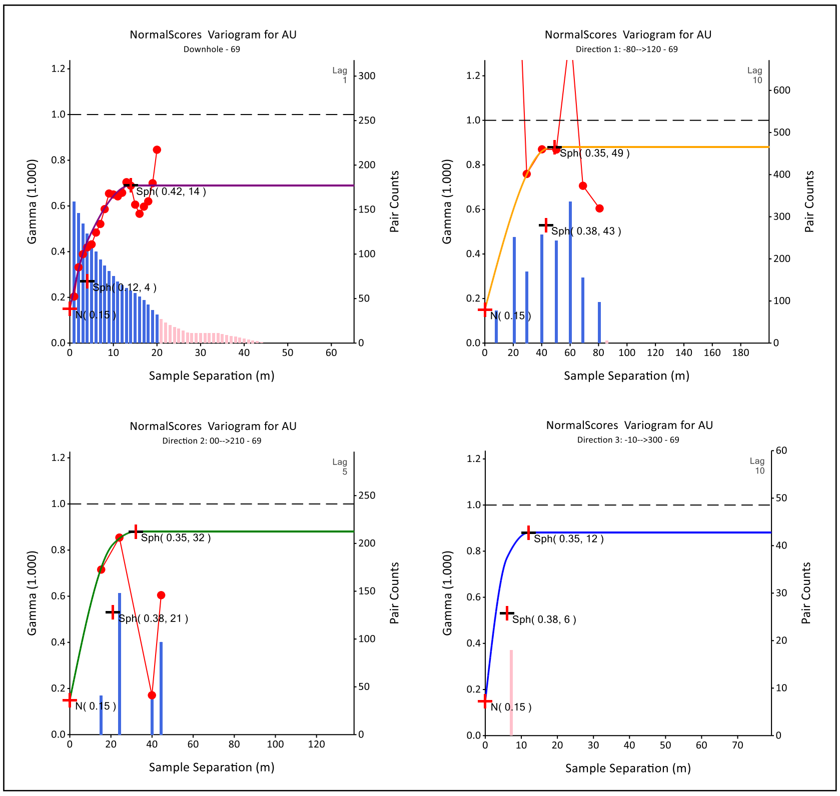


Figure 117: Zergoré – variogram (VREFNUM=2) modelled on MINZON=69

Used for Au g/t estimation within MINZONs 45-69

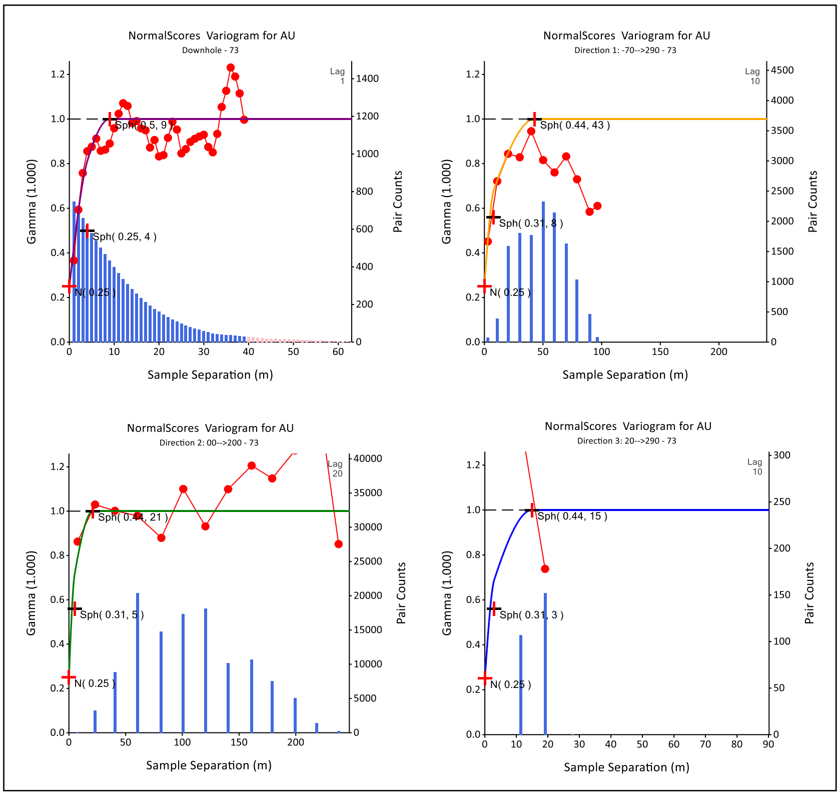


Figure 118: Zergoré – variogram (VREFNUM=3) modelled on MINZON=73

Used for Au g/t estimation within MINZONs 70-78

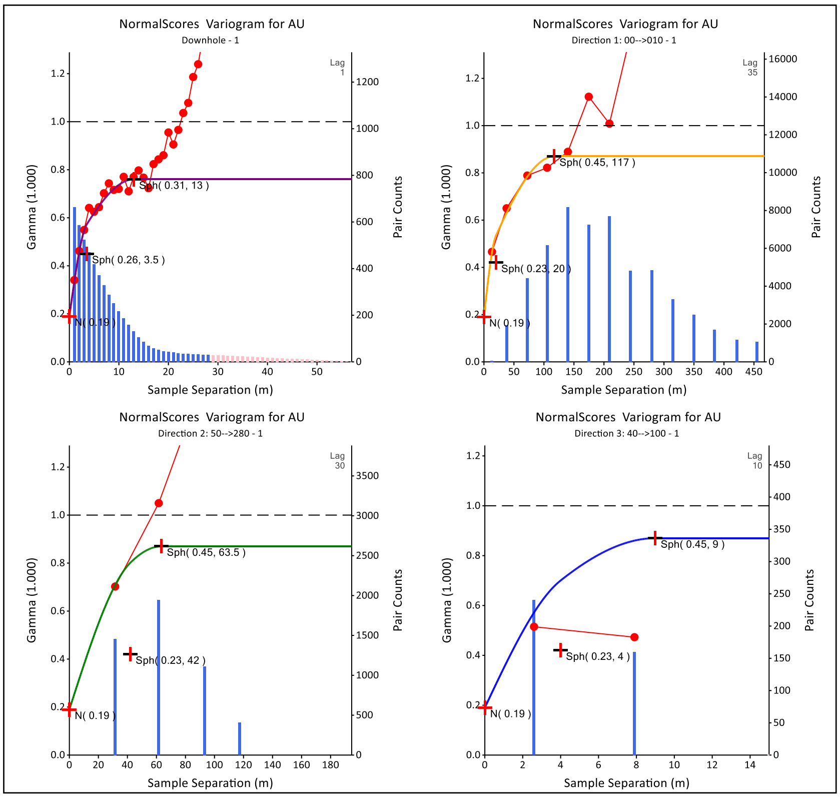


Figure 119: NTV – variogram (VREFNUM=1) modelled on MINZON=1

Used for Au g/t estimation within MINZONs 1, 3, 8

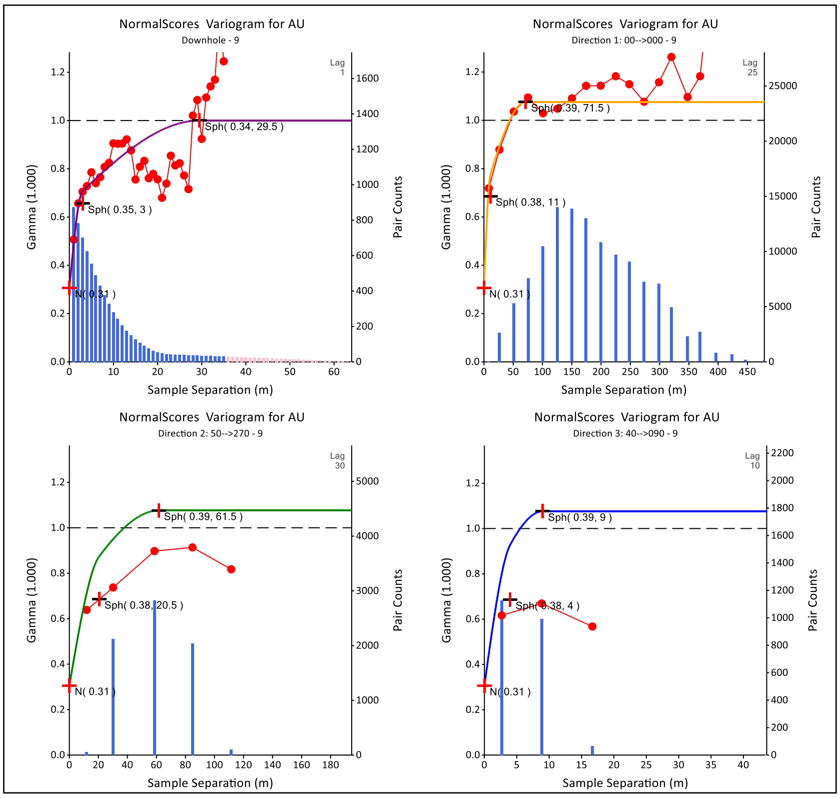


Figure 120: NTV – variogram (VREFNUM=9) modelled on MINZON=9

Used for Au g/t estimation within MINZONs 5-7, 9

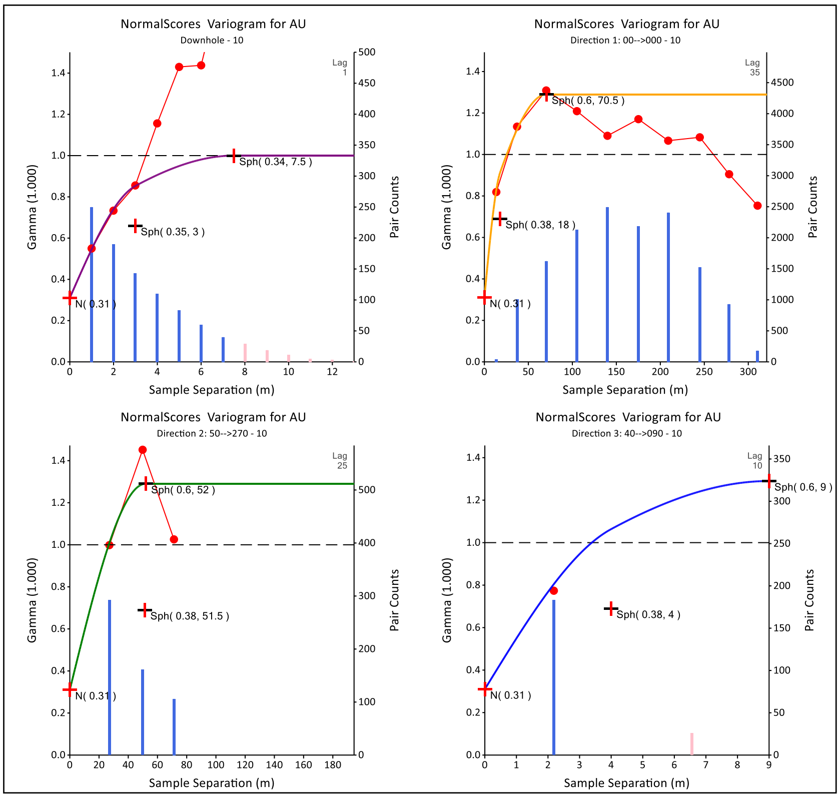


Figure 121: NTV – variogram (VREFNUM=10) modelled on MINZON=10

Used for Au g/t estimation within MINZON 10

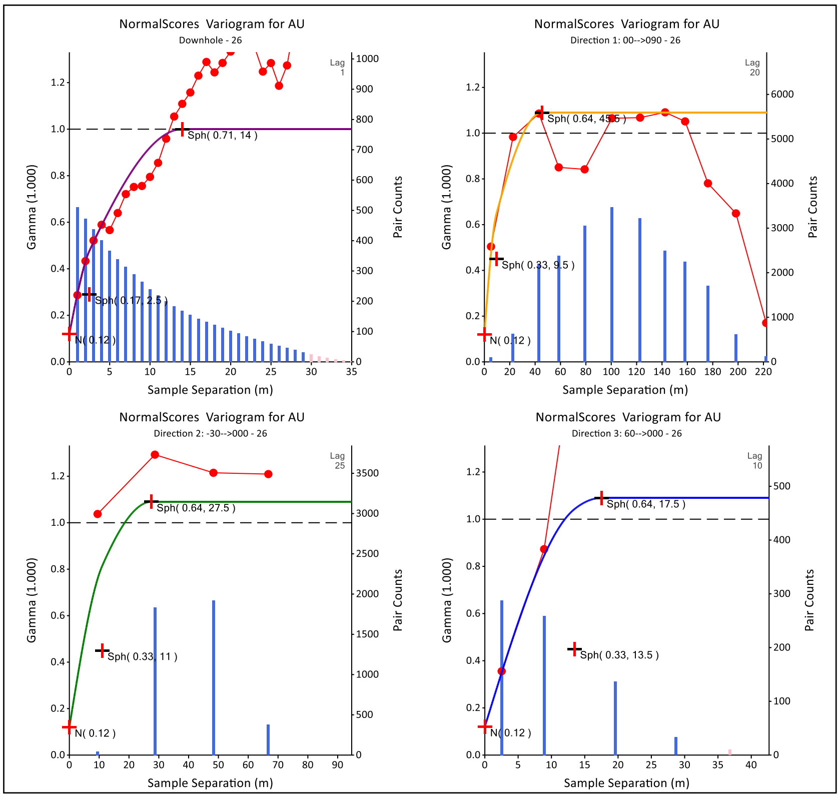


Figure 122: NTV – variogram (VREFNUM=26) modelled on MINZON=26

Used for Au g/t estimation within MINZONs 21-29, 33

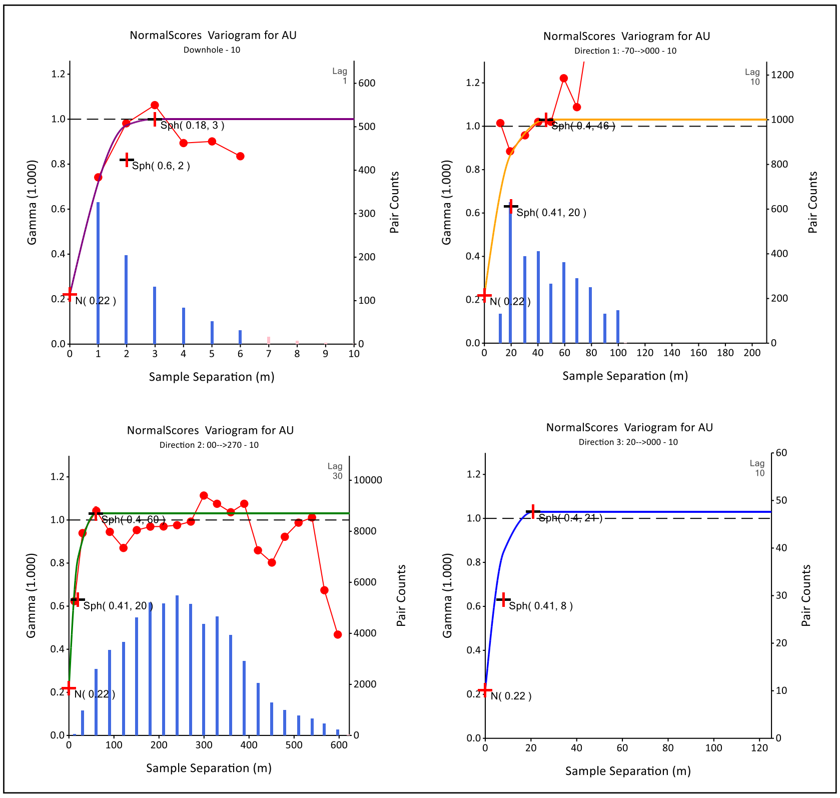


Figure 123: A2NE – variogram (VREFNUM=1) modelled on MINZON=10

Used for Au g/t estimation within all MINZONs (10-44)

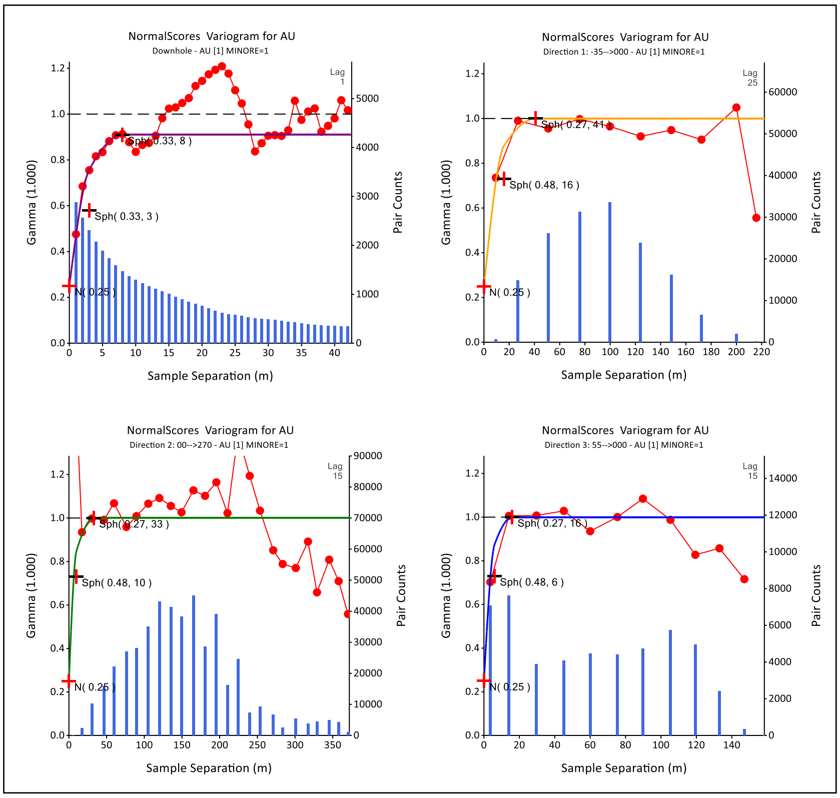


Figure 124: East Pit – variogram (VREFNUM=1) modelled on all MINZONs combined.

Used for Au g/t estimation within all MINZONs (1-25)

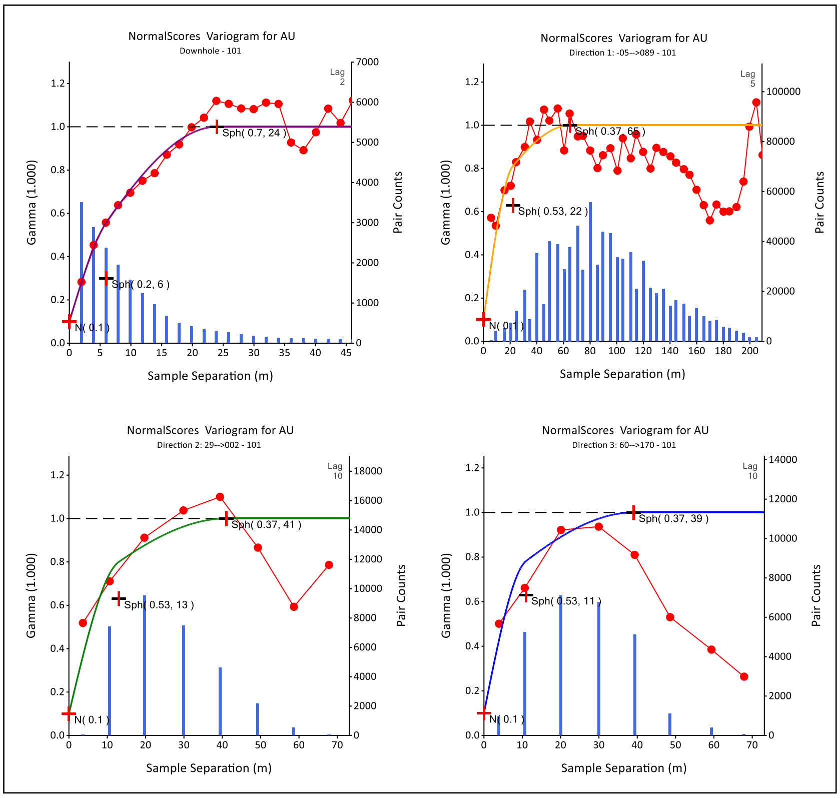


Figure 125: West Pit 1 – variogram (VREFNUM=101) modelled on MINZON=101

Used for Au g/t estimation within all MINZONs (101-103)

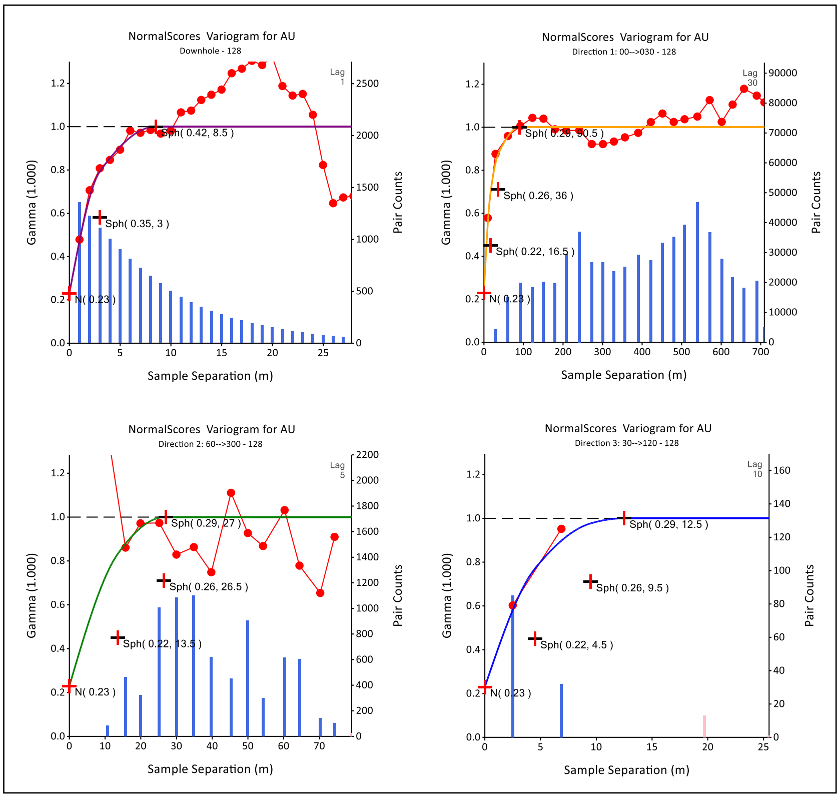


Figure 126: West Pit 2 – variogram (VREFNUM=128) modelled on MINZON=128

Used for Au g/t estimation within all MINZONs (101-129)

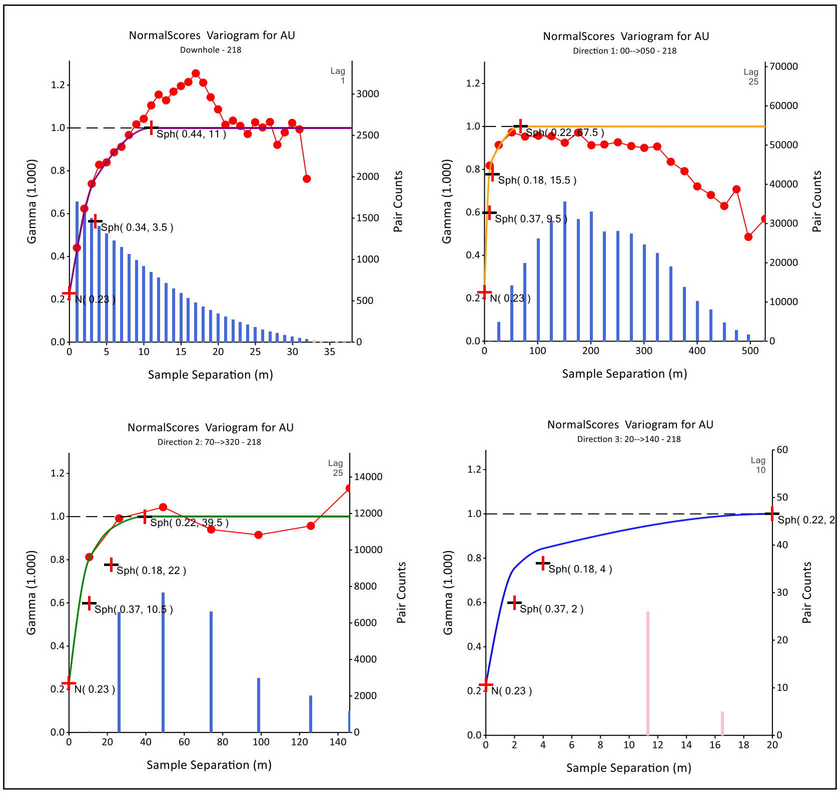


Figure 127: West Pit 3 – variogram (VREFNUM=218) modelled on MINZON=218

Used for Au g/t estimation within all MINZONs (201-218)

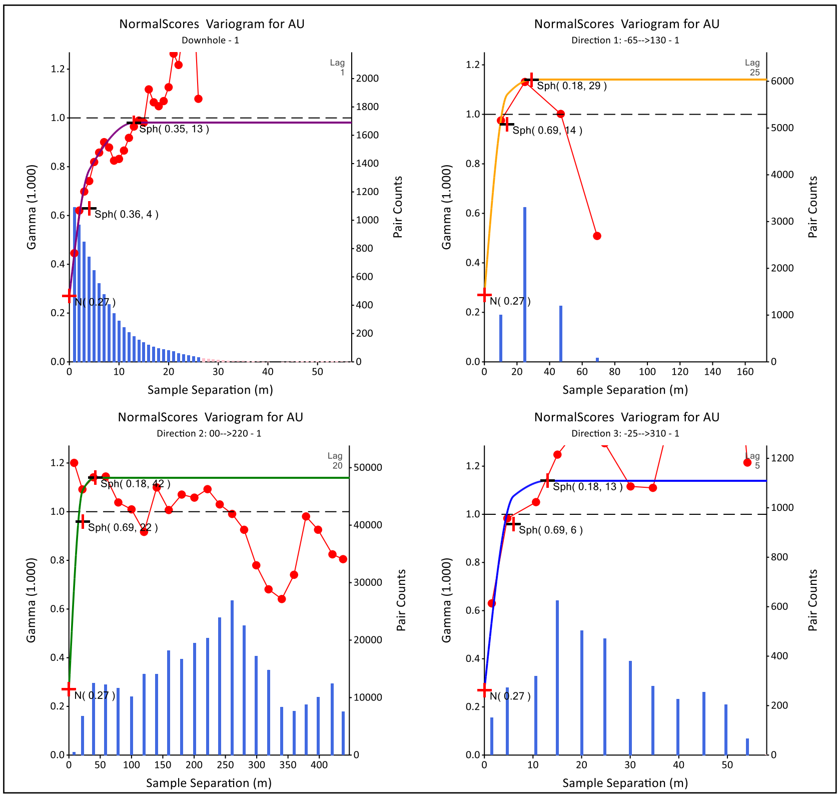


Figure 128: West Pit 4 – variogram (VREFNUM=1) modelled on MINZON=1

Used for Au g/t estimation within all MINZONs (1-21)

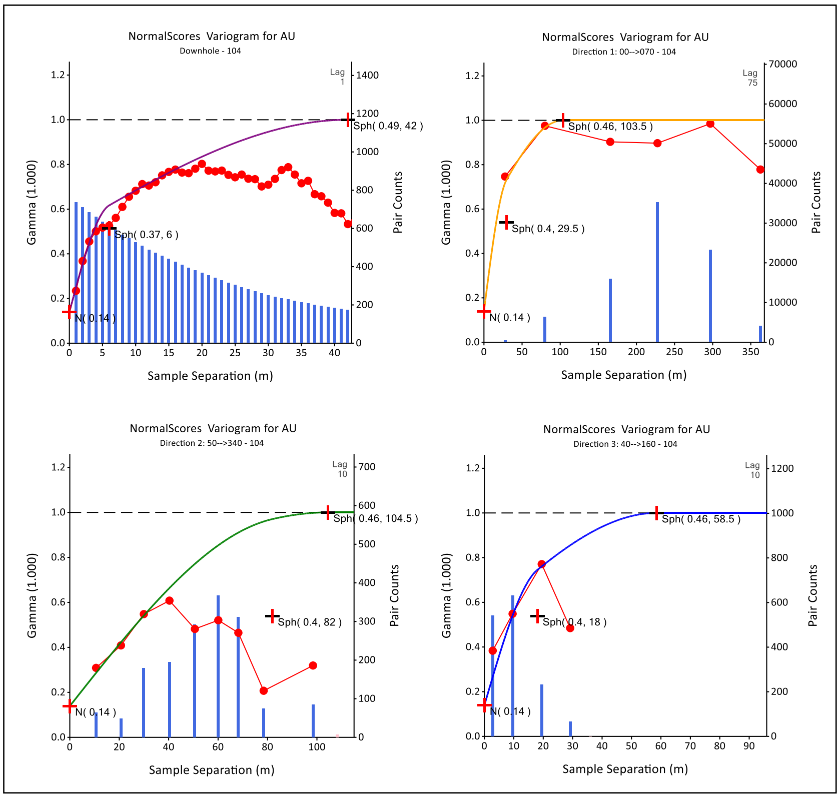


Figure 129: LeDuc – variogram (VREFNUM=104) modelled on MINZON=104

Used for Au g/t estimation within all MINZONs (101-111)

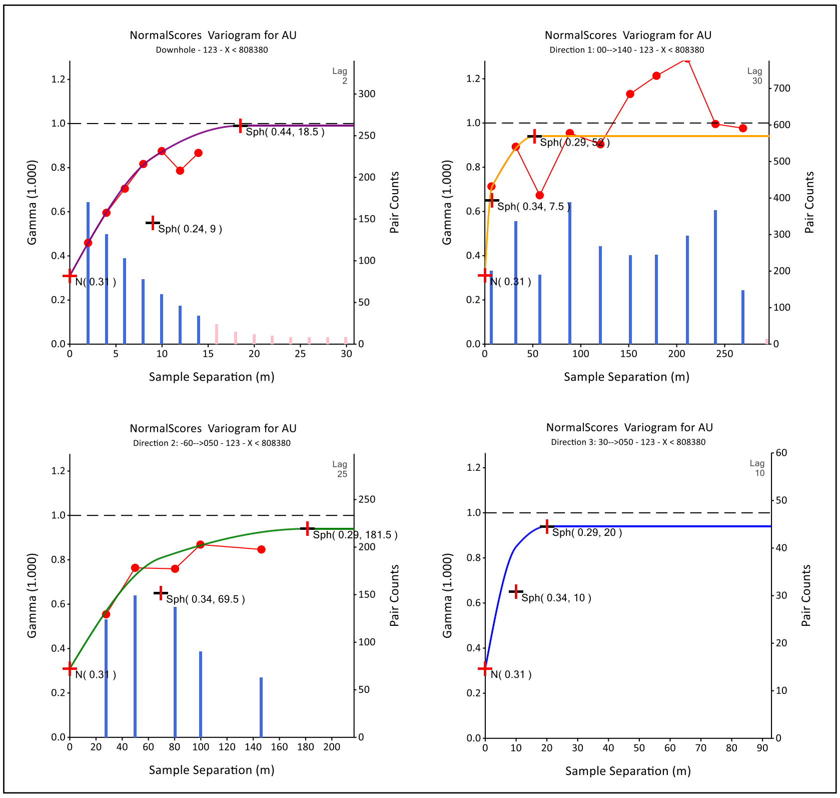


Figure 130: Ouaré – variogram (VREFNUM=123) modelled on MINZON=123

Used for Au g/t estimation within all MINZONs (101-163)

Table 73: Youga and Ouaré deposits – variogram parameters

Deposit	VREFNUM (MINZON)	Datamine rotation	Datamine axis	Nugget	Structure 1		Structure 2		Structure 3	
					Partial sill	Range	Partial sill	Range	Partial sill	Range
Main Pit	1 (1, 13-15, 17, 20, 30)	80	3	0.03	0.58	19	0.39	111	-	-
		30	1			61		102.5		-
		180	3			10		15		-
	2 (2, 3, 18, 19, 21, 23, 28, 29)	80	3	0.13	0.51	15	0.27	29	0.09	109
		40	1			15		49		137.5
		180	3			12.5		18		30.5
	5 (4-7, 16, 24, 27, 31)	80	3	0.30	0.37	23	0.16	27	0.17	119.5
		90	1			19.5		61.5		99
		-120	3			6.5		17		23
	11 (8-12)	90	3	0.05	0.34	58	0.61	202	-	-
		70	1			48		91.5		-
		-150	3			10		15		-
	22 (22, 25, 26)	120	3	0.08	0.44	32	0.48	69.5	-	-
		90	1			17.5		77.5		-
		180	3			10		15		-

Deposit	VREFNUM (MINZON)	Datamine rotation	Datamine axis	Nugget	Structure 1		Structure 2		Structure 3	
					Partial sill	Range	Partial sill	Range	Partial sill	Range
Zergoré	1 (1-44)	-70	3	0.35	0.51	11	0.15	29	-	-
		110	1			22		54		-
		-90	3			10		15		-
	2 (45-69)	-60	3	0.21	0.55	43	0.24	49	-	-
		100	1			21		32		-
		-90	3			6		12		-
	3 (70-78)	-70	3	0.31	0.34	8	0.35	43	-	-
		70	1			5		21		-
		-90	3			3		15		-
NTV	1 (1, 3, 8)	100	3	0.26	0.39	20	0.35	117	-	-
		50	1			42		63.5		-
		180	3			4		9		-
	9 (5-7, 9)	90	3	0.40	0.31	11	0.29	71.5	-	-
		50	1			20.5		61.5		-
		180	3			4		9		-
	10 (10)	90	3	0.40	0.13	18	0.47	70.5	-	-
		50	1			51.5		52		-
		180	3			4		9		-
	26 (21-29, 33)	0	3	0.16	0.31	9.5	0.53	45.5	-	-
		30	1			11		27.5		-
		0	3			13.5		17.5		-
A2NE	1 (10-44)	0	3	0.36	0.44	20	0.21	46	-	-
		70	1			20		60		-
		-90	3			8		21		-
East Pit	1 (1-25)	0	3	0.33	0.48	16	0.18	41	-	-
		35	1			10		33		-
		-90	3			6		16		-
West Pit 1	101 (101-103)	1.508	3	0.10	0.53	22	0.37	65	-	-
		-29.499	1			13		41		-
		-5.725	2			11		39		-
West Pit 2	128 (101-129)	-60	3	0.34	0.28	16.5	0.21	36	0.17	90.5
		-60	1			13.5		30		34
		0	2			4.5		9.5		12.5
West Pit 3	218 (201-218)	-40	3	0.35	0.40	9.5	0.13	15.5	0.12	67.5
		-70	1			10.5		22		39.5
		0	2			2		4		20
West Pit 4	1 (1-21)	-50	3	0.36	0.53	14	0.12	29	-	-
		115	1			22		42		-
		-90	3			6		13		-
LeDuc	104 (101-111)	-20	3	0.139	0.40	29.5	0.461	103.5	-	-
		-50	1			82		104.5		-
		0	2			18		58.5		-
Ouaré	123 (101-163)	50	3	0.31	0.34	7.5	0.29	52	-	-
		60	1			69.5		181.5		-
		0	2			10		20		-

14.6 Block Model and Grade Estimation

14.6.1 Summary

Estimation of Au grade was carried out using ordinary kriging (OK) into parent cell panels. Grade was estimated into all mineralisation blocks, using available data within the mineralisation domain. The MRE was completed by CSA Global using the Datamine StudioRM™ software package.

14.6.2 Block Modelling

The model was cut to below the topographic surface. A model prototype with parent cells and sub-celling was created. The model prototypes parameters, including cell dimensions and model extents, are shown in Table 74.

Panel sizes for grade estimation were based on the following:

1. Results of kriging neighbourhood analysis (KNA).
2. The density of the drilling grids.
3. The geometry of the mineralisation.
4. The mining parameters.

Table 74: Block model dimensions

Deposit	Easting		Northing		RL		Block X (m)	Block Y (m)	Block Z (m)
	Min.	Max.	Min.	Max.	Min.	Max.			
Main Pit	776000	778010	1227000	1228560	-300	275	15	15	5
Zergoré	779000	780200	1226400	1228000	0	250	5	5	5
NTV	778000	779200	1225800	1227500	50	275	10	10	5
A2NE	778300	780800	1228300	1229800	0	250	5	5	5
East Pit	777050	778100	1227000	1227855	-25	225	15	15	5
West Pit 2/3	774300	775600	1226600	1228100	-20	240	5	5	5
West Pit 4	775200	776375	1227570	1228780	0	250	5	5	5
West Pit 1	774500	775000	1226200	1226610	100	300	10	10	5
LeDuc	773300	774300	1225360	1226060	80	260	10	10	5
Ouaré	807200	810160	1247350	1248000	30	280	10	10	5

14.6.3 Kriging Neighbourhood Analysis

KNA on the composites (1 m or 2 m, depending on the deposit) was used to optimise the parent cell sizes and to determine the optimal theoretical estimation and search parameters during kriging.

The following was reviewed for each of the variables per selected domain:

- Slope and kriging efficiency (KE) statistics for a well-informed block for different block sizes.
- On choosing a block size, optimum minimum and maximum samples were chosen. The maximum was set at the lowest number of samples from which consistently good slopes and KE could be derived. The minimum was defined as the lowest minimum from which moderate to good statistics could be derived.
- On choosing the minimum/maximum samples, search ellipse ranges were defined. The quality of the statistics was least sensitive to this parameter. The ranges chosen approximated the ranges of the first structure of the variogram.
- Negative weights were reviewed at each stage to ensure the parameters chosen were not leading to excessive negative weights.

- Discretisation was defined at:
  - 5 x 5 x 1 (X x Y x Z) for West Pits 1 to 4, LeDuc and Ouaré
  - 5 x 5 x 3 (X x Y x Z) for Main Pit, Zergoré, NTV and East Pit
  - 5 x 5 x 5 (X x Y x Z) for A2NE.

The KNA results show that the search parameters and block size selected are suitable for use in the MREs and adequately take drill spacing, geology and practicality into account. The plots with the selected estimation parameters, per deposit, are shown in Figure 131 to Figure 144.

The number of composites used for the Au grade estimations per deposit are presented in Table 75. The modelled variogram parameters together with the selected estimation panel size and number of samples was used to determine the appropriate search ellipse for the primary search pass. These are also presented in Table 75.

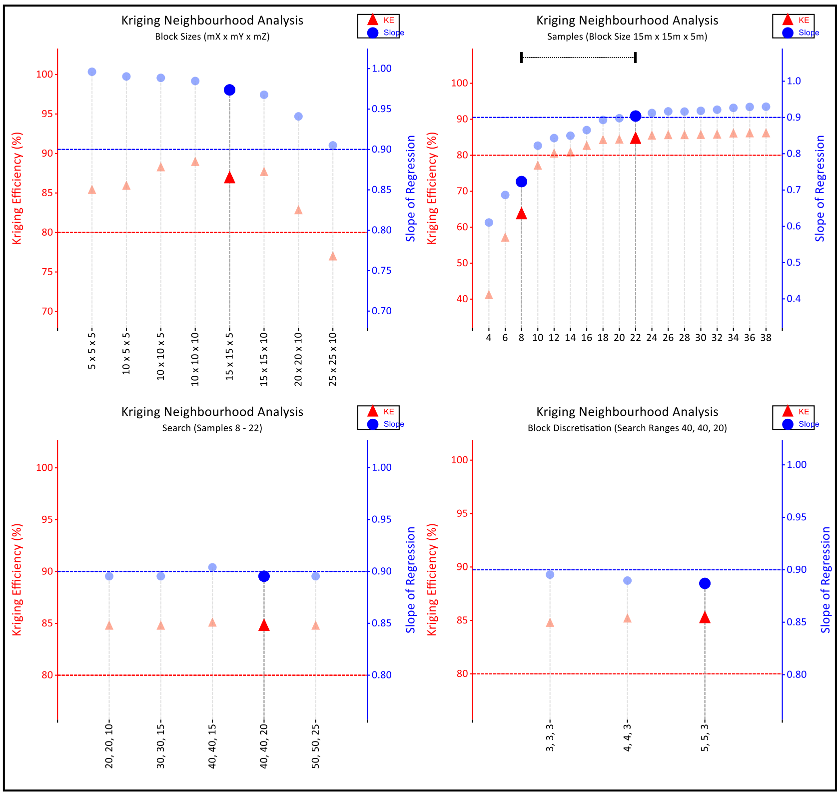


Figure 131: Main Pit – KNA parameters (SREFNUM=1) modelled on MINZON=2

From top left, clockwise: block size, samples, discretisation and search results.
Used for Au g/t estimation within all MINZONs (1-30).

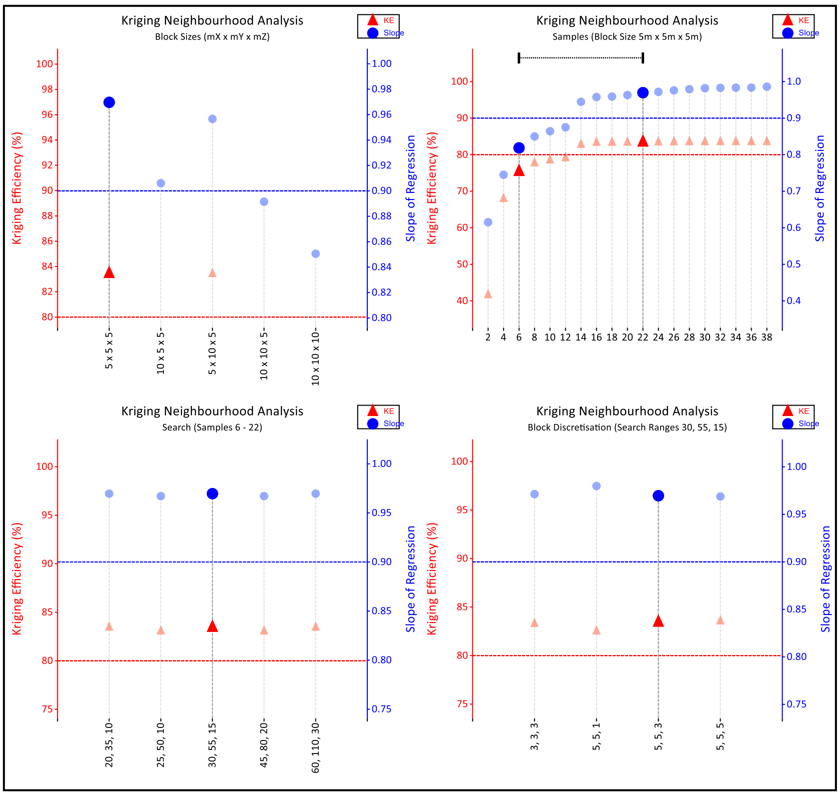


Figure 132: Zergoré – KNA parameters (SREFNUM=101) modelled on MINZON=1

From top left, clockwise: block size, samples, discretisation and search results.
Used for Au g/t estimation within MINZONs 1-44.

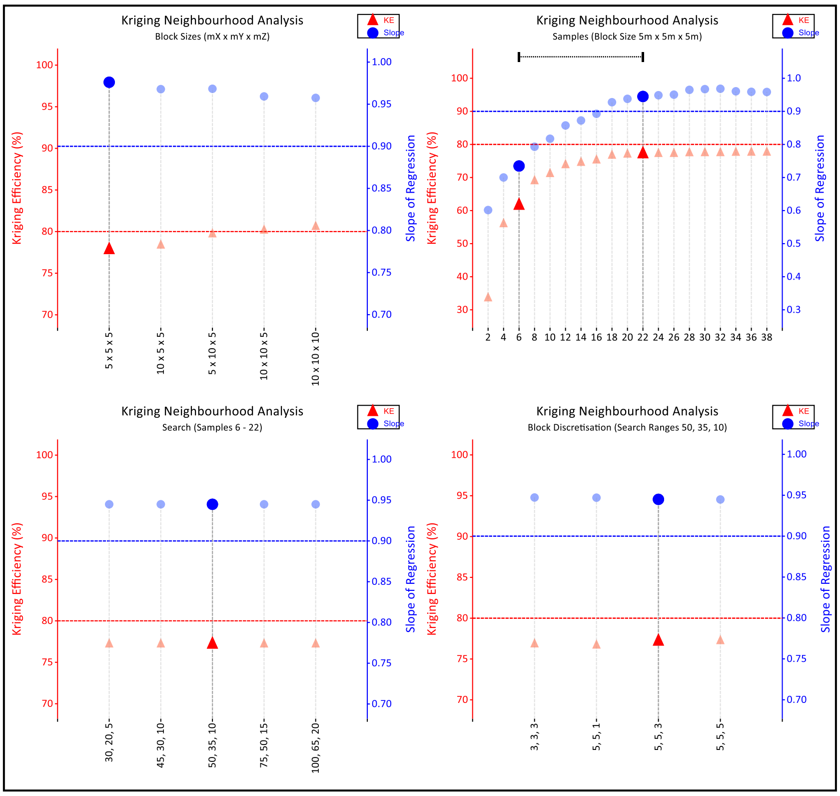


Figure 133: Zergoré – KNA parameters (SREFNUM=102) modelled on MINZON=69

From top left, clockwise: block size, samples, discretisation and search results.
Used for Au g/t estimation within MINZONs 45-69.

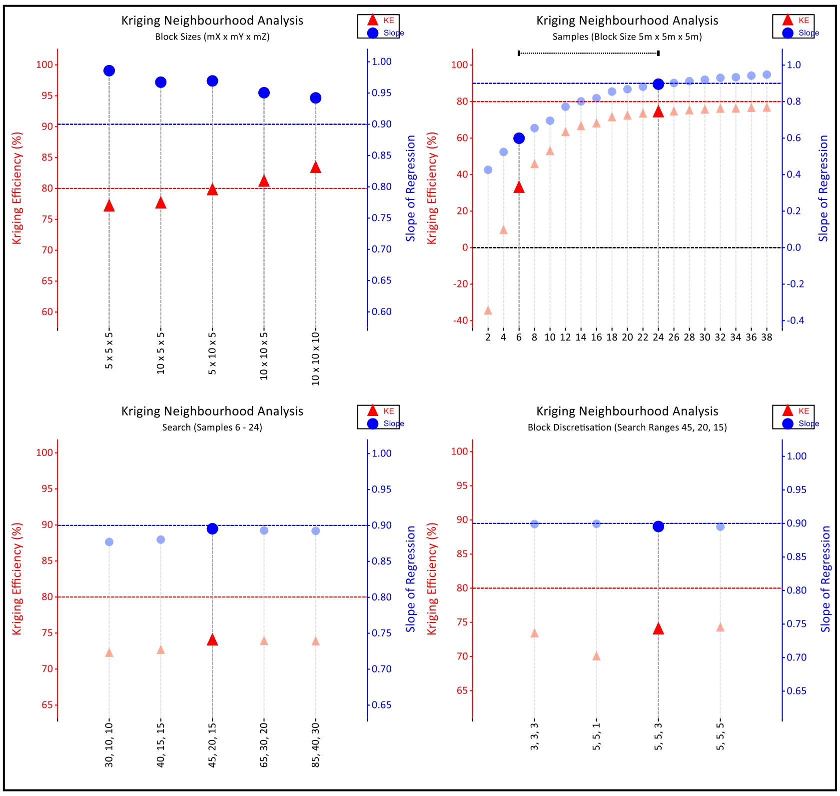


Figure 134: Zergoré – KNA parameters (SREFNUM=103) modelled on MINZON=73

From top left, clockwise: block size, samples, discretisation and search results. Used for Au g/t estimation within MINZONs 70-78.

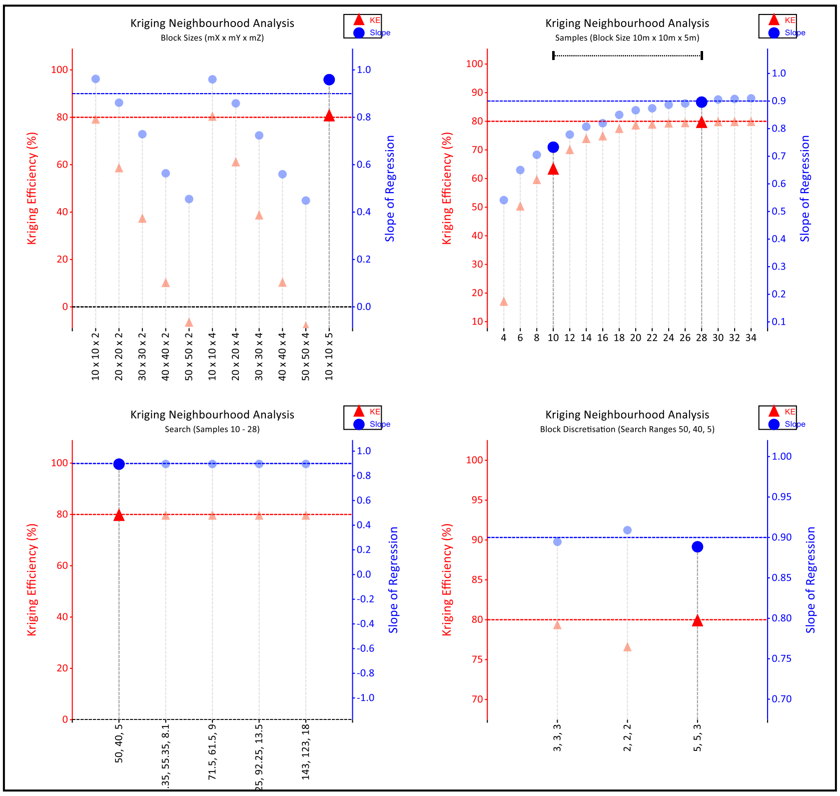


Figure 135: NTV – KNA parameters (SREFNUM=1) modelled on MINZON=9

From top left, clockwise: block size, samples, discretisation and search results. Used for Au g/t estimation within MINZONs 1, 3, 5-10.

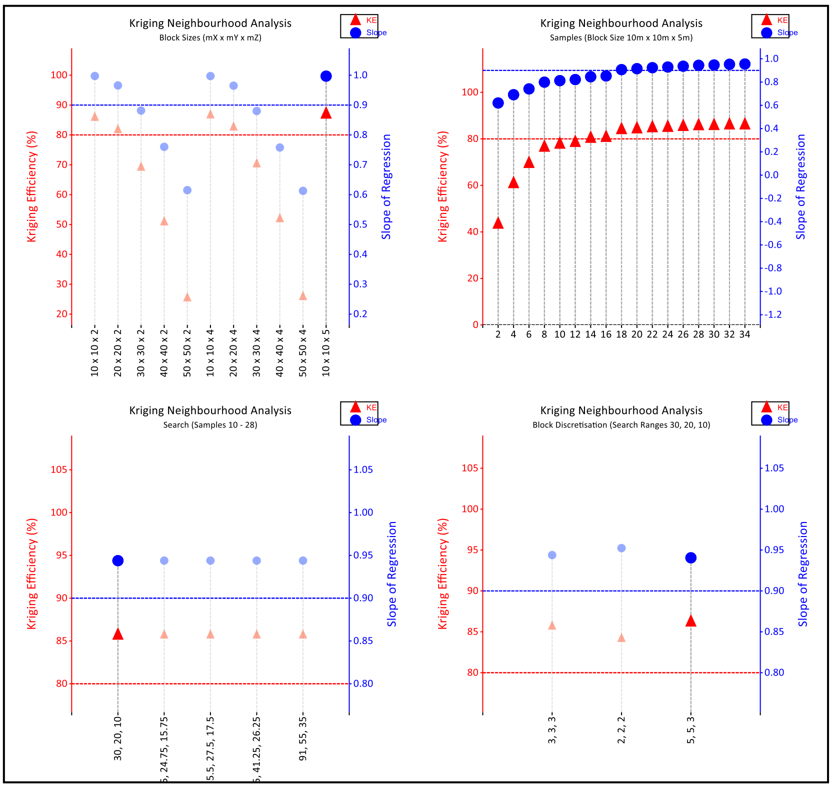


Figure 136: NTV – KNA parameters (SREFNUM=2) modelled on MINZON=26

From top left, clockwise: block size, samples, discretisation and search results. Used for Au g/t estimation within MINZONs 21-29, 33.

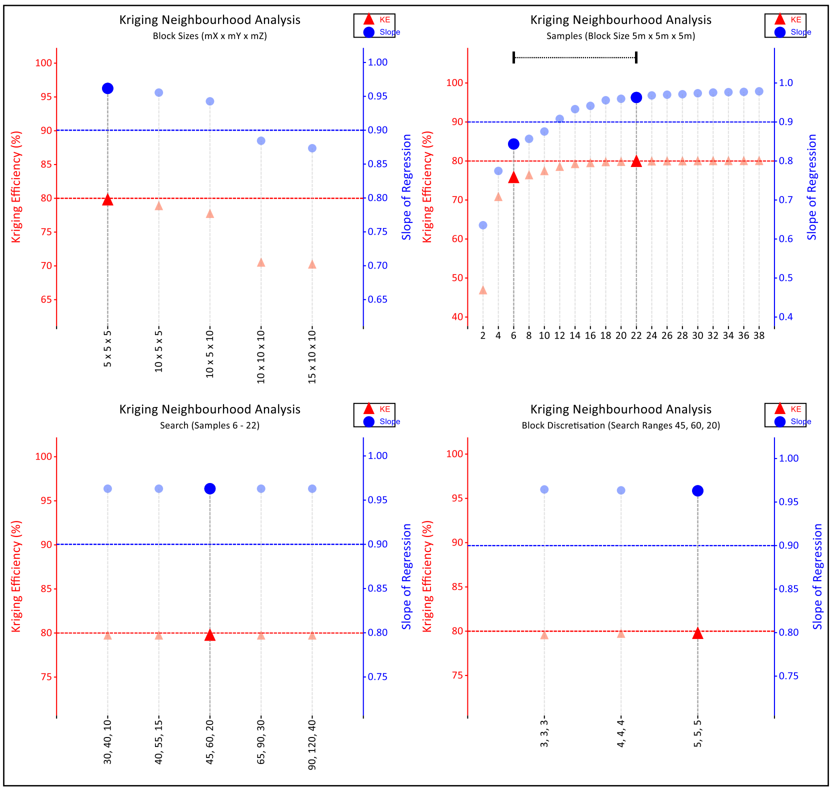


Figure 137: A2NE – KNA parameters (SREFNUM=1) modelled on MINZON=10

From top left, clockwise: block size, samples, discretisation and search results. Used for Au g/t estimation within all MINZONs (1-44).

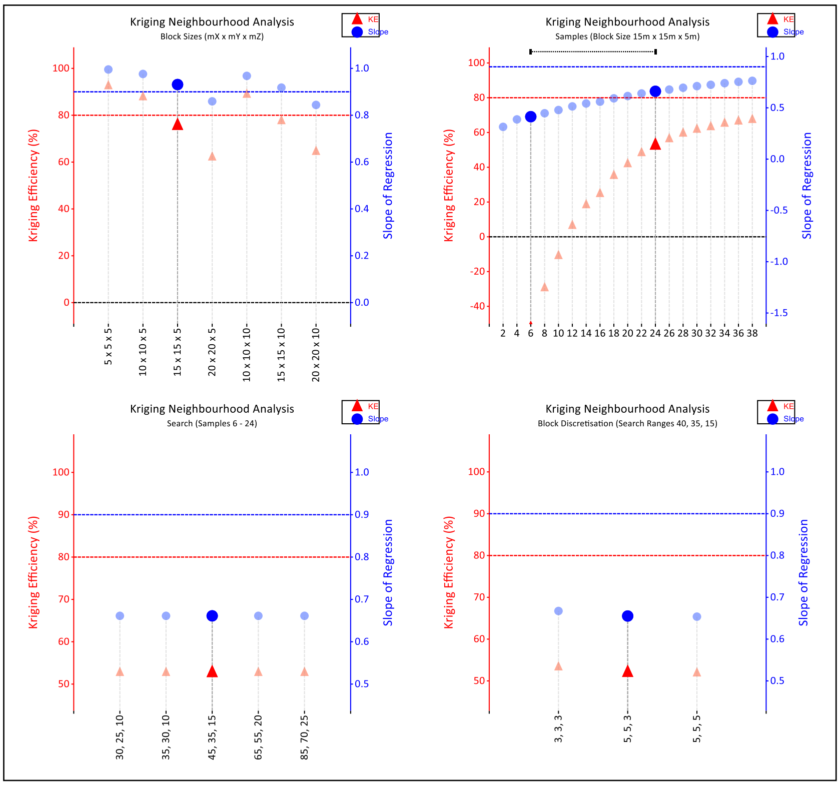


Figure 138: East Pit – KNA parameters (SREFNUM=1) modelled on all MINZONs combined

From top left, clockwise: block size, samples, discretisation and search results.
Used for Au g/t estimation within all MINZONs (1-25).

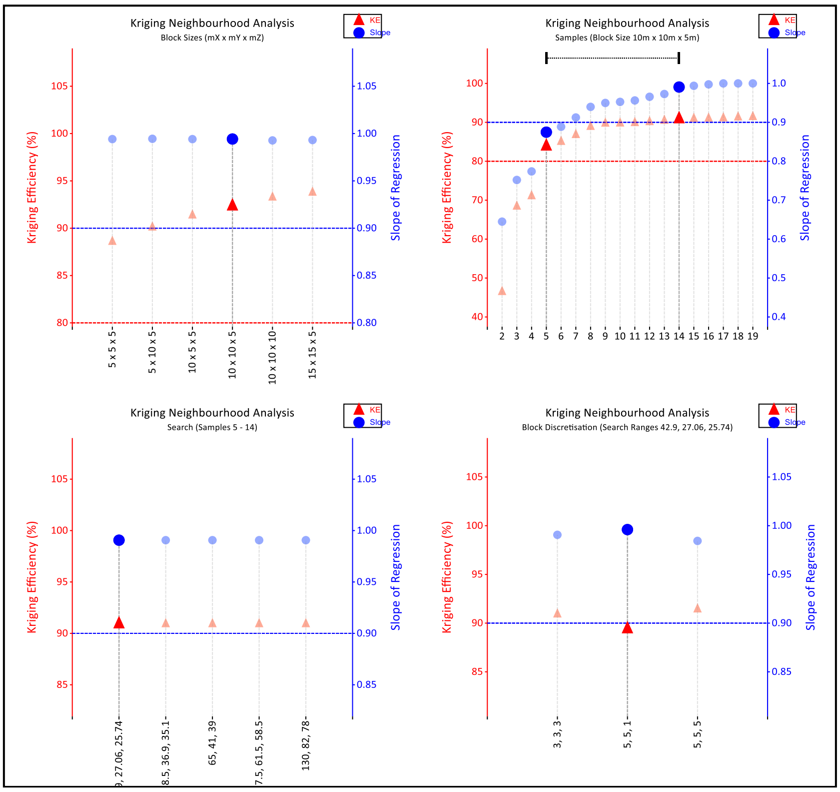


Figure 139: West Pit 1 – KNA parameters (SREFNUM=101) modelled on MINZON=101

From top left, clockwise: block size, samples, discretisation and search results.
Used for Au g/t estimation within all MINZONs (101-103).

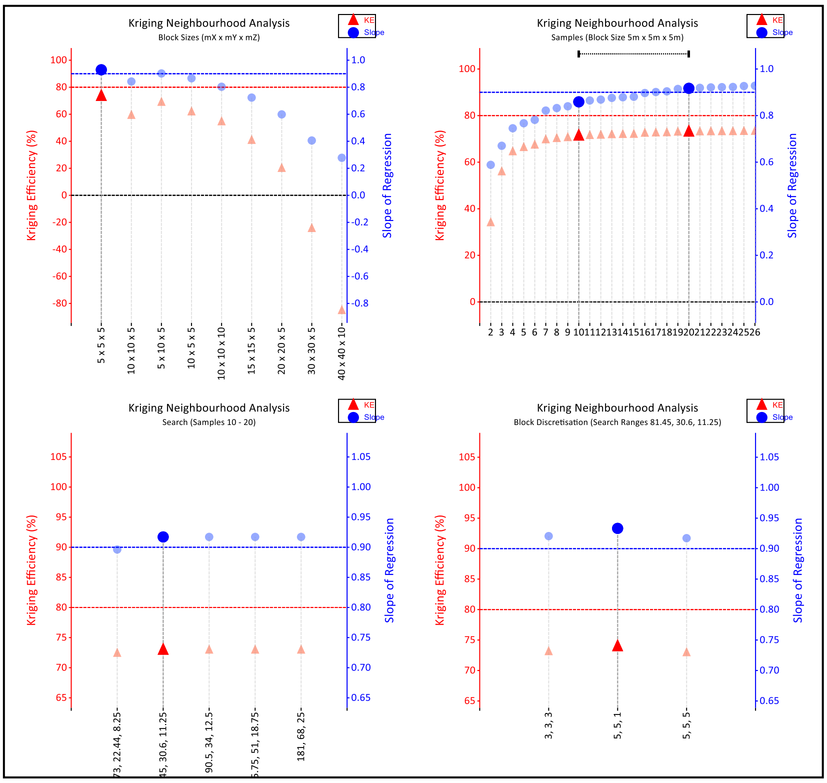


Figure 140: West Pit 2 – KNA parameters (SREFNUM=128) modelled on MINZON=128

From top left, clockwise: block size, samples, discretisation and search results. Used for Au g/t estimation within MINZONs 101-129.

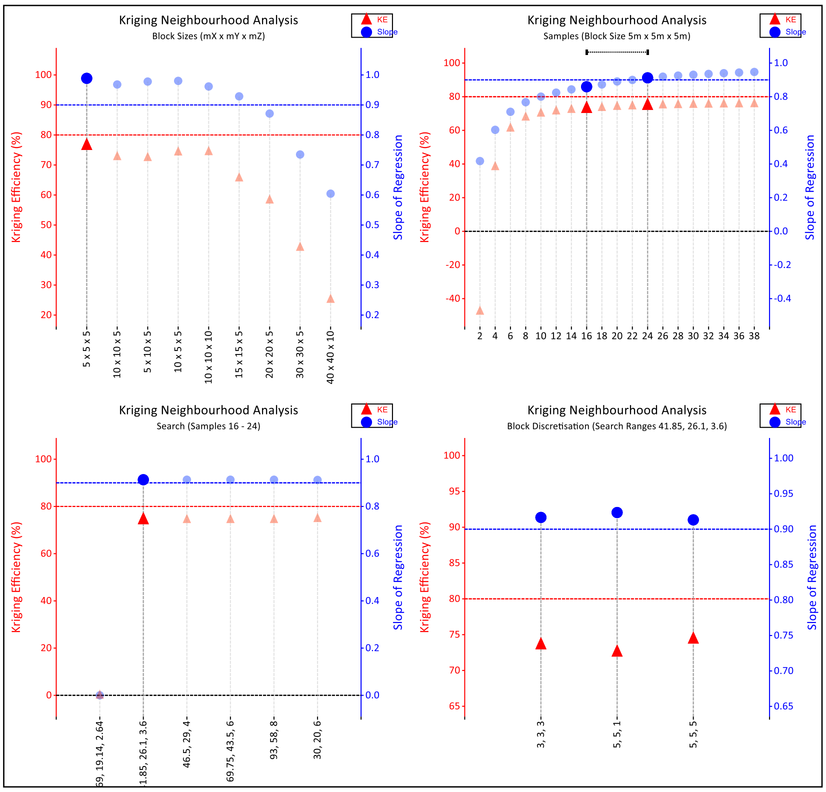


Figure 141: West Pit 3 – KNA parameters (SREFNUM=218) modelled on MINZON=218

From top left, clockwise: block size, samples, discretisation and search results. Used for Au g/t estimation within MINZONs 201-218.

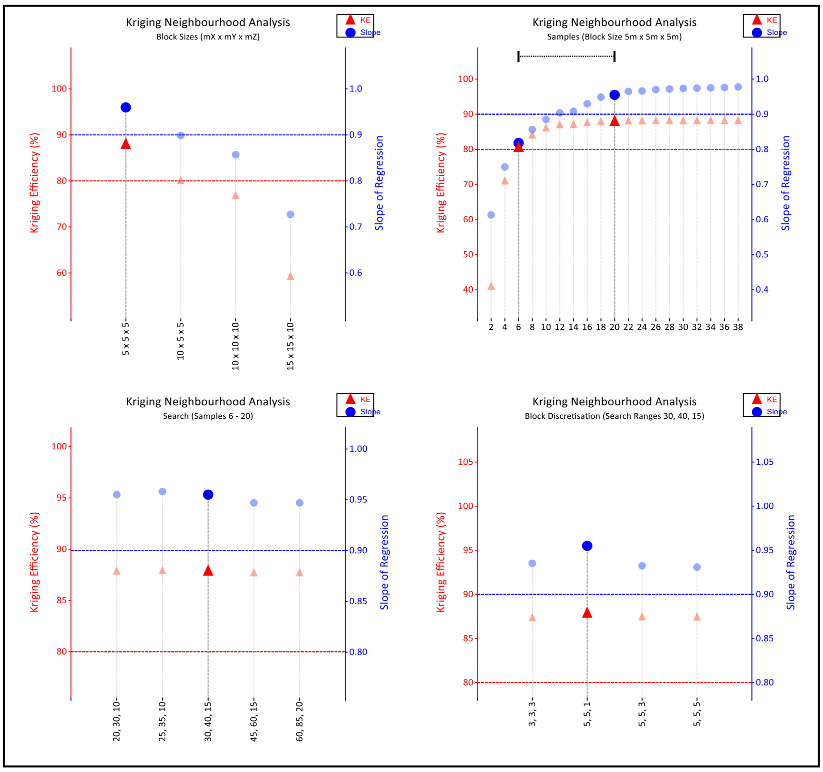


Figure 142: West Pit 4 – KNA parameters (SREFNUM=1) modelled on MINZON=1

From top left, clockwise: block size, samples, discretisation and search results. Used for Au g/t estimation within all MINZONs (1-21).

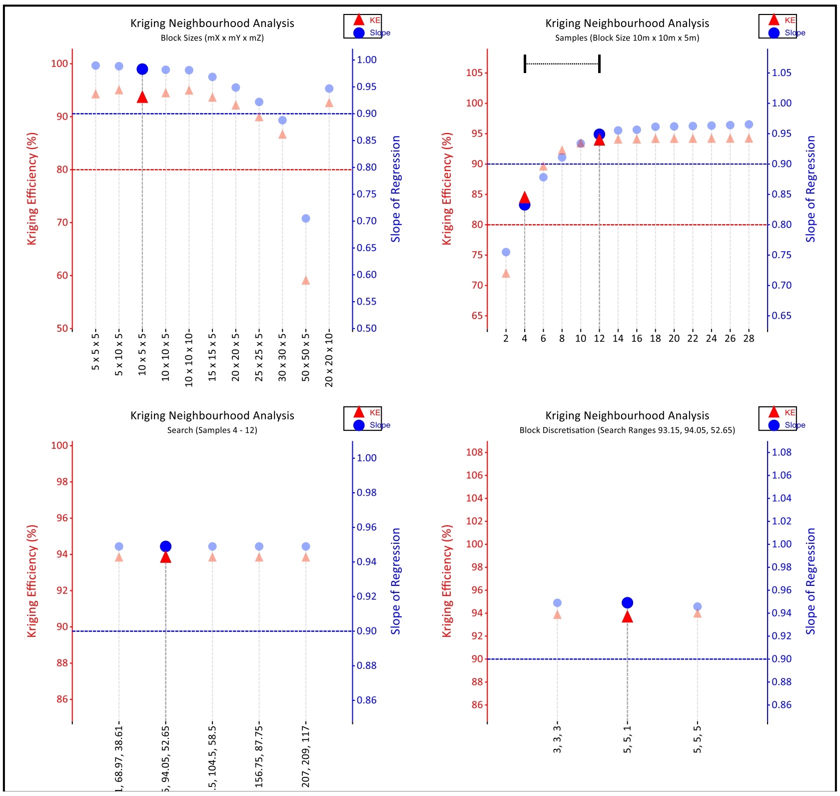


Figure 143: LeDuc – KNA parameters (SREFNUM=104) modelled on MINZON=104

From top left, clockwise: block size, samples, discretisation and search results. Used for Au g/t estimation within all MINZONs (101-111).

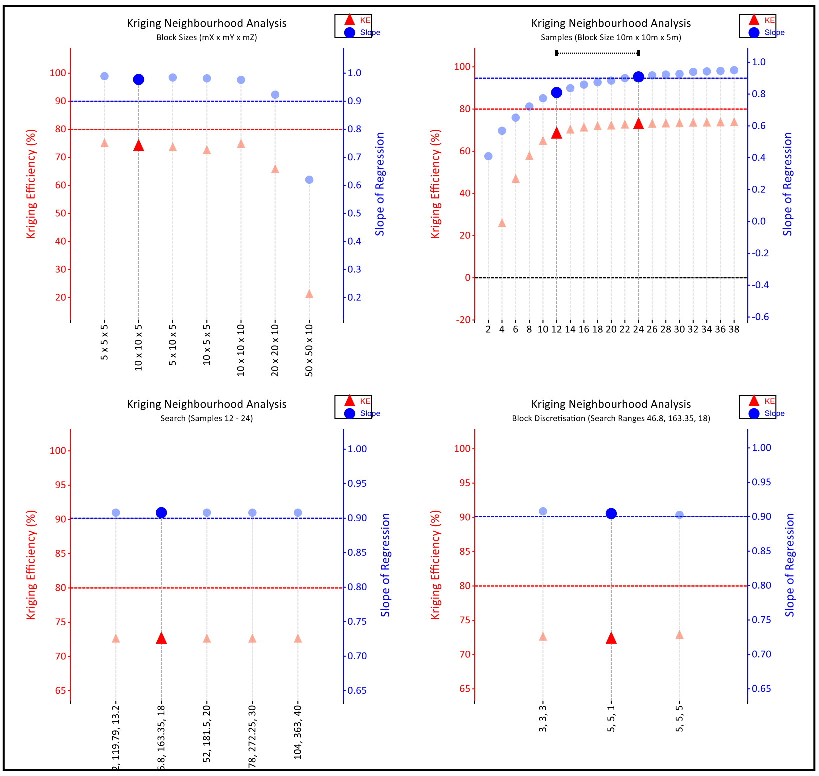


Figure 144: Ouaré – KNA parameters (SREFNUM=123) modelled on MINZON=123

From top left, clockwise: block size, samples, discretisation and search results.
Used for Au g/t estimation within MINZONs 101-163.

Table 75: Youga and Ouaré deposits – search neighbourhood parameters for Au

Deposit	SREFNUM (MINZON)	Search volume 1			Search volume 2			Search volume 3			MAXKEY
		Ranges	Composites		Range	Composites		Range	Composites		
			Min.	Max.		Min.	Max.		Min.	Max.	
Main Pit	1 (1-30)	40	8	22	80	8	22	160	2	6	3
		40			80			160			
		20			40			80			
Zergoré	101 (1, 8, 10, 12, 13, 15, 17, 18, 20, 23-26, 28, 35, 37-39, 41, 42)	30	8	22	60	8	22	90	2	12	4
		55			110			165			
		15			30			45			
	102 (46, 50-52, 54-56, 58, 65, 69)	50	8	22	100	8	22	150	2	12	4
		35			70			105			
		10			20			30			
	103 (71, 73, 75, 77)	45	8	24	90	8	24	135	2	12	4
		20			40			60			
		15			30			45			
	111 (5, 6, 9, 14, 19, 22, 27, 31, 34, 36, 40, 44)	30	8	22	60	6	22	90	2	12	3
		55			110			165			
		15			30			45			
	112 (47-49, 53, 57, 59, 60, 63, 64, 66, 67)	50	6	22	100	6	22	150	2	12	3
		35			70			105			
		10			20			30			
	113 (74, 78)	45	6	24	90	6	24	135	2	12	3
		20			40			60			
		15			30			45			
	121 (4, 7, 16, 43)	30	8	22	60	8	22	90	2	12	2
		55			110			165			

Deposit	SREFNUM (MINZON)	Search volume 1			Search volume 2			Search volume 3			MAXKEY
		Ranges	Composites		Range	Composites		Range	Composites		
			Min.	Max.		Min.	Max.		Min.	Max.	
		15			30			45			
	122 (62, 68)	50	8	22	100	8	22	150	2	12	2
		35			70			105			
		10			20			30			
	131 (11, 21, 29, 30, 32, 33)	30	6	22	60	6	22	90	2	12	7
		55			110			165			
		15			30			45			
	132 (45, 61)	50	6	22	100	6	22	150	2	12	7
		35			70			105			
		10			20			30			
	133 (70, 76)	45	6	24	90	6	24	135	2	12	7
		20			40			60			
		15			30			45			
	2 (2)	30	6	22	60	6	22	90	2	12	2
		55			110			165			
		15			30			45			
	3 (3)	30	10	22	60	10	22	90	2	12	5
		55			110			165			
		15			30			45			
	72 (72)	45	6	30	90	6	30	135	2	12	2
		20			40			60			
		15			30			45			
NTV	1 (1, 3, 5-10)	50	10	25	100	10	28	200	4	12	2
		40			80			160			
		5			10			20			
	2 (21-29, 33)	30	10	28	60	10	28	120	4	12	2
		20			40			80			
		10			20			40			
A2NE	1 (10-20, 22-44)	45	6	21	90	6	21	135	3	12	3
		60			120			180			
		10			20			30			
	21 (21)	45	10	20	90	10	20	135	5	10	5
		60			120			180			
		10			20			30			
East Pit	1 (1-25)	45	6	24	90	6	24	135	2	12	2
		35			70			105			
		15			30			45			
West Pit 1	101 (101-103)	43	5	14	64.5	5	14	86	3	8	2
		27			40.5			54			
		26			39			52			
West Pit 2	128 (101-129)	60	10	20	90	10	20	180	3	20	3
		20			30			60			
		10			15			30			
West Pit 3	218 (201-218)	45	16	24	67.5	16	24	135	3	20	3
		25			37.5			75			
		10			15			30			
West Pit 4	1 (1-21)	30	6	21	60	4	21	90	2	15	4
		40			80			120			
		15			30			45			
LeDuc	104 (101-111)	70	4	12	105	4	12	280	2	8	2
		70			105			280			
		40			60			160			
Ouaré	123 (101-163)	35	12	24	52.5	12	24	140	3	9	3
		60			90			240			
		13			19.5			52			

14.6.4 Grade Estimation

Estimation of Au grade was carried out using OK into parent cell panels. Zonal control with a hard boundary between mineralisation domains was used during the grade estimation. MINZON was used as the estimation domain for each deposit.

A three-phased search pass was applied and the orientation of the search ellipsoid was aligned to the modelled variography. This process involves the estimation being performed three times, where two expansion factors are used. During each individual estimation run this factor increases the size of the search ellipse used to select samples. This method ensures that blocks which are not estimated and populated with a grade value in the first run, are populated during one of the subsequent runs.

The mineralised areas were estimated using dynamic anisotropy. This process allows the rotation angles for the search ellipsoid to be defined individually for each cell in the models, so that the search ellipsoid is aligned with the axes of mineralisation. This therefore requires the rotation angles to be estimated into the model cells, which in turn requires a set of angles as the input data file for interpolation. The dip and dip direction of the major axis of anisotropy were defined by digitising strings in section perpendicular to the strike of the mineralisation for A2NE, West Pit 4, Zergoré and East Pit, while DTM surfaces were created honouring the dip and dip direction of the various units for the remaining deposits. These strings/triangle files were converted to points that contained the true dip and dip direction of the mineralisation and stratigraphy (fields SANGLE1_F and SANGLE2_F in the search parameter files).

The rotations of the modelled variograms aligned with the dominant orientation of the mineralisation for each deposit. Therefore, the variogram also used dynamic anisotropy.

Discretisation was used and is summarised in Table 76.

Table 76: Discretisation cell sizes

Deposit	X	Y	Z
Main Pit	5	5	3
Zergoré	5	5	3
NTV	5	5	3
A2NE	5	5	5
East Pit	5	5	3
West Pit 1	5	5	1
West Pit 2 and 3	5	5	1
West Pit 4	5	5	1
LeDuc	5	5	1
Ouaré	5	5	1

Validation of the block model was completed by comparing input and output means. Several techniques were used for the validation. These included visual validation of block grades, global grade comparisons and swath plots.

14.6.5 Visual Validation

The block model was visually reviewed section by section to ensure that the grade tenor of the input data was reflected in the block model (examples shown in Figure 145 to Figure 155). Generally, the estimates compare well with the input data. The grades in the composites align with the corresponding grades in the block models.

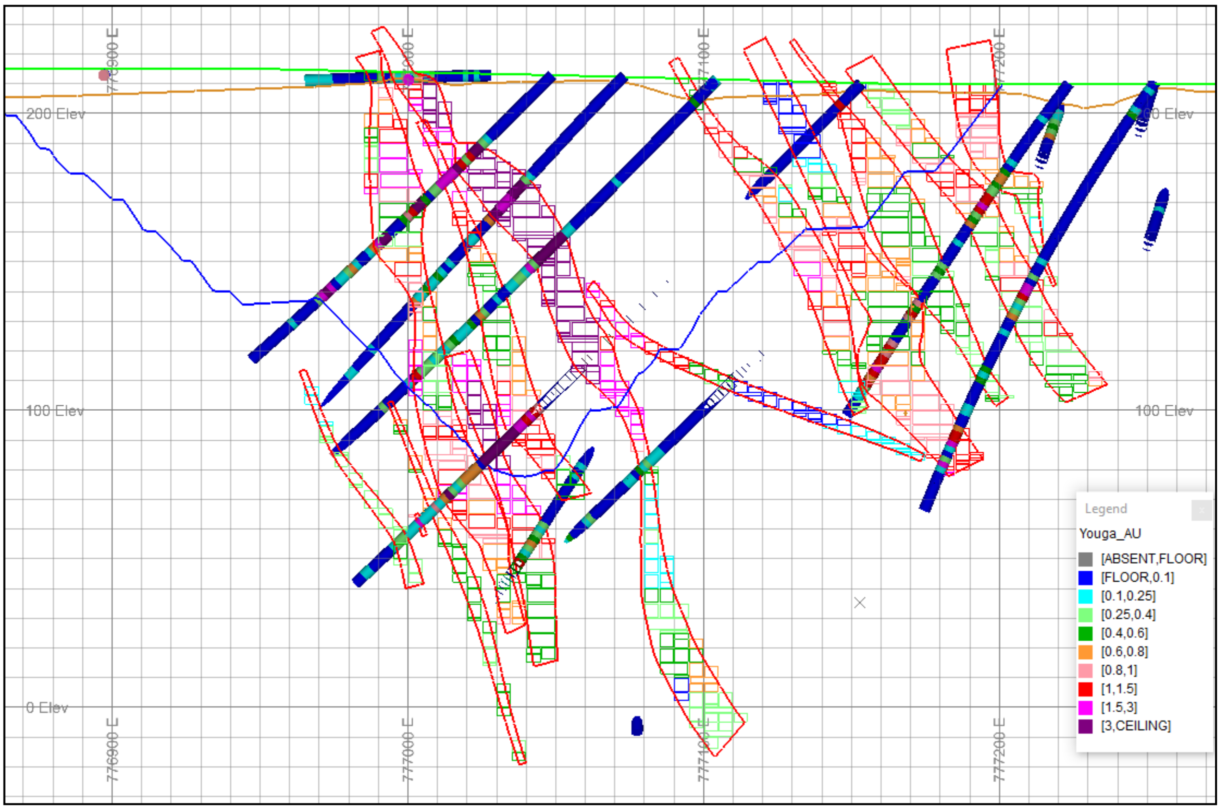


Figure 145: Section view – Main Pit grade model and composites

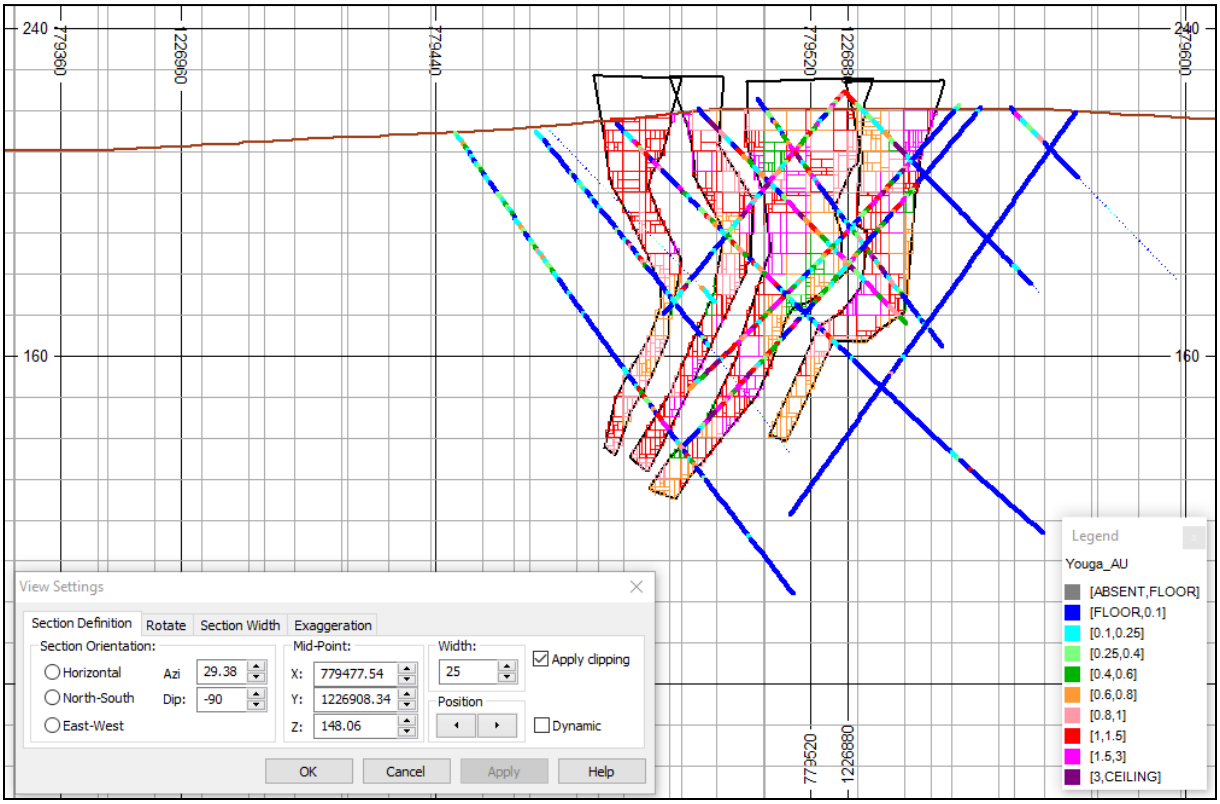


Figure 146: Section view – Zergoré grade model and composites

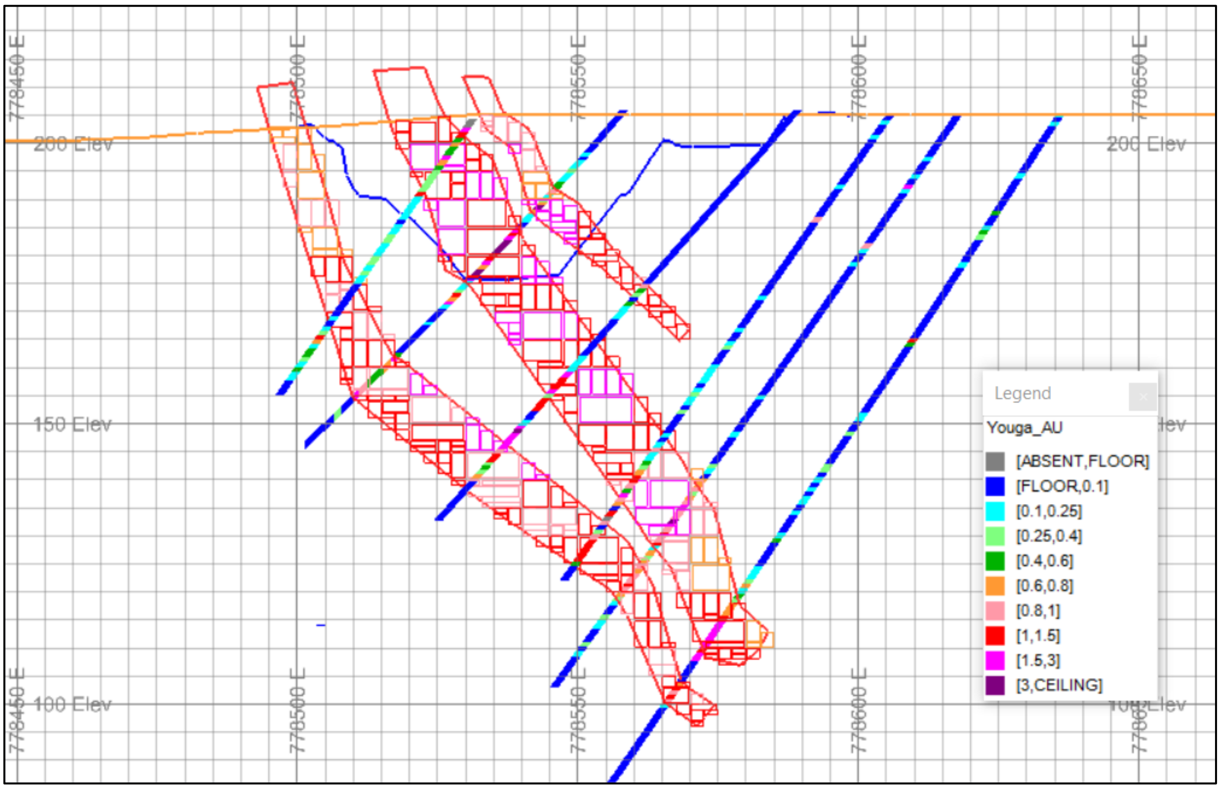


Figure 147: Section view – NTV grade model and composites

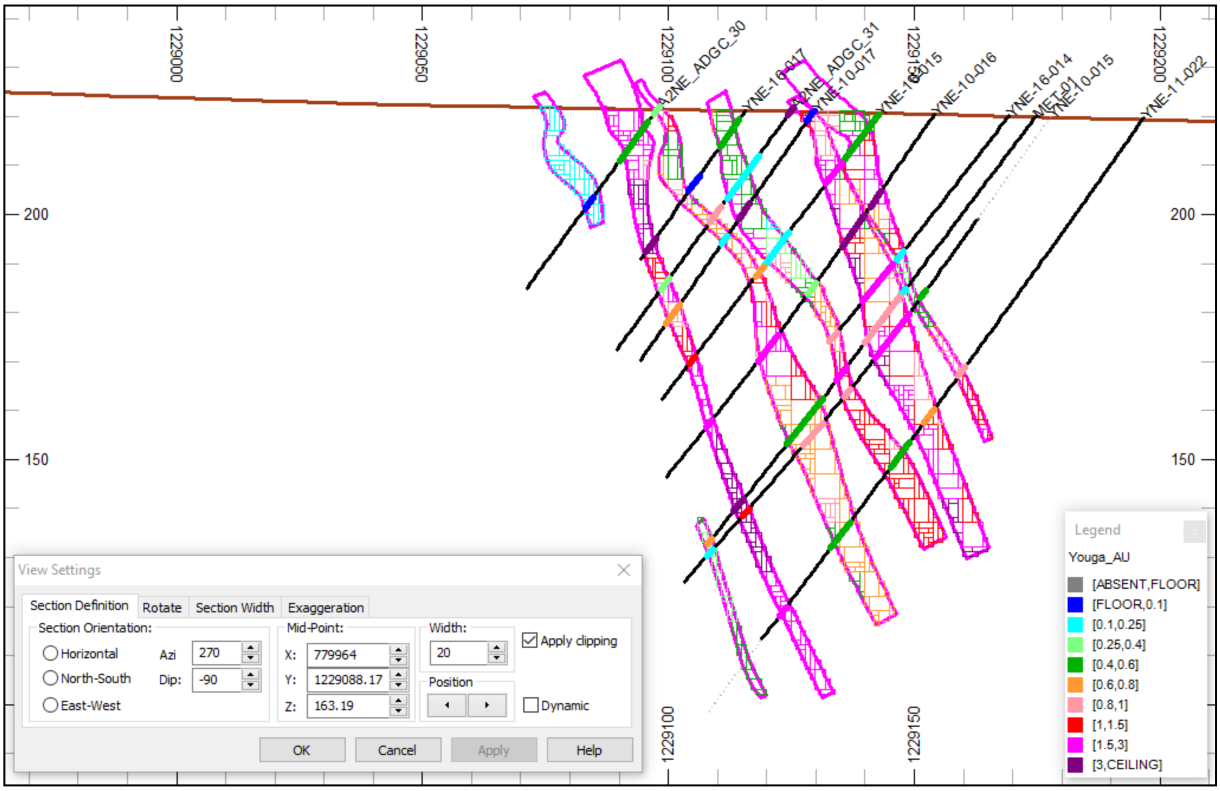


Figure 148: Section view – A2NE grade model and composites

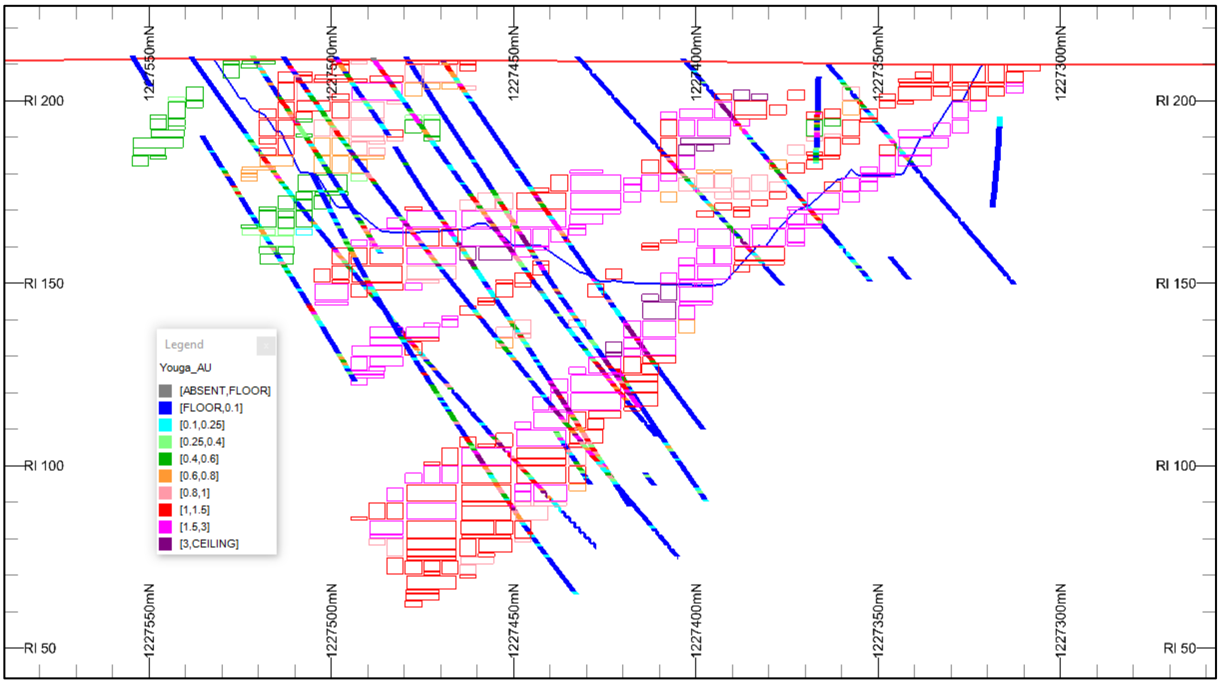


Figure 149: Section view – East Pit grade model and composites, 777353 mE

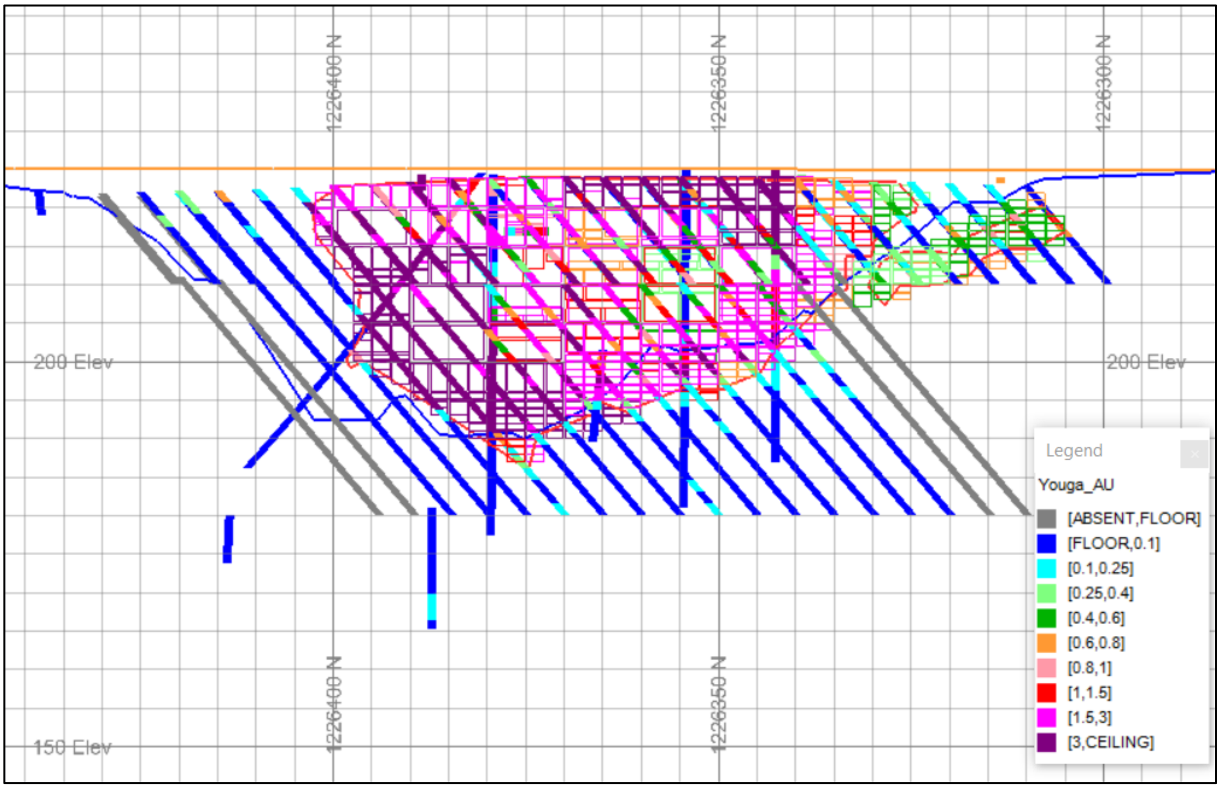


Figure 150: Section view – West Pit 1 grade model and composites, 774800mE

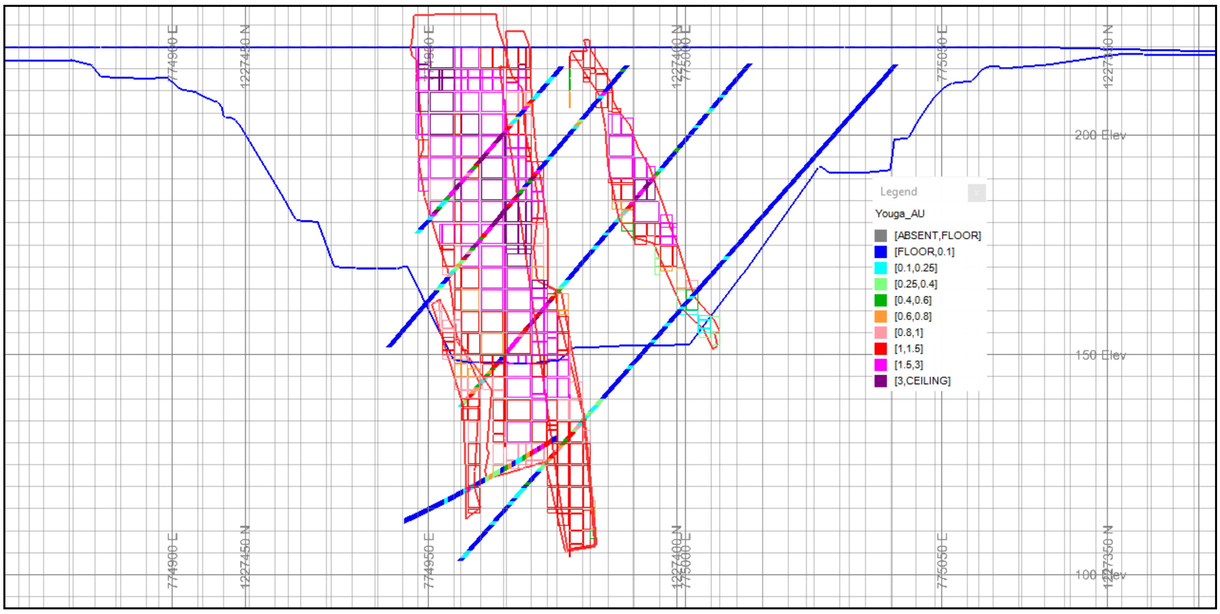


Figure 151: Section view – West Pit 2 grade model and composites

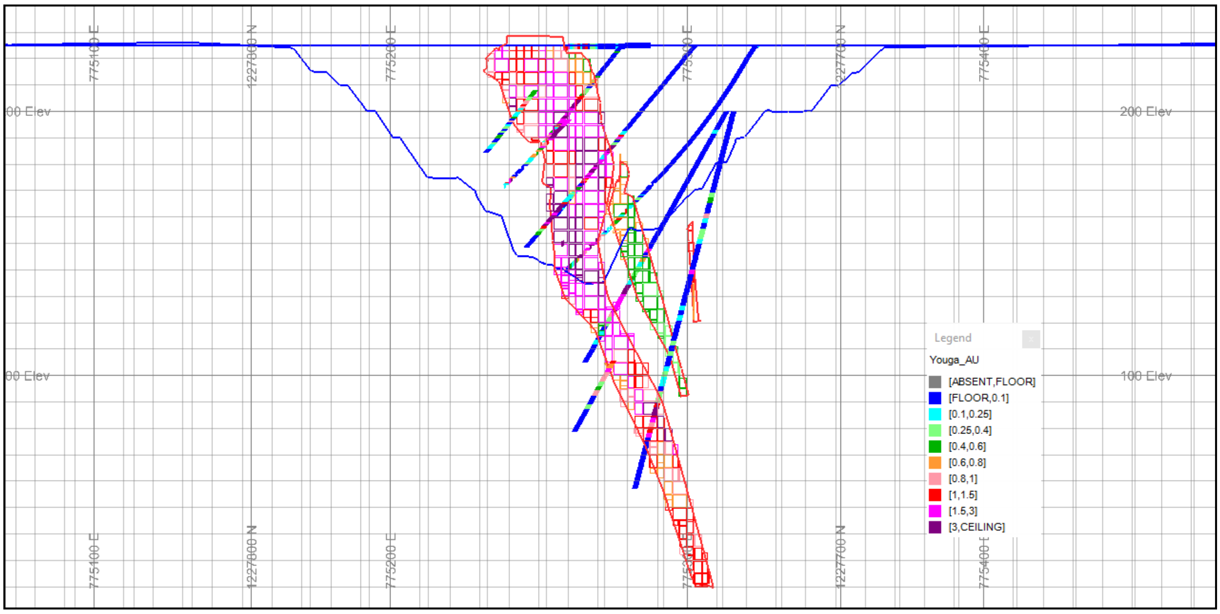


Figure 152: Section view – West Pit 3 grade model and composites

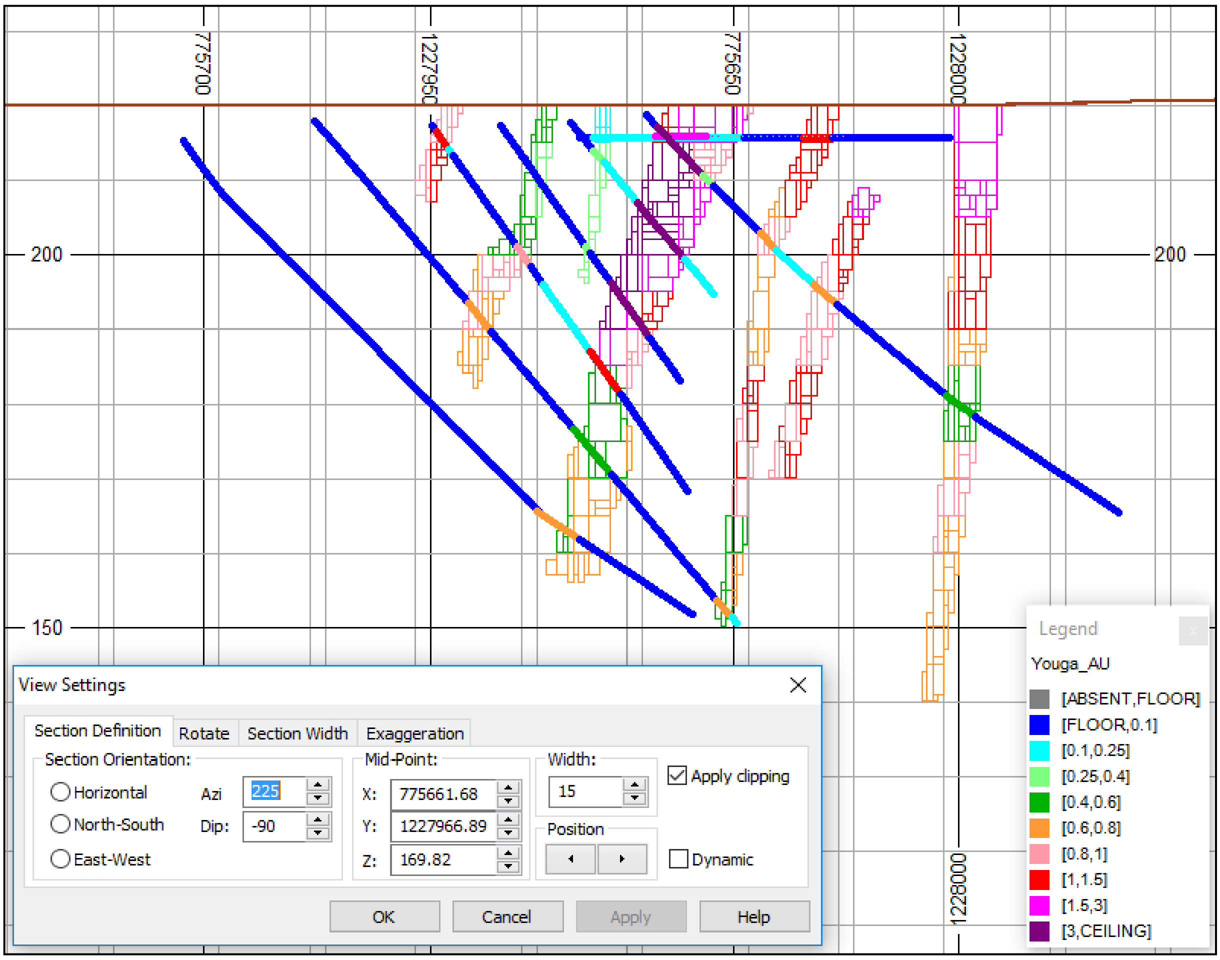


Figure 153: Section view – West Pit 4 grade model and composites

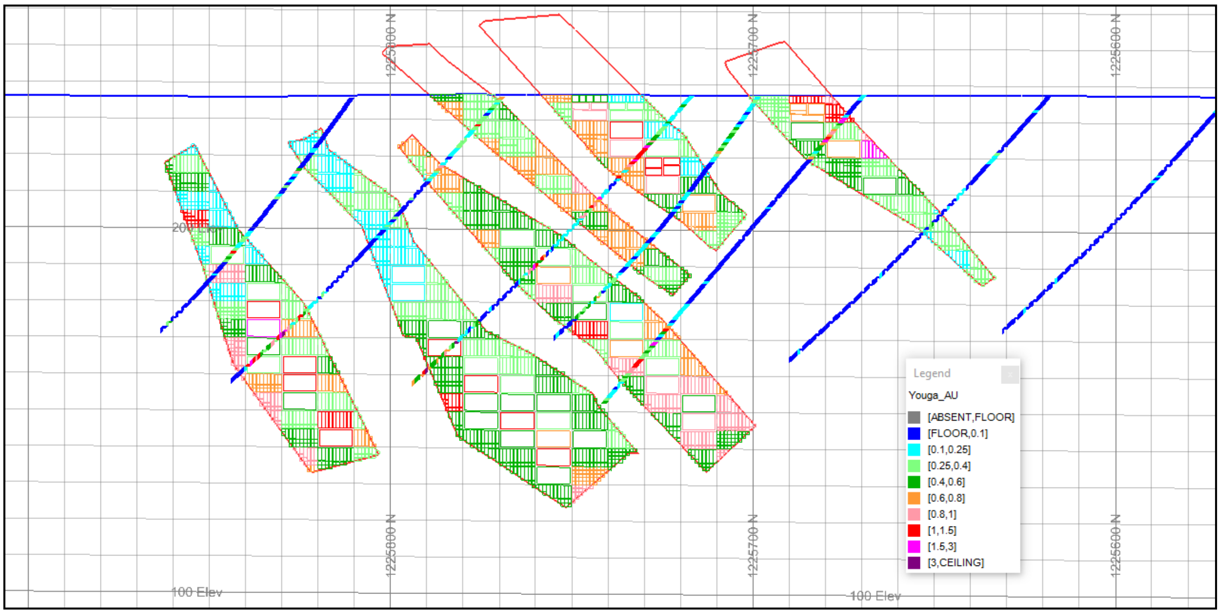


Figure 154: Section view – LeDuc grade model and composites, 773735mE

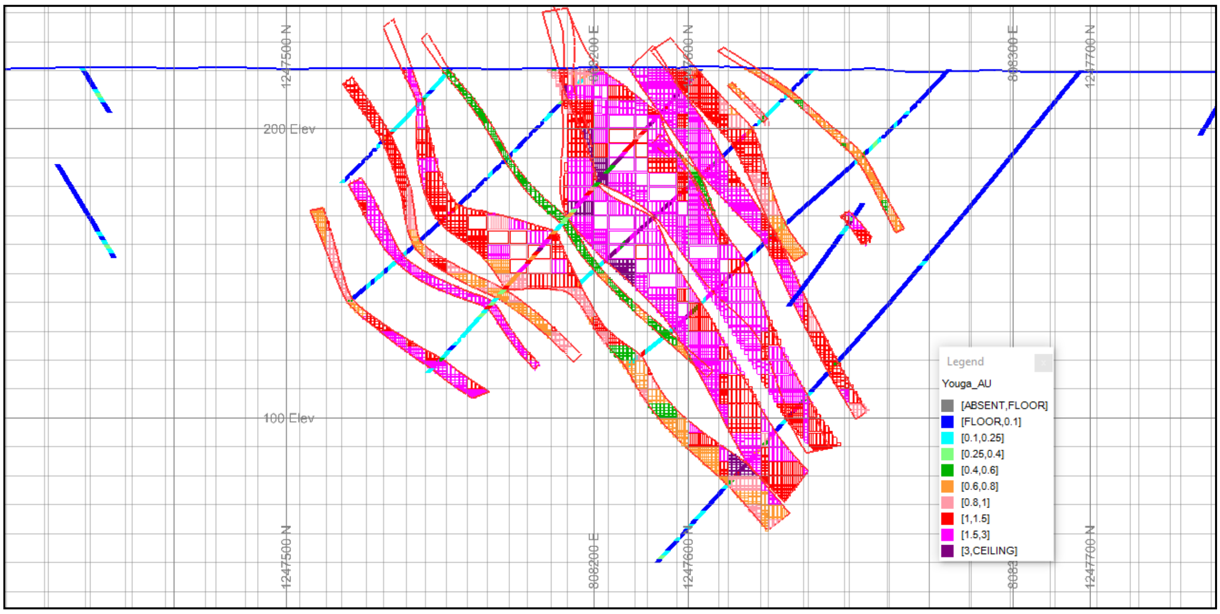


Figure 155: Section view – Ouaré grade model and composites

14.6.6 Statistical Validation

De-clustering

Irregular sampling of a deposit, most commonly through infill drilling or drilling in multiple orientations, causes clustering. Clustering results in a disproportionate distribution grades (usually high grades from the infill drilling) in the dataset used for statistical analysis. Mixed populations in the histogram can create a bias when comparing the drillhole sample distribution with the block model distribution (which is de-clustered) and distort the calculated mean grades and variance.

Different ways of de-clustering data each give different results. These include interactive filtering, polygonal de-clustering, nearest neighbour de-clustering and cell-weighted de-clustering.

The method used for geostatistical analysis and validation for the current MRE update is cell-weighted de-clustering, since all samples are considered when determining the average. This method involves placing a grid of cells over the data. Each cell that contains at least one sample is assigned a weight of one. That weight of one is distributed evenly between the samples within each cell.

The OK grade estimation process is a very efficient way of data clustering, therefore de-clustering before grade estimation is not necessary. De-clustering of the input data does give a good indication of the global mean. It is used in the validation of the estimate (comparison of the means). De-clustering was applied to remove any bias due to drill spacing prior to validation. The de-clustering parameters are presented in Table 77.

Table 77: De-clustering parameters

Deposit	Cell size (m)			Anchor point		
	X	Y	Z	X	Y	Z
Main Pit	15	15	5	776000	1227000	-300
Zergoré	5	5	5	779000	1226400	0
NTV	10	10	5	778000	1225800	50
A2NE	5	5	5	778300	1228300	2
East Pit	15	15	5	777050	1227000	-24
West Pit 1	10	10	5	774500	1226200	100
West Pit 2 and 3	Nearest Neighbour used – nearest sample to 5x5x5 block					
West Pit 4	5	5	5	775200	1227570	0
LeDuc	30	35	35	773446	1225580	108
Ouaré	Regular spaced drilling, no de-clustering required					

Results

The global statistics of Au g/t were reviewed and the results are reported below in Table 78.

All estimated block grades are included. The mean grades in the estimated model block parent cells were compared to the raw, as well as the de-clustered, top-cut composite data.

Generally, the model validates well, showing <12% difference between the de-clustered composites and the block estimates, except for West Pit 4. This is within expected parameters. Only at West Pit 4 was there a larger difference. When the comparison was completed using blocks that had been classified as Indicated Mineral Resources, the difference decreased to 7%.

Table 78: De-clustered mean grade comparison for Au g/t

Deposit	Block Au g/t	De-clustered composite Au g/t	% Difference
Main Pit	1.27	1.44	-12%
Zergoré	0.94	0.92	2%
NTV	1.08	1.10	-1%
A2NE	1.22	1.33	-8%
East Pit	1.59	1.50	6%
West Pit 1	1.81	1.98	-9%
West Pit 2 and 3	1.27	1.25	1%
West Pit 4	0.85	1.18	-28%
West Pit 4 – Indicated	1.26	1.35	-7%
LeDuc	0.57	0.59	-3%
NTV	1.08	1.10	-1%
Ouaré	1.29	1.27	1%

14.6.7 Swath Plots

Swath plots were created as part of the validation process, by comparing the model parent block grades and input composites (de-clustered and top cut) in spatial increments. These plots display northing, easting and elevation slices throughout the deposit (Figure 156 to Figure 165).

The plots show that the distribution of block grades honours the distribution of input composite grades. There is a minor degree of smoothing evident, which is to be expected from the estimation method used, with block grades showing lower overall variance. The general trend of the composite grades is reflected in the block model.

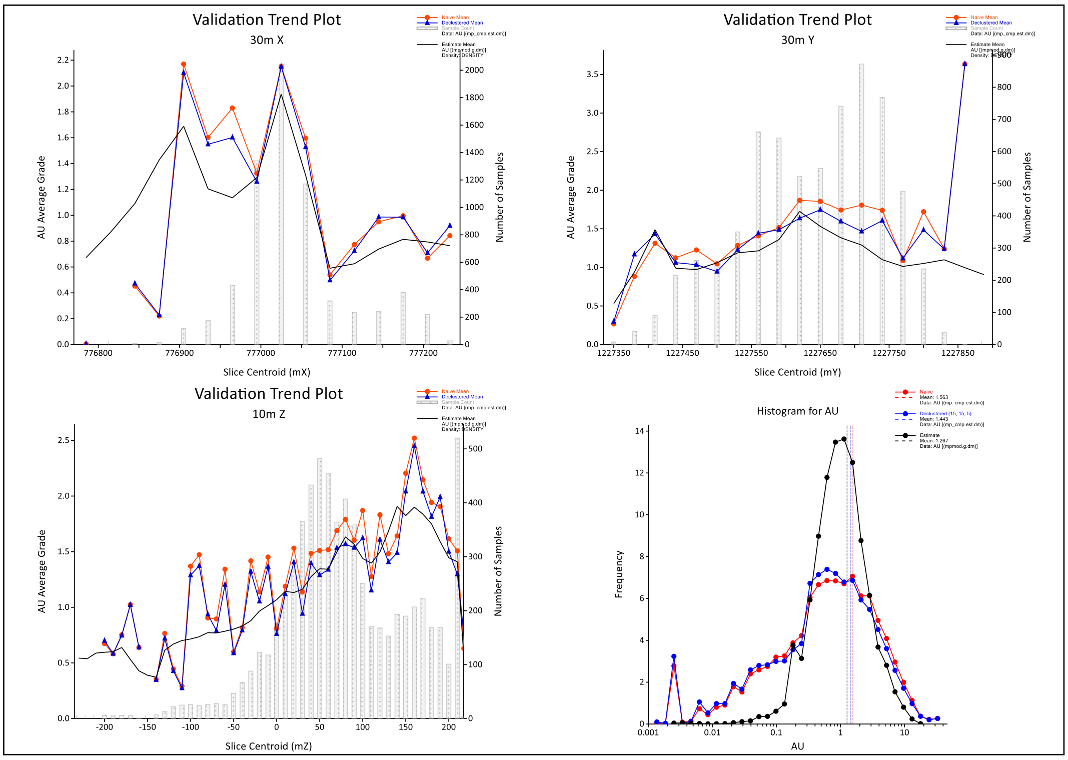


Figure 156: Swath plot Main Pit

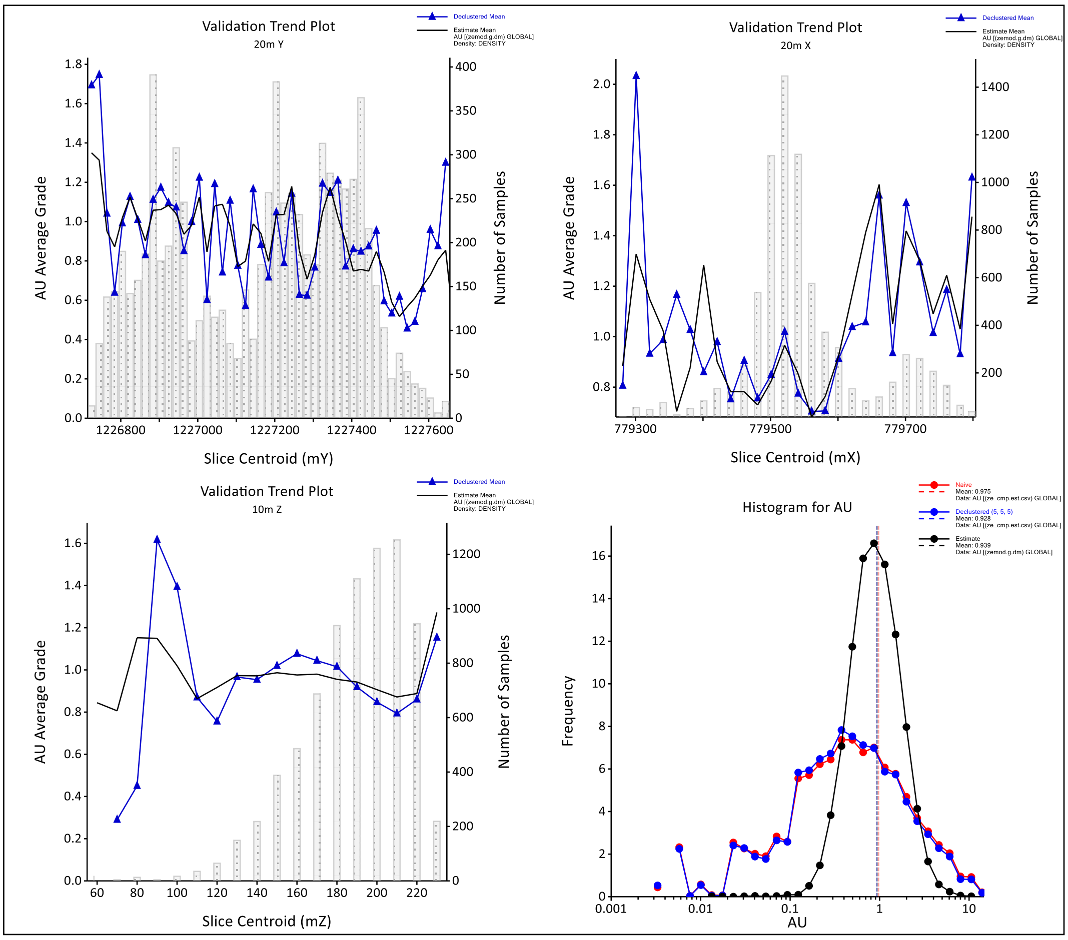


Figure 157: Swath plot Zergoré

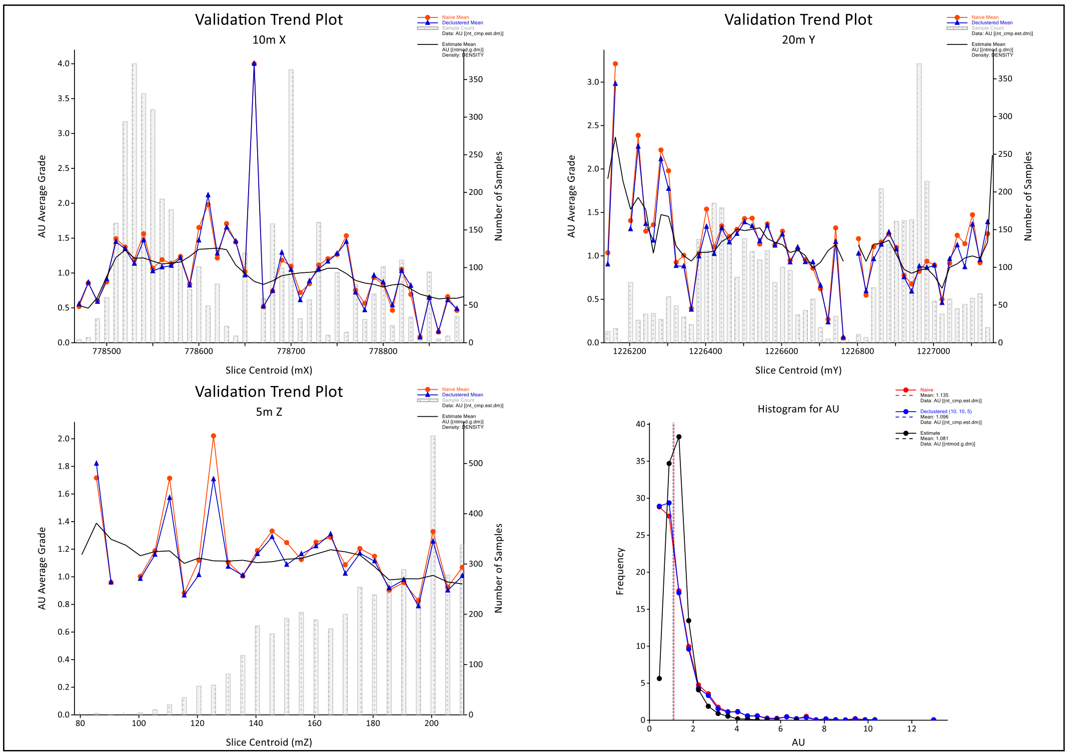


Figure 158: Swath plot NTV

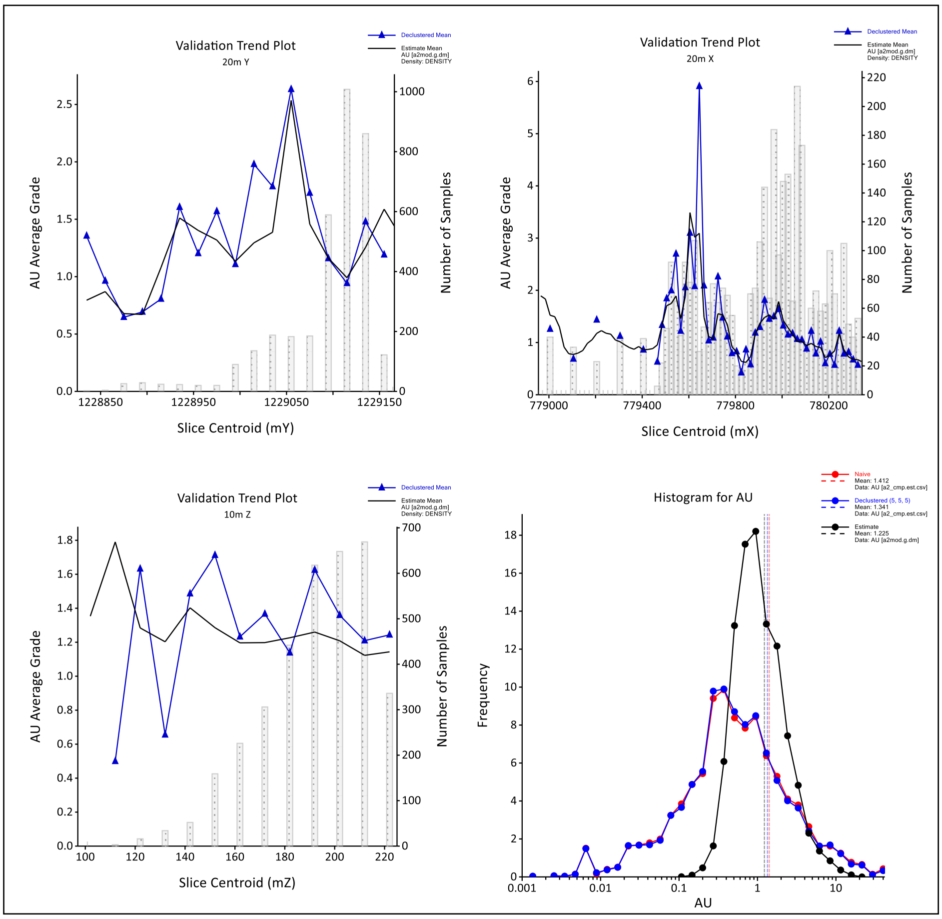


Figure 159: Swath plot A2NE

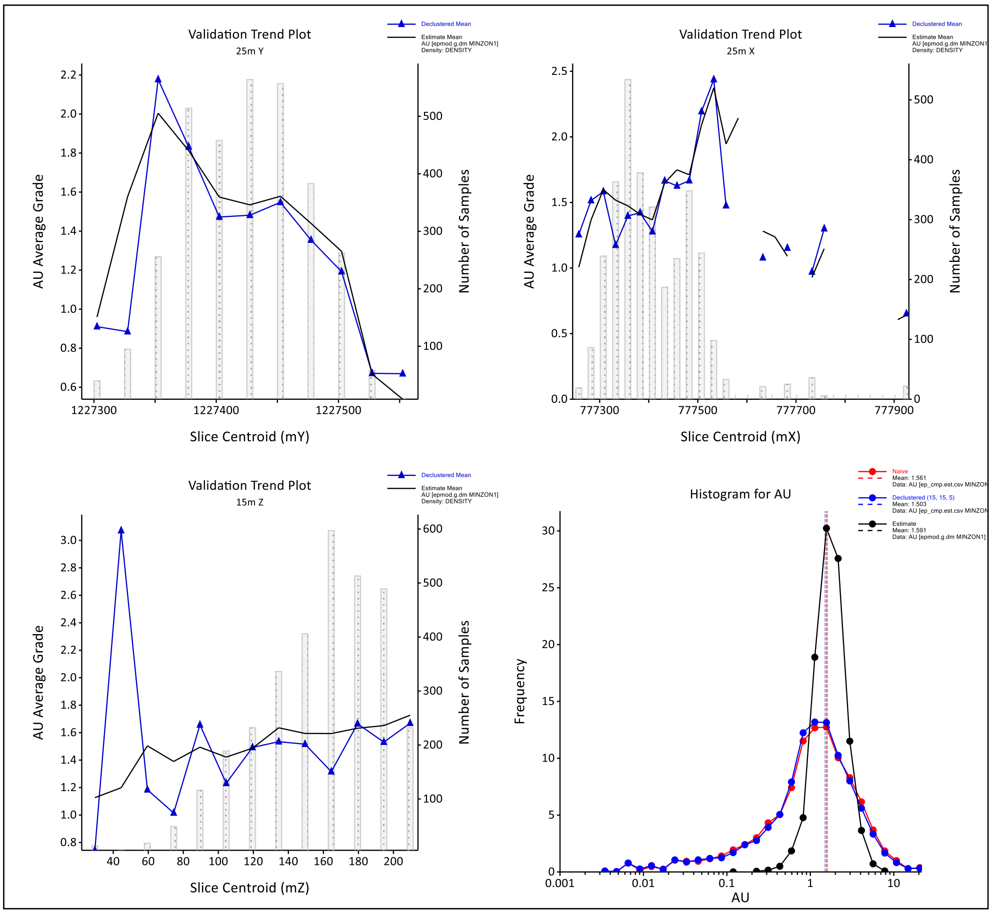


Figure 160: Swath plot East Pit

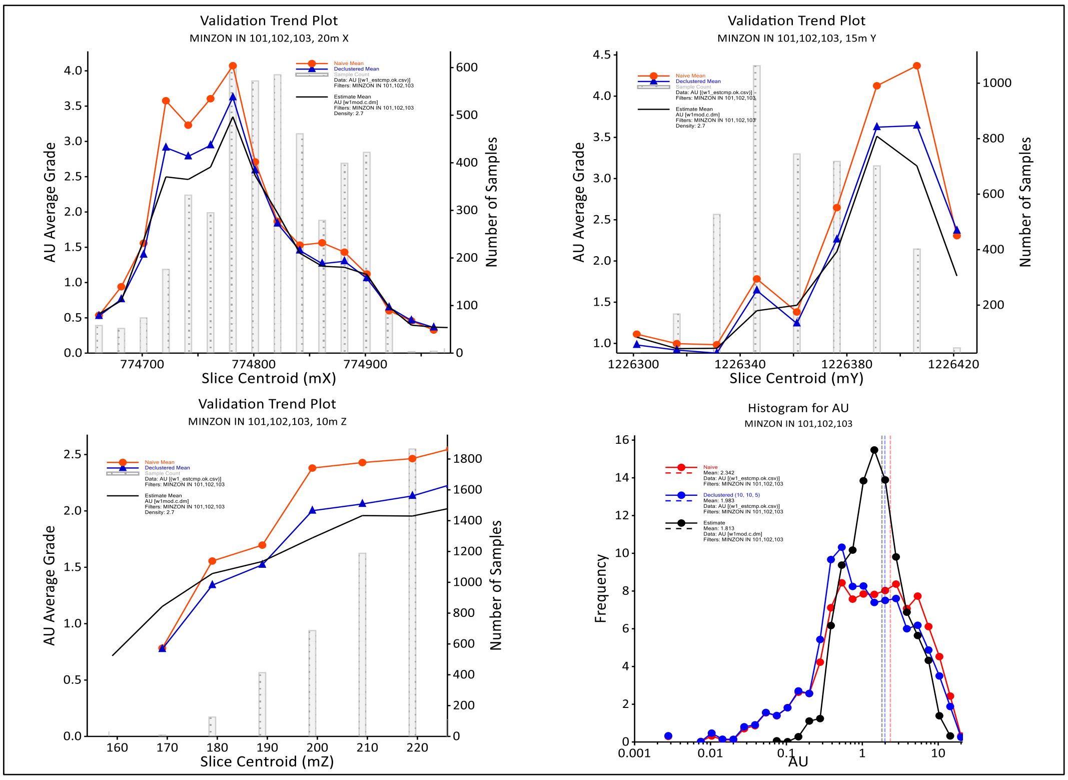


Figure 161: Swath plot West Pit 1

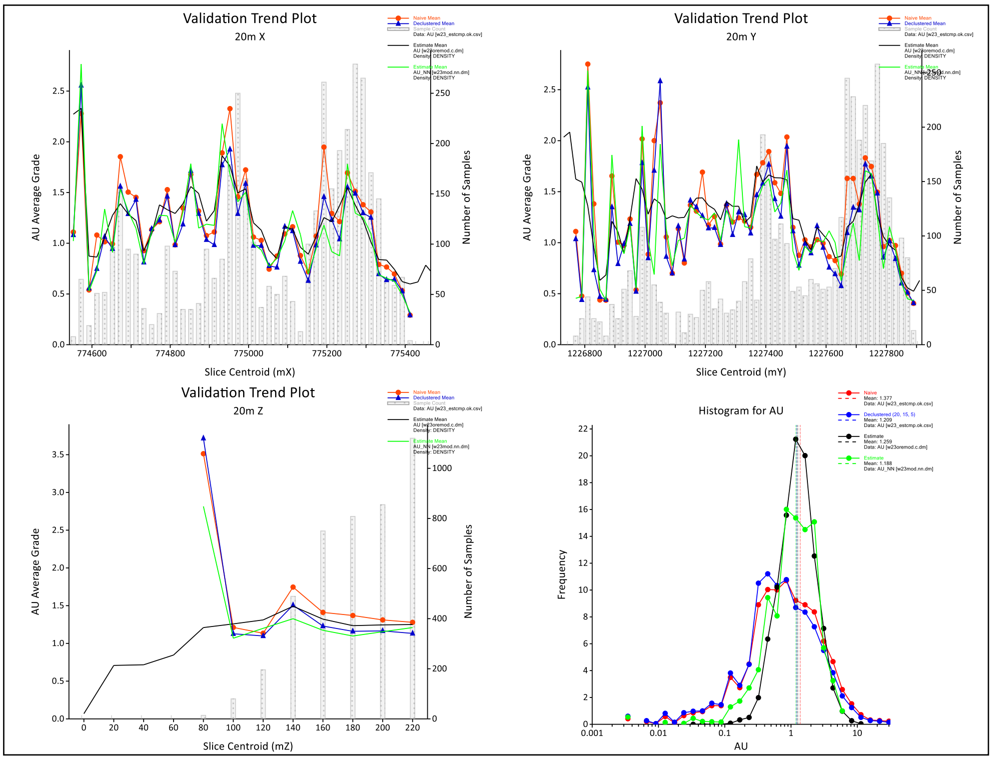


Figure 162: Swath plot West Pit 2 and 3, Nearest Neighbour estimate (for de-clustering purposes) shown in green

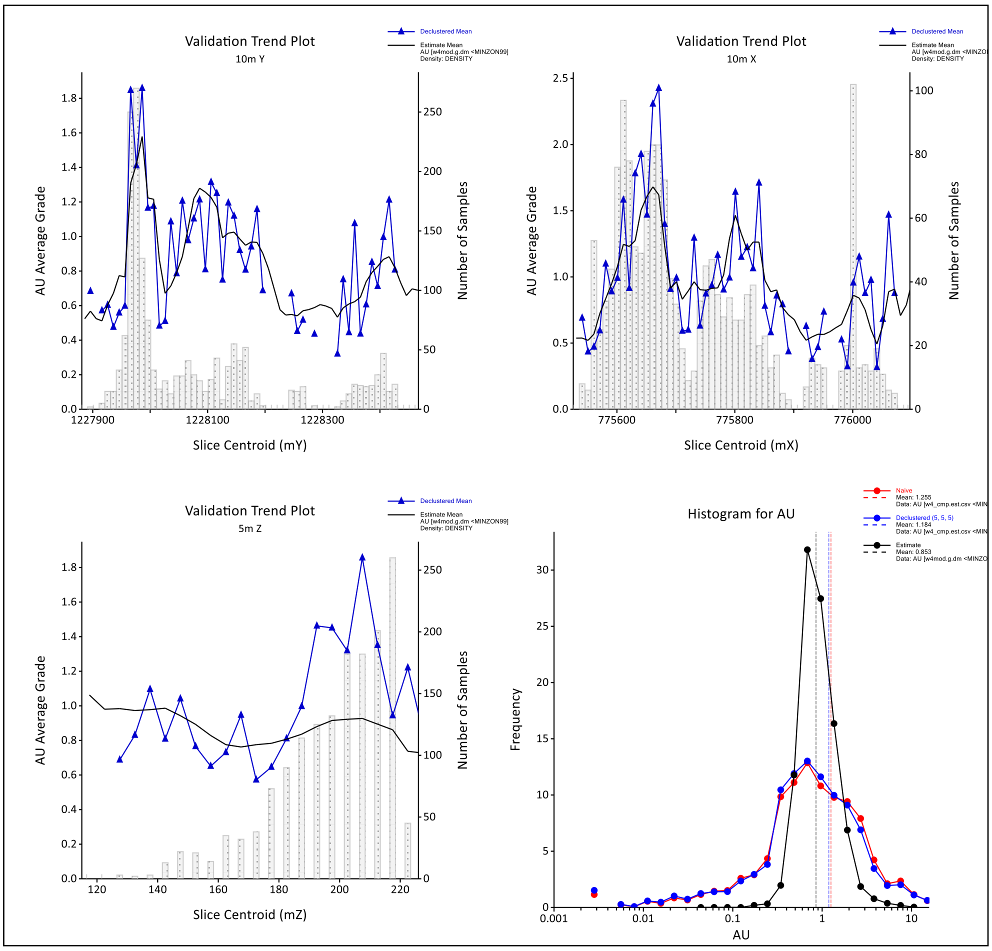


Figure 163: Swath plot West Pit 4

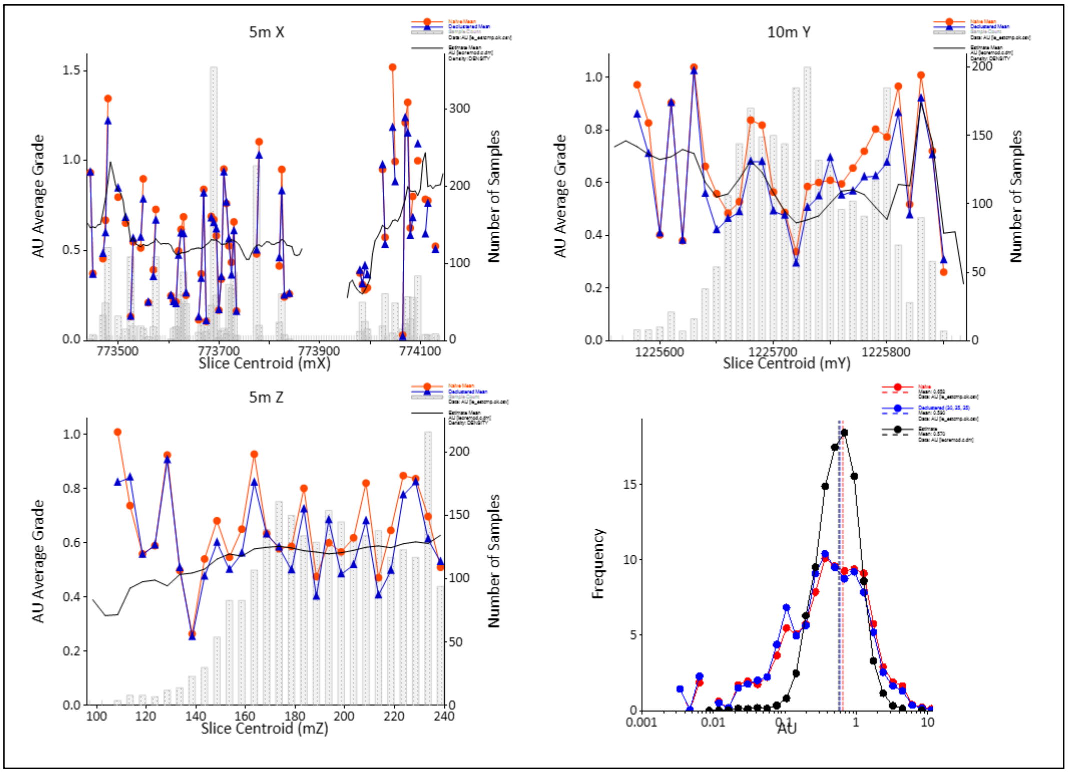


Figure 164: Swath plot LeDuc

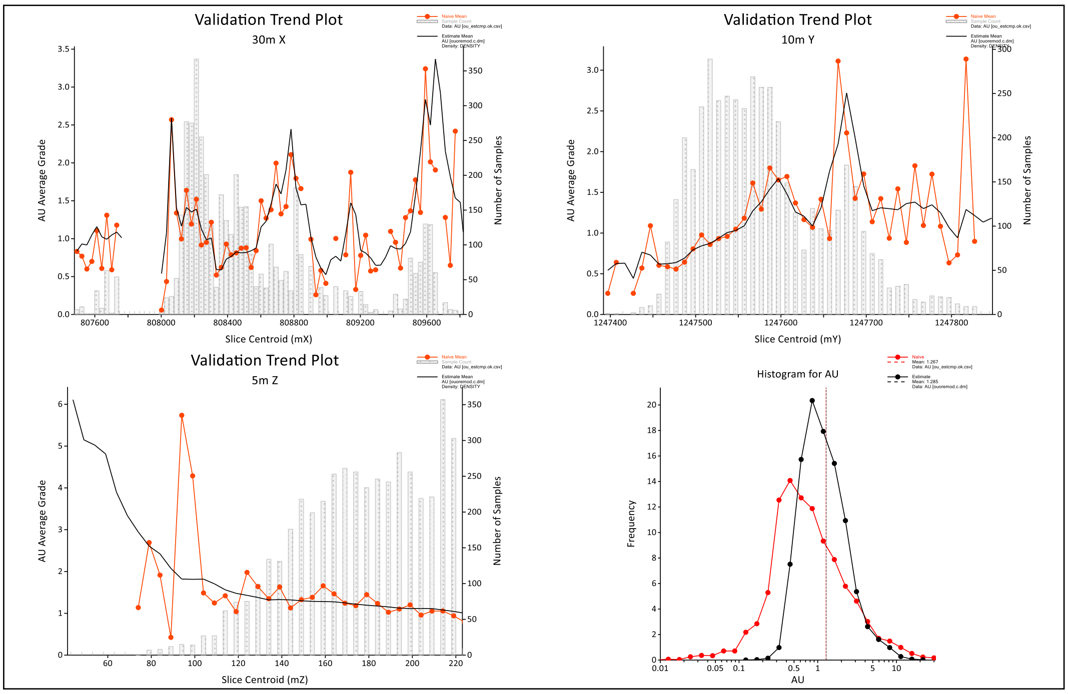


Figure 165: Swath plot Ouaré

14.7 Classification

The Mineral Resource has been classified as Indicated Mineral Resources and Inferred Mineral Resources under the guidelines of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves, Definitions and Guidelines prepared by the CIM Standing Committee on Reserve Definitions and adopted by CIM Council, and procedures for classifying the reported Mineral Resources were undertaken within the context of the Canadian Securities Administrators National Instrument 43-101 (NI 43-101).

The classification level is based upon an assessment of geological understanding of the deposit, geological and mineralisation continuity, drillhole spacing, quality control results, search and estimation parameters and an analysis of available density information.

The criteria reviewed for classification applied to all deposits was as follows:

- Review of potential for eventual economic extraction
- Review of geological continuity
- Review of data quality
- Review of QAQC
- Review of drill spacing and estimation quality statistics such as search pass, number of samples used to estimate, slope of regression.

For all deposits, a resource shell was run in NPV Scheduler (NPVS) using input parameters outlined in Table 80 to constrain and classify Mineral Resources for each deposit. This was completed to provide support that each Mineral Resource has the potential for eventual economic extraction, a key criterion for the classification of Mineral Resources under NI 43-101. Any material outside the resource shell remains unclassified and does not contribute to the Mineral Resource inventory.

For all deposits, the drill spacing is sufficient to allow the geology and mineralisation zones to be modelled into coherent wireframes for each domain. Reasonable consistency is evident in the orientations, thickness and grades of the mineralised zone.

Validation of the historical drillholes, particularly in relation to the exact collar locations and assay results, and the availability of QAQC information, has allowed for the classification of Indicated Mineral Resources.

For Indicated Mineral Resources, the specific criteria for each deposit is summarised in Table 81. No Indicated Mineral Resources were classified at LeDuc or West Pit 1 due to lack of data.

A summary of the classification codes applied in the model are shown in Table 79. Figure 166 to Figure 175 shows the classified block models in 3D view, alongside the constraining resource shells.

Table 79: CLASS field and description

Class	Description
1	Measured Mineral Resource (none defined)
2	Indicated Mineral Resource
3	Inferred Mineral Resource
9	Unclassified – Estimated Material outside a Whittle $1,500 gold price and assumptions regarding operating costs and recoveries pit shell, as well as all waste material not estimated

Table 80: Input parameters for resource shell (NPVS)

Parameter	Units	Value
Price	US$/Troy Oz	1,500
Selling Cost	%	4.0
Mining Cost	US$/t mined	2.2
Process Cost	US$/t ore	17
G&A	US$/t ore	5.0
Transport Cost	US$/t ore	2.0
Pit Slope Angle	Degrees	45
Mining Recovery	%	95
Mining Dilution	%	5
Process Recovery	%	91

Table 81: Additional specific criteria for the classification of Indicated Mineral Resources

Deposit	Criteria				Domain	Comment
	Search pass	No. of samples	Slope of regression	Drill spacing		
Main Pit	1	15	0.8		1, 2, 3, 5, 9, 11, 13, 17, 20, 21, 22, 23, 31	
Zergoré	1	6	0.5		1, 2, 3, 4, 5, 8, 9, 10, 13, 15, 16, 18, 20, 23, 24, 25, 26, 27, 46, 49, 50, 51, 52, 53, 55, 58, 65, 69, 70, 71, 73, 74, 75	
NTV	1	12	0.75		1, 9, 23, 24, 26, 33	
A2NE	1	6	0.7		10, 11, 12, 13, 14, 15, 17, 23, 24, 26, 27	
East Pit	1	6			1, 2, 3, 4, 12	
West Pit 2	2	16		25 m x 25 m	128, 129	Blocks estimated within the first two search passes do not exceed the variogram range.
West Pit 3	2	16		25 m x 25 m	218	Blocks estimated within the first two search passes do not exceed the variogram range.
West Pit 4	1	6	0.7		1, 2, 5, 6	
Ouaré	2	12	0.7	25 m x 25 m	101, 102, 103, 120, 121, 122, 123, 125, 126, 131, 116, 117	Thickness of zone was also considered; thinner zones not considered for Indicated Mineral Resources; Blocks estimated within the first two search passes do not exceed the variogram range.

Note: No Indicated Mineral Resources at West Pit 1 or LeDuc

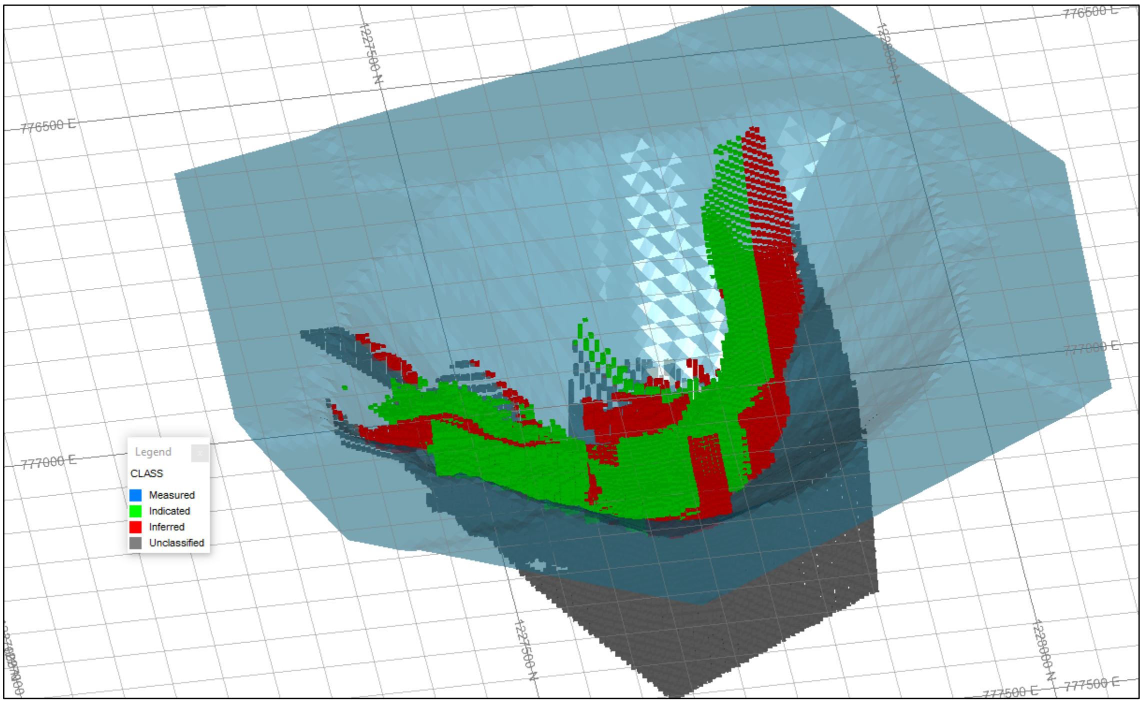


Figure 166: Main Pit – 3D view of the classified Mineral Resource and constraining US$1,500 resource shell

Unclassified material in grey (falls outside resource shell). View towards northwest.

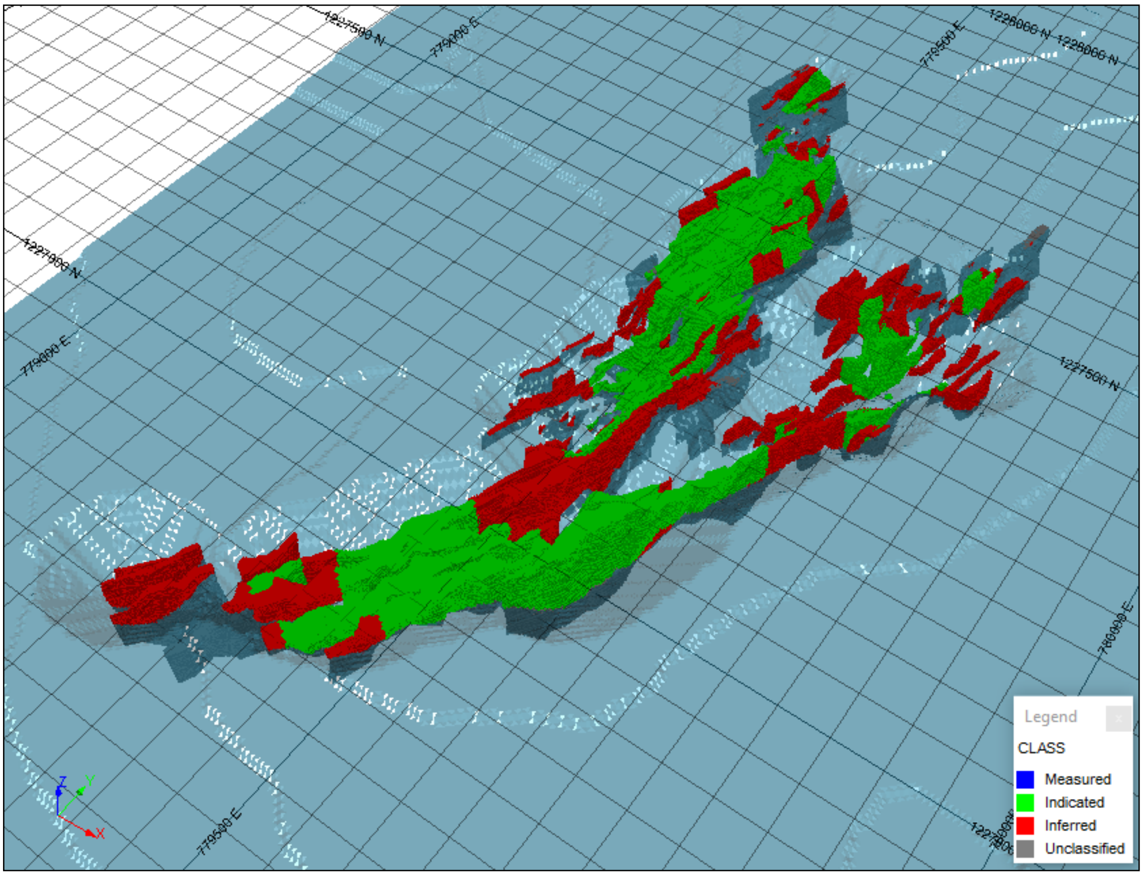


Figure 167: Zergoré – 3D view of the classified Mineral Resource and constraining US$1,500 resource shell

Unclassified material in grey (falls outside resource shell). View towards north-northwest.

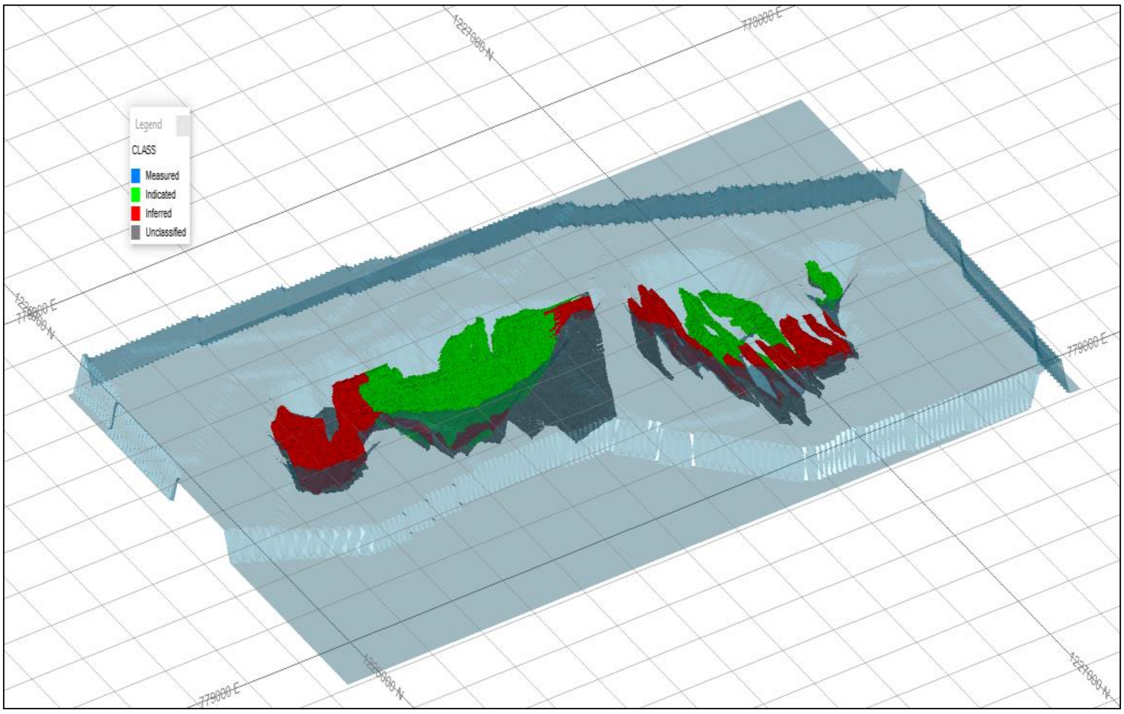


Figure 168: NTV – 3D view of the classified Mineral Resource and constraining US$1,500 resource shell

Unclassified material in grey (falls outside resource shell). View towards northwest.

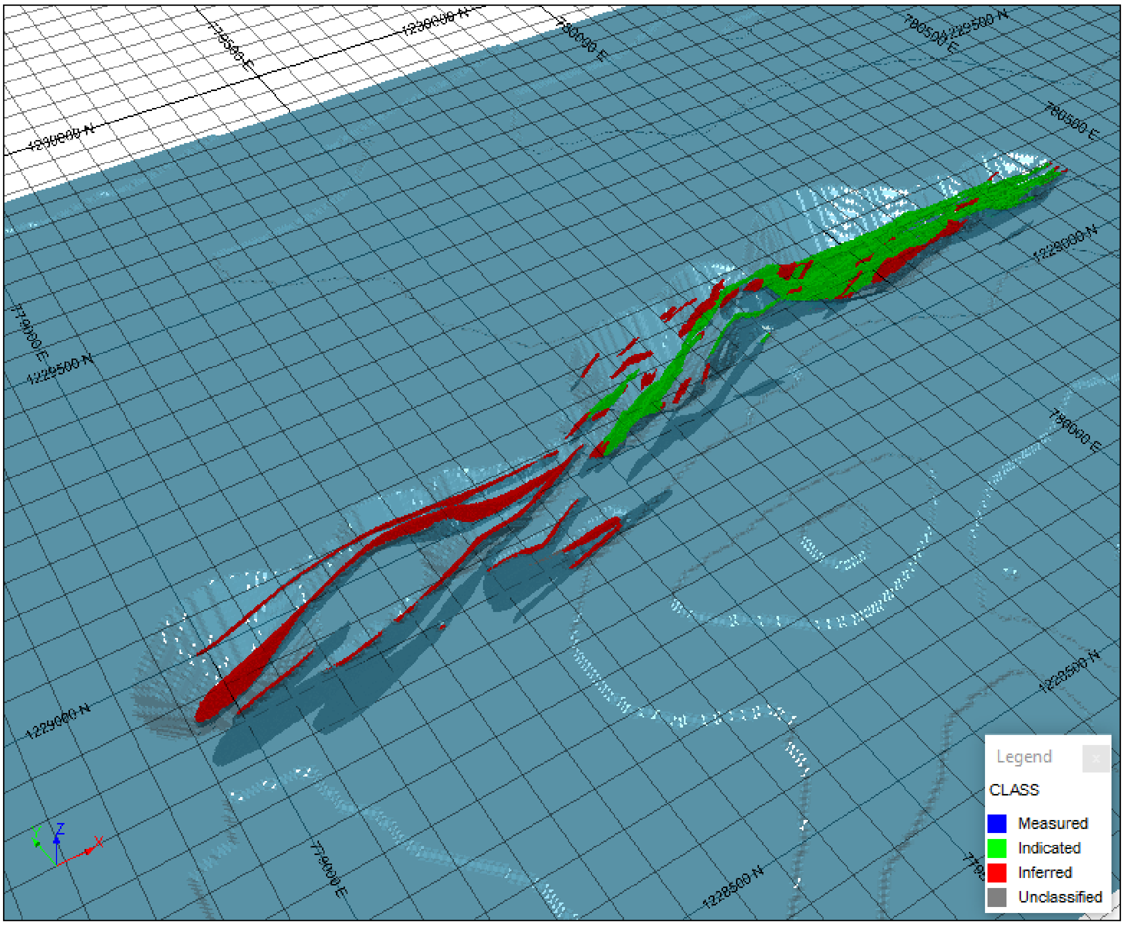


Figure 169: A2NE – 3D view of the classified Mineral Resource and constraining US$1,500 resource shell

Unclassified material in grey (falls outside resource shell). View towards northeast.

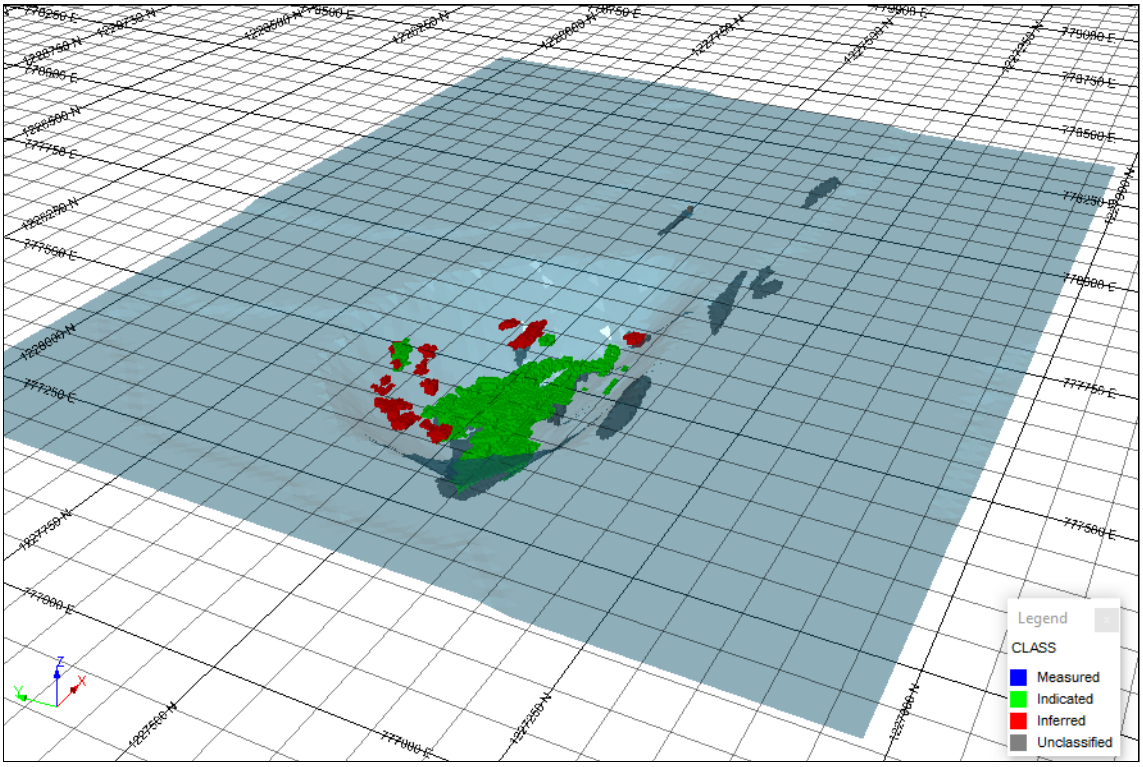


Figure 170: East Pit – 3D view of the classified Mineral Resource and constraining US$1,500 resource shell

Unclassified material in grey (falls outside resource shell). Looking east.

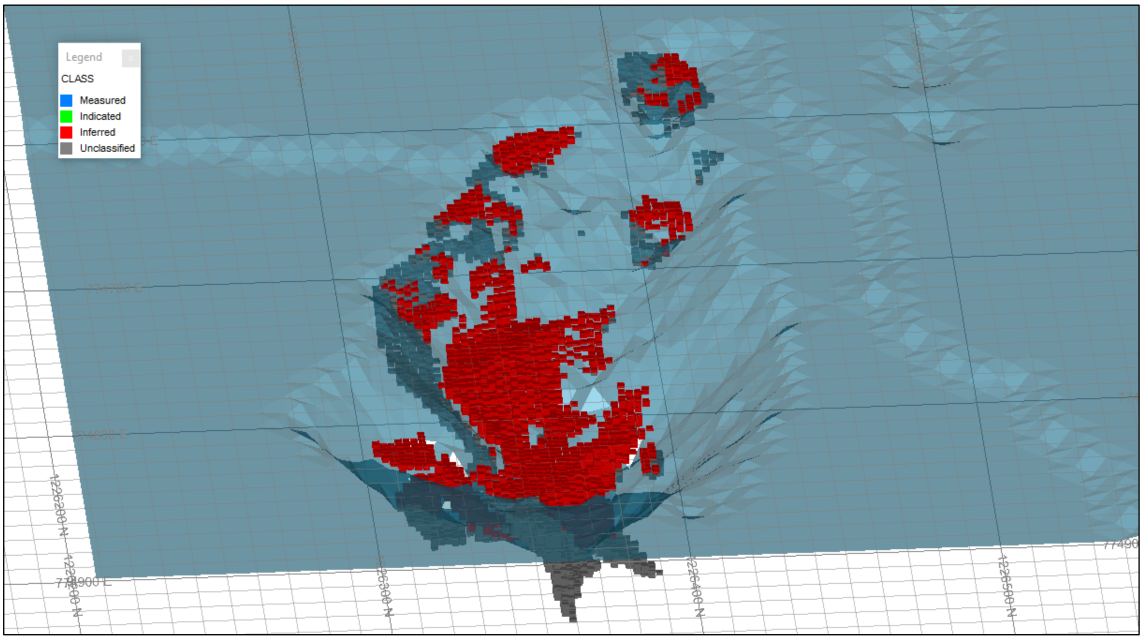


Figure 171: West Pit 1 – 3D view of the classified Mineral Resource and constraining US$1,500 resource shell

Unclassified material in grey (falls outside resource shell). View towards east.

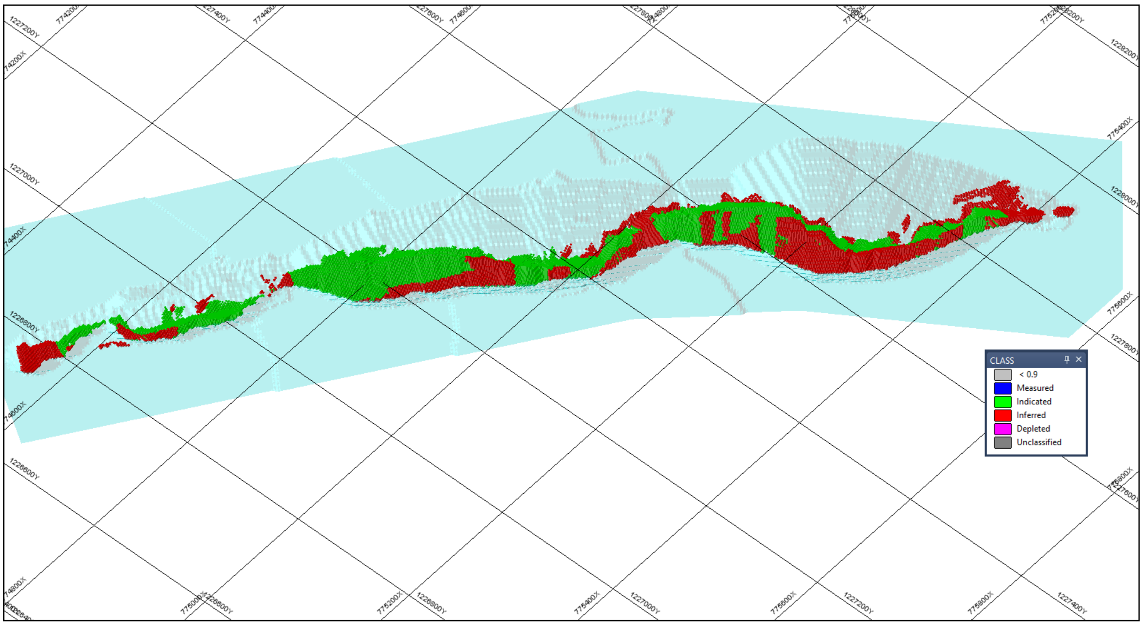


Figure 172: West Pit 2 and 3 – 3D view of the classified Mineral Resource and constraining US$1,500 resource shell

Unclassified material in grey (falls outside resource shell). View towards northwest.

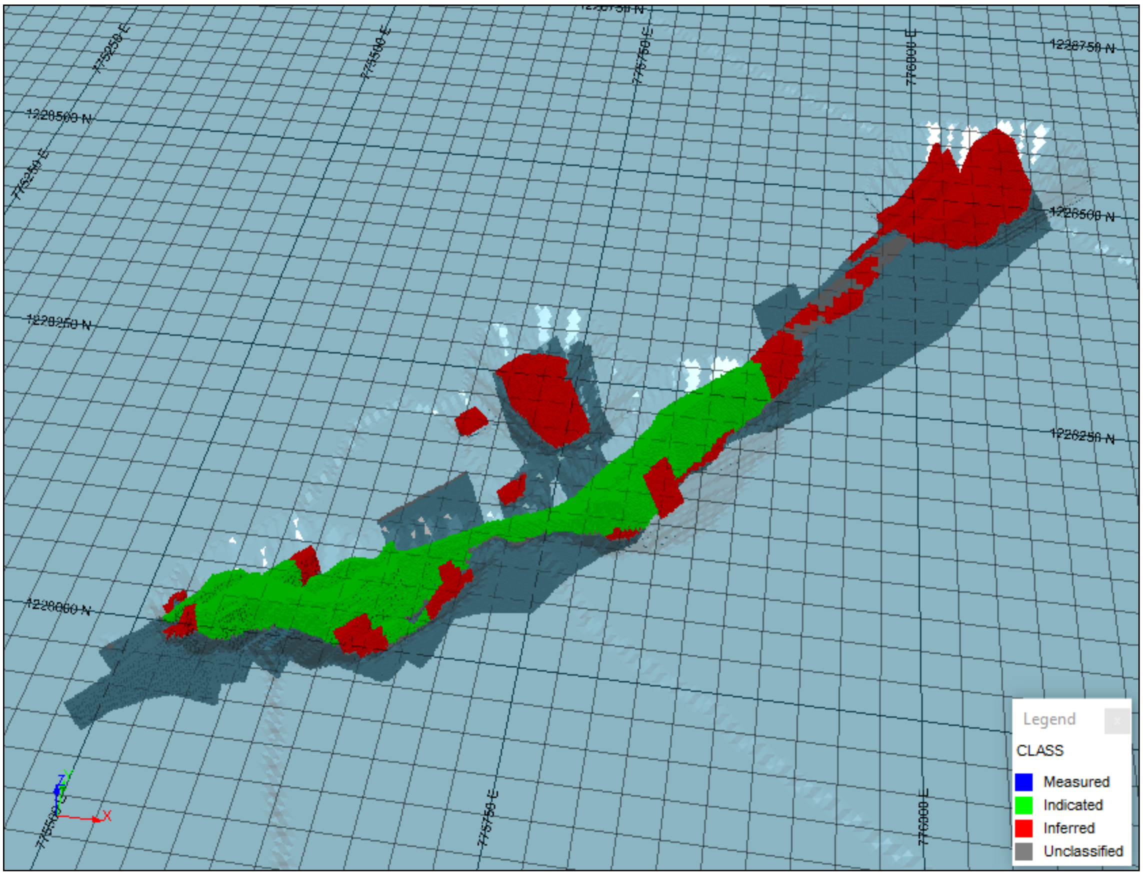


Figure 173: West Pit 4 – 3D view of the classified Mineral Resource and constraining US$1,500 resource shell

Unclassified material in grey (falls outside resource shell). View towards north.

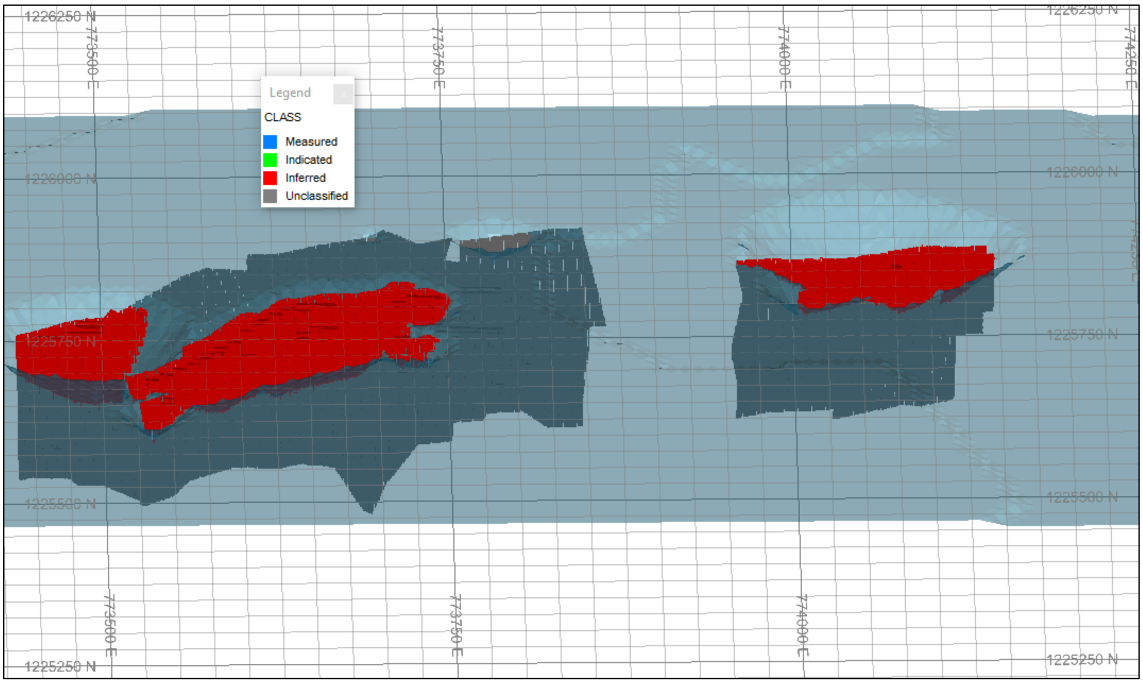


Figure 174: LeDuc – 3D view of the classified Mineral Resource and constraining US$1,500 resource shell

Unclassified material in grey (falls outside resource shell). View towards north.

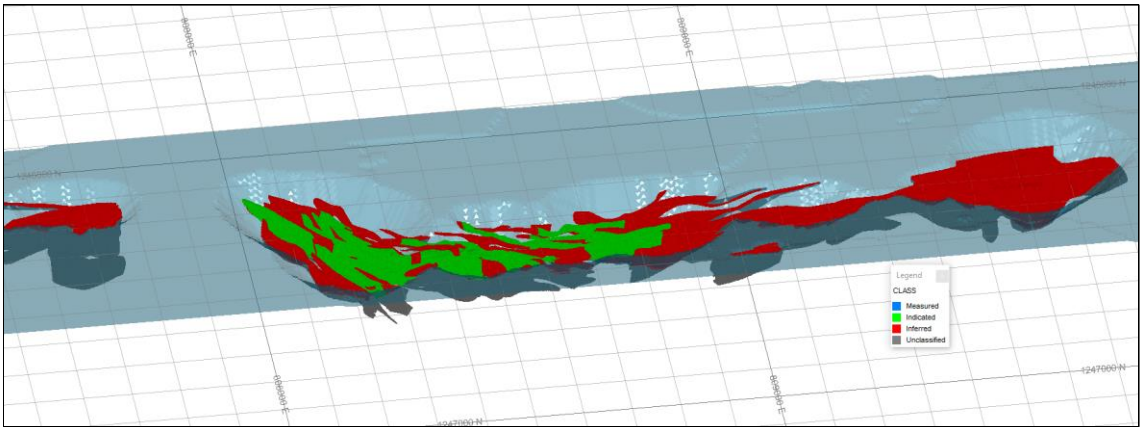


Figure 175: Ouaré – 3D view of the classified Mineral Resource and constraining US$1,500 resource shell

Unclassified material in grey (falls outside resource shell). View towards north-northwest.

14.8 Mineral Resource Statement

The Mineral Resource estimate is shown in Table 82 as at 28 February 2017. The MRE compiled by CSA Global has been classified and is reported as Indicated Mineral Resources and Inferred Mineral Resources under the guidelines of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves, Definitions and Guidelines prepared by the CIM Standing Committee on Reserve Definitions and adopted by CIM Council, and procedures for classifying the reported Mineral Resources were undertaken within the context of the Canadian Securities Administrators National Instrument 43-101 (NI 43-101).

Table 82: Youga and Ouaré gold deposits – Mineral Resource estimate, reported at a 0.55 g/t Au cut-off, 28 February 2017

Deposit	Indicated			Inferred		
	Tonnes (Mt)	Au grade (g/t)	Au metal (koz)	Tonnes (Mt)	Au grade (g/t)	Au metal (koz)
Main Pit	2.96	1.53	145.6	0.8	1.4	36
Zergoré	2.57	1.20	99.1	1.0	1.2	39
NTV	1.88	1.10	66.6	1.5	1.3	61
A2NE	0.86	1.98	54.7	0.5	1.8	29
East Pit	0.68	1.55	33.8	0.0	1.2	2
West Pit 3	0.64	1.53	31.5	0.2	1.2	7
West Pit 2	0.57	1.46	26.8	0.2	1.5	8
West Pit 4	0.34	1.53	16.6	0.4	0.9	13
West Pit 1	-	-	-	0.1	1.6	5
LeDuc	-	-	-	1.0	1.0	34
Ouaré	5.10	1.39	228.3	7.2	1.8	406
Total	**15.6**	**1.40**	**703**	**12.9**	**1.57**	**640**

Notes:

1. *Reporting cut-off is 0.55 g/t Au for all deposits.*
2. *The Mineral Resource Estimate has been depleted for mining up to 28 February 2017. The effective date of the Mineral Resource is 28 February 2017.*
3. *Figures have been rounded to the appropriate level of precision for the reporting of Resources.*
4. *Due to rounding, some columns or rows may not compute exactly as shown.*
5. *The Mineral Resources are stated as in situ dry tonnes. All figures are in metric tonnes.*
6. *The Mineral Resource has been classified under the guidelines of the CIM Standards on Mineral Resources and Reserves, Definitions and Guidelines prepared by the CIM Standing Committee on Reserve Definitions and adopted by CIM Council, and procedures for classifying the reported Mineral Resources were undertaken within the context of the Canadian Securities Administrators NI 43-101.*
7. *The model is reported above a surface based on the NPVS shell from a US$1,500 gold price pit optimisation run to support assumptions relating to reasonable prospects of eventual economic extraction.*
8. *Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. The estimate of Mineral Resources may be materially affected by environmental, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues.*
9. *Mineral Resources have been reported inclusive of Mineral Reserves, where applicable.*
10. *No Mineral Reserves have been estimated for the Ouaré, West Pit 1 and LeDuc deposits.*

The grade vs. tonnage curves for the Indicated Mineral Resources and Inferred Mineral Resource categories of each deposit are shown in Figure 176 to Figure 185.

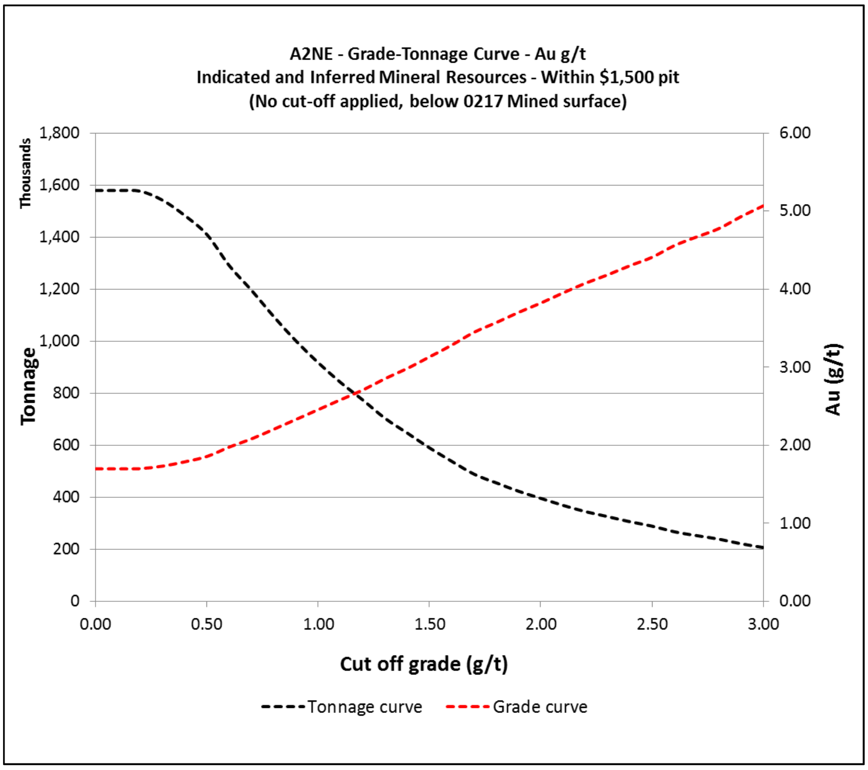


Figure 176: A2NE grade-tonnage curve

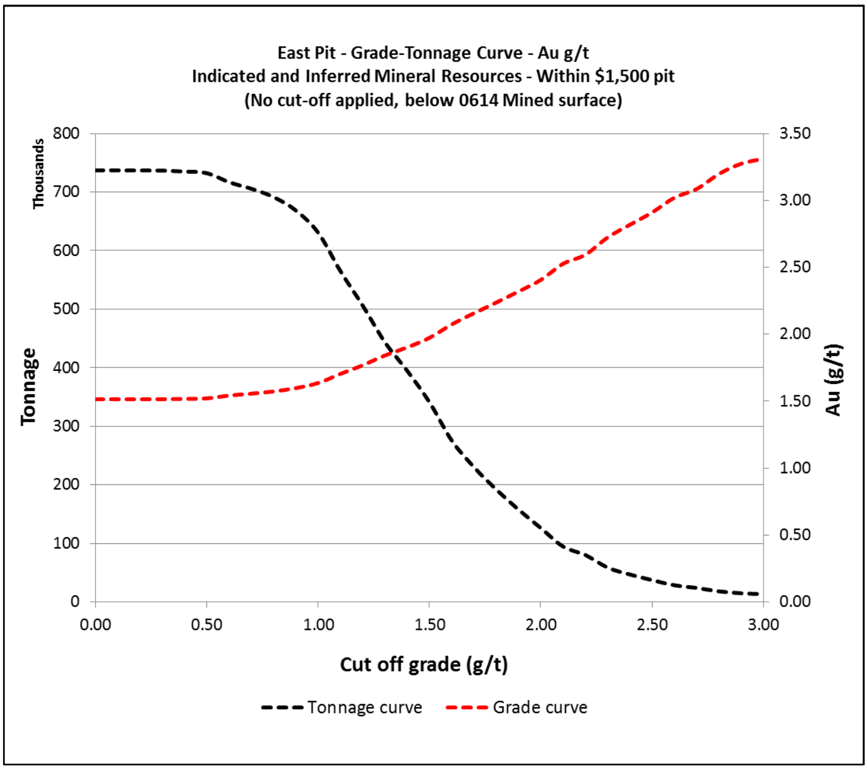


Figure 177: East Pit grade-tonnage curve

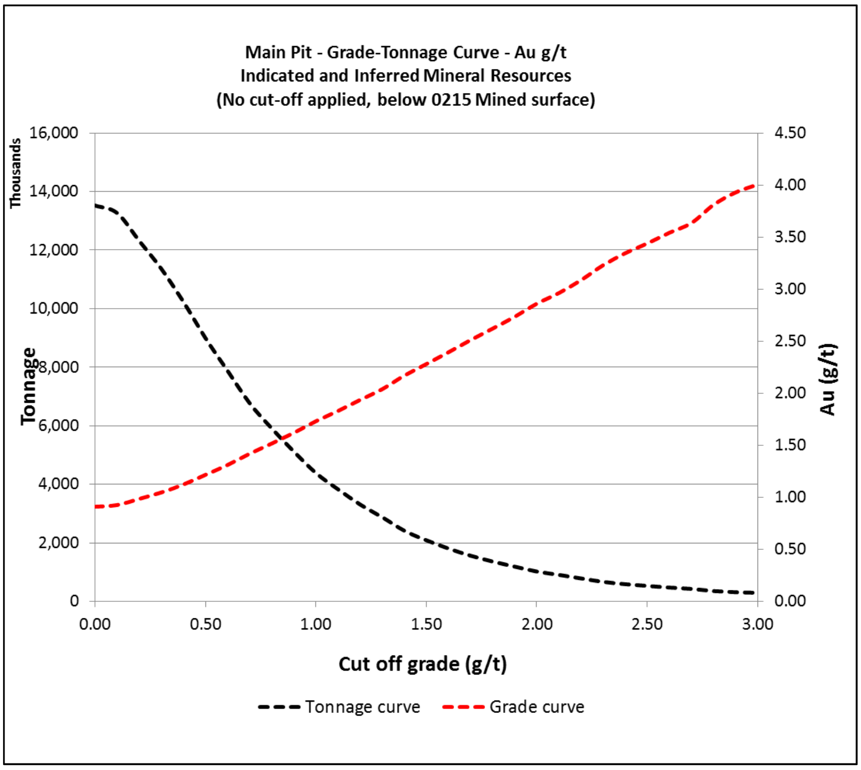


Figure 178: Main Pit grade-tonnage curve

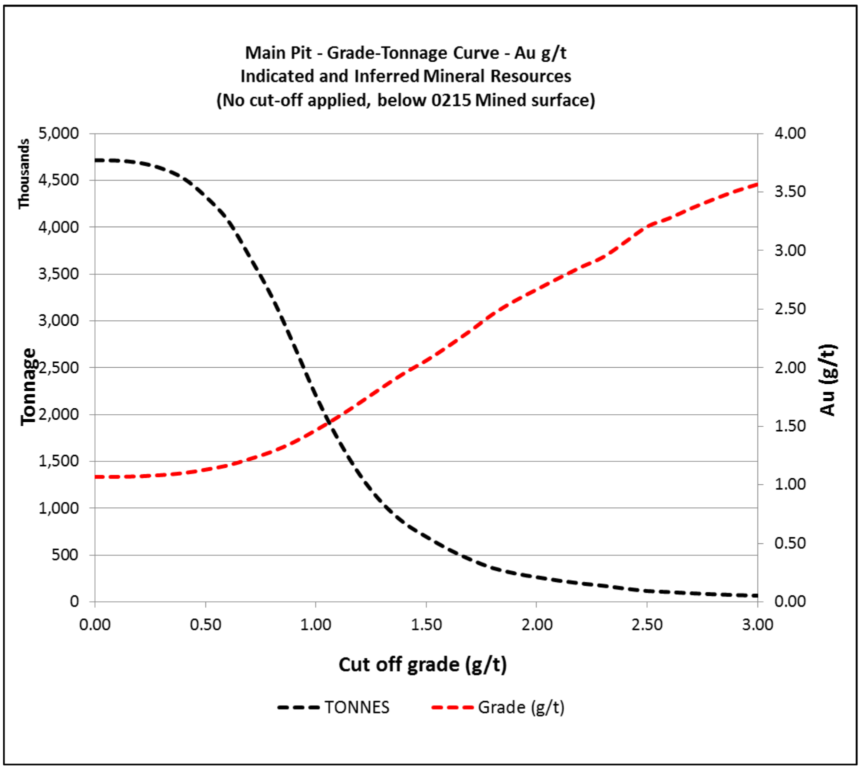


Figure 179: NTV grade-tonnage curve

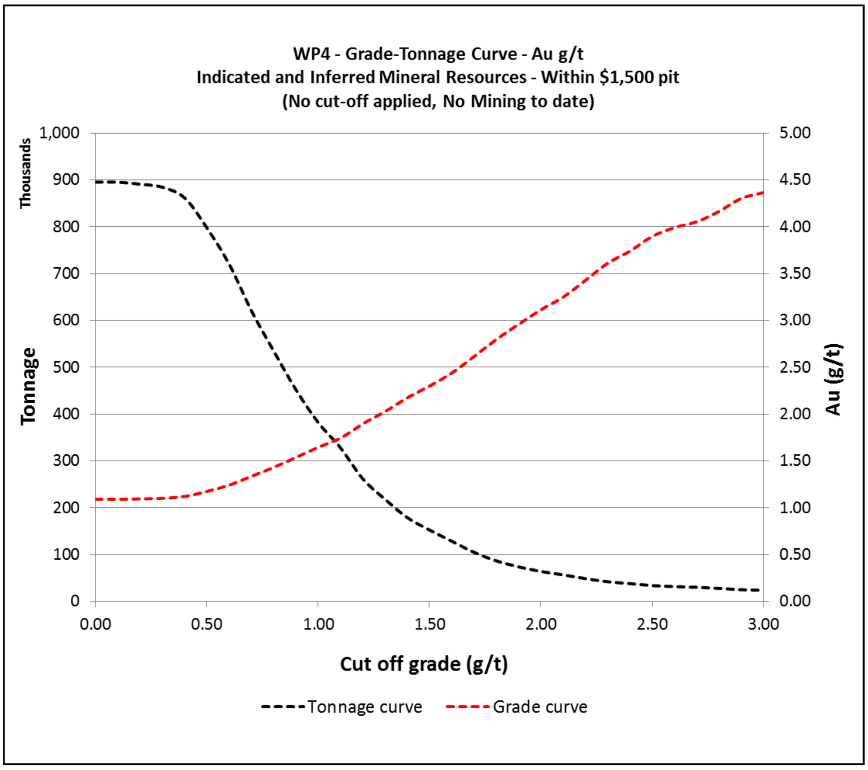


Figure 180: West Pit 4 grade-tonnage curve

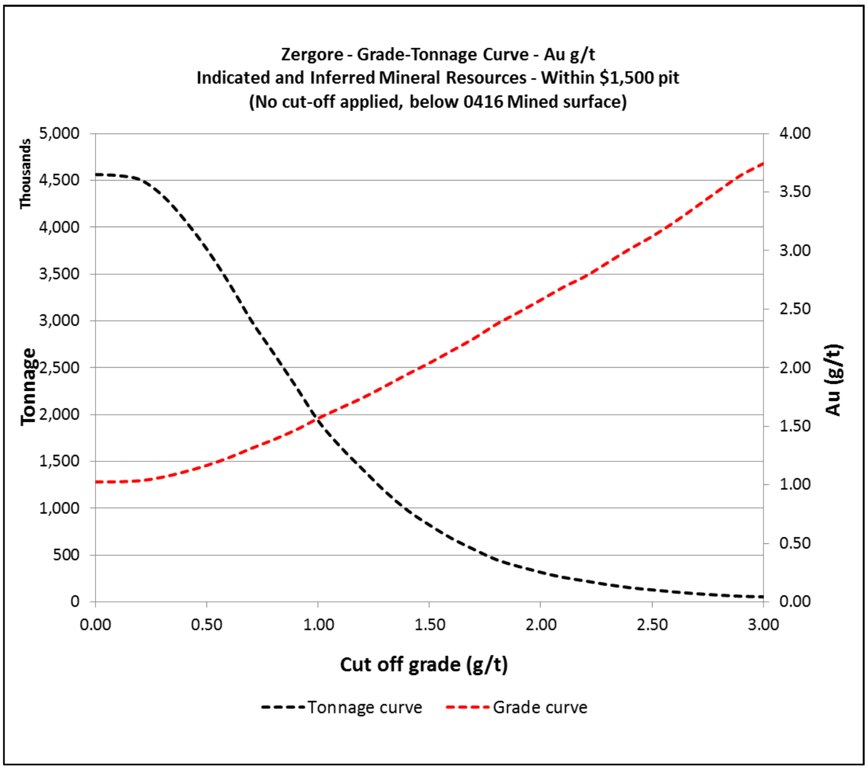


Figure 181: Zergoré grade-tonnage curve

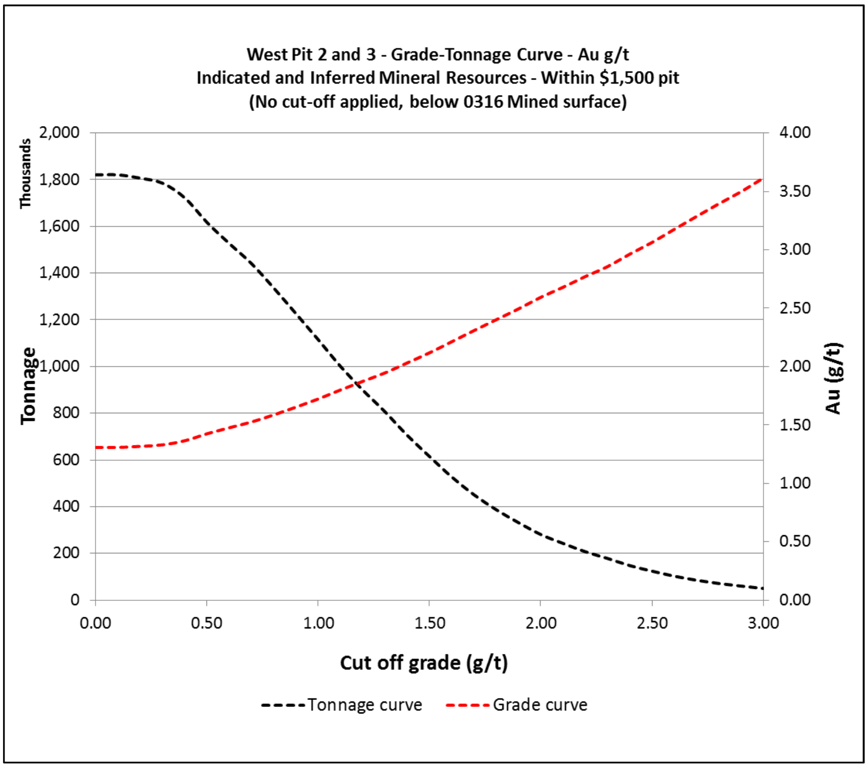


Figure 182: West Pit 2 and 3 grade-tonnage curve

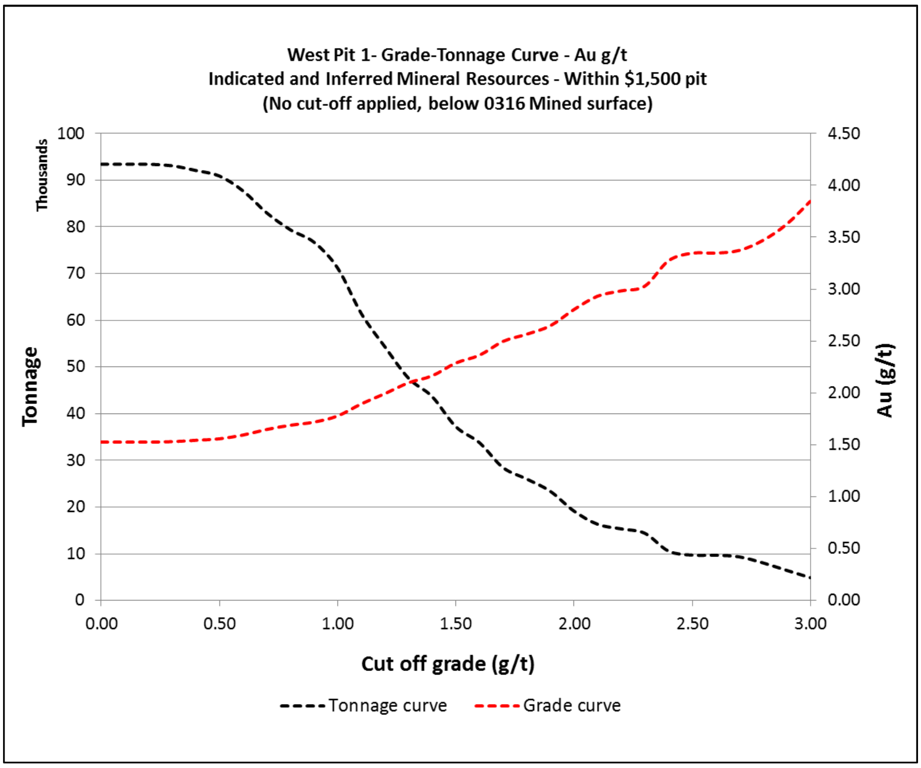


Figure 183: West Pit 1 grade-tonnage curve

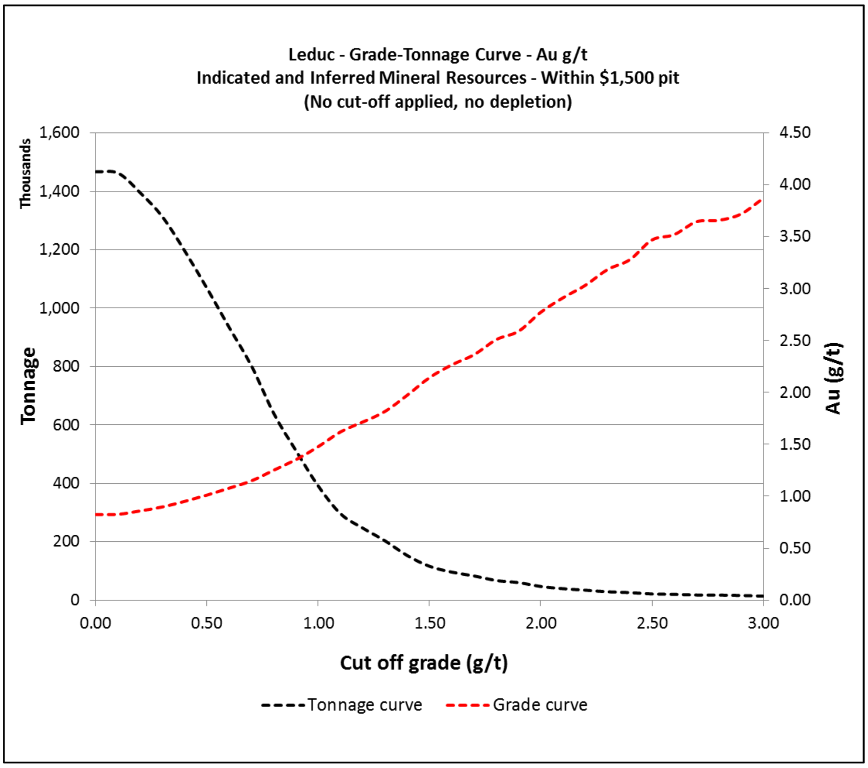


Figure 184: LeDuc grade-tonnage curve

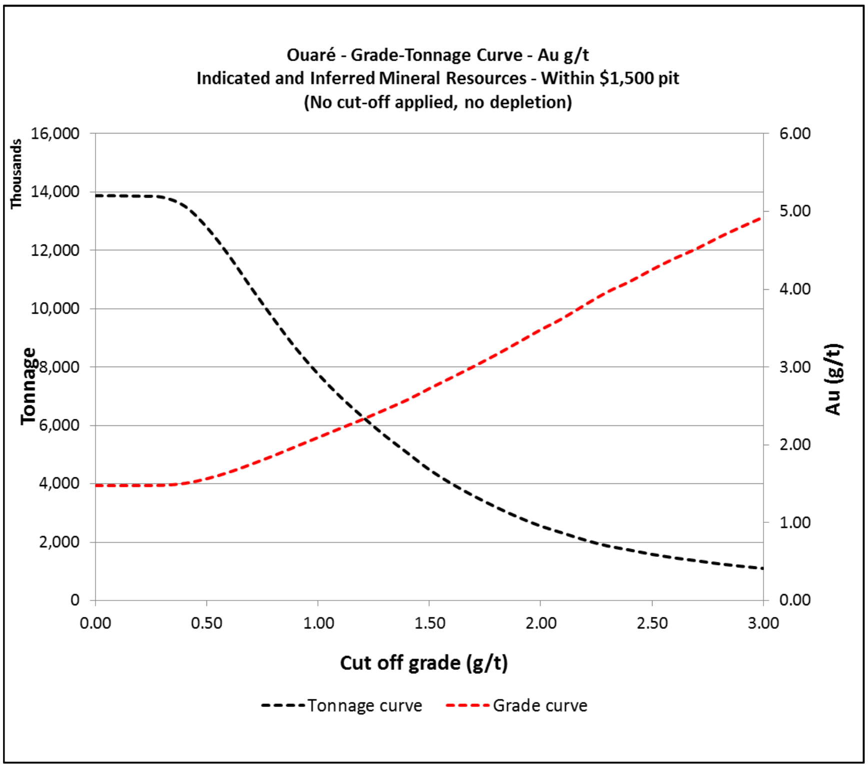


Figure 185: Ouaré grade-tonnage curve

14.9 Comparison with Previous Estimates

The previous MRE was reported by Endeavour as at 31 December 2014 (effective date), and is contained within the 2015 Technical Report. The Mineral Resource Statement from 2014, 2017 and percentage differences between the two is presented in Table 84. The reasons for changes per deposit are summarised in Table 83, subject to the limitations and assumptions outlined above.

Limitations to the comparison are as follows:

- CSA Global was not provided with the previous resource models as reported in the 2015 Technical Report. As such, the comparisons are based on the Resource numbers as reported (Endeavour, 2015).
- CSA Global did not receive the data used in the 2014 MRE so the conclusions reached about additional data used in the current MRE has been derived from the MRE data table previously reported in the 2015 Technical Report (Endeavour, 2015).
- CSA Global has not been able to quantify how much mining has taken place since the previous MRE, because no pit surveys as at 31 December 2014 have been supplied.

The following changes are applicable to all deposits:

- The reporting cut-off has increased slightly from 0.50 g/t to 0.55 g/t Au.
- The resource shells are different for all deposits. It is understood that all those used to constrain the 2014 models used a gold price of US$1,500/oz, as is the case with the current resource, the remaining pit optimisation parameters were not supplied, so it is not possible to attribute the changes to differences in parameters, or if it was solely differences in the underlying models that drove these changes.

The total Measured and Indicated Mineral Resources (M&I) has decreased by 1.4 Mt (8%) for a decrease in metal of 109,000 oz (13%). Total Inferred Mineral Resources have increased by 12.9 Mt (366%) for an increase in metal of 500,000 oz (352%).

The total Mineral Resource has increased by 8.7 Mt for 390,000 oz, resulting in a 44% increase in tonnes, and a 41% increase in ounces of metal, for approximately equivalent grade. Note: the numbers presented here are at the respective reporting cut-off grades, i.e. 0.50 g/t Au for the 2014 MRE and 0.55 g/t Au for the current MRE.

Measured Mineral Resources have not been classified at any deposit in Youga or Ouaré which is a departure from the previous MRE. CSA Global has not received sufficient information to confirm, but it has been assumed that for the deposits that have had mining since December 2014, that much of the material that had been classified as Measured Mineral Resources, has been mined off.

In addition, Measured Mineral Resources have not been classified for the following reasons:

- At Ouaré, there has been depletion at surface by artisanal mining. The locations of these pits have not been picked up and therefore represent a risk to the Mineral Resource at surface.
- At West Pit 4 and Ouaré, and the unmined material at Zergoré, A2NE and East Pit, it is the opinion of CSA Global, that the grade continuity is not sufficient for Measured Mineral Resources – i.e. geological evidence is derived from detailed and reliable exploration, sampling and testing and is not sufficient to confirm geological and grade or quality continuity between points of observation. It is likely that the nature of grade variability West Pit 4 and Ouaré are such that Measured Mineral Resources may not be possible prior to production drilling and mining.
- Insufficient work has been carried out using production/GC data and/or reconciliation to inform how reliable the MRE has been to date, which is vital information for these types of deposits.

Table 83: Key changes between 2014 MRE and 2017 MRE

Deposit	Mining	Drilling	Changes to interpretation	Bulk density	Summary
Main Pit	February 2015	No additional drilling.	Changes to the mineralisation and weathering models are because of reinterpretation and extension below the current mined pit surface. Previously, grade shells were produced at a 0.5 g/t cut-off, with a minimum width interpretation of 1 m to 2 m, depending on continuity and grade of the mineralisation (Endeavour, 2015). The current grade shells were also modelled on mineable intercepts at a cut-off of 0.25 g/t with a minimum true thickness of 2 m.	For the 2014 MRE, a fresh BD (2.70 t/m^3) was assigned to all material. For the current MRE, CSA Global has applied lower BD for oxide (2.00 t/m^3) and transitional (2.20 t/m^3) material, but slightly higher BD for fresh material (2.72 t/m^3). The effect is likely to be not material, since most of the unmined parts of the deposit is in fresh material.	M&I increase of 2 Mt for 76,000 oz. Inferred increase of 737,000 t for 30,000 oz. Total increase of 2.75 Mt for 106,000 oz.
Zergoré	April 2016	37 drillholes for 2,277 m. These do not include GC, blast holes, rip lines or face mapping since the previous MRE.	Changes to the mineralisation and weathering models are as a result of the additional drilling. Furthermore, grade shells were previously produced at a 0.5 g/t cut-off, with a minimum width interpretation of 1 m to 2 m, depending on continuity and grade of the mineralisation (Endeavour, 2015). The current grade shells were modelled on mineable intercepts at a cut-off of 0.25 g/t, down to 0.1 g/t in some instances, with a minimum true thickness of 2 m.	For the 2014 MRE, the BD applied were 2.19 t/m^3 for oxide, 2.67 t/m^3 for transitional and 2.70 t/m^3 for fresh material. For the current MRE, CSA Global has applied lower BD for transitional (2.46 t/m^3) material, but similar BD for oxide (2.19 t/m^3) and fresh (2.71 t/m^3) material.	M&I increase of 340,000 t for 15,000 oz. Inferred increase of 46,000 t for 2,000 oz. Total increase of 390,000 t for 70,000 oz.
NTV	April 2016	37 RC holes.	No change in strategy.	For the 2014 MRE, the BD applied were 1.80 t/m^3 for overburden, 2.50 t/m^3 for oxide, 2.67 t/m^3 for transitional and 2.70 t/m^3 for fresh material. For the current MRE, CSA Global has applied higher BD for overburden (2.08 t/m^3), lower BD for oxide (2.23 t/m^3) and transitional (2.46 t/m^3) material. The effect is likely to be not material, since most of the unmined parts of the deposit are in fresh material.	M&I increase of 340,000 t for 15,000 oz. Inferred increase of 46,000 t for 2,000 oz. Total increase of 390,000 t for 70,000 oz.

Deposit	Mining	Drilling	Changes to interpretation	Bulk density	Summary
A2NE	February 2017	127 drillholes for 5,447 m.	Changes to the mineralisation and weathering models are as a result of the additional drilling. Furthermore, grade shells were previously produced at a 0.5 g/t cut-off, with a minimum width interpretation of 1 m to 2 m, depending on continuity and grade of the mineralisation (Endeavour, 2015). The current grade shells were modelled on mineable intercepts at a cut-off of 0.25 g/t with a minimum true thickness of 2 m.	Following review of all available density data, changes were made to the BD applied to the MRE. For the 2014 MRE, the BD applied were 2.53 t/m^3 for oxide, 2.59 t/m^3 for transitional and 2.70 t/m^3 for fresh material. For the current MRE, CSA Global has applied lower BD for oxide (2.23 t/m^3) and transitional (2.46 t/m3) material, but slightly higher BD for fresh material (2.74 t/m^3).	M&I decrease of 133,000 t for an increase of 5,000 oz. Inferred increase of 50,000 t for 3,000 oz. Total decrease of 83,000 t for an increase of 8,000 oz.
East Pit	No additional mining since June 2014	No additional drilling.	No change in strategy.	For the 2014 MRE, a fresh BD (2.70 t/m^3) was assigned to all material. For the current MRE, CSA Global has applied lower BD for oxide (2.00 t/m^3) and transitional (2.20 t/m^3) material, but slightly higher BD for fresh material (2.72 t/m^3). The effect is likely to be not material, since most of the unmined parts of the deposit is in fresh material.	M&I increase of 344,000 t for 15,000 oz; Inferred increase of 46,000 t for 2,000 oz Total increase of 389,000 t for 17,000 oz
West Pit 1	March 2016	GC holes were used in 2017 in the absence of sufficient exploration drilling below pit surface.	Changes to the mineralisation and weathering models are as a result of the additional drilling. Furthermore, grade shells were previously produced at a 0.5 g/t cut-off, with a minimum width interpretation of 1 m to 2 m, depending on continuity and grade of the mineralisation (Endeavour, 2015). The current grade shells were modelled on mineable intercepts at a cut-off of 0.25 g/t with a minimum true thickness of 2 m.	For the 2014 MRE, a fresh BD (2.70 t/m^3) was assigned to all material. For the current MRE, CSA Global has applied lower BD for oxide (2.00 t/m^3) and transitional (2.40 t/m^3) material. The effect is likely to be not material, since most of the unmined parts of the deposit is in fresh material.	M&I decrease of 49,000 t for 3,000 oz. Inferred increase of 83,000 t for 4,000 oz. Total increase of 34,000 t for 1,000 oz.
West Pit 2 and 3	March 2016	No additional drilling.	Grade shells were previously produced at a 0.5 g/t cut-off, with a minimum width interpretation of 1 m to 2 m, depending on continuity and grade of the mineralisation (Endeavour, 2015). The current grade shells were modelled on mineable intercepts at a cut-off of 0.25 g/t with a minimum true thickness of 2 m.	For the 2014 MRE, a fresh BD (2.70 t/m^3) was assigned to all material. For the current MRE, CSA Global has applied lower BD for oxide (2.00 t/m^3). The effect is likely to be not material, since most of the unmined parts of the deposit is in fresh material.	M&I increase of 392,000 t for no change in metal. Inferred increase of 297,000 t for 11,000 oz. Total increase of 690,000 t for 10,000 oz.

Deposit	Mining	Drilling	Changes to interpretation	Bulk density	Summary
West Pit 4	Maiden Mineral Resource 2017.				M&I increase of 336,000 t for 17,000 oz. Inferred increase of 430,000 t for 13,000 oz. Total increase of 767,000 t for 30,000 oz.
Youga Stockpile	No Mineral Resource stated in 2017.				M&I decrease of 1.9 Mt for 58,000 oz. No change in Inferred.
LeDuc	No depletion	No additional drilling.	Grade shells were previously produced at a 0.5 g/t cut-off, with a minimum width interpretation of 1 m to 2 m, depending on continuity and grade of the mineralisation (Endeavour, 2015). The current grade shells were modelled on mineable intercepts at a cut-off of 0.25 g/t with a minimum true thickness of 2 m.	For the 2014 MRE, a fresh BD (2.70 t/m^3) was assigned to all material. For the current MRE, CSA Global have applied lower BD for oxide (2.20 t/m^3) and transitional (2.40 t/m^3). The effect is likely to be not material, since most of the unmined parts of the deposit is in fresh material.	No change in M&I. Inferred increase of 778,000 t for 23,000 oz.
Ouaré	No depletion	68 drillholes for 8,967 m.	Changes to the mineralisation and weathering models are as a result of the additional drilling. Furthermore, grade shells were previously produced at a 0.5 g/t cut-off, with a minimum width interpretation of 1 m to 2 m, depending on continuity and grade of the mineralisation (Endeavour, 2015). The current grade shells were modelled on mineable intercepts at a cut-off of 0.25 g/t with a minimum true thickness of 2 m.	CSA Global do not know what previous density was used for Ouaré. The current MRE uses the following: for overburden (2.00 t/m^3), oxide (2.20 t/m^3), transitional (2.40 t/m^3) and fresh (2.74 t/m^3) based on density data received.	M&I decrease of 1.3 Mt for 79,000 oz. Inferred increase of 6.6 Mt for 379,000 oz. Total increase of 5.3 Mt for 300,000 oz.

Table 84: Youga and Ouaré – Mineral Resource estimate comparison – 31 December 2014 vs. 28 February 2017

Deposit	Model	Measured			Indicated			M&I			Inferred			Total		
		kt	Au g/t	koz	kt	Au g/t	koz	kt	Au g/t	koz	kt	Au g/t	koz	kt	Au g/t	koz
A2 Main	MRE 2014	432	2.36	33	513	2.24	37	946	2.29	70	82	2.23	6	**1,027**	**2.29**	**76**
	MRE 2017				2,962	1.53	146	2,962	1.53	146	819	1.36	36	**3,780**	**1.49**	**181**
	% Difference				477%	-32%	294%	213%	-33%	109%	904%	-39%	517%	**268%**	**-35%**	**140%**
A2 East	MRE 2014	223	1.87	13	109	1.52	5	332	1.76	19	4	1.08	0	**335**	**1.74**	**19**
	MRE 2017				675	1.55	34	675	1.55	34	50	1.21	2	**725**	**1.53**	**36**
	% Difference				522%	2%	537%	104%	-12%	81%	1203%	12%	1829%	**116%**	**-12%**	**90%**
A2W Z1	MRE 2014	24	2.08	2	25	1.45	1	49	1.90	3	6	2.00	0	**55**	**1.92**	**3**
	MRE 2017										89	1.58	5	**89**	**1.58**	**5**
	% Difference				-100%	-100%	-100%	-100%	-100%	-100%	1383%	-21%	1029%	**62%**	**-18%**	**33%**
A2W Z2	MRE 2014	186	1.93	12	411	2.07	27	597	2.03	39	20	1.83	1	**617**	**2.02**	**40**
	MRE 2017				572	1.46	27	572	1.46	27	169	1.46	8	**741**	**1.46**	**35**
	% Difference				39%	-30%	-2%	-4%	-28%	-31%	766%	-20%	618%	**20%**	**-28%**	**-14%**
A2W Z3	MRE 2014	134	2.45	11	88	3.31	9	222	2.79	20	44	2.53	4	**266**	**2.75**	**24**
	MRE 2017				639	1.53	32	639	1.53	32	192	1.16	7	**831**	**1.45**	**39**
	% Difference				627%	-54%	236%	189%	-45%	58%	336%	-54%	98%	**213%**	**-47%**	**65%**
Zergoré	MRE 2014	1,525	1.64	80	1,436	1.43	66	2,961	1.54	147	918	1.60	47	**3,879**	**1.55**	**194**
	MRE 2017				2,573	1.20	99	2,573	1.20	99	995	1.22	39	**3,568**	**1.20**	**138**
	% Difference				79%	-16%	50%	-13%	-22%	-32%	8%	-24%	-17%	**-8%**	**-23%**	**-29%**
NTV	MRE 2014	1,605	1.13	58	596	1.20	23	2,201	1.15	81	219	1.26	9	**2,421**	**1.16**	**90**
	MRE 2017				1,879	1.10	67	1,879	1.10	67	1,454	1.31	61	**3,333**	**1.19**	**128**
	% Difference				215%	-8%	189%	-15%	-4%	-18%	563%	4%	587%	**38%**	**3%**	**42%**
A2NE	MRE 2014	21	2.93	2	971	1.54	48	992	1.57	50	457	1.72	25	**1,448**	**1.62**	**75**
	MRE 2017				858	1.98	55	858	1.98	55	507	1.75	29	**1,365**	**1.90**	**83**
	% Difference				-12%	29%	14%	-13%	26%	9%	11%	2%	13%	**-6%**	**17%**	**10%**
LeDuc	MRE 2014										222	1.56	11	**222**	**1.56**	**11**
	MRE 2017										1,000	1.05	34	**1,000**	**1.05**	**34**
	% Difference										351%	-33%	203%	**351%**	**-33%**	**203%**

Deposit	Model	Measured			Indicated			M&I			Inferred			Total		
		kt	Au g/t	koz	kt	Au g/t	koz	kt	Au g/t	koz	kt	Au g/t	koz	kt	Au g/t	koz
Ouaré	MRE 2014	1,072	1.14	39	5,368	1.55	268	6,440	1.49	308	571	1.49	27	**7,011**	**1.49**	**335**
	MRE 2017				5,100	1.39	228	5,100	1.39	228	7,214	1.75	406	**12,314**	**1.60**	**635**
	% Difference				-5%	-10%	-15%	-21%	-7%	-26%	1163%	18%	1383%	**76%**	**8%**	**89%**
Stockpile	MRE 2014	1,919	0.94	58				1,919	0.94	58				**1,919**	**0.94**	**58**
	MRE 2017															
	% Difference															
West Pit 4	MRE 2014															
	MRE 2017				336	1.53	17	336	1.53	17	430	0.94	13	**767**	**1.20**	**30**
	% Difference															
Total	**MRE 2014**	7,319	1.35	317	9,696	1.58	494	17,016	1.48	812	2,773	1.59	142	**19,788**	**1.50**	**952**
	MRE 2017				15,595	1.40	703	15,595	1.40	703	12,918	1.54	639	**28,513**	**1.46**	**1,342**
	% Difference				**61%**	**-11%**	**42%**	**-8%**	**-5%**	**-13%**	**366%**	**-3%**	**352%**	**44%**	**-2%**	**41%**

Note: MRE 2014 reported at 0.50 g/t Au and MRE 2017 reported at 0.55 g/t Au

14.10 Risk – Mineral Resource

Project	Data Management System	Geology	QAQC	Artisinal Workings	Nature of Gold Mineralisation	Dry in-sity bulk density	Topography
Youga	Opportunity to improve on excel and passprot-based data cpature and storage, with a move towards more secure relational database structure to improve intergrity and more efficiencies in data management, storage and security.	No digital geology data provided.	At WP2, high blank failure rate, numerous failutres on CRMs and inadequate quanity of duplicates with poor precision and bias. Mitigated by extensive GC data.		High degree of complexity of gold mineralisation and variability exists at Zergoré	Measured in-situ bulk density not available for most deposits at Youga.	
Ouaré	Opportunity to improve on excel and passprot-based data cpature and storage, with a move towards more secure relational database structure to improve intergrity and more efficiencies in data management, storage and security.	No digital geology data provided.	Contamination: 4% of blanks having values > 10xDL; Drill holes with multiple failutes, implying comtamination of assay results.	Significant artisinal activity has been documented but no pits have been surveyed. Surface metal may be at risk.	Grade variability is high both in terms of intra and inter-composite variabilty and so Indicated category is as high as is likely to be achieved here, and even that may be open to question in places.	Oxide and transitional density is not based on actual measured values, due to likely oversampling of competent material in core. This leads to uncertainty in the density values used for approx. 30% of the mineralisation, but based on CSA Global's experience, these values are unlikely to be too high.	

Risk Category	Definition
(red)	Fatal Flaw (significant material risk to metal)
(orange)	Moderate (metal may be at risk)
(yellow)	Low (unlikely to have material affect on metal)
(green)	Insignificant (errors detected, but immaterial)
(blue)	Potential upside or opportunity

15 Mineral Reserves

15.1 Key Assumptions

The Mineral Reserves for Youga and Ouaré are supported by a Life of Mine (LOM) plan, which was developed using the following key parameters.

15.1.1 Pit Slopes

The overall slope angle (OSA) for the open pit was set to 38 degrees for the weathered material (Regolith and Oxide) and 45° for the Transition and Fresh material. These material types were coded into the block model.

15.1.2 Metal Price and Selling Cost

The pit limit design and Reserve estimate are based on a metal price of US$1,250/Troy Oz. A deduction of 4% was made to account for Royalty payments.

15.1.3 Operating Costs

The waste and ore-based costs applied for pit optimisation and mine planning were based on a combination of a Mine Cost model developed by CSA Global and the 2017 Budget costs supplied by Avesoro Holdings. The mining cost (inclusive of ore control, geology, lab services, and a mining equipment-sustaining capital allowance) was US$2.0/t, plus an appropriate incremental haulage cost per bench. The total ore-based costs (including processing and G&A) are US$22.0/t ore.

Ouaré ore-based costs include an additional US$4.0/t overland ore haulage cost from Ouaré to the processing plant at Youga.

15.1.4 Pit Optimisation and Phase Design

The standard Lerch-Grossman (LG) pit optimisation was run to determine the economic limits for the deposit. The block value for ore was estimated from the revenue and costs discussed above and Inferred Resources were treated as waste.

The start face was assumed to be 1st March and all of the Reserves were depleted to the 28th February 2017.

A series of pit shells were determined by varying the Price Factor in steps of 2% up to a maximum of 100%. The pit limit was selected at a Price Factor of 100% in order to maximise the Reserve and a set of pushbacks were constructed based on the shells. Suitable minimum mining widths and practical ramp access constraints were applied in the selection of the pushbacks.

15.1.5 Mining Recovery and Dilution

Modifying factors of 90% mining recovery (i.e. 10% ore loss) and 10% waste dilution were included in the estimate of the Mineral Reserves. These were based on relevant mining experience at Youga and the typical configuration of the mineralised zones. It is assumed that the mining method chosen for Ouaré supports the assumptions regarding selective mining to minimise ore loss and waste dilution.

15.1.6 Conversion Factors from Mineral Resource to Mineral Reserve

Mineral Reserves have been modified from Mineral Resources by taking into account geological, mining, processing, and economic parameters and permitting requirements. And are therefore classified in accordance with the CIM Definition Standards for Mineral Resources and Mineral.

15.2 Mineral Reserve Statement

The Mineral Reserve for Youga and Ouaré (Table 85) were converted from the Mineral Resource using the modifying factors discussed in Section 16. All of the Mineral Reserve is classified as Probable based on a Resource Classification of Indicated. Inferred and Unclassified Resources have been excluded from the conversion of Resources to Reserves.

Table 85: Youga and Ouaré Converted Mineral Reserves

Ore Reserve Estimated for the Youga and Ouare Gold Projects, Burkina Faso, as at 28th February 2017

Deposit	Cut-off Grade	Proved			Probable		
		Tonnes Mt	Au Grade g/tAu	Metal Koz	Tonnes Mt	Au Grade g/tAu	Metal Koz
Main Pit	0.70				1.3	1.63	66.6
Zergore	0.70				1.5	1.22	57.1
NTV	0.70				1.2	1.07	41.6
A2NE	0.70				0.6	2.18	38.7
East Pit	0.70				0.5	1.47	22.4
West Pit 2	0.70				0.4	1.34	15.8
West Pit 3	0.70				0.4	1.61	20.2
West Pit 4	0.70				0.3	1.53	12.9
Ouare	0.82				2.6	1.67	141.4
LG Stockpiles					0.4	1.32	17.7
Total					**9.0**	**1.49**	**434.4**

Notes
1. Reporting cut-off grade varies for each deposit as shown
2. The Ore Reserve has been depleted for mining up to 28th February 2017
3. Figures have been rounded to the appropriate level of precision for reporting
4. Due to rounding, some columns or rows may not compute exactly as shown
5. The Ore Reserves are stated as in situ dry metric tonnes
6. The Ore Reserves were prepared under the guidelines of the CIM, for reporting under NI43-101
7. The Ore Reserve is reported at a US$ 1,250 gold price
8. Modifying factors of 90% mining recovery and 10% waste dilution have been applied
9. Probable Reserves were derived from Indicated Resources
10. Ore Reserves are inclusive of Mineral Resources

15.3 Factors affecting the Mineral Reserve Estimate

Factors that may affect the Mineral Reserve estimates include dilution; metal prices; refining, and shipping terms; metallurgical recoveries and geotechnical characteristics of the rock mass; capital and operating cost estimates; and effectiveness of surface and groundwater management.

The Qualified Persons are of the opinion that these potential modifying factors have been adequately accounted for using the assumptions in this report, and therefore the Mineral Resources within the mine plan can be converted to Mineral Reserves. Factors that may affect the assumptions in this report are:

- Commodity price and exchange rate assumptions are important factors that affect revenue and costs. It has been shown that Price is a significant driver to the project economics and that a 10% change in price could result in at least a 10% change in the Reserve.
- Changes in process cost, mining cost or slope angle (±2°) generally have a relatively small impact (approximately 5%) on the estimate of contained metal and confirm that the pit limits are not as sensitive to these parameters as they are to price. This is evident when you look at the plot of cumulative rock tonnes vs. price, which shows an almost linear relationship in the range US$750 to US$1,250/oz.
- The mine plan has initially been limited by an assumed annual mill throughput of 1.1 Mt/a, with an uplift of 8% in 2018 with the addition of the oxygen plant. Mill throughput may prove to be higher or lower than this depending on the ore type. This is particularly relevant to the new deposits such as Netiana and Ouaré, as bulk metallurgical tests have not been carried out yet.
- If certain rock types or blends of rock types, have lower throughputs than currently modelled, this would increase the processing cost, which would in turn increase the mill cut-off grade. If all other things held constant, this would tend to reduce the tonnage of the Mineral Reserve and the amount of contained metal. If throughput reductions are significant, this could reduce the size of the economic pit limits, further reducing the Mineral Reserve. Furthermore, a reduction in throughput would delay cash flow, resulting in a negative impact on Project economics.
- Effective surface and groundwater management is important to the safety and productivity of the mining operation. Although this is only really an issue during the rainy season, if the currently planned water management methods prove to be inadequate, additional sumps and pump systems may be required. This would add to the capital and operating costs, resulting in a negative impact on Project economics and a potential reduction in the Mineral Reserves.
- Transport of ore between the Ouaré project and the process plant at Youga is a key part of the plan and relies on the efficient planning of the transport route, good road maintenance and proactive management of community relations. The 44 km route will potentially pass near to existing villages and there is a high risk of road traffic accidents. Major public unrest due to injury or fatality could disrupt the transport of ore to Youga.

16 Mining Methods

16.1 Mining Method

The proposed method of mining for Youga and Ouaré is a conventional open pit method using drilling and blasting, loading with excavators, and hauling with articulated dump trucks. The ore will be extracted by small hydraulic excavator (30 t to 40 t) to maximise selectivity where the orebody is narrow, and the waste will be loaded by slightly larger hydraulic excavators (70 t to 80 t) to allow for higher productivity.

There is potential for additional Mineral Resources to be exploited by open pit mining methods, although this is dependent on improved project economics and/or reclassification of the Inferred Resources through additional drilling. Consideration of underground mining has not been necessary at this stage of the Project, although if mineralisation were found to continue at depths beyond economic open pit limits then this could be considered in the future.

The evaluation of Youga and Ouaré assumes that the ore will be transported to the main processing facility at Youga. The optimal production rate is therefore constrained by the capacity of this plant, which is nominally set at 1.1 Mt/year. However, provision is made for the addition of an oxygen plant in January 2018, which will increase the plant throughput by 8% to 1.2 Mt/a.

The mining rate varies over the life of the mine, depending on the stripping ratio for the individual deposits or pits. Eight independent mining areas have been identified in this study, namely:

- A2N (East and West).
- Main and East Pit.
- West Pit 2, 3 and 4.
- Zergoré.
- NTV.
- Ouaré.

Note that the cut-off grade applied to each pit depends mainly on the location and transport cost. Other costs (processing, G&A etc.) were constant across all deposits.

16.2 Pit Optimisation

The open pits have been optimised using the geological models and Mineral Resource estimates completed by CSA Global, as well as industry standard methods (pit shell selection, mine design, mine layout) that are based on criteria discussed in the following sections.

16.2.1 Optimisation Parameters and Inputs

Datamine's pit "optimisation" software (NPV Scheduler) was used to determine the pit limit. This software uses the industry standard LG algorithm that has been shown to give near identical results to the Whittle™ pit optimiser.

The input values used in the determination of the pit limits and the development of the mine designs are presented in Table 86. The output from the NPVS optimisation process is used to select the pit limit for each deposit so that subsequent detailed design can be completed, as well as identifying options for subdivision of the pit into stages or pushbacks.

Table 86: Open pit optimisation parameters

Parameter	Unit	Value
Start date		1 March 2017
Overall slope angle – Weathered	degrees	38
Overall slope angle – Transition/Fresh	degrees	45
LOM metal price	US$/Troy oz	1,250
Royalty/Selling cost	%	4.0
Mining cost – reference at pit exit	US$/t mined	2.0
Mining cost increment per 5 m bench	US$/t mined	0.02
Processing cost	US$/t ore	17.0
G&A	US$/t ore	5.0
Process recovery	%	91
Mining recovery	%	90
Mining dilution	%	10
Bench height	m	5
Discount rate	%	10

At Youga and Ouaré there is limited opportunity to create pushbacks or stages within a final pit limit and it has generally only been possible to divide the individual deposits into sub pits that may or may not be contiguous.

It should be noted that the discount rate used in the LG algorithm has no impact on the evaluation of the pit limit or internal pit shells, as the algorithm does not account for the time value of money.

16.2.2 Selling Price

The LOM metal price is based on the World Gold Council Price (http://www.gold.org/investment) for the period 2014 to 2017. The price used in this study was US$1,250/Troy oz, which was agreed with Avesoro as an appropriate price to be used for determining the Mineral Reserves.

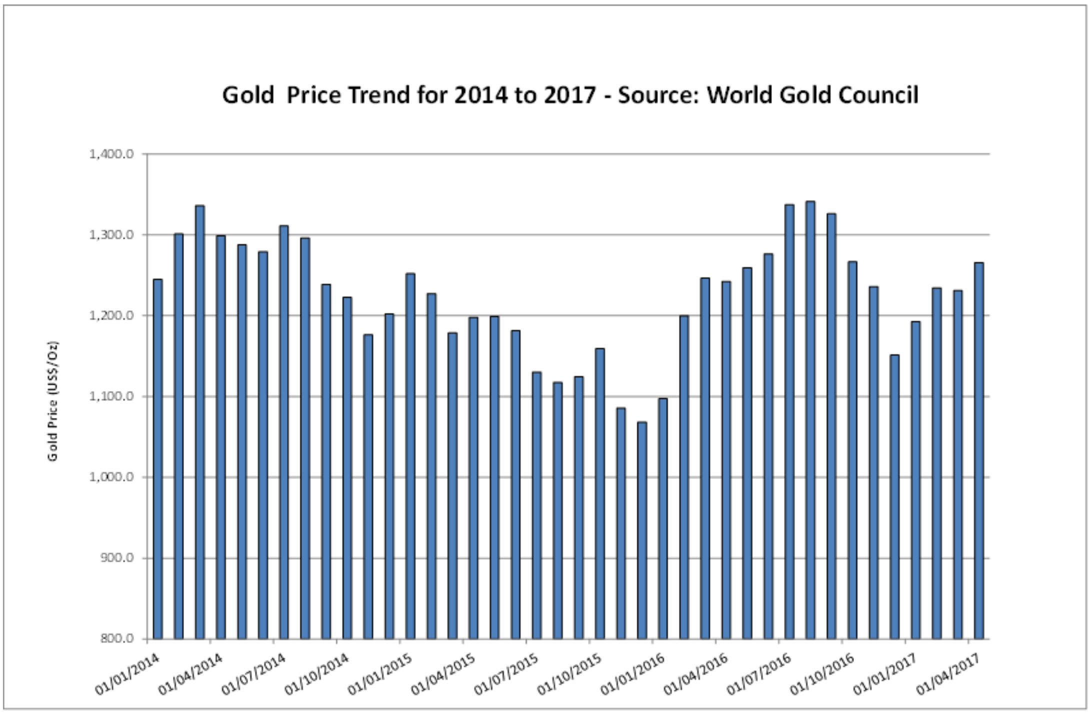


Figure 186: Gold spot price (2014 to 2017)

16.2.3 Pit Shell Selection

Using the parameters listed in Table 86, the optimal pit limit was selected at US$1,250/Troy oz (Price Factor of 1.0) in order to maximise the Mineral Reserve. Whilst there may be an opportunity to reduce the pit limits for individual deposits, it was generally found that the near linear relationship between contained metal and price meant that the optimal pit limit coincided with the pit limit at a Price or Revenue Factor of 1.0.

The results from the pit optimisation of the various deposits are shown below.

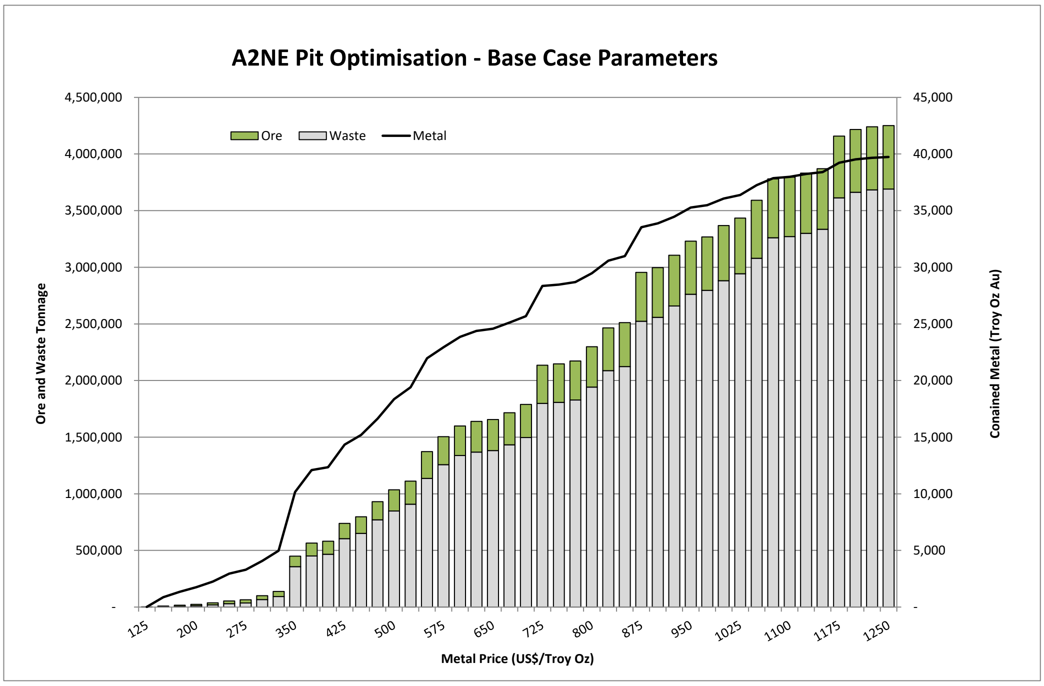


Figure 187: Graph of cumulative ore, waste and contained metal for A2N

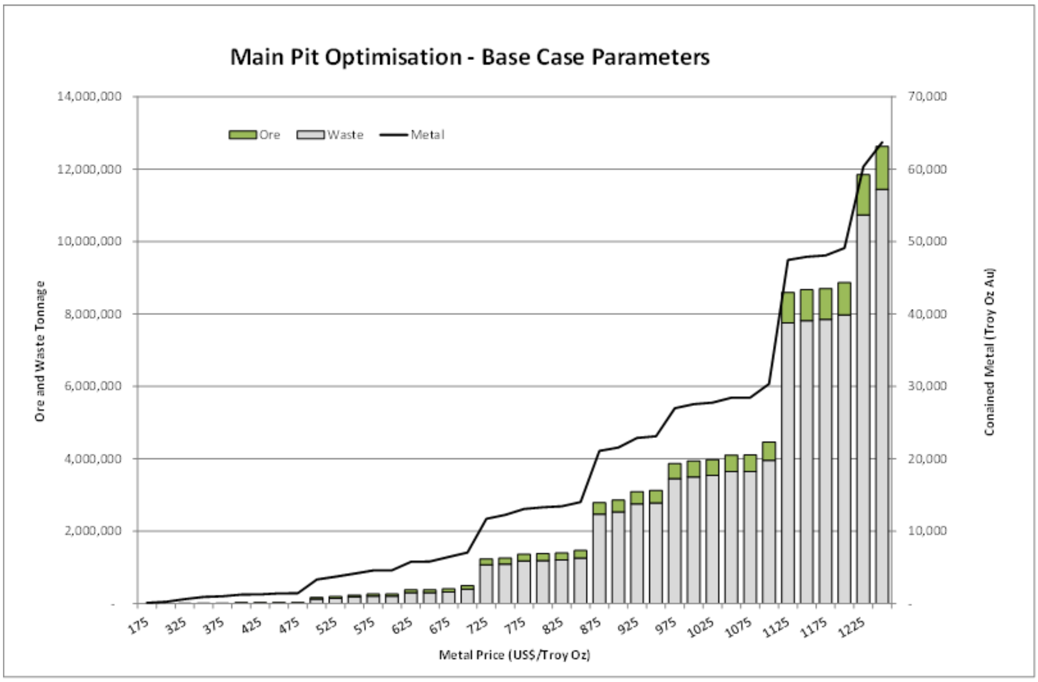


Figure 188: Graph of cumulative ore, waste and contained metal for Main Pit

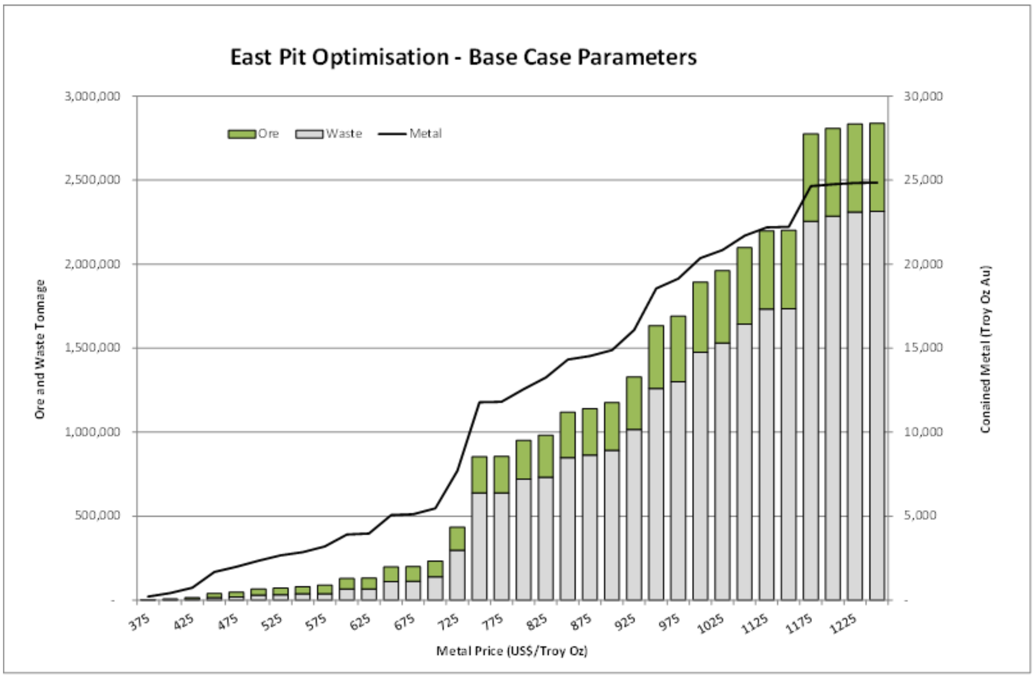


Figure 189: Graph of cumulative ore, waste and contained metal for East Pit

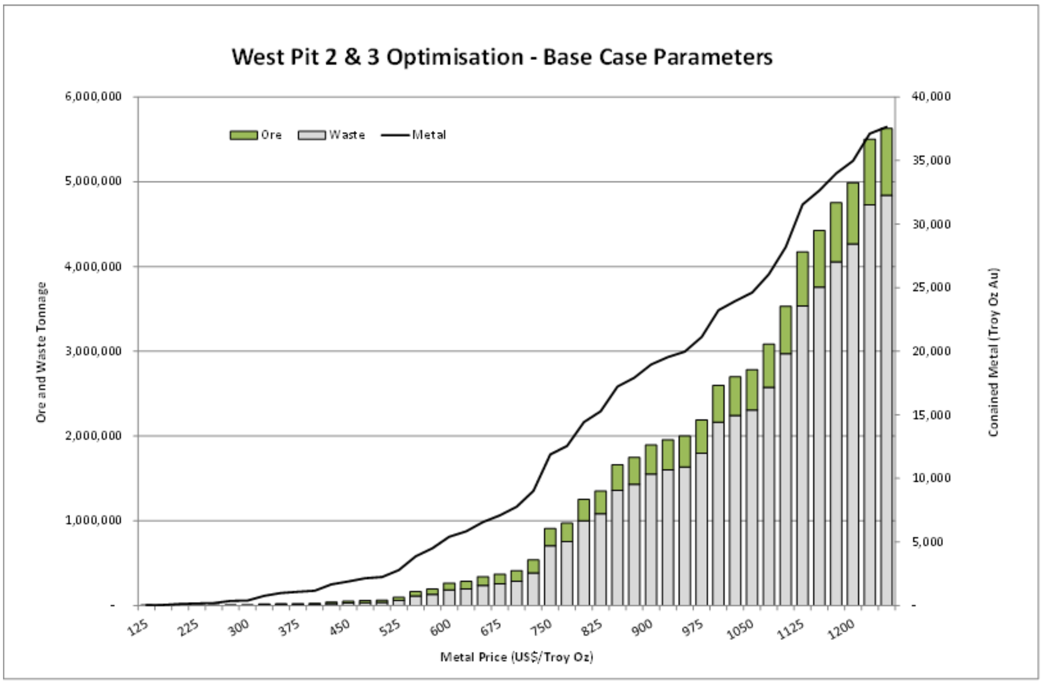


Figure 190: Graph of cumulative ore, waste and contained metal for West Pit 2 and 3

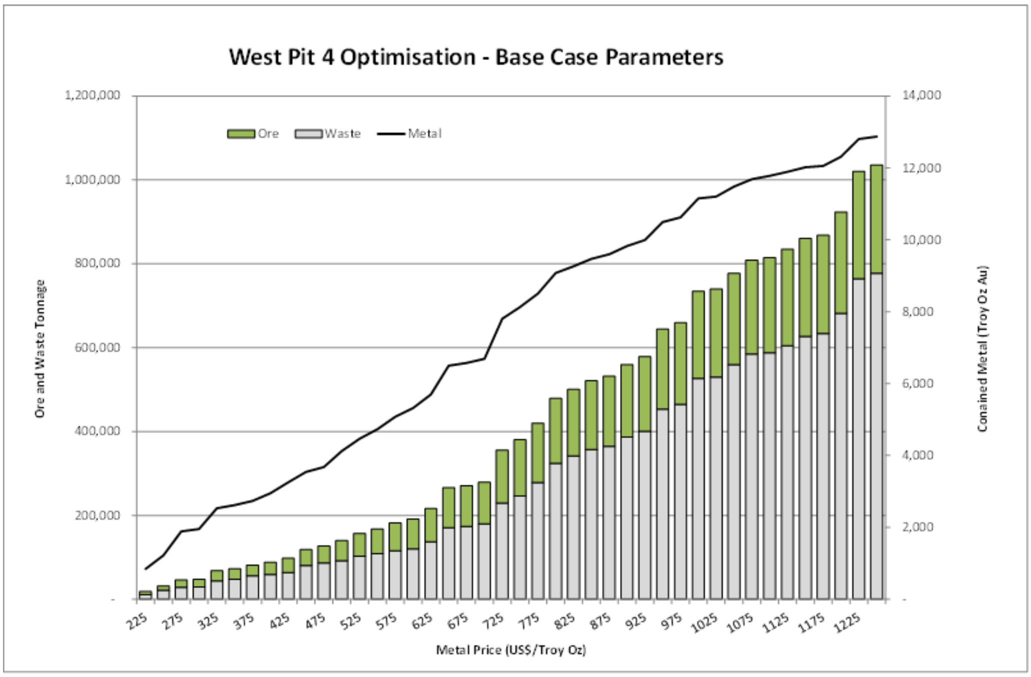


Figure 191: Graph of cumulative ore, waste and contained metal for West Pit 4

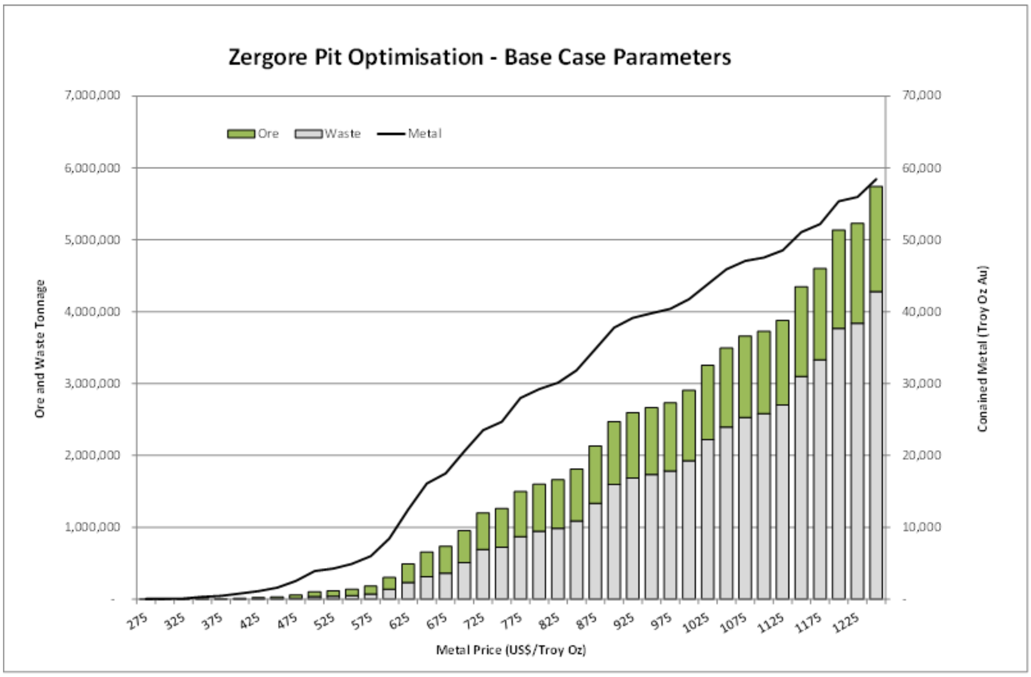


Figure 192: Graph of cumulative ore, waste and contained metal for Zergoré

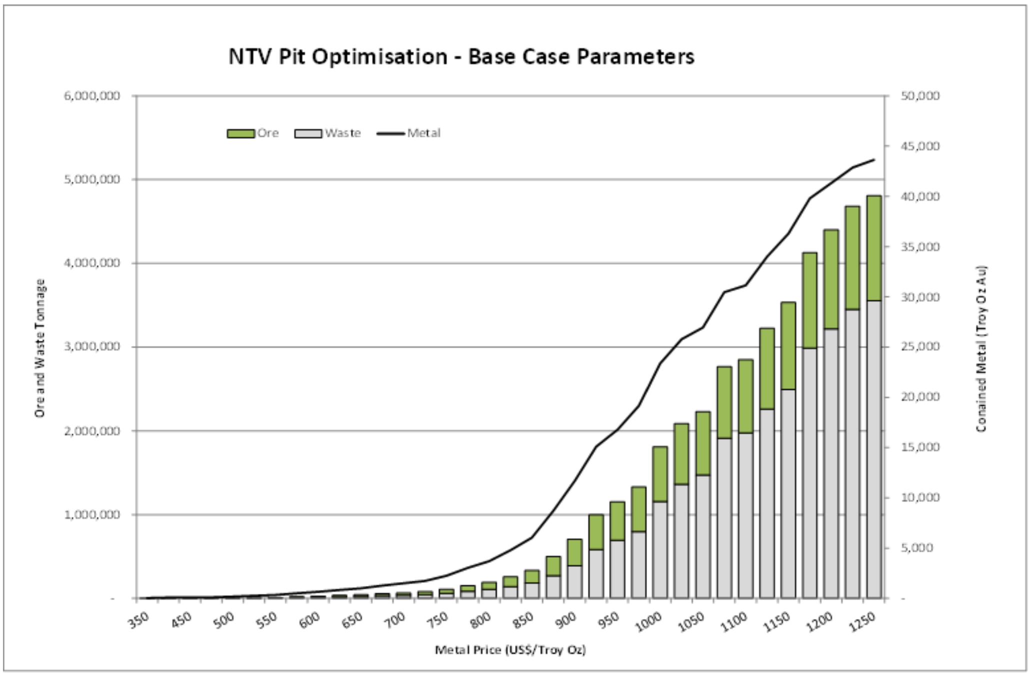


Figure 193: Graph of cumulative ore, waste and contained metal for NTV

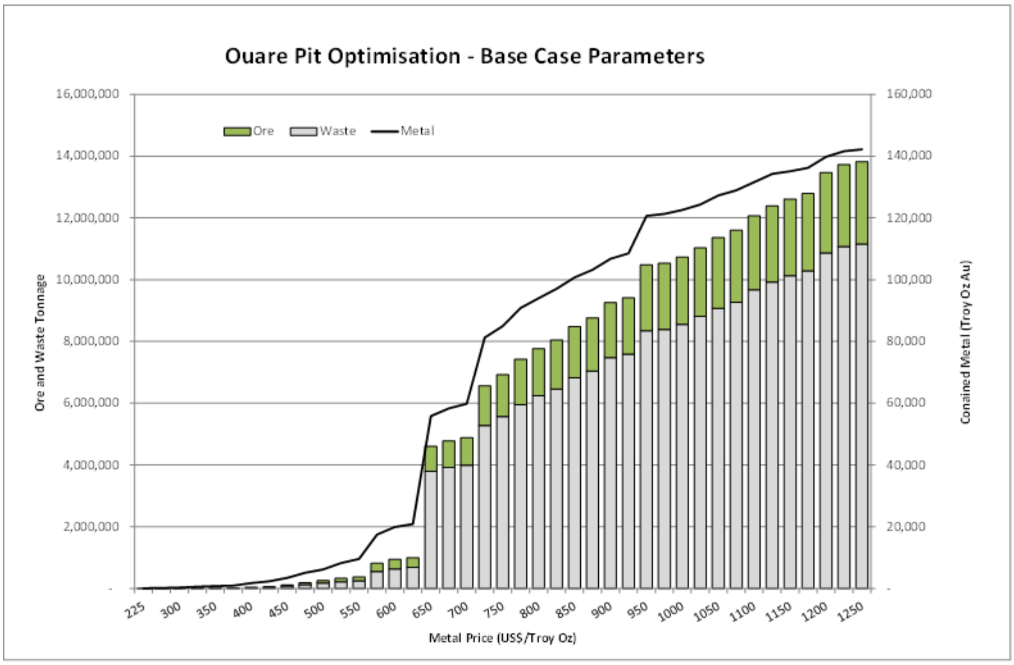


Figure 194: Graph of cumulative ore, waste and contained metal for Ouaré

The Ore Reserves for the selected optimised pits are shown in Table 87. This shows a total Reserve of 8.71 Mt at 1.5 g/t Au. The contained gold was estimated to be in excess of 423,000 troy oz with an average strip ratio of 4.8:1.

Table 87: Ore Reserve for the optimised pits (as at 28 February 2017)

	Ore Reserves as at 28th February 2017 (After Modifying Factors[1])					
	Cut-off (g/t Au)	Waste[3] (tonnes)	Ore (tonnes)	(g/t)	Contained (Troy Oz)	Strip Ratio
A2NE/W	0.70	3,690,630	560,000	2.2	39,738	6.6
East Pit	0.70	2,314,444	524,288	1.5	24,855	4.4
West Pit 2&3	0.70	4,838,743	787,978	1.5	37,639	6.1
West Pit 4	0.70	777,393	257,921	1.6	12,871	3.0
Main Pit	0.69	11,437,557	1,191,669	1.7	63,701	9.6
NTV	0.70	3,551,510	1,255,515	1.1	43,636	2.8
Zergore	0.70	4,280,410	1,461,547	1.2	58,424	2.9
Ouare	0.81	11,150,277	2,666,845	1.7	142,175	4.2
Total		**42,040,964**	**8,705,763**	**1.5**	**423,038**	**4.8**

An analysis was run on each deposit to look at the sensitivity of the optimised pit limit to the following parameters:

- Gold price.
- Process cost.
- Mining cost.
- Overall pit slope angle.

It was noted that a 10% change in process or mining cost, or a 2° change in the overall slope angle, all have a similar impact on the contained metal (Table 88). It was therefore concluded that the Ore Reserve was not particularly sensitive to these parameters.

It was clear that price is the main driver for the majority of the deposits and a 10% change in price resulted in a 13% change in contained metal. This is consistent with the charts of cumulative contained metal versus price where there is a near linear relationship for most deposits. This is supports the notion of selecting the pit at a Price Factor of 1.0.

Table 88: Sensitivity of the optimised pit limit (contained metal)

Optimised Pit Limit - Variance in Contained Metal (Oz Au)								
Deposit	**Price**		**Process Cost**		**Mining Cost**		**Pit Slope**	
	+10%	**-10%**	**+10%**	**-10%**	**+10%**	**-10%**	**+2°**	**-2°**
Youga	**47,268**	**- 51,529**	**- 16,587**	**27,626**	**- 22,248**	**22,524**	**17,853**	**- 21,908**
A2NE	1,293	- 2,092	- 721	928	- 197	564	494	- 192
Main	22,141	- 16,618	- 4,061	11,297	- 14,379	10,176	4,921	- 15,929
East	2,501	- 2,709	- 45	2,106	- 208	2,047	2,289	25
West 2&3	5,529	- 6,669	- 2,582	2,795	- 2,608	2,756	3,358	- 2,309
West 4	740	- 1,163	- 709	485	- 395	201	299	- 284
NTV	5,029	- 10,653	- 3,453	2,990	- 1,812	1,773	1,550	- 153
Zergore	10,036	- 11,624	- 5,014	7,024	- 2,649	5,006	4,941	- 3,066
Ouare	**18,161**	**- 11,459**	**- 4,322**	**6,359**	**- 917**	**2,478**	**1,045**	**546**
Balogo	**514**	**- 1,522**	**- 161**	**186**	**- 425**	**254**	**1,020**	**- 718**
Grand Total	**65,943**	**- 64,510**	**- 21,070**	**34,171**	**- 23,589**	**25,255**	**19,918**	**- 22,079**
Variance	13%	-13%	-4%	7%	-5%	5%	4%	-4%

16.2.4 Cut-off Grade

Using the parameters in Table 86, the cut-off grade was calculated for each deposit. It was found that the cut-off grade for the majority of the deposits could be set to 0.7 g/t Au, the exception being Ouaré where the cut-off was set to 0.82 g/t Au due to the additional cost of transporting the ore to the run of mine (ROM) pad.

The transportation cost between Ouaré and Youga was estimated to be US$4/t hauled for a haul distance of 44 km. The actual route to be taken has not been designed as yet and it may be possible to reduce this distance, which could reduce the cut-off grade.

16.2.5 Stockpiling Strategy

It is assumed that all material above the cut-off grade will be transported to the ROM pad at Youga. This material is then loaded by a front-end loader (FEL) and dumped in the crusher feed bin. The blend is determined by the number of FEL loads from each ROM stockpile (HG, MG, LG and LLG).

Marginal material between 0.5 g/t Au and the cut-off is stockpiled separately as a Resource that could be converted to a Reserve in the future, should it become economic to process.

By segregating the ROM pad into several stockpiles, it is possible to prioritise higher grade material in the early periods. It also provides the opportunity to blend the feed to the plant by controlling the mix of ore from other satellite deposits such as Ouaré and Netiana.

The cut-off grade for Ouaré is slightly raised compared to the deposits at Youga, which means that material classified as Low-Low Grade (LLG) has a grade range of between 0.82 g/t and 1.2 g/t Au.

Marginal material at Ouaré (between 0.5 g/t and 0.82 g/t Au) is stockpiled separately near to the pits. This material is not economic at this time but is a potential Resource should the economics improve. It would be advisable to segregate this stockpile into a high and a low grade portion.

16.3 Geotechnical Investigations

16.3.1 Review of Previous Studies

The Youga pits are located in Burkina Faso, close to its southern border with Ghana. The mine has been in operation for some time and slopes have been established. The slope angles used in the original mine design were specified by Golder Associates (Golder) in a geotechnical report compiled at the onset of the mining operation.

The Golder report describes some limited geotechnical parameters but stops short of detailing rock mass classification values or mechanical properties of the rock types. Golder performed kinematic analyses, based on the quantification of discontinuity orientations, obtained from orientated core. Slope angles were provided for mine design and slope optimisation purposes, based on this information.

A number of site visits were subsequently conducted by SRK, and reports, detailing the observations, conclusions and recommendations, were studied. From these reports, it could be established that some slope instability has been observed since the onset of mining, using the slope angles provided by Golder.

Revised slope angles, described as “preliminary”, are provided by SRK. Although the reports state that the slope angles were obtained from empirical charts, input data used in the design is not described. Furthermore, the report does not reference the empirical design charts that were used to obtain the recommended preliminary slope angles.

It is concluded that additional modelling is required to improve the accuracy of the estimate of the geotechnical parameters so as to improve the reliability of the mine design criteria. The geotechnical parameters also need to be updated with data from ongoing exploration drilling and face mapping.

Although the level of geotechnical data in the design is limited, some experience has been gained, through the mining that has been done to date, which does allow for a basic understanding of the risk associated with the slope design.

16.3.2 Recommendations

Based on the information provided, it is concluded that mining operations should be planned on the available slope angle specification, recommended by SRK and detailed in Table 89.

Table 89: Preliminary slope angles provided by SRK.

Design Elements	Initial SRK Design Slope Parameters	Final SRK Design Slope Parameters
Bench Height (m)	10	10
Batter Angle (°)	70	70
Berm Width (m)	7	7m to -70m depth then 5m
Stack Height (m)	50	50
Stack Angle (°)	46	51 (49° over upper 70m)
No. of Stacks	4	4
Overall Angle	39	41

In order to improve the reliability of the mine design criteria, additional geotechnical parameters will have to be collated from exploration drilling and face mapping. These parameters must then be used in a logical methodology to establish stable slope angles.

16.4 Mine Design Parameters

16.4.1 Design Criteria

The parameters proposed by CSA Global (Table 90) are considered reasonable at this level of study for the reporting of Reserves. However, CSA Global recommends reviewing these parameters prior to mining.

Table 90: Pit design parameters

		Youga Main	Youga East	WP2B	WP2A	WP3	WP4	Zergoré	NTV	A2NE	Ouaré
Batter angle	Weathered	45	45	40	40	45	45	42	40	55	40
	Rest	65	65	65	65	65	65	65	70	75	65
Berm height	Weathered	10	10	10	10	10	10	10	10	10	10
	Rest	10	10	10	10	10	10	10	10	10	10
Berm width	Weathered	4	4	5	7	4	4	4	4	4	7
	Rest	4	4	5	5	4	4	4	4	4	5
Inter ramp angle	Weathered	36	36	31	28	36	36	34	32	42	28
	Rest	49	49	49	46	49	49	49	52	56	46
Ramp width	Weathered	15	15	12	12	15	12	12	12	12	12
	Rest	15	15	12	12	15	12	12	12	12	12
Overall angle	Range	40/45	40/43	31/35	31/40	41/43	40/46	40/46	30/50	41/47	35/40

Note: Overall slope angle (OSA) depends on how many ramps there are per wall.

16.4.2 Geotechnical and Safety Berms

With respect to the design of the overall pit slope it was assumed that no additional geotechnical berms will be required. Therefore, in order to provide a substantial width for the safety berm it is proposed that the final pit wall is double benched to 10 m. This will provide a catch bench every 10 m that will have sufficient capacity to contain localised failures.

The ramp also acts as a catch bench that can be regularly cleaned. The configuration of this ramp system means that the maximum inter-ramp stack height is mostly less than 50 m. This is an important factor when considering the potential for failure of the rock mass.

16.4.3 Primary Mining Equipment

The Ouaré Project will be managed alongside the existing projects at Balogo and Youga. These projects will share a lot of the same infrastructure and therefore it makes sense to standardise the fleet across all operations. The mining fleet has therefore been standardised on a mix of medium size hydraulic excavators (30 t to 80 t), loading 40 t articulated trucks.

The smaller 30 t to 40 t excavators are well suited to selective mining of the ore on 2.5 m flitches, whilst the larger 70 t to 80 t hydraulic excavators are predominately used for waste due to their higher productivity.

The combined mining rate for Youga, Ouaré and Balogo has been limited to 1,600 kt/month, which can be accommodated by a total of up to five excavators and 18 trucks. The exact split between Youga, Ouaré and Balogo will vary with time.

During the period May 2017 to June 2018, the mining rate at Youga is somewhat lower (500 kt/month to 700 kt/month) as mining is also taking place at Netiana. On completion of the Netiana mining, the mining fleet will be moved to Ouaré.

Backup loading capacity is provided by a FEL that can load the 40 t trucks. The FEL is also used to load the ore into the trucks for transport of ore from Ouaré to Youga.

16.4.4 Benches

A bench height of 5 m has been selected in order to ensure selective mining of the ore. The bench will be blasted on 5 m intervals and loaded on two flitches of 2.5 m. This is the current practice at A2NE and it can be demonstrated that this works well for the given rock types and distribution of ore.

This bench height is well suited to the selected size of hydraulic excavators, each having a maximum reach between 5 m and 6 m (Figure 195).

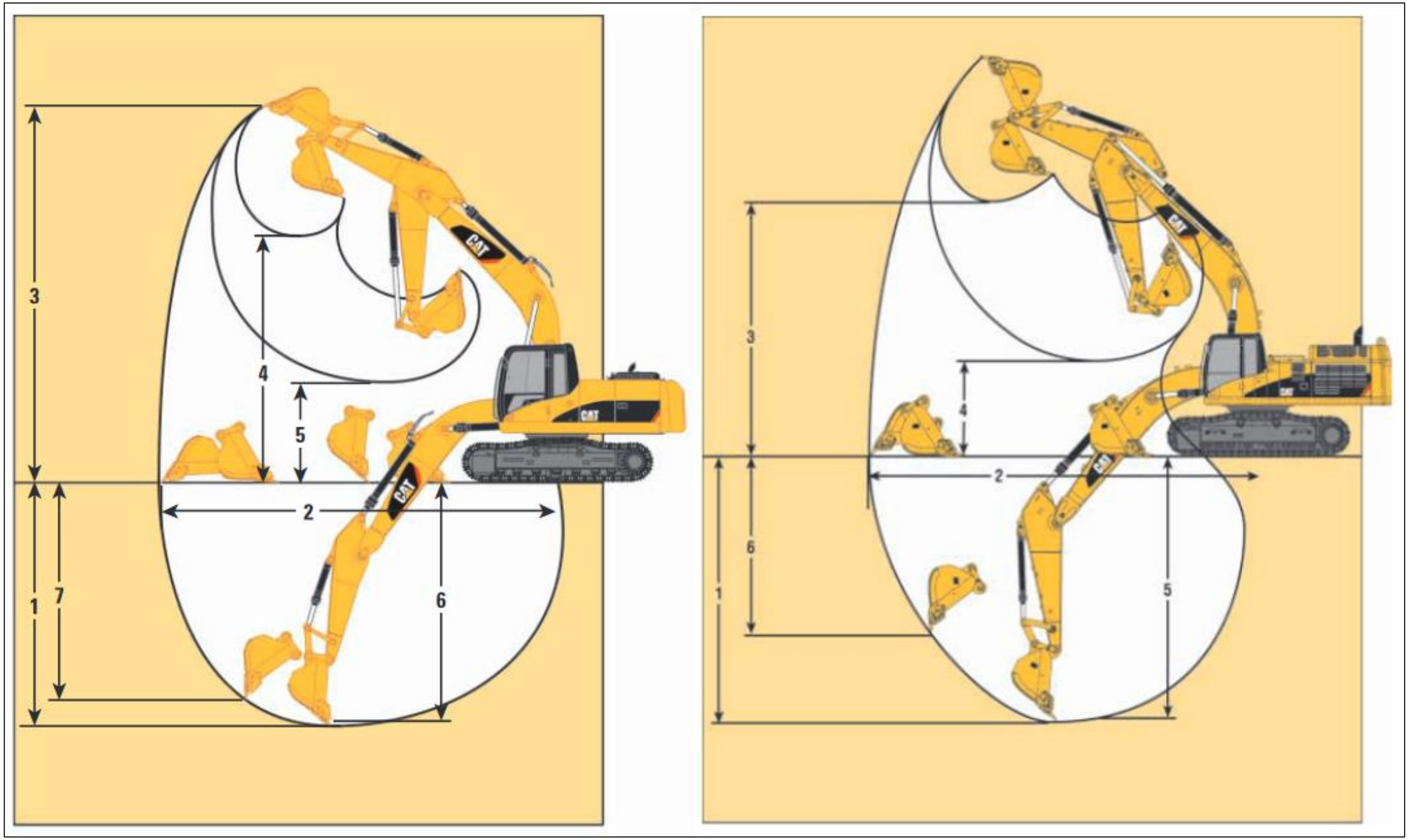


Figure 195: Maximum mining reach for a Cat 336 (35 t) and a Cat 374 (75 t) excavator

16.4.5 Minimum Mining Width

The minimum mining floor width has been designed at 35 m to allow turning of the trucks (SAE turning radius of 8.7 m). This also allows sufficient clearance during normal operations for the minimum distance from the highwall and allowance for safety berms at the crest.

16.4.6 Pit Dewatering

Burkina Faso has a relatively dry climate with a total rainfall of less than 800 mm per year. The majority of the rainfall is between June and October (Figure 196).

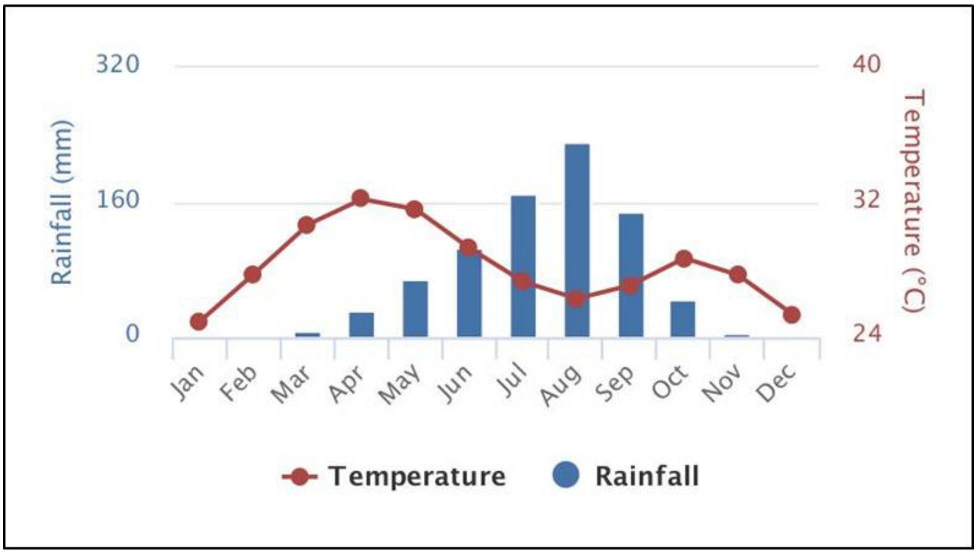


Figure 196: Average monthly temperature and rainfall for Burkina Faso (1991 to 2015)

Source: Climate Change Knowledge Portal (http://sdwebx.worldbank.org/climateportal)

The stream beds are typically dry for the majority of the year but there is a need to provide for water diversion to avoid inflow into the pit. Surface runoff that is captured by the pit is collected in a sump and provision has been made for pumping as required.

16.4.7 Haul Roads and Ramps

To meet the production targets and to match the selected loading machines a 40 t articulated haul truck has been selected. This truck has an overall operating width of 4.16 m, which means that the minimum ramp width at 2.5 x truck width is 10.4 m. Ideally, the ramp width should be at least 3.5 x truck width (14.6 m) to allow passing on the ramp. However, it is accepted that 12 m will be sufficient for the shallower pits if passing places are provided and a lower operational efficiency is accepted.

On the lower benches the ramp width has been reduced to 10 m on the assumption of a single lane. This helps to maximise the ore recovery and minimise the waste stripping.

Ramps will be established at a maximum gradient of 10% (1 in 10). To facilitate drainage of the roadway, a 2% cross slope on the ramp should be included.

It is necessary to have a safety bund equivalent to at least half the tire height on the low-wall side and preferably an allowance for a drainage ditch on the high wall side of the ramp. With this configuration, it is possible to attain a road width of 15 m (2.75 x truck width), which is an acceptable compromise.

Truck	Operating Width (m)	Tyre Size	Tyre Dia (m)	Bund Height (m)	Bund Width (m)	Road Width (m)	Drain Width (m)	Width (m)
Cat 740	4.16	29.5R25	1.87	0.93	2.9	11.44	0.5	15.1

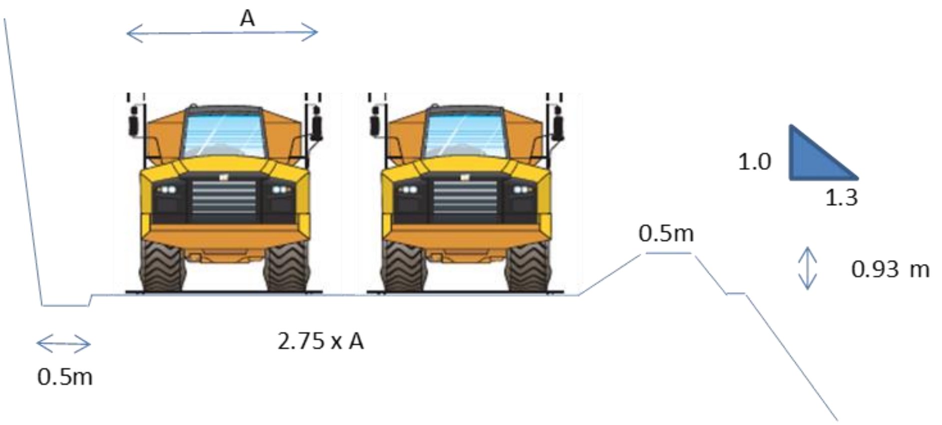


Figure 197: Proposed haul road dimensions for a 40 t truck

16.4.8 Mining Recovery and Waste Dilution

The mining recovery and waste dilution have been set at 90% and 10% respectively. This takes into account that ore mining will be with the smaller hydraulic excavator (1.6 m^3 to 2.5 m^3 bucket) on 2.5 m flitches. Considerable care needs to be taken with the blasting to minimise movement and, as a consequence, the blast design assumes choke blasting with a relatively low powder factor of 0.29 kg/m^3.

These factors are reasonable for the conditions. However, the factors will vary considerably depending on the width of the veins and the amount of internal waste.

16.4.9 Pit Limit

The pit limits for each deposit were selected at a Price Factor of 1.0 so as to maximise the Ore Reserve. The wireframe for the pit limit was exported from NPVS and then used as a guide to designing the final pit. As discussed below this includes the provision for the ramps and access to benches.

It should be noted that the pit limit generated by NPVS is based on an overall slope angle that includes the provision for safety berms and ramps. However, the exact location of the ramps is unknown at the time of optimisation and consequently there will be minor differences between the pit limit generated by NPVS and the subsequent engineered pit designs. Ideally this variance will be minimised so as to maximise ore recovery and minimise waste stripping.

16.4.10 Topsoil

There is a thin layer of topsoil (<0.5 m) covering the mining area, which will be stripped off and stored separately for reuse later.

16.5 Mine Design

16.5.1 Phases/Pushbacks

The relatively small size of the individual pits has meant that it is not possible to sub-divide them into stages or pushbacks. Individual deposits are however split into a number of separate pits, which can be seen at A2N, West Pit, Zergore, NTV and Ouaré.

16.5.2 Pit Design Quantities

The Reserves were calculated using the block model values and the engineered pit design surface for Youga and Ouaré. The quantities shown are after applying the modifying factors of 90% mining recovery and 10% mining dilution. Table 91, Table 92 and Table 93 show the pit design quantities for Youga and Ouaré.

Table 91:Pit design quantities for Youga Main, Youga East and A2N

	Youga Main			Youga East			A2N		
	Tonnes	troy oz	g/t	Tonnes	troy oz	g/t	Tonnes	troy oz	g/t
High Grade	235,952	27,018	3.56	32,585	3,001	2.86	235,952	27,018	3.56
Medium Grade	214,369	14,721	2.14	118,013	7,900	2.08	82,289	5,355	2.02
Low Grade	431,894	20,236	1.46	211,349	10,143	1.49	128,576	6,065	1.47
Total Ore	**882,215**	**61,975**	**2.18**	**361,947**	**21,044**	**1.81**	**446,816**	**38,438**	**2.68**
Low-Low Grade	400,370	12,000	0.93	116,259	3,844	1.03	182,051	5,762	0.98
Marginal	203,811	3,936	0.60	11,885	220	0.58	89,280	1,562	0.54
Total Stockpile	**604,181**	**15,937**	**0.82**	**128,144**	**4,064**	**0.99**	**271,331**	**7,324**	**0.84**
Waste	20,549,686			3,518,860			4,371,189		
GRAND TOTAL	**21,431,901**			**3,880,807**			**4,818,005**		

Table 92: Pit design quantities for West Pit 2, West Pit 3 and West Pit 4

	West Pit 2			West Pit 3			West Pit 4		
	Tonnes	troy oz	g/t	Tonnes	troy oz	g/t	Tonnes	troy oz	g/t
High Grade	22,093	2,234	3.15	73,537	7,298	3.09	32,338	4,100	3.94
Medium Grade	55,927	3,722	2.07	97,162	6,635	2.12	43,633	2,993	2.13
Low Grade	147,324	7,046	1.49	102,536	4,915	1.49	91,390	4,286	1.46
Total Ore	**225,344**	**13,001**	**1.79**	**273,235**	**18,847**	**2.15**	**167,360**	**11,379**	**2.11**
Low-Low Grade	145,828	4,566	0.97	120,719	3,627	0.93	97,259	2,900	0.93
Marginal	25,921	506	0.61	35,149	690	0.61	29,630	605	0.64
Total Stockpile	**171,749**	**5,072**	**0.92**	**155,868**	**4,318**	**0.86**	**126,889**	**3,505**	**0.86**
Waste	3,591,877			4,365,432			1,356,538		
GRAND TOTAL	**3,817,221**			**4,638,667**			**1,523,898**		

Table 93: Pit design quantities for NTV, Zergoré and Ouaré

	NTV			Zergoré			Ouaré		
	Tonnes	**troy oz**	**g/t**	**Tonnes**	**troy oz**	**g/t**	**Tonnes**	**troy oz**	**g/t**
High Grade	9,497	951	3.11	62,982	6,207	3.07	410,318	48,096	2.00
Medium Grade	48,090	3,199	2.07	192,033	12,875	2.09	556,332	37,407	1.48
Low Grade	399,593	18,115	1.41	467,669	21,869	1.45	948,973	45,187	0.87
Total Ore	**457,180**	**22,265**	**1.51**	**722,683**	**40,951**	**1.76**	**1,915,623**	**130,689**	**2.12**
Low-Low Grade	763,197	23,917	0.97	750,251	22,517	0.93	750,954	26,409	1.09
Marginal	97,861	1,968	0.63	376,602	7,246	0.60	734,637	13,410	1.12
Total Stockpile	**861,059**	**25,885**	**0.94**	**1,126,852**	**29,763**	**0.82**	**1,485,590**	**39,819**	**0.83**
Waste	5,717,533			5,677,401			13,448,352		
GRAND TOTAL	**6,174,713**			**6,400,085**			**15,363,976**		

Figure 198 to Figure 201 show Youga pit designs and Figure 202 shows the Ouaré pit designs.

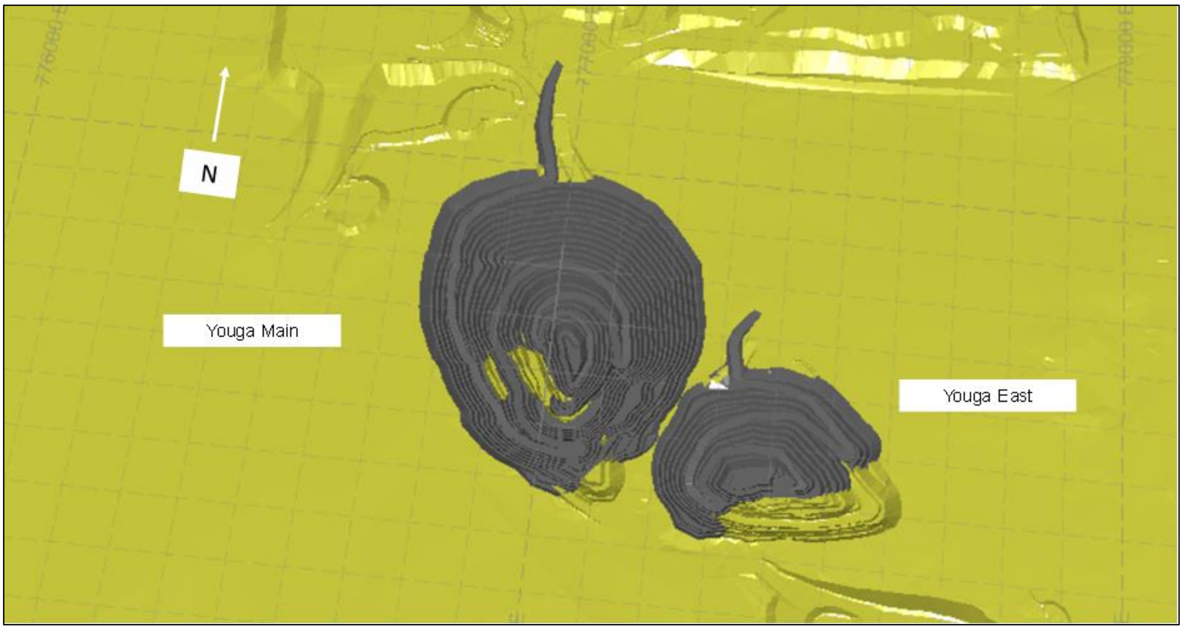


Figure 198: Youga Main and Youga East pit designs

Youga Main has a depth of 215 m and the ramp width of 15 m width is designed from the surface to the last 55 m. Youga East has been designed with a depth of 115 m.

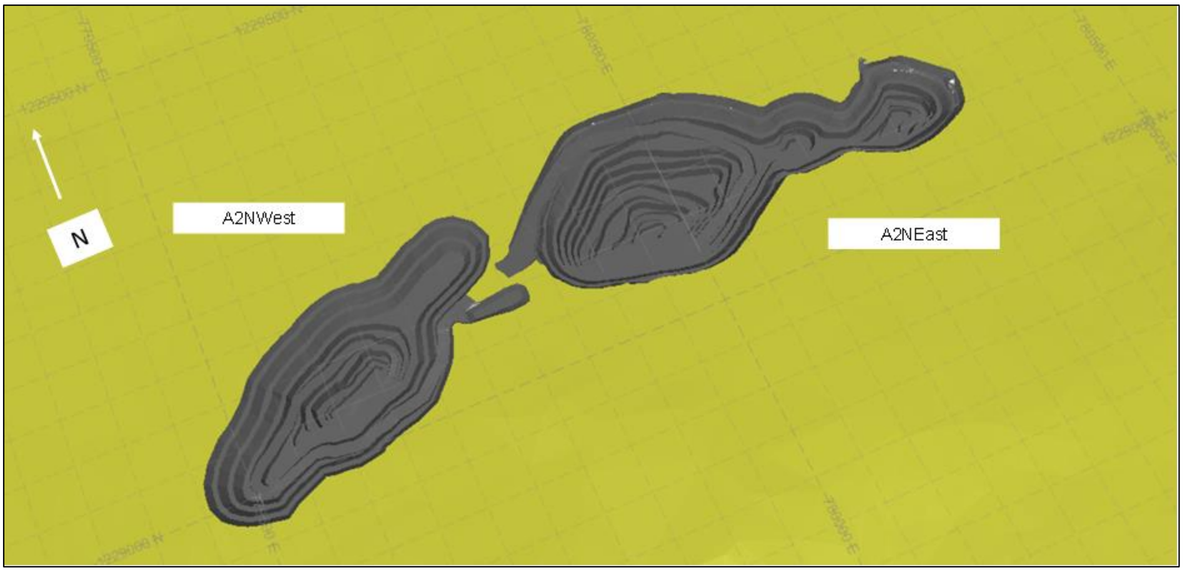


Figure 199: A2N pit designs

In both the A2NWest and A2NEast pits, the road width changes from 12 m to 7 m for the last 15 m depth in the pit. Topography surface is at an RL of 224 m and the bottom of the pit is located at a RL of 140 m in A2NEast and 165 m in A2NWest.

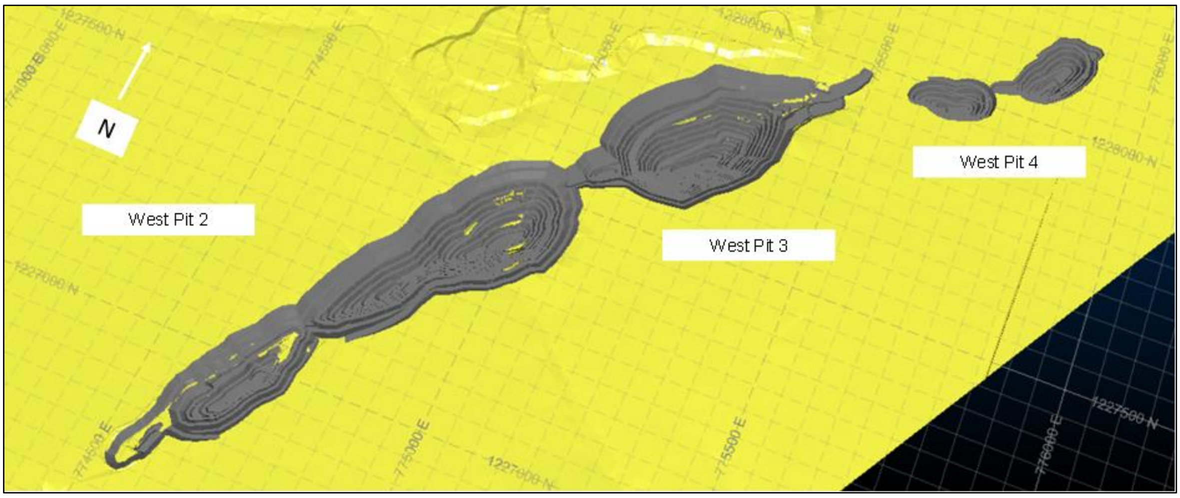


Figure 200: West Pit 2, 3 and 4 pit designs

West Pit 2A (North) and 2B (South) reach a depth of 52 m and 89 m respectively. West Pit 3 is located to the northeast of West Pit 2B and is 52 m deep. West Pit 4 is located to the northeast of West Pit 3 and reaches a depth of 52 m.

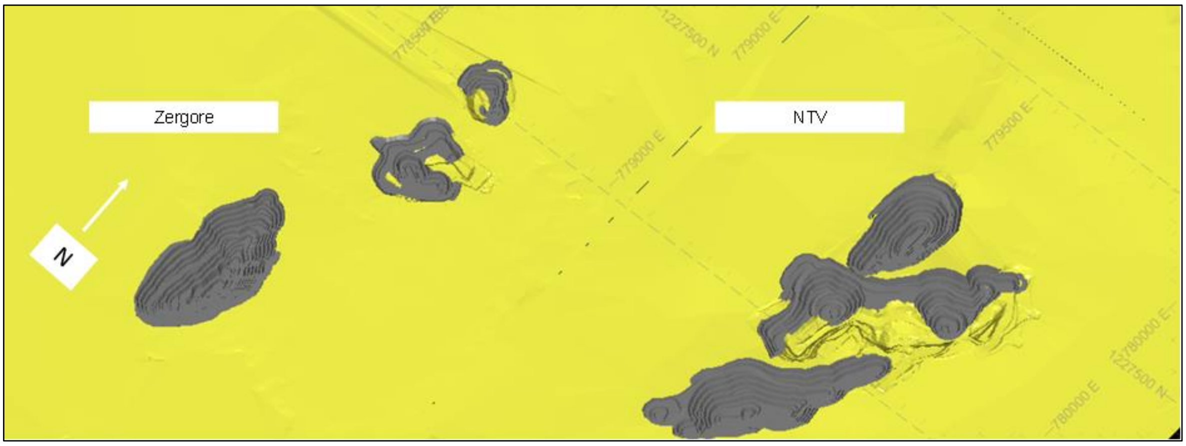


Figure 201: Zergoré and NTV pit designs

Zergoré comprises three main pits (North, Mid and South). Zergoré North reaches a deep of 67 m, whilst Zergoré Mid is formed by two pits, each 59 m in depth, and Zergoré South is 69 m deep.

NTV comprises three pits, NTV North (31 m deep), NTV Mid (41 m deep) and NTV South (90 m deep).

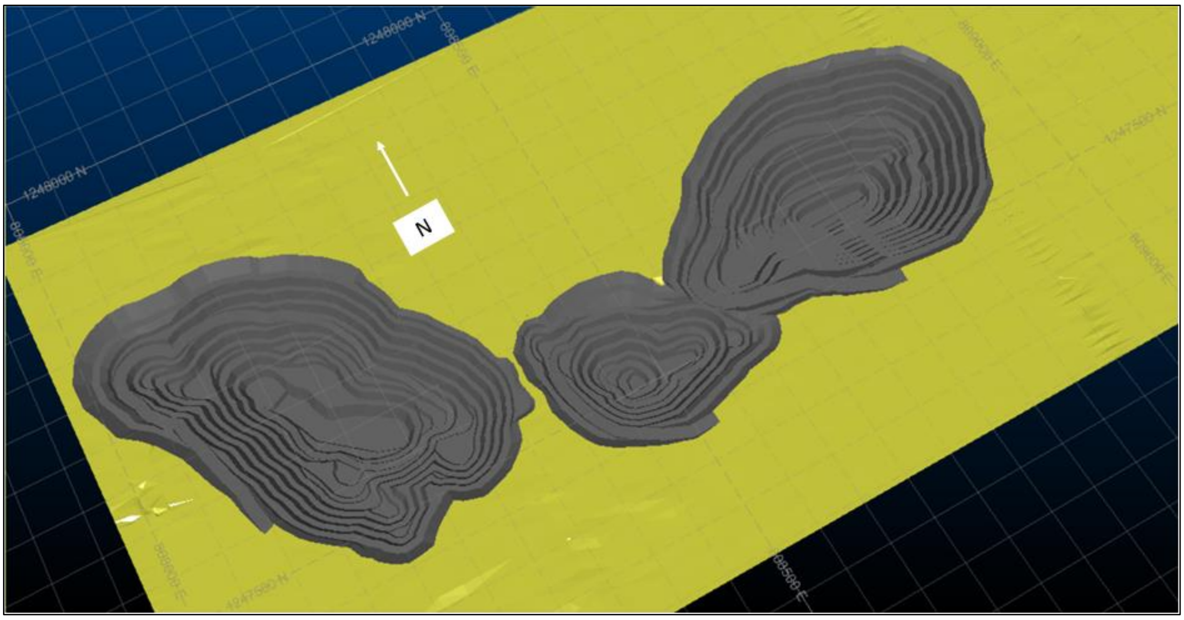


Figure 202: Ouaré pit designs

Ouaré comprised three pits; (West, Mid and East). Ouaré East is the deepest pit (98 m) and Ouaré West and Ouaré Mid which reach depths of 69 m and 65 m respectively.

16.6 Waste Dumps and Stockpiles

Waste dump capacities have been based on a swell factor of 30% and no allowance has been made for backfilling of the pits. The new waste dump positions have been selected based on the locations of the old waste dumps, with most of the new waste dumps intersecting, surrounding or covering the old waste dumps (except for at Ouaré and A2N). In addition, the following factors have also been considered when positioning the waste dumps:

- Avoiding geologically prospective ground
- Including sterilisation drilling as required
- Allowing for existing or proposed infrastructure

- Within Mining Exploitation licence areas
- Stockpiles have been designed adjacent to the waste dumps.

16.6.1 Design Parameters

The design parameters for waste dumps are based on recommendations from the Wardell-Armstrong report "Review of mine Closure, Youga mine Burkina Faso. November 2016".

A 25 m wide ramp has been selected for the waste dump designs to permit a truck double lanes together with simultaneous works such as maintenance, drainage and topsoiling. Table 94 shows the design parameters used for waste dumps and stockpiles at Youga and Ouaré.

Table 94: Design parameters for Youga and Ouaré waste dumps and stockpiles

Design parameters	Units	Waste dumps	Stockpiles (Low Grade and Marginal)
Batter angle	Grade	20	35
Swell factor	%	30	30
Bench height	m	15	15
Berm width	m	30	30
OSA	Grade	11.3	24/35
Road width	m	25	12

The standard profile for Youga and Ouaré is shown in Figure 203.

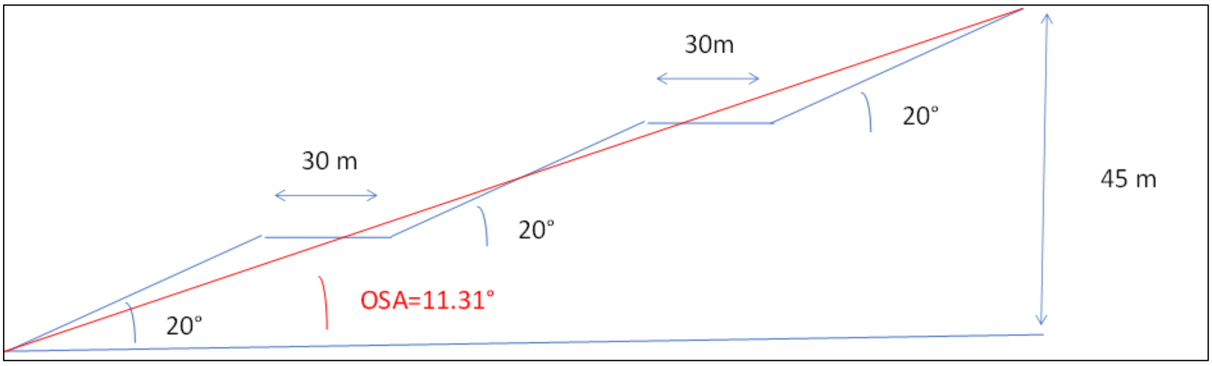


Figure 203: Waste dump profile

16.6.2 Waste Dump and Stockpile Capacity

The capacities and projected area for waste dumps and stockpiles have been summarised in Table 95.

Table 95: Waste dump/stockpile capacities and projected areas

	Capacity (m^3)	Projected area (m^2)	Maximum height (m)	Stockpile	Capacity (m^3)	Projected area (m^2)	Maximum height (m)	Grade
Youga Main	10,192,794	637,200	37	Marginal	97,781	12,974	17	0.5 to 0.7
Youga East	4,831,874	360,658	37	Marginal	5,694	3,485	3	0.5 to 0.7
NTV	4,831,874	360,658	37	Marginal	47,183	10,073	6	0.5 to 0.7
A2N	2,253,439	139,372	32	Marginal	43,231	14,808	4	0.5 to 0.7
Zergoré	2,877,963	268,281	34	Marginal	189,342	29,614	8	0.5 to 0.7
West34	2,828,847	254,658	20	Marginal	31,895	8,072	6	0.5 to 0.7
West2	1,782,805	209,226	22	Marginal	12,437	6,624	3	0.5 to 0.7
Ouaré	6,945,744	640,631	46	Marginal	380,961	36,312	19	0.5 to 0.7

Figure 204 to Figure 210 show the waste dumps and stockpiles. In some cases, pit designs have been included in order to show the waste dump positions relative to the pits.

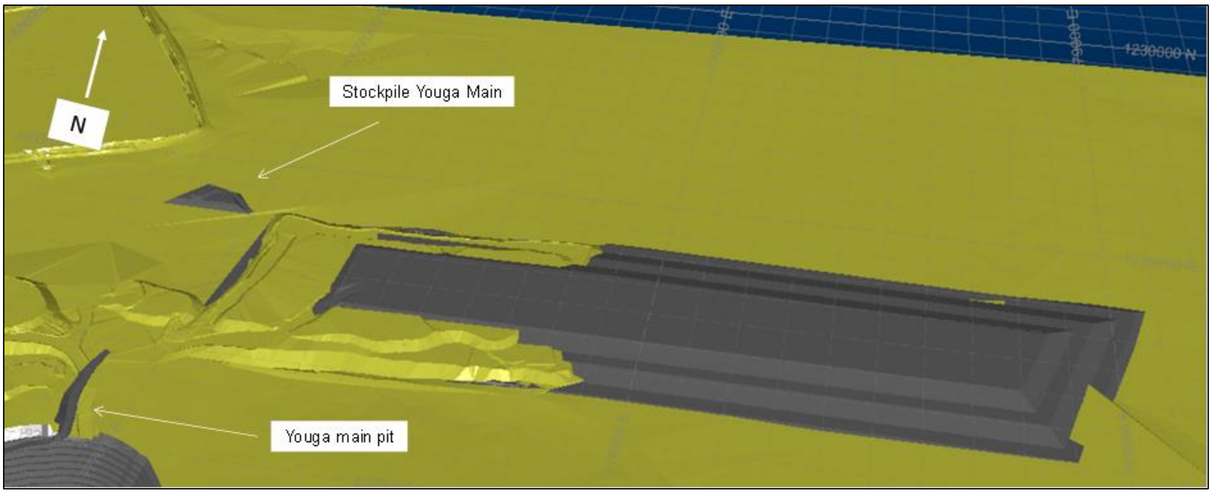


Figure 204: Youga Main waste dump and stockpile designs

The average distance between Youga Main and its waste dump is 1.4 km.

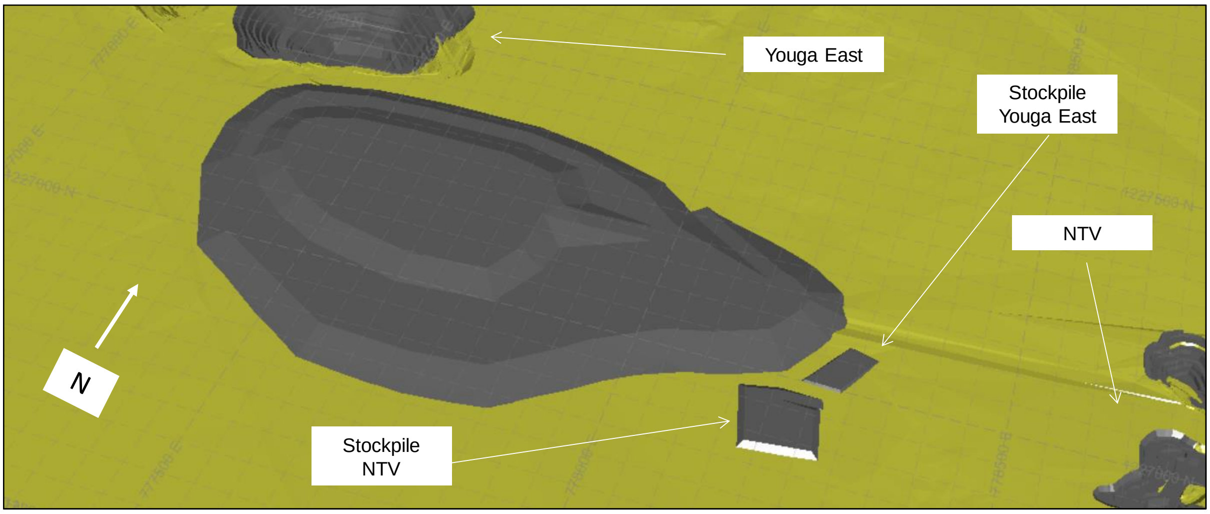


Figure 205: Youga East/NTV waste dump and stockpile designs

Although the new waste dump design covers the position of the old waste dump at Youga East, it will be used as the dump for both Youga East and NTV due to its position between the deposits. The average distances from the waste dump to Youga East and NTV are 1.5 km and 1.7 km respectively.

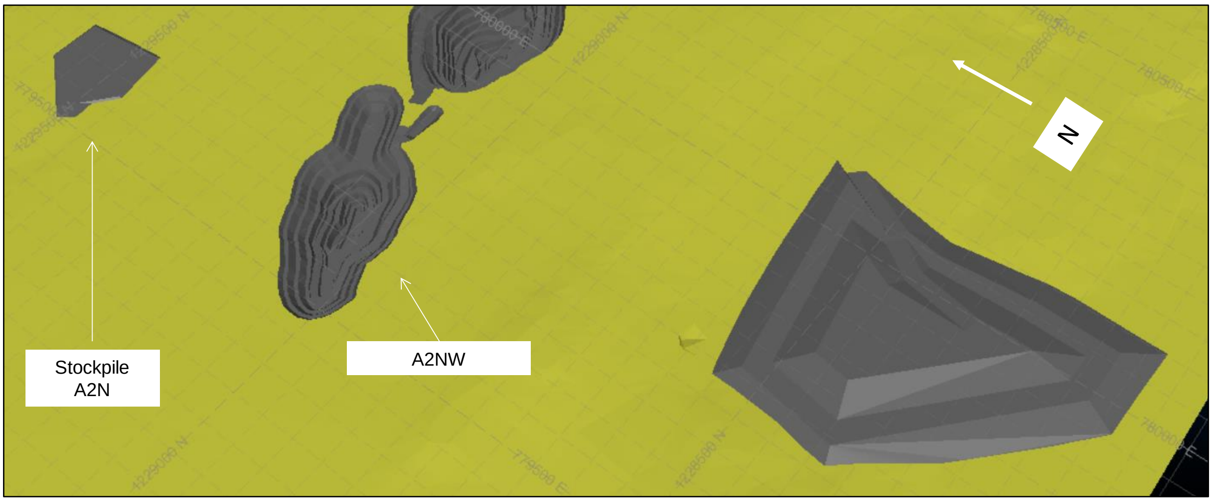


Figure 206: A2N waste dump and stockpile designs

The stockpile of marginal material has been located close to the old waste dump. Due to the proximity to the Ghana border, and the proposed volume of waste to be mined, a new position for the waste dump has been planned. The average distance from the pits to the new waste dump is 1 km.

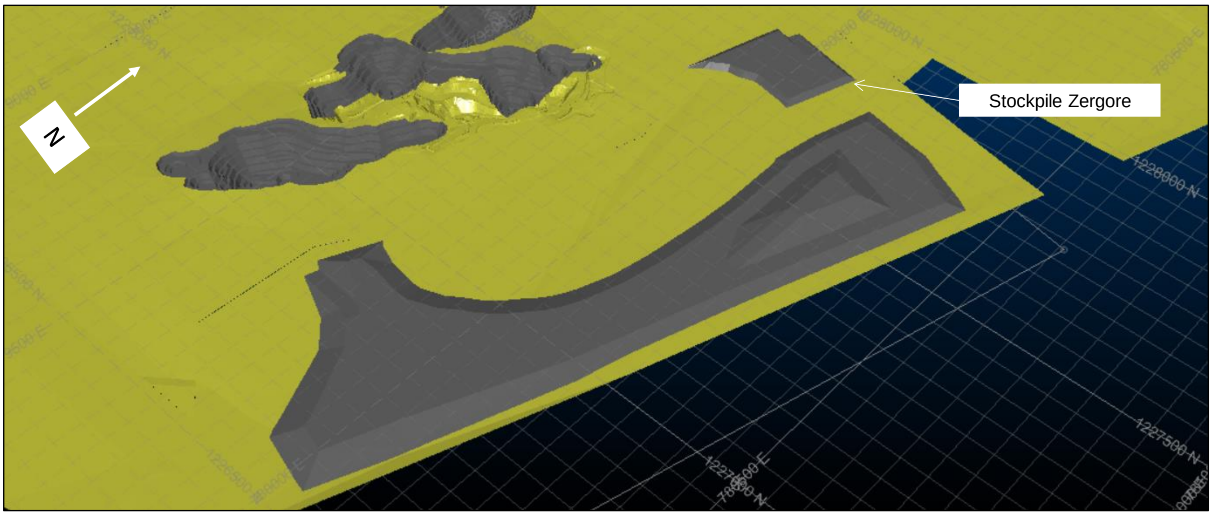


Figure 207: Zergoré waste dump and stockpile designs

The waste dump design at Zergoré surrounds the existing waste dump. The average distance between the pits and the new waste dump is 1.3 km.

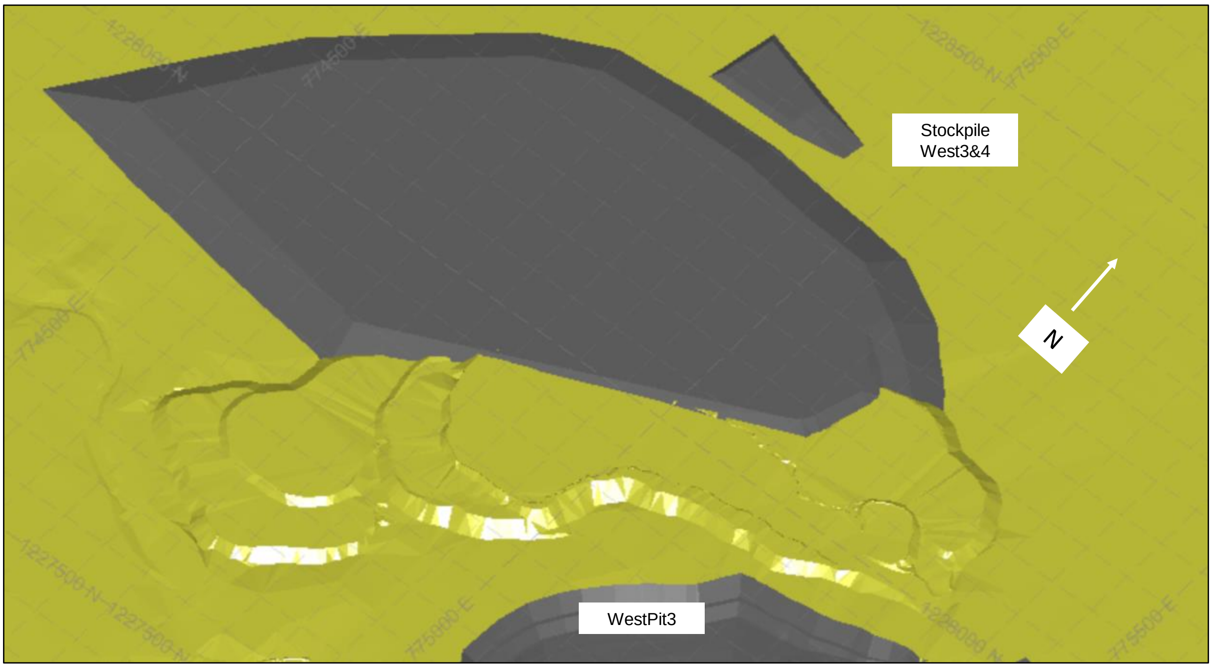


Figure 208: West Pit 3 and West Pit 4 waste dump and stockpile designs

The old waste dump at West Pit 3 has been expanded to the north to create the new waste dump for both deposits, West Pit 3 and West Pit 4 with an average distance from the pits to the waste dump of 778 m.

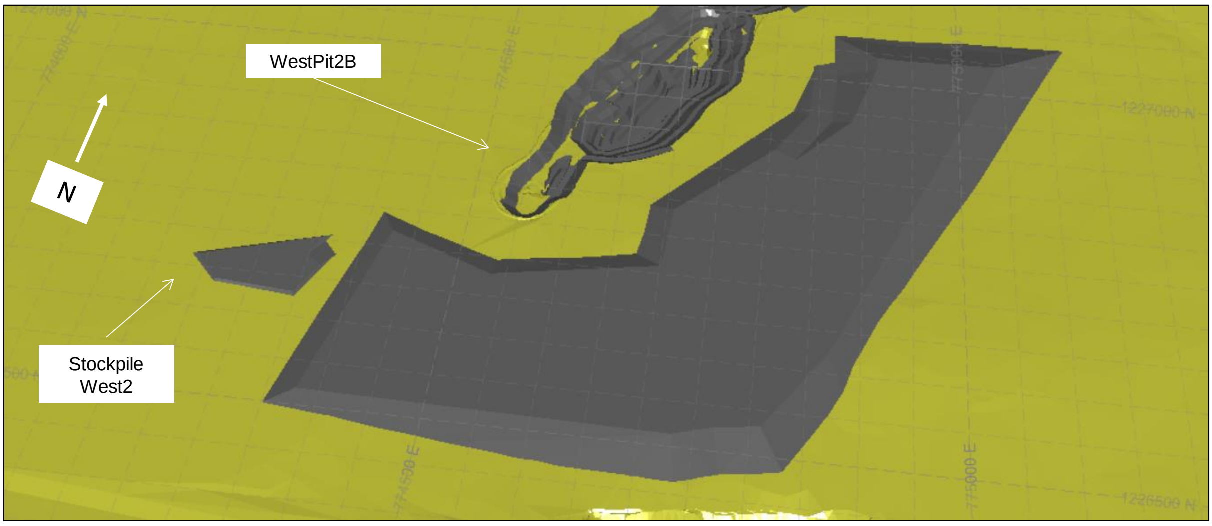


Figure 209: West Pit 2 waste dump and stockpile designs

The new waste dump design covers the existing waste dump and the average distance from the waste dump to the pit is 0.7 km.

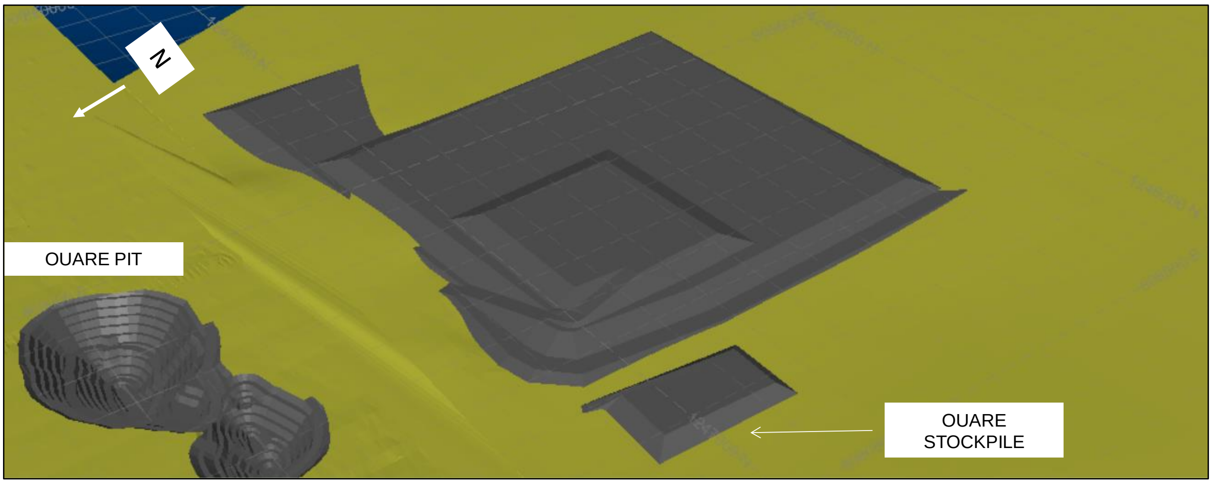


Figure 210: Ouaré waste dump and stockpile design

The average distance between the Ouaré pit and the waste dump is 0.9 km.

16.7 Mine layout

The mine layouts are depicted below in Figure 211 and Figure 212 for Youga and Ouaré respectively and include the following:

- Waste dump new designs (indicated as "WD").
- Current stockpiles.
- Pits.
- Plant.
- Tailings dam.

Figure 211: Youga mine layout

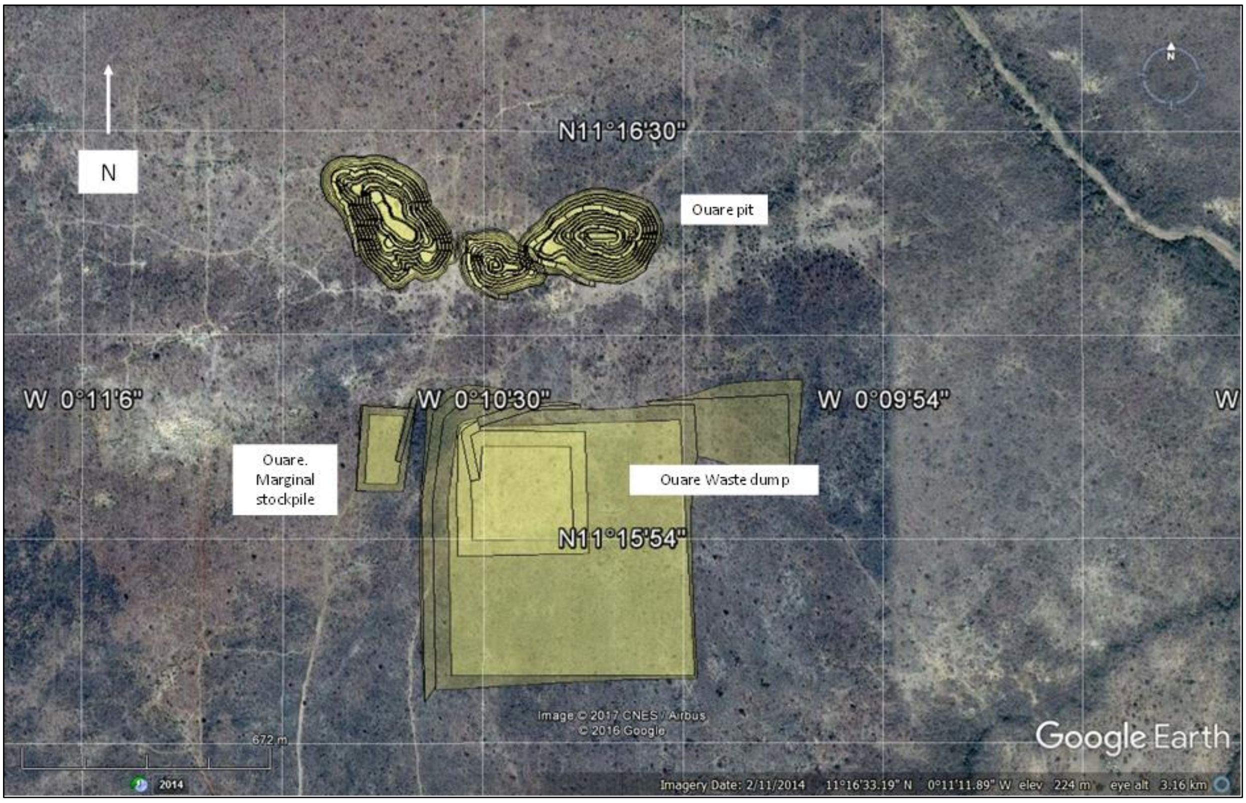


Figure 212: Ouaré mine layout

16.8 Mining Sequence

The Mining sequence for Youga commences at A2N East (A2NE) in March 2017 and this pit is mined out over a six-month period. Mining of the adjoining A2N West (A2NW) pit commences in May 2017 and this is also mined out over a six-month period.

For the first three months (March to May 2017), the feed to the ROM pad is dependent solely on A2NE, until such time as Netiana (part of the Balogo Project) can be brought into production to supplement the feed to the ROM pad.

The remaining pits at Youga, and the satellite deposit of Ouaré, are essentially sequenced in order of profitability so as to maximise early cashflow. However, there are a number of practical considerations that need to be applied when sequencing, namely:

- The earliest production from Ouaré has been set to May 2018 due to the need to develop this project. This includes building a 44 km access road and constructing a bridge over the Nakambe River.
- Production rates form individual pits are constrained by access space and bench sinking rate. Typically, the bench sinking rate is limited to 10 m/month.
- No more than three active pits should be operational at any one time. This is a function of the available equipment and limits on logistics of running multiple pits.
- If possible a deposit is mined out before moving to the next one. This allows the pit to be closed and rehabilitation to proceed as the project continues.
- Where two pits of a single deposit are joined then some pre-stripping may have to be done to develop a common access ramp. For example, this occurs with Main Pit and East Pit.

The overall mining sequence is depicted as a bar chart in Figure 213 The mining sequence includes material sourced for the Balogo Project (see Section 16.11 for further information) The Reserve tonnes and average grade are shown in the figure below to illustrate the logic behind the sequencing of the deposits.

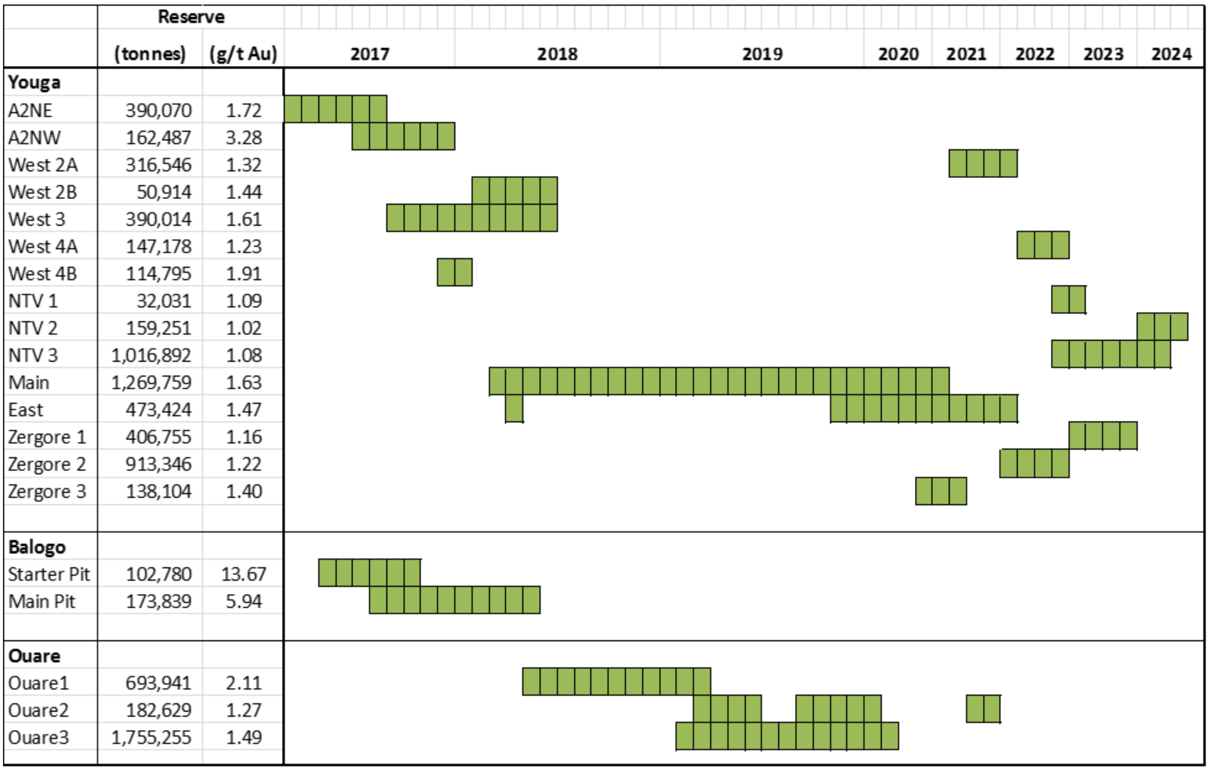


Figure 213: Mining sequence for the Youga, Balogo and Ouaré projects

Mining extends until the 3rd quarter of 2024, when the remains of the stockpiles are fed to the plant in the 4th quarter of 2024 and the 1st quarter of 2025. The total material mined over the eight-year period is 78.3 Mt.

16.9 Mining Equipment

16.9.1 Drill and Blast

Drilling is with an Atlas Copco D60 rig that drills a 105 mm diameter hole on 5 m benches with a 0.3 m sub-drill. The design parameters for the production shots are shown in Table 96.

Table 96: Drill and blast parameters – production shots

Project Assumptions	Units	Oxide Ore Dry	Fresh Ore Dry	Oxide Waste Dry	Fresh Waste Dry
Production Patterns					
Input Parameters					
Drill	-	Primary Drill	Primary Drill	Primary Drill	Primary Drill
Proportion of material	(%)	100.0	100.0	100.0	100.0
Bench Height	(m)	5.0	5.0	5.0	5.0
Hole Diameter	(mm)	105.0	105.0	105.0	105.0
Subdrill	(m)	0.3	0.30	0.30	0.30
Spacing	(m)	3.2	3.20	3.20	3.20
Burden	(m)	3.6	3.60	3.60	3.60
Stemming Height	(m)	3.2	3.20	3.20	3.20
Re-drill	(%)	10.0	10.0	10.0	10.0
Rod Length	(m)	7.50	7.50	7.50	7.50
Hoisting Rate	(m/min)	27.70	27.70	27.70	27.70
Cleaninng, retract, tramming, etc	(min.)	3.25	3.25	3.25	3.25
Add/remove rods	(min.)	2.50	2.50	2.50	2.50
Sampling	(%)	100.0	20.0	20.0	20.0
Samples per Hole	(#)				
Primers per Hole	(#)	1	1	1	1
Explosive Product		ANFO	ANFO	ANFO	ANFO
Checks					
Bench Height : Hole Diameter	(m:m)	48	48	48	48
Subdrill to Hole Diameter	(m:m)	2.9	2.9	2.9	2.9
Stemming to Burden	(m:m)	0.89	0.89	0.89	0.89
Drilling					
Hole Depth	(m)	5.3	5.3	5.3	5.3
Volume Rock per Hole	(m3)	57.6	57.6	57.6	57.6
Quantity Rock per Hole	(t)	121.0	150.9	121.0	150.9
Yield of Rock	(m3 rock/m drilled)	10.9	10.9	10.9	10.9
Yield of Rock	(t rock/m drilled)	22.8	28.5	22.8	28.5
Penetration Rate	(m/hr)	33.5	33.5	33.5	33.5
Drill time per Hole	(min.)	12.9	12.9	12.9	12.9
Productivity per meter	(m/doh)	24.6	24.6	24.6	24.6
Productivity per tonne	(t/doh)	561	700	561	700
Blasting					
Stemming Volume	(m3)	0.03	0.03	0.03	0.03
Volume of Charge	(m3)	0.02	0.02	0.02	0.02
Charge Height	(m)	2.1	2.1	2.1	2.1
Charge per Hole	(kg)	14.5	14.5	14.5	14.5
Powder Factor	**(kg/m3)**	**0.25**	**0.25**	**0.25**	**0.25**
Powder Factor	**(kg/t)**	**0.12**	**0.10**	**0.12**	**0.10**

The explosive selected is a heavy ANFO product (Emunex 7000), which has a density of 1.2 t/m^3 and Velocity of Detonation (VoD) of 4,600 m/s. This product is mixed on site by the contractor (Maxam).

The drill pattern for wall control (trim blasting) is also drilled with a 105 mm diameter hole and assumes a three row shot with no sub-drill. The parameters are shown in Table 97.

Table 97: Drill and blast parameters – wall control

Project Assumptions	Units	Oxide Ore Dry	Fresh Ore Dry	Oxide Waste Dry	Fresh Waste Dry
Trim Patterns					
Wall Control					
Drill Patern		1.8 x 2.0	1.8 x 2.0	1.8 x 2.0	1.8 x 2.0
Drill	-	Primary Drill	Primary Drill	Primary Drill	Primary Drill
Bench Height	(m)	5.0	5.0	5.0	5.0
Hole Diameter	(mm)	105.0	105.0	105.0	105.0
Spacing	(m)	1.8	1.8	1.8	1.8
Burden	(m)	2.0	2.0	2.0	2.0
Stemming Height	(m)	3.5	3.5	3.5	3.5
Subdrill	(m)	0.0	0.0	0.0	0.0
Charge Height	(m)	1.5	1.5	1.5	1.5
Re-drill/Drilling Overlap Factor	(%)	10.0	10.0	10.0	10.0
Rod Length	(m)	7.50	7.50	7.50	7.50
Hoisting Rate	(m/min)	27.70	27.70	27.70	27.70
Cleaninng, retract, tramming, etc	(min.)	3.25	3.25	3.25	3.25
Add/remove rods	(min.)	2.50	2.50	2.50	2.50
Sampling	(%)	0.0	0.0	0.0	0.0
Samples per Hole	(#)				
Primers per Hole	(#)	1	1	1	1
Explosive Product		ANFO	ANFO	ANFO	ANFO
Drilling					
Hole Depth	(m)	5.00	5.00	5.00	5.00
Volume Rock per Hole	(m3)	18.0	18.0	18.0	18.0
Quantity Rock per Hole	(t)	37.8	47.2	37.8	47.2
Yield of Rock	(m3 rock/m drilled)	3.6	3.6	3.6	3.6
Yield of Rock	(t rock/m drilled)	7.6	9.4	7.6	9.4
Penetration Rate	(m/hr)	33.5	33.5	33.5	33.5
Drill time per Hole	(min.)	12.4	12.4	12.4	12.4
Blasting					
Stemming Volume	(m3)	0.03	0.03	0.03	0.03
Volume of Charge	(m3)	0.01	0.01	0.01	0.01
Charge Height	(m)	1.5	1.5	1.5	1.5
Charge per Hole	(kg)	10.4	10.4	10.4	10.4
Productivity per meter	**(m/doh)**	**24.22**	**24.22**	**24.22**	**24.22**
Productivity per tonne	**(t/doh)**	**183.11**	**228.46**	**183.11**	**228.46**

16.9.2 Loading and Hauling

The primary loaders for Youga and Ouaré are assumed to be with a mix of hydraulic excavators (30 t to 80 t), which will load 40 t articulated trucks. This combination has been tried and tested at Youga over the period October 2016 to February 2017 and has been shown to provide a good compromise between productivity and selectivity.

Based on a loader utilisation of 74%, it can be shown that the theoretical loader productivity ranges for the mid-size exactor (3.5 m^3 bucket) is between 480 t per Direct Operating Hour (doh) for weathered material (Regolith or Oxide) to 600 t/doh for Transition or Fresh material.

Table 98: Loader productivity parameters

	Units					
Material Type	-	Fresh Waste	Fresh Ore	Oxide Waste	Oxide Ore	RoM Rehandle
Loading						
Loading Unit		Primary Excavator	Primary Excavator	Primary Excavator	Primary Excavator	Primary Excavator
Bucket Size	(m3)	3.5	3.5	3.5	3.5	3.5
Loading Spot Time	(min.)	0.50	0.50	0.50	0.50	0.50
Loading Cycle Time	(min.)	0.50	0.50	0.50	0.50	0.50
First Bucket Dump	(min.)	0.05	0.05	0.05	0.05	0.05
Haulage						
Truck		Primary Truck	Primary Truck	Primary Truck	Primary Truck	
Capacity	(t)	40.00	40.00	40.00	40.00	
Capacity	(m3)	14.00	14.00	14.00	14.00	
Dump & Spot Time	(min.)	1.20	1.20	1.20	1.20	
FEL Travel Time	(min)					1.00
Bucket Fill Factor	(%)	90	90	90	90	95
In-Situ Density	(t/bcm)	2.62	2.62	2.10	2.10	2.00
Swell Factor	(lcm/bcm)	1.40	1.40	1.40	1.40	1.40
Loose Density	(t/lcm)	1.87	1.87	1.50	1.50	1.43
Moisture Factor	(%)	5.0	5.0	5.0	5.0	5.0
Passes	(#)	4.4	4.4	4.4	4.4	
Passes (Rounded)	(#)	4	4	4	4	
Passes (Override)	(#)					
Loaded Quantity	(t)	26.2	26.2	21.0	21.0	5.0
Loaded Volume	(m3)	14.0	14.0	14.0	14.0	3.5
Loading Productivity						
Total Loading Cycle Time	(min.)	2.05	2.05	2.05	2.05	1.05
Loader Operator Efficiency	(%)	83	83	83	83	83
Loader Productivity	**(t/doh)**	**606**	**606**	**486**	**486**	**226**
Loader Productivity	(lcm/doh)	324	324	324	324	158
Loading Unit Utilisation	(%)	73.7	73.7	73.7	73.7	73.7
Loading Productivity	**(Mtpa)**	**3.9**	**3.9**	**3.1**	**3.1**	**1.5**

The haul truck productivity is primarily based on the travel time, which in the case of Youga varies considerably between deposits depending on:

- Distance from pit exit to ROM pad.
- Distance from pit exit to waste dump.
- Depth of the pit.

The ex-pit travel time for Ouaré is relatively short as the ore is dumped at the pit exit on the ROM pad for future rehandling into the trucks used to transport ore from Ouaré to Youga.

The number of trucks required has been calculated for each schedule period (months or quarters) by estimating the truck hours for each pit included in the mining sequence. This takes into account the loading time, dumping time, queue and spot time, bench haul distance, pit depth and travel time to the destination. Average speeds are allocated to the haul profile to allow for speed loaded and empty on the flat and on ramps.

16.9.3 Ancillary Equipment

The ancillary equipment consists of drills, dozers, graders and FELs. The proposed equipment list is shown in Table 99. The number of units is kept constant over the life of the mine and will only be reduced once the pit is mined out. At this time, reclaiming of any remaining stocks will continue with a reduced fleet of a FEL, two trucks, one grader and one track dozer.

Table 99: Support equipment

Equipment	Model/Size	Units
Drills	Atlas Copco D60	3
FEL	Cat 988	1
Track dozers	Cat D8, D7, D6	3
Graders	Cat 14M	2

16.9.4 Service Equipment

The proposed service equipment list for Youga and Ouaré is shown in Table 100.

Table 100: Service equipment

Equipment	Model/Size	Units
Backhoe	Cat 330	1
Service truck		1
Fuel truck	Man	1
Tyre handler		1
Compactor		1
Large crane		1
Pumps		2
Low bed	Man	1
Light vehicles		10
Personnel carrier		1
Lighting towers	Wacker Neuson	3

The equipment list for machines currently on site may differ slightly from the above due to a mix of equipment with different states of mechanical availability and condition. The list shown above is used to estimate the mining costs and is representative of the minimum list of equipment needed to support the selected major pieces of equipment.

16.10 Operational Considerations

16.10.1 Blasting

For the production shots, it is assumed that 105 mm diameter holes are drilled on 5 m benches with a 0.3 m sub-drill. The stemming length has been adjusted to account for the air gap that is typically left in the column so that the total explosive per hole is approximately 14 kg.

The normal practice is to "paddock" blast ore and waste together with no free face. This minimises the movement during blasting and limits the mixing of ore and waste at the contacts.

During a site visit it was observed at A2NE that with a relatively low powder factor the heave is typically less than 1 m. This helps with the grade control as the bench preparation for loading is fairly minimal, which helps to avoid contamination of the ore during dozing.

The blast pattern for wall control uses close-spaced holes with a reduced charge per hole. These shots are typically taken in advance of the production shots so as to limit the damage to the final wall.

16.10.2 Grade Control

The grade control process is based on a combination of interpretation of ore composites from the block model, infill drilling with RC holes and trench sampling of the working bench. By applying a range of cut-off grades the mineralised material is split into the following categories.

Table 101: Material categories for grade control

Category	Material code	Grade range	
		g/t Au	g/t Au
High-High Grade	HHG	≥15.0	
High Grade	HG	≥10.0	<15.0
Low-High Grade	LHG	≥5.0	<10.0
Medium	MG	≥1.8	<5.0
Low Grade	LG	≥1.2	<1.8
Low-Low Grade	LLG	≥0.7	<1.2
Marginal	Marginal	≥0.5	<0.7

At Youga the cut-off grade has been set to 0.7 g/t Au. Marginal material below cut-off grade and above 0.5 g/t Au is stockpiled as a Resource for future use. Material with a grade less than 0.5 g/t Au is sent to the waste dump.

The same grade control procedure is applied to Ouaré, except the cut-off grade for LLG has been adjusted to 0.82 g/t Au to allow for the additional cost of transportation of ore from Ouaré to Youga.

16.11 Production Schedule

16.11.1 Methodology

It should be noted that in this Section and in Section 18, reference is made to the Balogo deposit, owned by Netiana Mining Company, a subsidiary of Avesoro Holdings, along with Burkina Mining Company. Balogo ore will provide feed blend to the processing plant and is anticipated that some equipment will be moved to Youga following completion of mining activities (see Section 18). As such, reference to the Balogo Project is significant and the reader is referred to "NI43-101 Technical Report, Mineral Resource and Mineral Reserve update for the Balogo Project, CSA Global report # R169.2017, dated 16 June 2017 for more information.

The production schedule was created in MS Excel by first importing the bench reserves for each pushback. The bench reserves are split into the following material categories.

Table 102: Material categories and destinations for scheduling

Category	Material code	Grade range		Destination
		(g/t Au)	(g/t Au)	
High Grade	HG	≥2.5		ROM
Medium	MG	≥1.8	<2.5	ROM
Low Grade	LG	≥1.2	<1.8	ROM
Low-Low Grade	LLG	≥0.7	<1.2	LLG stocks
Marginal	Marginal	≥0.5	<0.7	Marginal stocks
Waste	Waste		<0.5	Waste dump

The schedule is driven by the specified mining rate (t/hour) in a scheduling period. For Youga the scheduling periods were months and the first period of mining was March 2017. For Ouaré mining commences in May 2018.

The Excel scheduler automatically selects material from the bench reserves to match the specified production for a scheduling period. This means that the mining progresses bench by bench and that a proportion of a bench can be mined in a scheduling period.

Based on the total rock moved, the quantities of each material type that are sent to each destination (ROM pad, stockpile or waste dump) are computed and the cumulative quantities recorded. The reclaim from the ROM stockpile is then automated such that the highest-grade material is reclaimed first.

The main constraints on the mine schedule are:

- Maximum bench sinking rate.
- Limit of three active pits at any one time.
- Maximum ore transport rate form Ouaré to Youga.

The maximum vertical sinking rate has been set at 10 m/month per pushback, which equates to a vertical sinking rate of two benches of 5 m. On the uppermost benches, it may be possible to exceed this rate by using temporary ramps but as the pushback deepens the access constraint to a bench becomes the limiting factor. This is particularly true of the bottom benches where single lane ramps are used and the area of each bench diminishes with depth.

The constraint on ore transport from Ouaré to the ROM pad at Youga is dependent on:

- Number of trucks.
- Truck availability.
- Truck size.
- Shifts per day.
- Cycle time.

The plan is to use up to 30 Volvo trucks (40 t capacity) on two shifts per day. It is estimated that each truck will be able to complete two trips per shift, or four trips per day, which with an 80% availability, translates into a fleet capacity of 120,000 t/month. This is within the planned transport rates for the schedule and indicates that the ore transport capacity should not be a constraint with 30 trucks available.

16.11.2 Stockpiling

The ore grade material from the Youga pits will be transported to the ROM pad next to the crusher. The ore will be segregated into separate stockpiles based on grade so that they can be loaded by a FEL to achieve the required blend.

The ore grade material from Ouaré will be stockpiled near to the pit exit on a temporary ROM pad. This material will then be loaded into the Volvo trucks and transported to the main ROM pad at Youga. Final blending of the crusher feed is performed at the Youga ROM pad, as there are multiple ore sources from the Youga, Balogo and Ouaré.

Sub-economic mineralised material (Marginal) will be stockpiled at Youga or Ouaré as a potential Resource should the price increase or a buyer is found for the raw material. The Marginal material should ideally be split into at least two areas on the Marginal stockpile in order to provide flexibility.

16.11.3 Production

The production profile for Youga commences in March 2017 with the A2NE pit. This pit has been in production since October 2016 and has been stripped down to the ore benches so that it is actively producing ore. Low grade material from A2NE, and other pits mined previous to October 2016, has been stockpiled and this Reserve of 417,000 t at 1.32 g/t Au, is included in the schedule.

The monthly production profile for the Youga and the Ouaré pits for the period March 2017 to December 2019 are shown in Figure 214.

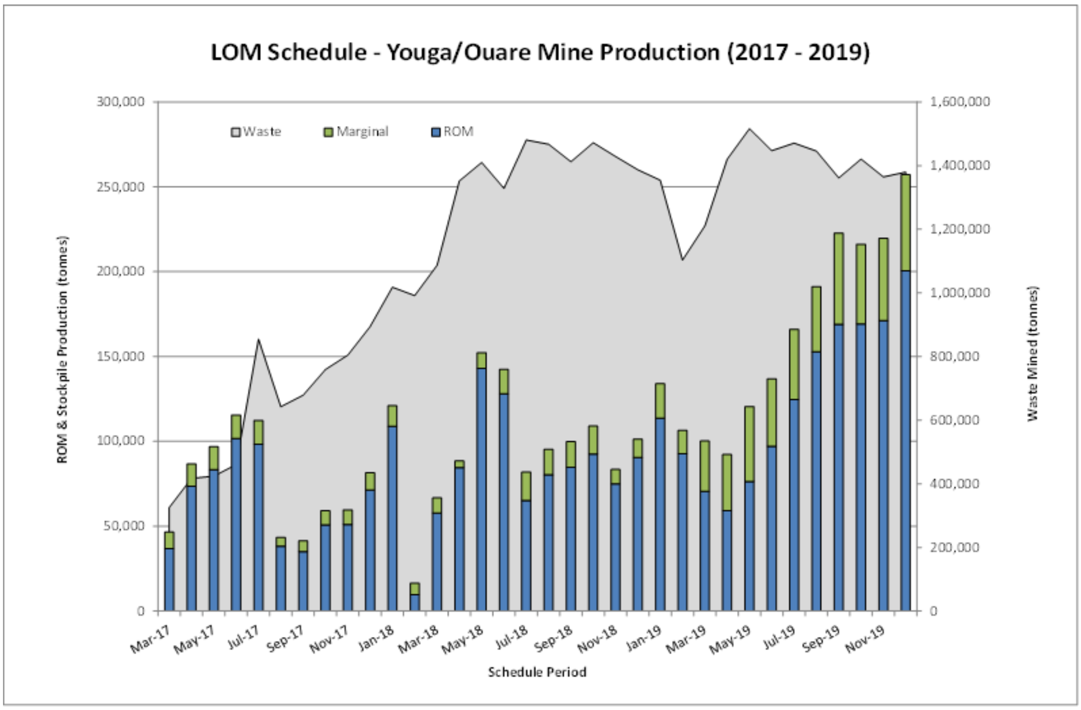


Figure 214: Production profile for Youga and Ouaré (2017 to 2019)

The production for 2020 to 2024 was scheduled in quarters and is shown in Figure 215.

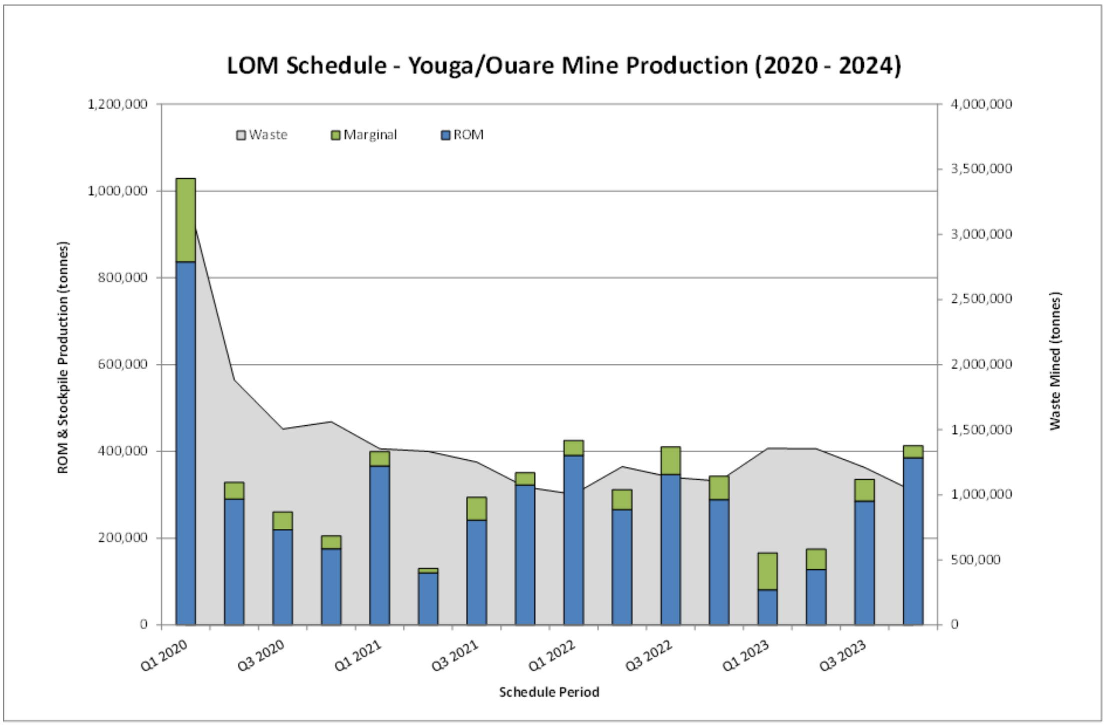


Figure 215: Production profile (2020 to 2024)

The corresponding stockpile levels for Youga and Ouaré are shown in Figure 216 and Figure 217.

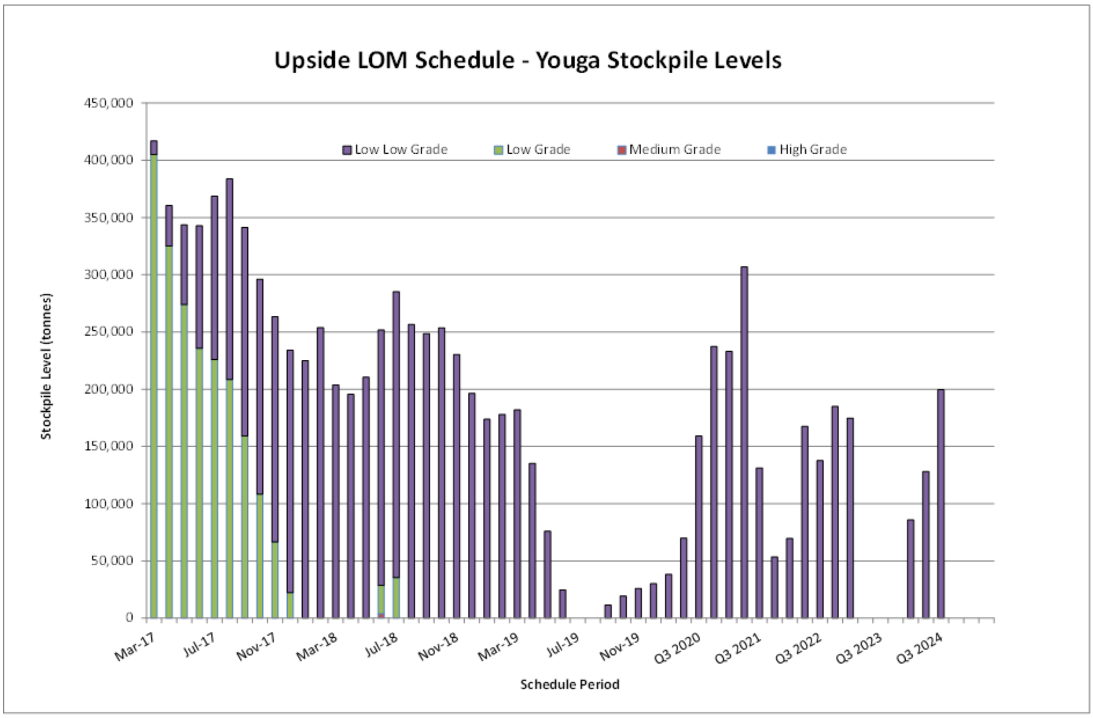


Figure 216: Stockpile levels for Youga

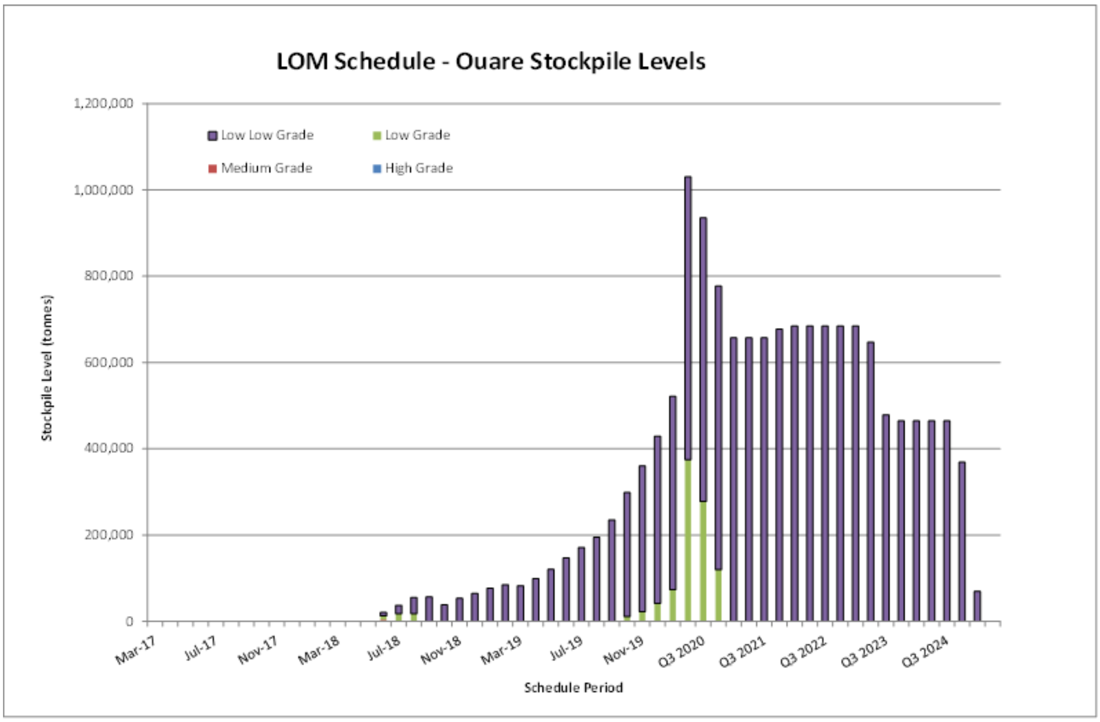


Figure 217: Stockpile levels for Ouaré

The combined stockpile levels for Youga, Ouaré and Balogo are shown in Figure 218.

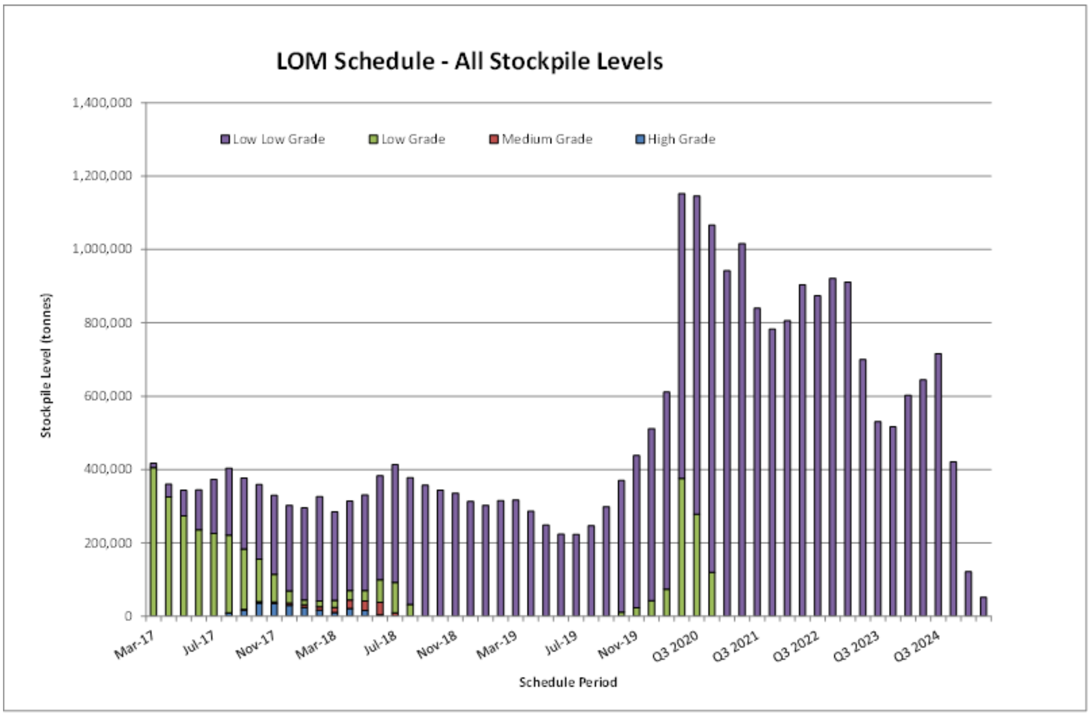


Figure 218: Combined stockpile levels (Youga, Ouaré and Balogo)

It can be seen in Figure 218 that the combined stockpile level is kept at between 200,000 t and 400,000 t between March 2017 and December 2019. After October 2017, the majority of this material is classified as LLG and has an average grade of around 0.8 g/t Au. Whilst this provides a buffer between the mine production and plant production it highlights the issue of grade control and the desire to high grade as much as possible.

From 2020 onwards the level of LLG stockpiles continues to grow to in excess of 1 Mt. This is primarily due to the fact that lower grade pits are coming into production. It is possible that the level of this stockpile could be significantly reduced by reducing the mining rate. However, this would mean that the average grade in these periods would drop due to the reclamation of the LLG stocks.

By operating a high grading policy during the period 2017 to 2023, the NPV is increased. As a consequence:

- Mining rate is increased due to higher levels of stockpiling.
- Cashflow is increased in the early periods due to an increased feed grade.
- LLG stocks are reclaimed once the open pits are closed.

The feed to the plant is shown in Figure 219 and Figure 220.

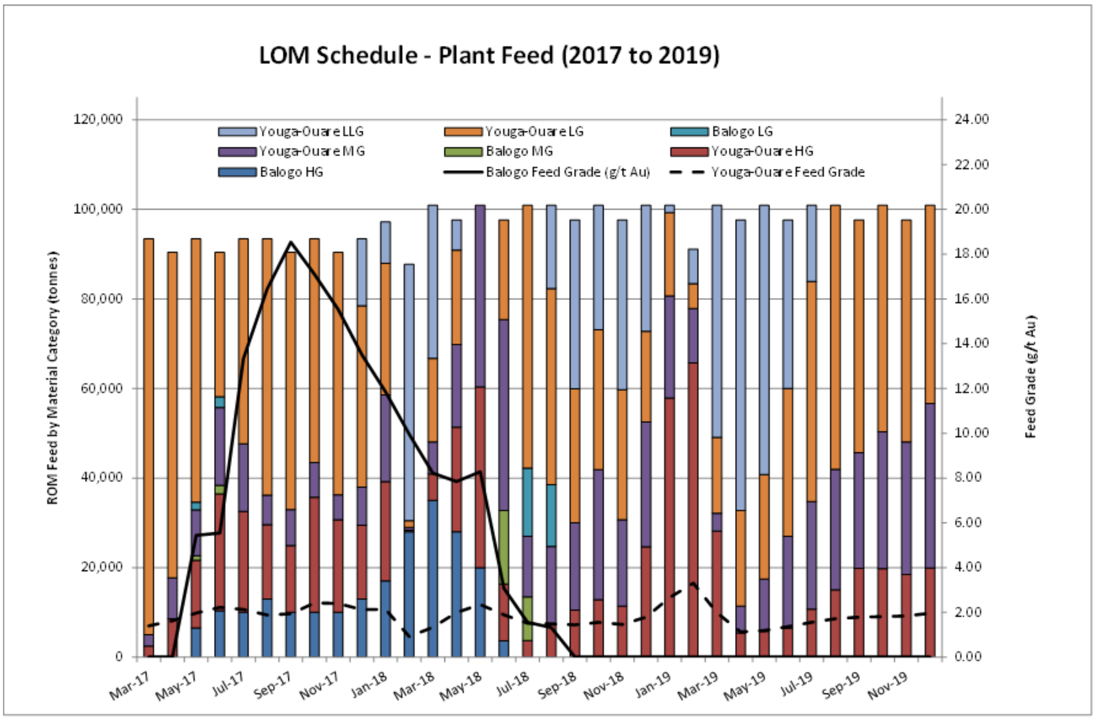


Figure 219: Plant feed (2017 to 2019)

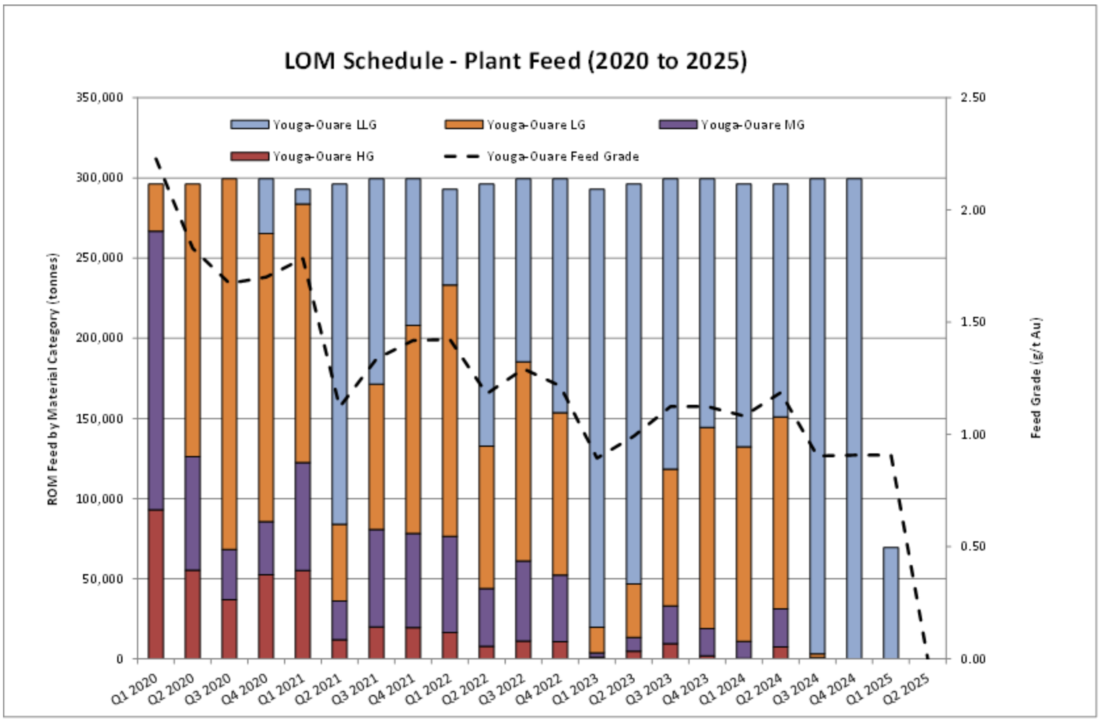


Figure 220: Plant feed (2020 to 2025)

It can be seen that the production from Balogo has a significant impact on the overall feed grade to the plant due to the high grade of the starter pit. As a consequence, the average feed grade exceeds 3.3 g/t Au between July 2017 and May 2018.

It can also be seen that the feed rate for LLG from Youga and Ouaré significantly increases from Q2 2021 due to issues with exposing sufficient High or Medium grade ore and the general downward trend in the average grade of the pits at Youga.

16.11.4 Equipment Requirements

The major items of equipment are summarised in Table 103.

Table 103: Equipment list

Equipment type	Model/Size	Units
Excavator	Mix of 30 t to 80 t	3 to 5
Haul trucks	40 t	8 to 18
Drill	Atlas Copco D60	2 to 5
FEL	Cat 988	1

It should be noted that although the haul truck requirements increase from eight in 2017 to 17 in 2018, this increase is offset by transferring equipment from Balogo to Ouaré. This means that only three or four additional haul trucks need to be purchased.

Similarly, the support equipment from Balogo will be transferred to Ouaré so that Youga and Ouaré can to all intents and purposes be treated as two different operations with their own fleets. This greatly simplified matters as it is not practical to transfer equipment between Youga and Ouaré on a short-term basis (daily or weekly). On a longer-term basis, it is feasible to move loading equipment between sites using the low bed.

16.11.5 Consumables

Fuel and lube were estimated from first principles from the industry standard consumption figures for each equipment type. Provision is also made for wear parts.

The blasting consumables (ANFO, primers, detonators and cord) were also calculated from first principles using the yield per hole (t/m drilled) and the power factor. These were split into production shots and wall control.

16.11.6 Labour

The labour requirements were estimated as follows:

- Managerial staff.
- Supervisors.
- Engineer/Geologist.
- Operators.

For non-shift pattern workers, a six and two rotation is assumed and there is no additional coverage during leave. Sufficient managerial or supervisory staff has been allowed for to cover operations for 365 days per year.

For shift workers, the number of full-time-employees (FTEs) was estimated on the basis of two shifts per day and a three-crew roster. Provision is also made for coverage for leave and absenteeism.

Table 104: Labour requirements – Mine Operations

Labour group – Mine Operations	Expat or Local	Full-time employees	
		2017	2018
Mine Manager	Expat	1	1
Mine Ops Supervisors	Expat	2	2
Production Engineers	Local	2	2
Trainer	Local	4	4
Mine Admin Assistant	Local	1	1
Excavator Operators	Local	9	15
FEL Operators	Local	3	3
Truck Operators	Local	24	48
Dozer Operators	Local	9	9
Grader Operators	Local	6	6
Backhoe Operator	Local	3	3
Other Equipment	Local	51	51
Blast Crew	Local	1	1
Mine Ops Coverage	Local	6	6
Drillers	Local	9	15
D&B Supervisors	Local	4	4
D&B Engineers	Local	2	2
Total		**137**	**173**

Table 105: Labour requirements – Maintenance

Labour group – Maintenance	Expat or Local	Full-time employees	
		2017	2018
Maintenance Manager	Expat	1	1
Maintenance Supervisor	Expat	1	1
Maintenance Admin Assistants	Local	3	3
Maintenance Coverage	Local	3	3
Total		**8**	**8**

Table 106: Labour requirements – Technical Services

Labour Group – Technical Services	Expat or Local	Full-time employees	
		2017	2018
Chief Mining Engineer	Expat	1	1
Planning Engineers	Expat	4	4
Senior Surveyor	Expat	1	1
Mine Surveyors	Local	2	2
Senior Mine Geologist	Expat	1	1
Mine Geologists	Local	3	3
Grade Control	Local	8	8
Samplers	Local	4	4
Technical Admin Assistant	Local	1	1
Total		**25**	**25**

The total workforce for 2017 and 2018 is therefore 170 and 206 respectively.

17 Recovery Methods

17.1 General Description of the Process Plant ((Ref – HGC Study Report, 2016)

The Youga processing plant uses the conventional gravity/CIL gold recovery process, similar to various facilities in operation in West Africa. This consists of a 3-stage crushing operation, ball milling, gravity concentration and cyanidation by carbon-in-leach (CIL). Pressure Zadra elution is utilized for recovery of gold from loaded carbon.

17.1.1 Crushing Circuit

Run of Mine (ROM) ore is delivered to the primary crusher feed bin by front-end loader (FEL). Ore is withdrawn by a variable speed apron feeder to the primary (jaw) crusher. The crushed ore is conveyed to the secondary (cone) crusher, which operates in open circuit. The secondary crushed product is fed to a single deck screen (14 mm openings to produce a nominal -12.5mm crushed product), with the screen oversize reporting to the tertiary crusher section (two cone crushers in parallel) feed bins, while the screen undersize reports to the fine ore stockpile feed conveyor. The tertiary crushed products report back to the single deck screen, completing the circuit.

17.1.2 Milling Circuit

The crushing circuit product reports to the fine ore stockpile, from which feed to the grinding circuit is withdrawn by one of three vibrating feeders onto the mill feed conveyor. Hydrated lime is added via a rotary valve onto the conveyor to ensure the ground ore is fed to the leaching circuit at the correct pH (>10.5). The ball mill discharge is pumped to a 'cluster' of hydro-cyclones, the overflow product from which forms the feed to leach circuit. The underflow product returns to the mill feed after a portion (approximately 20%) is diverted to the gravity circuit.

17.1.3 Gravity Circuit

The bleed stream is passed over a vibrating scalping screen to remove coarse (+2mm) particles, which gravitate back to the mill inlet chute. The underflow feeds the centrifugal bowl type concentrator for recovery of the coarse free gold and other particles of sufficiently high specific gravity. Concentrator tails gravitate to the mill feed inlet, while the concentrate is periodically discharged from the concentrator and flows into a storage tank located in the gold room for upgrading by further gravity devices.

17.1.4 Leaching circuit

The cyclone overflow slurry flows onto a linear trash screen for removal of natural and mining debris such as woodchips, cloth, plastic and wire which can cause operating issues in the downstream stages. The slurry gravitates through a sampler and into the first leach tank (mechanically agitated) where cyanide solution is added. From there it overflows and gravitates through five subsequent, mechanically agitated, Carbon-in-Leach (CIL) tanks to enable maximum possible dissolution of gold as a cyanide complex and subsequent adsorption onto activated carbon. Each CIL tank is equipped with an interstage screen mechanism, with a cylindrical basket-type stainless steel wedge-wire screen surface for retention of activated carbon in the tank. Air blowers installed on the top of the CIL tank platform provide air in the slurry through the agitator shaft in order to improve oxygenation of the slurry and enhance the dissolution process. By the end of the year this will be supplemented by the addition of an oxygen plant, which should further increase oxygen transfer into the process.

17.1.5 Tailings

The barren slurry from the last CIL tank gravitates to a vibrating screen (Carbon Safety Screen) prior to a sampler, and then to the tailings pumping station from where it is pumped to the slimes dam. Any carbon recovered from the screen will be re-circulated as required.

17.1.6 Carbon Treatment

Barren carbon is added to the last of the CIL tanks and advanced through to the first where the loaded carbon is routinely removed from the circuit, washed in acid, and the adsorbed gold removed by washing in cyanide under pressure and temperature. The desorbed gold is recovered by electrowinning onto steel wool. The electrodes are routinely 'harvested', and, combined with the separately collected gravity concentrate, converted to bullion by smelting.

17.1.7 Supplementary Systems include:

Raw Water

This is taken from the Nakambé River, stored in a desanding holding tank from where it is pumped over 11 km to the site raw water pond. Distribution points include: Elution - for making up acid wash and carbon desorption solutions, gland service, reagent preparation, and the fire water head tank.

Process Water

Decanted excess settled water from the tailings dam pool gravitates to the return water dam. A return water pump at the dam recycles water to the plant process water tank. Process water is reticulated throughout the plant where required, servicing specific process requirements, as well as general hose points.

Potable Water Supply

Raw water is treated through a filtration and sterilisation system before being stored in a dedicated tank. Potable water is reticulated to the various drinking water and ablution facilities throughout the plant and offices, and all safety showers on site.

Fire-water Supply

The fire system consists of a main fire pump, an electric jockey (pressure booster) pump, a diesel driven pump, a fire pipe manifold and hydrants in chosen locations throughout the plant.

Compressed Air

Standard air compressed air systems are supplied for a plant of this type, including leach air compressors, high pressure and instrument air. Later in 2017, the operation proposes to install an oxygen separation plant to supplement the air supply to the leach circuit.

17.2 Historical Process Plant Performance

Processing operations commenced in 2008, ramping up to a throughput of 1 Mt in 2012, and 1.12 Mt in 2016. Figure 221 shows how the plant throughput has steadily increased over the period, while gold production peaked in 2013 at 89,000 oz, and thereafter steadily declining due to falling head grades as the current ore sources moved into lower grade zones.

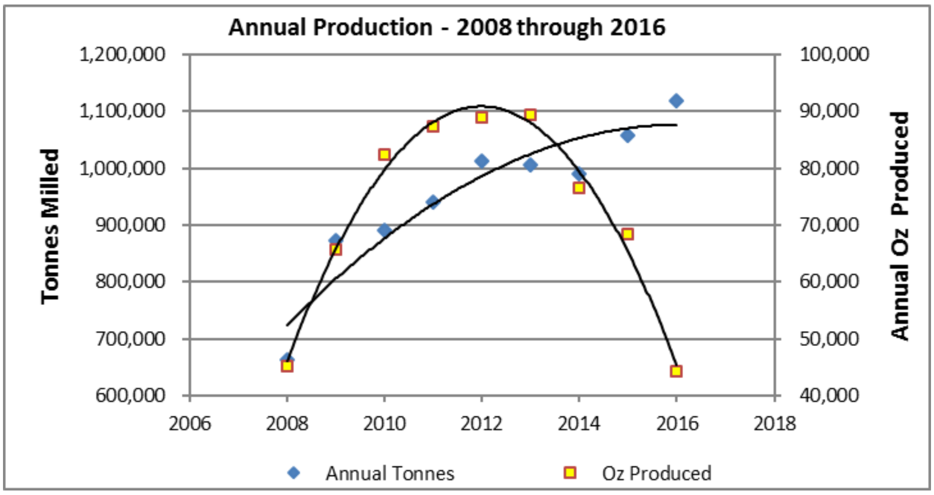


Figure 221: Annual Tonnes Processed and Gold Produced

The decrease in production is principally due to the falling off in feed grades during the latter years, and the relative effect of decreasing head grades on overall recovery is shown in Figure 222 below. The decrease in production was only partially offset by an increase in tonnes milled (+10% in 2016 over 2012).

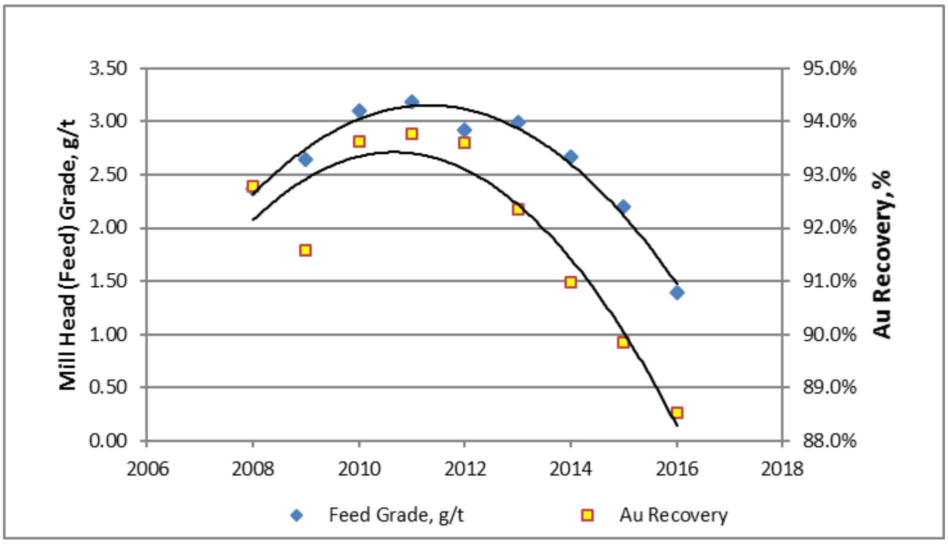


Figure 222: Youga Operation - Annual Mill Feed Grade and Gold Recovery

Examination of the tailings grades recorded over the same period (shown below) shows a gradual increase as the feed grades have decreased while circuit throughput has increased.

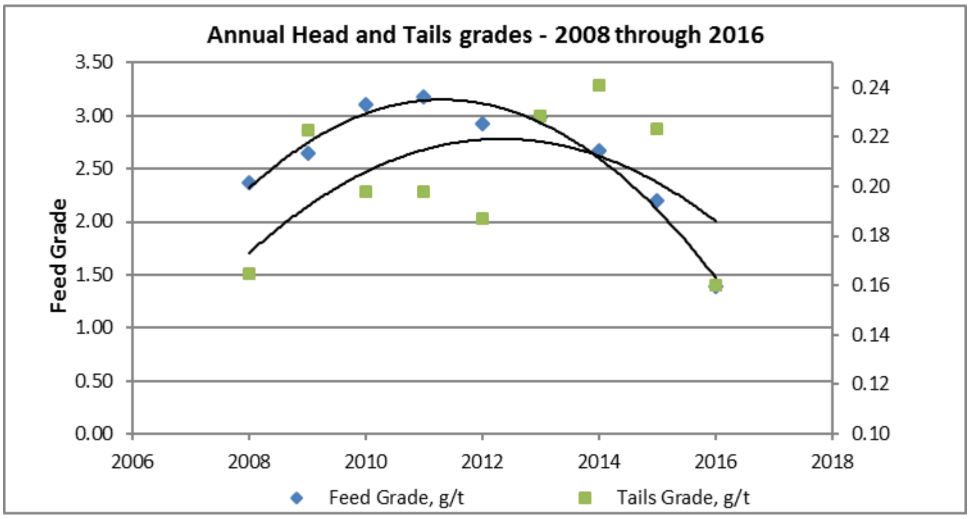


Figure 223: Youga Operation – Annual Mill Feed Grades and Residue Grades, 2008 - 2016

17.3 Current (YTD – January to May) Process Plant Performance

Monthly performance data for the Youga operation for 2017 (including May) has been provided (Client Communication, email 2nd June from Avesoro to CSA Global), and is summarised in Table 107.

Table 107: Youga Plant Operation – Overall Production January to May 2017

2017	Tonnes Milled	Head Grade, g/t	Au Recovery	Oz Produced
January	110,895	1.68	90.13%	5,399
February	100,466	1.88	88.99%	5,404
March	106,499	1.98	90.19%	6,114
April	102,148	2.81	92.63%	8,548
May	99,554	4.71	91.36%	13,773
YTD	519,562	2.58	90.65%	39,238

The data has been consolidated to produce a 'Bond' Ball Mill model based on the feed hardness, product sizing, and available mill power for the actual mill operation.

Table 108: Youga Plant Operation: January to May Mill Model Inputs

2017	Tonnes/Op. Hour	P80, Microns	Work Index
January	153.7	103	19.9
February	151.0	121	20.3
March	146.2	112	20.8
April	144.5	104	21.2
May	138.3	105	21.8
YTD	146.7	108.9	20.8

Note the 'Work Index' quoted in Table 108 is not a physical Bond Ball Mill Index measurement from a laboratory, but is 'inferred' from the operational data (feed and product sizes produced, and the adjusted power draw) actually recorded. The model has been used to predict the throughputs possible for the future ore sources using the available mill power of 2,890 kW, and for Ouaré samples particularly a product P80 size of 75 microns.

17.4 Projected Plant Throughput

The current mine plan (Figure 213) is projecting the material from Ouaré to be processed in 2018, 2019 and 2020 in the proportions of 34, 73, and 53 percent respectively, of the proposed mill annual throughput of 1.18 million tonnes.

Four samples of Ouaré material (designated East 1, East 2, Central 2, and West 2) from the 2012 test programme measured the Bond Ball Mill Index at 18.2, 22.2, 16.1 and 11 kWh/t (Table 51) respectively. The arithmetic average is 17.05 kWh/t, which is lower than those from the ore that has been treated through 2017. Table 109 lists the range of predicted mill circuit throughputs for the range of 'hardnesses' measured for the Ouaré ore types at the recommended grind size (80% passing 75 microns).

Table 109: Ouaré through Youga – Predicted circuit throughputs

Ball Mill Work Index	Operating Work Index	Predicted Power Draw, kW	Predicted Circuit throughput, t/h
15	16.5	3,002	180.0
17.5	19.3	2,987	145.0
20	22.0	2,990	127.0
22.5	24.8	2,993	113.0
17.08	18.8	2,980	148.3

The mill feed to the operation is scheduled to average 1.18 Mt/year. At the design utilization of availability of 95% (8,330 operating hours), the average plant throughput required is 143 t/operating hour.

18 Project Infrastructure

18.1 Introduction

Details of the infrastructure for Youga have been taken from Endeavour Mining's Technical Report of 2015. The mine has been operating since 2008 and was taken over by MNG in February 2016. MNG subsequently restarted the mining operation in October 2016, following a period of operations where ore was processed from existing stockpiles.

Under the management of Endeavour the mine operations were run by a mining contractor, PW Mining International Ltd, but since the takeover by MNG in 2016 the mine has been run by the owner. This has not substantially changed the operation other than to introduce new mining equipment.

The one area of change is that the Ouaré deposit has been included in the Reserves for Youga and is treated as a satellite deposit that will be run from Youga. Consequently, the facilities at Ouaré will be kept to a minimum. These are discussed below in the relevant sections.

18.2 Water

Water at Youga is taken from the Nakambé River using a submersible pump anchored on the riverbank including stand-by to ensure that there is an uninterrupted water supply to the plant. Power to the pumps will be via an overhead line running from the plant to the water extraction point at the river.

The raw water from the Nakambé River is pumped to a raw water storage pond located close to the plant. The pond supplies water to the plant raw water tank as well as supplying raw water to the process water tank to supplement the tailings dam water supply when the process water dam runs low.

Potable is produced at the plant from river raw water. This water is passed through a filtering and sterilization system to clarify and kill off biological organisms before it is stored for distribution to the camp and plant.

The tailings dam incorporates a return water decant system linked to a return water pond. Reclaim water is pumped to the process water tank within the plant area for re-use in the process.

Potable water will be produced at Ouaré by pumping raw water from the Ouaré River. This water will be passed through a filtering and sterilisation system to clarify and kill off biological organisms before it is stored for distribution to the camp and other mine buildings.

18.3 Electricity

Burkina Faso has no infrastructure close enough to supply power to the Youga plant. The option of generating power on site with diesel-powered generators has been implemented as a back-up solution while main power is supplied from the Ghanaian grid. A power line running between Zebila and the Youga site has been installed, as well as the associated transformers and switchgear to supply power to the plant grid.

The 34 kV/11kV switchyard consists of a pole mounted fused isolator, a 34 kV outdoor circuit breaker and a 34 kV/11kV 10 MVA power transformer. The indoor 11 kV switchgear panel consists of an incomer with protection and power metering, power factor correction, ball mill contactor/circuit breaker, five transformer feeders and overhead line/mini sub-feeders.

The motor control centres (MCCs) are of the fully detachable plug-in type for ease of maintenance. The MCCs have been designed to service specific areas of the plant, and the drives, including the variable speed drives, requiring emergency standby power have been equipped with auto changeover incomers. Grounding networks is looped around substations and shared by both high-voltage and low-voltage units.

Electrical power required for the camping area and the mine buildings will be sourced from two diesel generators of 100 kVA and 150 kVA.

18.4 Access

Plant access roads to Youga were constructed on laterite base and are maintained and upgraded on an "as required" basis. The haul roads are constructed on a similar base but are wider and covered by waste rock. The construction of the haul roads and ROM pad was completed by the mining contractor.

At Youga a substantial bridge has been built across the Zéra River, which divides the mine camp and the mine operating infrastructure, in order to avoid isolation of the sites during periods of heavy downpour.

An airstrip for light aircraft is currently being constructed along the East Pit mine haul road to provide an alternative emergency medical evacuation option for personnel.

A new 44 km access road will be constructed to connect Youga to Ouaré. This will include the construction of a substantial bridge to cross the Nakambe river. It is noted that the Company will only be required to construct a road of 11 – 14 kms (including bridge construction), with the government currently constructing the remainder.

18.5 Buildings

The administration office block at Youga consist of 500 m^2 of prefabricated building and accommodates financial, purchasing, human resources (HR), and health, safety and environment (HSE) staff. Adjacent to it is the infirmary and another office for the geologists, surveyors and mining team. Other offices within the processing area are used by the maintenance and process plant supervisors.

There is also a workshop and reagent store at Youga, which are located within the plant high security area. A smaller workshop will be located at Ouaré to deal with minor repairs. This workshop will be constructed from containers and will be relocated from Balogo.

The mine buildings at Ouaré will be very limited and will be mainly be constructed from container style buildings that can be relocated from Balogo.

18.6 Laboratory

A comprehensively equipped analytical laboratory is provided at Youga to cater for the process control, metallurgical accounting, mine assay and environmental monitoring. Equipment was supplied and is maintained by ALS, the contractor managing the laboratory.

There is no provision for a laboratory at Ouaré. All the samples from Ouaré will be sent back to the laboratory at Youga.

18.7 Fuel Storage

Fuel and oil storage is supplied under contract from TOTAL, facilities include two 200 m^3 horizontal tanks, fuel service area for both light and heavy vehicles (including high capacity filling pumps) a covered area for storage of lubricant and offices for the contractor staff.

A smaller fuel and oil storage facility will be located at Ouaré to deal with the mine equipment used at this site. This facility can be relocated from Balogo.

18.8 Fire Protection

Portable fire extinguishers are placed outside of the offices, sleeping quarters, kitchens, workshops and stores and distributed around the plant site for fighting small fires.

The MCC rooms are equipped with incomer cut-offs to trip the power feeding to the MCC room should a fire break out.

18.9 Waste and Sewage

Solid wastes are buried in dedicated facilities within the mine lease areas. This site consists of a series of pits (cells) which will be filled with waste materials and sealed once filled to design capacity.

Sewage is collected in septic tanks, and drains away through French drains. The camp at Youga is located on a hilltop, and French drains run away from the accommodation units. A similar arrangement will be constructed for Ouaré.

18.10 Communications

The area is under coverage of more than one cell phone company and a standalone VSAT (very small aperture terminal) system allows internet and voice transmissions that are carried on the same signal using VOIP (voice over internet protocol).

Mine mobile communications are done via handheld mobile radio sets, with a base station located near the centre of operations.

18.11 Transport

The site vehicle fleet of pick-ups is used for the transport of materials and personnel to and from Ouagadougou and between the mine sites and camps. Contracted busses provide transportation to work for personnel living in the nearby villages and Ouagadougou.

18.12 Security

The main entrance security office is located on Youga's Main Plant access road. All visitors to the mine complex report to this security gate for authorisation prior to entry. If required, personal protection equipment (PPE) is available for issue from this point. A separate security gate will be constructed at Ouaré to deal with traffic to and from the camp at Ouaré and also traffic coming from Youga.

Monitoring systems are installed in the plant overseeing the mill, cyclones, concentrator and gold room to monitor activities. This system uses smart camera technology to provide improved image quality, coverage of operations and image storage and review capacity.

18.13 Accommodation

The accommodation camp at Youga is located on a hilltop approximately 3.5 km south of the plant and is approximately 1.5 km south of the A2 main pit. All services have been provided to the camp and plant since there was no existing water or power infrastructure in the region at the time of construction of the mine.

There are five stand-alone two-bedroom houses with a separate bathroom, separate toilet, living room and a small kitchenette for senior management. Managers and supervisors housing consists of a 30 m^2 single room with its own shower, toilet and basin and sufficient space for a desk and a living area with provision for a television connection point. All enclosed rooms are air-conditioned.

The camp can accommodate 100 persons.

The laundry, a prefabricated structure 42 m^2 in size, is equipped with eight industrial washing machines. The room includes a washbasin and worktop for ironing and folding clothes.

The kitchen and dining facility is fully equipped to prepare and serve food as required by the mine shift roster.

Television signals are received from satellite television systems. The camp recreation area consists of a bar, games area, open veranda, swimming pool and a gym.

A smaller camp will be built at Ouaré to accommodate key members of the mine operations personnel. Where possible the main camp at Youga will be used for personnel that are not working on shift.

18.14 Personnel

Although nationals from Burkina Faso are filling most operational and management positions within the company, some selected posts requiring specific skills or experience not available within Burkina Faso, have been filled by expatriates. In addition to performing their job function, expatriate personnel are expected to transfer knowledge and expertise to develop the capabilities of their national staff.

18.15 Tailings Disposal

The TSF for the project was originally designed by Digby Wells and Associates (DWA) (Digby Wells and Associates, 2006). The facility construction commenced in November 2006 and was scheduled to be completed by the end of July 2007. However, due to significant delays in construction it was not completed until March 2008, when production began.

DWA was not involved in the construction or has had no involvement since the design. KP assisted BMC in the construction supervision and was asked to conduct regular audits on the facility from 2010 onwards.

The existing TSF is a paddock style impoundment, and is located approximately 200 m north of the Youga processing plant. In April 2017 Knight Piesold (KP) reported that the existing TSF covers an area of approximately 540,000 m^2 and contains just over 5 Mt of tailings. It was noted that the TSF has been constructed up to its initial intended DWA design height of 242 m RL.

At the time, it was recognised by KP that the Life of Mine (LOM) plan requires further storage to handle an expected tonnage of up to 7.0 Mt of added storage capacity, above the 5 Mt capacity in April 2016.

KP concluded that there were two main expansion options to consider:

- Raise the existing TSF beyond the current proposed design height of 242 to 249 masl.
- Extend the TSF by creating new starter walls on available ground to the West and North of the existing TSF.

A third option of raising the existing facility to 252 masl was also considered by KP by adding another phase (249 – 252 masl).

KP assumed that the method delivery of the tailings, the tailings deposition and the water reclaim all remain unchanged from the existing philosophy. It is assumed that no additional pumping equipment will be necessary to transfer the tailings to the TSF. In addition, BMC indicated that no changes to the nature or character of the tailings are expected over the LOM.

On this basis, KP concluded that:

- The lowest net present cost option is Option 1, whereby the existing TSF is raised to 249 masl. However, this option only provides sufficient storage for 5.1 Mt and assumes that the existing tailings conditions.
- The decant arrangements would not affect future construction or operation.
- A detailed investigation of the geotechnical conditions of the existing tailings (using Cone Penetration Testing/boreholes) and analysis of the decant arrangements would need to be made to increase the confidence in this design and the stability thereof.

- It is especially important to determine the settled tailings density in order to increase accuracy of calculations to determine the future storage capacity requirements.
- Further expansion beyond 249 masl might be possible but the tailings strength and decant arrangements would become critical and investigation would need to be repeated more regularly to confirm that the stability of the TSF is not compromised.
- The option to raise the existing TSF has the added benefit of not affecting any further land take and reducing environmental impact.

If additional storage is required above 5.1 Mt and the further raising of the existing TSF is considered too risky, or the site investigation proves it to be impractical, then it is considered that the extended option (Option 2) provides a suitable alternative.

With Option 2, based upon the stage storage curves, a starter wall to 239 masl, followed by taking the extended facility upstream to 242 masl, in conjunction with the existing facility being raised to 249 masl, would provide sufficient storage for 7.0 Mt of tailings.

However, construction material availability and suitability of the ground conditions is uncertain. Consequently, to verify that the design is viable a full site investigation of the TSF expansion area and the existing tailings using boreholes will be required. This option would also require careful management of the tailings deposition in order to reduce the rate of rise and provide suitable foundations for the subsequent upstream raise.

Based upon the above, KP recommended that a detailed investigation of Option 1 is carried out to:

- Establish the geotechnical conditions of the existing tailings.
- Analyse the decant arrangements to confirm that raising the TSF to 249 masl can be carried out safely.
- Determine whether it is possible for further raise the facility to 252 masl.

At the time KP considered that raising the existing TSF to be more cost effective than creating an extension, and that the costs for the investigations are small compared with the additional costs for preparing the expanded TSF, with or without the need for an HDPE liner.

However, the updated LOM schedule presented in this report demonstrates that the total storage requirements as of 1st March 2017 are now 9 Mt and it will be necessary to reconsider the option of extending the current facility as it is unlikely that Option 1 by itself will provide sufficient capacity.

For the purposes of this study the incremental cost of expanding the TSF by 5 to 7 Mt have been used to arrive at a cost of expanding the facility to 9 Mt.

19 Market Studies and Contracts

19.1 Market Studies

Gold is a freely traded commodity and as such there has been no market study made and nor is one proposed.

The plant at Youga currently produces Dore bars that are sold to independent refineries under normal commercial conditions. Ore from Ouaré is trucked to Youga plant.

The gold is collected from site and is transported to Ouagadougou, from where it is flown to Europe for further refining. The funds flow back into Burkina.

As soon as the gold is collected from the gold room at Youga, all risks are transferred to the security company/refinery.

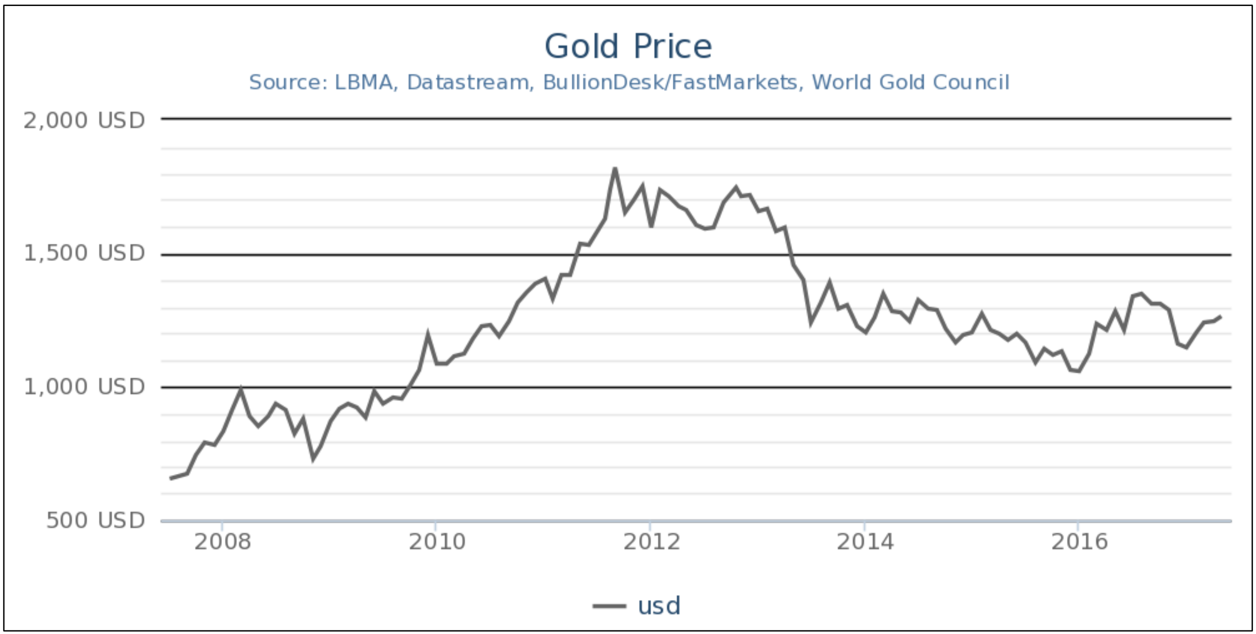


Figure 224: Gold price in US$ for the past 10 years

Source: World Gold Council website (http://www.gold.org/investment/interactive-gold-price-chart), accessed on 1 June 2017

The gold price dynamics (Figure 224) suggests that the base case scenario gold price of US$1,250/oz is within the current market trends.

19.2 Contracts

Currently there are no long-term contracts in place for the project.

20 Environmental Studies, Permitting and Social or Community Impact

20.1 Overview

Youga is an operational mine with several open pits and a conventional gravity carbon-in-leach (CIL) processing plant, which was due to be closed when Avesoro acquired it from the previous owner. Balogo is a gold deposit some 130 km west of Youga, which will produce ore to feed into the Youga processing plant. There is also a further gold deposit, Ouaré, approximately 50 km east of Youga, which could potentially also feed ore to the Youga plant. This report comments on the level of environmental permitting and study work completed, to inform the Reserve reporting, sufficient to meet or exceed prefeasibility study standard work.

The review is based on the following main documents:

- Youga EIA Report, SGS Environmental (Ghana), February 2005.
- Youga EMP (version 1), date unclear but pre-2012.
- Review of Mine Closure, Youga Mine, Wardell Armstrong, January 2017.
- Ouaré Project Feasibility Study Report, HCG Turkey, May 2017.
- Ouaré Preliminary E&S Assessment Report, Socrege, November 2012.

Other relevant documents also sighted:

- Copy of Youga Mining Permit, 2003.
- Signed Company Environmental Policy, January 2017.
- Youga EMP, 2016.
- Youga 'Respect to Commitments' (Social Mitigations), 2015.
- Youga Environmental Program Organisation, 2016.

20.2 Youga

20.2.1 Area Context

The Project is located within the Sudanese climatic type of southern Burkina Faso but influenced by the south Sudano-Sahelian zone, where annual evaporation exceeds rainfall. The wet season runs from May to October, bringing around 900 mm rainfall on south and south-westerly winds, while the dry season from November to March, is associated with dusty north and northeast "Harmattan" winds. Annual evaporation is around 2870 mm. Highest temperatures occur at the end of the dry season with mean monthly maxima exceeding 39°C. Surface water is largely ephemeral and rain-fed groundwater fluctuates seasonally, giving rise to water supply issues for people, livestock and wildlife.

The Project area is entirely rural with savannah woodland cover but with rapidly expanding agricultural cultivation and pastoralist activities, as well as artisanal mining and felling for firewood and charcoal, causing significant deforestation. Population density is low and scattered with severely limited infrastructure, social structures and services.

20.2.2 Current Condition and Status

The Project is composed of several open pits and responding waste rock dumps; a ROM stockpile; processing plant and mine offices; paddock-style tailings storage facility (TSF); and a mine camp. Operations at the site are ongoing but currently no mining is taking place, with the process plant being fed from the ROM stockpile which has sufficient material to sustain the plant through 2017. Mining operations at Youga are expected to recommence and further feed is to be provided from the Balogo mining operation.

As no site visit was undertaken as part of this review, the current condition and status of the Youga Project site is derived from the Wardell Armstrong (WA) site visit, undertaken at the end of 2016, whose visual assessment of the various Youga Project components was as follows:

Open Pits

- **Main Pit** – Mining terminated in early 2016. Pumping continues to maintain dry workings to allow further mining should this prove viable.
- **East Pit** – Mining terminated in early 2016. Water has been allowed to accumulate in the excavation before being pumped to the process plant as a source of technical water. Depth of water in the pit is c. 80.
- **West Pit 1** – Mining completed in 2011 with rehabilitation undertaken. The pit was flooded via diversion of a local watercourse, with controlled outflow returning water to the same river. The remaining visible pit rim appears in generally sound condition with significant vegetation re-growth;
- **West Pits 2a and 2b** – Both pits no longer operational. Pit 2b is flooded to within 5 m of the pit rim from a water course, with intention to cut a channel between the pits to flood Pit 2a.
- **West Pit 3** – Mining terminated in early 2016. Some surface runoff has been allowed to accumulate with long-term intention to channel through to West Pits 2a and 2b to create three consecutive ponds as part of a local watercourse with natural inflow/outflow.
- **West Pit 4** – Planned for development in late-2016/early-2017.
- **NTV 1, 2 and 3** – Small excavations mined during 2016, subsequently backfilled with waste rock, covered with replacement top soil and fertiliser to maintain land for future use.
- **NTV 4** – Excavated to completion and flooded to form a lake as part of a local water course. The pit is to be backfilled to keep crocodiles from posing a risk to villagers.
- **Zergoré A** – Shallow excavation (≈30 m) currently in operation. To be completely backfilled with waste rock following completion of mining.
- **Zergoré B** – Mining completed and pit backfilled to surface with replacement of topsoil.
- **Zergoré C** – Mining completed and backfilling with waste rock underway.
- **A2 North-east** – Planned for development in early-2017 with surface clearing undertaken.

Open pit closure and rehabilitation will continue to comprise either backfilling with waste rock or flooding. Backfilled pits are to be returned to farming or cultivation land use, while flooded pits may be used as water storage facilities with offtake for irrigation and farming. Water quality samples have been recently tested though this data has not been seen.

Waste Rock Dumps

The Youga waste rock dumps are spread out across the site, with each pit area having dedicated waste rock dumps. All dumps are below 45 m in height and are constructed with 45° to 50° slope angles, are generally in good condition with no apparent stability concerns and some vegetation regrowth:

- **Main Dump** – The largest waste rock dump at the site, covers ≈39 ha and has a maximum height of 43 m in two lifts. Small amounts (<100 kg) material removed from top of the dump by artisanal miners (issue of access control). A watercourse runs under the dump. A topsoil bund surrounds approximately 75% of the dump, for covering slopes during rehabilitation.

- **East WRD** – Covers ≈31 ha, maximum height 23 m with two lifts. Slopes have significant vegetation regrowth covering at least 50% of slopes on which topsoil has been replaced, but there is some slippage of this topsoil. There is similar perimeter topsoil bund for later rehabilitation.
- **West 1 WRD** – Covers 4 ha with a maximum height of 15 m.
- **West Dumps 2 and 3** – Adjoining waste dumps separated from the open pits by some 30 m of flat ground. The dumps cover a combined area of 30 ha and vary in height from 8 m to 14 m. Waste rock is likely to be used for open pit abandonment bunding system.
- **Zergoré Dump** – Used to backfill Zergoré pits, with Zergoré C pit backfilling currently taking place. Remaining material covers 17 ha to a maximum height of 10 m but will be significantly reduced with backfill completion. The terrain at Zergoré is more undulating than the rest of the site and the waste rock dump is to be re-profiled to limit the visual impact.

Tailings Storage Facility

The TSF, 500 m from the processing plant, covers around 64 ha and contains tailing slurry, domestic wastewater and surface runoff. The base of the structure is apparently made of impervious materials and the paddock area is contained within a system of bunds covered by geomembrane. The embankment was constructed in a single lift to ≈8 m with slope angles of 40° to 45° and is apparently in good condition with vegetation regrowth at the base. A decant tower takes supernatant water from the TSF to a settling pond for reuse in the processing plant, with no discharge to the environment except for accidental ruptures in the tailings pipeline, the return-water pipeline or failure of the decant tower. The TSF appears to be reaching maximum capacity with <1 m freeboard. The mine plans to construct an additional 3 m lift to increase the capacity of the TSF for continued operations.

Water Management System

The water management system on the Youga site comprises the following components:

- Water tower located on the bank of the Nakambé River.
- Pumping station at the Nakambé River.
- An 11.2 km pipeline to take water from the river to the process plant.
- 7 km of pipe to take water from pits to the plant.
- A sump facility at the receiving point of the pipeline.

Mine Infrastructure

The mine infrastructure includes process plant and mine offices; stores and warehouse, garage, contractor workshops, fuel farm (owned/operated by TOTAL), and generator sets. The main mining camp comprises eight blocks of residential buildings, each containing 10 bedrooms, serviced by a restaurant/canteen, a bar, social facility and three concrete buildings. There are also three junior camps at Youga Village.

The Project is served by approximately 10 km of roads which vary in width from 15 m to 20 m. The majority are in good condition and suitable for both mine and civilian traffic. A number of small roads forming part of the national road network also traverse the site, but are in significantly worse condition than the mine roads. As a result, many local people use those mine roads outside the restricted areas.

20.2.3 Environmental and Social Impact Assessment

The original Youga Environmental Impact Assessment (EIA) report was prepared in partnership with local consultancy SOCREGE, who was responsible for both local coordination and collection of baseline data and information. Initial baseline data collection started in 1999 and the submitted EIA resulted in the granting of an Exploitation Permit by the Government of Burkina Faso in April 2003. The 2005 SGS updated EIA study for the Youga Project was undertaken as the proposed development had changed from that described in the original mining plan and associated EIA upon which the permit was granted.

Socrege and SGS appear to have a good understanding of the Burkina Faso legislative framework for the Project and all the environmental studies and reviews (for all components – Youga and Ouaré) have given comprehensive details of the laws and regulations that apply to the Project, including listing of the different permits, authorisations and licenses required. The legal components of the EIAs and reviews have all included reference to international standards, guidelines, treaties and commitments, including the IFC Performance standards and Equator Principles.

The Youga EIA Project description was detailed and based on the updated mine plan. The site infrastructure locations, including for the waste rock dumps, process plant and offices, TSF and camp were all selected based on suitable criteria of topography, geotechnical considerations, access and proximity as well as environmental impacts and health and safety (H&S) issues. Water balance calculations indicated average climatic conditions would cause a shortage of process water and that water would need to be pumped from the Nakambé River to meet process plant requirement. This also meant that discharge from the TSF was not necessary except in emergency flood conditions. Typical reagents required for operation of the process plant were identified as sodium cyanide, lime, caustic, hydrochloric acid, activated carbon and flocculant. Project waste streams, including waste rock and tailings, industrial and domestic garbage, sewage and liquid wastes were identified and disposal routes proposed.

The geology and mineralogy of the deposits are well understood and a preliminary geochemical study was undertaken on 24 waste rock samples representing the main lithologies to be extracted in the open pits, to determine the potential for acid rock drainage (ARD). All the samples gave neutral or alkaline slurry pH values and acid-base account (ABA) testing showed that they were all non-acid forming (NAF). This indicated that there should be no ARD risk and it would be permissible to discharge runoff and percolation from the waste dump directly into the local waterways, via settlement ponds, without chemical treatment. However, there was no testing of ore material or process tailings and no metal leaching tests undertaken. This review has not seen any evidence of further geochemical study or operational water monitoring data to confirm the absence of ARD or metal leaching since mining and disposal of waste rock started in 2006.

The Youga environmental baseline studies assessed the climate, air quality, surface and groundwater hydrology, ecological, land (soils and land use) and socio-economic characteristics of the Youga Gold Project area and immediate surrounds. Much of this information was obtained as part of the original baseline survey carried out in 1999, updated in 2004/05 to reflect current conditions and assess potential costs of compensation for farmers and resettlement of some isolated hamlets.

Description of rainfall and other climate parameters were based on data obtained from the closest national meteorological stations (40 km to 75 km distance from the Project site) covering over 40 years and was sufficient to determine likely site conditions for planning and impact mitigation. No site data was collected, but the Environmental Management Plan (EMP) proposed establishment of a Project site met station. It is not clear if this was accomplished and review has not seen any updated operational site met data. The water resources of the area are described and although flow measurement was limited, the ephemeral nature of most surface water and important springs identified. Groundwater resources are the main sources of water supply for domestic and agricultural use, and the local water-table levels recorded. A limited sampling program for water quality assessment was undertaken in 1999, which suggested surface and groundwater water is little affected by mineral leaching, but microbiological contamination is common, together with turbidity and sediment loading in the rainy season. No further operational monitoring results have been seen.

Detailed soil and vegetation studies reflect the strengths of the study team and Project area flora diversity is considered relatively rich but with increasing anthropogenic degradation from agriculture and pressure of population demands. Fauna surveys are less well detailed, but the importance of riparian forest areas was identified include sacred and protected areas and forest pockets in the Project area that are important to local communities and critical habitats for birds, medium and small mammals, insects, reptiles and amphibians, particularly during the dry season. Human activity including agriculture, grazing livestock, gold washing and hunting has impacted the area ecology.

The main agricultural and other land uses were surveyed and include cultivated annual crops; fallow land; animal husbandry and pasture; savannah woodland; artisanal gold washing; mine exploration areas, access roads and accommodation camp; and villages and scattered small hamlets. The total Project footprint was estimated at ≈1.75 km^2 in an area where there was limited settlement and agricultural activities, 70% of which is covered by marginal soils unsuitable for agricultural purposes.

In 2005 the population of the area was estimated at 6,200 with Youga and Zergoré having a combined population of less than 2,000. Socio-political relations between the various communities are still largely administered by traditional authorities, particularly when it comes to land management and acquisition. The economy of the district is dominated by agriculture followed by livestock, and since 1993, artisanal mining. Farming is usually on a small scale and designed to meet local food needs. Cultural and economical relations have been maintained with the neighbouring and related population based in Ghana. In-migration is limited to neighbouring villages and particularly from Ghana during the rainy season for farming, with people returning to their villages after harvest. There is strong emigration of young people away from the area in search of employment and other opportunities. Prior to mining the economic development of the area was severely hampered by restricted road networks, poor spatial distribution of very limited social infrastructure (education, health and local government) and the lack of skilled workforce.

20.2.4 Impact Assessment and Mitigations

The Youga EIA identified impacts for both construction and operational phases of the Project. Potential negative impacts of the project assessed included to air quality; noise; pollution and depletion of water resources; to soils, vegetation and wildlife, and on local communities. Impacts of enforced relocation and loss of land and crops were identified as significant, with preliminary surveys showing up to four hamlets needing resettlement and approximately 100 ha of farms requiring compensation. As the majority of local residents depend on farming for their livelihood, appropriate compensation was acknowledged as critical to mitigate local socio-economic risk and confrontation. The EIA also identified a number of potential positive impacts of the project relating to employment, economic opportunities and social/infrastructure benefits for local communities and to national and regional government through payments of royalties and taxes.

Proposed impact mitigation included conventional and Best Practice measures recommended for avoiding, reducing, mitigating or compensating impacts. A precautionary approach was proposed to relocate or restrict access to a 500 m buffer zone around the main Project infrastructure. A Project liaison consultation committee was to be established to address issues associated with employment, social and livelihood impacts, as well as effects of in-migration attracted to the Project, especially across borders. However, no details were provided on a formal Project Grievance Mechanism.

The EIA incorporated a preliminary EMP which included: waste management; community relations and compensation; a basic monitoring program; Reclamation Closure and Decommissioning Plan; Emergency Response Plan; and provisions for environmental and social auditing and review. The preliminary EMP gave estimates for the environmental and social budget for the Project to be financed from the annual budget and operating costs. An annual operational budget of approximately US$30,000 was allowed for the implementation of the EMP, excluding on-going rehabilitation costs or environmental auditing (every two years at US$20,000). In addition, there was also to be an allocation of a minimum fund of US$20,000 per year over the mine life of the Project for community relation expenses. Resettlement costs and compensation payments for buildings and farms were additional to this, but not provided as a separate budget.

According to the 2017 WA report, actual Project expenditure for obligatory and voluntary social commitments has included construction of educational facilities and other social infrastructure and roads. Total social expenditure for the years 2013 to 2015 was US$1,134,635, considerably more than the projected annual budget in the 2005 EIA EMP.

20.2.5 Environmental and Social Management Plan

The operational working Environmental and Social Management Plan (ESMP), c. 2011, is a 23-page document that covers the general requirements for Project environmental and social management, including targets; key procedures, roles and responsibilities; monitoring and reporting requirements; and performance indicators. It describes management activities for waste; equipment, chemicals and hazardous materials management; control of wildlife; land disturbance and erosion control; management of in-migration; and more detailed actions for water, air quality, noise and vibration, and hydrocarbon management. The plan monitoring programs do not include either ecological or social monitoring. The plan also covers consultation and communication; training; investigation and reporting of incidents and complaints; and emergency preparedness and response.

Most of these management activities are also contained in the more recent 2015/16 environmental management system, plans and programme organisation developed subsequent to Project acquisition. Social/community management measures for ongoing stakeholder consultation, compensation and influx issues are also recorded in the 2015 “Respect to Commitment” document.

No budget is given for these current management plans, but CSA Global believe that for a project of this size, a minimum of US$100,000 per annum should be allowed for ESMP implementation, with community assistance and ongoing compensation and resettlement costs additional to this.

This review has seen no operational monitoring results, or monthly/annual reports of environmental and community relations activities; accident reports; or records of grievances and resolutions – to be able to comment on implementation of the ESMP and Project environmental and social performance over the last nine years since operations started.

20.2.6 Stakeholder Engagement

As part of the EIA studies, stakeholder engagement included meetings with local representatives (governmental and traditional) for project disclosure and to gain information about the views of local communities. No major objections to the proposed development were received from any of the government officials, chiefs or villagers interviewed. According to the WA Youga Closure review, the Project has a track record of conducting public consultation and stakeholder engagement with community representatives and traditional authorities. Project stakeholders are identified but the Project Public Consultation and Information Disclosure Plan was lacking at the mine at the time of the WA review in 2016. Some documented meeting minutes from February and March 2015 made available to WA, show residents expressed concerns about the following:

- Lack of water and need for a new water well (to reduce trespass on Project land).
- Proper security measures to prevent theft of livestock.
- The lack of jobs.
- A local farmer claimed his land was larger than what he was compensated for.

- Other local residents claim that compensation was not given for land on or around the Project site.

These suggest that despite identifying compensation issues as a significant social risk, this remains the main area of contention at the Project. In 2006, Socrege conducted an inventory of the Project area for resettlement and displaced farmland and developed pricing for compensation payments based on land size and agricultural products grown, but post start-up demands for compensation are particularly difficult to address – to verify who should receive compensation payments; and to avoid creation of precedent. However, continuing activities at site will impact more people and further compensation issues are likely to arise.

20.2.7 Closure and Rehabilitation

The 2005 EIA included a preliminary Closure Plan for the Project. This included site end-use and proposed flooding of the pit excavations; capping and revegetation of the TSF and waste rock dumps; dismantling of buildings not required by the communities; rehabilitation of roads not needed by the local people; and post-closure monitoring and maintenance for two years. Costing for closure and rehabilitation was calculated in some detail, giving a total of US$1,495,733, including post-closure monitoring. According to the National Mining Code, any holder of a mining licence must open an account at the Central Bank of West African States or in a commercial bank in Burkina Faso and make deposits in a fiduciary account to cover the costs of rehabilitation. The EIA Closure Plan proposed accrual of the estimated cost for reclamation and decommissioning on a yearly basis to reflect the mining schedule.

The Closure Plan has subsequently been revised and updated during operations, and the WA review had access to the Youga Rehabilitation and Closure Plan, 2013; and the Mine Closure Strategy, Version 2, 2015. It was also stated that as part of the recent approval stage of the Youga EIA in 2016, a number of additional social aspects were incorporated into the official mine closure objectives.

The 2016 WA review of Youga Closure included visual assessments of the open pits, waste rock dumps, TSF and site infrastructure which suggest that closure activities so far have been effective. However, the review also recommends significantly more investment in social and community capacity building in preparation for post-closure. The report provides an updated estimate of scheduling and costs for proposed future rehabilitation works, with total costs given as US$3,768,000 – more than double the 2005 EIA estimate. CSA Global believe this updated rehabilitation and closure budget is realistic.

20.3 Ouaré Summary

The Ouaré exploration project is located in the commune of Bittou, province of Boulgou in the Center-East Region. Ore is to be excavated and hauled to the Youga processing plant.

Socrege was contracted to undertake an initial environmental and social review of the project area in 2012 as a precursor to developing an ESIA study. The review was to undertake scoping baseline physical, biological and social studies to identify issues prior to any development; and recommend appropriate communication and consultations for stakeholder engagement.

The area is part of the Nouhao valley where an agro-pastoral development project was implemented by the government in 1986 and is dominated by these activities. Much of the review was desktop based research, using available data from nearby meteorological stations and government records for water resources, land use and demographics and social information. Several field trips were also undertaken for water quality sample collection; soil studies; vegetation surveys; field observations for mammals and birds; interviews with locals; and socio-economic surveys of the villages in the Project area. Statistics were collected from municipal sources, regional authorities and from local communities on social, political and land organisation; education, health and other social service provisions. There is much detail on the rural activities in the area and land-use conflicts between agricultural, pastoral and artisanal mining activities.

The area is heavily impacted by 15 years of intense artisanal mining, with rapid deforestation along the river banks, multiple excavations (some to considerable depth) and significant siltation and contamination of local rivers and streams, particularly the Ouaré River.

The report also provides recommendations for stakeholder engagement, additional studies and Project impact assessment and provides a good basis for ESIA scoping studies.

A preliminary feasibility study was undertaken on the proposed Ouaré Project in early 2017 by Turkey based HCG Cement and Mineral Processing Technologies. This cursory report, of only 68 pages, has no specific environmental content, but refers to the previous Socrege scoping baseline. It describes the geology and mineral exploration and defines an open pit operation to extract approximately 2.6 Mt of ore and 13.5 Mt of waste from three small pits, over 26 months. No details are provided on the planned waste rock dump. The ore is to be stockpiled at site and hauled to Youga for processing. This will require construction of a new 44 km road, including a new 100 m bridge crossing the Nouaho River. The haul road and bridge will require a separate ESIA study with investigation of ambient conditions, consultation with route communities and impact assessment.

20.4 CSA Global Conclusions

Generally, there has been a considerable amount of environmental and social work undertaken on the Youga Project and EIA reports are of reasonable content and quality. Baseline data collection has been detailed and comprehensive and impact assessment and mitigations appropriate. While not to Standard Operating Procedure detail, the ESMPs are at an adequate level for implementation.

The ESIA submission for the original Youga Project was obviously sufficient for National Burkina Faso requirements as the Youga operation received environmental permitting and exploitation mining license and has been active for over 10 years. While this review cannot comment on operational environmental and social performance, given that no operational or monitoring reports have been seen, the current condition and status of the Youga site; apparent lack of environmental penalties or social conflict; and proposed continuation of activities imply that there have not been any significant non-compliance or grievance issues.

However, ongoing community complaints about compensation and water resources suggest that there is room for improvements on some issues, and the current operation can address these with increased SE, community consultation and demonstrated transparency.

Inclusion of the Ouaré deposit in the Youga Project has a good (if now 5 years old) scoping baseline data resource to initiate ESIA studies, but considerably more work is required to complete the Ouaré ESIA and ESMP for the mine and additionally for the proposed new haul road and bridge. However, much can be learnt from experiences gained at Youga and effort therefore focussed on identified issues.

20.5 CSA Global Recommendations

There are some gaps and deficiencies in investigations, impact assessments and mitigation and management measures, which are highlighted below. Required work to address gaps in the Project environmental and social work:

- Urgently undertake full ESIA studies on the Ouaré component of the Project, building on the Socrege review.
- Undertake EISA studies on the haul route from Ouaré to Youga, including baseline data collection, stakeholder consultation, impact assessment and mitigations.
- Establish site meteorological stations at Youga and Ouaré (as required).
- Install permanent flow gauges at Project streams and depth rods at ponds/dams.

- Undertake more detailed faunal biodiversity studies at Youga to determine the most appropriate measures to avoid and/or offset for Project impacts.
- Implement and publicise a formal Grievance Mechanism for all components of the Project (Youga and Ouaré).
- Undertake geochemical testing, including metal leaching tests on ore material and tailings from Youga and representative ore material from Ouaré as required.
- Define and implement ecological and social monitoring at Youga.
- Develop and disclose an appropriate procedure for evaluating post start-up demands for compensation at Youga (for expanding Project area).
- Assess impacts on and from artisanal mining at Ouaré in particular and establish dialogue to reduce environmental impacts and conflicts.

21 Capital and Operating Costs

21.1 Capital Expenditure

The existing load and haul fleet at Youga consists of a mix of three hydraulic excavators and eight haul trucks. At the outset in March 2017 these are located at A2NE and A2NW, and are then used to develop West 3, Ouaré and other deposits at Youga. It was assumed that there is no need for additional capital spend on the mining fleet at Youga in 2017.

By July 2018 the mining rate at Youga is significantly increased as Netiana is mined out and the focus of the operation moves to Youga and Ouaré. This means that the load and haul fleet is increased to five hydraulic excavators and 17 haul trucks. There is also a similar increase in the drill requirements and the ancillary equipment to support the load and haul fleet.

A large part of the is increase in equipment requirements comes from transferring the fleet from the Balogo Project at Netiana to Ouaré. This means that the capital spend is limited to US$5.28 million in 2018 and there is a sustaining capital is US$1.12 million for the remaining life of the mine.

Other capital costs included in the financial analysis are;

- To accommodate the increase in the Reserves to 9.3 Mt the tailing storage facility needs to be extended. The capital expenditure is expected to be US$2 million, there is also an expenditure of US$4.8 million to extend the dumps, which is spread over the life of the mine and can be treated as either a capital or an operating cost.
- The capitalised environmental and social expenditures are estimated at US$9.66 million and are spread across the mine life.
- There is also a capital allowance of US$1.7 million in 2018 to build the road from Ouaré to Youga so that ore can be transported from Ouaré to the plant at Youga. This capital includes provision for the construction of a bridge over the Nakambe river.

21.2 Operating Costs

The mine operating costs were estimated from first principles from the required mine equipment to support the schedule. A breakdown of the costs for 2017 and 2024 is shown in Table 110.

Table 110: Summary of Mine Operating Costs for the Youga and Ouaré Projects

	Units	Total	2017	2018	2019	2020	2021	2022	2023	2024
Operating Costs - Category	**(USD/t)**	**1.62**	**1.79**	**1.23**	**1.20**	**1.58**	**2.05**	**2.11**	**1.72**	**1.72**
Labour	(USD/t)	**0.30**	0.41	0.22	0.21	0.34	0.54	0.56	0.21	0.21
Overhaul	(USD/t)	**0.08**	0.08	0.07	0.07	0.08	0.09	0.10	0.09	0.09
Maintenance	(USD/t)	**0.12**	0.12	0.10	0.10	0.11	0.14	0.14	0.14	0.14
Fuel	(USD/t)	**0.70**	0.69	0.51	0.50	0.64	0.83	0.85	0.84	0.84
Lubricants	(USD/t)	**0.08**	0.08	0.06	0.06	0.07	0.09	0.09	0.09	0.09
Tires	(USD/t)	**0.03**	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Wear Parts	(USD/t)	**0.08**	0.08	0.06	0.06	0.08	0.10	0.10	0.10	0.10
Explosives	(USD/t)	**0.22**	0.30	0.18	0.19	0.22	0.23	0.24	0.22	0.22
Miscellaneous	(USD/t)	**0.01**	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01

The Miscellaneous category includes the annual fixed costs for provision of contract services to supply fuel and explosives.

A summary of the operating costs is given in Table 111.

Table 111: Summary of Operating Costs for the Youga and Ouaré Projects

Cost Area	Units	2017	LOM
Mining Cost	US$/t mined	1.79	1.61
Ore Transport	US$/t ore	Varies	Varies
Processing (variable)	US$/t ore	17.58	17.58
G&A	KUS$/annum	6,908	6,908

Note: The ore transport cost is from the pit exit (or ROM pad in the case of Ouaré) to the ROM pad at Youga. For Ouaré the transport cost over the 44 km route is 4.05 US$/t ore. For Youga the transport cost varies between 0.06 US$/t ore to 0.56 US$/t ore, depending on haul distance to the ROM Pad.

22 Economic Analysis

This Economic Analysis of the Youga and Ouaré Projects project is based on the Mineral Reserves presented in Section 15. The analysis is based on discounted cash flow approach. Results are expressed as pre-tax and pre-financing terms. However, the analysis takes into account the 4% royalty paid on revenue and 1.8% royalty on revenue paid to Endeavour. No inflation or escalation of revenue or costs has been incorporated into the base case economic model. Project expenditures prior to March 2017 are considered as sunk costs and are excluded from the cash flow model.

The model is developed in US$ at current prices and does not include considerations for exchange rate fluctuations.

22.1 Inputs and Assumptions

Inputs to the cash flow model include

- Mining operations for eight years until 2024, with ore re-handling operations spanning into 2025.
- Total LOM production of 9,030 kt with average grade of 1.49 g/t containing 13.4 t of gold.
- No processing facilities on Ouaré site, the ore from Ouaré transported to Youga processing plant.
- The cost of ore transportation is at US$4.05/t based on the information provided by the Client.
- Capex of US$1.7 million is provisioned for building of the road from Ouaré to Youga in 2018.
- Tailing dam expansion capex of US$1,407 k.
- Processing recovery at 91% for 2 g/t or less feed grade, 92% for the feed grade between 2 g/t and 3 g/t, 93% for the feed grade between 3 g/t and 4 g/t and 94% for the feed grade above 4 g/t with average recovery for the LOM of 91% for Youga ores.
- Processing recovery at 89% for the LOM for Ouaré due to higher hardness of the ores.
- Revenue based on a gold price of US$1,250/oz.
- Sales cost of US$7/oz.
- Contingency on mining OPEX of 10% has been provisioned to factor in risk of salaries increase.
- Total expenditures related to environmental and social impact of US$9.68 million over the eight years.
- Mineral royalty of 4% of revenue.
- Royalty to Endeavour of 1.8% of revenue.
- Mining capex of US$5,277 k in 2018 for the equipment purchase from Balogo Project.
- Net present value (NPV) assessment at two discount rate levels of 6% and 8%.

22.2 Cash Flow Model and Economic Result

The Youga and Ouaré deposit cash flow model is shown in Table 112.

The following pre-tax economic indicators were calculated:

- Net cash flow of US$85.0 million.
- NPV at 6% discount rate of US$68.9 million.
- NPV at 8% discount rate of US$64.6 million.

Internal rate of return (IRR) and payback period assessments are not applicable to the project as its cash flow positive from year one.

Table 112: Youga and Ouaré project cash flow model

Group	Item	Unit	Total	2017	2018	2019	2020	2021	2022	2023	2024	2025
Mining summary	Ore	kt	**17,574.36**	1,472.72	2,013.86	2,684.72	2,713.46	2,239.81	2,481.13	2,067.18	1,901.48	-
	Ex-pit to stockpile	kt	**8,613.39**	640.40	1,019.71	1,496.72	1,522.21	1,051.81	1,293.13	879.18	710.23	-
	ROM re-handle	kt	**9,030.42**	832.32	994.14	1,188.00	1,191.25	1,188.00	1,188.00	1,188.00	1,191.25	69.45
Waste	Waste	kt	**64,310.37**	6,363.01	15,971.56	16,959.82	8,589.35	5,122.83	4,659.73	5,161.08	1,482.98	-
Stripping ration	t/t		**7.47**	9.94	15.66	11.33	5.64	4.87	3.60	5.87	2.09	
Processing summary	Ore to plant (Youga)	kt	**6,398.59**	**832.32**	**588.27**	**315.41**	**557.57**	**1,152.88**	**1,188.00**	**968.04**	**796.11**	**-**
	Head grade (Youga)	g/t	**1.42**	2.00	1.59	1.15	2.03	1.40	1.28	1.06	1.07	-
	Gold content (Youga)	kg	**9,111.78**	1,662.83	935.09	362.85	1,132.45	1,615.58	1,517.58	1,029.60	855.80	-
	Recovery (Youga)	%		91%	91%	91%	92%	91%	91%	91%	91%	91%
	Ore to plant (Ouaré)	kt	**2,631.83**	**-**	**405.88**	**872.59**	**633.68**	**35.12**	**-**	**219.96**	**395.15**	**69.45**
	Head grade (Ouaré)	g/t	**1.64**	-	1.77	2.10	1.70	1.84	-	0.91	0.91	0.91
	Gold content (Ouaré)	kg	**4,321.98**	-	720.42	1,836.32	1,079.10	64.56	-	199.73	358.79	63.06
	Recovery (Ouaré)	%		89%	89%	89%	89%	89%	89%	89%	89%	89%
	Gold recovered	**koz**	390.62	**48.65**	**47.97**	**63.16**	**64.37**	**49.11**	**44.40**	**35.84**	**35.30**	**1.80**
CAPEX	Mining equipment capital	kUS$	**5,277.60**		5,277.60							
	Sustaining capex – Mining	kUS$	**1,120.00**	-	-	700.00	200.00	-	220.00			
	Sustaining capex – Processing	kUS$	**-**									
	Road Ouaré-Youga	kUS$	**1,700.00**		1,700.00							
	Waste dumps	kUS$	**4,846.25**	616.35	883.11	1,212.57	896.61	596.72	560.88	80.00	-	-
	Tailing dams	kUS$	**1,407.29**			-			638.26	726.67	42.36	
E&S	Environmental and rehabilitation	kUS$	**4,808.00**	140.00	120.00	140.00	120.00	1,396.00	1,376.00	1,396.00	120.00	-
	Cut-off grades to BF	kUS$	**4,855.39**	604.72	596.30	785.09	800.17	610.50	551.89	445.47	438.84	22.43
	Total		**24,014.53**	**1,361.07**	**8,577.01**	**2,837.66**	**2,016.77**	**2,603.22**	**3,347.03**	**2,648.14**	**601.20**	**22.43**
OPEX	Mining cost	kUS$	**111,013.71**	12,566.11	20,919.14	22,214.36	15,933.99	12,639.33	12,539.33	10,418.52	3,782.94	-
	Mining cost per ton	US$/t		1.79	1.23	1.20	1.58	2.05	2.11	1.72		
	Contingency on Mining opex	kUS$	**11,101.37**	1,256.61	2,091.91	2,221.44	1,593.40	1,263.93	1,253.93	1,041.85	378.29	-
	Transportation (Ouaré to Youga)	kUS$	**10,658.89**	-	1,643.80	3,534.00	2,566.40	142.24	-	890.85	1,600.34	281.27
	Ore re-handling	kUS$	**593.70**	95.96	-	-	-	68.10	-	154.41	240.51	34.72
	Processing cost	kUS$	**158,734.19**	14,630.24	17,474.78	20,882.33	20,939.54	20,882.33	20,882.33	20,882.33	20,939.54	1,220.75
	G&A	kUS$	**56,635.50**	6,906.77	6,906.77	6,906.77	6,906.77	6,906.77	6,906.77	6,906.77	6,906.77	1,381.35
	Total	**kUS$**	**348,737.37**	**35,455.69**	**49,036.40**	**55,758.89**	**47,940.10**	**41,902.69**	**41,582.36**	**40,294.73**	**33,848.40**	**2,918.10**

Group	Item	Unit	Total	2017	2018	2019	2020	2021	2022	2023	2024	2025
Revenue	Gold sold	koz	**390.62**	48.65	47.97	63.16	64.37	49.11	44.40	35.84	35.30	1.80
	Sell cost	kUS$	**$7.00**	340.55	335.81	442.12	450.62	343.80	310.80	250.87	247.13	12.63
	Gold price	$	**1,250**	1250	1250	1250	1250	1250	1250	1250	1250	1250
	Total revenue	**kUS$**	**485,539.24**	**60,471.62**	**59,629.62**	**78,508.54**	**80,016.91**	**61,049.70**	**55,189.21**	**44,546.73**	**43,884.04**	**2,242.86**
Royalties	Royalty	kUS$	**4%**	2,418.86	2,385.18	3,140.34	3,200.68	2,441.99	2,207.57	1,781.87	1,755.36	89.71
	Royalty EDV	kUS$	**1.8%**	1,044.95	1,030.40	1,356.63	1,382.69	1,054.94	953.67	769.77	758.32	38.76
Cashflow			**84,975.65**	**20,191.05**	**-1,399.37**	**15,415.02**	**25,476.66**	**13,046.86**	**7,098.58**	**-947.77**	**6,920.76**	**-826.14**

22.3 Sensitivity Analysis

The base case results shown in Table 112 were tested for sensitivities to:

- Gold price fluctuations in the range from US$1,000/oz to US$1,350/oz and mining cost variation from 0% to increase of 10% (the base case with the contingency on mining cost) to increase of 20% from the current level. See Table 113 for the results.
- Gold price fluctuations in the range from US$1,000/oz to US$1,350/oz and processing recoveries change from -4% to +2% from the current base case. See Table 113 and Table 114 for the results.

Due to lower grades, the Project shows high sensitivity to gold price and cost and recovery variations in stress scenarios:

- NPV at 8% discount rate with Project mining costs 10% higher than the base case and gold price at US$1,000/oz is at -US$10.4 million
- NPV at 8% discount rate with processing recoveries for Youga and Ouaré ores at 4% lower than the base case and gold price at US$1,000/ounce is at -US$13.8 million.

Table 113: Youga and Ouaré project NPV (at 8%) sensitivity to mining cost increase and gold price fluctuations (NPV in $1,000)

Mining cost variation	Gold price (per ounce)							
	$1,000.00	$1,050.00	$1,100.00	$1,150.00	$1,200.00	$1,250.00	$1,300.00	$1,350.00
10%	-$10,441.93	$2,892.45	$16,226.82	$29,561.20	$42,895.57	$56,229.95	$69,564.33	$82,898.70
5%	-$6,264.76	$7,069.62	$20,403.99	$33,738.37	$47,072.75	$60,407.12	$73,741.50	$87,075.87
0%	-$2,087.59	$11,246.79	$24,581.16	$37,915.54	$51,249.92	$64,584.29	$77,918.67	$91,253.05
-5%	$2,089.58	$15,423.96	$28,758.34	$42,092.71	$55,427.09	$68,761.47	$82,095.84	$95,430.22
-10%	$6,266.76	$19,601.13	$32,935.51	$46,269.88	$59,604.26	$72,938.64	$86,273.01	$99,607.39

Table 114: Youga and Ouaré project NPV (at 8%) sensitivity to processing recovery rate change and gold price fluctuations (NPV in $1,000)

Processing recovery variations	Gold price (per ounce)							
	$1,000.00	$1,050.00	$1,100.00	$1,150.00	$1,200.00	$1,250.00	$1,300.00	$1,350.00
-4%	-$13,802.36	-$1,057.85	$11,686.66	$24,431.17	$37,175.68	$49,920.19	$62,664.69	$75,409.20
-2%	-$7,944.97	$5,094.47	$18,133.91	$31,173.35	$44,212.80	$57,252.24	$70,291.68	$83,331.12
0%	-$2,087.59	$11,246.79	$24,581.16	$37,915.54	$51,249.92	$64,584.29	$77,918.67	$91,253.05
1%	$841.10	$14,322.95	$27,804.79	$41,286.63	$54,768.48	$68,250.32	$81,732.16	$95,214.01
2%	$3,769.80	$17,399.11	$31,028.42	$44,657.73	$58,287.04	$71,916.35	$85,545.66	$99,174.97

23 Adjacent Properties

There are no relevant adjacent properties (Pers. Comm. Gökhan Kellecioglu).

24 Other Relevant Data and Information

24.1 Hydrology

24.1.1 Overview

CSA Global undertook a review of the available hydrological and hydrogeological aspects of the Youga and Ouaré deposit. The aim of the review was to evaluate the level of understanding of the hydrology and hydrogeology at each of the two sites and to identify any potential mine water management issues and risks at each site. To complete the review, the available hydrological and hydrogeological data were compiled and is summarised in this report.

The scope of work for the review includes the following tasks:

- Review all hydrological and hydrogeological information currently available relating to the Youga and Ouaré projects
- Identify any gaps in the data currently available and put forward recommendations to address these data gaps.
- Prepare a technical memorandum detailing the findings of the above.

The data available for review included the following:

- Endeavour (2015); Technical Report Mineral Resource and Mineral Reserve Update for the Youga Gold Mine Burkina Faso West Africa, Endeavour Mining Corporation, March 2015.
- SGS (2005); Youga Gold Project Updated Environmental Impact Assessment, SGS Environment, 2005.
- Youga Gold Mine, Burkina Faso: Mining Geotechnics Site Visit – 19 to 25 August 2010.
- Youga Gold Mine, Burkina Faso: Technical Site Visit Report – 27 to 30 August 2013.
- Review of Mine Closure, Youga Mine, Burkina Faso 2016.
- Youga Mine Environmental Management Plan.
- Water Management System, BMC YOUGA MINE.
- HCG Cement & Mineral Processing Technologies, 2017; Ouaré Project Feasibility Study, Prepared for Etruscan Resources Inc., 5 May 2017.

24.1.2 Youga Conceptual Hydrological and Hydrogeological Model

Climate

A climatological assessment for the Youga Project area is presented in Section 5.2.

Hydrology and Physiography

A hydrology and physiography assessment for the Youga Project area is presented in Section 5.3.

Hydrogeology

Aquifers

An assessment of the hydrogeological setting of the Youga mine area is provided in Section 3.3.2 of the "Youga Gold Project Updated Environmental Impact Assessment (2005)". According to the report, there are likely to be two main aquifer units within the mine area:

- **Shallow weathered aquifer**. The Youga Mine area is characterised by a shallow weathered zone with a maximum thickness of 10 mbgl. The shallow aquifer is recharged by rainfall during the wet season, feeding several springs, including the Gossé Stream which flows all year round. Porosity is estimated at being between 30% and 40% and permeability is estimated to range from 1 to 10-3 (no units given).

- **Fractured bedrock aquifer**. The Youga Mine area is highly fractured. The bedrock aquifer has a low permeability ranging from 10-5 to 10-10 (no units given) and porosity is estimated to be less than 5%.

In general, the rocks are low yielding and not ideally suited to exploitation using boreholes. The above hydraulic information is provided in "Youga Gold Project Updated Environmental Impact Assessment, SGS Environment, 2005"; however, no information is provided regarding the hydraulic testing methodology and no empirical units are provided for permeability.

Groundwater Levels and Flow Direction

Four groundwater monitoring wells (BH1 to BH4) are referenced in the EIA (2005); however, no groundwater level data are provided.

According to report "Youga Gold Mine, Burkina Faso: Mining Geotechnics Site Visit – 19 to 25 August 2010", three additional piezometers were installed in the vicinity of the main pit. The exact location of these piezometers is uncertain. A monthly time-series of water levels from GPBH-01, GPBH-02 and GPBH-03 is illustrated in Figure 4-6 of report "Youga Gold Mine, Burkina Faso: Technical Site Visit Report – 27 to 30 August 2013".

In the absence of water level data for monitoring wells BH1-BH4 and location data for the on-site piezometers (GPBH-01 to GPBH-03), it is not currently possible to infer groundwater flow direction at the Youga mine site.

According to the Technical Report (2015), the hydrogeology, hydrology and surface water aspects at the Youga mine were originally assessed by Knight Piésold (KP) in 1999. Their findings are summarised in the report "Youga Mine Project Feasibility Study – Tailings Facility, Plant Site, Pit Slopes and Storm Water Management". This report did not appear to be available for this review, but may provide additional hydrogeological insight.

24.1.3 Youga Water Management and Supply

Pit Stability

In technical site visit reports (2010) and (2013), potential issues were raised concerning water management and pit stability, as detailed in the following excerpts from those reports:

- Technical site visit (2010): Mining of the Main Pit has been temporarily halted due to flooding following heavy rains. This notwithstanding, areas of concern in the Main Pit include a recent wedge failure in the NE corner of the pit.
- Technical site visit (2013): Taken in conjunction, the observations on site, together with the interpretation of available piezometer data, suggests that, to date, the influence of water on the development of the tension cracks and contribution towards the instability of the West Wall of the East Pit is serious.

While measures to counteract these concerns were detailed in both reports, it is not clear if these measures were successful in effectively managing the effect of surface water and groundwater ingress on pit stability.

Pit Status (Post-2016 Cessation of Active Mining)

The current pit statuses are:

- **Main Pit**: Pumping continued to maintain dry workings.
- **East Pit**: Water has been allowed to accumulate to a depth of up to approximately 80 m in the pit before being pumped to the process plant as a source of water. No major instabilities were identified at an inter-ramp or wall scale for the east pit in the decommissioning report, suggesting that the issues identified in the technical site visit in 2013 (Section 4.5.1) may have been rectified.
- **West Pit**: West Pit 2b is flooded while it is intended to flood West Pit 2a and West Pit 3 by creating adjoining channels between the pits. West Pit 4 is planned for development.

The status of smaller on-site excavations is provided in "Review of Mine Closure, Youga Mine, Burkina Faso, 2016".

Pit Dewatering

Pit dewatering is achieved utilising in-pit sumps. It is reported that the quantity of water pumped from the pits is recorded on a daily basis and that water quality is monitored daily and monthly. Pit dewatering was initially predicted (KP, 1999) to be of the order 5 L/s to 15 L/s (400 m^3/day to 1,300 m^3/day) but no actual dewatering rates were available for review.

Process Water

Water is recycled from the TSF lagoon. It is pumped from the TSF to the plant process water tank and then subsequently on to the process plant as a water supply.

Potable Supply

Raw water is pumped from the Nakambé River, is stored in a de-sanding holding tank, from where it is then pumped over 11 km to the raw water pond. Potable water is supplied from the raw water pond, and is treated through a filtration and sterilisation system before being stored in a dedicated 20 m^3 potable water tank. According to the mine closure review (2016), the water tower, pumping station and pipeline could provide a long term agricultural water supply for the local community assuming the following maintenance actions are undertaken:

- Periodic inspections to evaluate the state of the remaining structures
- Continuation of monitoring of surface water and underground water channels.

Water Quality

Surface water quality is measured at upstream and downstream points on the Zera River and at the Gossé Stream. Surface water on site was found to be unsuitable for human consumption owing to extensive microbial contamination.

Water quality is monitored at four borehole locations (BH1 to BH4). The concentration of iron in well CSPS (BH3) and the school borehole (BH4) was reported to be twice the level allowed for potable consumption. The concentration of manganese in BH4 was more than three times the WHO drinking water standard (0.05 ppm).

Water Management

A detailed Environmental Management Plan is provided in "Youga Mine Environmental Management Plan". The plan sets out actions, reporting procedures and corrective actions to achieve the following:

- Minimise or prevent potential negative impacts on water quality
- Minimise disturbance to drainage through erosion or deposition, beyond natural fluctuations

- Contain potential acid mine drainage on site and prevent impact on local waterways.

24.1.4 Ouaré Conceptual Hydrological and Hydrogeological Model

Climate

A climatological assessment for the Ouaré Project area is presented in Section 5.2.

Hydrology and Physiography

A hydrology and physiography assessment for the Ouaré Project area is presented in Section 5.3.

Hydrogeology

The Feasibility Study indicates that there is limited groundwater use within the Ouaré Project Area. The Feasibility Study report contains a short section on potential aquifers in the area. No site-specific hydrogeological investigation data was provided, except for limited groundwater quality data. No information on potential groundwater levels or aquifer parameters was provided.

Groundwater in the area is reported to be calcium magnesium bicarbonate type with low conductivity and low turbidity. Microbial contamination of groundwater is reported in the project area.

24.1.5 Ouaré Water Management and Supply

Water Supply

The Ouaré mine water supply requirements will depend upon the operation of the mine and may include requirements for dust suppression, ablution and potable water. As the ore will be transported to the Youga mine for processing, the processing water requirements for the Ouaré site are likely to be minimal.

A water supply strategy for the Ouaré Project, including water supply options and their potential yields, quality and long-term sustainability have not been provided for review.

Water Management

Three open pits, with depths up to 130 m, are proposed for the Ouaré mine. A specific water management plan, including both groundwater and surface water management, is not provided for the Ouaré site.

24.1.6 CSA Global Conclusions

Youga Conclusions

In summary, and based on the information provided for review, there appears to be a good understanding of most operational water management issues at the mine site. However, additional assessments and site-specific investigations would improve future operational water management including:

- Long-term prediction of dewatering and depressurisation requirements
- Long term water supply security
- Optimisation of overall site water management
- Assessment of potential impacts from mine water management on the environment.

Additional observations include:

- Uncertainty also remains as to whether there is an understanding of the hydrogeological regime at the site. It is reported that a preliminary assessment of dewatering requirements was completed as part of the Feasibility Study.

- Surface water management issues have been identified at several of the open pits, including aspects such as the erosion of the pit crest and enhanced pit inflows resulting in pit wall instability. A water course has also been identified as being present beneath the main waste dump. Again; hydrogeological assessments have been completed for the Youga mine site.
- Although hydrological assessments have been completed for the Youga gold mine, there appears to be limited site specific meteorological data and limited quantitative surface water flow monitoring data available for the site. Thus, there remains some uncertainty as to whether surface water management strategies are appropriately designed for conditions at the site. An overall surface water management plan for the Youga mine site has not been sighted.
- No issues regarding pit dewatering have been reported.
- It is reported that depressurisation was identified as a potential requirement to ensure pit wall stability, although there is uncertainty whether depressurisation strategies have been developed for the site. Pit wall stability issues have been identified in a number of the open pits.
- In site visit reports, pit instabilities related to groundwater and surface water ingress have been highlighted. While we understand that corrective actions were implemented, no follow up was provided in the available documentation regarding the success or failure of these mitigation measures. In addition, the consequences of pit flooding following the decommissioning of the mine do not appear to have been assessed from a hydrogeological perspective.
- Water supply for the Youga mine site is reported to be provided by a number of sources, including TSF return, the Nakambé River, pit dewatering and boreholes. A water tower currently exists at the Nakambé River and there is also an on-site water treatment facility. A water balance for the site has not been sighted. However, no water supply issues were reported in the documentation available for review.
- An EIA, EMP and Water Management System have been completed for the Youga mine site. While no issues with respect to the impact of water management at the site on the surrounding environment have been reported, a risk of potential impact on the environment (from the mine operation) remains due to the uncertainties regarding the hydrological and hydrogeological understanding at the site.
- The Youga site has an existing water monitoring network, including both upstream and downstream groundwater and surface water monitoring locations. The EMP which is in place details compliance criteria, sampling and reporting procedures and corrective actions required to achieve water quality objectives.
- While a monitoring network is in place, additional work is recommended to collate spatial data from the monitoring points outlined in the EIA and the on-site boreholes described in the technical site visit reports. The current hydrogeological interpretation lacks specific information on the location of test boreholes and the hydraulic testing method used. No information has been provided regarding groundwater flow direction at the site.

Ouaré Conclusions

Extremely limited hydrological and hydrogeological assessments have been completed for the Feasibility Study for the Ouaré Project and significant uncertainty remains with respect to water management for the project. Additional site-specific assessments are recommended in order to ensure that the water management aspects of the project are fully understood and appropriate surface water and groundwater management strategies are developed and costed. Observations include the following:

- The proposed infrastructure for the Ouaré mine includes three open pits, a waste rock stockpile, an ore stockpile and related administration facilities. It is proposed that there will be no processing plant at Ouaré and that the ore extracted from Ouaré will be transported to the Youga mine for processing.

- The assessment of the hydrology and hydrogeology for the Ouaré Project area, completed as part of the Feasibility Study, is extremely limited. A site specific hydrological and hydrogeological field investigation does not appear to have been completed for the Ouaré Project, except for limited water quality sampling. Significant uncertainty remains regarding the hydrological and hydrogeological understanding of the Ouaré Project area due to the lack of site specific data.
- An assessment of design rainfall events, design flood events, derivation of peak flow rates and peak flood heights is not included in the Feasibility Study and a surface water management plan for the Ouaré Project is not included in the Feasibility Study.
- An assessment of potential pit inflows (derived from both rainfall runoff/surface water and groundwater) is not included in the Feasibility Study and a dewatering strategy for the proposed open pits is not included in the Feasibility Study.
- The water demands for the Ouaré Project are not detailed in the Feasibility Study. It is likely that there will be a water demand associated with dust suppression and for the administration and mine camp. Water supply options for the project are not detailed in the Feasibility Study. A water balance for the Ouaré mine has not been provided for review.
- The potential impact of mine water management on the water environment is not included in the Feasibility Study. Potential impacts may include:
  - local groundwater table drawdown as a result of pit dewatering/depressurisation
  - impact on surface water bodies from site discharges (water quality and flow regime)
  - reduction of surface water flows due to surface water interception/harvesting
  - pit void remaining at mine closure.
- A water monitoring program for the Ouaré Project has not been provided.
- Capital and operating costs for the Ouaré mine have been developed. However, the costs are not presented in sufficient detail to determine whether they include an adequate provision for water management for the project.

24.1.7 CSA Global Recommendations

Youga Recommendations

Additional studies are recommended to improve the level of understanding relating to the hydrology and hydrogeology at Youga. This additional information would also increase the confidence with regards predictions for mine water management at Youga. More specifically, CSA Global recommends the following:

- Additional site investigations to improve the hydrological and hydrogeological understanding for the site, including:
  - Installation of an on-site rain gauge to record site specific rainfall data relating to both individual storm events and daily rainfall totals.
  - Monitoring of flows in surface water features in the immediate project area.
  - Mapping of the depth to bedrock across the project area to identify the depth of the weathered zone and position of the weathered rock/fresh rock contact (transition zone) which often represents a zone of enhanced permeability and preferential groundwater flow and is important in terms of managing pit inflows.
  - A review of the hydrogeological monitoring infrastructure and collation of all available data relating to groundwater levels, well-head elevation, hydraulic testing and geochemical analysis. Once the data is organised, it may be necessary to carry out additional hydraulic testing.

- An integrated surface water management plan should be developed for the Youga mine site to optimise surface water management systems, minimise pit dewatering pumping requirements, enhance pit wall stability, maintain safe working conditions and minimise potential surface water related impacts on the environment.
- Operational groundwater management strategies for the entire Youga mine site should be reviewed and where possible integrated to optimise water use and management across the mine.

Ouaré Recommendations

Specifically, CSA Global recommends the following:

- Hydrological and hydrogeological site investigations should be completed to improve the hydrological and hydrogeological understanding for the site, including:
  - Installation of an on-site rain gauge to record site specific rainfall data relating to both individual storm events and daily rainfall totals.
  - Monitoring of flows and water quality associated with surface water features in the immediate project area.
  - Mapping of the depth to bedrock across the project area in order to identify the depth of the weathered zone and the position of the weathered rock/fresh rock contact (transition zone) which often represents a zone of enhanced permeability and preferential groundwater flow and is important in terms of managing pit inflows and as a target depth for potential water supply bores.
  - A site-specific hydrogeological field investigation programme, including:
    - installation of site-specific monitoring boreholes upstream and downstream of mine activity
    - site-specific aquifer parameters for the various lithologies across the project site
    - investigate the hydraulic connection between different units
    - groundwater levels and groundwater flow direction
    - groundwater quality.
- A water monitoring program should be developed in order to ensure that the program enables the water management issues for the entire site to be fully evaluated.
- An assessment of pit inflows and dewatering requirements should be completed and an appropriate dewatering and depressurisation strategy developed.
- A surface water management plan should be developed for the proposed Ouaré mine site in order to minimise pit dewatering pumping requirements, enhance pit wall stability, maintain safe working conditions and minimise potential surface water related impacts on the environment.
- An assessment of potential water supply options and their long-term water supply security should be completed to ensure a sustainable water supply is available to meet local requirements for the life of the mine.
- An assessment of the potential impacts of mine water management on the environment should be completed.

25 Interpretations and Conclusions

The following conclusions are relevant to this study:

25.1 Mineral Processing and Metallurgical Testing

- The results show the potential of good recovery by gravity for the ore types tested, with the exception for the samples recorded from Zegore South.
- Testwork on Ouaré and Satellite samples has demonstrated that a P_{80} grind size of 75 microns should be the target when treating the future Ouaré ores.
- The historical and 2017 YTD comminution circuit data has been incorporated into a mill model, which has been used to predict the milling capacity of the Youga plant for the future ores. This has shown that the Youga milling circuit has the capacity to treat the future Ouaré ores as specified in the mine production schedule.
- Satellite deposit samples show generally lower or equal numbers for hardness tests which confirm that for these ores tested, there should be no bottlenecks in achieving the required mill throughputs.

25.2 Geology and Mineral Resources

CSA Global considers that data collection techniques are consistent with industry good practice and suitable for use in the preparation of a Mineral Resource estimate to be reported in accordance with NI 43-101. Quality control data supports the integrity of the analytical data which has been utilised.

- Mineral Resources for ten deposits were estimated at Youga and Ouaré. At Youga, they are Main Pit, Zergoré, NTV, A2NE, East Pit, West Pit 1, West Pit 2, West Pit 3, West Pit 4 and Leduc. At Ouaré, there was one deposit also named Ouaré. West Pit 2 and 3 represent a contiguous zone of mineralisation and were estimated together into a single block model.
- Within the Youga deposit there are two distinct styles of mineralisation; the moderately to weakly silicified arkose with quartz stockwork veining and pyrite is the predominant sulphide which generally grades between 0.5 g/t and 2 g/t and the intensely silicified arkose with abundant quartz veins and more diverse sulphides which generally grades >3 g/t. At Ouaré, gold mineralisation is associated with shear zones at the contacts between felsic and mafic volcanics.
- A 3D block model representing the mineralisation and oxidation was created by CSA Global and Avesoro geologists using Micromine™, Leapfrog and Datamine Studio RM software. High-quality RC, DD and in some cases trench samples were used to estimate grades into blocks using OK. The block model was validated visually and statistically. Grade control data, where it exists, was excluded from the estimation dataset except for West Pit 1, which has very little exploration data below the existing pit surface.
- The total drilling used for the MRE update was 3,320 holes and trenches for 145,635 m. The previous owners, Endeavour, filed a Technical Report in 2015 which documented that 1,808 drillholes for 190,672 m were used in that MRE. West Pit 4 is reported for the first time here as a Mineral Resource.
- 52,179 samples were flagged within the mineralised volume and composited downhole into 1 m lengths. The resultant 42,985 composite samples were used in the estimate. Composite length was dependent on dominant sampling length and proportion of lengths greater than the dominant sampling length. 1 m was chosen for most deposits, with 2 m chosen for Main Pit, West Pit 1 and Ouaré.
- Additional in-situ dry bulk density (BD) analysis is required. The only density data available for review by CSA Global was for Main Pit, A2NE, West Pit 4 and Ouaré. The BD values applied to the Youga Project MREs were informed by review of the Youga technical reports (AMEC, 2013a and 2013b;

Endeavour, 2015), inspection of DD core photos, communication with site and considering Main Pit, A2NE and West Pit 4 density review results. The values used for non-fresh material have been informed by experience of other deposits in the region, given that samples measured in these materials are generally competent and tend to be overstated in the density measurements provided.

- Hard boundaries were used between mineralisation and waste zones, and between different mineralisation domains. Following contact analysis, oxidation boundaries were soft. Variograms were modelled for larger domains using the composites, with outliers top cut or excluded to prevent biasing the resultant model.
- Grade was estimated into parent blocks using OK, controlled by dynamic anisotropy (DA).
- Grade estimates were validated against drill data. There is good correlation between the input composites and output model for the estimated Au grade. Generally, the model grade trends follow the pattern of the drill samples grades, with reasonable levels of smoothing of the higher and lower grades.
- The Youga and Ouaré MRE satisfies the requirements for Indicated and Inferred Mineral Resource categories as embodied in the NI 43-101 Canadian National Instrument for the reporting of Mineral Resources and Reserves.
- The MRE indicates reasonable prospects for economic extraction, as supported by the generation of a constraining pit shell using NPV Scheduler (NPVS) using a gold price of US$1,500 and a cut-off of 0.55 g/t Au.
- At a comparable 0.5 g/t Au cut-off, changes in the total Measured and Indicated Mineral Resources (M&I) are a decrease of 875 kt, a 5% decrease in tonnage. Mining has occurred in various pits since the 2015 Technical Report, resulting in the decrease in M&I in these areas. No Measured Mineral Resource material was classified in the 2017 MRE.
- Global M&I Au grade decreased from 1.48 g/t to 1.37 g/t Au (-7%). This is likely attributed to higher grades closer to surface that have been depleted since the last MRE.
- Inferred Mineral Resources have substantially increased (threefold) by 508 kt due to a combination of reasons – resource shells have changed and a maiden Mineral Resource for West Pit 4 has been reported in 2017 and remodelling of the mineralisation volumes.

25.3 Mineral Reserves

Mineral Reserves are classified as Probable based on a Resource Classification of Indicated. Inferred and Unclassified Resources have been excluded from the conversion of Resources to Reserves. The QPs are of the opinion that potential modifying factors have been adequately accounted for using the assumptions in this report, and therefore the Mineral Resources within the mine plan can be converted to Mineral Reserves.

- Changes in Process cost, Mining cost or slope angle (± 2 degrees) generally have a relatively small impact (< 5%) on the estimate of contained metal and confirm that the pit limits are not as sensitive to these parameters as they are to price.
- Effective surface and groundwater management is important to the safety and productivity of the mining operation. Although this is only really an issue during the rainy season, if the currently planned water management methods prove to be inadequate, additional sumps and pump systems may be required.
- Transport of ore between the Ouaré project and the process plant at Youga is a key part of the plan and relies on the efficient planning of the transport route, good road maintenance and proactive management of community relations.

25.4 Mining Methods

The proposed method of mining for Youga and Ouaré is a conventional open pit method using drilling and blasting, loading with hydraulic excavators, and hauling with articulated dump trucks (ADT). Consideration of underground mining has not been necessary at this stage of the Project.

- The optimal production rate is constrained by the capacity limit of the ore transport fleet and the capacity of the plant at Youga.
- The cut-off grade applied to each pit depends mainly on the location and transport cost, other costs (Processing, G&A etc.) were constant across all deposits.
- It was noted that a 10% change in process or mining cost, or a 2-degree change in the overall slope angle, all have a similar impact on the contained metal and it was therefore concluded that the Ore Reserve was not particularly sensitive to these parameters.
- Price is the main driver for most of the deposits and a 10% change in price resulted in a 13% change in contained metal. This is consistent with the charts of cumulative contained metal versus price where there is a near linear relationship for most deposits which supports the notion of selecting the pit at a Price Factor of 1.0.
- The cut-off grade for the majority of the deposits could be set to 0.7 g/t Au, the exception being Ouaré where the cut-off was set to 0.82 g/t Au due to the additional cost of transporting the ore to the ROM pad.
- No proper quantification of the rock mass properties could be found in the documentation provided and therefore, it must be concluded that the limited data that could be studied comprises the bulk of the knowledge at this time. The methodology that was followed to quantify the slope design parameters could not be established and therefore it must be concluded that the reliability of this design is limited.
- Production from Balogo has a significant impact on the overall feed grade to the plant due to the high grade of the starter pit.
- The increase in the number of haul trucks required in 2018 is offset by transferring equipment from Balogo to Ouaré.

25.5 Recovery Methods

Preliminary circuit simulations with a simple mill model (calibrated to actual mill performance results) show that the Ouaré material should on average be able to be processed at the required average throughput (148 t/h) at the required grind size P80 of 75 microns to achieve the predicted recoveries for Ouaré ores. A range of 89 to 91% is predicted, subject to consistently achieving the required grind size (80% passing 75 microns).

25.6 Environmental Studies, Permitting and Social or Community Impact

There has been a considerable amount of environmental and social work undertaken on the Youga Project and EIA reports are of reasonable content and quality. Baseline data collection has been detailed and comprehensive and impact assessment and mitigations appropriate. While not to Standard Operating Procedure detail, the ESMPs are at an adequate level for implementation.

- The Youga operation received environmental permitting and an exploitation mining license and has been active for over 10 years. While this review cannot comment on operational environmental and social performance, the current condition and status of the Youga site; apparent lack of environmental penalties or social conflict; and proposed continuation of activities imply that there have not been any significant non-compliance or grievance issues.

- However, on-going community complaints about compensation and water resources suggest that there is room for improvements on some issues, and the current operation can address these with increased SE, community consultation and demonstrated transparency.
- Inclusion of the Ouaré deposit in the Youga Project has a good (if now 5 years old) scoping baseline data resource to initiate ESIA studies, and can learn from experiences at Youga.

25.7 Economic Analysis

The base case results (See Section 22.1) were tested for sensitivities to:

- Gold price fluctuations in the range from US$1000/oz to US$1,350/oz and mining cost variation from minus 10% to an increase of 10% from the base case.
- Gold price fluctuations in the range from US$1000/oz to US$1,350/oz and processing recoveries change from -4% to +2% from the current base case.

Due to lower grades the project shows high sensitivity to gold price and cost and recovery variations in stress scenarios:

- NPV at 8% discount rate with project mining costs 10% higher than the base case and gold price at US$1000/ounce is at minus US$4.6 million.
- NPV at 8% discount rate with processing recoveries for Youga and Ouaré ores at 4% lower than the base case and gold price at US$1000/ounce is at minus US$8.5 million.

25.8 Hydrology

25.8.1 Youga Project

Based on the information provided for review, there appears to be a good understanding of most operational water management issues at the mine site. However, additional assessments and site specific investigations would improve future operational water management including:

- Long term prediction of dewatering and depressurisation requirements.
- Long term water supply security.
- Optimisation of overall site water management.
- Assessment of potential impacts from mine water management on the environment.

Additional observations include:

- Uncertainty also remains as to whether there is an understanding of the hydrogeological regime at the site. It is reported that a preliminary assessment of dewatering requirements was completed as part of the Feasibility Study.
- Surface water management issues have been identified at several of the open pits, including aspects such as the erosion of the pit crest and enhanced pit inflows resulting in pit wall instability. A water course has also been identified as being present beneath the main waste dump.
- Although hydrological assessments have been completed for the Youga Gold Mine, there appears to be limited site specific meteorological data and limited quantitative surface water flow monitoring data available for the site. Thus, there remains some uncertainty as to whether surface water management strategies are appropriately designed for conditions at the site. An overall surface water management plan for the Youga mine site has not been sighted.
- No issues regarding pit dewatering have been reported.
- It is reported that depressurisation was identified as a potential requirement to ensure pit wall stability, although there is uncertainty whether depressurisation strategies have been developed for the site. Pit wall stability issues have been identified in a number of the open pits.

- In site visit reports, pit instabilities related to groundwater and surface water ingress have been highlighted. While we understand that corrective actions were implemented, no follow up was provided in the available documentation regarding the success or failure of these mitigation measures. In addition, the consequences of pit flooding following the decommissioning of the mine do not appear to have been assessed from a hydrogeological perspective.
- Water supply for the Youga Mine site is reported to be provided by a number of sources, including TSF return, the Nakambé River, pit dewatering and boreholes. A water tower currently exists at the Nakambé River and there is also an on-site water treatment facility. A water balance for the site has not been sighted. However, no water supply issues were reported in the documentation available for review.
- An Environmental Impact Study, Environmental Management Plan and Water Management System have been completed for the Youga Mine site. While no issues with respect to the impact of water management at the site on the surrounding environment have been reported, a risk of potential impact on the environment (from the mine operation) remains due to the uncertainties regarding the hydrological and hydrogeological understanding at the site.
- The Youga site has an existing water monitoring network, including both upstream and downstream groundwater and surface water monitoring locations. The Environmental Management Plan which is in place details compliance criteria, sampling and reporting procedures and corrective actions required to achieve water quality objectives.
- While a monitoring network is in place, additional work is recommended to collate spatial data from the monitoring points outlined in the Environmental Impact Assessment and the on-site boreholes described in the technical site visit reports. The current hydrogeological interpretation lacks specific information on the location of test boreholes and the hydraulic testing method used. No information has been provided regarding groundwater flow direction at the site.

25.8.2 Ouaré Project

Extremely limited hydrological and hydrogeological assessments have been completed for the Feasibility Study for the Ouaré Project and significant uncertainty remains with respect to water management for the project. Additional site-specific assessments are recommended in order to ensure that the water management aspects of the project are fully understood and appropriate surface water and groundwater management strategies are developed and costed. Observations include the following:

- The proposed infrastructure for the Ouaré Mine includes three open pits, a waste rock stockpile, an ore stockpile and related administration facilities. It is proposed that there will be no processing plant at Ouaré and that the ore extracted from Ouaré will be transported to the Youga Mine for processing.
- The assessment of the hydrology and hydrogeology for the Ouaré project area, completed as part of the FS, is extremely limited. A site specific hydrological and hydrogeological field investigation does not appear to have been completed for the Ouaré Project, except for limited water quality sampling. Significant uncertainty remains regarding the hydrological and hydrogeological understanding of the Ouaré Project area due to the lack of site specific data.
- An assessment of design rainfall events, design flood events, derivation of peak flow rates and peak flood heights is not included in the FS and a surface water management plan for the Ouaré project is not included in the FS.
- An assessment of potential pit inflows (derived from both rainfall runoff/surface water and groundwater) is not included in the FS and a dewatering strategy for the proposed open pits is not included in the FS.
- The water demands for the Ouaré project are not detailed in the FS. It is likely that there will be a water demand associated with dust suppression and for the administration and mine camp. Water

supply options for the project are not detailed in the FS. A water balance for the Ouaré Mine has not been provided for review.

- The potential impact of mine water management on the water environment is not included in the FS. Potential impacts may include:
  - Local groundwater table drawdown as a result of pit dewatering/depressurisation.
  - Impact on surface water bodies from site discharges (water quality and flow regime).
  - Reduction of surface water flows due to surface water interception/harvesting.
  - Pit void remaining at mine closure.
- A water monitoring programme for the Ouaré Project has not been provided.
- Capital and operating costs for the Ouaré mine have been developed. However, the costs are not presented in sufficient detail to determine whether they include an adequate provision for water management for the project.

25.9 Project Risks

Project risks have been summarised in Table 115 and are categorised from insignificant to fatal flaw (Table 116 lists the risk categories used). No fatal flaws were observed, with the majority of risks noted being either low or moderate with potential upside or opportunity also noted in many categories.

Table 115: Risk Table for Youga and Ouaré (Coloured by risk category)

Project	Youga	Ouaré
Data Management System	Opportunity to improve on excel and passport-based data capture and storage, with a move towards more secure relational database structure to improve integrity and more efficiencies in data management, storage and security.	Opportunity to improve on excel and passport-based data capture and storage, with a move towards more secure relational database structure to improve integrity and more efficiencies in data management, storage and security.
Geology	No digital geology data provided.	No digital geology data provided.
QAQC	At WP2, high blank failure rate, numerous failures on CRMs and inadequate quantity of duplicates with poor precision and bias. Mitigated by extensive GC data.	Contamination: 4% of blanks having values > 10xDL; Drill holes with multiple failures, implying contamination of assay results.
Artisanal Workings		Significant artisanal activity has been documented but no pits have been surveyed. Surface metal may be at risk.
Nature of Gold Mineralisation	High degree of complexity of gold mineralisation and variability exists at Zergoré	Grade variability is high both in terms of intra and inter-composite variability and so Indicated category is as high as is likely to be achieved here, and even that may be open to question in places.
Dry in-situ bulk density	Measured in-situ bulk density not available for most deposits at Youga.	Oxide and transitional density is not based on actual measured values, due to likely oversampling of competent material in core. This leads to uncertainty in the density values used for approx. 30% of the mineralisation, but based on CSA Global's experience, these values are unlikely to be too high.

Haul Road ESIA		No baseline data collection, impact assessment or stakeholder engagement along the proposed haul road from Ouaré to Youga.
Geochemistry	Geochemical testing of ore material and tailings from Youga, Balogo and Ouaré required to identify any potential metal leaching impacts from Youga TSF.	Geochemical testing of representative waste rock material required to avoid unforeseen metal leaching from WRD.
Water supply source	Mine water supply requirements and source needed and potential impacts on other users identified.	Mine water supply requirements and source needed and potential impacts on other users identified.
Artisanal Mining	Potential conflicts and environmental damage from artisanal mining. Requires assessment of impacts on- and from- artisanal mining and dialogue.	Assessment of impacts on- and from- artisinal mining required with dialogue to reduce environmental impacts and potential conflicts.
Compensation	Potential for conflict over unresolved compensation grievances. Need to strengthen and disclose formal and transparent compensation procedure and Grievance Mechanism.	Potential for conflict over compensation grievances. Need to develop and disclose formal and transparent compensation procedure and Grievance Mechanism.
Closure	Opportunity to provide infrastructure, improved land-use conditions, regenerated forest resources and water supplies to communities' post closure. Positive legacy.	Opportunity to provide infrastructure, improved land-use conditions, regenerated forest resources and water supplies to communities' post closure. Positive legacy.
Mining Recovery & Dilution	The historical information on the modifying factors for Youga is not entirely relevant as previously the Mining Contractor used much larger equipment. The style of mineralisation also varies considerably between deposits and factors should be developed by simulation for each deposit rather than use global factors.	
Slope Stability	Although there has been extensive mining of the deposits at Youga over the last 9 years with no evidence of major slope failures the development of these deposits in depth raises the risk of slope failure. Stability analysis should be undertaken.	
Metallurgical Recovery	Samples tested aren't necessarily representative of the actual ores, but recovery to date has been in line with predicted rates. Future testwork of new ore types could assist with mitigation of risk.	Samples tested aren't necessarily representative of the actual ores, but recovery to date has been in line with predicted rates. Future testwork of new ore types could assist with mitigation of risk.
Ore Transport	The transport route between the various deposits at Youga has crossing points with the national highways. These are being manned to control traffic flow but there is always a risk to the public where there is interaction with mine traffic.	The 44km route between Ouaré and Youga should be designed to avoid passing close to settlements. There will however be a residual risk of traffic accidents when crossing the national highway or other routes used by the public.

Table 116: Risk categories used

Risk Category	Definition
	Fatal Flaw (significant material risk to metal)
	Moderate (metal may be at risk)
	Low (unlikely to have material effect on metal)
	Insignificant (errors detected, but immaterial)
	Potential upside or opportunity

26 Recommendations

The following recommendations are relevant to this study:

26.1 Mineral Processing and Metallurgical Testing

A finer primary grind significantly improves the leach performance, and CSA Global recommends that the 75-micron grind should be the target grind for the leach circuit.

26.2 Geology and Mineral Resources

- A sound geological and structural model should form the basis of any future MRE, so that faulting and other mineralisation controls are integrated in the model.
- Additional dry bulk density data should be collected routinely during grade control and/or mine production and reviewed to build up a useful bulk density database of values that can be used to improve the confidence of the tonnage factors for the MRE. The methodology and measurements should be verified and standardised.
- The current level of understanding of the Au distribution and geological controls are sufficient for mine planning purposes. CSA Global recommends that instead of additional infill drilling to upgrade Indicated Mineral Resources to Measured Mineral Resources, grade control drilling should be sufficient to delineated blast and dig lines during open cast mining.
- The resource is open down dip. CSA Global recommends additional drilling for resource delineation with depth to allow Inferred Mineral Resources to be considered for an Indicated Mineral Resources classification level. A drill spacing of about 25 mZ (down dip) is recommended to allow the classification of Inferred Mineral Resources.

26.3 Mineral Reserves

The mill throughput process is dependent on the ore type. This is particularly relevant to the new deposits such as Netiana and Ouaré, as bulk metallurgical tests have not been carried out yet. It is recommended that bulk metallurgical tests are undertaken on the various ore types.

26.4 Mining Methods

CSA Global recommends the following:

- To improve the reliability of the mine design criteria, additional geotechnical parameters will have to be collated from exploration drilling and face mapping. These parameters must then be used in a logical methodology to establish stable slope angles.
- CSA Global consider the pit design parameters a reasonable assumption at this stage. However, these parameters should be reviewed prior to mining.
- Considerable care needs to be taken with the blasting to minimise movement and as a consequence the blast design assumes choke blasting with a relatively low powder factor of 0.29 Kg/m^3.
- No more than 3 active pits should be operational at any one time. This is a function of the available equipment and limits on logistics of running multiple pits.
- If possible a deposit should be mined out before moving to the next one. This allows the pit to be closed and rehabilitation to proceed as the project continues.

26.5 Environmental Studies, Permitting and Social or Community Impact

There are some gaps and deficiencies in investigations, impact assessments and mitigation and management measures, which are highlighted below. The most significant gap is the apparent lack of E&S work on the haul routes from Ouaré to Youga. This requires urgent work to describe ambient conditions, identify potential impacts and engage with affected communities - together with completion of the Ouaré ESIA - to develop suitable E&S management plans prior to start-up of haulage.

Required work to address gaps in the Project E&S work include:

- Urgently undertake full ESIA studies on the Ouaré component of the Project, building on the Socrege review.
- Undertake EISA studies on the haul route from Ouaré to Youga, including baseline data collection, stakeholder consultation, impact assessment and mitigations.
- Establish site meteorological stations at Youga and Ouaré (as required).
- Install permanent flow gauges at Project streams and depth rods at ponds/dams.
- Undertake more detailed faunal biodiversity studies at Youga to determine the most appropriate measures to avoid and/or offset for Project impacts.
- Implement and publicise a formal Grievance Mechanism for Youga and Ouaré.
- Undertake geochemical testing, including metal leaching tests on ore material and tailings from Youga; representative ore material from Balogo; and from Ouaré as required.
- Define and implement ecological and social monitoring at Youga.
- Develop and disclose an appropriate procedure for evaluating post start-up demands for compensation at Youga (for expanding Project area).
- Assess impacts on- and from- artisanal mining in the Youga area (and Ouaré in particular) and establish dialogue to reduce environmental impacts and conflicts.

26.6 Hydrology

26.6.1 Youga Recommendations

Additional studies are recommended to improve the level of understanding relating to the hydrology and hydrogeology at Youga. This additional information would also increase the confidence with regards predictions for mine water management at Youga. More specifically; CSA Global recommends the following:

- Additional site investigations to improve the hydrological and hydrogeological understanding for the site, including:
  - Installation of an on-site rain gauge to record site specific rainfall data relating to both individual storm events and daily rainfall totals.
  - Monitoring of flows in surface water features in the immediate project area
  - Mapping of the depth to bedrock across the project area to identify the depth of the weathered zone and position of the weathered rock/fresh rock contact (transition zone) which often represents a zone of enhanced permeability and preferential groundwater flow and is important in terms of managing pit inflows.
  - A review of the hydrogeological monitoring infrastructure and collation of all available data relating to groundwater levels, well-head elevation, hydraulic testing and geochemical analysis. Once the data is organised, it may be necessary to carry out additional hydraulic testing.
- An integrated surface water management plan should be developed for the Youga Mine site to optimise surface water management systems, minimise pit dewatering pumping requirements,

enhance pit wall stability, maintain safe working conditions and minimise potential surface water related impacts on the environment.

- Operational groundwater management strategies for the entire Youga Mine site should be reviewed and where possible integrated to optimise water use and management across the mine.

26.6.2 Ouaré Recommendations

- Hydrological and hydrogeological site investigations should be completed to improve the hydrological and hydrogeological understanding for the site, including:
  - Installation of an on-site rain gauge to record site specific rainfall data relating to both individual storm events and daily rainfall totals.
  - Monitoring of flows and water quality associated with surface water features in the immediate project area.
  - Mapping of the depth to bedrock across the project area in order to identify the depth of the weathered zone and the position of the weathered rock/fresh rock contact (transition zone) which often represents a zone of enhanced permeability and preferential groundwater flow and is important in terms of managing pit inflows and as a target depth for potential water supply bores.
  - A site specific hydrogeological field investigation programme, including:
    - Installation of site specific monitoring boreholes upstream and downstream of mine activity.
    - Site specific aquifer parameters for the various lithologies across the project site.
    - Investigate the hydraulic connection between different units.
    - Groundwater levels and groundwater flow direction.
    - Groundwater quality.
- A water monitoring programme should be developed in order to ensure that the programme enables the water management issues for the entire site to be fully evaluated.
- An assessment of pit inflows and dewatering requirements should be completed and an appropriate dewatering and depressurisation strategy developed.
- A surface water management plan should be developed for the proposed Ouaré Mine site to minimise pit dewatering pumping requirements, enhance pit wall stability, maintain safe working conditions and minimise potential surface water related impacts on the environment.
- An assessment of potential water supply options and their long term water supply security should be completed to ensure a sustainable water supply is available to meet local requirements for the life of the mine.
- An assessment of the potential impacts of mine water management on the environment should be completed.

27 References

27.1 Reports

AMEC, 2012; Youga Gold Mine Satellite Deposits and Ouaré Gold Project, Burkina Faso, West Africa Deposit; Metallurgical Testwork Report, July 2012

AMEC, 2013a; Endeavour Mining Corporation. Youga Deposits. NTV Deposit – Resource Update 2012. Report date: 31 January 2013.

AMEC, 2013b; Endeavour Mining Corporation. Youga Deposits. Zergoré Deposit – Resource Update 2012. Report date: 5 February 2013.

Burkina Mining Company, 2016; Youga Mine Environmental Management Plan, Revision 002, June 2016.

Burkina Mining Company; Water Management System, BMC YOUGA MINE.

Burkina Mining Company; Youga Mine Environmental Management Plan, Revision 01.

Endeavour Mining Corporation, 2015; Technical Report Mineral Resource and Mineral Reserve Update for the Youga Gold Mine Burkina Faso West Africa, 26 March 2015.

Golder Associates Inc, 2005; Feasibility-Level Pit slope design study, 23 Feb 2005.

HCG Cement and Mineral Processing Technologies, 2016; Feasibility Study for the Balogo Project in Burkina Faso, Prepared for MNG Gold, 20 March 2016.

HCG Cement & Mineral Processing Technologies, 2017; Ouaré Project Feasibility Study, Prepared for Etruscan Resources Inc., 5 May 2017.

Knight Piesold, 2016; Burkina Mining Company S.A, 2016; Youga Gold Mine Tailings Options Study, LO301-00192/09, issued by Knight Piesold, April 2016.

Lycopodium (1999). Ashanti Goldfields Company Echo Bay Mines Joint Venture, Youga Gold Project Feasibility Study. Unpublished Report. Lycopodium Pty Ltd.

Micon International Ltd, 2013; Technical Report and Preliminary Economic Assessment on the Ouaré Gold Deposit, Burkina Faso, West Africa, March 2013.

SGS, 2005; Youga Gold Project Updated Environmental Impact Assessment, SGS Environment, February 2005.

Socrege, 2012. Ouaré Preliminary E&S Assessment Report, Socrege, November 2012.

Socrege, 2016; ETUDE D'IMPACT ENVIRONNEMENTAL ET SOCIAL DU PROJET DE REHABILITATION DE LA ROUTE DE TRANSPORT DU MINERAI DE NETIANA A YOUGA, April 2016.

Socrege, 2017; EIES on Balogo-Youga Ore Transport Route, Socrege, April 2017.

SRK Consulting (South Africa) Ltd, 2010; Youga Gold Mine, Burkina Faso: Mining Geotechnics Site Visit – 19 to 25 August 2010.

SRK Consulting Ltd., 2011; Youga Gold Mine Draft Site Report, 26 July 2011.

SRK Consulting (South Africa) Ltd, 2013; Youga Gold Mine, Burkina Faso: Technical Site Visit Report – 27 to 30 August 2013, August 2013.

SRK Consulting Ltd., 2014; 20140806_Youga_Site_Visit_Report_Final, 6 Aug 2014.

Youga 'Respect to Commitments' (Social Mitigations), 2015.

Youga EIA Report, SGS Environmental (Ghana), February 2005.

Youga EMP (version 1), Date unclear but pre-2012.

Youga EMP, 2016.

Youga Environmental Program Organisation, 2016.

Youga Gold Mine, Burkina Faso: Mining Geotechnics Site Visit – 19 to 25 August 2010.

Youga Gold Mine, Burkina Faso: Technical Site Visit Report – 27 to 30 August 2013.

Wardell Armstrong, 2016; Review of Mine Closure, Youga Mine, Burkina Faso, 30 November 2016.

27.2 Presentations

MNG Gold, Burkina Faso Reserves and Exploration Upsides – November 2016.

MNG Gold, YOUGA Annual Overview Exploration, Burkina Faso – January 2017.

Plant Presentation, Avesoro, Burkina Mining Company, Internal Powerpoint presentation provided by MNG. January 2017.

Australia • Canada • Indonesia • Russia
Singapore • South Africa • United Kingdom

csaglobal.com