Report to:

Panoro Minerals Ltd.

Technical Report and Resource Estimate of the Cotabambas Copper-Gold Project, Peru

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Report to:

PANORO MINERALS LTD.

TECHNICAL REPORT AND RESOURCE ESTIMATE OF THE COTABAMBAS COPPER-GOLD PROJECT, PERU

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UNITS OF MEASURE

above mean sea level	amsl
acre	ac
ampere	A
annum (year)	a
billion	B
billion tonnes	Bt

billion years ago	Ga
British thermal unit	BTU
centimetre	cm
cubic centimetre	cm^3
cubic feet per minute	cfm
cubic feet per second	ft^3/s
cubic foot	ft^3
cubic inch	in^3
cubic metre	m^3
cubic yard	yd^3
Coefficients of Variation	CVs
day	d
days per week	d/wk
days per year (annum)	d/a
dead weight tonnes	DWT
decibel adjusted	dBa
decibel	dB
degree	°
degrees Celsius	°C
diameter	ø
dollar (American)	US$
dollar (Canadian)	Cdn$
dry metric ton	dmt
foot	ft
gallon	gal
gallons per minute (US)	gpm
Gigajoule	GJ
gigapascal	GPa
gigawatt	GW
gram	g
grams per litre	g/L
grams per tonne	g/t
greater than	>
hectare (10,000 m^2)	ha
hertz	Hz
horsepower	hp
hour	h
hours per day	h/d
hours per week	h/wk
hours per year	h/a
inch	in
kilo (thousand)	k
kilogram	kg
kilograms per cubic metre	kg/m^3
kilograms per hour	kg/h

kilograms per square metre	kg/m^2
kilometre	km
kilometres per hour	km/h
kilopascal	kPa
kilotonne	kt
kilovolt	kV
kilovolt-ampere	kVA
kilovolts	kV
kilowatt	kW
kilowatt hour	kWh
kilowatt hours per tonne	kWh/t
kilowatt hours per year	kWh/a
less than	<
litre	L
litres per minute	L/m
megabytes per second	Mb/s
megapascal	MPa
megavolt-ampere	MVA
megawatt	MW
metre	m
metres above sea level	masl
metres Baltic sea level	mbsl
metres per minute	m/min
metres per second	m/s
microns	µm
milligram	mg
milligrams per litre	mg/L
millilitre	mL
millimetre	mm
million	M
million bank cubic metres	Mbm^3
million bank cubic metres per annum	Mbm^3/a
million tonnes	Mt
minute (plane angle)	'
minute (time)	min
month	mo
ounce	oz
pascal	Pa
centipoise	mPa·s
parts per million	ppm
parts per billion	ppb
percent	%
pound(s)	lb
pounds per square inch	psi
revolutions per minute	rpm

second (plane angle)	"
second (time)	s
short ton (2,000 lb)	st
short tons per day	st/d
short tons per year	st/y
specific gravity	SG
square centimetre	cm^2
square foot	ft^2
square inch	in^2
square kilometre	km^2
square metre	m^2
three-dimensional	3D
tonne (1,000 kg) (metric ton)	t
tonnes per day	t/d
tonnes per hour	t/h
tonnes per year	t/a
tonnes seconds per hour metre cubed	ts/hm^3
volt	V
week	wk
weight/weight	w/w
wet metric ton	wmt

Abbreviations and Acronyms

Antofagasta Plc	Antofagasta
Bond ball mill work index	BWi
Canadian Institute of Mining, Metallurgy and Petroleum	CIM
certified reference materials	CRMs
Certimin S.A.	Certimin
Coefficient of Variance	CV
Companhia do Rio Vale Doce	CVRD
copper equivalent	CuEQ
copper	Cu
Cordillera de las Minas S.A.	CDLM
Cordillera de las Minas	CDLM
Cotabambas copper-gold porphyry Property	the Property or the Project
digital terrain model	DTM
general and administrative	G&A
global positioning system	GPS
gold	Au
gravity recoverable gold	GRG
induced polarization	IP
inductively coupled plasma	ICP
inverse distance squared	ID^2
Kriging Efficiency	KE

molybdenum	Mo
National Instrument 43-101	NI 43-101
NCL Ingeneria y Construccion SA	NCL
nearest neighbour	NN
Ordinary Kriging	OK
Panoro Minerals Ltd.	Panoro
Peacocke & Simpson Minerals Processing Engineers	Peacocke & Simpson
polyvinyl chloride	PVC
Preliminary Economic Assessment	PEA
Qualified Person	QP
quality assurance	QA
quality control	QC
Quantitative Kriging Neighbourhood Analysis	QKNA
silver	AG
South American Datum	SAD
Standard Deviation	Std Dev
theoretical slope of regression	ZZ*
Toronto Stock Exchange Venture Exchange	TSX-V
Universal Transverse Mercator	UTM

1.0 SUMMARY

1.1 INTRODUCTION AND PROPERTY DESCRIPTION

Panoro Minerals Ltd. (Panoro) is a Canadian-registered resource company, based in Vancouver, Canada and in Lima, Peru, and is publicly listed on the Toronto Stock Exchange Venture Exchange (TSX-V) as PML.V. Panoro is a mineral exploration company focused on exploring and developing its copper-molybdenum and copper-gold deposits in Peru.

This technical report and resource estimate covers the Cotabambas copper-gold porphyry Property (the Property or the Project) in the Apurimac Region of southern Peru, situated approximately 50 km southwest of Cusco.

Panoro retained Tetra Tech to produce a new National Instrument 43-101 (NI 43-101) compliant resource estimate and technical report on the Property. This technical report conforms to the standards set out in NI 43-101 Standards of Disclosure for Mineral Projects and is in compliance with Form 43-101F1. The Qualified Persons (QPs) responsible for this report are: Mr. Paul Daigle, P.Geo., Senior Geologist with Tetra Tech; Dr. Robert Sinclair Morrison, Ph.D., MAusIMM (CP), P.Geo., former Lead Resource Geologist with Tetra Tech; and Dr. Jianhui (John) Huang, Ph.D., P.Eng., Senior Metallurgist with Tetra Tech.

Mr. Paul Daigle, P.Geo., conducted a site visit to the Property from June 3 to 7, 2013, inclusive. The Project site and drill core logging and sampling facilities were inspected for one day during the site visit. Drill core from the Property are stored at site and in a secure warehouse in Cusco and was also inspected for one day. Mr. Daigle was accompanied on the site visit by Mr. Luis Vela Arellano, Vice President Exploration for Panoro and Mr. John Romero Villanueva, Chief Project Geologist for Panoro. Mr. Daigle also met with Mr. Edwin Mayte, Manager Technical Services for Panoro at the warehouse in Cusco and the office in Lima.

The Property is defined by the mineral rights to 17 mining concessions (Rosseló 2013) and are currently 100% held by Panoro Apurimac S.A., a 100% subsidiary of Panoro. The 17 mining concessions cover an area of approximately 15,900 ha.

1.2 GEOLOGY AND MINERALIZATION

The Cotabambas deposit is a copper-gold porphyry deposit is located in the Andahuaylas-Yauri belt of the high Andes of southern Peru. The Andahuaylas-Yauri belt is located immediately south of the Abancay deflection of the cordillera where thrust faulting oriented dominantly north-south is deflected to strike north-west south-east. The geology of the Andahuaylas-Yauri belt is dominated by the Andahuaylas-Yauri batholith which is exposed for approximately 300 km between the towns of Yauri in the southeast and Andahuaylas in the northwest, and Mesozoic to Early Cenozoic clastic and marine sediment sequences.

The batholith intrudes Precambrian to Palaeozoic basement rocks which are exposed to the northeast. The basement sequence culminates in Permian to Early Triassic age Mitu Group volcaniclastic and clastic rocks. The basement is overlain by Mesozoic and Cenozoic sediments deposited in the Eastern and Western Peruvian basins. The eastern basin is made up of marine clastic and carbonate rocks. The northeastern edge of the western basin is includes the Lagunilla and Yura Groups, made up of middle to late Jurassic quartz-arenite, quartzite, and shale grading upward to massive micritic limestone, shale, and chert of the Mara and Ferrobamba Formations. At the top of the Yura Group is the Soraya Formation, composed of arenite, quartz arenite, and quartzite, which hosts the Antilla deposit.

Major mineralization styles in the region include porphyry copper (± Mo ± Au), iron-copper skarn, replacement and sediment-hosted oxide zinc deposits and minor epithermal vein-style mineralization.

1.3 EXPLORATION AND DRILLING

The Property has been explored since its discovery in 2002. Exploration consisted of geological mapping, geochemical sampling, and geophysical surveys. Most of this exploration work was conducted by Cordillera de las Minas S.A. (CDLM) between 2003 and 2005. The deposit was drilled by two companies, CDLM and Panoro, between 2003 to present. In total, 9,923 m of diamond drilling by CDLM and 56,813 m by Panoro were completed in 140 drillholes on the Ccalla and Azulcacca deposits.

Tetra Tech reviewed the drill core to the drill logs and reviewed the sampling and logging protocols from the various drill programs and found that they meet or exceed industry standards. Assay analyses and quality assurance (QA)/quality control (QC) sampling was also reviewed and found to be adequate for this type of deposit. Tetra Tech found no significant errors in the database and that the data is acceptable for resource estimation.

1.4 RESOURCE ESTIMATE

Tetra Tech completed a block model, grade interpolation and mineral resource estimate on the Cotabambas deposit (this report). Drillhole data and assay data were supplied by Panoro, including preliminary geological and topographic wireframes. The resource model and estimate were completed using Datamine™ software (version 3.20.6140.0). The estimation utilized Ordinary Kriging (OK) method of interpolation on density, copper, gold, silver, and molybdenum to provide an in-situ mineral inventory based on copper equivalent (CuEQ) cut-offs. Mineral Resources were estimated as contained within a conceptual pit shell developed based on a set of bench-marked input parameters (mining, processing and general and administrative (G&A) costs), metal prices and preliminary metallurgical recovery data. An Indicated Resource was established based on data density, interpolation strategy, statistics, and proximity to surface. Inferred and Indicated Resources for the Project are tabulated in Table 1.1.

At a 0.2% CuEQ cut-off, Tetra Tech's 2013 resource model (this report) estimates a total in situ Indicated Resource of 117 Mt at 0.42% copper, 0.23 g/t gold, 2.74 g/t silver and 0.0013% molybdenum, and a total in situ Inferred Resource of 605 Mt at 0.31% copper, 0.17 g/t gold, 2.33 g/t silver and 0.0019% molybdenum. The conceptual pit shell used to constrain the mineral resource shows a strip ratio of 1.3:1.

Table 1.1 Indicated and Inferred Resources Estimate at a 0.2% CuEQ Cut-off

Zone	Geology	Resource Category	CuEQ Cut-off	Million Tonnes	Cu (%)	Au (g/t)	Ag (g/t)	Mo (%)	Cu Metal (Blbs)	Au (Moz)	Ag (Moz)	Mo Metal (Mlbs)
-	Total	Indicated	0.2	117.11	0.423	0.228	2.737	0.0013	1.09	0.86	10.30	3.45
4	Hypogene		0.2	84.18	0.373	0.215	2.730	0.0018	0.69	0.58	7.39	3.43
5	Oxide		0.2	23.82	0.490	0.241	2.627	0.0000	0.26	0.18	2.01	0.01
6	Leach Cap		0.2	0.19	0.000	0.657	3.741	0.0000	-	0.00	0.02	-
7	Supergene		0.2	8.92	0.728	0.307	3.069	0.0000	0.14	0.09	0.88	0.01
-	Total	Inferred	0.2	605.34	0.311	0.174	2.331	0.0019	4.16	3.38	45.37	24.83
4	Hypogene		0.2	521.00	0.293	0.176	2.409	0.0021	3.36	2.94	40.35	24.22
5	Oxide		0.2	75.78	0.405	0.152	1.821	0.0003	0.68	0.37	4.44	0.50
6	Leach Cap		0.2	1.18	0.000	0.605	3.273	0.0000	-	0.02	0.12	-
7	Supergene		0.2	7.38	0.727	0.183	1.931	0.0007	0.12	0.04	0.46	0.11

1.5 METALLURGICAL TESTING AND MINERAL PROCESSING

Two test programs were conducted for the Project, one by Certimin S.A (Certimin) in 2012 and the other by Peacocke & Simpson Minerals Processing Engineers (Peacocke & Simpson) in 2013. The samples tested were generated from four different mineralization zones. The test programs investigated the metallurgical responses of the mineralization to acid leach, cyanidation, flotation concentration and gravity concentration. The test results show that the oxide gold and oxide gold-copper samples responded reasonable well to conventional cyanidation and sulphuric acid/cyanide combined leaching respectively. The sulphide mineralization showed good responses to conventional flotation process. Further test work is required to optimize process conditions and flowsheets due to a substantial difference in mineralogy among these mineralization zones.

1.6 POTENTIAL FOR EXPLORATION

Mineralized targets in Cotabambas are joined and aligned in two main structural trends of 10 to 12 km lengths in northeast-southeast direction. These trends form two exploration targets:

- Target 1: Maria Jose, Cochapata, Ccalla-Azulccaca, Jean Louis and Cullusayhua (12 km length)
- Target 2: Buenavista, Guaclle, Ccarayoc, and Chuyllullo (10 km length).

Exploration targets were defined with surface mapping and referential outcrop chip rock sampling to identify the presence of anomalous copper, molybdenum, gold, lead and zinc.

Tetra Tech cautions that the potential quantity and grade is conceptual in nature for the exploration targets. There has been insufficient exploration to define a mineral resource and it is uncertain whether further exploration will result in the exploration targets being delineated as mineral resources.

1.7 RECOMMENDATIONS

Quantitative Kriging Neighbourhood Analysis (QKNA) was not undertaken during this resource estimate due to time constraints. Future resource estimates should employ QKNA to optimize sample search strategies for grade interpolation.

A Preliminary Economic Assessment (PEA) should be undertaken and can be based on this current model. One of the results of a PEA is the generation of an optimized pit shell which would comprehensively demonstrate potential for economic extraction. Once this optimized pit shell is realized, then the immediate strategy would be to convert the within-optimized-pit Inferred Resource to Indicated or even Measured classification with additional drilling. Optimal drill spacing for an Indicated resource is 40 to 50 m on section, and 50 to 70 m along strike. This density of infill drilling would also better define the main geological units of the deposit and enhance to confidence in any subsequent resource estimate.

Conditional Simulation (co-located co-kriging) could be used to estimate CuCN, CuR and CuAS throughout the deposit if there is sufficient correlation between leach data and corresponding assay data in each respective domain.

The current model requires review and extensions of the base of oxide and the base of leached cap (geological) wireframes.

An infill drilling plan is recommended to convert additional Inferred resources to Indicated status.

For exploration targets adjacent to the current pit, it is recommended to drill test geochemical and geophysical anomalies (i.e. the Cochapata and Maria Jose porphyries). It is also recommended to undertake geochemical and geophysical surveys of the Jean Louis, Caraccyoc, Chaupec exploration targets, as well as drill test exposed skarn mineralization.

2.0 INTRODUCTION

Panoro is a Canadian-registered resource company, based in Vancouver, Canada and in Lima, Peru, and is publicly listed on the TSX-V as PML.V. Panoro is a mineral exploration company focused on exploring and developing its copper-molybdenum and copper-gold deposits in Peru.

This technical report and resource estimate covers the Property in the Apurimac Region of southern Peru, situated approximately 50 km southwest of Cusco.

2.1 TERMS OF REFERENCE AND PURPOSE OF REPORT

Panoro retained Tetra Tech to produce a new NI 43-101 compliant resource estimate and technical report on the Property. This technical report conforms to the standards set out in NI 43-101 Standards of Disclosure for Mineral Projects and is in compliance with Form 43-101F1. The QPs responsible for this report are: Mr. Paul Daigle, P.Geo., Senior Geologist with Tetra Tech; Dr. Robert Sinclair Morrison, Ph.D., MAusIMM (CP), P.Geo., former Lead Resource Geologist with Tetra Tech; and Dr. Jianhui (John) Huang, Ph.D., P.Eng., Senior Metallurgist with Tetra Tech.

All units of measurement used in this technical report and resource estimate are in metric, unless otherwise stated.

2.2 INFORMATION AND DATA SOURCES

The main sources of information in preparing this report are from internal reports from Panoro, previous NI 43-101 reports, and press releases from Panoro. A complete list of references is provided in Section 19.0.

2.3 TETRA TECH QP SITE VISIT

Mr. Daigle conducted a site visit to the Property from June 3 to 7, 2013, inclusive. The Project site and drill core logging and sampling facilities were inspected for one day during the site visit. Drill core from the Property are stored at site and in a secure warehouse in Cusco that was also inspected for one day. Mr. Daigle was accompanied on the site visit by Mr. Luis Vela Arellano, Vice President Exploration for Panoro and Mr. John Romero Villanueva, Chief Project Geologist for Panoro. Mr. Daigle also met with Mr. Edwin Mayte, Manager Technical Services for Panoro at the warehouse in Cusco and the office in Lima.

3.0 RELIANCE ON OTHER EXPERTS

In preparation of this report, Tetra Tech has relied upon Panoro and others for information and for matters relating to property ownership, property titles, and environmental issues, including status tenure associated with the Property. The majority of the information has been sourced from Panoro internal reports, previous NI 43-101 reports, and press releases from Panoro. Third-party sources are disclosed in Section 19.0.

Tetra Tech has not conducted an independent examination of land titles or mineral rights for the Property. However, Panoro has provided Tetra Tech with a legal opinion on the Property from Rosseló, Attorneys at Law, a Lima-based law firm (Rosseló 2013).

4.0 PROPERTY DESCRIPTION AND LOCATION

The centre of the Property lies in Universal Transverse Mercator (UTM) Zone 18 at the coordinates 784,500 mN and 8,480,000 mE, with elevations ranging from 3,000 to 4,000 masl.

The Property is defined by the mineral rights to 12 mining concessions (Rosseló 2013) and are currently 100% held by Panoro Apurimac S.A., a 100% subsidiary of Panoro. The 17 mining concessions cover an area of approximately 15,900 ha.

4.1 LOCATION

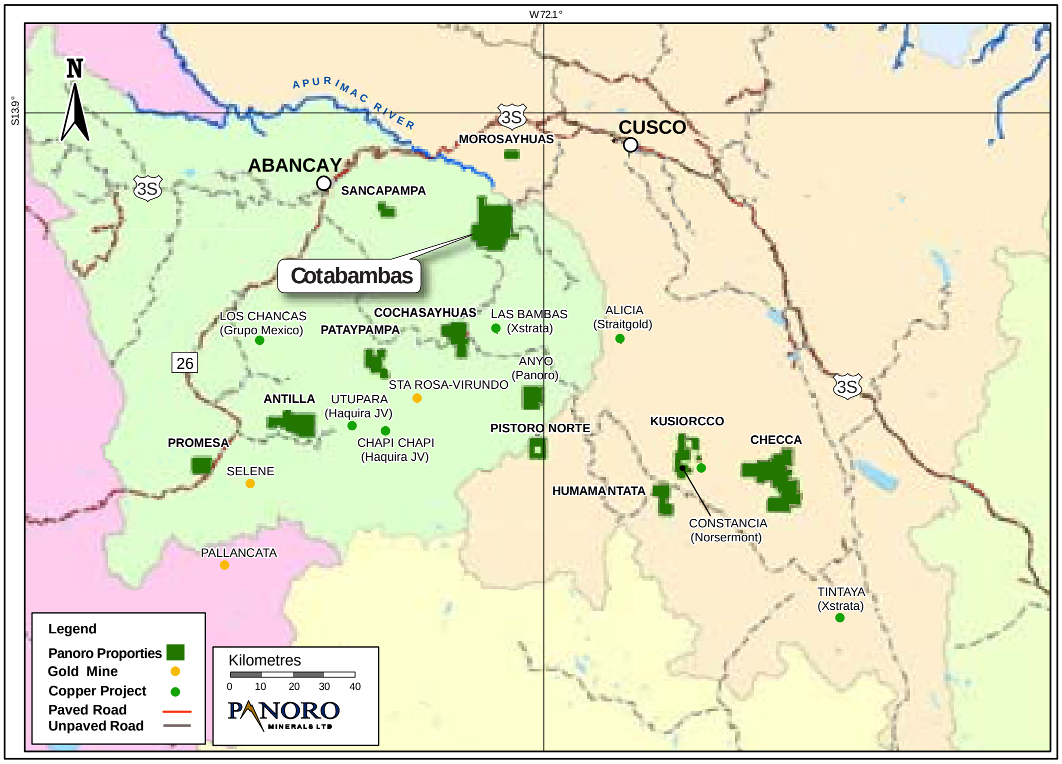
The Property is located:

- at approximately 13°45' south and 72°21' west in southeast Peru
- at approximately 8,480,000 mE and 784,500 mN (Zone 18L; South American Datum (SAD) 69)
- at approximately 545 km southeast of Lima, capital city of Peru
- at approximately 50 km southwest of Cusco
- at approximately 60 km east of Abancay, capital of Apurimac Region
- at approximately 1 km south of the village of Ccalla and 0.5 km to the northwest of the village of Cotabambas
- in the Apurimac Region (*Departamento*) of southern Peru
- in the southeast of Cotabambas Province (*Provincia*)
- in the Cotabambas and Ccalla Districts (*Distritos*)
- at roughly 2.3 km southwest of Rio Apurimac.

The Property is situated as shown in Figure 4.1 and Figure 4.2.

Figure 4.1 Location Map

Figure 4.2 Property Location Map

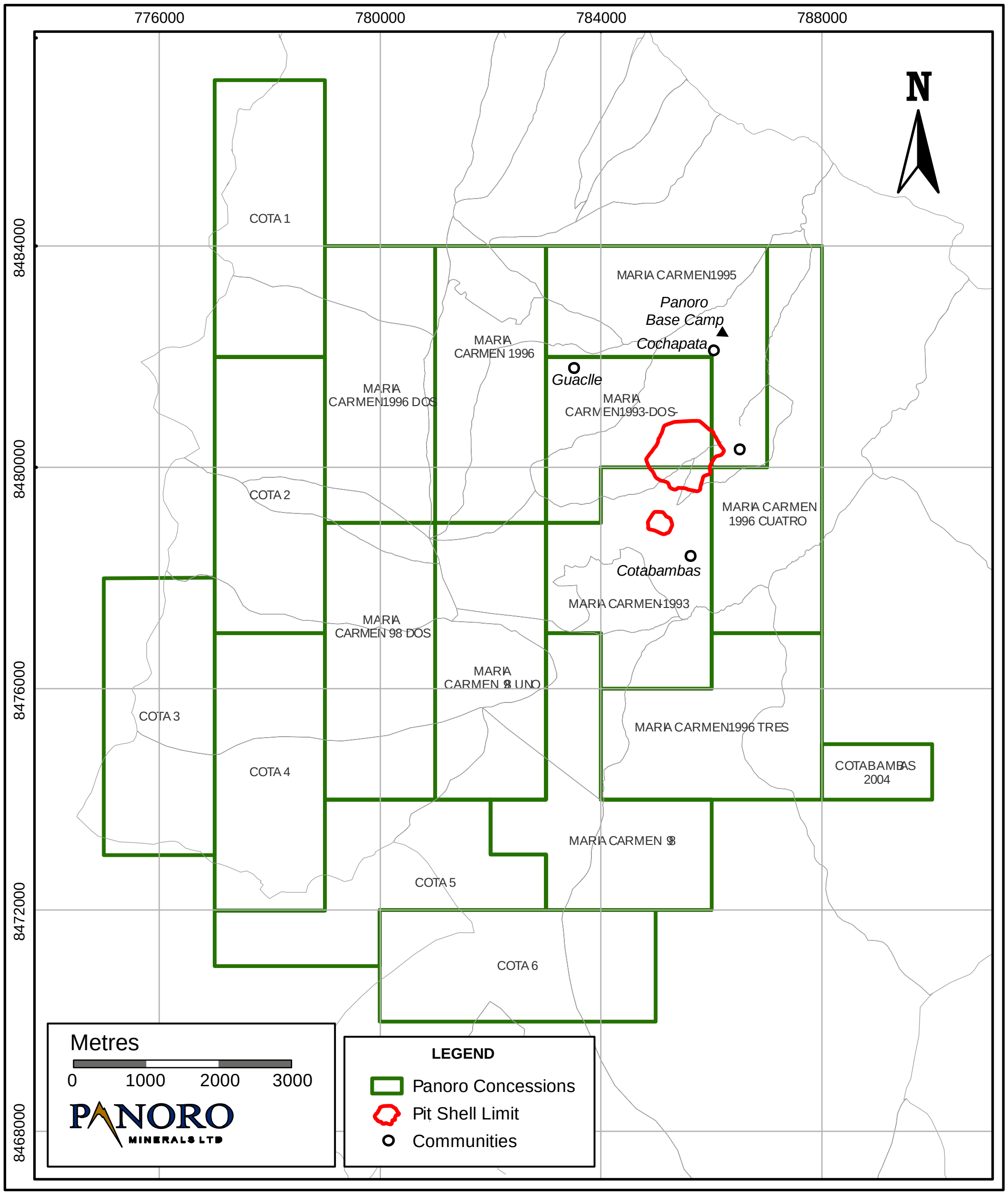


4.2 PROPERTY DESCRIPTION

The Project area consists of 17 concessions (Table 4.1 and Figure 4.3), and covers a total land area of 15,900 ha. The mineral rights are held by Panoro Apurimac S.A., a wholly owned subsidiary of Panoro. The concessions cover the entire known Ccalla and Azulcacca deposits which are situated mainly within Concessions 10077493 and 10214793; 'Maria Carmen-1993' and 'Maria Carmen 1993 Dos', respectively.

Panoro is currently operating under a Class B exploration permit. The Property is subject to annual payments to maintain concession in good standing. All concessions are in good standing as of July 17, 2013 (Rosseló 2013).

Figure 4.3 Cotabambas Concession Map



Source: Panoro (2013)

Table 4.1 Cotabambas Exploration Concessions

Concession No.	Concession Name	Area (ha)	Expiry Date
10077493	Maria Carmen 1993	1,000	June 2014
10214793	Maria Carmen 1993 Dos	700	June 2014
10221295	Maria Carmen 1995	1,000	June 2014
10128796	Maria Carmen 1996	1,000	June 2014
10142696	Maria Carmen 1996 Cuatro	1,000	June 2014
10142496	Maria Carmen 1996 Dos	1,000	June 2014
10142596	Maria Carmen 1996 Tres	1,000	June 2014
10087098	Maria Carmen 1998	1,000	June 2014
10086398	Maria Carmen 1998 Dos	1,000	June 2014
10086898	Maria Carmen 1998 Uno	1,000	June 2014
10230704	Cotabambas 2004	200	June 2014
10138512	COTA 1	1,000	June 2014
10138612	COTA 2	1,000	June 2014
10138712	COTA 3	1,000	June 2014
10138412	COTA 4	1,000	June 2014
10138812	COTA 5	1,000	June 2014
10138912	COTA 6	1,000	June 2014
Total	-	**15,900**	-

4.3 SURFACE RIGHTS

Panoro does not own any surface rights on the Property. Agreements have been negotiated with the surrounding communities of Cochapata, Ccalla, and Guaclle, as well as individual surface rights holders in the town of Cotabambas, which have allowed Panoro to conduct exploration activities from 2010 through 2013, in two three-year periods. The agreement with the Guaclle community was not renewed in 2013 as this was not considered a priority target for the current focus of exploration activities. Negotiations are ongoing for continued access agreements, including an overall community development agreement in the Cotabambas area.

4.4 ENVIRONMENTAL LIABILITIES

Tetra Tech is not aware of any environmental liabilities on the Property.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 ACCESSIBILITY

The Property is most easily accessed via Cusco and by highway via Abancay. The Property is situated approximately 50 km southwest of Cusco and approximately 130 km by road. The Property may be accessed from Cusco via:

- Highway 3S west for approximately 32 km in the direction of Abancay to join
- an unpaved road, Highway 3SF south, via the town of Chinchaipujio, for approximately 77 km to arrive at
- the bridge over the Apurimac River, which separates the Apurimac and Cusco Regions and joins
- an unpaved road for approximately 22 km south and up the southern slope of the Apurimac valley to Panoro's base camp on the Property.

The Project site is a further 6.5 km along a dirt road from the base camp and access around the Project site is limited to drill roads. These roads are in good condition.

The main highways in this region of Peru are paved. The secondary highways are generally unpaved but are well maintained. The highways and roads through the mountains are subject to many switchbacks, to overcome the high relief, therefore highway distances are longer than in a direct line. The drive from Cusco to the Property is typically 3.5 hours.

There are regular scheduled flights to and from Cusco. Flight time from Lima to Cusco is typically an hour.

5.2 CLIMATE

The climate in this region is a temperate highland tropical climate climatic zone (Cwb; Köppen climate classification) and is characterized by dry winters and rainy summer seasons. Generally, the dry winter season, between May to October is marked by very little precipitation; and the wet summer season, between November and April are marked with rain.

Daytime temperatures in the dry season range between 18° and 22°C with highs near 30°C. Night time temperatures tend to be cold. The wet season has moderate variations in temperatures with the daytime average ranging between 15° to 18°C and night time lows between 5° and 8°C (Wright 2009).

The closest precipitation records are of Cusco which shares the same climate as the Property. Average precipitation is 670 mm where June and July received a minimum rainfall of less than 4 mm per month. January receive a maximum of up to 150 mm.

Exploration activities may take place all year-round.

5.3 LOCAL RESOURCES

Cusco, population 510,000 (2009), is the closest major town to the Property and can provide most supplies for the base camp. Basic supplies, food, and fuel can be sourced from the surrounding villages. Mining related equipment, skilled and professional services must be sourced elsewhere. Unskilled labor may be found in the nearby villages.

Panoro has set up a permanent base camp next to Cochapata village with fixed buildings for offices and core logging, sampling and storage facilities. The base camp also serves as equipment storage depot and garage. A second base of operations is also set up in the town of village of Ccalla, approximately 2.5 km south, or 2 km by road. Here, there are offices, kitchen, as well as second drill core logging and sampling facility. Accommodations for personnel are available in Cotabambas.

The Property has sufficient land for exploration and development purposes.

5.4 INFRASTRUCTURE

The Project site is relatively isolated from public infrastructure and is limited to a small network of access roads. There is intermittent cellular telephone coverage on the Property.

The only source of electricity on the Property is low voltage single phase and three phase power lines which services the communities around Cotabamabas.

It should be noted Cotabambas relative proximity to Xstrata's Las Bambas Cu-Au Mine. As of the date of this report, Xstrata has constructed a new access road to the Las Bambas Mine that connects with an access road to the Property. The intersection is situated approximately 40 km, in a straight line, of the Property. In the future, this may serve as an alternative access to the Property.

The nearest major airport is in Cusco, to the north, and the nearest railhead is in Izcuchaca, a town roughly 20 km west of Cusco.

Sufficient water sources are found in the creeks and rivers in the valleys on and around the Property.

5.5 PHYSIOGRAPHY

The Property is located in high altitudes of the Andean Cordillera where elevations vary between 2,100 to 4,500 masl. Relief on the Property varies from moderate slopes along ridgetops to very high along the flanks of the ridges. The region is characterized by deeply incised river valleys and canyons such as the Rio Apurimac which lies 600 m below the town of Cotabambas.

The vegetation on the Property is sparse, limited to alpine grass and shrubs. Much of the moderate grassy slopes are used for local livestock and subsistence crops.

6.0 HISTORY

6.1 ANTOFAGASTA MINERALS 1995 TO 2002

In 1995, Anaconda Peru S.A., a Peruvian subsidiary of Antofagasta Plc (Antofagasta), carried out mapping, soil and rock geochemical sampling programs, and geophysical surveys over the Ccalla, Cochapata, Azulccacca, and Huaclle areas of the Property.

The first diamond drill testing of the surface soil and rock geochemical and geophysical anomalies occurred in July 1996. Intermittent drilling continued until April 2000. In total, 24 drillholes totaling 8,538 m were completed, with numerous mineralized intervals intersected. The results of these drill campaigns were reported in internal company reports by Val d'Or (1996) and Perello et al. (2001). The Property was dormant between 2000 and 2002.

6.2 CORDILLERA DE LAS MINAS 2002 TO 2006

Antofagasta and Companhia do Rio Vale Doce (CVRD) formed a joint venture company called Cordillera de las Minas (CDLM) in 2002, and to it transferred ownership of several groups of exploration concessions in southern Peru.

From 2002 to 2006, CDLM carried out additional mapping, surface rock and soil geochemical sampling, induced polarization (IP) surveying, magnetometer surveying, and diamond drill testing of previously identified geological, geochemical, and geophysical anomalies. In total, nine drillholes totalling 3,252 m were drilled.

6.3 PANORO MINERALS 2007 TO PRESENT

In March 2007, Panoro paid US$16.6 million to acquire all outstanding shares of CDLM on the Lima exchange. The deal was comprised of US$13 million cash and the remainder in common shares. The deal saw Panoro acquire 13 properties, including the Property.

From 2011 to present, Panoro completed additional mapping, surface rock and stream sediments geochemical sampling, induced polarization (IP) surveying, and magnetometer surveying. Panoro also conducted diamond drill testing of geological, geochemical, and geophysical anomalies in Ccalla and Azulccacca deposits. In total, 140 drillholes totalling 56,813 m were drilled.

7.0 GEOLOGICAL SETTING AND MINERALIZATION

The following is taken from Wright (2012).

7.1 REGIONAL GEOLOGY

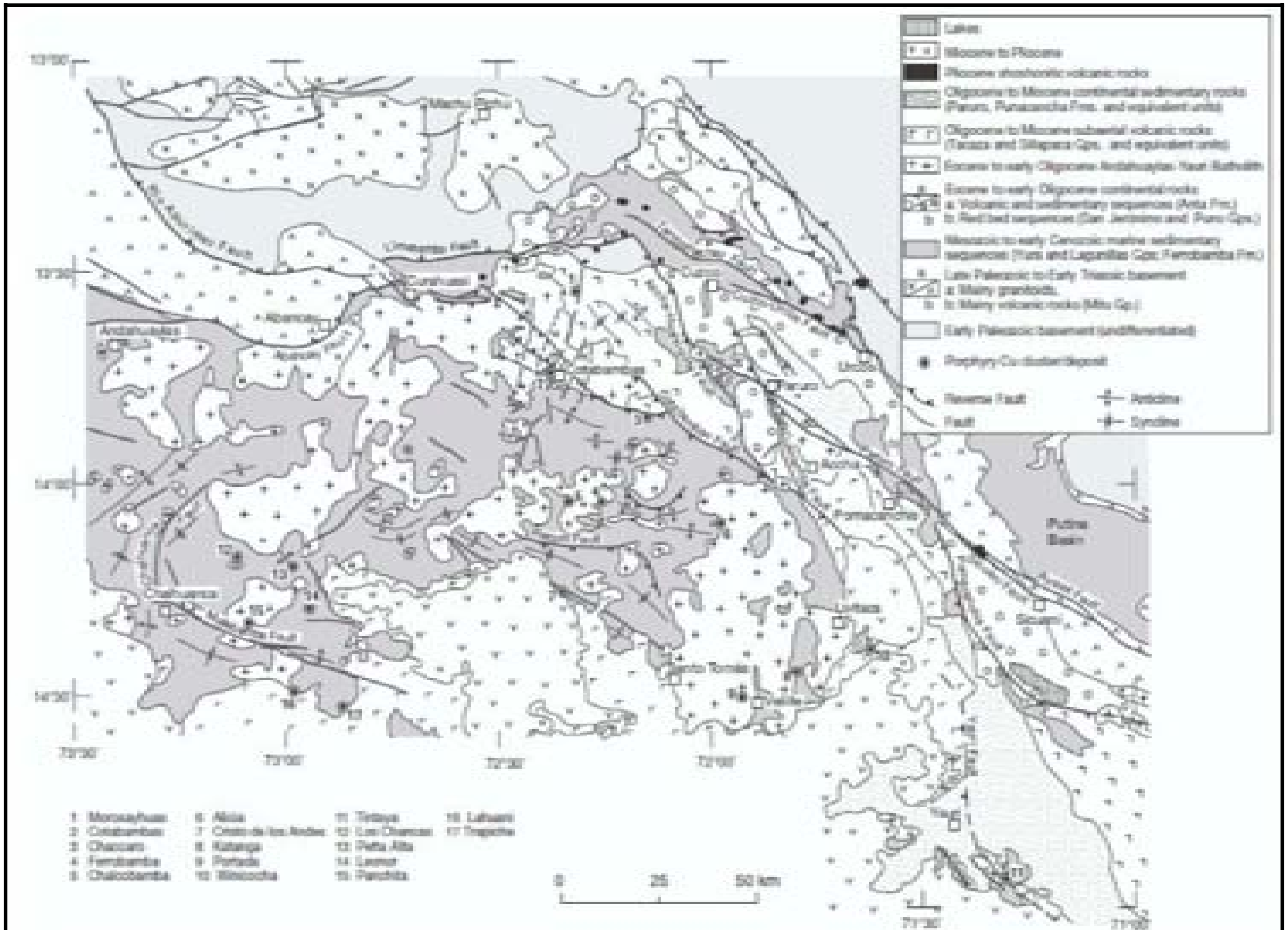
The Andahuaylas-Yauri belt is located immediately south of the Abancay deflection of the cordillera where thrust faulting oriented dominantly north-south is deflected to strike north-west south-east (Figure 7.1). At the deflection the normal subduction of southern Peru and northern Chile changes to flatter subduction below central and northern Peru.

The geology of the Andahuaylas-Yauri belt is dominated by the Andahuaylas-Yauri batholith which is exposed for approximately 300 km between the towns of Yauri in the southeast and Andahuaylas in the northwest, and Mesozoic to Early Cenozoic clastic and marine sediment sequences (Figure 7.2). The batholith is ranges from 25 km wide at the east end to 130 km wide near Abancay and is composed of early mafic to intermediate intrusive with cumulate textures, grading to intermediate intrusive rocks with equigranular to porphyritic textures. The batholith intrudes Precambrian to Palaeozoic basement rocks which are exposed to the northeast. The basement sequence culminates in Permian to Early Triassic age Mitu Group volcaniclastic and clastic rocks. The basement is overlain by Mesozoic and Cenozoic sediments deposited in the Eastern and Western Peruvian basins. The eastern basin is made up of marine clastic and carbonate rocks. The northeastern edge of the western basin is includes the Lagunilla and Yura Groups, made up of middle to late Jurassic quartz-arenite, quartzite, and shale grading upward to massive micritic limestone, shale, and chert of the Mara and Ferrobamba Formations. At the top of the Yura Group is the Soraya Formation, composed of arenite, quartz arenite, and quartzite, which hosts the Antilla deposit.

Eocene and Oligocene stratigraphy is dominated by the sedimentary San Jerónimo Group and the dominantly volcanic Anta Formation, which un-conformably overlie the Mesozoic and Cenozoic sediments. Miocene and Pliocene volcanics and sediments overlie Oligocene sediments. A discontinuous veneer of Pleistocene fluvio-glacial sediments and re-worked gravels overlie the region.

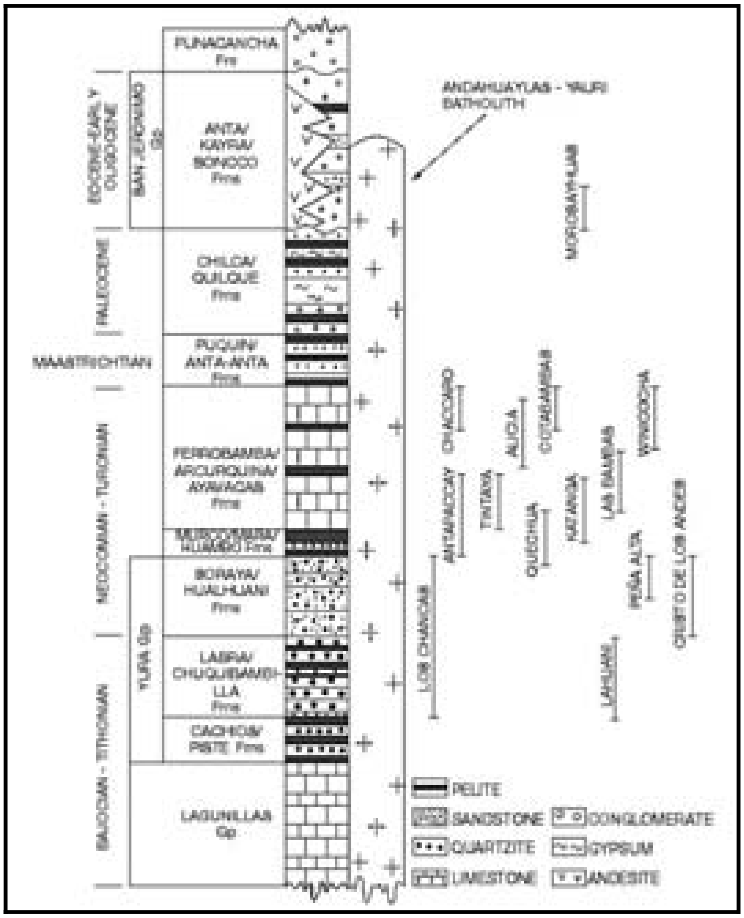
Major mineralization styles in the region include porphyry copper (± Mo ± Au), iron-copper skarn, replacement and sediment-hosted oxide zinc deposits and minor epithermal vein-style mineralization.

Figure 7.1 Regional Geology of the Yauli-Andahuaylas Belt



Source: Perelló et.al. (2003)

Figure 7.2 Regional Stratigraphy for the Cotabambas and Other Deposits



Source: Perelló et.al. (2003)

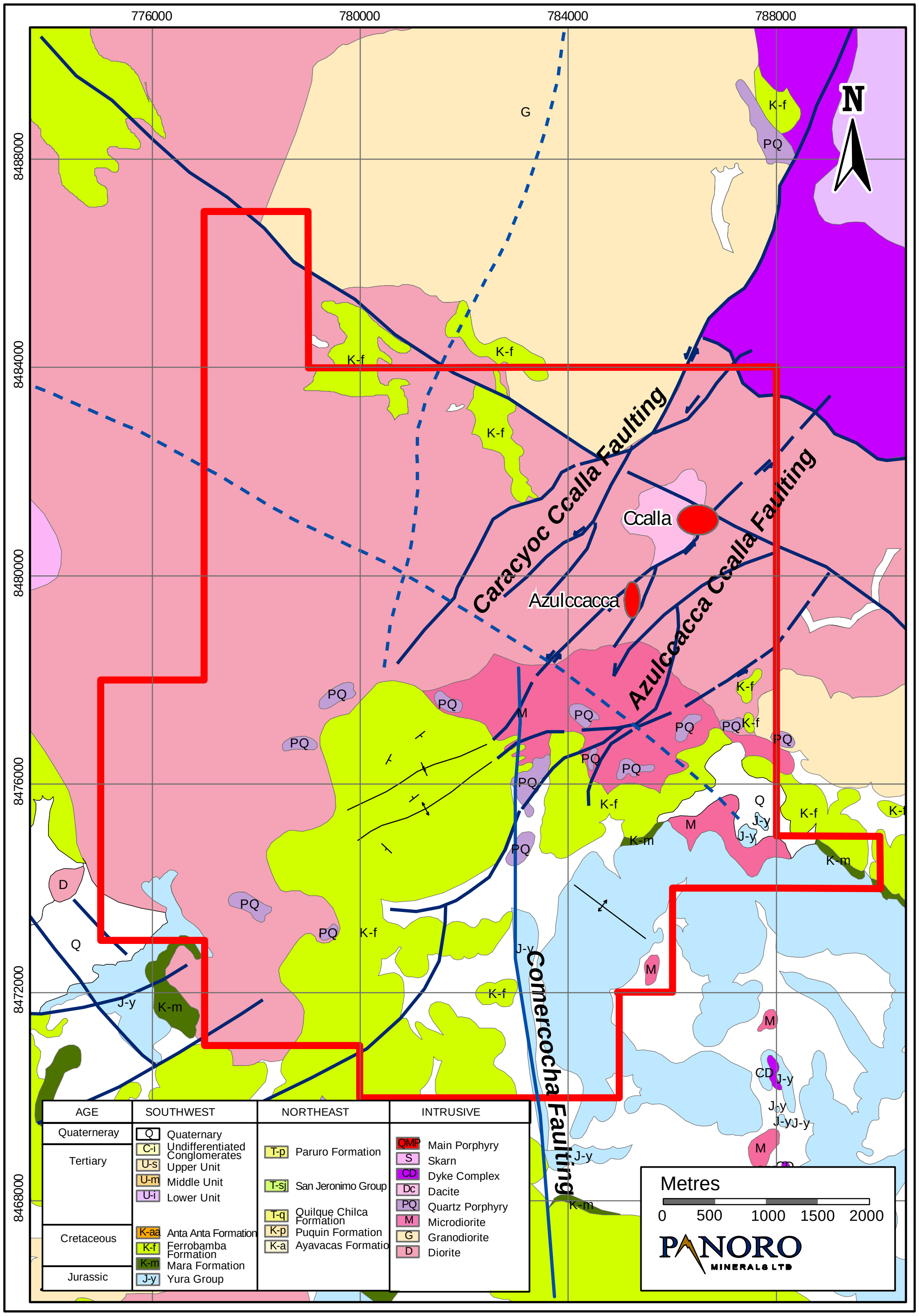
7.2 PROPERTY GEOLOGY

Based on an understanding of the regional geology of the area and the Property-wide 1:10,000 and 1:5,000 scale mapping, the geology of the Property is dominated by:

- Andesite of the Eocene to early Oligocene Anta Formation
- diorite related to the Eocene to early Oligocene Andahuaylas-Yauri Batholith
- later, altered, mineralized quartz monzonite porphyry, also related to the Eocene to early Oligocene Andahuaylas-Yauri Batholith
- late dacite volcanic dome and associated latite dikes.

The emplacement of the quartz monzonite porphyry and later latite dykes are controlled by a system of strong sub-vertical fault and shear zones that have an azimuth of approximately 030°. A second set of structures, perpendicular to the 030° system and parallel to the regional thrust fault systems with azimuth 120° runs between the Ccalla area and the Guacclle area to the west (Figure 7.3).

Figure 7.3 Geology of the Cotabambas Property

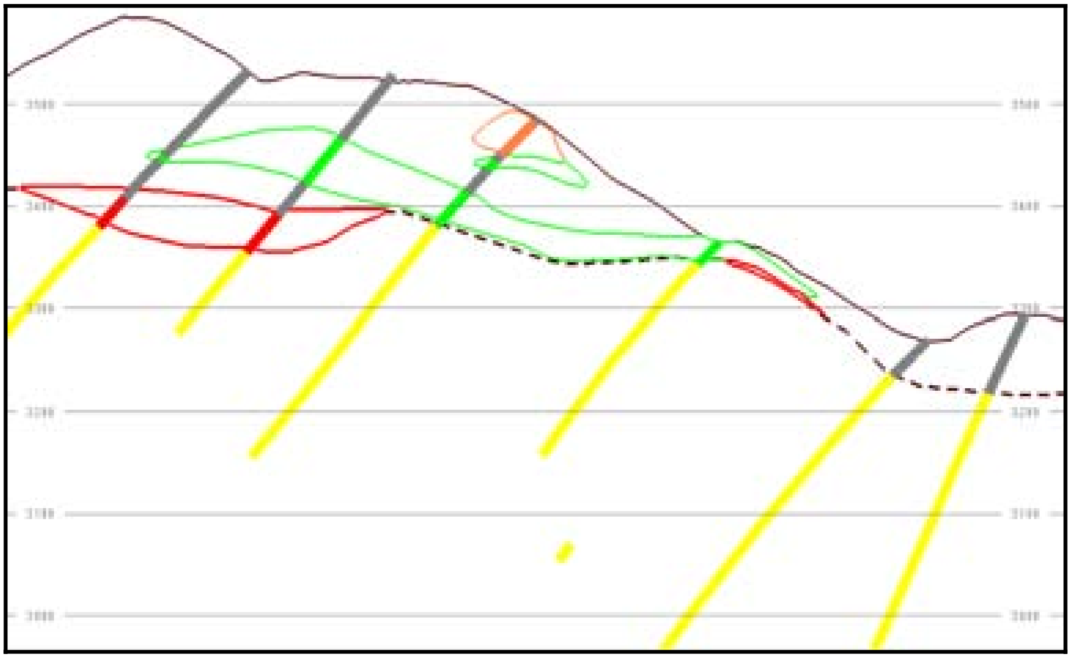


Source: Panoro (2013)

7.3 MINERALIZATION

Important concentrations of copper, gold and silver mineralization are encountered on the Property. Mineralization occurs in hypogene, supergene enrichment and oxide zones. A well-developed leached cap hosts the oxide mineralization. Sulphide mineralization occurs below the base of the leached cap. This zonation is typical of porphyry-style copper and porphyry-style copper-gold deposits (Figure 7.4).

Figure 7.4 Diagram of Porphyry-Style Mineralization Zonation



Note: Yellow designates hypogene mineralization; red designates supergene mineralization; green designates oxide mineralization; orange designates leach-cap mineralization.

7.3.1 HYPOGENE MINERALIZATION

Hypogene mineralization at the Property has been intersected at depths from approximately 20 m from surface to depths of over 500 m from surface. Hypogene copper-gold-silver mineralization is best developed with pyrite mineralization in quartz-sericite-altered quartz monzonite porphyry dykes running parallel to the north north-east trending structural corridors at Ccalla and Azulccacca. Mineralization occurs as disseminated chalcopyrite and pyrite, pyrite-chalcopyrite stringers or veinlets and quartz chalcopyrite pyrite veinlets. Local patches of hypogene mineralization are developed in diorite, peripheral to the quartz monzonite porphyry, where the north-northeast-trending structural system passes within 10 to 20 m of the diorite-porphyry contact. Chalcopyrite mineralization intensity decreases and disseminated pyrite mineralization increases distal to the higher grade parts of the hypogene zone.

Sulphide mineralization consists of chalcopyrite and pyrite and gold grades are strongly correlated to copper grades in the hypogene zone. Some occurrences of bornite have been noted in deeper portions of the hypogene zones. Silver grades are not as strongly correlated to copper grades as gold grades, but are generally elevated where copper-gold mineralization is present.

Hypogene mineralization (Figure 7.5 and Figure 7.6) occurs as disseminated, stringers and in four different types of veinlets:

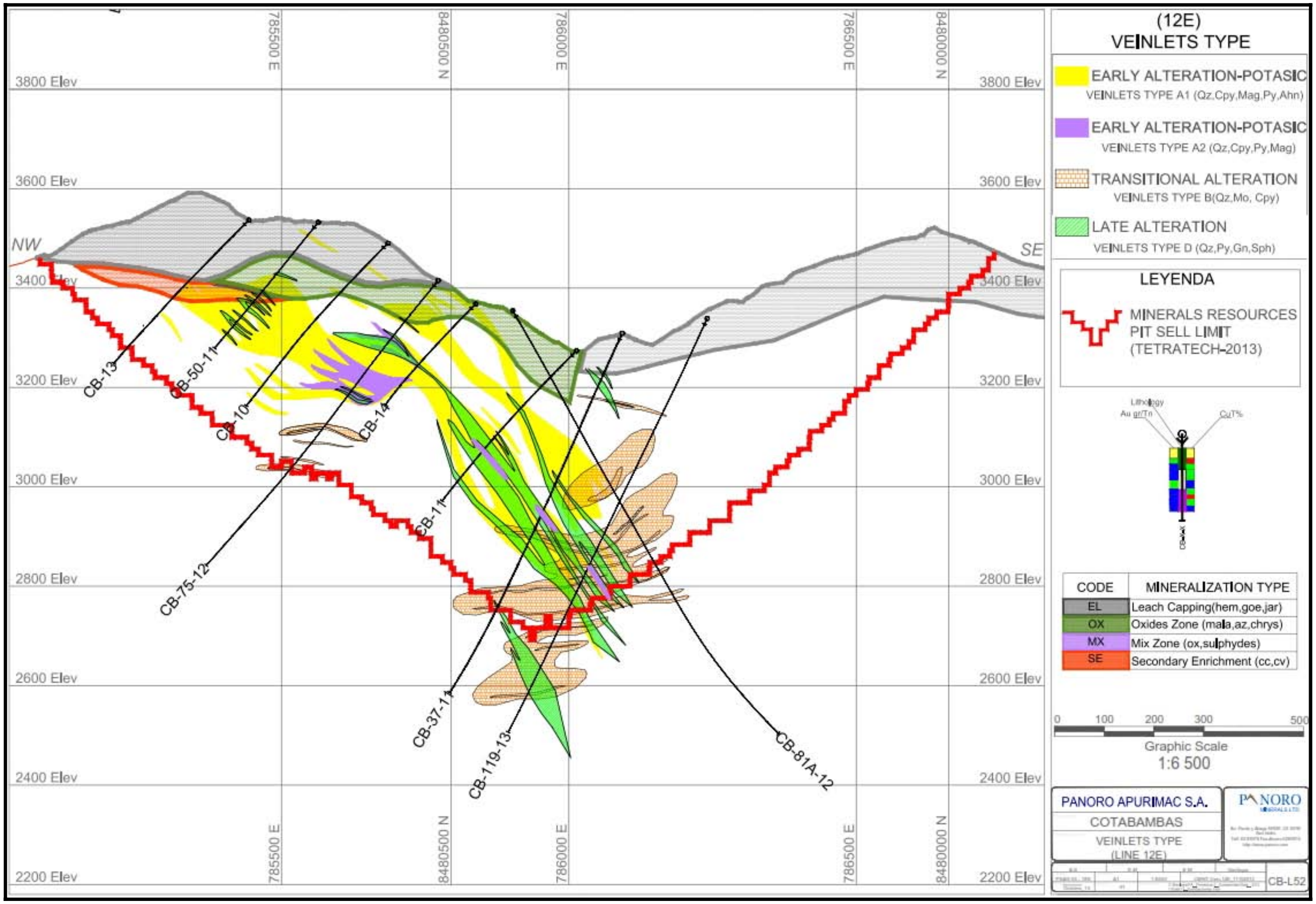
- A1: quartz, anhydrite, magnetite, chalcopyrite and pyrite
- A2: quartz, magnetite, chalcopyrite, pyrite
- B: quartz, chalcopyrite, molybdenite
- D: quartz, pyrite, galena and sphalerite.

Veinlets type A1 and A2 are part of a potassic early alteration. Veinlets type B are part of a transitional phyllic alteration. Type D mineralization is part of late alteration.

Local hypogene mineralization is developed in diorite, peripheral to the quartz monzonite porphyry, where the north-northeast-trending structural system passes within 10 to 20 m of the diorite-porphyry contact. Chalcopyrite mineralization intensity decreases and disseminated pyrite mineralization increases distal to the higher grade parts of the hypogene zone.

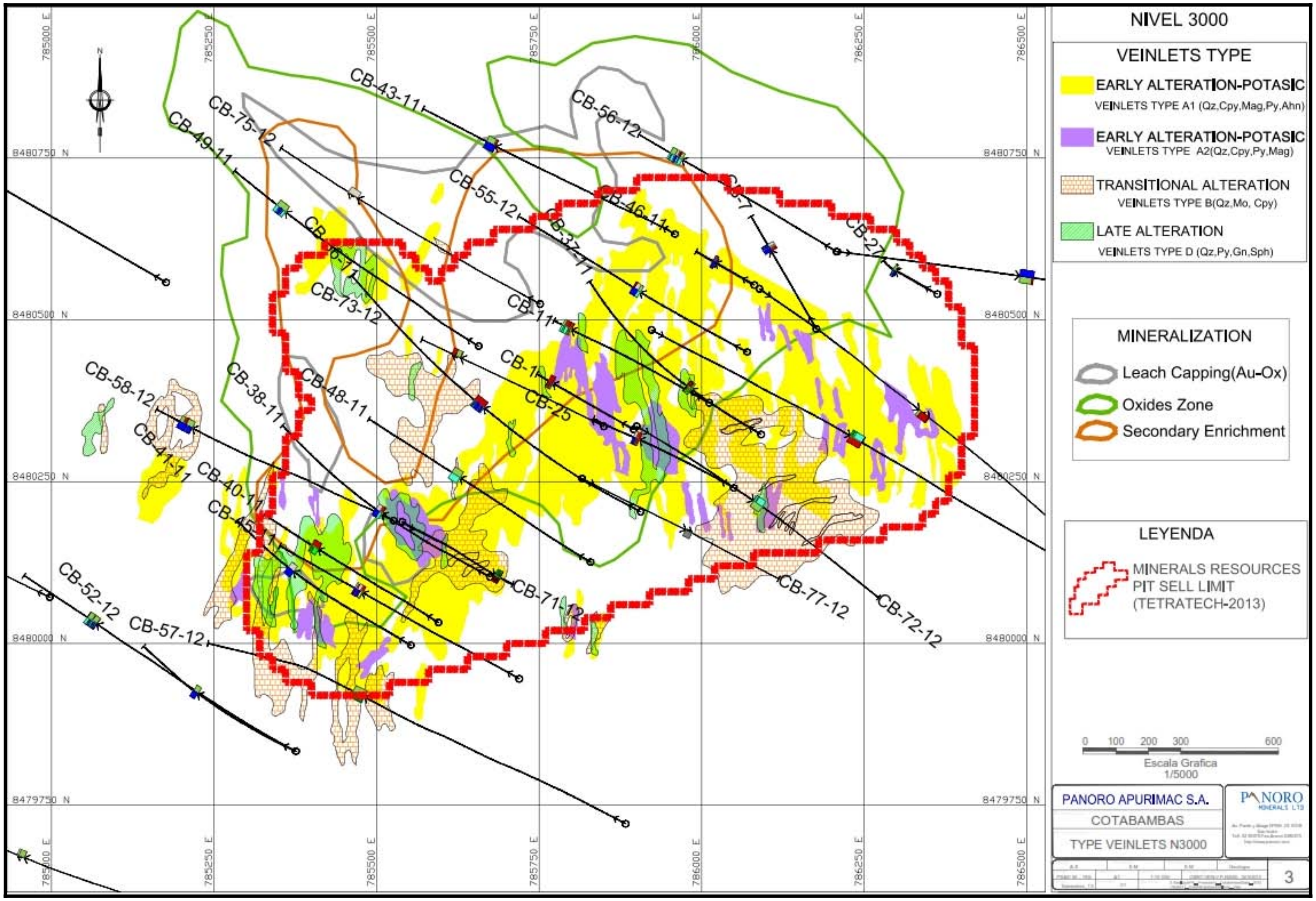
Sulphide mineralization consists of chalcopyrite and pyrite and gold grades are strongly correlated to copper grades in the hypogene zone. Some occurrences of bornite have been noted in deeper portions of the hypogene zones. Silver grades are not as strongly correlated to copper grades as gold grades, but are generally elevated where copper-gold mineralization is present.

Figure 7.5 Typical Cross-section of Porphyry-Style Mineralization Zonation in Cotabambas



Source: Panoro (2013)

Figure 7.6 Plan View of Level 3000 of the Porphyry-Style Mineralization Zonation in Cotabambas



Source: Panoro (2013)

7.3.2 Supergene Sulphide Enrichment Zone

Zones of high-grade chalcocite mineralization with lesser covelite and chalcopyrite occur at the top of the hypogene sulphide mineralization, and at the base of the leached cap. This type of mineralization is interpreted to be a zone of supergene enrichment that typically forms in porphyry copper deposits where low pH argillic and advanced argillic alteration at the top of the porphyry system leach primary copper mineralization above the paleo-water table and re-deposit it as chalcocite at the water-table surface (Figure 7.6).

Supergene zones occur at Ccalla and Azulccacca and are characterized by high chalcocite content, correspondingly high cyanide soluble copper assay grades, and total copper grades of greater than 1%.

7.3.3 Oxide Copper-Gold Mineralization

Oxide mineralization occurs in the leached cap of the Ccalla and Azulccacca deposits. The leached cap is characterized by abundant limonite, goethite and manganese wad replacing and a characteristic mottled orange brown colour. Iron oxides and oxy-hydroxides replace pyrite and oxide copper-gold mineralization occurs as patches of green copper oxides, typically criscolla, malachite and broncanthite. Copper oxides occur as coating on disseminated chalcopyrite grains and filling fractures and veinlets.

Lenses of oxide copper-gold mineralization having lateral extents of 100 to 200 m and thicknesses of 10 to 50 m have been mapped in outcrop and intersected in diamond drillholes. These lenses typically occur over hypogene and secondary sulphide mineralization; however, isolated drillhole intersections indicate that oxide copper-gold mineralization may also overlie low-grade hypogene mineralization indicating possible remobilization of copper mineralization in the leached cap.

7.3.4 Oxide Gold Mineralization

Oxide gold mineralization has been defined in a lens in the Azulccacca area, but has also been intersected in short, isolated 1 to 5 m intervals in other parts of the leached cap of the deposit. Oxide gold mineralization is associated with limonite and occurs near major structures cutting the hypogene sulphide zone associated with the quartz monzonite porphyry.

8.0 DEPOSIT TYPES

The following is taken from Wright (2012).

Key characteristics of mineralization on the Property are:

- Mineralization is hosted by quartz-monzonite porphyry intrusive.
- Alteration is predominantly pervasive quartz-sericite alteration with quartz-sulphide veining. Distal alteration includes weak chloritization, epidotization and sulphidation (pyrite) of un-mineralized diorite.
- The deposit consists of hypogene sulphide, enriched secondary sulphide and oxide copper-gold and gold-only mineralization types.
- Hypogene mineralization consists of chalcopyrite and pyrite with locally important chalcocite, and copper silicates, oxides and carbonates. Gold mineralization is disseminated and generally associated with copper sulphides, and with ironoxy-hydroxides such as limonite in the leached cap of the deposit.
- Gold grades are associated with copper grades but are higher than those typically observed in the Andahuaylas-Yauri belt. Silver grades are approximately 10:1 to gold grades and are also higher than typical for the district.
- There is a strong structural control on mineralization with the most intense mineralization associated with strong north north-east trending faults and shears.

These characteristics are typical of porphyry-style copper deposits of the South American Cordillera. Mineralization on the Property is classified as a copper-gold porphyry system, because the mineralization has many characteristics of this deposit type (Perelló et al. 2003).

On the northwest part of the Property, there is local evidence of polymetallic (lead-zinc-silver) mineralization hosted in calcareous sediments that may be associated with a skarn or replacement-type system.

9.0 EXPLORATION

Beginning in mid-2010, an agreement was reached with the local communities which allowed Panoro to perform exploration activities including surface mapping, geochemical sampling, geophysical surverys and diamond drilling.

The Property is relatively large and access to parts of the property is difficult either due to a lack of roads or ongoing negotiations with surface rights holders. Despite being explored for over 15 years, exploration work has been carried out over a relatively restricted area. Work has largely been restricted to the Ccalla and Azulccacca areas as access and infrastructure in these areas is reasonably good and results of preliminary drilling in these areas has been encouraging (Wright 2012).

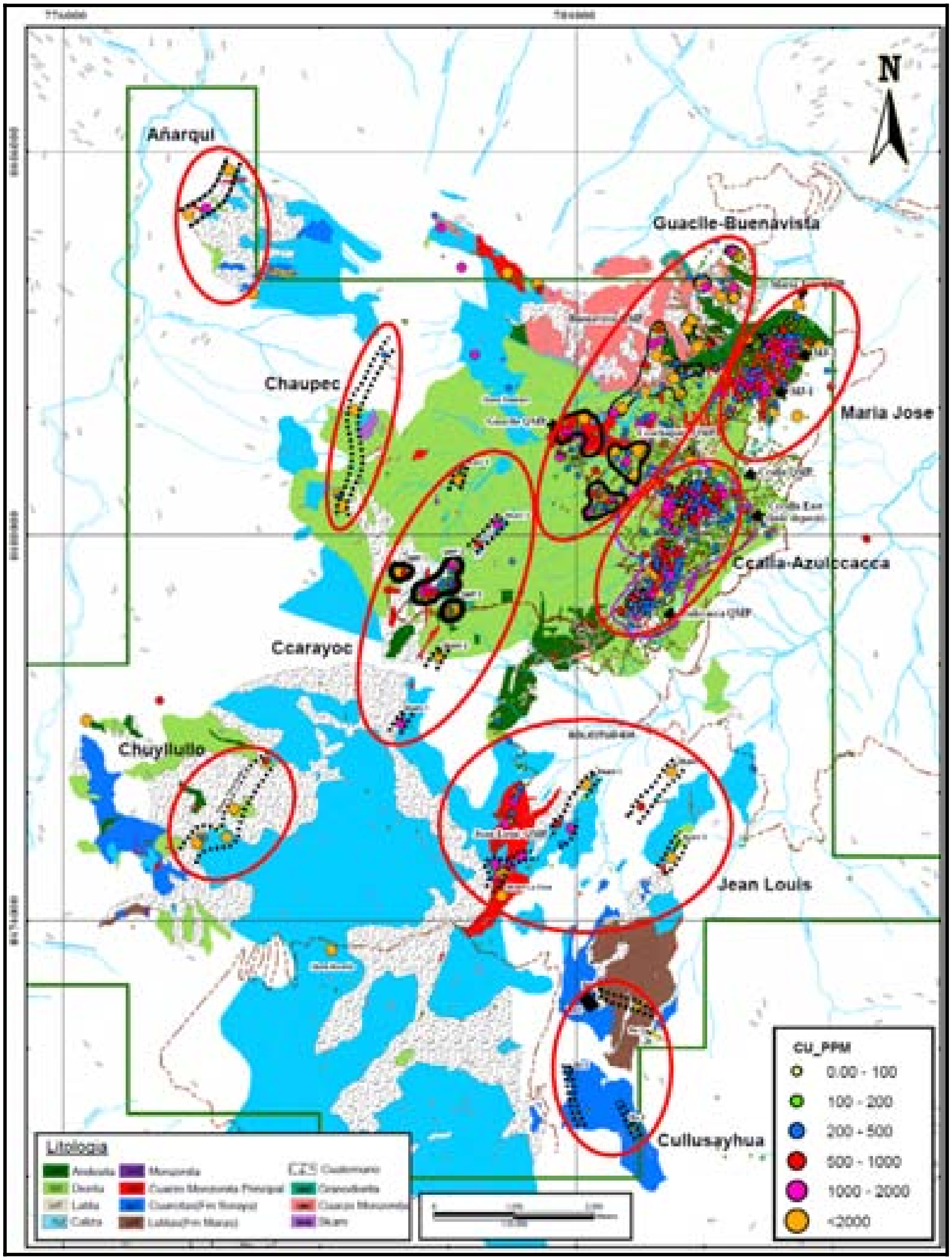
More recently, exploration by Panoro has located three other mineralized porphyry areas; Buenavista, Cochapata, and Maria Jose. These have been identified as the north and northwest continuity of the Ccalla deposit. Panoro has also delineated four other target areas: Chuyllullo, Chaupec, Anarqui and Cullusayhua. These four areas host outcrops of skarn-type mineralization. These areas are not subject to this report. Figure 9.1 illustrates the location of these targets.

9.1 GEOLOGICAL MAPPING

Reconnaissance-scale geological mapping has been carried out over the northern half of the Property from the town of Cotabambas to the Huaclle area in the west. More detailed 1:10:000 scale mapping has been carried out over the Azulccacca and Ccalla areas and work to extend the 1:10,000 scale mapping westward to Guaclle is under way.

More detailed 1:2,000 scale mapping has been completed for the Azulccacca and Ccalla areas. Mapping is in progress to the south-southwest of Azulccaca.

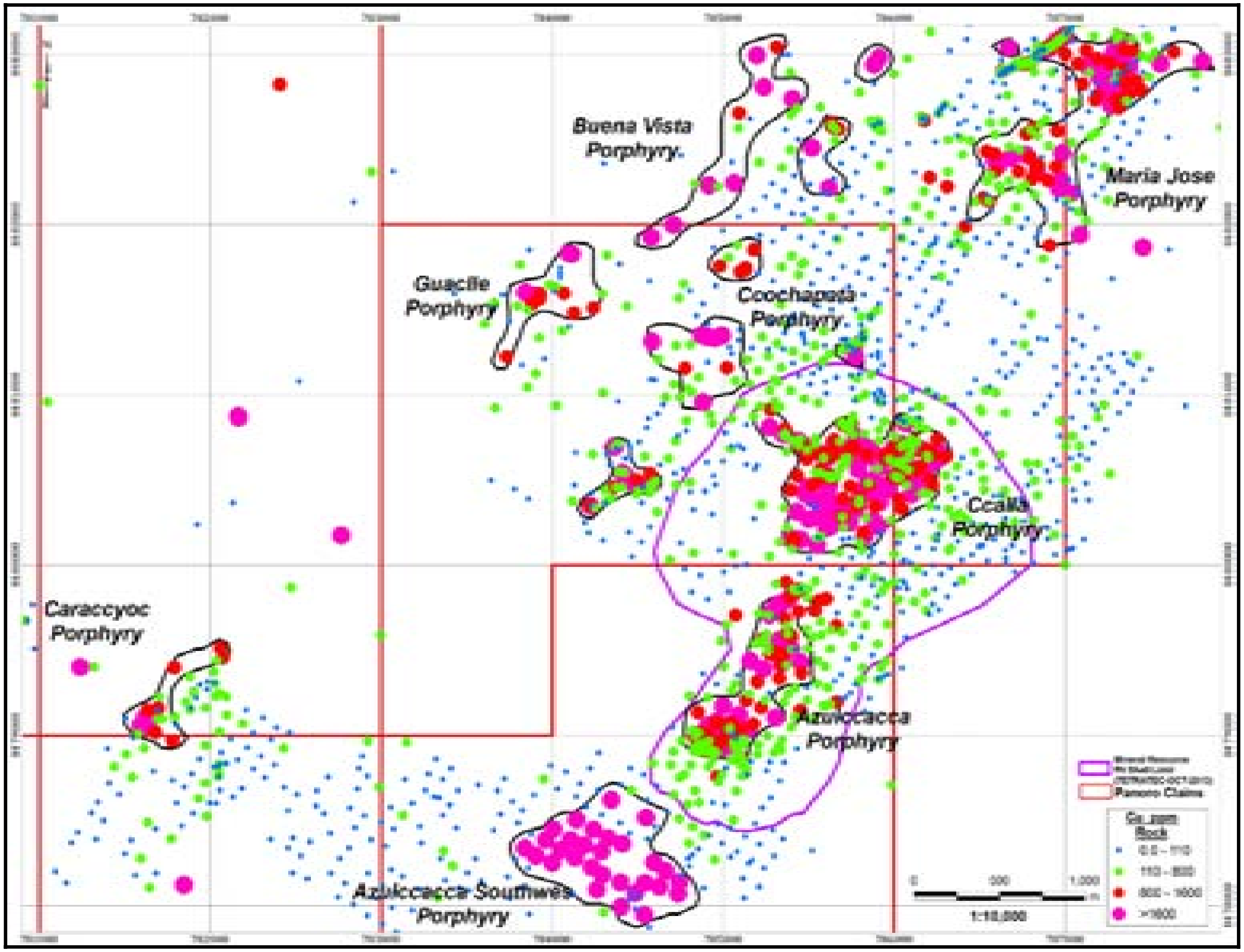
Figure 9.1 Exploration Targets on the Property



9.2 SOIL AND ROCK GEOCHEMICAL SAMPLING

Soil and rock geochemical sampling has been carried out on a 100 m grid over the Azulccacca, Calla and Huaclle areas (Figure 9.2). Samples in the geochemistry database were taken by Panoro and previous workers and are used to define geochemical anomalies to help define drilling targets. Anomalous values of copper, gold and silver correspond with known mineralization at Ccalla and Azulccacca. To the west, zinc and lead anomalies appear to be associated with skarn-type mineralization.

Figure 9.2 Rock Geochemical Map of Copper



9.3 GEOPHYSICAL SURVEYS

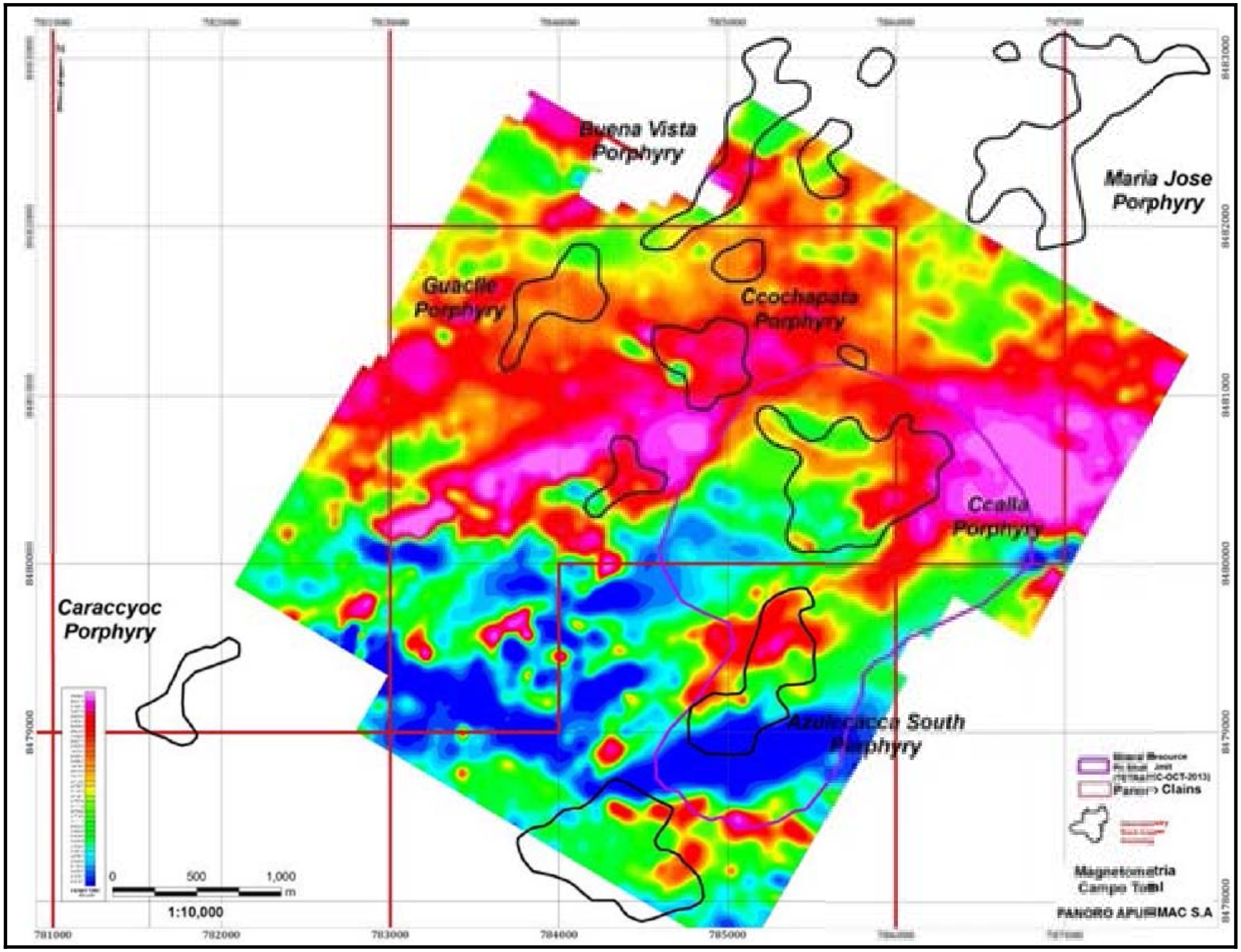
Magnetometer and IP surveys have been carried out over the main exploration areas. In 1996, Antofagasta contracted Val d'Or Geophysics (Peru) to carry out IP and magnetometer surveys on the Ccalla and Azulccacca areas. In 2003, CDLM contracted Val d'Or Geophysics to carry out reconnaissance surveys in the Cayrayoc area. The surveys were carried out on lines spaced 200 m apart. A total of 42.8 km of magnetometer survey and 10.5 km of IP survey were carried out. A chargeability anomaly was identified and tested in the 2003 CDLM drill campaign.

In 2011, Panoro contracted Val d'Or Geophysics to extend the IP and magnetometer coverage at Ccalla and Azulccacca and westward towards the Huaclle area. A 162 line-km magnetic survey and 82 line-km of IP survey was carried out. The surveys were centred on the Ccalla-Azulccacca area of the Property. The surveys confirm that rather than being related to a single trend, the Ccalla and Azulccacca zones are actually part of two separate, 2 to 3 km long, northeasterly-trending mineralized corridors defined by low chargeability values (Figure 9.3). Two other northeasterly-trending chargeability lows are associated with the Cochapata and Huaclle porphyry centres to the northwest of Ccalla were identified.

9.4 EXPLORATION

Exploration targeting based on prospecting and reconnaissance-scale mapping, followed by surface mapping at 1:10,000 scale outcrop mapping and soil and rock geochemical sampling have are have been successful in identifying porphyry and skarn type mineralization on the Property. Detailed 1:5,000 scale mapping and IP and magnetometer surveys have proven to be important to understanding structural geology controlling mineralization and the geometry of the deposits.

Figure 9.3 Total Field Magnetic Map



10.0 DRILLING

Prior to commencing their drill programs, Panoro had re-logged drill core from previous drill programs and selected assay pulps and rejects were re-analyzed.

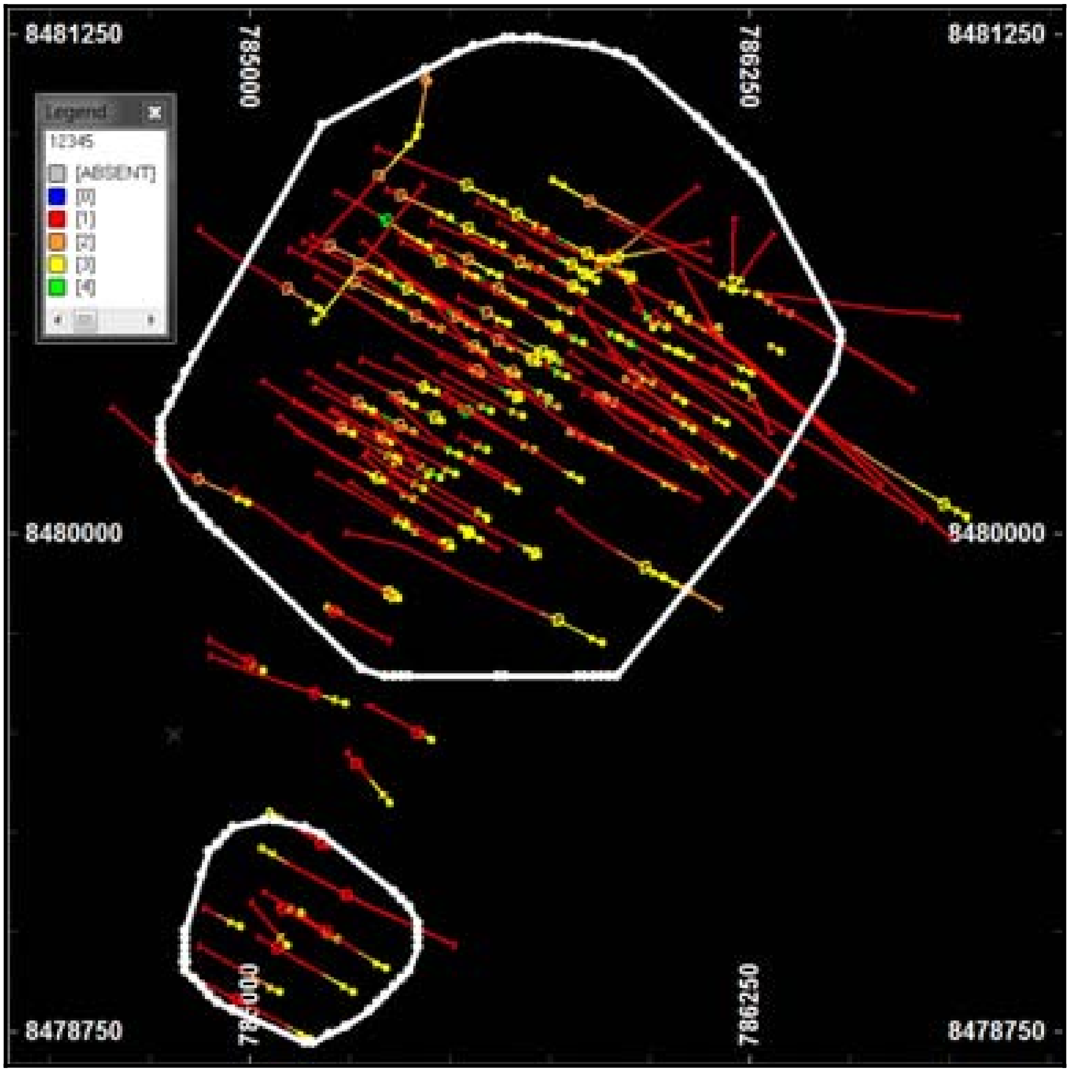
Panoro conducted diamond drilling on the Property from 2010 to present. Table 10.1 presents a summary of all drilling completed on the Property as of the date of this report.

Table 10.1 Drillhole Summary on the Property

Company	Year	Drillholes	Metres
Antofagasta	1995 to 2002	24	8,538
CDLM	2002 to 2007	10	3,252
Panoro	2007 to present	110	58,252
Total	-	**144**	**70,042**

The image below depicts the drillhole plan in reference with the optimized pit margins reported in this resource estimate. North is to the top of the image. Drillholes are coloured by domain (1 – hypogene, 2 – oxide, 3 – leached cap and 4 – supergene).

Figure 10.1 Drillhole Location Map



10.1 Panoro, 2010 to 2011

The first drill program carried out by Panoro confirmed copper-gold mineralization at Azulccacca and Ccalla. A total of five diamond drill core holes totalling 2,809 m were drilled during the campaign. Panoro contracted Bradley Brothers for this drill campaign and drillholes were drilled using a Hydro-core machine drilling NQ diameter drill core.

10.2 Panoro, 2011 to 2013

In the second half of 2011, Panoro initiated a drill campaign with the objective of expanding the limits of mineralization at Ccalla and Azulccacca. Panoro contracted Bradley Co. who used LD-250 and LF-38 machines to drill HQ, NQ and BQ diameter core.

In January 2012, Bradley Co. brought a LF-70 machine to Cotabambas to drill 650 to 1,100 m long holes.

In this campaign, drillholes were collared to the north of where mineralization had been intersected previously, between the two deposits and immediately east of Ccalla, northward along strike from Azulccacca. The database for the mineral resource published by AMEC (Perú) in September 2012 was closed on June 14, 2012 with results from 26 drillholes totalling 15,060 m from the Panoro 2011 to 2012 campaign. The database was closed with results received up to drillhole CB-64-12 to a depth of 577 m (Wright 2009).

After the mineral resource database closure, and before by 24 July, 2012, Panoro had drilled holes CB-65-12 to CB-78-12 and had received assay results up to drillhole CB-74-12. Drillholes CB-68-12, CB-72-12 and CB-74-12 intersected copper-gold porphyry mineralization in quartz monzonite porphyry on the east side of the Ccalla fault, 150 m to the on east of the limits of the Ccalla deposit, 1,500 m north north-east along strike of the Azulccacca zone (Figure 10.1). The results of hole CB-68-12 and CB-71-12 were disclosed in a press release on July 10, 2012 (Panoro 2012a). The results of new drillhole intersections in this zone are listed in Table 10.2. By June 2013, Panoro completed drillholes CB-65-12 to CB-144-13, a total of 80 additional drillholes. The drilling during this period was primarily step out drilling to determine the lateral extends of the Ccalla and Azulcacca deposits and infill/definition drilling within the known deposits. Table 10.3 shows selected drillhole intersects within the Ccalla and Azulcacca deposits (Panoro 2013a; 2013b; 2013c; 2013d)

These intersections define a significant exploration target and are not included in the current mineral resource estimate.

By June 2013, Panoro completed drillholes CB-65-12 to CB-144-13, a total of 80 additional drillholes. The drilling during this period was primarily step out drilling to determine the lateral extents of the Ccalla and Azulcacca deposits and infill/definition drilling within the known deposits. Table 10.3 shows selected drillhole intersects within the Ccalla and Azulcacca deposits (Panoro 2013a; 2013b; 2013c; 2013d).

Table 10.2 Selected Drillhole Results from Porphyry Mineralization East of the Ccalla Deposit

Drillhole	From (m)	To (m)	Length (m)	Cu (%)	Au (g/t)	Ag (g/t)
CB-68-12	0.00	31.30	31.30	0.41	0.14	1
	31.30	123.70	92.40	0.65	0.11	2
including	31.30	96.50	65.20	0.83	0.13	2
	415.00	818.30	403.30	0.47	0.16	4
including	415.00	530.80	115.80	0.38	0.09	2
	588.55	722.30	133.75	0.62	0.23	3
	752.30	782.30	30.00	0.78	0.46	10
CB-71-12	0.00	8.00	8.00	0.31	0.09	1
	26.20	46.90	20.70	0.53	0.15	3
	93.10	272.40	179.30	0.87	0.54	5
including	115.50	212.40	96.90	1.21	0.80	7
including	236.40	248.40	12.00	1.41	0.66	6
	287.80	330.50	42.70	1.31	0.53	9
	347.80	371.20	23.40	0.95	0.32	7
	405.20	535.00	129.80	0.32	0.12	2

Table 10.3 Selected Drillhole Results from the Ccalla and Azulcacca Deposits

Drillhole	From (m)	To (m)	Length (m)	Cu (%)	Au (g/t)	Ag (g/t)
CB-88-12	11.5	49.5	38.0	0.83	0.08	1
	69.5	93.5	24.0	0.27	0.13	1
	93.5	121.1	27.6	0.36	0.12	2
	145.7	195.9	50.2	0.29	0.11	1
	198.1	241.7	43.6	0.48	0.13	2
CB-92-12	0	28.7	28.7	0.22	0.25	6
	28.7	45.2	16.5	0.89	0.39	7
	45.2	101.5	56.4	0.75	0.44	4
	132.4	290.5	158.1	0.74	0.37	5
including	168.2	212.4	44.2	1.01	0.52	5
	304.6	321.1	16.5	0.26	0.11	2
	340.8	353.9	13.1	0.24	0.11	2
CB-99-13	44.0	146.6	102.6	0.24	0.18	2.3
including	110.6	126.6	16.0	0.49	0.25	2.4
	161.6	235.5	73.9	0.92	0.04	1.4
including	199.5	231.5	32.0	1.93	0.04	1.1
	263.9	299.9	36.0	0.15	0.04	1.4

table continues...

Drillhole	From (m)	To (m)	Length (m)	Cu (%)	Au (g/t)	Ag (g/t)
CB-104-13	1.2	112	110.8	1.64	0.68	6.4
including	1.2	14.7	13.5	1.00	0.05	0.9
including	8.6	14.7	6.1	1.85	0.01	1.2
	14.7	84.0	69.3	1.83	0.66	7.1
including	30.7	70.7	40.0	2.88	0.67	7
	84.0	299.1	215.1	0.42	0.26	2.4
including	84.0	112.0	28.0	1.48	1.03	7.4
including	130.0	162.0	32.0	0.58	0.42	2.6
CB-115-13	118.7	164.7	46.1	0.32	0.16	2.3
	192.3	212.3	20.0	0.13	0.03	1.9
	222.1	274.1	52.1	0.31	0.24	3.5
	284.9	404.5	119.6	0.61	0.25	4.3
including	324.9	389.2	64.3	0.82	0.32	5
CB-120-13	0	155.3	155.3	0.60	0.06	1
including	0	8.0	8.0	0.73	0.01	0.7
including	54.0	100.8	46.8	0.89	0.07	0.9
including	115.6	132.9	17.3	1.01	0.10	1.6
	155.3	227.4	72.1	0.32	0.09	1.4
	243	268.8	25.8	0.18	0.06	1.4
	278	386.0	108.0	0.34	0.11	2.5
including	327.6	338.0	10.4	0.80	0.23	7.4
CB-139-13	45.5	174.4	128.9	1.29	0.96	9.4
including	63.5	174.4	110.9	1.47	1.09	10.6
including	99.5	159.2	59.7	1.64	1.30	10.3
	193.0	391.6	198.6	0.48	0.24	4.7
including	193.0	279.0	86.0	0.74	0.37	7.2
including	193.0	241.0	48.0	0.82	0.41	8.3

Note: The intercept are metres drilled and are not true widths.

10.3 DOWNHOLE HOLE SURVEYS

Downhole surveys were acquired using Eastman and Sperry Sun photographic tools at approximately 100 m intervals for drillholes drilled during the Antofagasta and CDLM drill campaigns (Wright 2009).

For the Panoro 2010 to 2011 campaign, with the exception of CB-40-11, downhole surveys were acquired at roughly 3 m intervals using an electronic multi-shot magnetic survey tool. Drillhole CB-40-11 was surveyed with a single-shot magnetic tool at 50 m downhole intervals.

For the Panoro 2011 to 2013 campaign, the first five drillholes, to hole CB-45-11, were surveyed at 3 m intervals with a multi-shot magnetic tool. Beginning with drillhole CB-46-

11 and continuing to drillhole CB-142-12, drillholes were surveyed with a single shot magnetic tool at roughly 50 m downhole intervals.

10.4 Drill Core Logging

A Panoro geologist is assigned to each drill and supervises drilling on all shifts. The geologist supervises transfer of core from the core tube to core boxes, measurement of core recovery and insertion of core blocks marking the end of drill runs. Moulded plastic drill core boxes are used to store whole core. The moulded boxes are stacked and a cover is snap-fit onto the top box for transport and storage. Either the drill contractor or the Panoro geology team bring core boxes to the core storage area once per day. Geotechnical and geological logging are carried out on whole core by the Panoro geology team. Standardized geological and geotechnical logs are filled out by hand and then entered into a Microsoft Excel® drillhole log template. The log sheets capture interval lengths, lithology code, alteration mineralogy and intensity, sulphide and oxide mineralogy, intensity and occurrence, and major structures (Wright 2009).

All historic drilling has been re-logged using the same standardized log sheets for consistency.

10.5 Drilling

Diamond drilling is the best method to gather geological information and sample for the Cotabambas deposit. Drill core allows for logging of lithology, alteration and structural geology which assist in Mineral Resource modeling. High precision total station collar surveys and downhole surveying allow for reasonable control of the position of sampling and logging locations (Wright 2009).

During reviews of pre-Panoro and Panoro drilling, AMEC noted that drill core recovery is excellent at Cotabambas. In relatively competent and fractured rock, core recovery is greater than 95%. In intervals crossing strong faults of less than 5 m, generally intersected once or twice per drillhole, core recovery is poor, ranging from as low as 30 to 75% and loss of chalcopyrite from fractures resulting in a possible decrease in apparent grade for these zones.

11.0 SAMPLE PREPARATION, ANALYSES AND SECURITY

11.1 SAMPLING METHOD

The following is taken from Wright (2013).

Core sampling methods can be split into two periods: historic sampling by Antofagasta and CDLM, and sampling by Panoro. All historic core drilled by Antofagasta and CDLM has been re-logged by Panoro and transferred to a core storage facility in Cusco.

11.1.1 HISTORIC DRILL CORE SAMPLING

The details of drill core sampling methods for the Antofagasta and CDLM campaigns are not known; however, re-logging by Panoro and a review of the database has led to some conclusions regarding sampling practices.

Antofagasta took samples at continuous 2 m downhole intervals, splitting the 2 m samples at major geological contacts to produce two shorter samples, one on each side of the contact. Samples were split with a hydraulic press splitter. Half core samples were sent to the laboratory for preparation and the other half core was archived in corrugated plastic boxes with the hole name, box number and interval meterage marked on the box. Boxes were stacked in the core storage facility at Ccalla.

Samples were taken at continuous, un-broken 2 m lengths downhole during the CDLM drill program. Samples were not broken at rock type contacts. One half core was sent to the laboratory for sample preparation, the other half was archived in corrugated plastic boxes in a similar manner to core drilled by Antofagasta.

11.1.2 PANORO DRILL CORE SAMPLING

Both drill programs operated by Panoro followed the sample core sampling approach. The core storage facility in Ccalla was used during the first program, but during the second program, a new core storage and logging facility was built at Cochapata and core logging and storage of new drillholes were moved to the new facility (Figure 11.1). During a visit to site in April 2012, AMEC observed drill core handling, logging, sampling and density determination procedures as Panoro staff were processing drillholes CB-66-12, CB-68-12 and CB-69-12.

During logging, the geologist assigned to the drillhole marks sample intervals on the core box. The sampling interval is nominally 2 m, but, samples are broken at major contacts in lithology and mineralization type. Samples are divided so that the minimum sample length is approximately 0.5 m and the maximum sample length is 3.0 m. Drill core is washed in the core box prior and dried in open air prior to photography. Core is photographed first dry, then wet, three boxes at a time with a graphic scale and a sign noting the drillhole number and meterage.

11.1.3 DENSITY MEASUREMENTS

Density samples measuring 10 to 15 cm long are taken from the core boxes prior to sampling. The samples are marked with their drillhole number and meterage. Density samples are taken at roughly 10 m intervals or at least once per mineralized intersection as advised by the core logging geologist. Samples are dried for up to 30 minutes in an electric oven. Once dry, samples are weighed, then coated in clear, polyethylene film and weighed again with the film. Samples are weighted a third time, coated in film and suspended in water. The film is then removed and samples are weighed a fourth time, this time without film, suspended in water. Once the samples have been weighed, they are returned to the core boxes.

The core logging geologist marks a line down the length of competent drill core where continuous lengths and large pieces of core are cut using a rotary saw with a diamond carbide blade and returned to the core boxes.

Cut core is taken to the sampling area where core samplers put the half-sawn core in sample bags. Sample bags are pre-numbered with a felt tip pen and doubled to prevent bags from splitting and spilling sample. Broken core is sampled from the core tray using a small scoop. Once the nominally 2 m sampling intervals have been taken, a sample tag with bar code is placed in the bag, the bag tops are rolled down and stapled shut then wound with clear packing tape.

A pre-defined sample dispatch sheet is filled out during sampling for lots of 70 samples. The dispatch sheet captures the sample number, sampling interval and has control samples pre-inserted into the sampling stream. Control samples consist of coarse blanks, commercially prepared certified reference materials (CRMs) and core twin samples. Core twin samples are sent as a quarter cut original and quarter cut twin sample. CRMs are of high-, medium-, and low-grade copper-gold standards prepared by WGM laboratories in Vancouver, Canada.

Samples are transferred to rice bags and stored in a 24-foot container at the core logging facility where they are stored until a truck load is ready for shipment. Panoro delivers samples sent to the ALS Chemex sample dispatch facility in Cusco, where ALS Chemex manages their transport to the sample preparation facility in Arequipa, and then the assay facility in Callao.

11.2 DENSITY DETERMINATIONS

There are three sources of density data for the Project:

- Pre-Panoro data for 3,125 samples for which individual weights are not recorded and density determination protocols are unknown.
- Cellophane film-sealed water immersion density determinations on 1,443 samples with sealed and un-sealed weights in water and air carried out by Panoro
- One hundred seven density validation determinations carried out on behalf of Panoro by ALS Chemex in Lima using a wax-sealed water immersion method.

All density samples were taken from 7 to 15 cm long pieces of un-cut drill core.

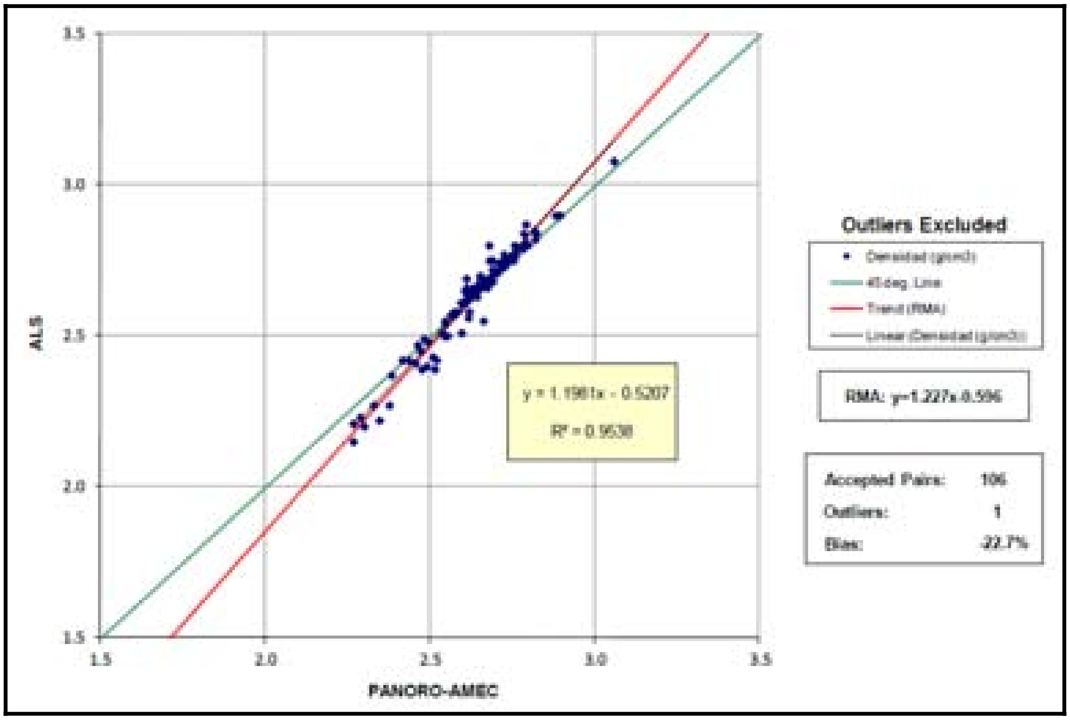
Historic, pre-Panoro data could not be validated and was rejected.

A systematic bias was observed with the cellophane sealed dry bulk in situ density values 10% lower on average than the corresponding ALS Chemex check samples. This bias was attributed to the inclusion of air bubbles in the cellophane used to seal the samples. Air bubbles increase the sample volume when immersed in water and decrease its apparent density.

Unsealed bulk in situ density values were plotted against the ALS Chemex density validation samples. There is excellent correlation between the ALS Chemex and unsealed Panoro determinations above 2.5 specific gravity, but below this specific gravity, the unsealed Panoro densities were systematically lower than the wax-sealed density. This conditional bias is due to the porosity of the lower density samples and the overstatement of the in situ dry bulk density of porous samples when determined by water immersion methods without sealant.

A least-square linear regression equation was derived to relate unsealed bulk density to dry in situ bulk density and the full suite of Panoro density determinations were used to estimate dry in situ bulk density for each domain (Figure 11.1).

Figure 11.1 Panoro Unsealed versus ALS Chemex Wax Sealed Dry In Situ Bulk Density



12.0 DATA VERIFICATION

12.1 TETRA TECH DATA VERIFICATION

Upon receipt of Panoro's database for the Project, all relevant data underwent extensive data verification. Of the 144 drillholes included, 22 were chosen for validation, representing approximately 11% of the drillholes in the database.

12.1.1 COLLAR DATA

Collar data was provided in "csv" (comma-separated values) spreadsheet format. No original survey information for the collar locations was provided, and therefore no verification was possible.

12.1.2 LITHOLOGY DATA

Lithological data was provided in csv spreadsheet format. The lithologies of the 22 chosen holes represent 20% of the lithological database. There were discrepancies between the originals and the database, however all of these differences are attributable to recent updating, relogging, and consolidation of lithological data. When these changes are factored out, 100% of the data verified match the originals.

12.1.3 ASSAY DATA

Assay data was provided in csv spreadsheet format. The assay results for the 22 chosen holes represent 18% of the assay database. These results were verified against the original lab certificates and lab-issued pdf spreadsheets. One hundred percent of the verified samples matched the original data.

12.1.4 DOWNHOLE SURVEY DATA

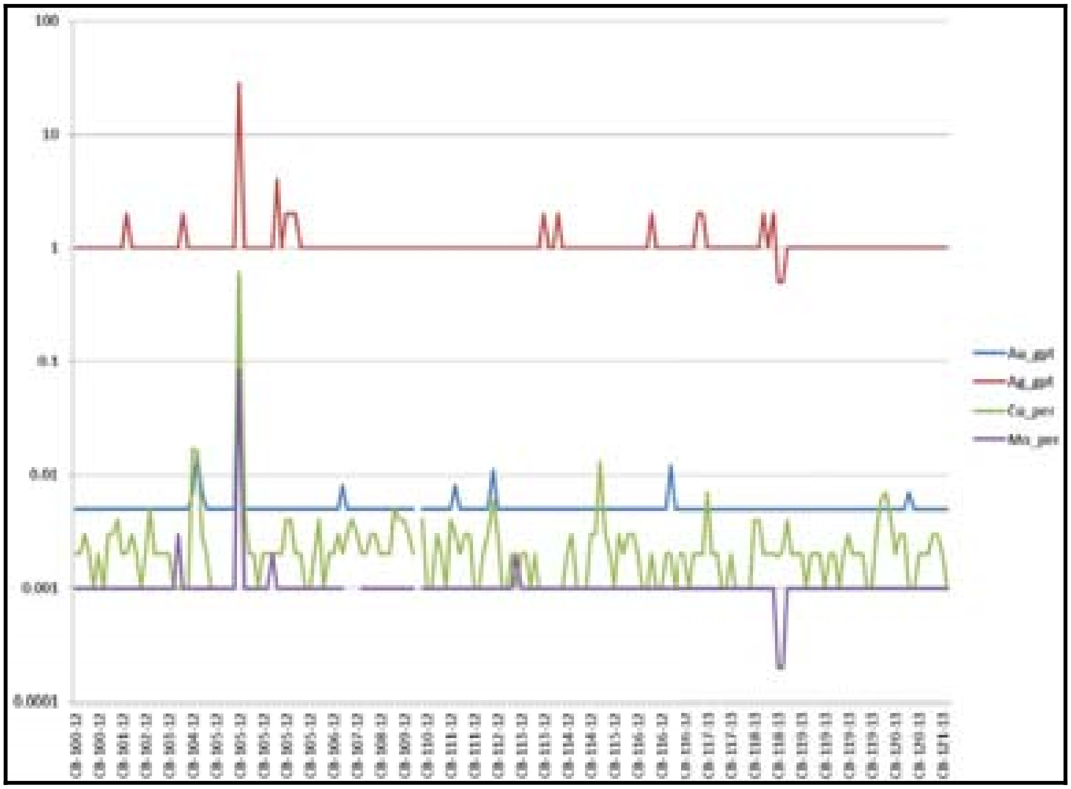
Downhole survey data was provided in .csv spreadsheet format. No original downhole survey information was provided and therefore no verification was possible.

12.1.5 QUALITY ASSURANCE/QUALITY CONTROL DATA

BLANKS

Crushed quartz samples (external source) were used by Panoro as blank reference material. Performance of the blank samples was adequate, with a few anomalous samples returning higher than background values for copper and silver. Although these anomalies represent less than 1% of the samples, it is recommended that any failures be re-assayed by the lab. Figure 12.1 displays the blank performance.

Figure 12.1 Blank Performance



Duplicates

Three duplicate types were used by Panoro for reference material: split core duplicates, reject duplicates, and pulp duplicates. All three performed well, with less than 5% of the samples falling outside of the two times the standard error for each type. Figure 12.2 through Figure 12.4 display the duplicate control graphs.

Figure 12.2 Split Core Duplicate Control Graph

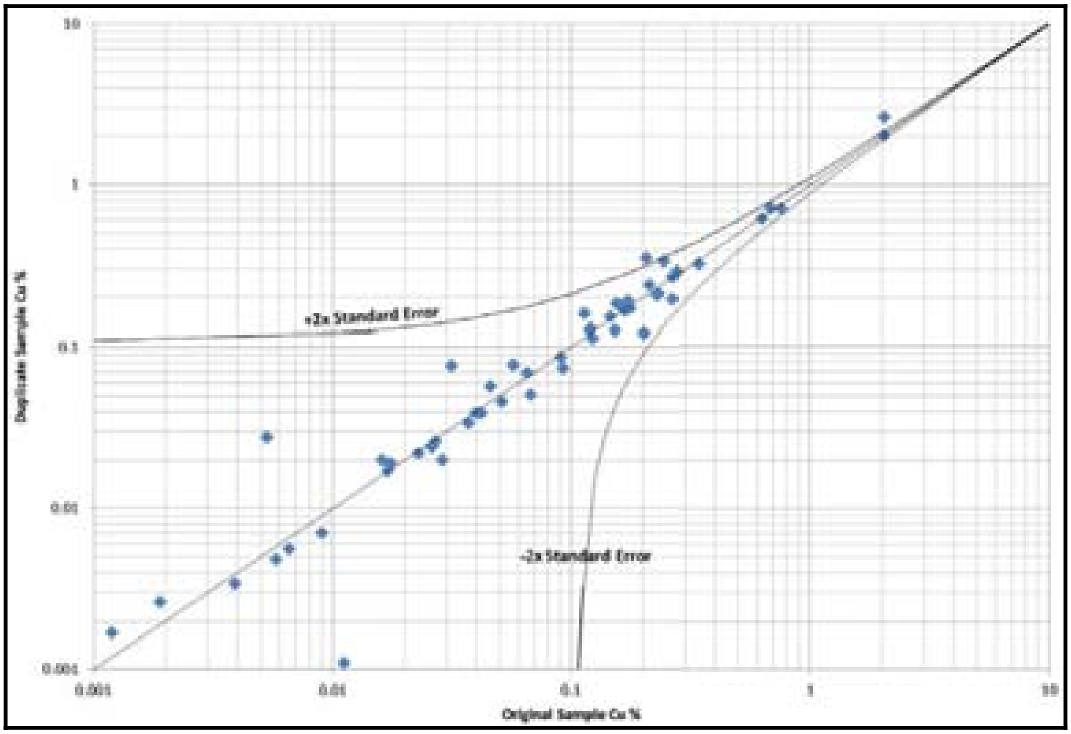


Figure 12.3 Reject Duplicate Control Graph

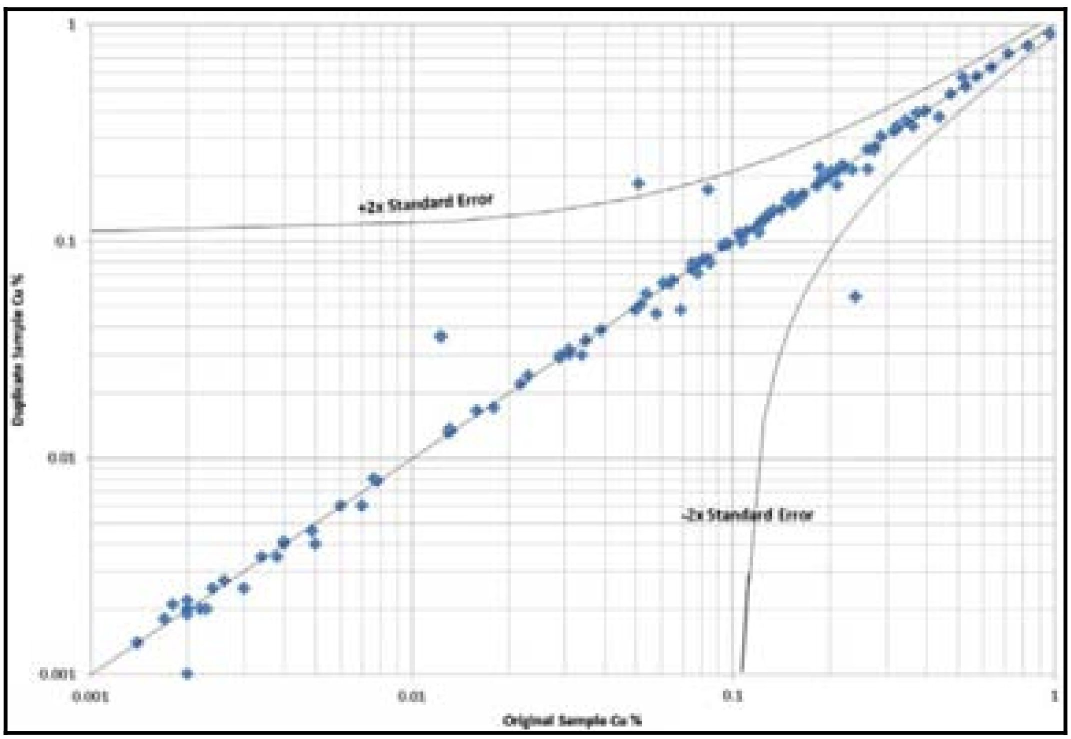
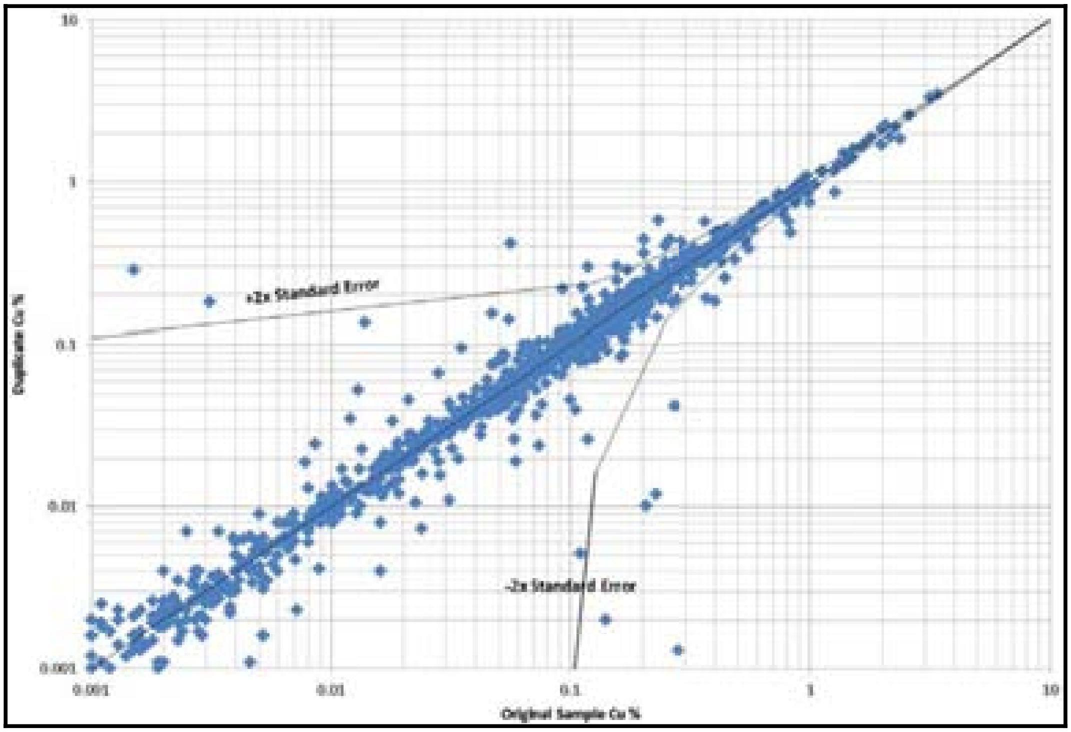


Figure 12.4 Pulp Duplicate Control Graph



12.2 SITE VISIT

The QP responsible for this site visit is Paul Daigle, P.Geo., Senior Geologist with Tetra Tech. Mr. Daigle conducted the site visit to the Property from June 3 to 7, 2013, inclusive. One day was spent on the Property and one day at Panoro's core storage warehouse in Cusco. Mr. Daigle was accompanied on the site visit by Mr. Luis Vela Arellano, Vice President Exploration for Panoro; Mr. John Romero Villanueva, Chief Project Geologist for Panoro; and Mr. Edwin Mayte, Manager Technical Services, for Panoro.

12.2.1 BASE CAMPS AND FACILITIES

The Cotabambas base camps and project site were visited on June 6, 2013. The main base camp is located adjacent to the village of Cochapata and is made up of several permanent bungalow style buildings (offices) (Figure 12.5), and semi-permanent wood and corrugated tin structures (drill logging, sampling) (Figure 12.6 to Figure 12.9). Storage of samples and drill core boxes are kept in a locked sea container at the camp before being transported to Cusco for shipping to the laboratory for analysis and for drill core storage. Drill core and core samples are temporarily stored at this base camp in a locked chain link fence enclosure until transport is arranged to the second base of operations in the village of Cotabambas, situated approximately 7 km away by road. Both bases are kept clean and are well-maintained.

Figure 12.5 Cotabambas Base Camp

Figure 12.6 Cotabambas Base Camp – Core Logging and Sampling Facility

Figure 12.7 Cotabambas Base Camp – Core Sampling

Figure 12.8 Cotabambas Base Camp – Core Photography

Figure 12.9 Cotabambas Base Camp – Core Density Measurements

The second base camp also has a permanent cement building for offices and includes a kitchen for personnel. It also has similar drill logging, sampling, and photography facilities as the main base camp. The author was able to review drillhole CB-141-13 that was currently being drilled by Panoro at the time of the site visit. Figure 12.10 and Figure 12.11 present the facilities at the second based camp.

The core logging and sampling facilities at both base camps are kept clean and orderly. When stored, the core boxes are stacked by drillhole. The plastic core boxes are sturdy and made to be stackable. The core boxes are marked in black text marker showing drillhole number, box number, and sample interval.

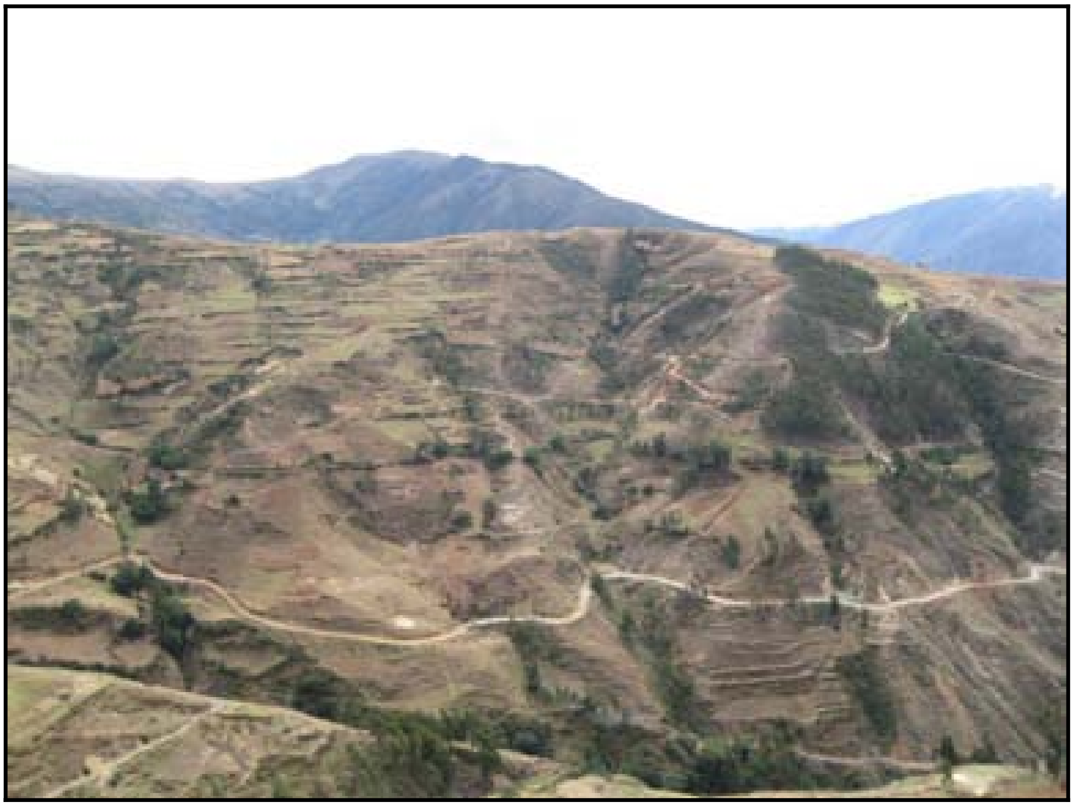
Figure 12.10 Second Base Camp – Drill Core Logging, Sampling and Storage Facility

Figure 12.11 Second Base Camp – Temporary Core Storage

12.2.2 PROJECT SITE

The Project site of the Ccalla deposit is located approximately 1.5 km by road to the main base camp. The Project site is situated on the western slope of the Ccalla Creek. The slope is relatively steep sided with A network of roads allows passage for 4x4 vehicles to most of the drillhole locations as shown in Figure 12.12. The Project site was clear of drilling debris.

Figure 12.12 Access Roads on the Ccalla Deposit; Looking West



Sixteen drillhole collars were sited in by handheld global positioning system (GPS). All checked drillhole collars were consistent with the drillhole coordinates in the drill logs and in the database. Drill collars are clearly marked on the ground. The collar is fitted with polyvinyl chloride (PVC) pipe and cemented into place. The drillhole number is engraved in the cement and, at some drillhole locations, marked on a nearby boulder or outcrop. Figure 12.13 illustrates drillhole CB-80.

Figure 12.13 Drillhole Collar for CB-80, -82, -74

12.2.3 Core Storage Warehouse, Cusco

The Cotabambas drill core is stored temporarily at site or in one of three warehouses in Cusco. The author visited one of these warehouses in Cusco prior to visiting the Property. The warehouse is secured under lock and has its own watchman. The warehouse contained most of the Cotabambas drill core and some drill core from Panoro's other projects.

The warehouse also serves as a storage depot for exploration, field and camp supplies and equipment for the various projects. The warehouse is kept clean and has a wooden drill core tables along its length for viewing drill core (Figure 12.14).

Figure 12.14 Panoro's Drill Core Storage Facility, Cusco

12.2.4 CHECK SAMPLES

Independent check samples were collected during Tetra Tech's site visit. Three samples were collected from the available drill core at the core storage site at Panoros's core storage warehouse in Cusco.

The check sample intervals were selected randomly within the mineralized lithologies and collected from the same sample intervals as Panoro. As no core saw was available, Tetra Tech selected alternating pieces of half core. The samples were collected by the author, placed in labelled sample bags and sealed. Sample tags were inserted in the core box and in the sample bag. The samples were kept with the author at all times during the site visit. Upon returning to Toronto, the author shipped the samples to Activation Laboratories Ltd. (Actlabs) for analysis. Figure 12.15 shows a check sample taken from drillhole CB-68-12.

Figure 12.15 Drillhole CB-68-12

At Actlabs, the samples were prepared and analyzed as close to Panoro's method as possible. In sample preparation, the sample was crushed to up to 90% of the sample passing a 2 mm screen, split to 250 g and pulverized where 90% passed 105 µm screen (Actlabs Code RX-1). Analysis was conducted using four acid digestion (Actlabs Code 8 – Cu, Mo, Ag) and induced coupled plasma–optical emission spectroscopy (ICP-OES). For gold, fire assay and atomic absorption was employed (Actlabs Code 1A1).

The purpose of the check sample assays are to confirm indications of mineralization are not intended as duplicate or QA/QC samples. Tetra Tech check sample analysis correlates with Panoro's assay results, for the same sample intervals. Results of the check assay sample analysis and corresponding sample analysis by Panoro are shown in Table 12.1 and Table 12.2.

Table 12.1 Summary of Check Samples Collected by Tetra Tech

Tetra Tech Sample No.	Panoro Sample No.	Drillhole	Sample Interval (m)	Core Boxes	Deposit
626475	M166222	CB-68-12	336.8 to 338.8	88	Ccalla
626476	M166049	CB-68-12	43.0 to 45.0	7, 8	Ccalla
626487	M166297	CB-68-12	465.3 to 467.0	117	Ccalla Este

Table 12.2 Summary of Check Samples Results Collected by Tetra Tech

	Drillhole	Cu%	Mo%	Au (g/t)	Ag (g/t)
Tetra Tech Sample No.					
626475	CB-68-12	0.342	0.008	0.076	<3
626476	CB-68-12	1.02	<0.003	0.064	<3
626487	CB-68-12	0.512	0.011	0.129	<3
Panoro Sample No.					
66457	CB-68-12	0.313	0.008	0.059	1
66492	CB-68-12	0.732	0.001	0.081	3
69580	CB-68-12	0.666	0.025	0.240	1
Difference	-	0.029	0.000	0.017	-
	-	0.288	-	-0.017	-
	-	-0.154	-0.014	-0.111	-

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 INTRODUCTION

There were two test programs conducted for the Project, one by Certimin in 2012 and the other by Peacocke & Simpson in 2013. The samples tested were generated from four different mineralization zones. The 2012 test program investigated the metallurgical responses of the mineralization to acid leach, cyanidation and flotation concentration. The 2013 test work, using reject samples from the 2012 test work, focused on investigating the metallurgical responses of the mineralization to gravity concentration, although preliminary scoping tests using acid leach, cyanidation and flotation procedures were also conducted on the tailings produced from the gravity concentration tests.

13.2 2012 TEST WORK – CERTIMIN

The following is taken from Wright (2012).

The results of preliminary comminution, hydrometallurgical and flotation test work carried out in May and June of 2012 are discussed in this section. The objective of the test program was evaluating the amenability of the main mineralization types at Cotabambas to conventional metallurgical flow sheets by carrying out preliminary of leaching, flotation and comminution test work. Test work was carried out at the Certimin laboratory in Lima in May and June 2012.

A summary of the test work program is listed in Table 13.1. The sample locations and preparation for the tests noted are discussed in the AMEC 2012 report.

Table 13.1 Preliminary Test Work Program

Mineralization Type	Metallurgical Test	Sample Parameters
Gold Oxide Zone	Comminution Cyanide leach test	Moderate gold grades, low copper grade, abundant iron oxides/hydroxides, from leached cap.
Copper-Gold Oxide Zone	Comminution Cyanide leach test Acid leach test	Moderate gold and copper grades, visible green copper oxides, abundant iron oxides/hydroxides, minor copper sulphides, from leached cap.
Secondary Sulphide Zone	Comminution Flotation test	Sulphide zone with chalcocite and chalcopyrite. High copper grade, moderate gold grade.
Hypogene Sulphide Zone	Comminution Flotation test	Sulphide zone with predominantly chalcopyrite. Moderate to low copper grade

Preliminary Comminution Test Work

Certimin determined the Bond ball mill work index (BWi) for the four mineralization types and the results are listed in Table 13.2.

Table 13.2 Bond Ball Mill Work Index Results

Mineralization Type	BWi (kWh/t)
Gold Oxide Zone	10.51
Copper-Gold Oxide Zone	10.22
Secondary Sulphide Zone	10.44
Hypogene Sulphide Zone	14.23

Results of the BWi test work indicate that gold oxide, copper-gold oxide and secondary sulphide mineralization types are relatively soft and hypogene sulphide mineralization is of moderate hardness that suggests that conventional crushing and grinding system will be required.

Metallurgical Sample Head Assays

A split of each of the four metallurgical composites was assayed to provide information about the head grade of the selected samples (Table 13.3). Arsenic and bismuth are deleterious elements in copper concentrates and have grades of below 25 ppm, which is low.

Table 13.3 Head Assay Results

Zone	Gold Oxide	Copper-Gold Oxide	Secondary Sulphide	Hypogene Sulphide
Determination by Atomic Absorption				
Au (g/t)	1.029	0.504	0.836	0.336
Ag (g/t)	4.5	3.8	7.2	6.0
Cu (%)	0.078	0.542	2.368	0.542
Cu H_2SO_4 (%)	0.014	0.346	0.282	0.012
CuCN (%)	0.011	0.027	1.395	0.037
Cu Residual (%)	0.047	0.152	0.654	0.501
Fe (%)	4.071	4.887	5.382	6.477
Determination by Induction Furnace				
S total (%)	0.25	0.11	2.96	2.03
S sulphur (%)	0.09	0.02	2.03	1.31
S sulphide (%)	0.16	0.09	0.93	0.72
C total (%)	0.03	0.01	0.06	0.43
C organic (%)	0.02	<0.01	0.05	0.06

table continues...

Zone	Gold Oxide	Copper-Gold Oxide	Secondary Sulphide	Hypogene Sulphide
Multi-element ICP				
Al (%)	4.99	6.24	4.98	6.24
Ca (%)	0.2	0.11	0.26	2.17
K (%)	2.52	3.66	3.04	2.96
Mg (%)	0.2	0.42	0.42	1.22
Na (%)	0.73	0.85	0.94	1.71
P (%)	0.06	0.07	0.08	0.08
S (%)	0.23	0.12	2.78	1.83
Ti (%)	0.1	0.1	0.09	0.18
As (ppm)	18	<3	11	18
Ba (ppm)	530	680	607	556
Bi(ppm)	<5	8	<5	<5
Cd (ppm)	<1	<1	<1	<1
Mn (ppm)	104	307	569	1,634
Mo (ppm)	7	15	10	16
Pb (ppm)	61	110	148	142
Sb (ppm)	9	<5	<5	8
Sn (ppm)	<10	<10	16	<10
Zn (ppm)	56.3	93	260	231

Note: ICP = inductively coupled plasma

Cyanide Leaching Test Work

The gold oxide metallurgical sample was subjected to cyanide leach tests with varying grind sizes and cyanide concentrations. At a cyanide concentration of 1,000 ppm, test results indicate recoveries of 79% gold and 46% silver with cyanide consumptions of approximately 0.75 kg/t and lime consumptions of 1.5 kg/t for grinds from -100 mesh to -325 mesh with no significant improvement in gold recovery at finer grinds. At a grind of P_{80} -200 mesh and with cyanide concentration ranging from 1,000 to 500 ppm, gold and silver recoveries remain are 77% and 40%, respectively, which are reasonably high and cyanide consumption drops to 0.63 kg/t. The result shows that on average it is possible to obtain a gold recovery of 79% and a silver recovery of 46% with a cyanide consumption of 0.70 kg/t from the gold oxide mineralization.

A similar battery of cyanide leach tests was carried out on the copper-gold oxide sample. The results shows that it is possible to obtain an 80% gold recovery and 23% silver recovery with a cyanide consumption of 2.10 kg/t. Gold recovery from the copper-gold oxide samples is not sensitive to grind size. The presence of copper oxide mineralization in the sample does not cause excessive cyanide consumption.

Acid Leach Test Work

The copper-gold oxide sample was subjected to sulphuric acid leach testing at varying acid concentrations for samples crushed to P_{100} -10 mesh. Results indicate that it is possible to obtain a copper recovery of 71% and bottle roll tests yielded an acid consumption of 29 kg/t, which is a typical acid consumption rate for bottle roll tests on copper oxides.

Flotation Test Work

The flotation test work consisted of batch tests evaluating reagents, grind, pH, pyrite depressors, rougher kinetics, rougher concentrate regrind and cleaner kinetics to followed by a locked cycle flotation test. Work was carried out individually for the secondary sulphide composite and the hypogene sulphide sample.

The flotation flow sheet for the secondary sulphide mineralization consisted of grinding, conditioning, two-stage rougher flotation followed by re-grinding of the rougher concentrate product to produce a cleaner concentrate that was fed back to the conditioning circuit. The locked-cycle flotation test on the secondary sulphide sample shows that it is possible to obtain a copper concentrate with 31% copper, 9.2 g/t gold and 92 g/t silver with recoveries of 83% for copper, 90% for gold and 92% for silver.

The flow sheet for the hypogene sulphide locked cycle test work consisted of milling, conditioning, and two-stage rougher flotation followed by three-stage cleaner flotation (Figure 13.1). The results indicate that is possible to obtain a copper concentrate with a grade of 27% copper, 11.9 g/t gold and 152 g/t silver with 87% copper, 62% gold and 60% silver recovery (Table 13.4). The combined lead and zinc grade of about 1.4% in the locked cycle test concentrate would be expected to attract a penalty as it exceeds the normal smelter penalty limit of 0.5% (Table 13.5). However, it may be possible to mitigate this using metallurgical flotation or grade control blend strategies that should be investigated in the future.

Figure 13.1 Hypogene Sulphide Locked Cycle Flotation Flowsheet

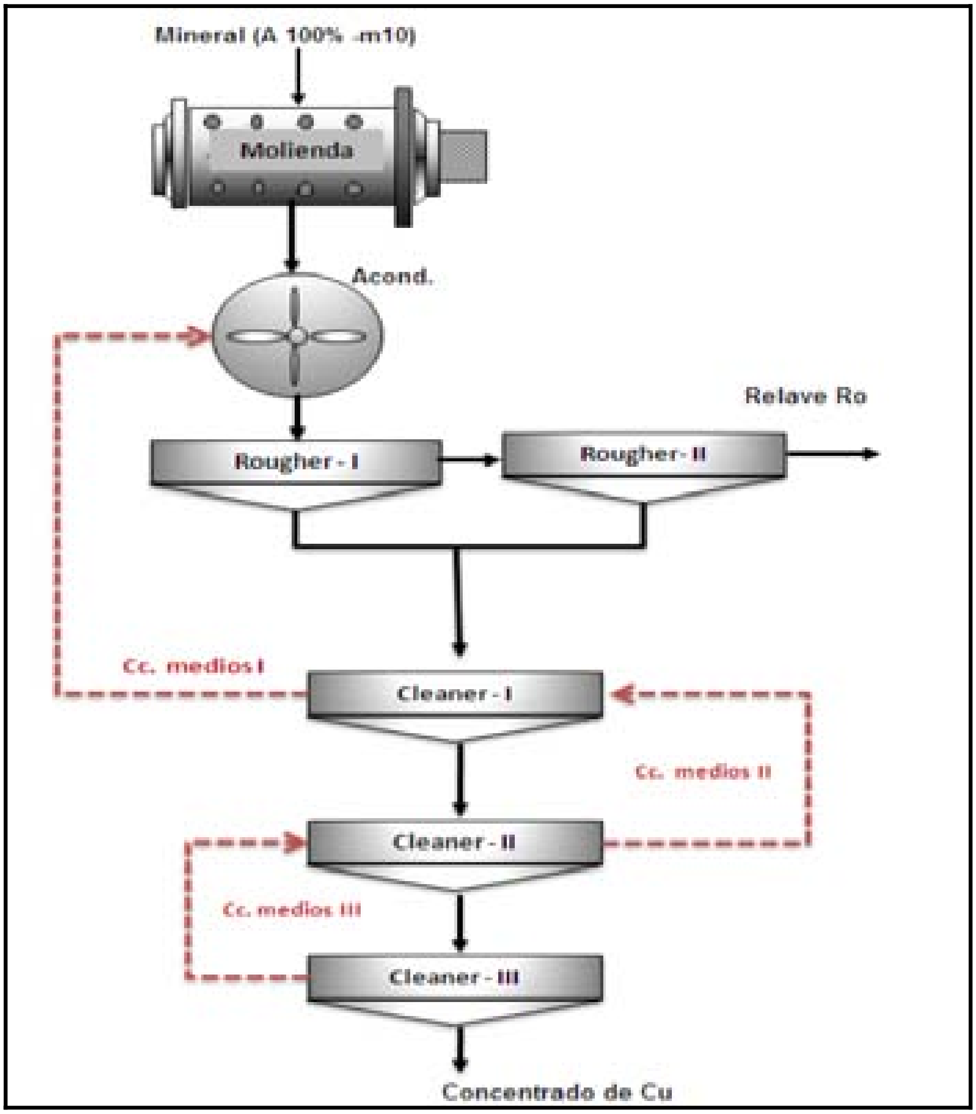


Table 13.4 Hypogene Sulphide Zone – Locked Cycle Flotation Test Results

Product	Weight (%)	RC	Grades					Recovery			
			Au (g/t)	Ag (g/t)	Cu (%)	Fe (%)	Mo (ppm)	Cu (%)	Au (%)	Ag (%)	Fe (%)
Copper Concentrate	1.75	57.1	11.90	152.05	27.05	30.71	613.3	87.37	62.02	60.36	7.59
Tail	98.25	-	0.13	1.78	0.07	6.66	-	12.63	37.98	39.64	92.41
Calculated Head	100.00	-	0.34	4.41	0.54	7.08	-	100.00	100.00	100.00	100.00

Source: Wright (2012)
Note: RC = Concentration Ratio

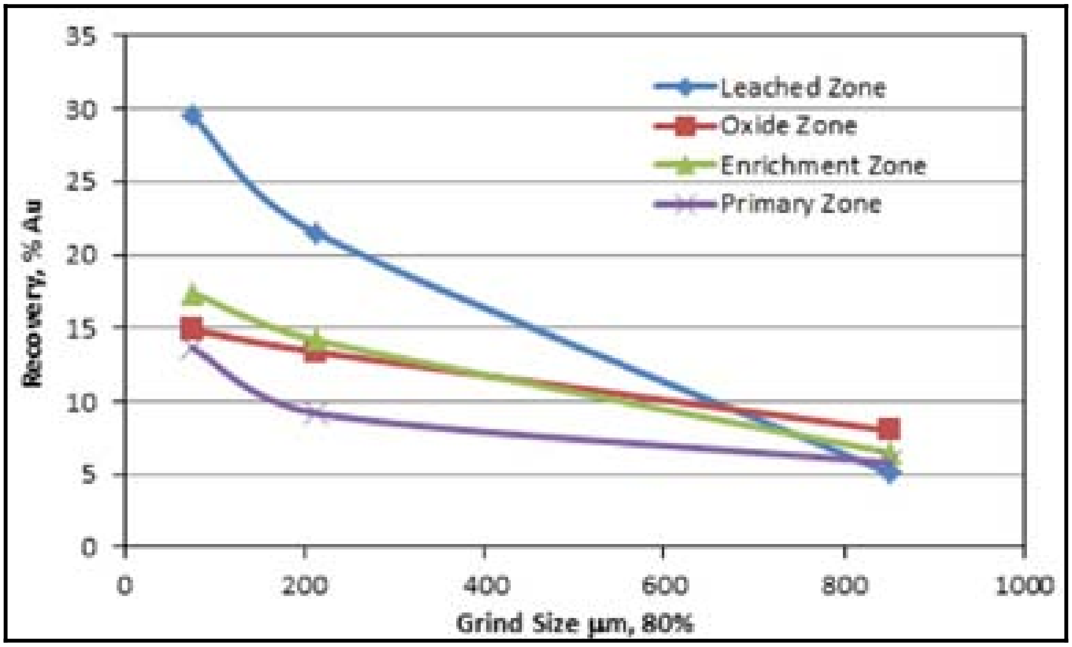
Table 13.5 ICP Analysis of Copper Concentrate

Zone	Secondary Sulphide	Hypogene Sulphide
Al (%)	1.62	0.98
Ca (%)	0.36	1.02
K (%)	1.12	0.51
Mg (%)	0.14	0.3
Na (%)	0.24	0.33
P (%)	0.03	0.01
Ti (%)	0.04	0.06
As (ppm)	130	58
Ba (ppm)	46	59
Be (ppm)	<0.5	<0.5
Bi (ppm)	394	125
Cd (ppm)	10	24
Co (ppm)	73	39
Cr (ppm)	267	64
Ga (ppm)	<10	<10
La (ppm)	2.3	1.9
Mn (ppm)	254	436
Mo (ppm)	105	583
Nb (ppm)	<1	<1
Ni (ppm)	186	53
Pb (ppm)	1,447	4,857
Sb (ppm)	<6	<8
Sc (ppm)	2.2	3
Sn (ppm)	23	25
Sr (ppm)	73.7	50.1
Tl (ppm)	<2	<2
V (ppm)	31	19
W (ppm)	<10	23
Y (ppm)	8.8	3.4
Zn (ppm)	2,580	8,180
Zr (ppm)	7.7	15.3

13.3 2013 Test Work – Peacocke & Simpson

The 2013 test work by Peacocke & Simpson mainly focused on the investigation of gravity recoverable gold (GRG) for the samples generated from the gold oxides zone (labelled as Leached Zone), copper-gold oxides zone (labelled as Oxide Zone), secondary sulphides zone (labelled as Enrichment Zone) and hypogene sulphides (labelled Primary Zone). The GRG test results are summarized in Figure 13.2.

Figure 13.2 GRG Test Results



Peacocke & Simpson indicated that at a primary grind size of 80% passing 75 µm, the GRG values for the samples are:

- 29.5% for the Leached Zone sample
- 14.9% for the Oxide Zone sample
- 17.4% for the Enrichment Zone sample
- 13.7% for the Primary Zone sample.

The findings should be further confirmed because the grades of the centrifugal gravity concentrates produced were low, ranging from 4.8 g/t gold to 32.2 g/t gold.

The gold extractions by cyanidation on the tailings of the GRG tests from the Leached Zone and Oxide Zone samples were similar to the results produced by Certimin. The copper extraction by sulphuric acid leaching on the Oxide Zone sample (GRG tailings) was 83.3%. However, the preliminary open batch flotation tests on the Enrichment Zone and Primary Zone samples (GRG tailings) produced low concentrate grades and metal recoveries.

13.4 DISCUSSIONS AND RECOMMENDATIONS

The test samples from the four mineralization zones at Cotabambas have been preliminarily tested for metallurgical response. The test results provide a preliminary indication of the amenability of the copper-gold mineralization to conventional mineral process procedures, including flotation, cyanidation and sulphuric acid leaching. The estimated metal recoveries for the head samples tested are shown in Table 13.6.

Table 13.6 Estimated Average Metallurgical Recoveries

Mineralization		Cu	Au	Ag	Mo	Process Method
Hypogene Sulphide	Recovery	87%	62%	64%	40%	Flotation
	Head Grade	0.54%	0.34 g/t	6.0 g/t	20 ppm	
Secondary Sulphide	Recovery	91%	84%	90%	30%	Flotation
	Head Grade	2.4%	0.84 g/t	7.5 g/t	20 ppm	
Copper-Gold Oxide	Recovery	78%	82%	21%	-	Acid Leach + Cyanidation
	Head Grade	0.54%	0.50 g/t	4.0 g/t	-	
Gold Oxide	Recovery	-	78%	44%	-	Cyanidation
	Head Grade	-	1.0 g/t	4.5 g/t	-	

Further test work is required to optimize process conditions and flowsheets due to a substantial difference in mineralogy among these mineralization zones.

14.0 MINERAL RESOURCE ESTIMATES

For the purposes of this mineral resource estimate, Datamine™ Studio 3 (version 3.21.7164.0) resource software was employed to analyze data, create associated wireframes of mineralization, and subsequent block modelling and grade interpolation.

14.1 INTRODUCTION

The following sections outline the NI 43-101 compliant resource estimate for the Property. The effective date of this resource estimate is August 12, 2013. The following sections describe and discuss the Cotabambas deposit resource estimate. The resource estimate includes, but is not restricted to:

- review of geological and assay data provided by Panoro
- geological interpretation and domaining of the mineralization
- application of the interpretation in the form of designed domain wireframes
- assessment of the data with respect to the different geological domains
- construction and configuration of a suitable block model
- interpolations of attributes (grade, density, etc.) into cells of the block model
- verification and validation of the interpolations
- application if resource classification (Inferred and Indicated)
- reporting on the respective mineral inventory
- recommendations for further work.

14.2 GEOLOGICAL INTERPRETATION

The geology of the Cotabambas deposit has been described by Wright & Colquhoun (2012) as part of the AMEC (Perú) S.A. NI 43-101 technical report on the Property. The Property has been recognized as porphyry copper-gold mineralization, coincident with the intrusion of Eocene to Oligocene Period quartz monzonites. Wright & Colquhoun (2012) described "emplacement of the quartz monzonite porphyry and later latite dykes are controlled by a system of strong sub-vertical fault and shear zones that have an azimuth of approximately 030°. A second set of structures, perpendicular to the 030° system and parallel to the regional thrust fault systems with azimuth 120° runs between the Ccalla area and the Huacclle area to the west."

Galley et al. (2007) noted that the Cotabambas deposit represents an example of a large tonnage volcanogenic massive sulphide (VMS) deposit at 25.06 Mt at 1.79% copper and 10.63 g/t silver.

14.2.1 Geological Domains and Wireframes

Four broad domains are recognized from drill core logging at the Cotabambas deposit. These domains have been flagged in the drillhole data with the attribute "zone1" and are listed as follows:

- Fresh rock where primary suphides (chalcopyrite, pyrite) are noted, also referred to as the *hypogene zone* (zone1 = 1).
- A zone of secondary enrichment, noted for the development of secondary sulphides (chalcocite and lesser covelite), also known as the *supergene zone* (zone1 = 4).
- A copper-gold oxide zone overlying the zones of primary and secondary sulphide mineralization (zone1 = 2).
- A leached cap zone characterized by abundant iron-magnesium oxide and oxy-hydroxide minerals (zone1 = 3), which occasionally contains copper-gold oxides.
- Sub-vertical and NE-trending latite dykes (zone2 = 1).

Planar wireframes forming the base and top of these zones were designed and constructed in Datamine™ using the drill core logs. These were confirmed by comparing with geological wireframes and sections prepared by Panoro geologists. The topographic surface wireframes were provided by Panoro geologists. These were compiled in Datamine™ to create a single digital terrain model (DTM) wireframe which was used in the resource model.

The sub-vertical and northeast trending latite dykes formed a sub-domain of these four geological domains. Wireframes modelling these dykes were also designed and constructed in Datamine™ using the drill core logs. These were confirmed by geological wireframes prepared by Panoro geologists for the latite dykes.

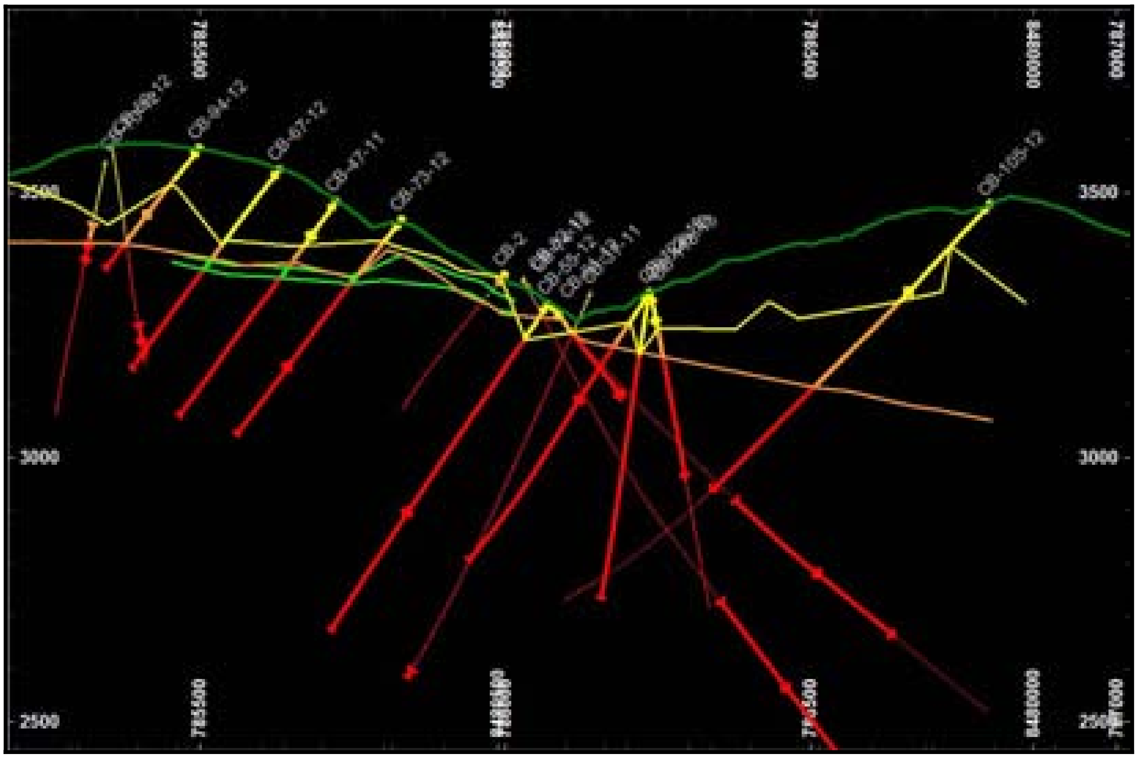
The final resource model is comprised of a total of 8 domains as delineated in the attribute "ZONE"; ZONEs 1-3 represent unmineralized rock (fresh rock, oxide rock and leached cap respectively. ZONEs 4-7 represent mineralized rock (hypogene, oxide, leached cap respectively and supergene). Hypogene mineralization in latite dykes (zone2 = 1) were estimated separately from the rest of the hypogene mineralization, while latite dykes in other domains (supergene, oxide and leached cap) were estimated together.

14.3 Data

Data was provided by Panoro as both a Microsoft Access® database (.mdb file) and as a series of csv text files to replicate diamond drillhole collar, survey, geology and assay data. After separate verification and validation, all data were imported into Datamine™

software and resurveyed to create an appropriate drillhole file for geological interpretation and grade estimation. The desurveyed drillhole data were flagged with the appropriate domain attribute. A representative northwest – southeast cross-section is depicted in Figure 14.1.

Figure 14.1 Northwest-southeast Cross-section of Domain Wireframes with Drillhole Traces, Coloured by Domain (yellow – leached cap, orange – oxide, bright green – supergene, red – hypogene)



Note: Dark green line represents the topographic wireframe surface.

The final mineralization model employed in the Cotabambas resource model was designed, developed, and verified by Tetra Tech.

14.4 Exploratory Data Analysis

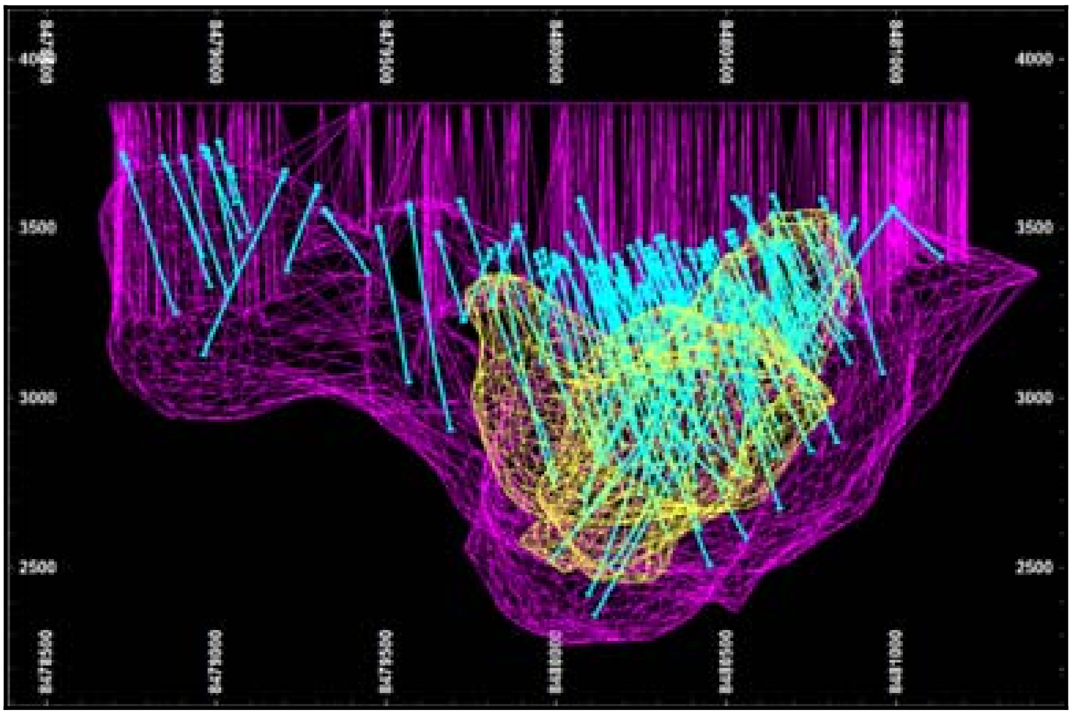
The following discussion describes the data used in the Panoro resource estimate. It outlines the data statistics for respective domains; methodology used to identify and control the influence of outlier data and compositing data to maintain consistency in the estimation process.

14.4.1 Drillhole Statistics

Metals – Cu, Au, Ag, Mo

Table 14.1 displays the drillhole statistics for the Project. It includes drillholes only within the broad zone of mineralization which was manually delineated by Datamine™ wireframes. One wireframe was used to identify the copper-gold-silver volume of mineralization, and another smaller separate wireframe identified a volume of molybdenum mineralization. These volumes, with the drillholes, are depicted as a west-east section in Figure 14.2.

Figure 14.2 West-east Cross-section of Data Wireframes (magenta for copper, gold and silver; yellow for molybdenum)



Note: Wireframes were also used to restrain grade extrapolation.

As previously mentioned, drillhole data were also coded relative to the geological unit in which they were logged and located. These geological units were designated as follows:

- (zone1=1) "hypogene" or sulphide mineralization which occurs at depth in fresh rock.
- (zone1=2) "oxide" mineralization which occurs at shallower levels.
- (zone1=3) "leached cap" mineralization, which occurs near surface.
- (zone1=4) "supergene" or secondary enrichment mineralization which occurs proximal to the oxide-sulphide boundary.

The drillholes statistics are also sub-divided into raw data, raw data with the “cap” or “top-cut” for each of the metals applied, and capped and composited data (to 4m intervals). A discussion relating to the capping strategy (i.e. “outlier management” and compositing strategy can be found in the immediately following sections of this report.

Table 14.1 Cotabambas Deposit – Raw Drillhole Statistics – Copper, Gold, Silver and Length

Type	Zone1	Field	Records	Samples	Minimum	Maximum	Mean	Variance	Std Dev	CV
Raw	1	Cu_pct	52,655	41,127	0.0001	19	0.1843	0.1026	0.3203	1.738
		Au_gt	52,655	36,839	0.001	33.8	0.1058	0.0912	0.3019	2.855
		Ag_gt	52,655	36,921	0.19	112	1.9226	6.7957	2.6069	1.356
		LENGTH	52,655	41,448	0.002	3.4	1.2387	0.4879	0.6985	0.564
	2	Cu_pct	52,655	4,047	0.0008	8.95	0.2740	0.2461	0.4961	1.811
		Au_gt	52,655	3,713	0.001	4.49	0.1183	0.0649	0.2547	2.153
		Ag_gt	52,655	3,592	0.5	41	1.6891	3.4428	1.8555	1.099
		LENGTH	52,655	4,119	0.002	10	1.2904	0.5279	0.7265	0.563
	3	Cu_pct	52,655	5,847	0.0004	3.14	0.1217	0.0600	0.2449	2.012
		Au_gt	52,655	5,421	0.001	2.72	0.1024	0.0467	0.2161	2.112
		Ag_gt	52,655	5,215	0.5	33	1.4726	2.1143	1.4541	0.987
		LENGTH	52,655	5,937	0.001	7.6	1.2947	0.4951	0.7036	0.543
	4	Cu_pct	52,655	1,149	0.0006	8.14	0.8270	1.1062	1.0518	1.272
		Au_gt	52,655	1,138	0.003	5.12	0.2903	0.1577	0.3971	1.368
		Ag_gt	52,655	981	0.5	34	3.0238	11.7396	3.4263	1.133
		LENGTH	52,655	1,151	0.005	2	1.2502	0.4456	0.6675	0.534
Capped	1	Cu_pct	52,655	41,127	0.0001	3.5	0.1831	0.0775	0.2784	1.520
		Au_gt	52,655	36,839	0.001	2.6	0.1033	0.0405	0.2013	1.949
		Ag_gt	52,655	36,921	0.19	30	1.9065	4.9643	2.2281	1.169
		LENGTH	52,655	41,448	0.002	3.4	1.2387	0.4879	0.6985	0.564
	2	Cu_pct	52,655	4,047	0.0008	3.5	0.2682	0.1856	0.4308	1.606
		Au_gt	52,655	3,713	0.001	2.6	0.1162	0.0514	0.2268	1.951
		Ag_gt	52,655	3,592	0.5	30	1.6843	3.1291	1.7689	1.050
		LENGTH	52,655	4,119	0.002	10	1.2904	0.5279	0.7265	0.563
	3	Cu_pct	52,655	5,847	0.0004	3.14	0.1217	0.0600	0.2449	2.012
		Au_gt	52,655	5,421	0.001	2.6	0.1023	0.0466	0.2158	2.109
		Ag_gt	52,655	5,215	0.5	30	1.4720	2.0798	1.4422	0.980
		LENGTH	52,655	5,937	0.001	7.6	1.2947	0.4951	0.7036	0.543
	4	Cu_pct	52,655	1,149	0.0006	3.5	0.7837	0.7560	0.8695	1.109
		Au_gt	52,655	1,138	0.003	2.6	0.2881	0.1419	0.3767	1.308
		Ag_gt	52,655	981	0.5	30	3.0197	11.5033	3.3917	1.123
		LENGTH	52,655	1,151	0.005	2	1.2502	0.4456	0.6675	0.534

table continues…

Type	Zone1	Field	Records	Samples	Minimum	Maximum	Mean	Variance	Std Dev	CV
Capped and Composited (4 m)	1	Cu_pct	16,463	12,728	0.0001	3.0329	0.1760	0.0639	0.2528	1.436
		Au_gt	16,463	11,487	0.0020	2.5782	0.0973	0.0321	0.1792	1.840
		Ag_gt	16,463	11,832	0.1959	30.0000	1.8623	3.6504	1.9106	1.026
		LENGTH	16,463	12,829	2.0000	4.7500	3.9998	0.0008	0.0276	0.007
	2	Cu_pct	16,463	1,307	0.0016	3.4466	0.2610	0.1546	0.3932	1.507
		Au_gt	16,463	1,194	0.0040	2.4022	0.1112	0.0384	0.1960	1.763
		Ag_gt	16,463	1,205	0.5000	16.7402	1.6414	2.2441	1.4980	0.913
		LENGTH	16,463	1,337	2.0000	5.0000	3.9731	0.0218	0.1477	0.037
	3	Cu_pct	16,463	1,908	0.0007	2.4124	0.1252	0.0552	0.2349	1.877
		Au_gt	16,463	1,799	0.0017	1.8350	0.1049	0.0451	0.2123	2.024
		Ag_gt	16,463	1,760	0.5000	17.4286	1.4635	1.6296	1.2766	0.872
		LENGTH	16,463	1,934	2.0000	5.5000	3.9737	0.0223	0.1493	0.038
	4	Cu_pct	16,463	363	0.0006	3.5000	0.7680	0.6888	0.8299	1.081
		Au_gt	16,463	358	0.0045	2.1573	0.2793	0.1207	0.3474	1.244
		Ag_gt	16,463	325	0.5000	24.0000	2.9103	10.4897	3.2388	1.113
		LENGTH	16,463	363	3.0000	4.9000	3.9642	0.0500	0.2236	0.056

Note: Std Dev = Standard Deviation; CV – Coefficient of Variance

Table 14.2 Cotabambas Deposit – Raw Drillhole Statistics - Molybdenum

Type	Zone1	Field	Records	Samples	Minimum	Maximum	Mean	Variance	Std Dev	CV
Raw	1	Mo_pct	20,880	17,517	0.0001	0.1900	0.0041	0.0001	0.0086	2.0842
	2		20,880	402	0.0001	0.0200	0.0025	0.0000	0.0024	0.9621
	3		20,880	337	0.0001	0.0100	0.0022	0.0000	0.0018	0.8326
	4		20,880	95	0.0006	0.0100	0.0024	0.0000	0.0022	0.9267
Capped	1	Mo_pct	20,880	17,517	0.0001	0.1900	0.0041	0.0001	0.0086	2.0842
	2		20,880	402	0.0001	0.0200	0.0025	0.0000	0.0024	0.9621
	3		20,880	337	0.0001	0.0100	0.0022	0.0000	0.0018	0.8326
	4		20,880	95	0.0006	0.0100	0.0024	0.0000	0.0022	0.9267
C & C (4 m)	1	Mo_pct	6,623	5,763	0.0001	0.1125	0.0042	0.0000	0.0067	1.5855
	2		6,623	141	0.0001	0.0120	0.0026	0.0000	0.0021	0.8150
	3		6,623	111	0.0001	0.0082	0.0021	0.0000	0.0016	0.7357
	4		6,623	31	0.0007	0.0069	0.0022	0.0000	0.0016	0.7603

Note: "C & C" refers to capped and composited data.

Note that the CV is relatively low; generally less than 2 for most all scenarios. This indicates that defined domains by the four zones are valid for grade interpolation.

SEQUENTIAL LEACHING

Data pertaining to sequential leaching characteristics, including cyanide leaching (CuCN), acid leaching (CuAS), and sulphide flotation (CuR) was also collected in a more limited number of drillhole samples in the immediate vicinity of the supergene mineralization (Zone1 = 4). Table 14.3 summarizes the statistics for this data in each of the respective domains (Zone1 1-4).

Table 14.3 Cotabambas Deposit – Raw Drillhole Statistics – Copper Leaching Data

Zone1	Field	Records	Samples	Minimum	Maximum	Mean	Variance	Std Dev	CV
1	CuCN_pct	39,683	697	0.022	0.84	0.1280	0.0099	0.0995	0.7772
	CuAS_pct	39,683	697	0.013	0.911	0.1387	0.0226	0.1504	1.0845
	CuR_pct	39,683	697	0.039	0.943	0.7333	0.0391	0.1978	0.2698
2	CuCN_pct	39,683	1,374	0.003	0.705	0.0833	0.0069	0.0828	0.9940
	CuAS_pct	39,683	1,374	0.03	0.982	0.4763	0.0545	0.2334	0.4901
	CuR_pct	39,683	1,374	0.012	0.909	0.4405	0.0462	0.2150	0.4881
3	CuCN_pct	39,683	1,426	0.004	0.63	0.1126	0.0095	0.0972	0.8632
	CuAS_pct	39,683	1,426	0.053	0.951	0.3609	0.0345	0.1858	0.5148
	CuR_pct	39,683	1,426	0.037	0.895	0.5265	0.0325	0.1802	0.3423
4	CuCN_pct	39,683	337	0.008	0.866	0.2881	0.0613	0.2476	0.8596
	CuAS_pct	39,683	337	0.029	0.933	0.3601	0.0811	0.2848	0.7909
	CuR_pct	39,683	337	0.011	0.9	0.3518	0.0707	0.2659	0.7559

Note the order of magnitude difference in the number of standard assays in comparison with the number of leach assays. To maximize the number of leach assays available for interpolation, no capping or compositing was applied to the dataset.

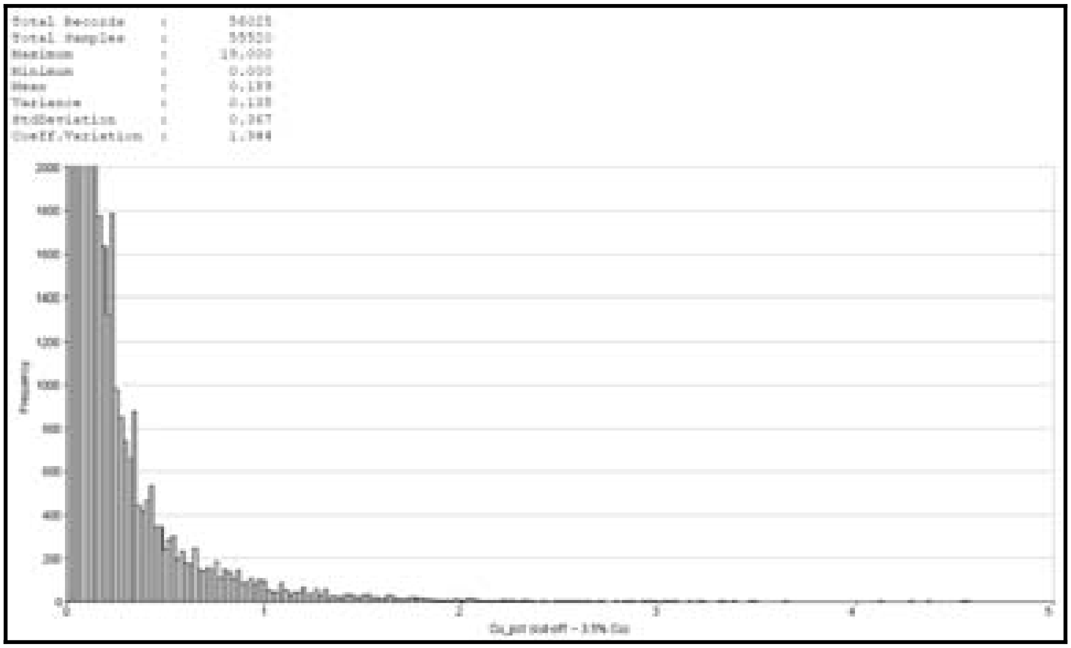
14.4.2 Outlier Management and Capping Strategy

For sample outlier population management, the entire dataset was considered for copper, gold, and silver. Although the paragenesis of the deposit differed between domains, it was considered that the entire dataset provided sufficient samples to adequately interrogate the statistics for outlier capping (or "top-cutting"). Histograms and log normal plots were used to identify outlier sample populations. These populations were subsequently confirmed not to form independent volumetrically discrete high-grade domains. The following discussion provides a synopsis of this management strategy.

Copper

The main copper mineral in the Cotabambas deposit is chalcopyrite ($CuFeS_2$). Chalcopyrite is an iron-copper sulphide composed of up to 34.6% copper, 30.4% iron and 35% sulphur. As massive sulphides are not a common component of Cotabambas mineralization, it is reasonable to expect few samples with high grades. The raw sample drillhole data records one sample with 19% copper. The next highest sample grade is 9% copper (Figure 14.3). A 3.5% copper cap has been applied. This equates to a total metal loss of 0.8% and effects 0.08% of the samples (28 out of 36,158).

Figure 14.3 Copper Log Histogram of Raw Drillhole Data

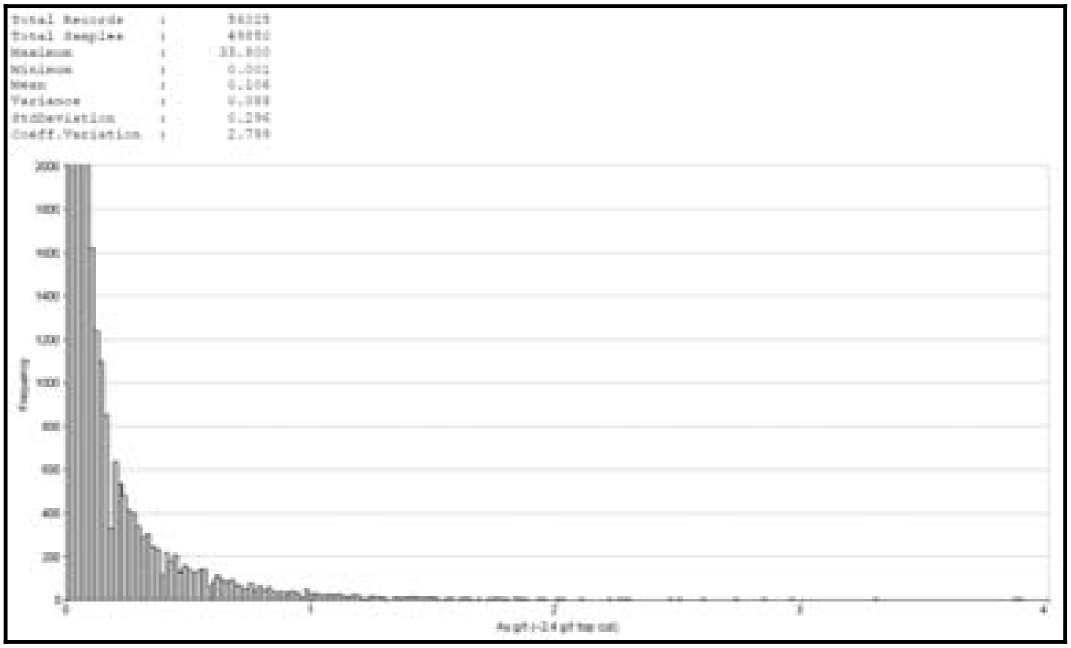


Of the 47 samples with greater than 3.5% copper, 28 correspond to Zone 4 (supergene mineralization). However, none are sufficiently spatially related to warrant the generation of a separate high grade copper domain.

GOLD

The histogram for gold raw assay data for in the deposit shows several outliers (Figure 14.4).

Figure 14.4 Gold Log Histogram and Raw Drillhole Data

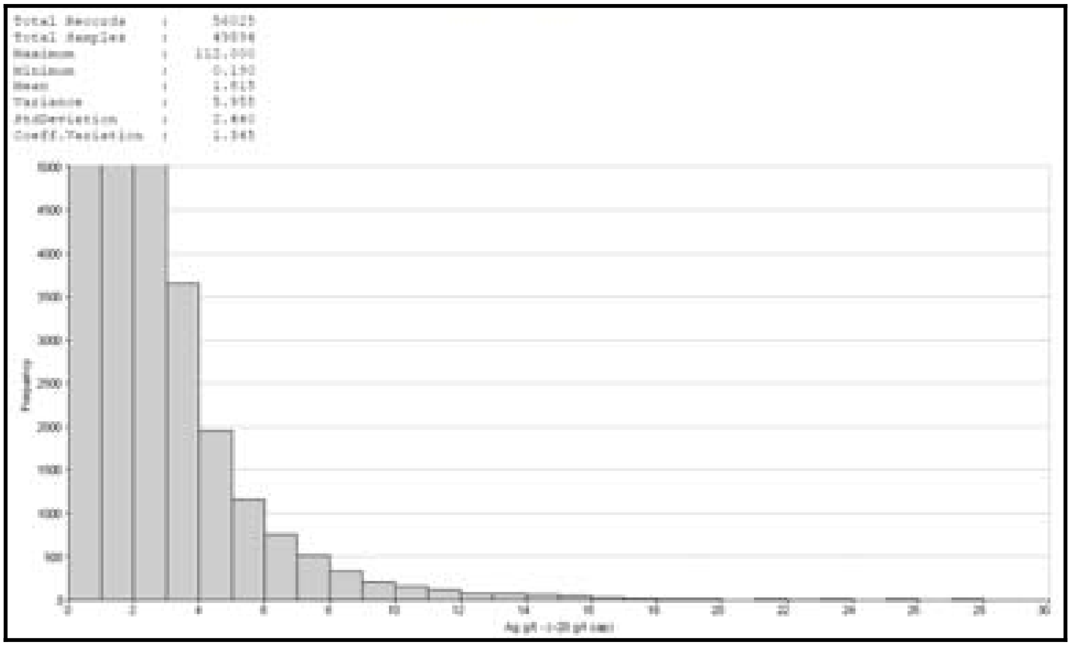


In order to manage these abnormally high grades, a cap was set at 2.6 g/t where the continuity of the distribution begins to break down. This represents application of a cap to 37 samples. Of these, 26 samples belong to Zone 1 (hypogene mineralization). Like copper, these high grade samples are insufficiently clustered to warrant the generation of a separate high grade domain.

SILVER

The raw data histogram for silver in the deposit shows several outliers (Figure 14.5).

Figure 14.5 Silver Log Histogram of Raw Drillhole Data



In order to manage these abnormally high grades, a cap was set at 30 g/t where the continuity of the distribution begins to break down. This 30 g/t cap effects 22 samples, of which 18 are from Zone 1 (hypogene mineralization). None are spatially related to warrant the generation of a separate high grade silver domain. Although Zone 1 also hosts the higher grade gold assays, there is little immediate correlation between the high grade silver assays and the high grade gold assays.

SUMMARY

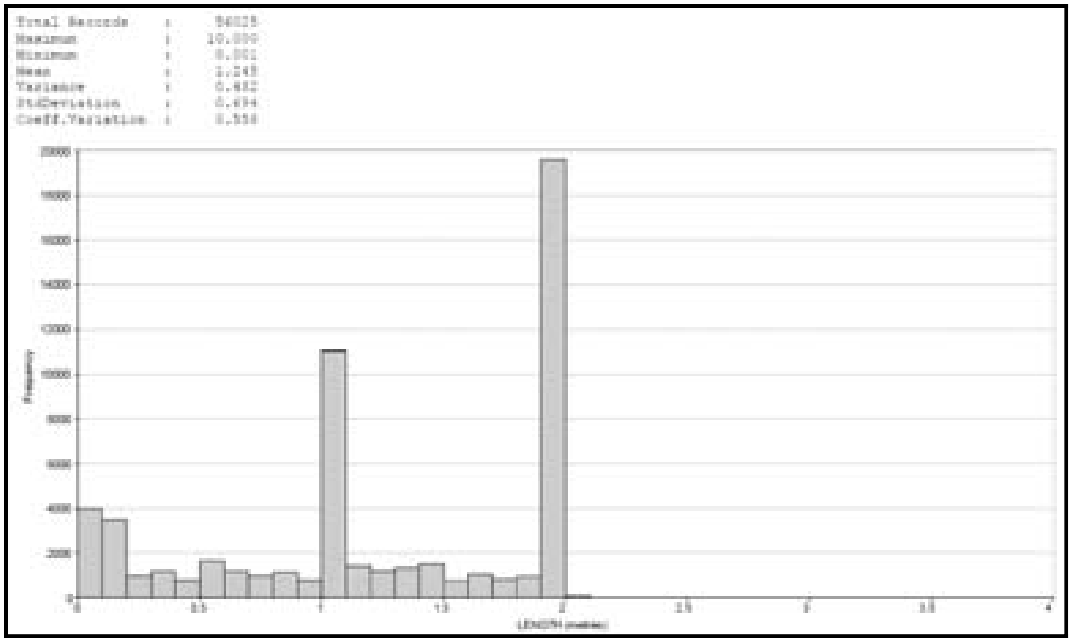
The raw assay data was examined for outlier populations and a "cap" (or "top-cut") as applied to copper, gold, and silver; these are 3.5%, 2.6 g/t and 30 g/t respectively. Table 14.4 summarises the statistics for the capped drillhole assay data.

Copper in Zone 4 experienced the greatest change in the average value, reduced by 7%, followed by gold in Zone 3. Most metals and zones experienced less than 2% change in mean grade with the application of a cap. The CV was reduced by up to 31% in gold (Zone 1 and 3), and up to 15% in copper (Zone 4).

14.4.3 DRILLHOLE COMPOSITING

The histogram of raw drillhole sample lengths is depicted in Figure 14.6.

Figure 14.6 Sample Length Histogram of Raw Drillhole Data



The majority of raw sample lengths used for assaying measure 2.0 m in length, with a significant number of 1.0 m samples.

To minimize estimation bias through differing sample lengths, the drillhole data was composited to a number of lengths and the resultant statistics assessed. Compositing honoured the zone boundaries, and composite lengths for individual samples adjusted to minimize excessively long or short samples at the end of individual drillholes.

The statistics for different sample lengths is tabulated in Table 14.4.

Table 14.4 Cotabambas Deposit – Composite Length Statistics

Length (m)	Field	Records	Samples	Minimum	Maximum	Mean
2	Cu_pct	34,906	34,569	0.000	3.50	0.181
	Au_gt	34,906	31,113	0.001	17.81	0.102
	Ag_gt	34,906	31,994	0.190	109.09	1.775
3	Cu_pct	23,219	23,000	0.000	3.50	0.181
	Au_gt	23,219	20,748	0.001	22.49	0.101
	Ag_gt	23,219	21,362	0.199	93.46	1.774
4	Cu_pct	17,434	17,273	0.000	3.50	0.181
	Au_gt	17,434	15,626	0.002	17.06	0.101
	Ag_gt	17,434	16,056	0.196	92.14	1.775
5	Cu_pct	13,930	13,803	0.000	3.50	0.181
	Au_gt	13,930	12,512	0.002	2.41	0.099
	Ag_gt	13,930	12,854	0.215	30.00	1.765

table continues…

Length (m)	Field	Records	Samples	Minimum	Maximum	Mean
6	Cu_pct	11,609	11,504	0.000	3.50	0.181
	Au_gt	11,609	10,442	0.003	2.38	0.099
	Ag_gt	11,609	10,725	0.207	27.05	1.766

The statistics for the different composite lengths show that the mean grade for copper, gold, and silver begins to fall at lengths above 4 m.

In order to capture most of the sample lengths into a consistent composite while maintaining sufficient resolution and maximizing the number of composited samples available for grade interpolation, a composite length of 4 m was used in this resource estimate.

14.4.4 WIREFRAMING

The domain zones were modelled by wireframes in Datamine™. These wireframes were used to define geological zones in the resource model (base of oxidation, base of leached cap and zone of supergene mineralization), and are based on interpreted geological contacts as logged in drillholes by Panoro geologists. These wireframes were extrapolated from the drillholes on which they are based, to provide reasonable coverage for the resource model. To the north, where there is insufficient drill data to extrapolate the wireframes, a nominated elevation was used to define the base of leached cap and the base of oxidation.

The topographical wireframes were supplied by Panoro and combined in Datamine™ to create a single surface.

Wireframes were also constructed to provide reasonable grade extrapolation limits to the block model drillhole to contain mineralization for, (1) copper, gold, and silver mineralization and (2) molybdenum mineralization. These wireframes are based on spatial positions of drillhole data, and were not based on any grade shells.

14.4.5 CONTACT PROFILES

Mineralization contact profiles were generated between zones for all of the contiguous mineralized domains. Copper, gold and silver were examined. Due to the relatively limited extent and low grades, molybdenum was treated as one domain. Examples of the contact profiles are presented in Appendix A.

These contact profiles were used to establish if a mineralization domain boundary represented a “hard” (i.e. domains cannot share assays for grade interpolation) or “soft” (i.e. domains can share assays for grade interpolation) boundaries. A “semi-soft” boundary is such that external lower grade samples can be used to interpolate internal cells, whereas higher grade external samples are prevented from interpolating internal cells. This only occurred with respect to Zones 3 and 4. The oxide assays (Zone 3) were used to help estimate the supergene (Zone 4) cells, but the high-grade supergene assays were not used to estimate the contiguous oxide (Zone 3) cells (Table 14.5).

Table 14.5 Boundary Relations as Interpreted from Domain Contact Profiles for Resource Estimation

	Zone 1	Zone 2	Zone 3	Zone 4
Zone 1	-	Soft	Hard	Soft
Zone 2	Soft	-	Soft	Soft
Zone 3	Hard	Soft	-	semi-soft
Zone 4	Soft	Soft	Semi-soft	-

14.4.6 Variography

Variography was completed using Datamine™ software. Variography was completed of all interpolated grades (copper, gold, and silver) based on mineralized geological domains (Zones 1 to 4) and the latite dykes. Variography was also performed on molybdenum, but data was not domain-restricted as for copper, gold, and silver. Density was also interpolated, and density variography was completed utilizing all spatial density data available.

Downhole variography was first performed to calculate the intrinsic sample variance (or "nugget") for each respective estimation domain. If necessary, the experimental variogram generated from the downhole analysis was used to model the third (shortest) axis. Downhole variography used capped raw data with a 2 m lag distance.

Spatial variography was performed on a series of orientations. This variography used 4 m composited and capped data, usually with 40 m lag distances. For the hypogene domain (zone1 = 1), orientations around both the full vertical and horizontal axes were evaluated. For the more planar domains (zone1 = 2, 3 and 4), the dip of the plane was estimated and variograms constructed around the horizontal axis. These multiple experimental variograms were inspected, and the optimal variogram used in the estimate was based on ranges, sample pair numbers and nugget-to-sill characteristics. The optimal variogram was modeled, and the variogram parameters were recorded in the appropriate file as discussed below.

Figure 14.7 to Figure 14.10 show representative variograms, both experimental and modelled, generated from Datamine™.

Figure 14.7 Copper Downhole Variograms for Zone 1 (Hypogene Mineralization)

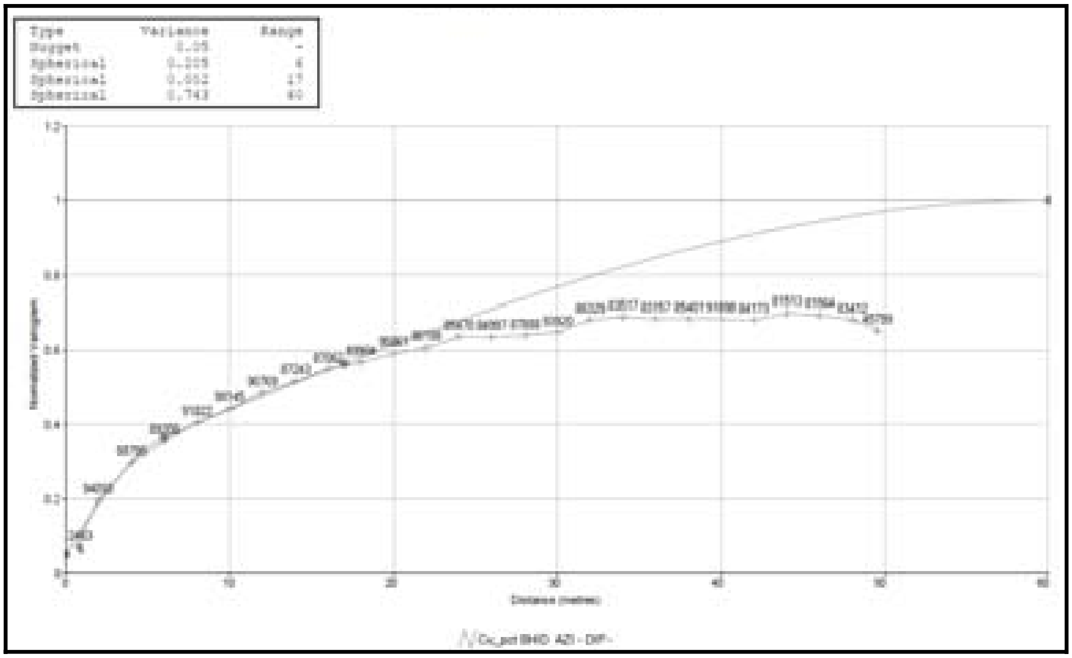


Figure 14.8 Copper Downhole Variograms for Zone 1 (Hypogene Mineralization)

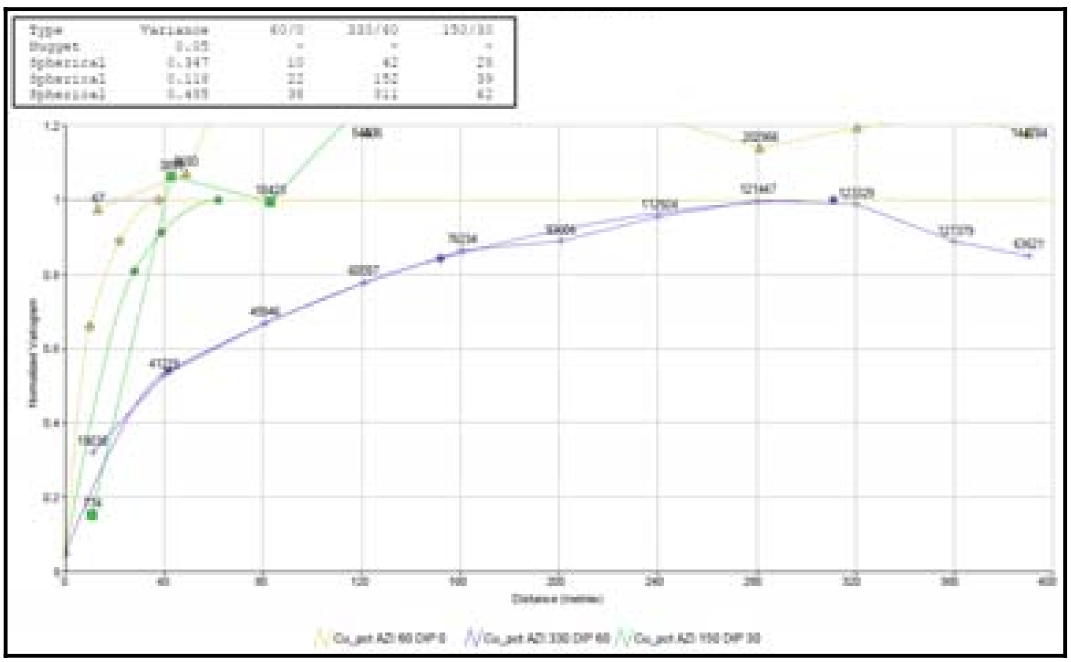


Figure 14.9 Gold Downhole Variograms for Zone 2 (Oxide Mineralization)

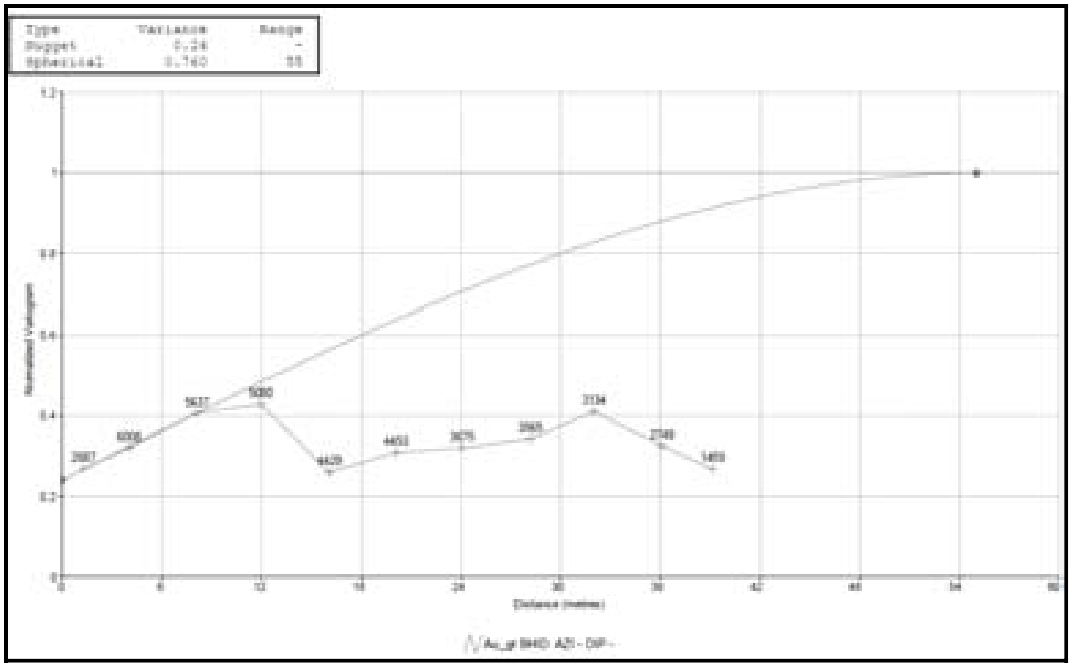
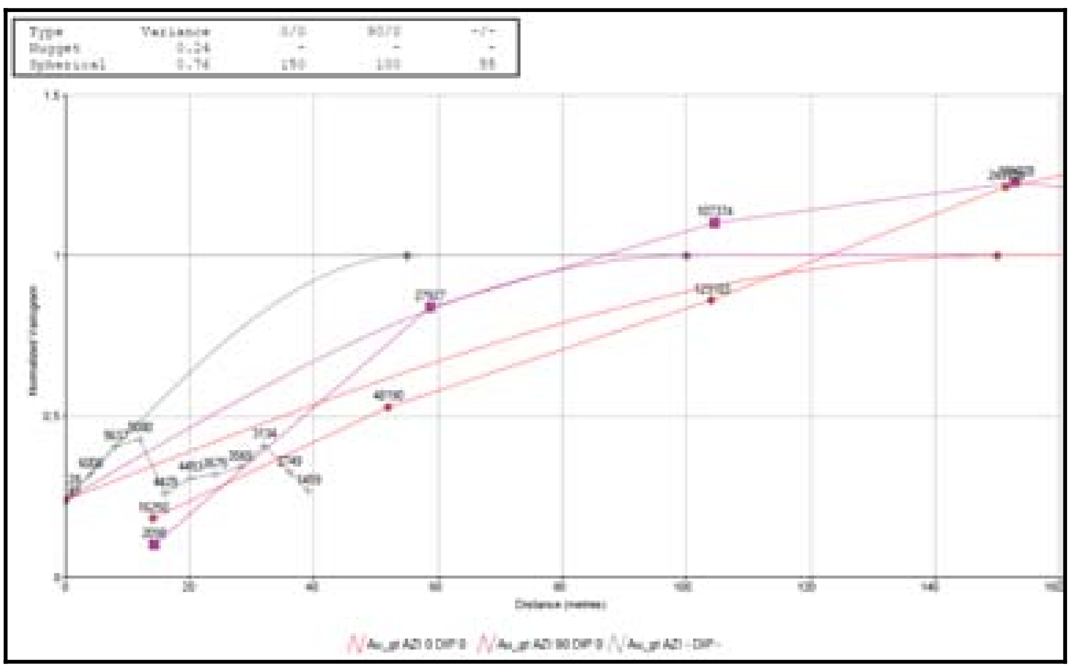
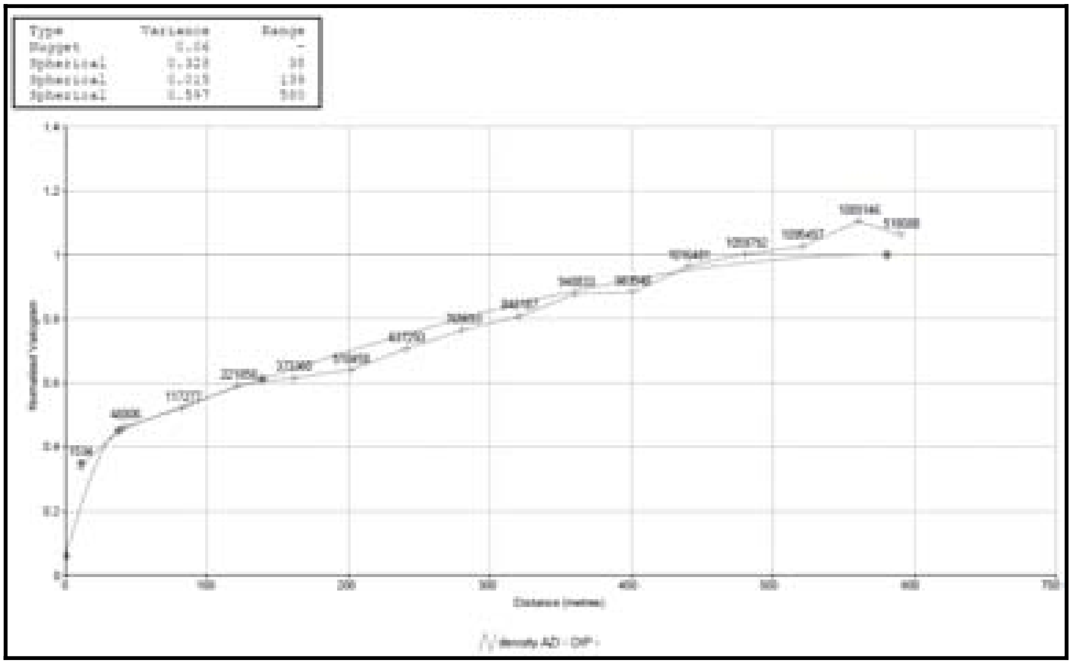


Figure 14.10 Gold Variograms for Zone 2 (Oxide Mineralization)



In contrast with the oriented anisotropic variography performed for each of the metals by domain (or Zone), density was estimated using a single omnidirectional isotropic variogram for all domains (Figure 14.11).

Figure 14.11 Density Variograms



14.5 BLOCK MODEL

14.5.1 BLOCK MODEL CONFIGURATION

The Cotabambas resource model was designed and constructed using Datamine™ software. Table 14.6 summarizes the fundamental model design. The block model was not rotated.

Table 14.6 Resource Block Model Configuration

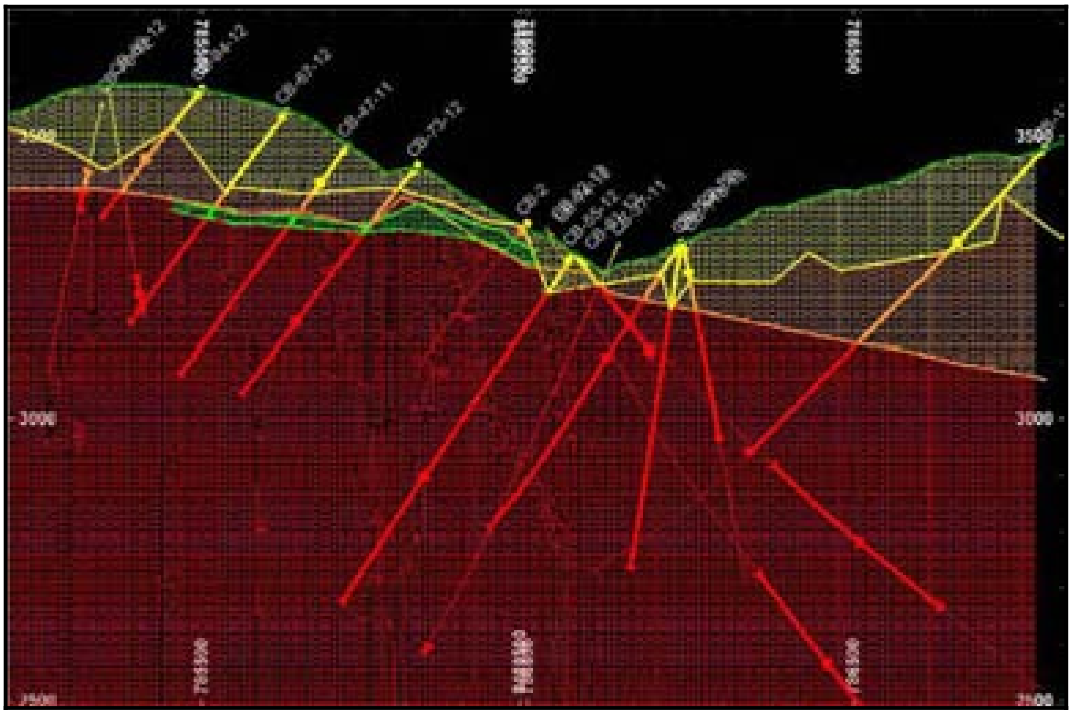
	Easting (m)	Northing (m)	Elevation (m)
Model origin	783,700	847,7600	2,200
Cell size (m)	20	20	12
Number of cells	190	200	158
Sub-cells per cell	4	4	4

The parent cell size (20 m by 20 m by 12 m) is significantly larger than the 2012 model completed by AMEC which employed 10 m by 10 m by 10 m cells. This is in order to provide more robust sample support for the estimation of grade into individual cells, given the current level of drillhole spacing. Sub-cells (no smaller than 5 m by 5 m by 3 m) were used to improve the model resolution along the topographic surface and domain boundaries. The estimated model can be re-blocked to a smaller parent cell size if mine planning requires smaller cells.

Model Domains

The same domains as identified in the drillhole data were applied to the block model. These include the leached cap (zone1 = 3), the oxide zone (zone1 =2), hypogene mineralization (zone1=1) and supergene mineralization (zone1=4). The wireframes and the drillhole data used to design these wireframes are depicted in Figure 14.12 along with the block model, coloured by domain.

Figure 14.12 Northwest-southeast Cross-section of Domain Wireframes with Drillhole Traces and Block Model, Coloured by Domain (yellow – leached cap, orange – oxide, bright green – supergene, red – hypogene)



14.6 Grade and Density Estimation

Interpolation of metal grades (copper percent, gold grams per tonne, silver grams per tonne and molybdenum percent) and interpolation of density (specific gravity) was performed in Datamine™. Datamine™ requires the use of three parameter files (estimation, samples and variography) to complete estimation. These parameters are listed and described below.

14.6.1 Estimation Parameters

The estimation parameter files lists what variables are estimated and what types of estimation methods are used. In addition to metals and density, the Lagrange Multiplier and F-Function, based on copper grades, were also interpolated. These values (LG and F) facilitated the calculation of the theoretical slope of regression (ZZ*) and Kriging

Efficiency (KE). These are variables which assist in evaluating the quality of the ordinary kriged estimation, and are discussed in subsequent sections.

Most estimated variable used three different interpolation methods: OK, inverse distance squared (ID^2 ["power" is set to 2]), and nearest neighbour (NN). Of these methods, only OK was reported on in the final resource tabulation. The other methods are only used for model estimation validation.

Density

As mentioned above, three estimation methods were used to interpolate density throughout the entire block model; OK, ID^2, and NN. These methods are listed in Table 14.7 as "I Method" 3, 2 and 1 respectively. The "srefnum" and "vrefnum" refers to the sample search and variogram parameter files used, and "krignegw" flags a request to retain negative kriging weights. As density estimation was not restricted to geological units (i.e. zone1=1, zone1=2, zone1=4 and zone1=4), no further refinement of the estimation parameter file was required.

Table 14.7 Density Estimation Parameter File

Description	Value In	Value Out	srefnum	imethod	power	vrefnum	krignegw
Density	Density	dens_ok	1	3	-	1	0
Density	Density	dens_id	1	2	2	1	0
Density	Density	dens_nn	1	1	-	1	0

Metals

Like density, molybdenum estimation was based on three methods and was not restricted by and domains or zones, apart from the designated molybdenum wireframe shell.

Copper, gold, and silver were interpolated by domain (i.e. zone1=1, zone1=2, zone1=4 and zone1=4; hypogene, oxide, leached-cap and supergene respectively). Each domain interpolation required a specific drillhole dataset as identified thought the contact profile analyses (i.e. a specific zone would use that zone's drillhole data plus contiguous zones data if the contact rofile has identified "soft" contact boundaries). Table 14.8 uses copper for an example of the metals estimation parameter file.

Note IMETHOD 101 and 102 are used to interpolate the F-Function and Lagrange Multiplier based on Cu variography and copper values only. Also recorded are the number of samples ("NUMSAM") and which search volume ("SVOL" - out of three) are used for a successful interpolation. These attributes assist in evaluating the quality of the estimate, and in particular reference to the search volume, help configure the Indicated Resource classification.

Similar estimation parameter files were compiled and completed for density, latite dykes (hypogene zone only), molybdenum, gold and silver.

Table 14.8 Copper Estimation Parameter File

Description	EREFNUM	Value In	Value Out	SREFNUM	NUMSAM	SVOL	VAR	IMETHOD	POWER	VREFNUM	KRIGNEGW	zone1
Cu_ok	1	Cu_pct	Cu_ok	1	numsam	svol	kv	3	-	1	0	1
Cu_id	2	Cu_pct	Cu_id	1				2	2	1	0	
Cu_nn	3	Cu_pct	Cu_nn	1				1	-	1	0	
Cu_f	4	Cu_pct	Cu_f	1				101	-	1	0	
Cu_lg	5	Cu_pct	Cu_lg	1				102	-	1	0	
Cu_ok	6	Cu_pct	Cu_ok	2	numsam	svol	kv	3	-	2	0	2
Cu_id	7	Cu_pct	Cu_id	2				2	2	2	0	
Cu_nn	8	Cu_pct	Cu_nn	2				1	-	2	0	
Cu_f	4	Cu_pct	Cu_f	1				101	-	1	0	
Cu_lg	5	Cu_pct	Cu_lg	1				102	-	1	0	
Cu_ok	9	Cu_pct	Cu_ok	3	numsam	svol	kv	3	-	3	0	3
Cu_id	10	Cu_pct	Cu_id	3				2	2	3	0	
Cu_nn	11	Cu_pct	Cu_nn	3				1	-	3	0	
Cu_f	4	Cu_pct	Cu_f	1				101	-	1	0	
Cu_lg	5	Cu_pct	Cu_lg	1				102	-	1	0	
Cu_ok	12	Cu_pct	Cu_ok	4	numsam	svol	kv	3	-	4	0	4
Cu_id	13	Cu_pct	Cu_id	4				2	2	4	0	
Cu_nn	14	Cu_pct	Cu_nn	4				1	-	4	0	
Cu_f	4	Cu_pct	Cu_f	1				101	-	1	0	
Cu_lg	5	Cu_pct	Cu_lg	1				102	-	1	0	

14.6.2 VARIOGRAPHY PARAMETERS

Variography was completed using Datamine™ software for each zone (VREFNUM =1, 2, 4 and 4 equate to Zone1 =1, 2, 3, and 4 respectively). Modelled variograms were anisotropic and spherical (ST1, 2, 3 = 1) with the exception of density (isotropic) and sequential copper leaching (ID^2 only).

Table 14.10 summarizes the variography parameter file used in copper resource estimation. Rotation methodology used is positive degrees are rotated clockwise with the long axis represented by the X-axis (west-east - VAXIS1), and the short axis represented by the Z-axis (elevation - VAXIS3).

Similar variography parameter files were completed for density, latite dykes (hypogene zone only), molybdenum, gold and silver. As sequential leaching data was interpolated by ID^2 only, no variography was required.

Table 14.9 Cotabambas Copper Variography Parameter File

Description	VREFNUM	VANGLE1	VANGLE2	VANGLE3	VAXIS1	VAXIS2	VAXIS3	NUGGET
Cu1	1	-30	0	60	3	2	1	0.05
Cu2	2	-32.5	-15.94	-8.39	3	2	1	0.08
Cu3	3	-49.78	-4.83	-18.4	3	2	1	0.03
Cu4	4	-60.85	-7.44	-13.06	3	2	1	0.06
Description	ST1	ST1PAR1	ST1PAR2	ST1PAR3	ST1PAR4			
Cu1	1	10	42	28	0.347			
Cu2	1	22	30	30	0.444			
Cu3	1	18	14	2	0.061			
Cu4	1	109	16	26	0.64			
Description	ST2	ST2PAR1	ST2PAR2	ST2PAR3	ST2PAR4			
Cu1	1	22	152	39	0.118			
Cu2	1	76	127	30	0.476			
Cu3	1	59	24	11	0.209			
Cu4	1	124	162	26	0.3			
Description	ST3	ST3PAR1	ST3PAR2	ST3PAR3	ST3PAR4			
Cu1	1	38	311	62	0.485			
Cu2	-	-	-	-	-			
Cu3	1	80	155	140	0.7			
Cu4	-	-	-	-	-			

14.6.3 SEARCH AND SAMPLE PARAMETERS

The sample search used for estimation sample selection is based on the geological strike and dip orientation of mineralization as interpreted by Panoro site geologists. The total sill ranges and orientations derived from variography for each respective zone, such that the search ellipse (SMETHOD=2) for the first estimation pass matched the total sill ranges and rotations. However, for copper, the search ellipse size was designed to represent only 66% of the total sill range. This was purposely completed to assist in defining an Indicated resource classification in the estimated cells (i.e. SVOL = 1). An example of the search and sample parameter file, with restricted search ranges (SDIST1, 2 and 3), is tabulated in

Table 14.10 Cotabambas Copper Search and Sample Parameter File

SDESC	SREFNUM	SMETHOD	SDIST1	SDIST2	SDIST3	MAXKEY		
Cu1	1	2	250	150	80	3		
Cu2	2	2	76	127	30	3		
Cu3	3	2	80	155	140	3		
Cu4	4	2	124	162	26	3		
SDESC	SANGLE1	SANGLE2	SANGLE3	SAXIS1	SAXIS2	SAXIS3		
Cu1	-50	-80	0	3	1	2		
Cu2	-32.5	-15.94	-8.39	3	2	1		
Cu3	-49.78	-4.83	-18.4	3	2	1		
Cu4	-60.85	-7.44	-13.06	3	2	1		
SDESC	MINNUM1	MAXNUM1	SVOLFAC2	MINNUM2	MAXNUM2	SVOLFAC3	MINNUM3	MAXNUM3
Cu1	6	14	1.5	6	14	2	6	14
Cu2	6	14	1.5	6	14	2	6	14
Cu3	6	14	1.5	6	14	2	6	14
Cu4	6	14	1.5	6	14	2	6	14

This parameter file also defines the minimum and maximum number of samples to satisfy cell interpolation requirements. For sample selection, only 3 samples could be allocated to any single drillhole through the definition of “MAXKEY” (3). This was to ensure optimal special representation for interpolation.

The minimum number of samples required for successful interpolation in all passes was set to 6. This was designed to maximize the number of cells which could be interpolated while minimizing excessive averaging to preserve local variability in the estimate. The maximum number of samples was capped at 14. This was also to prevent over-averaging of the interpolation.

In Table 14.10, the search volume was expanded to 1.5 times the initial volume in the second pass, then twice the volume in the third pass (i.e. SVOLFAC2, 3). This was to accommodate the 66% ranges for the copper estimate. In other parameter files, the second and third search passes at two and three times the volume respectively.

14.7 RESOURCE BLOCK MODEL

14.7.1 METAL ESTIMATION

Copper, gold, silver and molybdenum were estimated into the resource model cells by means of OK, ID^2 and NN. Both ID^2 and NN were performed for model validation purposes only. Copper, gold and silver were estimated into their domains using samples as defined by the contact profiles for each domain. Molybdenum was estimated without any domain restraints due to the relatively low grades of the metal.

14.7.2 DENSITY ESTIMATION

Density was estimated into cells of the block model without domain restraints. Both ID^2 and NN were also estimated for density, but were only used for validation purposes only. If the OK estimation failed to interpolate into any cell, it was replaced by the ID^2 value. If ID^2 value failed to interpolate, it was replaced by the NN value. If all three estimation methods failed to estimate a cell, the absent value was assigned the average estimated cell value for that specific domain.

14.7.3 CELL ATTRIBUTES

Table 14.11 lists the cell attributes in the Cotabambas resource model. These attributes are either estimated, assigned to calculate.

Table 14.11 Cotabambas Model Cell Attributes

Attribute	Description	Type	
IJK	Unique cell identifier	Integer	Assigned
XC	Easting cell centroid	Integer	Assigned
YC	Northing cell centroid	Integer	Assigned
ZC	Elevation cell centroid	Integer	Assigned
XINC	Cell size - easting	Integer	Assigned
YINC	Cell size - northing	Integer	Assigned
ZINC	Cell size - elevation	Integer	Assigned
density	Density	Variable	Estimated
zone1	Domains for estimation	Integer	Assigned
zone2	Latite dykes domain	Integer	Assigned
dens_ok	Density estimated by OK	Variable	Estimated
dens_id	Density estimated by ID	Variable	Estimated
dens_nn	Density estimated by NN	Variable	Estimated
Cu_ok	Copper estimated by OK	Variable	Estimated
Cu_id	Copper estimated by ID^2	Variable	Estimated
Cu_nn	Copper estimated by NN	Variable	Estimated
Cu_f	F-Function estimated with copper	Variable	Estimated
Cu_lg	Lagrange Multiplier estimated with copper	Variable	Estimated

table continues...

Attribute	Description	Type	
Au_ok	Gold estimated by OK	Variable	Estimated
Au_id	Gold estimated by ID^2	Variable	Estimated
Au_nn	Gold estimated by NN	Variable	Estimated
Ag_ok	Silver estimated by OK	Variable	Estimated
Ag_id	Silver estimated by ID^2	Variable	Estimated
Ag_nn	Silver estimated by NN	Variable	Estimated
Mo_ok	Molybdenum estimated by OK	Variable	Estimated
Mo_id	Molybdenum estimated by ID^2	Variable	Estimated
Mo_nn	Molybdenum estimated by NN	Variable	Estimated
numsam	Number of samples used in cell estimation	Integer	Assigned
svol	Search volume used in cell estimation	Integer	Assigned
kv	Kriging variance for copper	Variable	calculated
bv	Block variance	Variable	calculated
KE	Kriging Efficiency	Variable	calculated
ZZ	Slope of Regression (ZZ*)	Variable	calculated
Cu_eq	Copper equivalent grade	Variable	calculated
rescat	Resource classification	Integer	Assigned
pit	Optimized pit shell number	Integer	Assigned
CuAS	Acid leach recovery	Variable	Estimated
CuCN	Cyanide leach grade	Variable	Estimated
CuR	Flotation recovery grade	Variable	Estimated
CuL	Copper sequential leaching grade	Variable	calculated
AuL	Gold sequential leaching grade	Variable	calculated
AgL	Silver sequential leaching grade	Variable	calculated
CuL_eq	Copper sequential leaching equivalent grade	Variable	calculated

14.8 MODEL VALIDATION

This section describes the methods and results in validating the OK block model. It essentially involves comparing statistics, visual sectional valuation of estimated cell grades and proximal drillhole data, and construction of swath plots which show the OK results in comparison with ID^2 and NN interpolations.

14.8.1 STATISTICS

Table 14.12 compares the statistics, per domain, of the different interpolation methods, as well as with the drillhole data (capped and composited) used for the estimation. The model statistics were generated from a regularized block model (no sub-cells) and confined to cells within pit number 36.

Table 14.12 Cotabambas Model and Drillhole Statistics by Domain

Zone	Type	Field	Records	Samples	Minimum	Maximum	Mean	Variance	Std Dev	CV
4	Model	Cu_ok	219,281	121,410	0.000	2.132	0.161	0.024	0.156	219,281
		Au_ok	219,281	121,410	0.000	1.647	0.095	0.012	0.111	1.3489
		Ag_ok	219,281	121,410	0.000	14.556	1.794	0.958	0.979	219,281
	ddh	Cu_pct	16,463	12,728	0.0001	3.0329	0.1760	0.0639	0.2528	1.4358
		Au_gt	16,463	11,487	0.0020	2.5782	0.0973	0.0321	0.1792	1.8405
		Ag_gt	16,463	11,832	0.1959	30.0000	1.8623	3.6504	1.9106	1.0260
5	Model	Cu_ok	219,281	26,036	0.000	2.266	0.161	0.052	0.229	0.9828
		Au_ok	219,281	26,036	0.000	1.200	0.076	0.012	0.111	1.2424
		Ag_ok	219,281	26,036	0.000	10.032	1.153	1.165	1.079	0.7876
	ddh	Cu_pct	16,463	1,307	0.0016	3.4466	0.2610	0.1546	0.3932	1.5065
		Au_gt	16,463	1,194	0.0040	2.4022	0.1112	0.0384	0.1960	1.7631
		Ag_gt	16,463	1,205	0.5000	16.7402	1.6414	2.2441	1.4980	0.9127
6	Model	Cu_ok	219,281	29,517	0.000	1.063	0.052	0.005	0.071	1.2217
		Au_ok	219,281	29,517	0.000	1.033	0.034	0.004	0.067	219,281
		Ag_ok	219,281	29,517	0.000	6.646	1.218	0.430	0.656	0.9610
	ddh	Cu_pct	16,463	1,908	0.0007	2.4124	0.1252	0.0552	0.2349	1.8766
		Au_gt	16,463	1,799	0.0017	1.8350	0.1049	0.0451	0.2123	2.0243
		Ag_gt	16,463	1,760	0.5000	17.4286	1.4635	1.6296	1.2766	0.8722
7	Model	Cu_ok	219,281	2,893	0.036	2.707	0.646	0.224	0.474	0.6973
		Au_ok	219,281	2,893	0.000	1.524	0.235	0.041	0.203	0.8146
		Ag_ok	219,281	2,893	0.500	12.605	2.451	2.411	1.553	0.5745
	ddh	Cu_pct	16,463	363	0.0006	3.5000	0.7680	0.6888	0.8299	1.0807
		Au_gt	16,463	358	0.0045	2.1573	0.2793	0.1207	0.3474	1.2436
		Ag_gt	16,463	325	0.5000	24.0000	2.9103	10.4897	3.2388	1.1129

Table 14.12 confirms the close affinity of the estimated grades with the actual (drillhole) grades. Note that the resource model was regularized to the parent cell configuration, and that the cells with “zero” Cu_ok were not deleted from the calculation. This is to accommodate absent values, as absent values cannot be regularized and must retain a “zero” value.

14.8.2 SECTIONS

The block model was visually validated by comparing the OK estimated grades and density with the immediate drillhole data. In general, there is good correlation, although localized averaging or “smoothing” will have, (a) lower estimated grades than immediate drillhole assays, and (b) in some cases have higher estimated grades than immediate drillhole assays. As there are many lower drillhole grade assays than higher drillhole grade assays, (a) will be more common than (b). Figure 14.13 to Figure 14.23 are representative northwest-southeast cross-sections of the block model with the drillhole traces.