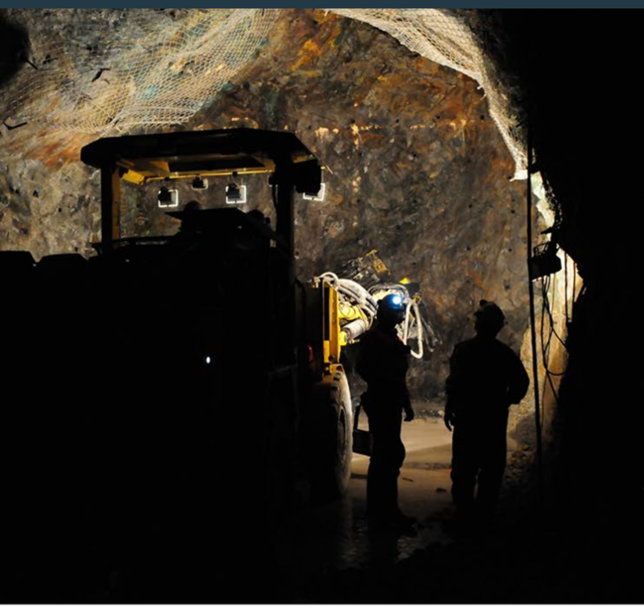
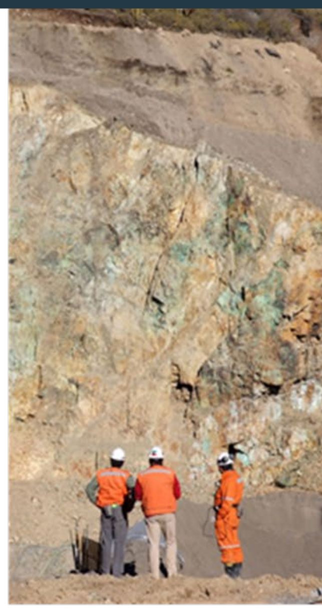
SRHI Inc.

wood.

INDEPENDENT
MINING CONSULTANTS, INC.

Minera Tres Valles Copper Project

Salamanca, Coquimbo Region, Chile
NI 43-101 Technical Report



Prepared for:
SRHI Inc.

Prepared by:
Mr Antonio Luraschi, Manager Metallurgic Development, Wood
Mr Alfonso Ovalle, Associate, Wood
Mr Michael G. Hester, FAusImm, Independent Mining Consultants, Inc.
Mr Enrique Quiroga, Mining Eng., Independent Consultant
Mr Gabriel Vera, Metallurgical Process Consultant, GVMetallurgy
Mr Sergio Alvarado, Consultant Geologist, Geoinvest Sergio Alvarado Casas E.I.R.L.

Effective Date:
04 October 2018

Revised and Amended Date:
27 May 2021

Project Number:
248964

CERTIFICATE OF QUALIFIED PERSON

I, Antonio Luraschi Gioia, Chemical Professional Engineer and Metallurgical Professional Engineer (Ingeniero Civil Químico and Ingeniero Civil Metalúrgico), am employed as a Project Manager and Consultant with Amec Foster Wheeler International Ingeniería y Construcción Ltda., a Wood company (Wood) with an address of Av. Presidente Riesco 5335, Piso 8, Las Condes, Santiago, Chile.

This certificate applies to the technical report titled "Minera Tres Valles Copper Project, Salamanca, Coquimbo Region, Chile. NI 43-101 Technical Report", dated May 27, 2021 with an effective date of October 4, 2018 (the "Technical Report").

I am a Registered Member of the Chilean Institute of Mining Engineers and a Qualified Person (persona competente) with the Chilean Mining Commission, registration number #188. I graduated from the University of Concepcion, Chile in 1970, and obtained M.Sc. (1973) and Ph.D. (1976) degrees from MIT in the United States.

I have practiced my profession for 45 years. I have been directly involved in economic evaluation of mining and metallurgical projects starting with my engineering thesis and continuing with numerous projects along my career, several of them similar to the present mining development project in recent years. As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 Standards of Disclosure for Mineral Projects (NI 43–101).

I have not visited the Minera Tres Valles site.

I am responsible for Sections 1.18, 1.19, 1.20, 1.21, 1.22, 1.23, 1.25, 1.26; Section 3, Section 19, Sections 21.1.2, 21.1.3, 21.2.3, 21.2.4; Section 22, Section 24; Sections 25.1, 25.12, 25.13, 25.14, 25.15, 25.16, and Section 27 of the Technical Report.

I am independent of Minera Tres Valles as independence is described by Section 1.5 of NI 43–101.

I have had no previous involvement with the Minera Tres Valles Copper Project other than co-authoring the technical report on the Minera Tres Valles Project filed on SEDAR on December 14, 2018.

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: May 27, 2021

"signed"

____

Antonio Luraschi
RM CMC

CERTIFICATE OF QUALIFIED PERSON

I, Alfonso Ovalle, Mining Engineer, am a subconsultant to Wood engineering company, with an address of Av. Presidente Riesco 5335, Piso 8, Las Condes, Santiago, Chile.

This certificate applies to the technical report titled "Minera Tres Valles Copper Project, Salamanca, Coquimbo Region, Chile. NI 43-101 Technical Report", dated May 27, 2021 with an effective date of October 4, 2018 (the "Technical Report").

I am a Registered Member of the Chilean Mining Commission (RM CMC #243). I graduated from the University of Chile as a Civil Mining Engineer in 1970. I enrolled in a Master of Science in Mineral Economics degree course at the Henry Krumb School of Mines, Columbia University, N.Y. from 1972 to 1973.

I have practiced my profession for 51 years since graduation. I have been directly involved in base and precious metals and limestone operations, planning, engineering, consulting, and management of underground mines mines in Chile, Peru, Argentina, Ecuador, South Africa, Australia, USA and Canada.

I have had no previous involvement with the Minera Tres Valles Copper Project other than co-authoring the technical report on the Minera Tres Valles Project filed on SEDAR on December 14, 2018.

I visited the Minera Tres Valles site on October 24, 2018.

I am responsible for Sections 1.1, 1.5, 1.12, 1.13, 1.14, 1.16, 1.24, 1.25; Section 2; Section 3; Section 6; Sections 15.1, 15.2.2, 15.2.3, 15.3, 15.4; Sections 16.1, 16.3, 16.4, 16.5; Section 18; Sections 25.1, 25.7, 25.8, 25.10, 25.16; Section 26.1 and Section 27 of the technical report.

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: May 27, 2021

"Alfonso Ovalle"

____

Alfonso Ovalle
RM CMC

INDEPENDENT
MINING CONSULTANTS. INC.

CERTIFICATE OF QUALIFIED PERSON

I, Michael G. Hester, Mining Engineer, am employed as Vice President and Principal Mining Engineer of Independent Mining Consultants, Inc., at 3560 E. Gas Road, Tucson, Arizona, 85714, USA.

This certificate applies to the technical report titled "Minera Tres Valles Copper Project, Salamanca, Coquimbo Region, Chile, NI 43-101 Technical Report", dated May 27, 2021 with an effective date of October 4, 2018 (the "technical report").

I am a Fellow of the Australasian Institute of Mining and Metallurgy (FAusIMM #221108). I graduated from the University of Arizona with a B.S. in mining engineering in 1979 and a M.S. in mining engineering in 1982.

I have practiced my profession for 42 years since graduation. I am a founding partner, Vice President, and Principal Mining Engineer for Independent Mining Consultants, INC. ("IMC"), a position I have held since 1983. I have been employed as an Adjunct Lecturer at the University of Arizona (1997-1998) where I taught classes in open pit mine planning and mine economic analysis. I am also a member of the Resources and Reserves Committee of the Society of Mining, Metallurgy, and Exploration since March 2012. I have many years of experience developing mineral resource models, developing open pit mine plans and production schedules, calculating equipment requirements for open pit operations, developing mine capital and operating cost estimates, performing economic analysis of mining operations and managing various PEA, Pre-Feasibility, and Feasibility Studies.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* (NI 43–101).

I visited the Minera Tres Valles site on September 20-21, 2017 and May 17-18, 2017.

I am responsible for Sections 1.1, 1.2, 1.3, 1.4, 1.10, 1.11, 1.12, 1.13, 1.14, 1.16, 1.17, 1.25; Section 2; Section 3; Section 4; Section 5; Section 14; Sections 15.1, 15.2, 15.2.1, 15.2.3, 15.3, 15.4; Sections 16.2, 16.2.1, 16.2.2, 16.2.3, 16.2.4, 16.2.5, 16.2.6, 16.2.7; Section 18; Section 20; Sections 21.1, 21.1.1, 21.2, 21.2.1, 21.2.2; Section 23; Sections 25.1, 25.2, 25.6, 25.7, 25.8, 25.10, 25.11, 25.13, 25.14, 25.16; Section 26.1 and Section 27 of the technical report.

I am independent of SRHI Inc. as independence is described by Section 1.5 of NI 43–101.

My previous involvement with the Minera Tres Valles Copper Project includes work for the March 29, 2018 technical report and also work during 2017 for a due diligence review for another party.

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: May 27, 2021

"*Michael G. Hester*"

Michael G. Hester, FAusIMM

CERTIFICATE OF QUALIFIED PERSON

I, Enrique Quiroga, Mining Engineer, work as an Independent Consultant, with a business address at Quillapy 7292, Huechuraba, Santiago, Chile.

This certificate applies to the technical report titled "Minera Tres Valles Copper Project, Salamanca, Coquimbo Region, Chile, NI 43-101 Technical Report", dated May 27, 2021 with an effective date of October 4, 2018 (the "technical report").

I am a Registered Member of the Chilean Mining Commission (RM CMC #039). I graduated from the University of Chile as a Civil Engineer in 1984. I completed a postgraduate degree in Hydrometallurgy and Electrometallurgy at the same University in 1995.

I have practiced my profession for 41 years since graduation. I have been directly involved in base and precious metals and limestone operations, planning, consulting, and management of underground mines and open pit mines in Chile, Peru, Argentina and Panama.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* (NI 43–101).

I visited the Minera Tres Valles site on the 2nd of August 2018. Between 2015 and 2017 I worked as a mining consultant for Minera Tres Valles and visited the mines several times.

I am responsible for Sections 1.15; Section 17; Section 25.9; Section 26.1 and Section 27 of the technical report.

I am independent of SRHI Inc. as independence is described by Section 1.5 of NI 43–101.

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: May 27, 2021

"*Enrique Quiroga*"

Enrique Quiroga
RM CMC

GVMetallurgy

CERTIFICATE OF QUALIFIED PERSON

I, Gabriel Vera, Extractive Metallurgical Engineer, am employed as an Independent Consultant at GVMetallurgy EIRL, at Camino Lo Pinto S/N, Parcela 182 Condominio Las Garzas II, Santiago, Chile.

This certificate applies to the technical report titled "Minera Tres Valles Copper Project, Salamanca, Coquimbo Region, Chile. NI 43-101 Technical Report", dated May 27, 2021 with an effective date of October 4, 2018 (the "technical report").

I am a Registered Member of the Chilean Mining Commission (RM CMC #280). I graduated from the Arturo Prat University as an Extractive Metallurgical Engineer in 1989.

I have practiced my profession for 32 years since graduation. I have been directly involved in base metals projects in a Mineral Processing facility in Chile.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* (NI 43–101).

I visited the Minera Tres Valles site on the 23 of March 2018.

I am responsible for Sections 1.9; Section 13; Section 25.5; Section 26.1 and Section 27.

I am independent of SRHI Inc. as independence is described by Section 1.5 of NI 43–101.

I have had no previous involvement with the Minera Tres Valles Copper Project.

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: May 27, 2021

"*Gabriel Vera*"

Gabriel Vera
RM CMC

CERTIFICATE OF QUALIFIED PERSON

I, Sergio Alvarado, am a Consultant Geologist, General Manager and partner, who works at Geoinvest Sergio Alvarado Casas EIRL as Project Manager, the main office of which is located at Badajoz 100 office 523, Las Condes, Santiago, Chile.

This certificate applies to the technical report titled "Minera Tres Valles Copper Project, Salamanca, Coquimbo Region, Chile, NI 43-101 Technical Report", dated May 27, 2021 with an effective date of October 4, 2018 (the "technical report").

I am a Registered Member of the Chilean Institute of Mining Engineers and a Qualified Person (persona competente) with the Chilean Mining Commission, registration number #004. I am registered at the Canadian Institute of Mine (CIM), license #144015. I graduated from the Catholic University of the North as a Geologist in 1991. I enrolled in postgraduate studies in resource assessment at the University of Chile in 1997.

I have practiced my profession for 30 years since graduation. I have reviewed the calculations of many resources and reserves estimations for both metallic and nonmetallic projects.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* (NI 43–101).

I visited the Minera Tres Valles site on the 15 to 17 of July 2015.

I am responsible for Sections 1.6, 1.7, 1.8; Section 7; Section 8; Section 9; Section 10; Section 11; Section 12; Sections 25.3, 25.4; Section 26.2 and Section 27 of the technical report.

I am independent of SRHI Inc. as independence is described by Section 1.5 of NI 43–101.

I have had no previous involvement with the Minera Tres Valles Copper Project.

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: May 27, 2021

"*Sergio Alvarado*"

Sergio Alvarado
RM CMC

IMPORTANT NOTICE

This report was prepared as National Instrument 43-101 Technical Report for SRHI Inc. *(SRHI)* by Wood Canada Limited (*Wood*). The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in Wood's services, based on i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this report. This report is intended for use by SRHI subject to terms and conditions of its contract with Wood. Except for the purposed legislated under Canadian provincial securities law, any other uses of this report by any third party is at that party's sole risk.

CONTENTS

TABLES

FIGURES

APPENDICES

1.0 SUMMARY

1.1 Introduction

SRHI Inc. (SRHI) requested that Wood Canada Limited (Wood), compile a report in Form 43-101F1 format (the Report) for the Tres Valles Copper Project (the Project) located in Chile (Figure 2-1).

The purposes of this Report are the following:

- Development of a Mineral Resource estimate for the Don Gabriel and Papomono deposits using Canadian Institute of Mining, Metallurgy, and Petroleum (CIM) Definitions Standards for Mineral Resources and Mineral Reserves - May 10, 2014 (CIM Definition Standards)
- Present the study for the implementation of chloride leaching done at a Preliminary Feasibility Study (PFS) level
- Present a Feasibility Study (FS) for the expansion of the Don Gabriel Manto open pit
- Present a Preliminary Feasibility Study (PFS) for the underground exploitation of the Papomono Masivo mining zone, and
- At the request of staff of the Ontario Securities Commission a revised technical report was prepared to replace the previous technical report by excluding the Preliminary Economic Assessment of the additional mineral resources on the Minera Tres Valles property. No other adjustments or updates were made to this revised technical report. This revised technical report retains the economic and technical assumptions valid at the date of its original publication.

This work commenced during January 2018 and was completed during October 2018.

The mine plan considers the exploitation of Don Gabriel Manto open pit, the Papomono Masivo underground mining zone and the processing of the ore, from July 2019 by chloride leaching. The previously mentioned studies support the Mineral Reserves incorporated into the mine plan.

Don Gabriel Manto commenced the exploitation in 2012 using open pit method and, after a period of suspension from 2014 to 2016, it is currently in the ramp-up phase reaching its maximum production capacity (about 2.4 kt/d) at the beginning of 2019.

The mine plan is based on Mineral Reserves of 5.168 million tonnes at 0.81% total copper (TCu) and is expected to produce approximately 14 million pounds of copper per year over a six-year reserve life.

The Papomono Masivo is designed to be exploited using the inclined block caving method (IBC) and its underground operation is planned to start in September 2019. A sector of Papomono Masivo is under exploitation using front caving method (FC) and is planned to continue until before the start-up of the inclined block caving operation. The mine plan considers reserves of 3.07 million tonnes at 1.5% TCu and during its useful life of about 5 years will produce the order of 12.5 million pounds of copper per year.

When both the Don Gabriel Manto and Papomono Masivo sectors reach their production capacity, the total capacity of mine production will be around 5.0 kt/d (year 2021). This will allow the plant to operate at a substantial percentage of its capacity (nominal 150,000 t/month and maximum 180,000 t/month).

MTV plans to improve the confidence level of the Mineral Resources and to convert them into Mineral Reserves, through additional in-fill and geotechnical drill holes and additional engineering applied within at least a PFS.

The project is 100% owned by MTV. SRHI purchased a 70% interest in MTV from the Vecchiola Group during October 2017. The Vecchiola Group retains a 30% interest in MTV.

1.2 Terms of Reference

The Report was prepared using the format and content requirements in Form 43-101F1 to provide updated information on the Mineral Resources, Mineral Reserves and current mine plans.

The Report uses Canadian English. Monetary units are in United States dollars (US$) unless stated otherwise. The Chilean currency is the peso (CLP). Units are metric unless otherwise stated.

In this Report, the term “heap leach” is used to refer to crushed and stacked material that is subject to leaching.

1.3 Project Setting

The Project is located in the Coquimbo Region, approximately 290 km north of Santiago, between latitude 31°39′50″ S and 31°42′20″ S and longitude 70°55′00″ W and 70°57′35″ W.

The main access to MTV uses the D-81 road, which connects Illapel with Salamanca. From Santiago, it is 222 km north by route 5-N until the city of Los Vilos. From Los Vilos, the road runs for 93 km east, following the Pupios Valley, crossing the Cavilolén Range and entering into the Choapa Valley. The main MTV entrance is located 9 km from Salamanca in the Chuchiñí community. At this point a 5 km long private road connects to the MTV process plant. The plant site coordinates are 31°43′43″ S and 71°00′45″ W.

The elevation of the plant is around 600 m.a.s.l. (meters above sea level), while the mines are between 1,400 m.a.s.l. and 1,600 m.a.s.l., allowing year-round operation (snowfall is minimal and very uncommon). The project is located around the La Horqueta Hill (1,965 m.a.s.l) which acts as a watershed for three valleys: Manquehua to south, Quilmenco to SW and Cárcamo to north.

The Project is primarily situated in the Choapa River basin, specifically in the Quebradas Manquehua (tributary of the Chalinga River sub-basin) and Quilmenco and in the Quebrada de Cárcamo (tributary of the Illapel River). The area is situated in a temperate steppe climate.

1.4 Mineral Tenure, Surface Rights, Water Rights, Royalties and Agreements

MTV holds 229 exploitation concessions, totalling an area of 46,378 ha. A total of 215 exploitation concessions are fully constituted and registered. Fourteen exploitation concessions are under administrative process, waiting resolution through a legal judgement and require topographic survey, or are over-staking existing MTV concessions to close slivers or gaps ("demasías") between concessions.

Three concessions have partial overlaps with concessions held by third-parties; however, none of the Mineral Resources, Mineral Reserves or infrastructure areas are affected by these overlaps.

Under Chilean law, exploitation concessions do not have an expiry date.

MTV currently holds approximately 218 ha of effective occupation area and 373 ha of easements areas, besides MTV has 445 ha of owned property. This is sufficient to support the open pit, underground and process plant operations.

The project has rights to both surface and underground water sources. Water is collected from irrigation canals from two different watersheds, the Chalinga watershed and the Choapa watershed. The Choapa watershed is a reliable water source even during the dry months in Salamanca.

In addition to these watersheds, the rights to underground water reserves are available for use by MTV. There is also potential to use underground water from the Papomono mine, which has a flow rate of approximately 2 to 5 L/s.

At full capacity, the Project will use 20 L/s of water, less than a third of the available water rights. The Project is permitted to use 64 L/s.

There is a royalty payable to the Chilean government depending on the production rate.

There are no remaining payments required, and SRHI has a full 70% interest in the Project. There are no back-in rights or clawback agreements whereby the Project interest held by SRHI could revert to the former owners

1.5 History

Vale S.A. (Vale) acquired mineral tenure in what became the Project area through a tenure purchase agreement with Minera Werenfried. The selected tenures covered an area of oxide copper mineralization being exploited by artisanal miners.

The copper mineralization within the MTV Project was identified by Vale in 2005, through a combination of ground induced polarization (IP) geophysical surveys and drilling. The Papomono deposit was discovered in June 2005, and the Don Gabriel deposit in April 2006.

During 2008, Vale approved Project construction. The Project environmental license was granted in October 2009. The plant was commissioned in December 2010, and cathode production commenced in February 2011.

Vale sold the Project to the Vecchiola Group in 2013. The Vecchiola Group closed the mining operations, focusing instead on toll-treatment material, to re-evaluate the

Project as a whole. In October 2015, small-scale production recommenced on a trial basis, and an updated long-term mine plan was produced.

In 2016, metallurgical testwork focused on whether recoveries could be improved using oxidizing agents.

In September 2017 Vecchiola sold 70% of MTV to SRH Chile SpA, a SRHI subsidiary.

A FS on Don Gabriel Manto was completed in March 2018. During 2018 a PFS was competed on Papomono Masivo zone.

1.6 Geology and Mineralization

The MTV deposits are in a regional horst–graben system, formed by a 10 km wide corridor of middle to upper Cretaceous volcanic rocks, and bounded by kilometre-scale north–south-trending faults.

The volcanic units consist of a thick package of flat-lying or gently dipping beds of lava, pyroclastic and epiclastic rocks. Valley slopes host pediments of the Barremian–Albian Quebrada Marquesa Formation.

Two major faults have been delineated, the Manquehua and Llimpo Faults. The faults result in a sharp contact between intrusive and volcanic rocks, and are also visible in aeromagnetic survey data.

The geophysical data also indicate a number of east–northeast to west–southwest trans-Andean structures that are coincident with some valleys (e.g. Chalinga Valley). These structures are often associated with Chilean porphyry copper deposits.

The Project have two deposits named Don Gabriel and Papomono, which are described as follow.

The Papomono deposit has been divided into seven major areas, some of which have sub-zones.

- Papomono Masivo
- Papomono Norte
- Manto Norte
- Papomono Sur
- Papomono Mantos Conexión

- Papomono Cumbre
- Epitermal

The stratigraphy observed in the Papomono deposit consists of a sequence of andesites interbedded with pyroclastic rocks of the Quebrada Marquesa Formation.

The dominant hypogene sulphides in the deposit are in decreasing order: chalcocite–covellite (~85%), bornite (~6%), enargite (~5%) and chalcopyrite (~4%). Supergene chalcocite is not common. In places where intense fracturing and faulting occurs, the action of oxidizing agents generates oxide copper minerals including chrysocolla, malachite, brochantite and atacamite. For this reason, the traditional vertical zonation of oxides on the top of a deposit and sulphides at depth does not occur at Papomono.

The Don Gabriel deposit has been divided into two major areas.

- Don Gabriel Manto
- Don Gabriel Vetas

Don Gabriel Manto occur in a 110 m thick package of andesites. The mantos are continuous along strike and dip but the thickness can vary from 20–60 m. The mantos can merge and split: typically, there are two main mantos that may join up to form a single manto, and there may be minor mantos adjacent to the main mantos. The mineralized zone is outlined by a 0.2% TCu isograd.

The 100 m thick upper manto zone consists of stratabound, finely disseminated chalcocite mineralization dipping to the south–southwest at 30°. The mineralized zone is developed in amygdaloidal andesites.

In Don Gabriel Vetas, the mineralization is not vein hosted, but has a vein-type shape, with high-grade copper mineralization following contacts of sub-vertical microdioritic dikes. These dikes are 1–8 m-thick and, in general have N45°W strike, dipping 50° to 85° to the northeast or southwest. A minor low-grade manto has also been identified.

The lower, vein-shaped zone consists of high-grade stockwork or sheeted veinlets, and sulphide-bearing knots and disseminations. The primary copper minerals include chalcocite, digenite and some bornite. The host rock to mineralization is a medium- to coarse-textured porphyritic andesite and/or dioritic to microdioritic dikes.

Five lithological units are found in the Don Gabriel deposit area, all of which are upper members of the Quebrada Marquesa Formation. The units strike N60°W, and dip to the southwest at 25°.

In addition to the major mantos-style mineralization, the Project hosts cupriferous epithermal veins. These are examples of high sulphidation epithermal deposits.

1.7 Drilling and Sampling

From 2005 to 2012, Vale executed more than 170,000 m of exploration and in-fill drill holes, which is about 22,300 m/a on average. The maximum yearly drilling program was 40,767 m, in 2008.

Major Drilling, Terraservice and Geotec Boyles performed the drilling campaigns. About 98.5% of drilling are diamond drill holes (DDH).

From 2007 to 2011, 18,000 m of in-fill underground drill holes were executed in Papomono, from the main tunnel stubs and cross-stations.

Most of the drilling (65%) was executed in the Papomono area, as it was considered the more complex mineralization. Then, Don Gabriel, with 23% and Amarilla-Verde and surrounding area, with 8% of the total. Only 4% of regional exploratory drillholes were executed in the 97% remaining land away from the known Mineral Resources.

Drill core was delivered by the drilling contractors in 1 m long wooden boxes, identified by project, hole ID, box number and box interval. Inside the boxes “blocking plugs” marked the core metreage and the core recovery of the interval. This was then checked by MTV´s geological technicians, validating the core information with the recovery sheet delivered by the contractor.

The same team proceeded to a “core regularization” process, marking equal-length core intervals. Core boxes were photographed under daylight conditions. The cores were then sent to geological and geotechnical personnel for logging at 1:100 scale, sample markup and diamond-saw cutting. The samples were then bagged, labeled and packaged and dispatched to the laboratory. The weight of sample sent to the laboratory was typically between 2 and 4 kg.

At ALS Chemex laboratory, the samples were crushed to 70% passing 2 mm. A riffle splitter was then used to split out about 250 g of material that was then pulverized to 85% passing 75 µm.

The analytical work for the exploration drilling was performed at ALS Chemex in Santiago, Chile.

First, each sample was digested in aqua regia followed by ICP-AES analysis to obtain assays on 36 different elements. For sample intervals where the copper ICP-AES determination exceeded 2,000 ppm, i.e. 0.2% copper, two additional sets of determinations were done:

- A total copper (TCu) assay by four-acid digestion and atomic absorption spectroscopy (AAS)
- A three-step sequential analysis to determine sulphuric acid-soluble copper (ASCu), cyanide-soluble copper (CNCu), and residual copper (RCu).

QA/QC procedures in MTV were initially established by Vale's Exploration Department and then were improved and complemented following the recommendations from the Snowden audits.

Since all the drilling was completed during Vale's ownership, it was not possible for the Qualified Person to observe the chain of custody for samples. However, there was an audit of the standard procedures conducted by Snowden and reported in "Soc. Contractual Minera Tres Valles: Resource/Reserve Practices – Standard Procedures", dated March 2013.

1.8 Data Verification

For Don Gabriel, Independent Mining Consulting, Inc. (IMC) selected 9 drill holes to compare the assays in the database with original assay certificates.

For Papomono, IMC selected 20 drill holes to compare the assays in the database with original assay certificates.

IMC checked the ICP total copper, the AAS total copper, and the soluble copper assays for each sample interval. IMC also checked the downhole survey information for each hole against the original measurements.

1.9 Metallurgical Testwork

To evaluate copper recovery, column tests were performed at SGS between 2008 and 2011 with samples from Papomono and Don Gabriel. In addition, column and heap tests were operated by MTV at the mine site in 2016 and 2017 using fresh samples of Papomono and Don Gabriel material, taken after improved access to both deposits.

After plant start-up in 2010, 12 leaching columns of 0.19 m diameter (six 6 m columns of and six 3 m columns of) were set up at SGS and operated between February 3 and October 18, 2011 for periods of 267 and 273 days.

The SGS column tests used four columns of high-grade (HG) copper-bearing material from Papomono (3.72– 4.06% TCu), four columns of low-grade (LG) copper-bearing material from Papomono (1.02–1.17% TCu), and four columns of copper-bearing material from Don Gabriel (1.21–1.23% TCu).

The MTV plant has been operating with primary ("oxide") and secondary ("sulphide") leaching under chemical leaching conditions during the whole leaching cycle, taking advantage of the ferric ions generated during leaching of the oxide and sulphide materials.

The SGS column test results are used as convenient reference information, as an acceptable copper recovery was obtained with leaching cycles around 270 days. The comparison factors between P80 below ¼" against P50 below ¼" (with P95 below ½" in both cases) are also of interest. The copper recovery control per column metre represented an important tool for leaching optimization, such as sulphuric acid addition to the agglomeration drum and specification of the heap height.

Process studies and columns tests conducted during 2016 and 2017 by MTV indicated an opportunity to improve sulphide copper recovery results by using salt or chloride leaching.

The implementation of the chloride leach process is expected to be operative in July 2019.

1.10 Mineral Resource Estimation

To establish "reasonable prospects for eventual economic extraction", estimated unit costs for mining, processing, general and administrative (G&A), and SX/EW, as well as process recoveries have been developed to calculate appropriate cut-off grades for mining. The resource estimates are based on a copper price of US$3.30 per pound of finished copper. The open pit mining methods are constrained within a pit shell, and those amenable to underground mining methods are constrained within mineable shapes.

1.11 Mineral Resource Statement

Table 1-1 presents the Mineral Resource estimate for the Minera Tres Valles Copper Project.

Table 1-1: Mineral Resource

Resource Class	Mining Method	TCu Cut-off (%)	Tonnage (kt)	TCu (%)	ASCu (%)	CNCu (%)	RCu (%)	Copper (klbs)
Measured								
Don Gabriel Manto	OP	0.20	983	0.82	0.13	0.59	0.11	17,857
Don Gabriel Vetas	UG	0.64	0	0.00	0.00	0.00	0.00	0
Papomono Masivo	UG	0.34	2,449	1.94	0.47	1.34	0.14	104,796
Papomono Cumbre	OP	0.19	266	0.49	0.07	0.38	0.04	2,844
Papomono Cumbre	UG	0.34	0	0.00	0.00	0.00	0.00	0
Papomono Mantos Conexión	UG	0.59	262	1.27	0.41	0.67	0.19	7,312
Papomono Sur	UG	0.58	634	1.28	0.24	0.95	0.08	17,821
Epitermal	UG	0.65	0	0.00	0.00	0.00	0.00	0
Papomono Norte	OP	0.19	102	0.96	0.58	0.22	0.15	2,150
Manto Norte	UG	0.58	834	1.08	0.50	0.52	0.06	19,894
Measured Mineral Resource			**5,530**	**1.42**	**0.37**	**0.94**	**0.11**	**172,674**
Indicated								
Don Gabriel Manto	OP	0.20	5,476	0.83	0.11	0.63	0.09	99,959
Don Gabriel Vetas	UG	0.64	0	0.00	0.00	0.00	0.00	0
Papomono Masivo	UG	0.34	891	1.62	0.43	1.08	0.11	31,881
Papomono Cumbre	OP	0.19	2,388	0.54	0.10	0.39	0.06	28,429
Papomono Cumbre	UG	0.34	351	0.48	0.04	0.41	0.02	3,699
Papomono Mantos Conexión	UG	0.59	1,287	1.02	0.33	0.47	0.23	28,856
Papomono Sur	UG	0.58	989	1.00	0.32	0.58	0.10	21,760
Epitermal	UG	0.65	509	0.98	0.34	0.32	0.32	10,997
Papomono Norte	OP	0.19	250	1.00	0.57	0.29	0.14	5,506
Manto Norte	UG	0.58	633	0.97	0.44	0.46	0.07	13,495
Indicated Mineral Resource			**12,774**	**0.87**	**0.20**	**0.56**	**0.11**	**244,581**
Measured+Indicated								
Don Gabriel Manto	OP	0.20	6,459	0.83	0.11	0.62	0.10	117,816
Don Gabriel Vetas	UG	0.64	0	0.00	0.00	0.00	0.00	0
Papomono Masivo	UG	0.34	3,340	1.86	0.46	1.27	0.13	136,676
Papomono Cumbre	OP	0.19	2,654	0.53	0.09	0.39	0.05	31,273
Papomono Cumbre	UG	0.34	351	0.48	0.04	0.41	0.02	3,699
Papomono Mantos Conexión	UG	0.59	1,549	1.06	0.34	0.50	0.22	36,168
Papomono Sur	UG	0.58	1,623	1.11	0.29	0.73	0.09	39,581
Epitermal	UG	0.65	509	0.98	0.34	0.32	0.32	10,997
Papomono Norte	OP	0.19	352	0.99	0.58	0.27	0.14	7,656
Manto Norte	UG	0.58	1,467	1.03	0.47	0.50	0.07	33,389
Meas+Ind Mineral Resource			**18,304**	**1.03**	**0.25**	**0.68**	**0.10**	**417,255**
Inferred								
Don Gabriel Manto	OP	0.20	79	0.70	0.50	0.12	0.07	1,216
Don Gabriel Vetas	UG	0.64	2,020	1.33	0.14	1.04	0.15	59,273
Papomono Masivo	UG	0.34	22	2.64	0.42	1.98	0.25	1,282
Papomono Cumbre	OP	0.19	537	0.66	0.17	0.42	0.08	7,861
Papomono Cumbre	UG	0.34	298	0.53	0.07	0.43	0.04	3,482

Resource Class	Mining Method	TCu Cut-off (%)	Tonnage (kt)	TCu (%)	ASCu (%)	CNCu (%)	RCu (%)	Copper (klbs)
Papomono Mantos Conexión	UG	0.59	117	0.79	0.28	0.18	0.33	2,043
Papomono Sur	UG	0.58	111	0.95	0.40	0.38	0.17	2,317
Epitermal	UG	0.65	223	1.01	0.48	0.21	0.33	4,970
Papomono Norte	OP	0.19	13	2.90	0.50	2.23	0.18	832
Manto Norte	UG	0.58	37	1.39	0.70	0.39	0.30	1,131
Inferred Mineral Resource			**3,457**	**1.11**	**0.19**	**0.77**	**0.15**	**84,408**

Notes to accompany Mineral Resources table:

1. The Mineral resource estimate has an effective date of January 1, 2018 and is classified in accordance with the CIM Definition Standards in accordance with the requirements of National Instrument 43-101 - Standards of Disclosure for Mineral Projects ("NI 43-101"). The Qualified Person is Michael G. Hester, Vice President, IMC, M.S. Mining Engineering.
2. Mineral resources were estimated using a copper price of US$3.30/lb.
3. OP means open pit mining, UG means underground mining method.
4. Cutoff grades vary by deposit to reflect likely mining methods, variations in costs and slight variances in expected metal recovery by deposit.
5. The Mineral Resources are in-situ estimates. IMC has not included any dilution or mining loss assumptions in the estimates.
6. TCu is total copper assay, comprised of acid soluble (ASCu), cyanide soluble (CNCu) and residual copper (RCu), each with different metallurgical recoveries. Recoveries based on conversion from existing acid leach method to chloride media acid leaching.
7. Average copper recovery is estimated at about 87% for the Don Gabriel Manto and Don Gabriel Vetas. The copper recovery for the various Papomono deposits range from 85% for the Epitermal to 90% for Papomono Masivo.
8. It is assumed that Don Gabriel Manto, Papomono Norte and a portion of Papomono Cumbre will be mined by open pit methods by a mining contractor. Estimated contract mining costs are $2.35 and $2.15/t for mineralization and waste respectively. The plant feed haulage cost is estimated at $2.21/t for Don Gabriel and $1.76/t for Papomono and is based on a contractor quote.
9. IMC does not believe that there are significant risks to the mineral resource estimates based on environmental, permitting, legal, title, taxation, socio-economic, marketing, or political factors other than discussed in the Report.
10. Further information, including key assumptions, parameters and methods used to estimate mineral reserves and mineral resources are described in the Report.
11. Mineral resources are reported inclusive of mineral reserves. Mineral resources that are not mineral reserves do not have demonstrated economic viability. Mineral resources for proposed open pit deposits are constrained within an economic pit shell.
12. Totals may not add due to rounding.

Measured and Indicated Mineral Resources amount to 18.3 Mt at 1.03% TCu for 417.3 million contained pounds of copper. Inferred Mineral Resources are an additional 3.46 Mt at 1.108% TCu for 84.4 Mlbs copper. The table also shows grades for ASCu, CNCu, and residual copper (RCu) since these components are used for metal recovery calculations, however they are not additive to the TCu grade.

1.12 Mineral Reserve Estimation

Mineral Reserves are based on an open pit mine plan developed by IMC and underground mine plan and mine production schedule developed by Wood with a cut-off grade of 0.25% TCu for open pit, and 0.40% TCu and 0.47% TCu cut-off grades for the inclined block caving and front caving methods respectively. The Mineral Reserves are based on a copper price of US$ 2.75 per pound. Measured Mineral Resources in the mine production schedule were converted to Proven Mineral Reserves, and Indicated Mineral Resources were converted to Probable Mineral Reserves. Ore loss and dilution assumptions are also incorporated into the estimate.

1.13 Mineral Reserve Statement

Mineral Reserves are reported in Table 1-2 for the Don Gabriel Manto and Papomono Masivo deposits. The Proven and Probable Mineral Reserve amounts to 8.2 million tonnes at 1.071% total copper for 88.3 kt contained copper. The effective date of this mineral reserve estimate for Don Gabriel Manto is January 1, 2018 and for Papomono Masivo is July 31, 2018.

Factors that may affect the estimates include: changes to the metal price assumptions; commodity market conditions and pricing; changes to the estimated Mineral Resources used to generate the mine plan; changes in the metallurgical recovery factors; changes in the geotechnical assumptions used to determine the overall slope angles; changes to the operating cut-off assumptions for heap leach feed and ability to maintain social and environmental licence to operate.

Table 1-2: Mineral Reserve Statement

Category	Tonnage (kt)	Grade (% TCu)	Contained Copper (kt Cu)
Don Gabriel Manto			
Proven	898	0.80	7.1
Probable	4,270	0.82	34.9
Total Proven and Probable for Don Gabriel Manto	***5,168***	***0.81***	***42.1***
Papomono Masivo			
Proven	2,559	1.51	38.7
Probable	508	1.48	7.5
Total Proven and Probable for Papomono Masivo	***3,067***	***1.51***	***46.2***
Total Proven and Probable	***8,235***	***1.07***	***88.3***

Notes to accompany Mineral Reserves table:

1. Mineral Reserves are reported with an effective date of January 1st, 2018 for Don Gabriel Manto and July 1st, 2018 for Papomono Masivo.

2. The Qualified Persons for the estimate are Mr. Michael Hester, FAusIMM, an IMC employee for the Don Gabriel Manto Mineral Reserves and Mr. Alfonso Ovalle, RM CMC, a sub-consultant to Wood, for the Papomono Masivo Mineral Reserves.
3. For the open pit mining, all Mineral Reserves are contained within an optimized pit shell. Mining will use conventional open pit methods and equipment. Direct mining costs are estimated averaging $2.15 /t of material mined and $1.95/t per waste tonne. The overall slope angle was 50°. Minimal dilution and ore loss are incorporated into the block model. For mine planning and mineral reserve estimation a diluted model was constructed. Blocks with less than 30% manto solid contained in them were excluded as lost ore. Blocks with between 30% and 99.9% manto solid contained in them were diluted to full blocks with a dilution grade of 0.1% TCu.
4. For the underground mining, all Mineral Resources within the cave outline have been converted to Probable and Proven Mineral Reserves. This includes low-grade Indicated Mineral Resource and Inferred Mineral Resource assigned zero grade that is treated as dilution. A footprint cut-off 0.40% TCu for the inclined block cave and 0.47% TCu for front caving was used define the footprint and column heights. An average dilution entry point of 40% of the column height was used. The NSR calculation assumed metal prices of $2.75/lb Cu. Metallurgical assumptions in the NSR include recoveries of 89.37% for Cu. The recoveries correspond to the chloride leach process, to be operational from July 2019 onwards in the process plant.
5. Processing costs for material sent to the heap leach are $9.64/t for underground mining and $9.73/t for open pit.
6. G&A costs were assumed as $0.20/lb Cu and the SX/EW costs were assumed as $0.19/lb Cu.
7. Tonnage and contained copper are reported in metric units and grades are reported as percentages.
8. Rounding as required by reporting guidelines may result in apparent summation differences between tonnes, grade and contained metal.

There are no other known environmental, legal, title, taxation, socioeconomic, marketing, political or other relevant factors that would materially affect the estimation of Mineral Reserves that are not discussed in this Report.

1.14 Mining Methods

The Don Gabriel open pit mine plan includes an ore production rate for 852,000 t/a, that corresponds to 2,400 t/d for 365 days per year. During April, May, and June of 2018 the operation takes a total production ramp up until 55,000 t/month. It can also be seen that total production peaks at 1.7 Mt per quarter (6.8 Mt per year) during 2019 to achieve full production for three of the four quarters of the year. Total production is 1.6 Mt per quarter for the first three quarters of 2020 after which it can be reduced. Total Mineral Reserve amounts to 5.17 Mt at 0.81% TCu. This contains 92.7 million copper pounds or 80.5 million payable copper pounds. Average recovery of total copper is 86.9%. Total ROM is 27.1 Mt for a 4.26 strip ratio.

Papomono Masivo uses a combination of front caving and inclined block caving mining methods, based on financial considerations, deposit geometry and geotechnical characteristics.

Three dominant fault systems are present:

- Manquehua fault: This structure strikes N20°W and dips to the east (60° to 85°).
- Papomono fault system: N40°W striking structure (320°), with a variable dip from 60° to 90° to the west.
- East-west faults: Approximately 1 m wide east-west to northeast-striking structures, with subvertical dips.

A work plan was derived, based on an investment limit concept: Project initial infrastructure (civil and mining) whose costs should not exceed US$ 10 million as the initial capital cost, excluding mobile equipment and attain a production capacity of 2,000 t/d.

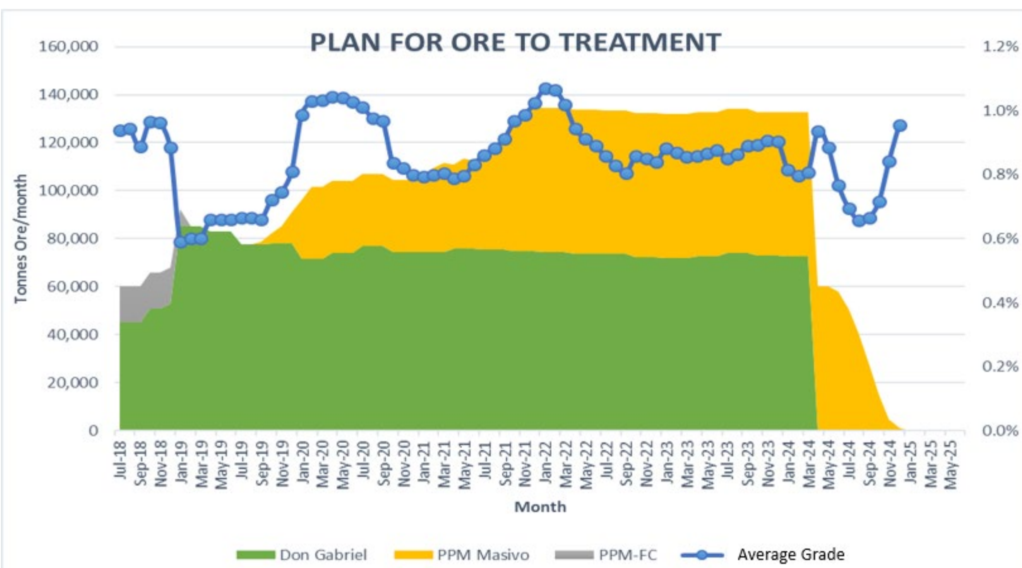
The base of the Papomono Masivo inclined block caving layout was a 10 x 10 x 10 m operational grid with 130 draw points and five levels.

The ventilation strategy for the inclined block cave maintains the existing fresh air intake from the North and South portals. Vitiated air will be exhausted through a new adit that will be located at the "Narbona" tunnel.

The material handling system assumes mining by means of 3.5 yd^3 load-haul-dump (LHD) equipment, conveying ore from the mining points to ore passes that will be located in the main haulage tunnel.

The mine production plan is shown in Figure 1-1.

Figure 1-1: Mine Production Plan



Note: Figure prepared by Wood, 2018. PPM = Papomono; FC = Front caving.

1.15 Recovery Methods

MTV currently produces high grade copper cathodes using a heap-leach and SX/EW process. Ore is stockpiled above the crusher, and is loaded into a primary jaw crusher, secondary cone crusher, tertiary and quaternary crushers; reducing the rock to fragments to a final granularity of the ore with a target size distribution 80% < 6.4 mm (1/4").

The crushed material is agglomerated, and water and acid are added to commence the leaching process.

The product of this first leaching stage is the "oxide-pregnant leach solution" (oxide-PLS), which has high copper content and is accumulated in a pond at the bottom of the leach pads. For the subsequent six months, the material is irrigated on an intermittent basis, with lower acid concentration to extract the copper from sulphides (chalcocite, covellite and some bornite). The resulting PLS (sulphide-PLS) is stored in another pond.

The oxide and sulphide PLS are pumped to the solvent extraction plant (SX) and the resulting highly concentrated solution (electrolyte) is sent to the electro-winning plant (EW).

MTV decided to implement a process improvement using salt or chloride leaching, increasing sulphide metallurgical recovery and kinetics, and the process is expected to be operative in July 2019.

1.16 Project Infrastructure

The major infrastructure required for the Don Gabriel open pit and Papomono Masivo underground projects has been completed, and consists of:

- Access roads
- Process plant
- Administration, warehousing, emergency, and maintenance facilities
- Power and water supply and related distribution infrastructure
- Water management infrastructure for the underground operations
- Waste management

- Explosives storehouse (magazine)

MTV has approximately 27 km of private roads, including 5 km of high-quality dirt road connecting the D-81 paved road to the plant. Another 12 km of roads connects the plant to the Papomono mine, and a further 5 km of road connects the Don Gabriel mine to the Papomono road.

The underground and open pit operations are connected to the process plant via gravel roads. Consumables are transported along these roads, and the roads are used by light vehicles and 32 to 42 tonnes haul trucks.

MTV is the owner of a 4.6 km-long 23 kV overhead power line that runs from the El Tebal Sub-Station (operated by the Conafe Power Company) to the plant.

Power is distributed through 220 kV/35 kV transformers which provide power to 35 kV substations to supply the process plant, including crushing, conveying, agglomeration and selected infrastructure.

1.17 Environmental, Permitting and Social Considerations

1.17.1 Environmental Considerations

The Sustainable Development Policy focuses on three major areas:

- Environmental protection
- Community relations
- Safety

To produce efficiently and carry out sustainable development goals, MTV created a Foundation that works closely with the project's stakeholders (community members, employees, and shareholders) demonstrating mutual respect and careful management.

1.17.2 Water Management

MTV has rights to both surface and underground water sources. Water is transported throughout the property via pipeline and is collected from irrigation canals from two different surface watersheds, the Chalinga watershed and the Choapa watershed.

MTV also has well water rights and the rights to use underground water from the Papomono mine, which flows at a rate of approximately 2 to 5 L/s.

At full capacity, the MTV mine will use about 20 L/s of water, which is less than a third of the water permitted through the available water rights.

1.17.3 Closure and Reclamation Planning

Table 1-3 presents all the site closure commitments for the mine plan, consolidated in the Arcadis Chile (Arcadis) report, together with the respective previous authorization resolution from the government authorities

Table 1-3: Commitments for Closure and Respective Resolutions

Area	Commitment	Resolution)
Mines	Slope Stabilization	Res 0800/2010 PCFM
	Access closure	Res 0800/2010 PCFM
	Signals installation	Res 0800/2010 PCFM
	Adapt peripheral rain water channel	Res 0800/2010 PCFM
	Portals, adits and shafts closure	RCA 283/2008 DIA
Crushing Plant	Dismantling of installations/facilities	RCA 265/2009 EIA
	Transport of hazard/other waste	Res 0906/2010 PCFM
SX/EW/Lixiviation Plant	Peripheral channel around heap pads	Res 0008/2011 PCFM
	Heaps slope stabilization	Res 0008/2011 PCFM
	Flatness and compaction of heap top level	Res 0008/2011 PCFM
	Coverage of heap slope with stored top soil	Res 0008/2011 PCFM
	Heap spent ore rinsing (neutralization) for 1 year	Res 0008/2011 PCFM
	Heap toe wall construction	Res 0008/2011 PCFM
	Signals installations	Res 0008/2011 PCFM
	Dismantling of equipment and installations	RCA 265/2009 EIA
	Transportation of hazard/other wastes	Res 0906/2010 PCFM
	Pools closure with waste rock and leveling	RCA 265/2009 EIA
	Economic assessment for reprocessing spent ore	Res 0008/2011 PCFM
Waste Dumps	Adapt peripheral rain water channels	Res 0800/2010
	Slope stabilization (stability study)	Res 0800/2010
	Leveling and compaction of top platform	RCA 265/2009 EIA
	Revegetation of altered surfaces	RCA 265/2009 EIA
	Accesses closure	Res 0800/2010
	Safety Berm construction	RCA 265/2009 EIA
Infrastructure of Services	Dismantling of installations, deenergizing and surface leveling	RCA 265/2009 EIA
	Transportation of hazard/other wastes	RCA 265/2009 EIA
	Pools closure with waste rock and surface leveling	RCA 265/2009 EIA
	Access closure with barriers	RCA 265/2009 EIA
	Signals installations	RCA 265/2009 EIA

The closure plan considers including the closure for the overall mine operations (including Don Gabriel plus Papomono zones as Papomono Cumbre, Papomono Norte and underground mines). Administration costs such as Owners team, engineering and studies needed for execution, and contingency are included. The plan also accounts for post-closure activities such as water monitoring during the year after closure and site inspections and maintenance for a three-year period after closure.

Table 1-4: Closure Costs

Stage	Item	Cost (UF)	Cost (kUS$)
Closure Stage	Total Direct Costs	103,351	4,584
	Total Indirect Costs	8,773	389
	Direct+Indirect Costs	112,124	4,973
	Contingencies (17.7%)	19,846	880
	Closure costs	131,969	5,853
	VAT (19%)	25,074	1,112
	TOTAL CLOSURE COST	**157,043**	**6,965**
Post Closure Stage	Total Direct+Indirect costs	1,945	86
	Contingencies (15%)	292	13
	post closure cost	2,237	99
	VAT (19%)	425	19
	TOTAL POST CLOSURE COST	**2,661**	**118**

The closure cost is based on 26,966 pesos per UF, CLP 608 to the US$, and are current as of March 25, 2018. The closure cost in US$ is 157,043 x 26,966 / 608 = US$6,965,000. The mine closure plan was submitted to Sernageomin and approved on November 30, 2016.

1.17.4 Permitting Considerations

The MTV operation is fully permitted with all necessary government and environmental licenses, including the Don Gabriel open pit and Papomono Masivo Underground operations.

Three "Resoluciones de Calificación Ambiental" (RCA) have been obtained.

- RCA 012 Manquehua Prospecting Tunnel
- RCA 283 Manquehua Prospecting Tunnel Modification
- RCA 265 MTV Project

1.17.5 Social Considerations

MTV's vehicle for social investment and community relations is the MTV Foundation, a non-profit charitable organization dedicated to improving the quality of life in the communities that are in the Project direct and indirect impact areas. A five-member board of directors manages the Foundation. Two members are MTV representatives, and the remaining three directors represent each of the Chalinga, Cárcamo and Chuchiñí valleys.

The Foundation operates under a participation-based management model in which community organizations, with the help from the Foundation, create project proposals and present them to the board. By requiring community participation, MTV can ensure that the projects that are funded are of the utmost concern for the people and that these projects have the greatest positive impact on the largest group of community members.

Between 2015 and 2017, 70 projects were funded by the MTV Foundation.

1.18 Markets and Contracts

MTV has an existing contract with Kalkos Mineria y Metales (Kalkos) for services associated with the marketing of copper cathodes and sulphuric acid supplies. Kalkos undertakes annual negotiations with logistics operators on behalf of MTV, in areas such as:

- Shipping lines
- Warehouses
- Port terminals
- Container deposit terminals.

Kalkos also co-ordinates the receipt of applicable approvals from Chilean authorities for exports and performs post-sale logistics services. Wood evaluated the 2017 cathode production in terms of the fees levied by Kalcos under the prevailing contract agreement. The charges appear to be reasonable.

MTV entered into an off-take contract with WERCO Trading AG for a minimum delivery of 500 t of copper cathode per month at the end of 2016. The contract, expiring end 2019, uses benchmark commercial terms and a standard business basis.

The mine is currently connected to the Chilean power grid and operates under a take-or-pay contract, with KDM Energía, a local bio-gas power producer. The contract requires a minimum consumption of 65 MW/d (approximately US$ 0.11 per kW), and is in force until May 31, 2024.

MTV has a tolling contract with ENAMI (a Chilean state-owned company). The ENAMI contract has the following main terms:

- MTV is committed to receive a minimum of 15,000 t/month of feed material from ENAMI
- ENAMI pays MTV a tolling rate of US$ 27.50/t of material received. ENAMI provides, free-of-charge, sulphuric acid to treat this material, at a rate of 60 kg/t of feed material
- MTV delivers copper cathodes produced from supplied feed material to ENAMI, on the basis of a contractual metallurgical recovery of 78%, any metallurgical recovery beyond 78% is owned by MTV.

MTV presently has a three years contract with Vecchiola S.A. for mining the Don Gabriel open pit and a ore haulage contract with Tiex for the ore extracted from this open pit. The LOM mine plan will require new mining and haulage contracts will be required for material moved from other mining zones in Don Gabriel and Papomono deposits to the plant.

The forecasted copper price used for the mine plan is US$ 2.75/lb. This is lower than Wood's assessment of the industry consensus on a long-term forecast price of US$ 3.00/lb.

1.19 Capital Cost Estimates

The capital cost estimate is provided in Table 1-5. Costs are inclusive of costs for the chloride leach process, sustaining capital considerations for the plant, and closure costs.

Table 1-5: Capital Cost Summary

	Property-wide				Mining Zones			
Year	Plant Salt Leach (kUS$)	Plant Sustaining Capex (kUS$)	Closure Costs (kUS$)	Sub Total (kUS$)	Don Gabriel Manto (kUS$)	Papomono Masivo IBC (kUS$)	Papomono Masivo FC (kUS$)	**Total (kUS$)**
2018	5,600	0	0	5,600	0	1,712	0	**7,312**
2019	1,400	497	0	1,897	0	6,071	0	**7,968**
2020	0	532	0	532	0	1,788	0	**2,320**
2021	0	497	0	497	0	3,967	0	**4,464**
2022	0	532	0	532	0	780	0	**1,312**
2023	0	497	0	497	0	0	0	**497**
2024	0	512	0	512	0	0	0	**512**
2025	0	427	0	427	0	130	0	**557**
2026	0	0	6,965	6,965	0	0	0	**6,965**
Total	**7,000**	**3,494**	**6,965**	**17,459**	**0**	**14,448**	**0**	**31,907**

Note: IBC = inclined block caving; FC = front caving. Capital costs shown for 2018 are those expenses projected to be incurred from July 2018 (month one for all cash flows considered in this Report) to December 2018. Each of the remaining years is a complete calendar year. The prestripping for Don Gabriel Manto was considered as Operating Cost.

1.20 Operating Cost Estimates

Operating costs include:

- Mine operating costs
- Leach plant operating costs (from ore crushing to leach solution generation)
- SX-EW plant operating costs (solvent extraction and cathode electrowinning)
- General and administrative (G&A) costs.

The overall operating cost estimate is provided in Table 1-6 and is based on mineral reserves only.

Table 1-6: Operating Cost Summary

Operation	Units	Unit Cost	Nominal Production	Fixed Cost (kUS$/month)
Mine				
Don Gabriel open pit, ore mining	US$/t	2.35		
Don Gabriel open pit, ore haulage	US$/t	2.21		
Don Gabriel open pit, waste haulage	US$/t	2.15		
Papomono Masivo inclined block cave	US$/t	11.29		
Papomono Masivo front caving	US$/t	18.00		
Plant, Leaching		**US$/t**	**t ore/month**	**kUS$/month**
Leaching Variable, Underground	US$/t	5.10		
Leaching Variable, open pit	US$/t	5.19		
Leaching ENAMI tolling, Variable	US$/t	1.20		
Leaching, Fixed	US$/t	4.54	150,000	681
Plant, SX-EW		**US$/lb**	**t Cu/month**	**kUS$/month**
SX/EW, Variable	US$/lb	0.121		
SX/EW, Fixed	US$/lb	0.070	1,550	239
General and Administration		**US$/lb**	**t Cu/month**	**kUS$/month**
G&A, Fixed	US$/lb	0.225	1,550	769
Total Plant and G&A Fixed Cost				**1,689**

Mine operating costs are treated as variable costs per tonne of ore, and in the case of the open pit, per tonne of waste material mined. Plant costs have both variable and fixed cost components. G&A costs are considered to be fixed costs.

For the leach plant variable costs are expressed per tonne of ore, and for the SX/EW plant, costs are expressed per pound of copper cathode produced. G&A costs, although fixed, are also reported per pound of copper cathode produced.

Fixed costs for the existing process plant and G&A assume that the process plant is operated at capacity. Costs will increase per tonne of ore mined if this assumption is not met.

1.21 Cautionary Statements

Certain information and statements contained in this section and in the Report are "forward looking" in nature. Forward-looking statements include, but are not limited to, statements with respect to the economic and study parameters of the Project; Mineral Resource and Mineral Reserve estimates; the cost and timing of Project development; the proposed mine plan and mining methods; dilution and extraction recoveries; processing method and rates and production rates; projected metallurgical recovery rates; additional infrastructure requirements or infrastructure modifications; capital, operating and sustaining cost estimates; the projected life of mine and other expected attributes of the Project; the net present value (NPV) and internal rate of return (IRR) and payback period of capital; capital; future metal prices; changes to the Project configuration that may be requested as a result of stakeholder or government input; government regulations and permitting timelines; estimates of reclamation obligations; requirements for additional capital; environmental risks; and general business and economic conditions.

All forward-looking statements in this Report are necessarily based on opinions and estimates made as of the date such statements are made and are subject to important risk factors and uncertainties, many of which cannot be controlled or predicted. Material assumptions regarding forward-looking statements are discussed in this Report, where applicable. In addition to, and subject to, such specific assumptions discussed in more detail elsewhere in this Report, the forward-looking statements in this Report are subject to the following assumptions:

- There being no signification disruptions affecting the development and operation of the Project
- The availability of certain consumables and services and the prices for power and other key supplies being approximately consistent with assumptions in the Report
- ENAMI delivering the contracted tonnage
- Labor and materials costs being approximately consistent with assumptions in the Report

- Fixed operating costs being approximately consistent with assumptions in the Report
- Permitting and arrangements with stakeholders being consistent with current expectations as outlined in the Report
- Certain tax rates, including the allocation of certain tax attributes, being applicable to the Project
- The availability of financing for MTV's planned development activities
- Assumptions made in Mineral Resource and Mineral Reserve estimates and the financial analysis based on the Mineral Reserve estimate, including, but not limited to, geological interpretation, metal grades, geotechnical assumptions, commodity price assumptions, extraction and mining recovery rates, hydrological and hydrogeological assumptions, capital and operating cost estimates, and general marketing, political, business and economic conditions.

1.22 Economic Analysis

The Project has been valued using a discounted cash flow (DCF) approach.

Capital cost estimates have been prepared for initial development and construction of the Project, in addition to ongoing operations (sustaining capital). Cash flows are assumed to occur from July 2018. The currency used to document the cash flow is US$ Q3 of 2018, considering that the estimation was developed during the third quarter 2018. The internal rate of return (IRR) is calculated as the discount rate that yields a zero NPV. The payback period is calculated as the time needed to recover the initial capital costs.

The economic analysis assumes contributions from the following sources:

- Don Gabriel Manto open pit
- Papomono Masivo inclined block caving zone
- Papomono Masivo front caving zone
- ENAMI tolling contract

The economic analysis is based on the following parameters and assumptions:

- The mine production schedule
- A copper price forecast of US$2.75/lb.

- Variable costs are applied on the basis of the monthly tonnages of ore processed or copper produced.
- Fixed costs do not vary on a monthly basis, except for the final months of operation.
- Processing recovery is based on the salt leach process as described in Section 13, for all years, except for 2018. 2018 assumptions are based on acid leaching without salt.

Revenues and operating costs for the ENAMI toll treatment is based on the terms set out in the ENAMI tolling contract. Only the toll treatment charges are considered as revenue.

MTV has tax losses available to apply to operating profits, due to construction costs and operating losses sustained by previous owners. Table 1-7 summarizes the results for the post-tax evaluation.

Table 1-7: Production, Cash Flow Summary and Economic Indicators Post-Tax

Item	Production (Mlbs Cu)	Capital Costs (MUS$)	Operating Costs (US$/lb Cu)	Revenue Pre-Tax (MUS$)	Cash Flow (MUS$)
Cumulative Production and Cash Flows	177	32	1.66	448	123

Item	NPV Post-Tax (MUS$)	IRR (% year)	Payback (months)	Payback (years)
Cashflow 8% discount rate (valuation start-off-month July 2018)	87	93	28	2.0

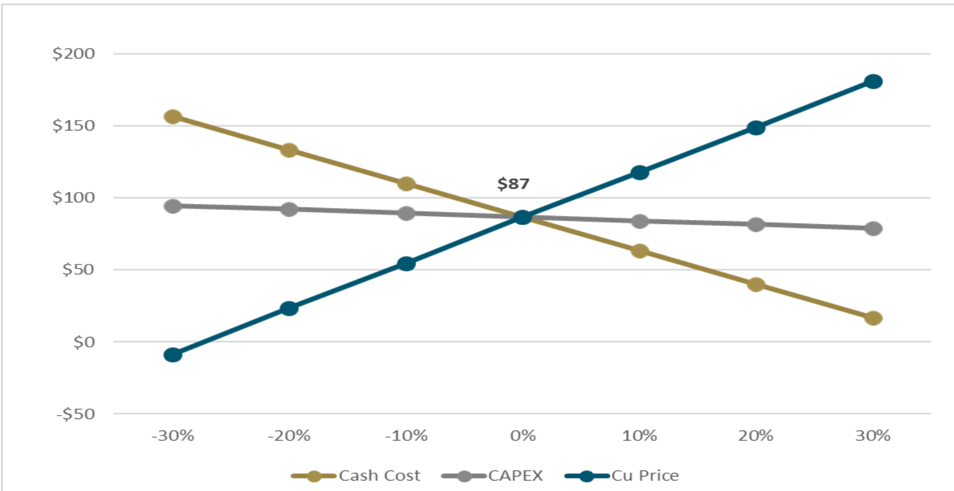
The analysis indicates an undiscounted post-tax cashflow of US$123.2 million and an operating cost of US$1.66 per pound finished copper. At a 0.64% monthly discount rate (8% annual equivalent), the NPV post-tax is US$ 86.7 million. The internal rate of return, IRR is 93.2% per annum. With a total capital investment of US$31.9 million, the NPV to capital cost ratio is 2.7. The projected payback period is 28 months.

1.23 Sensitivity Analysis

Sensitivity analysis was performed considering variations in the copper price, operating costs and capital costs. The results for NPV sensitivity to these variables are shown in Figure 1-2.

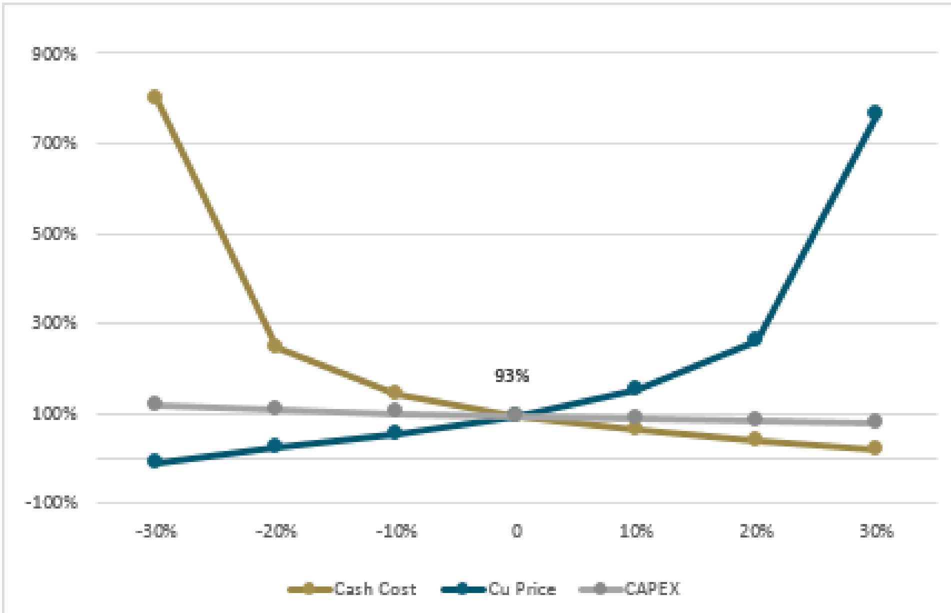
IRR sensitivities were evaluated using the same variables. The results for IRR sensitivity to variations in copper price, operating costs, and capital costs are shown in Figure 1-3. Note that the IRR function can give more than one answer to the same calculation, or in some cases produce meaningless values, in cases where the investment pattern is out of the usual distribution of capital expenses heavily concentrated at the beginning of the project. This is the case here, which causes some anomalous sensitivity results. This explains why one point of the sensitivity curve for the capital cost estimate variation has been omitted.

Figure 1-2: Sensitivity Analysis Post-Tax Evaluation (NPV; MUS$)



Note: Figure prepared by Wood, 2018

Figure 1-3: Sensitivity Analysis Post-Tax Evaluation (IRR; %)



Note: Figure prepared by Wood, 2018

1.24 Interpretation and Conclusions

The Project is in a jurisdiction friendly to mining and has operated in the past and is currently operating. The following main risks that may affect the Project were identified:

- Commodity market conditions and pricing;
- Changes to the estimated Mineral Resources used to generate the mine plan;
- Changes in the metallurgical recovery factors;
- Changes in the geotechnical assumptions used to determine the overall slope angles or selected underground mining methods;
- Changes to the operating cut-off assumptions for heap leach feed;
- Ability to maintain social and environmental license to operate.

Under the assumptions in this Report, the Project has positive economics.

1.25 Recommendations

- According to the Preliminary Feasibility Study Wood recommends developing the detailed engineering and an early start of the construction of the Papomono Masivo works to ensure its operation start-up.
- The QPs recommend execution of the in-fill drilling campaign and related works for the sectors Cumbres, Papomono Sur, Papomono Mantos Conexión, Papomono Mantos Norte, Papomono Norte, Epitermal and Don Gabriel Vetas to improve the confidence of its Mineral Resources and facilitate the early development of pre-feasibility studies that allow the transformation of these resources into mineral reserves.
- Use the results of the new contracts for material movement for the Don Gabriel open pit to optimize the exploitation plan of this deposit in order to capitalize these economic advantages in its mine plan.
- Modify the processing plant to apply the salt leaching process.
- Develop a long-term exploration strategy in order to extend the economic sustainability to the available assets and the mining business of MTV.

2.0 INTRODUCTION

2.1 Introduction

SRHI Inc. (SRHI) requested that Wood Canada Limited (Wood), compile a report in Form 43-101F1 format (the Report) for the Tres Valles Copper Project (the Project) located in Chile (Figure 2-1).

The Project is 100% owned by Minera Tres Valles SpA (MTV). SRHI purchased a 70% interest in MTV from the Vecchiola Group during October 2017. The Vecchiola Group retains a 30% interest in MTV.

2.2 Terms of Reference

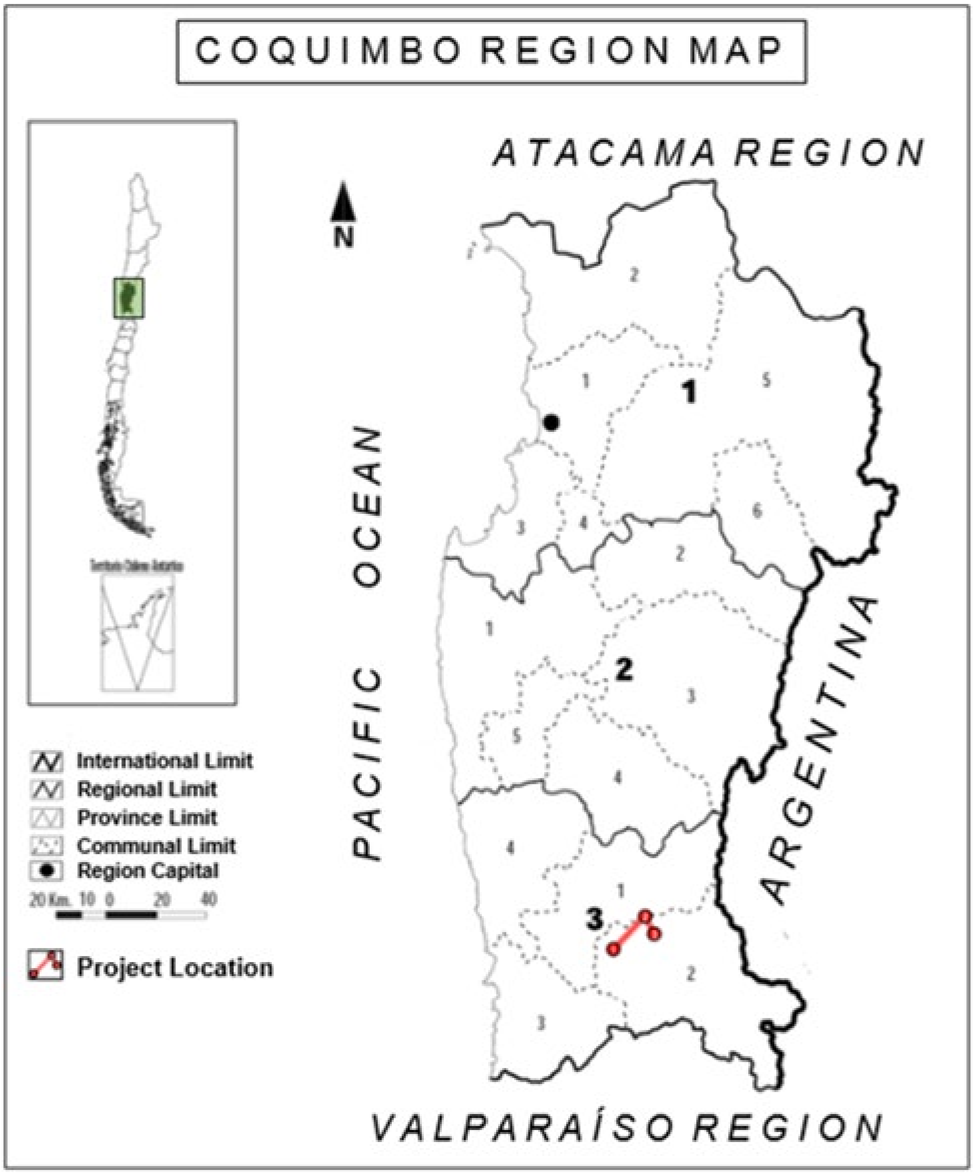
The Report was prepared using the format and content requirements in Form 43-101F1 to provide updated information on current and proposed mine plans. A mine plan incorporating a FS level study of the Don Gabriel Manto open pit mine, a PFS level study of the Papomono Masivo underground mine, and a conversion of the process circuit to a salt leach.

At the request of staff of the Ontario Securities Commission a revised technical report was prepared to replace the previous technical report by excluding the Preliminary Economic Assessment of the additional mineral resources on the Minera Tres Valles property. No other adjustments or updates were made to this revised technical report. This revised technical report retains the economic and technical assumptions valid at the date of its original publication.

The Report uses Canadian English. Monetary units are in United States dollars (US$) unless stated otherwise. The Chilean currency is the peso (CLP). Units are metric unless otherwise stated.

In this Report, the term “heap leach” is used to refer to crushed and stacked material that is subject to leaching.

Figure 2-1: Tres Valles Location Plan



Note: Figure prepared by Wood, 2018.

2.3 Qualified Persons

The following serve as the QPs for this Report as defined in National Instrument 43-101, Standards of Disclosure for Mineral Projects, and in compliance with Form 43-101F1:

- Dr Antonio Luraschi, RM CMC, Manager of Metallurgic Development and Senior Financial Analyst, Wood
- Mr Alfonso Ovalle, RM CMC, Mining Engineer, sub-consultant to Wood
- Mr Michael G. Hester, FAusIMM, Vice President and Principal Mining Engineer, Independent Mining Consultants, Inc.
- Mr Enrique Quiroga, RM CMC, Mining Engineer, Q&Q Ltda
- Mr Gabriel Vera, RM CMC, Metallurgical Process Consultant, GVMetallurgy
- Mr Sergio Alvarado, RM CMC, Consultant Geologist, General Manager and Partner, Geoinvest Sergio Alvarado Casas E.I.R.L.

2.4 Site Visits and Scope of Personal Inspection

Mr Hester visited the site from May 17–18, 2017 and again from September 20–21, 2017. Mr Hester viewed the underground and open pit operations, the process plant, surface facilities and core library.

Mr Vera visited the site on March 23, 2018. Mr Vera viewed the process plant, the pilot plant and the heap leach dump.

Mr Quiroga has visited the site many times, the most recent visit being on June 27, 2017. Mr Quiroga viewed the underground and open pit operations, the process plant, the heap leach dump and surface facilities.

Mr Ovalle visited the site on August 7, 2018. During that visit Mr Ovalle visited the underground and open pit operations, the process plant and surface facilities.

Mr Sergio Alvarado visited the site from July 15–17, 2015. During that visit, Mr Alvarado viewed the core library, and the underground and open pit operations.

2.5 Effective Dates

The Report has a number of effective dates as follows:

- Date of Feasibility Technical Report for Don Gabriel open pit: March 29, 2018
- Date of Prefeasibility Study for Papomono Masivo Underground Mine: July 31, 2018
- Date of Mineral Resource estimates: January 1, 2018

- Date of Mineral Reserve estimates for Don Gabriel Manto: January 1, 2018
- Date of Mineral Reserve estimates for Papomono Masivo: July 31, 2018.

The overall Report effective date is October 04, 2018.

2.6 Information Sources and References

The following studies are summarized in the Report:

- Hester, M., Vera, G., Quiroga, E., 2018: NI 43-101 F1 Technical Report on Mineral Resource Estimate, Chloride Leach Processing, and Don Gabriel Manto Pit Expansion: prepared by Independent Mining Consultants, Inc., effective date 29 March 2018 (referred to as the feasibility study or FS report)
- Papomono Masivo Prefeasibility Study, Amec Foster Wheeler (Wood), July 2018 (referred to as the pre-feasibility study or PFS report)

Report and documents listed in Section 3 and Section 27 of this Report were used to support preparation of the Report. Additional information was provided by MTV personnel as requested.

2.7 Previous Technical Reports

A technical report was prepared for SRHI and MTV on the Project earlier in 2018:

- Hester, M., Vera, G., Quiroga, E., 2018: NI 43-101 F1 Technical Report on Mineral Resource Estimate, Chloride Leach Processing, and Don Gabriel Manto Pit Expansion: prepared by Independent Mining Consultants, Inc., effective date 29 March, 2018.
- Luraschi, A., Ovalle, A., Hester, H., Quiroga, E., Vera, G., Alvarado, S., 2018: Minera Tres Valles Copper Project, Salamanca, Coquimbo Region, Chile, NI 43-101 Technical Report: effective date 04 October 2018.

3.0 RELIANCE ON OTHER EXPERTS

3.1 Introduction

The QPs have relied upon the following other expert reports, which provided information regarding mineral rights, surface rights, royalties, environmental, permitting, social and community impacts, and taxation as follows.

3.2 Ownership, Mineral Tenure, Surface Rights, and Royalties

The QPs have not independently reviewed ownership of the Project area and any underlying mineral tenure, surface rights, or royalties. The QPs have fully relied upon, and disclaim responsibility for, information derived from SRHI and legal experts retained by SRHI for this information through the following document:

- Aceval Canales, D., 2018: Resguardo Mensual Concesiones Mineras, Proyecto Sociedad Contractual Minera Tres Valles prepared by Terradap Chile (Skilled Mining Engineers), for Minera Tres Valles, 3 March, 2018, 14 p.

This information is used in Section 4 of the Report. The information is also used in support of the Mineral Resource estimate in Section 14, the Mineral Reserve estimate in Section 15, the financial analysis in Section 22.

3.3 Environmental and Social Impacts

The QPs have not independently reviewed environmental and social impacts of the Project area and any underlying mineral tenure, surface rights, or royalties. The QPs have fully relied upon, and disclaim responsibility for, information derived from SRHI and legal experts retained by SRHI for this information through the following document:

- Geobiota, 2017: Due Dilligence Ambiental Proyecto Minero Tres Valles prepared by Geobiota for Sprott Resource Holdings, September, 2017, 36 p.

This information is used in Section 20 of the Report. The information is also used in support of the Mineral Resource estimate in Section 14, the Mineral Reserve estimate in Section 15, the financial analysis in Section 22.

3.4 Taxation

The QPs have not independently reviewed the taxation that the Project is subject to. The QPs have fully relied upon, and disclaim responsibility for, information derived from SRHI and experts retained by SRHI for this information through the following document:

- Soza, R., 2018: Tax Regime and Tax Losses prepared by Puente Sur Tax Advisory for Minera Tres Valles, 10 September, 2018, 2 p.

This information is used in Section 22 of the Report. The information is also used in support of the Mineral Reserve estimate in Section 15.

3.5 Markets

The QPs have not independently reviewed the market conditions that the Project is subject to. The QPs have fully relied upon, and disclaim responsibility for, information derived from SRHI and experts retained by SRHI for this information through the following document:

- Werco, 2017: Purchase Contract N° P-Cu17945 prepared by Werco Trade AG for Minera Tres Valles, 20 February, 2017, 6 p.

This information is used in Section 19 of the Report.

4.0 PROPERTY DESCRIPTION AND LOCATION

4.1 Introduction

The Project is located in the Coquimbo Region, approximately 290 km from Santiago, between latitude 31°39′50″ S and 31°42′20″ S and longitude 70°55′00″ W and 70°57′35″ W.

The process plant is located 8 km north of the city of Salamanca, and 19 km southeast of the Choapa Province's capital, Illapel. The plant site coordinates are 31°43′43″ S and 71°00′45″ W.

4.2 Property and Title in Chile

Information in this subsection is based on data in the public domain (Baker Mackenzie, 2013; Barriga, 2011; Fraser Institute, 2018; Vergara and Mackenna, 2011, Olivares, 2016; Nieto and Morán, 2018), and has not been independently verified by Wood.

4.2.1 Regulations

Chile's legal mining framework is based on three pillars:

- The constitution (1980)
- The organic constitutional law on mining concessions (1982)
- The mining code (1983).

The state owns all mineral resources, but exploration and exploitation of these resources by private parties is permitted through mining concessions, which are granted by the courts. The concessions grant both rights and obligations, as defined by the Constitutional Organic Law on Mining Concessions and the Mining Code.

4.2.2 Mineral Tenure

Concessions can be mortgaged or transferred, and the holder has full ownership rights. An owner is also entitled to obtain rights-of-way. In addition, a concession holder has the right to defend concession ownership against the state and third parties. A concession is obtained by filing a claim and includes all minerals that may exist within its area. Mining rights in Chile are acquired in the following stages.

Pedimento

A pedimento is an initial exploration claim whose position is well defined by Universal Transverse Mercator (UTM) coordinates which define north–south and east–west boundaries. The minimum size of a pedimento is 100 ha, and the maximum is 5,000 ha with a maximum length-to-width ratio of 5:1.

A pedimento is valid for a maximum period of two years; however, at the end of this period, and provided that no overlying claim has been staked, the claim may be renewed for an additional two years if it is reduced in size by at least 50%. If the yearly claim taxes are not paid on a pedimento, the claim can be restored to good standing by paying double the annual claim tax the following year.

New pedimentos are allowed to overlap with pre-existing ones; however, the underlying (previously-staked) claim always takes precedence, providing the claim holder meets required payment obligations, checks for and corrects minor filing errors, and converts the pedimento to a manifestación within the initial two-year period.

Manifestación

Before a pedimento expires, or at any stage during its two-year life, it may be converted to a manifestación or exploration concession (exploration license). Within 220 days of filing a manifestación, the applicant must file a "Request for Survey" (Solicitud de Mensura).

A manifestación may also be filed on any open ground without going through the pedimento filing process.

The manifestación owner is entitled to explore and remove materials for study purposes only (i.e. commercial production is not allowed).

Mensura

Within nine months of the approval of the "Request for Survey" by the court, the claim must be surveyed by a government licensed surveyor. Surrounding claim owners may be present during the survey.

Once surveyed, presented to the court, and reviewed by the National Mining Service (Sernageomin), the application is ruled by the court to be a permanent property right (a mensura). The mensura or exploitation (mining) concession is valid indefinitely and is subject to the payment of annual fees. Once an exploitation concession has been granted, the concession owner can actively mine the area.

Claim Processes

At each of the stages of the claim acquisition process, several steps are required before the application is finally approved. Many of the steps involved in establishing the claim are published in Chile's official weekly mining bulletin for the appropriate region. Legislation is being considered that seeks to streamline the processes.

4.2.3 Surface Rights

Ownership rights to the subsoil are governed separately from surface ownership rights. Articles 120 to 125 of the Mining Code regulate mining easements. The Mining Code grants full rights to use the surface land to any owner of a mining exploitation or exploration concession, provided that reasonable compensation is paid to the surface land owner.

4.2.4 Rights-of-Way

The Mining Code also grants general rights to an exploitation concession holder to establish a right-of-way, again subject to payment of reasonable compensation to the owner of the surface land. Rights-of-way are granted through a private agreement or legal decision which indemnifies the surface land owner. A right-of-way must be established for a particular purpose and expires after cessation of the activities for which the right-of-way was obtained. Exploitation easement owners must provide third parties with usage of the granted right-of-way, providing that this would not affect the mining easement owner's usage.

4.2.5 Mining Concessions

There is a mining tax for the exploration and exploitation concessions. This is calculated as a percentage of the Unidad Tributaria Mensual (UTM or monthly tax unit) and applies to each hectare of the concession. The tax is required to be paid before 31 March of each year.

For exploitation concessions the tax rate is currently 10% of a UTM per hectare. The value of the UTM is adjusted each month, based on the prevailing Chilean consumer price index (IPC).

4.2.6 Water Rights

Water is considered part of the public domain and is independent of land ownership. Individuals can obtain rights to use public water. In accordance with the Water Code, water rights are expressed in liters per second (L/s) and usage rights are granted on the basis of total water reserves.

Article 110 of the Mining Code allows an exploitation concession holder to use any water that can be found within the concession boundary.

4.2.7 Environmental Regulations

Environmental impact statements are required for mining projects, and all projects must be approved by the national and/or regional environmental commissions.

New regulations were promulgated in 2013 under the Regulations for the System of Environmental Impact Assessment (Reglamento del Sistema de Evaluación de Impacto Ambiental or RSEIA). The RSEIA defines what information must be included in an Environmental Impact Assessment (Evaluación de Impacto Ambiental, EIA) or an Environmental Impact Declaration (Declaración de Impacto Ambiental, DIA). A key change includes a requirement for public consultation.

4.2.8 Land Use

Chile's zoning and urban planning are governed by the General Law of Urban Planning and Construction that contains several administrative provisions which are applicable to different geographical and hierarchical levels and sets specific standards for both urban and non-urban areas.

Projects must also comply with any urban legislation governing land usage.

4.2.9 Closure Considerations

Closure plans must be submitted to Sernageomin prior to mining operations commencing. Closure plan content requirements depend upon the mine capacity and are simplified if the production rate is under 10,000 tonnes per month.

Larger operations must provide a monetary guarantee with the closure plan, which must cover closure and post-closure costs. Sernageomin is required to review the plan, associated costs, and the adequacy of the bond every five years.

4.2.10 Fraser Institute Survey and Risk Discussion

Wood has used the Policy Perception Index from the 2017 Fraser Institute Annual Survey of Mining Companies report (the 2017 Fraser Institute survey) as a credible source for the assessment of the overall political risk facing an exploration or mining project in Chile. Each year, the Fraser Institute sends a questionnaire to selected mining and exploration companies globally. The Fraser Institute survey is an attempt to assess how mineral endowments and public policy factors such as taxation and regulatory uncertainty affect exploration investment.

Wood has relied on the 2017 Fraser Institute survey because it is globally regarded as an independent report-card style assessment to governments on how attractive their policies are from the point of view of an exploration manager or mining company and forms a proxy for the assessment by industry of political risk in specific political jurisdictions from the mining industry's perspective.

Of the 91 jurisdictions surveyed in the 2017 Fraser Institute survey, Chile ranks eighth for investment attractiveness, 25th for policy perception, and seventh for best practices mineral potential.

Risks specific to the mine plan are described in the relevant sections of the Report.

4.3 Project Ownership

SRHI, through its indirectly-held subsidiary SRH Chile SpA, purchased a 70% interest in Minera Tres Valles SpA (MTV) from the Vecchiola Group for a purchase price of US$39.9 million during October 2017. The Vecchiola Group retains a 30% interest in MTV.

4.4 Mineral Tenure

MTV holds 229 exploitation concessions, totaling an area of 46,378 ha. The concessions are summarized in Table 4-1 and tenure locations are shown in Figure 4-1.

A total of 215 exploitation concessions are fully constituted and registered (Figure 4-1). Fourteen exploitation concessions are under administrative process, waiting resolution through a legal judgement, require topographic survey, or are "second-floor" being staked over existing MTV concessions in order to close slivers or gaps ("demasías") between concessions.

Three concessions have partial overlaps with concessions held by third-parties; however, none of the Mineral Resources, Mineral Reserves or infrastructure areas are affected by these overlaps.

Under Chilean law, exploitation concessions do not have an expiry date.

4.5 Surface Rights

MTV currently holds approximately 218 ha of effective occupation area (see Table 4-2) and 373 ha of easements areas (see Table 4-3), besides MTV has 445 ha of own property. This is sufficient to support the open pit, underground and process plant operations (Figure 4-2).

4.6 Water Rights

The project has rights to both surface and underground water sources. Water is collected from irrigation canals from two different watersheds, the Chalinga watershed and the Choapa watershed. The Choapa watershed, in particular, is a reliable water source even during the dry months in Salamanca.

In addition to these watersheds, the rights to underground water reserves are available for use by MTV. There is the potential to use underground water from the Papomono deposit, which has a flow rate of approximately 2 to 5 L/s.

At full capacity, the Project will use 20 L/s of water, less than a third of the available water rights. The Project is permitted to use 64 L/s.

Figure 4-1: Mining Concessions, Mine Area

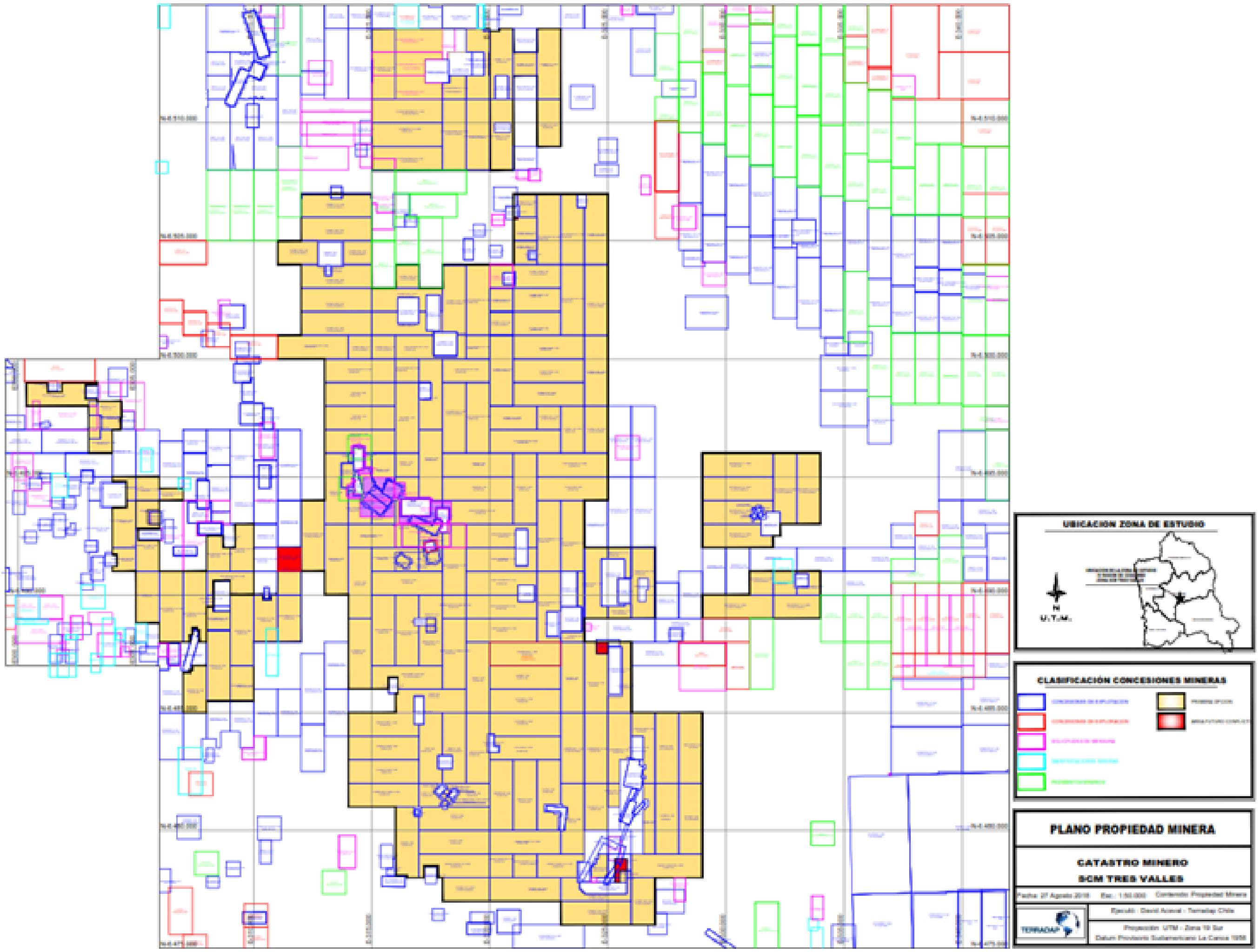


Table 4-1: Mineral Concessions – Fully Constituted and Registered

ID	CONCESSION NUMBER	CONCESSION NAME	CONCESSION TYPE	CONCESSION STATUS	SIZE Ha.
1	043011021-7	ACUERDO 1/10	EXPLOITATION	CONSTITUTED	50
2	043021325-3	ALEJANDRA 1 AL 11	EXPLOITATION	CONSTITUTED	53
3	043021031-9	BARTOLOME 1 AL 60	EXPLOITATION	CONSTITUTED	300
4	043020997-3	BERTA 1 AL 60	EXPLOITATION	CONSTITUTED	276
5	04302-1363-6	BLANQUITA 1 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
6	04302-1370-9	BLANQUITA 10 DEL 1 94	EXPLOITATION	CONSTITUTED	94
7	04302-1371-7	BLANQUITA 11 DEL 1 AL 70	EXPLOITATION	CONSTITUTED	70
8	04302-1372-5	BLANQUITA 12 DEL 1 AL 200	EXPLOITATION	CONSTITUTED	200
9	04302-1361-k	BLANQUITA 2 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
10	04302-1362-8	BLANQUITA 3 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	250
11	04302-1364-4	BLANQUITA 4 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	275
12	043021365-2	BLANQUITA 6 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	100
13	04302-1367-9	BLANQUITA 7 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
14	04302-1368-7	BLANQUITA 8 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	285
15	04302-1369-5	BLANQUITA 9 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
16	043020155-7	CALIFORNIA 1/30	EXPLOITATION	CONSTITUTED	40
17	043020998-1	CANDELARIA 1 AL 60	EXPLOITATION	CONSTITUTED	300
18	04301-1713-0	CANELA 21 DEL 1 AL 200	EXPLOITATION	CONSTITUTED	200
19	04301-1715-7	CANELA 31 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
20	04301-1718-1	CANELA 34 DEL 1 AL 294	EXPLOITATION	CONSTITUTED	294
21	04301-1719-K	CANELA 35 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
22	04301-1720-3	CANELA 36 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
23	04302-1375-K	CANELA 37 DEL 1 AL 100	EXPLOITATION	CONSTITUTED	100
24	04302-1340-7	CANELA 38 DEL 1 AL 200	EXPLOITATION	CONSTITUTED	200
25	04302-1341-5	CANELA 39 DEL 1 AL 200	EXPLOITATION	CONSTITUTED	200
26	04302-1346-6	CANELA 44 DEL 1 AL 200	EXPLOITATION	CONSTITUTED	200
27	04302-1352-0	CANELA 50 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
28	04302-1356-3	CANELA 54 DEL 1 AL 58	EXPLOITATION	CONSTITUTED	58
29	04302-1357-1	CANELA 55 DEL 1 AL 161	EXPLOITATION	CONSTITUTED	161
30	04302-1358-K	CANELA 56 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
31	04302-1360-1	CANELA 58 DEL 1 AL 200	EXPLOITATION	CONSTITUTED	200
32	04301-2060-3	CANELA B 11 DEL 1 AL 27	EXPLOITATION	CONSTITUTED	204
33	04301-2061-1	CANELA B 12 DEL 1 AL 22	EXPLOITATION	CONSTITUTED	191
34	04301-2062-K	CANELA B 13 DEL 1 AL 10	EXPLOITATION	CONSTITUTED	100
35	04301-2052-2	CANELA B 2 DEL 1 AL 30	EXPLOITATION	CONSTITUTED	300
36	04301-2070-0	CANELA B 24 DEL 1 AL 10	EXPLOITATION	CONSTITUTED	100
37	04301-2071-9	CANELA B 25 DEL 1 AL 10	EXPLOITATION	CONSTITUTED	84
38	04301-2072-7	CANELA B 26 DEL 1 AL 22	EXPLOITATION	CONSTITUTED	194
39	04301-2073-5	CANELA B 27 DEL 1 AL 20	EXPLOITATION	CONSTITUTED	200
40	04301-2074-3	CANELA B 28 DEL 1 AL 20	EXPLOITATION	CONSTITUTED	200
41	043012075-1	CANELA B 29 DEL 1 AL 30	EXPLOITATION	CONSTITUTED	300
42	04301-2053-0	CANELA B 3 DEL 1 AL 18	EXPLOITATION	CONSTITUTED	170
43	043012076-K	CANELA B 30 DEL 1 AL 30	EXPLOITATION	CONSTITUTED	300
44	04301-2054-9	CANELA B 4 DEL 1 AL 20	EXPLOITATION	CONSTITUTED	120
45	04301-2055-7	CANELA B 5 DEL 1 AL 30	EXPLOITATION	CONSTITUTED	277
46	04301-2056-5	CANELA B 6 DEL 1 AL 30	EXPLOITATION	CONSTITUTED	300
47	04301-2057-3	CANELA B 7 DEL 1 AL 30	EXPLOITATION	CONSTITUTED	300
48	04301-2058-1	CANELA B 8 DEL 1 AL 10	EXPLOITATION	CONSTITUTED	100
49	04301-1722-K	CAREN 11 DEL 1 AL 236	EXPLOITATION	CONSTITUTED	236
50	04301-1723-8	CAREN 12 DEL 1 AL 100	EXPLOITATION	CONSTITUTED	100
51	04301-1724-6	CAREN 13 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
52	04301-1725-4	CAREN 14 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
53	04301-1727-0	CAREN 16 DEL 1 AL 200	EXPLOITATION	CONSTITUTED	200
54	043012010-7	CARENCITA 5 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
55	04302-0110-7	CARIDAD	EXPLOITATION	CONSTITUTED	5
56	043020999-K	CARLOS 1 AL 34	EXPLOITATION	CONSTITUTED	96
57	043021001-7	CHRISTHOFER 1 AL 40	EXPLOITATION	CONSTITUTED	200
58	043021034-3	CHRISTIANE DOS 1 AL 60	EXPLOITATION	CONSTITUTED	300
59	043021035-1	CHRISTIANE TRES 1 AL 60	EXPLOITATION	CONSTITUTED	360

ID	CONCESSION NUMBER	CONCESSION NAME	CONCESSION TYPE	CONCESSION STATUS	SIZE Ha.
60	043021033-5	CHRISTIANE UNO 1 AL 60	EXPLOITATION	CONSTITUTED	290
61	043020953-1	CLEMENCIA 1/13	EXPLOITATION	CONSTITUTED	13
62	043021037-8	CLEMENTE DOS 1 AL 60	EXPLOITATION	CONSTITUTED	300
63	043021038-6	CLEMENTE TRES 1 AL 50	EXPLOITATION	CONSTITUTED	248
64	043021036-K	CLEMENTE UNO 1 AL 60	EXPLOITATION	CONSTITUTED	300
65	043021552-3	COCHI LEUFU 24 DEL 1 AL 6	EXPLOITATION	CONSTITUTED	6
66	043020107-7	CONSUELO	EXPLOITATION	CONSTITUTED	5
67	043021003-3	CRISTOBAL 1 AL 60	EXPLOITATION	CONSTITUTED	285
68	043020986-8	CRUZ DEL SUR 1 AL 60	EXPLOITATION	CONSTITUTED	280
69	043021199-4	CYPRUS 1 AL 60	EXPLOITATION	CONSTITUTED	300
70	043021004-1	DAVID 1 AL 60	EXPLOITATION	CONSTITUTED	300
71	04302-0889-6	DON CHURRUS 1, 1/30	EXPLOITATION	CONSTITUTED	260
72	04302-0898-5	DON CHURRUS 10, 1/30	EXPLOITATION	CONSTITUTED	199
73	04302-0899-3	DON CHURRUS 11, 1/10	EXPLOITATION	CONSTITUTED	57
74	04302-0900-0	DON CHURRUS 12, 1/14	EXPLOITATION	CONSTITUTED	102
75	04302-0901-9	DON CHURRUS 13, 1/30	EXPLOITATION	CONSTITUTED	279
76	04302-0902-7	DON CHURRUS 14, 1/30	EXPLOITATION	CONSTITUTED	300
77	04302-0890-K	DON CHURRUS 2, 1/30	EXPLOITATION	CONSTITUTED	272
78	04302-0891-8	DON CHURRUS 3, 1/30	EXPLOITATION	CONSTITUTED	279
79	04302-0892-6	DON CHURRUS 4, 1/30	EXPLOITATION	CONSTITUTED	300
80	04302-0893-4	DON CHURRUS 5, 1/30	EXPLOITATION	CONSTITUTED	234
81	04302-0894-2	DON CHURRUS 6, 1/30	EXPLOITATION	CONSTITUTED	260
82	04302-0895-0	DON CHURRUS 7, 1/30	EXPLOITATION	CONSTITUTED	300
83	04302-0896-9	DON CHURRUS 8, 1/30	EXPLOITATION	CONSTITUTED	288
84	04302-0897-7	DON CHURRUS 9, 1/28	EXPLOITATION	CONSTITUTED	101
85	043020197-2	DON GABRIEL 1/20 (1/5)	EXPLOITATION	CONSTITUTED	25
86	043020533-1	EL ROSARIO 1/16 (1/7)	EXPLOITATION	CONSTITUTED	35
87	043020113-1	EL ROSARIO 1/16 (8/16)	EXPLOITATION	CONSTITUTED	45
88	043020987-6	EL SEÑOR DE LA TIERRA 1 AL 60	EXPLOITATION	CONSTITUTED	300
89	043021531-0	ELIAS 1 AL 300	EXPLOITATION	CONSTITUTED	146
90	043021201-K	ELISEO 1 AL 60	EXPLOITATION	CONSTITUTED	300
91	043010273-7	EMMANUEL 1/50 (16,17,24 al 27 y 34 al 37)	EXPLOITATION	CONSTITUTED	50
92	043020109-3	ESPERANZA	EXPLOITATION	CONSTITUTED	5
93	043021005-K	EUGENIA 1 AL 60	EXPLOITATION	CONSTITUTED	300
94	043020108-5	FE	EXPLOITATION	CONSTITUTED	5
95	043020988-4	FERNANDA 1 AL 57	EXPLOITATION	CONSTITUTED	267
96	04302-1007-6	GABRIEL 1 AL 60	EXPLOITATION	CONSTITUTED	300
97	043021040-8	GLADYS DOS 1 AL 40	EXPLOITATION	CONSTITUTED	200
98	043021041-6	GLADYS TRES A 1 AL 10	EXPLOITATION	CONSTITUTED	50
99	043021084-K	GLADYS UNO 1 AL 60	EXPLOITATION	CONSTITUTED	270
100	043020990-6	GUADALUPE DOS 1 AL 60	EXPLOITATION	CONSTITUTED	294
101	043020989-2	GUADALUPE UNO 1 AL 39	EXPLOITATION	CONSTITUTED	168
102	043021202-8	HONORIO 1 AL 60	EXPLOITATION	CONSTITUTED	174
103	043021009-2	IGNACIA 1 AL 60	EXPLOITATION	CONSTITUTED	300
104	043021010-6	IGNACIO 1 AL 60	EXPLOITATION	CONSTITUTED	300
105	043021011-4	ISABEL 1 AL 60	EXPLOITATION	CONSTITUTED	300
106	043021012-2	ISIDRO 1 AL 59	EXPLOITATION	CONSTITUTED	287
107	043021013-0	JACINTA 1 AL 6	EXPLOITATION	CONSTITUTED	18
108	043021105-6	JACINTA DOS 1 AL 4	EXPLOITATION	CONSTITUTED	8
109	043021043-2	JAVIER 1 AL 53	EXPLOITATION	CONSTITUTED	265
110	043021014-9	JERONIMO 1 AL 60	EXPLOITATION	CONSTITUTED	300
111	04302-1015-7	JORGE 1 AL 60	EXPLOITATION	CONSTITUTED	267
112	043021016-5	JOSE 1 AL 60	EXPLOITATION	CONSTITUTED	270
113	043020991-4	JUAN DIEGO 1 AL 60	EXPLOITATION	CONSTITUTED	300
114	043021046-7	JUAN DOS 1 AL 60	EXPLOITATION	CONSTITUTED	294
115	043021047-5	JUAN TRES 1 AL 60	EXPLOITATION	CONSTITUTED	300
116	043021044-0	JUAN UNO A, 1 AL 20	EXPLOITATION	CONSTITUTED	81
117	043021045-9	JUAN UNO B, 1 AL 35	EXPLOITATION	CONSTITUTED	156
118	043021017-3	JUANA 1 AL 57	EXPLOITATION	CONSTITUTED	270

ID	CONCESSION NUMBER	CONCESSION NAME	CONCESSION TYPE	CONCESSION STATUS	SIZE Ha.
119	043020208-1	LA DESPRECIADA 1 al 4	EXPLOITATION	CONSTITUTED	20
120	043020239-1	LA PALOMA 1/10	EXPLOITATION	CONSTITUTED	48
121	04302-1253-2	LEUFU COCHI 11 DEL 1 AL 100	EXPLOITATION	CONSTITUTED	100
122	04302-1254-0	LEUFU COCHI 18 DEL 1 AL 270	EXPLOITATION	CONSTITUTED	270
123	04302-1255-9	LEUFU COCHI 19 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
124	04302-1256-7	LEUFU COCHI 20 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
125	04302-1257-5	LEUFU COCHI 21 DEL 1 AL 179	EXPLOITATION	CONSTITUTED	179
126	04302-1258-3	LEUFU COCHI 22 DEL 1 AL 100	EXPLOITATION	CONSTITUTED	100
127	04301-1573-1	LOS MAQUIS 18 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
128	04301-1574-K	LOS MAQUIS 20 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
129	04301-1575-8	LOS MAQUIS 21 DEL 1 AL 282	EXPLOITATION	CONSTITUTED	282
130	04301-1576-6	LOS MAQUIS 23 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
131	04301-1577-4	LOS MAQUIS 32 DEL 1 AL 100	EXPLOITATION	CONSTITUTED	100
132	04301-1578-2	LOS MAQUIS 33 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
133	04301-1579-0	LOS MAQUIS 34 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
134	04301-1580-4	LOS MAQUIS 35 DEL 1 AL 210	EXPLOITATION	CONSTITUTED	210
135	04301-1581-2	LOS MAQUIS 36 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
136	04301-1582-0	LOS MAQUIS 37 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
137	04301-1583-9	LOS MAQUIS 38 DEL 1 AL 200	EXPLOITATION	CONSTITUTED	200
138	04301-1584-7	LOS MAQUIS 39 DEL 1 AL 300	EXPLOITATION	CONSTITUTED	300
139	04301-1585-5	LOS MAQUIS 40 DEL 1 AL 100	EXPLOITATION	CONSTITUTED	100
140	043021018-1	LUIS 1 AL 60	EXPLOITATION	CONSTITUTED	278
141	043021019-K	LUISA 1 AL 60	EXPLOITATION	CONSTITUTED	300
142	04302-1205-2	MALLACUN 1 AL 60	EXPLOITATION	CONSTITUTED	300
143	043021048-3	MANUEL 1 AL 60	EXPLOITATION	CONSTITUTED	300
144	04302-1405-5	MARCE CIENTO DIECISEIS 1 AL 40	EXPLOITATION	CONSTITUTED	200
145	04302-1406-3	MARCE CIENTO DIECISIETE 1 AL 40	EXPLOITATION	CONSTITUTED	194
146	043021339-3	MARCE TREINTA Y CUATRO 1 AL 60	EXPLOITATION	CONSTITUTED	300
147	04302-1334-2	MARCE TREINTA Y DOS 1 AL 40	EXPLOITATION	CONSTITUTED	189
148	04302-1335-0	MARCE TREINTA Y TRES 1 AL 60	EXPLOITATION	CONSTITUTED	300
149	043021284-2	MARGARITA 1 AL 60	EXPLOITATION	CONSTITUTED	300
150	043021050-5	MARGARITA NIETA 1 AL 60	EXPLOITATION	CONSTITUTED	300
151	043021022-K	MARIA 1 AL 60	EXPLOITATION	CONSTITUTED	300
152	043021023-8	MARTA 1 AL 20	EXPLOITATION	CONSTITUTED	100
153	043021024-6	MAURO 1 AL 59	EXPLOITATION	CONSTITUTED	295
154	043021051-3	MIGUEL 1 AL 60	EXPLOITATION	CONSTITUTED	300
155	043020992-2	NATALIA 1 AL 60	EXPLOITATION	CONSTITUTED	300
156	043020381-9	NATALYA 1 AL 10	EXPLOITATION	CONSTITUTED	50
157	04302-1533-7	ORÉGANO B 2 DEL 1 AL 30	EXPLOITATION	CONSTITUTED	300
158	04302-1534-5	ORÉGANO B 3 DEL 1 AL 10	EXPLOITATION	CONSTITUTED	19
159	04302-1535-3	ORÉGANO B 4 DEL 1 AL 30(29)	EXPLOITATION	CONSTITUTED	222
160	04302-1536-1	ORÉGANO B 5 DEL 1 AL 30(25)	EXPLOITATION	CONSTITUTED	207
161	04302-1537-k	ORÉGANO B 6 DEL 1 AL 20(3)	EXPLOITATION	CONSTITUTED	18
162	043021437-3	OREGANO 91 DEL 1 AL 167	EXPLOITATION	CONSTITUTED	167
163	04302-1206-0	OSEAS 1 AL 60	EXPLOITATION	CONSTITUTED	300
164	043021025-4	PEDRO 1 AL 60	EXPLOITATION	CONSTITUTED	300
165	04302-1207-9	POLICARPO 1 AL 40	EXPLOITATION	CONSTITUTED	197
166	043020460-2	PRISCILA 2/4	EXPLOITATION	CONSTITUTED	12
167	04302-1470-5	QUILMENCO 1 DEL 1 AL 150	EXPLOITATION	CONSTITUTED	150
168	04302-1474-8	QUILMENCO 2 DEL 1 AL 86	EXPLOITATION	CONSTITUTED	86
169	04302-1472-1	QUILMENCO 3 DEL 1 AL 200	EXPLOITATION	CONSTITUTED	200
170	043021054-8	RAFAEL 1 AL 60	EXPLOITATION	CONSTITUTED	300
171	043021055-6	ROSA 1, 1 AL 30	EXPLOITATION	CONSTITUTED	127
172	043021026-2	SANTIAGO 1 AL 60	EXPLOITATION	CONSTITUTED	300
173	043021057-2	SEBASTIAN 1, 1 AL 60	EXPLOITATION	CONSTITUTED	240
174	043021058-0	SEBASTIAN 2, 1 AL 18	EXPLOITATION	CONSTITUTED	74
175	043021059-9	SEBASTIAN TRES, 1 AL 60	EXPLOITATION	CONSTITUTED	265
176	043021027-0	SEGISMUNDO 1 AL 60	EXPLOITATION	CONSTITUTED	292
177	043020993-0	SEÑOR DE LOS CIELOS 1 AL 20	EXPLOITATION	CONSTITUTED	100
178	043020516-1	TABITA UNO AL TRES	EXPLOITATION	CONSTITUTED	12

ID	CONCESSION NUMBER	CONCESSION NAME	CONCESSION TYPE	CONCESSION STATUS	SIZE Ha.
179	043021061-0	TALHUEN DOS 1 AL 60	EXPLOITATION	CONSTITUTED	298
180	043021062-9	TALHUEN TRES 1 AL 60	EXPLOITATION	CONSTITUTED	280
181	043021060-2	TALHUEN UNO 1 AL 60	EXPLOITATION	CONSTITUTED	300
182	043021028-9	VICENTE 1 AL 60	EXPLOITATION	CONSTITUTED	300
183	04302-1208-7	ZACARIAS 1 AL 60	EXPLOITATION	CONSTITUTED	300
184	043011800-5	SALAMANCA 1 1/12	EXPLOITATION	CONSTITUTED	52
185	043011801-3	SALAMANCA 2 1/100	EXPLOITATION	CONSTITUTED	100
186	043011802-1	SALAMANCA 3 1/10	EXPLOITATION	CONSTITUTED	50
187	043021412-8	SALAMANCA 9 1/182	EXPLOITATION	CONSTITUTED	182
188	043011806-4	SALAMANCA 10A 1/100	EXPLOITATION	CONSTITUTED	100
189	043011807-2	SALAMANCA 10B 1/135	EXPLOITATION	CONSTITUTED	135
190	043021414-4	SALAMANCA 13B 1/135	EXPLOITATION	CONSTITUTED	135
191	043021415-2	SALAMANCA 14 1/180	EXPLOITATION	CONSTITUTED	180
192	043021418-7	SALAMANCA 17 1/50	EXPLOITATION	CONSTITUTED	246
193	043021420-9	SALAMANCA 19B 1/108	EXPLOITATION	CONSTITUTED	108
194	043011810-2	SALAMANCA 24A 1/80	EXPLOITATION	CONSTITUTED	80
195	043011813-7	SALAMANCA 29 1/90	EXPLOITATION	CONSTITUTED	90
196	043021458-6	SALAMANCA 30 1/220	EXPLOITATION	CONSTITUTED	220
197	043021459-4	SALAMANCA 31 1/300	EXPLOITATION	CONSTITUTED	300
198	043021460-8	SALAMANCA 32 1/280	EXPLOITATION	CONSTITUTED	280
199	043021461-6	SALAMANCA 33 1/158	EXPLOITATION	CONSTITUTED	158
200	043021462-4	SALAMANCA 34 1/15	EXPLOITATION	CONSTITUTED	15
201	043011544-8	HERMINIA 1/14	EXPLOITATION	CONSTITUTED	93
202	043011257-0	LA POR LLEGAR 1/10	EXPLOITATION	CONSTITUTED	50
203	S/R	LAS BANDURRIAS 4 1 AL 60	EXPLOITATION	CONSTITUTED	300
204	S/R	LAS BANDURRIAS 6 1 AL 60	EXPLOITATION	CONSTITUTED	300
205	S/R	LAS BANDURRIAS 7 1 AL 60	EXPLOITATION	CONSTITUTED	300
206	S/R	LAS BANDURRIAS 10 1 AL 60	EXPLOITATION	CONSTITUTED	300
207	S/R	LAS BANDURRIAS 8 1 AL 60	EXPLOITATION	CONSTITUTED	300
208	S/R	LAS BANDURRIAS 9 1 AL 60	EXPLOITATION	CONSTITUTED	300
209	S/R	CANELA C1 1 AL 60	EXPLOITATION	CONSTITUTED	300
210	S/R	CANELA C8 1 AL 20	EXPLOITATION	CONSTITUTED	100
211	S/R	CANELA C17 1 AL 20	EXPLOITATION	CONSTITUTED	100
212	S/R	CANELA C12 1 AL 20	EXPLOITATION	CONSTITUTED	100
213	S/R	CANELA C13 1 AL 20	EXPLOITATION	CONSTITUTED	100
214	S/R	CANELA C16 1 AL 60	EXPLOITATION	CONSTITUTED	300
215	S/R	CANELA C18 1 AL 60	EXPLOITATION	CONSTITUTED	300
1	043021424-1	OREGANO 90 DEL 1 AL 300	EXPLOITATION	UNARCHIVING AND REVISE	10
2	04302-1532-9	OREGANO B 1 DEL 1 AL 30 (31)	EXPLOITATION	CONSTITUTED	283
3	043011912-5	OREGANO B 68 DEL 1/11	EXPLOITATION	RESIGNATION RESOURCE OVERLAY	11
4	043011911-7	OREGANO B 69 DEL 1/21	EXPLOITATION	RESIGNATION RESOURCE OVERLAY	21
5	043011910-9	OREGANO B 70 DEL 1/147	EXPLOITATION	RESIGNATION RESOURCE OVERLAY	147
6	043021456-K	OREGANO B 71 DEL 1/98	EXPLOITATION	RESIGNATION RESOURCE OVERLAY	98
7	043021455-1	OREGANO B 88 DEL 1/39	EXPLOITATION	RESIGNATION RESOURCE OVERLAY	39
8	043021454-3	OREGANO B 89 DEL 1/100	EXPLOITATION	RESIGNATION RESOURCE OVERLAY	100
9	S/R	LAS BANDURRIAS 1 1 AL 60	EXPLOITATION	APPROVED, WAITING FOR JUDGMENT	300
10	S/R	LAS BANDURRIAS 2 1 AL 60	EXPLOITATION	APPROVED, WAITING FOR JUDGMENT	300
11	S/R	LAS BANDURRIAS 3 1 AL 60	EXPLOITATION	APPROVED, WAITING FOR JUDGMENT	300
12	S/R	CANELA C11 1 AL 20	EXPLOITATION	APPROVED, WAITING FOR JUDGMENT	100
13	S/R	MARGARA	EXPLOITATION	APPROVAL SERNAGEOMIN	300
14	S/R	DON CHURRUS 10A 1/210	EXPLOITATION	EXECUTE MESSAGE	210

Table 4-2: Effective Occupation Area

Zone	Facilities Area (ha)
Papomono Cumbre open pit	2
Don Gabriel open pit	30
Papomono Norte open pit	5
Leach Pad and Pools	61
Cumbre Waste Rock Storage Facility	5
Don Gabriel Waste Rock Storage Facility	40
Papomono Norte Waste Rock Storage Facility	11
North and South Portal Waste Rock Storage Facility	2
Road Facilities	46
Crushing – Agglomeration Plant	5
SX – EW Plant	3
Support Area Plant	4
Support Area Mine	2
Total	218

Table 4-3: Easements Area

Property	Hectares
Chalinga Community	164.1
Chuchiñí Community	46.4
Cárcamo Community	160.0
Villalobos Land	1.8
Díaz Land	0.7
Total	372.9

Figure 4-2: Tenure Locations MTV Project

Note: Figure courtesy MTV, 2018.

4.7 Royalties and Encumbrances

There is a royalty payable to the Chilean government depending on the production rate. This royalty is discussed in Section 22 for the mine plan as it applies to the Mineral Reserves and financial model.

4.8 Property Agreements

There are no remaining payments required, and SRHI has a full 70% interest in the Project. There are no back-in rights or clawback agreements whereby the Project interest held by SRHI could revert to the former owners.

4.9 Permitting Considerations

Permit considerations are discussed in Section 20.

4.10 Environmental Considerations

Environmental considerations, including liabilities, are discussed in Section 20.

4.11 Social License Considerations

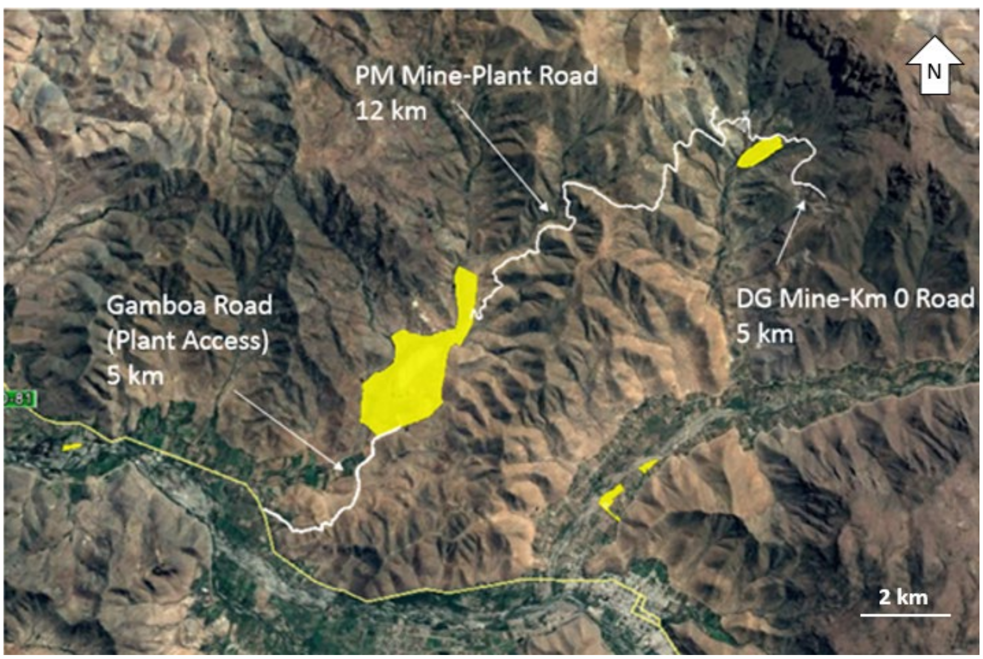
Social license considerations are discussed in Section 20.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY

5.1 Access

The main access to MTV uses the D-81 road, which connects Illapel with Salamanca. From Santiago, it is 222 km north by route 5-N until the city of Los Vilos. From Los Vilos, the road runs for 93 km east, following the Pupios Valley, crossing the Cavilolén Range and entering into the Choapa Valley. The main mine entrance is located 9 km from in Salamanca in the Chuchiñí community. At this point a 5 km long private road connects to the MTV process plant (Figure 5-1).

Figure 5-1: Roads MTV



Note: Figure courtesy MTV, 2018.

5.2 Climate

The Project area is situated in a temperate steppe climate. The average annual temperature is 16°C. In summer, the highest temperatures fluctuate between 29°C and 31°C, and in winter, the lowest temperatures are around -1 °C and 1 °C. The annual average of precipitations is 117 mm/a. Historically, the Coquimbo region has been adversely affected by floods, primarily due to El Niño events. In 1997, during the most intense storm of the 20th century, Salamanca received 460 mm of rain in June, July and August. Snowfall is minimal, and uncommon.

During the summer months, the relative humidity of the area is low, with maximum humidities at dawn. This is unlike the winter months, where the relative humidity remains high throughout the day, reaching a maximum value of 98%. Mining activities are conducted year-round.

5.3 Local Resources and Infrastructure

The Choapa province is the southernmost part of the Coquimbo region. It is formed by four counties (comunas), spreading from the coast to the Argentinean border. The Papomono mine is located in Illapel county while all other infrastructure is situated in Salamanca County. Illapel, the capital of Choapa province, is a city with 31,500 inhabitants. Salamanca has a population of 25,600. The city is located on the north Choapa River bank, close to the confluence with the Chalinga River. Due to the proximity to Antofagasta Minerals Ltd. Los Pelambres mine, Salamanca has skilled mining labor and contractors. Additional information on infrastructure and local resources is provided in Section 18.

5.4 Physiography

The altitude of the plant is around 600 m.a.s.l. (meters above sea level), while the mines are between 1,400 m.a.s.l. and 1,600 m.a.s.l., allowing year-round work. Snowfall is minimal and very uncommon. The Project is located around the La Horqueta Hill (1,965 m.a.s.l.) which acts as a watershed for three valleys: Manquehua to south, Quilmenco to the southwest and Cárcamo to the north (hence the Tres Valles in the Project name).

There are no National System of Wild Protected Areas of the State, or Wetlands of Importance within the Project area, or that would be affected by the development envisaged in this Report.

The high mountains generally lack vegetative cover. River valleys are generally farmed. Elevations between these two may have sparse succulents or bushes growing. One plant species, the Guayacán (Porlieria chilensis), may occur in the Project area, and is classified as "vulnerable" under the Chilean Wildlife Classification Regulations.

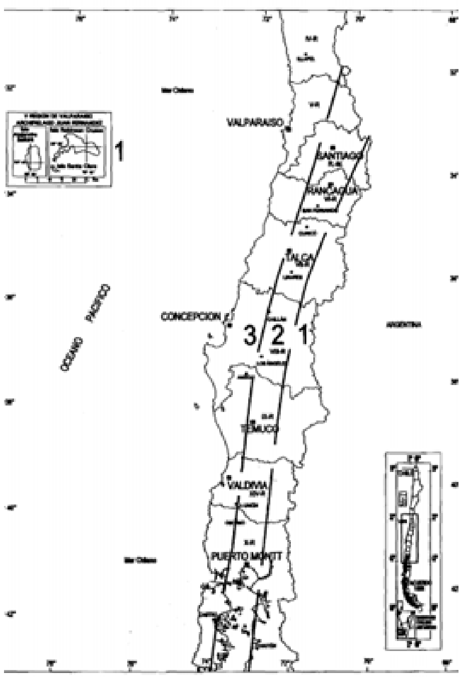
The Project is primarily situated in the Choapa River basin, specifically in the Quebradas de Manquehua (tributary of the Chalinga River sub-basin) and Quilmenco and in the

Quebrada de Cárcamo (tributary of the Illapel River). The area is situated in a temperate steppe climate.

5.5 Seismicity

The mining operations are located within seismic zone 3, as defined by the Chilean Standard 433-1996 (Figure 5-2). This zone has a 0.4 g rating. The zone rating assumes that at least one earthquake of magnitude five would be experienced annually.

Figure 5-2: Chilean Seismic Zones



Note: Source: NCh 433 – 1996.

5.6 Comments on Section 5

The Project includes an operating open pit and development of an underground mine. There is sufficient power and water available to sustain these operations. The contemplated mine plan (FS + PFS) does not require any additional water or power infrastructure to that already in place.

The Project also has sufficient surface rights for the leach pad, processing facilities, and the required waste rock storage facilities to support assumptions in the current operating mine plan.

Mining activities are currently performed year-round. The mine plans also assume year-round operations.

6.0 HISTORY

6.1 Exploration History

Vale S.A. (Vale) acquired mineral tenure in what became the Project area through a tenure purchase agreement with Minera Werenfried. The selected tenures covered an area of oxide copper mineralization being exploited by artisanal miners.

The copper mineralization within the MTV Project was identified by Vale in 2005, through a combination of ground induced polarization (IP) geophysical surveys and drilling. The Papomono deposit was discovered in June 2005, and the Don Gabriel deposit in April 2006.

Ten regional IP grids were established; some chargeability anomalies generated by the surveys were drill tested, but results were not encouraging.

A preliminary assessment (PA) was conducted in August 2006, which envisaged production from combined underground and open pit exploitation of the Papomono and Don Gabriel deposits, treatment of mineralized material in a solvent extraction-electrowin (SX/EW) plant, and production of copper cathode. Study results were positive.

A decline to provide metallurgical bulk samples commenced in March 2007. The decline was upgraded to support production activities and completed in 2009.

During 2008, Vale approved Project construction. The plant site was located within the Quilmenco Valley. The Project environmental license was granted in October 2009. The plant was commissioned in December 2010, and cathode production commenced in February 2011. The crushing and SX/EW plants had maximum permitted capacities of 5,500 t/d ore and 50.7 t/d copper cathode, respectively.

Early plant feed was from the Papomono underground mine, the Cumbre open pit and plant feed material purchased from the Chilean National Mining Corporation, "Empresa Nacional de Minería" (ENAMI). In 2012 a third-party purchase system was implemented, sourcing plant feed from local miners.

The access road to Don Gabriel was completed in June 2012 in support of open pit production. A quaternary crusher, designed to crush Don Gabriel chalcocite material to ¼", was completed in August 2013.

Vale sold the Project to the Vecchiola Group in 2013. The Vecchiola Group closed the mining operations, focusing instead on toll-treatment material, in order to re-evaluate the Project as a whole. In October 2015, small-scale production recommenced on a trial basis, and an updated long-term mine plan was produced.

In 2016, metallurgical testwork focused on whether recoveries could be improved using oxidant agents.

In September 2017 Vecchiola sold 70% of MTV to SRH Chile SpA, a SRHI subsidiary.

A FS on Don Gabriel Manto was completed in March 2018. During 2018 a PFS was competed on Papomono Masivo deposit. The remaining sections of this Report discuss the information supporting these studies and the study outcomes.

6.2 Production

Between December 2010 and August 31, 2018, MTV processed a total of 6.92 Mt averaging 1.20% TCu through the plant, resulting in 65,936 t of copper cathodes (see Table 6-1). These figures include contributions from external feed purchases and toll treatment based on actual production records.

Table 6-1: General Production for Current MTV Process Plant

Year	Crushed and Stacked Ore (t)	Total TCu (%)	Copper Cathode Production (t)
2010	46,682	1.24	247
2011	992,179	1.20	8,839
2012	1,737,696	1.02	14,029
2013	1,569,583	1.06	12,490
2014	556,898	2.00	8,238
2015	281,602	1.84	5,771
2016	436,677	1.30	5,412
2017	663,851	1.28	6,278
2018*	630,902	0.89	4,632
Total	**6,916,070**	**1.20**	**65,936**

Note: *Until August 31, 2018

7.0 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

7.1.1 Setting

The MTV deposits are located in a regional horst–graben system, formed by a 10 km wide corridor of middle to upper Cretaceous volcanic rocks, and bounded by kilometre-scale north–south-trending faults. To the west and east of the horst–graben complex, are intrusive granodioritic to dioritic rocks of the Early Cretaceous Illapel Supergroup.

7.1.2 Lithologies

The volcanic units consist of a thick package of flat-lying or gently-dipping beds of lava, pyroclastic and epiclastic rocks. Valley slopes host pediments of the Barremian–Albian Quebrada Marquesa Formation. In its type location, the Quebrada Marquesa Formation consists of a 1,900 m thick succession of continental coarse and fine sedimentary deposits, volcaniclastic deposits and lavas, with a marine calcareous and fossiliferous intercalation near the base (Charrier et al., 2007). In the Salamanca–Illapel region, the major lithologies belong to the Quellen Member of the Quebrada Marquesa Formation. These consist of intercalations of andesitic lava, volcanic breccias and agglomerates, with subordinate sandstones. The Quebrada Marquesa Formation is the main mineralization host in the Project area.

Overlying the Quebrada Marquesa Formation is the Upper Cretaceous Viñita Formation; the contact may be conformable or unconformable (Charrier et al., 2007). The Viñita Formation consists of andesites, basaltic andesites and abundant coarse and fine pyroclastic intercalations. It is divided into two members, the Santa Virginia Member, consisting primarily of oxidized sandstones and conglomerates, and the Rio Manque Member, consisting of lava and volcanoclastic units.

In the Project area, the grey-coloured Quebrada Marquesa Formation forms pediments on valley slopes. The reddish-hued Viñita Formation forms plateaus, such as the Llanos de Talhuen located north of the Chalinga Valley, and can also form cliffs and escarpments.

Overlying these units are remnant Tertiary tuffs, which form isolated outcrops in the upper parts of the plateaus. Quaternary fluvial sediments infill river valleys.

7.1.3 Structure

Two major faults have been delineated, the Manquehua and Llimpo Faults. The faults result in a sharp contact between intrusive and volcanic rocks, and are also visible in aeromagnetic survey data (Figure 7-1).

The geophysical data also indicate a number of east–northeast to west–southwest trans-Andean structures that are coincident with some valleys (e.g. Chalinga Valley). These structures are often associated with Chilean porphyry copper deposits.

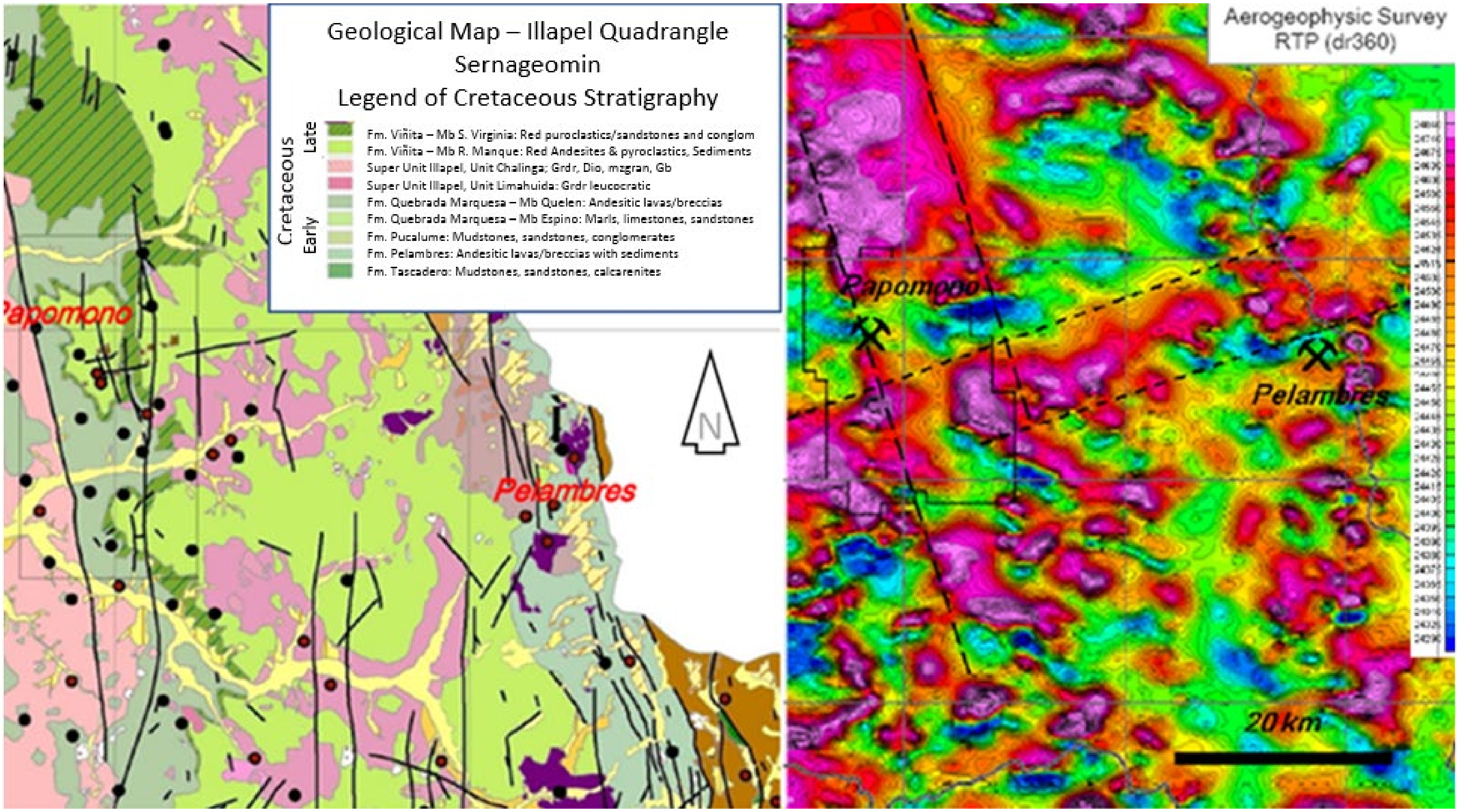
The known mantos-style mineralization within the Project area is close to the western Manquehua Fault (Figure 7-2). The Llimpo Fault, to the east, is less evident and to date, only skarn or vein copper deposits have been found in the fault vicinity.

In the Manquehua Valley, developed laterally to the Manquehua Fault trace, a sigmoidal, 6 km long, northwest–southeast-oriented structural corridor has been identified. The Papomono deposit is at the north of the sigmoid, and the Don Gabriel deposit to the south. Within the valley, several smaller deposits have been identified, and may be related to north–south, west–northwest to east–southeast, or east–west structures.

7.2 Deposit Geology

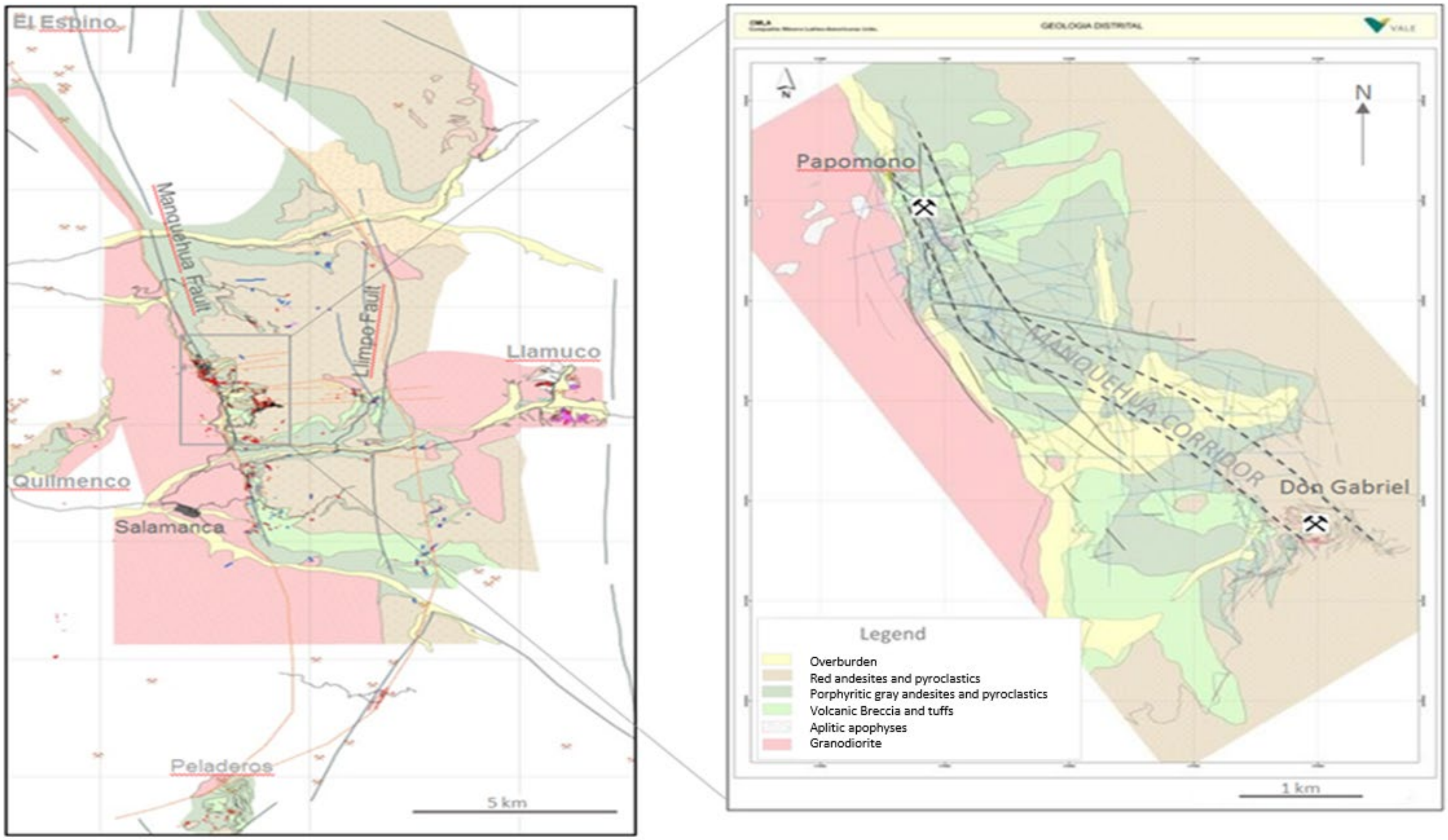
Two major deposits are located in the Project area (Figure 7-3) and have been divided into a number of zones.

Figure 7-1: Geology Map, Illapel Region



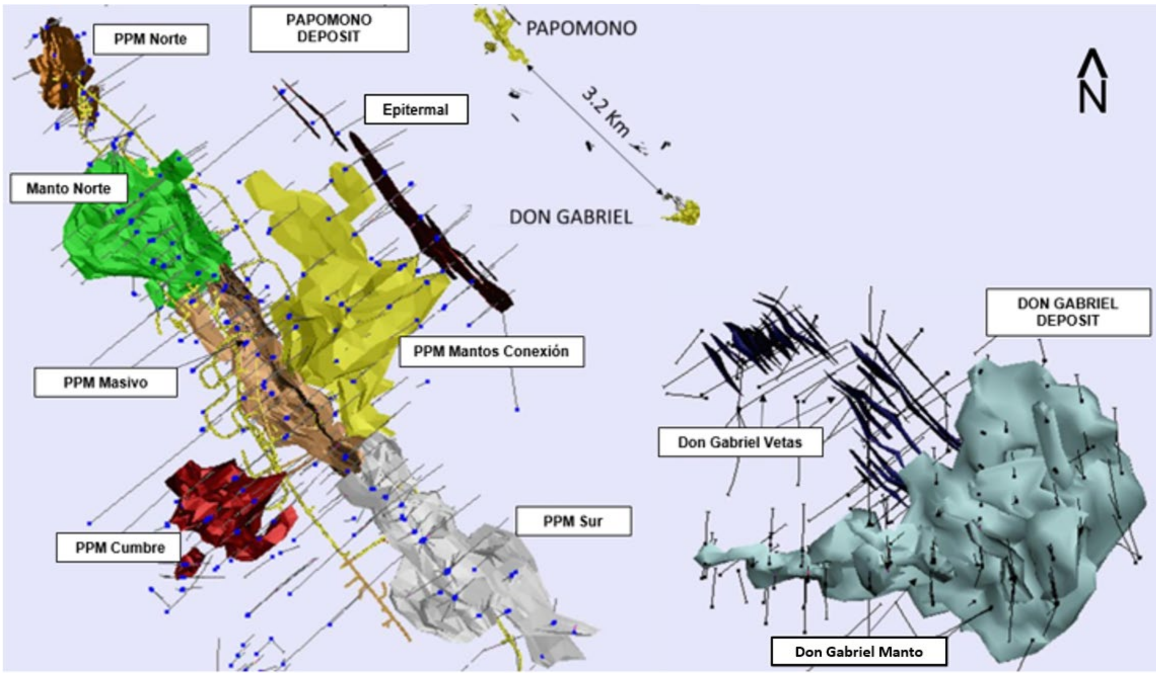
Note: Figure courtesy MTV, 2018. Left figure: horst–graben structure, producing a long regional belt of volcanic rocks bounded by batholitic intrusives. Mapping by Sernageomin, 1991. Right figure: reduced to pole airborne geophysical data showing the regional north–northwest to south–south-east trending faults cut by a trans-Andean east-northeast to west–southwest-trending regional structure.

Figure 7-2: Regional Geology Plan



Note: Figure courtesy MTV, 2006. Left figure is a regional map of the MTV Project area, showing the Manquehua and Llimpo regional faults, as well as the relation between intrusive rocks (pink) and volcanic units (green to gray). Right figure is an inset showing the structural setting of the Manquehua Valley.

Figure 7-3: Deposit Plan



Note: Figure courtesy MTV, 2018.

7.2.1 Papomono Deposit

Introduction

The Papomono deposit has been divided into four major areas, some of which have sub-zones.

Papomono Masivo

This zone is the most complex of the Papomono areas, due to the mineralization having three separate geological controls:

- A fault zone, the Papomono fault zone, acted as a feeder zone
- Mantos-hosting strata
- A swarm of narrow north–south/45°E oriented chalcocite veins.

Although earlier modelling efforts tried to differentiate between the three mineralization types, the current drill density, in particular for the narrow chalcocite veins, does not support quality local interpretations. A second consideration is that migrating fluids from the fault zone have flooded the mantos-hosting strata, and it is difficult to differentiate mineralization resulting from the feeder zone areas from the mantos area mineralization. As the current mining method is a bulk-mining method, the geological modelling focused on the area as a whole, rather than the individual mineralization types.

Papomono Mantos

The Papomono Mantos area includes the Manto Norte, Papomono Mantos Conexión, and Papomono Sur zones. Mineralization in these areas is mantos in style, stratabound, and associated with the Papomono fault zone as feeder zone. The Manto Norte, Papomono Mantos Conexión and Papomono Sur zones have the same orientation (N27°W/15°SW), a strike extent of about 1.5 km, and along dip extensions of about 240–340 m. The Papomono Mantos Conexión and Papomono Sur zones extend updip to the northeast from the Papomono fault zone.

Each of the three zones were separately geologically modelled, based on geotechnical considerations.

Papomono Cumbre

Mineralization in this zone consists of disseminated chalcocite and bornite or sheeted sulphide-rich veinlets associated with the presence of an intrusive plug ranging from dioritic to gabbroic composition. Mineralization can also be found in fractures and small faults along the intrusive contact with the andesitic wallrock. Copper grades are generally low, although some higher grades (1.0–1.8% Cu) occur in brecciated zones (magmatic breccia).

Epitermal

This zone consists of a number of well-defined, epithermal sugary quartz–alunite veins, containing enargite and chalcocite, striking N40°W.

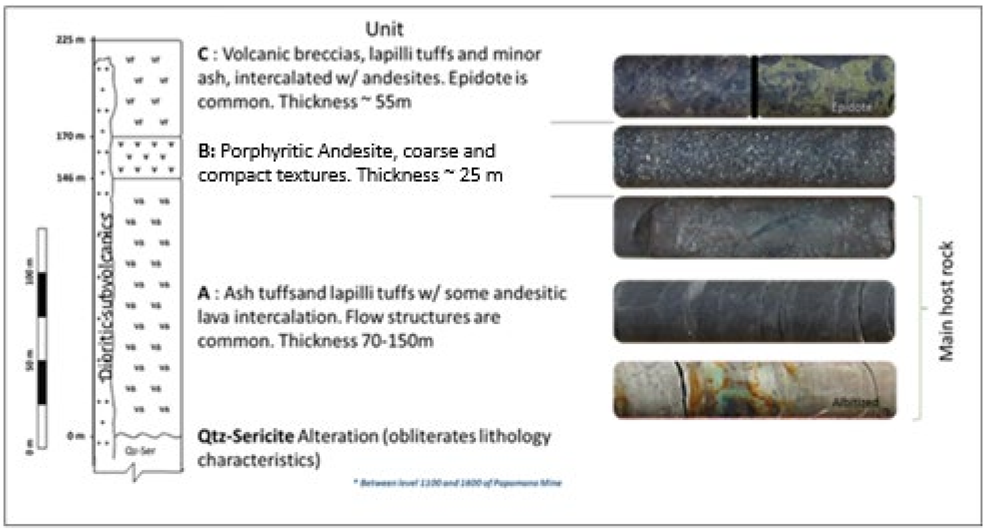
Stratigraphy

The stratigraphy observed in the Papomono deposit consists of a sequence of andesites interbedded with pyroclastic rocks of the Quebrada Marquesa Formation. The units strike N40°W and dip to the southwest at 15°. The lithostratigraphy used for deposit modeling purposes consists of three main sequences, from top to base:

- Unit C: Volcanic breccias and lapilli tuffs intercalated with andesitic lava. It is commonly epidote-altered. This unit hosts a small amount of mineralization and is the most common outcropping unit
- Unit B: Porphyritic and compact andesite; the unit is considered to be a physical barrier for the ascendant mineralizing fluids
- Unit A: Ash and lapilli tuffs with some andesites, typically flow-structure bearing. This unit is the main host rock in the Papomono deposit, and is commonly subject to intense albitization

Figure 7-4 includes additional descriptions of the three sequences.

Figure 7-4: Papomono Stratigraphic Units



Note: Figure courtesy MTV, 2018.

A small intrusive dioritic–gabbroic cylindrical plug, displaying fine equigranular textures, cuts all of the andesitic volcanic sequences. It is located between the Manquehua and Papomono faults and is a host for the mineralization within the Papomono Cumbre zone.

Dykes of intermediate andesitic–microdioritic composition intrude the volcanic sequences along structural discontinuities and are typically oriented east–west or northeast–southwest. The dykes are typically 0.5–5 m in thickness, are variably mineralized, and chlorite-altered.

Granodiorites of the Illapel Supergroup are in sharp faulted contact with the volcanic sequence. Locally, some aplitic apophyses have been identified.

To the west, some reddish volcanoclastic rocks of the Viñita Formation are preserved unconformably in the upper part of the hills.

Structure

Four structural systems have been mapped (Figure 7-5). The most obvious surface structure is the regional N15°W striking, 85°NE dipping Manquehua Fault, which produces the sharp contact between the granodioritic batholith to the west and the andesitic sequence to the east. This fault is believed to have been reactivated after the emplacement of the Illapel batholith as the andesites around its contact have been hornfelsed.

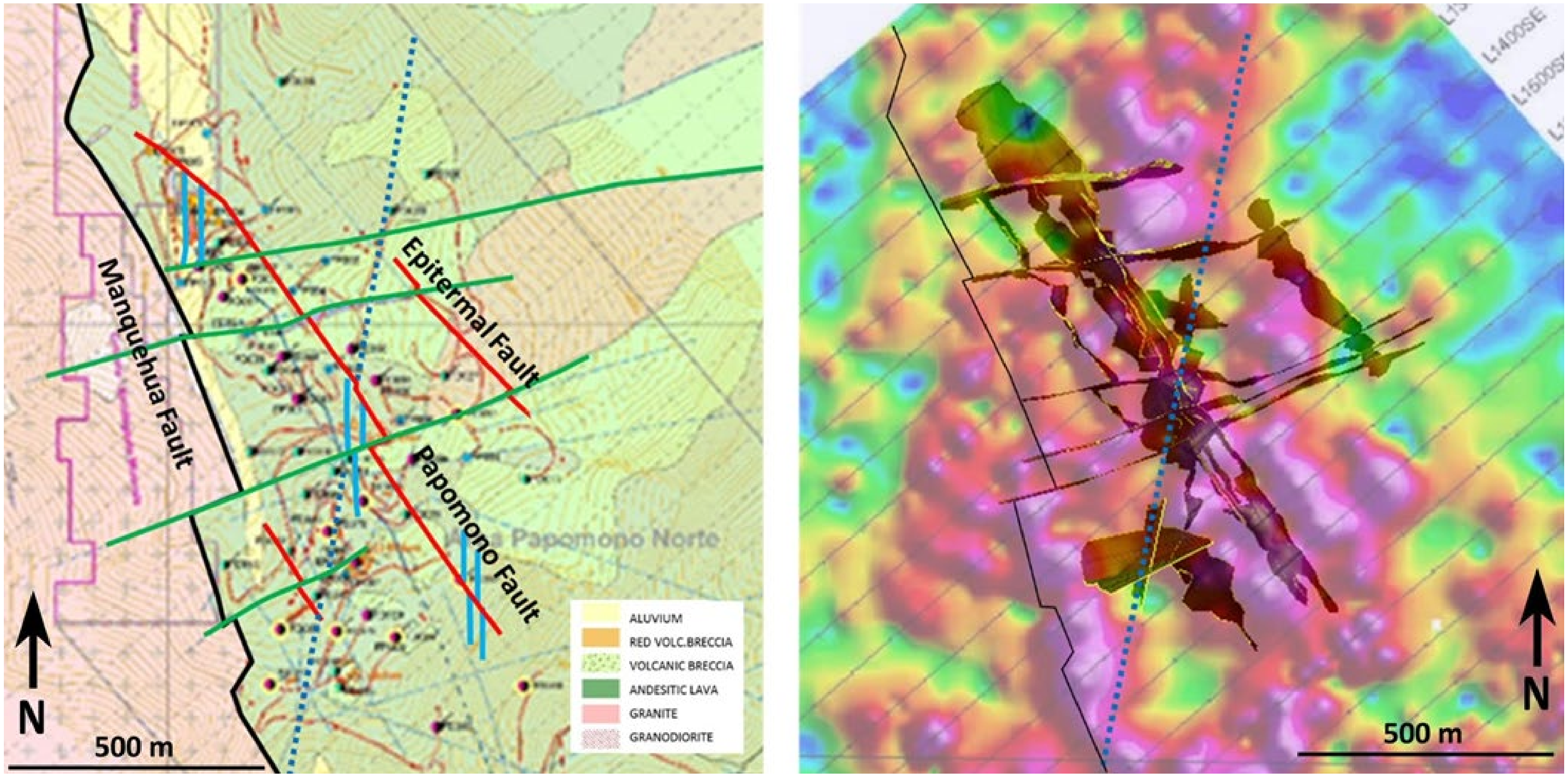
The most important structure in terms of mineralization control is the Papomono Fault system. This system is oriented N35°W to N40°W, dipping 80°–85° to the southwest and includes the Papomono Fault and the Epitermal vein-controlling fault. In the Cumbre open pit, a fault with the same direction was also mapped. The Papomono Fault is an intensely fractured and brecciated zone, mapped over a distance of 950 m. In the central zone it is wider, displaying 10–50 m of intense fracturing, with some chalcocite-bearing gouge bands. This fault system is considered to be the main hydrothermal fluids conduit in Papomono.

The third structural group consists of north–south-striking, 55°E dipping, short and narrow trans-tensional faults, generally filled by chalcocite. These structural sets repeat at about 550 m intervals along the Papomono Fault zone, suggesting they may correspond to a Riedel-type structure. They are shown in blue on Figure 7-5. A more extensive, N8°E striking fault (blue dots on Figure 7-5) coincides with the central set of north–south veins and is clearly seen in the magnetometry data presented on the right-hand side of the figure.

The fourth group is a set of late N70°E to N80°E striking vertical structures that displace all other previous structures, generally in a transcurrent dextral movement. At one point a horizontal throw of up to 140 m can be observed in the Manquehua Fault, while a 25 m horizontal component was measured in the Papomono Fault.

The Papomono fault was also subject to a transpressive effort towards the east, which is expressed by a low-angle fault, concordant with bedding, observed in the Papomono Masivo zone. In this area, the hanging wall appears to be overthrust by some 25 m over the footwall.

Figure 7-5: Structural Interpretation, Papomono



Note: Figure courtesy MTV, 2006. Left figure shows the colour-coded Papomono structures (red: Papomono Fault system; blue: north–south veins; blue dots: N8°E striking fault; green: N70°E faults). Right figure 3D-modelled structures showing the coincidence between geophysical response and mapped structures

Mineralization

The dominant hypogene sulphides in the deposit are in decreasing order: chalcocite–covellite (~85%), bornite (~6%), enargite (~5%) and chalcopyrite (~4%). Supergene chalcocite is not common. In places where intense fracturing and faulting occurs, the action of oxidizing agents generates oxide copper minerals including chrysocolla, malachite, brochantite and atacamite. For this reason, the traditional vertical zonation of oxides on the top of a deposit and sulphides at depth does not occur at Papomono.

The most common deposit geometry within the Papomono deposit is manto-type (stratiform). The individual "mantos" have a thickness that ranges from 2–50 m, strike extents of as much as 500 m and lengths along dip that can be as much as 600 m. Examples of this type of deposit geometry are the Papomono Sur, Papomono Mantos Conexión, and the Manto Norte zones.

The second most common deposit geometry is vein-type, with a thickness that can range from 2–15 m, a strike length that can vary from 100–420 m and dip extensions of 100–250 m. The dip angle is generally steep, between 80° and 90° to the west. There are also sets of tens of centimetre-thick north–south-oriented veins that typically dip at about 55° to the east. These vein sets occur in clusters of about 10 to 30 narrow, massive chalcocite veins, and can reach as much as 50 m in length.

The Papomono Masivo zone, due to the complex geometry, has a rough inverse triangle or a truncated rhomb shape. The zone has a strike extent of about 440 m, and can be as much as 190 m wide and 190 m high.

The Papomono Cumbre zone has a vertical extent of about 400 m, extending 310 m below the oxide mineralization that was mined in the Cumbre open pit, and a diameter of about 180 m. The remaining mineralization consists of disseminated chalcocite and bornite.

The main epithermal vein is about 420 m long and range from 8–14 m in thickness. Two significant veins occur on either side of the main vein and are 210–260 m long and 1–3 m thick. The main and secondary vein vertical extents are estimated at 160 m. Two smaller veins, 110 m in length, occur to the northwest of the main vein.

Alteration

The most common hydrothermal alteration, directly related to mineralization, is albitization, which can occur pervasively, forming homogeneous light pink or light grey beds, halos around structures, spotty disseminations or filling amygdules. Around the mineralized bodies, it is common to find fine disseminated hematite, occasionally in association with chlorite. In sectors where volcanic breccias dominate, intense epidotization is the most common alteration halo.

Intense quartz–sericite–pyrite alteration characterizes the deeper parts of the deposit. This alteration type is not concordant with the stratigraphy, but appears to be superimposed on the stratigraphy, forming a grossly horizontal level, with stair-step-like contacts. The Project geologists use the term "quartz–sericite floor" for this, because significant chalcocite mineralization does not occur under the contact and mineralization is restricted to minor chalcopyrite and pyrite. Despite limited information on this contact, since the drill holes generally stopped before or immediately at this level, it is considered to be a different alteration event that is not related to the stratabound mineralization.

7.2.2 Don Gabriel Deposit

Introduction

Don Gabriel Manto

The mantos occur in a 110 m thick package of andesites. The mantos are continuous along strike and dip but the thickness can vary from 20–60 m. The mantos can merge and split: typically, there are two main mantos that may join up to form a single manto, and there may be minor mantos adjacent to the main mantos. The mineralized zone is outlined by a 0.2% Cu isograd.

Don Gabriel Vetas

The mineralization is not vein hosted, but has a vein-type shape, with high-grade copper mineralization following the contacts of sub-vertical microdioritic dikes with the host andesite. These dikes range in thickness from 1–8 m, in general have a strike of N45°W strike, dipping 50° to 85° to the northeast or southwest. A minor, low-grade manto has also been identified.

Stratigraphy

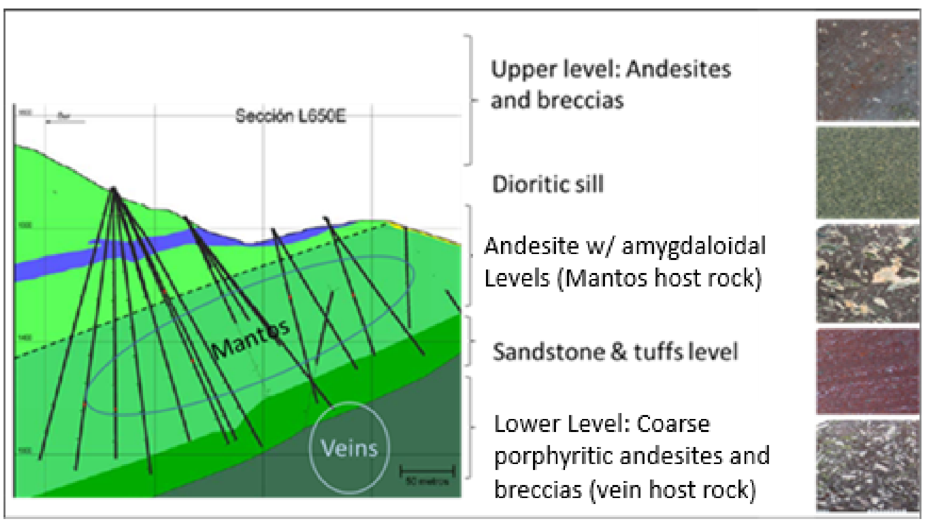
Five lithological units are found in the Don Gabriel deposit area, all of which are considered to be upper members of the Quebrada Marquesa Formation. The units strike N60°W, and dip to the southwest at 25° (Figure 7-6).

The uppermost unit consists of red to grey-colored intercalations of porphyritic, fine- to medium-textured andesite and breccias. Some andesites may have amygdules. The package has been intruded by a 10 m thick, fine equigranular or aphanitic textured, pale grey to green, dioritic sill.

Underlying the andesite and breccias is a suite of 100 m thick porphyritic to medium–coarse textured, red to grey, flow-textured andesites. Amygdules in the andesites can be filled by chalcocite-bearing albite, and where the andesites have oxidized, the fill consists of green copper oxides. The unit hosts the mantos-type mineralization at Don Gabriel.

Coarse reddish-brown sandstones (volcaniclastic sands) to microconglomerate units, which range in thickness from 0.6 to 10 m, forming an overall 50 m thick package, underly the andesite unit. The sediments are cross-bedded and may have intercalations of hematite-rich red andesites and breccias. The lowest package consists of gently-dipping, red, coarse–medium textured porphyritic andesites and breccias. The andesites may display trachytic textures. Northwest-striking microdioritic dykes cut all of the above units. A 350 x 130 m stock, elongated northwest–southeast, is believed to be the intrusive center feeding the dykes.

Figure 7-6: Don Gabriel Stratigraphy



Note: Figure courtesy MTV, 2007.

Structure

Four sub-vertical structural sets have been recognized (Figure 7-7).

The most common are the N45°W to N35°W striking set of faults that can be seen in the existing pit walls. At least six faults with this attitude were identified. The faults consist of 1–2 m thick zones of intense fracturing. The main fault, the Nuñez Fault, is believed to be part of the structures that control the high-grade veins that formed underneath the Don Gabriel Manto. Even inside the mantos, higher copper grades are observed around this fault and other structures that are parallel to it. Towards the northwest, several microdioritic dikes outcrop with the same orientation, suggesting magma emplacement took place during the formation of the structural discontinuities.

Field relationships suggest these structures cut and displace an earlier east–west-trending fault zone that is also visible in the open pit.

The third set of structures are oriented north–south, and have a limited strike extent. The set is represented in the open pit by the Gaby Fault, and two to three adjacent, parallel faults.

The last set of structures, which are N60°E striking, produce displacements in several other faults. These faults appear to have produced a sinistral displacement in the Don Gabriel Vetas deposit, with 60 m of horizontal throw in the southeastern block.

Mineralization

The Don Gabriel deposit consists of two main zones, a manto and a vein zone.

The 100 m thick upper manto zone consists of stratabound, finely disseminated chalcocite mineralization dipping to the south–southwest at 30°. The mineralized zone is developed in amygdale andesites.

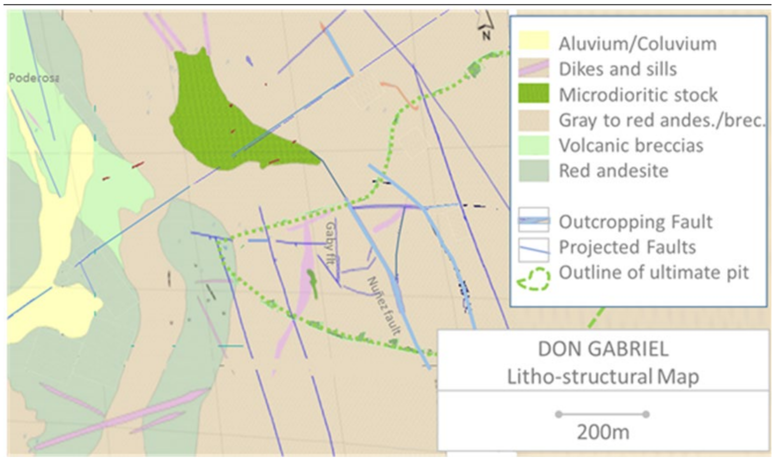
The lower, vein-shaped zone consists of high-grade stockwork or sheeted veinlets, and sulphide-bearing knots and disseminations. The primary copper minerals include chalcocite, digenite and some bornite. The host rock to mineralization is a medium- to coarse-textured porphyritic andesite and/or dioritic to microdioritic dikes.

The sandstone lithologies are used as separators between the two mineralized zones, and form the boundaries between the Don Gabriel Mantos and Don Gabriel Vetas geological models.

Alteration

The major alteration minerals are epidote and chlorite. Albitization may locally be present.

Figure 7-7: Don Gabriel Litho-Structural Map



Note: Figure courtesy MTV, 2012.

8.0 DEPOSIT TYPES

8.1 Mantos Deposits

Much of the mineralization within the MTV Project area is considered to be consistent with a stratabound, mantos-type deposit model. Such stratabound deposits in Chile can be either Jurassic (e.g. the Michilla deposit) or Lower Cretaceous age (e.g. the El Soldado deposit). Figure 8-1 provides the locations of major copper deposits in Chile in different age belts. Figure 8-2 shows the locations of the major Chilean stratabound copper deposits and provides schematics for the mineralization setting of the Michilla and El Soldado deposits. The following summary of the general features of mantos-type deposits is abstracted from Kojima and Campos (2011).

- Occur in andesitic to basaltic rock-dominated monoclinal volcano-sedimentary piles of Mesozoic age
- Typically form in intracontinental rift zones near the plate margin with continental-arc volcanism
- Nearly all deposits are hosted in several thousand meters-thick volcanic piles formed under an extensional regime with a steeply dipping Mariana-type subduction
- Temporal and spatial distribution:
  - Jurassic deposits; developed laterally along the coastal range (Arica-Iquique and Tocopilla-Taltal areas)
  - Early Cretaceous deposits; developed in the intracontinental back-arc basins (Copiapó, La Serena and Santiago areas)
- Host rocks underwent low-grade regional (or burial) metamorphism, and may be intruded by magnetite series calcalkaline granitic rocks
- Primary copper zones generally developed in host rocks that locally experienced propylitic alteration with albite, chlorite, epidote and calcite
- Major orebodies consist of a primary zone of chalcocite–digenite, bornite, and chalcopyrite, which can be partially altered to secondary sulphides (secondary chalcocite–digenite, covellite), and oxides (atacamite, chrysocolla, black copper)
- May be three modes of occurrence:

- Tabular orebodies in a particular stratigraphic horizon (e.g. Talcuna, Cerro Negro)
- Stacked tabular orebodies in lithologically permeable parts (e.g. Buena Esperanza, Michilla)
- Structurally-controlled irregular deposits (e.g. Mantos Blancos, El Soldado, Lo Aguirre).

The genetic source for the mineralizing fluids for mantos deposits is still under some debate. Kojima et al., (2009) note there are three major hypotheses:

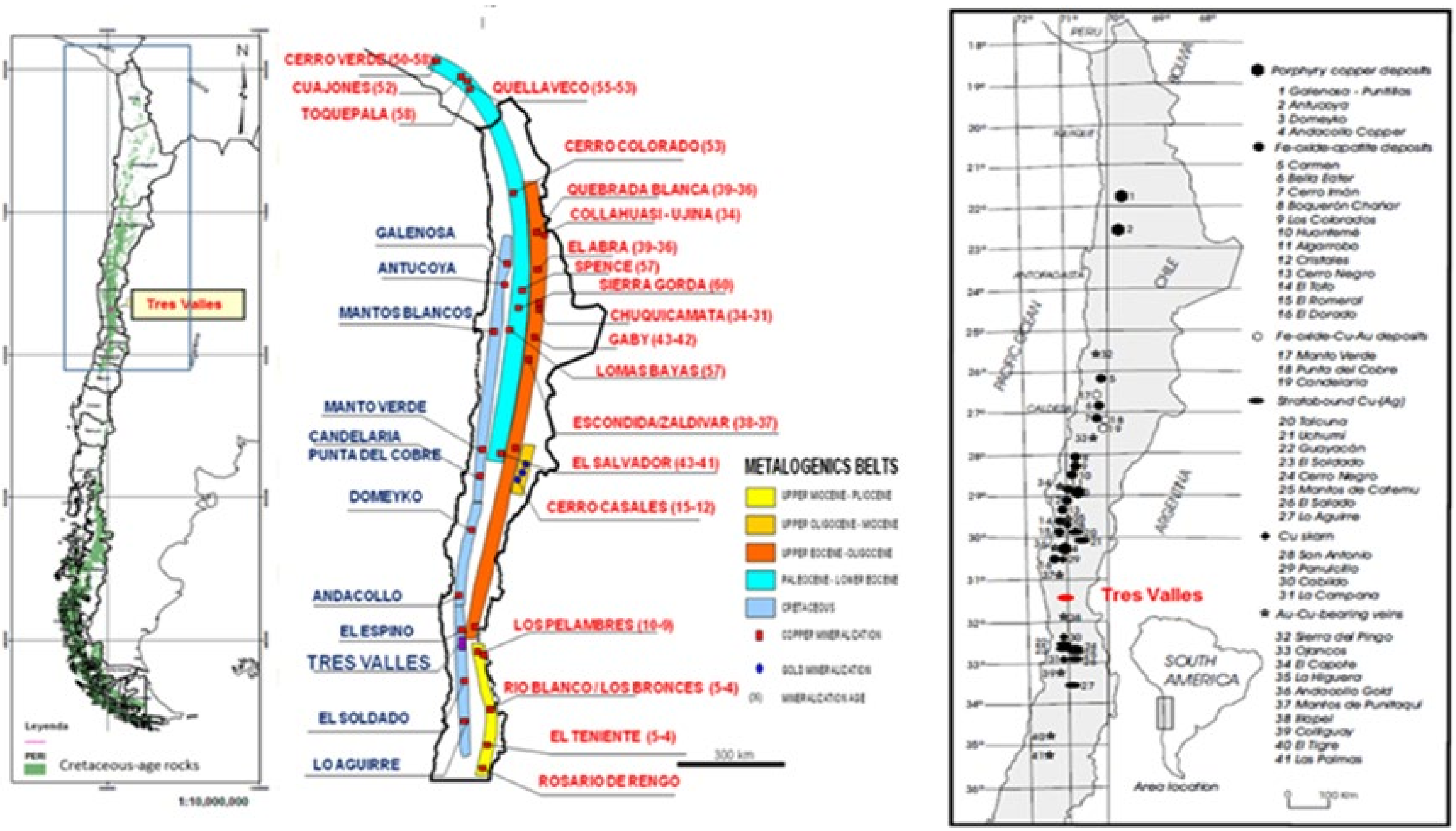
- Volcanic-derived syngenetic. In this interpretation, the deposit forms from contemporaneous cupriferous volcanic exhalations.
- Pluton-derived epigenetic.
- Host rock-derived epigenetic. Metamorphic water generated during low-grade regional (burial) metamorphism and surface-derived fluids such as meteoric water and seawater including deeper basinal brine are assumed as the origin of ore-forming fluids.

Kojima et al., (2009) consider that either the pluton-derived or host-rock derived epigenetic genesis hypotheses are more likely for the mantos-style deposits in Chile. Figure 8-3 is a cartoon of a potential formation model for Chilean mantos deposits.

Sillitoe (2005) proposed the mineralizing fluids that formed the Papomono deposit were basinal–diagenetic, leached from the upper Viñita Formation oxidized beds. These fluids would flow down through permeable beds and, when reaching reducing horizons (chemical traps), precipitate, with a lateral sulphide zonation. This zonation, from close-to-distal redox contact, would result in the precipitation of chalcocite, chalcocite–bornite, chalcocite–chalcopyrite, and finally pyrite. Sillitoe (2005) interpreted the quartz–sericite–pyrite alteration zone to be the most distal expression of the fluid flow.

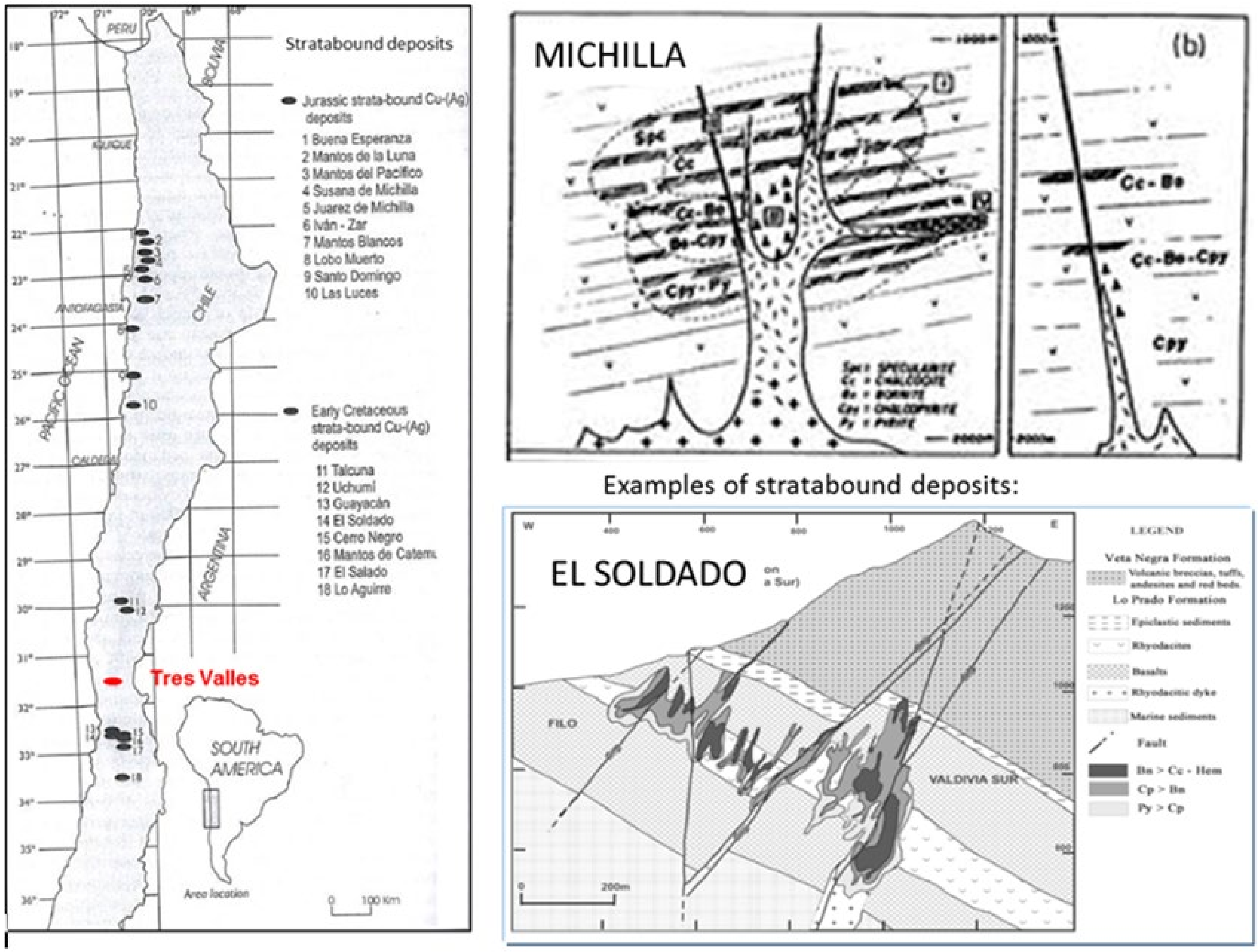
In contrast, MTV's geologists believe that the fluid is hydrothermal in origin and the solutions rose through structural discontinuities from deeper levels to zones with less lithostatic pressure, precipitating sulphides in receptive stratigraphical levels that were physically and chemically favorable. The favorable lithological horizons that served as fluid conduits were strongly affected by a pervasive to sparse albitic alteration. The presence of chemical traps for precipitation is a fact in Papomono, as pyro-bitumen was found in some thin sections, closely associated with chalcocite. Pyro-bitumen has been described in other stratabound deposits in Chile, such as El Soldado (Boric et al., 2002). MTV has observed that the precipitation of copper minerals generally occurs between 1,350 and 1,450 masl at Papomono. This may be related to a combination of favorable pressure and rock characteristics.

Figure 8-1: Chilean Copper Deposits



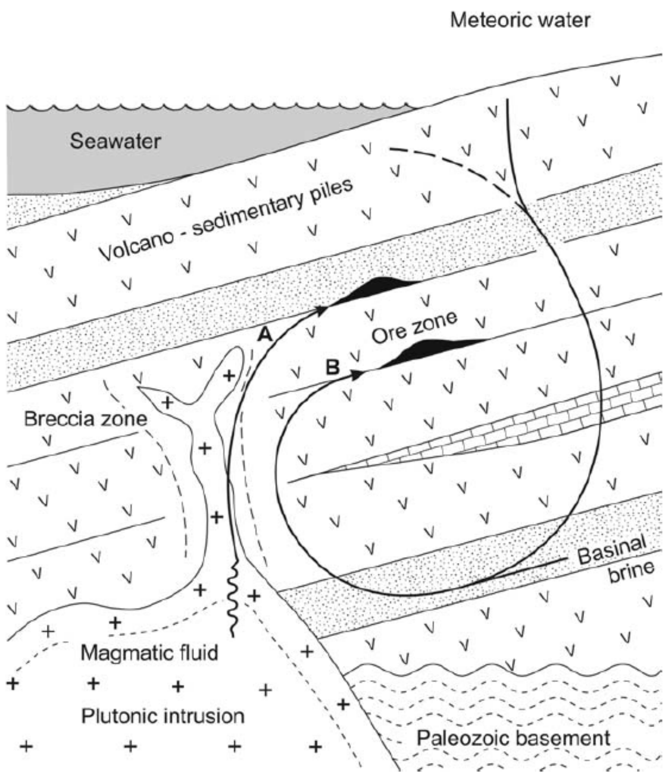
Note: Figure courtesy MTV, 2018, modified after Maksaev et al., 2007. The left figure shows the locations of the major metallogenic belts and deposits. The figure on the right indicates the major mineralization style. In this figure, mantos deposits are reported as stratabound Cu-(Ag) deposits.

Figure 8-2: Chilean Stratabound Deposits



Note: Figure courtesy MTV, 2018. The left figure shows the location of stratabound Cu–Ag deposits in Chile, after Maksaev et al., 2007. The right figures are type-sections for the Michilla and El Soldado deposits, after Boric et al., 2002.

Figure 8-3: Chilean Mantos Deposit Model



Note: Figure from Kojima et al., 2009. Flow paths of magmatic emanation (A) and surface water leaching (B) are shown. The host rock is volcano-sedimentary piles composed of andesite-dominant volcanic rocks, tuffaceous sandstone and limestone. Local faults are not shown.

8.2 High-Sulphidation Epithermal Deposits

In addition to the major mantos-style mineralization, the Project hosts cupriferous epithermal veins. These are considered to be examples of high-sulphidation epithermal deposits.

Key features of such deposits include (Sillitoe, 1999):

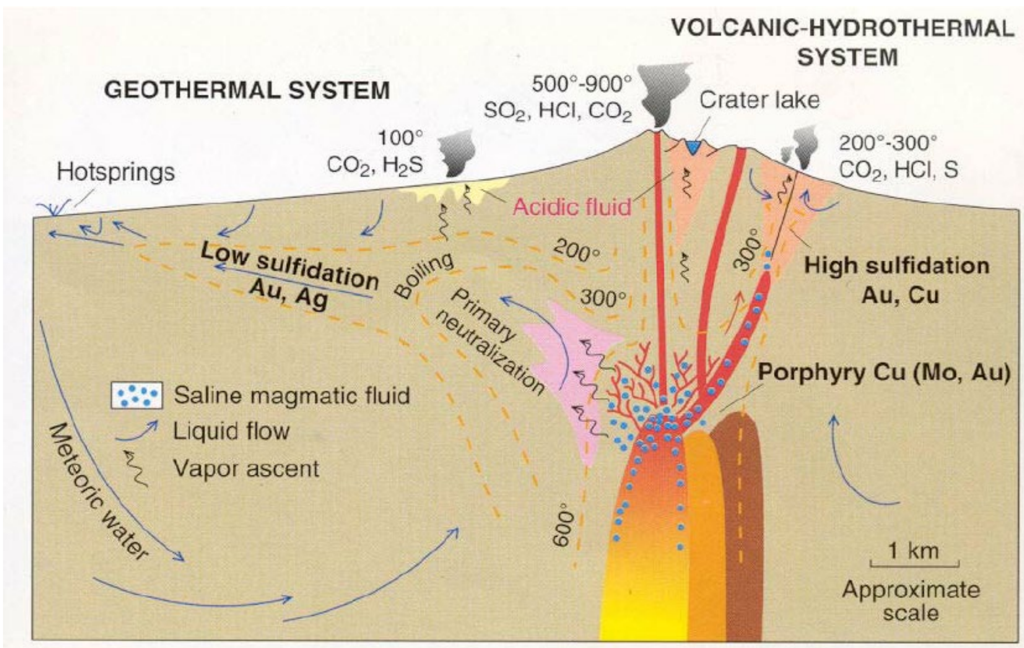
- Generated in both the epithermal and the upper parts of the underlying porphyry environments over vertical intervals of up to 2 km
- Mineralisation styles reflect depth of formation as well as the interplay between structural, lithological and hydrothermal parameters

- Intermediate levels of high-sulphidation systems commonly contain fault-controlled copper-gold mineralisation, typically as enargite in bodies of vuggy residual quartz, silicification and/or massive pyritic sulphide.

Overall, their defining features include pyrite-rich, high sulphidation-state sulphide assemblages typified by enargite, luzonite, digenite, chalcocite and covellite; and advanced argillic alteration assemblages typified by quartz, alunite, pyrophyllite and kaolinite/dickite (Sillitoe, 1999).

A deposit genesis cartoon is presented as Figure 8-4.

Figure 8-4: High-Sulphidation Epithermal Model



Note: Figure from Saunders and Hames, 2015.

8.3 Comment on Section 8

The QP considers that exploration programs that use the Chilean mantos-style deposit or high-sulphidation epithermal models would be appropriate for the Project area.

9.0 EXPLORATION

9.1 Initial Exploration

There has been no exploration conducted by, or on behalf, of MTV or SRHI. This section is a brief summary of the Vale exploration programs that led to the discovery of the Papomono and Don Gabriel deposits.

Vale commenced exploration activities in 2005, searching for large-scale, potentially blind, iron oxide copper gold (IOCG) deposits with more than 100 Mt. Thus, the initial exploratory strategy was strongly based on geophysics. An IP dipole-dipole and magnetometry survey was completed in the Manquehua valley, where a 6 km anomalous trend was identified with tens of copper occurrences. The surveys were undertaken by Zonge Ingeniería y Geofísica (at that time Zonge International´s Chilean branch), headed by senior geophysicist Jim Scarbrough.

The magnetometric survey totaled 91 linear kilometers. Results were not particularly effective in target selection, due to background noise mainly in the northern part of the grid. However, the magnetometric maps proved very useful for defining the main structures and trends in the area.

During the IP survey a strong IP-phase anomaly was identified in the northern part of the Manquehua grid (Papomono area). This strong chargeability zone was drill-tested, and abundant pyrite–sericite alteration was noted. A medium chargeability–medium resistivity anomaly was tested by the ninth drill hole of the program, and resulted in the discovery of the Papomono deposit. Continued exploration showed that chalcocite mineralization was generally related to low to medium chargeability anomalies (10 to 20 mRad). In the Papomono target area, the chargeability anomalies were usually located laterally and over the higher-phase values, while in the Don Gabriel deposit area, no strong chargeable anomalies were present.

From 2008 on, the work focus was concentrated on resource definition drilling campaigns in the Papomono and Don Gabriel deposit areas, with little additional exploration outside these zones.

9.2 Mine Site Exploration

Infill drilling is likely to be conducted in deposit extensions, including the Don Gabriel Vetas, Epitermal and Cumbre areas to support potential upgrades of mineralization currently classified as Inferred to higher-confidence categories.

9.3 District Targets

The Project area retains exploration upside potential. The Vale exploration programs identified a number of geophysical anomalies that remain to be investigated. Geological mapping has recorded in excess of 100 copper occurrences, the majority of are artisanal mining sites. Many of these sites appear to have similar geological settings to those of the Papomono and Don Gabriel deposits.

10.0 DRILLING

10.1 Introduction

During the first eight years of the Project, Vale completed more than 170,000 m of exploration and infill drill holes, which is about 22,300 m/a on average. The annual drilling maximum was 40,767 m, in 2008. Figure 10-1 shows the drilling completed in the period 2005–2012. There was a drilling hiatus from 2012, the last year of Vale work, until the third quarter of 2018, when MTV begins a new campaign.

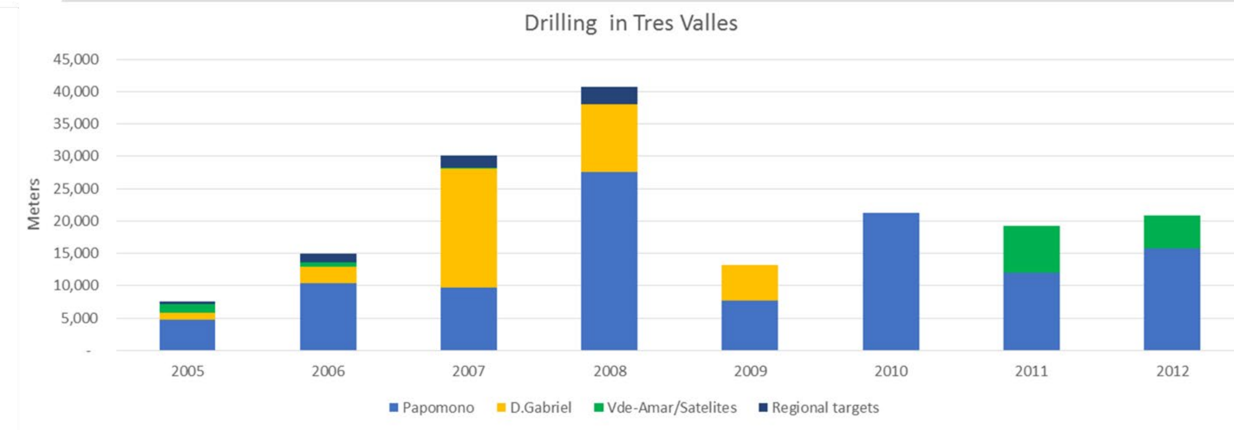
10.2 Legacy Drill Data

The companies Major Drilling, Terraservice and Geotec Boyles performed the drilling campaigns. About 98.5% of the drilling consists of diamond drill holes (DDH).

In 2006, 2,694 m of reverse circulation (RC) drilling was executed, but after some twin-DDH studies, it was concluded this type of drilling was not appropriate for the mineralization type, and resulted in serious bias and contamination issues. The probable cause was the softness of the chalcocite contrasting with the hard albite-rich rock, producing fine pulverization of the chalcocite, loss of material, and varying sample recovery. For this reason, no RC drilling results are used in geological modeling or resource estimation.

From 2007 to 2011, 18,000 m of infill underground drill holes were completed at Papomono, from the main tunnel and cross-stations. These campaigns were performed along sections between the previous surface drilling sections, with drill holes crossing the vertical structures orthogonally, while the surface drill hole orientations were angled to crosscut the mantos orthogonally. This pattern generated a complete coverage of the two main mineralization directions in the Papomono deposit area and avoided biased sampling.

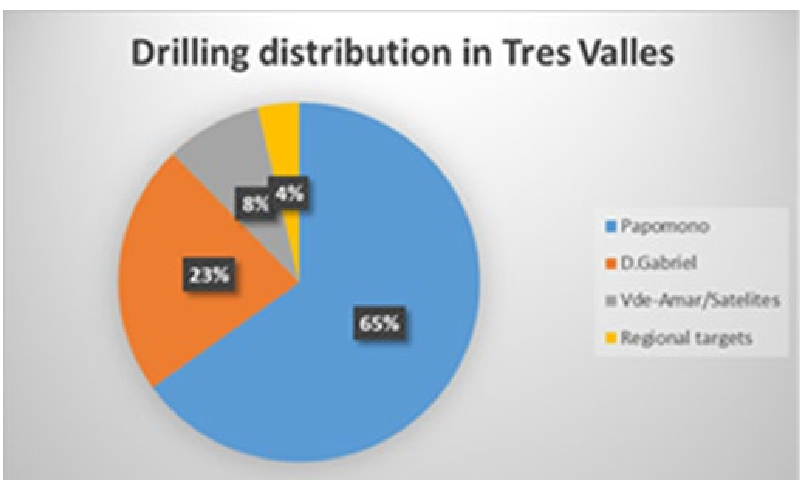
Figure 10-1: Drilling by Year



Note: Figure courtesy MTV, 2018.

The majority of the drilling (65%) was completed in the Papomono area, as it was considered the more complex deposit (Figure 10-2). About 23% of the drilling was in the Don Gabriel area. The remaining drilling was in the Amarilla and Verde areas (two small deposits between Don Gabriel and Papomono), and other regional exploration targets. Approximately 4% of the regional exploratory drill holes were collared outside of the Papomono and Don Gabriel deposit areas.

Figure 10-2: Distribution of Drilling by Area



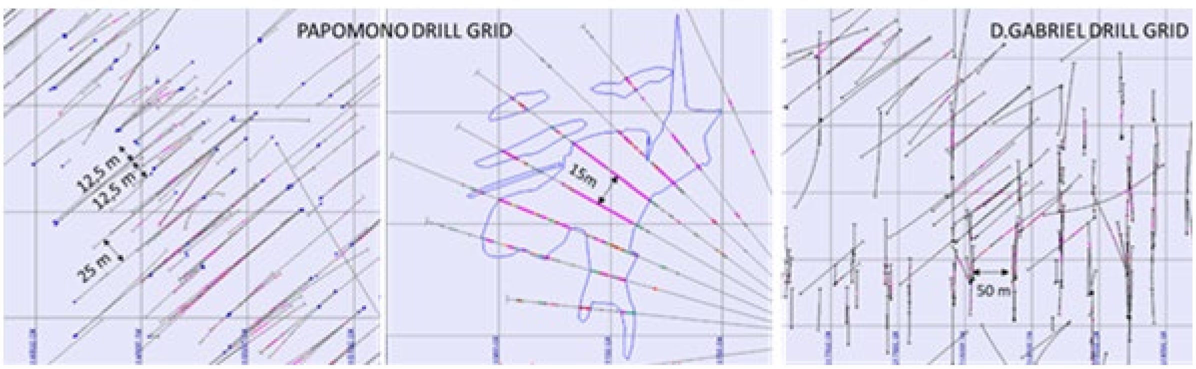
Note: Figure courtesy MTV, 2018.

10.3 Logging Procedures

The grid spacing in the Papomono deposit was variable. The whole deposit was generally drilled along sections located 25 m apart, although some sections had 12.5 m spacing (see Figure 10-3 and Figure 10-6). Infill drilling was performed in a fan-pattern, from a single platform or station. For this reason, the drill spacing between contiguous DDH varies along the lengths of the drill holes, being narrower at the collar than the toe. The spacing was designed to generate relevant information every 15 m.

In the Don Gabriel area the grid spacing was also variable. The initial "manto" drilling campaigns were developed in north–south sections on 50 m spacing. Some infill drilling occurred at 25 or 35 m spacings. Over this grid, a second grid, oriented northeast–southwest, was completed, targeting at the high-grade vein systems underneath the "manto" deposit. The overlapping portion of the grids generated additional detailed information for this part of the "manto" geological model.

Figure 10-3: Drill Section Spacing in Papomono and Don Gabriel



Note: Figure courtesy MTV, 2018.

The drill hole database provided to IMC included 771 holes (145,529 m). Table 10-1 summarizes this data for the Don Gabriel versus Papomono areas.

Table 10-1: Summary of Drilling Data

Year	Papomono								Don Gabriel			
	Surface				Tunnel							
	DH		PZ		DH		GT		DH		MT	
	N°	Length	N°	Length	N°	Length	N°	Length	N°	Length	N°	Length
2005	25	7,578.55										
2006	65	15,736.85									1	169.8
2007	45	8,247.25	1	230.3	18	1,665.00			82	17,657.05	5	756.3
2008	103	22,927.50			30	4,807.00	1	32.45	64	10,207.60		
2009	19	3,901.30			18	3,274.10	2	550.00	20	5,460.75		
2010	75	15,324.30			50	6,467.75						
2011	132	20,813.65			13	1,207.95						
2012	128	18,627.42										
Total	**592**	**113,156.82**	**1**	**230.3**	**129**	**17,421.80**	**3**	**582.45**	**166**	**33,325.40**	**6**	**926.1**

Note: DH: Diamond Hole, PZ: Piezometer Hole, GT: Geotechnical Hole, MT: Metallurgical Hole.

Figure 10-4 shows the drill traces for the Don Gabriel drilling and Figure 10-5 shows Papomono drilling with respect to the various Papomono deposit areas. Note that one collar site may have a number of drill holes completed from it, due to the fan arrangement used in the drilling. Figure 10-6 shows the collar locations of the regional drilling.

It is the opinion of the QP that the drilling methods are adequate for the style of the mineralization at Don Gabriel and Papomono.

During the first two years of exploration, all samples were assayed by multi-element packages (> 32 elements) + sequential copper (total copper (TCu) %, acid-soluble copper (ASCu) %, cyanide-recoverable copper (CNCu) % and residual copper (RCu) %) + Au by fire assay. From 2007 onwards, gold analyses were discontinued. Sequential copper was automatically assayed only if Cu ppm (AA) was equal or higher than 2,000 ppm. In the final assay database, columns with an "MOD" code are calculated as mathematical completion of the gaps (Cu < 0.2%) with Cu ppm value from atomic absorption analysis divided by 10,000.

It was observed that the sequential copper analysis also works very well as a mineralogical and geometallurgical mapping tool for the following reasons:

- The green/blue oxides (such as chrysocolla, malachite, brochantite, atacamite) are represented by the ASCu grades
- Chalcocite, covellite, digenite are represented by CNCu grades
- Low-recovery minerals (e.g. bornite, enargite) to refractory minerals (e.g. chalcopyrite) are expressed as RCu.

The visual proportions of these minerals in the drill cores are very similar to the analytical proportion of the different sequential copper analyses.

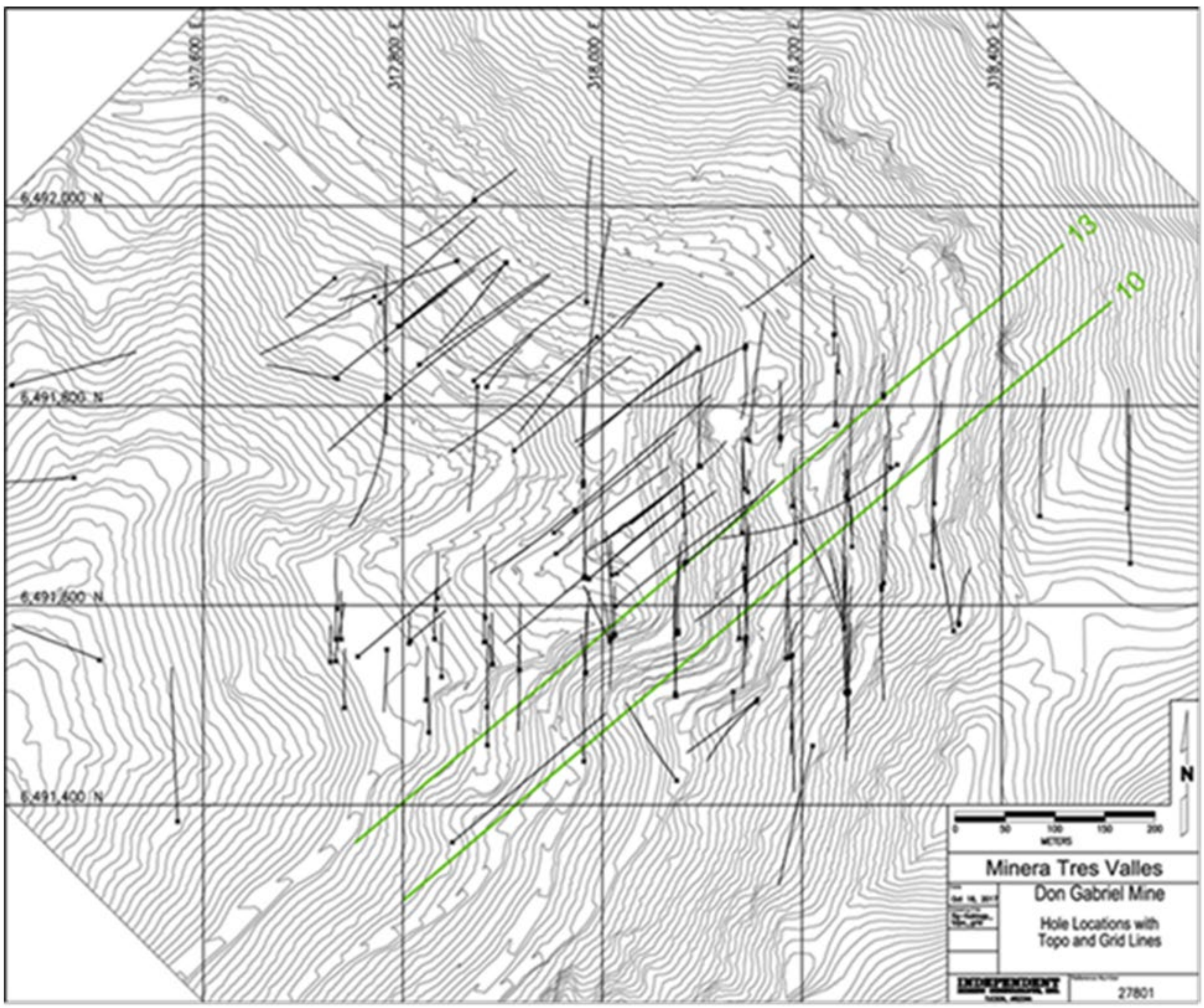
Between 2005 and 2008, more than 300 rock samples (mainly drill cores) were sent out for specialized petrography studies, generating 29 reports, which support the rock and mineral classifications used in logging and mapping.

The cores were logged initially in paper format, considering lithology, alteration, mineralogy, structures and rock quality designation (RQD).

From 2007 on, information was captured into the commercially-available acQuire software platform. Assay data from ALS Chemex was directly uploaded in digital format into the database. Existing geology, assays and survey data were consolidated into acQuire. Data were verified using the inbuilt acQuire software tools.

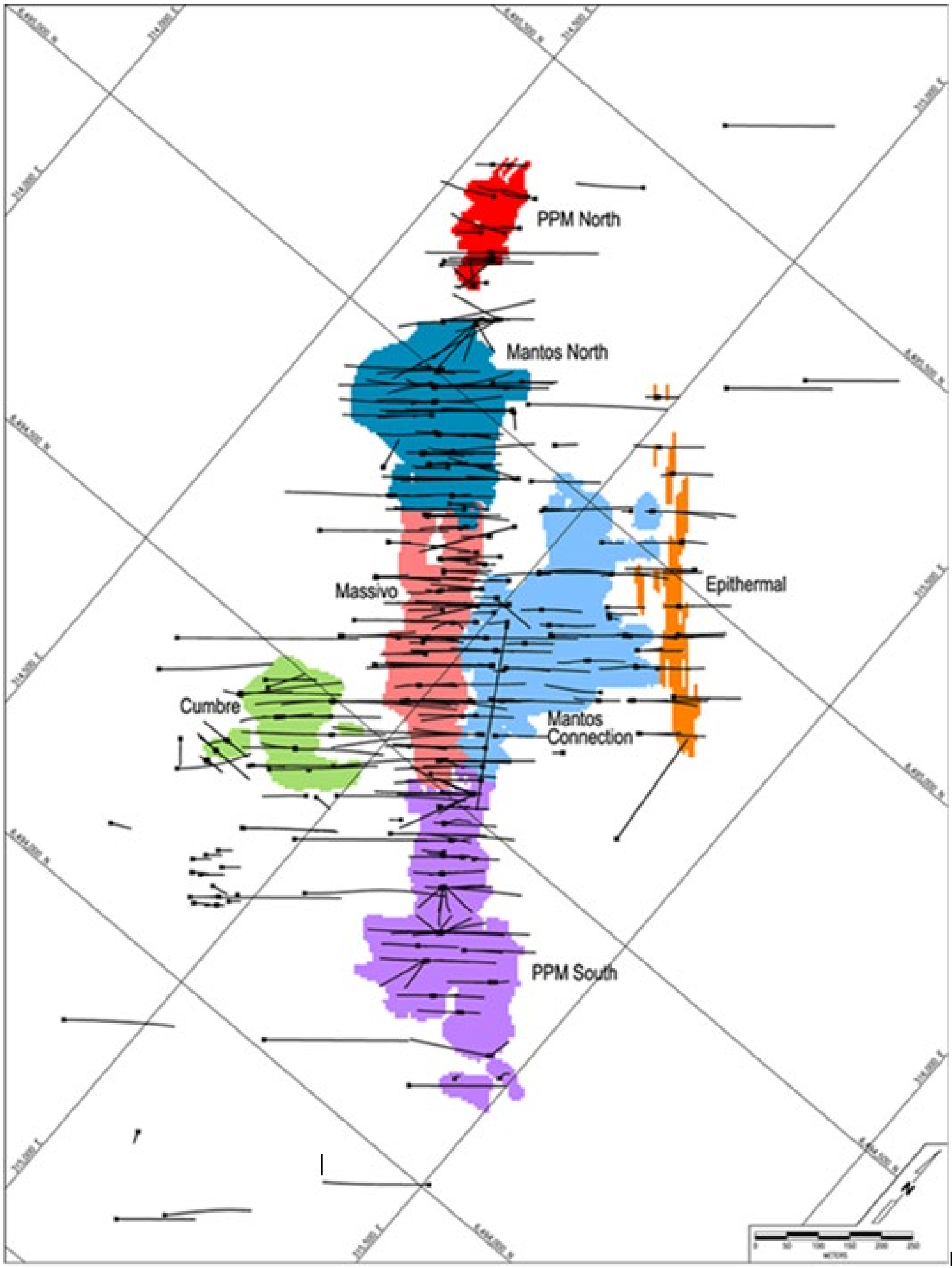
There are some gaps in the geology logging database because during infill drilling campaigns, visibly-barren parts of the drill holes were not logged in detail, only a paper quick-log was performed. The paper quick-log information was not transferred to the acQuire database. A digitization and re-logging campaign would be required to have full coverage of the geology of the drill cores.

Figure 10-4: Don Gabriel Drilling



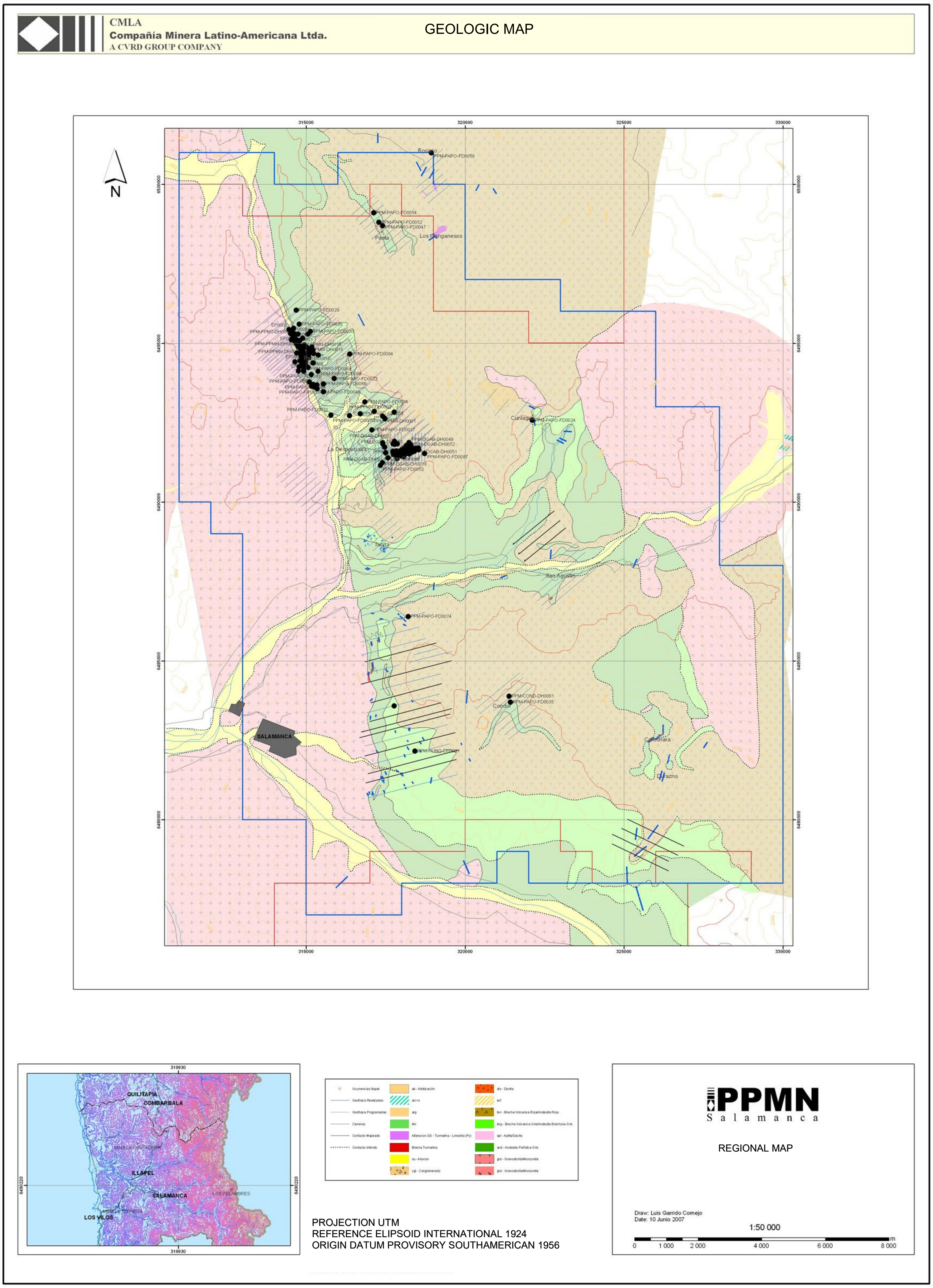
Note: Figure prepared by IMC, 2018.

Figure 10-5: Papomono Drilling and Deposit Areas



Note: Figure prepared by IMC, 2018.

Figure 10-6: Regional Drillhole Location Plan



Note: Courtesy MTV, 2018.

11.0 SAMPLE PREPARATION, ANALYSES, AND SECURITY

11.1 Sampling

Sampling was conducted every 1 m, except for areas of low recovery, and was geology-oriented. The cores were photographed in the boxes. All cores were cut longitudinally with a diamond saw and each half core was typically sent for analysis at independent accredited laboratories. For some drill holes, metallurgical samples were also extracted, leaving ¼ core in the box.

11.2 Laboratories

The primary analytical laboratory was ALS Chemex in Santiago, Chile. ALS Chemex is a commercial laboratory that is independent of MTV, and Vale. The Santiago laboratory holds ISO 9001:2015 certification and is accredited to ISO 17025:2005 UKAS ref 4028 for selected analytical techniques.

The umpire laboratory was SGS Lakefield laboratory in Ontario, Canada. The laboratory was independent of MTV and Vale. It has held ISO17025 accreditations for selected analytical, metallurgical and mineralogy services since 2000.

11.3 Sample Preparation

Drill core was delivered by the drilling contractors in 1 m long wooden boxes, identified by project, hole ID, box number and box interval. Inside the boxes "blocking plugs" marked the core metreage and the core recovery of the interval. This was then checked by MTV´s geological technicians, validating the core information with the recovery sheet delivered by the contractor. The same team proceeded to a "core regularization" process, marking equal-length core intervals. Core boxes were photographed under daylight conditions. The cores were then sent to geological and geotechnical personnel for logging at 1:100 scale, sample markup and diamond-saw cutting. The samples were then bagged, labeled and packaged and dispatched to the laboratory. The weight of sample sent to the laboratory was typically 2–4 kg.

At ALS Chemex, the samples were crushed to 70% passing 2 mm. A riffle splitter was then used to split out about 250 g of material that was then pulverized to 85% passing 75 µm.

11.4 Analysis

The analytical work for the exploration drilling was performed at ALS Chemex. Table 11-1 and Table 11-2 shows the ALS Chemex analytical procedures and sample preparation used for the MTV Project samples.

Table 11-1: Analytical Procedures

ALS Chemex Code	Description	Instrument
Au-AA23	Au 30 g fire assay atomic absorption (FA-AA) finish	AAS
Cu-AA62a	Ore grade copper – four acid/atomic absorption spectroscopy (AAS)	AAS
CNCu-AN06	Antofagasta sequential cyanide-recoverable copper (CNCu)	AAS
RCu-AN06	Antofagasta sequential – residual copper (RCu)	AAS
ASCu-AN06	Antofagasta sequential – acid-soluble copper (ASCu)	AAS
ME-ICP41	34 elements aqua regia inductively coupled plasma, atomic emission spectroscopy (ICP-AES)	ICP-AES

Table 11-2: Sample Preparation

ALS Chemex Code	Description
WEI-21	Received Sample Weight
LOG-22	Sample login – Rcd w/o BarCode
CRU-31	Fine crushing – 70% <2 mm
SPL-21	Split sample – riffle splitter
PUL-31	Pulverize split to 85% <75 µm

Each sample was digested in aqua regia followed by ICP-AES analysis to obtain assays for 36 different elements. For sample intervals where the copper ICP-AES determination exceeded 2,000 ppm, i.e. 0.2% Cu, two additional sets of determinations were done:

- A TCu assay by four-acid digestion and atomic absorption spectroscopy (AAS)
- A three-step sequential analysis to determine sulfuric ASCu, CNCu, and RCu.

For Don Gabriel, the number of copper assays in the database consist of 37,147 ICP analysis results, 10,902 TCu analyses, and 10,856 each ASCu, CNCu, and RCu sequential analyses. The final total copper assay in the database is based on the total copper analysis where performed, and otherwise, the ICP-AES analysis result is used for the low-grade intervals.

For Papomono, the number of copper assays in the database includes 92,996 ICP analyses, 21,847 TCu analyses, and 21,020 each ASCu, CNCu, and RCu sequential analyses. The final total copper assay in the database was based on the total copper analysis where performed, and otherwise, the ICP-AES analysis result is used for the low-grade intervals.

It is the opinion of IMC QP that the sample preparation and analytical work is adequate for the MTV Project requirements.

11.5 Databases

The digital database is hosted on an on-site server, while backups are available in the Santiago office. A physical database backup is on site (paper files organized by year/DH_ID) and includes density test results, geological and geotechnical logs, chemical analysis certificates, down-hole survey measures, sampling reports and procedures.

11.6 Core Shed

Drill cores are stored at the Quilmenco stockyard. Wooden boxes over pallets are organized by target and DH_ID. Pulps and rejects are stored in boxes and barrels over pallets, in a roofed warehouse.

11.7 Density

Density measurements in ore and waste material were performed by Vale personnel using the Archimedes (water displacement) method in an onsite laboratory. The methodology used followed Vale's internal procedures for such measurements. A total of 8,827 core samples (15% of the total samples) were measured.

11.8 QA/QC Programs

QA/QC procedures were initially established by Vale's Exploration Department and then were improved and complemented following recommendations from independent audits performed by independent third-party consultants, Snowden.

During drilling surveys drill collars and platforms were located by detailed topography using total station survey instruments. The drilling contractor performed down-hole surveys using Gyroscope, Single-shot or Maxibor equipment, the latter being the most common. The results comprise the "survey" database.

"White" and "Grade" standard reference materials (standards) were prepared by Vale, and covered low, medium and high-grade ranges. The standards were randomly inserted on an approximately 5% insertion rate with 10% double-check.

Annual QA/QC reports completed for the period 2008–2012 evaluated the standard and duplicate data. No significant QA/QC issues were noted in the reports. Some outlier samples were reassayed, and some minor data entry errors were fixed.

Pulp and duplicate rejects (1% to 5% of total) and drill core duplicate samples (0.3% to 1% of total) were re-assayed and the results compared to the initial assays.

The laboratory analysis results were automatically loaded to acQuire, and data checks were performed using analysis tools within the software package. Results were re-checked by external audits once a year, with audits conducted by Snowden in 2008, 2009, 2010, 2011, and 2012.

All of the original drill hole database information is in acQuire, allowing tracking of any kind of data alteration and ensuring data integrity.

11.9 Sample Security

Since all the drilling was completed during Vale's ownership, it was not possible for the Qualified Person to observe the chain of custody for samples. However, there was an audit of the standard procedures conducted by Snowden and reported in "Soc. Contractual Minera Tres Valles: Resource/Reserve Practices – Standard Procedures", dated March 2013. Figure 11-1 describes the sample security procedures. It is the opinion of the QP that these procedures meet or exceed industry-accepted practices.

The core, coarse rejects, and sample pulps stored in the secured core logging area near the plant.

Figure 11-1: Procedures for Sample Security as Documented by Snowden

Standard Procedures

SNOWDEN

Soc. Contractual Minera Tres Valles

Analysis: Chain of Custody

Originator: ______________________

Approved by: ______________________

Date: ______________________

Description of best practices:

An important quality assurance aspect of all drill sampling and analytical programs is the chain of custody of the core from the drill site to the analytical laboratory. Care must be taken to ensure that the location of each core boxes and the samples within are known at each stage of the process. It is especially important to ensure that the transportation and preparation of samples is controlled and transparent. For this reason the following procedures will be followed:

- each core box will be accompanied by a paper register
- the geologist or technician who puts the core samples into the core box and seals the box will sign and date the register when the core box is moved to the core logging location. A metallic label including the hole name, cores FROM and TO and date should be installed on the core box.
- the core logger who opens the core box will sign and date the register when the box is received and resealed
- the core splitter who opens the core box to cut the core will sign and date the register when the core has been cut and the box is resealed
- When samples are submitted for preparation the sample preparation manager will sign and date the register
- When the samples have been prepared, the coarse rejects will be sent to the core storage facility and the person responsible for that facility will sign and date a new register for these coarse rejects. When the sample pulps have been picked up by the laboratory, the responsible laboratory person will sign and date the coarse rejects register.
- When the sample pulps are returned by the laboratory to the core storage facility, the person responsible for that facility will sign and date the coarse rejects register and keep it on file. If subsequent samples are taken from either the coarse rejects or the sample pulps, the core storage person will sign and date the register.
- the person responsible for the core storage facility will sign and date the register upon receipt of the core box with the cut core. The register will then be filed with all other core box registers as a record of the movements of the core. When the core is removed from storage for review or other action, the person responsible for the core storage facility will sign and date the register for that core box

Additional to the core box register and chain of custody, the drill program manager will keep a daily record of the locations of each of the core boxes and of each of the samples taken from them for analysis. This daily record will become part of the final drill program report.

12.0 DATA VERIFICATION

12.1 Don Gabriel

For Don Gabriel, the IMC QP selected nine drill holes to compare the assays in the database with original assay certificates:

PPM-DGAB-DH0160	PPM-DGAB-DH0166	PPM-DGAB-DH0077
PPM-DGAB-MT0002	PPM-DGAB-DH0146	PPM-DGAB-DH0113
PPM-DGAB-DH0023	PPM-DGAB-DH0006	PPM-DGAB-DH0138

IMC QP checked the ICP total copper, the AAS total copper, and the soluble copper assays for each sample interval. IMC QP also checked the downhole survey information for each hole against the original measurements. The survey values in the database were checked against the values from the corresponding Maxibor field report. Collar checking was carried out by plotting the collars upon an up-to-date satellite image, and verifying that collar location coincided with existing drill platforms.

There were no significant discrepancies noted between the database and assay certificates. Based on this review IMC QP concluded the Don Gabriel database is acceptable for resource modeling for feasibility study level work.

12.2 Papomono

For Papomono, IMC randomly selected 20 drill holes to compare the assays in the database with original assay certificates:

PPM-PPMN-DH0046	PPM-PPMT-DH0079	PPM-PPMT-DH0106
PPM-PPMN-DH0090	PPM-PPMN-DH0120	PPM-PPMN-DH0152
PPM-PAPO-FD0021	PPM-PPMT-DH0067	PPM-PPMN-DH0030
PPM-PPMN-DH0182	PPM-PPMT-DH0035	PPM-PAPO-FD0009
PPM-PAPO-FD0013	PPM-PAPO-FD0016	PPM-PAPO-FD0018
PPM-PAPO-FD0022	PPM-PAPO-FD0051	PPM-PAPO-FD0012
PPM-PAPO-FD0017	PPM-PAPO-FD0027	

IMC checked the ICP total copper, the AAS total copper, and the soluble copper assays for each sample interval. IMC also checked the downhole survey information for each hole against the original measurements.

The check against the assay certificates and also a logical check for AsCu + CNCu <TCu identified errors in nine of the Papomono drill holes. These were mostly FD-series holes drilled during 2005, the first year of the exploration program. The assay certificates from the laboratory were not consistent in the order in which the various TCu and ASCu assays were reported and this resulted in copper assays in the wrong database columns for portions of several of the holes. IMC QP believes all the impacted holes have been corrected and the Papomono database is acceptable for resource modeling for feasibility study level work.

12.3 Comments on Section 12

The data verification completed by IMC QP, and the independent data verification completed by others, including the current QP, are sufficient to conclude the drill hole database is reasonably free of errors and suitable to support Mineral Resource estimation.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Acid Heap Leach Process

The estimate of copper recovery is based on historical plant performance between 2010 and October 31, 2017, on column tests reported by SGS Minerals Services (SGS), an independent laboratory based in Santiago, and on column and heap tests operated by MTV at the mine site.

The original plant design was based on an assumption of bacterial leaching, using information derived from column tests performed at Geomet S.A. (Geomet) in Santiago, which were coordinated and guided by Domic S.A. The leaching design was based on a maximum of 80% total copper recovery for Don Gabriel and Papomono ore to be obtained during the first years of operation at a net sulphuric acid consumption of 30 kg H_2SO_4 per ore dry metric tonne (dmt, using a total leach cycle of 400 days (AMEC, 2008).

During the first year of operation, MTV had SGS complete leach tests with the main purpose of determining the final copper recovery and acid consumption by using bacterial leach process. Specific objectives were to study the effect of ore type, particle size, heap height, and the inclusion of a tailings lift in leaching results, by comparing high-grade Papomono ore, low-grade Papomono ore, and Don Gabriel ore. The ore samples were crushed at two different particle size distributions, the first at P95 below ½" (12.7 mm) and P50 below ¼" (6.4 mm), and the second at P95 below ½" and P80 below ¼".

As MTV started to treat third-party and ENAMI oxide material, which used more acid in comparison to Papomono/Don Gabriel ore, the impurities and total sulphate began to increase above expectation in leach solutions, reaching total sulphate concentrations above 130 g/L SO_4 within 12 months of operation. Under such operating conditions, bacterial leaching was no longer suitable, and has been replaced by traditional acid heap leaching.

The historical MTV plant operation between 2010 and October 2017 (seven years) is summarized from evaluations undertaken by Oryxeio Ingeniería Ltda (Oryxeio).

13.1.1 Plant Operation

The MTV plant was commissioned in late 2010 and since then crushing, heap leaching, solvent extraction (SX), and electrowinning (EW) have been conducted with variable cathode production rates. MTV has treated mixed copper ore from Papomono and Don Gabriel, as well as third-party and ENAMI copper oxide materials. The third-party sources are small-scale, local miners.

Table 13-1 shows an annual summary for the material that has been crushed and stacked, and the resulting copper grades. The total historical amount of material treated from 2010 until October 31, 2017 corresponds to 6,139,043 dmt, averaging 1.22% TCu.

Table 13-1: Copper Mineralized Material Crushed and Stacked in the MTV Plant Since Startup In 2010

Year	Crushed & Stacked Material (dmt)	Copper Grade			
		Total Copper (% TCu)	Acid Soluble Copper (% ASCu)	Cyanide Soluble Copper (% CNCu)	Residual Copper (% RCu)
2010	46,682	1.24	0.51	0.67	0.07
2011	992,179	1.20	0.80	0.28	0.11
2012	1,737,696	1.02	0.67	0.25	0.11
2013	1,569,583	1.06	0.73	0.23	0.10
2014	556,898	2.00	1.84	0.07	0.09
2015	281,602	1.84	1.62	0.12	0.10
2016	436,677	1.30	0.78	0.38	0.14
2017*	517,726	1.17	0.69	0.33	0.14
Total	**6,139,043**	**1.22**	**0.87**	**0.25**	**0.11**

Note: *Until October 31, 2017.

The material treated is identified by source and is shown on Table 13-2.

Table 13-2: Origin of Treated Copper Mineralized Material between 2010 and October 31, 2017

Source	Crushed & Stacked Material (dmt)	Copper Grade			
		Total Copper (% TCu)	Acid Soluble Copper (% ASCu)	Cyanide Soluble Copper (%CNCu)	Residual (% RCu)
Papomono*	3,018,231	0.97	0.46	0.37	0.13
Don Gabriel	1,197,363	0.73	0.49	0.15	0.10
Third-party sources	959,301	1.70	1.55	0.10	0.05
ENAMI	964,147	2.14	1.92	0.11	0.11
Total	**6,139,043**	**1.22**	**0.87**	**0.25**	**0.11**

Note: *Mixture of Papomono underground zones (~1.7% TCu) with Papomono Cumbre open pit (0.6% TCu).

The determination of historical accumulated copper recovery until October 31, 2017 was achieved by comparing the cathode production with copper fines contained in the crushed and stacked material (tCuf). There was copper present in process operations and in cathodes not yet harvested at the time of the certification. Therefore, the copper pending recovery as at October 31, 2017, i.e., the recoverable copper being leached plus the recoverable copper in solutions plus the hanging copper in electro-winning tanks, must be added to the overall historical cathode copper production to determine actual plant copper recovery.

Table 13-3 outlines the annual and accumulated copper recovery based on cathode production, without including recoverable copper available in the plant by October 31, 2017.

Table 13-3: Copper Recovery Based on Copper Cathode Production

Year	Copper Fines in Treated Material (tCuf)	Copper Cathode Production (tCuf)	Annual Copper Recovery (%)	Accumulated Copper Recovery (%)
2010	581	247	42.56	42.56
2011	11,862	8,839	74.51	73.02
2012	17,721	14,029	79.17	76.63
2013	16,628	12,490	75.11	76.09
2014	11,144	8,238	73.92	75.67
2015	5,185	5,771	111.29	78.60
2016	5,672	5,412	95.41	79.99
2017*	6,037	4,966	82.26	80.17
Total	**74,830**	**59,991**	**80.17**	**80.17**

Note: *Until October 31, 2017.

In 2015 the annual copper recovery exceeded 100%. This is because in 2014 the Papomono and Don Gabriel mining operations were shut down and inventory on the leach pads and process solutions was drawn down during 2015.

The Papomono mine was reopened in September 2015 to provide plant feed to compensate for a lack of third-party material due to low copper prices.

The estimated recoverable copper fines available in the plant by October 31, 2017 are shown in Table 13-4, whereby the value of 1,259.4 TCuf was taken from Oryxeio's monthly copper recovery certification spreadsheet for October 31, 2017.

Table 13-4: Estimated Recoverable Copper in the Plant as at October 31, 2017

Item	Copper Stock (tCuf)
Copper cathodes hanging in EW cells	42.4
Copper in ore to be leached on heaps	1,259.4
Copper in leach solutions, SX organic, and electrolyte	114.0
Total	**1,415.8**

By adding the recoverable copper available on October 31, 2017 to the historical copper cathode production, the copper recovery reached 82.06%, presented in Table

13-5 as corrected copper recovery. The copper recovery considers the global amount of Papomono, Don Gabriel, third-party, and ENAMI materials, all of which were crushed at approximately P80 below ½" and P50 below ¼".

In April 2017, the quaternary crusher restarted operations and since then crushing has gradually improved to P95 below ½" and P~71-74 below ¼", as at October 2017. Currently the plant is coordinating some final adjustments (changes on screens and setting adjustments) for achieving an overall particle size distribution of P95 below ½" and P80 below ¼" to improve overall recovery.

Table 13-5: Corrected Copper Recovery as of October 31, 2017

Item	Amount
Copper cathodes produced (tCuf)	59,991
Recoverable copper stock (tCuf)	1,416
Expected copper production (tCuf)	61,407
Copper fines in treated ore (tCuf)	74,830
Corrected copper recovery (%)	**82.06**

The historical corrected copper recovery of 82.06% since start-up until October 31, 2017 was obtained for an average ASCu/TCu ratio of 0.71, a mineralized material particle size distribution of P80 below ½" and in the absence of expected bacterial activity, due to the high level of impurities. This is summarized in Table 13-6.

Table 13-6: Monthly PLS Composite Analysis (June 2012 and September 2017)

Element	June 2012		September 2017	
	Oxide PLS	Sulphide PLS	Oxide PLS	Sulphide PLS
Total iron (g/L TFe)	9.2	7.8	12.2	11.7
Ferrous ion (g/L Fe^{2+})	5.8	2.1	8.8	9.3
Manganese (g/L Mn)	3.0	2.4	3.0	3.0
Magnesium (g/L Mg)	16.7	16.9	18.8	19.0
Aluminum (g/L Al)	17.9	18.1	18.9	18.1
Chloride (gLl Cl)	<0.3	<0.3	<0.3	<0.3
Nitrate (g/L NO_3)	3.4	N.A.	N.A.	N.A.
Total sulphate (g/L SO_4)	198	196	207	224
pH	2.0	1.9	2.2	2.2
Total suspended solids (ppm TSS)	10	19	16	13
Viscosity (cP)	5.2	5.1	5.0	4.8

Note: PLS = pregnant leach solution.

The historical sulphuric acid consumption is presented in Table 13-7. In the period between January 2014 and September 2015 the plant feed was restricted exclusively to third-party and ENAMI materials and, consequently, the acid consumption expressed in kg/dmt increased accordingly, as most of that material had high sulphuric acid consumption.

The acid leaching requires a minimum concentration of ferric of 3 g/L Fe3+ to achieve a successful copper recovery from copper sulphides. Part of the ferric ion present in the pregnant leach solution (PLS) has been obtained by leaching third-party and ENAMI materials, causing at the same time higher sulphuric acid consumption, an increase of impurities in the PLS, and may have contributed to a great extent in inhibiting the bacterial leach activity.

Table 13-7: Sulphuric Acid Consumption in the MTV Plant Since Start-up

Description	2011	2012	2013	2014	2015	2016	2017*
Dry feed (dmt)	992,179	1,737,696	1,569,583	556,898	281,602	436,677	517,726
H_2SO_4 in agglomeration (t H_2SO_4)	13,175	20,651	15,938	12,014	10,564	8,794	8,934
H_2SO_4 in leaching/SX (t H_2SO_4)	21,274	56,554	45,766	20,646	29,070	23,547	26,748
H_2SO_4 in agglomeration (%)	38.2	26.7	25.8	36.8	26.7	27.2	25.0
H_2SO_4 in leaching/SX (%)	61.8	73.3	74.2	63.2	73.3	72.8	75.0
Total H_2SO_4 consumption (t H_2SO_4)	34,449	77,204	61,704	32,660	39,634	32,341	35,682
Cu cathode production (t Cu)	8,839	14,029	12,490	8,238	5,771	5,412	4,966
Unit H_2SO_4 consumption (kg/DMT)	34.7	44.4	39.3	58.6	140.7**	74.1	68.9
Unit H_2SO_4 consumption (kg/kg Cu)	3.90	5.50	4.94	3.96	6.87	5.98	7.19***

Note: * Until October 31, 2017. ** Essentially only external and ENAMI material was leached. *** The higher unit net sulphuric acid consumption is compensated for by a higher copper recovery from tailings.

Although the tests performed at SGS until 2011 that were related to bacterial leaching are not representative of any future leaching scheme, they allow for comparison of sulphuric acid consumption, multiple lift heap leaching and copper recovery per metre of column (i.e., heap) height for different particle size distributions in comparison to the actual MTV plant performance.

13.1.2 Metallurgical Test Work

SGS Column Tests

To evaluate copper recovery, column tests were performed at SGS between 2008 and 2011 with samples from Papomono and Don Gabriel. In addition, column and heap tests were operated by MTV at the mine site in 2016 and 2017 using fresh samples of Papomono and Don Gabriel material, taken after improved access to both deposits. This material was taken from the 50% of the Papomono deposit and three first phases from Don Gabriel Manto open pit.

After plant start-up in 2010, 12 leaching columns of 0.19 m diameter (six 6 m columns of and six 3 m columns of) were set up at SGS and operated between February 3 and October 18, 2011 for periods of 267 and 273 days. The 6 m columns (columns 1–6) were first loaded with 3 m of heap leach tailings in the lower part and 3 m of acid-agglomerated fresh ore in the top of the columns. The 3 m columns (columns 7–12) were loaded only with acid-agglomerated fresh ore. Consequently, all 12 columns generated comparable copper recovery results for the 3 m of acid-agglomerated ore.

The SGS column tests used four columns of high-grade (HG) copper-bearing material from Papomono (3.72– 4.06% TCu), four columns of low-grade (LG) copper-bearing material from Papomono (1.02–1.17% TCu), and four columns of copper-bearing material from Don Gabriel (1.21–1.23% TCu). Six columns were loaded with P95 below ½” and P50 below ¼” material and six columns were loaded with P95 below ½” and P80 below ¼” material. In Table 13-8 the sequential analysis is shown for fresh agglomerated material in the 6 m and 3 m columns.

Table 13-8: Copper Head Grades for SGS Column Tests

Source	**Papomono (HG)**		**Papomono (LG)**		**Don Gabriel**	
Columns	**1 & 7**	**4 & 10**	**2 & 8**	**5 & 11**	**3 & 9**	**6 & 12**
Size	P_{95}<½” & P_{50}<¼"	P_{95}<½” & P_{80}<¼"	P_{95}<½” & P_{50}<¼"	P_{95}<½” & P_{80}<¼"	P_{95}<½” & P_{50}<¼"	P_{95}<½” & P_{80}<¼"
Total Cu (%TCu)	3.720	4.060	1.023	1.170	1.210	1.230
Acid sol. Cu (%ASCu)	1.240	1.000	0.603	0.690	0.940	0.950
Cyanide sol. Cu (%CNCu)	2.410	3.020	0.383	0.390	0.190	0.180
Residual Cu (%RCu)	0.070	0.040	0.037	0.090	0.080	0.100

All columns operated the first 91 days under chemical leaching and the remaining days under bacterial leaching conditions, until a total leach cycle of 267 and 273 days was completed. The MTV plant has been operating with primary (“oxide”) and secondary (“sulphide”) leaching under chemical leaching conditions during the whole leaching cycle, taking advantage of the ferric ions generated during leaching of the oxide and sulphide materials. The SGS column tests used synthetic solutions with 0.5 g/L Cu, 8 g/L sulphuric acid, and 5 g/L Fe in the chemical leaching period, followed by 0.1 g/L Cu, 5 g/L sulphuric acid, and 5 g/L Fe in the bacterial leaching period. There are differences between the SGS column tests and the actual plant operation related to ferric versus bacterial leaching, as well as synthetic solutions versus presence of impurities.

In Table 13-9 and Table 13-10, the copper recovery and the sulphuric acid consumption of the SGS column tests are shown for the 3 m of fresh agglomerated material, once the leaching cycle was completed. The copper recovery results, as shown, are based on head/tailings analysis. The lower copper grade material from Papomono showed excellent recovery results, even exceeding the higher copper grade Papomono material.

Table 13-9: Copper Recovery and Sulphuric Acid Consumption for the First 3 m of the 6 m SGS Column Tests (Columns 1–6)

Source	Papomono (HG)		Papomono (LG)		Don Gabriel	
Column	1	4	2	5	3	6
TCu recovery (%)	91.2	93.9	91.2	94.8	81.8	87.6
ASCu recovery (%)	93.1	92.6	94.7	97.6	84.1	91.4
CNCu recovery (%)	91.3	95.6	90.3	94.1	74.9	77.6
RCu recovery (%)	56.2	0.8	45.0	76.7	71.7	69.3
Net acid cons. (kg/dmt)	15.85	15.34	26.63	26.59	26.44	27.00
Net acid cons. (kg/kg Cu)	0.84	0.78	4.19	4.01	4.35	4.24

Table 13-10: Copper Recovery and Sulphuric Acid Consumption for the 3 m SGS Column Tests (Columns 7–12)

Source	Papomono (HG)		Papomono (LG)		Don Gabriel	
Columns	7	10	8	11	9	12
TCu recovery (%)	86.9	92.1	90.3	92.9	77.8	85.9
ASCu recovery (%)	90.1	90.0	94.7	96.4	83.2	89.3
CNCu recovery (%)	88.6	94.2	88.5	91.7	67.9	77.4
RCu recovery (%)	-	-	36.0	70.7	37.9	69.0
Net acid cons. (kg/dmt)	16.85	15.04	41.20	42.16	42.47	43.42
Net acid cons. (kg/kg Cu)	0.52	0.42	4.31	4.00	4.68	4.34

An interesting aspect of the SGS column tests is that samples were taken for each metre of loaded agglomerated ore in the 12 columns, as well for each equivalent metre of tailings. In Table 13-11 and Table 13-12 the copper recovery is shown for the top metre of each column.

Table 13-11: Copper Recovery in the Top Metre of the 6 m SGS Column Tests (Columns 1–6)

Source	Papomono (HG)		Papomono (LG)		Don Gabriel	
Columns	1	4	2	5	3	6
TCu recovery (%)	96.5	97.6	91.7	95.6	84.2	90.9
ASCu recovery (%)	96.4	98.0	94.7	98.3	87.9	94.0
CNCu recovery (%)	97.3	98.7	90.9	94.6	74.2	80.6
RCu recovery (%)	72.9	7.5	51.4	80.0	65.0	80.0

Table 13-12: Copper Recovery in the Top Metre of the 3 m SGS Column Tests (Columns 7–12)

Source	Papomono (HG)		Papomono (LG)		Don Gabriel	
Columns	7	10	8	11	9	12
TCu recovery (%)	93.4	95.0	93.5	95.9	80.5	92.4
ASCu recovery (%)	96.9	96.3	97.7	98.6	85.3	94.7
CNCu recovery (%)	93.3	95.7	91.4	94.4	72.1	85.0
RCu recovery (%)	37.1	15.0	45.9	82.2	43.8	83.0

The SGS column test results are used as convenient reference information, as an acceptable copper recovery was obtained with leaching cycles around 270 days. The comparison factors between P80 below ¼” against P50 below ¼” (with P95 below ½” in both cases) are also of interest. The copper recovery control per column metre represented an important tool for leaching optimization, such as sulphuric acid addition to the agglomeration drum and specification of the heap height.

Columns 4, 5, 6, 10, 11, and 12, demonstrate a higher increase in recovery for Don Gabriel than Papomono in the finer crush size of P80 <¼”.

The mineralogical composition of the ore tested at SGS is shown on Table 13-13 and the particle size distribution is given in Table 13-14.

Table 13-13: Mineralogical Copper Composition of the Ore Tests at SGS

Mineral	Copper Grade Contribution Papomono (HG) % Cu	 Papomono (LG) % Cu	 Don Gabriel % Cu
Crysocolla ($CuSiO_3.2H_2O$)	0.788	0.321	0.584
Malachite ($Cu_2CO_3(OH)_2$)	0.431	0.353	0.356
Pseudo malachite ($Cu_5(PO_4)_2(OH)_4.H_2O$)	0.041	0.016	0.000
Chalcocite (Cu_2S)	2.437	0.335	0.261
Covellite (CuS)	0.010	0.000	0.005
Bornite (Cu_5FeS_4)	0.013	0.008	0.003
Chalcopyrite ($CuFeS_2$)	0.000	0.000	0.002
Total copper (% TCu)	**3.720**	**1.033**	**1.210**
Acid soluble copper (% ASCu)	**1.260**	**0.690**	**0.940**
Residual copper (% RCu)	**2.460**	**0.343**	**0.270**

Table 13-14: Particle Size Distribution of the Ore Tested at SGS

Fraction	Papomono (HG)		Papomono (LG)		Don Gabriel	
	P_{50}<¼”	P_{80}<¼”	P_{50}<¼”	P_{80}<¼”	P_{50}<¼”	P_{80}<¼”
-3/4” +1/2”	5.0	5.1	5.0	5.1	5.3	5.3
-1/2” +1/4”	46.1	15.1	45.2	15.0	45.5	14.7
-1/4” +10#	27.6	52.2	30.6	53.2	29.9	53.6
-10# +65#	14.2	19.6	13.8	19.4	14.8	20.2
-65# +100#	1.2	1.5	0.9	1.3	1.1	1.6
-100#	5.9	7.5	4.5	6.0	3.4	4.6
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

MTV Heap and Column Tests

MTV decided to implement salt (sodium chloride) leaching as an optimization to the current acid heap leaching. The corresponding test work started in the second semester of 2016.

The salt leaching was selected to complement sulphuric acid leaching. To obtain comparison results of salt leaching with traditional acid leaching, a column leach test and a heap test were arranged for Don Gabriel and Papomono ore, each using traditional acid leaching.

As part of the chloride media leach project described in Section 13.2, MTV performed control test columns and heaps at the mine site during 2016 and 2017 with fresh samples of Papomono and Don Gabriel material.

The tests were performed under equivalent conditions to the plant, considering the same leaching solutions, heap height (3 m for test heaps and columns), irrigation rates, and leaching cycle (two steps). The only differences were the particle size (P93.5 <½" and P63.0 <¼" for Don Gabriel as well as P96.1 <½" and P59.9 <¼" for Papomono) and the number of operating days. The heaps and columns were loaded with acid-agglomerated fresh material (agglomerated at 10 kg H2SO4/dmt) and the irrigation rate was around 6 to 9 L/h/m2. The copper grades for the heap and column tests are shown respectively in Table 13-15 and Table 13-16.

Table 13-15: Head and Tailings Copper Grades for MTV Heap Tests

Heap	**Heap 26A**	**Heap 26B**
Source	**Don Gabriel**	**Papomono**
Particle Size	**$P_{93.5}$<½" & $P_{63.0}$<¼"**	**$P_{96.1}$<½" & $P_{59.9}$<¼"**
Dry Material (kg)	**626,755**	**630,781**
Head		
Total Cu (%TCu)	0.95	1.59
Acid sol. Cu (%ASCu)	0.27	0.52
Cyanide sol. Cu (%CNCu)	0.60	0.82
Residual Cu (%RCu)	0.08	0.25
Tailings		
Total Cu (%TCu)	0.40	0.51
Acid sol. Cu (%ASCu)	0.05	0.09
Cyanide sol. Cu (%CNCu)	0.13	0.17
Residual Cu (%RCu)	0.22	0.25

Table 13-16: Head Copper Grades for MTV Column Tests

Column	**Column 1**	**Column 7**
Source	**Don Gabriel**	**Papomono**
Particle Size	**$P_{93.5}$<½" & $P_{63.0}$<¼"**	**$P_{96.1}$<½" & $P_{59.9}$<¼"**
Dry Material (kg)	**245**	**219**
Head		
Total Cu (%TCu)	0.95	1.59
Acid sol. Cu (%ASCu)	0.27	0.52
Cyanide sol. Cu (%CNCu)	0.60	0.82
Residual Cu (%RCu)	0.08	0.25

The copper recovery for the heap tests is given in Table 13-17 and the copper recovery for the column tests in Table 13-18. The effective leach cycles of the MTV acid leach tests were much shorter than the leach cycles used in the plant, as the purpose of these tests was to compare their performance with salt leaching, which requires shorter leach cycles. The chloride leach (salt) tests are discussed in Section 13.2.

Table 13-17: Copper Recovery for Heap Tests at ~130 Days of Operation

Heap Source Days of Operation	Heap 26A Don Gabriel 132.9	Heap 26B Papomono 133.3
Head/solution		
TCu recovery (%)	58.2	68.2
Head/tailings		
TCu recovery (%)	57.9	67.9
ASCu recovery (%)	81.5	82.7
CNCu recovery (%)	78.3	79.3
RCu recovery (%)	-	0.0

Table 13-18: Copper Recovery for Column Tests at ~130 Days Average Operation

Column Source Days of Operation	Column 1 Don Gabriel 141.3	Column 7 Papomono 120.3
Head/solution		
TCu recovery (%)	56.7	63.5

For the acid column and heap leach tests, the sulphuric acid consumption rates were as indicated in Table 13-19.

Table 13-19: Sulphuric Acid Consumption, Leaching Ratio and Copper Recovery at MTV Acid Leaching Tests

Item	Don Gabriel		Papomono	
	Column 1	Heap 26A	Column 7	Heap 26B
Primary leaching (days)	30.2	89.0	89.9	90.0
Secondary leaching (days)	111.1	43.9	30.4	43.3
Leaching cycle (days)	141.3	132.9	120.3	133.3
Unit acid consumption (kg/dmt)	20.94	26.78	33.50	24.29
Unit acid consumption (kg/kg Cu)	3.89	4.84	3.34	2.24
Leaching ratio (m^3/DMT)	6.23	4.39	5.81	4.64
Total copper recovery (%)	**56.7**	**58.2**	**63.0**	**68.2**

13.1.3 Leach Challenge

Bacterial leaching was replaced by traditional acid leaching during the first year of operation, due to an excessive level of impurities in both oxide and sulphide PLS flows.

Between 2011 and 2017, the ratio of acid soluble copper to total copper (ASCu/TCu), without considering third-party and ENAMI material, had an average value of 0.522 (Table 13-20), whereas the determined average value of this ratio for the Don Gabriel and Papomono Measured and Indicated Mineral Resources is 0.242.

To achieve acceptable copper recoveries at the MTV plant, as the proportion of cyanide-soluble copper sulphides is increasing for the Don Gabriel and Papomono ore, the leach cycle would need to be increased. One way to reduce the required leach cycle and at the same time obtain additional benefits such as increased copper recovery and lower acid consumption rates, is to implement chloride or salt leaching.

Table 13-20: MTV Historical Don Gabriel and Papomono Ore Treated Since Startup (2010) Until October 31, 2017

Mineral Resources	Tonnage (kt)	TCu (%)	ASCu (%)	CNCu (%)	RCu (%)	ASCu/TCu
Don Gabriel	1,197	0.73	0.49	0.15	0.10	0.671
Papomono	3,018	0.97	0.46	0.37	0.13	0.474
Total Don Gabriel/Papomono	**4,215**	**0.90**	**0.47**	**0.31**	**0.12**	**0.522**

13.2 Chloride Leach Process

Process studies and columns tests conducted by MTV indicated an opportunity to improve sulphide copper recovery results by using salt or chloride leaching. Test work using material from the Papomono and Don Gabriel deposits showed that it was possible to obtain an increment close to 10% on copper recovery, a significant reduction of leaching cycle time, and a reduction in sulphuric acid consumption, mainly due to the shorter leaching cycle.

Based on these studies, MTV retained Propipe S.A. (Propipe) to carry out a study to define the infrastructure required to implement salt leaching.

The objective of this sub-section is to provide an estimate of the achievable copper recovery for Papomono and Don Gabriel ore under chloride leach conditions.

13.2.1 Chloride Leach Test Program

Based on exploratory 1 m column tests, the decision was taken to operate six 3 m columns and two heaps of 3 m height for Don Gabriel material, and six 3 m columns and two heaps of 3 m height for Papomono.

Don Gabriel columns were labeled as Column 1 (C1) to Column 6 (C6) and the Don Gabriel heaps as Heap 25A and Heap 26A. Papomono columns were labeled as Column 7 (C7) to Column 12 (C12) and the Papomono heaps as Heap 25B and Heap 26B.

The test program scheduled to operate the columns and the heaps in parallel. For Columns 1 and 7, as well as for Heaps 26A and 26B there was no salt addition in agglomeration and no additional chloride concentration increase in the irrigation flow during leaching. The chloride concentration in leach solutions was below 0.3 g/L Cl, as industrial raffinate was used for all the columns and heaps.

Heaps 25A and 25B operated with sodium chloride additions in agglomeration, but without additional chloride concentration increase in the irrigation flow. Columns 2 and 8 operated under equivalent conditions.

All remaining columns had respectively the same sodium chloride additions in agglomeration as Heaps 25A (Don Gabriel) and 25B (Papomono), and miscellaneous chloride concentrations were added for the irrigation flows (raffinates) during leaching. The chloride concentrations scheduled in these column tests were 15 g/L in Column 3 and Column 9, 30 g/L in Column 4 and Column 10, 60 g/L in Column 5 and Column 11, and 90 g/L in Column 6 and Column 12.

Column Leach Test Conditions

The leach conditions of the twelve 3 m columns are summarized in Table 13-21 and Table 13-22 for Don Gabriel (C1–C6) and Papomono (C7–C12) respectively column leach test conditions. The Don Gabriel columns began their effective leaching on October 9, 2016 and the Papomono columns began their effective leaching on October 23, 2016, both immediately after agglomeration and a rest period of approximately 30 days.

Table 13-21: Don Gabriel Column Leach Test Conditions

Condition	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Agglomerated ore (kg)	256	284	253	263	274	254
Dry ore (kg)	245	262	234	243	260	235
Total copper (%TCu)	0.95	1.06	1.06	1.06	1.06	1.06
Acid soluble copper (%ASCu)	0.27	0.21	0.21	0.21	0.21	0.21
Cyanide sol. copper (%CNCu)	0.60	0.70	0.70	0.70	0.70	0.70
Residual copper (%RCu)	0.08	0.15	0.15	0.15	0.15	0.15
Particle size below ½" (%)	93.5	93.5	93.5	93.5	93.5	93.5
Particle size below ¼" (%)	63.0	63.0	63.0	63.0	63.0	63.0
Agglomerated ore:						
H_2SO_4 (kg/dmt)	10.3	11.0	11.0	11.0	11.0	11.0
NaCl (kg/dmt)	0.0	21.0	21.0	21.0	21.0	21.0
H_2O (%)	3.6	5.3	4.9	5.2	2.3	4.9
Initial leaching date	09-10-16	09-10-16	09-10-16	09-10-16	09-10-16	09-10-16
Leaching cycle (days)	141.3	121.3	121.3	121.3	121.3	121.3
First 30 irrigation days:						

Condition	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Irrigation rate (m^3/h-m^2)	8.0	8.0	8.0	8.0	8.0	8.0
Average acid (g/L H_2SO_4)	8.0	8.0	8.1	8.3	8.5	8.7
Average chloride (g/L Cl)	<0.30	<0.30	15.5	30.5	61.4	91.3
Average total iron (g/L TFe)	10.9	10.9	10.9	11.0	10.6	10.4
Average ferric iron (g/L Fe^{3+})	2.7	2.7	2.8	3.0	2.7	2.7
Irrigation after 30 days:						
Irrigation rate (m^3/h-m^2)	4.0-6.0	4.0-6.0	4.0-6.0	4.0-6.0	4.0-6.0	4.0-6.0
Average acid (g/L H_2SO_4)	2.5	2.5	3.4	3.7	4.0	3.7
Average chloride (g/L Cl)	<0.30	<0.30	15.5	30.4	56.9	69.5
Average total iron (g/L TFe)	10.8	10.8	12.2	11.5	11.5	12.1
Average ferric iron (g/L Fe^{3+})	1.9	1.9	3.6	3.1	3.4	3.5

To compare the column leach tests with the heap leach tests, the following was applied:

- The heap material was agglomerated and transferred to the columns alternatively from the material placed on the heaps or from the trucks transporting the agglomerated material to the heaps. This procedure was applied to the Don Gabriel material for Heap 26A and Column 1 and to the Papomono material for Heap 26B and Column 7 without any salt addition in agglomeration. The procedure was applied to Don Gabriel material for Heap 25A and Columns 2 to 6, and to Papomono material for Heap 25B and Columns 8 to 12, with salt addition in agglomeration.
- The agglomerated material transferred to the columns had variable moisture contents. For a suitable column leach mass balance, it was necessary to determine the equivalent amounts of dry solids loaded into the columns. For this purpose, the proportional amounts of salt and sulphuric acid added to agglomeration were discounted, besides of the effective moisture content of the agglomerated material.

Table 13-22: Papomono Column Leach Test Conditions

Condition	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12
Agglomerated ore (kg)	240	238	242	236	242	243
Dry ore (kg)	219	211	214	209	215	215
Total copper (%TCu)	1.59	1.62	1.62	1.62	1.62	1.62
Acid soluble copper (%ASCu)	0.52	0.50	0.50	0.50	0.50	0.50
Cyanide sol. copper (%CNCu)	0.82	1.01	1.01	1.01	1.01	1.01
Residual copper (%RCu)	0.25	0.11	0.11	0.11	0.11	0.11
Particle size below ½" (%)	96.1	96.1	96.1	96.1	96.1	96.1
Particle size below ¼" (%)	59.9	59.9	59.9	59.9	59.9	59.9
Agglomerated ore:						
H_2SO_4 (kg/dmt)	16.0	16.0	16.0	16.0	16.0	16.0
NaCl (kg/dmt)	0.0	32.0	32.0	32.0	32.0	32.0

Condition	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12
H_2O (%)	7.0	8.0	8.0	8.0	8.0	8.0
Initial leaching date	23-10-16	23-10-16	23-10-16	23-10-16	23-10-16	23-10-16
Leaching cycle (days)	120.3	120.3	120.3	120.3	120.3	120.3
First 30 irrigation days:						
Irrigation rate (m^3/h-m^2)	8.0	8.0	8.0	8.0	8.0	8.0
Average acid (g/L H_2SO_4)	8.0	8.0	8.1	8.3	8.5	8.7
Average chloride (g/L Cl)	<0.30	<0.30	15.6	29.3	60.6	91.6
Average total iron (g/L TFe)	10.9	10.9	11.2	11.4	10.6	10.9
Average ferric iron (g/L Fe^{3+})	2.6	2.6	3.6	3.9	3.3	3.9
Irrigation after 30 days:						
Irrigation rate (m^3/h-m^2)	4.0-6.0	4.0-6.0	4.0-6.0	4.0-6.0	4.0-6.0	4.0-6.0
Average acid (g/L H_2SO_4)	6.9	2.5	3.3	3.5	3.6	3.8
Average chloride (g/L Cl)	<0.30	<0.30	~15	~30	~60	~90
Average total iron (g/L TFe)	10.9	10.7	12.8	12.1	11.2	11.8
Average ferric iron (g/L Fe^{3+})	2.4	1.9	3.9	3.6	2.8	3.2

- During the column leach tests the daily solution volumes of plant raffinate solutions that were added to, and drained from, the columns were measured and analyzed. The daily total copper recoveries and daily acid consumptions were calculated, the daily ferric and total iron concentrations were analyzed.
- The column leach tailings were analyzed for TCu, ASCu, CNCu, and RCu. These chemical analyses were used to determine the feed/tailings copper recovery. The feed/solution copper recovery was obtained by controlling and analyzing the daily in and out solution volumes. For both copper recovery determinations, the sequential copper analysis of the feed to the respective heaps was considered.

Heap Leach Test Conditions

The four heap leach test conditions are summarized in Table 13-23. For comparison with Column 1 (Don Gabriel without salt), Column 2 (Don Gabriel with salt), Column 7 (Papomono without salt) and Column 8 (Papomono with salt), the sampling for the heap leach tests was undertaken using a similar procedure to that for the column leach tests. Once the leach cycles were concluded, 12 to 15 drill samples were taken and analyzed for each heap, and an average value of all obtained sequential copper analyses produced.

Table 13-23: Don Gabriel and Papomono Heap Leach Test Conditions – Chloride Leach

Condition	Don Gabriel		Papomono	
	Heap 25A	Heap 26A	Heap 25B	Heap 26B
Agglomerated ore (kg)	655,986	656,445	713,878	684,786
Dry ore (kg)	624,154	626,755	632,871	630,781
Total copper (%TCu)	1.06	0.95	1.62	1.59

Condition	Don Gabriel		Papomono	
	Heap 25A	Heap 26A	Heap 25B	Heap 26B
Acid soluble copper (%ASCu)	0.21	0.27	0.50	0.52
Cyanide sol. copper (%CNCu)	0.70	0.60	1.01	0.82
Residual copper (%RCu)	0.15	0.08	0.11	0.25
Particle size below ½" (%)	93.5	93.5	96.1	96.1
Particle size below ¼" (%)	63.0	63.0	59.9	59.9
Agglomerated ore:				
H_2SO_4 (kg/dmt)	11.0	10.0	16.0	16.0
NaCl (kg/dmt)	21.0	0.0	32.0	0.0
H_2O (%)	1.9	3.6	8.0	7.0
Leaching start (date)	09-10-16	09-10-16	23-10-16	23-10-16
Leaching cycle (days)	132.9	132.9	133.3	133.3
First 30 irrigation days:				
Irrigation rate (m^3/h-m^2)	8.2	8.2	7.9	7.9
Average acid (g/L H_2SO_4)	7.9	7.8	8.0	7.8
Average chloride (g/L Cl)	<0.30	<0.30	<0.30	<0.30
Average total iron (g/L TFe)	11.3	11.3	10.5	10.6
Average ferric iron (g/L Fe^{3+})	2.9	2.8	2.0	2.0
Irrigation after 30 days:				
Irrigation rate (m^3/h-m^2)	6.2	7.5	6.1	7.4
Average acid (g/L H_2SO_4)	3.3	6.0	2.9	6.3
Average chloride (g/L Cl)	<0.30	<0.30	<0.30	<0.30
Average total iron (g/L TFe)	11.7	11.8	11.9	12.0
Average ferric iron (g/L Fe^{3+})	2.7	3.1	2.7	3.2

The heaps were irrigated in the flat area on the top of the heap. At the end of the leach cycle the same area was drilled and sampled at depth by using suitable drilling equipment for tailings. Copper recoveries were obtained by feed/solution and by feed/tailings determinations.

13.2.2 Chloride Leach Test Results

All test heaps were irrigated for 133 days, whereas the test columns were irrigated for 120 to 141 days. Ahead of irrigation, the agglomerated Don Gabriel and Papomono material had a rest period of one day for Column 1, Column 7, Heap 26A, and Heap 26B (tests without salt), and a rest period of 30 days for all other heaps and columns (tests with salt). During the rest period the agglomerated material was frequently wetted, without causing solution drainage.

Column Leach Test Results

The column leach test results for Don Gabriel are provided in Table 13-24 and Table 13-25 for Papomono.

Under planned plant operation, the addition of sodium chloride into the agglomeration drum will transfer chloride into the leach solution. The definitive chloride level in leach solutions will depend on several operating factors and for that reason several chloride concentrations, including 0, 15, 30, 60, and 90 g/L were used in testing.

Based on test results and observations made in other plants, the leach solutions will increase the chloride concentrations up to a level where chloride loss equilibrates with the chloride input or feed. By reaching a chloride level in the leach solution of approximately 5 to 15 g/L chloride, the impact on total copper recovery of the chloride level above such concentration will be minor. This observation also applied to the chloride column tests at MTV for Don Gabriel and Papomono.

Table 13-24: Don Gabriel Column Test Results

Item	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Head grade:						
Total copper (%TCu)	0.95	1.06	1.06	1.06	1.06	1.06
Acid soluble copper (%ASCu)	0.27	0.21	0.21	0.21	0.21	0.21
Cyanide sol. copper (%CNCu)	0.60	0.70	0.70	0.70	0.70	0.70
Residual copper (%RCu)	0.08	0.15	0.15	0.15	0.15	0.15
Tailings grade:						
Total copper (%TCu)	0.48	0.24	0.25	0.22	0.23	0.24
Acid soluble copper (%ASCu)	n.a.	0.04	0.04	0.04	0.04	0.03
Cyanide sol. copper (%CNCu)	n.a.	0.18	0.14	0.13	0.14	0.14
Residual copper (%RCu)	n.a.	0.02	0.07	0.05	0.05	0.07
Recovery by solutions:						
TCu recovery (%)	56.7%	64.6%	70.1%	70.8%	68.0%	76.3%
Recovery by tailings:						
TCu recovery (%)	49.5%	77.4%	76.4%	79.2%	78.3%	77.4%
ASCu recovery (%)	-	81.0%	81.0%	81.0%	81.0%	85.7%
CNCu recovery (%)	-	74.3%	80.0%	81.4%	80.0%	80.0%
RCu recovery (%)	-	86.7%	53.3%	66.7%	66.7%	53.3%

Note: n.a. = not applicable

Table 13-25: Papomono Column Test Results

Item	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12
Head grade:						
Total copper (%TCu)	1.59	1.62	1.62	1.62	1.62	1.62
Acid soluble copper (%ASCu)	0.52	0.50	0.50	0.50	0.50	0.50
Cyanide sol. copper (%CNCu)	0.82	1.01	1.01	1.01	1.01	1.01
Residual copper (%RCu)	0.25	0.11	0.11	0.11	0.11	0.11
Tailings grade:						
Total copper (%TCu)	0.48	0.32	0.33	0.26	0.26	0.34
Acid soluble copper (%ASCu)	n.a.	0.09	0.09	0.08	0.11	0.11
Cyanide sol. copper (%CNCu)	n.a.	0.18	0.20	0.15	0.12	0.19
Residual copper (%RCu)	n.a.	0.05	0.04	0.03	0.03	0.04
Recovery by solutions:						

Item	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12
TCu recovery (%)	63.0%	72.4%	73.8%	75.2%	76.4%	86.6%
Recovery by tailings:						
TCu recovery (%)	69.8%	80.2%	79.6%	84.0%	84.0%	79.0%
ASCu recovery (%)	-	82.0%	82.0%	84.0%	78.0%	78.0%
CNCu recovery (%)	-	82.2%	80.2%	85.1%	88.1%	81.2%
RCu recovery (%)	-	54.5%	63.6%	72.7%	72.7%	63.6%

Note: n.a. = not applicable

As the heaps operated without chloride in leach solutions, only the average copper recoveries of Columns 3 to 6 were considered for Don Gabriel and the average copper recoveries of Columns 9 to 12 were considered for Papomono. Test Columns 2 and 8 were not included in the average values, as these columns were irrigated with less than 0.3 g/L of chloride in the raffinate solutions. This chloride level would not be representative of future plant operations. In Table 13-26 the respective copper recovery is shown for the evaluated chloride column tests, in reference to Don Gabriel and Papomono.

Table 13-26: Average Don Gabriel and Papomono Column Test Results

Item	Don Gabriel	Papomono
	Average Columns 3–6	Average Columns 9–12
Head grade:		
Total copper (%TCu)	1.06	1.62
Acid soluble copper (%ASCu)	0.21	0.50
Cyanide sol. copper (%CNCu)	0.70	1.01
Residual copper (%RCu)	0.15	0.11
Tailings grade:		
Total copper (%TCu)	0.24	0.30
Acid soluble copper (%ASCu)	0.04	0.10
Cyanide sol. copper (%CNCu)	0.14	0.17
Residual copper (%RCu)	0.06	0.04
Recovery by solutions:		
TCu recovery (%)	71.3%	78.0%
Recovery by tailings:		
TCu recovery (%)	77.8%	81.6%
ASCu recovery (%)	82.1%	80.5%
CNCu recovery (%)	80.4%	83.7%
RCu recovery (%)	60.0%	68.2%

The acid consumption data related to the Don Gabriel and Papomono column tests is summarized in Table 13-27 and Table 13-28, respectively.

Table 13-27: Sulphuric Acid and Ferric Consumption for Don Gabriel Column Tests

Description	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Acid feed in agglomeration (%)	29.5	41.3	34.8	33.9	36.3	37.1
Acid feed in primary leaching (%)	36.4	36.0	37.7	33.3	35.2	36.1
Acid feed in secondary leaching (%)	34.1	22.7	27.5	32.8	28.5	26.8
Total H_2SO_4 feed (%)	100.0	100.0	100.0	100.0	100.0	100.0

Description	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Primary leaching - PL (days)	30.2	30.2	30.2	30.2	30.2	31.2
Acid in PL feed (g/L H_2SO_4)	8.02	8.02	8.11	8.31	8.50	8.74
Secondary leaching - SL (days)	111.1	91.1	91.1	91.1	91.1	90.0
Acid in SL feed (g/L H_2SO_4)	2.54	2.54	3.38	3.67	3.99	3.56
Total effective leaching (days)	141.3	121.3	121.3	121.3	121.3	121.3
Leaching ratio (m_3/dmt)	6.23	3.57	4.04	3.56	3.42	3.47
Net unit ferric cons. (kg Fe^{3+}/kg Cu)	-0.11	-0.61	0.08	-0.04	-0.25	0.05
Acid consumption efficiency* (%)	84.2	89.2	86.8	84.1	77.5	77.7
Net unit acid cons. (kg H_2SO_4/dmt)	20.94	13.22	16.01	13.72	12.36	10.56
Net unit acid cons. (kg H_2SO_4/kg Cu)	3.89	1.93	2.15	1.83	1.72	1.31

Note: * Ratio of kg H_2SO_4 consumed divided by kg H_2SO_4 in the feed. PL = primary leaching; SL = secondary leaching.

Table 13-28: Sulphuric Acid and Ferric Consumption for Papomono Column Tests

Description	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Acid feed in agglomeration (%)	27.7	43.8	44.0	42.0	42.4	42.1
Acid feed in primary leaching (%)	68.5	36.2	30.6	31.7	32.4	31.9
Acid feed in secondary leaching (%)	3.8	20.0	25.4	26.3	25.2	26.0
Total H_2SO_4 feed (%)	100.0	100.0	100.0	100.0	100.0	100.0
Primary leaching - PL (days)	89.9	30.2	29.0	29.0	29.0	29.0
Acid in PL feed (g/L H_2SO_4)	8.03	8.03	8.12	8.27	8.50	8.71
Secondary leaching - SL (days)	30.4	90.1	91.3	91.3	91.3	91.3
Acid in SL feed (g/L H_2SO_4)	2.54	2.54	3.31	3.46	3.63	3.84
Total effective leaching (days)	120.3	120.3	120.3	120.3	120.3	120.3
Leaching ratio (m^3/dmt)	5.81	4.52	4.16	4.35	4.06	3.95
Net unit ferric cons. (kg Fe^{3+}/kg Cu)	0.37	-0.33	0.19	0.15	-0.40	-0.08
Acid consumption efficiency* (%)	84.6	86.0	84.9	82.0	75.5	75.5
Net unit acid cons. (kg H_2SO_4/dmt)	33.50	13.34	12.47	12.47	9.44	7.10
Net unit acid cons. (kg H_2SO_4/kg Cu)	3.34	1.14	1.04	1.02	0.76	0.51

Note: * Ratio of kg H_2SO_4 consumed divided by kg H_2SO_4 in the feed. PL = primary leaching; SL = secondary leaching.

Heap Leach Test Results

The heap leach test results are summarized in Table 13-29.

Table 13-29: Don Gabriel and Papomono Heap Test Results

Item	Don Gabriel		Papomono	
	Heap 25A	Heap 26A	Heap 25B	Heap 26B
Head grade:				
Total copper (%TCu)	1.06	0.95	1.62	1.59
Acid soluble copper (%ASCu)	0.21	0.27	0.50	0.52
Cyanide sol. copper (%CNCu)	0.70	0.60	1.01	0.82
Residual copper (%RCu)	0.15	0.08	0.11	0.25
Tailings grade:				
Total copper (%TCu)	0.32	0.40	0.35	0.51
Acid soluble copper (%ASCu)	0.06	0.05	0.11	0.09
Cyanide sol. copper (%CNCu)	0.11	0.13	0.11	0.17
Residual copper (%RCu)	0.15	0.23	0.12	0.25
Recovery by solutions:				
TCu recovery (%)	69.9%	58.2%	78.0%	68.2%
Recovery by tailings:				

Item	Don Gabriel		Papomono	
	Heap 25A	Heap 26A	Heap 25B	Heap 26B
TCu recovery (%)	70.0%	57.5%	78.5%	68.1%
ASCu recovery (%)	73.4%	82.5%	77.3%	83.2%
CNCu recovery (%)	84.3%	78.3%	88.8%	79.8%
RCu recovery (%)	-	-	-	-

The sulphuric acid data for the Don Gabriel and Papomono heap leaching tests is indicated in Table 13-30.

Table 13-30: Sulphuric Acid and Ferric Consumption for Don Gabriel/Papomono Heap Tests

Item	Don Gabriel		Papomono	
	Heap 25A	Heap 26A	Heap 25B	Heap 26B
Acid feed in agglomeration (%)	46.2	28.3	51.8	39.0
Acid feed in primary leaching (%)	31.4	64.9	29.1	56.2
Acid feed in secondary leaching (%)	22.4	6.8	19.1	4.8
Total H_2SO_4 feed (%)	100.0	100.0	100.0	100.0
Primary leaching - PL (days)	33.0	89.0	28.0	90.0
Acid in PL feed (g/L H_2SO_4)	7.81	7.92	8.03	8.02
Secondary leaching - SL (days)	99.9	43.9	105.3	43.3
Acid in SL feed (g/L H_2SO_4)	2.99	3.01	2.93	2.94
Total effective leaching (days)	132.9	132.9	133.3	133.3
Leaching ratio (m_3/dmt)	3.02	4.39	3.94	4.64
Net unit ferric cons. (kg Fe^{3+}/kg Cu)	-0.05	1.02	-0.11	0.20
Acid consumption efficiency* (%)	89.3	83.8	85.5	80.5
Net unit acid cons. (kg H_2SO_4/dmt)	12.41	26.78	11.42	24.29
Net unit acid cons. (kg H_2SO_4/kg Cu)	1.67	4.84	0.90	2.24

Note: * Ratio of kg H_2SO_4 consumed divided by kg H_2SO_4 in the feed.

13.2.3 Column and Heap Leach Comparison

The only columns to be compared with Heap 25A (Don Gabriel) and Heap 25B (Papomono) are Column 2 (Don Gabriel) and Column 8 (Papomono), respectively, as each of these had sodium chloride additions in agglomeration, whereas no chloride was added directly to leach solutions.

The copper recovery of the columns and heaps is indicated in Table 13-31.

The average (total) copper recovery of Don Gabriel Heap 25A was 70.0% and the average (total) copper recovery of Column 2 was 71.0%. Both copper recoveries are lower than the average (total) copper recovery of Columns 3 to 6 of 74.6%, considering feed/solution and feed/tailings recoveries.

The average (total) copper recovery of Papomono Heap 25B was 78.3% and the average (total) copper recovery of Column 8 was 76.3%. Both copper recoveries are lower than the average 79.8% copper recovery of Columns 9 to 12, considering the average value of feed/solution and feed/tailings recoveries.

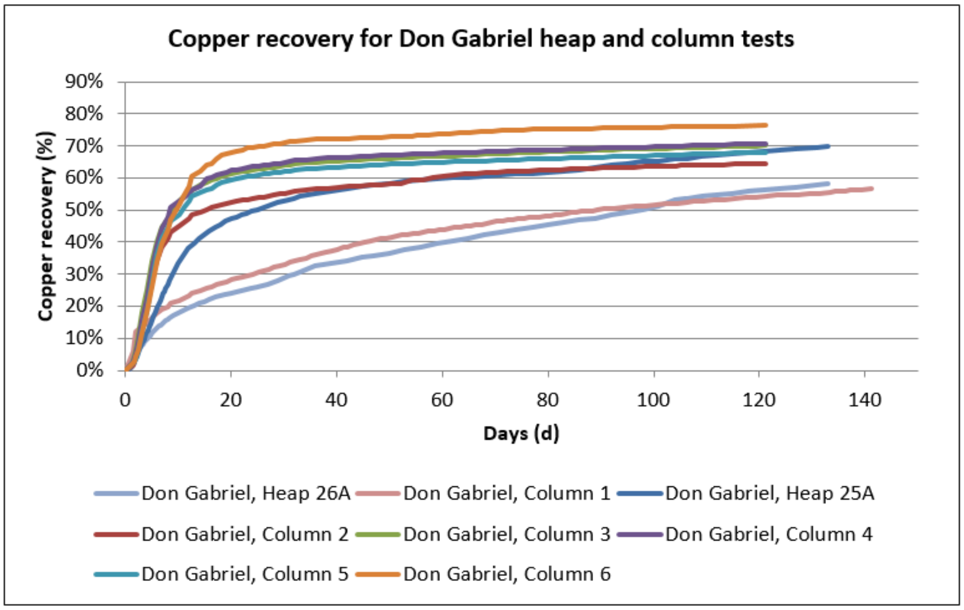
Table 13-31: Don Gabriel and Papomono Heap and Column Test Results Comparison

Condition	Don Gabriel		Papomono	
	Heap 25A	Column 2	Heap 25B	Column 8
Head grade:				
Total copper (%TCu)	1.06	1.06	1.62	1.62
Acid soluble copper (%ASCu)	0.21	0.21	0.50	0.50
Cyanide sol. copper (%CNCu)	0.70	0.70	1.01	1.01
Residual copper (%RCu)	0.15	0.15	0.11	0.11
Tailings grade:				
Total copper (%TCu)	0.32	0.24	0.35	0.32
Acid soluble copper (%ASCu)	0.06	0.04	0.11	0.09
Cyanide sol. copper (%CNCu)	0.11	0.18	0.11	0.18
Residual copper (%RCu)	0.15	0.02	0.12	0.05
Recovery by solutions:				
TCu recovery (%)	69.9%	64.6%	78.0%	72.4%
Recovery by tailings:				
TCu recovery (%)	70.0%	77.4%	78.5%	80.2%
ASCu recovery (%)	73.4%	81.0%	77.3%	82.0%
CNCu recovery (%)	84.3%	74.3%	88.8%	82.2%
RCu recovery (%)	-	86.7%	-	54.5%
Total effective leaching (days)	132.9	121.3	133.3	120.3
Leaching ratio (m^3/dmt)	3.02	3.57	3.94	4.52
Net unit ferric cons. (kg Fe^{3+}/kg Cu)	-0.05	-0.61	-0.11	-0.33
Net unit acid cons. (kg H_2SO_4/DMT)	12.41	13.22	11.42	13.34
Net unit acid cons. (kg H_2SO_4/kg Cu)	1.67	1.93	0.90	1.14

Based on the previous two paragraphs, it is possible to observe a copper recovery increase of 2.6 to 4.0 percentage points when chloride is added to leach solutions during agglomeration. This increase is slightly higher when the average copper recovery of columns C3–C6 and C9–C12 is compared with the copper recovery of Column 2 and Column 8, respectively.

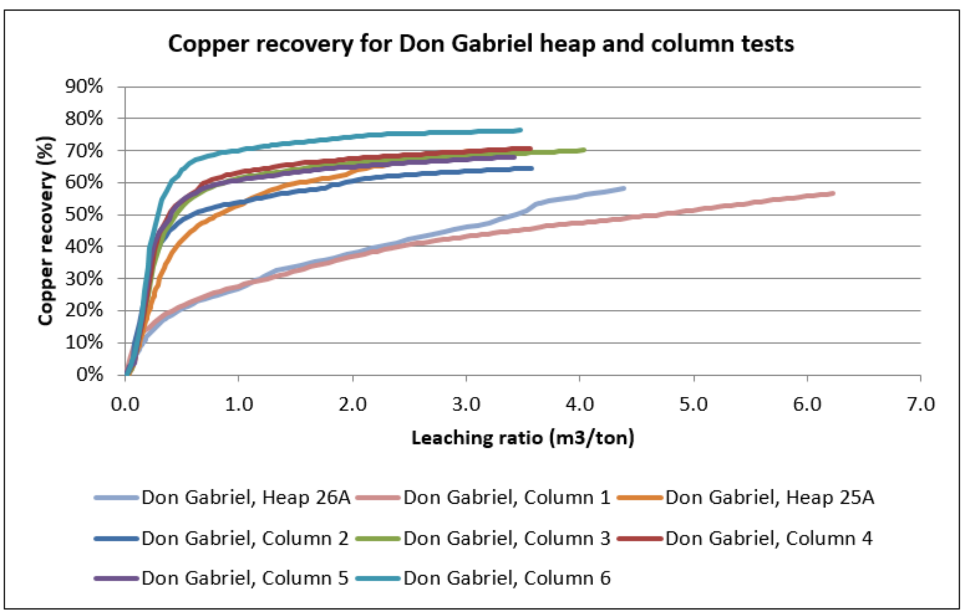
A graph for the copper recovery by solutions for the Don Gabriel heap and column tests is given in Figure 13-1 and Figure 13-2, and for the Papomono heap and column tests in Figure 13-3 and Figure 13-4, respectively for effective leaching days and leaching ratio.

Figure 13-1: Copper Recovery by Solutions for Don Gabriel Heap and Column Tests with Respect to Effective Leaching Days



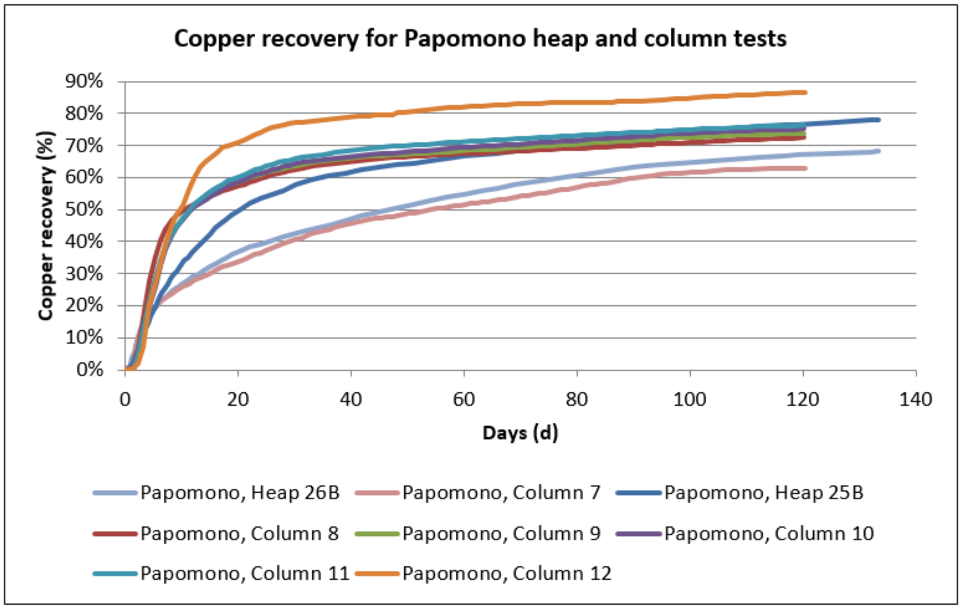
Note: Figure prepared by Orixeyo, 2017.

Figure 13-2: Copper Recovery by Solutions for Don Gabriel Heap and Column Tests with Respect to Leaching Ratio



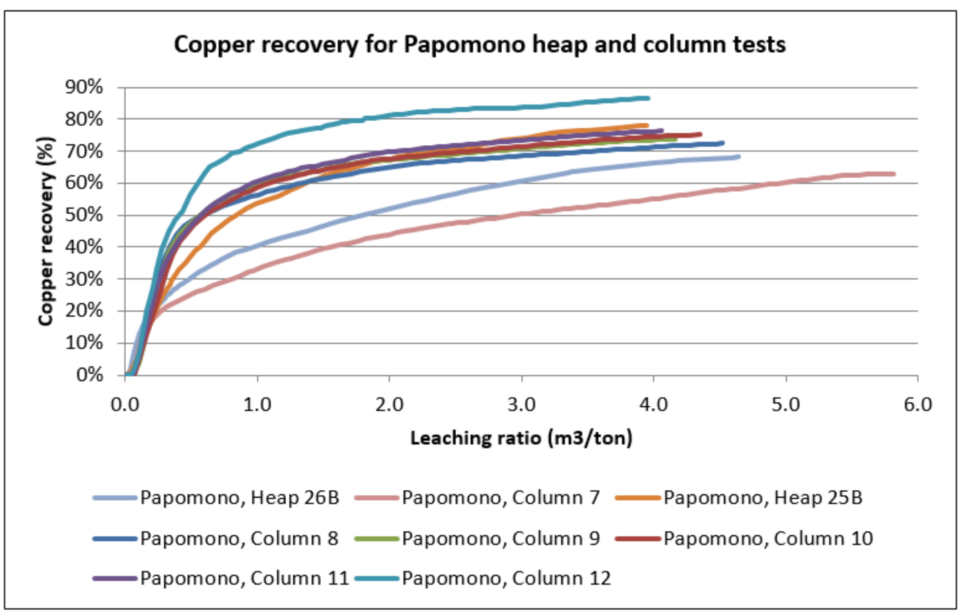
Note: Figure prepared by Orixeyo, 2017.

Figure 13-3: Copper Recovery by Solutions for Papomono Heap and Column Tests with Respect to Effective Leaching Days



Note: Figure prepared by Orixeyo, 2017.

Figure 13-4: Copper Recovery by Solutions for Papomono Heap and Column Tests with Respect to Leaching Ratio



Note: Figure prepared by Orixeyo, 2017.

13.2.4 Impact of Salt Addition in Agglomeration

The current operation at MTV uses traditional agglomeration with concentrated sulphuric acid and water. Salt additions during agglomeration will generate oxidizing conditions and can improve the copper recovery of copper sulphides. To improve oxidation, a rest period is recommended after agglomeration. Preliminary evaluation tests for one day, 15 days, and 30 days showed that 30 days of rest period improved sulphation by as much as approximately 45%. The conclusion was that as much as 45% of the copper could be dissolved within the first few days just by rinsing the agglomerated material.

The preliminary sulphation test results are shown in Table 13-32, where total copper sulphation of chalcocite is compared using different mesh sizes (100% below ½" or 100% below ¼"), chloride additions in agglomeration (10, 20, or 30 kg Cl/dmt), and rest periods (15 days or 30 days).

Table 13-32: Preliminary Sulphation Test Results – Chloride Leach

Chloride Dose kg (Cl/dmt)	Total Copper Sulphation (%)			
	Mesh – ½"		Mesh – ¼"	
	15 days	30 days	15 days	30 days
0	9.2	8.2	11.2	10.2
10	27.6	34.4	40.3	41.3
20	29.5	36.8	42.9	45.4
30	33.9	43.6	45.4	48.0

By comparing both particle size distributions and taking into account the average values, a sulphation increase of 41.3% was obtained for 15 days and an additional sulphation increase of 17.8% was obtained for a 30-day rest period, when looking at the 100% below ¼" screen size.

In summary, the sodium chloride addition accelerates the initial leaching kinetics and such behavior allows the leach cycle time to be reduced.

13.2.5 Chloride Presence in Leach Solutions

All test heaps operated with less than 0.3 g/L chloride in leach solutions, because the plant was not prepared to deal with higher concentrations. Based on the results presented in Section 13.2.3, the low chloride concentration in leach solution causes a slightly lower copper recovery. Nevertheless, significant copper recovery differences were not observed when comparing levels between 15, 30, 60, and 90 g/L chloride in leach solutions.

Columns 6 and 12 had some interruption in the leach cycle, due to precipitation problems with sulphate salts. High chloride levels such as 90 g/L showed test issues due to high salt additions to the leach solution. This kind of salt addition will not be practiced in plant operations, as sodium chloride will be added during the agglomeration step, and not the leach solution. The chloride concentration in the leach solution will build up gradually until steady chloride concentrations are achieved.

13.2.6 Copper Mineralogy

One single sample from each of the test material was petrographically studied. The copper minerals that contributed to the copper contained in these test materials is provided in Table 13-33.

Table 13-33: Mineralogical Copper Composition of the Ore for MTV Heap and Column Tests

Mineral	Copper Grade Contribution	
	Don Gabriel (% Cu)	Papomono (% Cu)
Crysocolla ($CuSiO_3.2H_2O$)	-	0.50
Atacamite ($Cu_2Cl(OH)_3$)	0.21	-
Chalcocite (Cu_2S)	0.35	1.06
Covellite (CuS)	0.03	0.05
Chalcopyrite ($CuFeS_2$)	0.06	-
Bornite (Cu_5FeS_4)	0.41	0.01
Total copper (% TCu)	**1.06**	**1.62**

13.2.7 Particle Size Distribution

The leaching tests in columns and heaps had the particle size distribution shown in Table 13-34.

Table 13-34: Particle Size Distribution, Heap and Column Tests

Particle size	Don Gabriel (%)	Papomono (%)
+¾″	0.5	0.0
-¾″ +½″	8.2	5.2
-½″ +¼″	30.2	36.7
-¼″ +10#	31.7	35.7
-10# +50#	17.1	11.8
-50# +100#	3.6	2.5
-100# +200#	2.9	2.2
-200#	5.8	5.9
Total	**100.0**	**100.0**

The SGS column tests performed in 2011 showed a significant copper recovery improvement particularly for the Don Gabriel mineralized material once a finer particle size was reached after crushing. MTV is planning to operate the whole crushing plant, including tertiary and quaternary crushing for the chloride leach process. Under such conditions MTV is planning to achieve particle sizes of P95 below ½" and P80 below ¼". The SGS column tests showed significant recovery improvements at these crush sizes, particularly for Don Gabriel. At March 2018, the product size was about 75% passing ¼".

Based on the particle size evaluation from the SGS column tests, a copper recovery increase (scaling) of 7.05% will be applied for Don Gabriel ore and 2.83% for Papomono ore, to account for the improvement of particle size to P95 below ½" and P80 below ¼".

13.2.8 Copper Recovery Model

The overall copper recovery model is based exclusively on mineralization from the Papomono and Don Gabriel deposits in the relative proportions and average grades as the MTV Measured/Indicated Mineral Resource, confirmed by the Mineral Resource Qualified Person. The Papomono deposit has a higher copper grade in comparison to Don Gabriel in reference to total copper, acid soluble copper, and cyanide soluble copper. The insoluble or residual copper is similar in both deposits.

The mineralogy of both deposits is quite similar, except that Don Gabriel requires better mineral liberation and hence a finer particle size in comparison to Papomono, in particular to have the ore crushed at P80 below ¼" instead of P50 below ¼" in order to achieve acceptable copper recoveries. However, the copper recovery from both deposits improves by crushing at a more reduced particle size distribution. On this basis, when the Don Gabriel mining operation recommenced in early 2017, the available quaternary crushing equipment was re-commissioned shortly thereafter, and the particle size of the crushed ore has been incrementally reduced slowly.

Based on information made available during March 2018, the range of copper recovery for Papomono and Don Gabriel material is shown in Table 13-35. Such copper recovery considers an effective leach period between 120 and 180 days for material crushed at P95 below ½" and P80 below ¼". The estimated total copper recovery Don Gabriel is 86.5% and the estimated total copper recovery for Papomono is 86.9%, both at 160 days of effective leaching, considering acceptable salt additions in agglomeration.

Table 13-35: Estimated Copper Recovery

Source	Copper Recovery (%) Leach Cycle (120 days)	Leach Cycle (140 days)	Leach Cycle (160 days)	Leach Cycle (180 days)
Don Gabriel				
Total copper	83.8	85.2	86.5	87.7
Acid soluble copper	87.9	89.2	90.4	91.6
Cyanide soluble copper	86.0	87.4	88.6	89.8
Residual copper	64.2	66.0	67.6	69.2
Papomono				
Total copper	83.5	85.3	86.9	88.3
Acid soluble copper	82.8	84.4	85.9	87.2
Cyanide soluble copper	86.0	87.7	89.2	90.5
Residual copper	70.1	73.0	75.7	78.1

Note: Estimated recovery under chloride leach conditions at 120, 140, 160, and 180 days leaching with feed crushed at P95 <½" and P80 <¼", scaled assuming improved particle sizes.

The copper recoveries indicated in Table 13-35 are based on the following conditions:

- The material is crushed to P_{95} < ½" and P_{80} < ¼"
- The amount of sulphuric acid and sodium chloride is adjusted to requirements determined as convenient in agglomeration
- Rest period for the agglomerated material of 20 to 40 days
- Heap height of 2.5 to 3 m.
- Irrigation flow of 7 to 9 L/h-m^2 during 20 to 60 days in primary (oxide) leach
- Sulphuric acid concentration of 7 to 9 g/L H_2SO_4 in primary (oxide) leach irrigation
- Irrigation flow of 5 to 10 L/h-m^2 during 60 to 150 days in secondary (sulphide) leach
- Sulphuric acid concentration of 2 to 3 g/L H_2SO_4 in secondary (sulphide) leach irrigation
- Complete leach cycle of 120 to 180 days
- Minimum of 10 g/L total iron, 10 g/L chloride, and 3 g/L concentration in primary (oxide) and secondary (sulphide) leach.

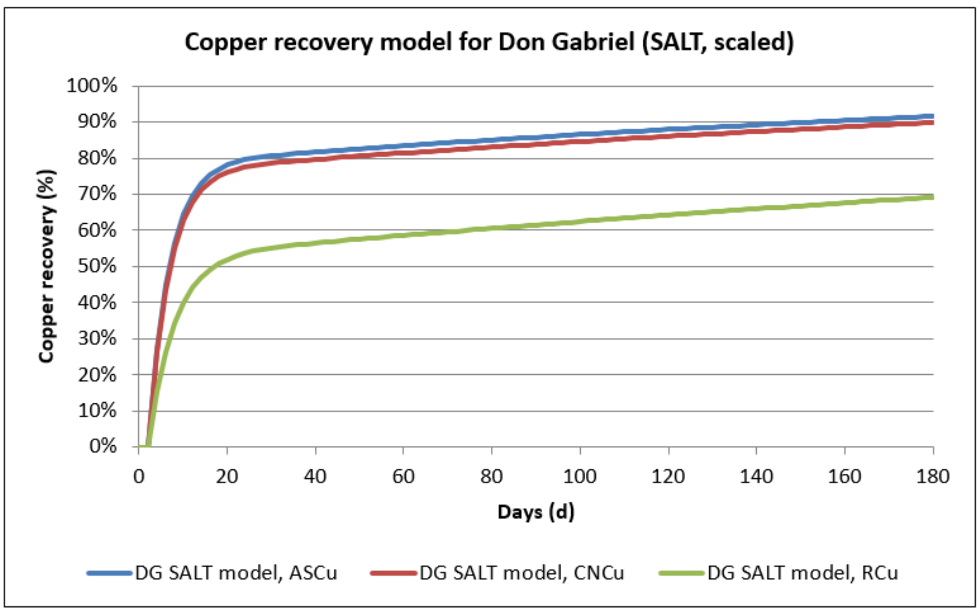
13.2.9 Copper Recovery Curves

To estimate the leaching kinetics under chloride leach conditions and to establish the achievable copper recoveries, a copper recovery model was prepared. The model is based on leaching kinetics and copper recovery results of column tests performed at the MTV plant during 2016 and 2017. Columns 3, 4, 5, and 6 related to Don Gabriel and Columns 9, 10, 11, and 12 related to Papomono were of interest for this purpose.

The copper recovery model considers ferric leaching with a two-stage leaching cycle in the range of 120 to 180 days on heaps of 3 m height and crushed ore at P95 below ½" and P80 below ¼". A different copper recovery model was developed for each type of ore, Papomono and Don Gabriel, under chloride leach conditions. The copper recovery curves shown in Figure 13-5 and Figure 13-6 consider scaling factors of 1.0705 and 1.0283 respectively (for Don Gabriel and Papomono ore), extracted from the SGS test work, to account for the improvement of particle size of the crushed ore with respect to existing plant operating conditions (and column test work conditions).

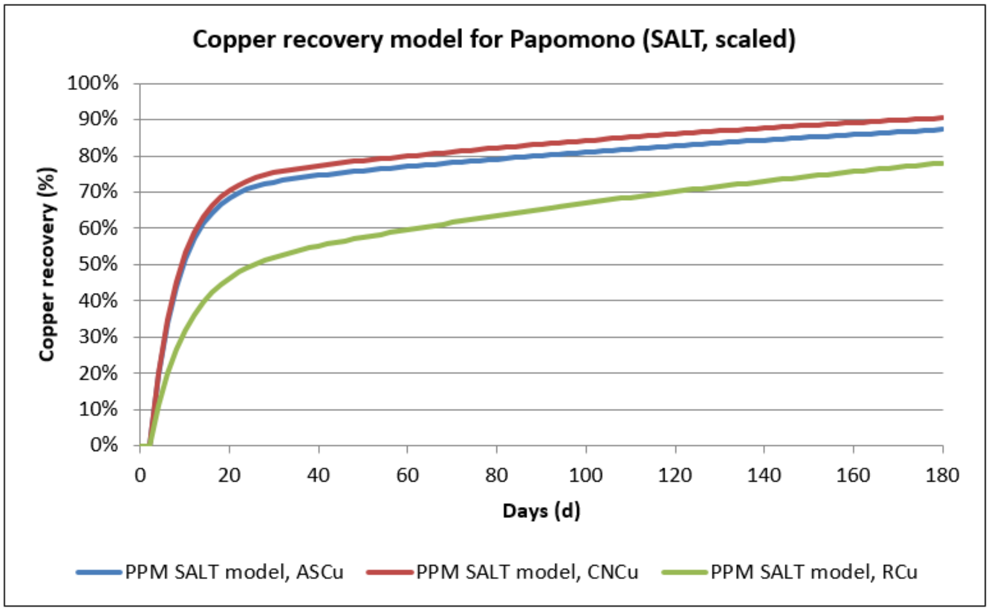
Each copper recovery model is based on individual copper recovery curves related ASCu, cyanide soluble copper (CNCu), and residual copper (RCu). The copper recovery curve for total copper (TCu) is obtained then in each case by combining the individual copper recovery curves according to the specific composition of the ore. This model may be used as well for calculations on changing leaching cycles.

Figure 13-5: Copper Recovery Model Under Chloride Leach Conditions, Don Gabriel



Note: Figure prepared by Oryxeio, 2017. Figure shows ASCu, CNCu, and RCu recoveries for Don Gabriel ore, crushed at P_{95} < ½" and P_{80} < ¼", scaled to include improved particle size.

Figure 13-6: Copper Recovery Model Under Chloride Leach Conditions, Papomono



Note: Figure prepared by Oryxeio, 2017. Figure shows ASCu, CNCu, and RCu recoveries for Don Gabriel ore, crushed at P95 < ½" and P80 < ¼", scaled to include improved particle size.

The copper recovery model is based on the following equation, with the specific parameters given in Table 13-36 for each case:

$$RCu(t) = fps * \max \{0; 1 - A*\exp(-\alpha*(t-t0)) - B*\exp(-\beta*(t-t0))\},$$

where the time t is expressed in days and the recovery RCu as a fraction (to be multiplied by 100% to be expressed as percentage), and where fps is the scaling factor for the improved particle size distribution, listed in Table 13-37.

Table 13-36: Specific Parameters for The Copper Recovery Model

Ore Type	A	B	α	β	t_0
Papomono					
Acid soluble copper (ASCu)	0.68	0.32	0.16	0.004198	2
Cyanide soluble copper (CNCu)	0.70	0.30	0.16	0.005150	2
Residual copper (RCu)	0.45	0.55	0.13	0.004638	2
Don Gabriel					
Acid soluble copper (ASCu)	0.73	0.27	0.21	0.003500	2
Cyanide soluble copper (CNCu)	0.71	0.29	0.21	0.003303	2
Residual copper (RCu)	0.49	0.51	0.17	0.002059	2

Table 13-37: Scaling Factor for the Copper Recovery Model

Ore Type	f_{ps}
Papomono	1.0283
Don Gabriel	1.0705

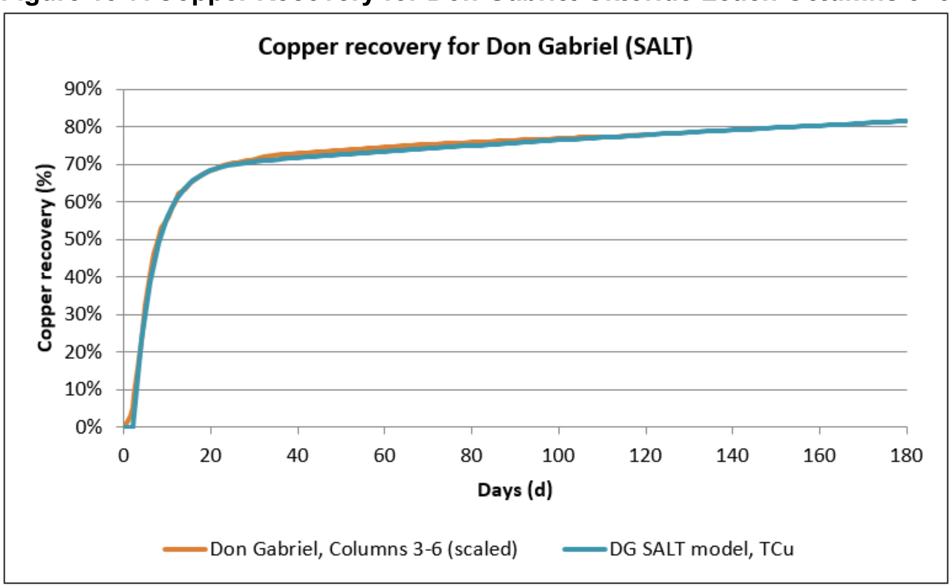
The total copper (TCu) recovery curve is then obtained from the linear combination of the individual copper recovery curves of ASCu, CNCu and RCu, using the equation:

RTCu(t) = (GASCu*RASCu(t) + GCNCu*RCNCu(t) + GRCu*RRCu(t)) / GTCu,

where GCu denotes the copper grade, expressed either as % Cu or as a fraction.

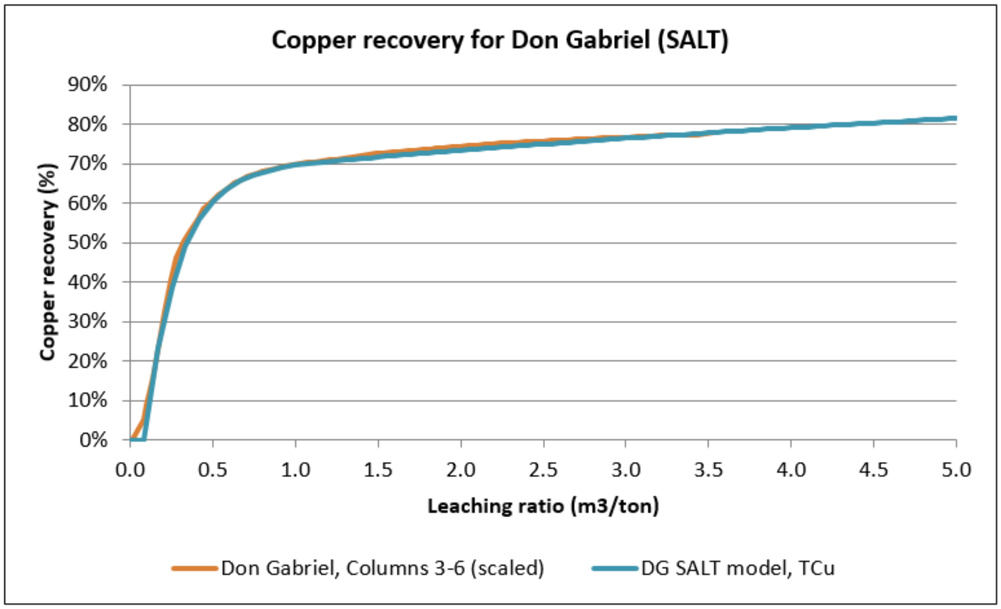
Based on the test work performed at the MTV plant during 2016 and 2017, leaching kinetics curves under chloride leach conditions were obtained for the purpose of calculating different leaching cycles and changing ore characteristics for each year of the project life (Don Gabriel and Papomono Masivo life of mine). These curves are shown in comparison to the average column test results (scaled to total copper recovery by tailings, but not to improved particle size) under chloride leaching conditions on Figure 13-7 for Don Gabriel and on Figure 13-9 for Papomono. The recovery model is extrapolated to a 180-day leaching cycle in each case. The corresponding curves for leaching ratio (as average for the different column tests) are shown in Figure 13-8 and Figure 13-10. The comparison of the copper recovery model with the individual (unscaled) column test results are shown on Figure 13-11 for Papomono and on Figure 13-13 for Don Gabriel ore. The corresponding curves for leaching ratio (with the actual leaching rates for each column test) are shown in Figure 13-12 and Figure 13-14.

Figure 13-7: Copper Recovery for Don Gabriel Chloride Leach Columns 3–6 Tests



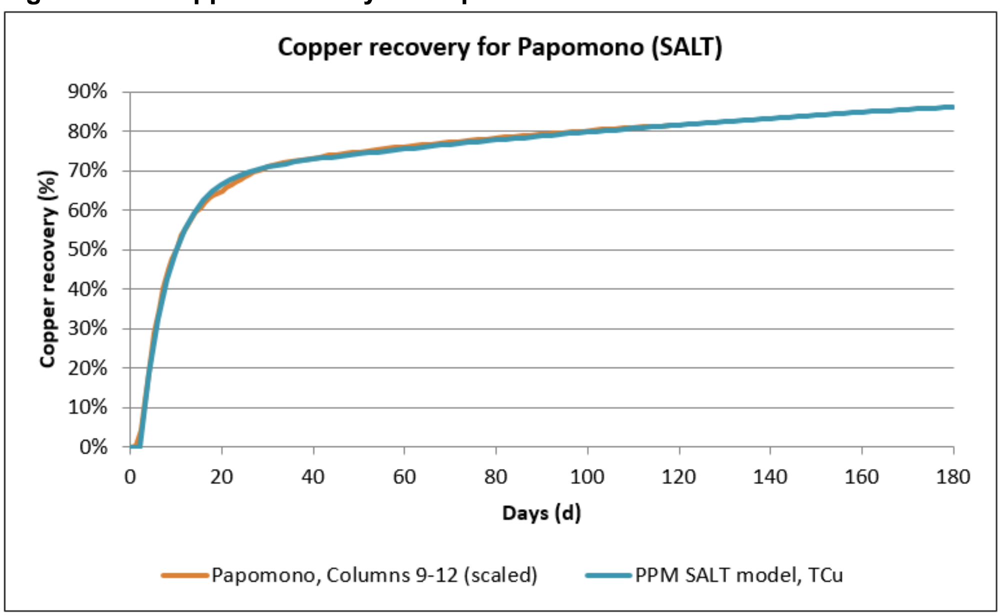
Note: Figure prepared by Oryxeio, 2017. Average of Columns 3 to 6, scaled to total copper recovery by tailings) and extrapolated to a 180-day leaching cycle with the Don Gabriel copper recovery model under chloride leach conditions.

Figure 13-8: Copper Recovery for Don Gabriel Chloride Leach Columns 3–6 Tests



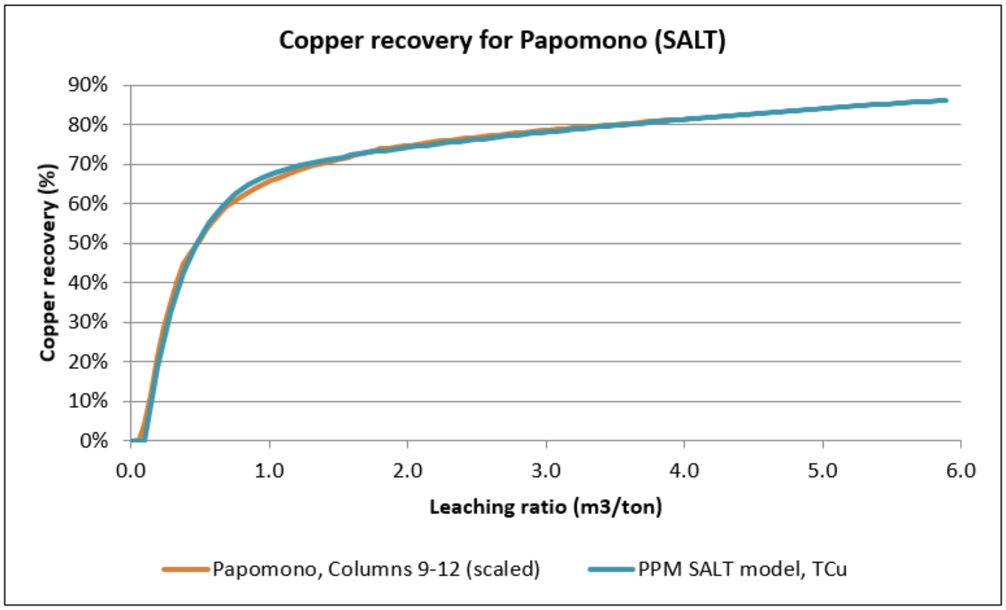
Note: Figure prepared by Oryxeio, 2017. Average of Columns 3 to 6, scaled to total copper recovery by tailings, and extrapolated to a leaching ratio of 5.0 m3/t with the Don Gabriel copper recovery model under chloride leach conditions.

Figure 13-9: Copper Recovery for Papomono Chloride Leach Columns 9–12 Tests



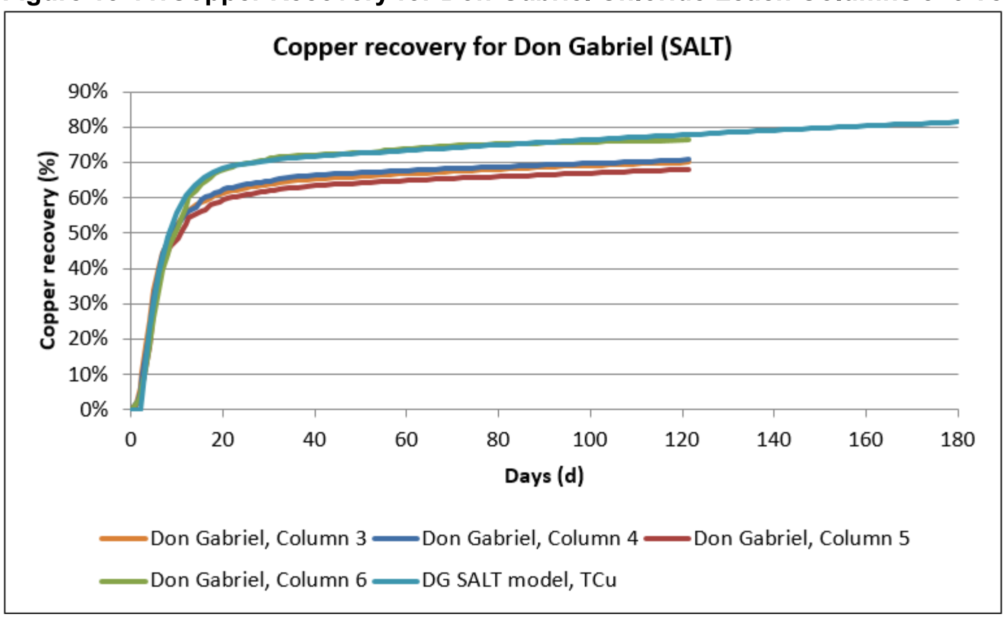
Note: Figure prepared by Oryxeio, 2017. Average of Columns 9 to 12, scaled to total copper recovery by tailings and extrapolated to a 180-day leaching cycle with the Papomono copper recovery model under chloride leach conditions.

Figure 13-10: Copper Recovery for Papomono Chloride Leach Columns 9–12 Tests



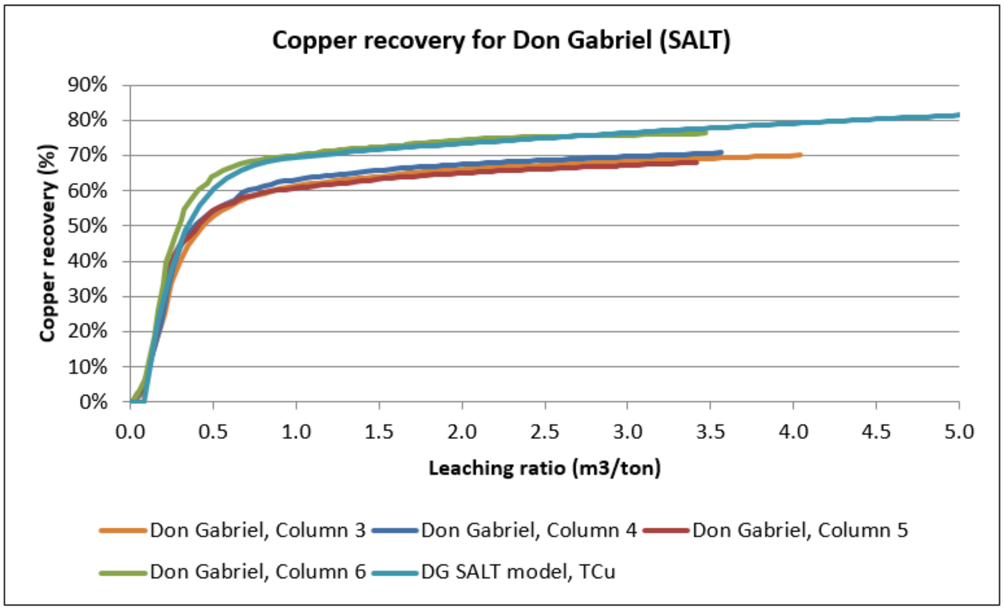
Note: Figure prepared by Oryxeio, 2017. Average of Columns 9 to 12, scaled to total copper recovery by tailings and extrapolated to a leaching ratio of 5.9 m^3/t with the Papomono copper recovery model under chloride leach conditions.

Figure 13-11: Copper Recovery for Don Gabriel Chloride Leach Columns 3–6 Tests



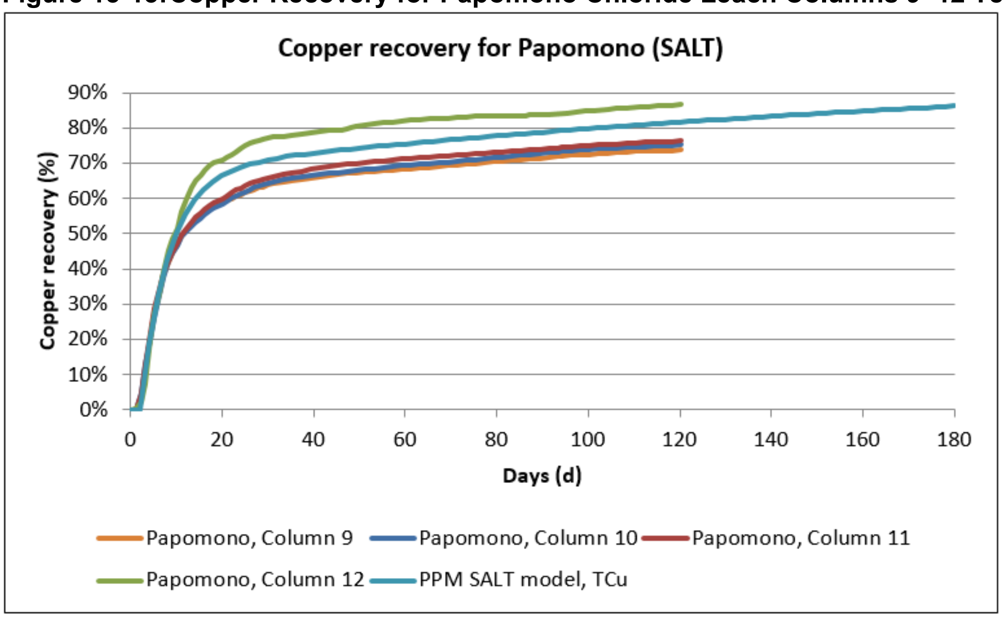
Note: Figure prepared by Oryxeio, 2017. Columns 3 to 6, unscaled, and extrapolated to a 180-day leaching cycle with the Don Gabriel copper recovery model under chloride leach conditions.

Figure 13-12: Copper Recovery for Don Gabriel Chloride Leach Columns 3–6 Tests



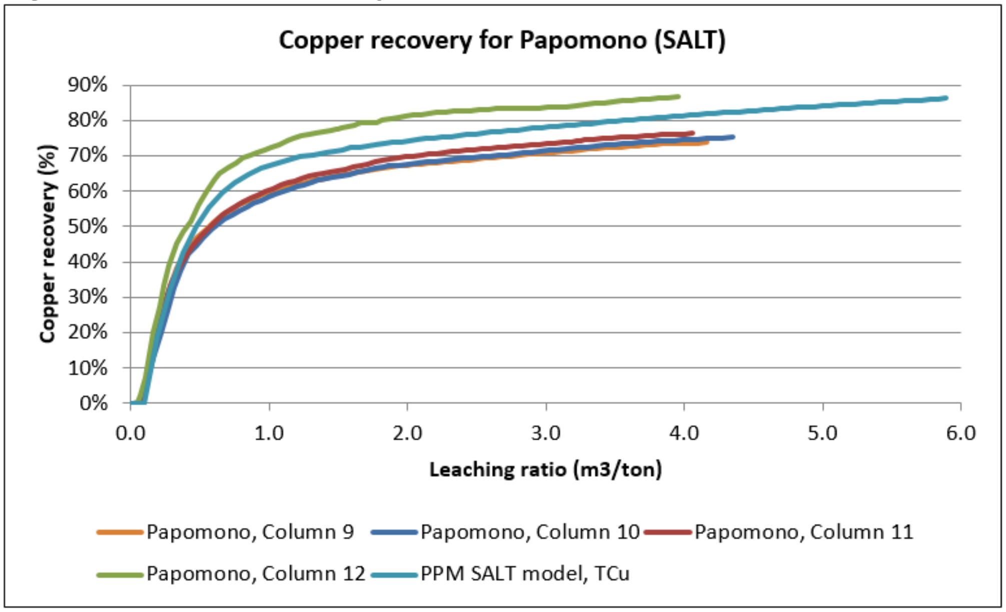
Note: Figure prepared by Oryxeio, 2017. Columns 3 to 6, unscaled, and extrapolated to a leaching ratio of 5.0 m^3/t with the Don Gabriel copper recovery model under chloride leach conditions.

Figure 13-13: Copper Recovery for Papomono Chloride Leach Columns 9–12 Tests



Note: Figure prepared by Oryxeio, 2017. Columns 9 to 12, unscaled, and extrapolated to a 180-day leaching cycle with the Papomono copper recovery model under chloride leach conditions.

Figure 13-14: Copper Recovery for Papomono Chloride Leach Columns 9–12 Tests

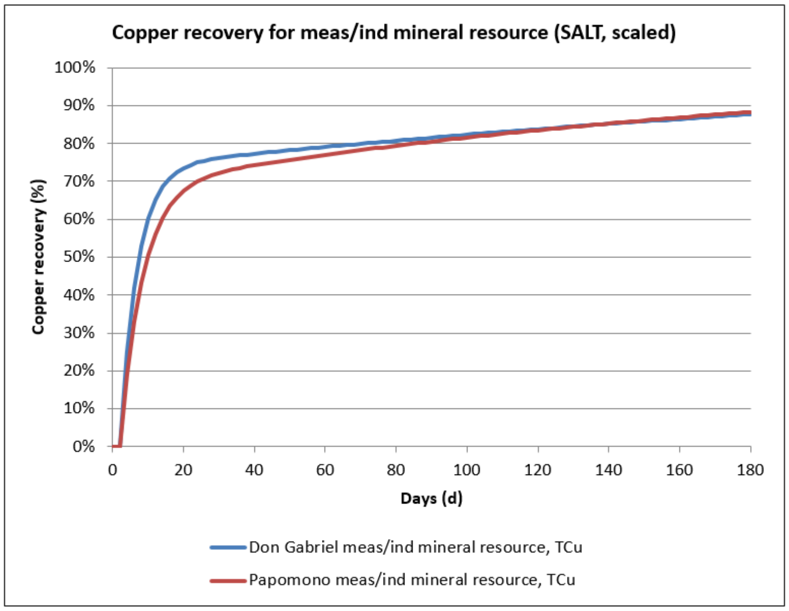


Note: Figure prepared by Oryxeio, 2017. Columns 9 to 12, unscaled and extrapolated to a leaching ratio of 5.9 m^3/t with the Papomono copper recovery model under chloride leach conditions.

In the previous figures (Figure 13-8, Figure 13-10, Figure 13-12 and Figure 13-14), the curves related to the leaching ratio for the copper recovery model using an average value for the unit leaching ratio for the first 30 days of irrigation and a different average value for the remaining leaching duration. These were based on the average of Columns 3–6 for Don Gabriel and the average of Columns 9–12 for Papomono.

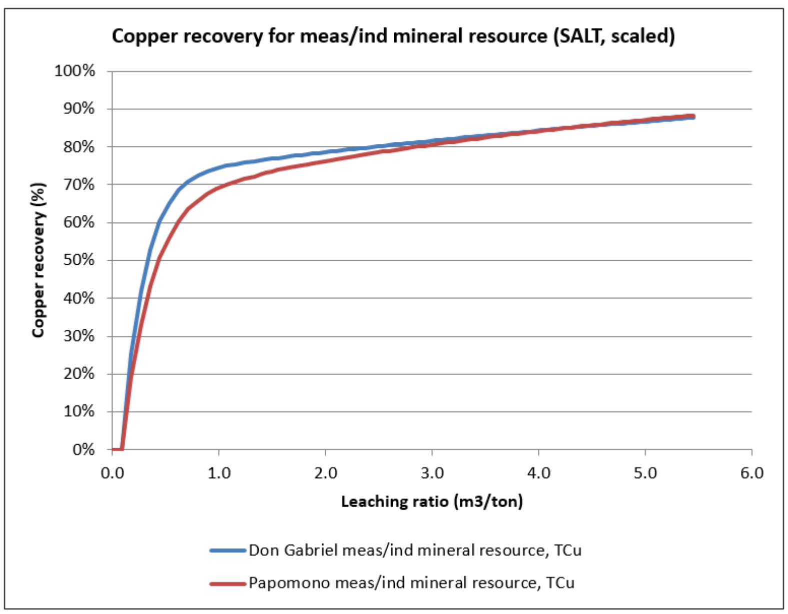
The estimated total copper recovery kinetics up to 180 days for Don Gabriel and Papomono, based on the copper recovery model under chloride conditions, is shown on Figure 13-15. The copper recoveries correspond to crushed material at P95 <½" and P80 <¼", i.e., they use the scaling factor associated with improved particle size. The corresponding curves for leaching ratio are given in Figure 13-16, using a mean average unit leaching ratio for the first 30 days of leaching and second for the leaching days thereafter, based on both Don Gabriel and Papomono column tests (Columns 3–6 and 8–12).

Figure 13-15: Copper Recovery, 180-Day Chloride Leach, Scaled for Particle Size



Note: Figure prepared by Orixeyo, 2017.

Figure 13-16: Copper Recovery, Leaching Ratio to 5.5 m³/t, Scaled for Particle Size



Note: Figure prepared by Orixeyo, 2017.

13.2.10 Sulphuric Acid Consumption Model

The net sulphuric acid consumption for chloride leaching is based on MTV's column and heap tests. The average of the acid consumption rates of five chloride leaching columns for each ore type (Don Gabriel and Papomono) was averaged with the corresponding chloride leaching heap (Heap 25A and 25B, respectively). At commercial scale it is more difficult to adequately control irrigation flow and sulphuric acid concentration in primary and secondary irrigation solutions. Therefore, an additional amount of 5 kg H_2SO_4/dmt is considered for the scaled mean net acid consumption value for Don Gabriel and Papomono material (approximately 40% additional net acid consumption in reference to test results).

The sulphuric acid consumption model is given for 120, 140, 160, and 180 days of leaching cycle, considering respectively an increase of 1.4 kg H_2SO_4/dmt for Don Gabriel ore and of 1.0 kg H_2SO_4/dmt for Papomono ore for every 20 days of leaching cycle in addition (or a corresponding decrease for every 20 days less), in reference to the scaled mean obtained from test results. The difference between both types of ore is based on the MTV test work results.

The sulphuric acid consumption model is given for Don Gabriel and Papomono respectively in Table 13-38 and Table 13-39.

Table 13-38: Sulphuric Acid Consumption Model, Don Gabriel

Description	Don Gabriel Test Work			Meas/Ind Mineral Resource			
	Columns 3–6	Heap 25A	Scaled Mean	120 days	140 days	160 days	180 days
Leaching cycle (days)	121.3	132.9	127.1	120.0	140.0	160.0	180.0
Scaling to commercial heap (kg/dmt)	-	-	5.00	-0.50	0.90	2.30	3.70
Net unit acid consumption (kg/dmt)	**13.17**	**12.41**	**17.79**	**17.29**	**18.69**	**20.09**	**21.49**
Total copper grade (%TCu)	1.06	1.06	1.06	0.827	0.827	0.827	0.827
Total copper recovery (%)	70.0	69.9	70.0	83.8	85.2	86.5	87.7
Unit copper recovery (kg Cu/dmt)	7.417	7.414	7.415	6.932	7.047	7.154	7.255
Net unit acid consumption (kg/kg Cu)	**1.78**	**1.67**	**2.40**	**2.49**	**2.65**	**2.81**	**2.96**

Note: Information presented for Measured/Indicated Mineral Resource under chloride leach conditions at 120, 140, 160, and 180 days leaching with feed crushed at P_{95} <½" and P_{80} <¼".

Table 13-39: Sulphuric Acid Consumption Model, Papomono.

Description	Papomono Test Work			Meas/Ind Mineral Resource			
	Columns 9–12	Heap 25B	Scaled Mean	120 days	140 days	160 days	180 days
Leaching cycle (days)	120.3	133.3	126.8	120.0	140.0	160.0	180.0
Scaling to commercial heap (kg/dmt)	-	-	5.00	-0.34	0.66	1.66	2.66

Description	Papomono Test Work			Meas/Ind Mineral Resource			
	Columns 9–12	Heap 25B	Scaled Mean	120 days	140 days	160 days	180 days
Net unit acid consumption (kg/dmt)	**10.96**	**11.42**	**16.19**	**15.85**	**16.85**	**17.85**	**18.85**
Total copper grade (%TCu)	1.62	1.62	1.62	1.147	1.147	1.147	1.147
Total copper recovery (%)	76.9	78.0	77.5	83.5	85.3	86.9	88.3
Unit copper recovery (kg Cu/dmt)	12.45	12.64	12.55	9.574	9.776	9.960	10.127
Net unit acid consumption (kg/kg Cu)	**0.88**	**0.90**	**1.29**	**1.66**	**1.72**	**1.79**	**1.86**

13.3 Summary of Mineral Processing and Metallurgical Testing

Chloride leach recovery estimates for Don Gabriel and Papomono have been conveniently evaluated for a leach cycle of 160 days, based on MTV column tests and test heaps. The estimates are 86.5% for Don Gabriel ore at a net acid consumption of 2.81 kg H_2SO_4/kg Cu and 86.9% for Papomono ore at a net acid consumption of 1.79 kg H_2SO_4/kg Cu, assuming the material is combined. These estimates include any material that may be processed from third-party or ENAMI sources.

The estimates are based on the following assumptions and parameters:

- Particle size distribution of crushed mineral content to P_{95} <12.7 mm (½") and P_{80} <6.4 mm (¼")
- Leach cycle of 120 to 180 days and heap height of 2.5–3 m
- Minimum chloride concentration of 10 g/L Cl-, ferric above 3 g/L Fe^{3+}, and a minimum total iron concentration of 10 g/L TFe in leach solutions (primary and secondary)
- The agglomeration process is carried out with NaCl, sulphuric acid, and process water
- The agglomerated material needs a rest period of 20 to 40 days before leaching, a period in which the material is kept moist
- After the rest period, leaching is carried out
- Irrigation flow of 7 to 9 L/h-m^2 for a period of 20 to 60 days with a sulphuric acid concentration of 7 to 9 g/L H_2SO_4 in primary leaching
- Irrigation flow of 5 to 10 L/h-m^2 for a period of 60 to 150 days with a sulphuric acid concentration of 2 to 3 g/L H_2SO_4 in secondary leaching.

The current crushing plant was designed for the expected particle size distribution.

The conditions for agglomeration in reference to sulphuric acid and salt (NaCl) additions may be further optimized, as well as the impact of total iron presence in agglomeration liquids, wetting solutions during the rest period, and irrigation solutions during the leach cycle.

The combined leaching of third-party and ENAMI material in conjunction with Don Gabriel and Papomono ore has to be evaluated to determine any impacts that may result on global copper recovery and global sulphuric acid consumption.

Based on performed MTV metallurgical test work, the ferric mass balance will improve significantly by using chloride leaching. Additional testing related to ferric generation and consumption is recommended.

The reduced sulphuric acid consumption obtained with chloride leaching has an additional benefit, besides economics, in that any impurities are kept at a reasonable level in primary and secondary leaching, even during increased copper production.

The leach solutions will operate at lower viscosity in comparison to past operation and this particularly will benefit solvent extraction.

14.0 MINERAL RESOURCE ESTIMATES

14.1 Mineral Resource

Table 14-1 presents the Mineral Resource estimate for the Minera Tres Valles Copper Project.

Table 14-1: Mineral Resource Statement

Resource Class	Mining Method	TCu Cut-off (%)	Tonnage (kt)	TCu (%)	ASCu (%)	CNCu (%)	RCu (%)	Copper (klbs)
Measured								
Don Gabriel Manto	OP	0.20	983	0.82	0.13	0.59	0.11	17,857
Don Gabriel Vetas	UG	0.64	0	0.00	0.00	0.00	0.00	0
Papomono Masivo	UG	0.34	2,449	1.94	0.47	1.34	0.14	104,796
Papomono Cumbre	OP	0.19	266	0.49	0.07	0.38	0.04	2,844
Papomono Cumbre	UG	0.34	0	0.00	0.00	0.00	0.00	0
Mantos Conexión	UG	0.59	262	1.27	0.41	0.67	0.19	7,312
Papomono Sur	UG	0.58	634	1.28	0.24	0.95	0.08	17,821
Epitermal	UG	0.65	0	0.00	0.00	0.00	0.00	0
Papomono Norte	OP	0.19	102	0.96	0.58	0.22	0.15	2,150
Manto Norte	UG	0.58	834	1.08	0.50	0.52	0.06	19,894
Total Measured Mineral Resource			**5,530**	**1.42**	**0.37**	**0.94**	**0.11**	**172,674**
Indicated								
Don Gabriel Manto	OP	0.20	5,476	0.83	0.11	0.63	0.09	99,959
Don Gabriel Vetas	UG	0.64	0	0.00	0.00	0.00	0.00	0
Papomono Masivo	UG	0.34	891	1.62	0.43	1.08	0.11	31,881
Papomono Cumbre	OP	0.19	2,388	0.54	0.10	0.39	0.06	28,429
Papomono Cumbre	UG	0.34	351	0.48	0.04	0.41	0.02	3,699
Mantos Conexión	UG	0.59	1,287	1.02	0.33	0.47	0.23	28,856
Papomono Sur	UG	0.58	989	1.00	0.32	0.58	0.10	21,760
Epitermal	UG	0.65	509	0.98	0.34	0.32	0.32	10,997
Papomono Norte	OP	0.19	250	1.00	0.57	0.29	0.14	5,506
Manto Norte	UG	0.58	633	0.97	0.44	0.46	0.07	13,495
Total Indicated Mineral Resource			**12,774**	**0.87**	**0.20**	**0.56**	**0.11**	**244,581**
Measured+Indicated								
Don Gabriel Manto	OP	0.20	6,459	0.83	0.11	0.62	0.10	117,816
Don Gabriel Vetas	UG	0.64	0	0.00	0.00	0.00	0.00	0
Papomono Masivo	UG	0.34	3,340	1.86	0.46	1.27	0.13	136,676
Papomono Cumbre	OP	0.19	2,654	0.53	0.09	0.39	0.05	31,273
Papomono Cumbre	UG	0.34	351	0.48	0.04	0.41	0.02	3,699
Mantos Conexión	UG	0.59	1,549	1.06	0.34	0.50	0.22	36,168
Papomono Sur	UG	0.58	1,623	1.11	0.29	0.73	0.09	39,581
Epitermal	UG	0.65	509	0.98	0.34	0.32	0.32	10,997
Papomono Norte	OP	0.19	352	0.99	0.58	0.27	0.14	7,656
Manto Norte	UG	0.58	1,467	1.03	0.47	0.50	0.07	33,389
Total Meas+Ind Mineral Resource			**18,304**	**1.03**	**0.25**	**0.68**	**0.10**	**417,255**

Resource Class	Mining Method	TCu Cut-off (%)	Tonnage (kt)	TCu (%)	ASCu (%)	CNCu (%)	RCu (%)	Copper (klbs)
Inferred								
Don Gabriel Manto	OP	0.20	79	0.70	0.50	0.12	0.07	1,216
Don Gabriel Vetas	UG	0.64	2,020	1.33	0.14	1.04	0.15	59,273
Papomono Masivo	UG	0.34	22	2.64	0.42	1.98	0.25	1,282
Papomono Cumbre	OP	0.19	537	0.66	0.17	0.42	0.08	7,861
Papomono Cumbre	UG	0.34	298	0.53	0.07	0.43	0.04	3,482
Mantos Conexión	UG	0.59	117	0.79	0.28	0.18	0.33	2,043
Papomono Sur	UG	0.58	111	0.95	0.40	0.38	0.17	2,317
Epitermal	UG	0.65	223	1.01	0.48	0.21	0.33	4,970
Papomono Norte	OP	0.19	13	2.90	0.50	2.23	0.18	832
Manto Norte	UG	0.58	37	1.39	0.70	0.39	0.30	1,131
Total Inferred Mineral Resource			**3,457**	**1.11**	**0.19**	**0.77**	**0.15**	**84,408**

The Mineral Resource has an effective date of January 1, 2018 and is inclusive of those Mineral Resources that have been modified to produce Mineral Reserves. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

Measured and Indicated Mineral Resources amount to 18.3 Mt at 1.03% TCu for 417.3 million contained pounds of copper. Inferred Mineral Resources are an additional 3.46 Mt at 1.11% TCu for 84.4 Mlbs copper. The table also shows grades for ASCu, CNCu, and residual copper RCu since these components are used for metal recovery calculations, however they are not additive to the TCu grade.

To establish "reasonable prospects for eventual economic extraction", estimated unit costs for mining, processing, general and administrative (G&A), and SX/EW, as well as process recoveries have been developed to calculate appropriate cut-off grades for mining. The resource estimates are based on a copper price of US$3.30 per pound finished copper.

Process costs and recoveries are based on crushing and heap leaching with sulphuric acid, and chloride leaching. The recoveries were incorporated into the model on a block-by-block basis. It can be seen from Table 14-2 that average recoveries vary by deposit due to variations in the ASCu, CNCu, and RCu components.

With these parameters, the average copper recovery is estimated at about 87% for the Don Gabriel Manto and Don Gabriel Vetas. The copper recovery for the various Papomono deposits range from 85% for the Epitermal to 90% for Papomono Masivo.

The process costs for crushing, agglomeration, leaching, and SX/EW, as well as the cost for G&A and Services were estimated by Propipe.

It is assumed that Don Gabriel Manto, Papomono Norte and a portion of Papomono Cumbre will be mined by open pit methods by a mining contractor. Estimated contract mining costs are $2.35 and $2.15/t for process feed material and waste respectively. These are based on a quotation from a recognized Chilean contract mining company. This estimate includes the cost for geology, mine engineering, and ore control.

The plant feed haulage cost is estimated at $2.21/t for Don Gabriel and $1.76 for Papomono and is based on a contractor quote. The one-way haulage distances are about 17 km from Don Gabriel and 12 km from Papomono.

The Mineral Resources for Don Gabriel Manto, Papomono Norte and Papomono Cumbre are tabulated inside Lerchs–Grossmann (LG) shells run with the conceptual economic and recovery parameters. Figure 14-1 through Figure 14-3 shows these shells. Measured, Indicated, and Inferred Mineral Resources were used to develop the shells.

Table 14-2: Conceptual Economic Parameters for Mineral Resource Estimates

	Unit	Don Gabriel Manto	Don Gabriel Vetas	Papomono Masivo	Papomono Cumbre	Papomono Cumbre	Papomono Mantos Conexión	Papomono Sur	Epitermal	Papomono Norte	Manto Norte
Commodity Prices											
Copper Price per Pound	US$	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
Dilution and Mining Loss											
Dilution	%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mining Loss	%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mining Cost per Tonne											
Proposed Mining Method		Open Pit	Sublevel Stoping	Block Caving	Open Pit	Block Caving	Front Caving	Front Caving	Sublevel Stoping	Open Pit	Front Caving
Mining Cost per Mineralization Tonne	US$	2.35	24.00	8.40	2.35	8.40	22.00	22.00	24.00	2.35	22.00
Mining Cost per Waste Tonne	US$	2.15	N/A	N/A	2.15	N/A	N/A	N/A	N/A	2.15	N/A
Processing Cost per Mineralization Tonne											
Crushing	US$	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56
Agglomeration	US$	3.07	3.07	3.07	3.07	3.07	3.07	3.07	3.07	3.07	3.07
Leaching	US$	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20
Process Cost	US$	8.83	8.83	8.83	8.83	8.83	8.83	8.83	8.83	8.83	8.83
Mineralization Haulage	US$	2.21	2.21	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76
Total Process and Mineralization Haulage	US$	11.04	11.04	10.59	10.59	10.59	10.59	10.59	10.59	10.59	10.59
G&A and Services per Pound											
General and Administration	US$	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Services	US$	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
G&A and Services	US$	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Average Recovery											
Total Copper	%	87.00	87.00	89.00	89.00	89.00	87.00	89.00	85.00	89.00	90.00
SX/EW Cost per Pound											
Solvent Extraction	US$	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Electrowinning	US$	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
SX/EW Cost	US$	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Cut-off Grades (Total Copper)											
Internal (Mining is Sunk Cost)	%	0.20	N/A	N/A	0.19	N/A	N/A	N/A	N/A	0.19	N/A
Break-even	%	0.24	0.64	0.34	0.23	0.34	0.59	0.58	0.65	0.23	0.58

The estimated internal cut-off grades for the Don Gabriel Manto, Papomono Norte, and Papomono Cumbre pits are 0.20%, 0.19% and 0.19% TCu respectively. Internal cut-off grade applies to blocks that have to be removed from the pit, so mining is considered a sunk cost. The blocks only have to pay processing, mineralization haulage, G&A, SX/EW, and the $0.20 differential between mineralization and waste mining cost. The Mineral Resources for the open pits in Table 14-1 are based on internal cut-off grades.

For the underground deposits proposed underground mining methods were selected for each deposit and approximate mining costs for the various methods estimated. The proposed methods and costs are summarized in Table 14-3.

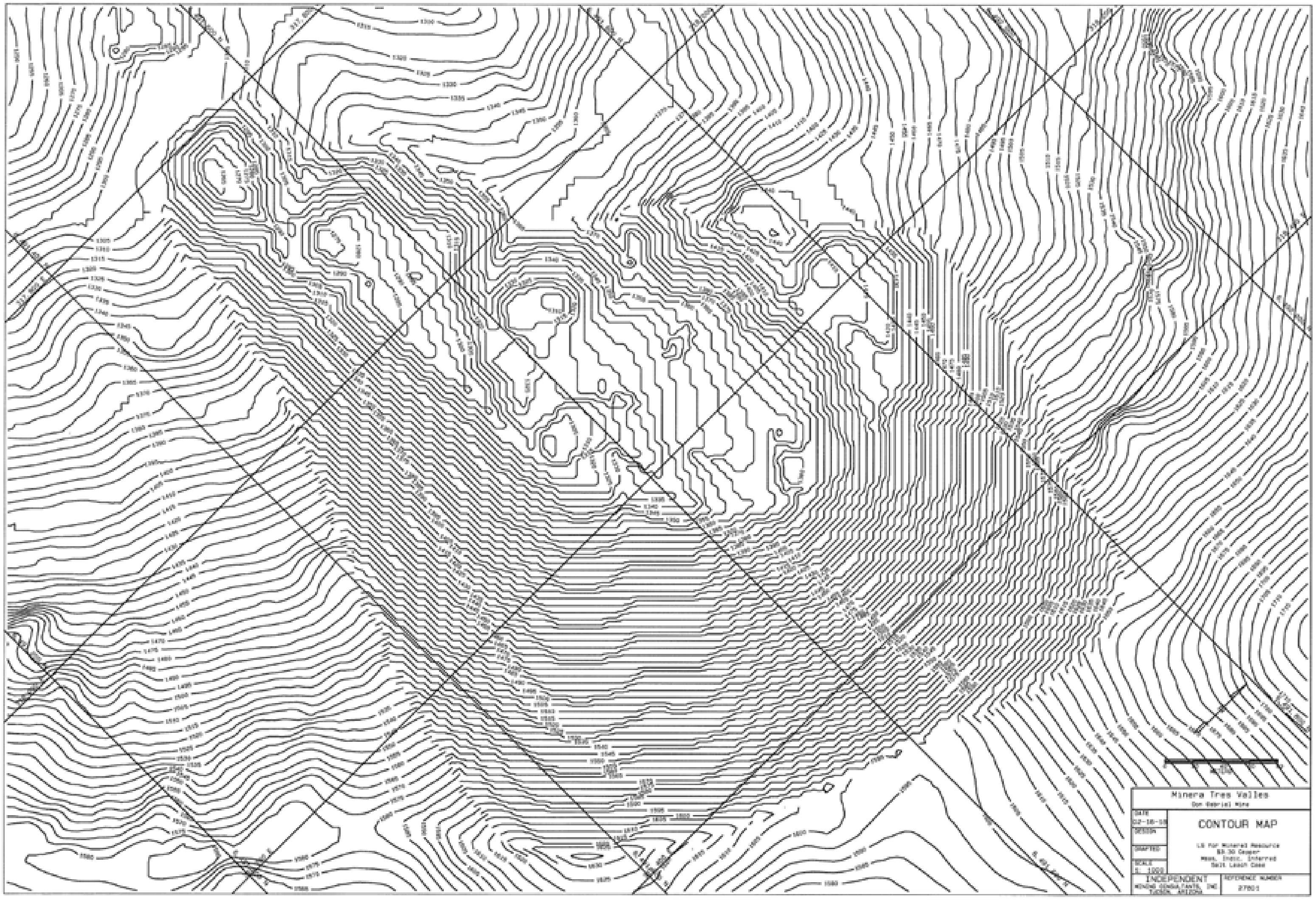
Table 14-3: Conceptual Underground Mining Methods

Mining Method	Zone	Estimated Mining Cost
Block caving	Papomono Masivo, Papomono Cumbre	US$8.40/t
Front caving	Papomono Sur, Papomono Mantos Conexión, Manto Norte	US$22.00/t
Sublevel stoping	Don Gabriel Vetas, Epitermal	US$24.00/t

There is a portion of Papomono Cumbre beneath the existing and potential open pit that might be amenable to underground mining. Estimated breakeven cut-off grades for each deposit are shown on Table 14-2. The Mineral Resources for underground mining for each deposit are tabulated at these cut-off grades. The Mineral Resources are in-situ estimates. IMC has not included any dilution or mining loss assumptions in the estimates. The Mineral Resources are classified in accordance with the CIM Definition Standards (2014). Mineral Resource estimates reflect the reasonable expectation that all necessary permits and approvals will be obtained and maintained.

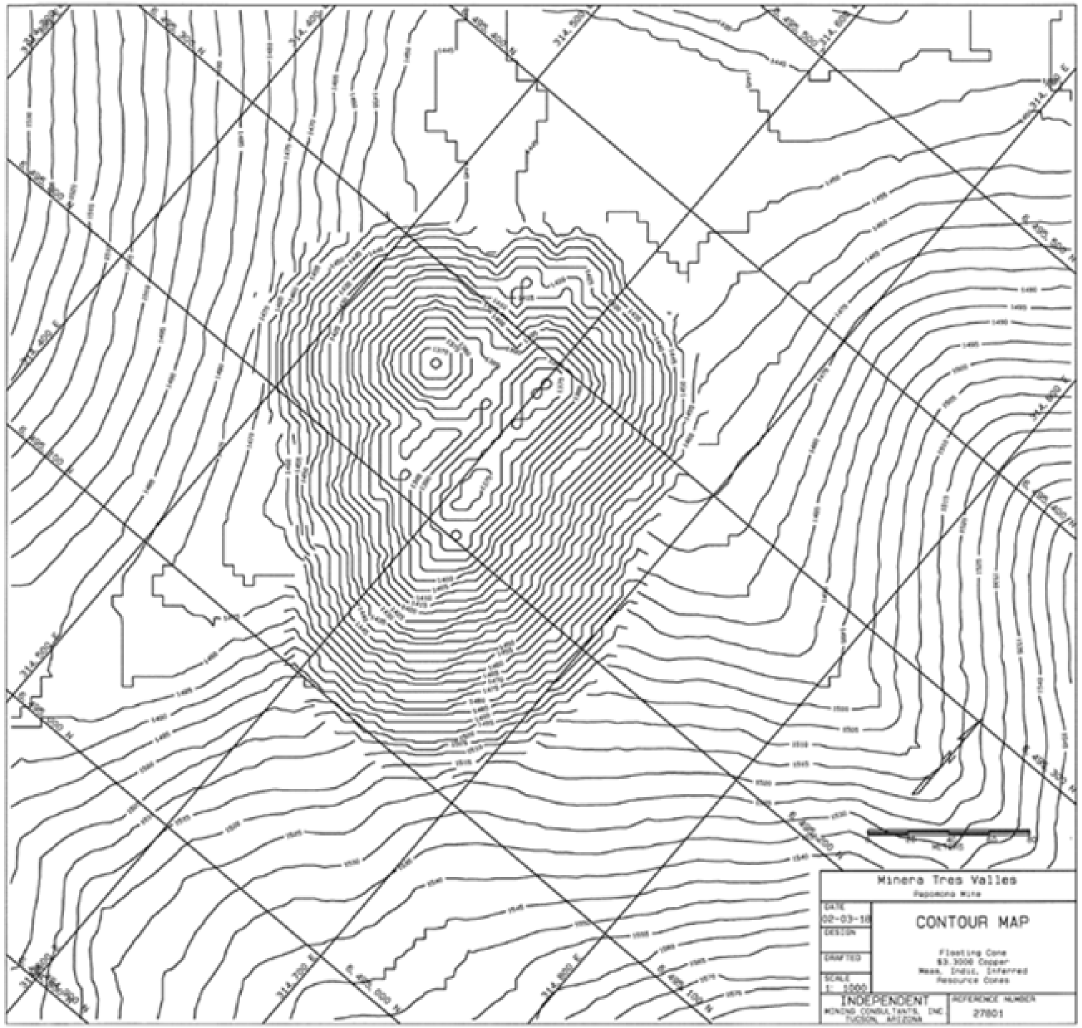
The QP does not believe that there are significant risks to the Mineral Resource estimates based on environmental, permitting, legal, title, taxation, socio-economic, marketing, or political factors other than discussed in this Report. The Project is in a jurisdiction friendly to mining and has operated in the past and is currently operating at a low level of production. The most significant risks to the Mineral Resource estimate are related to economic parameters such as prices lower than forecast, recoveries lower than forecast, or costs higher than the current estimates. There could also be geological risk if additional drilling supports a reduction in the current resource estimates or identifies more erratic deposit geometries that prove difficult to mine.

Figure 14-1: Don Gabriel Manto Resource Cone Shell Outline



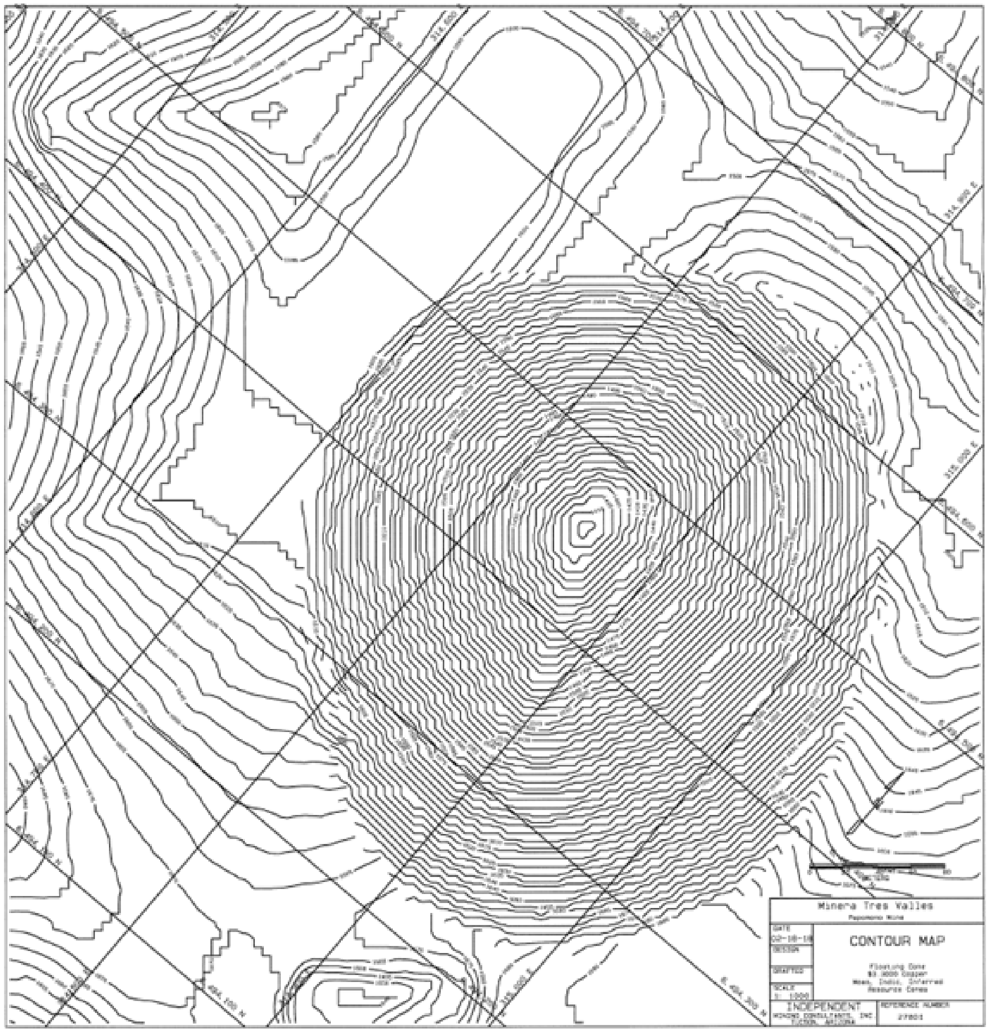
Note: Figure prepared by IMC, 2018

Figure 14-2: Papomono Norte Resource Shell outline



Note: Figure prepared by IMC, 2018

Figure 14-3: Papomono Cumbre Resource Shell Outline



Note: Figure prepared by IMC, 2018

14.2 Description of the Block Models

The Mineral Resources are based on block models developed by IMC from October 2017 to February 2018. There are two block models, one for the Don Gabriel Manto and Don Gabriel Vetas, and one for the seven Papomono deposit zones.

14.2.1 Don Gabriel

General

The resource block model was developed by IMC during October and November 2017; it was completed on November 29, 2017. The model is based on 5 x 5 x 5 m blocks. The model is rotated 45° to align with the strike of the veins.

Geological Controls

MTV personnel provided the following geological solids for the Don Gabriel model:

- The Don Gabriel Manto interpreted at a copper cut-off grade of 0.2%
- A sandstone volcanic unit that is below the manto
- As intrusive sill unit that is above the manto
- An intrusive unit that is related to the Don Gabriel Vetas
- Twenty-two mineralized, near vertical, veins-shaped solids.

IMC reviewed and incorporated the MTV solids for the sandstone, intrusive sill, the intrusive related to the veins, and the Don Gabriel Vetas into the updated block model.

IMC did, however, develop an updated interpretation for the manto unit. IMC's interpretation was developed using LeapFrog implicit modeling software. The interpretation was developed based on the 1 m assay intervals and was also based on a 0.2% Cu grade. Parameters provided for the interpretation included the approximate strike and dip of the manto unit and factors to elongate the interpretation in the strike and dip directions versus the tertiary direction, i.e. to preserve the general shape of the unit. This interpretation was incorporated into the updated block model.

The Don Gabriel Manto interpretation is based on individual assays, should be considered an in-situ representation of mineralization, and minimal mining dilution is incorporated into the model.

The rock type model for Don Gabriel, model variable "rock", is defined in Table 14-4.

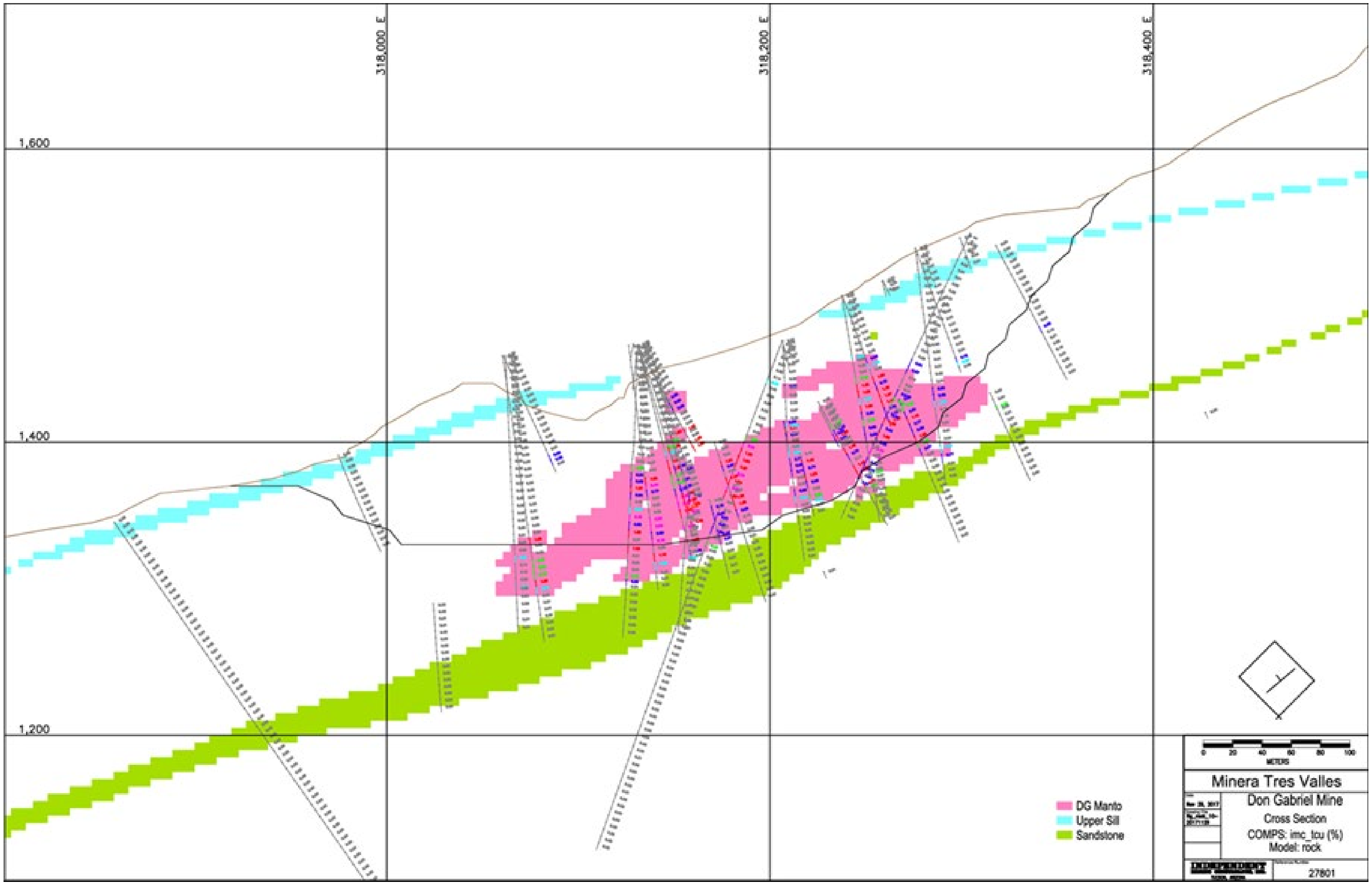
Table 14-4: Don Gabriel Model Rock Codes

IMC Code	Description
10	Upper Sill
20	Sandstone
30	Intrusion
50	Don Gabriel Manto
60	Don Gabriel Vetas
70	Host Rock
90	Waste or Fill

The codes for the Upper Sill, Sandstone, and Intrusion were assigned to the nearest whole block, i.e. the code was assigned if more than 50% of the block was included in the solid. The Don Gabriel Manto and Don Gabriel Vetas, codes 50 and 60, were coded on a partial block basis, i.e. these blocks were coded if any portion of the solid was included in them. Figure 14-4 shows a cross section of the Don Gabriel rock types at Section 10 through the deposit. Figure 10-3 shows the location of this cross section.

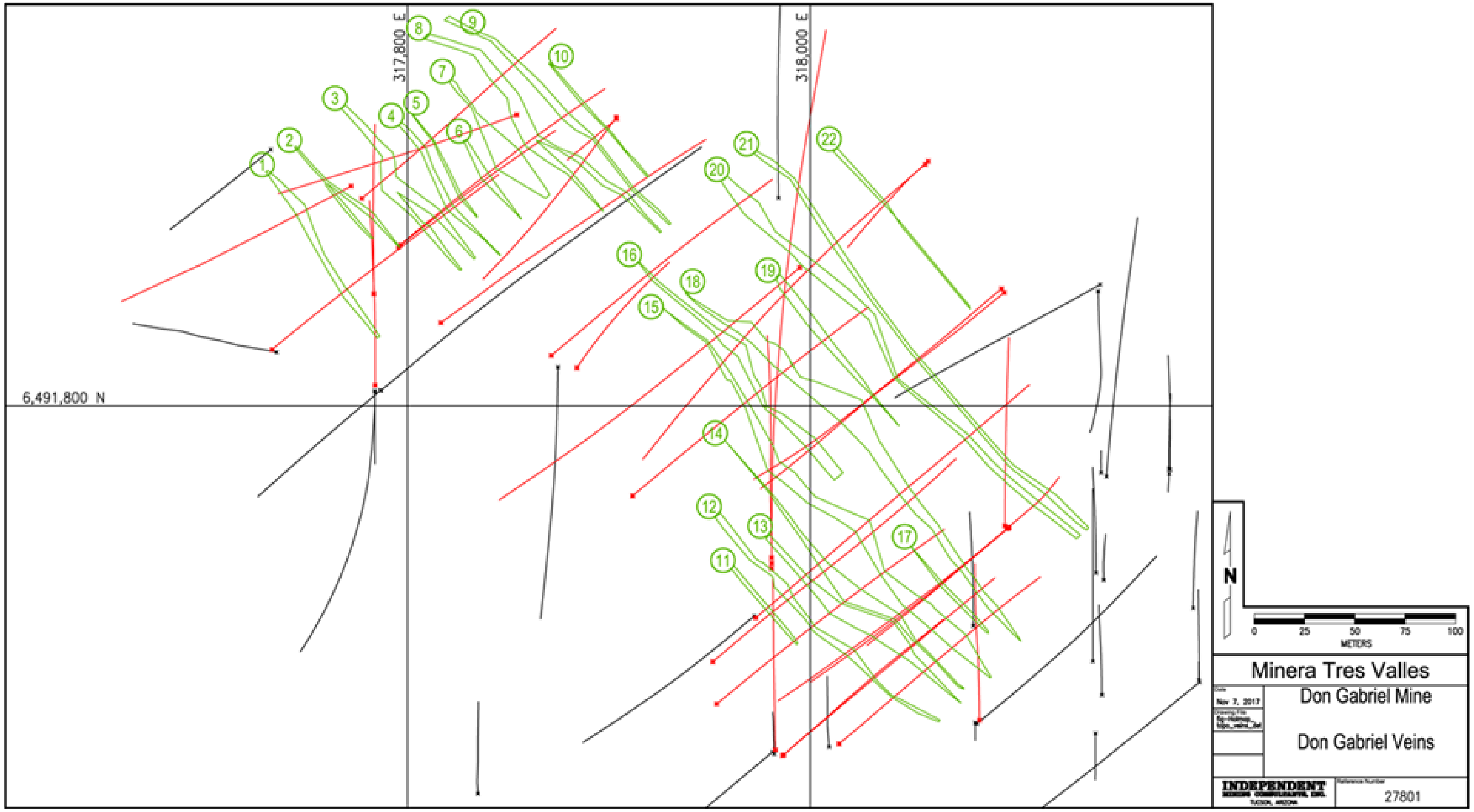
IMC also included the geological variables “vein” and “pct_vein” to code the Don Gabriel Manto, individual veins, and the decimal percent (0 to 1) of the block in the manto or vein. The vein codes were from 1 to 22. The manto was coded as vein 50. Figure 14-5 shows the approximate locations and the 1 to 22 numeric identifiers for the Don Gabriel Vetas. Comparing this figure with Figure 10-3 shows the veins to be in the northwest portion of the model area. The N45ºW strike of the vein system is also evident in the figure.

Figure 14-4: Don Gabriel Rock Types on Section 10



Note: Figure prepared by IMC, 2017

Figure 14-5: Don Gabriel Vetas



Note: Figure prepared by IMC, 2017

Grade Capping and Compositing

Don Gabriel Manto

IMC reviewed the distribution of assays in the manto and capped assays at 3.4% TCu. This was at the 98th percentile so 2% of the assays were impacted, or a total of 84 assays with a mean value of 4.25% TCu. Figure 14-6 shows a probability plot for original assays (green) and capped assays (red) in the manto. Figure 14-7 shows the probability plot for 5 m composites.

For sample intervals with capped TCu assays, IMC reduced the ASCu assays by the same proportion that the TCu assays were reduced. For example, for a 4% copper assay capped at 3.4% TCu, all the ASCu assays were also factored by 3.4/4.0 or 0.85.

The ASCu assays were generally not undertaken when TCu was less than 0.2% and a considerable number of assays in the manto are lower than this threshold. This truncation of the lower end of the distribution could result in a distortion of the ASCu block grade estimates, unless corrected.

It was also noted that the manto somewhat naturally divides into an upper portion that is oxide dominant (ASCu > CNCu), and a lower portion that is sulphide-dominant (ASCu < CNCu). Figure 14-8 shows assays in the manto that illustrate this. Note that the CNCu assay follows the ASCu assay, so it only measures mineralization that is not acid soluble in character; chalcocite or bornite would be the most common copper mineral species.

IMC filled in the missing ASCu assays as follows. For oxide-dominant material the ASCu was set to 0.70 x TCu and the CNCu was set to 0.15 x TCu. For sulphide-dominant material the ASCu was set to 0.15 x TCu and the CNCu was set to 0.70 x TCu. These ratios are based on the statistics for the oxide- and sulphide-dominant populations for the available assays. Note that these filled in missing values are mostly place holders in the lower-grade data; some variance in these values will not have a material impact on results.

The assay database was then composited to 5 m composites, respecting the manto contacts, i.e. only assays in the manto were composited. Single assays down to 1 m in length were allowed to form a composite in narrow zones.

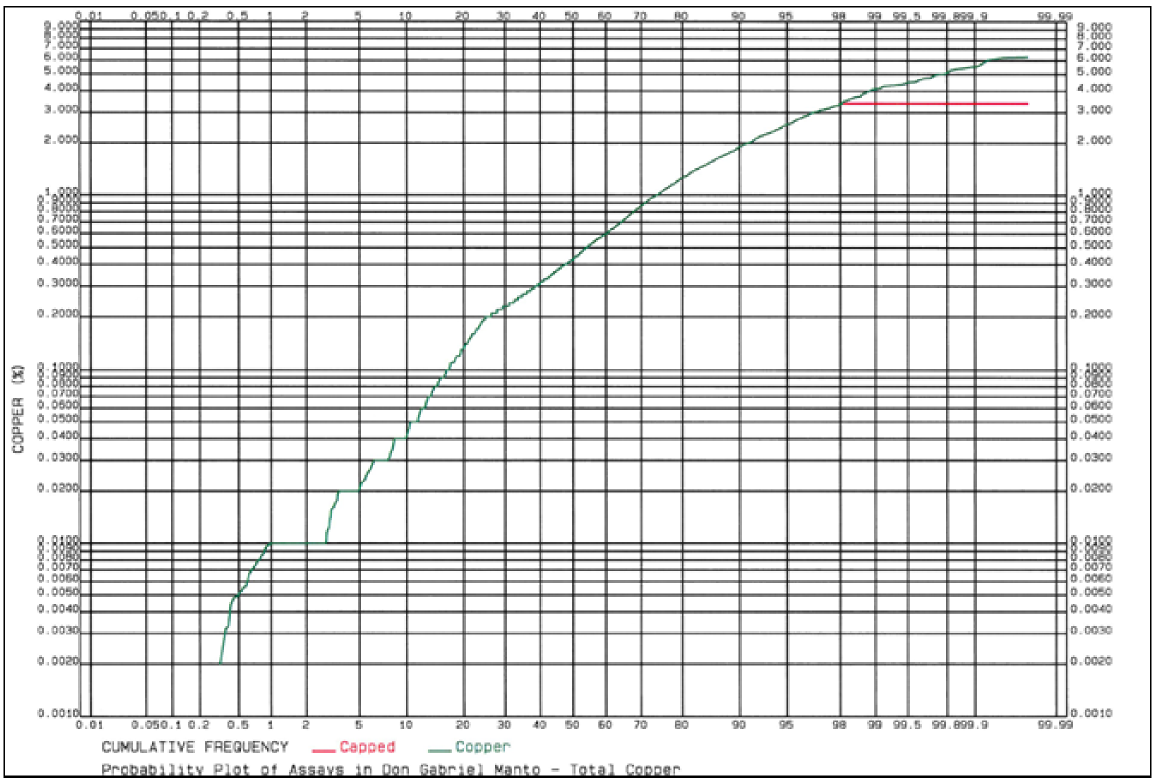
Table 14-5 shows summary statistics for assays and 5 m composites for:

- All assays/composites in the manto

- Capped values
- Uncapped assays >0.2% TCu
- Capped assays >0.2% TCu.

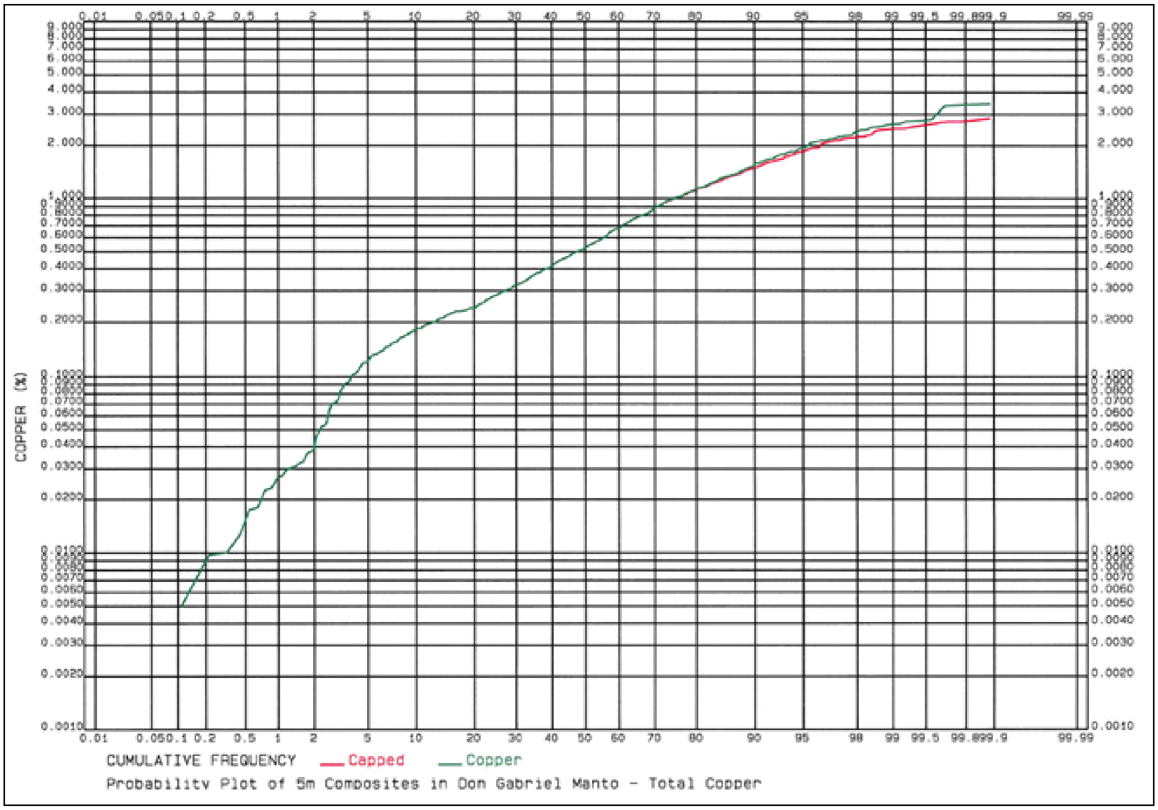
For composites, 802 out of 917 composites are above 0.2% TCu, or 87.5% of the composites exceed the nominal design cut-off of 0.2% TCu. For assays, 3,237 of the 4,316 assays (75.0%) are above the 0.2% TCu threshold. This is a good result with only 25.0% of the assays in the manto below 0.2% TCu.

Figure 14-6: Probability Plot of Assays in Don Gabriel Manto – Total Copper



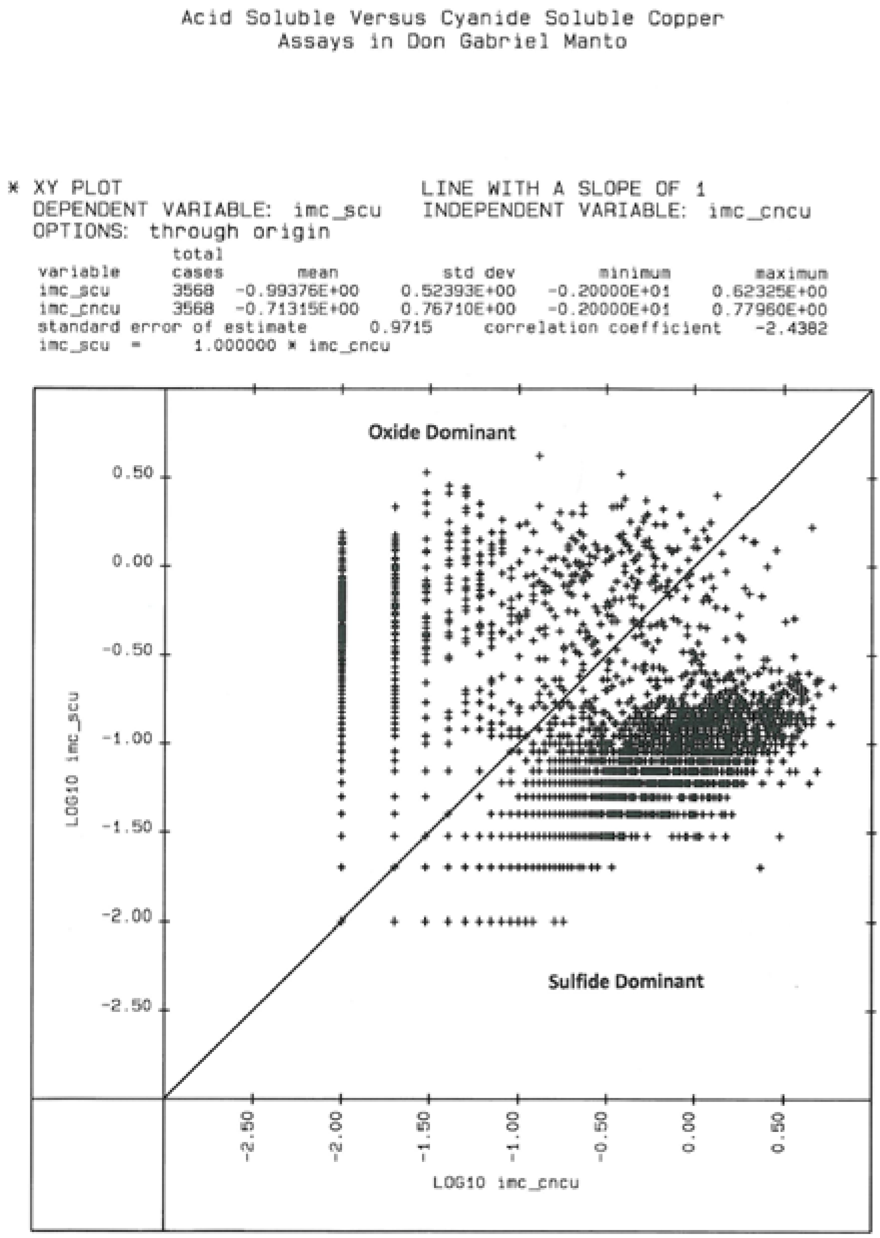
Note: Figure prepared by IMC, 2017.

Figure 14-7: Probability Plot of 5 m Composites in Don Gabriel Manto – Total Copper



Note: Figure prepared by IMC, 2017.

Figure 14-8: Oxide Versus Sulphide Dominant Assays in Don Gabriel Manto



Note: Figure prepared by IMC, 2017.

Table 14-5: Summary Statistics of Assays and Composites in DG Manto – Total Copper

Assays				
Parameter	All Uncapped	All Capped	>= 0.2% Cu Uncapped	>= 0.2% Cu Capped
Number of Samples	4,316	4,316	3,237	3,237
Mean	0.757	0.740	0.984	0.962
Standard Deviation	0.865	0.799	0.889	0.808
Minimum	0.000	0.000	0.200	0.200
Maximum	6.540	3.400	6.540	3.400
5 m Composites				
Parameter	All Uncapped	All Capped	>= 0.2% Cu Uncapped	>= 0.2% Cu Capped
Number of Samples	917	917	802	802
Mean	0.720	0.706	0.805	0.789
Standard Deviation	0.591	0.555	0.584	0.544
Minimum	0.005	0.005	0.200	0.200
Maximum	3.600	2.890	3.600	2.890

Don Gabriel Vetas

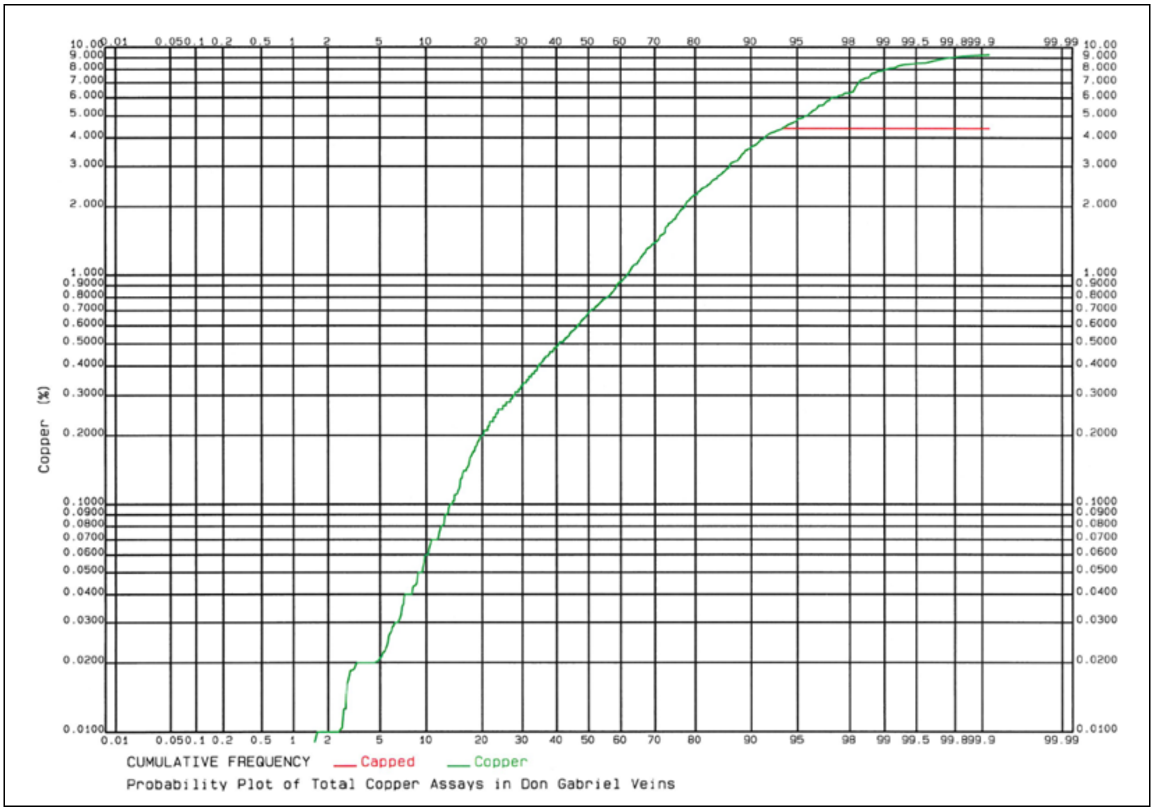
IMC reviewed the distribution of assays in the veins and capped assays at 4.4% TCu. During the analysis it was noted that a single drill hole, PPM-DGAB-DH0059, accounted for 28 of 104 vein assays exceeding 4% TCu. This is a near-vertical hole that went down vein 15. The cap grade is at the 95th percentile of the assays in the veins, except that PPM-DGAB-DH0059 was excluded for the determination of the percentile ranking. Capped assays amount to 79 assays with a mean value of 6.1% TCu. Figure 14-9 shows a probability plot for original assays (green) and capped assays (red) in the manto. Figure 14-10 shows the probability plot for 5 m composites.

As with the Don Gabriel Manto, for sample intervals with capped TCu assays, the ASCu assays were reduced by the same proportion that the TCu assays were reduced.

Figure 14-11 shows the plot of CNCu versus ASCu assays for 1 m assay intervals. This illustrates that the veins consist of sulphide-dominant mineralization.

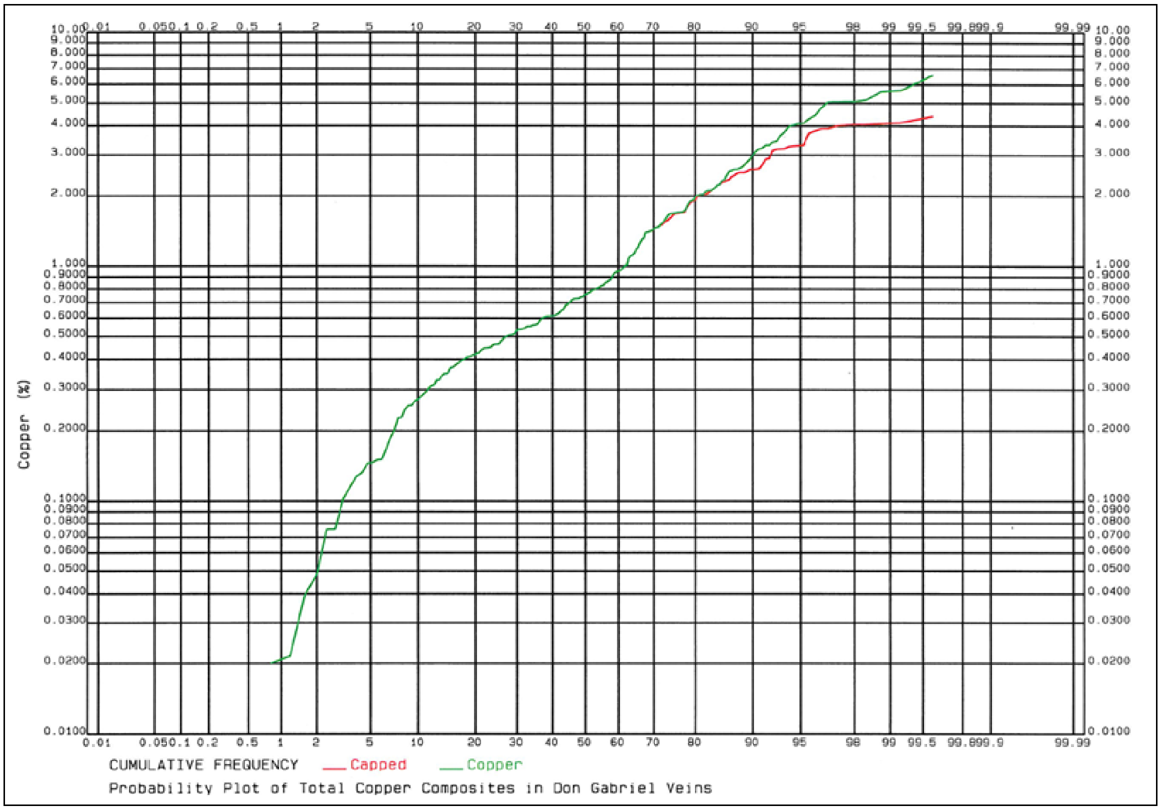
As with the Don Gabriel Manto, there are assay intervals in the veins where the ASCu assays were not done. IMC filled in the missing ASCu assays as follows. For oxide-dominant material the ASCu was set to 0.82 x TCu and the CNCu was set to 0.10 x TCu. For sulphide-dominant material the ASCu was set to 0.075 x TCu and the CNCu was set to 0.82 x TCu.

Figure 14-9: Probability Plot of Assays in Don Gabriel Vetas – Total Copper



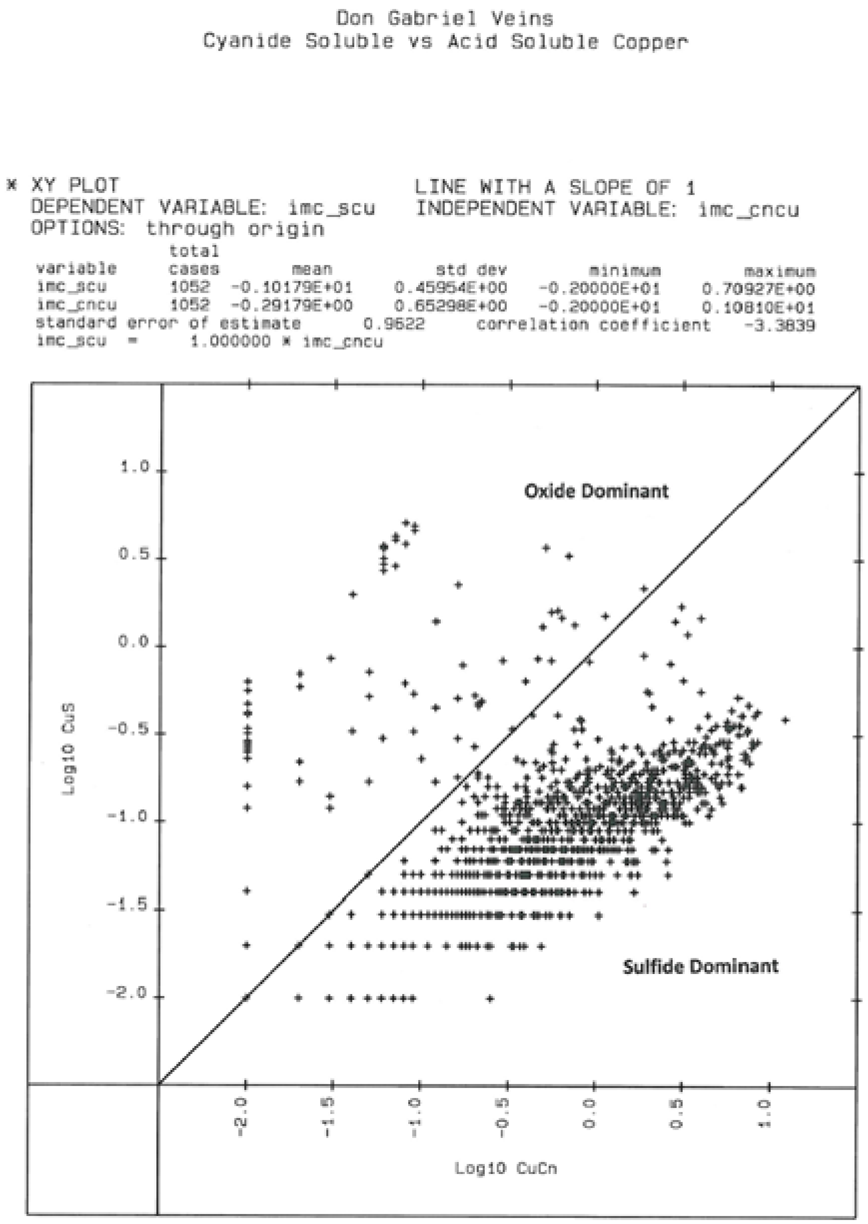
Note: Figure prepared by IMC, 2017.

Figure 14-10: Probability Plot of 5 m Composites in Don Gabriel Vetas – Total Copper



Note: Figure prepared by IMC, 2017.

Figure 14-11: Oxide Versus Sulphide Dominant Assays in Don Gabriel Vetas



Note: Figure prepared by IMC, 2017.

The assay database was then composited to nominal 5 m composites, respecting the vein contacts, i.e. only assays in the vein were composited. Single assays down to 1 m in length were allowed to form a composite if they were the only assay in the drill hole to intersect the vein.

Table 14-6 and Table 14-7 show summary statistics by vein for assays and 5 m composites respectively. Each table shows the number of drill holes that intersect each vein, the number of samples contained in each vein, and the mean, standard deviation, and maximum value for TCu for uncapped and capped data. Veins 5, 6, 10, 11, and 16 are intersected by two or fewer drill holes. Veins 12, 14, 15, and 17 are intersected by seven or more drill holes. Note that only 36 drill holes intersect the veins. Most of the drill holes intersect multiple veins, so the summation of the number of drill holes column for all veins is considerably greater than 36.

Based on the probability plots (Figure 14-9 and Figure 14-10) it can be seen that 80% of the assays in the veins exceed 0.2% TCu; 20% of the assays are <0.2% TCu. For composites, about 92% of the composites exceed 0.2% TCu.

Table 14-6: Summary Statistics for Assays in Don Gabriel Vetas

Vein	N° of Holes	N° of Samples	Not Capped			Assays Capped at 4.4% TCu		
			Mean % Cu	Std Dev % Cu	Max % Cu	Mean % Cu	Std Dev % Cu	Max % Cu
V1	3	31	0.722	1.002	4.27	0.722	1.002	4.27
V2	3	30	0.482	0.320	1.22	0.482	0.320	1.22
V3	4	84	1.848	1.703	5.55	1.791	1.598	4.40
V4	6	30	1.179	1.508	7.36	1.081	1.143	4.40
V5	2	11	2.015	1.191	4.18	2.015	1.191	4.18
V6	2	30	1.532	1.198	4.91	1.515	1.151	4.40
V7	4	80	1.492	1.494	8.00	1.424	1.279	4.40
V8	5	94	1.451	1.592	6.29	1.380	1.416	4.40
V9	4	33	0.558	0.521	2.10	0.558	0.521	2.10
V10	2	9	0.993	0.824	3.10	0.993	0.824	3.10
V11	1	7	0.451	0.413	1.37	0.451	0.413	1.37
V12	8	74	1.043	1.283	5.95	1.006	1.161	4.40
V13	5	71	1.312	1.427	7.34	1.245	1.204	4.40
V14	8	65	1.449	2.538	12.60	1.049	1.347	4.40
V15	10	209	2.329	2.286	9.15	1.987	1.645	4.40
V16	2	24	0.264	0.379	1.52	0.264	0.379	1.52
V17	7	100	0.696	0.760	3.43	0.696	0.760	3.43
V18	6	101	1.154	1.460	9.28	1.063	1.063	4.40
V19	3	36	1.031	1.320	5.25	0.988	1.189	4.40
V20	6	62	0.834	0.909	4.01	0.834	0.909	4.01
V21	4	40	0.523	0.471	1.71	0.523	0.471	1.71
V22	3	16	0.786	0.708	2.88	0.786	0.708	2.88
Total	**36**	**1237**	**1.332**	**1.662**	**12.60**	**1.222**	**1.314**	**4.40**

Note: Most drill holes intersect more than one vein.

Table 14-7: Summary Statistics for Composites in Don Gabriel Vetas

Vein	N° of Holes	N° of Samples	Not Capped			Assays Capped at 4.4% TCu		
			Mean % Cu	Std Dev % Cu	Max % Cu	Mean % Cu	Std Dev % Cu	Max % Cu
V1	3	6	0.699	0.563	1.78	0.699	0.563	1.78
V2	3	7	0.500	0.084	0.60	0.500	0.084	0.60
V3	4	17	1.750	1.535	4.42	1.696	1.443	4.06
V4	6	9	1.067	0.928	3.22	0.992	0.739	2.53
V5	2	3	1.827	0.654	2.56	1.827	0.654	2.56
V6	2	6	1.532	0.824	3.01	1.515	0.788	2.91
V7	4	16	1.475	0.977	3.99	1.407	0.839	3.18
V8	5	15	1.395	1.322	4.76	1.324	1.146	4.10
V9	4	7	0.586	0.147	0.73	0.586	0.147	0.73
V10	2	2	0.923	0.453	1.24	0.923	0.453	1.24
V11	1	2	0.451	0.232	0.62	0.451	0.232	0.62
V12	8	15	1.064	0.979	3.31	1.034	0.937	3.20
V13	5	15	1.222	0.906	3.41	1.163	0.780	2.61
V14	8	15	1.338	1.820	5.60	0.991	1.082	3.27
V15	10	39	2.290	1.867	1.17	1.959	1.329	4.40
V16	2	4	0.268	0.179	0.51	0.268	0.179	0.51
V17	7	21	0.681	0.519	2.01	0.681	0.519	2.01
V18	6	19	1.169	1.095	5.09	1.072	0.764	3.31
V19	3	8	0.944	0.787	2.57	0.908	0.706	2.30
V20	6	13	0.842	0.647	2.24	0.842	0.647	2.24
V21	4	7	0.509	0.233	0.88	0.509	0.233	0.88
V22	3	5	0.808	0.552	1.69	0.808	0.552	1.69
Total	**36**	**251**	**1.277**	**1.281**	**7.17**	**1.175**	**1.017**	**4.40**

Note: Most drill holes intersect more than one vein.

Block Grade Estimation

Don Gabriel Manto

IMC conducted a variogram analysis of the 5 m composites in the Don Gabriel Manto. The manto strikes N70ºW with an approximate dip of 30° to the southwest. Figure 14-12 shows the variogram in the strike direction, the primary direction. The nugget to sill ratio is relatively high. This is a pairwise relative variogram. This method has some data smoothing built into the calculations. For pairwise relative variograms the sill should theoretically tend to the variance divided by the mean squared of the data and is dimensionless. This would be about 0.67 for these data. The sill fit of 0.54 is lower than this value.

IMC estimated block grades for TCu, ASCu, and CNCu using inverse distance weighting to the second power (ID2). The search radii are 55 m along strike, 45 m down dip, and 20 m in the tertiary direction, and are consistent with the variogram ranges in the various directions. A maximum of eight composites, a minimum of two composites, and a maximum of two composites per drill hole were used in the estimation. The effect of inverse distance weighting along with a relatively low number of composites should produce relatively unsmoothed estimates of block grades based on the composites, i.e. the estimates should not be overly smeared.

The grade estimates were reviewed on cross sections and appear to acceptably follow the mineral trends evident in the composites. Figure 14-13 shows a cross section of TCu block grades.

Don Gabriel Vetas

The Don Gabriel Vetas strike N45°W with a near vertical dip. The search radius was 75 m along strike, 75 m down dip, and 30 m in the tertiary direction. A maximum of eight composites, a minimum of one composite, and a maximum of two composites per hole were used in the estimation. Total copper and the various ASCu grades were estimated with the same parameters. It is noted that these are longer search radii and a lower minimum number of composites than was used for the manto. This was to fill in most of the vein blocks with a grade estimate. Not all this material is classified as Mineral Resources.

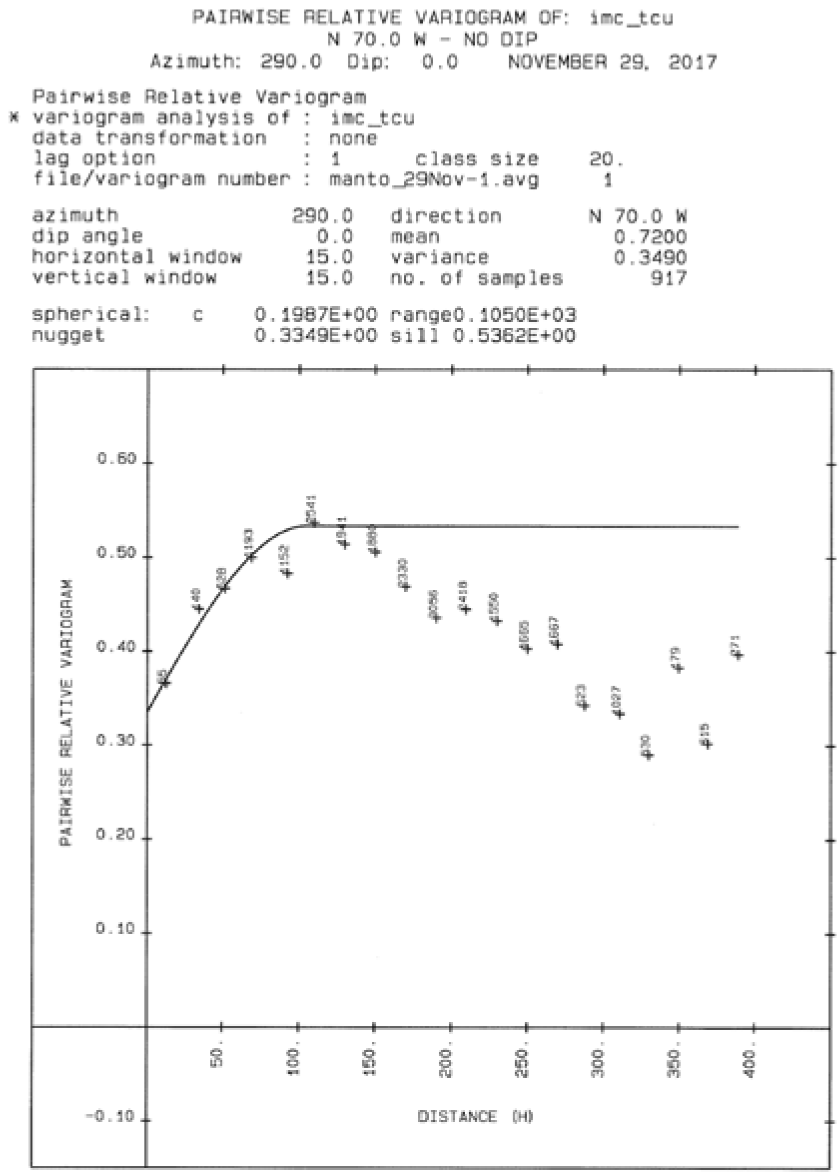
After the grade estimates were completed for the manto and veins, a check was made for blocks with ASCu + CNCu >TCu. These amounted to three blocks in the manto and 17 blocks in the veins. The ASCu grades were factored to equal TCu. Residual copper was then calculated as TCu – ASCu – CNCu for all blocks.

Oxide Versus Sulphide Dominant

Upon completion of the grade estimation, the blocks were segregated into oxide-dominant and sulphide-dominant domains based on the ASCu block grades. Blocks with ASCu<CNCu were deemed to be oxide-dominant and blocks with CNCu ≥ASCu were considered to be sulphide dominant.

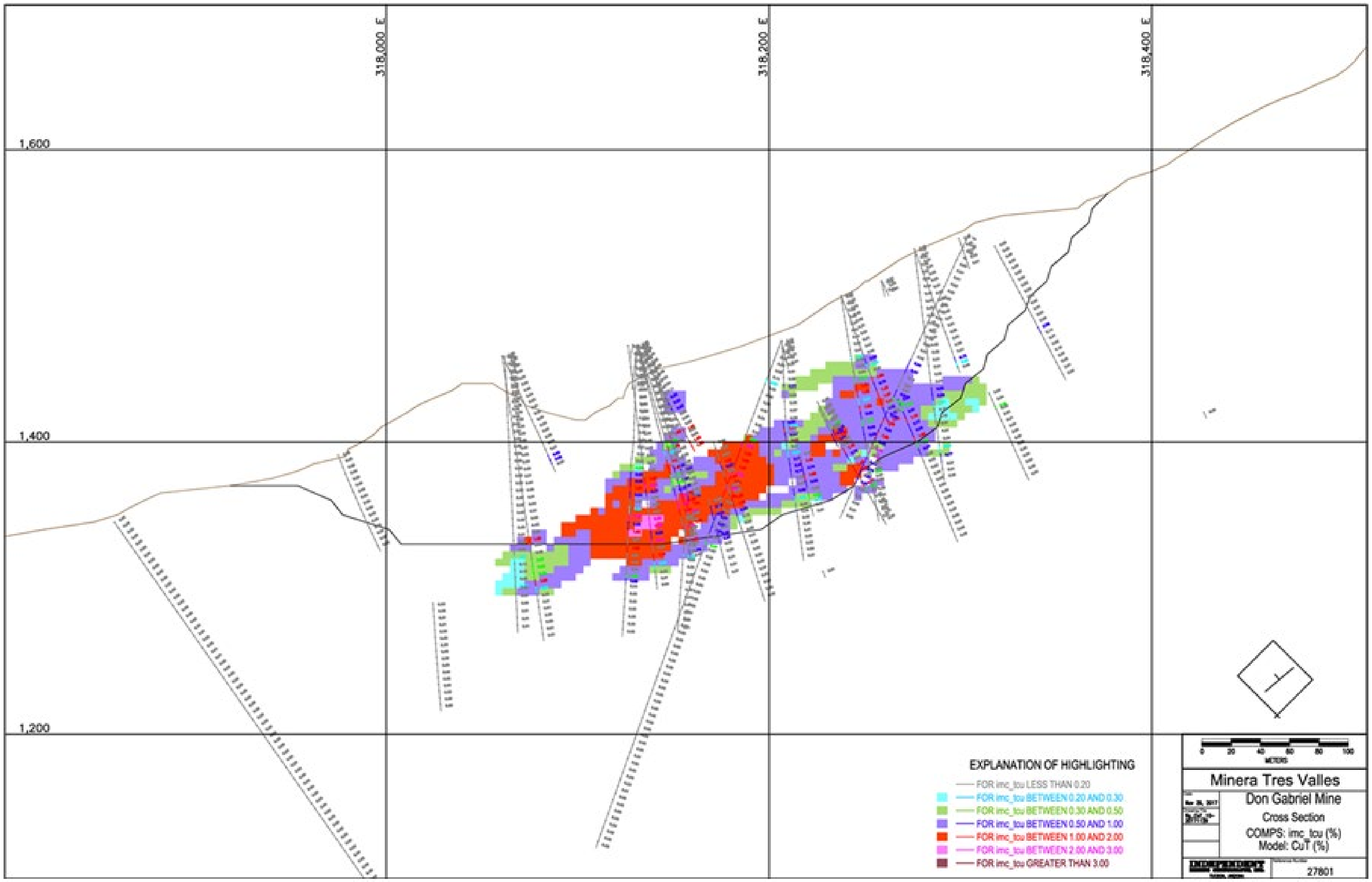
The variable “oxslf” in the block model is set to “1” for oxide-dominant and “2” for sulphide-dominant. About 20% of the blocks in the manto are oxide-dominant and 80% are sulphide-dominant. For the veins, about 4% of the blocks are oxide-dominant and 96% are sulphide-dominant.

Figure 14-12: Don Gabriel Manto Variogram – Along Strike



Note: Figure prepared by IMC, 2017.

Figure 14-13: Total Copper Grades for Don Gabriel Manto on Section 10



Note: Figure prepared by IMC, 2017.

Resource Classification

Don Gabriel Manto

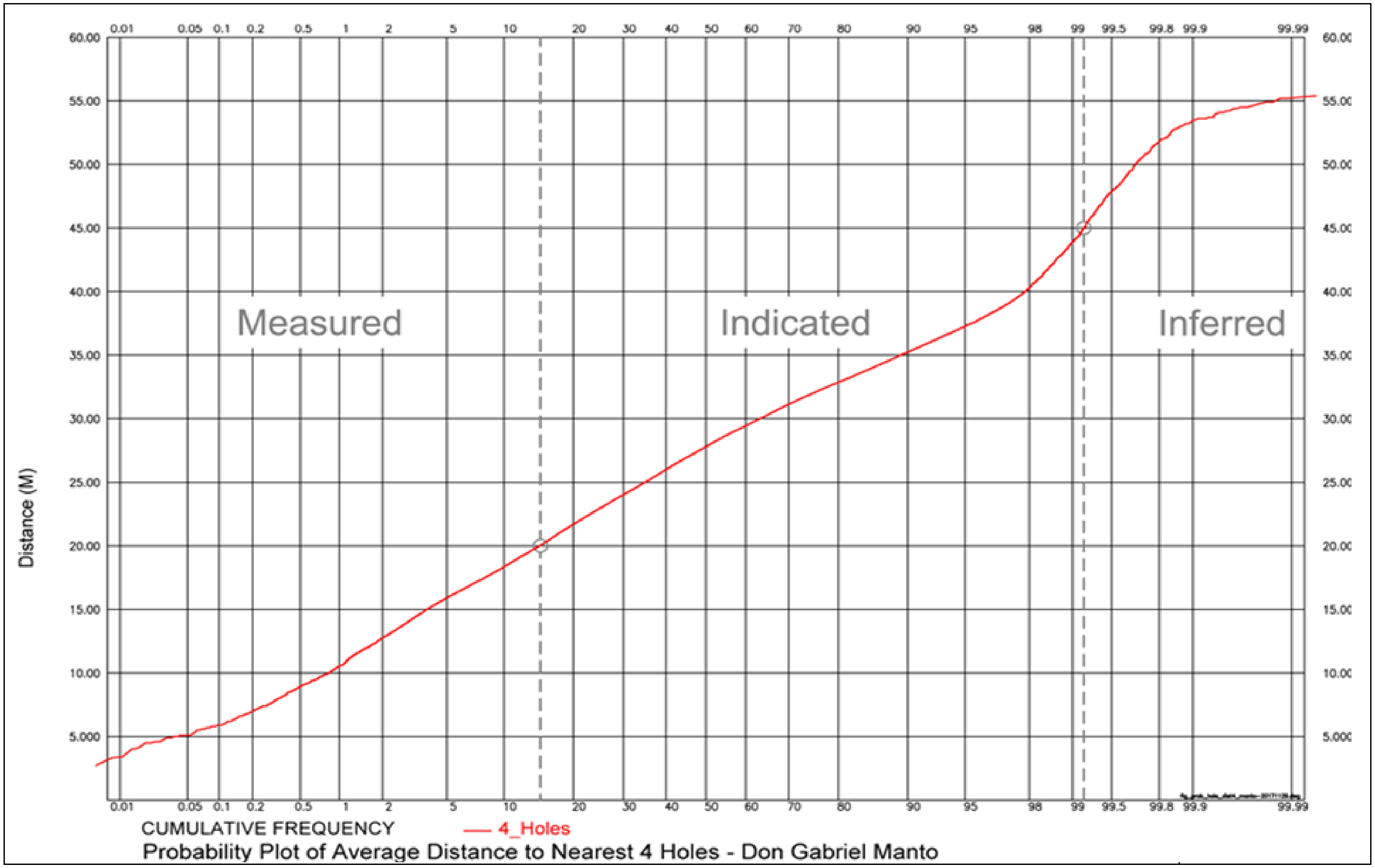
For classifying the Mineral Resources of the Don Gabriel Manto, an additional block estimate was done. It was based on search radii of 60 m along strike, 60 m down dip and 25 m in the tertiary direction. The estimate was also based on a maximum of four composites, a minimum of four composites, and a maximum of one composite per drill hole. This estimate provides the average distance to the nearest four drill holes to each block and was put into the block model. Figure 14-14 shows the probability plot of the average distances. Blocks with an average distance ≤20 m were classified as Measured. These blocks amount to about 14.3% of the blocks. Blocks with an average distance between 20 and 45 m were classified as Indicated. These blocks amount to about 81.0% of the blocks. Blocks with an average distance to four drill holes >45 m were classified as Inferred and amount to about 4.7% of the blocks. Figure 14-15 shows the resource classification in cross-section.

Don Gabriel Vetas

For the purpose of classifying the Mineral Resources of the Don Gabriel Vetas, an additional block estimate was undertaken. It was based on the search radii of 75 m along strike, 75 m down dip and 30 m in the tertiary direction, the same as the grade estimates. The estimate was also based on a maximum of two composites, a minimum of two composites, and a maximum of one composite per drill hole. This estimate provides the average distance to the nearest two drill holes to each block and was put into the block model. Blocks with an average distance of about ≤60 m were classified as Inferred. These blocks amount to about 62% of the blocks.

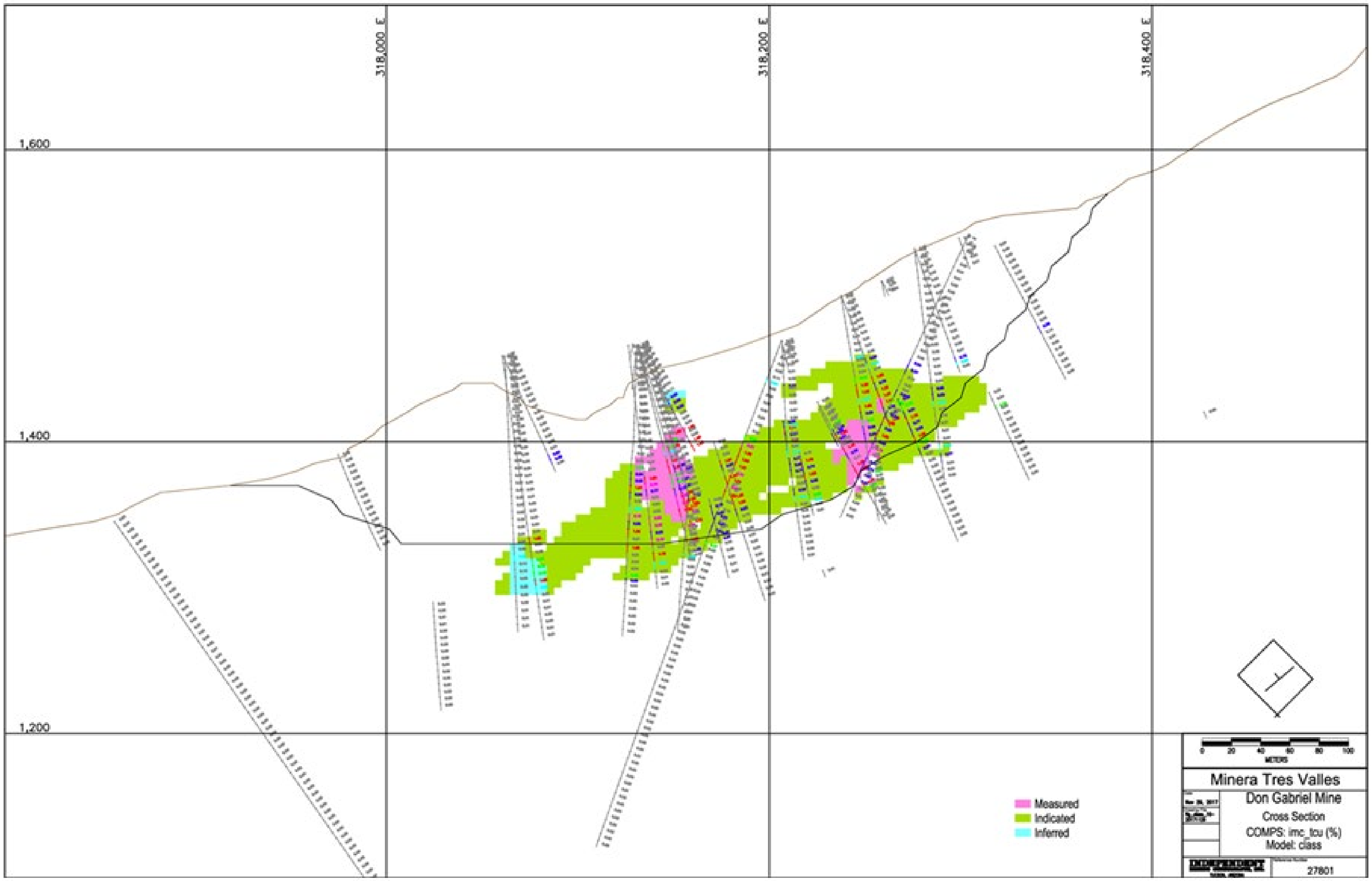
For this analysis, IMC is assuming an average distance of less than 60 m to the nearest two holes defines a reasonable maximum limit of extrapolation of the data. Additional drilling is required to support potential upgrade of the Inferred to higher confidence categories. This represents a significant Project opportunity.

Figure 14-14: Probability Plot of Average Distance to Nearest Four Drill Holes – Don Gabriel Manto



Note: Figure prepared by IMC, 2017.

Figure 14-15: Resource Classification for Don Gabriel Manto on Section 10



Note: Figure prepared by IMC, 2017.

Bulk Density

The Don Gabriel drill hole database includes 4,368 specific gravity (SG) determinations on short pieces of core. The estimates were done by sealing the core in paraffin, weighing the sample in air and submerged in water. The original SG measurements were received by IMC and included the weight as received at the laboratory, the dry weight, the weight with paraffin, and the submerged weight. IMC checked the calculations to verify that the result was a dry SG adjusted for the volume and weight of paraffin. IMC also verified the values were correctly loaded in the database. IMC back-loaded the model rock type onto this database to calculate the SG by model rock types. Values >5 and values <1.5 were excluded. Table 14-8 summarizes the density determinations.

Table 14-8: Specific Gravity and Bulk Density for Don Gabriel Units

IMC Code	Description	N° of Samples	Average SG	Bulk Factor	Bulk Density (t/m^3)
10	Upper Sill	62	2.819	98%	2.763
20	Sandstone	263	2.781	98%	2.725
30	Intrusion	176	2.801	98%	2.745
50	Don Gabriel Manto	1,488	2.711	97%	2.630
60	Don Gabriel Vetas	459	2.710	98%	2.656
70	Host Rock	1,878	2.733	98%	2.678
90	Fill	-	-	-	2.000

The average SG was reduced 2% for all rock types, except the Don Gabriel Manto, to obtain an estimate of bulk density. This is to allow for voids in the rock mass at a larger scale than what could be captured in the small core samples. A 3% reduction was used for the Don Gabriel Manto; by nature, the manto includes numerous-small scale vugs.

Topography

The topographic surface used in the Don Gabriel model was as of January 1, 2018. There is current mining activity at Don Gabriel. The topography was assembled from several source maps. IMC used the various sources to construct as accurate a topographic surface as possible. Fill blocks, where current topography is higher than pre-mine topography (or other available mine topographies), were added to the model as rock code 90.

Vein Resources by Individual Vein

Table 14-9 presents the Mineral Resource estimate for the Don Gabriel Vetas by individual vein at a total copper cut-off of 0.64%. The entire resource estimate is classified as Inferred. The table also shows the number of drill holes that intersect each vein. The Inferred Mineral Resource amounts to 2,020 Mt at 1.331% TCu for 59.3 Mlbs contained copper. This is the largest Inferred Mineral Resource for any of the Don Gabriel or Papomono zones.

Table 14-9: Inferred Mineral Resource for Don Gabriel Vetas

Vein	N° of Holes	Tonnage (kt)	TCu (%)	ASCu (%)	CNCu (%)	RCu (%)	Contained Copper (Mlbs)
V1	3	56	0.87	0.37	0.45	0.05	1.10
V2	3	0	0.00	0.00	0.00	0.00	0.00
V3	4	187	1.63	0.49	0.97	0.18	6.70
V4	6	54	0.95	0.08	0.74	0.14	1.10
V5	2	13	1.88	0.12	1.66	0.10	0.50
V6	2	39	1.55	0.10	1.38	0.07	1.30
V7	4	177	1.41	0.09	1.20	0.11	5.50
V8	5	164	1.16	0.08	1.02	0.06	4.20
V9	4	8	0.66	0.06	0.24	0.37	0.10
V10	2	0	0.00	0.00	0.00	0.00	0.00
V11	1	0	0.00	0.00	0.00	0.00	0.00
V12	8	94	1.24	0.08	1.12	0.04	2.60
V13	5	138	1.20	0.08	0.92	0.20	3.60
V14	8	116	1.30	0.08	1.15	0.08	3.30
V15	10	380	1.84	0.11	1.53	0.20	15.40
V16	2	0	0.00	0.00	0.00	0.00	0.00
V17	7	27	0.74	0.09	0.46	0.18	0.40
V18	6	307	0.99	0.08	0.73	0.18	6.70
V19	3	73	1.34	0.13	0.97	0.24	2.20
V20	6	160	1.13	0.09	0.85	0.19	4.00
V21	4	23	0.77	0.16	0.53	0.09	0.40
V22	3	3	0.88	0.15	0.68	0.05	0.10
Total	**36**	**2,020**	**1.33**	**0.14**	**1.04**	**0.15**	**59.30**

14.2.2 Papomono

General

The resource block model was developed by IMC during December 2017 through February 2018, with completion of the final deposit on February 9, 2018. The model is based on 5 m x 5 m x 5 m blocks and includes all the Papomono zones in the same model. The model is rotated 40.4º counter clockwise to align with the strike of several of the deposits.

Geological Controls

Figure 10-4 showed the various Papomono area mineral deposits and the location of the drill holes.

The rock types included in the Papomono block model are summarized in Table 14-10:

Table 14-10: Papomono Rock Types

Rock Code	Unit	Description
100	Dio	Diorite
110	GRrn	Granodiorite
210	C	Unit C
220	B	Unit B
230	A	Unit A

Units A, B, and C are various volcanic flows. MTV personnel provided solids for the geological units and they were incorporated into the model in the variable "rock".

The main control for grade estimation in each zone is a grade shell designed at a 0.2% TCu cut-off grade. Below this threshold no AA TCu or ASCu assays were undertaken. An initial design for each of the shells was provided by MTV personnel. IMC developed an updated interpretation for most of the deposits using Leap Frog. IMC's interpretation was also based on a 0.2% TCu grade cut-off and used the MTV interpretation to guide the updated designs. Papomono Masivo was interpreted as two solids, one relatively steep, paralleling the Papomono fault zone, and a flatter-dipping solid to model the manto-style mineralization. Papomono Sur was also interpreted as two solids, one east of the Papomono Fault Zone and one west of the fault. For Papomono Cumbre, Papomono Norte, and Manto Norte IMC reviewed and accepted the MTV interpretation of the grade shells.

The grade shell interpretations for are based on individual assays and should be considered an in-situ representation of mineralization; minimal mining dilution is incorporated into the grade solids for the model.

The grade shells for the various Papomono deposits are defined in Table 14-11:

Table 14-11: IMC Grade Shells

IMC Code	Description
10	Papomono Masivo Step Zone
15	Papomono Masivo Flat Zone
20	Papomono Cumbre
30	Papomono Mantos Conexión
40	Papomono Sur – East
45	Papomono Sur – West
50	Epitermal
60	Papomono Norte
70	Manto Norte

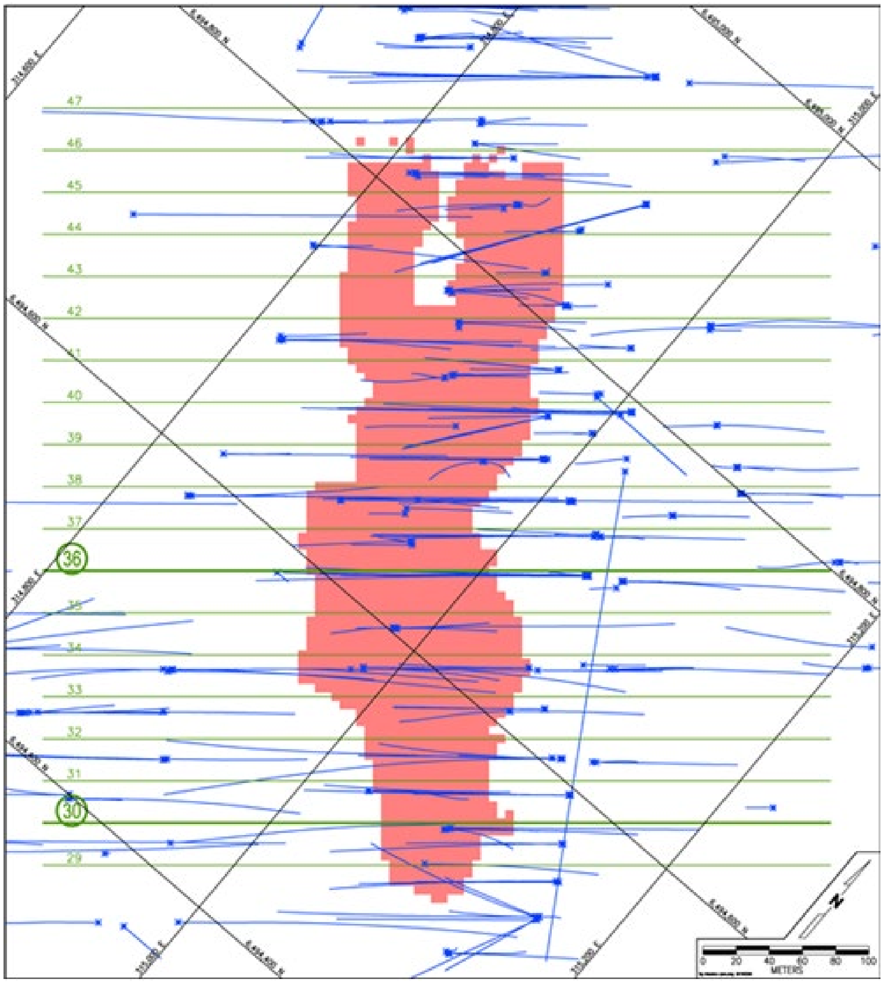
The codes for the grade shells are coded on a partial block basis, i.e. these blocks were coded if any portion of the solid was included in them.

Figure 14-16 shows a more detailed view of the Papomono Masivo deposit drilling and the section line locations for the cross sections used when discussing aspects of the Papomono estimation. Figure 14-17 shows the rock types, Papomono fault zone, and grade shell for Papomono Masivo. It can be observed that the grade shell is mostly in Unit A of the volcanic units.

Figure 14-18 and Figure 14-19 show a detailed view of Papomono Sur drilling and the rock types and grade shell. This is also hosted mostly in Unit A. Though not shown on the section, the Papomono fault divides the grade shell into east and west components; this is evident in the offset visible in Unit B on the figure. These figures are also considered representative of the Papomono Mantos Conexión and Manto Norte deposits.

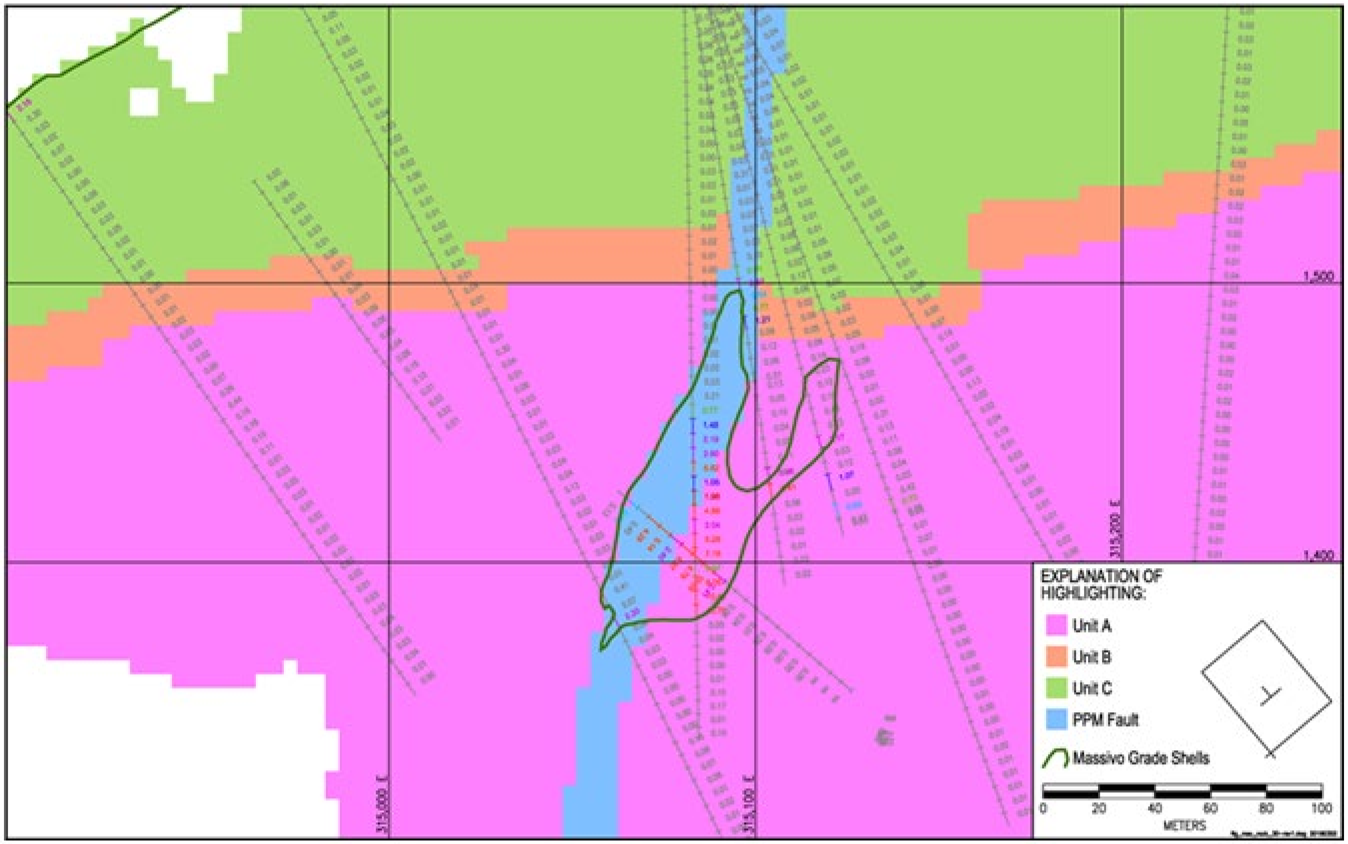
Figure 14-20 and Figure 14-21 show detailed views of the Papomono Cumbre drilling and the rock types and grade shell. The deposit is hosted in a diorite intrusion and Unit C of the volcanic flow sequences. The higher copper grades tend to be in Unit C, and it appears that much of this higher-grade material was extracted in the existing Papomono Cumbre pit.

Figure 14-16: Papomono Masivo Deposit Showing Drilling



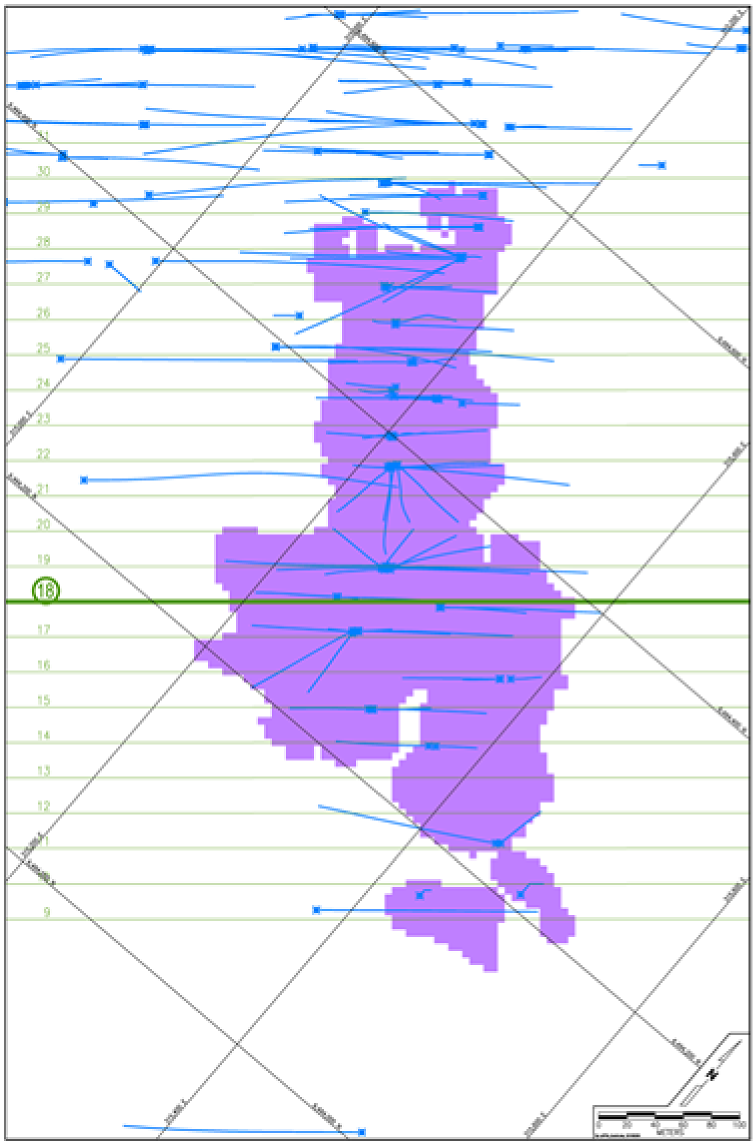
Note: Figure prepared by IMC, 2018

Figure 14-17: Papomono Masivo Deposit, Rock Types and Grade Shell on Section 30



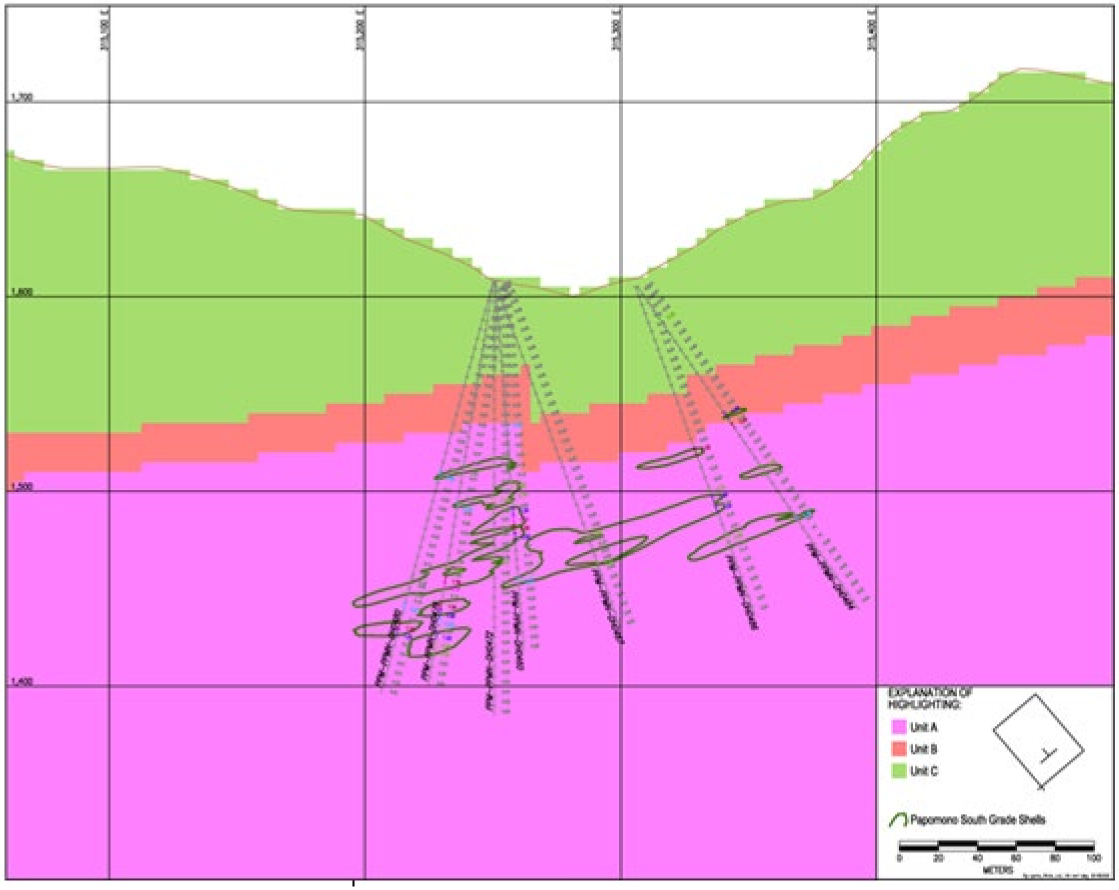
Note: Figure prepared by IMC, 2018

Figure 14-18: Papomono Sur Deposit Showing Drilling



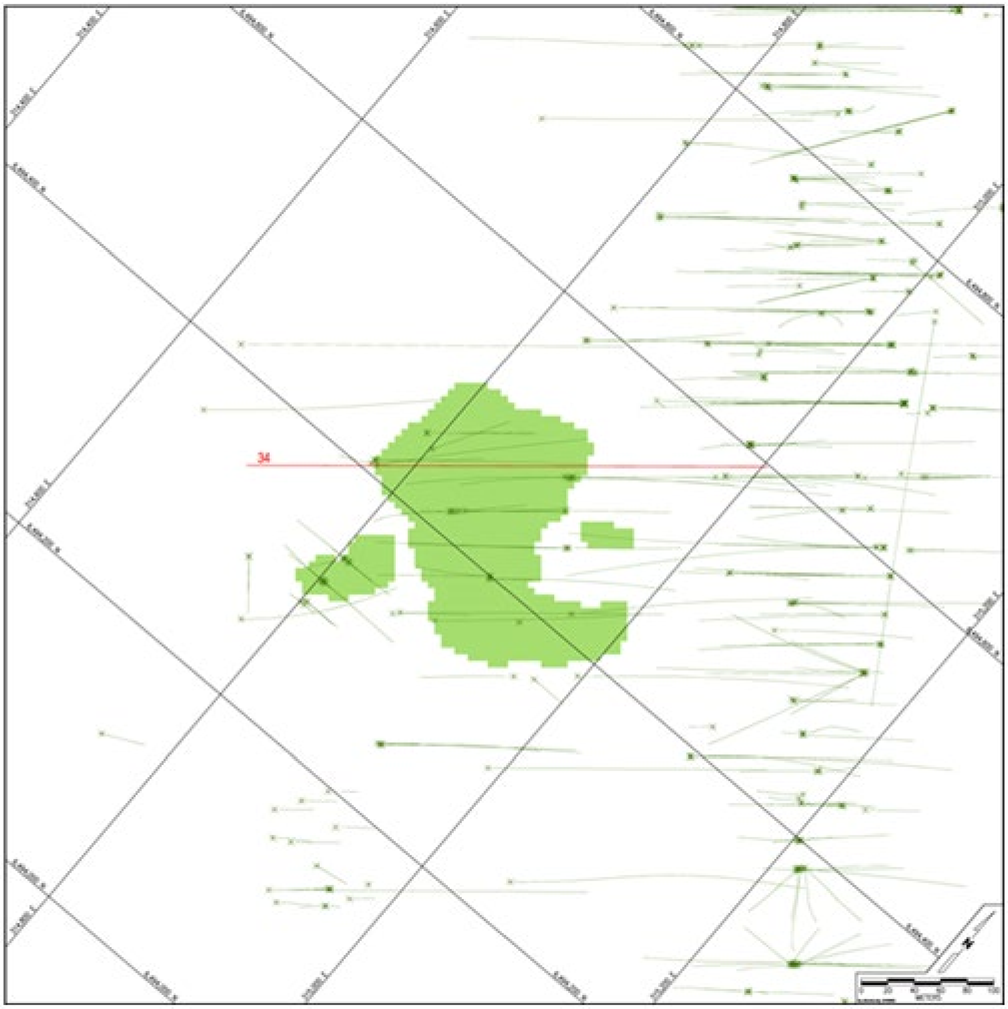
Note: Figure prepared by IMC, 2018

Figure 14-19: Papomono Sur Deposit, Rock Types and Grade Shell on Section 18



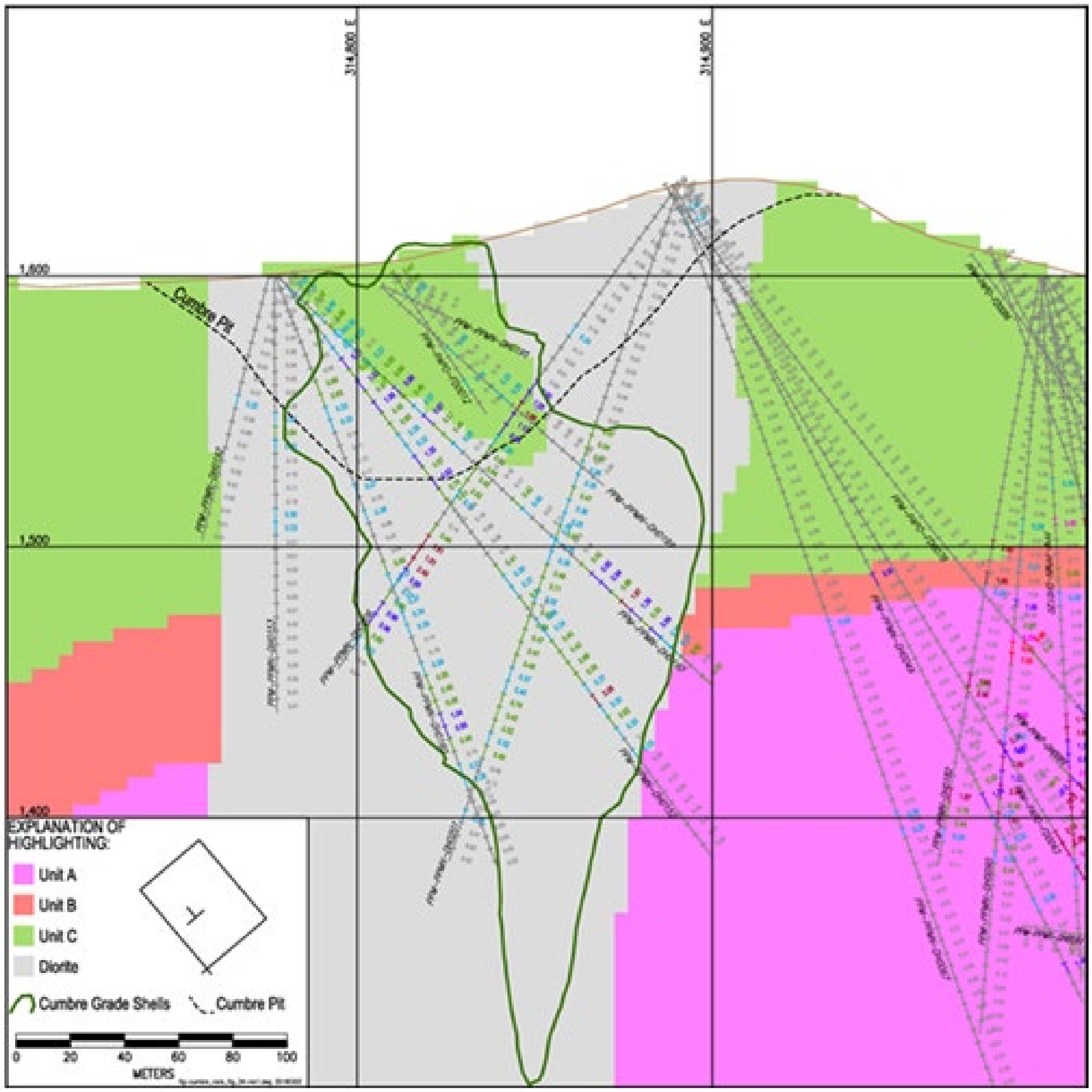
Note: Figure prepared by IMC, 2018

Figure 14-20: Papomono Cumbre Deposit Showing Drilling



Note: Figure prepared by IMC, 2018

Figure 14-21: Papomono Cumbre Deposit, Rock Types and Grade Shell on Section 32



Note: Figure prepared by IMC, 2018

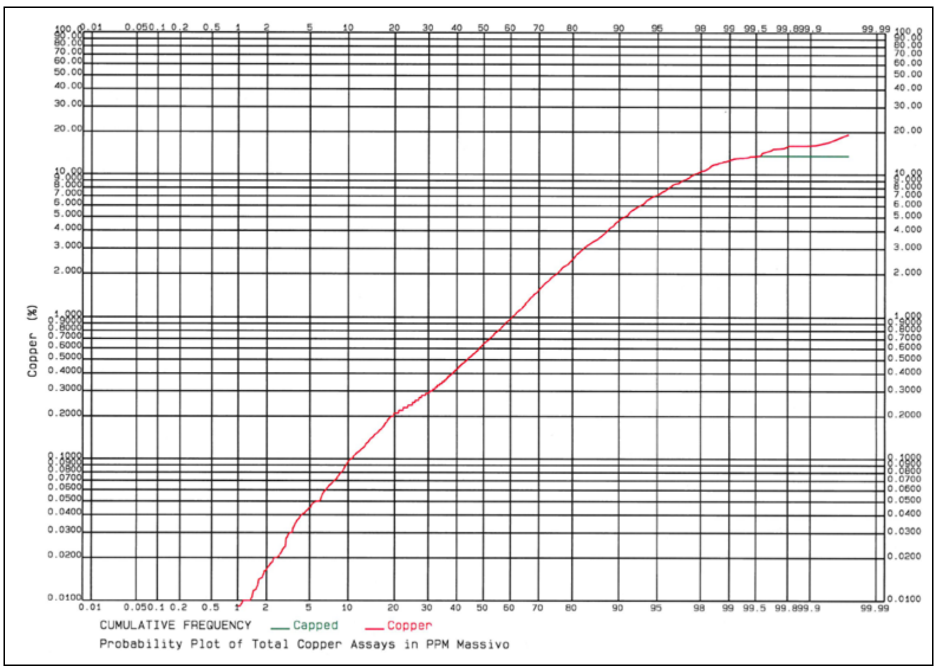
Grade Capping and Compositing

IMC reviewed the distribution of assays in the grade shells by deposit and applied caps as shown in Table 14-12. These generally corresponded to breaks in the grade distribution as evident in probability plots. Figure 14-22 and Figure 14-23 show examples for Papomono Masivo and Papomono Sur respectively.

Table 14-12: Cap Grades for Papomono Deposits - Assays

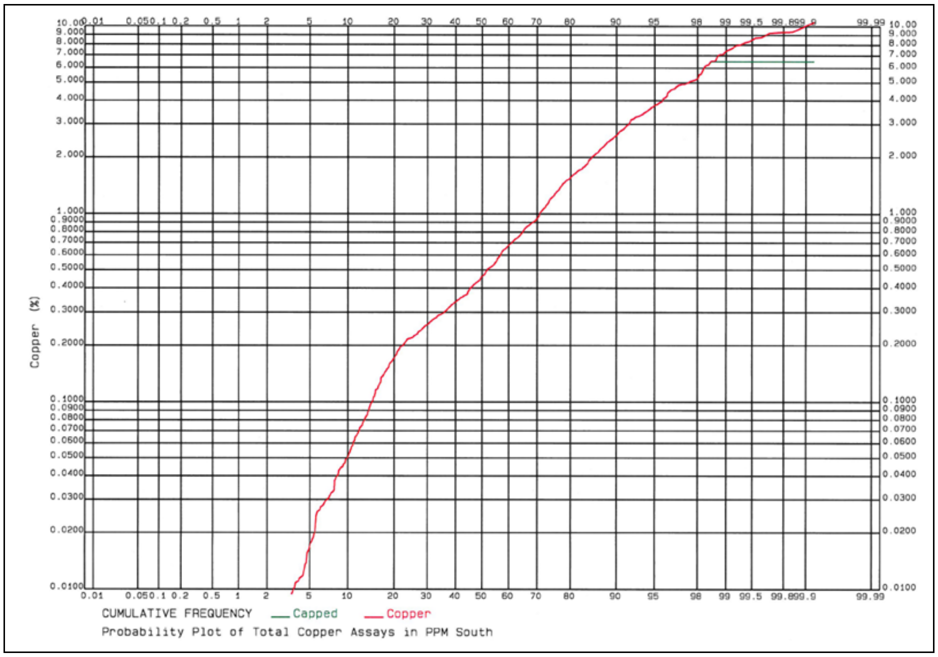
Deposit	Cap Grade (% TCu)	Approximate Percentile	Number Capped	Average Grade (% TCu)
Papomono Masivo	13.5%	99.5%	16	15.90%
Papomono Cumbre	5.9%	99.5%	11	7.94%
Papomono Mantos Conexión	6.5%	98.5%	16	10.70%
Papomono Sur	6.5%	98.5%	20	8.19%
Epitermal	3.5%	98.7%	6	5.19%
Papomono Norte	6.5%	98.5%	9	8.90%
Manto Norte	10.0%	99.0	44	14.30%

Figure 14-22: Probability Plot of Assays in Papomono Masivo Grade Shell – Total Copper



Note: Figure prepared by IMC, 2018.

Figure 14-23: Probability Plot of Assays in Papomono Sur Grade Shell – Total Copper



Note: Figure prepared by IMC, 2018.

For sample intervals with capped TCu assays, IMC reduced the ASCu assays by the same proportion that the total copper assays were reduced. For example, for a 15% copper assay in Papomono Masivo capped at 13.5% TCu, all the ASCu assays were also factored by 13.5/15 or 0.90.

The assay database was then composited to 5 m composites, respecting the grade shell contacts, i.e. only assays in the grade shells were composited. Single assays down to 1 m in length were allowed to form a composite in narrow zones. Epitermal was composited to 2.5 m intervals due to the narrow nature of the veins.

Table 14-13 and Table 14-14 show the summary statistics for assays and composites respectively. They show:

- All assays/composites in the grade shell
- Uncapped values >0.2% TCu
- Capped values
- Capped values >0.2% copper.

The rightmost column of Table 14-13 and Table 14-14 show the percentage of the assays or composites in the grade shells that exceed the 0.2% TCu design cut-off. This is a measure that indicates the efficiency of the shells. The percentage of composites above 0.2% TCu in the grade shells exceeds 80% for all deposits, except Manto Norte. This is a good result for the designs. The Manto Norte solid could be improved some with additional interpretation, though much of Manto Norte was previously exploited during the Vale ownership. The percentage of assays in the grade shells above 0.2% TCu range from 57.1% in Manto Norte to 87.2% in Papomono Norte. These are relatively good results.

Table 14-13: Summary Statistics of Assay in Grade Shells

	All Samples					Samples > 0.2% TCu					
	N° of Samples	**Mean (% TCu)**	**Std. Dev. (% TCu)**	**Min (% TCu)**	**Max (% TCu)**	**N° of Samples**	**Mean (% TCu)**	**Std. Dev. (% TCu)**	**Min (% TCu)**	**Max (% TCu)**	**Percent > 0.2 % TCu**
Assays/Not Capped											
Papomono Masivo	3,573	1.691	2.547	0.000	19.600	2,894	2.066	2.695	0.200	19.600	81.00%
Papomono Cumbre	2,140	0.551	0.843	0.001	9.860	1,409	0.783	0.958	0.200	9.860	65.80%
Papomono Mantos Conexión	1,108	0.852	1.589	0.000	19.770	810	1.136	1.776	0.200	19.770	73.10%
Papomono Sur	1,303	1.013	1.422	0.000	11.980	1,010	1.284	1.510	0.201	11.980	77.50%
Epitermal	485	0.726	0.856	0.006	8.100	385	0.888	0.891	0.200	8.100	79.40%
Papomono Norte	508	1.140	1.602	0.000	13.300	443	1.291	1.663	0.200	13.300	87.20%
Manto Norte	4,334	0.829	1.894	0.000	25.100	2,475	1.384	2.359	0.200	25.100	57.10%
All	**13,451**	**1.041**	**1.921**	**0.000**	**25.100**	**9,426**	**1.447**	**2.171**	**0.200**	**25.100**	**70.10%**
Assays/Capped	**N° of Samples**	**Mean (% TCu)**	**Std. Dev. (% TCu)**	**Min (% TCu)**	**Max (% TCu)**	**N° of Samples**	**Mean (% TCu)**	**Std. Dev. (% TCu)**	**Min (% TCu)**	**Max (% TCu)**	**Percent > 0.2 % TCu**
Papomono Masivo	3,573	1.680	2.488	0.000	13.500	2,894	2.053	2.629	0.200	13.500	81.00%
Papomono Cumbre	2,140	0.540	0.756	0.001	5.900	1,409	0.767	0.846	0.200	5.900	65.80%
Papomono Mantos Conexión	1,108	0.792	1.180	0.000	6.500	810	1.054	1.283	0.200	6.500	73.10%
Papomono Sur	1,303	0.987	1.290	0.000	6.500	1,010	1.250	1.355	0.201	6.500	77.50%
Epitermal	485	0.705	0.741	0.006	3.500	385	0.862	0.755	0.200	3.500	79.40%
Papomono Norte	508	1.098	1.395	0.000	6.500	443	1.243	1.438	0.200	6.500	87.20%
Manto Norte	4,334	0.785	1.570	0.000	10.000	2,475	1.307	1.917	0.200	10.000	57.10%
All	**13,451**	**1.013**	**1.754**	**0.000**	**13.500**	**9,426**	**1.406**	**1.967**	**0.200**	**13.000**	**70.10%**

Table 14-14: Summary Statistics of Composites in Grade Shells

	All Samples					Samples >= 0.2% TCu					
	N° of Samples	Mean (% TCu)	Std. Dev. (% TCu)	Min (% TCu)	Max (% TCu)	N° of Samples	Mean (% TCu)	Std. Dev. (% TCu)	Min (% TCu)	Max (% TCu)	Percent > 0.2 % TCu
Composites/Not Capped											
Papomono Masivo	764	1.655	1.909	0.011	12.830	731	1.723	1.924	0.201	12.830	95.70%
Papomono Cumbre	404	0.544	0.599	0.011	6.710	323	0.647	0.629	0.203	6.710	80.00%
Papomono Mantos Conexión	293	0.789	1.051	0.001	8.710	236	0.953	1.110	0.200	8.710	80.50%
Papomono Sur	326	0.944	0.891	0.000	5.610	291	1.047	0.889	0.204	5.610	89.30%
Epitermal	193	0.703	0.700	0.024	4.970	168	0.789	0.710	0.202	4.970	87.00%
Papomono Norte	107	1.084	1.042	0.010	5.280	101	1.143	1.043	0.209	5.280	94.40%
Manto Norte	853	0.763	1.307	0.000	15.200	633	0.987	1.452	0.200	15.200	74.20%
All	2,940	0.995	1.399	0.000	15.200	2,483	1.156	1.465	0.200	15.200	84.50%
Composites/Capped	**N° of Samples**	**Mean (% TCu)**	**Std. Dev. (% TCu)**	**Min (% TCu)**	**Max (% TCu)**	**N° of Samples**	**Mean (% TCu)**	**Std. Dev. (% TCu)**	**Min (% TCu)**	**Max (% TCu)**	**Percent > 0.2 % TCu**
Papomono Masivo	764	1.645	1.871	0.011	11.400	731	1.712	1.886	0.201	11.400	95.70%
Papomono Cumbre	404	0.533	0.523	0.011	4.860	323	0.634	0.540	0.203	4.860	80.00%
Papomono Mantos Conexión	293	0.741	0.852	0.001	4.840	236	0.893	0.883	0.200	4.840	80.50%
Papomono Sur	326	0.921	0.822	0.000	4.950	291	1.021	0.833	0.204	4.950	89.30%
Epitermal	193	0.683	0.619	0.024	3.050	168	0.767	0.621	0.202	3.050	87.00%
Papomono Norte	107	1.050	0.985	0.010	5.280	101	1.106	0.984	0.209	5.280	94.40%
Manto Norte	853	0.726	1.078	0.000	8.760	633	0.936	1.180	0.200	8.760	74.20%
All	2,940	0.970	1.301	0.000	11.400	2,483	1.127	1.357	0.200	11.400	84.50%

Adjustments for Soluble Copper

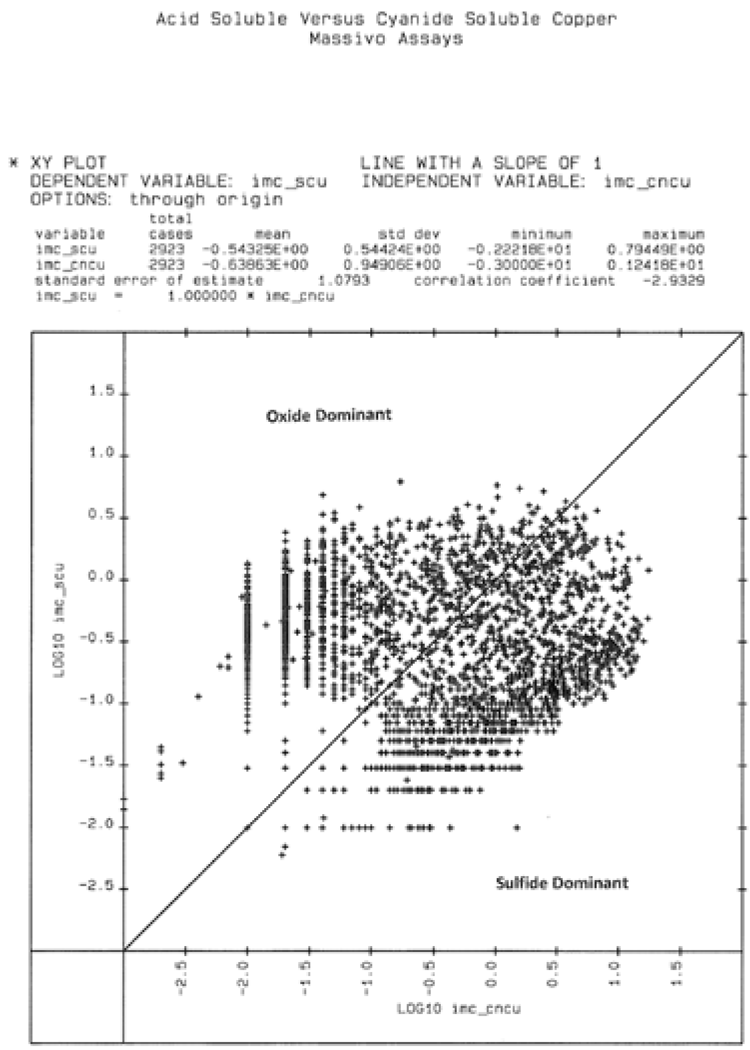
As previously discussed, soluble copper assays were generally not done when total copper was <0.2% and a considerable number of assays in the grade shells are lower than this threshold. This truncation of the lower end of the distribution could result in a distortion in the ASCu block grade estimates, unless corrected.

As was done for Don Gabriel, assays were classified as oxide-dominant mineralization (ASCu >CNCu), or sulphide-dominant mineralization (ASCu CNCu). Note that the CNCu assay follows the ASCu assay, so it only measures minerals that are not acid soluble in character; chalcocite or bornite would be the most common copper minerals species. Figure 14-24 and Figure 14-25 show oxide- and sulphide-dominant assays for Papomono Masivo and Papomono Sur respectively as examples.

IMC filled in the missing ASCu assays as follows. First, the ASCu:CNCu ratio and the CNCu:TCu ratio were calculated for oxide dominant assays and sulphide-dominant assays for each zone. These values are shown in Table 14-15. These were calculated as the ratio of the means, i.e. average of the ASCu assays divided by the average of the TCu assays (as opposed to calculating a ratio for each assay and calculating the mean of the ratios). Second, samples without ASCu assays were classified as either oxide-dominant or sulphide-dominant based on nearby samples that had been assayed. Third the missing intervals were assigned ASCu grades based on the TCu grade and the calculated ratios. For Papomono Masivo oxide-dominant material, the ASCu was set to 0.752 x TCu and the CNCu was set to 0.163 x TCu. For sulphide-dominant material ASCu was set to 0.117 x TCu and the CNCu was set to 0.821 x TCu. The ratios shown in the table are reasonable for what they are used for, which is assigning approximate grades for missing ASCu assays for the low-grade data.

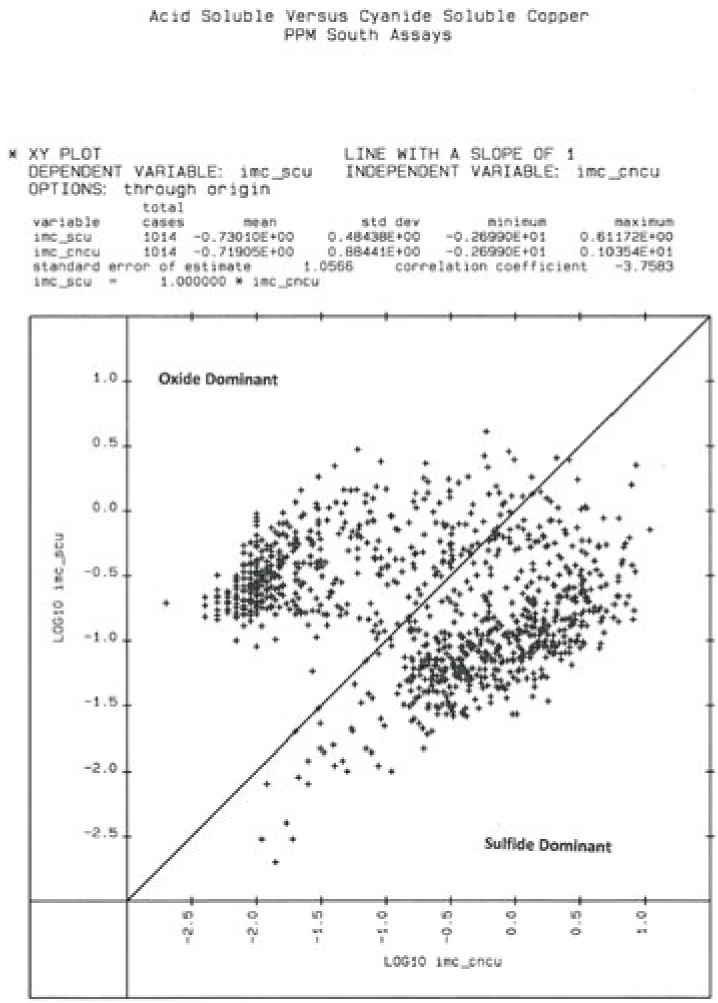
These adjustments were applied to the assays prior to compositing.

Figure 14-24: Oxide-Dominant Versus Sulphide-Dominant Assays in Papomono Masivo



Note: Figure prepared by IMC, 2018.

Figure 14-25: Oxide-Dominant Versus Sulphide-Dominant Assays in Papomono Sur



Note: Figure prepared by IMC, 2018.

Table 14-15: Ratio of Soluble Copper to Total Copper by Oxide- Versus Sulphide-Dominant

Deposit	Oxide-Dominant		Sulphide-Dominant	
	ASCu/TCu	CNCu/TCu	ASCu/TCu	CNCu/TCu
Papomono Masivo	0.752	0.163	0.117	0.821
Papomono Cumbre	0.715	0.142	0.109	0.817
Papomono Mantos Conexión	0.763	0.114	0.105	0.649
Papomono Sur	0.752	0.143	0.109	0.810
Epitermal	0.792	0.055	0.078	0.448
Papomono Norte	0.740	0.103	0.244	0.704
Manto Norte	0.759	0.171	0.210	0.732

Variogram Analysis

Papomono Masivo

IMC conducted a variogram analysis of the 5 m composites within the Papomono Masivo zone. The deposit strikes N40ºW. What IMC has termed the "steep" mineralization dips at about 67º to the southwest. The flatter mineralization dips at about 22º to the southwest. Figure 14-26 and Figure 14-27 present variograms in the strike and dip direction for the steep mineralization. The range is slightly longer along strike than down dip. These are pairwise relative variograms. This method has some data smoothing built into the calculations. For pairwise relative variograms the sill should theoretically tend to the variance divided by the mean squared of the data and is dimensionless. This would be about 1.22 for these data. The sill fit of 0.71 is lower than this value.

Composites in the flatter portion of the deposit only amounted to about 247; variograms in the flat domains were of relatively poor clarity due to the limited data.

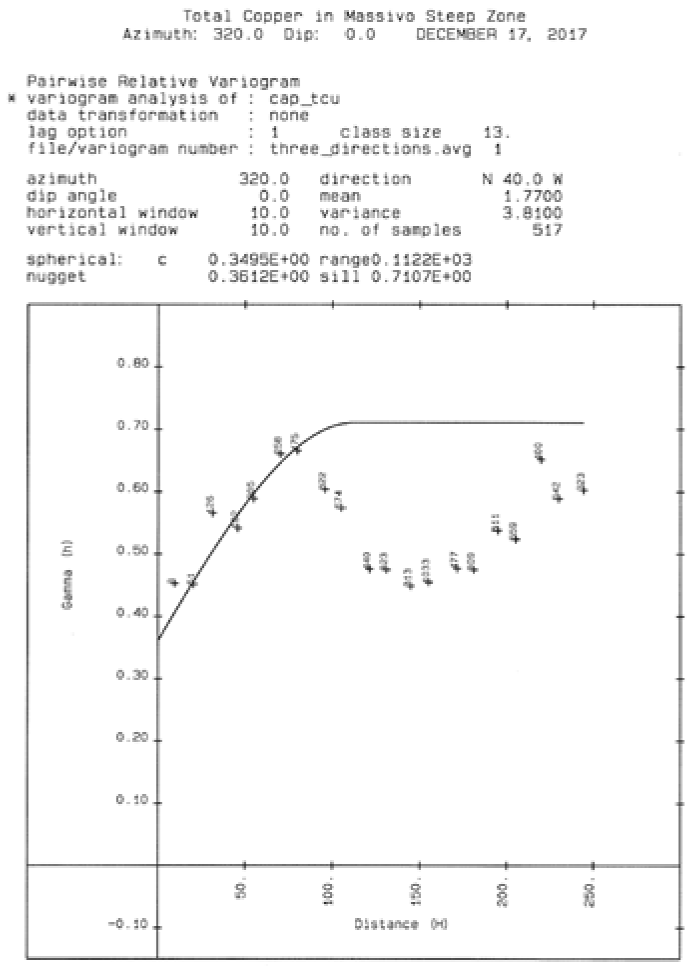
Papomono Mantos Conexión and Papomono Sur

Composites for both Mantos Conexión and Papomono Sur were used in the variogram analysis because they have similar geology and orientation of mineralization. They are also like the Manto Norte deposit. This provides significantly more data for the analysis. The deposit strikes approximately N40ºW and dips about 14° to the southwest. Figure 14-28 and Figure 14-29 present variograms in the strike and dip direction respectively. The down dip variograms have better clarity than the variograms along strike. These are pairwise relative variograms.

Other Zones

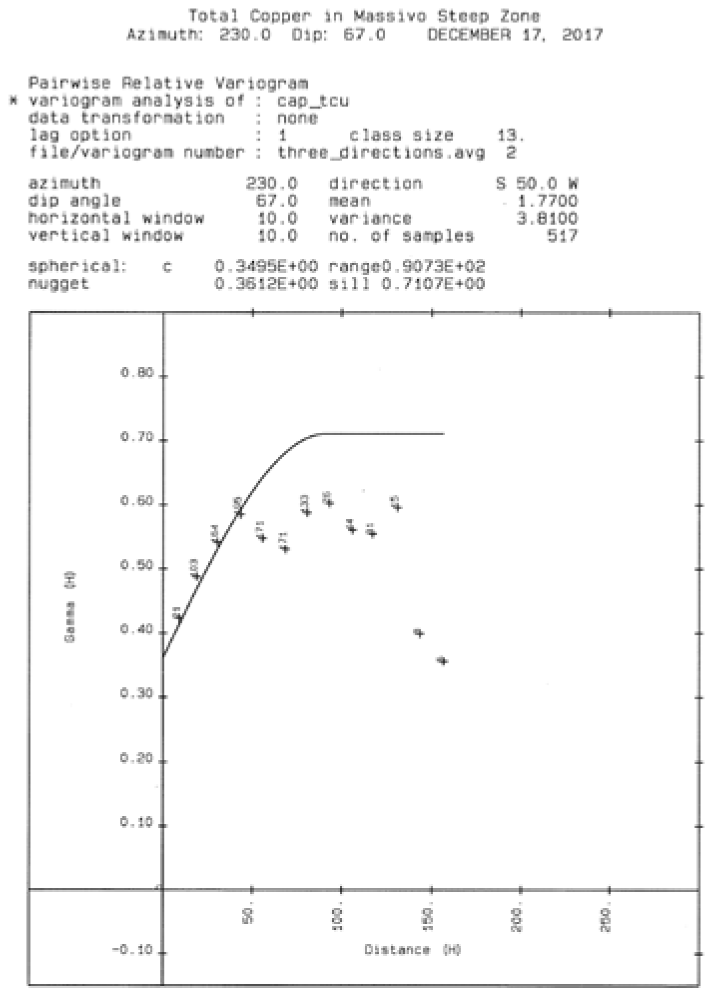
The data available for Epitermal and Papomono Norte were insufficient for the calculation of reliable variograms. IMC relied on the fact that the mineralization orientation for grade estimation is evident. Reasonable variograms were obtained for Papomono Cumbre, but they were not consistent with geological understanding of the deposit and were not used.

Figure 14-26: Papomono Masivo Copper Variogram – Steep Zone – Along Strike



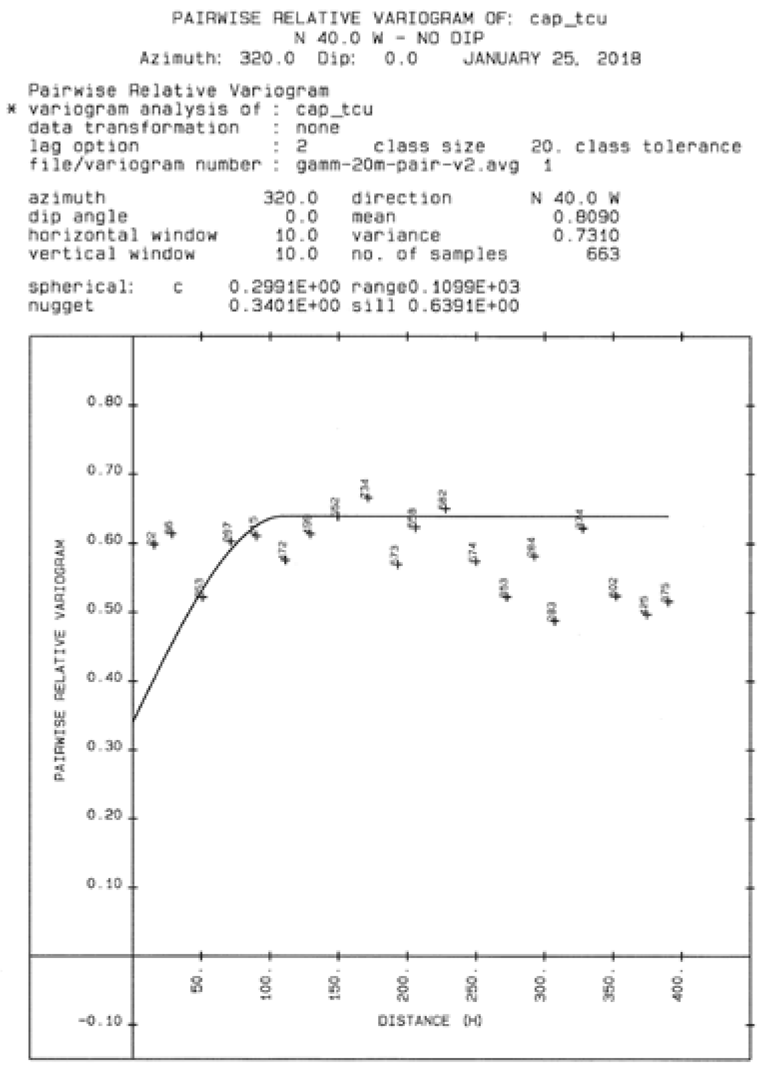
Note: Figure prepared by IMC, 2018.

Figure 14-27: Papomono Masivo Copper Variogram – Steep Zone – Down Dip



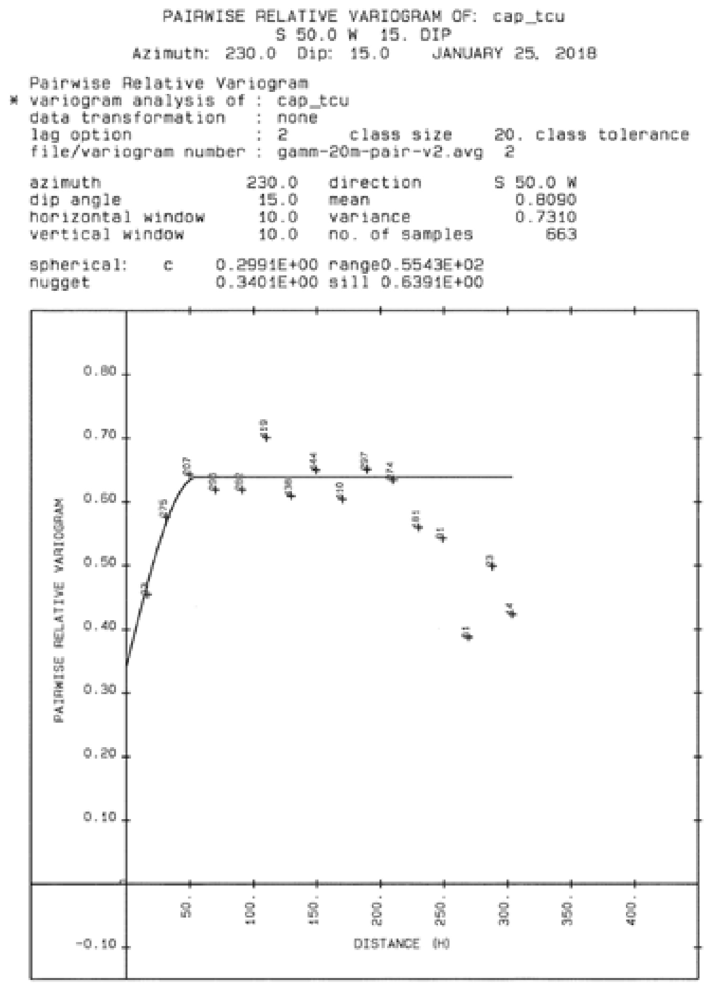
Note: Figure prepared by IMC, 2018.

Figure 14-28: Papomono Sur/ Papomono Mantos Conexión Copper Variogram – Along Strike



Note: Figure prepared by IMC, 2018.

Figure 14-29: Papomono Sur/ Papomono Mantos Conexión Copper Variogram – Down Dip



Note: Figure prepared by IMC, 2018.

Grade Estimates

IMC estimated block grades for TCu, ASCu, and CNCu using ID2. Table 14-16 shows the orientation of the search ellipse and the search radii along the major, minor, and tertiary axes respectively. Search radii were generally 65 m in the major and minor axis directions. The search radii for Papomono Masivo, Manto Norte and Papomono Norte were shorter than 65 m. Due to relatively high data densities in these deposits, the shorter searches are adequate to fill in all the block grades. Epitermal had longer search radii at 75 m, but not all the blocks were classified as Mineral Resources.

A maximum of eight composites, a minimum of two composites, and a maximum of two composites per drill hole were used for the estimations, except Epitermal which has a maximum of 12 composites, a minimum of three composites, and a maximum of three composites per drill hole. Epitermal was also estimated with 2.5 m composites, instead of the 5 m composites used for the other deposits.

The effect of inverse distance weighting along with a relatively low number of composites should produce relatively unsmoothed estimates of block grades based on the composites, i.e. the estimates should not be overly smeared.

For Papomono Cumbre, it can also be seen in Table 14-16 that the diorite versus the volcanic rocks were also treated as separate populations.

After the grade estimates were done, a check was made for blocks with ASCu + CNCu >TCu. These tended to be only a few blocks per deposit. For these blocks, the ASCu grades were factored to equal TCu. Residual copper was then calculated as TCu – ASCu – CNCu for all blocks. Figure 14-30 and Figure 14-31 show cross sections of total copper grades for Papomono Masivo and Papomono Sur.

Resource Classification

For classifying the Mineral Resources, two additional block estimates were conducted. The first estimate was based on a maximum of four composites, a minimum of four composites, and a maximum of one composite per drill hole. The second estimate was based on a maximum of three composites, a minimum of three composites, and a maximum of one composite per drill hole. The estimates provide the average distance to the nearest three and four drill holes to each block and were put into the block model. Figure 14-32 and Figure 14-33 show probability plots of the average distances for Papomono Masivo and Papomono Sur respectively. Blocks with an average distance to four drill holes ≤22.5 m were classified as Measured. Blocks with an average distance to the nearest three drill holes <45 m, but >22.5 m from the nearest four drill holes, were classified as Indicated. Blocks with an average distance to three drill holes >45 m were classified as Inferred. For Epitermal, there were some blocks where the average distance to the nearest two drill holes exceeded 60 m; these blocks were not included in the Mineral Resource estimate. Figure 14-34 and Figure 14-35 shows the resource classification on cross-sections for Papomono Masivo and Papomono Sur.

Table 14-16. Grade Estimation Parameters for Copper

Domain Code	Domain	Allowable Domains	Rotation Angles (Note 1)			Search Radii (M)			N° of Composites			Cap (% TCu)	ID Power	Comments
			Theta (azimuth)	Phi	Psi (dip)	Major	Minor	Tertiary	Max	Min	Max/Drill Hole			
10	Papomono Masivo Steep	10 - 15	320	0	-67	55	45	20	8	2	2	13.5	2	
15	Papomono Masivo Flat	10 - 15	320	0	-22	55	45	20	8	2	2	13.5	2	
20	Papomono Cumbre Diorite	20 - diorite	22	0	-90	65	65	40	8	2	2	5.9	2	
20	Papomono Cumbre Volcanics	20 - volcanics	45	0	-90	65	65	40	8	2	2	5.9	2	
30	Papomono Mantos Conexión	30	320	0	-14	65	65	20	8	2	2	6.5	2	
40	Papomono Sur - East	40	320	0	-14	65	65	20	8	2	2	6.5	2	
45	Papomono Sur - West	45	320	0	-14	65	65	20	8	2	2	6.5	2	
50	Epitermal	50	320	0	-90	75	75	25	12	3	3	3.5	2	2.5 m composites
60	Papomono Norte	60	340	25	50	40	40	20	8	2	2	6.5	2	
70	Manto Norte	70	320	0	-15	50	50	20	8	2	2	10	2	

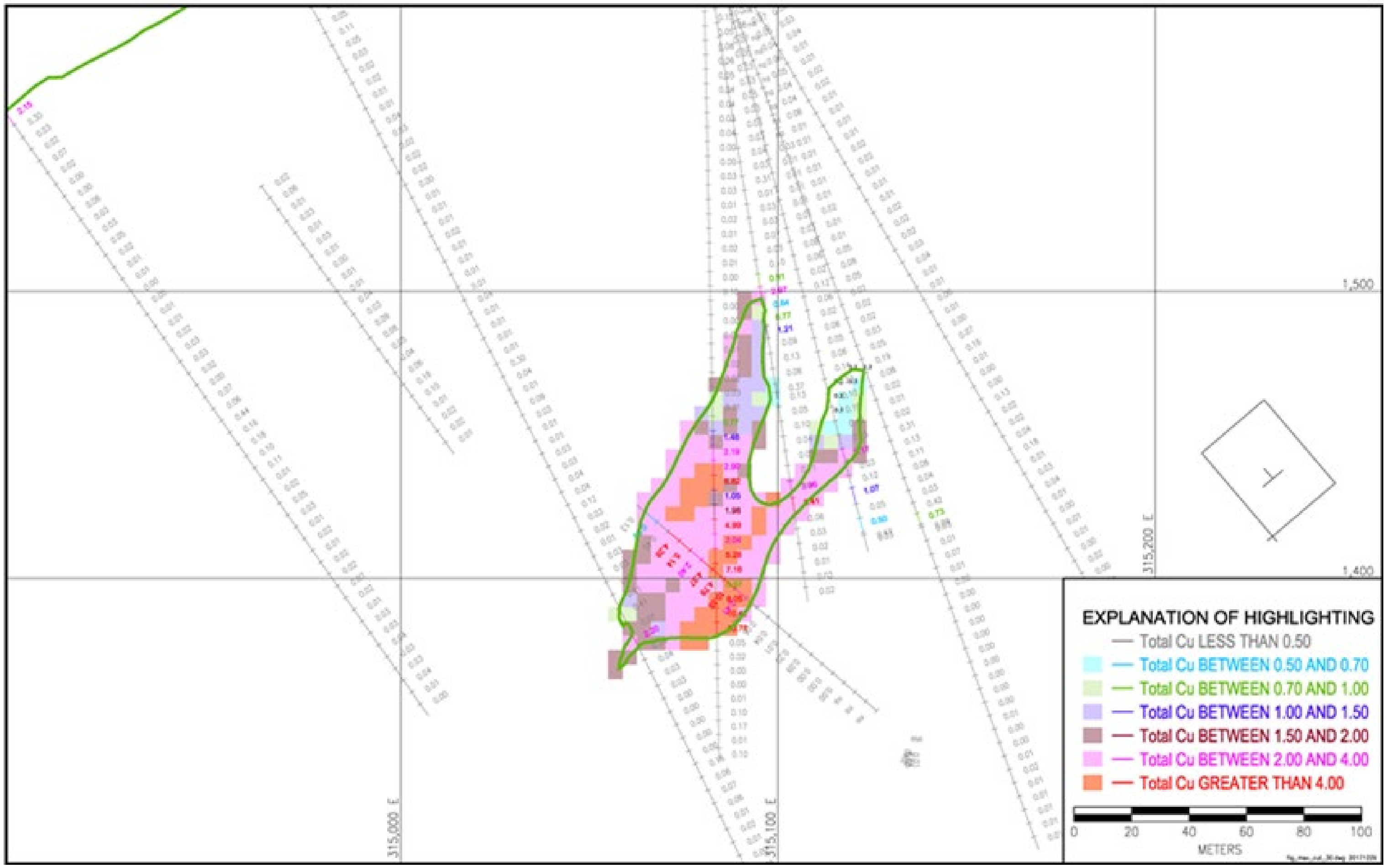
Note 1: GSLIB convention for angles

Theta – Rotation of Y (North) axis clockwise to principal direction in horizontal plan

Phi – Dip of principal axis, negative is down

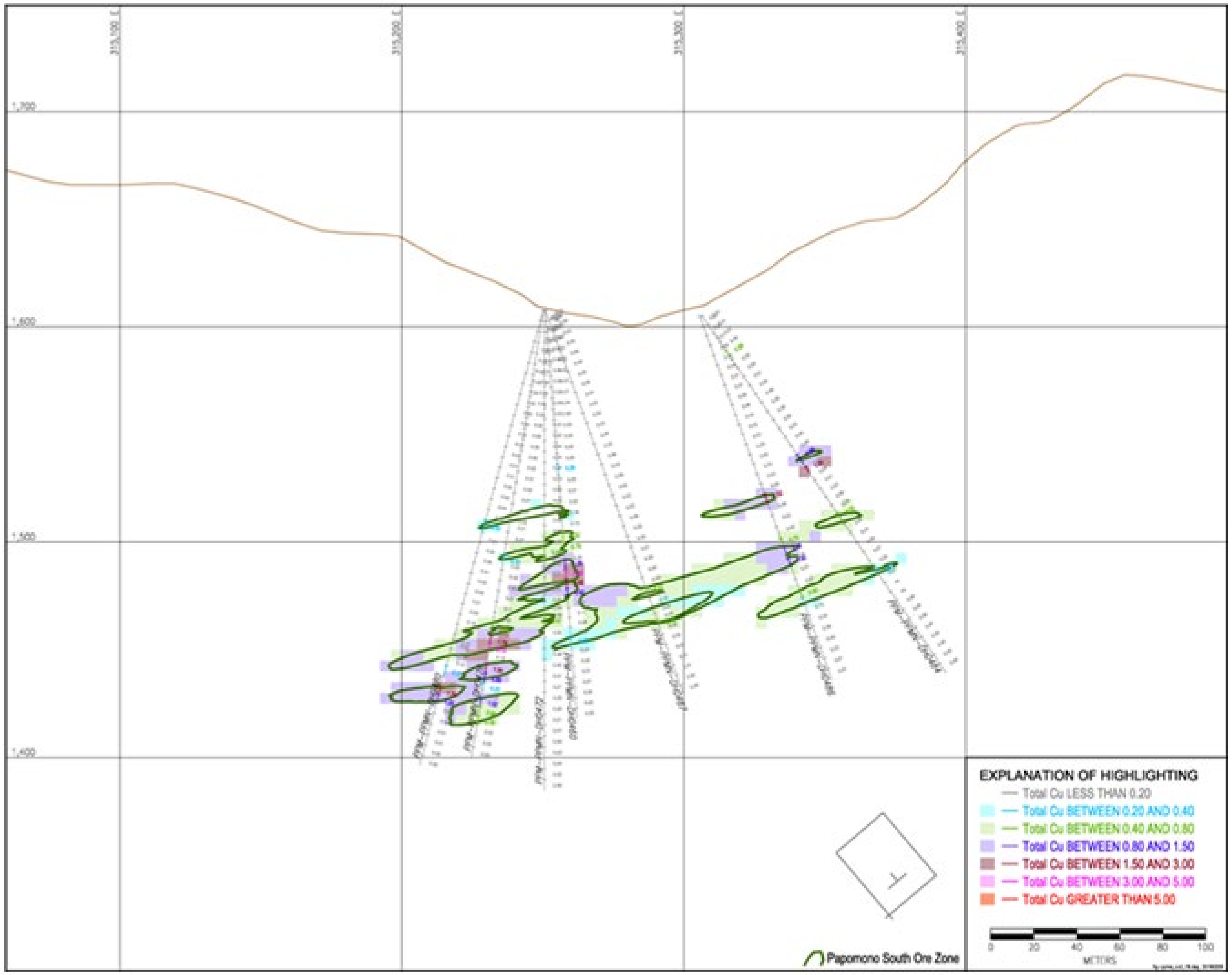
Psi – Rotation around principal axis, clockwise is negative

Figure 14-30: Total Copper on Papomono Masivo Cross Section 30



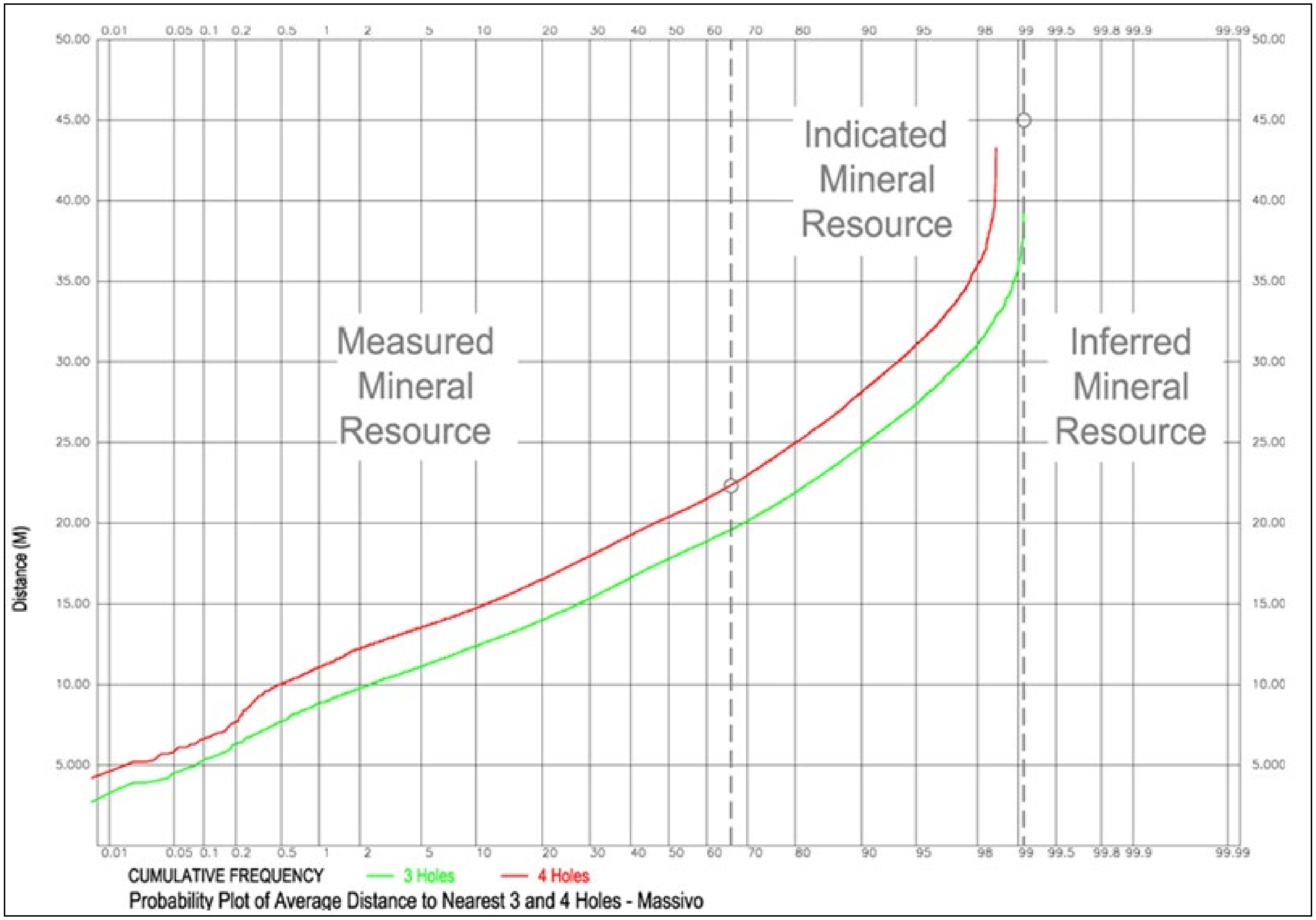
Note: Figure prepared by IMC, 2018.

Figure 14-31: Total Copper on Papomono Sur Cross Section 18



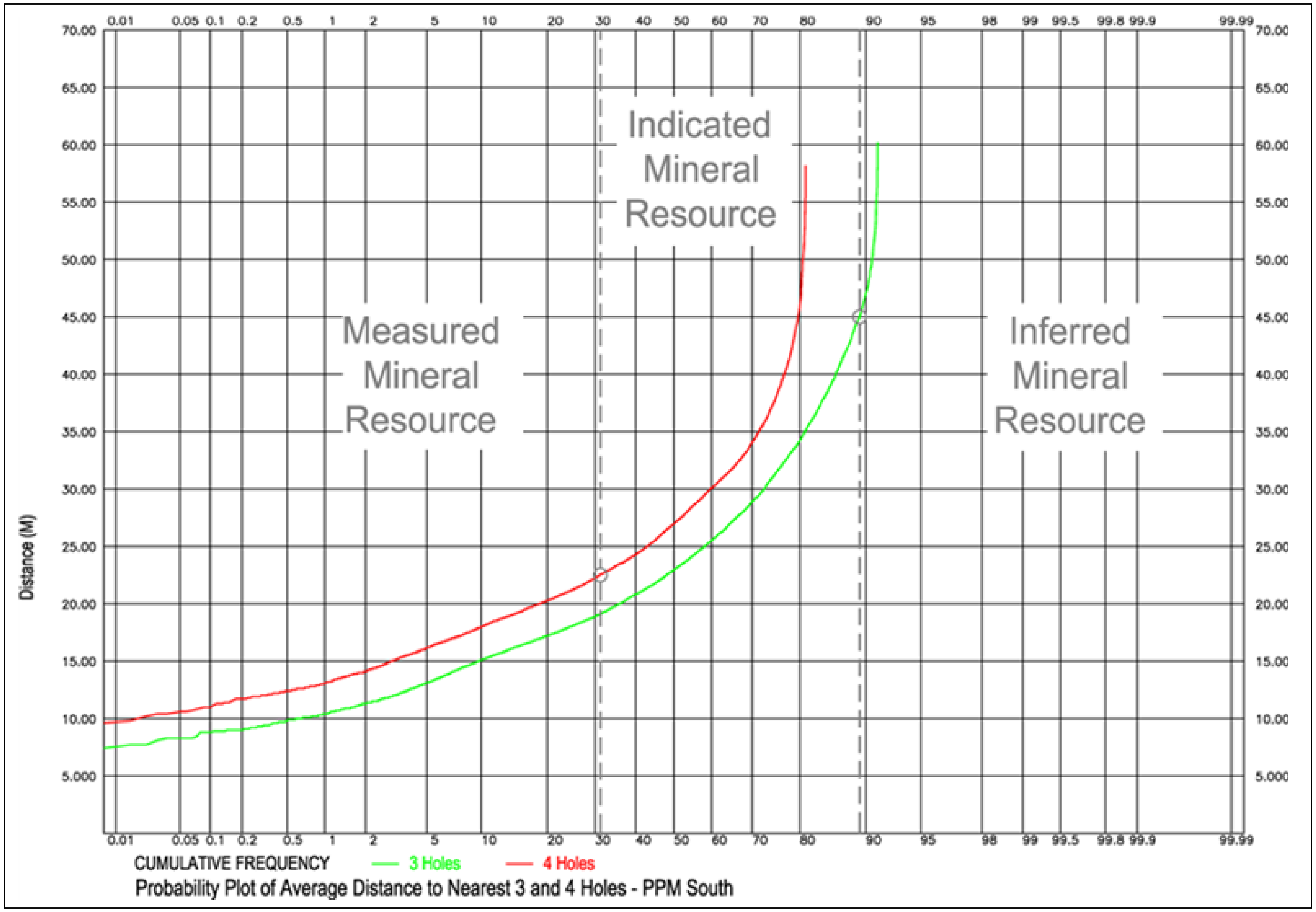
Note: Figure prepared by IMC, 2018.

Figure 14-32: Probability Plot of Average Distance to Nearest Three and Four Drill Holes – Papomono Masivo



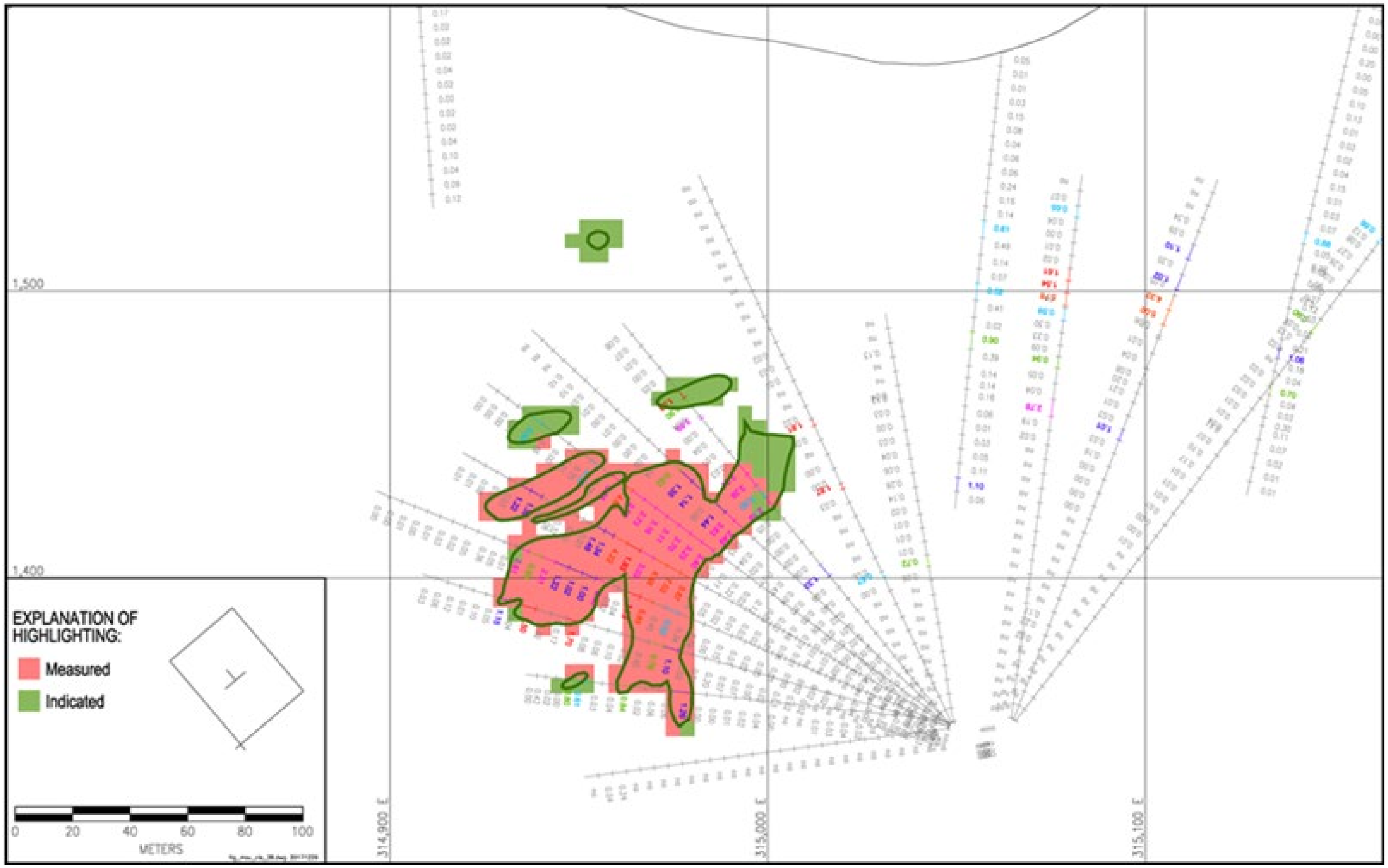
Note: Figure prepared by IMC, 2018.

Figure 14-33: Probability Plot of Average Distance to Nearest Three and Four Drill Holes – Papomono Sur



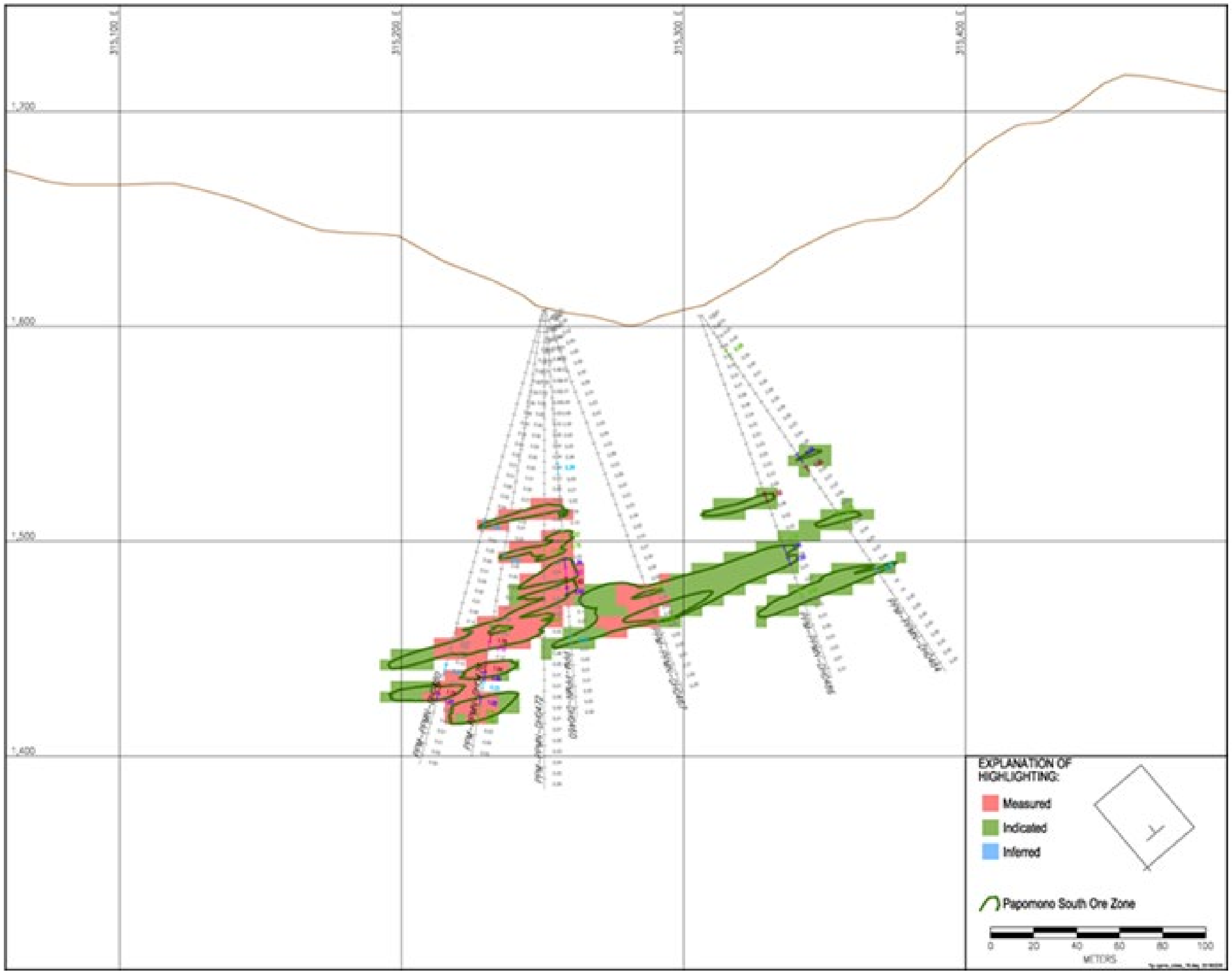
Note: Figure prepared by IMC, 2018.

Figure 14-34: Resource Classification on Papomono Masivo Section 36



Note: Figure prepared by IMC, 2018.

Figure 14-35: Resource Classification on Papomono Sur Section 18



Note: Figure prepared by IMC, 2018.

Oxide Versus Sulphide

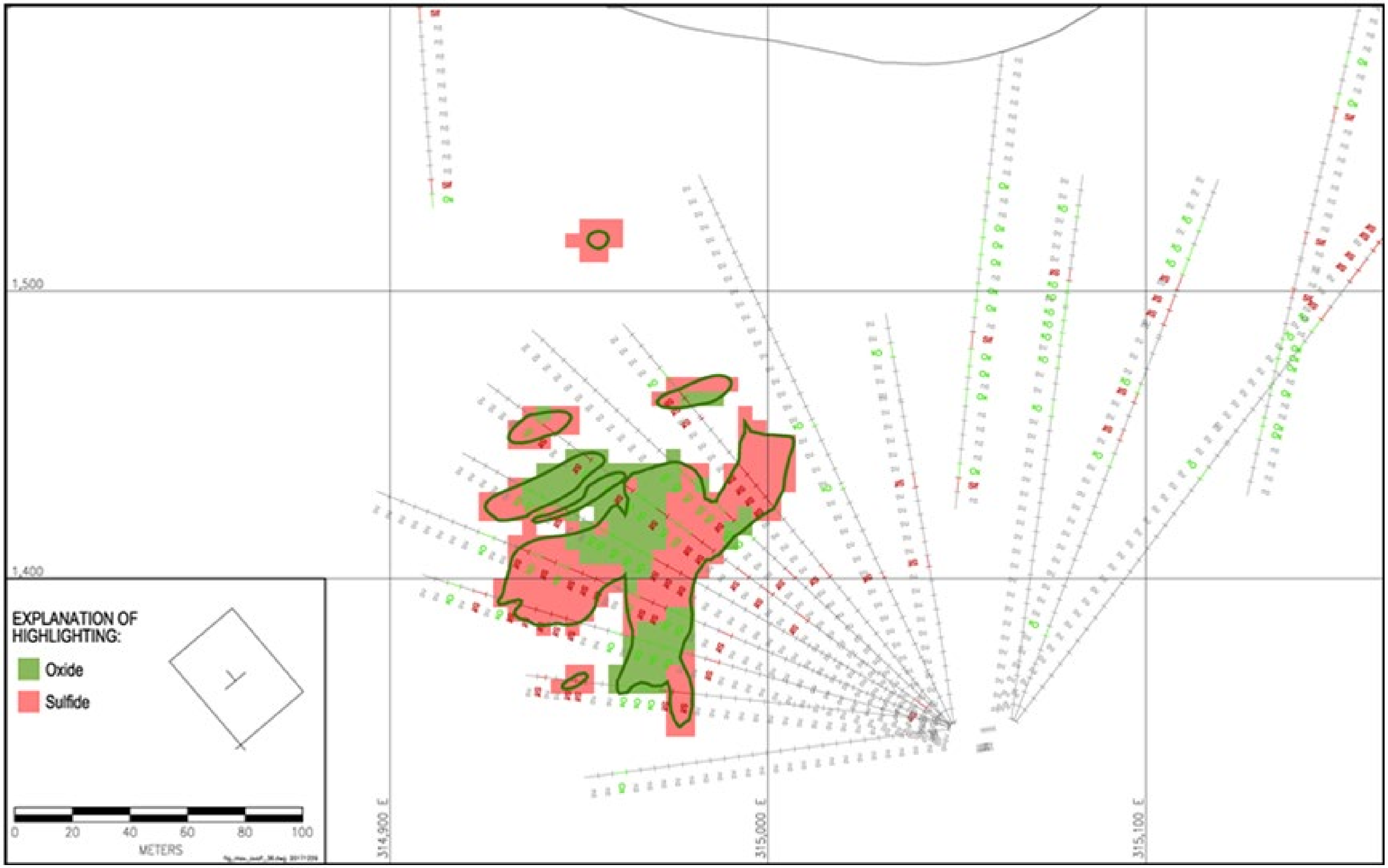
Upon completion of the grade estimation, the blocks were segregated into oxide-dominant and sulphide-dominant domains based on the ASCu block grades. Blocks with ASCu > CNCu are deemed to be oxide-dominant and blocks with CNCu ≥ ASCu are considered to be sulphide-dominant.

Figure 14-36 and Figure 14-37 show example cross sections for Papomono Masivo and Mantos Conexión respectively.

Bulk Density

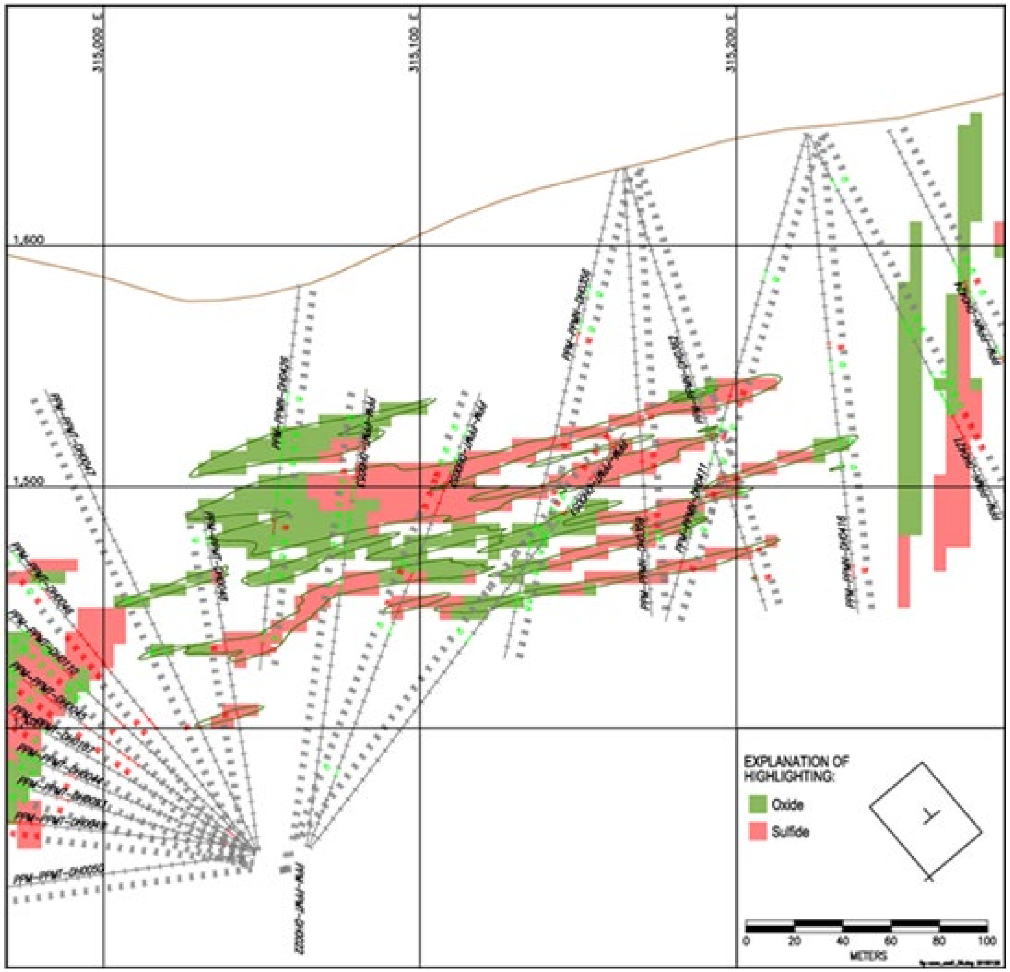
The Papomono drill hole database includes 2,148 SG determinations on short pieces of core. The estimates were done by sealing the core in paraffin, weighing the sample in air and submerged in water. The upper portion of Table 14-17 shows the number of samples and average SG for each of the major rock type units. The lower portion of the table shows the results for the measurements by deposit, i.e. samples inside the grade shell solids for each deposit. Values greater than 3.1 and values less than 1.5 were excluded from the calculations. The average SG was reduced by 2% to obtain an estimate of bulk density. This was to allow for voids in the rock mass at a larger scale than what could be captured in the small core samples. There were about 145 measurements for samples in the Papomono Masivo grade shell. The measurements average about 2.623 for the steep zone and 2.671 for the flat zone. IMC estimated the SG values on a block-by-block basis for Papomono Masivo and used background values for blocks that were not estimated. The SG estimates for Papomono Norte were also done on a block-by-block basis. For Papomono Cumbre, Mantos Conexión, and Epitermal, the averages shown on the table were assigned to all blocks in the grade shell, as in IMC's opinion there was insufficient data to assign these on a block-by-block basis. There were no samples for Papomono Sur. The Mantos Conexión values were used for this zone since the geology is similar in the two zones.

Figure 14-36: Oxide-Dominant Versus Sulphide-Dominant Blocks for Papomono Masivo Section 36



Note: Figure prepared by IMC, 2018.

Figure 14-37: Oxide-Dominant Versus Sulphide-Dominant Blocks for Papomono Mantos Conexión Section 36



Note: Figure prepared by IMC, 2018.

Table 14-17: Specific Gravity and Bulk Density for Papomono Units

Rock Code	Grade Shell	Description	N° of Samples	Average SG	Bulk Factor	Bulk Density (t/m³)
100		Diorite	18	2.882	98.00%	2.824
210		Unit C	622	2.741	98.00%	2.686
220		Unit B	113	2.768	98.00%	2.713
230		Unit A	1,364	2.649	98.00%	2.596
	10	Papomono Masivo Steep	87	2.623	98.00%	2.571
	15	Papomono Masivo Flat	58	2.671	98.00%	2.618
	20	Papomono Cumbre	42	2.609	98.00%	2.557
	30	Papomono Mantos Conexión	46	2.595	98.00%	2.543
	40,45	Papomono Sur		2.595	98.00%	2.543
	50	Epitermal	20	2.357	98.00%	2.310
	60	Papomono Norte	136	2.567	98.00%	2.516
	70	Manto Norte	250	2.641	98.00%	2.588

Historic Mining

During the Vale tenure there was significant open pit mining in the Papomono Cumbre pit. IMC was provided with topography to show the status of Papomono Cumbre.

There was also significant underground mining in Manto Norte, as well as additional underground development to explore and prepare for development of Papomono Masivo, Conexión, and Papomono Sur. IMC was provided with solids to represent historic Vale underground mine development and mining and also mining conducted by MTV during 2017. These were incorporated into model to show the percentage of the blocks extracted by underground development and mining.

There was also some open pit mining activity in Papomono Norte during 2016. IMC received a topography update for this and it is incorporated into the model. Based on the current IMC model, IMC would estimate that about 67,000 t at 1.391% TCu was mined. These tonnes are above the topography surface used for the current Mineral Resource, so are not included in the resource. In terms of tonnes this is about 13.5% of the current grade shell. One of the existing main declines into the Papomono underground is established in the wall of this small pit.

15.0 MINERAL RESERVE ESTIMATES

15.1 Introduction

The Mineral Reserves are contained within Don Gabriel Manto deposit, assumed to be mined using open pit methods, and the Papomono Masivo deposit, which is planned to be mined using an inclined block cave and front caving methods.

The Mineral Reserve estimate is based on what is deemed minable when considering the following factors:

- Open pit: general slope angle, minimum width, cut-off grade for open pit, economic viability.
- Underground: Footprint cut-off grade, maximum height of draw, consideration of planned dilution, economic viability.

15.2 Mineral Reserves Estimation

15.2.1 Don Gabriel

The Don Gabriel Manto deposit is based on an open pit mine plan and mine production schedule developed by IMC at a cutoff grade of 0.25% TCu. The Mineral Reserve is based on a copper price of $2.75/lb Cu. Measured Mineral Resources in the mine production schedule were converted to Proven Mineral Reserves, and Indicated Mineral Resources were converted to Probable Mineral Reserves.

Dilution and ore loss are incorporated into the block model. For mine planning and Mineral Reserve estimation a diluted model was constructed. Blocks with less than 30% manto solid contained in them were excluded as lost ore. Blocks with between 30% and 99.9% manto solid contained in them were diluted to full blocks with a dilution grade of 0.1% TCu. Compared to the undiluted model, this calculation resulted in 4.2% more tonnes at a 6.4% lower copper grade. IMC considers this a reasonable estimate of dilution effects.

The slope angle design for the Don Gabriel pit is based on two reports by E-Mining Technology S.A. The first is "*Informe Extendido – Estimación de Parámetros de Diseño y Análisis de Estabilidad Rajo Don Gabriel*" dated May 2011, and the second is an addendum dated April 2012. The two reports specified the same design. The interramp slope angle was specified as 52°. Furthermore, it was specified that the height of continuous slope could not exceed 150 m without the inclusion of an additional 20 m catch bench. This would limit the overall angle to about 50°.

15.2.2 Papomono Masivo

The Papomono Masivo underground deposit is to be mined by a variant of the block cave method, inclined block caving, and a minor zone by a variant of the sublevel caving, front caving. The mine planning work conducted by Wood was completed using industry-standard mining software and techniques, developed by high-skilled professionals involved in base and precious metals operations, planning, consulting, and management of underground mines in Chile, Peru, South Africa, Canada and Australia, under QP supervision. Key assumptions used by Wood in estimation included:

- Copper price used for calculating the Papomono Masivo NSR is $2.75/lb Cu, based on SRHI's recommendation as at the date the Mineral Reserve estimation process began and what Wood considers reflective of industry consensus of long term copper prices for use in Mineral Reserves
- A footprint cut-off of 0.40% TCu was used for the inclined block caving and a 0.47% TCu cut-off grade was used for the front caving method to maintain grade and production capacity
- All Measured and Indicated Mineral Resources within the block cave shell and front caving were converted to Mineral Reserves. This includes low-grade blocks classified as Indicated as the mining method does not allow for separate handling of low grade material. Engineering was carried out to a prefeasibility level to support the underground Mineral Reserve
- There are currently round 22 kt of Inferred Mineral Resources in the Papomono Masivo area. Copper grades for the Inferred Mineral Resources within the block cave shell were set to zero and such material was assumed to be dilution. The underground Mineral Resource block models used for reporting the Mineral Reserves are the models reported in the Mineral Resource section.

The block cave shell was defined by a 0.40% TCu and 0.47% TCu for the front caving. The NSR cut-off was $55.51/t and the dilution were assumed to be 36%. The maximum height of column was estimated to be 90 m. The Mineral Reserve for Papomono Masivo is reported within the boundaries of the Minera Tres Valles Copper

Project, more specifically in the area of the Minera Tres Valles property covered by the environmental license and sectorial permits.

A Geovia PCBC software dilution model was used for Papomono Masivo to model block and panel caving dynamics. Modelling commenced using simple vertical blending models (Laubscher or pre-vertical blending) and proceeded to probabilistic and dynamic models that incorporate appropriate blending and dilution considerations depending on the selected extraction (template mixing and cellular automation). The dilution model used for Papomono Masivo was based on the geotechnical characteristics from the work completed by Laubscher (1994, 2000), with a height of interaction zone (HIZ) of 60 m and an entry dilution point of 40%.

15.2.3 Model

Wood completed a check of the Mineral Resources block model provided in the 2018 Papomono Masivo prefeasibility study against the estimates reported in the 2018 IMC Technical Report (Hester et al., 2018), and considers the estimate to be in general agreement with the Mineral Resources provided in those reports. Wood reviewed the metal price assumptions and concluded that the Mineral Reserves remain valid at these prices.

15.3 Mineral Reserves Statement

Mineral Reserves are reported in Table 15-1 for the Don Gabriel Manto and Papomono Masivo deposits. The estimated Proven and Probable Mineral Reserve amounts to 8.2 Mt grading 1.07% TCu for 88.3 kt contained copper. The effective date of the Mineral Reserve estimate for Don Gabriel Manto is January 1, 2018 and for Papomono Masivo is July 31, 2018.

Table 15-1: Mineral Reserves Statement

Category	Tonnage (kt)	Grade (%Cu)	Contained Copper (kt Cu)
Don Gabriel Manto			
Proven	898	0.80	7.1
Probable	4,270	0.82	34.9
Total Proven and Probable for Don Gabriel Manto	***5,168***	***0.81***	***42.1***
Papomono Masivo			
Proven	2,559	1.51	38.7
Probable	508	1.48	7.5
Total Proven and Probable for Papomono Masivo	***3,067***	***1.51***	***46.2***
Total Proven and Probable	***8,235***	***1.07***	***88.3***

Notes to accompany Mineral Reserves table:

1. Mineral Reserves are reported effective January 1st, 2018 for Don Gabriel Manto and July 1st, 2018 for Papomono Masivo.
2. The Qualified Persons for the estimate are Mr. Michael Hester, FAusIMM, an IMC employee, for the Don Gabriel Manto Mineral Reserves and Mr. Alfonso Ovalle, RM CMC, a Wood employee, for the Papomono Masivo Mineral Reserves.
3. For the open pit mining, all Mineral Reserves are contained within an optimized pit shell. Mining will use conventional open pit methods and equipment. Direct mining costs are estimated averaging $2.15 /t of material mined and $1.95/t per waste tonne. The overall slope angle was 50°. Minimal dilution and ore loss are incorporated into the block model. For mine planning and mineral reserve estimation a diluted model was constructed. Blocks with less than 30% manto solid contained in them were excluded as lost ore. Blocks with between 30% and 99.9% manto solid contained in them were diluted to full blocks with a dilution grade of 0.1% TCu.
4. For the underground mining, all Mineral Resources within the cave outline have been converted to Probable and Proven Mineral Reserves. This includes low-grade Indicated Mineral Resource and Inferred Mineral Resource assigned zero grade that is treated as dilution. A footprint cut-off 0.40% TCu for the inclined block cave and 0.47% TCu for front caving was used define the footprint and column heights. An average dilution entry point of 40% of the column height was used. The NSR calculation assumed metal prices of $2.75/lb Cu. Metallurgical assumptions in the NSR include recoveries of 89.37% for Cu. The recoveries correspond to the chloride leach process, currently implemented in the process plant.
5. Processing costs for material sent to the heap leach are $9.64/t for underground mining and $9.73/t for open pit.
6. G&A costs were assumed as $0.20/lb Cu and the SX/EW costs were assumed as $0.19/lb Cu.
7. Tonnage and contained copper are reported in metric units and grades are reported as percentages.
8. Rounding as required by reporting guidelines may result in apparent summation differences between tonnes, grade and contained metal.

15.4 Factor that May Affect the Mineral Reserves

There are, among others, certain key factors that could materially affect the interpretation of the Mineral Reserve estimate. These may include:

- Commodity market conditions and pricing;
- Changes to the estimated Mineral Resources used to generate the mine plan;
- Changes in the metallurgical recovery factors;
- Changes in the geotechnical assumptions used to determine the overall slope angles, dilution, or underground mining shapes;
- Changes to the operating cut-off assumptions for heap leach feed;
- Ability to maintain social and environmental license to operate.

16.0 MINING METHODS

16.1 Overview

The open pit mine plan for the Don Gabriel Manto was developed by IMC staff in March 2018, and the underground mine plan for the Papomono Masivo inclined block cave and front cave were developed by Wood staff in July 2018. The integrated plan for the open pit and underground operations (integrated case), supporting the mine plan, was prepared by Wood staff in August 2018. The production parameters are summarized in Table 16-1.

Table 16-1: Key Production Parameters

Parameter	Quantity
Proven and Probable Mineral Reserves	8,235 kt at 1.07% TCu
LOM production	807 t/month Copper
Mine life	7.5 years (2018–2025)

16.2 Don Gabriel Manto

16.2.1 Dilution and Ore Loss

Dilution and ore loss are discussed in Section 15.2.1.

16.2.2 Slope Angles

The slope angle design for the Don Gabriel pit is based on two reports by E-Mining. The first is “Informe Extendido – Estimación de Parámetros de Diseño y Análisis de Estabilidad Rajo Don Gabriel” dated May 2011, and the second is an addendum dated April 2012. The two reports specified the same geotechnical design. The interramp slope angle was specified by E-Mining as 52º. The height of continuous slope could not exceed 150 m without the inclusion of an additional 20 m catch berm. This would limit the overall angle to about 50º. The E-Mining analyses looked at possible large-scale slope failures (low probability) and bench scale failures. The bench scale issues, maintenance of catch berms and retention of most failures on the catch berms, were the main considerations for the interramp slope angle recommendations.

16.2.3 Economic Parameters

Table 16-2 shows the economic parameters for open pit design assuming the mineralization would be treated using salt leaching. The long-term metal price assumption was $2.75/lb Cu

The mining costs for ore and waste are based on contract mining and are estimated at $2.15/t and $1.95/t respectively. IMC estimated mine engineering, geology, and ore control at an additional $0.20/t based on labor rates for supervisory personnel that were provided by MTV. The mining costs are the same costs as used for the Mineral Resource estimate.

The process cost is estimated at $9.73/t for Don Gabriel. This is slightly higher than the $8.83 average cost used in the Mineral Resource estimate. The Don Gabriel will benefit from finer crushing than will be required for the other deposits. The haulage distance from Don Gabriel to the crusher is about 12 km and is not included in the ore mining cost. The $2.21/t estimate for ore haulage is based on a contractor quote, and is the same as the cost used for the Mineral Resource estimate.

General and administrative (G&A) costs will be pro-rated for the Don Gabriel and Papomono deposits, based on potential copper production. The Don Gabriel portion is estimated at about $3.09/t ore. This was assumed at $0.24/lb finished copper for the Mineral Resource estimate.

The estimated recoverable copper grade is incorporated into the block model on a block by block based on the ASCu, CNCu, and RCu grades for the block and the parameters shown in Table 13-29. The average metallurgical recovery is anticipated at 87% for the salt leach process, based on these recovery parameters.

The SX/EW plus cathode transport is estimated at $0.19/lb finished copper.

Table 16-2: Don Gabriel Economic Parameters for Pit Design

Parameter	Units	Ore	Waste
Commodity prices			
Copper Price per Pound	US$	2.75	
Mining cost per tonne			
Contract mining cost	US$	2.15	1.95
Engineering, geology, ore control	US$	0.20	0.20
Total mining cost	US$	2.35	2.15
Processing cost per ore tonne			
Crushing, agglomeration and leaching	US$	9.73	
Ore haulage	US$	2.21	
Total ore haulage and process cost	US$	11.94	
G&A per ore tonne			

Parameter	Units	Ore	Waste
G&A	US$	3.09	
Average recovery			
Total copper	%	87.0	
SX/EW and cathode transport per pound			
SX/EW cost	US$	0.19	
Cut-off grades (TCu)			
Internal	%	0.31	
Break-even	%	0.35	
Low grade (does not pay G&A cost)	%	0.25	

Based on average recovery the internal total copper cutoff grade is estimated at 0.31% TCu. The internal cutoff grade applies to blocks that have to be removed from the pit, so only the mining costs in addition to the $2.15/t waste mining cost are included in the calculation. The breakeven cutoff of 0.35% TCu considers the entire $2.35/t mining cost. The marginal cutoff grade of 0.25% TCu excludes the G&A cost from the cutoff grade calculation. This cutoff grade is appropriate if the plant is not operating at full capacity, i.e. blocks above this grade do not pay the full G&A cost, but contribute to it.

16.2.4 Mining Phases

The Don Gabriel phase designs are based on analysis performed by Tetra Tech and summarized in the PowerPoint presentation "Optimización y Diseño – Rajo Don Gabriel Minera Tres Valles", dated December 22, 2017. IMC also ran independent analyses to verify the final pit design.

The Tetra Tech analysis proposed dividing Don Gabriel into five mining phases. Figure 16-1 shows the relative locations of the phases. It is noted that the designs are conceptual in nature; in particular access roads were not included. IMC updated the designs to make the phases operational. It is assumed that most of the Don Gabriel ore and waste will exit the pit on contour since the pit is cut into a hill, so internal roads are expected to be fewer than in more typical open pits.

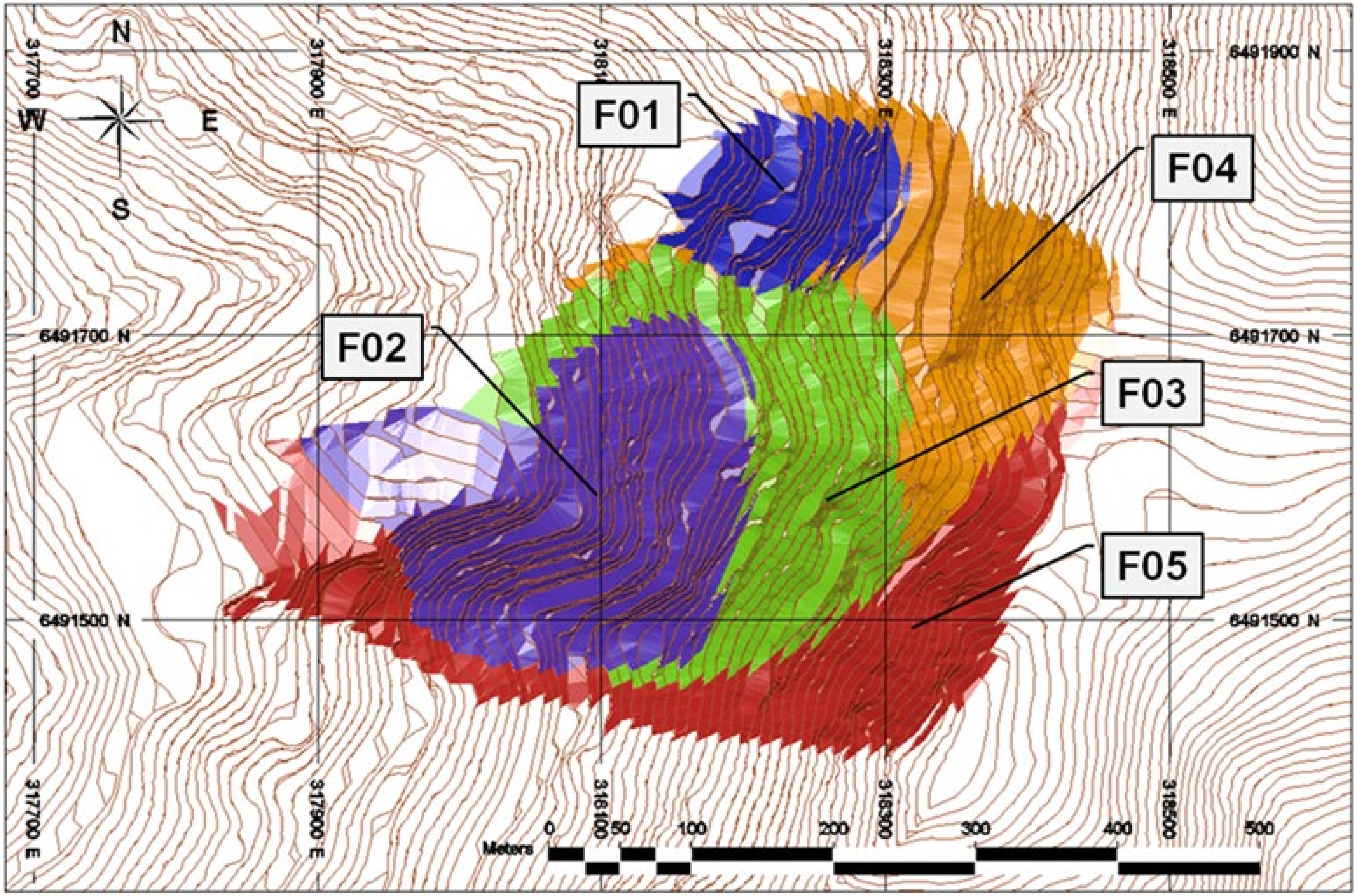
The final mining phases are a combination of MTV, Tetra Tech, and IMC designs. There will be six pit phases, numbered 2 through 7.

- Phases 2 and 3 are MTV designs for short-term planning in the north part of the Don Gabriel deposit. These phases replace the Tetra Tech phase 1 pit. The MTV phase 1 pit has been completed
- Phases 4, 5, 6, and 7 are the IMC/Tetra Tech phases 2, 3, 4, and 5.

Figure 16-2 to Figure 16-4 shows the pit phases that resulted from the combined MTV, Tetra Tech, and IMC designs.

The mining phases amount to 5.17 Mt at 0.81% TCu and 0.71% recoverable copper (RecCu) for 92.7 million contained copper pounds and 81.1 million recoverable copper pounds. The metallurgical recovery averages about 87.4%. Total material in the pit is 27.2 Mt for a waste:ore ratio of 4.3 to 1. The indicated recovery and payable copper are slightly higher than the Mineral Reserve in Table 15-1. The Mineral Reserve is based on acid leaching for 2018, thus the difference. The biggest operational challenge will be the IMC's pit phase 6. At about the 1560 bench, the phase 6 wall will catch up to the phase 5 wall. All the material between the 1560 bench and the 1470 flat will have to exit the pit to the north. This means waste will exit to the north and go around the pit to get to the south waste storage area. The second issue is the bottom several benches of the phase are in the narrow wedge between phase 3 and phase 4.

Figure 16-1: Location of the Tetra Tech Mining Phases



Note: Figure prepared by Tetra Tech, 2017

Table 16-3: Summary of Mining Phases – Salt Leach Case

IMC's Mining Phases	High Grade – 0.31 % TCu			Low Grade – 0.25 % TCu			All Reserves				Cont. Copper (klbs)	Payable Copper (klbs)	Waste (kt)	Total (kt)	Waste Ratio
	(kt)	TCu (%)	Rec Cu (%)	(kt)	TCu (%)	Rec Cu (%)	(kt)	TCu (%)	Rec Cu (%)	Rec. (%)					
Phase 2	31	1.07	0.95	0	0.00	0.00	31	1.07	0.95	88.8	726	644	73	104	2.38
Phase 3	208	0.95	0.84	12	0.29	0.25	219	0.91	0.81	88.7	4,419	3,920	309	529	1.41
Phase 4	643	0.82	0.71	58	0.78	0.24	700	0.77	0.67	87	11,915	10,361	2,869	3,570	4.10
Phase 5	1,172	0.84	0.73	60	0.28	0.24	1,231	0.81	0.71	87.4	21,991	19,230	6,217	7,449	5.05
Phase 6	1,046	0.75	0.66	72	0.28	0.25	1,119	0.72	0.63	87.7	17,795	15,614	4,737	5,855	4.23
Phase 7	1,793	0.90	0.78	74	0.28	0.24	1,867	0.87	0.76	87.2	35,833	31,263	7,799	9,666	4.18
Total	**4,892**	**0.84**	**0.74**	**276**	**0.28**	**0.24**	**5,168**	**0.81**	**0.71**	**87.4**	**92,678**	**81,032**	**22,005**	**27,173**	**4.26**

16.2.5 Mine Production Schedule

A mine production schedule was developed for the Don Gabriel pit. The schedule incorporates the following parameters and assumptions:

- Topography has been updated to December 31, 2017
- The schedule was developed to incorporate current mining activity and short-range plans in the north part of the pit
- A new contractor, with larger equipment, started operations on June of 2018
- The acid leach process case is assumed for 2018; it is assumed the salt leach process will be in place for mid-2019 and thereafter
- Only Measured and Indicated Mineral Resources are included in the production schedule; Inferred Mineral Resources are considered waste. This is, however, a negligible amount of material; Table 14-1 shows the Don Gabriel Inferred Mineral Resources as totaling 79 kt.

The ore production rate for the schedule is 852,000 t/a. This is 2,400 t/d for 355 d/a. This rate should be achieved during the first quarter of 2019.

Table 16-4 shows the mine production schedule. 2018 is shown by month and the rest of the schedule is by quarterly periods. During April, May, and June of 2018, total production ramped up to 550,000 t/month. It can also be seen that total production peaks at 1.7 Mt per quarter (6.8 Mt/a) during 2019 to achieve full production for three of the four quarters of the year. Total ROM is 1.6 Mt per quarter for the first three quarters of 2020 after which the production rate is reduced. Figure 16-8 to Figure 16-14 provide the pit outlines at the end of each schedule phase.

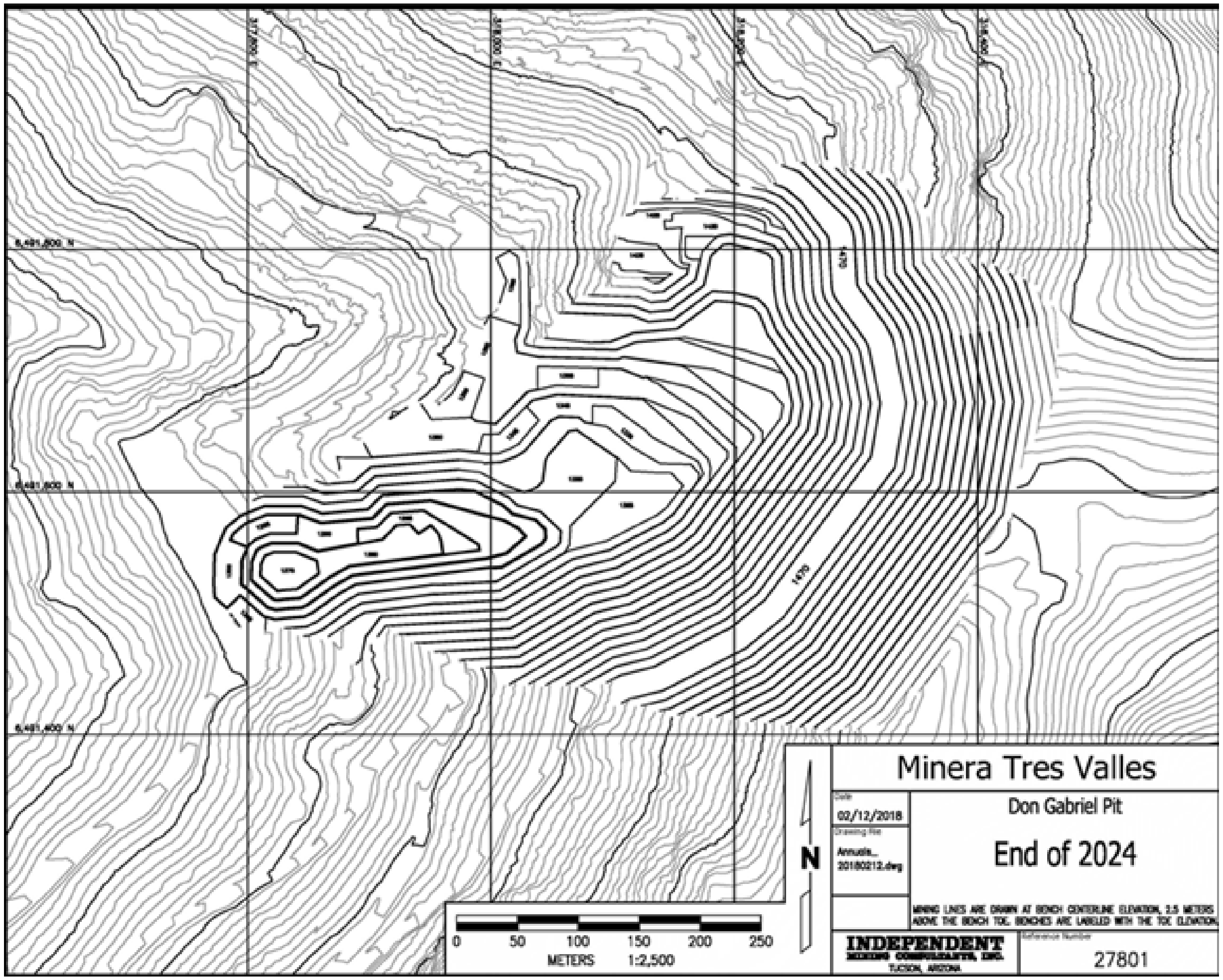
The Proven and Probable Mineral Reserve estimate is 5.168 Mt at 0.81% TCu and 0.71% RecCu. This amounts to 92.7 Mlbs contained copper and 80.5 Mlbs payable copper. Average TCu recovery is 86.9%. Total material mined will be 27.1 Mt for a 4.26 to 1 waste ratio. The schedule has lower recoveries during 2018 due to the assumption of acid leach process.

This schedule is based on a total copper cutoff grade of 0.31%, which is the internal cutoff for the salt leach case at the average recovery. Low-grade mineralization is material between 0.25% and 0.31% TCu. The low-grade material does not pay for the full G&A cost allocated to Don Gabriel, but the material has to be mined and if the plant is not running at full capacity it will contribute to fixed costs.

Table 16-4: Mine Production Schedule

Mining Period	Copper Cutoff (%)	Ore Tonnes	Ore CuT (%)	Ore Rec Cu (%)	Low Grade Tonnes	Low Grade CuT (%)	Low Grade Rec Cu (%)	All Resources Tonnes	All Resources CuT (%)	All Resources Rec Cu (%)	All Resources Recov. (%)	Cont. Copper (klbs)	Payable Copper (klbs)	Waste Tonnes	Total Tonnes	Waste Ratio
Jan-18	0.31	18,650	1.083	0.909				18,650	1.083	0.909	83.9%	445	374	81,350	100,000	4.36
Feb-18	0.31	14,291	0.939	0.786	2,630	0.285	0.230	16,921	0.837	0.700	83.5%	312	261	83,079	100,000	4.91
Mar-18	0.31	29,151	0.524	0.434	6,122	0.284	0.230	35,273	0.482	0.399	82.6%	375	310	83,880	119,153	2.38
Apr-18	0.31	30,000	1.052	0.887	2,228	0.293	0.243	32,228	1.000	0.842	84.3%	710	599	167,772	200,000	5.21
May-18	0.31	30,000	1.213	1.020	108	0.263	0.193	30,108	1.210	1.017	84.1%	803	675	319,892	350,000	10.62
Jun-18	0.31	50,000	0.983	0.821	367	0.277	0.211	50,367	0.978	0.817	83.5%	1,086	907	499,632	549,999	9.92
Jul-18	0.31	43,496	0.929	0.781	37	0.277	0.229	43,533	0.928	0.781	84.1%	891	749	506,467	550,000	11.63
Aug-18	0.31	33,639	0.893	0.746	1,168	0.274	0.217	34,807	0.872	0.728	83.5%	669	559	515,193	550,000	14.80
Sep-18	0.31	46,434	0.845	0.684	74	0.258	0.207	46,508	0.844	0.683	80.9%	865	701	503,492	550,000	10.83
Oct-18	0.31	50,000	0.811	0.659	1,073	0.274	0.219	51,073	0.800	0.650	81.2%	900	732	498,927	550,000	9.77
Nov-18	0.31	50,000	0.768	0.619	2,265	0.276	0.220	52,265	0.747	0.602	80.6%	860	693	497,736	550,001	9.52
Dec-18	0.31	50,000	0.728	0.590	2,545	0.276	0.220	52,545	0.706	0.572	81.0%	818	663	497,454	549,999	9.47
Q1 2019	0.31	213,000	0.676	0.590	33,504	0.280	0.241	246,504	0.622	0.543	87.2%	3,381	2,949	1,453,498	1,700,002	5.90
Q2 2019	0.31	213,000	0.755	0.653	27,153	0.277	0.236	240,153	0.701	0.606	86.4%	3,711	3,208	1,459,846	1,699,999	6.08
Q3 2019	0.31	194,671	0.769	0.669	29,233	0.281	0.244	223,904	0.705	0.614	87.0%	3,481	3,028	1,476,097	1,700,001	6.59
Q4 2019	0.31	213,000	0.837	0.733	12,313	0.280	0.242	225,313	0.807	0.706	87.6%	4,006	3,508	1,474,687	1,700,000	6.55
Q1 2020	0.31	213,000	0.869	0.763	1,951	0.284	0.245	214,951	0.864	0.758	87.8%	4,093	3,593	1,385,048	1,599,999	6.44
Q2 2020	0.31	213,000	0.894	0.783	8,802	0.277	0.241	221,802	0.870	0.761	87.6%	4,252	3,724	1,378,199	1,600,001	6.21
Q3 2020	0.31	213,000	0.969	0.847	17,988	0.282	0.245	230,988	0.916	0.800	87.4%	4,662	4,074	1,369,012	1,600,000	5.93
Q4 2020	0.31	213,000	0.738	0.643	10,778	0.280	0.242	223,778	0.716	0.624	87.1%	3,532	3,077	1,259,502	1,483,280	5.63
Q1 2021	0.31	212,999	0.759	0.668	10,128	0.278	0.243	223,127	0.737	0.649	88.0%	3,626	3,191	1,052,106	1,275,233	4.72
Q2 2021	0.31	213,000	0.716	0.631	14,375	0.277	0.243	227,375	0.688	0.606	88.1%	3,450	3,040	617,225	844,600	2.71
Q3 2021	0.31	213,000	0.727	0.638	14,049	0.283	0.247	227,049	0.700	0.614	87.7%	3,501	3,072	599,988	827,037	2.64
Q4 2021	0.31	213,000	0.828	0.721	11,779	0.276	0.234	224,779	0.799	0.695	87.0%	3,960	3,446	448,331	673,110	1.99
Q1 2022	0.31	213,000	0.864	0.755	10,137	0.284	0.243	223,137	0.838	0.732	87.4%	4,121	3,600	336,643	559,780	1.51
Q2 2022	0.31	213,000	0.761	0.668	7,763	0.281	0.241	220,763	0.744	0.653	87.8%	3,622	3,178	572,382	793,145	2.59
Q3 2022	0.31	213,000	0.776	0.670	7,643	0.291	0.253	220,643	0.759	0.656	86.3%	3,693	3,189	576,217	796,860	2.61
Q4 2022	0.31	213,000	0.916	0.797	3,670	0.283	0.244	216,670	0.905	0.788	87.0%	4,324	3,762	366,884	583,554	1.69
Q1 2023	0.31	212,999	1.031	0.903	2,902	0.282	0.246	215,901	1.021	0.894	87.6%	4,859	4,256	392,558	608,459	1.82
Q2 2023	0.31	213,000	1.055	0.918	5,121	0.280	0.240	218,121	1.037	0.902	87.0%	4,986	4,338	417,065	635,186	1.91
Q3 2023	0.31	213,000	0.969	0.845	9,158	0.276	0.235	222,158	0.940	0.820	87.2%	4,606	4,015	367,450	589,608	1.65
Q4 2023	0.31	213,000	0.947	0.829	5,497	0.287	0.246	218,497	0.930	0.814	87.5%	4,482	3,923	251,940	470,437	1.15
Q1 2024	0.31	204,754	0.783	0.680	12,974	0.277	0.240	217,728	0.753	0.654	86.8%	3,614	3,138	495,944	713,672	2.28
TOTAL		4,892,084	0.844	0.733	275,535	0.280	0.241	5,167,619	0.814	0.707	86.9%	92,698	80,531	22,005,496	27,173,115	4.26

Figure 16-2: Overall LOM Pit



Note: Figure prepared by IMC, 2018.

16.2.6 Waste Rock Storage Facilities

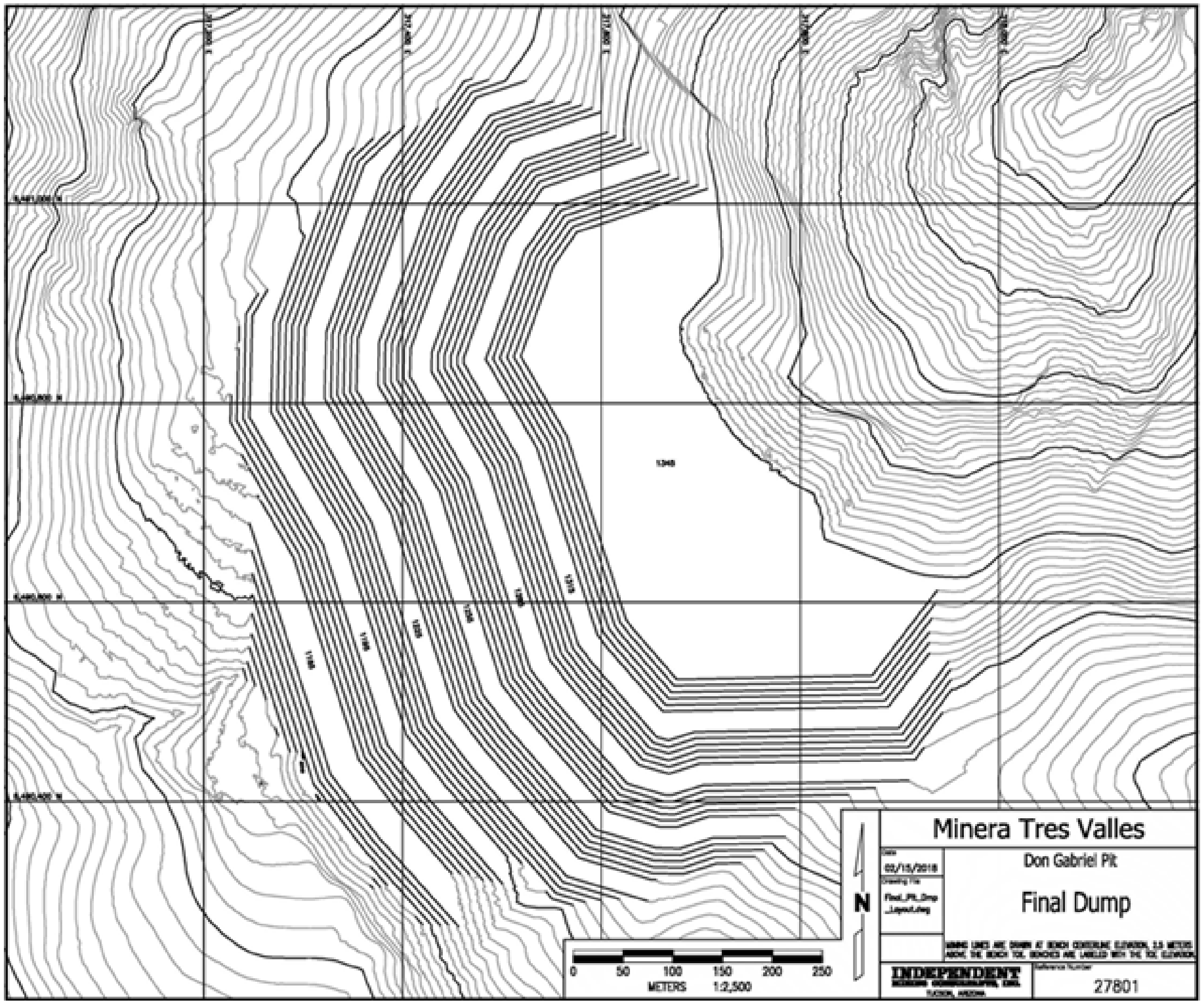
A waste rock storage facility (WRSF) was designed for the Don Gabriel open pit. Based on the mine production schedule, the total waste rock volume is anticipated to be about 22 Mt. It was reported to IMC that the following parameters were specified in the environmental impact statement (EIS) regarding the facility:

- Maximum lift height of 30 m
- Lifts at 38° angle of repose
- Setbacks between lifts to achieve final overall slope of 28°.

Figure 16-15 shows the WRSF design. Figure 16-16 shows the WRSF along with an approximate final pit design. Note the figure shows a discontinuity in the topography where two different topographic datasets were joined.

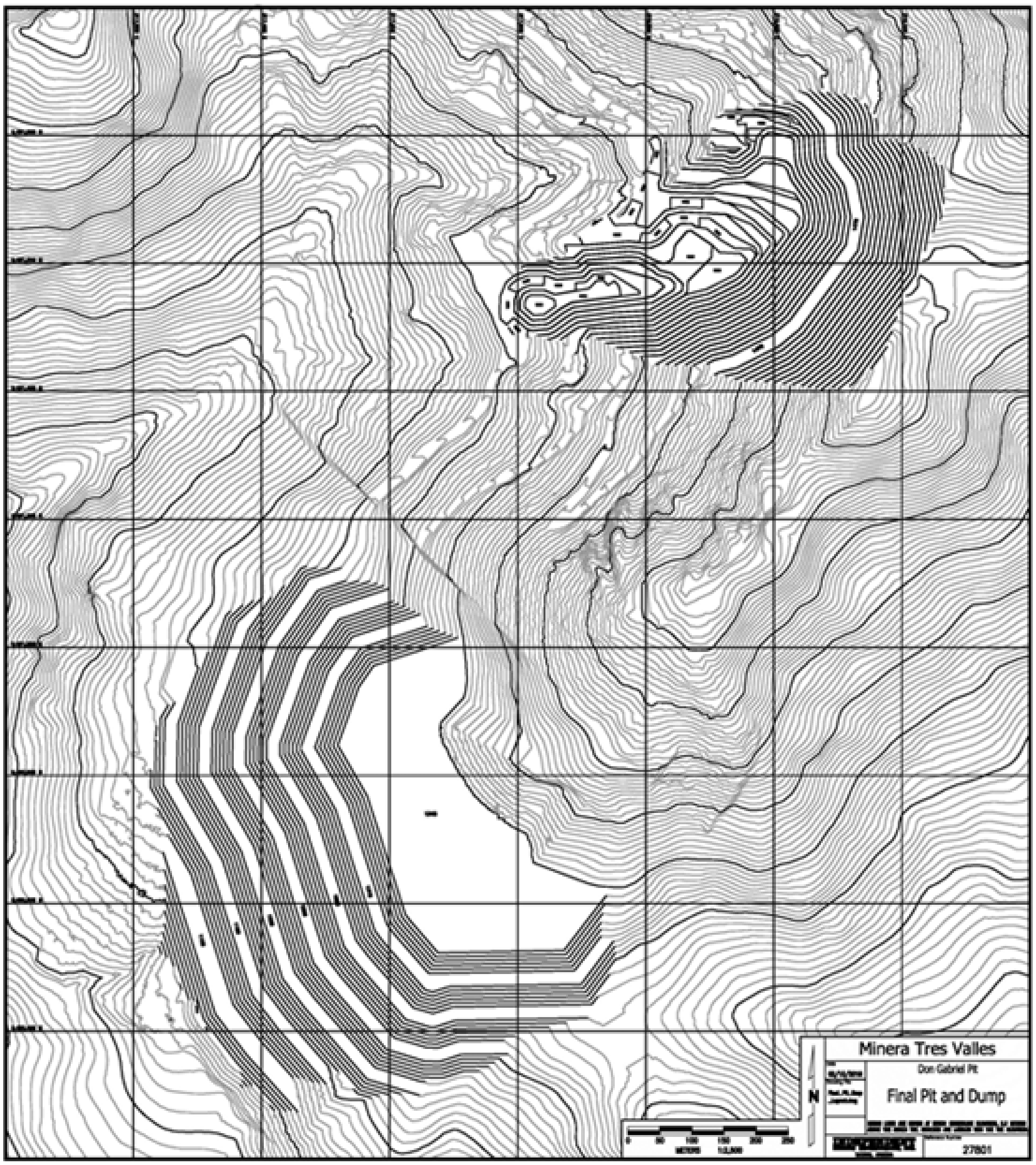
The filling curve for the facility is summarized in Table 16-5.

Figure 16-3: Don Gabriel Waste Storage Facility



Note: Figure prepared by IMC 2018.

Figure 16-4: Final Don Gabriel Pit and Waste Storage Facility



Note: Figure prepared by IMC 2018.

Table 16-5: Filling Curve for Don Gabriel Waste Storage

From Elevation	To Elevation	Tonnage (kt)	Cumulative Tonnage (kt)
1125	1165	833	833
1165	11994	2,104	2,937
1195	1225	3,599	6,536
1225	1255	4,633	11,169
1255	1285	5,487	16,656
1285	1315	6,337	22,993
1315	1345	5,670	28,663

The design has a capacity of about 28.7 Mt, more than is currently required. The facility would only be stacked to the 1285 lift to accommodate the projected 22 Mt of waste.

16.2.7 Open Pit Mining Equipment

Contract mining is planned for Don Gabriel. The following is a list of major mining equipment that IMC would consider typical for this project size.

- Two blast hole drills capable of drilling 8.9–12.7 cm holes (3.5–5 inches)
- Two shovels/excavators of approximate 4 m^3 capacity.
- 12 to 15 trucks of approximate 32 t capacity
- Two-wheel dozers – Caterpillar D9 class
- Two motor graders – Caterpillar 14H class
- One-wheel dozer – Caterpillar 824 class
- One backhoe of approximate 1 m^3 capacity
- One water truck of 50,000 L capacity

A mixed fleet size is used with larger equipment for waste mining.

16.3 Papomono Masivo

Caving and stoping mining methods were analyzed, assessing low mining cost and high dilution ratio scenarios versus higher mining cost and lower dilution ratio scenarios. Studies completed by INGEROC in 2013 had recommended the combined use of sub-level caving and inclined block caving methods for the recovery of

Papomono Masivo sector. Further analysis and independent reviews by Wood supported the original INGEROC recommendation, based on:

- Financial considerations
- Deposit geometry
- Geotechnical (geomechanical) characteristics.

16.3.1 Geomechanical Considerations

Three dominant fault systems are present:

- Manquehua fault: This structure strikes N20W, and dips to the east (60° to 85°). Geomorphologically, this structure gives rise to the Quebrada Manquehua and Quebrada Cárcamo, which are oriented along the same strike direction as the fault. A corridor of intense fracturing approximately 200 m to 400 m wide is associated with the fault. The fault displacement has not been defined

- Papomono fault system: N40W striking structure (320°), with a variable dip from 60° to 90° to the west. The fault zone forms a 10–50 m wide structural corridor of intense fracturing. Displacement along the fault has not been determined

- East–west faults: Approximately 1 m wide east–west to northeast-striking structures, with subvertical dips. The sense of movement is apparently normal; the faults have limited continuity, and they become discontinuous when intersecting the northwesterly-striking structures.

Subsidence

For the subsidence analysis of the inclined block caving, the following parameters were considered:

- Density of caved material: 2.0 t/m^3
- Height of caved material: 70 m
- Depth: 200 m
- Laubscher Rock mass rating (RMR_L): 27.

Thus, the cave factor is 20.74 and the cave angle is 75°. The subsidence zone is a function of rock mass quality in terms of the MRMR[1], the subsidence for a MRMR of 20 is 50 m extent.

[1] Mining rock mass rating which has additional factors used to decrease or increase the Laubscher's rock mass rating or RMR_L

Rock Mechanics

A summary of the statistics of rock mass classifications of Papomono Masivo deposit from the logging data are shown in Table 16-6 for each domain.

Table 16-6: Summary of Rock Mass Classification

	Inside Papomono Fault			Outside Papomono Fault			Inside Mantos Zone		
	Q	RMR_{89}	RMR_L	Q	RMR_{89}	RMR_L	Q	RMR_{89}	RMR_L
Number of Values:	1000	1000	1000	8082	8082	8082	513	513	513
Min Value:	0.03	29	21	0.02	35	25	0.07	33	24
Lower Quartile:	0.82	37	26	0.89	47	34	1.06	46	33
Median:	1.85	41	29	1.73	51	38	1.80	50	37
Upper Quartile:	3.17	46	33	3.03	56	43	2.90	55	42
Max Value:	15.83	59	47	17.64	81	85	9.30	72	67
Mean:	2.27	42	30	2.28	52	40	2.15	51	39
Std Deviation:	1.96	6.2	5.2	2.06	7.0	8.0	1.56	7.6	8.0
Variance:	3.86	37.8	26.6	4.24	49.0	64.2	2.45	57.6	63.7

Caveability and Fragmentation of Inclined Block Cave

The fundamental viability for the use of the inclined block caving mining method is that the rock mass will fail and cave for a given area opened (critical hydraulic radius at caving) with subsequent growth of the cave upwards (advance vertically with the draw of material) such that the cave is self-sustaining until it reaches the surface or breaks all of the in-situ orebody column.

There are two conditions in caving mechanics (Brown, 2004): in a stress cave, the cave advance is vertically upward and in a subsidence cave, the cave advance is sideways. At the start of a new sector the caving advance is general vertically upwards.

A caveability assessment was undertaken using Laubscher's empirical stability chart version 2001 (Brown, 2004), based on worldwide experience on caving and stable situations in terms of the hydraulic radius (area divided by perimeter) for a range of MRMR values.

To estimate the required minimum hydraulic radius (HR = area/perimeter) of the footprint required to initiate caving (self-sustaining to surface), a RMR_L value of 27 will be used for the start of caving. Assuming that the initial caving front will be polygonal, an A-type curve will be used.

Thus, to determine the required HR, the RMR_L was adjusted based on the following criteria of weathering, orientation of structures, induced stresses and blasting type:

- Weathering (30–100): Dry conditions are expected; the adjustment parameter is 90%
- Orientation of structures (63–100): Considers the presence of three structural sets and two of these are not vertical. With these parameters, the adjustment is 80%
- Induced stresses (60–120) and blasting (80–100): For rock mass caveability evaluation purposes it was assumed that neither of these variables had an influence.

Based on these adjustments the MRMR (caveability) is determined to be 20. Thus, from the caveability chart (Laubscher, 2011), the critical HR to initiate caving for the Papomono Masivo rock mass is 9 m.

16.3.2 Mining Layout of Inclined Block Cave

A work plan was derived, based on the following concepts:

- Investment limit: Project initial infrastructure (civil and mining) whose costs should not exceed US$10 million as the initial capital cost, excluding mobile equipment
- Attain a production capacity of 2,000 t/d.

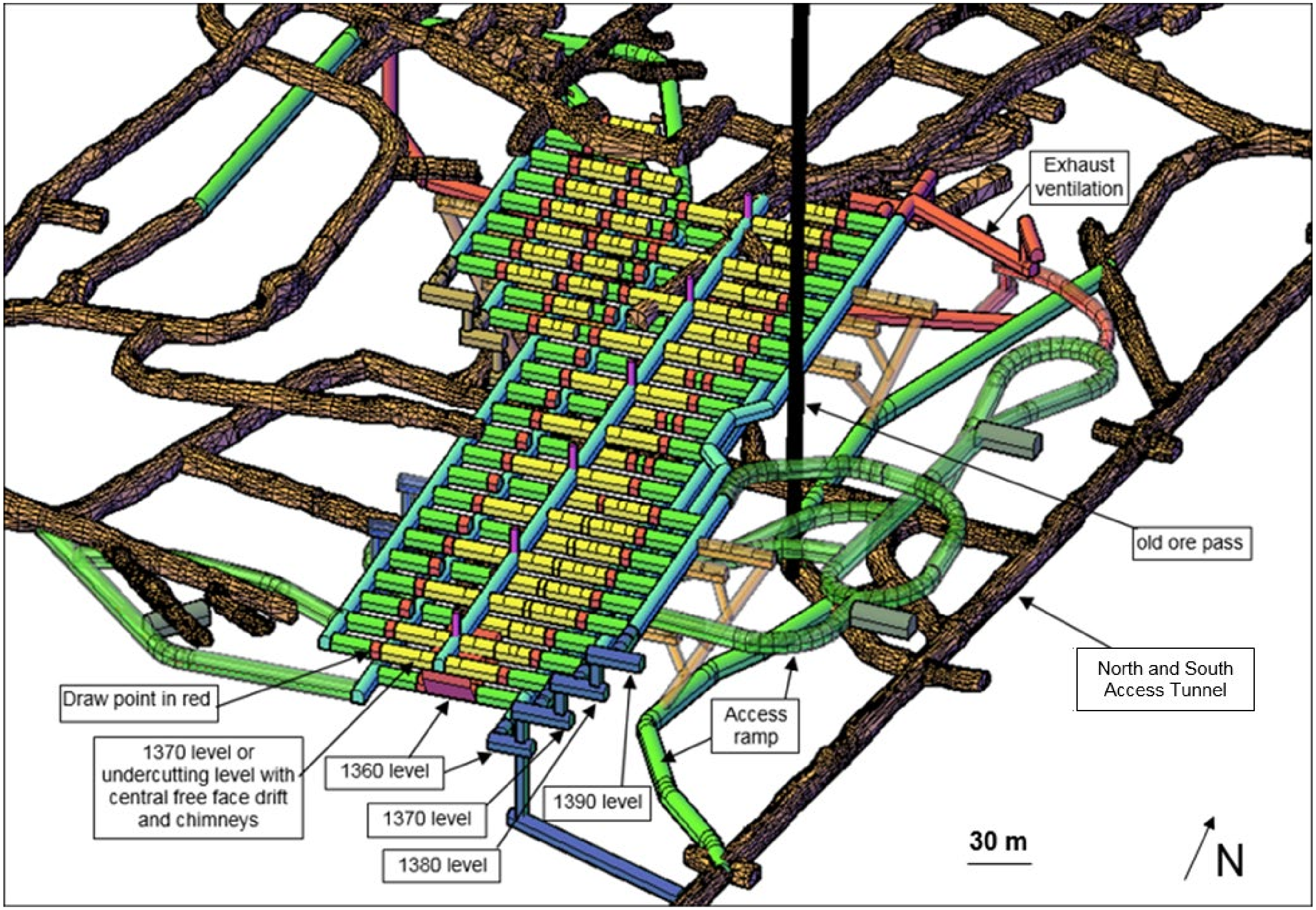
Design of the first phase must allow for flexibility of construction of the second phase. The base of the Papomono Masivo inclined block caving layout was a 10 x 10 x 10 m operational grid with 130 draw points and five levels. The two-phase plan consists of:

- Prepare a sufficient and minimum base area to ensure caving with HR = 9 m, i.e. an area of 3,000 m^2 plus a supplemental area to ensure continuity of development. The initial caved area corresponds to a zone 60 m long by 50 m wide, which results in a HR of 13, exceeding the minimum HR of 9 m which will assure the starting and propagation of caving. Besides this initial area, the adjacent drifts will also be developed so as to ensure uninterrupted operations while the second phase is being developed
- The initial area is bigger than what is strictly needed for caving in order to achieve the initiation and propagation of the caving with a limited extraction, and to allow for the gradual fracturing and collapse of the cave back without producing cavities in the cave vault, to prevent potential air blasts

- Develop the second phase after verifying the initial caving, until the total area to be mined using 130 draw points is reached.

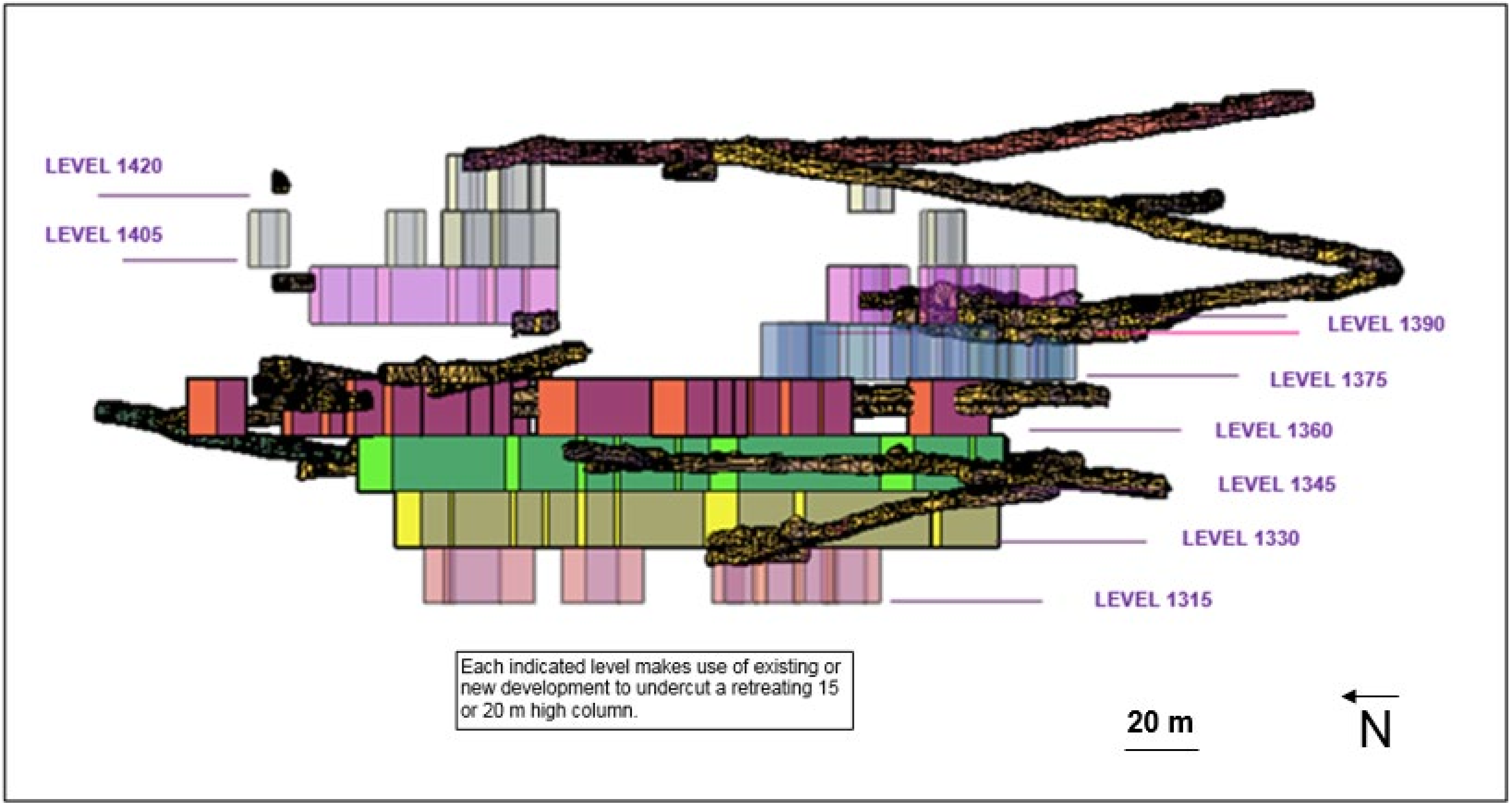
Figure 16-5 is a layout plan for the inclined block cave. Figure 16-6 is a layout plan for the proposed front cave operation.

Figure 16-5: General Arrangement of the Mine Design for the Inclined Block Caving



Note: Figure prepared by Wood, 2018.

Figure 16-6: General Arrangement of the Mine Design for the Front Caving



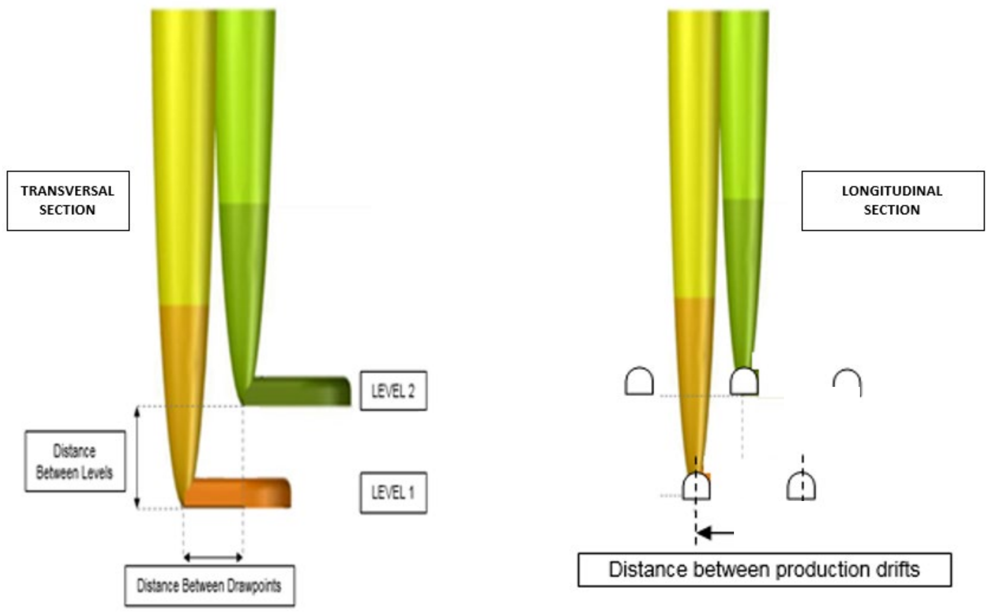
Note: Figure prepared by Wood, 2018.

16.3.3 Extraction Level and Drawpoints

Mining Grid Sizing

According to numerical simulation results carried out for the rib pillar and crown pillar, three types of mining grids will be required, which have the three dimensions indicated in Figure 16-7.

Figure 16-7: Inclined Block Caving Mining Grid Distances

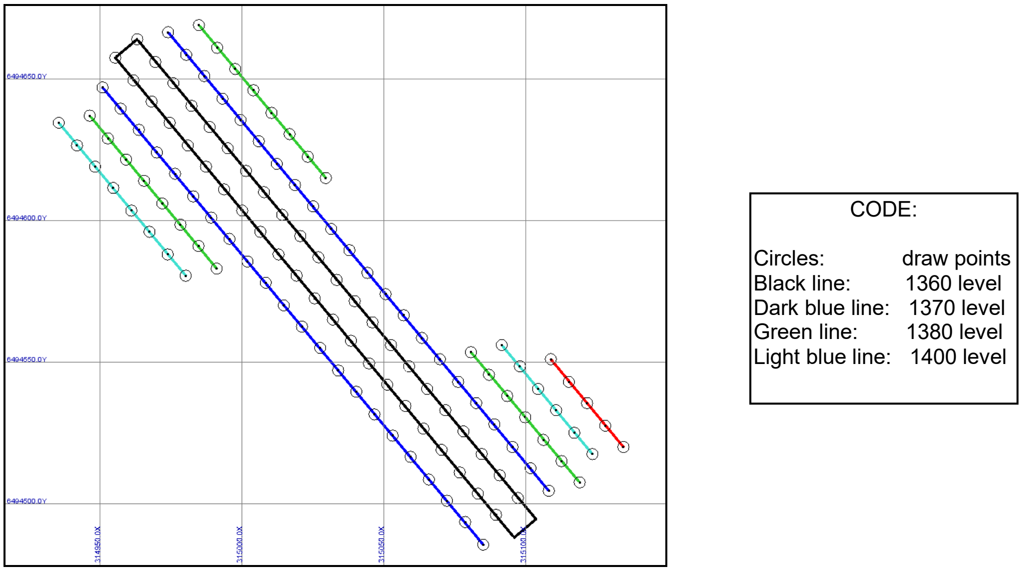


Note: Figure prepared by Wood, 2018. Dark colors represent the high interaction zone; Light colors represent the projection through the extraction elipsoid.

The mine design was optimized to regularize the footprint limits, and define the areas needed for caving. The design has 130 drawpoints on five levels (Figure 16-8). Several drawpoints were not included in the final design for the following reasons:

- Isolated points
- Low column height (constrained to 20 m minimum)
- Additional costs of access development to specific points
- Layout regularization.

Figure 16-8: 10 x 10 x 10 m Operational Grid



Note: Figure prepared by Wood, 2018. Grid in UTM coordinates.

For this footprint, the available tonnage was estimated based on the final drawpoints and levels (see Table 16-7). Figure 16-9 shows the draw heights (HOD) calculated for each draw point.

Table 16-7: Mineralization within the 10 x 10 x 10 m Operational Grid

Grid	Total Draw Points	Economic Draw Points	Average Benefit (US$/t)	Tonnage (kt)	Dil_rcuslt (%)	NSR (US$/t)	Dilution (%)
10 x 10 x 10	130	130	42.12	2,827	1.08	55.51	36

Notes:

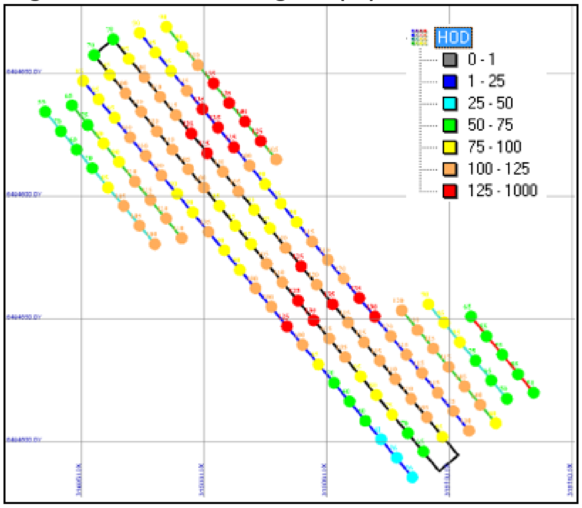
1. The benefit of each column is calculated on a marginal basis by subtracting the extraction and process cost on a $/t basis plus the preparation cost on a $/m^2 basis, from the net revenue produced by the metal content of the tonnage extracted from the column. Column height is defined by the maximum profit calculated for each column. The average benefit is the average of the 130 draw points considered. No capital costs are considered in this calculation.

2. "% Dil_rcuslt" is the diluted copper grade (after applying Laubscher's volumetric dilution model) including the metallurgical recovery obtained in the chloride leaching process

3. NSR is the per tonne benefit after applying smelter, refining and selling costs

4. Total dilution calculated using Laubscher's volumetric dilution model in the PCBC software runs, which accounts for low grade or zero grade material incorporated into the in-situ material above the cut-off grade.

Figure 16-9: Draw Heights (m), 10 x 10 x 10 m Operational Grid



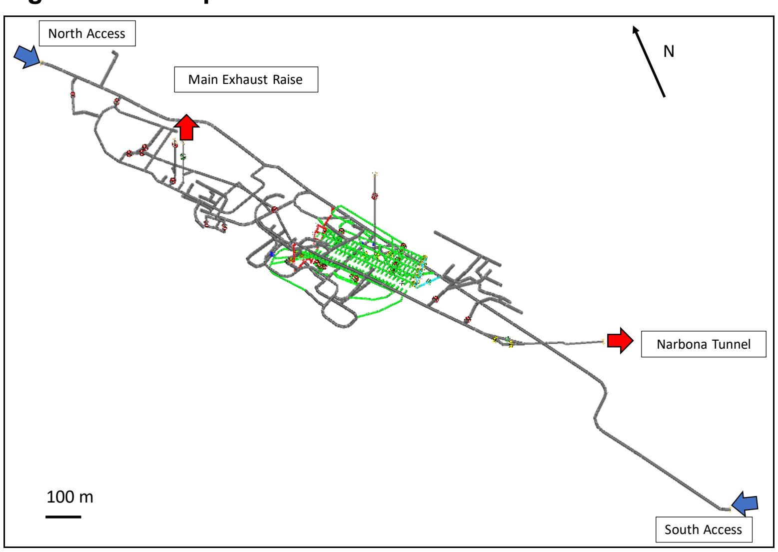
Note: Figure prepared by Wood, 2018.

16.3.4 Ventilation

The ventilation strategy for the inclined block cave maintains existing fresh air intakes from the North and South portals (Figure 16-10).

Vitiated air will be exhausted through a new adit that will be located at the "Narbona" tunnel. The main existing ventilation raise will be used as an exhaust system to serve the mine main access and the haul truck circuit (Figure 16-10).

Figure 16-10: Papomono Mine Air Intake and Outlet

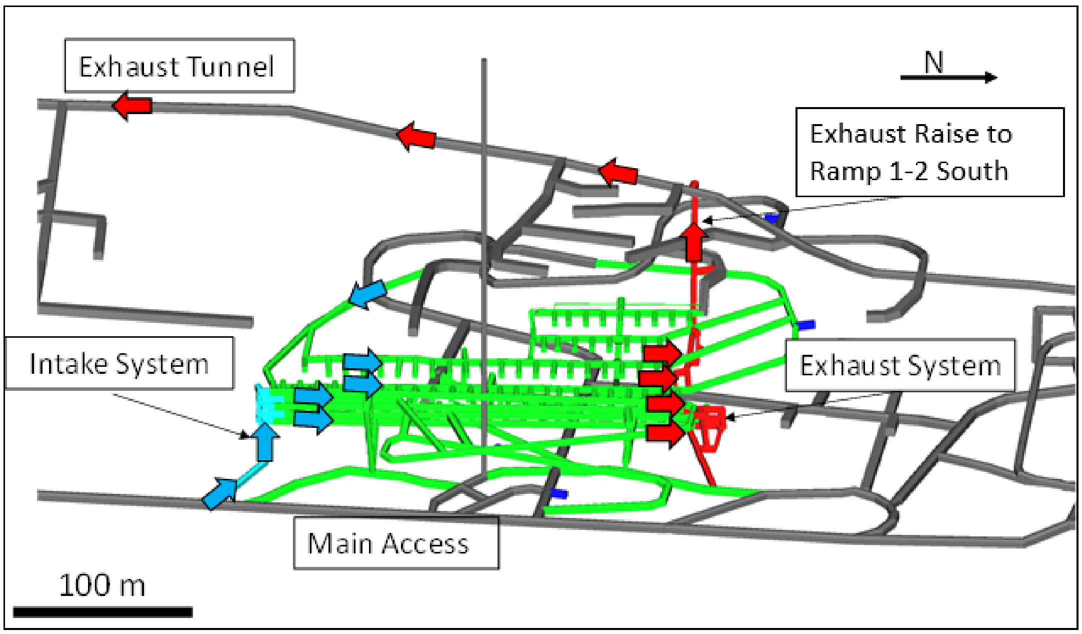


Note: Figure prepared by Wood, 2018

The total air requirement for the project is estimated at 103 m^3/s. The air will be taken from the main access to be distributed to the different levels in the southern area by the local air intake system consisting of galleries, raises, secondary and ancillary fans.

The exhaust will be through a raise connected to the northern area with the main extraction gallery to surface. This is illustrated in Figure 16-11.

Figure 16-11: Papomono Inclined Mine Air Intake and Outlet



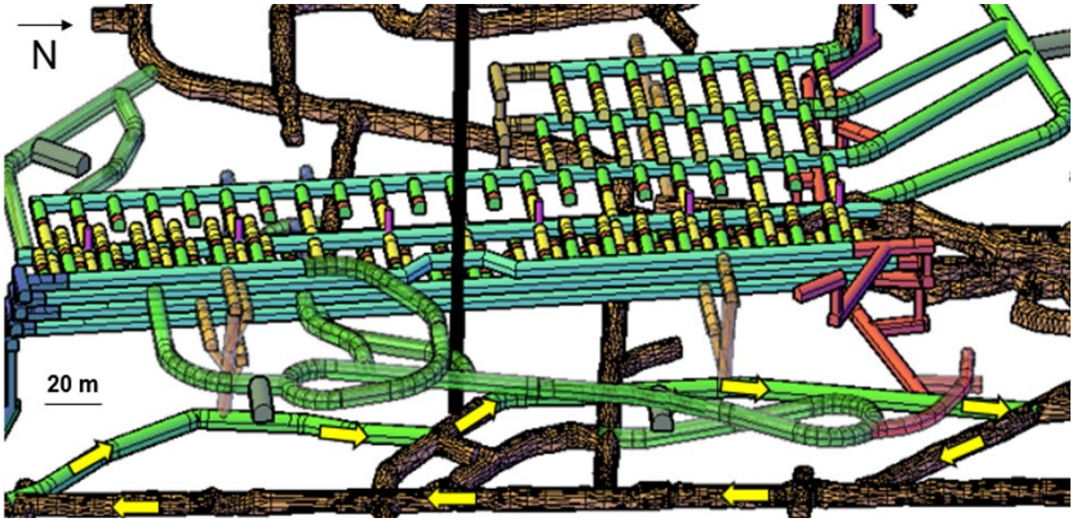
Note: Figure prepared by Wood, 2018

16.3.5 Material Handling

The material handling system assumes extraction using mining by means of 3.5 yd^3 load-haul-dump (LHD) equipment, conveying ore from the mining points to ore passes that will be located in the main haulage tunnel. These ore passes will include a grizzly, regulating ore size to 80 cm maximum and the eventual use of an existing mobile hammer for secondary reduction.

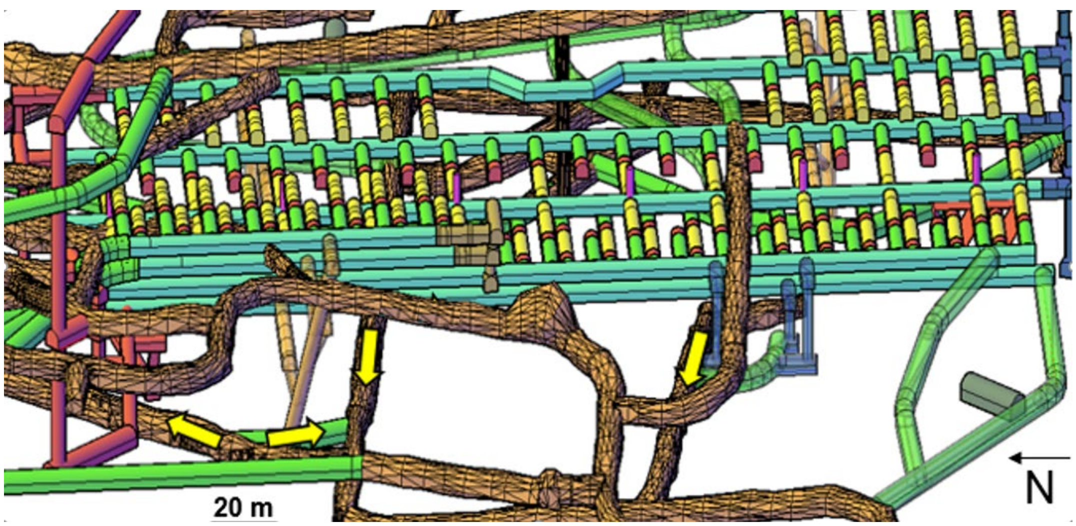
The ore passes will have a diameter of 3 m and will be arranged every 80 m. Each of these ore passes will discharge the ore directly to the floor of a cross-cut. A front-end loader will load the 30 t trucks which haul the ore from the mine to the plant. The truck routes are shown in Figure 16-12 and Figure 16-13.

Figure 16-12: Truck Routes for East Side



Note: Figure prepared by Wood, 2018

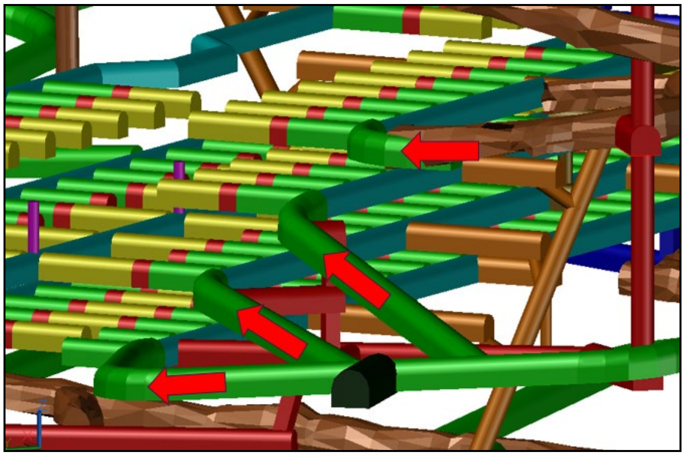
Figure 16-13: Truck Routes for West Side



Note: Figure prepared by Wood, 2018

Figure 16-13 shows routes to the four levels in the west sector. Access to these levels is on the north side. Figure 16-14 shows routes to the four levels available in the east side. Access to these levels is from the south sector.

Figure 16-14: Access to Production Levels, West Sector



Note: Figure prepared by Wood, 2018

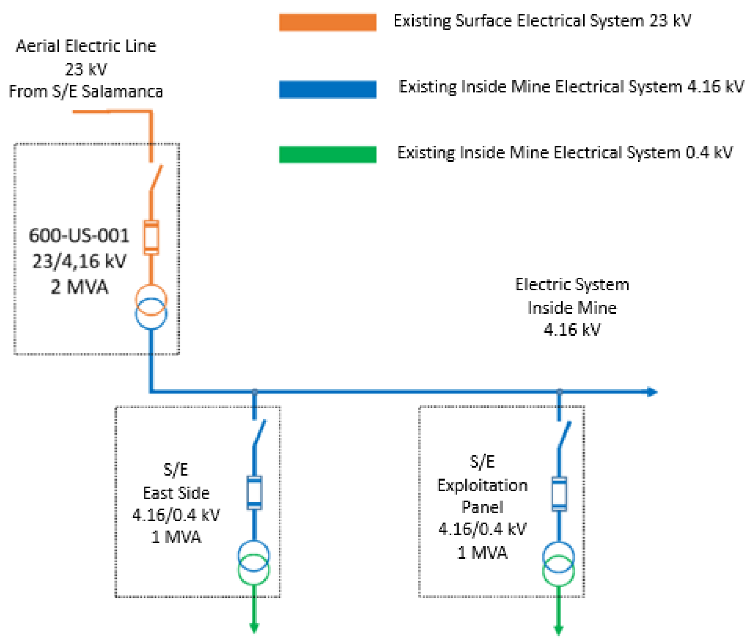
16.3.6 Power Supply

The power supply for the new Papomono Masivo sector power line will be an extension of the existing line, supplied by the Electrical Substation (ES) of 2 MVA; 23/4.16 kV, located in the south mine portal. The ES is currently supplied by a 23 kV overhead distribution line, coming from the Salamanca Substation (S/E) that is owned by the CGE power supply company. Per a Technical Memo from Wood, issued to MTV on January 19, 2018, this line has a capacity of 1,000 kVA. The current capacity is enough for the mine plan execution. Figure 16-15 shows the topology of the current power supply at the mine.

Description of the Proposed Power Supply

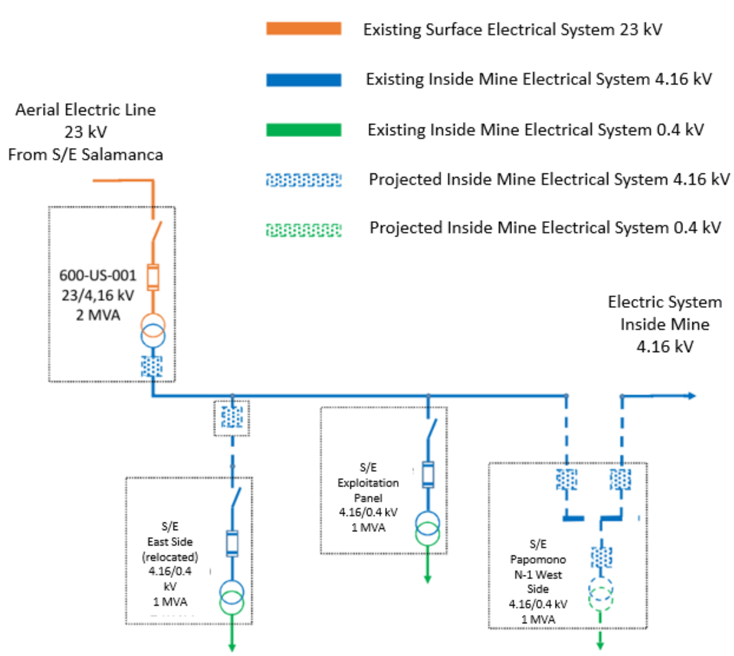
As reported by MTV, the existing charges and those projected for the new power line four-year operation, the Papomono Masivo demand will be around 1.35 MVA during the first three years of simultaneous activities by the current underground mine and the construction of the Papomono Masivo caving operation. The proposed topology for power supply is shown in Figure 16-16.

Figure 16-15: Existing Topology



Note: Figure prepared by Wood, 2018

Figure 16-16: Topology of Proposed Power Supply



Note: Figure prepared by Wood, 2018

16.3.7 Papomono Masivo Production Schedule

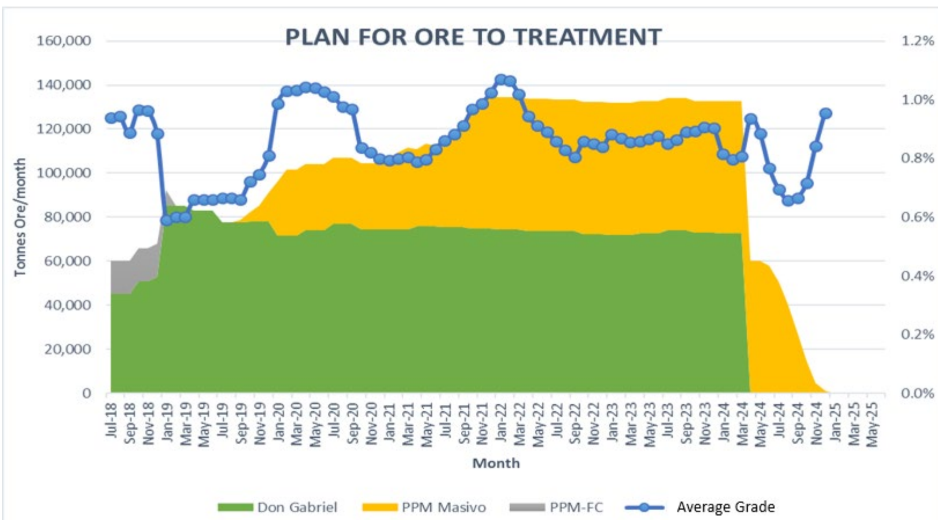
Table 16-8: Papomono Masivo Production Schedule

Year	Tonnage (t)	TCu (%)	dil_rcuslt (%)	Copper (t)
2019	259,950	2.06	1.59	4,130
2020	415,811	1.54	1.18	4,912
2021	694,586	1.73	1.30	9,026
2022	720,000	1.25	0.84	6,077
2023	688,849	1.36	0.88	6,033
2024	47,880	0.73	0.45	215
Total	**2,827,075**	**1.51**	**1.08**	**30,393**

16.4 Mine Plan

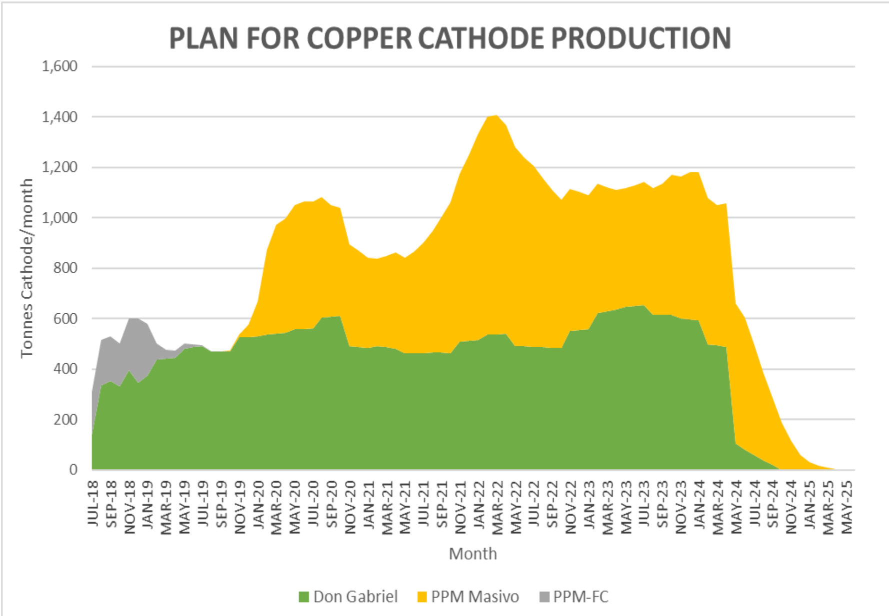
The mine production plan (mine plan) is shown in Figure 16-17 and Figure 16-18.

Figure 16-17: Mine Production Plan



Note: Figure prepared by Wood, 2018. PPM = Papomono; FC = front caving.

Figure 16-18: Cathode Copper Production from the Mine Production Plan

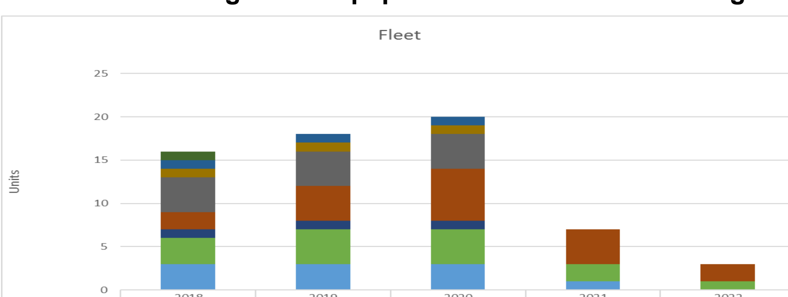


Note: Figure prepared by Wood, 2018. PPM = Papomono; FC = front caving.

16.5 Underground Equipment Fleet

The equipment fleet required for the underground mine plan (inclined and front caving) is summarized in Table 16-9. The following equipment is included: raise borer; scaler (RL852TSL2.6); concrete mixer (DB-260 Basic); dumper (truck; MT-2010); scoop (ST-1030); radial drill (H-1254); long hole drilling jumbo (Boomer 282); and drill rig (DE130).

Table 16-9: Underground Equipment Fleet for Front Caving and Inclined Block Caving



	2018	2019	2020	2021	2022
Raise Borer	1				
RL852TSL2.6	1	1	1		
DB - 260 Basic	1	1	1		
MT- 2010	4	4	4		
ST-1030	2	4	6	4	2
H-1254	1	1	1		
Boomer 282	3	4	4	2	1
DE130	3	3	3	1	

Year

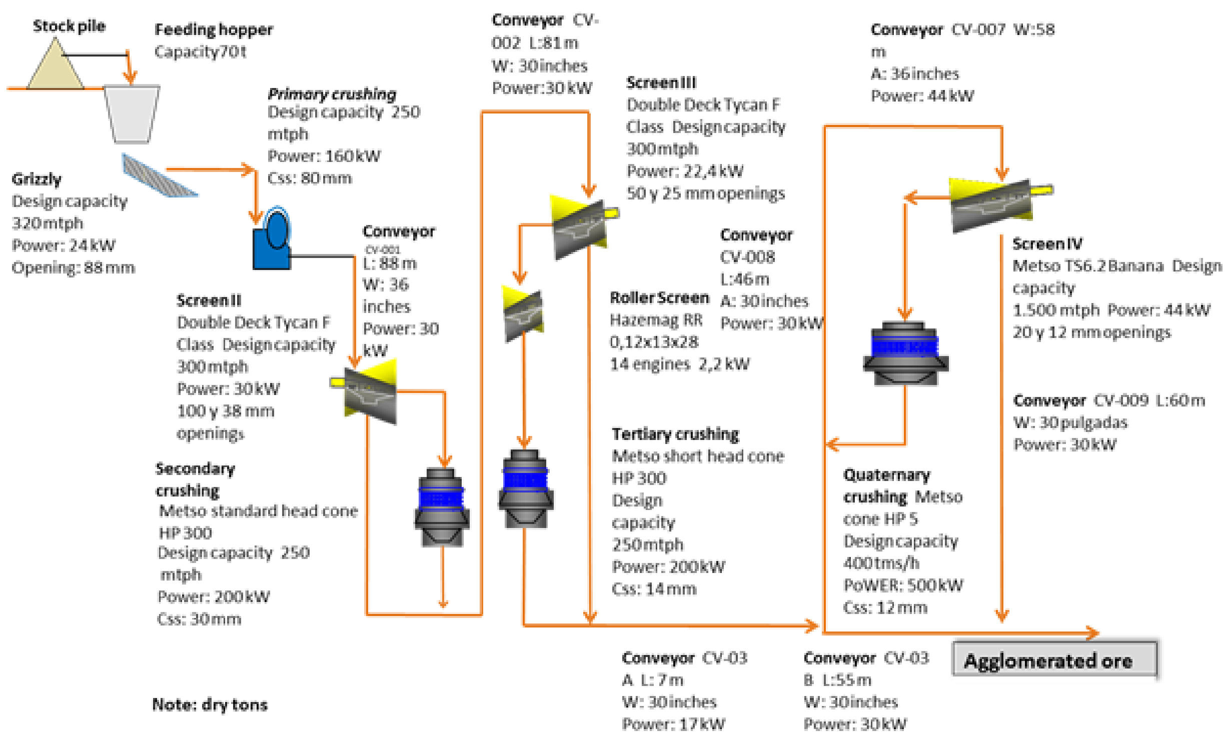
Note: Figure prepared by Wood, 2018

17.0 RECOVERY METHODS

17.1 Current Process Description

MTV currently produces high-grade copper cathodes using a heap-leach and SX/EW process. Ore (and toll treated material) is stockpiled above the crusher, and is loaded into a primary jaw crusher, secondary cone crusher, and tertiary and quaternary crushers; these crushers reduce the rock to fragments to a target size distribution 80% <6.4 mm (¼"). Figure 17-1 shows the crusher flowsheet.

Figure 17-1: Crusher Flowsheet

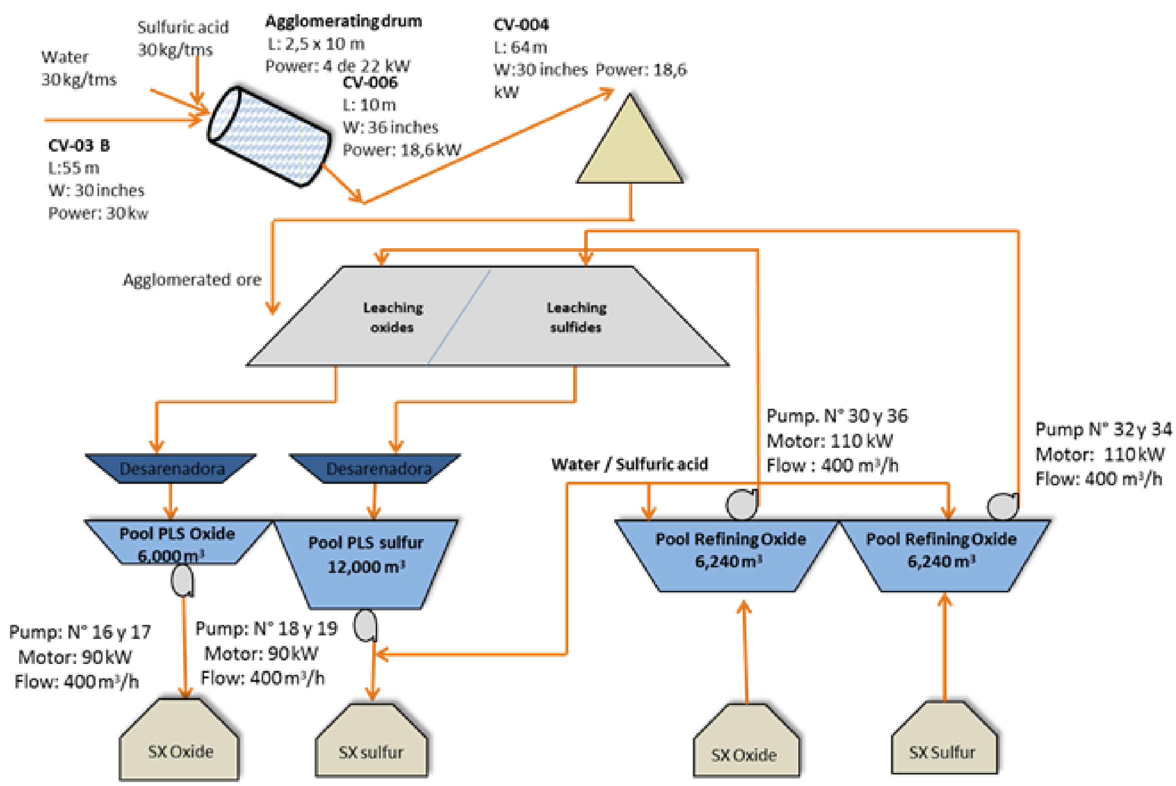


Note: Figure courtesy MTV, 2017

The crushed material is agglomerated, and water and acid are added to commence the leaching process. The agglomerated material is trucked to the heap leach area and stacked by front-end loaders. A grid of hoses with drippers is placed over the heaped material and the first phase of intensive leaching to recover the oxide mineralization during the first three-month period commences using constant and high acid-concentration irrigation. The product of this first leaching stage is the "oxide-pregnant leach solution" (oxide-PLS), which has a high copper content and is accumulated in a pond at the bottom of the leach pads. For the subsequent six months, the material is irrigated on an intermittent basis, with lower acid concentration to extract the copper from sulphides (chalcocite, covellite and some bornite). The resulting PLS (sulphide-PLS) is stored in another pond. Figure 17-2 shows the flowsheet for the agglomerator and leaching process.

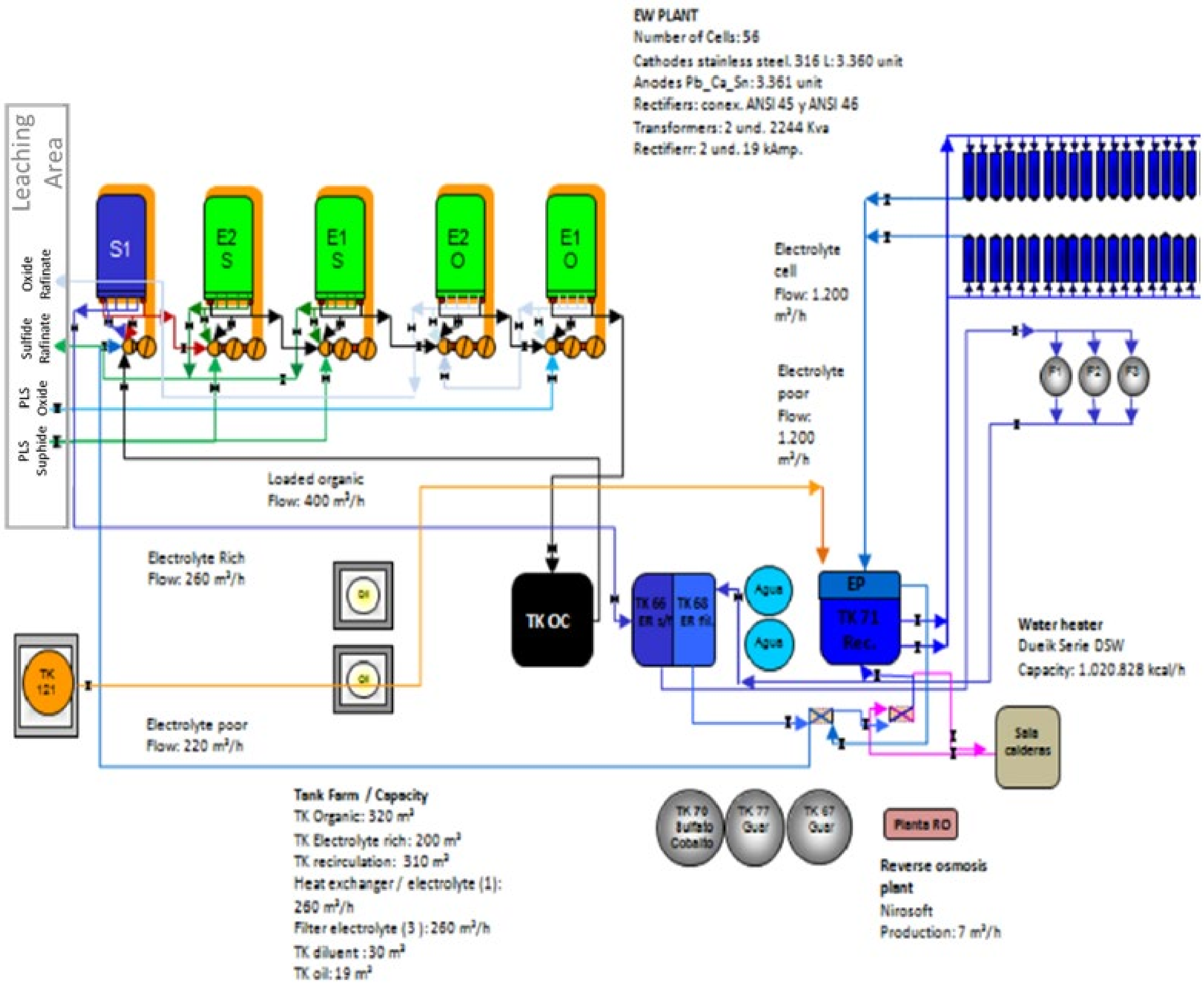
The oxide- and sulphide-PLS are pumped to the SX plant where organic resins are used to capture the copper ions in the solution, over the course of several stages. The copper is stripped from the organic resins and the resulting highly concentrated solution (electrolyte) is sent to the EW plant where an electrolysis process is responsible for the deposition of metallic copper over steel plates. Pure copper sheets (cathodes) are separated from the steel plates in a semi-automatic stripping machine. The cathodes are then stored in a finished goods inventory. Figure 17-3 shows the flowsheet for the SX/EW plant.

Figure 17-2: Flowsheet for Agglomerator and Heap Leaching



Note: Figure courtesy MTV, 2017

Figure 17-3: Flowsheet for SX/EW Plant



Note: Figure courtesy MTV, 2017

17.2 Historical Plant Performance

After passing through a series of improvements and adjustments in 2011–2012, the then three-stage crushing plant nameplate capacity was reached in September 2012. The crusher operated above nameplate for the next eight months, demonstrating that it could easily maintain a production rate of over 5,500 t/d. The maximum throughput was reached in April 2013, with an average of 6,164 t/d.

A 400 t/h quaternary crusher was commissioned in August 2013. This addition had been envisaged in the original Project environmental license (RCA), and was included to decrease the crush size and improve recovery. The crusher produced 3,505 t in an eight-hour single shift in August 2013, indicating that the newly-installed capacity could support production >7,000 t/d. However, additional permitting will be required to support such a throughput rate for an extended period of time. Table 17-1 shows crusher plant production by year for 2010 through December 31, 2017.

Cathode production reflects the crushing and heap stacking performance. In November 2012, 1,331 t of cathode was produced, representing 89% of the EW plant capacity. The total plant cathode capacity has not yet been achieved because 2012, the last year of full production, had the lowest average copper grade of 1.0% TCu. The results do show that the MTV plant is capable of operating at maximum capacity in all its stages: crushing, agglomeration, leaching, PLS pumping, extraction and electrowinning. Table 17-2 summarizes cathode production by year for 2010 through December 31, 2017. It does not account for additional recoverable copper available in that plant as of that date.

Table 17-1: Crushing Plant Throughput

Year	Crushed & Stacked Ore (dmt)	Copper Grade			
		Total Copper (% TCu)	Acid Soluble Copper (% ASCu)	Cyanide Soluble Copper (% CNCu)	Residual Copper (% RCu)
2010	46,682	1.24	0.51	0.67	0.07
2011	992,179	1.20	0.80	0.28	0.11
2012	1,737,696	1.02	0.67	0.25	0.11
2013	1,569,583	1.06	0.73	0.23	0.10
2014	556,898	2.00	1.84	0.07	0.09
2015	281,602	1.84	1.62	0.12	0.10
2016	436,677	1.30	0.78	0.38	0.14
2017	663,921	1.17	0.66	0.36	0.15
Total	**6,285,238**	**1.22**	**0.86**	**0.25**	**0.11**

Table 17-2: Historical Cathode Production

Year	Copper Fines in Treated Ore (tCuf)	Copper Cathode Production (tCuf)	Annual Copper Recovery (%)	Accumulated Copper Recovery (%)
2010	581	247	42.56	42.56
2011	11,862	8,839	74.51	73.02
2012	17,721	14,029	79.17	76.63
2013	16,628	12,473	75.01	76.06
2014	11,144	8,238	73.92	75.65
2015	5,185	5,771	111.29*	78.57
2016	5,672	5,395	95.11	79.94
2017	7,782	5,951	76.46	79.58
Total	**76,575**	**60,942**	**79.58**	**79.58**

Note: *During this year the plant was recovering the inventory accumulated in the heap in the last four years.

17.3 Chloride Leach Process Description

MTV set up a pilot plant on site during 2015 to evaluate optimum operational parameters; the plant was subsequently expanded. It currently comprises twelve 3 m high columns, twelve 1 m high mini-columns, and four 20 m x 20 m heap leach pads.

Different salt oxidant agents were tested. Salt water has been used in agglomeration in a number of Chilean operations, e.g. the Spence mine, owned by BHP, and the Michilla, Antucoya (owned by Antofagasta plc) and Mantos de la Luna mines.

MTV engaged Propipe to undertake a PFS level study on the chloride leaching process. The following is a description of the flowsheet that Propipe developed for the project, which was approved by MTV's Board to be implemented during the first half of 2019.

There were no changes proposed to the crushing plant; the feed would be processed in four stages to reduce the feed size to an 80% < 6.4 mm (¼").

Once crushed, the feed material will be sent via belt to an agglomeration system where water, sulphuric acid and salt (dosage 18 kg/t NaCl) will be added. Additive proportions will depend on the amount of sulphidation of copper species required, and the amount of stabilization needed for the fine particles. The agglomerated material will then be transported to the heap leach pads. The heaps will be rested for 30 days and kept wet to prevent the upper layers from losing moisture, which would damage the leaching process. After 30 days, the pads will be irrigated with raffinate solutions (acid solutions), in order to extract the contained copper. The leaching process includes chemical leaching stages for a period of 30–90 days for oxidized feed material, and 120–150 days for the sulphide feed with salt.

A raffinate-oxide solution will initially be applied to the heaps, and followed, for the sulphide feed with salt material, with raffinate-sulphide solution application. The collected PLS will be concentrated and cleaned in the leach circuit, using an SX process. The resultant electrolyte will be processed using EW to form a high-quality copper cathode.

The design assumes the following:

- Maximum flow rate of 400 m^3/h of PLS generated by the leaching of oxide copper (PLS-oxide), with average concentration between 2.2–3.7 g/L Cu and 0.5–1.5 g/L H_2SO_4

- Maximum flow rate of 800 m^3/h of PLS generated by the leaching of sulphide copper (PLS-sulphide), with an estimated average concentration between 1.8–3.5 g/L Cu and 0.5 to 1.5 g/L of H_2SO_4.

The two circuits will be operated in parallel with the mixer-decanter equipment, with a total design flow of 400 m^3/h each. The plant initially had four extraction phases and a re-extraction phase:

- E1: oxide
- E2: sulphur
- E3: sulphur
- E4: oxide
- S: re-extraction.

As operations progressed, the design was modified to include a wash phase (L) in place of an extraction phase. In the PFS for the chloride leaching process, a second wash step to control chloride levels was proposed, and the extraction system under that scenario would include:

- E1: oxide
- E2: sulphur
- E3: sulphur
- S: re-extraction
- L1: wash
- L2: wash.

The extraction facilities were designed with a flexible piping array to allow further modifications of the flowsheet such that there would be two oxide extractions, two sulphide extractions, one re-extraction, and one wash phase, increasing the flowrate of PLS to the SX facility. This re-design will support potential future expansions beyond the planned 18,500 t/a copper production rate. It also provides process stability when using salt, and supports the coalescer operation.

The SX plant will use conventional mixer settlers. In the mixers, the mixture of the aqueous and organic phases will be produced by a dispersion of one phase in the other, thus allowing the chemical transfer of the copper. Controlled drop size agitators will be used to avoid ultra-fine drops.

The organic reagent to be used is highly selective for copper, so any impurities in the leaching solution will return to the circuit until equilibrium is reached for each of the impurities. This step will use coalesce units, where the organic phase will be loaded upwards through a coalescer bed consisting of a hydrophobic, high porosity, specific surface material. Water droplets will coalesce, decant, and fall to the base of the coalescer, and be removed. Clean organic will leave from the top of the coalescer unit. The units were sized to the proposed flowrates and chloride abatement requirements defined in the process mass balance. Benchmarking to other operations using saltwater leach was undertaken; these do not use coalescer tanks despite several of the benchmarked operations having high chlorine levels.

Three organic coalescer units will be available, with two in operation, and one on stand-by. The loaded organic will be sent to a coalesce tank to remove the entrained aqueous phase contents (raffinate solution). The loaded organic will then be washed, sent to a second coalescer stage, and finally, sent to the re-extraction stage (copper discharge stage) where, due to a pH change, a copper-rich acid electrolyte will be produced. The electrolyte will be sent to the EW plant.

The planned reagent concentration in the organic phase will be ≤20% v/v (volume/volume), to allow for a 90% copper recovery in the leaching area from the PLS-oxide and PLS-sulphide solutions.

The SX plant will have a cleaning system using electrolyte filters to ensure residual organic is not forwarded to the EW plant. A recovery system for organic phase and solids trapped in a residue (crud) operates via a mechanical rupture plant. Organic content recovery in the crud will be undertaken using tricanter centrifuge to separate each of the organic, aqueous and solid phases. Recovered organic will be cleaned by applying clay in a stirred tank and subsequent separation of the phases through a filter press.

The tank farm is situated at a lower elevation between the SX and EW plants, to allow gravity solution feed in case of plant outages, such as power failure. This area includes a recirculation tank, electrolyte filters, waste recovery system, heat exchangers, centrifugal circulation pumps for electrolytes and organic. The coalescer units will be adjacent to the tank farm.

17.4 Upgrades to Existing Plant

No significant operational upgrades are required to the existing plant to accommodate chloride leaching. The proposed equipment requirements will include the following.

A salt metering and transport system is required to add salt to the existing agglomeration drum. The dosing system will consist of a volumetric, screw-type doser, that will be fed from a hopper mounted below the storage building floor level. The feeder will discharge onto a high-slope (36º) conveyor belt that will transport the salt to the existing ore-feed box, in the agglomeration drum.

A new mixer–settler will be needed for the washing stage. A new decanter, with primary and secondary mixers, similar to existing equipment, will be used. The piping requirements needed to support the mixer were included in design considerations, as were connections to existing piping.

Coalescer units are planned to be constructed adjacent to the tank farm, between the farm and the cathode storage area. The water supply for backwash and an air supply line are included in the plant design.

17.5 Consumables, Power and Water Requirements

Sulphuric acid consumption is estimated at about 39,000 t/a, assuming chloride leaching. This is expected to result in significant savings when compared to the current acid-leach process.

Salt consumption is projected to be 15,000–41,000 t/a, averaging 30,000 t/a.

Based on historic usages, and assuming that the plant will operate close to maximum capacity, the water consumption should be around 34,600 m^3 per month, which represents a flow between 13 and 17 L/s. This is considerably below the existing water rights and the current water pumping capacity.

MTV is connected to the Chilean power grid, and operates under a take-or-pay contract with a specific minimum consumption, with KDM Energía, a local bio-gas power producer. The current contract is through May 31, 2024. It is reported by MTV that this contract costs US$210,000 per month and the minimum consumption is 65 MWh/d. Based on minimum consumption this amounts to about $0.11 per kwh, a reasonable rate. As of the effective date of the Report, MTV was slightly below the minimum requirement.

18.0 PROJECT INFRASTRUCTURE

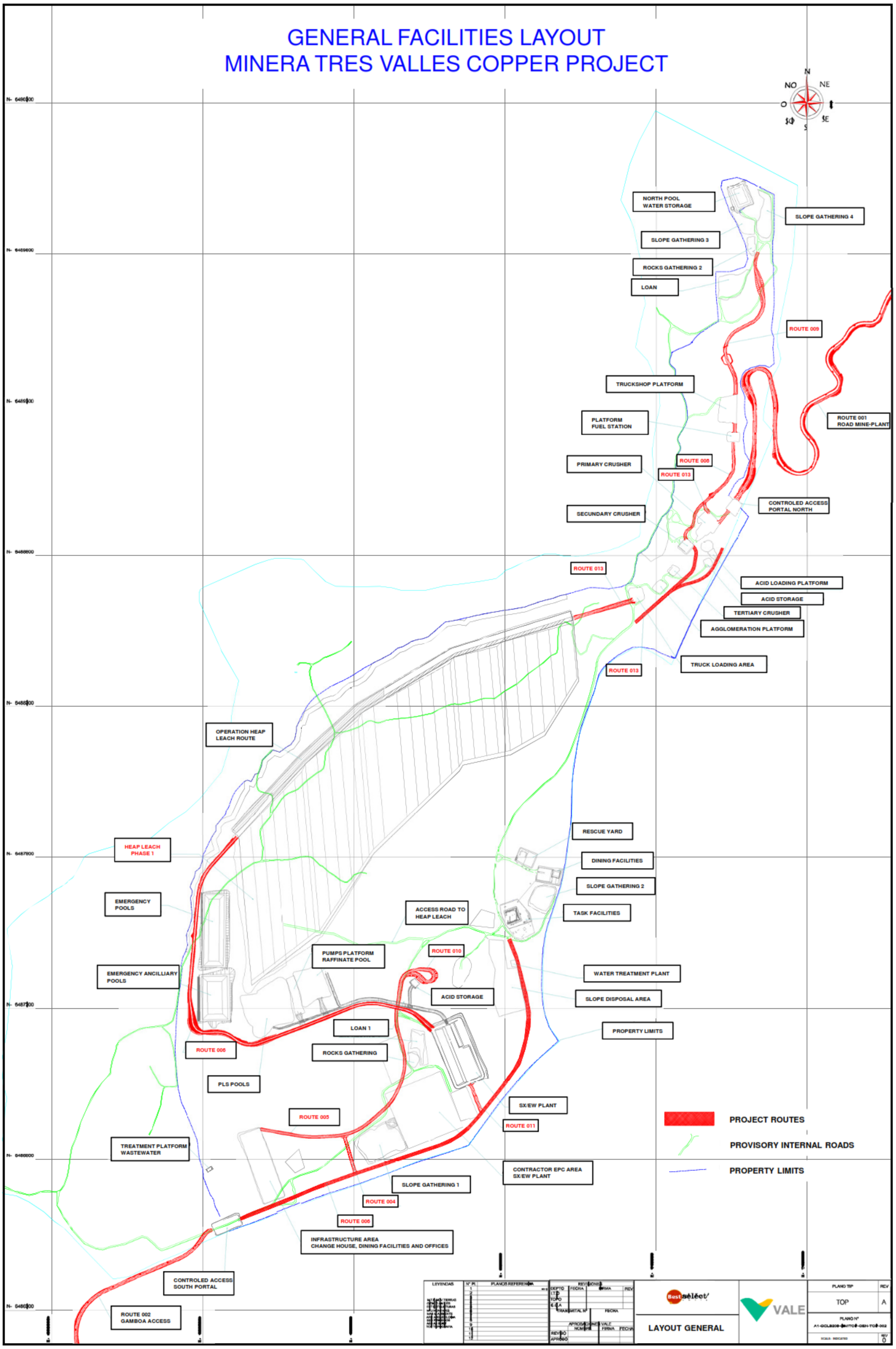
18.1 Introduction

The major infrastructure required for the Don Gabriel open pit and Papomono Masivo underground projects (mine plan) has been completed, and consists of:

- Access roads
- Process plant
- Administration, warehousing, emergency, and maintenance facilities
- Power and water supply and related distribution infrastructure
- Water management and ventilation infrastructure for the underground operations
- Waste rock storage facilities (WRSF)
- Explosives storehouse (magazine)

A site plan showing the key infrastructure and locations of the plant and surface facilities are shown in Figure 18-1.

Figure 18-1: General Facilities Layout.



Note: Figure courtesy MTV, 2018.

18.2 Road and Logistics

MTV has approximately 27 km of private roads, including 5 km of high-quality dirt road connecting the D-81 paved road to the plant. Another 12 km of roads connects the plant to the Papomono mine, and a further 5 km of road connects the Don Gabriel mine to the Papomono road. All these roads are covered by access easements with the owners of the surface rights. A final 5 km of internal roads are constructed inside private lands owned by MTV in the Quilmenco Valley.

The underground and open pit operations are connected to the process plant via gravel roads. Consumables are transported along these roads, and the roads are used by light vehicles and 32 to 42 t haul trucks.

Workers are transported in buses from Illapel and Salamanca to the mine or plant facilities as appropriate. Copper cathodes will continue to be shipped to San Antonio, by the contractor that is mentioned in Section 19.

The water pipeline and the power line run from the Chalinga Valley directly to the Quilmenco Valley, through the La Antena Hills (Figure 18-2). Additional information on Project accessibility is included in Section 5.

Figure 18-2: Surface Infrastructure

Note: Figure courtesy MTV, 2018.

18.3 Power and Electrical

18.3.1 Power Supply

MTV is the owner of a 4.6 km-long 23 kV overhead power line that runs from the El Tebal Sub-Station (operated by "Compañía Nacional de Fuerza Eléctrica" (CONAFE)) to the plant.

18.3.2 On-site Distribution

Power is distributed through 220 kV/35 kV transformers which provide power to 35 kV substations to supply the concentrator ring loads, including primary crushing, conveying and selected infrastructure. There is overcapacity. The distribution system is implemented in Papomono Masivo and the installed capacity is sufficient for the underground mine.

18.4 Mine Infrastructure

Mine infrastructure is mainly concentrated in the north portal area. The facilities include a camp that was originally installed by the El Dial Consortium, which includes geology, mine engineering, surveying, and mine management offices, the first-aid post, canteens and locker rooms for employees. During the preparation of this Report a portion of the north portal facilities was being transferred to a rented property, "El Canelo", halfway between the Papomono and the Don Gabriel deposits.

The mine maintenance workshops is also situated at the north portal facility, as are the mine warehouse and the fuel station. The offices are connected to the national power grid and have internet and telephone access.

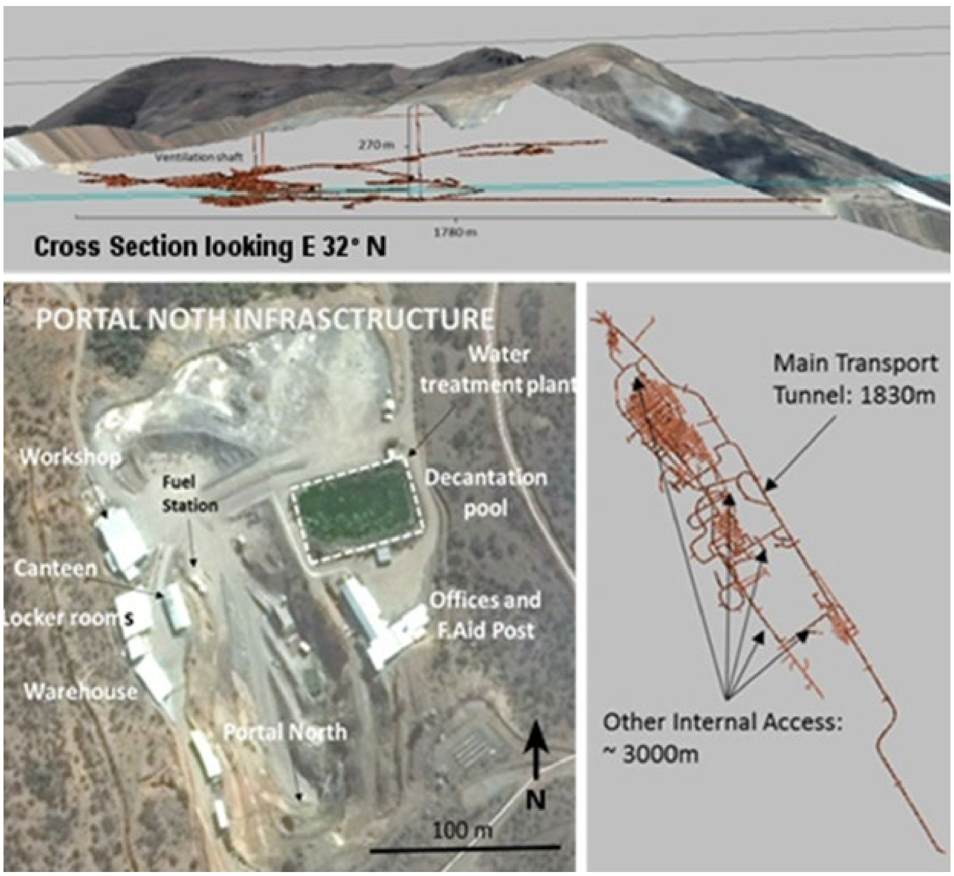
The waste rock storage facility (WRSF) for the Don Gabriel open pit is described in Section 16.2.6. The WRSF area contains a small amount of waste from previous mining activities. There is sufficient capacity in the facility for the planned life-of-mine (LOM).

A water treatment plant has been constructed to treat water coming out of the underground mine. This consists of two decantation concrete cells, a 55 x 30 m fine material decantation pool, and an automatic neutralization plant, which brings the water to neutral pH before discharging it into a creek from an agricultural community.

The Papomono Masivo underground mine includes a main transportation tunnel of 1,830 m length, which crosses the hill from one side to the other. It starts in the north portal, at 1,470 m.a.s.l. and finishes at the south portal, at 1,315 m.a.s.l. The main tunnel is fully lit.

The underground mine includes ventilation infrastructure and a ventilation shaft in the northern part, with an exhaust fan, compressed air, power stations and transmission system, pumping stations, and internal radio wire-antenna. More than 3,000 m of development in the north, central and south part of the deposit is in place and used during the current exploitation.

Figure 18-3: Infrastructure of Papomono Mine.



Note: Figure courtesy MTV, 2017. Top: Long-section showing the main tunnels and shafts, related to topography; Bottom, left: Satellite image showing the main facilities at Portal North. Right: plan view showing all underground workings.

19.0 MARKET STUDIES AND CONTRACTS

MTV produces finished copper cathode from the property. MTV has an existing contract with Kalkos Mineria y Metales (Kalkos) for services associated with the transportation of copper cathodes and sulphuric acid supplies. Kalkos undertakes annual negotiations with logistics operators on behalf of MTV, in areas such as:

- Shipping lines
- Warehouses
- Port terminals
- Container deposit terminals.

Kalkos also co-ordinates the receipt of applicable approvals from Chilean authorities for exports, and performs post-sale logistics services. This includes reporting on monthly shipment details, and annual marketing reports on target markets such as Hamburg, Rotterdam, Livorno and Salerno. Wood evaluated the 2017 cathode production in terms of the fees levied by Kalkos under the prevailing contract agreement. The charges appear to be reasonable.

19.1 Contracts

MTV entered into an off-take contract with WERCO Trading AG for a minimum delivery of 500 t of copper cathode per month at the end of 2016. The contract, expiring mid-2019, uses benchmark commercial terms and a standard business basis. Wood was provided with information on the pricing and added considerations (cost, insurance, and freight); the terms appear to be in line with Wood's knowledge of industry terms.

The mine is currently connected to the Chilean power grid and operates under a take-or-pay contract, with KDM Energía, a local bio-gas power producer. The contract requires a minimum consumption of 65 MW/day (approximately $0.11 per kW), and is in force until May 31, 2024. The mine usage is currently below the minimum daily consumption specified. When the current contract ends, or additional supply is contracted, there is potential for MTV to decrease its power costs, in line with changes occurring in the Chilean electric power market through reductions in power costs from renewable (wind and solar) power plants.

MTV has a tolling contract with ENAMI (a Chilean state-owned company). The ENAMI contract has the following main terms:

- MTV has committed to receive up to 15,000 t/month of feed material from ENAMI
- ENAMI pays MTV a tolling rate of US$27.50/t of material received. ENAMI provides, free-of-charge, sulphuric acid to treat this material, at a rate of 60 kg/t of feed material
- MTV delivers copper cathodes produced from supplied feed material to ENAMI, on the basis of a contractual metallurgical recovery of 78% of ASCu grade only. Any production in excess of 78% accrues to MTV.

MTV has signed contract and mobilized new contractors for Don Gabriel open pit and is requesting quotations for construction of Papomono Masivo underground development. The haulage unit costs used in the financial analysis are consistent with the contract terms in the new mining contract.

MTV have several existing contracts in place, including energy, explosives and sulphuric acid supply, catering, security, cathodes transportation, general services, environmental monitoring and toll-treatment.

19.2 Metal Prices

SRHI provided the forecast long-term copper price used for the mine plan of US$2.75/lb. This is within the range of what observes to be used by reputable sources in the mining industry. Wood's current assessment of industry consensus of long-term forecast price of copper for mineral reserves and financial analysis is US$3.00/lb. The US$2.75/lb copper pricing is considered to be acceptable for use in the Mineral Reserves and in the financial analysis in Section 22.

19.3 Cathode Sales

The commercial terms to be applied to copper cathode sales, based on current MTV sales terms and contracts and on standard commercial practices, were prepared and validated by MTV.

The costs indicated for premiums for quality, transport to port, discounts for freight and insurance (cost insurance and freight or CIF) destination port, sales commissions and financial cost, are considered by the QP to be reasonable and suitable for use in the financial analysis.

20.0 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

The Sustainable Development Policy focuses on three major areas:

- Environmental protection
- Community relations
- Safety.

In order to produce efficiently and carry out sustainable development goals, MTV already has a Foundation that works closely with the project's stakeholders (community members, employees, and shareholders) demonstrating mutual respect and careful management.

20.1 Permits and Environmental Licenses

The MTV operation is fully permitted with all necessary government and environmental licenses, including for the Don Gabriel open pit and Papomono Masivo underground operations.

Baseline studies were completed in support of Project permitting, and included the following areas:

- Climate;
- Geology;
- Geochemistry;
- Groundwater;
- Surface water drainage and topography;
- Biodiversity;
- Air quality;
- Heritage;
- Land use;
- Socio-economic.

Three "Resoluciones de Calificación Ambiental" (RCA) have been obtained.

RCA 012 Manquehua Prospecting Tunnel

RCA 012, which was granted in January 2007, is the result of an Environmental Impact Declaration (EID) submitted in October 2006. This declaration was submitted following discovery of copper mineralization in surface drill holes. The Manquehua Tunnel was an exploration decline, 1.14 km long and 4 x 4 m in diameter, used in support of mining studies.

RCA 283 Manquehua Prospecting Tunnel Modification

RCA 283 was granted in September 2008 to extend the Manquehua Tunnel to the south, joining the Cárcamo and Manquehua valleys. RCA 283 allowed the then owner, Vale, to construct a second, southern, entrance to the tunnel, which extended the tunnel length to 1.8 km. This level is currently used as the main transport level for the Papomono Masivo underground mine.

RCA 265 MTV Project

RCA 265 is MTV's comprehensive environmental license. This permit, which was approved in November 2009, sets out the environmental, safety and social requirements for the project for mine construction, operations, and closure for the Don Gabriel open pit and Papomono underground. RCA 265 is the result of an EIS that was presented by Vale in October 2008 and reviewed by the applicable public service agencies. This license dictates all processes carried out on the project site.

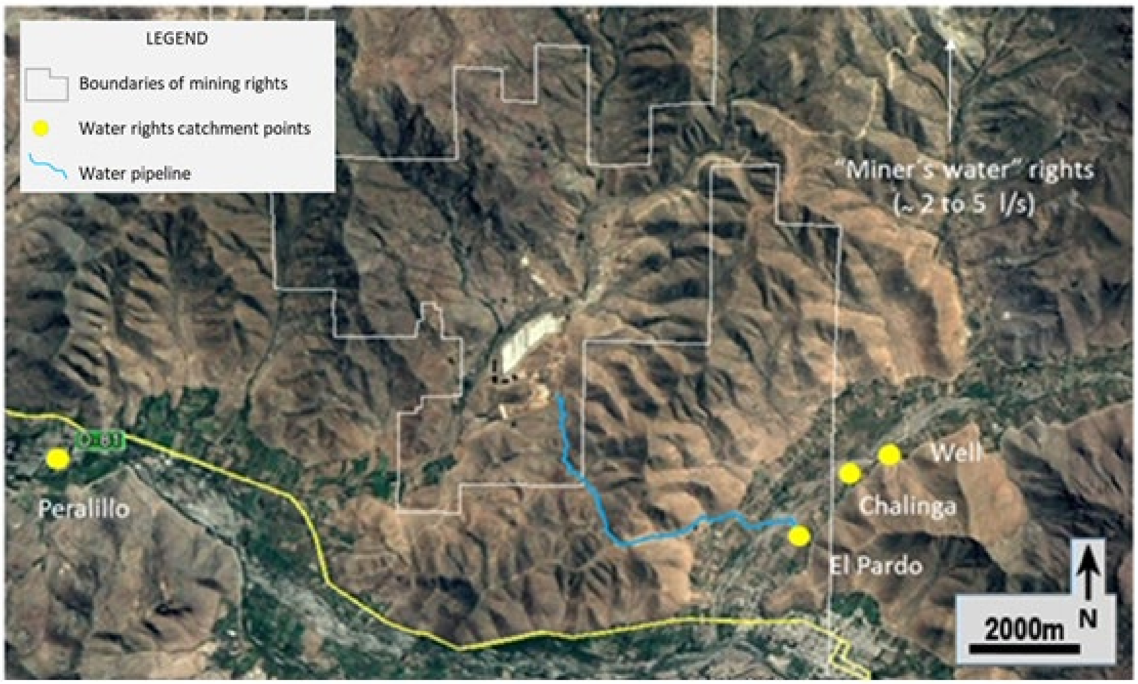
20.2 Water Rights and Use

MTV has rights to both surface and underground water sources. Water is transported throughout the property via pipeline, captured from canals belonging to two different surface watersheds, the Chalinga watershed and the Choapa watershed. The Choapa watershed, in particular, is a reliable water source even during the dry months in Salamanca. MTV also has well water rights and the rights to use underground water from the Papomono mine, which flows at a rate of approximately 2 to 5 L/s.

At full capacity, MTV mine will use about 20 L/s of water, which is less than a third of the water permitted through the available water rights. Figure 20-1 summarizes the water rights locations and extraction rates.

Figure 20-1: Water Rights

Well	Superficial			Total
	Canal El Pardo	Canal Chalinga (Cancha Brava)	Canal Peralillo	
9.00 L/sec	21.05 L/sec	21.42 L/sec	12.34 L/sec	63.81 L/sec



Note: Figure courtesy MTV, 2017.

The process plant operates with an exceptionally low water consumption, and MTV has won awards recognizing this achievement. Water flows through a closed-circuit system and almost all of the water that is used is recycled.

The leach pad irrigation system was designed so that the liquid solution goes directly into the material to be leached rather than being sprayed in the air on top of the material, thereby reducing evaporation. Total water consumption (including non-operational use) is around 0.11 m^3/t, which is among the lowest in Chile.

20.3 Community Relations and Social License

MTV's vehicle for social investment and community relations is the MTV Foundation, a non-profit charitable organization dedicated to improving the quality of life in the communities that are in the Project direct and indirect impact areas.

A five-member board of directors manages the Foundation. Two members are MTV representatives, and the remaining three directors represent each of the Chalinga, Cárcamo and Chuchiñí valleys.

The Foundation operates under a participation-based management model in which community organizations, with help from the Foundation, create project proposals and present them to the board. By requiring community participation, MTV is able to ensure that the projects that are funded are of the utmost concern for the people and that these projects have the greatest positive impact on the largest group of community members.

Between 2015 and 2017, 70 projects were funded by the MTV Foundation (Table 20-1).

Table 20-1: MTV Foundation Projects by Area, 2015-2017

Year	Number of Projects			
	Valley of Chuchiñí	Valley of Chalinga	Valley of Cárcamo	Total
2015	9	8	4	21
2016	8	9	4	21
2017	11	11	6	28

20.4 Mine Closure

Chilean law 20.551, dated October 28, 2011, established an obligation for all mining facilities that were processing more than 10 kt/month to have a closure plan.

MTV had presented preliminary closure plans and commitments prior to that date. These plans became the basis of the formal mine closure plan, prepared in 2016 by Arcadis Chile (Arcadis) using the 2011 law requirements.

Table 20-2 presents all the site closure commitments, consolidated in a report prepared by Arcadis (2016), together with the respective previous authorization resolution from the government authorities.

Table 20-2: Commitments for Closure and Respective Resolutions

Area	Commitment	Resolution)
Mines	Slope Stabilization	Res 0800/2010 PCFM
	Access closure	Res 0800/2010 PCFM
	Signals installation	Res 0800/2010 PCFM
	Adapt peripheral rain water channel	Res 0800/2010 PCFM
	Portals, adits and shafts closure	RCA 283/2008 DIA
Crushing Plant	Dismantling of installations/facilities	RCA 265/2009 EIA
	Transport of hazard/other waste	Res 0906/2010 PCFM

Area	Commitment	Resolution)
SX/EW/Lixiviation Plant	Peripheral channel around heap pads	Res 0008/2011 PCFM
	Heaps slope stabilization	Res 0008/2011 PCFM
	Flatness and compaction of heap top level	Res 0008/2011 PCFM
	Coverage of heap slope with stored top soil	Res 0008/2011 PCFM
	Heap spent ore rinsing (neutralization) for 1 year	Res 0008/2011 PCFM
	Heap toe wall construction	Res 0008/2011 PCFM
	Signals installations	Res 0008/2011 PCFM
	Dismantling of equipment and installations	RCA 265/2009 EIA
	Transportation of hazard/other wastes	Res 0906/2010 PCFM
	Pools closure with waste rock and leveling	RCA 265/2009 EIA
	Economic assessment for reprocessing spent ore	Res 0008/2011 PCFM
Waste Dumps	Adapt peripheral rain water channels	Res 0800/2010
	Slope stabilization (stability study)	Res 0800/2010
	Leveling and compaction of top platform	RCA 265/2009 EIA
	Revegetation of altered surfaces	RCA 265/2009 EIA
	Accesses closure	Res 0800/2010
	Safety Berm construction	RCA 265/2009 EIA
Infrastructure of Services	Dismantling of installations, deenergizing and surface leveling	RCA 265/2009 EIA
	Transportation of hazard/other wastes	RCA 265/2009 EIA
	Pools closure with waste rock and surface leveling	RCA 265/2009 EIA
	Access closure with barriers	RCA 265/2009 EIA
	Signals installations	RCA 265/2009 EIA

Unit closure costs were calculated by Arcadis, using the “Unidad de Fomento” (UF), an index which is adjusted daily using the Chilean inflation rate.

Arcadis calculated the unit costs for each activity, considering the direct costs for the necessary materials, equipment and man-hours, and adding general expenses and contractor profit margins. The closure plan includes the closure for the overall operations (including Don Gabriel and other open pit, and the underground mining zones). Administration costs such as Owners team, engineering studies needed for execution, and contingency are included. The plan also accounts for post-closure activities such as water monitoring during the year after closure and site inspections and maintenance for a three-year period after closure. Costs are summarized in Table 20-3

Table 20-3: Closure Costs

Stage	Item	Cost (UF)	Cost (kUS$)
Closure Stage	Total Direct Costs	103,351	4,584
	Total Indirect Costs	8,773	389
	Direct+Indirect Costs	112,124	4,973
	Contingencies (17.7%)	19,846	880
	Closure costs	131,969	5,853
	VAT (19%)	25,074	1,112
	TOTAL CLOSURE COST	**157,043**	**6,965**

Stage	Item	Cost (UF)	Cost (kUS$)
Post Closure Stage	Total Direct+Indirect costs	1,945	86
	Contingencies (15%)	292	13
	post closure cost	2,237	99
	VAT (19%)	425	19
	TOTAL POST CLOSURE COST	**2,661**	**118**

The closure cost is based on 26,966 pesos per UF, CLP 608 to the US$, and are current as of March 25, 2018. The closure cost in US$ is 157,043 x 26,966 / 608 = US$6,965,000.

Closure was projected to take 11 years, and a schedule for presentation of incremental Bank Guarantee Bonds was proposed, from 2016 to 2026, covering underground operations, including historical post-pillar zones, and open pit operations (e.g. Papomono Cumbres and Papomono Norte). The effective yearly cost for MTV, before mine closure, is the bank guarantee financial cost.

The mine closure plan was submitted to Sernageomin and approved on November 30, 2016.

21.0 CAPITAL AND OPERATING COSTS

Capital and operating costs in this section are based on open pit mining of the Don Gabriel Manto, and the Papomono Masivo inclined cave/front cave operation for the mine plan.

21.1 Capital Costs

The capital cost estimate is provided in Table 21-1. Costs are inclusive of mining costs, costs for the chloride leach process, sustaining capital considerations for the plant, and closure costs.

Table 21-1: Capital Cost Summary

	Property-wide				Mining Zones			
Year	Plant Salt Leach (kUS$)	Plant Sustaining Capex (kUS$)	Closure Costs (kUS$)	Sub Total (kUS$)	Don Gabriel Manto (kUS$)	Papomono Masivo IBC (kUS$)	Papomono Masivo FC (kUS$)	**Total (kUS$)**
2018	5,600	0	0	5,600	0	1,712	0	**7,312**
2019	1,400	497	0	1,897	0	6,071	0	**7,968**
2020	0	532	0	532	0	1,788	0	**2,320**
2021	0	497	0	497	0	3,967	0	**4,464**
2022	0	532	0	532	0	780	0	**1,312**
2023	0	497	0	497	0	0	0	**497**
2024	0	512	0	512	0	0	0	**512**
2025	0	427	0	427	0	130	0	**557**
2026	0	0	6,965	6,965	0	0	0	**6,965**
Total	**7,000**	**3,494**	**6,965**	**17,459**	**0**	**14,448**	**0**	**31,907**

Note: IBC = inclined block caving; FC = front caving. Capital costs shown for 2018 are those expenses projected to be incurred from July 2018 (month one for all cash flows considered in this Report) to December 2018. Each of the remaining years is a complete calendar year.

21.1.1 Don Gabriel Open Pit

Pre-stripping of a projected 2.67 Mt for the Don Gabriel Manto open pit is currently underway. At a unit cost of US$2.15/t mined, based on a quote from Vecchiola, the pre-strip is estimated at US$ 5.74 million. Table 21-1 does not show this amount as a capital expense, since it is included within the operating costs that are incurred from the beginning of the present year (2018). This is in line with previous presentations of the capital costs for the Don Gabriel open pit in Hester et al., (2018).

21.1.2 Papomono Masivo Underground Mine

Wood estimated the capital costs for the Papomono Masivo underground mine that are summarized in Table 21-2.

Table 21-2: Papomono Underground Capital Cost Estimate

Classification by Type	Equipment Fleet (kUS$)	Mine Development (kUS$)	Infrastructure (kUS$)	Indirect Costs (kUS$)	Contingency (kUS$)	Total (kUS$)
Papomono Masivo Inclined block caving	2,398	8,349	190	551	2,960	**14,448**
Papomono Masivo front caving	-	-	-	-	-	-

The front caving operation for a portion of the Papomono Masivo deposit is underway. Capital costs incurred prior to July 2018, the date of the cashflow analysis in this Report, consisted of US$487,000 in January 2018. The front caving section of the mine will operate until before the start-up of the inclined block caving operation. No capital costs are included in Table 21-2 as they are considered to be sunk costs.

21.1.3 Other Capital Costs

In addition to mining capital costs, the life-of-mine plan includes the following capital cost areas.

The plant and related infrastructure required for a plant throughput capacity of 6,000 t/d are in place, and the infrastructure is currently in operation. MTV has previously operated the plant at the 5,500 t/d rate, and this throughput value forms the basis of the mine plan.

The plant will be modified to accommodate salt leaching.

Propipe estimated that the modifications would be about US$6.9 million to complete. MTV revised the estimate slightly upward to US$7 million, during the plant construction bid process. The plant modifications are currently underway.

Sustaining capital provisions are related to the stay-in-business (SIB) costs estimated by MTV, based on the proposed electrode (cathode/anode) replacement and reagent stocking programs for the EW plant.

Closure costs were estimated as outlined in Section 20.6, and total about US$7 million, with a further US$0.2 million assumed to be required for post-closure monitoring.

21.2 Operating Cost

21.2.1 Basis of Estimate

Operating costs include:

- Mine operating costs
- Leach plant operating costs (from ore crushing to leach solution generation)
- SX-EW plant operating costs (solution purification and cathode electrowinning)
- General and administrative (G&A) costs.

The overall operating cost estimate is provided in Table 21-3.

Table 21-3: Operating Cost Summary

Operation	Units	Unit Cost	Nominal Production	Fixed Cost (kUS$/month)
Mine				
Don Gabriel open pit, ore mining	US$/t	2.35		
Don Gabriel open pit, ore haulage	US$/t	2.21		
Don Gabriel open pit, waste haulage	US$/t	2.15		
Papomono Masivo IBC	US$/t	11.29		
Papomono Masivo front caving	US$/t	18.00		
Plant, Leaching		**US$/t**	**t ore/month**	**kUS$/month**
Leaching Variable, underground	US$/t	5.10		
Leaching Variable, open pit	US$/t	5.19		
Leaching ENAMI tolling, Variable	US$/t	1.20		
Leaching, Fixed	US$/t	4.54	150,000	681
Plant, SX-EW		**US$/lb**	**t Cu/month**	**kUS$/month**
SX/EW, Variable	US$/lb	0.121		
SX/EW, Fixed	US$/lb	0.070	1,550	239
General and Administration		**US$/lb**	**t Cu/month**	**kUS$/month**
G&A, Fixed	US$/lb	0.225	1,550	769
Total Plant and G&A Fixed Cost				**1,689**

Mine operating costs are treated as variable costs per tonne of ore, and in the case of the open pit, per tonne of waste material mined. Plant costs have both variable and fixed cost components. G&A costs are considered to be fixed costs.

For the leach plant variable costs are expressed per tonne of ore, and for the SX/EW plant, costs are expressed per pound of cathode copper produced. G&A costs, although fixed, are also reported per pound of cathode copper produced.

Fixed costs for the existing process plant and G&A assume that the process plant is operated at full capacity. Costs will increase per tonne of ore mined if this assumption is not met.

21.2.2 Don Gabriel Open Pit

Open pit ore mining, waste mining/haulage, and ore haulage are those previously estimated in the Don Gabriel Feasibility Study by IMC.

21.2.3 Papomono Masivo Underground Mine

Wood estimated the operating costs for the Papomono Masivo underground mine at a Pre-Feasibility Study level. Mine operating costs were estimated in detail for the area of the Papomono Masivo deposit that will be mined using inclined block cave methods. Estimates included provision for annual personnel requirements, equipment fleet, blasting, haulage, maintenance, ore rehandling and other costs. These costs average US$ 11.29/t for the life of mine. Mining costs for the portion of the Papomono Masivo deposit that will be mined using front caving methods were estimated at US$18/t mined.

21.2.4 Plant and General and Administrative Costs

Plant and G&A costs are based on a 10-year plan prepared by MTV and supplied to Wood. Variable and fixed costs were estimated by MTV assuming 150,000 t/month ore processing rate, and production of 1,550 t Cu in cathodes. Table 21-3 shows the variable costs per tonne ore or pound of copper and fixed costs per month for the leaching process and SX/EW plants. Although fixed costs are also expressed per tonne or pound in Table 21-3 for illustrative purposes, in the cashflow analysis in Section 22, they are treated as fixed costs, applied per month or year, rather than per tonne or pound.

Variable leaching plant costs are given as per tonne ore in Table 21-3, because the different ores to be treated have different sulphuric acid consumptions. Material that is provided under the ENAMI toll-treatment agreement does not incur sulphuric acid costs, as ENAMI provides sulphuric acid at the rate of 60 kg/t material treated.

As noted in Section 21.2.1, fixed costs for the existing process plant and G&A assume that the process plant is operated at full capacity. Costs will increase per tonne of ore mined if this assumption is not met. For example, the fixed unit cost for the crushing and leaching plant is estimated at US$4.54/t, or US$681,000/month assuming a throughput of 150,000 t/month. If the throughput rate is lowered, the fixed unit cost will increase. Under the current operating throughput conditions of 100,000 t/month (⅔ of nameplate capacity), the fixed unit cost is US$6.81/t. This is 50% higher than the fixed unit cost rate when operating at nameplate capacity. The operating cost estimates, therefore, are sensitive to the throughput rate, and achieving the Project economic forecasts in this Report is dependent on attaining, and maintaining, the nameplate plant capacity.

The fixed unit costs of operation for the SX/EW plant are estimated at US$0.07/lb Cu. G&A fixed unit costs are estimated at US$0.22/lb Cu. These costs, on a monthly basis, are estimated at US$239,000 for the SX/EW plant, and US$769,000 for G&A.

Generally fixed costs are not dependent on production levels, within a certain range of variation, because such costs can be adjusted for lower production periods by, for example, reducing operating crews, administrative personnel, and curtailing expenses. Section 22 of this Report discusses the provisions made in the cashflow model for the last months of the mine life, where the plant will operate at a low throughput rate.

22.0 ECONOMIC ANALYSIS

22.1 Caution Statement

Certain information and statements contained in this section and in the Report are "forward looking" in nature. Forward-looking statements include, but are not limited to, statements with respect to the economic and study parameters of the Project; Mineral Resource and Mineral Reserve estimates; the cost and timing of Project development; the proposed mine plan and mining methods; dilution and extraction recoveries; processing method and rates and production rates; projected metallurgical recovery rates; additional infrastructure requirements or infrastructure modifications; capital, operating and sustaining cost estimates; the projected life of mine and other expected attributes of the Project; the net present value (NPV) and internal rate of return (IRR) and payback period of capital; capital; future metal prices; changes to the Project configuration that may be requested as a result of stakeholder or government input; government regulations and permitting timelines; estimates of reclamation obligations; requirements for additional capital; environmental risks; and general business and economic conditions.

All forward-looking statements in this Report are necessarily based on opinions and estimates made as of the date such statements are made and are subject to important risk factors and uncertainties, many of which cannot be controlled or predicted. Material assumptions regarding forward-looking statements are discussed in this Report, where applicable. In addition to, and subject to, such specific assumptions discussed in more detail elsewhere in this Report, the forward-looking statements in this Report are subject to the following assumptions:

- There being no signification disruptions affecting the development and operation of the Project
- The availability of certain consumables and services and the prices for power and other key supplies being approximately consistent with assumptions in the Report
- ENAMI delivering the contracted tonnage
- Labour and materials costs being approximately consistent with assumptions in the Report
- Fixed operating costs being approximately consistent with assumptions in the Report

- Permitting and arrangements with stakeholders being consistent with current expectations as outlined in the Report
- Certain tax rates, including the allocation of certain tax attributes, being applicable to the Project
- The availability of financing for MTV's planned development activities
- Assumptions made in Mineral Resource and Mineral Reserve estimates and the financial analysis based on the Mineral Reserve estimate, including, but not limited to, geological interpretation, grades, commodity price assumptions, extraction and mining recovery rates, geotechnical, hydrological and hydrogeological assumptions, capital and operating cost estimates, and general marketing, political, business and economic conditions.

22.2 Methodology

The Project has been valued using a discounted cash flow (DCF) approach. Estimates have been prepared for all the individual elements of cash revenue and cash expenditures for ongoing operations. Capital cost estimates have been prepared for initial development and construction of the Project, in addition to ongoing operations (sustaining capital). Cash flows are assumed to occur from July 2018. The currency used to document the cash flow is US$Q3 2018, considering that the estimation was developed during the third quarter of 2018. The internal rate of return (IRR) is calculated as the discount rate that yields a zero NPV. The payback period is calculated as the time needed to recover the initial capital costs.

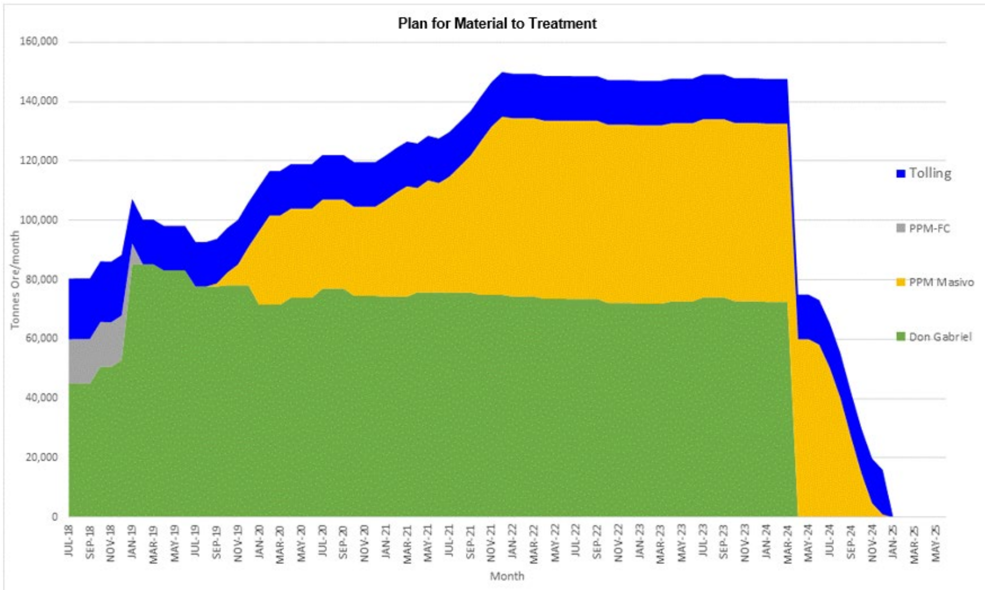
22.3 Basis for Evaluation

The economic analysis assumes contributions from the following sources:

- Don Gabriel Manto open pit at FS level of study
- Papomono Masivo inclined block caving zone at PFS level of study
- Papomono Masivo front caving zone at PFS level of study
- Salt Leach at PFS level of study
- ENAMI tolling contract

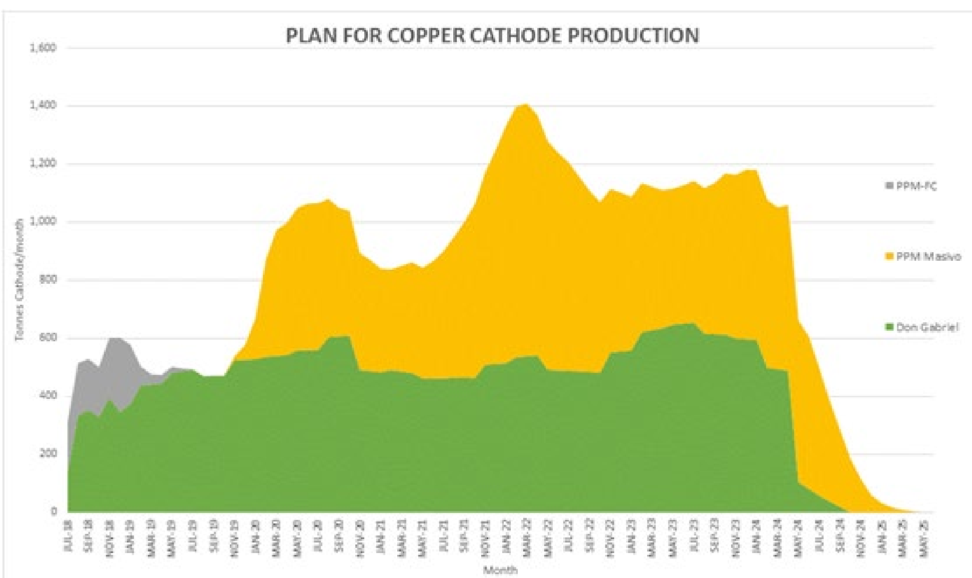
Section 16 presents the mine plan for the Mineral Reserves estimated in Section 15. Figure 22-1 shows the process plan. Cathode production derived from the mine plan is shown in Figure 22-2. The nominal plant capacity is 1,500 t/month copper cathode, but that throughput is only achieved for a short time frame.

Figure 22-1: Forecast Mine and Process Plan



Note: Figure prepared by Wood, 2018. Don Gabriel Manto open pit is the main mine zone from Don Gabriel deposit. Papomono Masivo IBC and Papomono Masivo FC are the zones that will be mined from the Papomono deposit.

Figure 22-2: Forecast Copper Cathode Production



Note: Figure prepared by Wood, 2018. Don Gabriel Manto open pit is the main mine zone from Don Gabriel deposit. Papomono Masivo IBC and Papomono Masivo FC are the zones that will be mined from the Papomono deposit

The economic analysis is based on the following parameters and assumptions:

- The mine production schedule presented in Figure 22-1
- A copper price forecast of US$2.75/lb
- Unit costs outlined in Section 21.2. Variable costs are applied on the basis of the monthly tonnages of ore processed or copper produced. Fixed costs do not vary on a monthly basis, except for the final months of operation, when processing and/or copper production falls under 50% of the values indicated in Table 21-3. For this latter period, fixed costs are adjusted to 50% of their Table 21-3 values. When no ore is being fed to the process plant and copper cathode production falls below 10% of the values indicted in Table 21-3, the plant and G&A fixed costs are adjusted to 25% of their Table 21-3 values
- Processing recovery is based on the salt leach process as described in Section 13, from the second half of 2019 onwards 2018 assumptions are based on acid leaching without salt
- Revenues and operating costs for the ENAMI toll treatment is based on the terms set out in the tolling (Maquila) ENAMI contract. Only the toll treatment charges are considered as revenue. Income from copper derived from incremental recoveries with respect to the contractual value is excluded for the purpose of this analysis. The copper production in Figure 22-2 does not include incremental copper from this source. The corresponding toll-treatment operating costs are included in the total operating costs.

Wood considers the assumptions to be reasonable.

22.4 Tax Considerations

22.4.1 Royalties

There is a royalty payable to the Chilean government depending on production. Currently production is below the minimum of 12,000 t/a copper so there are no payments. From 12 to 15 kt of copper production the marginal rate is 0.5% and between 15 and 20 kt of copper production the marginal rate is 1.0%. At full production of 18,000 t/a Cu, the effective royalty rate for total MTV production will be about 0.2% of the taxable income considering normal depreciation.

22.4.2 Income Tax

MTV has tax losses available to apply to operating profits, due to construction costs and operating losses sustained by previous owners. The economic analysis in Section 22.3 is presented both with, and without the accumulated tax losses.

Wood does not provide expert advice on taxation matters. Support for the accumulated tax losses was provided to Wood in the form of a certificate on tax losses by Puente Sur Tax Advisory (PSTA) to MTV, dated August 22, 2018 which includes the following statement (in italics):

In July 2017, Sprott Resource Holdings (SRHI) retained PSTA to conduct Tax Due Diligence on MTV, within the scope of SRHI's intent to acquire 70% stake in MTV from the Vecchiola Group. PSTA's final Tax Due Diligence report issued in August 2017 concluded that MTV had no material tax issues.

In October 2017 and via SRH Chile SpA ("SRH"), a legal entity domiciled in Chile (incorporated in July 2017), SRHI acquired a 70% stake in MTV. Puente Sur Outsourcing ("PSO") provides back-office services to SRH (as of inception), including accounting, financial reporting and tax compliance services. In addition, PSO's principals (Philip Brundell, Nicholas Walker and Rodrigo Soza) have been indistinctively appointed as SRH's statutory representatives. Rodrigo Soza was also appointed by MTV as its statutory representative and required to act in conjunction with Luis Vega (MTV's CEO) or with Pablo Mir (Partner at BMAJ law firm and SRHI's local legal counsel).

In February 2018, MTV retained PSTA's services aimed to (i) provide ad-hoc tax advice, and (ii) assess MTV's cumulative tax position as of Dec/31/2017 and prepare the corresponding year-end tax filings.

We hereby confirm that the following facts are accurate and reliable:

1. *MTV, SRH and SRHI issue their stand-alone Financial Statements in accordance with the International Financial Reporting Standards ("IFRS").*
2. *As per IAS 21, MTV's functional currency is the USD.*
3. *KPMG Chile issued an unqualified opinion on MTV's 2016/2017 Financial Statements.*

4.For tax purposes, MTV assesses its tax results in CLP and files taxes in the same currency.

5.As of Dec/31/2017, MTV's cumulative tax position amounts to a loss of CLP 226,325 million (equivalent to USD 340 million approx.).

6.MTV's cumulative tax loss is filed annually before the Servicio de Impuestos Internos ("SII", Chilean Internal Revenue Service). To date the SII has not objected to MTV's cumulative tax loss.

7.As per article 31, N°3 of the Chilean Income Tax Law, cumulative tax losses may offset current tax profits, year-to-year until their extinction. Cumulative tax losses are adjusted annually by the Consumer Price Index."

In conclusion, we hereby confirm that MTV's cumulative tax losses may be considered for credit rating purposes, as these may be carried forward indefinitely, allowing the entity to use them to offset future tax profits, resulting in no income tax liabilities until these losses have been completely consumed.

22.5 Economic Results

The results were obtained on the basis of a monthly mine plan and cashflows discounted on the same monthly basis. Table 22-1 shows payable copper tonnes and net revenue, which includes premiums and discounts. Costs for mining (including transport), waste mining, processing and G&A, and total costs are shown and are based on the unit costs presented in Section 21.

The pre-stripping costs for the Don Gabriel Manto open pit are carried as operating costs for this analysis, i.e. they are included in the mining operating costs.

The Papomono Masivo inclined block caving underground operation is planned to start in September 2019. The Papomono Masivo front caving operation has started, and is projected to be completed until before the start-up of the inclined block caving operation.

The analysis assumes cash flows starting in July 2018 (month one). The NPV is obtained on the basis of discounting cash flows on a monthly basis, however, the cashflow tables are based on annual figures.

Table 22-1: Production and Cashflow Summary Table Pre-Tax

Year	Production (kt)	Cathode Cu (t)	Total Capital Costs (kUS$)	Mine Operating Costs (kUS$)	Plant/G&A Operating Costs (kUS$)	Total Operating Costs (kUS$)	Revenue (kUS$)	Non Cumulative Cash Flow (kUS$)	Discounted Cash Flow (kUS$)*
2018	502	4,291	7,312	8,639	13,381	22,020	22,097	-7,236	-7,050
2019	1,185	7,932	7,968	19,600	27,777	47,377	42,022	13,322	-12,448
2020	1,426	13,418	2,320	20,844	30,482	51,326	76,169	22,522	19,242
2021	1,593	13,224	4,464	17,876	31,288	49,164	74,983	21,355	16,696
2022	1,781	16,585	1,312	15,742	33,155	48,897	95,582	45,373	33,341
2023	1,775	15,407	497	12,432	32,807	45,239	88,358	42,622	28,882
2024	894	8,958	512	6,733	20,302	27,035	48,836	21,289	13,604
2025	0	301	7,522	204	1,845	2,048	379	-9,192	-5,457
Total	**9,156**	**80,116**	**31,907**	**102,070**	**191,036**	**293,106**	**448,425**	**123,412**	**86,811**

Note: (*) The evaluation considers cash flows starting in July 2018 (month one). Net present values are obtained on the basis of discounting cash flows monthly, but the tables present annual figures.

Table 22-2 summarizes the results of the pre-tax evaluation.

Table 22-2: Production, Cash Flow Summary and Economic Indicators Pre-Tax

Item	Production (Mlbs Cu)	Capital Costs (MUS$)	Operating Costs (US$/lb Cu)	Revenue Pre-Tax (MUS$)	Cash Flow (MUS$)
Cumulative Production and Cash Flows	177	32	1.66	448	123
Cashflow 8% discount rate (valuation start-off-month July 2018)	**NPV Pre-Tax (MUS$)**		**IRR (%/year)**	**Payback (months)**	**Payback (years)**
	87		93	28	2.0

The analysis indicates an undiscounted pre-tax cashflow of US$123.4 million and an operating cost of US$1.66/lb finished copper. At a 0.64% monthly discount rate (8% annual equivalent), the NPV is US$ 86.8 million. The internal rate of return, IRR is 95.6% per annum. With a total capital investment of US$ 31.9 million, the NPV to capital cost ratio is 3.1. The projected payback period is 28 months.

Table 22-3 provides the post-tax evaluation.

Table 22-3: Production and Cashflow Summary Table Post-Tax

Year	Production (kt)	Cathode Cu (t)	Taxes (kUS$)	Total Capital Costs (kUS$)	Mine Operating Costs (kUS$)	Plant/G&A Operating Costs (kUS$)	Total Operating Costs (kUS$)	Revenue (kUS$)	Non Cumulative Cash Flow (kUS$)	Discounted Cash Flow (kUS$)*
2018	502	4,291	0.0	7,312	8,639	13,381	22,020	22,097	-7,236	-7,050
2019	1,185	7,932	0.0	7,968	19,600	27,777	47,377	42,022	-13,322	-12,448
2020	1,426	13,418	12.5	2,320	20,844	30,482	51,326	76,169	22,510	19,232
2021	1,593	13,224	13.3	4,464	17,876	31,288	49,164	74,983	21,342	16,686
2022	1,781	16,585	83.9	1,312	15,742	33,155	48,897	95,582	45,289	33,281
2023	1,775	15,407	58.6	497	12,432	32,807	45,239	88,358	42,564	28,843
2024	894	8,958	0.0	512	6,733	20,302	27,035	48,836	21,289	13,604
2025	0	301	0.0	7,522	204	1,845	2,048	379	-9,192	-5,457
Total	**9,156**	**80,116**	**168.4**	**31,907**	**102,070**	**191,036**	**293,106**	**448,425**	**123,244**	**86,693**

Note: (*) The evaluation considers cash flows starting in July 2018 (month one). Net present values are obtained on the basis of discounting cash flows monthly, but the tables present annual figures.

Table 22-4 summarizes the results for the post-tax evaluation.

Table 22-4: Production, Cash Flow Summary and Economic Indicators Post-Tax

Item	Production (Mlbs Cu)	Capital Costs (MUS$)	Operating Costs (US$/lb Cu)	Revenue Pre-Tax (MUS$)	Cash Flow (MUS$)
Cumulative Production and Cash Flows	177	32	1.66	448	123
Cashflow 8% discount rate (valuation start-off-month July 2018)	**NPV Post-Tax (MUS$)**		**IRR (%/year)**	**Payback (months)**	**Payback (years)**
	87		93	28	2.0

The analysis indicates an undiscounted post-tax cashflow of US$123.2 million and an operating cost of US$1.66 per pound finished copper. At a 0.64% monthly discount rate (8% annual equivalent), the NPV post-tax is US$ 86.7 million. The internal rate of return, IRR is 93.2% per annum. With a total capital investment of US$31.9 million, the NPV to capital cost ratio is 3.1. The projected payback period is 28 months.

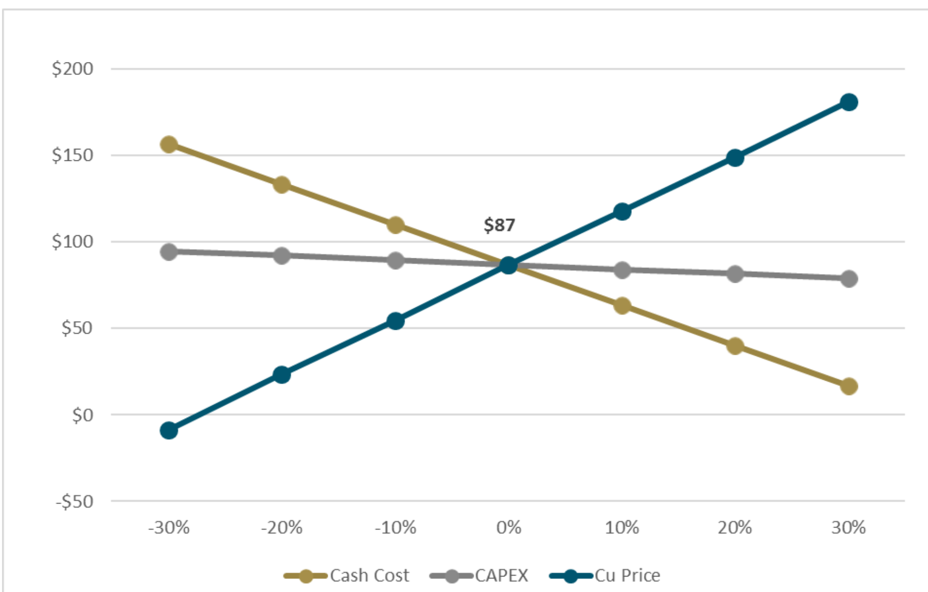
22.6 Sensitivity Analysis

Sensitivity analysis was performed considering variations in the copper price, operating costs and capital costs. The grade sensitivity is not shown, since changes in the copper grade are mirrored by the sensitivity to changes in the copper price. The results for NPV sensitivity to these variables are shown in IRR sensitivities were evaluated using the same variables. The results for IRR sensitivity to variations in copper price, operating costs, and capital costs are shown in Figure 22-4. Note that the IRR function can give more than one answer to the same calculation, or in some cases produce meaningless values, in cases where the investment pattern is out of the usual distribution of capital expenses being heavily concentrated at the beginning of a project. This is the case here, which explains anomalous sensitivity results, and is the reason for one point of the sensitivity curve for the capital cost estimate variation being omitted.

Figure 22-3.

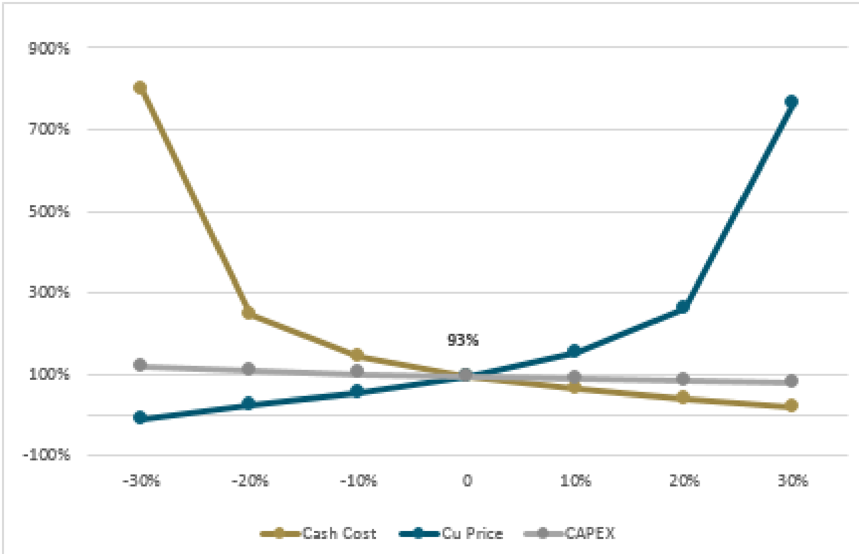
IRR sensitivities were evaluated using the same variables. The results for IRR sensitivity to variations in copper price, operating costs, and capital costs are shown in Figure 22-4. Note that the IRR function can give more than one answer to the same calculation, or in some cases produce meaningless values, in cases where the investment pattern is out of the usual distribution of capital expenses being heavily concentrated at the beginning of a project. This is the case here, which explains anomalous sensitivity results, and is the reason for one point of the sensitivity curve for the capital cost estimate variation being omitted.

Figure 22-3: Sensitivity Analysis Post-Tax Evaluation (NPV; MUS$)



Note: Figure prepared by Wood, 2018

Figure 22-4: Sensitivity Analysis Post-Tax Evaluation (IRR; %)



Note: Figure prepared by Wood, 2018

22.7 Comment on Section 22

The favorable economic results reflect the fact that capital investment for a process plant was not required to be included in the analysis, since plant costs are sunk costs that were already incurred in the original Vale project.

The positive economic analysis is based on the use of 78% of the plant nameplate capacity or 65% of the maximum plant capacity. There is considerable Project upside potential because the nameplate 1,500 t/month cathode production capacity is not reached in the mine plan. The average monthly copper output in the mine plan is 1,023 t of cathode, which is 68% of the nameplate capacity. The average tonnage sent to the plant for treatment is 117,400 t/month or 78% of the plant nameplate 150,000 t/month capacity, or 65%, when viewed in relation to maximum plant capacity of 180,000 t/month.

There is significant upside potential for MTV if the company can operate the plant at nameplate or maximum capacities, as fixed costs would reduce with the higher throughput rates. MTV should consider alternative mining and processing plans that would provide sufficient plant feed material to operate at 150,000–180,000 t/month rates. Operating at 180,000 t/month is about 53% higher than the rate envisaged in the current mine/process plan.

23.0 ADJACENT PROPERTIES

This section is not relevant to this Report.

24.0 OTHER RELEVANT DATA AND INFORMATION

This section is not relevant to this Report.

25.0 INTERPRETATION AND CONCLUSIONS

25.1 Introduction

The QPs note the following interpretations and conclusion in their respective areas of expertise, based on the review of data available for this Report.

25.2 Mineral Tenure, Royalties and Agreements

Information from MTV land experts supports that the mining tenure held is valid and is sufficient to support the declaration of Mineral Resources and Mineral Reserves.

MTV currently holds approximately 185 ha of surface rights. This is sufficient to support the open pit, underground and process plant operations.

MTV has rights to both surface and underground water sources. At full capacity, the Project will use 20 L/s of water, less than a third of the available water rights. The Project is permitted to use 64 L/s.

There is a royalty payable to the Chilean government depending on the production rate. Currently production is below the minimum of 12,000 t/a copper so there are no required royalty payments. At full production, the effective royalty rate for will be about 0.2% of the taxable income considering normal depreciation.

To the extent known, there are no other significant factors and risks that may affect access, title, or the right or ability to perform work on the property that have not been discussed in this Report.

25.3 Geology and Mineralization

The known deposits within the Project area are considered to be examples of stratabound, mantos-type copper deposits.

Knowledge of the deposit settings, lithologies, mineralization style and setting, and structural and alteration controls on mineralization is sufficient to support Mineral Resource and Mineral Reserve estimation.

25.4 Exploration, Drilling and Analytical Data Collection in Support of Mineral Resource Estimation

No major exploration activities have been conducted in the Project area other than those completed by Vale from 2005–2012. These exploration activities identified the Don Gabriel and Papomono deposits.

The Project area retains exploration upside potential. The Vale exploration programs identified a number of geophysical anomalies that remain to be investigated. Geological mapping has recorded in excess of 100 copper occurrences, the majority of which are artisanal mining sites. Many of these sites appear to have similar geological settings to those of the Papomono and Don Gabriel deposits.

The quantity and quality of the lithological, geotechnical, collar and downhole survey data collected in the exploration and infill drill programs conducted are sufficient to support Mineral Resource and Mineral Reserve estimation

Sample security procedures met industry standards at the time the samples were collected.

Data verification has been extensively conducted by MTV and its predecessor companies (initially by Vale´s exploration department), and no material issues have been identified by those programs. In addition, MTV has regularly used various computerized procedures to verify the quality of the data.

Third-party verification of the database indicated no material issues.

Data collected have been sufficiently verified that they can support Mineral Resource and Mineral Reserve estimation and be used for mine planning purposes.

25.5 Metallurgical Testwork

The estimate of copper recovery is based on historical plant performance between 2010 and October 31, 2017, on column tests reported by SGS, and on column and heap tests operated by MTV at the mine site.

The original plant design was based on bacterial leaching. This was subsequently replaced by traditional acid heap leaching due to a change in the source of material processed through the plant.

The MTV plant was commissioned in late 2010 and since then crushing, heap leaching, and SX/EW processes have been conducted with variable cathode production rates.

The current mine plan envisages a change in metallurgical process from traditional acid heap leaching by incorporating salt or chloride leaching. Testwork completed indicates a projected metallurgical recovery of 86.5% for Don Gabriel ore at a net acid consumption of 2.81 kg H_2SO_4/kg Cu and a metallurgical recovery of 86.9% for Papomono ore at a net acid consumption of 1.79 kg H_2SO_4/kg Cu. The recovery assumption is that the ores will be blended.

25.6 Mineral Resource Estimates

Mineral Resource estimation was performed by IMC staff.

To establish "reasonable prospects for eventual economic extraction" estimated unit costs for mining, processing, G&A, and solvent SX/EW, and process recoveries were used to calculate appropriate cutoff grades for mining. The Mineral Resource estimates are based on a copper price of US$3.30/lb finished copper.

Copper recoveries for the various Papomono zones range from 85–90%. Crushing, agglomeration, and leaching costs are estimated at $9.73/t and SX/EW costs at $0.19/lb Cu.

It is assumed that the Don Gabriel Manto, Papomono North and a portion of the Cumbre zone will be mined by a mining contractor, using open pit methods. Estimated contract mining costs are $2.35/t mineralized material and $2.15/t waste.

Haulage costs are estimated as $2.21/t for Don Gabriel mineralized material and $1.76/t for Papomono. The one-way haulage distances are about 17 km for Don Gabriel and 12 km for Papomono.

The Mineral Resource estimates for Don Gabriel Manto, Papomono North and Cumbre are tabulated inside LG shells.

The estimated internal cutoff grades for the Don Gabriel Manto, Papomono North, and Cumbre pits are 0.20%, 0.19% and 0.19% total copper respectively. Internal cutoff grade applies to blocks that have to be removed from the pit, so mining is a sunk cost. The blocks only have to pay processing, haulage, G&A, SXEW, and the $0.20 differential between plant feed material and waste mining cost.

For the underground deposits proposed underground mining methods were selected for each deposit and approximate mining costs for the various methods estimated.

The proposed methods are summarized as follows:

Table 25-1: Distribution of Mine Zones

Mining Method	Zone
Block Caving	Papomono Masivo, Papomono Cumbre
Front Caving	Papomono Sur, Papomono Mantos Conexión, Manto Norte
Sublevel Stoping	Don Gabriel Vetas, Epitermal

The Mineral Resources for underground mining for each deposit are tabulated at break-even cut-off grades appropriate for the proposed mining method.

The Mineral Resources are in-situ estimates. IMC has not included any dilution or mining loss assumptions in the estimates.

The Mineral Resources are classified in accordance with the CIM Definition Standards (2014). Mineral Resource estimates reflect the reasonable expectation that all necessary permits and approvals will be obtained and maintained.

IMC does not believe that there are significant risks to the mineral resource estimates based on environmental, permitting, legal, title, taxation, socio-economic, marketing, or political factors other than discussed in this Report. The Project is in a jurisdiction friendly to mining and has operated in the past and is currently operating at a low level of production. The most significant risks to the Mineral Resource estimate are related to economic parameters such as prices lower than forecast, recoveries lower than forecast, or costs higher than the current estimates. There could also be geological risk if additional drilling supports a reduction in the current resource estimates or identifies more erratic deposit geometries that prove difficult to mine.

25.7 Mineral Reserve Estimates

Mineral Reserves are based on an assumption of open pit mining of the Don Gabriel deposit, and underground mining of the Papomono Masivo deposit. Depending on the zone, the Papomono Masivo deposit will be mined using inclined block caving or front caving.

In the mine plan that supports the Mineral Reserve estimates, Inferred Mineral Resources were set to waste. Estimates include consideration of dilution and mining losses.

Other than disclosed in this Report, the QP does not believe that there are significant risks to the Mineral Reserve estimate based on environmental, permitting, legal, title, taxation, socio-economic, marketing, or political factors. The MTV property is in a jurisdiction friendly to mining, has operated in the past and is currently operating at a low level of production.

25.8 Mine Plan

The mine plan includes the exploitation of the Don Gabriel Manto and the Papomono Masivo deposits.

Don Gabriel has been exploited under the new mine plan since the beginning of 2018 through open pit mining and is currently in the ramp up phase of the plan until it reaches its production capacity of 2.4 kt/d at the beginning of 2019. The mine plan is based on Mineral Reserves of 5.17 million tonnes at 0.81% TCu, producing approximately 14 million pounds of copper per year over a six-year Reserve life.

Papomono Masivo IBC (inclined block caving) underground operation is planned to start in September 2019, and the Papomono Masivo FC (front caving) is already being exploited and is planned to continue until January 2019. The Papomono Masivo mining plan considers reserves of 2.92 million tonnes at 1.1% TCu during its useful life of about 5 years will produce the order of 12.5 million pounds per year.

When both sectors reach their production capacity, mine production will be around 5.0 kt/d (year 2021). This will allow the plant to operate at a substantial percentage of its capacity (nominal 150,000 t/month and maximum 180,000 t/month).

25.9 Recovery Plan

Plant feed material in the mine plan will be from open pit and underground sources.

MTV currently produces high-grade copper cathodes using a heap-leach and SX/EW process. The current process flowsheet for treatment of material is simple and is based on proven technology. The current process plan will be used for material processed in 2018.

After 2018, the process flowsheet will be modified to use salt leaching. Minor plant modifications required to support the chloride leach include a salt metering and transport system, a new washer stage (decanter and mixer–settler), and coalescer units.

25.10 Infrastructure

All major mine, process and support infrastructure is in place and operational.

Development of the Papomono Masivo inclined block cave mine will require expansion of the existing ventilation, electrical, and mine drainage systems.

25.11 Environmental, Permitting and Social Considerations

The MTV operation is fully permitted with all necessary government and environmental licenses. Three RCAs have been obtained.

The mine closure plan was submitted to Sernageomin and approved on November 30, 2016.

MTV operates the MTV Foundation, which administers the company's social investment and community relations programs.

25.12 Market and Contracts

The mine product is primarily Grade A copper cathode.

MTV has an existing contract with Kalkos for services associated with the marketing of copper cathodes and sulphuric acid supplies. Wood evaluated the 2017 cathode production in terms of the fees levied by Kalkos under the prevailing contract agreement. The charges appear to be reasonable.

MTV entered into an off-take contract with WERCO Trading AG for a minimum delivery of 500 t of copper cathode per month at the end of 2016. The contract, expiring end 2019, uses benchmark commercial terms and a standard business basis.

The forecast copper price used for the mine plan is US$2.75/lb. Wood considers this price reasonable for use in the mine plan for input to the Mineral Reserve cut-off and in the financial analysis in Section 22.

25.13 Capital Cost Estimates

The mine plan capital cost estimate is US$32 million. Costs are inclusive of costs for the chloride leach process, sustaining capital considerations for the plant, and closure costs

25.14 Operating Cost Estimates

Operating costs include mine operating costs, leach plant operating costs (from ore crushing to leach solution generation), SX/EW plant operating costs (solution purification and cathode electrowinning) and G&A costs.

Mine Operating costs total US$102 million over the LOM.

25.15 Economic Analysis

The mine plan has been valued using a DCF approach. Estimates have been prepared for all the individual elements of cash revenue and cash expenditures for ongoing operations. Capital cost estimates have been prepared for initial development and construction of the mine plan, in addition to ongoing operations (sustaining capital). Cash flows are assumed to occur from July 2018. The currency used to document the cash flow is US$, considering that the estimation was developed during the third quarter of 2018.

The economic analysis assumes contributions from the following sources:

- Don Gabriel Manto open pit
- Papomono Masivo inclined block caving zone
- Papomono Masivo front caving zone
- ENAMI tolling contract

At full production of 18,000 t/a Cu, the effective royalty rate for total MTV production will be about 0.2% of the taxable income considering normal depreciation. MTV has tax losses available to apply to operating profits, due to construction costs and accumulated operating losses.

The after-tax NPV is US$87 million. The IRR on an annual basis is 93%. The project will achieve payback within 28 months.

The Project NPV is most sensitive to changes in the copper price, less sensitive to changes in operating costs, and least sensitive to capital cost changes.

The Project IRR is most sensitive to changes in operating costs, less sensitive to changes in the copper price, and least sensitive to capital cost changes.

There is significant upside potential for MTV if the company can operate the plant at nameplate or maximum capacities, as fixed costs would reduce with the higher throughput rates.

25.16 Conclusions

The MTV property is in a jurisdiction friendly to mining and has operated in the past and is currently operating. The following main risks that may affect the Project were identified:

- Commodity market conditions and pricing;
- Changes to the estimated Mineral Resources used to generate the mine plan;
- Changes in the metallurgical recovery factors;
- Changes in the geotechnical assumptions used to determine the overall slope angles, dilution, or underground mining shapes;
- Changes to the operating cut-off assumptions for heap leach feed;
- Ability to maintain social and environmental license to operate.

Under the assumptions in this Report, the mine plan has positive economics.

26.0 RECOMMENDATIONS

26.1 Mine Plan

- In light of the new contracts for material movement for the Don Gabriel open pit, re-optimize the mine plan to assess the economic impact.
- Secure the production ramp-up through operational management.
- Perform the next stage of engineering according to the Preliminary Feasibility Study to allow an early start of the construction of the Papomono Masivo works to ensure its start-up during the third quarter of 2019.
- Implement the salt leaching process to the process plant.

26.2 Resource Drilling

- Conduct infill exploration drilling for the Cumbres, Papomono Sur, Papomono Mantos Conexión, Papomono Mantos Norte, Papomono Norte, Epitermal and Don Gabriel Vetas zones to improve the confidence of their Mineral Resources and to facilitate the early development of pre-feasibility studies that would allow the transformation of these resources into Mineral Reserves (see Table 26-1).
- Define a long-term exploration strategy in order to extend the economic sustainability to the available assets and the mining business of MTV.

Table 26-1: Investments for Drilling Campaign

Year	Drilling Campaign (kUS$)
2018	452
2019	1,636
2020	1,398
2021	486
2022	0
2023	0
2024	0
2025	0
2026	0
2027	0
Total	**3,972**

Note: Considering 400 drill hole with 100 m length average each one.

27.0 REFERENCES

Arcadis, 2014 Compañía Minera Tres Valles - Plan de Cierre Regimen Transitorio

Boric, R., Holmgren, C., Wilson, N.S.F., Zentilli, M. (2002) The geology of the El Soldado manto type Cu (Ag) deposit, Central Chile. In Porter, T.M. (Ed), - Hydrothermal Iron Oxide Copper-Gold & Related Deposits... Vol. 2, PGC Publ., Adelaide, 163-184.

D.D. Munro, TWP Projects (Ply) Lld, "Inclined Caving as a Massive Mining Method", 2010.

D.H. LAUBSCHER, "A Geomechanics Classification System for the Rating of Rock Mass in Mine Design", Oct. 1990.

E-Mining Technology S.A., "Informe Extendido – Estimación de Parámetros de Diseño y Análisis de Estabilidad Rajo Don Gabriel", Mayo 2011.

E-Mining Technology S.A., "Anexo a. Resultados Análisis de Estabilidad Pseudo-Estático Addendum Análisis Estabilidad Pseudo-Estático Diseño Rajo Don Gabriel", May 2011.

E-Mining Technology S.A., "Análisis Estabilidad Condición Pseudo-Estática Diseño Rajo Don Gabriel", April, 2012.

Geoinvestment Limitada, "Análisis, Evaluación y Redefinición Angulo Global Pit Don Gabriel – Sociedad Contractual Minera Tres Valles – Salamanca IV Region de Coquimbo, Chile – Informe Final", Julio 2015

Gilberto Schubert, Quiroga, Enrique, Luis Merino, "Mining Method for Tres Valles Copper Deposit - Selection and Design", 2016, Proceedings of the International Conference "Innovations in mine enterprises engineering", Saint Petersburg Mining University, Russia. p.18

Ingenieria de Rocas Ltda. (Ingeroc), "Informe de Estabilidad Rajo Don Gabriel - P-IDR-196-150-12-2-0", Marzo 2013

Ingeroc SpA, " Mining Method, Selection and Design – Presentacion final_BC.pdf", 2015

Maksaev V. (Coordinator), Townley B, Palacios C. and Camus F.(2007) Metallic ore deposits. In: Moreno T. and Gibbons W.(Ed.), - Geology of Chile, Geological Society of London, Geology of Series

MTV, "Tres Valles Mining Technical Report Ver-006_04-09-17 - Draft" , September, 2017

Minera Tres Valles, "Tres Valles Consolidating and Updating Report - The dawn of a new stage of operation", Ver-005_20-01-17, 2017.

Minera Tres Valles, "Scoping Study for Underground Exploitation of High Grade Orebodies in Don Gabriel-Veins Mineral Deposit", December 2015

Minera Tres Valles, " TresValles Property and Infrastructure", 2017

Minera Tres Valles, "TresValles Geology, Resources and LT Reserves", 2017

Oryxeio Ingeniería Limitada, "*Copper Recovery Statement on Mineral Reserves - Sociedad Contractual Minera Tres Valles - ORYXEIO-MTV-2018-R01-0", January 2018*.

Propipe S.A., "Compania Minera Tres Valles – Prefeasibility Study – Chloride Media Leaching – Final Report", February 2018.

Q&Q Ltda, "Proyecto Explotacion Vetas de Alta Ley – MTV", June 2015.

Q&Q Ltda, "Reopening of Don Gabriel Pit", November 2015.

Q&Q Ltda, "Plan de Produccion y Evaluaction Economica Preliminar Mina Papomono con Nueva Modelo Geologico", March 2016.

Snowden, "Soc. Contractual Minera Tres Valles: Resource/Reserve Practices – Standard Procedures", March 2013.

Snowden, "Cia. Contratual Tres Valles: Resource and Reserve Statement", May 2013.

Terradap Chile, "Resguardo Mensual Concesiones Mineras Proyecto Sociedad Contractual Minera Tres Valles", March 3, 2018.

Terradap Chile, "Resguardo Mensual Concesiones Mineras Proyecto Sociedad Contractual Minera Tres Valles", December 30, 2017.

Vale, "Technical Report - Visit to Tres Valles Project", November 2008

Vale,"Reporte QA/QC SCM Tres Valles - Campaña Sondajes 2012", Diciembre 2012

Vale, "Reporte QA/QC Proyecto Tres Valles", Octubre 2009

Vale, "Reporte QA/QC Proyecto Tres Valles", Octubre 2010

Vale, "Reporte QA/QC Proyecto Tres Valles", Diciembre 2011

Vale, "Reporte final Control de Duplicados de Testigos de Sondajes", Abril 2009