Cangrejos Gold-Copper Project

NI 43-101 Technical Report on the Pre-feasibility Study

El Oro Province, Ecuador

Effective Date: April 7, 2023

Issue Date: June 1, 2023

Prepared for:

Lumina Gold Corp.
410-625 Howe Street
Vancouver, BC, Canada V6C 2T6
M5H 3L5

Prepared by:

Ausenco Engineering Canada Inc.
1050 West Pender, Suite 1200
Vancouver, BC, Canada, V6E 0C3

List of Qualified Persons:
Kevin Murray, P.Eng., Ausenco Engineering Canada Inc.
Scott C. Elfen, P.E., Ausenco Engineering Canada Inc.
Scott Weston, P.Geo., Ausenco Sustainability Canada Inc.
Adrian Karolko, P.Geo., 2338538 Alberta Ltd.
Nelson D. King, SME, N D King Consulting, LLC
Norman I. Norrish, P.E., Wyllie & Norrish Rock Engineers Inc.
Robert Michel, SME, Robert Michel Enterprises, Inc.
Robert Sim, P.Geo., SIM Geological Inc.
Joseph McNaughton, P.Eng., Independent Mining Consultants, Inc.
Bruce Davis, FAusIMM, SIM Geological Inc.
Larry Breckenridge, P.E., Global Resource Engineering Ltd.

CERTIFICATE OF QUALIFIED PERSON

Kevin Murray, P.Eng.

I, Kevin Murray, P. Eng., do hereby certify that:

1. I am a Professional Engineer, currently employed as a Manager Process Engineering with Ausenco Engineering Canada Inc. ("Ausenco"), with an office address of 1050 West Pender Street, Suite 1200, Vancouver, BC Canada, V6E 3S7.

2. This certificate applies to the technical report titled, *"Cangrejos Gold-Copper Project, NI 43-101 Technical Report on Pre-feasibility Study, El Oro Province, Ecuador" (the "Technical Report"),* dated June 1, 2023, prepared for Lumina Gold Corp. (the "Company"), with an effective date of April 7, 2023 (the "Effective Date").

3. I graduated from the University of New Brunswick, Fredericton, New Brunswick, in 1995 with a Bachelor of Science in Chemical Engineering. I am a member in good standing of the Association of Professional Engineers and Geoscientists of the Province of British Columbia, Registration number# 32350 and the Northwest Territories Association of Professional Engineers and Geoscientists' Registration# L4940.

4. I have practiced my profession continuously for 22 years. I have been directly involved in all levels of engineering studies from preliminary economic assessments (PEAs) to feasibility studies including being a Qualified Person for flotation projects such as Skeena Resources' Eskay Creek Feasibility Study, Ero Copper Corp.'s Boa Esperança Feasibility Study and NorZinc Ltd.'s Prairie Creek PEA. I have been directly involved with test work and flowsheet development from preliminary testing through to detailed design and construction including my direct experience at Red Lake Gold Mine, Porcupine Gold Mine located in Ontario and Éléonore Gold Mine, located in Quebec, while working for Goldcorp Inc./Newmont Corporation.

5. I have read the definition of "Qualified Person" set out in National Instrument 43-101 - Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101 in connection with those sections of the Technical Report that I am responsible for preparing.

6. I have not visited the Cangrejos Project.

7. I am responsible for Sections 1.1, 1.12, 1.13.1, 1.13.2, 1.13.3, 1.16, 1.18, 1.19.1, 1.19.6, 2, 3.1, 17, 18.1, 18.2, 18.3, 18.4, 18.8, 21.1, 21.2.1, 21.2.2.1, 21.2.2.2, 21.2.2.3, 21.2.2.4, 21.2.3.1, 21.2.3.7, 21.3.1, 21.3.2, 21.3.3, 21.3.5, 24, 25.1, 25.9, 25.12, 25.13, 25.15.1.4, 25.15.2.4, 26.1, 26.6, and 27 of the Technical Report.

8. I am independent of the Company as independence is described by Section 1.5 of NI 43-101.

9. I have had no previous involvement with the Cangrejos Project.

10. I have read NI 43-101, Form 43-101F1 and the sections of the Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.

11. 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 this 1st day of June, 2023.

"*Signed and Sealed*"
Kevin Murray, P. Eng.

CERTIFICATE OF QUALIFIED PERSON

Scott C. Elfen, P.E.

I, Scott C. Elfen, P.E., certify that:

1. I am employed as the Global Lead Geotechnical and Civil Services of Ausenco Engineering Canada Inc. ("Ausenco"), with an office address of 1050 West Pender Street, Suite 1200, Vancouver, BC Canada, V6E 3S7.

2. This certificate applies to the technical report titled, "*Cangrejos Gold-Copper Project, NI 43-101 Technical Report on Pre-feasibility Study, El Oro Province, Ecuador*" (the "Technical Report"), dated June 1, 2023, prepared for Lumina Gold Corp. (the "Company"), with an effective date of April 7, 2023 (the "Effective Date").

3. I graduated from the University of California, Davis, California, in 1991 with Bachelor of Science degree in Civil Engineering (Geotechnical).

4. I am a Registered Civil Engineer in the State of California (license no. C56527) by exam since 1996 and I am also a member in good standing of the American Society of Civil Engineers (ASCE), and the Society for Mining, Metallurgy & Exploration (SME).

5. I have practiced my profession continuously for 26 years with experience in the development, design, construction and operations of mine waste storage facilities, such as waste rock storage facilities and tailings storage facilities ranging from slurry to dry stack facilities, focusing on precious and base metals, both domestic and international. In addition, I have developed geotechnical design parameters for pit slope design, plant foundation design, and other supporting infrastructure. Examples of projects I have worked on include: Skeena's Eskay Creek Project PEA, PFS and FS, O3 Mining's Marban Project PEA and PFS, First Mining Gold's Springpole PEA and PFS. SSR Mining's Puna Silver In-Pit Tailings Disposal PFS, and Detailing Engineering, and the Company's Cangrejos Project PEA.

6. I have read the definition of "Qualified Person" set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101 in connection with those sections of the Technical Report that I am responsible for preparing.

7. I have visited the Cangrejos Gold-Copper Project from August 8th 2022 through August 11th 2022 and October 23rd through 26th, 2022.

8. I am responsible for Sections 1.13.4, 1.13.5, 1.15.2, 1.15.3, 1.19.7, 5.5, 18.5, 18.6, 18.7, 18.9, 18.10, 20.1.4, 20.2.2, 25.10, 25.15.1.5, 25.15.2.5, 26.7, and 27 of the Technical Report.

9. I am independent of the Company as independence is defined in Section 1.5 of NI 43-101.

10. I have been previously involved with the Project. I was a co-author of the Technical Report titled "Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment", dated August 10, 2018, with an effective date of June 27, 2018, the Technical Report titled "Cangrejos Gold-Copper Project, El Oro Province, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment", dated July 24, 2020, with an effective date of June 8, 2020, and the Technical Report titled "Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment" dated June 1, 2022, with an effective date of June 15, 2022.

11. 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 this 1st day of June, 2023.

"Signed and sealed"
Scott C. Elfen, P.E.

CERTIFICATE OF QUALIFIED PERSON

Scott Weston, P.Geo.

I, Scott Weston, P. Geo., do hereby certify that:

1. I am a Professional Geoscientist, currently employed as Vice President, Business Development with Ausenco Sustainability Inc. (“Ausenco”), with an office address of 4515 Central Boulevard, Burnaby, BC, Canada.

2. This certificate applies to the technical report titled, *“Cangrejos Gold-Copper Project, NI 43-101 Technical Report on Pre-feasibility Study, El Oro Province, Ecuador*“(the “Technical Report”), prepared for Lumina Gold Corp. (the “Company”), dated June 1, 2023, with an effective date of April 7, 2023 (the “Effective Date”).

3. I graduated from University of British Columbia, Vancouver, British Columbia, Canada, in 1995 with a Bachelor of Science, Physical Geography, and Royal Roads University, Victoria, British Columbia, Canada, in 2003 with a Master of Science, Environment and Management.

4. I am a Professional Geoscientist of Engineers and Geoscientists British Columbia; registration number 124888.

5. I have worked as a geoscientist continuously for 27 years, leading or working on teams advancing multidisciplinary environmental projects related to natural resource development. Example of projects I’ve been involved with include: Wasamac Project FS, Eskay Creek Mine PFS, Las Chispas Mine FS, and Casino Project FS.

6. I have read the definition of “Qualified Person” set out in National Instrument 43-101 – Standards of Disclosure for Mineral Projects (“NI 43-101”) for the purposes of NI 43-101 in connection with those sections of the Technical Report that I am responsible for preparing.

7. I have not visited the Cangrejos Project.

8. I am responsible for Sections 1.15.1, 1.15.5, 1.15.6, 1.15.7, 1.19.8, 3.3, 4.5, 4.6, 4.7, 4.8, 20.1.1, 20.1.3, 20.2.1, 20.3, 20.4, 25.11.1, 25.15.1.6, 25.15.2.6, 26.8, and 27 of the Technical Report.

9. I am independent of the Company as independence is described by Section 1.5 of NI 43–101.

10. I have not previously been involved with the Cangrejos Project.

11. I have read the NI 43-101, Form 43-101F1 and the sections of the Technical Report for which I am responsible have been prepared in compliance with NI 43-101, Form 43-101F1.

12. 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 the Technical Report not misleading.

Dated this 1st day of June, 2023.

“Signed and sealed”

Scott Weston, P. Geo.

CERTIFICATE OF QUALIFIED PERSON
Adrian Karolko, P.Geo.

I, Adrian Karolko, P.Geo., certify that:

1. I am an independent consultant of 2338538 Alberta Ltd. with an office address of 13136 Coventry Hills Way NE, Calgary, Alberta, T3K6C1.

2. This certificate applies to the technical report titled "“*Cangrejos Gold-Copper Project, NI 43-101 Technical Report on Pre-feasibility Study, El Oro Province, Ecuador*” (the “Technical Report”), dated this June 1, 2023 and prepared for Lumina Gold Corp., with an effective date of April 7, 2023 (the “Effective Date”).

3. I graduated from the University of Calgary, Calgary, Alberta, Canada, with an Honours Bachelor of Science (Geology) in 2007.

4. I am Professional Geologist, in good standing, of The Association of Professional Engineers and Geoscientists of Alberta, Licence Number 92070.

5. I have practiced my profession for 15 years. I have been directly involved in mineral exploration in base metals, gold, uranium, and specialty metals in Canada, the United States, South America, Europe, and Africa.

6. I have read the definition of “Qualified Person” set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects (“NI 43-101”) and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a “Qualified Person” for the purposes of NI 43-101 in connection with those sections of the Technical Report that I am responsible for preparing.

7. I visited the Cangrejos Project on numerous occasions, most recently from February 19 to March 9, 2022, March 26 to April 23, 2022, May 10 to May 29, 2022, and July 28 to August 14, 2022.

8. I am responsible for Sections 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 3.2, 4.1, 4.2, 4.3, 4.4, 5.1, 5.2, 5.3, 5.4, 6, 7, 8, 9, 10, 11, 23, 25.2, 25.3, 25.4, and 27 of the Technical Report.

9. I am independent of the Company as independence is defined in Section 1.5 of NI 43-101.

10. I have had prior involvement with the property that is the subject of the Technical Report. I have been involved with geological and geotechnical logging during the 2018-2019 and 2021-2022 drilling campaigns. Also, I was a co-author of a previous technical report titled “Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment” dated June 1, 2022 with an effective date of June 15, 2022.

11. 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 this 1st day of June, 2023.

“Signed and sealed”

Adrian Karolko, P.Geo.

CERTIFICATE OF QUALIFIED PERSON
Nelson D. King, SME

I, Nelson D. King, SME Registered Member, certify that:

1. I am employed as a Principal Consultant (Metallurgical Engineer) with N D King Consulting, LLC, with an office address of 8317 Devinney Street, Arvada, Colorado, U.S.A.

2. This certificate applies to the technical report titled *"Cangrejos Gold-Copper Project, NI 43-101 Technical Report on the Pre-feasibility Study, El Oro Province, Ecuador" (the "Technical Report"),* dated June 1, 2023, prepared for Lumina Gold Corp. (the "Company"), with an effective date of April 7, 2023 (the "Effective Date").

3. I graduated from the Colorado School of Mines, located in Golden, Colorado, in 1972 with a B.Sc. degree in Metallurgical Engineering.

4. I am a member in good standing of the Society for Mining, Metallurgy and Exploration, Inc. (SME) and am an SME Registered Member, No. 4152661 RM.

5. I have practiced my profession for 50 years. I have experience in performing and directing metallurgical testing programs for flotation of copper, gold, silver, lead, zinc and molybdenum ores and cyanidation of gold and silver concentrates and ores. I also have experience at copper, gold, silver, lead, zinc and molybdenum mining operations in the U.S.A., with engineering and construction companies located in the U.S.A. and Canada and performing global metallurgical consulting services from offices in the U.S.A. and Australia.

6. I have read the definition of "Qualified Person" set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101 in connection with those sections of the Technical Report that I am responsible for preparing.

7. I visited the Cangrejos Project from January 16 to 17, 2018 for a visit duration of 2 days to review the drilling program and observe the core characteristics for the metallurgical test program as well as tour the potential sites for the process plant, tailings storage and site infrastructure.

8. I am responsible for Sections 1.8, 1.19.3, 13, 25.5, 25.15.1.1, 25.15.2.1, 26.3, and 27 of the Technical Report.

9. I am independent of the Company as independence is defined in Section 1.5 of NI 43-101.

10. I have been involved with the Cangrejos Project since 2015 as a co-authored on three previous reports. The first report was titled "Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment" dated August 10,2018 with an effective date of June 7, 2018. The second report was titled "Cangrejos Gold-Copper Project, El Oro Province, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment" dated July 24, 2020 with an effective date of June 8, 2020. The third report was titled "Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment" dated June 1, 2022, with an effective date of June 15, 2022.

11. 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 this 1st day of June, 2023.

"Signed and sealed"

Nelson D. King, SME Registered Member No. 4152661 RM

CERTIFICATE OF QUALIFIED PERSON

Norman I. Norrish, P.E.

I, Norman I. Norrish, P.E., certify that:

1. I am employed as a Principal with Wyllie & Norrish Rock Engineers Inc., with an office address of 110 – 909 Marine Drive, Bellingham, Washington, 98225.

2. This certificate applies to the technical report titled "*Cangrejos Gold-Copper Project, NI 43-101 Technical Report on the Pre-feasibility Study, El Oro Province, Ecuador*" (the "Technical Report"), dated June 1, 2023 and prepared for Lumina Gold Corp. (the "Company"), with an effective date of April 7, 2023 (the "Effective Date").

3. I graduated from the University of British Columbia, located in Vancouver, British Columbia, Canada, with a B.A.Sc. in Geological Engineering (Geotechnical) in 1971 and an M.A.Sc. in Mining Engineering (Rock Mechanics) in 1974. I am a Professional Engineer in good standing of the Washington State Board of Registration for Professional Engineers and Land Surveyors (#37407).

4. I have practiced my profession continuously for 46 years since graduation. I have been directly involved in the application of rock mechanics to mining, transportation, and civil construction projects including senior level project responsibility for the investigation, design and construction management of mining and transportation projects in mountainous terrain throughout Western North America. I have worked internationally on mining projects in Canada, Argentina, Columbia, Ecuador, Mexico, Panama, Peru, Chile, the Philippines, the former Soviet Union and the Peoples Republic of China. In addition to 42 years of consulting experience, I worked as Senior Mining Engineer for four years at Brenda Mines Ltd, a subsidiary of Noranda Inc.

5. I have read the definition of "Qualified Person" set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101 in connection with those sections of the Technical Report that I am responsible for preparing.

6. I visited the Cangrejos Project between May 2 to May 8, 2019, and June 16 to June 22, 2022, for durations of seven days on each visit.

7. I am responsible for Sections 1.11.2, 1.19.5, 16.2, 16.4, 25.8.2, 25.15.1.3, 25.15.2.3, 26.5, and 27 of the Technical Report.

8. I am independent of the Company as independence is defined in Section 1.5 of NI 43-101.

9. I participated in earlier studies of the property and the resultant Technical Reports titled "*Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment*", dated August 10, 2018, with an effective date of June 27, 2018, *"Cangrejos Gold-Copper Project, El Oro Province, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment"*, dated July 24, 2020, with an effective date of June 8, 2020, and *"Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment"* dated June 1, 2022 with an effective date of June 15, 2022.

10. 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 this 1st day of June, 2023.

"Signed and sealed"

Norman I. Norrish, P.E.

CERTIFICATE OF QUALIFIED PERSON

Robert Michel, SME

I, Robert Michel, SME Registered Member, certify that:

1. I am employed as a Principal with Robert Michel Enterprises, Inc., with an office address at 133 Furman Ave., Asheville, North Carolina, USA.
2. This certificate applies to the technical report titled "*Cangrejos Gold-Copper Project, NI 43-101 Technical Report on the Pre-feasibility Study, El Oro Province, Ecuador*" (the "Technical Report"), dated June 1, 2023, prepared for Lumina Gold Corp. (the "Company"), with an effective date of April 7, 2023 (the "Effective Date").
3. I graduated from the Colorado School of Mines, located in Golden, Colorado, with a B.S. in Metallurgical Engineering in 1984 and from Kettering University, located in Flint, Michigan, with a M.S. in Manufacturing Management in 1993.
4. I am a Registered Member of the Society for Mining, Metallurgy and Exploration, Inc. (SME), Member No. 04170421RM.
5. I have worked as a Metallurgical Engineer, manufacturing manager, or Project Manager for *39 years since my graduation from university*. In the past 15 years I have worked as a Project Manager or Economic Evaluator on the development of underground and open pit mining projects and related infrastructure in Peru, Chile, Colombia, Ecuador, Macedonia, Mali, and in the United States.
6. I have read the definition of "Qualified Person" set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101 in connection with those sections of the Technical Report that I am responsible for preparing.
7. I have not visited the Cangrejos Project.
8. I am responsible for Sections 1.14, 1.17, 3.4, 3.5, 19, 21.2.2.6, 21.2.3.4, 21.2.3.5, 21.2.3.6, 21.2.4, 21.3.6, 22, 25.14, and 27 of the Technical Report.
9. I am independent of the Company as independence is defined in Section 1.5 of NI 43-101.
10. I had prior involvement with the property that is the subject of the Technical Reports as a co-author and Qualified Person for the 2018 Technical Report titled Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment, dated August 10, 2018, with an effective date of June 27, 2018, the 2020 Technical Report titled "Cangrejos Gold-Copper Project, El Oro Province, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment," dated July 24, 2020, with an effective date of June 8, 2020, and the 2022 Technical Report titled "Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment" dated June 1, 2022 with an effective date of June 15, 2022.
11. 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 this 1st day of June, 2023.

"Signed and sealed"

Robert Michel, SME Registered Member

CERTIFICATE OF QUALIFIED PERSON

Robert Sim, P.Geo.

I, Robert Sim, P.Geo., certify that:

1. I am an independent consultant of: SIM Geological Inc. with an office address of 508-1950 Robson Street, Vancouver, British Columbia, Canada V6E 1E8.
2. This certificate applies to the technical report titled *"Cangrejos Gold-Copper Project, NI 43-101 Technical Report on the Pre-feasibility Study, El Oro Province, Ecuador"* (the "Technical Report"), dated June 1, 2023, prepared for Lumina Gold Corp. (the "Company"), with an effective date of April 7, 2023 (the "Effective Date").
3. I graduated from Lakehead University, located in Thunder Bay, Ontario, Canada with an Honours Bachelor of Science (Geology) in 1984.
4. I am a member, in good standing, of Engineers and Geoscientists British Columbia, Licence Number 24076
5. I have practiced my profession continuously for 37 years and have been involved in mineral exploration, mine site geology and operations, mineral resource and reserve estimations and feasibility studies on numerous underground and open pit base metal and gold deposits in Canada, the United States, Central and South America, Europe, Asia, Africa and Australia. I have directly worked on numerous similar deposits including New Afton in BC, Canada, Los Azules in Argentina and the Cerro Corona deposit in Peru.
6. I have read the definition of "Qualified Person" set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101 in connection with those sections of the Technical Report that I am responsible for preparing.
7. I visited the Cangrejos Project from November 28 to 29, 2017.
8. I am responsible for Sections 1.9, 1.19.2, 14, 25.6, 26.2, and 27 of the Technical Report.
9. I am independent of the Company as independence is defined in Section 1.5 of NI 43-101.
10. I have had prior involvement with the property that is the subject of the Technical Report. I was a co-author of previous Technical Reports titled *"Cangrejos Gold-Copper Project, El Oro Province, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment"* dated July 24, 2020, with an effective date of June 8, 2020, *"Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment"* dated June 1, 2022 with an effective date of June 15, 2022, *"Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report"* dated December 12, 2019 with an effective date of November 7, 2019, *"Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment"* dated August 10, 2018 with an effective date of June 27, 2018, *"Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report"* dated December 15, 2017 with an effective date of November 6, 2017, and *"Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report"* dated March 6, 2017 with an effective date of January 25, 2017.
11. I have read NI 43-101 Form 43-101F1 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 this 1st day of June, 2023.

"Signed and sealed"

Robert Sim, P.Geo.

CERTIFICATE OF QUALIFIED PERSON
Joseph McNaughton, P.E.

I, Joseph McNaughton, P.E., do hereby certify that:

1. I am a senior mining engineer of:

   Independent Mining Consultants, Inc.

   3560 East Gas Road Tucson, AZ 85714

2. This certificate applies to the technical report titled “Cangrejos Gold-Copper Project, NI 43-101 Technical Report on the Pre-feasibility Study, El Oro Province, Ecuador” (the “Technical Report”), dated June 1, 2023, prepared for Lumina Gold Corp. (the “Company”), with an effective date of April 7, 2023 (the “Effective Date”).

3. I graduated with the following degrees:

   Bachelors of Science, Mining Engineering from the University of Arizona (2012)

   Bachelors of Science, Engineering Management from the University of Arizona (2012)

   Bachelors of Arts, Business Finance from Butler University (2004)

4. I am a registered Professional Engineer in good standing in the State of Arizona in Mining Engineering Registration # 65646

5. I have worked as a mining engineer for a total of 12 years. I have worked as a short and long-range mine planner. I have worked on numerous projects that include mine design, mine planning, resource and reserve estimation, scheduling and cost estimation and evaluation.

6. I have visited the Cangrejos Project site on May 5 to 7, 2019.

7. I have read the definition of “Qualified Person” set out in National Instrument 43-101 (“NI 43-101”) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a “Qualified Person” for the purposes of NI 43-101.

8. I am responsible for Sections 1.10, 1.11.1, 1.19.4, 15, 16.1, 16.5, 16.6, 16.7, 16.8, 16.9, 21.2.2.5, 21.2.3.2, 21.2.3.3, 21.3.4, 25.7, 25.8.1, 25.15.1.2, 25.15.2.2, 26.4, and 27of the Technical Report.

9. I am independent of the Company as independence is defined in Section 1.5 of NI 43-101.

10. I have had prior involvement with the property that is the subject of the Technical Report. I was a co-author of previous Technical Reports titled “Cangrejos Gold-Copper Project, El Oro Province, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment” dated July 24, 2020, with an effective date of June 8, 2020, “Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment” dated June 1, 2022 with an effective date of June 15, 2022.

11. I have read NI 43-101 Form 43-101F1 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 this 1st day of June, 2023.

“Signed and Sealed”

Joseph McNaughton, P.Eng.

CERTIFICATE OF QUALIFIED PERSON

Bruce Davis, FAusIMM

I, Bruce M. Davis, FAusIMM, certify that:

1. I am employed as an independent geostatistical consultant contracted to Sim Geological Inc. with an office address of 2921 Brodick Way, Grand Junction, Colorado USA 81504.

2. This certificate applies to the technical report titled, *"Cangrejos Gold-Copper Project, NI 43-101 Technical Report on the Pre-feasibility Study, El Oro Province, Ecuador"* (the "Technical Report"), dated June 1, 2023, prepared for Lumina Gold Corp. (the "Company"), with an effective date of April 7, 2023 (the "Effective Date").

3. I graduated from Brigham Young University in Provo, Utah, with a Bachelor of Science in 1974, and a Master's in 1975. I also graduated from the University of Wyoming with a Doctor of Philosophy (Geostatistics) in 1978. I am a Fellow member of the Australasian Institute of Mining and Metallurgy, License no. 211185.

4. I have practiced my profession continuously for 45 years. I have been directly involved in resource estimation for the New Afton (Canada), Los Azules (Argentina), Cerro San Pedro (Mexico) and Cerro Corona (Peru) deposits. I have validated the data for the aforementioned projects, which are analogs to the subject of this report.

5. I have read the definition of "Qualified Person" set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101 in connection with those sections of the Technical Report that I am responsible for preparing.

6. I have not visited the Cangrejos Project.

7. I am responsible for Section 12 and 27 of the Technical Report.

8. I am independent of the Company as independence is defined in Section 1.5 of NI 43-101.

9. I have been involved with Cangrejos Copper-Gold Project as a co-author of previous technical reports titled "Cangrejos Gold-Copper Project, El Oro Province Ecuador, NI 43-101 Technical Report Preliminary Economic Assessment," dated June 15, 2022 with and effective date of June 1, 2022. "Cangrejos Gold-Copper Project, El Oro Province, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment," dated July 24, 2020 with an effective date of June 8, 2020. "Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment," dated August 10, 2018 with an effective data of June 27, 2018.

10. 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.

11. 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 this 1st day of June, 2023.

"Signed and sealed"

Bruce M. Davis, FAusIMM

CERTIFICATE OF QUALIFIED PERSON

Larry Breckenridge, P.E.

I, J. Larry Breckenridge, P.E. certify that:

1. I am employed as a Principal Environmental Engineer with Global Resource Engineering Ltd., with an office address of 600 Grant St, Suite 975, Denver Colorado, USA.

2. This certificate applies to the technical report titled, *"Cangrejos Gold-Copper Project, NI 43-101 Technical Report on the Pre-feasibility Study, El Oro Province, Ecuador" (the "Technical Report"),* dated June 1, 2023, prepared for Lumina Gold Corp. (the "Company"), with an effective date of April 7, 2023 (the "Effective Date").

3. I graduated from Dartmouth College, located Hanover, New Hampshire, in 1995 and the Colorado School of Mines, located in Golden, Colorado, in 1997 with a Bachelor of Science in Engineering and a Master's in environmental science and engineering, respectively. I am a Professional Engineer, license no. 38048 in Colorado, USA.

4. I have practiced my profession continuously for twenty-six years. I have been directly involved in hydrogeology, geochemistry, and environmental management for the Cangrejos Project. I have also been the lead geochemist and hydrogeologist at the Corani silver-lead-zinc project in Peru, the Santa Elena gold-silver project in Mexico, and the Amulsar gold project in Armenia.

5. I have read the definition of "Qualified Person" set out in the National Instrument 43-101 Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by virtue of my education, affiliation to a professional association and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101 in connection with those sections of the Technical Report that I am responsible for preparing.

6. I visited the Cangrejos Project between June 22nd to July 14th, 2022 for a visit duration of 20 days.

7. I am responsible for Sections 1.15.4, 1.19.9, 1.19.10, 16.3, 20.1.2, 25.11.2, 25.15.1.7, 25.15.2.7, 26.9, 26.10, and 27 of the Technical Report.

8. I am independent of the Company as independence is defined in Section 1.5 of NI 43-101.

9. I have been involved with the Project as a co-author of previous technical reports titled: "Cangrejos Gold-Copper Project, El Oro Province Ecuador, NI 43-101 Technical Report Preliminary Economic Assessment," dated June 15, 2022 with and effective date of June 1, 2022; "Cangrejos Gold-Copper Project, El Oro Province, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment," dated July 24, 2020 with an effective date of June 8, 2020; "Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report" dated December 12, 2019 with an effective date of November 7, 2019; "Cangrejos Gold-Copper Project, Ecuador NI 43-101 Technical Report Preliminary Economic Assessment," dated August 10, 2018 with an effective data of June 27, 2018.

10. I have read NI 43-101 and the sections of the Technical Report for which I am responsible have been prepared in compliance with NI 43-101.

11. 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 this 1st day of June, 2023.

"Signed and sealed"

J. Larry Breckenridge, P.E. Colorado No. 38048.

Important Notice

This report was prepared as National Instrument 43-101 Technical Report for Lumina Gold Corp. (Lumina) by Ausenco Engineering Canada Inc. (Ausenco), 2338538 Alberta, ND King Consulting (ND King),Wyllie & Norrish Rock Engineers (W&N), Robert Michel Enterprises (RME), SIM Geological Inc. (SIM), Independent Mining Consultants Inc. (IMC), Global Resource Engineering Ltd. (GRE), , collectively the Report Authors. The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in the Report Authors' 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 Lumina subject to terms and conditions of its contracts with each of the Report Authors. Except for the purposed legislated under Canadian provincial and territorial securities law, any other uses of this report by any third party are at that party's sole risk.

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1 SUMMARY

1.1 Introduction

Lumina Gold Corp (Lumina) commissioned Ausenco Engineering Canada Inc. (Ausenco) to compile a pre-feasibility study (PFS) of the Cangrejos project in southwestern Ecuador in the province of El Oro (the Project). The PFS was prepared in accordance with the Canadian disclosure requirements of National Instrument 43-101 – *Standards of Disclosure for Mineral Projects* (NI 43-101) and in accordance with the requirements of Form 43-101 F1.

The responsibilities of the engineering companies who were contracted by Lumina to prepare this report are as follows:

- Ausenco Engineering Inc. (Ausenco) managed and coordinated the work related to the report and developed the PFS-level design and cost estimate for the process plant, dry-stack tailings facility, waste stock storage facility, site water management, and general site infrastructure.
- Ausenco Sustainability Inc. (Ausenco Sustainability) provided a qualified person (QP) to review the technical information in Sections 1.15.1, 1.15.5, 1.15.6, 1.15.7, 3.3, 4.5, 4.6, 4.6.1, 4.7, 4.8, 20.1.1, 20.1.3, 20.2.1, 20.3, 20.4, 25.11, 25.11.2, 25.15.1.6, 25.15.2.6, and 26.8.
- Independent Mining Consultants (IMC) designed the open pit mine, mine production schedule, and mine capital and operating costs.
- Wyllie & Norrish Rock Engineers Inc. (W&N) completed the geotechnical and hydrological analyses and designs for the open pit mine.
- N D King Consulting, LLC (ND King) oversaw the metallurgical testwork program for the Project.
- SIM Geological Inc. (SIM) developed the mineral resource estimate for the Project.
- Independent consultant Bruce Davis was the QP for Section 12.
- Robert Michel Enterprises Inc. (RME) compiled the market studies and contracts information required for Section 19 and carried out the economic analysis for the Project.
- Global Resource Engineering Ltd. (GRE) completed the geochemical and hydrogeological studies for the Project.
- Independent consultant Adrian Karolko (2338538 Alberta Ltd.) reviewed the technical information and was the qualified person (QP) for Sections 4.1, 4.2, 5-11, and 23 of the report.

The Project is proposed to be developed in three phases of staged increases in daily milled throughput, as follows:

- 30 kt/d in Year 1
- 60 kt/d in Year 4
- 80 kt/d in Year 7 until the end of mine life.

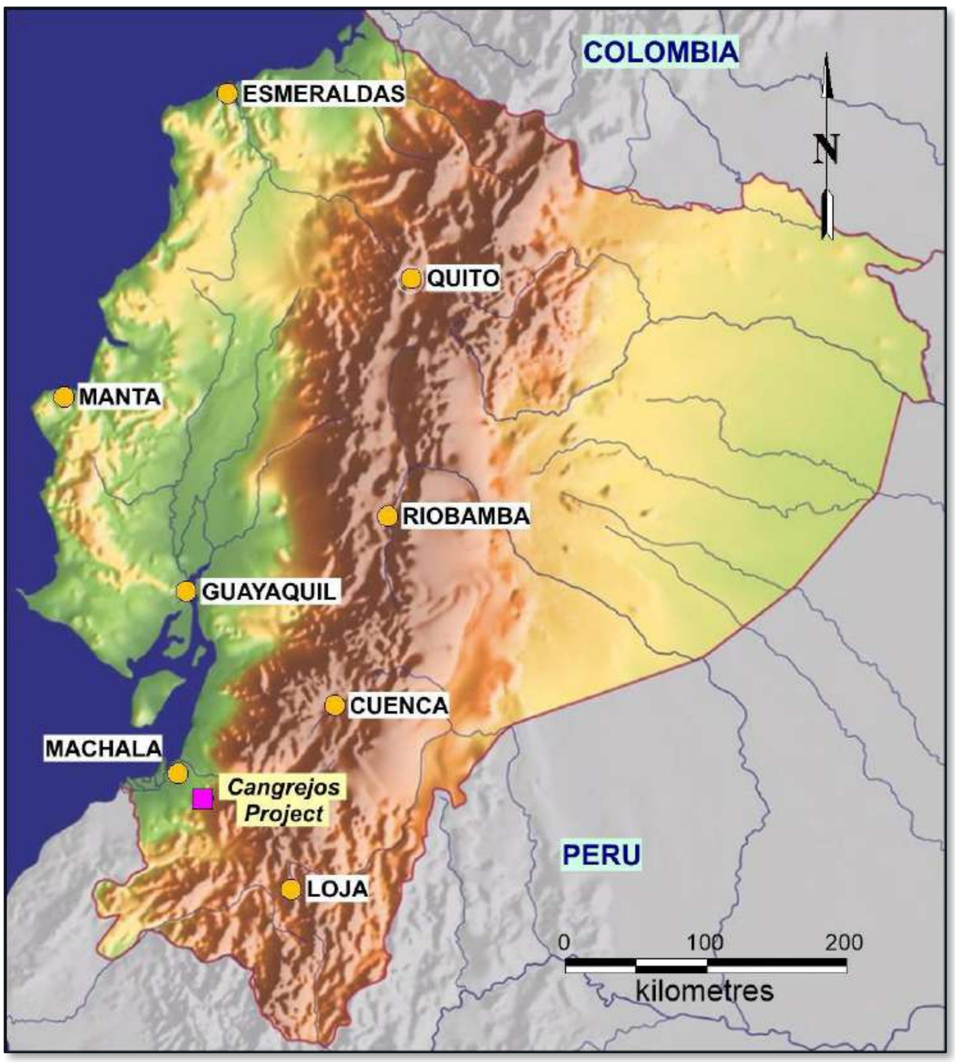
A preliminary economic assessment (PEA) with an effective date of June 1, 2022, was filed on the System for Electronic Document Analysis and Retrieval (SEDAR) based on a two-phased strategy of 40 kt/d to 80 kt/d.

This report is based on the results of further metallurgical testwork, resource drilling, mineral reserve estimation, mine design, and process optimization of the Project.

1.2 Property Description and Location

The Cangrejos Project is in southwestern Ecuador in the province of El Oro, about 223 km from Guayaquil and 30 km southeast of the provincial capital of Machala at 3° 28' 58" south latitude, 79° 49' 3" west latitude, as shown in Figure 1-1. The Project lies primarily within the Cantons (i.e., counties) of Santa Rosa and Atahualpa. The Project is in the El Oro Metamorphic Belt Zone of the Cordillera Real, in steep, high-relief terrain near the northeastern rim of an ancient caldera at the eastern edge of the coastal plain. Project elevations range from approximately 100 masl to 1,370 masl.

Figure 1-1: Cangrejos Project Location



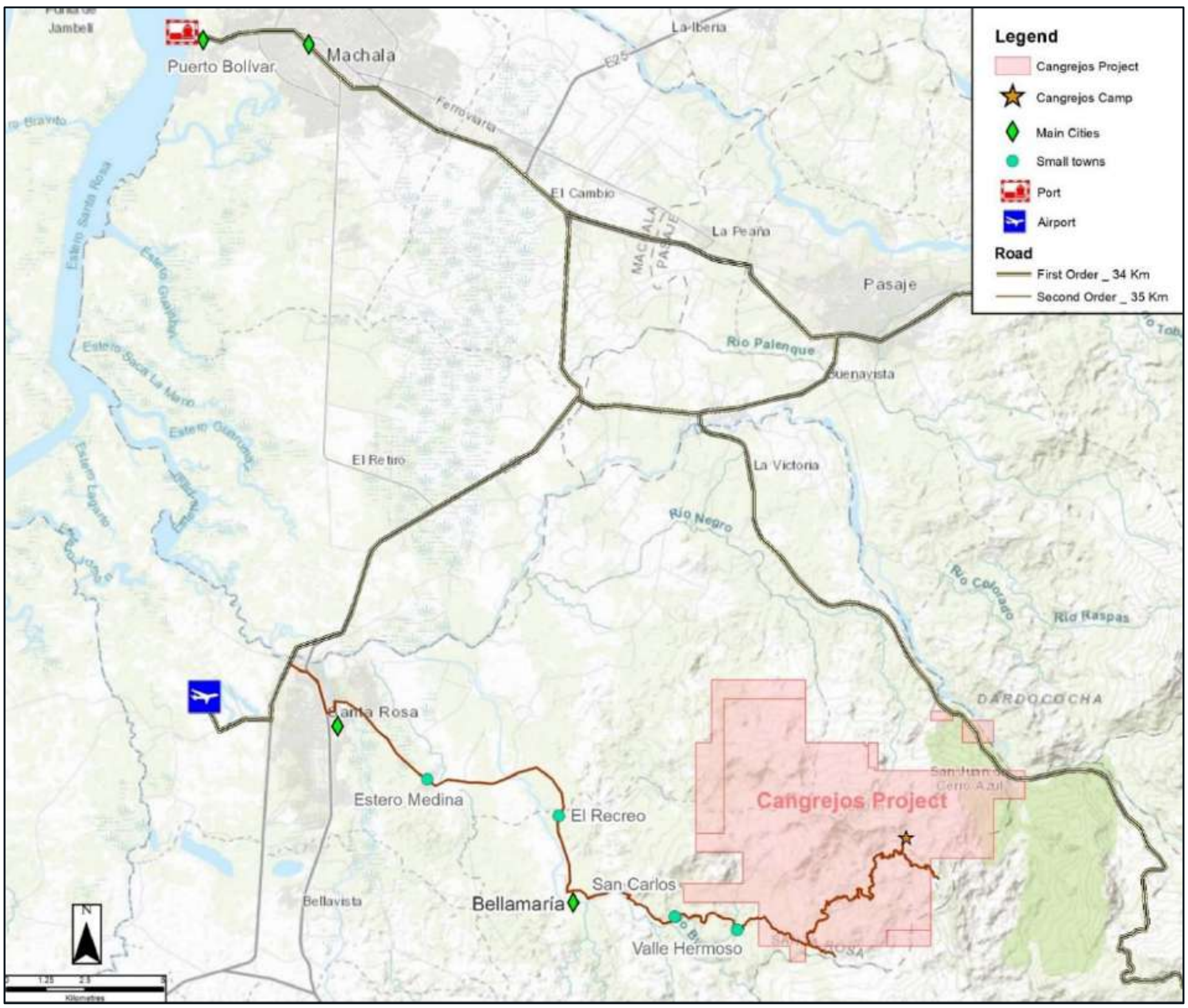
Source: Lumina, 2017.

The Universal Transverse Mercator (UTM) coordinates for the Project are 9,614,300 North and 633,200 East (geographic projection: Provisional South American 1956, Zone 17S). The proposed mine and major elements of supporting infrastructure will be located primarily in areas of evergreen montane and secondary forest, as well as altered pasture and agricultural areas in the central part of the Project.

1.3 Land Tenure

The Project consists of a group of six mining concessions totaling 5,682 ha. Odin Mining del Ecuador S.A. (Odin) is a 100% owned subsidiary of Lumina Gold Corp, and all concessions at the Cangrejos Project are held by Lumina through Odin. The concessions are in good standing with all fees paid to date. In addition, Odin owns or controls by legal easement land areas of approximately 1,729.97 ha. The concessions are outlined in the project area shown in Figure 1-2.

Figure 1-2: Cangrejos Project in Relationship to the Local Area



Source: Odin Mining, 2023.

1.4 Existing Infrastructure and Accessibility

Currently on-site infrastructure includes an exploration camp and core logging and storage facilities. The site also has power, high speed satellite internet, and cell phone coverage.

1.5 Geology and Mineralization

The Project is underlain by Miocene dacite porphyry intrusions which intrude the El Oro metamorphic complex. A large gold-copper soil anomaly is associated with breccia zones located near the contacts of these Miocene intrusions.

The Cangrejos Zone is a northeasterly trending zone of porphyry-style, gold-copper-silver-molybdenum mineralization. It extends for approximately 1,500 m in a northeasterly direction, has widths ranging from 70 m to 600 m, and has been defined to a depth of at least 600 m. The zone remains open to expansion with further exploration to the west and at depth.

At the Gran Bestia deposit, the porphyry-style gold-copper mineralization is associated with breccias. The mineralized zone has approximate dimensions of 700 m by 600 m and has been defined to depths of 700 m. The zone is open to depth and in all directions except to the southwest.

Mineralization at both the Cangrejos and Gran Bestia deposits consists of finely disseminated chalcopyrite, pyrite and minor bornite, molybdenite and pyrrhotite. The host rocks exhibit patchy secondary biotite (potassic) alteration and a late-stage, calcic-sodic alteration which is characterized by actinolite, chlorite and albite.

1.6 History

Odin is incorporated under the laws of the Republic of Ecuador by public deed and registered on December 15, 1993 (Zumarraga, 2022). It is a subsidiary of Lumina, which is a Canadian exploration company. In 1994, Odin formed the El Joven Joint Venture with Newmont Overseas Exploration Limited (Newmont) to explore the region. Newmont was the operator and carried out an airborne magnetic-radiometric survey, an IP survey, geological mapping, extensive soil and rock geochemical surveys, and a 29-hole diamond drill program. This work culminated in the discovery of two porphyry-style, gold-copper mineralized zones that were named the Cangrejos Zone and the Gran Bestia Zone.

In 2001, Newmont withdrew from the Joint Venture following a review of the exploration results that suggested that it would not meet their business model. Odin retained the northern claims which covered the Cangrejos Zone and several other geochemical anomalies.

In June 2014, Lumina Gold Corp acquired Odin Mining which included Odin Mining's 100% owned Ecuadorian subsidiary Odin Mining del Ecuador S.A.

The Cangrejos 20 concession (C20), which is now incorporated into the Los Cangrejos concession (as of November 2, 2021), was registered on December 15, 2016, and subsequently changed to an Advanced Exploration. Subsequently, Lumina applied for two mining easements in 2017 with the C20 easement being registered on March 27, 2018, and an access easement was registered on October 6, 2018.

1.7 Exploration

The Project is an advanced exploration project that has seen extensive geological mapping, historical geochemical (streams, soils, top of bedrock soils and rocks) surveys and an airborne magnetic-radiometric and electromagnetic surveys. This work defined several exploration targets and extensive drilling has outlined mineralized zones at both the Cangrejos and Gran Bestia deposits. A PEA incorporating both deposits was completed in 2020 and updated in 2022.

Subsequent to the 2020 PEA, from November 2021 to July 2022, an extensive infill and step-out drilling program was completed to expand and further convert the inferred mineral resource to an indicated mineral resource at both the Cangrejos and Gran Bestia deposits. The drilling program completed 101 drillholes, totalling 35,843.58 m. Of the completed holes, 52 infill resource holes totalling 17,810.68 m. were completed at Cangrejos. A total of 49 drillholes were completed at Gran Bestia, of which 38 drillholes totalling 12,610.50 m. were infill resource drillholes, and 11 drillholes totalling 5,341.40 m were exploration drillholes.

1.8 Metallurgical Testwork

Metallurgical testing programs were performed by Laboratorio Plenge (Plenge) of Lima, Peru, FLSmidth Minerals Testing and Research Center (FLS Testing) of Salt Lake City, Utah, USA, FLSmidth USA, Inc. Ore Characterization & Process Mineralogy Labs (FLS Mineralogy), also of Salt Lake City, Utah USA, Diemme Filtration (Diemme) of Lugo, Italy and Pocock Industrial, Inc. (Pocock) of Salt Lake City, Utah USA between 2015 and March 2023. Testing on samples from the deposits included mineralogy, gravity concentration, flotation, cyanidation, sedimentation, filtration and comminution.

Based on results of the test programs the optimum mineral processing flowsheet currently includes:

- primary, secondary and high-pressure grinding roll (HPGR) crushing and screening
- ball mill grinding and cyclone classification
- rougher flotation
- three-staged cleaner flotation with fine regrinding
- cyclone classification of rougher flotation tails
- flotation of the rougher tails cyclone underflow (sand)
- cyanidation of the cleaner scavenger tails and sand flotation concentrates
- detoxification of cyanide in the leach residues
- thickening and filtration of the combined tailings (flotation tails and leach residues)
- deposition of the filtered tailings in the dry-stack tailings facility (DSTF)
- production of gold-copper flotation concentrates and gold-silver doré.

Samples for the metallurgical test programs were obtained from 155 drillholes representing various rock types, alterations, lithologies, metal concentrations, and locations within the proposed Cangrejos and Gran Bestia pit areas.

The 2019 and 2023 Plenge metallurgical tests were analyzed to create two metallurgical models that project the gold, silver and copper recoveries and flotation concentrate grades when processing fresh and partially oxidized rock from the deposits. The tests included open-circuit and locked-cycle bulk rougher flotation and three-stage cleaner flotation tests of the Cangrejos and Gran Bestia master composites and variability samples to project metal recoveries into a flotation concentrate. Results from cyanide leaching of the combined cleaner scavenger flotation tailings plus the sand flotation concentrates were used to project silver and gold recoveries into a doré product.

The first model was prepared using open-circuit flotation and cyanidation test results from the 2019/2020 Plenge test program. This model has been used to estimate the metallurgical performance during the first three years of plant operations with process design parameters as follows:

- Initial Phase (Initial Plant) – 30 kt/d at a primary grind size P_{80} of 90 µm, 12 minutes rougher flotation time and a regrind target size P_{80} of 40 µm in the cleaner flotation circuit.

The second model was prepared using locked cycle flotation and cyanidation test results from the 2022/2023 Plenge test program to determine the metallurgical performance during the remaining twenty-three years of operation with process design parameters as follows:

- Expansion 1 Phase: First expansion of the plant in Year 4 to 60 kt/d at a primary grind size P_{80} of 90 µm, 16 minutes of rougher flotation, additional flotation reagents, a regrind target size P_{80} of 20 µm in an expanded cleaner flotation and cyanidation circuits. These operating conditions improve gold recovery and copper-gold concentrate grade over the Initial Phase design.
- Expansion 2 Phase: Second expansion in Year 7 to 80 kt/d for the duration of operations at a coarser primary grind size P_{80} of 120 µm, but with the flotation and cyanidation circuits operated as in the Expansion 1 Phase plant. Test results indicate that the coarser primary grind slightly reduces gold and copper recoveries but also lowers the impact of capital and operating costs compared to expanding to achieve the finer grind size.

Based on the plant feed grades and the metallurgical models the projected life-of-mine recoveries are 85% for gold, 79% for copper and 55% for silver. Flotation concentrates are projected to assay on average 122 g/t gold, 22% copper and 103 g/t silver. Detailed assays of the flotation concentrates also indicate that they do not contain deleterious elements and would not cause smelter penalties.

Over the mine life of 26 years, gold production is estimated at 9.8 Moz, silver production at 7.8 Moz and copper production at 1.12 billion pounds.

1.9 Mineral Resource Estimate

The mineral resource estimate was generated using drillhole sample assay results and the interpretation of a geological model, which relates to the spatial distribution of gold, copper, silver, molybdenum, sulphur, arsenic and antimony mineralization at the Project. Interpolation characteristics were defined based on the geology, drillhole spacing, and geostatistical analysis of the data. Estimations are made from 3D block models based on geostatistical applications using commercial mine planning software (MinePlan® v15.80-2, formerly called MineSight®).

Grade estimates have been made using ordinary kriging (OK) into a model with a nominal block size of 15 ×15 ×15 m (L×W×H). Potentially anomalous outlier grades have been identified and their influences on the grade models are controlled during interpolation through the use of top-cutting and outlier limitations. Specific gravities are estimated in model blocks using the inverse distance weighting (ID2) interpolation method.

The results of the modelling process were validated using a combination of visual and statistical methods to ensure the grade estimates are appropriate representations of the underlying sample data.

The mineral resources were classified according to their proximity to the sample data locations and are reported, as required by NI 43-101, according to the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) *Definition Standards for Mineral Resources and Mineral Reserves* (May 2014). Indicated mineral resources include zones of consistent mineralization where drillholes are spaced at a maximum distance of 100 m. Inferred class mineral resources include areas that are within a maximum distance of 150 m from a drillhole.

To ensure that the mineral resource exhibits reasonable prospects for eventual economic extraction, it has been constrained within a floating cone pit shell that has been generated using the following projected economic and technical parameters:

- Mining (Open Pit) $2.15/t
- Processing $8.00/t
- General & Administrative (G&A) $1.50/t
- Gold Price $1,600/oz
- Silver Price $21.00/oz
- Copper Price $3.50/lb
- Molybdenum Price $11.00/lb
- Gold Process Recovery .... 82% fresh rock; 80% trans.oxide; 85% SAP&SRK
- Silver Process Recovery .... 70% fresh rock; 60% trans.oxide; 85% SAP and SRK*
- Copper Process Recovery .... 86% fresh rock; 50% trans.oxide (no Cu recovered from SAP or SRK units)
- Molybdenum Process Recovery..... 50% fresh rock and trans.oxide (no Mo recovered from SAP or SRK units)
- Pit Slope .... 47 degrees
- Royalty 3%

*Note: As defined in Section 7.4.

The estimate of mineral resources, contained within the $1,600/oz Au pit shell, is based on gold equivalent grades (AuEq) calculated using the following formula:

$$AuEq = Au\ g/t + (Ag\ g/t \times 0.0131) + (Cu\% \times 1.50) + (Mo\ ppm/10{,}000 \times 4.71)\ x\ 0.97$$

(Note: there is no contribution from copper or molybdenum in the SAP or SRK units)

Using the assumed metal prices, operating costs and metallurgical recoveries listed above, the base case cut-off grade for mineral resources is estimated to be 0.25 g/t AuEq.

Table 1-1 shows the estimate of mineral resources at the Cangrejos deposit. Table 1-2 shows the estimate of mineral resources at the Gran Bestia deposit. Table 1-3 shows the combined estimate of mineral resources at the Cangrejos and Gran Bestia deposit.

Table 1-1: Estimate of Mineral Resources at Cangrejos Deposit, Effective Date: January 30, 2023

Type	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Indicated										
SAP+SRK	17.3	0.53	0.52	0.09	2.6	4.4	0.29	34	1.4	0.17
TransOxide	19.2	0.60	0.47	0.09	0.8	13.2	0.29	36	0.48	0.56
Fresh	615.0	0.68	0.52	0.11	0.6	22.3	10.3	1,424	12.5	30.2
Combined	**651.5**	**0.67**	**0.52**	**0.10**	**0.7**	**21.6**	**10.9**	**1494**	**14.2**	**31.0**
Inferred										
SAP+SRK	1.7	0.32	0.30	0.06	2.5	6.1	0.02	2	0.1	0.02
TransOxide	2.3	0.34	0.25	0.06	0.8	9.4	0.02	3	0.06	0.05
Fresh	77.8	0.46	0.35	0.07	0.6	17.5	0.9	125	1.5	3.0
Combined	**81.8**	**0.46**	**0.35**	**0.07**	**0.6**	**17.1**	**0.9**	**130**	**1.7**	**3.1**

Note: The estimates in Table 1-1 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral Resources are not Mineral Reserves because the economic viability has not been demonstrated. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 1-2: Estimate of Mineral Resources at Gran Bestia Deposit, Effective Date: January 30, 2023

Type	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Indicated										
SAP+SRK	6.1	0.48	0.46	0.07	2.3	6.0	0.09	9	0.4	0.08
TransOxide	16.7	0.50	0.40	0.07	0.8	11.4	0.21	25	0.44	0.42
Fresh	405.6	0.54	0.43	0.07	0.7	12.1	5.6	653	9.0	10.8
Combined	**428.4**	**0.54**	**0.43**	**0.07**	**0.7**	**12.0**	**5.9**	**689**	**9.8**	**11.3**
Inferred										
SAP+SRK	1.8	0.39	0.38	0.07	1.9	6.0	0.02	3	0.1	0.02
TransOxide	6.7	0.44	0.33	0.07	1.1	14.1	0.07	10	0.23	0.21
Fresh	205.9	0.52	0.41	0.07	0.8	9.6	2.7	336	5.0	4.4
Combined	**214.4**	**0.52**	**0.41**	**0.07**	**0.8**	**9.7**	**2.8**	**350**	**5.4**	**4.6**

Note: The estimates in Table 1-2 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral Resources are not Mineral Reserves because the economic viability has not been demonstrated. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 1-3: Estimate of Mineral Resources at Cangrejos and Gran Bestia Deposits, Effective Date: January 30, 2023

Type	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Indicated										
SAP+SRK	23.4	0.52	0.50	0.08	2.5	4.8	0.38	43	1.9	0.25
TransOxide	36.0	0.55	0.44	0.08	0.8	12.3	0.50	62	0.93	0.98
Fresh	1,020.6	0.62	0.48	0.09	0.7	18.3	15.9	2,070	21.3	41.2
Combined	**1,079.9**	**0.62**	**0.48**	**0.09**	**0.7**	**17.8**	**16.8**	**2166**	**24.3**	**42.4**
Inferred										
SAP+SRK	3.5	0.36	0.34	0.06	2.2	6.0	0.04	5	0.2	0.05
TransOxide	9.0	0.42	0.31	0.07	1.0	12.9	0.09	13	0.29	0.26
Fresh	283.7	0.50	0.39	0.07	0.7	11.8	3.6	463	6.5	7.4
Combined	**296.3**	**0.50**	**0.39**	**0.07**	**0.7**	**11.7**	**3.7**	**483**	**7.0**	**7.6**

Note: The estimates in Table 1-3 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral Resources are not Mineral Reserves because the economic viability has not been demonstrated. Mineral Resources are inclusive of Mineral Reserves.
Source: SIM Geological, January 2023.

1.10 Mineral Reserve Statement

This is the first estimate of mineral reserves for the Cangrejos Project. The mineral reserve estimate was developed from a computer block model provided to IMC by Robert Sim of SIM Geological, Inc. (SIM).

The mineral reserve estimate was established by tabulating the contained tonnage of material comprising the measured and indicated mineral resource within the designed final pit geometry, scheduled mill feed and planned cutoff grades (COG). The model did not contain material comprising a measured mineral resource; therefore, the mineral reserves only report material comprising the probable mineral reserve. A total of seven pushbacks were designed to be used as the basis for the scheduled mill feed. The mineralized ore feed is initially scheduled to process 30 kt/d, then increase to 60 kt/d in Year 4 and reach a maximum production rate of 80 kt/d during Year 7. The COG decreases over the life of mine (LOM), starting from an initial Net Smelter Return (NSR) COG of $23.00/t of mill feed down to $7.76/t.

IMC has utilized Net Smelter Return (NSR) to combine the values of all economic metals at the Cangrejos Project. Simply put, NSR is to the total sales value net of all off-site costs for smelting and refining. The equations for NSR are as follows, based on the metal grade units provided in the model.

Gold NSR = Au grade x Recovery x (1-Ecuadorian Royalty) x (Price – Au Refine) x 0.03215

\+ Silver NSR = Ag grade x Recovery x (1-Ecuadorian Royalty) x (Price – Ag Refine) x 0.03215

\+ Copper NSR = Cu grade x Recovery x (1-Ecuadorian Royalty) x (Price – Smelt/lb) x 22.0462

Total NSR in US$/t

Table 1-4: Cangrejos Project Mineral Reserve Statement – Effective Date: March 30, 2023

Classification	Mineralized Tonnes (Mt)	Contained Grade			Contained Metal		
		Gold Grade (g/t)	Copper (%)	Silver (g/t)	Gold (Moz)	Copper (Mlbs)	Silver (Moz)
Probable	659	0.55	0.10	0.68	11.56	1,420	14.38
Total Reserves	659	0.55	0.10	0.68	11.56	1,420	14.38

Notes: **1.** The mineral reserve estimate has an effective date of March 30, 2023. **2.** Mineral reserves in Table 1-4 are contained within the mineral resources; mineral resources are not included. **3.** The mineral reserves in this estimate are based on declining NSR cut-off grade between $23.00/t milled to $7.76/milled. **4.** Net smelter return (NSR) values were calculated using the following prices: a gold price of US$1,500 per ounce, a copper price of US$3.00 per pound, and a silver price of US$18.00 per ounce. NSR values are calculated using the following costs & recoveries: Costs of metal in copper concentrate: $7.50/oz Au, $0.51/lb Cu, and $0.65/oz Ag; Costs of metal in dore: $0.30/oz Au and $0.30/oz Ag; recoveries of metal in copper "oxide" rock concentrate: 60% Au, 50% Ag, and 50% Cu; recoveries of metal in copper "fresh" rock concentrate: 62% Au, 50% Ag, and 86% Cu; recoveries of metal in copper "oxide" rock dore: 20% Au and 10% Ag; recoveries of metal in copper "fresh" rock dore: 20% Au and 20% Ag; payables of metal in copper concentrate: 97.5% Au, 60% Ag, and 93.58% Cu; payables of metal in dore: 99.95% Au and 99.5% Ag. Saprolite and saprock are not included in the mineral reserve. **5.** The mineral reserves estimate was calculated with the Canadian Institute of Mining, Metallurgy and Petroleum ("CIM"), CIM Standards on Mineral Resources and Reserves, Definitions and Guidelines prepared by the CIM Standing Committee on Reserve Definitions. **6.** The probable mineral reserves are contained within an engineered pit design that is based on pit optimization associated with a $1,100/oz gold price. **7.** Gold is reported in millions of troy ounces and the gold grade is reported in grams per metric tonne. **8.** Totals may not add up due to rounding**. 9.** The qualified person for the mineral reserve estimate is Joseph McNaughton P.E., a senior engineer at Independent Mining Consultants, Inc. **10.** Lumina is not aware of any legal, political, environmental, or other risks that could materially affect the potential development of the mineral reserves. Source: IMC, 2023.

1.11 Mining Methods

1.11.1 Mine Planning

The Cangrejos Project consists of two adjacent open pit mines referred to as (1) Cangrejos (eastern pit) and (2) Gran Bestia (western pit). Both pits will be mined with conventional hard rock open pit mining methods. The terrain can be very steep with evergreen montane secondary forest, saprolite (SAP), and saprock (SRK) overlying both pit areas. Management of the saprolite and saprock presents challenges for mine operations. This was anticipated during the development of the mine production schedule and in selecting the mine equipment.

The mine delivers 30 kt/d of ore to the plant from mid-Year 1 through Year 3. Production ramps up in Year 4 so that the mine delivers 60 kt/d of ore from Years 5 to 6. Production ramps up a third time in Year 7, so that the mine delivers 80 kt/d of ore from Year 8 to the end of mine life (25 ½ years). Multiple mill feed ramp-up schedules were evaluated, but the 30-60-80 schedule resulted in the best balance of strong economic value and minimized initial capital requirements. A summary of the mined and processed material based on all material types is provided in Table 1-5 and Table 1-6. The material listed as Processed during the pre-production period (PP Period) is stockpiled and fed to the plant during year one.

Table 1-5: Mine Production Schedule – All Material Types

Year	NSR Cutoff Grade (US$/t)	Mineralized Material Mined							Waste Material (kt)	Total Mined Material (kt)
		Material To Be Processed (kt)	Contained Metal Grades							
			NSR (US$/t)	Gold (g/t)	Silver (g/t)	Copper (%)	Molybdenum (ppm)	Sulphur (%)		
PP	23.00	1,800	31.79	0.734	0.6	0.13	17	0.17	11,481	13,281
1	23.00	6,450	33.73	0.769	0.6	0.13	23	0.17	36,677	43,127
2	23.00	10,950	36.34	0.813	0.7	0.14	31	0.19	33,419	44,369
3	20.00	10,950	27.57	0.609	0.5	0.11	22	0.22	36,417	47,367
4	20.00	19,200	31.83	0.705	0.5	0.12	28	0.20	41,609	60,809
5	19.00	21,900	30.21	0.695	0.7	0.10	24	0.21	38,271	60,171
6	17.00	21,900	32.34	0.721	0.8	0.12	29	0.22	40,096	61,996
7	15.00	28,300	29.69	0.636	0.7	0.13	21	0.21	43,430	71,730
8	15.00	29,200	29.11	0.643	0.6	0.12	25	0.25	42,753	71,953
9	14.00	29,200	29.87	0.662	0.7	0.12	20	0.26	42,761	71,961
10	13.00	29,200	24.85	0.556	0.7	0.10	14	0.28	42,325	71,525
11	11.00	29,200	21.72	0.476	0.6	0.09	15	0.31	41,521	70,721
12	11.00	29,200	21.87	0.483	0.6	0.09	15	0.30	42,221	71,421
13	11.00	29,200	21.09	0.461	0.6	0.09	17	0.30	39,800	69,000
14	11.00	29,200	24.39	0.534	0.5	0.10	23	0.23	39,800	69,000
15	11.00	29,200	30.52	0.661	0.6	0.13	28	0.22	38,800	68,000
16	11.00	29,200	41.70	0.892	1.0	0.19	30	0.35	38,800	68,000
17	7.76	29,200	20.29	0.438	1.1	0.09	16	0.38	36,450	65,650
18	7.76	29,200	16.99	0.371	0.8	0.07	11	0.37	36,450	65,650
19	7.76	29,200	18.53	0.409	0.7	0.07	12	0.37	36,352	65,552
20	7.76	29,200	16.22	0.355	0.7	0.07	12	0.36	29,467	58,667
21	7.76	29,200	22.88	0.524	0.9	0.07	7	0.47	11,973	41,173
22	7.76	29,200	23.54	0.533	0.8	0.08	10	0.46	5,750	34,950
23	7.76	29,200	19.26	0.425	0.6	0.08	14	0.34	6,036	35,236
24	7.76	29,200	18.08	0.395	0.5	0.07	15	0.28	6,390	35,590
25	7.76	29,200	19.36	0.426	0.5	0.08	14	0.26	7,042	36,242
26	7.76	11,663	20.54	0.442	0.5	0.09	14	0.23	1,091	12,754
TOTAL		**658,713**	**24.74**	**0.545**	**0.7**	**0.10**	**18**	**0.30**	**827,182**	**1,485,895**

Note: molybdenum and sulphur are not included in the mineral reserves and are not treated as recovered products in this PFS. Source: IMC, 2023.

Table 1-6: Mill Production Schedule

Year	Total Mill Feed				
	Mill Feed (kt)	Contained Metal Grades			
		NSR (US$/t)	Gold (g/t)	Silver (g/t)	Copper (%)
PP					
1[1]	8,250	33.30	0.761	0.6	0.13
2	10,950	36.34	0.813	0.7	0.14
3	10,950	27.57	0.609	0.5	0.11
4	19,200	31.83	0.705	0.5	0.12
5	21,900	30.21	0.695	0.7	0.10
6	21,900	32.34	0.721	0.8	0.12
7	28,300	29.69	0.636	0.7	0.13
8	29,200	29.11	0.643	0.6	0.12
9	29,200	29.87	0.662	0.7	0.12
10	29,200	24.85	0.556	0.7	0.10
11	29,200	21.72	0.476	0.6	0.09
12	29,200	21.87	0.483	0.6	0.09
13	29,200	21.09	0.461	0.6	0.09
14	29,200	24.39	0.534	0.5	0.10
15	29,200	30.52	0.661	0.6	0.13
16	29,200	41.70	0.892	1.0	0.19
17	29,200	20.29	0.438	1.1	0.09
18	29,200	16.99	0.371	0.8	0.07
19	29,200	18.53	0.409	0.7	0.07
20	29,200	16.22	0.355	0.7	0.07
21	29,200	22.88	0.524	0.9	0.07
22	29,200	23.54	0.533	0.8	0.08
23	29,200	19.26	0.425	0.6	0.08
24	29,200	18.08	0.395	0.5	0.07
25	29,200	19.36	0.426	0.5	0.08
26	11,663	20.54	0.442	0.5	0.09
TOTAL	**658,713**	**24.76**	**0.546**	**0.7**	**0.10**

Notes: [1] Including stockpile reclaim. Source: IMC, 2023.

A monthly schedule was developed by IMC for the 28 months prior to plant commissioning for planning the capital expenditures, personnel requirements, and for scheduling. The first four to six months of the 28-month pre-production period develops the initial road access to the site facilities with the existing external roadways using the mining auxiliary fleet equipment. Once access is developed to the site facilities, the mine equipment is used for the bulk earthworks site preparations for the facilities. After the completion of the site facility bulk earthworks, (pre-production month -18), the mining fleet will begin developing the initial access to the pits and waste storage facilities from the crusher site. The access pioneering to mining areas is estimated to take five months to develop. Pioneering continues throughout the period of pre-production mining.

Waste material was reported by the rock types of overburden, saprolite, saprock, oxidized hard rock and fresh rock. During the first five years of the mine life, the saprolite and saprock are delivered to a saprolite-saprock storage facility (SRSF) and mineralized saprolite-saprock stockpile facility (MSRSF), which are both located south-southeast of the Cangrejos pit and directly east of the WRSF.

The hard rock is delivered to the waste rock storage facility (WRSF) located south of Cangrejos and the primary crusher. A portion of the saprock is delivered to the WRSF during the first five years. The ratio of hard rock to saprock during pre-production and Year 1 is 4.5:1, increasing to 10:1 by the end of Year 5 and remaining above a 10:1 for the remainder of the mine life. After Year 5, all of the saprolite and saprock that are incurred are also stored in the WRSF.

The Cangrejos Project is unusual in that the waste haulage distances begin to slowly reduce over much of the mine life from Year 15 until just a few years before completion of mine life. This is because the waste dump rises in elevation to meet the exit elevation from the pit.

The mine equipment requirements were calculated based upon the mine production schedule, bench heights and operating conditions at Cangrejos. As in previous evaluations of Cangrejos, IMC has established 3 basic fleets or categories of equipment to open the mine and sustain it. There will be three fleets at Cangrejos – a primary production fleet (shovels and 220-tonne trucks), a narrow mining fleet (FEL and 91-tonne trucks) and a pioneering fleet (excavators and 38-tonne articulated trucks).

1.11.2 Mine Geotechnical

In support of overburden pit slope design, saprolite, saprock and transition (i.e., weathered) rock characterization included landform imagery analyses and reconnaissance mapping, logging and sampling of 16 hand excavated test pits, and thin-walled tube sampling of select boreholes. Material properties defined by laboratory soil testing were combined with published empirical shear strength formulations for input to stability analyses.

Bedrock characterization was performed in 28 dedicated geotechnical boreholes supplemented with additional geotechnical data collected from 89 resource and infill boreholes. In addition to geomechanical rock mass and discontinuity parameters generated from the core logging, 10,364 m of televiewer logging using acoustic and optical techniques yielded some 10,000 orientation measurements to characterize the structural fabric (i.e., joints, faults, contacts, foliation, and other characteristics – collectively discontinuities). To complement index strength testing carried out as a routine adjunct to core logging, off-site laboratory rock testing was performed on core samples for compressive and shear strength.

The spatial variability of overburden character and rock mass quality were evaluated with multiple models for which key findings are described below.

- Geological Model – Thickness of overburden materials is inversely related to slope aspect. Therefore, steeper natural slopes northward and upslope of the proposed ultimate pit crests will have nominal thicknesses generally less than 10 m, but with potential greater thicknesses in natural drainage swales. Engineered slopes in the soil materials will be required for phase pits located at lower elevations on flatter topography where thicknesses are greater.

  Primary bedrock lithologies are host metamorphic and an intrusive assemblage for the Cangrejos deposit and metamorphic and breccia for the Gran Bestia deposit. Consistently high rock mass quality was determined between primary lithologies and between the two deposits.

- Alteration Model – Detailed geologic analyses by third-party consultants confirmed the absence of rock quality penalizing phyllic and argillic caps for the porphyry system and, similarly, the low sulphide content in the rock has inhibited the development of supergene clay in the weathering profile. Conversely and beneficially, the presence biotite alteration in the metamorphic basement is strength enhancing.

- Structural Model – Inter-hole correlations and drainage pattern interpretations by others have confirmed the limited presence of minor to intermediate faults. To date, only two steeply dipping faults, classed as intermediate to major, have been inferred and wireframed at the Cangrejos deposit. These faults were accounted for in-pit slope design analyses.

  Structural fabric analyses of televiewer data indicate preferred joint orientations steeply dipping to the northwest and southeast. Secondary joint sets are also steeply inclined with minor intermediate dip concentrations. Lithologic variability of the structural fabric was accounted for in-pit slope design analyses.

- Hydrogeologic Model – Consistent with the geotechnical characterization of the rock mass, hydrogeologic testing by Global Resource Engineering (GRE) demonstrated the rock mass to have uniformly low total conductivity with the consequence that natural groundwater drawdown will be inhibited as the pits are deepened. Furthermore, enhanced drainage by means of horizontal drains or pumped wells may be impractical unless higher conductivity fracture zones can be identified in future Feasibility Study programs.

Synthesis of these geologic attributes confirms that the project site is favorable for the excavation of steep, high pit slopes, notwithstanding the unfavorable influence of groundwater.

Overall slope stability was analyzed using limit equilibrium and finite element modeling methods that incorporated empirically derived rock mass shear strength modified by lithology-specific structural fabric to account for anisotropic shear strength. Consideration of planar, toppling, wedge and hybrid failure mechanisms demonstrated adequate stability margins to achieve or exceed industry standard acceptance criteria under static and earthquake induced loading. The analyses indicated feasible overall slope inclinations for both pits in the range of 46° (toe-to-crest) for nominal slope heights to 700 m within pit segments subject to toppling (southeast or northwest facing), and 50° for nominal slopes to heights of 1,000 m elsewhere.

Bench geometry, rockfall catchments, (i.e., geotechnical safety benches) and haul ramps, will reduce these theoretically feasible overall slopes. Allowable bench height and bench width for bedrock slopes are prescribed at 30 m and 10.5 m, respectively. Bench face angles were established through cumulative frequency analyses of structural fabric inclinations within pit slope dip direction segments such that a 70 percent reliability index was achieved by specific lithology. The integration of bench face angle, bench heights and bench widths will define inter-ramp angles, and ultimately control achievable overall slope angles.

Overburden thickness (nominally, saprolite and saprock using geologic classification) on natural slopes is localized and variable but, in general, thicknesses are inversely related to slope steepness. Where present above planned pit walls, hazards include erosion, rockfalls, natural landslides and debris flows related to precipitation. Analyses of cut slopes in these materials generated guidance for bench face and overall slope angles as a function thickness, and upslope inclination. This issue represents a greater geotechnical challenge for phase pits for which combined thicknesses could approach 50 m at Cangrejos and 30 m at Gran Bestia. These materials will require appropriate bench and slope angles or be removed or retained if layback is not feasible. In addition, mitigation measures at the pit crests will potentially include surface water interception and diversion structures or excavations, benches and slope embayments for slide containment, selective upslope scaling and rock removal, and rockfall control measures such as cable fences.

1.12 Recovery Methods

The process plant design incorporates a staged expansion approach, allowing the throughput to be increased and to accommodate higher feed grades over the life of mine. The selected flowsheet includes a three-stage crushing circuit with the crushed product reporting to the ball mill grinding circuit in a closed circuit with a cyclone cluster. The cyclone overflow material reports to sequential copper flotation. The concentrate is thickened and filtered before being sold and shipped to market and the tailings from the rougher flotation reports to the sand flotation circuit. The tailings from the cleaner scavenger flotation stage as well as the concentrate from the sand flotation stage are leached using a hybrid Carbon-in-Leach (CIL) circuit and gold doré is recovered after electrowinning and smelting. The tailings from the sand flotation stage as well as the detoxified tailings from the CIL circuit are thickened and filtered before being deposited in the DSTF on site.

The staged expansion of the process plant over the mine life is presented below:

- Initial Phase (Years 1 to 3): process plant is operated at a throughput of 30 kt/d
- Expansion 1 Phase (Years 4 to 6): plant is expanded to process material at a throughput of 60 kt/d
- Expansion 2 Phase (Year 7+): plant is further expanded to process material at a throughput of 80 kt/d.

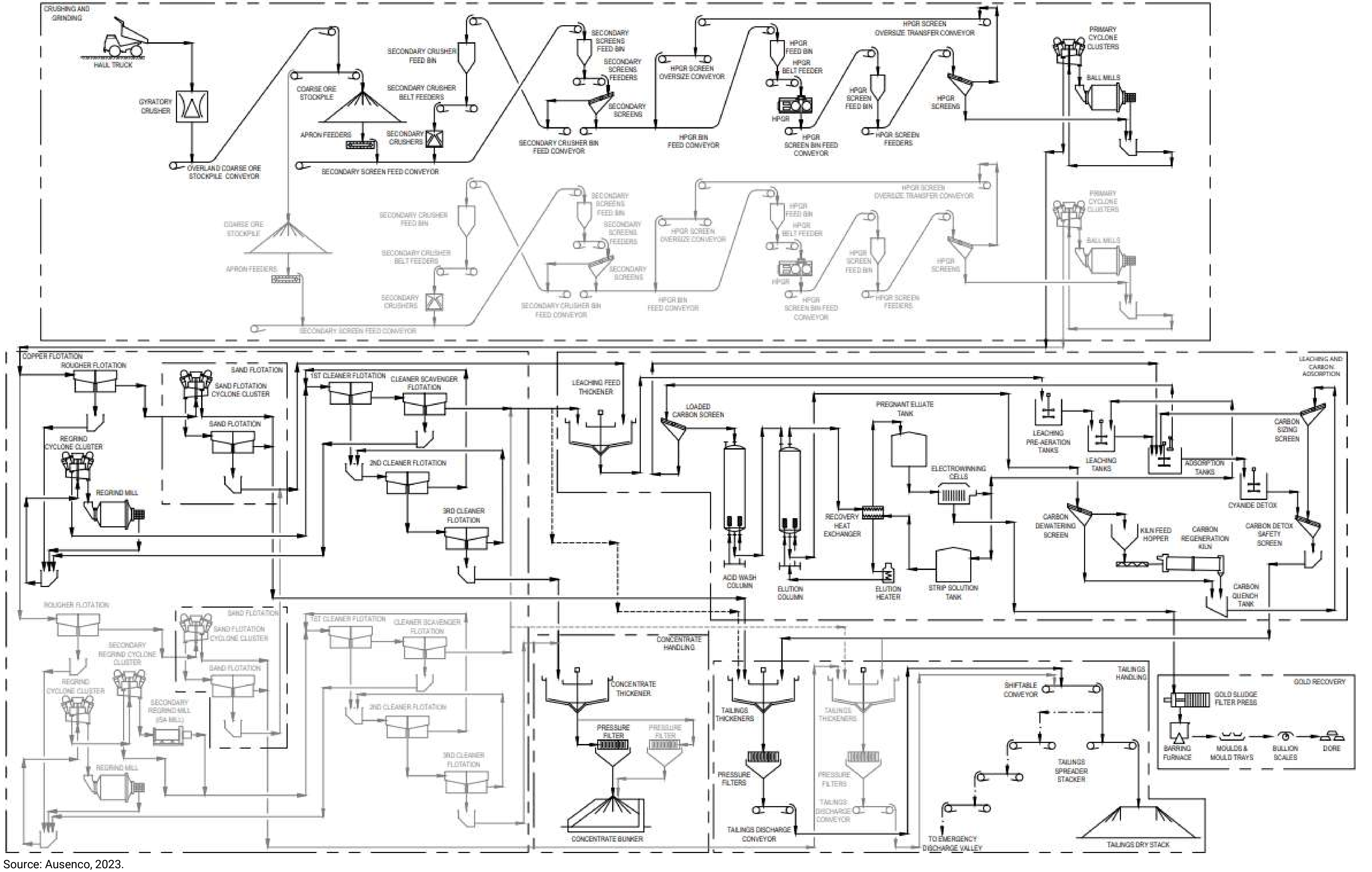
The unit operations and staged expansion approach were selected to accommodate the variable nature of the deposit in terms of copper and gold feed grades and to deploy capital efficiently throughout the life of mine.

A summary of the expected process performance is as follows:

- Primary crushing availability of 75%
- Secondary & tertiary crushing availability of 90%
- Grinding and flotation circuit availability of 90%
- Concentrate handling availability of 82.5%
- Tailings filtration availability of 75%
- Initial Phase throughput of 30 kt/d (average basis)
- Expansion 1 Phase throughput of 60 kt/d (average basis)
- Expansion 2 Phase throughput of 80 kt/d (average basis).

The process flowsheet is depicted in Figure 1-3, with Initial Phase equipment shown in black and Expansion 1 and 2 Phases equipment shown in grey scale.

Figure 1-3: Process Flowsheet



Source: Ausenco, 2023.

1.13 Project Infrastructure

1.13.1 Overview

There will be three principal areas of operation on site that will be separated by 13.5 km of road. The open pits, waste rock storage facility (WRSF) and truck shop will be located southeast of the process plant, the process plant will sit between the open pits and the dry-stack tailing facility (DSTF), and the filtered tailings facility will be located northwest of the process plant. The main access road connects the site to a public road.

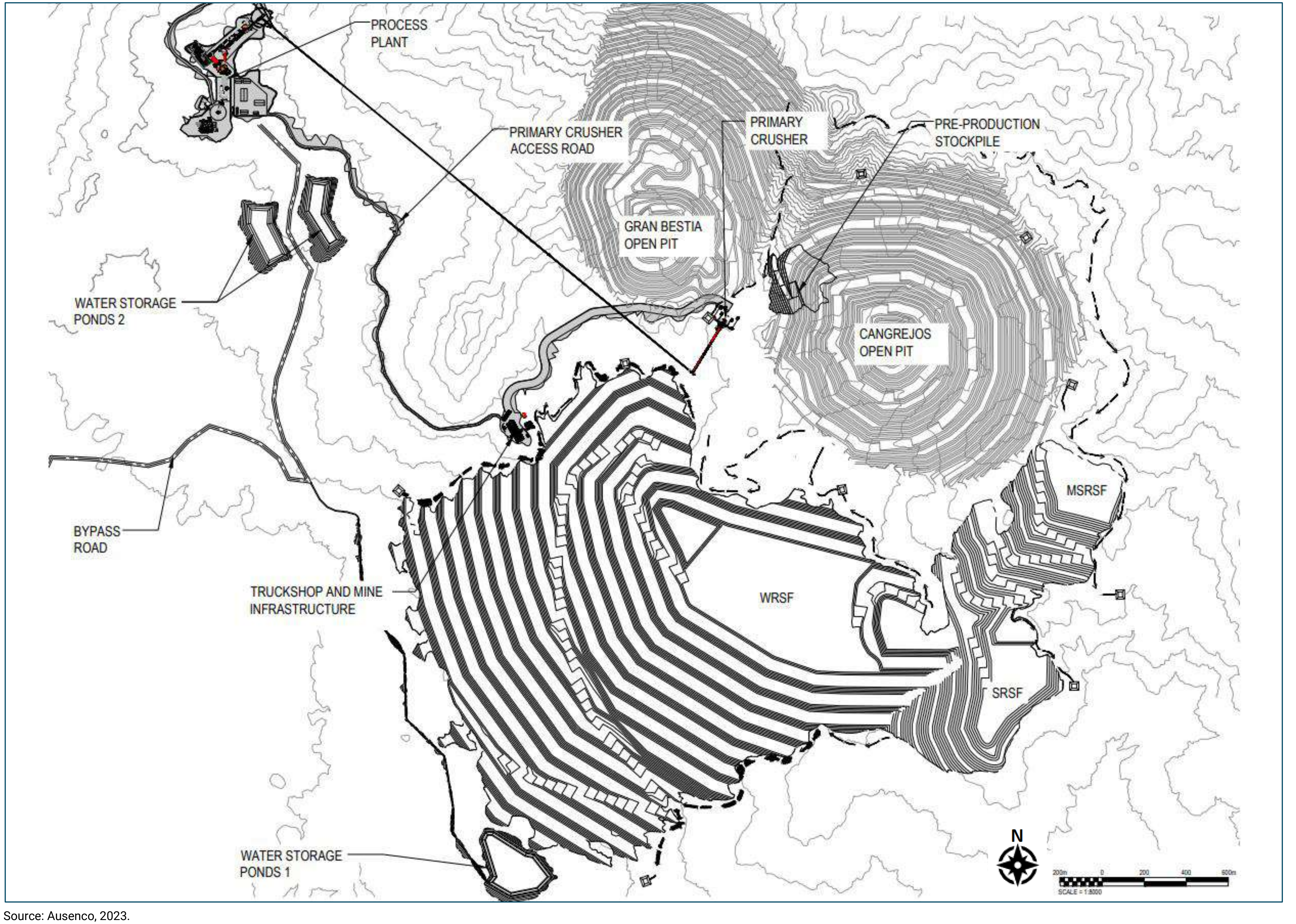
1.13.2 On-Site Infrastructure

The on-site infrastructure to support the Cangrejos Project will consist of civil works, facilities/buildings, on-site roads, a water management system, and site electrical power. Site facilities will include mine facilities, process facilities, and other supporting facilities and infrastructure, as follow:

- mine administration offices, truckshop, explosives storage, fuel storage and distribution, ore stockpiles, waste rock storage facility, saprolite saprock storage facility (SRSF), mineralized saprolite saprock storage facility (MSRSF) and truck wash
- process facilities including the process plant, aerial conveyor, crushing facilities, process plant workshop, assay laboratory, freshwater infrastructure, and tailings and reclaim water pipelines
- dry-stack tailings facility, including the tailings filtration plant and stacker conveyors
- general facilities include a gatehouse, site accommodations, administration building, communications, switchyard, and weigh scale
- catchments, ponds, and other site water management infrastructure
- outdoor substation and on-site power distribution
- water and wastewater treatment plants
- sanitary landfill and hazardous waste storage facility

A site layout of the Process Plant and Pit area of the Project is provided in Figure 1-4.

Figure 1-4: Infrastructure Layout Plan – Pit/Process Plant Area



Source: Ausenco, 2023.

The Project will have two access roads: the main access (northern) road and the bypass (southern) access road. The main access road will be the principal road for construction and operations. If there is an issue with the main access road, the second access road just north of Valle Hermoso will be used.

The mining infrastructure area includes haul roads from the pit to the different areas on site, explosives magazine and mixing facility, truckshop and truck washbay, mine warehouse, office and workshop.

The plant site consists of the necessary infrastructure to support the processing operations. All infrastructure buildings and structures will be built and constructed to all applicable codes and regulations. The project site will include an administration building, a plant maintenance shop and warehouse, and other buildings.

The maximum operating load for the process plant is estimated at 129 MW. The power demand for each phase is summarized in Table 1-7.

Table 1-7: Total Site Electrical Demand

Phase	Installed Power (MW)	Operating Load (MW)	Power Consumption (MWh/a)
Initial Phase (Year 1-3)	76.9	59.3	449,633
Expansion 1 (Years 4-6)	140.3	108.6	830,386
Expansion 2 (Years 7+)	150.4	129.1	990,975

Source: Ausenco, 2023.

The 230 kV/25 kV outdoor on-site substation will be fed by a single 230 kV incoming line. Power will be distributed across the site via 25 kV overhead lines originating from the plant's 25 kV switchgears housed within the primary electrical room near the substation area.

Non-contact water systems consisting of diversion channels are proposed for the principal mine facilities to maintain an environmental base flow in downstream drainages. The channels are provided at the upstream side to divert non-contact surface water away from the process facilities and then discharge to natural drainage courses. Contact water is defined as precipitation that falls onto the surface of the mine infrastructure or flows into the facility from surface water sources. Contact water from the open pits and WRSF will be used as makeup water and stored in two water storage ponds. Water storage pond 1 (pond 1) is located below the WRSF and collects runoff and underdrain water from the WRSF. Pond 1 is also used as a sediment control for water discharged to the environment. Water storage pond 2 (pond 2) is located between the mine infrastructure area and the process plant; these receive water from pond 1 and pit dewatering.

The two ponds are sized to take excess water during the rainy season and store for use during the dry season. Based on the site water balance (see Section 1.15.3), no additional source of water is required from surface water sources or groundwater sources. Water for gland seal, reagent mixing, and potable use will be sourced from ponds 1 and 2 and be processed through a water treatment plant. Further analysis on contact water quality is recommended in the Project's next phase, in order to understand whether water treatment is required and what kind of water treatment may be required, prior to discharge to the environment.

Contact water from the DSTF will be stored in sediment ponds near the DSTF. Some of the water will be used as makeup water, while the rest will be discharged to the environment.

1.13.3 Off-Site Infrastructure

The main off-site infrastructure to be constructed for the Project are:

- 230 kV transmission line to supply power to the site
- bypass road that will provide access to the mine site during construction and secondary access to the mine operations.

1.13.4 Filtered Tailings Management

A siting and deposition method trade-off study was performed between various potential storage sites and technologies. Filtered tailings storage into a DSTF was the preferred outcome, based on a number of factors. This tailings concept has distinct advantages over other options. Most notably, it requires significantly less water, and is also significantly safer for the environment and local residents than a conventional wet slurry tailings dam and pond. With a DSTF design, the consequences of any potential slope erosion or localized slump are unlikely to be catastrophic and can likely be readily controlled and stabilized.

The DSTF design has a capacity of 659 Mt. However, there is potential for 100 Mt of additional capacity should the life-of-mine plan be extended through additional drilling, mineral resource and reserve identification, and positive technical and economic studies. The thickened tailings from the process plant will be pumped to the filter plant in a slurry pipeline and will be filtered to produce a cake with a moisture content of approximately 15%. Filtered tailings will be conveyed to the DSTF, where they will be deposited using in 25-meter lifts using both radial and spreader stackers. Deposited tailings will be compacted to seal against precipitation and provide a trafficable surface. In addition, the permanent outslope will be compacted in thin lifts to the required density, in order to achieve both static and seismic stability.

The DSTF includes planning and handling of the filtered tailings, a starter facility, surface water management, an underdrain system, instrumentation, water quality monitoring systems, progressive rehabilitation, and a cover system at closure. The cover system will consist of a mixture of mulch and topsoil with natural vegetation cover, designed to reduce erosion and potential infiltration of surface water into the DSTF mass. The DSTF will be progressively reclaimed from the bottom up, in order to minimize erosion to the stack face as the facility expands. The DSTF will be designed to Canadian Dam Association and applicable Ecuadorian standards, in order to provide a safe and environmentally acceptable facility. Applicable elements of the Global Industry Standard on Tailings Management (ICMM, 2020) will also be integrated as appropriate.

1.13.5 Waste Rock Management

The WRSF and saprolite-saprock storage facility (SRSF) are designed to provide secure and permanent storage of approximately 843 Mt of non-economic waste rock and overburden, including saprolite, saprock, oxide rock, and fresh rock. Oxide rock and fresh rock will be mined over the 26-year mine life. Non-economic waste rock and overburden produced by mining activities may be used to construct site infrastructure, as road base, for other required construction or maintenance products, or placed in the storage facilities to the south and east of the Cangrejos open pit; the majority of the waste rock will be stored in the WRSF. There are two waste material storage facilities that will be developed below the Cangrejos open pit: 1) the WRSF, 2) the SRSF. During the first three years, the waste rock and overburden (saprolite and saprock) generated during operations will be managed in the two separate storage facilities due to the low waste rock to saprolite ratio (i.e., less than 5:1 ratio). At those ratios, the saprolite mechanical properties govern the stability of the waste storage facilities. After year five, the ratio is higher than 5:1. At this point, the mine can co-mingle waste rock and saprolite in a single facility and the mechanical properties of the waste rock will govern. The initial SRSF will be located on the east side of the WRSF.

Management of the WRSF will include separation and management of contact and non-contact water. The contact waters will be collected and used for mine operations in the pond at the base of the facility while the non-contact water will be released into the drainage below the facilities to maintain environmental base flows. Surface water upgradient from the mine site will be diverted via diversion channels around the site and re-joined to downgradient waterbodies. The WRSF and SRSF are located within a short haul distance from the open pits. The design provides adequate capacity for waste materials over the life of the mine. Waste rock and overburden will be hauled from the pit via a haul road built from the pit rim to the bottom of the facility over the first four years, then the WRSF will be constructed from the bottom up starting in Year 5. Similar to the DSTF, each lift of the lower tipping face of the WRSF will be progressively closed once completed to reduce erosion, contact water impact, and sediment management impacts from these facilities.

As part of the mine plan, the internal pit ramps connect to the external haul roads that support the primary crusher, WRSF, SRSF, truck maintenance area, ready-lines, and fuel depot. Additionally, after environmental clearance and removal of timber >10 cm in diameter, the underbrush, organic material, and thin soils that are excavated from within the pit limits, the stockpile areas, and infrastructure footprints will be stripped and chipped; the resulting mulch/topsoil mixture will be stockpiled for future reclamation use.

1.14 Markets and Contracts

1.14.1 Market Studies

H&H Metals was engaged to provide a marketing study for the concentrate. After reviewing the report and associated smelter quotations, the team determined that the most cost-effective outlet for the concentrate would be in Asia and applied the associated treatment and refining charges and payability in the cashflow model. The cost of transportation, treatment, and refining charges for the concentrate over the life of mine totals $598 million.

Doré transportation, treatment and refining charges were applied in the model based on confidential industry sources and totals $4.3 million over the life of mine.

1.14.2 Commodity Price Projections

After reviewing current market data, along with the analyst consensus long-term pricing forecasts, the following commodity price projections were selected as the basis for this pre-feasibility discounted cashflow model:

- Gold - $1,650/oz
- Silver - $20.00/oz
- Copper - $3.75/lb

At these selected commodity prices, after considering the treatment charges (TCs), refining charges (RCs), domestic and international freight and handling charges, payables, and minimum deductions, the landed Cangrejos flotation concentrate is valued at $7,900 per dry metric tonne on average over the life of mine.

1.14.3 Contracts

At this pre-feasibility stage of project development, no marketing contracts exist.

1.15 Environmental, Permitting and Social Considerations

1.15.1 Environmental Considerations

The Project will be located primarily in areas of high-relief evergreen montane secondary forest and altered pastoral and agricultural areas in the central (and adjacent to the northwestern) parts of the Project concessions. The Project is drained by a network of small streams; apart from these streams, no significant surface water features are located within the project concessions or are directly impacted by the Project. The natural environment in the area has been significantly altered by a wide range of intrusive human influences over the past century, and archaeological evidence suggests a history of human habitation and influence that dates back over a thousand years. No primary forest remains. Current land use in the area of the Project is a mixture of cattle grazing and light agriculture (primarily yucca, cacao, and bananas), in cleared areas adjacent to secondary forest “islands.” The latter are typically situated in steep ravines and rugged terrain unsuitable for agriculture or grazing. No villages or significant dwellings are present in the Project’s environmental Area of Influence (AOI).

1.15.2 Water Management

The project site is situated in a mountainous region with a wide range of elevations varying from 100 masl to 1,370 masl. The terrain ranges from steep mountainous terrain, roll hills, to flat alluvial plains. There are three main drainages surrounding the mine site. The open pits, WRSF, and the process plant site are situated in proximity to surface stream drainages. The DSTF has no streams running through the facility.

Baseline water quality has been evaluated against standard Ecuadorian hydrological indices. Surface water resources in the areas around the project concessions have experienced historical degradation from agriculture and grazing, and as well as from some small-scale mining operations and the impacts of marginal sanitation and treatment systems in local communities. Natural sediment loads tend to be high due to the level of rainfall and the steepness of terrain in the drainages reporting to lowland watercourses. These issues notwithstanding, local stakeholders remain sensitive to potential water quality issues and the potential interruption of surface water supplies. However, water balance studies (see Section 1.15.3) indicate that the Project’s water needs can be completely met from meteoric contact water sources collected from the pits, the WRSF, and contact water and filter press reclaim water from the DSTF. No abstraction of surface water sources or development of groundwater supply wells will be required. Non-contact surface water upgradient of major Project facilities will be intercepted and diverted around the facility perimeters, and discharged into natural waterways to maintain appropriate environmental base flows. A portion of the captured contact water will be processed in a water treatment plant to provide water of sufficient quality to serve as gland water, reagent mixing water, and, with further treatment and polishing, potable use. If excessive precipitation results in water that could compromise the capacity of the system, the excess will be routed to one or more retention ponds, tested to Ecuadorian discharge requirements, treated as necessary, and then discharged to the environment via natural watercourses.

Contact water from the open pits and WRSF will be collected for use as makeup industrial and potable water, stored in two water storage ponds. Water storage pond 1 (pond 1) is located below the WRSF and collects runoff and underdrain water from the WRSF. Pond 1 is also used as a sediment control for water discharged to the environment. Water storage pond 2 (pond 2) is located between the mine infrastructure area and the process plant; these receive water from pond 1 and pit dewatering. The two ponds are sized to take excess water during the rainy season and store for use during the dry season.

1.15.3 Water Balance

The Cangrejos Project involves multiple facilities and various sources of non-contact and contact water across the Project along with pit dewatering flows. The main mine site is located in a high rainfall environment with over 2 meters of annual rainfall; the DSTF is located in a less wet environment with approximately 1 meter of annual rainfall. Ausenco developed a site-wide water balance to estimate project water needs. The site-wide water balance was developed in GoldSim©, a computer-based modelling platform widely used to develop timestep water balances for mining operations. For stochastic analysis, GoldSim uses the Monte Carlo method to generate monthly precipitation and evaporation time series for the water balance model. The strategy behind the development of the water balance is to rely on contact water for makeup requirements along with removing water from the tailings in a filtration plant and recycling the effluent back into the process.

The water balance model considers site precipitation and groundwater, and evaporation and infiltration, where applicable, for the following mine components: Open Pits, WRSF, process plant and associated Infrastructure, Camp Site and Sewage Treatment Facility, DSTF, and the ponds. The site-wide water balance study provides a water management strategy focused on the following main objectives:

- estimating the effluent flows of the main mine components
- estimating requirements for pond capacities
- estimating the requirements for water storage pond capacities

In order to capture and estimate the amounts more accurately, three time periods (Year 3, Year 6, and Year 26) were chosen due to changes in production rates requiring an increase in water demands along with analyzing the 10-year dry year, Average year, and 10-year wet year. As part of the analysis, water storage ponds were developed to capture water during the wet season and to store water for the dry season.

Average annual makeup requirements calculated for the production rates of 30, 60, and 80 kt/d, totaled 201.7.4 m^3/h, 403.3 m^3/h, and 537.8 m^3/h, respectively. This requires two water storage ponds with a combined storage capacity of 800,000 m^3 to supply water during the 10-year dry year. Pond 1 is located at the base of the SRSF and pond 2 is located between the process plant and the mine infrastructure area. There is sufficient contact water from the open pits, WRSF and DSTF to supply the makeup water utilizing the two water storage ponds for the Project.

1.15.4 Environmental Geochemistry

An evaluation was conducted to determine if the anticipated environmental geochemistry of mine waste rock, dry-stack tailings, or pit wall rocks may impact water quality resulting from rock-water interactions (principally the risk from acid rock drainage (ARD) and metal leaching (ML)).

Based on the existing dataset (See Section 20.1.2), the geochemical risk from project waste rock and pit wall rock appears to be low to very low. This is due to the following factors:

- Acid base accounting (ABA) testing shows that the waste rock and pit wall rock samples are nearly all non-potentially acid-generating (NAG).
- Short-term metal leaching tests showed low metals concentrations.
- Long-duration (three year running period) on site kinetic testing shows that mine waste and pit wall rock leachate is pH neutral, low in sulphate, and low in metals.

Similarly, the dry-stack tailings appear to be a low geochemical risk due to the following factors:

- ABA testing shows that the tailings have residual neutralization potential and low total sulphides (less than 0.5%).
- Short-term metal leaching tests had low metals concentrations.
- Long-duration humidity cell kinetic testing was performed on tailings derived from the Cangrejos pit and showed no significant ARD production or metal leaching.
- Tailings supernatant appears to be suitable for direct discharge to the environment with only potential sediment control required.

Kinetic testing results of samples collected from both the waste rock and the post-mining pit walls strongly indicate that the post-mining pit lakes will contain water that will not be detrimentally impacted by geochemical reactions. Additionally, because groundwater is of good quality, it is likely that the water in the post-mining pit lakes will meet surface water discharge standards.

Therefore, based on the information available, waste rock and tailings are assumed to be NAG and will have no significant impact on water quality from ML.

Continued kinetic testing of mine tailings and waste rock is recommended as the Project advances to the feasibility study stage (see Section 26 of this technical report).

1.15.5 Closure and Reclamation Considerations

The Project is being developed in concert with a robust mine closure and reclamation strategy that provides for the physical, chemical, and environmental stabilization of major earthworks and other disturbed areas within the boundaries of the Project's environmental AOI, as well as the creation of stable environmental corridors and ecological offset areas for the preservation of biodiversity. Key elements of this strategy will be elaborated in a comprehensive Mine Reclamation and Closure Plan and other supporting management plans, developed in conjunction with the Project's exploitation-phase, Environmental Impact Study (*Estudio de Impacto Ambiental*, EIA)/Environmental Management Plan (*Plan de Manejo Ambiental,* PMA) and implemented in accordance with applicable Ecuadorian regulations and international BMPs. The exploitation phase EIA/PMA will define final technical requirements and the legal duration of the post-closure environmental monitoring period. However, for estimating purposes, this technical report assumes a post-closure monitoring period of ten years.

Ecuadorian regulations also require presentation of a surety, bond, or other acceptable mechanism to ensure sufficient financial resources are reserved to support proper implementation of the Project's exploitation phase PMA, including implementation of the Mine Reclamation and Closure Plan. This financial mechanism is to be updated on an annual basis to keep pace with project development, over the life of the mine. In addition, in the year prior to project closure, the exploitation phase PMA must also be updated to incorporate a definitive version of the Mine Reclamation and Closure Plan, which must be separately approved by the Ministry of Environmental, Water and Ecological Transition (*Ministerio de Ambiente, Agua y Transición Ecológica, MAATE*) prior to commencing closure activities.

1.15.6 Permitting Considerations

The Project is being developed in accordance with the Ecuadorian Constitution, the Ecuadorian Mining Law and its Regulations, the Environmental Organic Code and its Regulations, the Organic Law of Water Resources and its Regulations, and other applicable Ecuadorian norms, standards, laws, and regulations; these are discussed in greater detail in Section 20.3. As noted therein, an exploitation phase EIA/PMA and multiple supporting technical studies must be completed as a condition of the Project receiving its Environmental License. Based on prior experience with similar-scale projects in Ecuador, the licensing process is expected to require a minimum of 22 months to complete.

It is also expected that, as the Project is further developed to the Feasibility Study (FS) phase and lender engagement and financial support becomes an increasingly important consideration, additional international best management practices (BMPs) applicable to certain aspects of mine design, construction, operation, and closure will be implemented. Applicable Ecuadorian laws, regulations, norms, and standards will retain legal primacy in the event of any technical conflict (see Section 20.3 for additional detail).

1.15.7 Social Considerations

Social Capital Group updated the independent socioeconomic study for the Cangrejos Project, which is discussed in detail in Section 20.4. The Project is located entirely in the parishes of Bellamaria and La Victoria, which are both within the Canton of Santa Rosa, in the coastal province of El Oro. A small portion of the project concessions extends into the Canton of Atahualpa, but the area is not required for project infrastructure. The Project´s mining operation, access roads (after exiting the national highway network) will be limited to Bellamaria parish. As a result, the social AOI includes seven small nearby settlements in Bellamaria parish and two settlements each in Santa Rosa and La Victoria parishes (see Table 20-16). The Project's exploration and prospective mine construction activities are on rural land and physically distant from these villages. There are no villages in Atahualpa Canton that are near the Project.

1.16 Capital and Operating Cost Estimates

1.16.1 Capital Cost Estimates

The capital cost estimate conforms to Class 4 guidelines for a pre-feasibility- level estimate with an accuracy of -20% to +25%, as established by the Association for the Advancement of Cost Engineering International (AACE International). The capital cost estimate was developed in Q1 2023 dollars based on budgetary quotations for equipment and construction contracts, as well as Ausenco's in-house database of projects and studies including experience from similar operations.

Table 1-8 provides a summary of the capital costs for the Project including phased expansions and sustaining capital. Table 1-9 provides a summary of the same capital costs for the Project, categorized by the work breakdown structure (WBS) of the capital cost estimate.

Table 1-8: Summary of Capital Costs

Capital Category	Initial Capital (US$M)	Expansion 1 Capital (US$M)	Expansion 2 Capital (US$M)	Sustaining Capital (US$M)	Total Capital (US$M)
Process Plant, Infrastructure & Dry Stack Tailings Storage Facility	604	299	97	161	1160
Equipment (Mining and Ancillary Facilities)	73	0	0	424	497
Pre-production Mine Development	43	0	0	0	43
Other Direct and Indirect Costs, Including Working Capital	96	1	1	11	109
Sub Total	**816**	**300**	**97**	**596**	**1809**
Contingency	101	38	12	0	151
Freight, Duties and Taxes	8	5	1	2	16
Total Capital	**925**	**342**	**111**	**598**	**1976**

Source: Ausenco, 2023.

Table 1-9: Summary of Capital Costs, by WBS Code

WBS Code	WBS Description	Initial Capital (US$M)	Expansion 1 Capital (US$M)	Expansion 2 Capital (US$M)	Sustaining Capital (US$M)	Total Capital (US$M)
1000	Mining Infrastructure	14	0	1	50	65
2000	Site Development	19	3	0	19	40
3000	Process Plant	401	230	73	70	774
4000	On-Site Infrastructure	62	17	6	23	108
5000	Off-Site Infrastructure	4	0	0	0	4
6000	Construction Indirect Costs	30	11	3	0	45
7000	Contracted Indirect Costs	77	38	12	0	127
8000	Owner's Direct Costs	141	0	0	435	576
9000	Owner's Indirect Costs	58	0	0	0	58
10000	Other (Contingency and Freight)	109	43	14	2	167
Working Capital		9	1	1	0	11
Total Capital		**925**	**342**	**111**	**598**	**1976**

Source: Ausenco, 2023.

The closure costs for the Project are estimated at US$37.6 million.

1.16.2 Operating Cost Estimates

The average yearly operating cost for the Project varies as the Project undergoes numerous phases with different production rates and mineralized material types. Table 1-10 provides a summary of the operating costs considering the various operational phases, expressed on a basis of dollars per year and dollars per tonne milled.

Table 1-10: Summary of Operating Costs

Year	LOM	Initial Phase (Years 1-3)	Expansion 1 (Years 3-6)	Expansion 2 (Years 7+)	LOM	Initial Phase (Years 1-3)	Expansion 1 (Years 3-6)	Expansion 2 (Years 7+)
Operating Costs	**US$M**	**US$M/a**	**US$M/a**	**US$M/a**	**US$/t**	**US$/t**	**US$/t**	**US$/t**
Mining (per tonne milled)	3,188.1	107.1	131.6	123.6	4.84	10.66	6.27	4.37
Mining (per tonne mined)					2.16	2.38	2.16	2.14
Processing	4,998.8	83.6	179.4	210.5	7.59	8.32	8.54	7.44
Site G&A	527.0	22.0	21.9	19.8	0.80	2.19	1.04	0.70
Total	**8,714.0**	**212.7**	**332.9**	**353.9**	**13.23**	**21.16**	**15.85**	**12.51**

Source: Ausenco, 2023.

1.17 Economic Analysis

1.17.1 Forward-Looking Statement

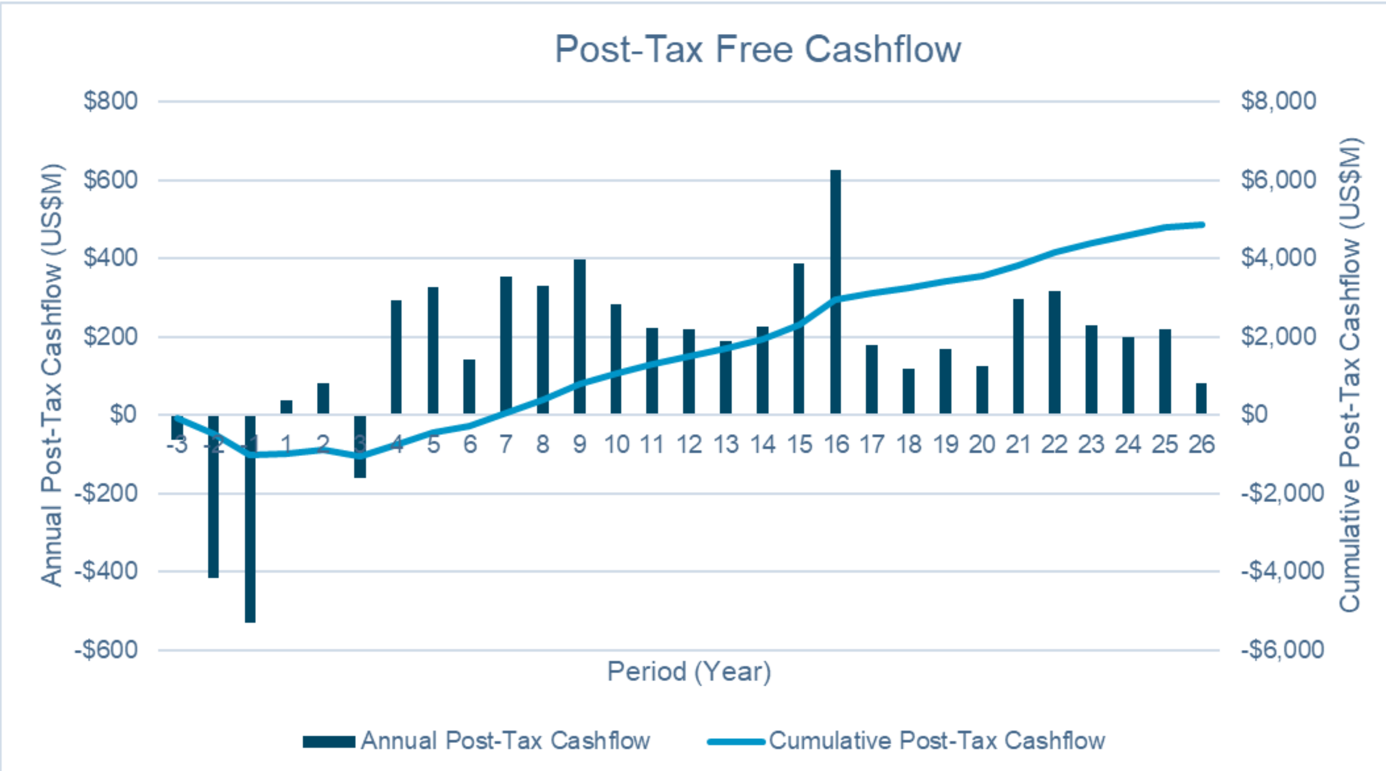
Certain statements and information herein, including all statements that are not historical facts, contain forward-looking statements and forward-looking information within the meaning of applicable securities laws. With respect to forward-looking statements and information contained herein, Lumina has made numerous assumptions including among other things, assumptions about general business and economic conditions; the prices of gold, copper and silver; the accuracy and reliability of technical data, forecasts, estimates and studies; anticipated costs and expenditures; future results of operations; ability to satisfy power infrastructure and water capacity requirements; availability and ability to procure personnel, machinery, supplies, and equipment from local sources where possible; tax rates and royalty rates applicable to the Project; and the success of exploration, development and processing activities. The foregoing list of assumptions is not exhaustive.

1.17.2 Economic Analysis

The base case financial model was developed according to the information described in this technical report and the results of applying a discounted cashflow model show that the Cangrejos Project will have an estimated post-tax internal rate of return (IRR) of 17.2%.

With a 5% discount rate over 26 years, the post-tax net present value (NPV) is estimated to be approximately $2,238 million. Annual and cumulative post-tax free cashflow are shown in Figure 1-5.

Figure 1-5: Post-Tax Free Cashflow



Source: RME, 2023.

Key project results are presented in

Table 1-11.

Table 1-11: Cangrejos Economic Analysis Summary

Cangrejos Project Key Results	Unit	Value
Total Material Produced	kt	658,713
Gold Grade	g/t	0.55
Silver Grade	g/t	0.68
Copper Grade	%	0.10
Concentrate Copper Content (LOM)	%	22
Gold Recovery	%	85
Silver Recovery	%	54
Copper Recovery	%	79
Gold Price	US$/oz	1,650
Silver Price	US$/oz	20.00
Copper Price	US$/lb	3.75
Gold Payability (weighted average)	%	98.2
Silver Payability (weighted average)	%	76.5
Copper Payability	%	95.4
Copper-Gold Concentrate Landed Value/DMT	US$M	7.93
Gold Revenue Split	%	79
Silver Revenue Split	%	1
Copper Revenue Split	%	20
Gross Revenue	US$M	20,043
Initial Capital Cost (incl. Working Capital, excl. VAT)	US$M	925
First Expansion Capital Cost (incl. Working Capital, excl. VAT)	US$M	342
Second Expansion Capital Cost (incl. Working Capital, excl. VAT)	US$M	111
Sustaining Capital Costs	US$M	598
Mine Operating Costs	US$M	3,188
Processing Operating Costs	US$M	4,999
General and Administrative Operating Costs	US$M	527
Total Operating Costs	US$M	8,714
Operating Cash Costs (Gold Equivalent)	US$/Eq oz	818.31
Post-Tax Payback Time – Initial Capex	Years	5.0
Post-Tax Payback Time – First Expansion Capital	Years	2.4
Post-Tax Payback Time – Second Expansion Capital	Years	1.2
Cumulative Net Pre-Tax Free Cashflow	US$M	8,105
Pre-Tax IRR	%	21.3
Pre-Tax NPV (5% Annual Discount Rate)	US$M	3,511
Cumulative Net Post-Tax Free Cashflow	US$M	5,468
Post-Tax IRR	%	17.2
Post-Tax NPV (5% Annual Discount Rate)	US$M	2,238

Source: RME, 2023.

1.17.3 Sensitivity Analysis

The results presented in the cashflow projections section are based on the base case conditions outlined in the technical report. Since actual conditions may vary, sensitivity analyses were performed to evaluate the financial results for a range of conditions. The base case discounted cashflow model was evaluated for its sensitivity to changes in selected inputs such as metal prices (Table 1-12), capital expenses (Table 1-14), metal feed grades, and operating expenses (Table 1-13), which were evaluated at plus or minus 10% and 20%.

Table 1-12: IRR and NPV Sensitivity to Metal Prices

Metals Prices	Gold ($/oz)	Silver ($/oz)	Copper ($/lb)	IRR	NPV (5%) $M
80%	1,320	16.00	3.00	10.0%	817
90%	1,485	18.00	3.38	13.9%	1,540
100%	1,650	20.00	3.75	17.2%	2,238
110%	1,815	22.00	4.13	20.3%	2,927
120%	1,980	24.00	4.50	23.1%	3,540

Source: RME, 2023.

Table 1-13: Post-Tax IRR and NPV Sensitivity to Operating Cost

Operating Cost	OPEX $/t processed	IRR	NPV (5%) $M
80%	10.55	20.0%	2,858
90%	11.87	18.6%	2,548
100%	13.19	17.2%	2,238
110%	14.51	15.7%	1,928
120%	15.83	14.2%	1,609

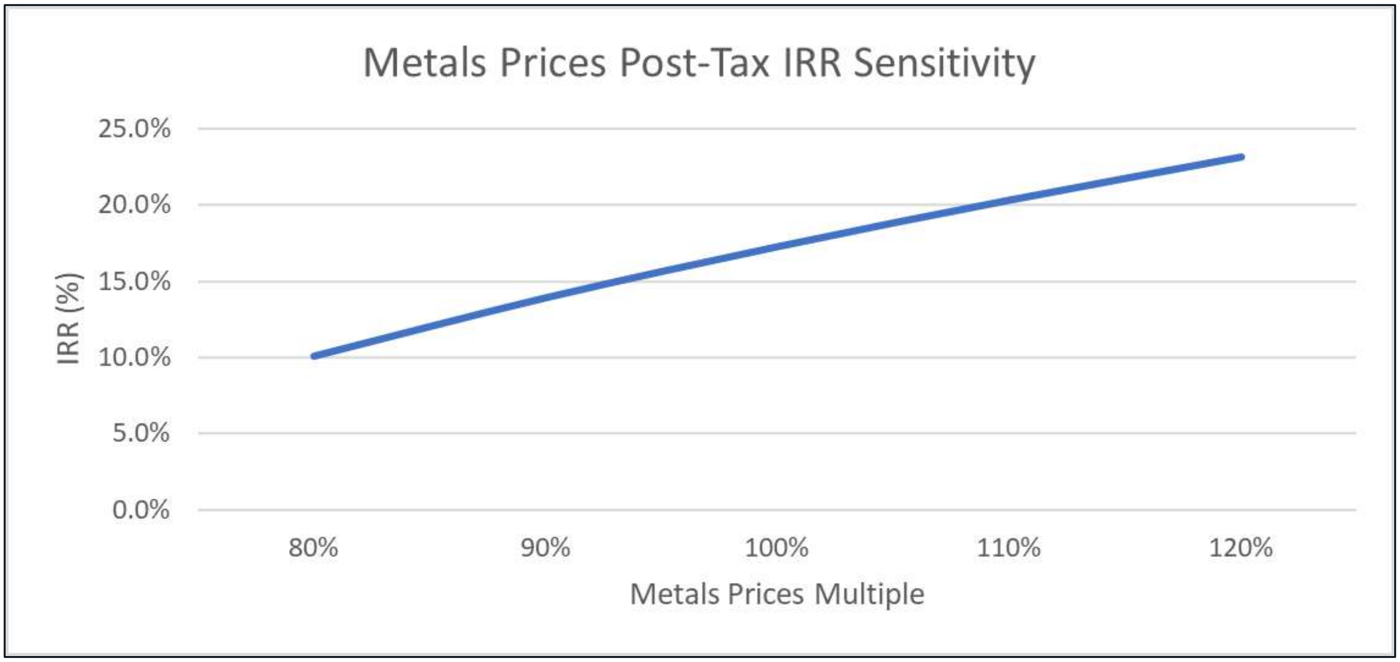
Source: RME, 2023.

Table 1-14: Post-Tax IRR and NPV Sensitivity to Capital Cost

Capital Cost	CAPEX $M	IRR	NPV (5%) $M
80%	1,108	20.1%	2,405
90%	1,242	18.5%	2,320
100%	1,375	17.2%	2,238
110%	1,508	16.1%	2,156
120%	1,642	15.0%	2,064

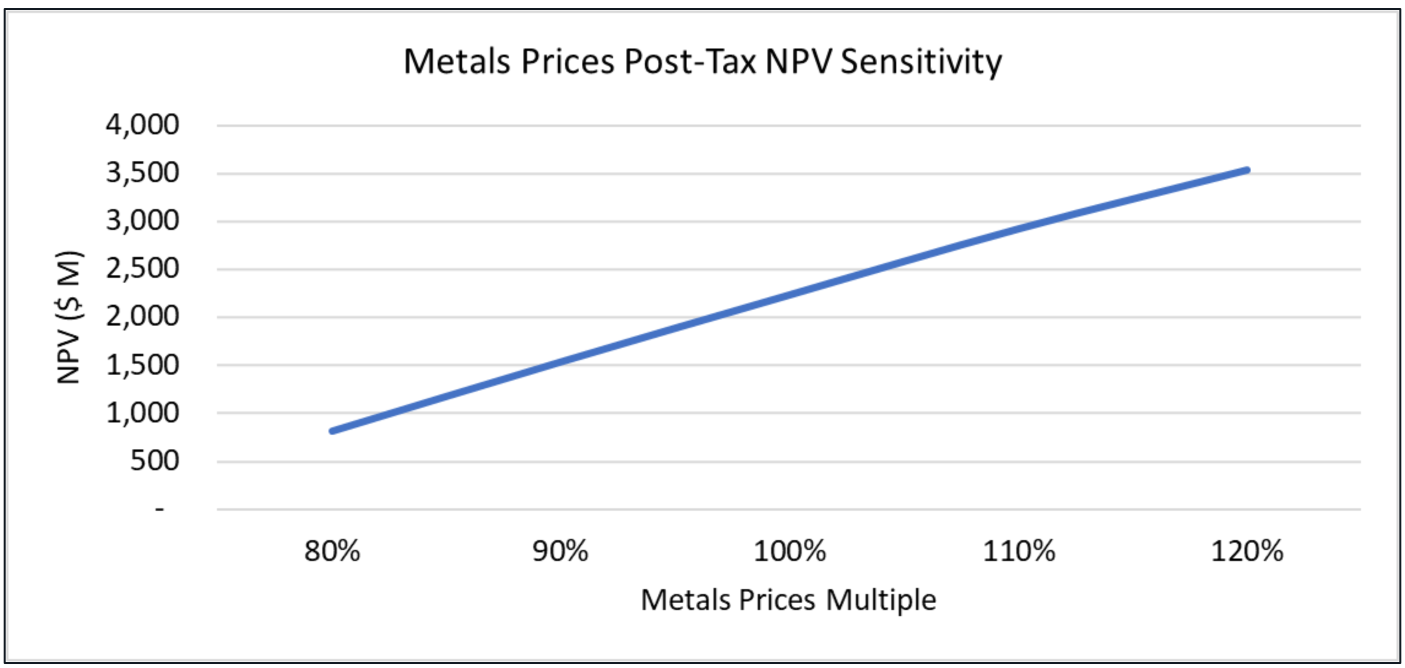
Source: RME, 2023.

Figure 1-6: Metal Prices Post-Tax IRR Sensitivity



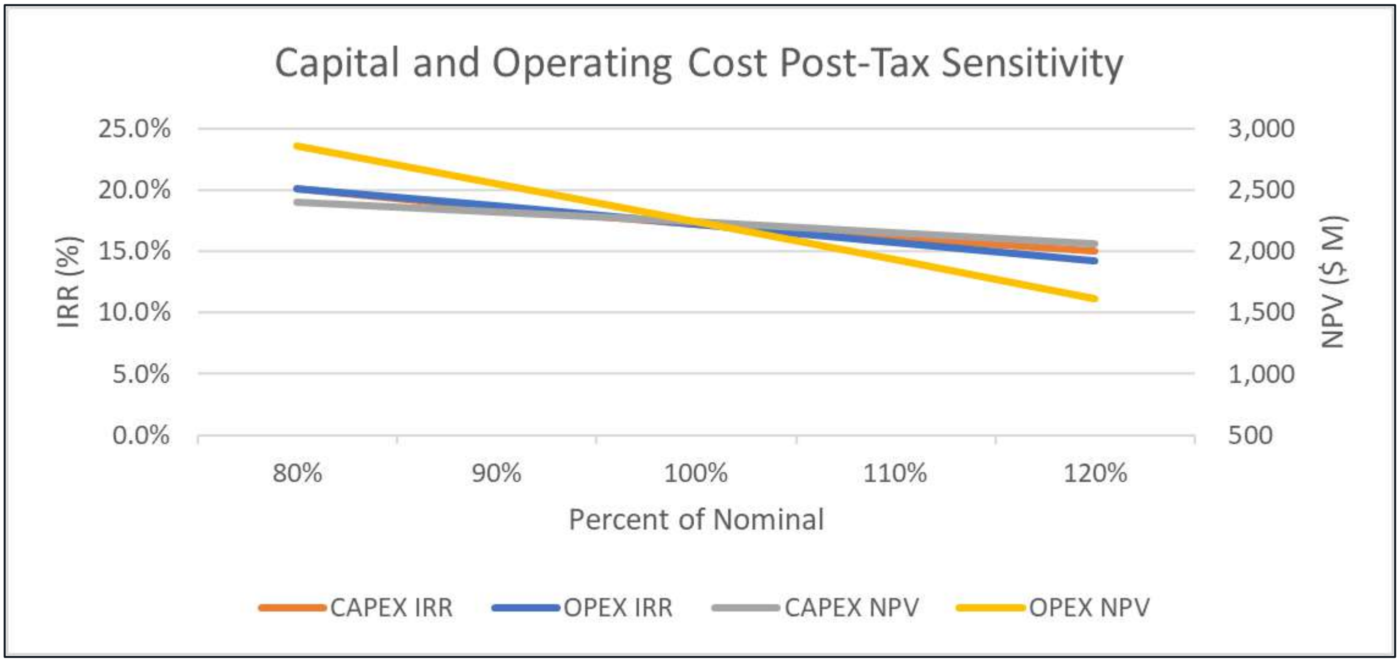
Source: RME, 2023.

Figure 1-7: Metal Prices Post-Tax NPV Sensitivity



Source: RME, 2023.

Figure 1-8: Capital and Operating Cost Post-Tax Sensitivity of IRR and NPV



Source: RME, 2023.

Additional sensitivity analyses are presented in Section 22.5.

1.18 Interpretation and Conclusions

The total indicated mineral resources for the Project are estimated at 1079.9 Mt grading 0.48 g/t Au, 0.09% Cu, 0.7 g/t Ag, and 17.8 ppm Mo for contained metals totals of 16.8 Moz Au, 2,166 Mlbs Cu, 24.3 Moz Ag, and 42.4 Mlbs Mo. Additional inferred mineral resources are estimated be 296.3 Mt grading 0.39 g/t Au, 0.07% Cu, 0.7 g/t Ag, and 11.7 ppm Mo for contained metal totals of 3.7 Moz Au, 483 Mlbs Cu, 7.0 Moz Ag, and 7.6 Mlbs Mo.

The total probable mineral reserves for the Cangrejos Project are estimated at 659 Mt grading 0.55 g/t Au, 0.10% Cu, and 0.68 g/t Ag for contained metal totals of 11.56 Moz Au, 1,420 Mlbs Cu, and 14.38 Moz Ag.

Based on the assumptions and parameters presented in this report, the PFS shows positive economics (i.e., US$2,238 million post-tax NPV (5%) and 17.2% post-tax IRR). The PFS supports a decision to carry out additional detailed studies.

1.19 Recommendations

1.19.1 Introduction

The results presented in the technical report demonstrate that the Cangrejos Project is technically and economically viable. It is recommended to continue developing through additional studies. The recommended budget totals US$26.5 million and the cost estimates for all works are summarized in Section 26.

1.19.2 Drill Program Recommendations for Future Feasibility Study

In preparation for the next stage of project evaluation, which may include the generation of a Feasibility Study, it is recommended that closer spaced drilling be conducted, over the area of the initial three years of planned production, resulting in the upgrading of mineral resources to measured mineral resource classification status.

A drill hole spacing study completed in February 2019 indicates that production volumes representing one year's production can be estimated with no greater than +/-15% uncertainty and with 90% confidence, when based on drilling spaced on a nominal 100 pattern. This means that in 9 out of 10 production periods, the forecast of tonnes and grade will be within +/-15% of the predicted mine plan. Annual production volumes that exhibit these levels of precision and accuracy are included in the indicated mineral resource category.

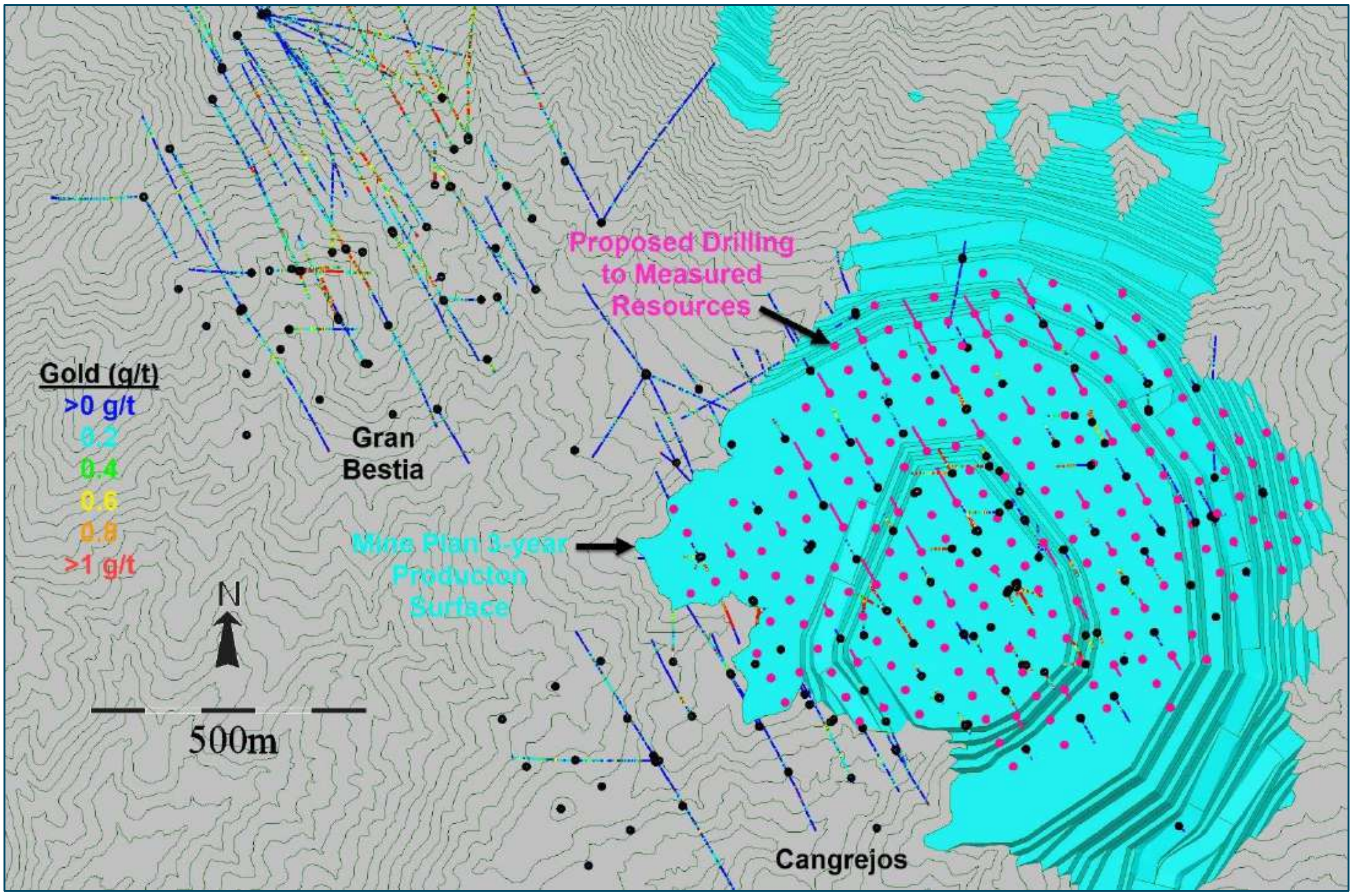
Similarly, volumes representing one quarter of a year's production can be estimated within approximately +/-20% uncertainty with 90% confidence, when drilling is available on a nominal 50 m spaced pattern. Portions of the deposit that meet these criteria are included in the measured mineral resource category.

Mine planning in the PFS suggests that the first three years of production would occur from the top 100-200 m of the Cangrejos deposit.

The proposed drilling includes a combination of inclined and vertically oriented holes that adhere to a nominal 50 m pattern, thus upgrading the area of the first 3 years of production to measured mineral resource status. The proposed program includes a total of 202 individual drill holes for a total of 21,305 m of drilling. Holes range from a minimum of 30 m to a maximum of 200 m in length, with an overall average length of 106 m. Based on previous drilling at the Cangrejos Project, "all-in" drilling costs are projected to average $310/m. The total cost of this program is estimated to be 21,305 m x $310/m = $6.6 million dollars.

Figure 1-9 shows the general layout of the drilling in this proposal.

Figure 1-9: Proposed Drilling for Measured Mineral Resources, Cangrejos and Gran Bestia View



Source: SIM Geological, 2023.

1.19.3 Metallurgy

1.19.3.1 Metallurgical Samples

Metallurgical samples selected for the FS should continue to be representative of the pit areas planned for mining and have variations in ore grades, rock types and lithologies representative of the long-term mining plan.

1.19.3.2 Metallurgical Testwork

Future metallurgical testing should include:

- Tests that continue to include the entire recovery flow scheme: Locked cycle tests that include rougher flotation, fine regrinding and cleaner flotation, flotation of coarse (sand) material from rougher tails and cyanidation of sand concentrates with cleaner scavenger tails.

- Cyanidation tests on sand concentrates and cleaner scavenger tails, including carbon adsorption investigations: leaching kinetics tests, gold loading tests and carbon elution tests.
- Investigation of using a laboratory cyclone instead of a screen prior to sand flotation to determine if gold recovery can be improved.
- Continue tests investigating the potential for gravity concentration prior to flotation.
- Investigate the potential for upgrading the gold in the cleaner scavenger tails stream by gravity concentration or alternate reagent schemes to reduce capital and operating costs for cyanidation of this stream.
- Investigate optimization of sand flotation reagent scheme to potentially improve gold recovery.
- Additional sedimentation and filtration tests on tailings and concentrates, including third-party testing by a contract lab and potential equipment suppliers.
- Produce sufficient flotation concentrates to provide samples to potential smelters.
- Provide representative tailings materials for third-party filtration and geochemical tests.
- Additional flotation tests using the identified site water sources.
- Additional Bond ball mill and abrasion index testing of samples throughout both deposits.
- An additional HPGR pilot test program using representative materials from both deposits.

The cost for the above testing is approximately $595,000.

1.19.4 Mineral Reserve Estimate and Mining Method

The most significant recommendation for mine planning is to commit to additional drilling to better define the inferred mineral resource category components and lower portion of the mineralization within the PFS mine plan. In the course of this drilling additional geotechnical information regarding the soil-like and transitional near surface material and the character of the hard rock high walls can be gathered as a risk reduction program.

As discussed in Section 25, IMC also recommends evaluating the potential of adding a low-grade stockpile to be processed, adding a standalone processing facility for the mineralized saprolite/saprock, and adding an additional pushback to the Cangrejos pit.

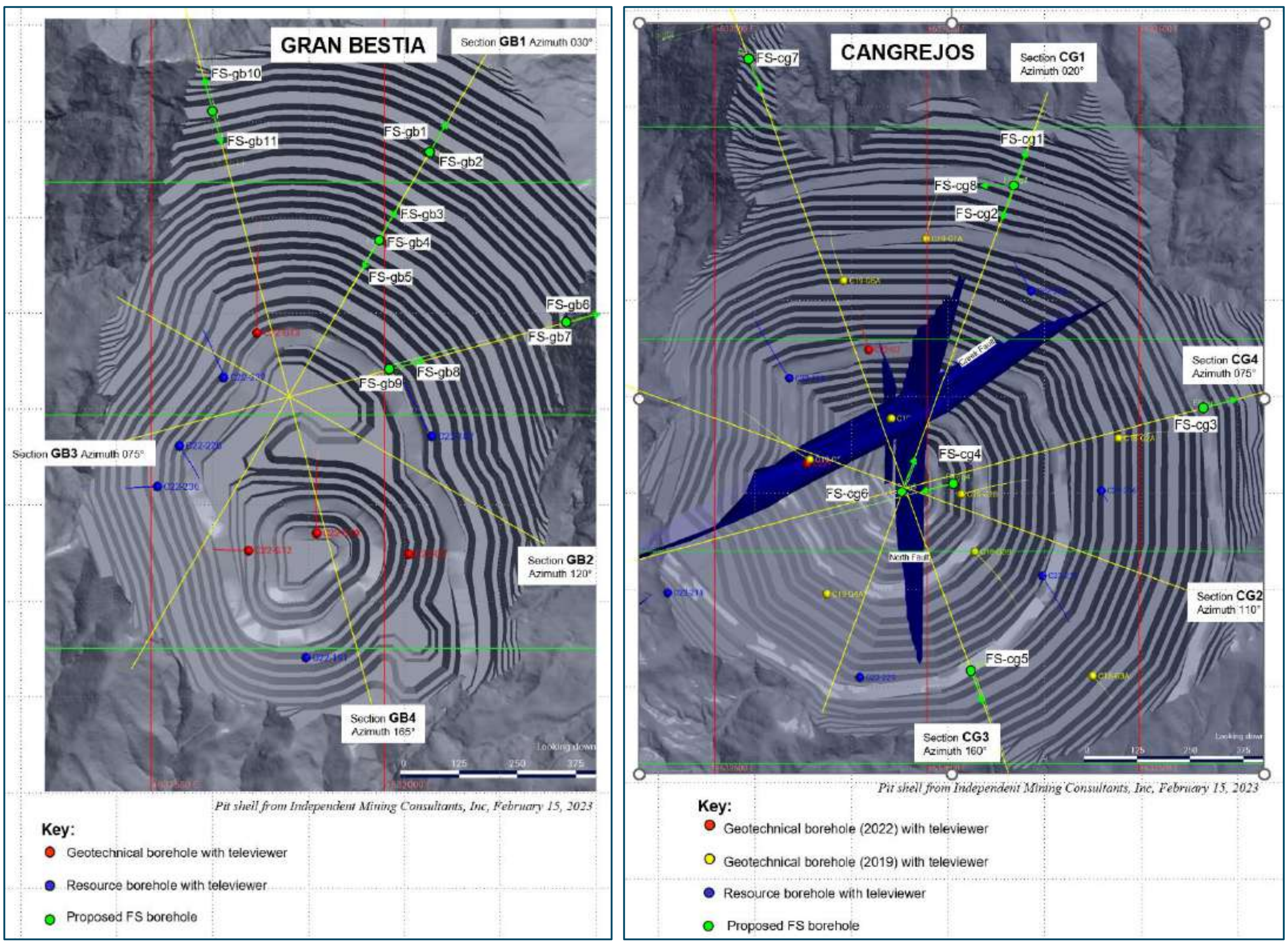
1.19.5 Geotechnical Recommendations

For the FS work plan, it is strongly recommended that vehicular road access be constructed around the circumference of both pits to facilitate preparation of drilling platforms at heretofore inaccessible sites. In lieu of a circumferential road, an overland road from the north could be considered. This would enable a satellite camp and helicopter staging site to be established from which unitized drill rigs could be transported and placed at steep platform sites using long-line methods. The proposed FS geotechnical drilling program assumes that specified collar locations will be made accessible. It is inevitable that this will not be universally true, and alternative platform locations may have to be developed to reach the intended subsurface targets.

1.19.5.1 Geotechnical Drilling

A 19-hole, 8000 m program is recommended consisting of 8 holes for the Cangrejos deposit and 11 holes at Gran Bestia. The objectives for Cangrejos are to provide geotechnical coverage to the unexplored upper-pit slopes, to characterize and verify the continuity of the North Fault and to investigate the presence of an inferred family of faults sympathetic to the North Fault that were based on image analysis of drainage patterns. For Gran Bestia, the primary drilling objective is to characterize significant portions of the upper slopes that are virtually unexplored due to access difficulties and the absence of mineralized drilling targets.

Figure 1-10: Feasibility Study Geotechnical Drilling Program



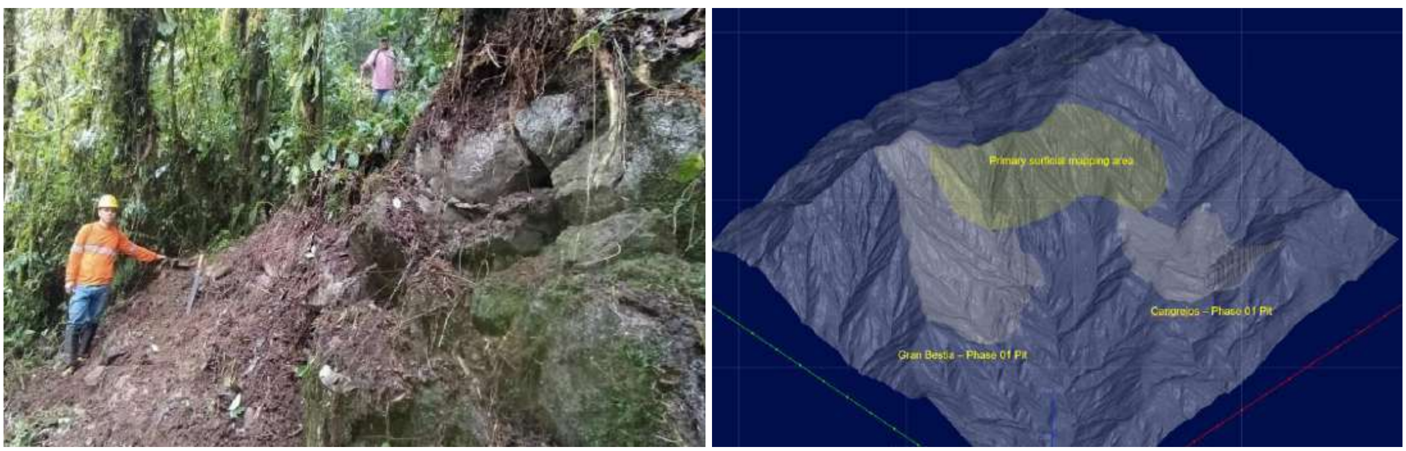
Source: W&N, 2023.

Due to the locations on the upper-pit walls, the geotechnical holes will intersect waste rock and offer little opportunity for dual purpose holes with infill geologic drilling. All holes are to be HQ triple tube cored, with televiewer logging and with the core to be geotechnically logged at the drill sites. Strength profiling by point load testing should also be continued, as per the current practice at the Project. Televiewer logging should include the 8000 m geotechnical drilling program with an allowance for 2000 m of televiewer logging in geologic resource boreholes.

1.19.5.2 Surficial Mapping

New road cuts should be mapped to refine the USL / URL (saprolite / saprock) thickness maps and to update engineering properties as available. During PFS site reconnaissance traverses for test pit siting by Lumina geologists, steep local slopes were identified with the potential to generate rockfalls from the natural slopes above the planned Cangrejos and Gran Bestia north pit crests (Figure 26-3, Left). In anticipation that selective rock removal and/or rockfall protection measures may be required, these slopes should be mapped during the FS program. Difficult access may require rope-assisted methods supplemented with drone imaging. The general locations for this surficial mapping are shown in Figure 1-11, Right.

Figure 1-11: Upslope Mapping Targets



Source: W&N, 2023.

1.19.5.3 Laboratory Testing

The saprolite has been extensively tested for the PEA and PFS programs and no further laboratory strength testing is recommended at FS other than incidental classification tests. For the bedrock, lithologically representative and/or feature-specific samples should be tested for unconfined compression, unit weight, point load and direct shear.

1.19.5.4 Rock Engineering Analyses

The lithologic (overburden and bedrock), alteration and structural models should be updated to incorporate all new geotechnical and resource drilling data available at the time of the FS work. Of particular importance is the continuity of fault intersections between boreholes and correlation to topographic expression. The structural studies at Cangrejos to refine the PFS wireframe models of the North and Creek faults should be extended, as well as implementation of an initial parallel effort at Gran Bestia.

After the new data are available, rock engineering analyses should integrate with the overall geotechnical program summarized as Table 1-12:

- Update the structural fabric database to refine the spatial variability and lithologic correlations.
- Update the rock mass geomechanical parameters and revise the design values, as required.
- Evaluate hazards posed by upslope overburden and weathered rock relative to pit crests and design mitigation measures accordingly. These measures could include targeted rock removal, rockfall control fences or slope drape, and pit crest safety benches. Slope embayments at intersections with drainage swales should be verified for debris slide retention capacity.
- Perform slope stability analyses incorporating updated rock mass and hydrogeological parameters. Implement design optimization by pit slope sector.
- Retain an expert geotechnical review board to provide guidance as to best practices for pit slope design in high-relief, tropical settings.

Table 1-15: Summary Program to Implement FS Geotechnical Recommendations

Item	Description
Geotechnical Drilling	8000 m, 19-hole HQ triple tube coring
Televiewer logging	19 FS geotechnical holes, select resource holes
Surficial Mapping	New access roads and upper steep, difficult access slopes
Laboratory Testing	Primarily rock testing, minor soils index testing
Geological Modeling	Structural, geologic & alteration model updates
Rock Engineering Analyses	Include Review Board

Source: W&N, 2023.

1.19.6 Recovery Methods

The following trade-off studies are recommended:

- Implementation of the expansion flowsheet (20 micron regrind size) from Year 1
- Review cost benefit of intensive leach reactor vs gold payability for gravity concentrate (copper concentrate vs. gold dore)
- Evaluation of the cost-recovery benefit for the cleaner scavenger concentrate leach circuit over the life of mine
- Evaluation to delay the sand flotation circuit from the initial years to a later stage of the mine life
- Evaluation of processing saprolite/saprock materials based on the separation of the finer material directly to the leaching circuit, with the coarser material joining the main plant circuit
- Re-evaluation of the molybdenum circuit after verifying local molybdenum occurrence across the deposit

- Completion of a feasibility study with supporting testwork, contractor and vendor engagement, additional infrastructure focused geotechnical investigation and more definition of engineering.

1.19.7 Infrastructure

To support the feasibility study, the following work programs are recommended.

1.19.7.1 Site Geotechnical Field and Laboratory Program

Several of mine site facilities changed location from the PEA, including the DSTF, mine infrastructure area, process plant, filter plant, roads, ponds, and ore conveyor. A gap analysis was performed for the PFS geotechnical program, and the following recommendations are made for site geotechnical and laboratory programs.

- Completion of thirty-two boreholes for a total length of 1,070 m, 99 test pits, and geophysics in the areas of the DSTF, SRSF, and filter plant to investigate and confirm foundation conditions, specifically the extent of the saprolite and colluvium along with depth to groundwater and bedrock.
- Laboratory index testing, including compaction tests, mechanical strength tests, and permeability tests on foundation soils and potential borrow materials.
- Additional laboratory testing to confirm the physical characteristics of the filtered tailings, including cyclic strength, trafficability, and permeability tests at both low and \high confining stresses to represent the height of the DSTF.
- Using the new data to recommend designs for foundations, borrow sources, construction materials for infrastructure, and DSTF, WRSF, filter plant and process plant, along with supporting infrastructure.

The estimated cost is approximately US$908,280, including the drilling and excavator rental.

1.19.7.2 Design and Analysis of Site Infrastructure

To bring the design and analysis of the DSTF, WRSF, SRSF, mine roads, site surface water management, process plant platform, mine infrastructure area platform, and filter plant platform to a feasibility-study level of detail, the following activities are recommended:

- Acquire additional satellite imagery to fill in additional topography missed in the 2022 program, including the access roads to mine site, mine access, and bypass access.
- Review and update meteorological and hydrology information, updating surface water. and sediment management for the DSTF, WRSF, SRSF and mine roads.
- Update geochemical characterization of tailings, waste rock and construction materials.
- Develop seepage predictions and seepage control measures for the DSTF, WRSF and SRSF.
- Optimize the tailings and waste rock handling and deposition strategy, including trafficability of material handling equipment for the DSTF.
- The stability model should be reviewed and updated, as required, with consideration of the final stacking plan using updated data about the material properties of the waste using laboratory results along with foundations for both the DSTF and WRSF.

- Perform a liquefaction assessment with consideration of updated information on material properties for the tailings along with foundation for both the DSTF and WRSF.
- Solicit additional budgetary quotes for earthworks and geosynthetics (i.e., geomembrane, geotextile, and piping) to get more accurate pricing for the next cost estimates.
- Develop FS level design of DSTF, WRSF (excluding stacking, site surface water management, water storage ponds, mine roads.
- Develop cost estimates (i.e, capital, sustaining capital, and operating costs) for site vegetation suppression, earthworks, WRSF and DSTF, mine roads, and ponds.

The estimated cost for the recommended work is approximately US$325,100.

1.19.8 Environmental and Social Recommendations

Environmental and social recommendations supporting the completion of the FS are presented as follows; general cost estimates are also provided, assuming an FS duration of approximately 18-24 months.

- Develop a comprehensive noise model for the construction and operations phases, in order to characterize potential auditory impacts on local communities and identify potential mitigation measures that should be included in the FS-level design (e.g., installation of acoustic shielding on sources, construction of earthen berms, placement of mulch/topsoil stockpiles, construction of vegetation barriers).
- Maintain and expand the meteorological, surface water, and groundwater monitoring and kinetic cell testing program as necessary to support FS data needs.
- Complete field studies in the project concession areas with the assistance of a biodiversity consultancy, to support the final delineation and location of environmental corridors and ecological offset areas for incorporation in the FS-level project design and environmental AOI. Develop practical options for locating, designing, and constructing faunal refuge, overpass, and underpass structures across mine roadways/pipelines, for inclusion in the FS-level design.
- Evaluate options for processing environmental clearance mulch/topsoil to serve as an effective growth medium for WRSF, DSTF, and other clearance area substrates, including potential generation and use of biochar as an amendment; develop a plan for the establishment of test plots and location of mulch/topsoil stockpiles.
- Conduct an in-depth social baseline study to examine the results of the 2023 census, the effects of the Covid-19 pandemic, and other factors in order to determine the welfare conditions and needs of local community residents. This work would likely include a household census in the immediate communities and interviews to cover populations further afield.
- Conduct an initial study of the potential viability for drilling, development, and maintenance of groundwater wells to provide a robust and healthful source of water for drinking and washing to local communities.
- Develop the SEP discussed in Section 20.4 for engagement and identification of stakeholders who were outside the exploration-phase social AOI.
- Continue, and, as appropriate, expand community relations program activities during the FS, including the expansion of environmental education, nutrition support, training, and entrepreneurship programs. Engage construction contractors and invoke appropriate contractual requirements for preferential local and regional employment, as well as the purchasing of good and services from local and regional sources. Where appropriate, engage FS contractors as participants in selected social investment initiatives.

1.19.9 Geochemistry

Up to 200 additional static geochemical samples are recommended in order to fully characterize future waste rock and pit walls, to be acquired from FS exploration drill core. These samples should be focused on improving spatial understanding of geochemical risk within the block model. The analysis of additional samples of mine tailings and supernatant from the FS metallurgical testing program are also recommended.

On-site and laboratory kinetic testing is also recommended through the FS, including the addition of at least 10 additional kinetic cells in the field, and an additional two tailings humidity cell tests in the laboratory.

A geochemical model for potentially mine-impacted water should also be developed. This should include any excess water discharged to rivers and streams, as well as a geochemical model of the post-mining pit lake water quality.

1.19.10 Hydrogeology

The hydrogeologic characterization for the Project should also be expanded to support the FS.

1.19.10.1 Packer Testing and VWP Installation in the Pit

Packer testing is recommended in twelve of the borings proposed for the FS pit slope stability work plan. Each boring should be packer tested in a manner consistent with prior packer testing (see Section 16.3.2.1). Two Vibrating Wire Piezometers (VWPs) should be installed in each boring after completion. This testing should target potential faults and fractures, and should provide improved characterization of the pit wall rock.

1.19.10.2 Saprolith Hydrogeologic Characterization in the Pit

An additional five saprolith wells are recommended to be installed for aquifer testing, and other hydrogeologic characterization.

1.19.10.3 Revised Groundwater Models

Both the 2D (pit stability) and 3D (pit dewatering) models should be updated, using the FS-level database.

1.19.10.4 Regional Hydrogeologic Program

Site-wide hydrogeologic characterization is also recommended as part of the FS, involving at least four new groundwater wells, and should include aquifer testing). This hydrogeologic characterization is necessary for the updated 3D model described above and should be integrated with the broader environmental monitoring requirements for the FS stage of the Project.

2 INTRODUCTION

2.1 Terms of Reference

This report supports disclosures by Lumina Gold Corp. in a news release dated April 17, 2023, titled "Lumina Gold Announces Positive Cangrejos Pre-Feasibility Study; US$2.2 Billion NPV, 26 Year Mine Life and Production of 371,000 Gold Ounces Per Year and 41 Million Pounds of Copper Per Year."

All measurement units used in this report are metric unless otherwise noted. Currency is expressed in United States dollars (symbol: US$) unless stated otherwise. The report uses Canadian English.

Mineral Resources and mineral reserves are reported in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves (May 2014; the 2014 CIM Definition Standards) and the CIM Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines (November 2019; the 2019 CIM Best Practice Guidelines).

2.2 Effective Dates

The technical report has three significant dates, as follows:

- Cangrejos mineral resource estimate: January 30, 2023
- Cangrejos mineral reserve estimate: March 30, 2023
- Financial analysis: April 7, 2023

The effective date of this report is April 7, 2023.

2.3 Qualified Persons

The qualified persons (QP) are listed in Table 2-1.

By virtue of their education, experience, and professional association membership, they are considered a qualified person as defined by NI 43-10.

Table 2-1: Report Contributors

Qualified Person & Professional Designation	Position	Employer	Independent of Lumina	Report Section
Kevin Murray, P.Eng.	Manager Process Engineering	Ausenco Engineering Canada Inc.	Yes	1.1, 1.12, 1.13.1, 1.13.2, 1.13.3, 1.16, 1.18, 1.19.1, 1.19.6, 2, 3.1, 17, 18.1, 18.2, 18.3, 18.4, 18.8, 21.1, 21.2.1, 21.2.2.1, 21.2.2.2, 21.2.2.3, 21.2.2.4, 21.2.3.1, 21.2.3.7, 21.3.1, 21.3.2, 21.3.3, 21.3.5, 24, 25.1, 25.9, 25.12, 25.13, 25.15.1.4, 25.15.2.4, 26.1, 26.6, and 27
Scott C. Elfen, P.E.	Global Lead Geotechnical & Civil Services	Ausenco Engineering Canada Inc.	Yes	1.13.4, 1.13.5, 1.15.2, 1.15.3, 1.19.7, 5.5, 18.5, 18.6, 18.7, 18.9, 18.10, 20.1.4, 20.2.2, 25.10, 25.15.1.5, 25.15.2.5, 26.7, and 27
Scott Weston, P.Geo.	Vice President, Business Development	Ausenco Sustainability Inc.	Yes	1.15.1, 1.15.5, 1.15.6, 1.15.7, 1.19.8, 3.3, 4.5, 4.6, 4.7, 4.8, 20.1.1, 20.1.3, 20.2.1, 20.3, 20.4, 25.11.1, 25.15.1.6, 25.15.2.6, 26.8, and 27
Adrian Karolko, P.Geo.	Independent Consultant	2338538 Alberta Ltd.	Yes	1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 3.2, 4.1, 4.2, 4.3, 4.4, 5.1, 5.2, 5.3, 5.4, 6, 7, 8, 9, 10, 11, 23, 25.2, 25.3, 25.4, and 27
Nelson D. King, SME	Principal Consultant (Metallurgical Engineer)	N D King Consulting, LLC	Yes	1.8, 1.19.3, 13, 25.5, 25.15.1.1, 25.15.2.1, 26.3, and 27
Norman I. Norrish, P.E.	Principal	Wyllie & Norrish Rock Engineers Inc.	Yes	1.11.2, 1.19.5, 16.2, 16.4, 25.8.2, 25.15.1.3, 25.15.2.3, 26.5, and 27
Robert Michel, SME	Principal	Robert Michel Enterprises, Inc.	Yes	1.14, 1.17, 3.4, 3.5, 19, 21.2.2.6, 21.2.3.4, 21.2.3.5, 21.2.3.6, 21.2.4, 21.3.6, 22, 25.14, and 27
Robert Sim, P.Geo.	Independent Consultant	SIM Geological Inc.	Yes	1.9, 1.19.2, 14, 25.6, 26.2, and 27
Joseph McNaughton, P.E.	Senior Mining Engineer	Independent Mining Consultants, Inc.	Yes	1.10, 1.11.1, 1.19.4, 15, 16.1, 16.5, 16.6, 16.7, 16.8, 16.9, 21.2.2.5, 21.2.3.2, 21.2.3.3, 21.3.4, 25.7, 25.8.1, 25.15.1.2, 25.15.2.2, 26.4, and 27
Bruce Davis, FAusIMM	Geostatistical Consultant	Independent Consultant (Sole Proprietor)	Yes	12 and 27

Qualified Person & Professional Designation	Position	Employer	Independent of Lumina	Report Section
Larry Breckenridge, P.E.	Principal Environmental Engineer	Global Resource Engineering Ltd.	Yes	1.15.4, 1.19.9, 1.19.10, 16.3, 20.1.2, 25.11.2, 25.15.1.7, 25.15.2.7, 26.9, 26.10, and 27

Source: Ausenco, 2023.

2.4 Qualified Person Site Visits and Scope of Personal Inspection

A summary of the site visits completed by the QPs is presented in Table 2-2.

Table 2-2: Qualified Person Site Visits

Qualified Person	No. of Site Visits	Dates of Site Visits	Days on Site
Kevin Murray, P.Eng.	0	Has not visited the site	0
Scott C. Elfen, P.Eng.	2	August 8 to August 11, 2022;	8
Scott Weston, P.Geo.	0	Has not visited the site	0
Adrian Karolko, P.Geo.	4	February 19 to March 19, 2022; March 26 to April 23, 2022; May 10 to May 29, 2022; July 28 to August 14, 2022	92
Nelson King, SME	1	January 16 to 17, 2018	1
Norman I. Norrish, P.E.	2	May 2 to 8, 2019; June 16 to 22, 2022	14
Robert Michel, SME	0	Has not visited the site	0
Robert Sim, P.Geo.	1	November 28 to 29, 2017	1
Joseph McNaughton, P.Eng.	1	May 5 to May 7, 2019	2
Bruce Davis, FAusIMM	0	Has not visited the site	0
Larry Breckenridge, P.Eng.	1	June 22 to July 14, 2022	20

Source: Ausenco, 2023.

Scott Elfen visited the site between August 8 and August 11, 2022, and October 23 and October 26, 2022. Activities during Mr. Elfen's visit included:

- Reviewed site conditions and locations for the DSTF, WRSF, and Process Plant

Adrian Karolko visited the site between February 19 and March 19, 2022; March 26 to April 23, 2022; May 10 to May 29, 2022; and July 28 to August 14, 2022. Activities during Mr. Karolko's visit included:

- Supervision of drill core sampling and QA/QC protocols
- Training and monitoring of Geotechnical drill core measurements

- QA/QC for Geotechnical Drill Program along with Overseeing geotechnical subcontractors data collection
- Logging and supervising logging of diamond drill core
- Completed Metallurgical sampling for third party contractor

Nelson King visited the site between January 16 and January 17, 2018. Activities during Mr. King's visit included:

- Review the drilling program and observe the core characteristics of the metallurgical test program
- Tour potential sites for the process plant, tailings storage, and site infrastructure

Norman Norrish visited the site between May 2 and May 8, 2019, and June 16 and June 22, 2022. Activities during Mr. Norrish's visit included:

- Review core from geotechnical boreholes and perform independent logging
- Select rock core samples for laboratory testing
- Review and finalize spatial distribution of overburden materials

Robert Sim visited the site between November 28 and November 29, 2017. Activities during Mr. Sim's visit included:

- Inspect drill core from numerous holes
- Visit a number of drill sites and the core storage facility

Joseph McNaughton visited the site between May 5 and May 7, 2019. Activities during Mr. McNaughton's visit included:

- Visit drill sites within the Cangrejos and Gran Bestia pit areas
- Toured potential waste storage sites, infrastructure and general site terrain
- Review the drill core, drilling program, material characteristics

Larry Breckenridge visited the site between June 22 and July 14, 2022. Activities during Mr. Breckenridge's visit included:

- Installation of a telemetry system for VWPs
- Geochemical sampling

2.5 Information Sources and References

2.5.1 General

Reports and documents listed in Section 3 and Section 27 of this report were used to support preparation of the report.

2.5.2 Previous Technical Reports

The Project has been the subject of previous technical reports, as summarized in Table 2-3.

Table 2-3: Previous Technical Reports

Reference	Company	Name
Odin Mining and Exploration, 2004	Odin Mining and Exploration Limited	Cangrejos Property, NI 43-101 Technical Report, Summary Report, May 2004
Odin Mining and Exploration, 2010	Odin Mining and Exploration Limited	Greater Cangrejos Property, NI 43-101 Technical Report, Summary Report, December 2010
Odin Mining and Exploration, January 2016	Odin Mining and Exploration Limited	Cangrejos Gold-Copper Project, NI 43-101 Technical Report, Ecuador, September 2016
Lumina Gold Corp., January 2017	Lumina Gold Corp.	Cangrejos Gold-Copper Project, NI 43-101 Technical Report, Ecuador, January 2017
Lumina Gold Corp., November 2017	Lumina Gold Corp.	Cangrejos Gold-Copper Project, NI 43-101 Technical Report, Ecuador, November 2017
MTB Enterprises, 2018	Lumina Gold Corp.	Cangrejos Gold-Copper Project, NI 43-101 Technical Report, Preliminary Economic Assessment, Ecuador, June 2018
Lumina Gold Corp., 2019	Lumina Gold Corp.	Cangrejos Gold-Copper Project, NI 43-101 Technical Report, Ecuador, November 2019
MTB Enterprises, 2020	Lumina Gold Corp.	Cangrejos Copper-Gold Project, NI 43-101 Technical Report, Preliminary Economic Assessment, Ecuador, June 2020
Lumina Gold Corp., 2022	Lumina Gold Corp.	Cangrejos Copper-Gold Project, NI 43-101 Technical Report, Preliminary Economic Assessment, Ecuador, June 2022

Source: SEDAR, 2023.

2.6 Definitions

Table 2-4: Unit Abbreviations

Abbreviation	Meaning	Abbreviation	Meaning
°	degree	M	million
%	percent	m^2	square meter
µm	micron	$m^2/t/d$	square meters per metric tonne per day
A	ampere	m^3	cubic meter
B	billion	m^3/h	cubic meter per hour
C$	Canadian dollar	$m^3/ m^2/h$	cubic meter per metric tonne per day
C	Celsius	Ma	million annum
cm	centimeter	masl	meters above sea level
cm^2	square centimeter	mg	milligram
cm^3	cubic centimeter	Mg/L	milligrams per liter
d	day	min	minute
dB	decibel	mm	millimeter
DEM	digital elevation model	Moz	million ounces

Abbreviation	Meaning	Abbreviation	Meaning
dmt	dry metric tonne	Mt/a	million tonnes per annum
E	East	MVA	megavolt-ampere
g	gram	MW	megawatt
g/L	gram per liter	MWh	Megawatt-hour
g/t	grams per metric tonne	N	North
gpm	gallons per minute	NL/h/m^2	normal liters per hour per square meter
h	hour	oz	ounce
Ha	hectare	oz/t	ounces per metric tonne
kg	kilogram	P_{80}	Particle size at which 80% of the material will pass when screened
km	kilometer	ppm	parts per million
km^2	square kilometer	ppb	parts per billion
kPa	Kilopascal	psi	pound-force per square inch
kVA	Kilovolt-ampere	W	West
kWh/t	Kilowatt hours per metric tonne	S	South
s	second	t/h/m^2	metric tonne per hour per square meter
t	tonne	t/a	metric tonnes per year
t/d	metric tonnes per day	US$	United States dollar
V	volt		
wmt	wet metric tonne		
wt%	weight percent		
y	year		

Table 2-5: Acronyms and Abbreviations

Abbreviation	Meaning
3D	three-dimensional
AAC	Civil Aviation Authority (*Autoridad de Aviación Civil*)
Ag	silver
AOI	area of influence
ARCERNNR	Energy and Non-Renewable Resources Regulation and Control Agency *(Agencia de Regulación y Control de Energía y Recursos Naturales no Renovables)*
ARCH	Hydrocarbon Regulation and Control Agency (*Agencia de Regulación y Control de Hidrocarburos*)
ARCOM	Mining Regulation and Control Agency (*Agencia de Regulación y Control de Minas)*
ARCONEL	Electrical Regulation and Control Agency (*Agencia de Regulación y Control Eléctrico*)
ARCOTEL	Telecommunications Regulation and Control Agency (*Agencia de Regulación y Control de las Telecomunicaciones*)
As	Arsenic
Au	Gold
AuEq	gold equivalent
AuEqR	recoverable gold equivalent
BMP	best management practices
BMMP	Biodiversity Monitoring and Management Plan
BWi	Bond Work Index
BTU	British thermal units

Abbreviation	Meaning
CC.FF.AA.	Joint Armed Forces Command (*Comando Conjunto de las Fuerzas Armadas*)
CIL	Carbon-in-Leach
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
COA	Environmental Code (*Código Ambiental*)
CRM	Certified Reference Material
CRP	Community Relations Plan
CSPT	China Smelter Purchase Team
Cu	Copper
DD	diamond drill
DE	Executive Decree (*Decreto Ejecutivo*)
Diemme	Diemme Filtration
DSTF	Dry-stack Tailings Facility
DTM	digital terrain model
EDA	exploratory data analysis
EE	Special Edition (*Edición Especial*)
E-GRG	Extended Gravity-Recoverable-Gold
EIA	Environmental Impact Assessment
EQD	equigranular quartz diorite
EQDF	foliated quartz diorite
ESMS	Environmental and Social Management System
FAE	Armed Forces of Ecuador (*Fuerzas Armadas del Ecuador*)
FEL	front-end loader
FI	Forest Inventory
FLS Mineralogy	Ore Characterization & Process Mineralogy Labs
GAB	meta-gabbros
GHG	Greenhouse Gas
GPS	global positioning system
GSC	fine-grained, massive amphibole-rich meta-basalt
HBx	hydrothermal breccia
HDPE	high-density polyethylene
HMBx	magnetite-biotite hydrothermal breccia
HSE	Health, Safety, and Environment
HSEC	Health Safety, Environmental, and Community Relations
Ibx	Igneous breccia
ICMC	International Cyanide Management Code
ICMI	International Cyanide Management Institute
ICMM	International Council on Mining and Metals
IESS	Ecuadorian Institute of Social Security (*Instituto Ecuatoriano de Seguridad Social*)
ICP	Inductively Coupled Plasma
IDW	inverse distance weighting
IFC	International Finance Corporation
INEC	National Institute of Statistics and Censuses (*Instituto Nacional de Estadistica y Censos*)
INPC	National Institute of Cultural Heritage (*Instituto Nacional de Patrimonio Cultural*)
IPQD	Intramineral PQD
LA-ICP-MS	laser ablation ICP mass spectrometer
LAC	LAC y Asociados Cia. Ltda.

Abbreviation	Meaning
LiDAR	light detection and ranging
LME	London Metal Exchange
LOM	Life of mine
Lumina	Lumina Gold Corp.
MAATE	Ministry of Environmental, Water and Ecological Transition (*Ministerio de Ambiente, Agua y Transición Ecológica*)
MAG	Ministry of Agriculture and Livestock (*Ministerio de Agricultura y Ganadería*)
ME	Ministry of Education (*Ministerio de Educación*)
MERNNR	Ministry of Non-renewable Energy, and Natural Resources (*Ministerio de Energía y Recursos Naturales No Renovables*)
Mo	molybdenum
MSP	Ministry of Public Health (*Ministerio de Salud Pública*)
MTOP	Ministry of Transportation and Public Works (Ministerio de Transporte y Obras Publicas)
NAG	Non-acid generating
NEC-SE-DS	Ecuadorian Construction Standard *(Norma Ecuatoriana de la Construcción)* on Seismic Hazard and Seismic -Resistant Design
Newmont	Newmont Overseas Exploration Limited
NGO	Non-Governmental Organization
NN	Nearest neighbour
NPV	Net present value
NSR	Net smelter return
Odin	Odin Mining (Lumina Gold Corp. subsidiary)
OK	ordinary kriging
OVB	Overburden
PAG	potentially acid generating
PEA	Preliminary Economic Assessment
PFS	Pre-feasibility Study
Plenge	Pleange Laboratory (*Laboratorio Plenge*)
PMA	Plan de Manejo Ambiental
PP	Pre-Production
PPP	Public Participation Process (*Proceso de Participación Pública*)
Pocock	Lugo, Italy and Pocock Industrial, Inc.
PQD	porphyritic dacite
PS	(IFC) Performance Standard
QA/QC	Quality Assurance/Quality Control
QD	quartz diorite
QP	Qualified Person
RAAM	Environmental Regulation for Mining Activities (*Reglamento Ambiental para las Actividades Mineras*)
RC	Refining charge
RO	Official Register (*Registro Oficial*)
ROM	Run-of-mine
SAP	Saprolite
Sb	Antimony
SCH	fine-grained biotite-feldspar-quartz schist
SCRP	Strategic Community Relations Plan
SEP	Stakeholder Engagement Program
SG	specific gravity

Abbreviation	Meaning
SRI	Internal Revenue Service (*Servicio de Rentas Internas*)
SRK	Saprock
STL	Solid-to-Liquid
SUIA	Unified Environmental Information System (*Sistema Unico de Informacion Ambiental*)
TC	Treatment charge
TOR	Terms of Reference
Trans Ox	Transitional Oxide
TULSMA	Unified Text of the Secondary Legislation of the Ministry of the Environment (*Texto Unificado de Legislación Secundaria del Ministerio del Medio Ambiente*)
UTM	Universal Transverse Mercator
UTPL	Private Technical University of Loja (*Universidad Técnica Particular de Loja*)
WAD	Weak Acid Dissociable
WRSF	Waste Rock Storage Facility
XRD	X-Ray Diffraction

3 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, property agreements, royalties, environmental, permitting, social license, closure, taxation, and marketing for sections of this report.

3.2 Property Agreements, Mineral Tenure, Surface Rights and Royalties

The QPs have not reviewed the mineral tenure, nor independently verified the legal status, ownership of the project area or underlying property agreements. The QPs have fully relied upon and disclaim responsibility for a legal opinion provided by Tobar ZVS C.L. *Legal Opinion on Cangrejos Project* dated April 28, 2023 (Zumarraga, 2023).

This information is used in Sections 1.2, 4.2, 4.3 of the report.

3.3 Environmental, Permitting, Closure, Social and Community Impacts

As discussions relating to potential environmental, permitting, closure, social, and community impacts are concerned, the QPs have fully relied upon data, reports, and professional opinions supplied by Lumina's Health Safety, Environmental, and Community Relations (HSEC) and legal staff, as well as other expert third-party sources, in particular:

- Permitting Handbook for the Development of the Cangrejos Mining Project, February, 2023 (Entrix Latin America, 2023)
- Permitting Handbook Schedule (Master .mpp file; Entrix Latin America, 2023)
- Wet Season Rapid Ecological Assessment (REA) and Forest Inventory: Evaluación Ecológica Rápida e Identificación de Hábitats Críticos para El Proyecto Cangrejos en la Provincia de El Oro, Ecuador: Resultados de la Evaluación Durante la Época Lluviosa (BEP Advisors, July 2019)
- Dry Season Rapid Ecological Assessment (REA): Evaluación Ecológica Rápida Para El Proyecto Cangrejos En La Provincia De El Oro, Ecuador: Resultados De La Evaluación Durante La Época Seca (BEP Advisors, October 2019)
- Critical Habitat Analysis: Estudio de Hábitats Críticos de la Concesión Minera Cangrejos, Provincia de El Oro, Ecuador (BEP Advisors, October 2019)
- Preliminary Biodiversity Monitoring and Management Plan Framework: Plan de Manejo y Monitoreo de Biodiversidad Preliminar Proyecto Cangrejos, El Oro, Ecuador - Marco Conceptual (BEP Advisors, January 2020)
- Biodiversity Monitoring Report: Informe Monitoreo de Biodiversidad Cangrejos (BEP Advisors, October 2022)
- Technical Memorandum Biodiversity Studies and Offsets (Gochnour & Associates, 2019)
- Independent Review of Biodiversity Studies (Gochnour & Associates, 2019)
- Independent Review of Biodiversity Monitoring Report (Gochnour & Associates, 2023)
- Social Report for Cangrejos PFS (SCG, 2023)

This information is used in Sections 1.15, 4, and 20 of the report.

3.4 Taxation

The QPs have fully relied upon, and disclaim responsibility for, information supplied by experts retained by Tobar ZVS and P.L. Services Eirelli for information related to taxation as applied to the financial model. It is important to note that the taxation assumptions used in the financial model are the same as those used in the 2022 PEA Update for the Cangrejos Project except for two basic changes: (i) Federal Corporate income tax decreased from 22% to 20% (reference "Solaris and Government of Ecuador Sign Investment Contract for Warintza Project," (www.globalnewswire.com, December 22, 2022), and (ii) full recapture of VAT extended from Year 1 to Year 4 of the Project in accordance with updated guidance provided by Tobar ZVS.

This information is used in Sections 1.17 and 22 of the report.

3.5 Markets

The QPs have not independently reviewed the marketing information. The QPs have fully relied upon, and disclaim responsibility for, information derived from H&H Metals Corp. and experts retained by H&H Metals Corp. for this information through the following documents:

- H&H Metals Corp., 2023. "Cangrejos Market Study", prepared for Lumina Gold Corp., April 15, 2023, 41 pages.

This information is used in Sections 1.14 and 19 of the report. The information is also used in support of the financial analysis in Section 22.

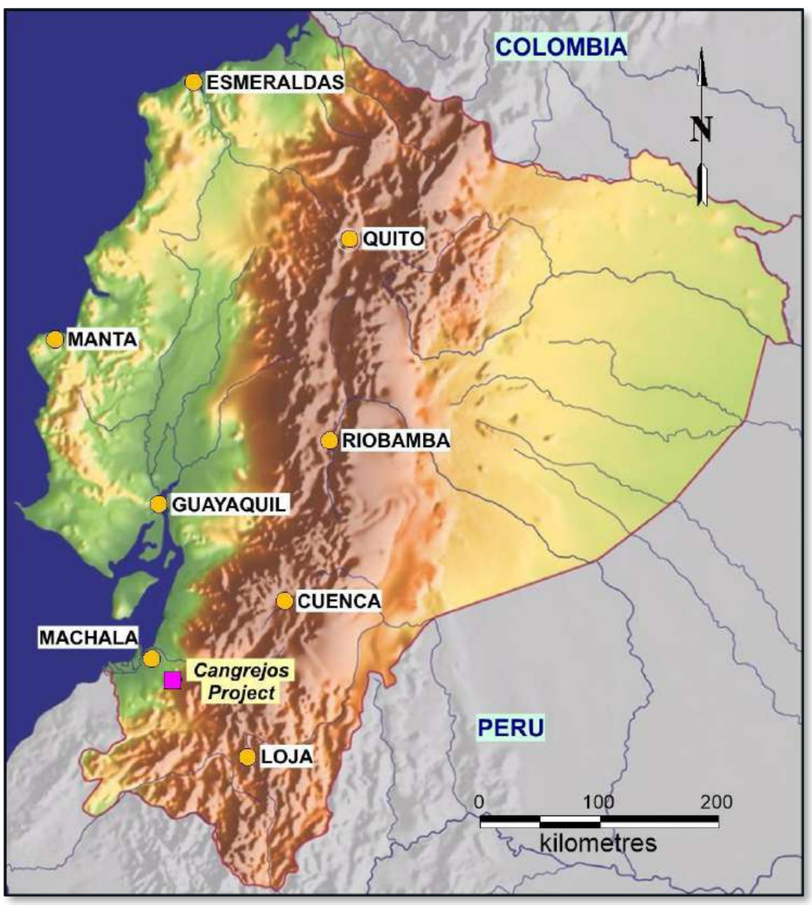
4 PROPERTY DESCRIPTION AND LOCATION

4.1 Property Location

The Cangrejos Project is in the Andean foothills of El Oro Province, in southwestern Ecuador, about 223 km from Guayaquil and 30 km southeast of the provincial capital of Machala, as shown in Figure 4-1. The Project lies primarily within the Cantons (counties) of Santa Rosa and Atahualpa. The Project is in the El Oro Metamorphic Belt Zone of the Cordillera Real, in steep, high-relief terrain near the northeastern rim of an ancient caldera at the eastern edge of the coastal plain. Project elevations range from approximately 100 to 1,370 masl.

The UTM coordinates for the Project are 9,614,300 North and 633,200 East (geographic projection: Provisional South American 1956, Zone 17S). The proposed mine and major elements of supporting infrastructure will be located primarily in areas of evergreen montane and secondary forest as well as altered pasture and agricultural areas in the central part of the Project.

Figure 4-1: Cangrejos Project Location

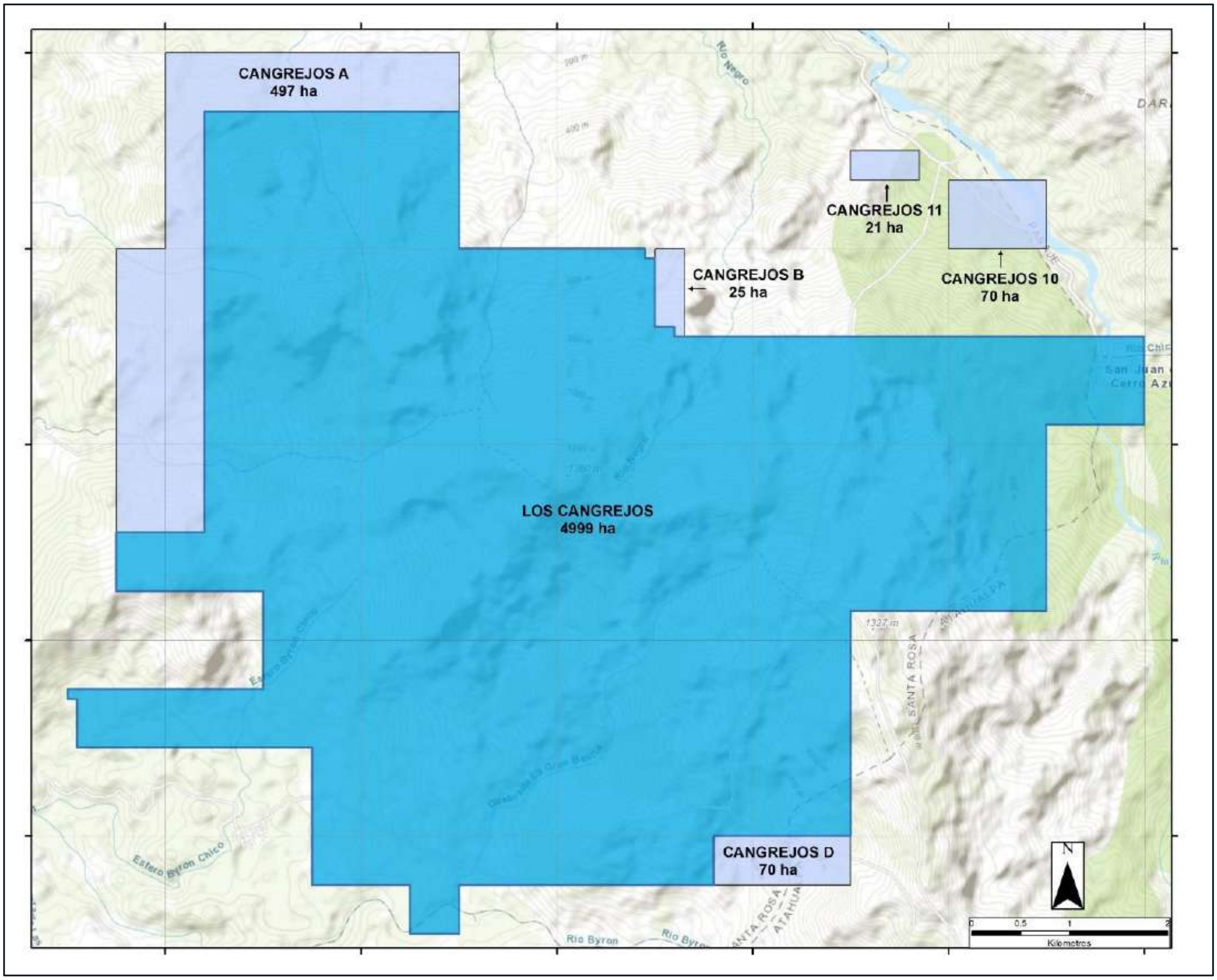


Source: Lumina, 2017

4.2 Property Ownership and Agreements

The Cangrejos Project currently consists of a group of five mining concessions and one advanced exploration concession totaling 5,682 Ha, as depicted in Figure 4-2 and as shown in Table 4-1. Odin Mining del Ecuador S.A. (Odin) is a 100% owned subsidiary of Lumina Gold Corp. (Lumina), and all concessions are held by Lumina through Odin.

Figure 4-2: Current Concession Boundaries



Source: Lumina, 2023.

Table 4-1 presents the legal descriptions and land areas of these concessions.

Table 4-1: Mining Concessions – Cangrejos

File Number	Concession	Date of Concession	Date of Registration or Re-registration (Day/Month/Year)	Area (Ha)	Phase	Date of Expiration (Day/Month/Year)
2847	Los Cangrejos	28/10/2021	17/11/2021	4,999	Advanced Exploration	29/11/2031
300972	Cangrejos 10	06/05/2010	25/05/2010	70	Small Mining	24/09/2034
300971	Cangrejos 11	04/05/2010	25/05/2010	21	Small Mining	24/09/2034
30000695	Cangrejos A	17/04/2019	28/05/2019	497	Small Mining	22/06/2031
30000694	Cangrejos B	17/04/2019	27/05/2019	25	Small Mining	21/06/2031
30000692	Cangrejos D	17/04/2019	28/05/2019	70	Small Mining	22/06/2031

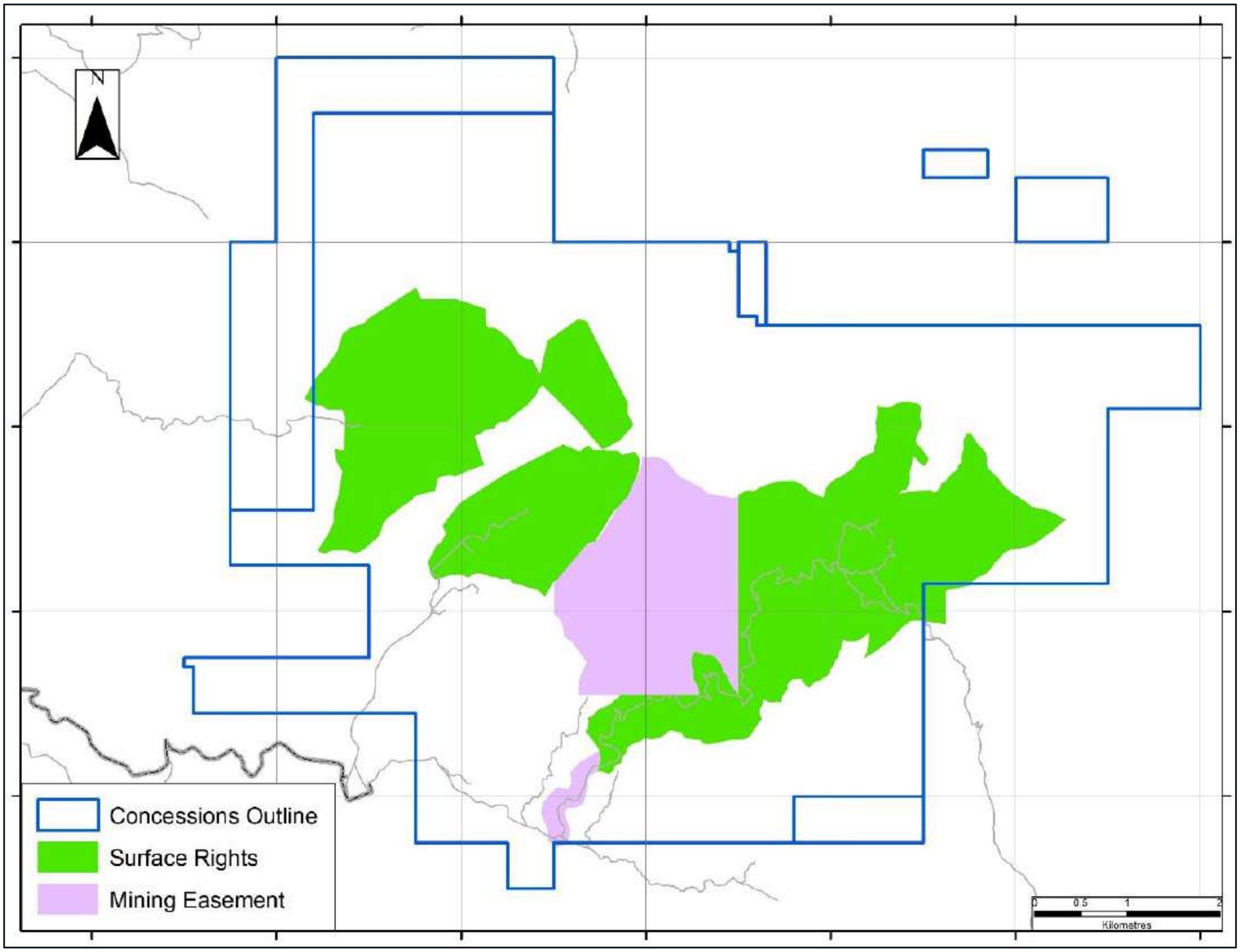
The maintenance of each mining concession requires an annual payment that is due before the 31st of March each year. For 2022, this amount totaled US$119,068 for the seven mining concessions. These fees were paid, and all concessions are in good standing. The Small Mining concession royalty for the Los Cangrejos concession has been reported as zero, as instructed by the Mining Control Agency.

Table 4-2 and Figure 4-3 describe land areas within or adjacent to these concessions that are currently owned by Odin or controlled by Odin via legal easement. The 25-year life span for the concessions can be renewed for additional 25-year periods as many times as needed.

Table 4-2: Surface Rights

Number	Previous Owner	Area (Ha)	Location	Date of Registration (Day/Month/Year)
1	Victor Manuel Ramírez Román	54.00	Santa Rosa	10/04/07
2	Manuel Abad Ruiz	66.38	Santa Rosa	21/09/07
3	Carlos Porfirio Tituana	81.20	Santa Rosa	17/12/07
4	Juan Antonio Tituana Torres	76.00	Atahualpa	02/04/08
5	Victor Manuel Ramírez Román	58.75	Santa Rosa	29/05/08
6	Francisco Castro Sanchez	122.40	Atahualpa	22/08/16
7	Francisco Castro Sanchez	46.50	Santa Rosa	28/12/16
8	Juan Eduardo Venegas Francisco Soria Venegas	95.00	Santa Rosa	17/02/17
9	Jose Ernesto Ponton Loaiza	24.69	Santa Rosa	08/01/19
10	Jorge Vicente Ponton Loaiza	21.77	Santa Rosa	08/01/19
11	Lauro Evaristo Pineda Labanda	79.47	Santa Rosa	20/11/19
12	Noblecilla Family	400.50	Santa Rosa	01/12/20
13	Tocadulomo S.A. Lot 1	108.6	Santa Rosa	31/11/22
14	Tocadulomo S.A. Lot 2	109.07	Santa Rosa	Registry Pending
	Total Purchased Subtotal	**1,235.26**		
15	Mauricio Mendieta (C20 Easement)	359.94	Santa Rosa	27/03/18
16	Andrea Armijos (Access Easement)	25.70	Santa Rosa	23/11/18
	Mining Easement Subtotal	**385.64**		
	Total Surface Rights	**1,729.97**		

Figure 4-3: Surface Rights



Source: Lumina, 2023.

4.3 Mineral Tenure

Physical access to the Cangrejos 20 (C20) concession, which is now included in the Los Cangrejos concession, required a mining easement over a portion of the surface of the concession to proceed with exploration. On 11 May 2017, Odin filed an easement request with the Energy and Non-Renewable Resources Regulation and Control Agency *(Agencia de Regulación y Control de Energía y Recursos Naturales no Renovables, ARCERNNR)* for 359.94 Ha of private surface rights within C20, in order to legally access the area of geologic interest and conduct exploration work. The easement was granted in December 2017, enabling the execution of exploration and drilling in C20. The legal easement is valid for the duration of the Project and mine, however, ARCERNNR will perform a new economic evaluation and define financial terms to compensate the owner over the long term when the Project moves to the production phase. Odin has the legal rights to change the regime phase of the mining easement with additional compensation requirements regulated by ARCERNNR's valuation.

4.4 Royalties and Encumbrances

Project lands and mining concessions have no royalty requirements beyond a 3% to 8% Net Smelter Return (NSR), mandated by and for the Ecuadorian government, which is negotiated once a PFS is completed[1]. No "back-in" rights or any other encumbrances exist that could affect the Project's title, nor are there any other known impediments or significant risks that could affect the ability to perform mining work on the property.

4.5 Environmental Considerations

To the extent known, no environmental liabilities of any materiality exist that would preclude development of the Project. There are no villages or significant human habitations in the Project's environmental AOI.

4.6 Permitting Considerations

The Project has all the permits and regulatory approvals necessary for its current activities and for the recommended work program (see Section 26). The major permits currently in effect are:

- Exploration licenses for the C20 and Los Cangrejos concessions
- Exploration-phase Environmental Impact Assessment and Environmental Management Plan *(Estudio de Impacto Ambiental / Plan de Manejo Ambiental, EIA/PMA)* documents for both C20 and Los Cangrejos concessions
- MAATE-Water Office permits for surface water use, as necessary to support exploration in both the C20 and Los Cangrejos concessions

A history of all baseline studies done under the auspices of the exploration-phase EIA/PMA is provided in Section 20.1.1.

4.6.1 Compliance with International Best Management Practices

As the Project is further developed during the FS and lender engagement and financial support becomes an increasingly important consideration, it is expected that additional international best management practices (BMPs) applicable to certain aspects of mine design, construction, operation, and closure will be implemented (although applicable Ecuadorian laws, regulations, norms, and standards will retain legal primacy in the event of any technical conflict). Given the nature, scale, and duration of the Project, such BMPs are expected to include, but not be limited to:

- The Equator Principles (Equator Principles Association, 2013)
- International Finance Corporation (IFC) Performance Standards for Sustainable Development (IFC, 2012)

[1] Recent agreements signed by other companies indicate a 5% NSR; however, negotiation of a 3% NSR is considered feasible because of the potential size of the Project.

- IFC Environmental, Health, and Safety Guidelines for Mining (IFC, 2007)
- International Cyanide Management Code (ICMC) [International Cyanide Management Institute (ICMI)] (ICMI, 2021)
- Potentially applicable elements of the International Council on Mining and Metals (ICMM) Global Industry Standard on Tailings Management (ICMM, 2020).

4.7 Social License Considerations

Lumina and Odin understand that the Project's "social license to operate" depends on more than just meeting minimum regulatory requirements. Among other factors, it requires proper identification and management of the Project's social impacts and risks, and that Project stakeholders receive substantial benefits, across all phases of mine development, construction, and operation.

Managing these risks, impacts, and benefits requires effective engagement with stakeholders. Effective engagement is expected to reduce any misconceptions held by stakeholders and the Project proponent, as well as require sharing of relevant information and addressing of stakeholder concerns and expectations with clear commitments. The engagement process will also provide stakeholders adequate input to decision-making processes and ensure that Project representatives show respect and objectivity, as well as demonstrate good faith.

Effective grievance management is a fundamental part of maintaining the social license. Lumina and Odin understand that appropriate efforts must be expended towards strengthening the channels for early identification of stakeholder grievances, and the implementation of procedures to address them appropriately.

Lumina has established corporate community relations and sustainability policies to guide these efforts. As the Project advances towards the FS, Odin will expand its social management and engagement efforts to address emerging issues and a potentially wider set of stakeholders.

4.8 Project Risks and Uncertainties

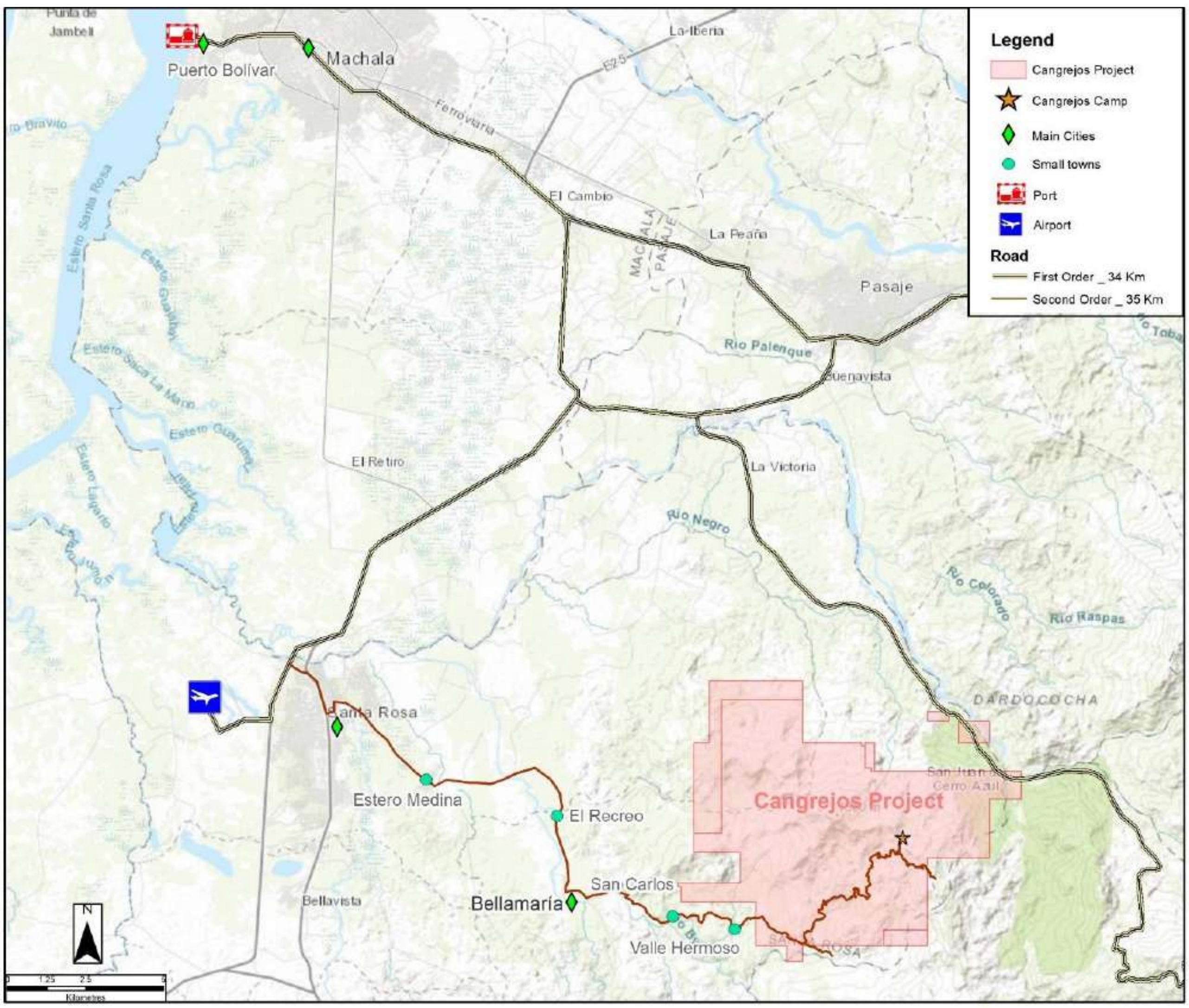
There are no known regulatory, environmental, or social risks or uncertainties that may affect access, title, or the right or ability to perform work on the Project. As noted previously, Odin is currently managing the Project in compliance with governing EIA/PMAs and all other applicable exploration phase permits. Odin is also maintaining its social license though the continuing implementation of its community relations program and proactive social investments, as well as its ongoing relationships with local, provincial, and national regulatory authorities, in order to be able to predict and adapt to any potential regulatory changes.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

Figure 5-1 shows the relative locations of the population centers and the Cangrejos Project site. Machala (population approximately 230,000 according to the 2010 Census) is 58 km from the Project and is the closest major city; it also is the capital of El Oro province. At 24 km away, Santa Rosa is the closest urban area to the Project. Santa Rosa has a population of approximately 50,000 and hosts the nearest commercial airport.

Figure 5-1: Access to Cangrejos



Source: Lumina, 2023.

Access to the Project is provided by paved roads to the village of Valle Hermoso. The Company rebuilt an abandoned road from Valle Hermoso to the project area and exploration camp in 2019. Driving time from Machala to the Cangrejos future site is typically 75 minutes, and the drive from Santa Rosa to the future site is approximately 35 minutes. The site access road from Santa Rosa to Valle Hermoso passes through four small towns: Medina, El Recreo, Bellamaria, and San Carlos.

The exploration project and camp are accessed by a private gravel road east from Valle Hermoso to a security gatehouse with visitor parking.

5.2 Climate

The Project is located in the El Oro Metamorphic Belt Zone of the Cordillera Real, in high-relief terrain near the northeastern rim of an ancient caldera at the eastern edge of the coastal plain. Elevations range from approximately 100 to 1,370 masl and temperatures are relatively constant, ranging between 18°C and 22°C.

The Project area experiences a wet season, typically from January through May and a dry season that lasts roughly June through December. Average annual rainfall for the Project varies greatly by elevation and by year. Initially, two meteorological stations were installed: an upper station located near the exploration camp at 1,149 masl, and a lower station near the future plant site at 348 masl. The yearly average of precipitation at the upper station is ~1500 to 2100 mm/yr, while the lower station measured approximately 30% to 50% less (~1400mm/yr.) in the same time periods.

In 2022, two additional meteorological stations were established 5.27 km and 10.45 km west-northwest of the upper station, respectively. Continuous monitoring began in 2022 and to date precipitation has averaged 86.4mm/month and 85.0 mm/month, respectively.

Based on available meteorological information, the mine and the processing facilities can operate year-round; however, the mine production schedule allows for the loss of five days per year due to weather delays.

5.3 Local Resources and Infrastructure

Machala, with a population of approximately 230,000, is the largest city in the vicinity of the Project, while Santa Rosa, a smaller city with a population of approximately 50,000, is closer to the Project. Both Santa Rosa and Machala can provide basic goods and services for the early stages of exploration and mining. Skilled and unskilled labor is also available from various small towns and villages in closer proximity to the Project.

The Project is well served by regional transportation infrastructure; Machala and Santa Rosa are both situated on the section of the Pan-American Highway linking Guayaquil to Lima, Peru. There are regular flights between Quito and the Santa Rosa airport, which also serves Machala.

Puerto Bolivar is a major deep-water port located nine km to the west of Machala and approximately 60 km from the Project. Having ready access to Puerto Bolivar is expected to facilitate the exportation of concentrate and importation of equipment, materials, and other consumables. The Mirador mine is currently shipping concentrates from Puerto Bolivar. It is expected, however, that some of the imported goods for the Project will require use of the Port of Guayaquil, located approximately 225 km from the Project.

The power study (EPTEC, 2022) indicates that the national grid has sufficient power to supply the total demand for the Project for the three mill throughput phases proposed by this PFS, which are 30 kt/d, 60 kt/d, and 80 kt/d.

Since the Project is in an area with a strongly net positive water balance (20.1.4.4), there is sufficient water from entirely meteoric sources to supply the operations, without having to abstract groundwater or install groundwater wells.

Since Odin owns or controls approximately 6,400 Ha of concessions and over 1,500 Ha of surface rights, in the opinion of the QP, there is sufficient area to support the mining, processing, mine overburden and waste disposal, and tailings deposition that are required over the life of the mine. Additionally, the local area can provide sufficient labor, power, and water.

5.4 Physiography

Cangrejos is in moderately hilly terrain, southeast of the coastal plain. Elevations range between 100 and 1,370 masl.

The Project will be located primarily in areas of evergreen montane and secondary forest and altered pasture and agricultural areas in the central part of the Project. The Project is drained by a network of small streams; apart from these streams, no significant surface water features are directly impacted by the Project. The natural environment in the area of the Project has been significantly altered by a wide range of intrusive human influences that span many decades, and archaeological evidence suggests a history of human habitation and influence that dates back hundreds of years. No primary forest remains. Current land usage in the area of the Project is typically a mixture of cattle grazing and light agriculture, in cleared areas adjacent to secondary forest “islands.” The latter are usually situated in steep ravines and rugged terrain unsuitable for agriculture or grazing. There are no villages or significant groups of dwellings in the Project’s environmental AOI.

Ecuador is a biodiverse country and, like other nations, has established a range of laws and regulations to protect its environmental resources. At the same time, the country is seeking to diversify and grow its economy, an increasingly vital component of which is mining. In keeping with Ecuadorian law and international BMPs, mining project proponents must seek a practical and appropriate balance between project economics and environmental protection, including the preservation of biodiversity.

In order to better understand the specific biodiversity considerations in the project area, Odin commissioned environmental studies as part of the various exploration-phase EIAs. A desktop biodiversity screening study was completed in 2017. Dry and wet season field studies were conducted in 2019 that were focused specifically on biodiversity in and around the initial project footprint, as defined by Lumina’s 2018 PEA.

The 2019 studies confirmed that the project location is many kilometers distant from any officially protected environmental areas and that the Project’s concession areas have been significantly impacted by centuries of intrusive human activity. Primary forest no longer exists, and the area of the Project is now comprised of a mixture of agricultural and grazing clearances and young or mature secondary forest islands. Such types of forests are not unique and can be found elsewhere in coastal areas of Ecuador.

Minor populations of several sensitive and/or endemic species of flora and fauna were found in land areas that will be required for mine construction and operation. However, the Project is adjacent to (and in several cases already owns) substantial areas not required for mining that are forested or modified. These can be set aside or rehabilitated as ecological offsets to compensate for any disturbance or loss of habitat that might be critical to the species observed. Establishment of offsets, in conjunction with a biodiversity monitoring program, robust adaptive management protocols, and specific management and mitigation measures based on international BMPs will enable successful project permitting and compliance with all applicable regulatory requirements.

5.5 Seismicity

Ecuador is a seismically active country. The seismicity has been considered in the PFS design.

In the case of Southern Ecuador, seismicity is mainly related to subduction of the Nazca plate beneath the South American plate, whose interaction has led to the formation of the Andes and the Colombo-Ecuadorian Ocean trench. On the continent, this activity has formed different mountain ranges separated by valleys and mountainous depressions, associated mainly along the main fault systems that limit the relief.

The municipality, Santa Rosa, is classified as "medium seismic hazard" category in the National Seismic Map from the Ecuadorian. Ausenco carried out a specific seismic hazard study for the project area in 2022. The resulting probabilistic peak ground accelerations at bedrock surface (International Building Code ("IBC") Site Class B) for various return periods, are shown in Table 5-1. Site Class B corresponds to bedrock material, which is not uniform over the project area. Therefore, seismic amplification parameters were used for specific infrastructure over C-type ground (soft rock/stiff soil), such as the processing plant, WRSF and DSTF.

Seismic design criteria from NEC-SE-DS indicate 0.35 peak ground acceleration for a 1:475 years earthquake, while Ausenco (2022) indicates 0.38 peak ground acceleration for the same return period. The project's design criteria use the more conservative earthquake, and therefore, design earthquakes for the project's infrastructure are based on Ausenco (2022), shown in Table 5-1.

Table 5-1: Peak Ground Acceleration

Return Period	100	475	2,475	5,000	10,000
	0.207	0.380	0.700	0.895	1.120

Source: Ausenco, 2022.

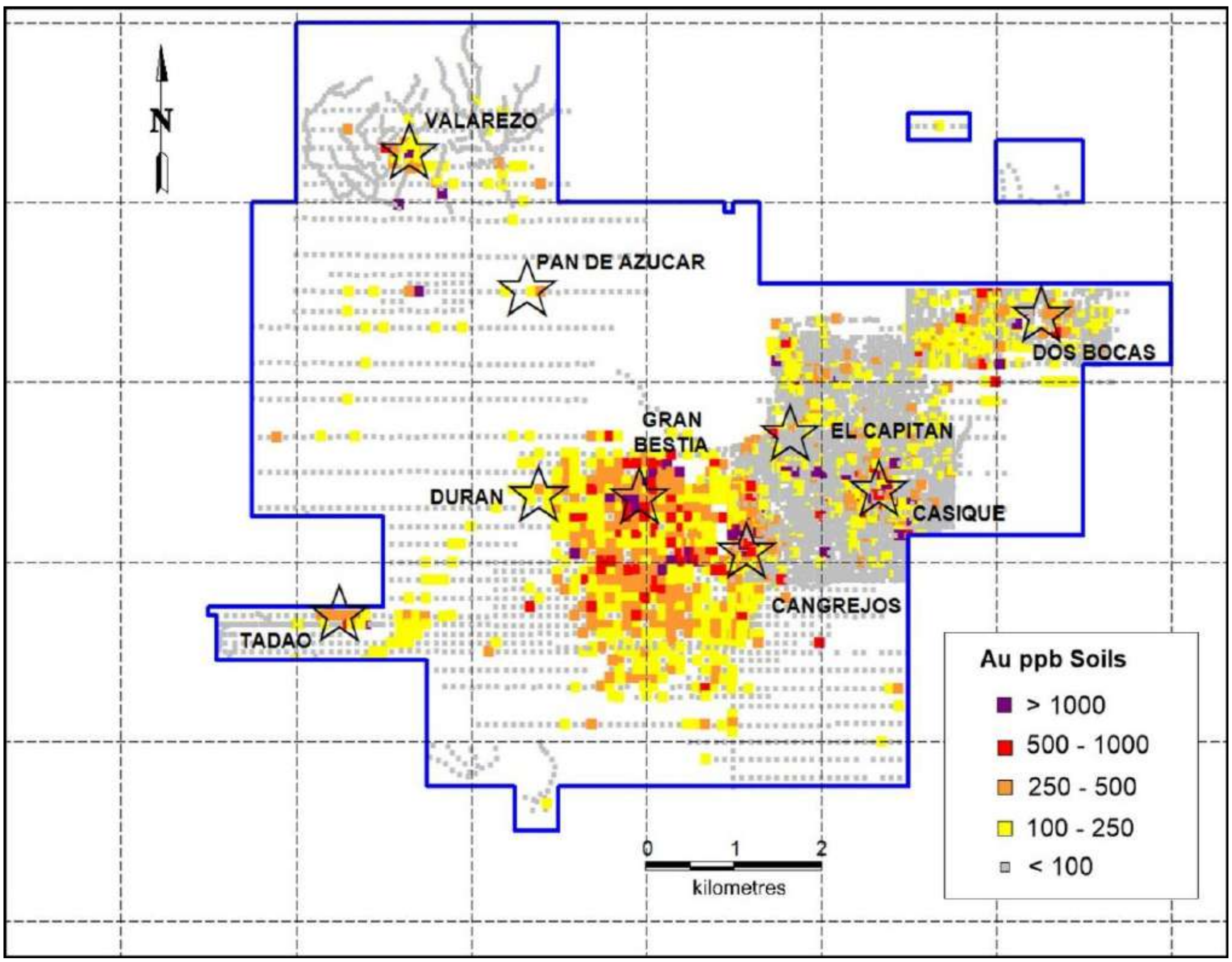
Ausenco also performed deterministic assessment to establish the potential earthquake magnitudes and ground accelerations that could impact the mine facilities, this assessment considers the effects of interface and intraslab subduction, which are the closest and most critical geological structures to the mine infrastructures. The results show that, the strongest earthquake would be of Momentum Magnitude Scale ("Mw") 7.5 and the near-source ground acceleration in the mine infrastructure (at rock level) would be 0.71 g (note that g = 981 cm/s^2). This ground acceleration does not consider site amplification effects, such as soil materials, geological structures, and topography.

6 HISTORY

Odin Mining del Ecuador S.A. is an Ecuadorian subsidiary of the Canadian exploration company Lumina Gold Corp. (formerly Odin Mining), incorporated under the laws of the Republic of Ecuador by public deed and registered on 15 December 1993 (Zumarraga, 2022). The history in this section is taken primarily from Potter (2010).

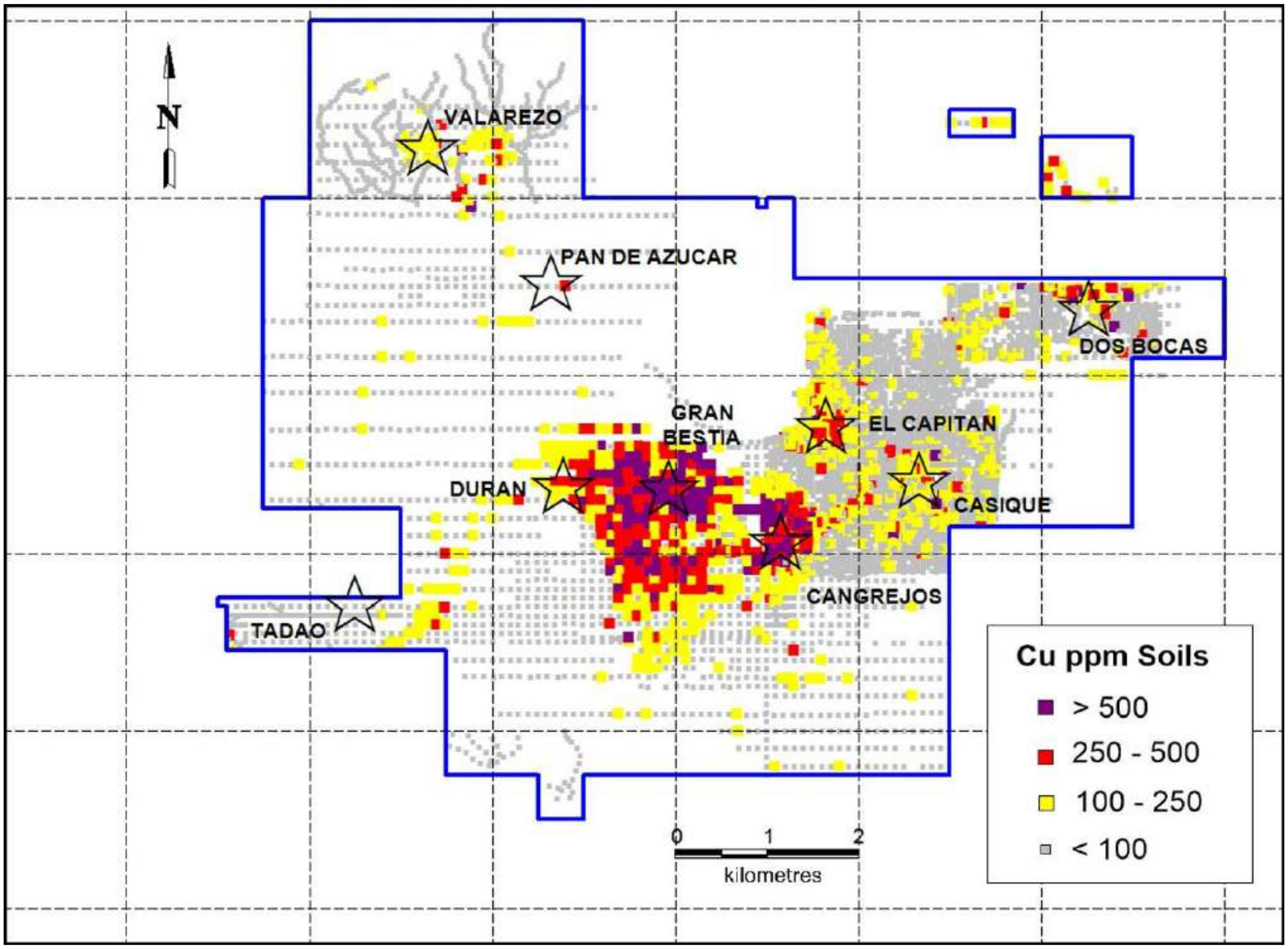
After mining the Biron alluvial gold mine, north of Bellamaria, Odin Mining initiated a stream sediment sampling program in 1993. The objective of the exploration program was to locate the hard-rock source of the alluvial gold in the Biron deposit. Figure 6-1 and Figure 6-2 illustrate the well-defined gold and/or copper soil anomalies. A sub-circular, gold-copper soil anomaly with a diameter of approximately 2,700 m occurs at the center of the property. The Cangrejos and Gran Bestia mineralized zones occur within this area of anomalous gold and copper soil values. The other mineralized showings on the property also have anomalous, but somewhat less-extensive, gold and copper soil values.

Figure 6-1: Soil Geochemistry – Gold



Note: Cangrejos Project is outlined in blue. Source: Lumina, 2023.

Figure 6-2: Soil Geochemistry – Copper



Note: Cangrejos Project is outlined in blue. Source: Lumina, 2023.

The overall extent of the anomalies was sufficiently encouraging for Newmont Overseas Exploration Limited (Newmont) to enter into a joint venture agreement with Odin Mining in 1994. The area of interest was 22,500 Ha encompassing the entire area that could be the source of gold at the Biron Project, and the joint venture was named the "El Joven Joint Venture." Odin Mining held a 40% interest and Newmont held 60% and was the operator.

Towards the end of 2000, after geological mapping, extensive soil and rock geochemical surveys, an airborne magnetic-radiometric survey, an IP survey, and a 29-hole diamond drill (DD) program, Newmont carried out a risk and evaluation review of the Project. With the gold price at about $270 per ounce, in order to continue with the Project, Newmont required strong evidence for the presence of several hundred million tonnes of mineralization at a grade higher than 1.0 g/t gold. Since Newmont did not consider this outcome to be likely, they reduced their work on the Project and formally withdrew from the joint venture in August 2001.

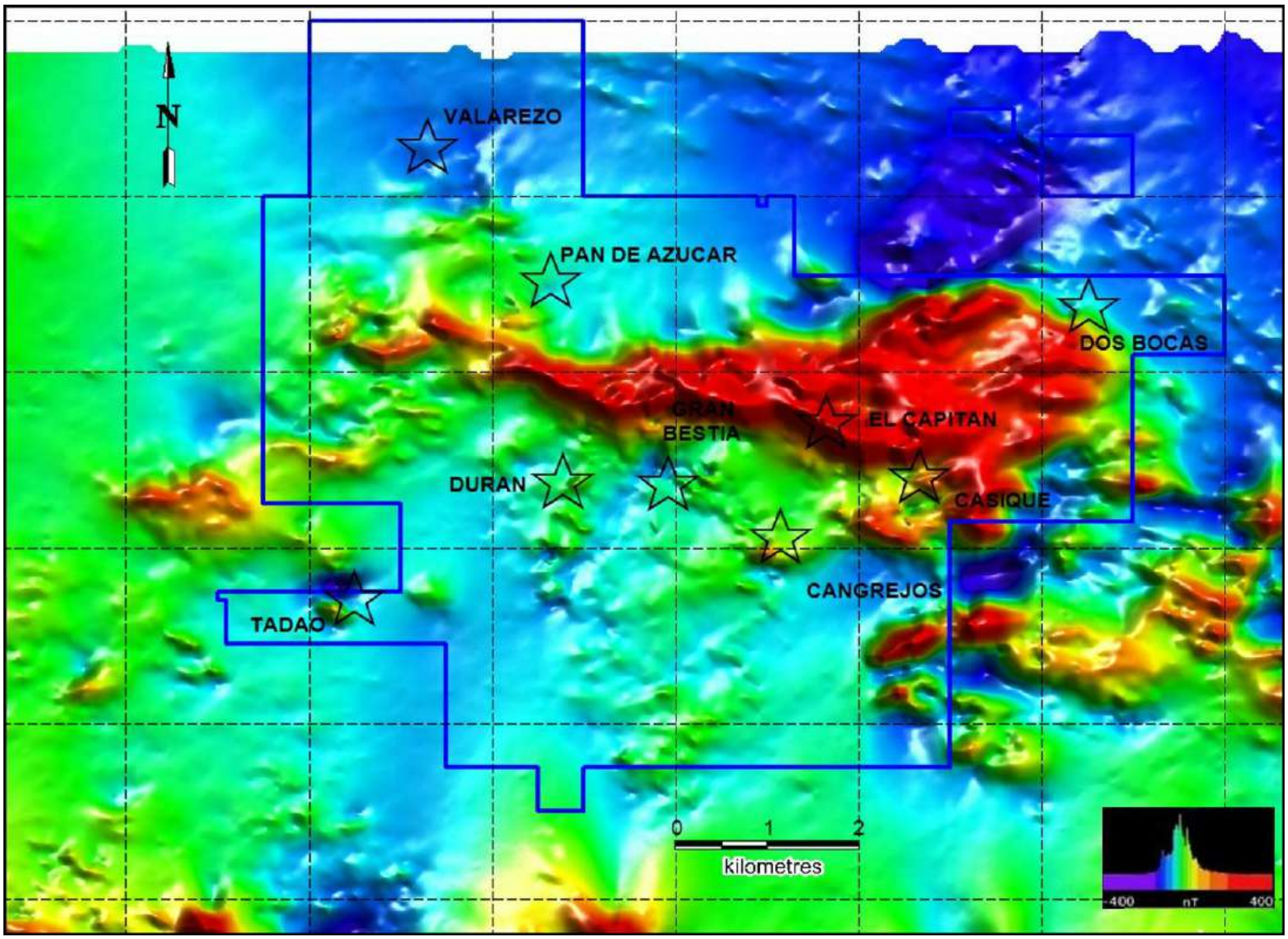
In accordance with the terms of the joint venture agreement Newmont transferred back to Odin the concessions that had been contributed to the joint venture.

Newmont also transferred to Odin all the remaining drill cores and an information package.

In late 2004 Odin acquired four additional concessions (Cangrejos 10, 11, 12, and 13) with a combined area of 3,043 Ha by direct application to the government.

In May 2007 Odin reached an agreement with Mr. Francisco Castro Sanchez to include the Casique and Las Canarias concessions with a combined area of 722 Ha in the Cangrejos property. These concessions are now incorporated into the Los Cangrejos concession. Also in 2007, airborne magnetic survey data was reprocessed by Encom and was used to help define structures. In addition, small circular magnetic highs are interpreted as breccia pipes. The location of exploration targets other than the Cangrejos and Gran Bestia deposits are shown in Figure 6-3 and described in Table 6-1.

Figure 6-3: Exploration Targets – Cangrejos Project – RTP Magnetics



Note: Cangrejos Project is outlined in blue. Source: Encom, 2007; Lumina, 2023.

Table 6-1: Untested Exploration Targets – Cangrejos Project

Target	Geochemistry	Magnetics	Geology
TADAO	Anomalous gold: rocks, soils and local streams	Circular magnetic high	Breccia pipes
DURAM	Anomalous gold, copper: rocks, soils	North-trending series of magnetic highs	Breccia pipes
DOS BOCAS	Anomalous gold, copper: streams, soils, rocks	Several magnetic highs and lows	Unknown
VALAREZO	Anomalous gold, copper, arsenic: rocks, soils	Weak to moderate magnetic anomaly south of the geochemical anomaly	Unknown

Source: Lumina, 2017

The Castro agreement included control of about 160 Ha of surface land. Subsequently, Odin purchased several additional land packages with a total area of approximately 380 Ha in critical locations to ensure that development programs could be carried out in a timely and cost-effective manner in the future. A mining and mineral exploration moratorium was implemented by the Ecuadorian government in April of 2008.

A new Mining Law came into effect on January 29, 2009, but general regulations had to be developed in order to implement the law. In March 2009 Odin's Ecuadorian legal team advised that they had informal indication that all of the Cangrejos concessions were likely to survive. Nevertheless, at the end of that month Odin voluntarily relinquished the Cangrejos 13 concession as a non-core asset.

On November 16, 2009 the general regulations needed to implement the new Mining Law were brought into effect and the mining and mineral exploration moratorium was lifted. Exploration was now to be conducted in a much more strictly regulated regime than previously. Environmental controls, evidence of social acceptance within the local community, and an increased level of government involvement in the approval, review, and audit of annual work plans and budgets were required under the new law.

In December 2009, Odin completed a non-brokered private placement to raise C$1.5 M. The funding allowed Odin to re-engage its former technical staff within Ecuador and its external technical advisers.

In January 2010, the company submitted a revised environmental impact study to begin to acquire the necessary permits to enter the advanced stage of exploration status that would allow diamond drilling (DD)on the property. In May 2010, Odin received formal confirmation that all twelve of the greater Cangrejos mining concessions were in good standing.

In June 2014, Lumina Gold Corp acquired Odin Mining which included Odin Mining's 100% owned Ecuadorian subsidiary Odin Mining del Ecuador S.A.

In 2016, Odin Mining, the Canadian corporation which owned Odin Mining del Ecuador S.A., changed its name to Lumina Gold Corp. (Lumina).

The Cangrejos 20 concession (C20), which is now incorporated into the Los Cangrejos concession, was registered on December 15, 2016, and subsequently changed to an Advanced Exploration claim.

Lumina applied for two mining easements in 2017. The C20 easement was registered on March 27, 2018, and an access easement was registered on October 6, 2018. They also acquired additional surface property rights for 95 Ha in the Cangrejos area.

Details of historic exploration and drilling at the property are described in Sections 9 and 10.

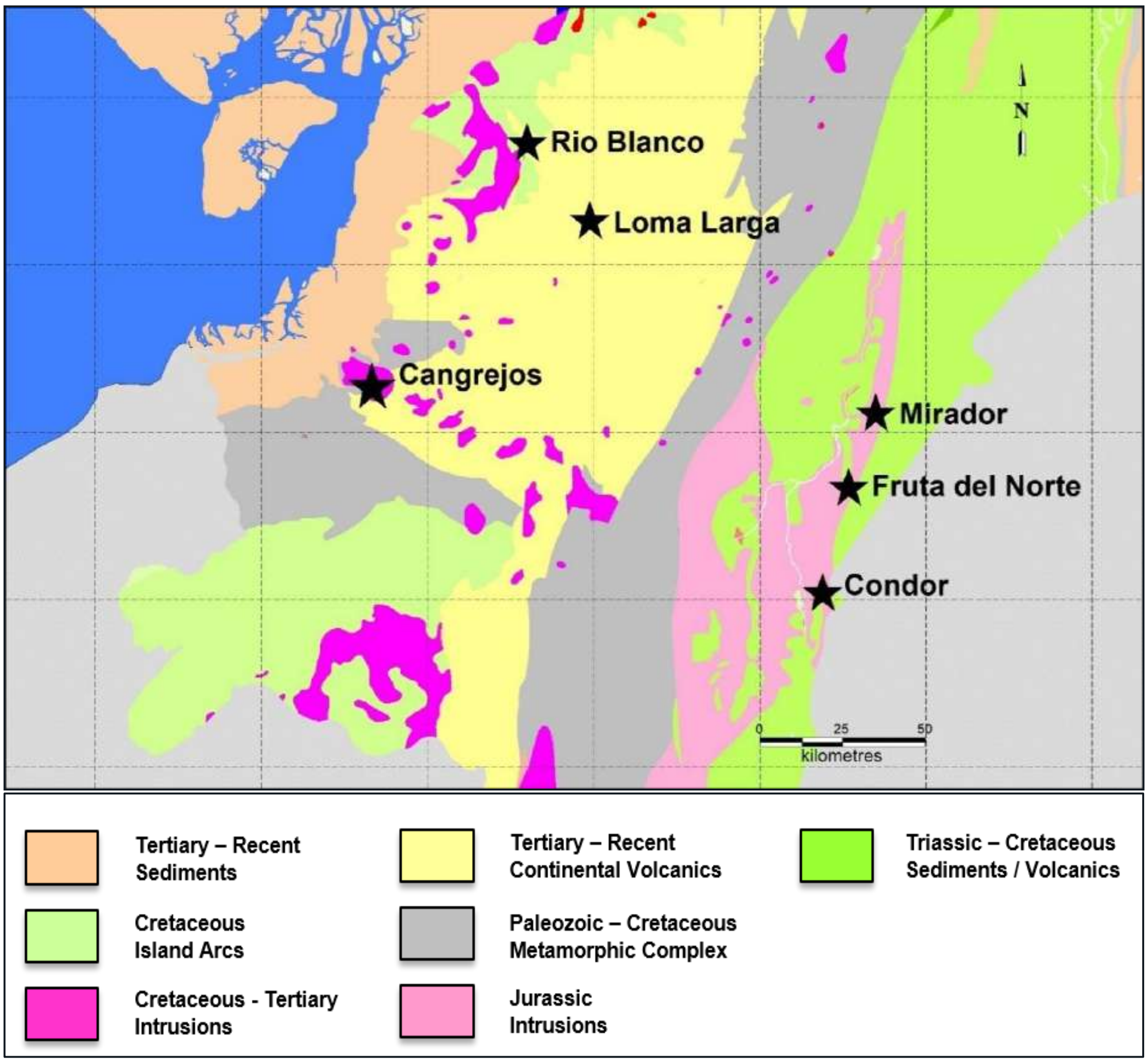
To the best of the QP's knowledge, there was no prior ownership of the property prior to Odin, no formal or documented exploration, and no historical mineral resource or mineral reserve estimate. Historically, there has been artisanal mining on the Cangrejos property, but no production estimates have been reported.

7 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The regional geology of southern Ecuador is shown in Figure 7-1. There are several north-south-trending domains of volcanic and sedimentary rocks which accreted onto the Amazon Craton from Late Jurassic to Eocene. These terranes are cut by younger magmatic intrusions which locally host porphyry copper/gold and epithermal gold deposits (shown as black stars in Figure 7-1).

Figure 7-1: Regional Geology Plan



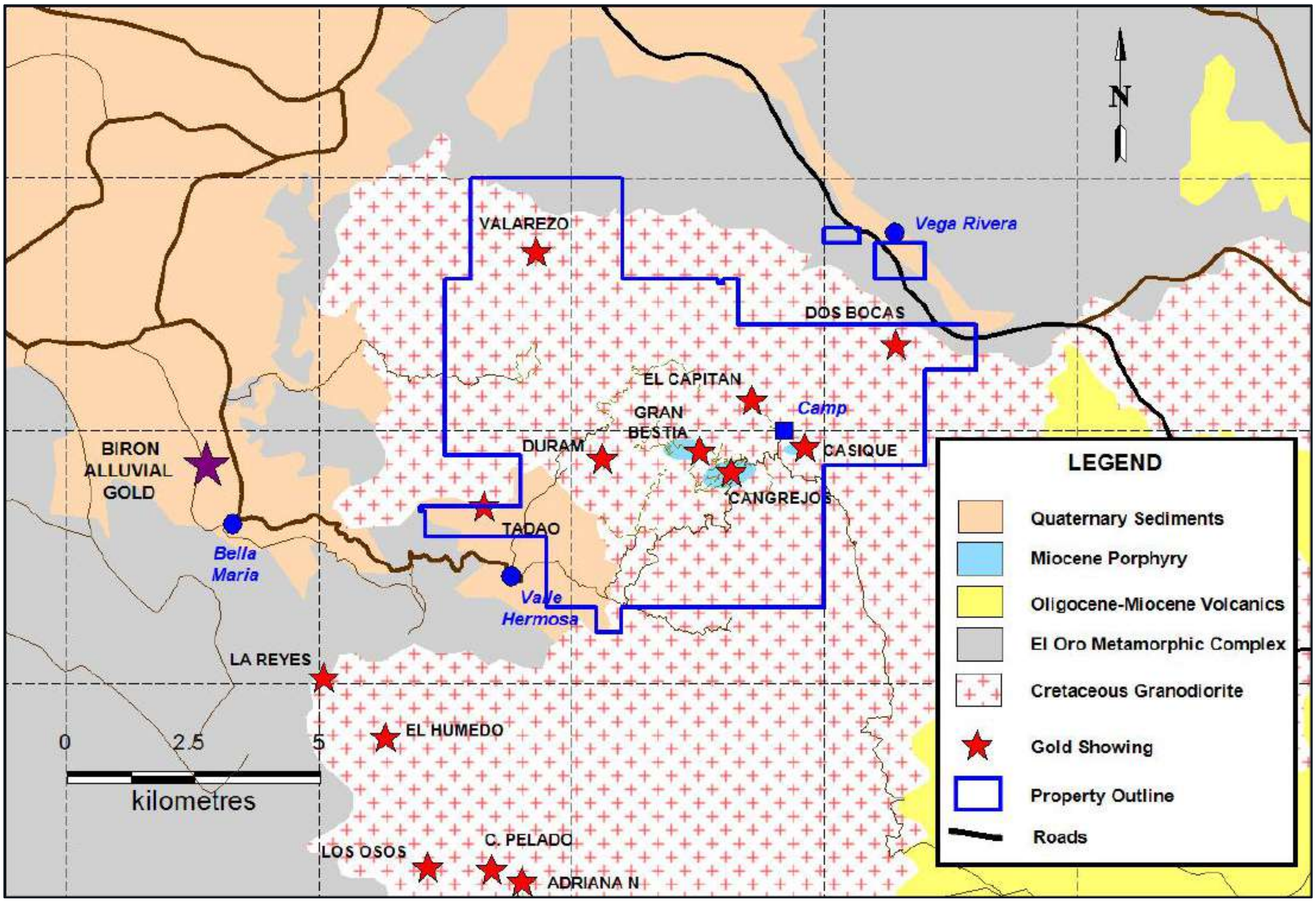
Note: Light-grey coloring refers to Peru. Only regional geology in Ecuador is shown. Source: DINAGE, 2001; Lumina, 2017

7.2 Local and Property Geology

A more detailed picture of the geology in the vicinity of the Cangrejos Project is shown in Figure 7-2. Quaternary sediments occur to the northwest in the coastal areas around Machala. Oligocene continental volcanics occur to the east. These two domains are separated by the Late Cretaceous-Paleozoic El Oro metamorphic complex which consists of phyllites, schists, amphibolites, granites, and serpentinites.

The Cangrejos Project is largely underlain by a Miocene porphyritic dacite and a Cretaceous equigranular quartz diorite which is interpreted as being part of the El Oro metamorphic complex. Gold showings are associated with the Miocene porphyry and adjacent breccias and metamorphic rocks.

Figure 7-2: Local Geology Cangrejos Project



Source: Newmont, 2001; INIGEMM, 2017; Lumina, 2023.

7.3 Geological Studies and Age Dating

Extensive drilling at Cangrejos and Gran Bestia has helped improve the geological map within the Cangrejos project area. Drillholes were relogged in 2018 by Pratt, Gordon, and Rowe; again in 2019 by Gordon and Rowe; and most recently in 2022 by Pratt. These relogging campaigns have resulted in a strong understanding of the geology and gold-copper mineralization at Cangrejos and Gran Bestia. No major material changes to the geological model have occurred from the addition of the 2021-2022 drilling.

Age dating of selected rock types has helped to interpret the geology. Seven samples representing the main rock types were dated at the Geological Institute, Bulgarian Academy of Sciences in Sofia, Bulgaria. U-Th-Pb isotope analyses of zircons were completed using a laser ablation ICP mass spectrometer (LA-ICP-MS) (Lumina, 2018). The Porphyritic Quartz Diorite (PPQD) returned a Miocene age ranging from 21.22 Ma to 22.49 Ma. The foliated and equigranular quartz diorite (SCH and EQD) is Cretaceous with ages ranging from 76.4 Ma to 79.09 Ma which correlates with the El Oro metamorphic complex.

Re-Os ages for two molybdenite samples were determined using Re-Os isotope analyses completed at ALS Labs in North Vancouver, Canada (Lumina, 2018). The age of the mineralization is 23.40 Ma to 23.52 Ma which is slightly older than the Miocene PQD intrusions.

7.4 Lithology

Based on relogging of drill core by Pratt, Gordon, and Rowe (2018); Gordon and Rowe (2019); and Pratt (2022) there are four main lithological units:

1. Saprolite (SAP)/Saprock (SRK) – This unit includes weathered bedrock which occurs as a generally thin layer at the top of a drillhole. Clay content varies from 10% to 50% and is dominated by kaolinite and smectite. The base of the saprolite/saprock is generally sharp with an abrupt change into fresh rock.

2. El Oro Metamorphic Complex (EQD, GSC, SCH, GAB) – This unit comprises of meta-diorites, amphibolites and schists. An equigranular, medium- to coarse-grained quartz diorite (EQD) is the most common lithology at Cangrejos. The rock is frequently foliated and grain size reduction is apparent. Feldspars are broken in sheared diorite in contrast to the euhedral crystals seen in the Miocene porphyries. Two types of schists are present: a fine-grained, massive amphibole-rich meta-basalt (GSC) and a fine-grained biotite-feldspar-quartz schist (SCH). Folding and boudinage are common in both schists. Rare intervals of medium – to coarse-grained meta-gabbros (GAB) are also present.

For geological and modelling purposes, all four El Oro Metamorphic Complex lithologies have been grouped together.

3. Miocene Intrusions (PQD, iPQD, PAD, QD) – There are four dominant types of porphyritic lithologies that comprise the Miocence Intrusions and range from dacitic to andesitic composition. All units have a fine-grained, sub-volcanic groundmass caused by instantaneous freezing of a high-level intrusion. The degree of crowding and dominant phenocryst type is one of the best ways of distinguishing between the four porphyries. Groundmass color of porphyries cannot be accurately relied upon due to the multiple overprinting alteration phases.

    a. Porphyritic Complex (iPQD and PQD). This unit is comprised of two very similar lithological types, PQD and intramineral Porphyritic Quartz Diorite (iPQD), and thus have been mapped as one unit. The PQD and iPQD occur as stocks and dykes that intrude the metamorphic complex, and together they account for the majority of Miocene intrusions at the Cangrejos Project. The PQD is a porphyritic dacite with crowded euhedral feldspar and hornblende, and scattered quartz phenocrysts in a pale siliceous, very fine-grained aplitic sugary groundmass and lacks xenoliths (Pratt, 2022). The iPQD is a porphyritic dacite to porphyritic dacite-andesite with a moderately crowded porphyritic texture, less crowded than the PQD, and relatively common quartz phenocrysts, scattered large equant zoned plagioclase phenocrysts up to 8 mm, and local large hornblendes. Distinctive rounded mafic (cognate) xenoliths are also observed (Pratt, 2022). The iPQD commonly lacks high temperature quartz veins compared to the PQD.

b. The quartz diorite (QD) unit has the most crowded texture of any of the other porphyry phases, with almost touching crowded hornblende and internally zoned plagioclase phenocrysts, and very few high temperature quartz veins. It almost resembles a plutonic rock (granodiorite), but still retains some fine-grained, sugary aplitic groundmass (Pratt, 2022) Overall the QD is very weakly mineralized compared to other porphyritic rocks.

After additional studies and drilling, the iPQD and PQD of the Porphyritic Complex and the Porphyritic andesite dyke (PAD) lithologies have been grouped together for geological and modelling purposes.

4. Breccias (Ibx, HBx, HMBx) – there are three dominant types of magmatic and hydrothermal breccias associated with the porphyry intrusions:

    a. The Igneous breccia (Ibx): unit is pre- and inter-mineralized and can be both clast- and matrix-supported. Subangular to rounded clasts occur in a matrix comprising of feldspar phenocrysts, biotite, mafic minerals, and fine-grained igneous material. This type of breccia is common at Gran Bestia.

    b. The Hydrothermal breccia (HBx): unit is common within the porphyry and at contacts with the country rock.and occurs most commonly as a monomict, clast-supported breccia. Clast sizes typically range from 1 cm to occasionally greater than several meters in diameter which can be misinterpreted as slivers of basement rock, when they are actually megaclasts within breccia. The breccia is clast-supported with <10% matrix usually comprising of actinolite, albite, chlorite, tourmaline, ± sulphides, and ± carbonates. When matrix content is very low, the breccia resembles a jigsaw texture. Gold and copper mineralization occurs within clasts as disseminations, and in veinlets, and within the breccia matrix as open-space fillings and veinlets.

    c. The magnetite-biotite hydrothermal breccia (HMBx): unit comprises of angular to subrounded clasts of metamorphic country rock occurring in a matrix of magnetite and subordinate biotite and quartz. Early quartz veins and chalcopyrite-bornite-pyrrhotite veinlets crosscut this unit. This lithology is associated with some of the highest gold-copper values, but overall, the HMBx represents a very small fraction of Breccias at Cangrejos and Gran Bestia. The HMBx dominantly occurs within the metamorphic country rock adjacent to porphyry contacts.

    After additional studies and drilling, all three breccia units, which were previously modelled separately, have been grouped together for geological and modelling purposes.

7.5 Alteration

Hydrothermal alteration is associated with the gold-copper mineralization. The main types of alteration include:

- Potassic –Potassic alteration is characterized by secondary biotite alteration of the mafic minerals and weakly developed “A” and “D” type veins.
- Propylitic – Propylitic alteration consists of chlorite and epidote which overprints and is peripheral to the potassic alteration.
- Calcic-Sodic – Calcic-sodic alteration overprints the early porphyry alteration phases. It is characterized by actinolite replacing hornblende and biotite, albite replacing feldspar crystals and bleaching the matrix, and minor epidote associated with tourmaline and chlorite. It is commonly seen in the breccia units. Most of the sulphide and gold-copper mineralization is associated with this alteration phase.
- Phyllic/Intermediate Argillic – Phyllic/Argillic alteration consists of scattered, narrow pyrite-rich veinlets with light green micaceous selvages, illite haloes and minor carbonate may represent an intermediate argillic alteration. The Cangrejos and Gran Bestia areas exhibit limited evidence of this style of alteration.

7.6 Mineralization

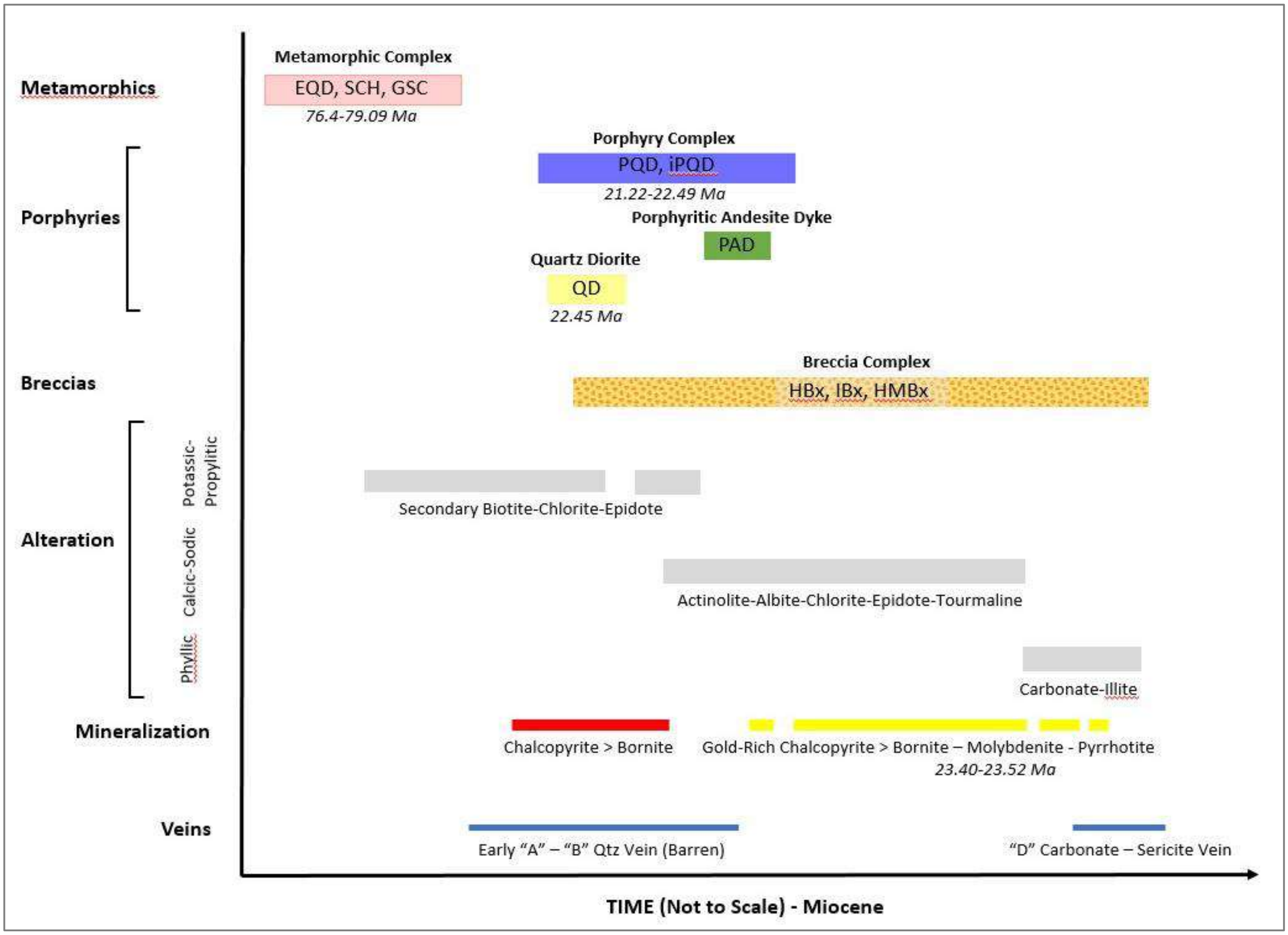
Gold-copper mineralization is associated with sulphides that occur as open-space breccia fill or as disseminations in former mafic phenocrysts. Total sulphide content is generally less than 5% and consists of chalcopyrite and pyrite with minor bornite, molybdenite and pyrrhotite. In drillhole C17-65, native copper is found on fracture surfaces at depths ranging from 142 m to 186 m. This is not very common and is probably due to strong oxidation along a fracture zone.

The highest gold grades occur in calcic-sodic altered breccias at contacts between the PQD and the metamorphic complex. The best gold grades occur in breccias where the dominant clast type is EQD. The EQD is more mafic in composition, and gold is preferentially deposited in reducing (mafic) environments.

7.7 Paragenetic Sequence

A paragenetic sequence for the lithologies, alteration, and mineralization is shown in Figure 7-3.

Figure 7-3: Paragenetic Sequence

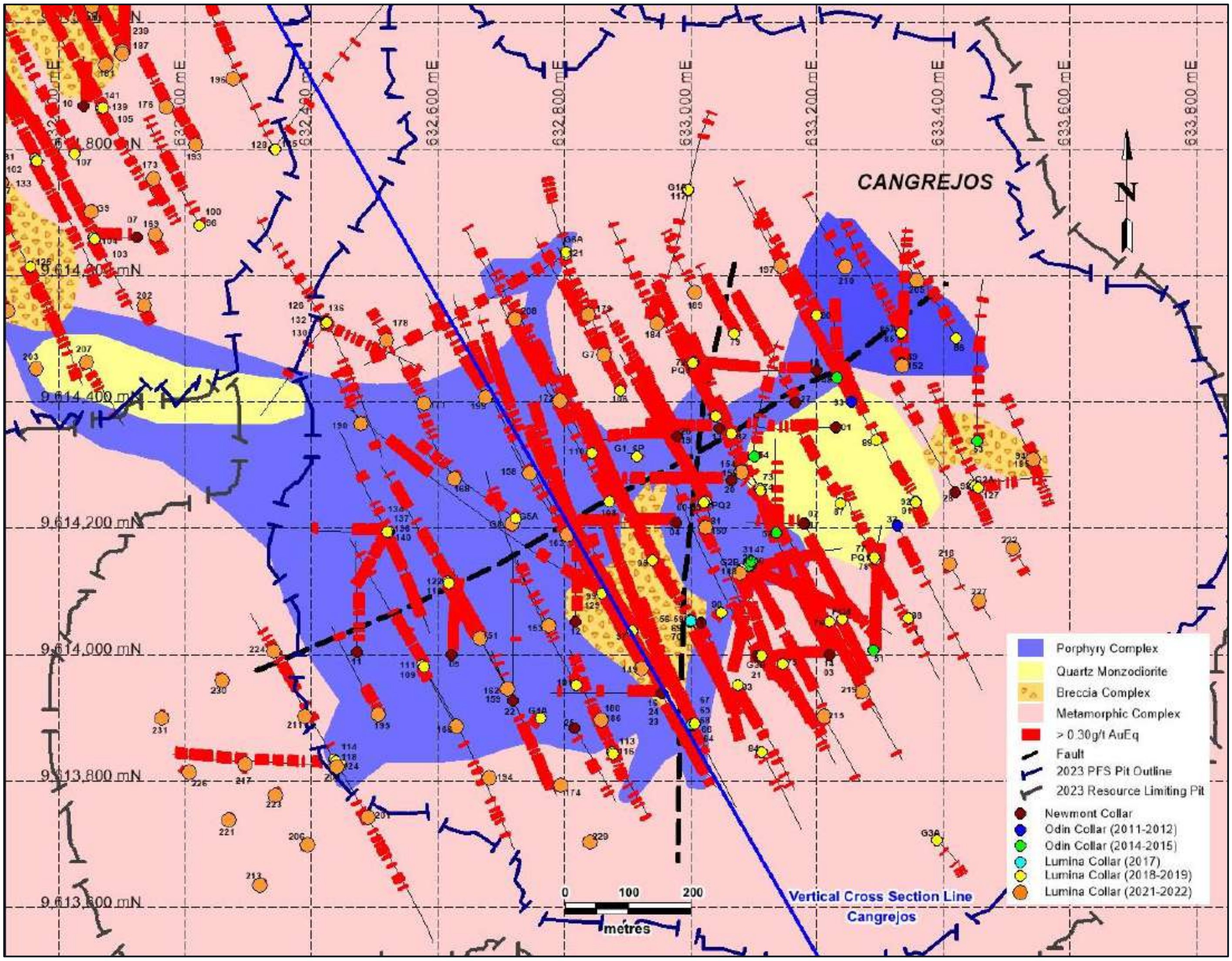


Source: Lumina, 2022.

7.8 Cangrejos Zone

Current understanding of the surface geology of the Cangrejos Zone is limited because of a lack of outcrop exposures. The simplified geological map shown in Figure 7-4 is based primarily on drillhole geological logs and assays. East-northeasterly trending porphyritic rocks (PQD, iPQD, QD) intrude EQD and schists (SCH) of the metamorphic complex. The southeastern contact is steep, but the northwestern contact dips approximately 50° to the southeast and is defined by porphyry dikes. The edges of the porphyry are brecciated with dominant PQD clasts. These breccias extend at depth and may relate to breccia pipes that are associated with the intrusion of the porphyry. Breccias with dominant metamorphic clasts (EQD, SCH) occur at the edge of the porphyry.

Figure 7-4: Simplified Geology Plan of the Cangrejos Gold – Copper Zone



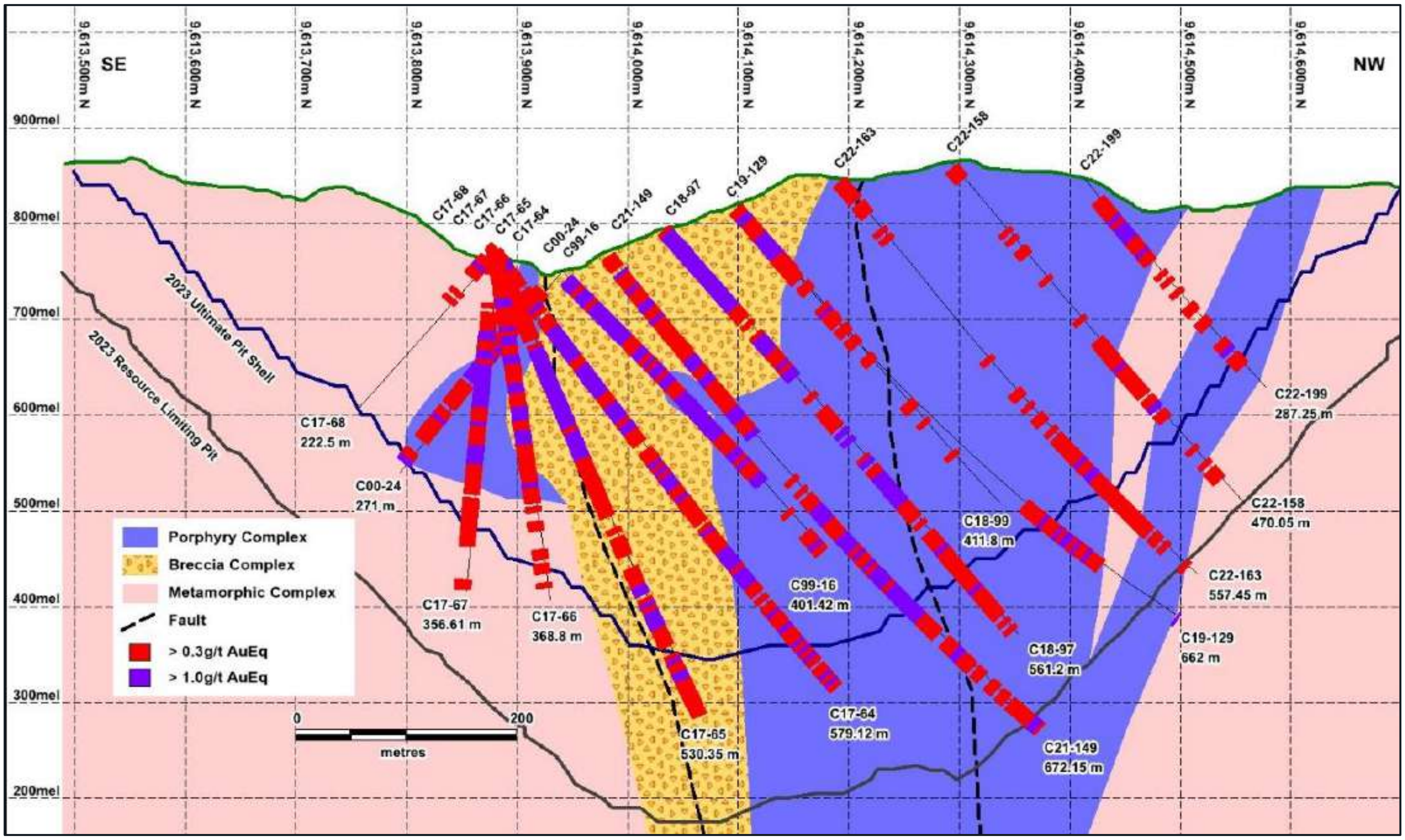
Source: Lumina, 2023.

A vertical cross-section across the central part of the deposit is shown in Figure 7-5; a higher-grade gold-copper zone is also highlighted in this figure.

Drilling has defined a northeast-southwest-trending, steeply dipping zone of gold-copper mineralization which is commonly associated with hydrothermal breccias and quartz vein stockwork in the dacite porphyry (Figure 7-5). Gold-copper values are not restricted to these lithologies and can be found in all units except for the late-stage dikes.

The mineralized zone extends for approximately 1,500 m in a northeasterly direction, has widths ranging from 70 m to 600 m, and has been defined to a depth of at least 600 m below surface. The zone remains open to expansion with further exploration to the west and at depth.

Figure 7-5: Cross-Section 700[E] – Cangrejos Zone



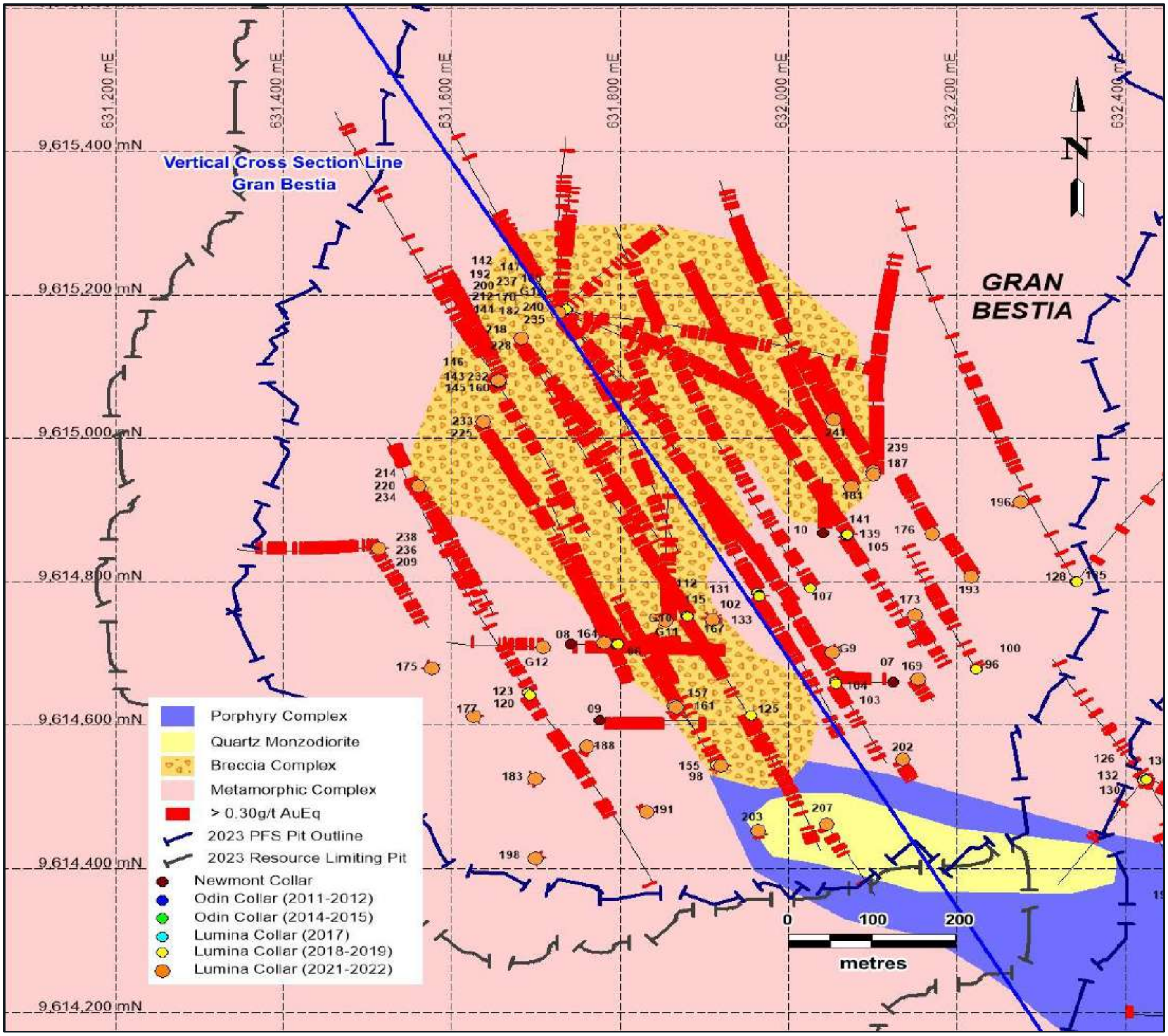
Source: Lumina, 2023.

7.9 Gran Bestia Zone

As with Cangrejos, current understanding of the surface geology of the Gran Bestia Zone is limited to drill core data due to a lack of outcrop exposures. The simplified geological map shown in Figure 7-6 is based primarily on drillhole geological logs and limited outcrop exposures.

The majority of the Gran Bestia deposit is hosted in hydrothermal breccia. The approximate dimensions of mineralization at Gran Bestia are 700 m by 600 m and defined to a depth of at least 700 m. The geology of the southeastern portion of Gran Bestia is similar to the Cangrejos deposit where porphyritic dacite (PQD) and Quartz Diorite (QD) intrusions are present. Gold-copper mineralization occurs within the hydrothermal breccia and the PQD, with higher grades associated with breccias and quartz vein stockworks and the contact between the PQD and surrounding metamorphic country rock. The QD unit is largely unmineralized with only minor small exceptions.

Figure 7-6: Simplified Geology Plan of the Gran Bestia Gold – Copper Zone



Source: Lumina, 2023.

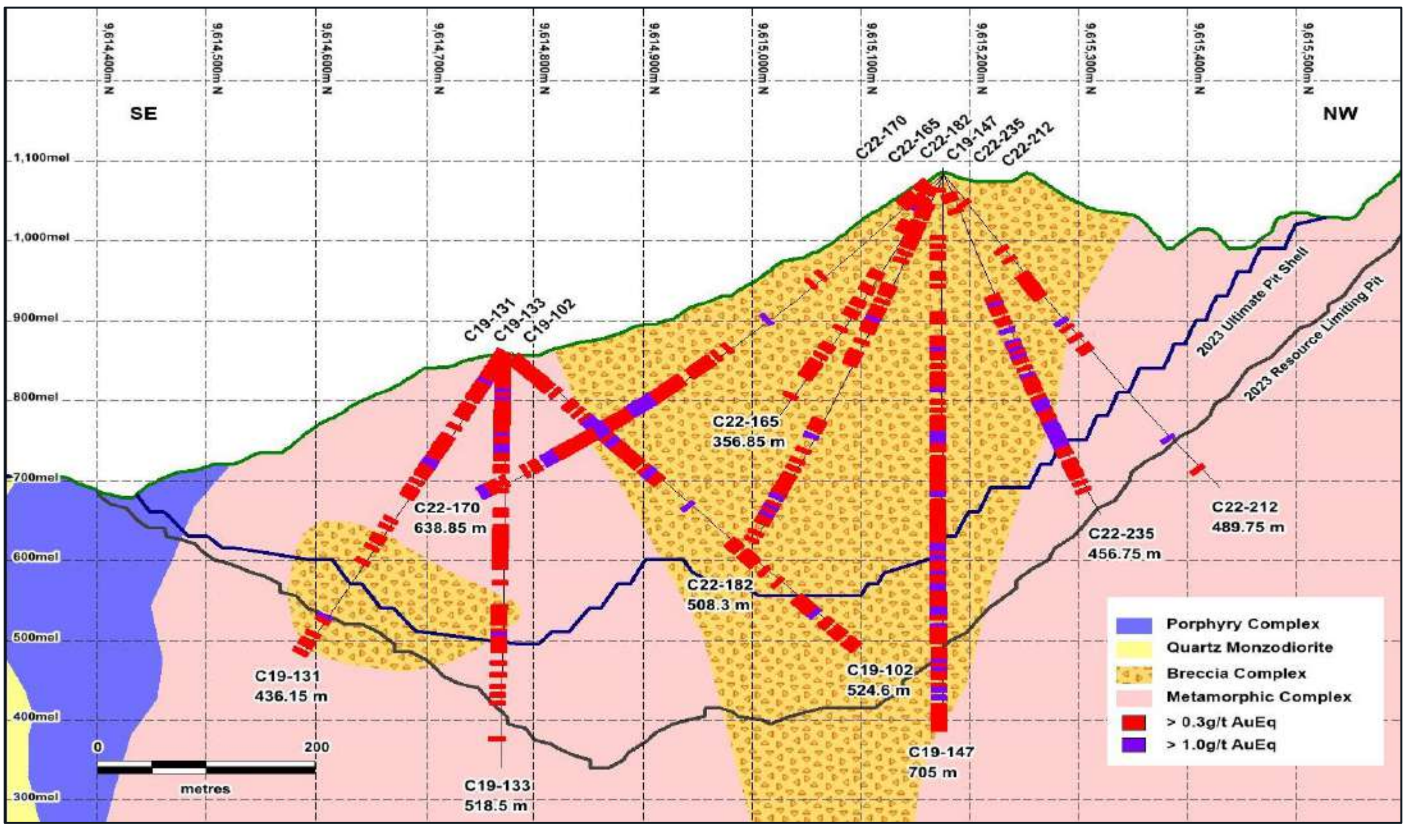
A vertical cross-section across the central part of the Gran Bestia deposit is shown in Figure 7-7.

Additional 2021-2022 infill drilling has revealed a high-grade breccia core within the overall mineralization at Gran Bestia. The high-grade breccia core trends northeast-southwest and is approximately 500 m (northeast-southwest) by 200 m (northwest-southeast) and is open to depth and in all directions except to the southwest.

In addition to recent infill drilling at Gran Bestia,11 exploration holes were also completed to test if mineralization extended outside of the 2019 Gran Bestia pit boundary. Nine holes were drilled in a northwest direction along the northwestern flank of the Gran Bestia, named the Gran Bestia Ridge, and two holes were drilled in the previously untested northeastern portion of Gran Bestia. Results from the Gran Bestia exploration holes intercepted mineralization up to 180 m outside the previous 2022 PEA pit boundary to the northwest and highlights include hole C22-160, which returned 0.49 g/t gold equivalent over 170 m, C22-234 which returned 0.69 g/t AuEq over 264 m, and C22-235 which returned 0.91 g/t AuEq over 282 meters. Two holes, C22-239 and C22-241, drilled in the previously untested northeastern section of Gran Bestia also intercepted mineralization. Hole C22-239 returned0.80 g/t AuEq over 453.7 m and ended in mineralization, while C22-241 returned 0.73 g/t AuEq over 132 m from surface and 0.89 g/t AuEq over 220 m from 174 m to 394 m. These two holes confirm that mineralization continues and is open in the northeastern direction.

With the deposit remaining open, more drilling is required to fully understand the expanse of the Gran Bestia deposit.

Figure 7-7: Vertical Cross-Section – Section 350E – Gran Bestia



Source: Lumina, 2023.

8 DEPOSIT TYPES

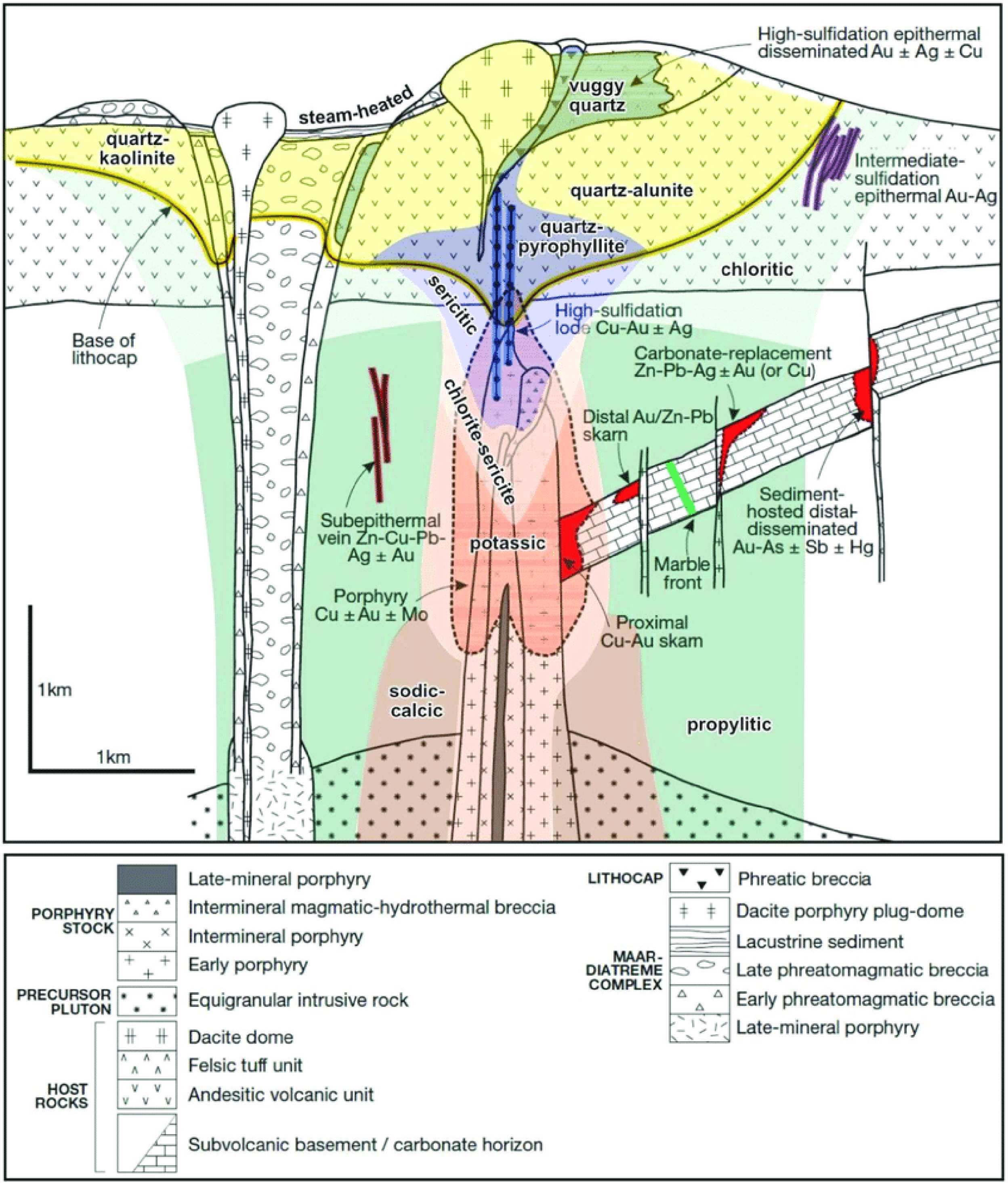
The Cangrejos and Gran Bestia deposits are gold-copper, silica-saturated, alkalic porphyry-style deposits. This type of deposit is found along paleo-subduction margins (Carter, 1981; Cox et al., 1987; Sillitoe, 2010).

Other deposits of note within this family include Cadia, Australia; Bingham Canyon, USA; Andacollo, Chile; and Red Chris, Canada. All of these deposits have the following similar chemical affinities and host-rock provenance:

- They are associated with porphyry intrusive rocks that intrude volcanic and sedimentary packages as stocks, plugs, dikes, and dike swarms.
- Mineralization results from late-stage hydrothermal activity driven by remnant heat from the porphyry intrusion. Thermal gradients within these systems give rise to broadly concentric, although often complexly intermingled, zones of alteration and mineralization. Mineralization is generally low grade and consists of disseminated, fractured, veinlet and quartz stockwork-controlled sulphide mineralization. Deposit boundaries are determined by economic factors that outline the zones of mineralized material.
- The distribution of alteration and mineral facies are largely influenced by breccias, dikes, veins, and fracture systems which concentrate and control fluid flow.
- Weathering from percolation of meteoric water can result in the oxidation of the hypogene sulphide mineralization in a portion of the deposit to chalcocite and native copper.

Figure 8-1 below, modified after Sillitoe, 2010, is a generalized representation of alteration and mineralization zoning patterns for telescoped porphyry Cu (+/- Au, Mo) deposits superimposed onto a generic geologic and deposit-type template.

Figure 8-1: Generalized Example of Porphyry Model



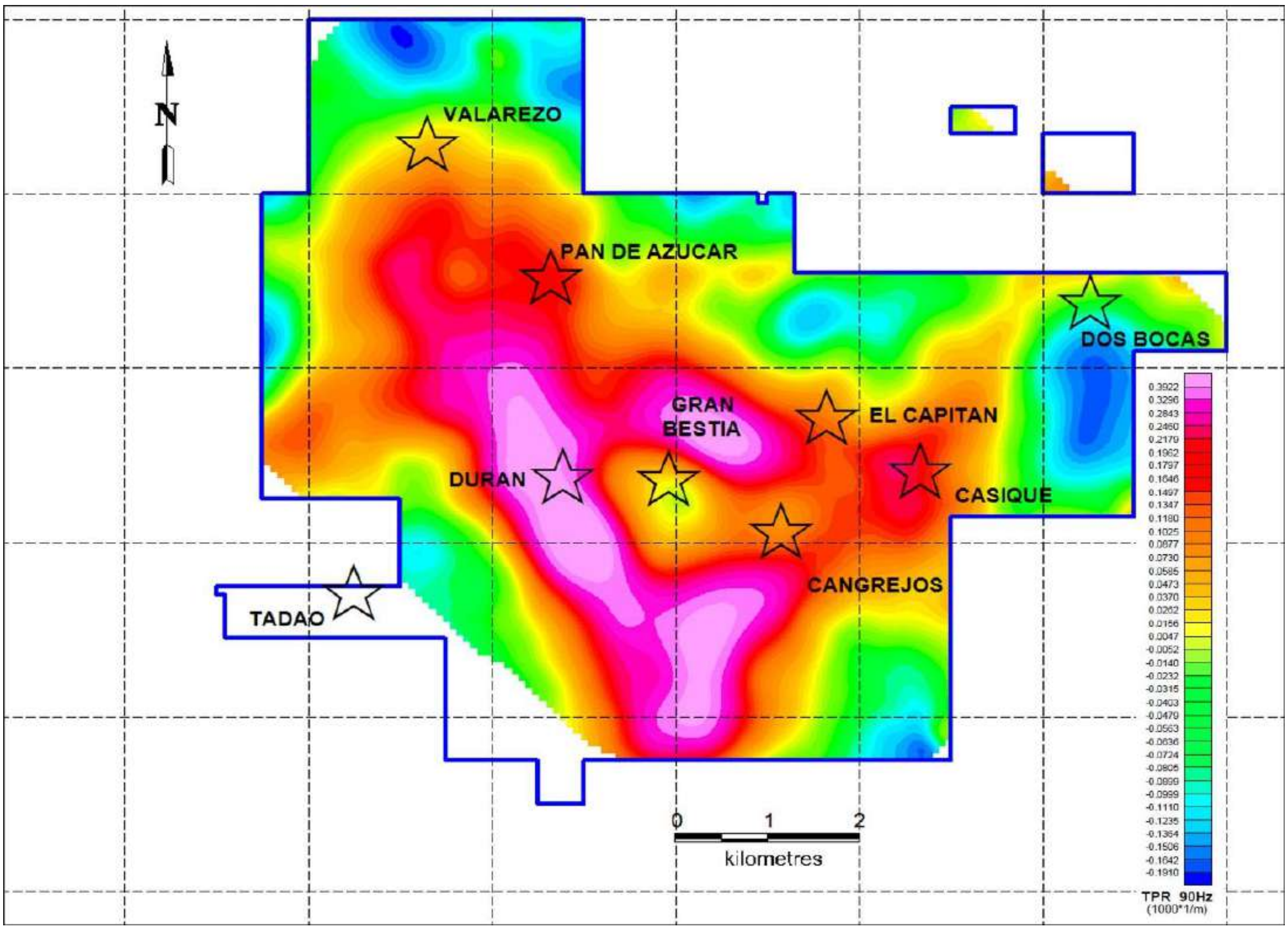
Source: Grosche, 2021 - modified after Sillitoe, 2010

9 EXPLORATION

Terra Remote Sensing completed a light detection and ranging (LiDAR) orthophotographic survey over part of the Project area from February 24, 2019 to March 31, 2019. This helicopter survey covered an area of 76.82 km^2 with a point density of 12 points per m^2 and a 10 cm orthophoto resolution. The purpose of the survey was to provide an accurate digital terrain model (DTM) for the area covering the Cangrejos and Gran Bestia deposits.

Between February 17 and March 5 2020, Geotech Limited was contracted by Lumina to fly a helicopter supporting ZTEM geophysical survey over the Cangrejos concessions. A total of 367.8 line-kilometers (line-km) were flown with a mix of line spacing between 200 and 400 meters, the denser data collected over the known porphyry system. The airborne survey mapped the known system with remarkable accuracy with a circular “bullseye” core corresponding to the known gold- and copper-in-soil anomalies (Figure 9-1).

Figure 9-1: ZTEM 90 Hz Plot with Gold-in-soil (+0.25 g/t) Outlined



Note: Cangrejos Project is outlined in Blue. Source: Lumina, 2023.

10 DRILLING

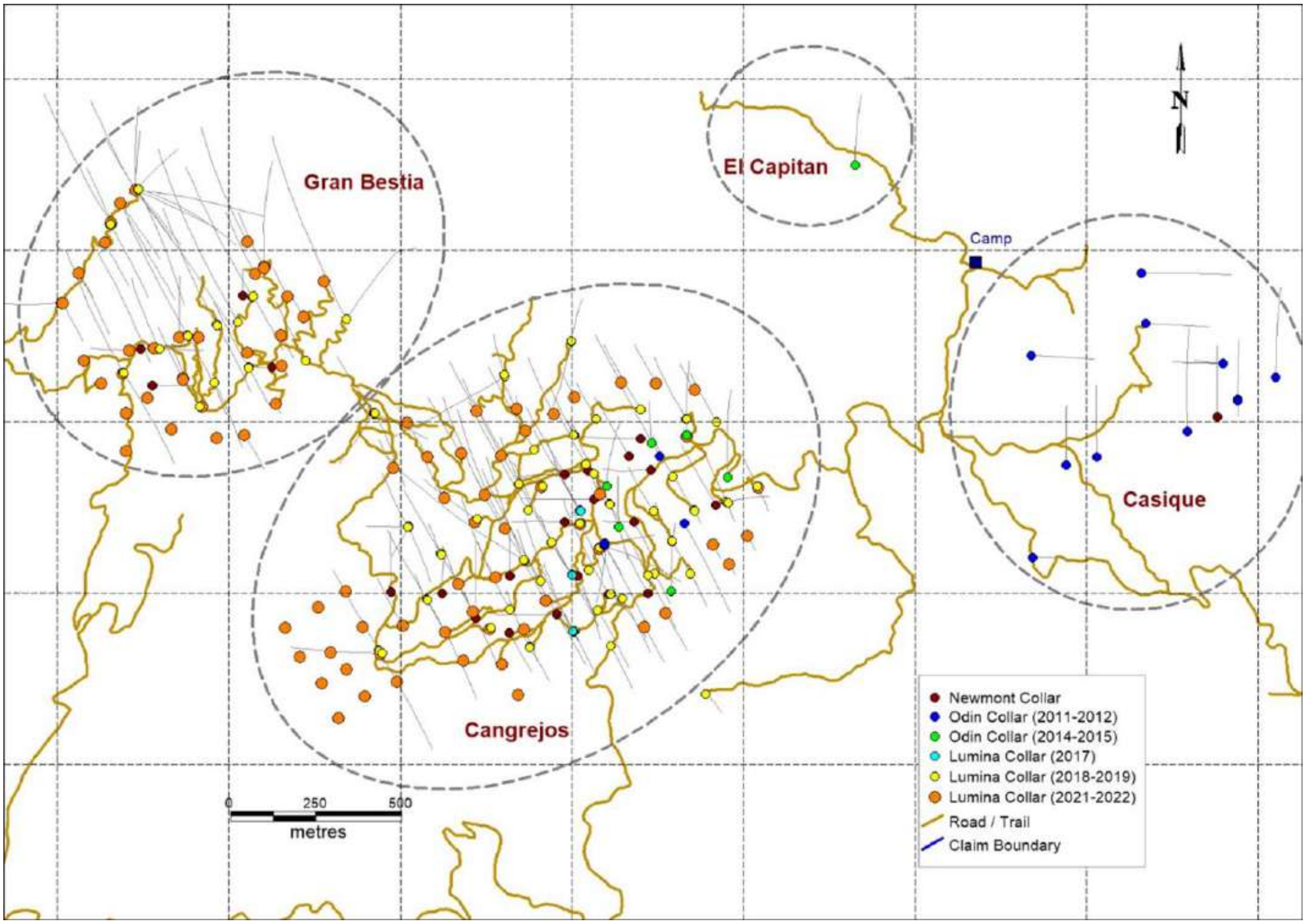
Since 1999, a total of 269 holes with assays, totalling 98,397.33 m have been completed on the project, the most recent being Lumina's 2021-2022 infill and exploration drilling program. All drilling conducted on the Cangrejos property is summarized in Table 10-1 and shown in Figure 10-1.

Table 10-1: Summary of Drilling Cangrejos Project with Assay Results (As of July 22, 2022)

Zone	Year	Operator	Number of Holes	Meters
Cangrejos	1999	Odin Mining-Newmont JV	17	4,617.10
	2000	Odin Mining-Newmont JV	6	1,620.30
	2011–2012	Odin Mining	4	1,402.00
	2014	Odin Mining	8	3,188.50
	2017	Lumina	15	7,186.07
	2018–2019	Lumina	72	26,450.85
	2021-2022	Lumina	52	17,810.68
	Total		**174**	**62,275.50**
Gran Bestia	1999	Odin Mining-Newmont JV	5	977.81
	2018–2019	Lumina	26	13,170.84
	2021-2022	Lumina	49	18,032.90
	Total		**80**	**32,181.55**
Casique	2000	Odin Mining-Newmont JV	1	294.00
	2011–2012	Odin Mining	13	3,296.13
	Total		**14**	**3,590.13**
El Capitán	2015	Odin Mining	1	350.15
	Total		**1**	**350.15**
Grand Total			**269**	**98,397.33**

Source: Lumina, 2022.

Figure 10-1: Drill Collar Plan Map Cangrejos Project



Source: Lumina, 2022.

10.1 Drill Programs

Details of the various drill programs are summarized in the following sections.

10.1.1 Newmont (1999-2000)

In 1999 and 2000, Newmont used Connors Perforaciones S.A. to drill 29 HQ holes totaling 7,509.2 m in the northern part of the El Joven Joint Venture area (Potter, 2004).

Drills were mobilized by helicopter and moved between sites by large crews of local workers. Twenty-three holes (6,237.4 m) tested the Cangrejos gold-copper porphyry zone; five holes (977.8 m) tested the gold-copper, porphyry-style mineralization at Gran Bestia; and one hole (294 m) tested a gold soil anomaly at Casique.

A Tropari was used to provide downhole deviation data. This was available for the 1999 drill program but not for the 2000 drill program.

10.1.1.1 Cangrejos Zone

Hole C99-14 intersected a wide zone of porphyry-style, gold-copper mineralization associated with the soil anomalies (Hole C99-14: 1.57 g/t Au, 0.19% Cu over a core length of 192 m; this may not represent the true width of the zone because additional drilling is required to determine the exact geometry of the mineralized zone) (Odin Mining, Dec. 1999).

Additional drilling delineated two sub-parallel northeasterly trending zones: Trinchera (southern zone) and Paloma (northern zone). These zones appear to have steep to sub-vertical dips. The Newmont drilling indicated that the mineralized zones have a lateral extent of 850 m, horizontal widths ranging from 100 m to 250 m and extend to depths of approximately 250 m.

10.1.1.2 Gran Bestia Zone

Five holes tested a gold-copper soil anomaly in the Gran Bestia area, approximately 1.2 km northwest of the Cangrejos Zone. All holes intersected wide zones of low-grade, gold mineralization associated with intrusive breccias containing fragments of diorite, porphyritic diorite, and QD. The rocks exhibit silica-chlorite alteration with patchy biotite, albite, and silica overprints. Sulphide mineralization consisting of pyrite, chalcopyrite, and traces of molybdenite occurs in quartz veins and as disseminations. Overall, sulphide content is low (<5%).

Hole C99-06 returned values of 1.19 g/t Au over 132 m (based on a 1 g/t Au cut-off) (Odin Mining, September 1999). Due to the widely spaced drilling, the true width of this mineralization is unknown, and additional drilling is required to determine the exact geometry of the mineralized zone.

10.1.1.3 Casique

One hole (C00-29) tested a gold soil anomaly in the Casique area. A 22-m wide zone with 2.56 g/t Au is associated with a silicified fracture or fault zone (Potter, 2010).

10.1.2 Odin Mining (2011-2012)

In 2011 and 2012, Odin Mining used Terranova Drilling S.A.C. to drill 17 HQ holes on the Cangrejos Project. A Hydracore 2000 drill was used and drill moves were completed using a small tractor. A Reflex EZ-SHOT™ was used to provide downhole deviation data.

Four holes (1,402 m) tested the extent of the Cangrejos Zone and the remaining 13 holes (3,296.13 m) tested a gold soil anomaly in the Casique area. The mineralization at Casique is confined to relatively narrow, discontinuous zones related to silicified diorite, hydrothermal breccias, faults, or fracture zones.

Significant results from this drill program have been included in several press releases (Odin Mining; January 2012, April 2012, June 2012). Highlights include the following holes:

- C12-37: 8.96 g/t Au, 0.23% Cu over 6 m
- C12-39: 2.55 g/t Au, 0.18% Cu over 18 m

- C12-40: 1.65 g/t Au, 0.08% Cu over 24 m
- C12-45: 14.2 g/t Au, 0.24% Cu over 2 m.

10.1.3 Odin Mining (2014-2015)

In 2014 and early 2015, Odin Mining used Hubbard Perforaciones S.A. (Hubbard) to complete nine HTW (HQ) drillholes (3,538.65 m) on the Cangrejos Project. A Hydracore 2000 drill was used and drill moves were completed using a small tractor. A Reflex EZ-SHOT™ was used to provide downhole orientation data at 50-m intervals.

Eight holes (3,188.5 m) tested the lateral and down-dip extent of the Cangrejos Zone and confirmed the grade as previously defined by Newmont (Odin Mining, 2015). In addition, one hole (350.15 m) tested the El Capitán copper-molybdenum soil anomaly. It intersected unaltered granodiorite with thin andesite dikes and intrusive breccia zones. No significant mineralization was present.

Four samples taken from the 2014 drilling program were used to conduct a preliminary metallurgical testing program that included determination of physical properties, comminution parameters, and testing of the metallurgical recovery of copper, gold, and molybdenum. The tests concluded that the samples were medium hard and both cyanide leaching and flotation were viable recovery options.

10.1.4 Lumina (2017)

In 2017, Lumina used Hubbard to complete 15 HTW (HQ) drillholes (7,186.1 m) on the Cangrejos Zone. A Hydracore 2000 drill was used and drill moves were completed using a small tractor. A Reflex EZ-SHOT™ was used to provide downhole orientation data at 50 m intervals.

This drilling discovered a zone of higher-grade gold-copper mineralization associated with hydrothermal breccias which occurs at depth below the resource pit used for the November 2017 Mineral Resources estimate (Sim and Davis, 2017).

10.1.5 Lumina (2018-2019)

In 2018 and 2019, Lumina continued to use Hubbard to complete 63 HTW (HQ) drillholes (26,457.31 m) on the Project. Two Hydracore 2000 drills were used and drill moves were completed using a small tractor. A Reflex EZ-SHOT™ was used to provide downhole orientation data at 50-m intervals. In February 2019, two more Hydracore 2000 drills owned by Rumi Drilling Company (Rumi) were mobilized to the Project. Rumi completed 35 HQ drillholes (13,164.38 m) on the Project. It used a small tractor to make drill moves. A Reflex EZ-SHOT™ was used to provide downhole orientation data at 50 m intervals.

A total of 72 holes (26,450.85 m) were completed on the Cangrejos Zone. This included infill resource holes (52 holes; 21,129.77 m) that were used for the 2020 updated Mineral Resources estimate, geotechnical holes (11 holes; 4,590.25 m), metallurgical holes (four holes; 585.0 m), and condemnation holes in areas of planned infrastructure (five holes; 145.83 m).

Wide-spaced drilling (26 holes; 13,170.84 m) was completed at Gran Bestia to assess the significance of this mineralized zone and provide a 2020 initial Mineral Resources estimate.

Eight samples taken from the 2018 drilling program were used for an additional metallurgical testing program. The testing included mineralogy, comminution tests, gravity concentration, cyanide leaching, and flotation tests. The results from the metallurgical testing and drilling were used to complete an updated Mineral Resource Estimate and a Scoping Study to evaluate the economic viability of the Cangrejos property. The results were reported publicly in a PEA technical report that was posted on SEDAR in August 2018 (Rose, et. Al., 2018).

10.1.6 Lumina (2021-2022)

In 2021 Hubbard drilling was once again commissioned by Lumina to complete an extensive drilling program on the Project. At maximum capacity, a total of eight drills were in operation: five Hydracore 4000 drills and three Hydracore 2000 drills. A total of 101 HQ sized drillholes, totalling 35,843.58 m were completed. All drill moves were completed with small rubber tracked Bobcat excavators and Marooka tracked machinery. A SPT Gyro RigAligner™ was used to align each drillhole prior to drilling, and a SPT MagCruiser™ was used to provide downhole orientation data at 50-m intervals.

A total of 52 drillholes (17,810.68 m) were completed on the Cangrejos Zone. All drillholes were classified as infill holes. Of the 52 infill holes drilled within Cangrejos, two holes totalling 1,327.18 m were drilled as a combination of infill/geotechnical drillhole.

A total of 49 drillholes (18,032.90 m) were completed at Gran Bestia. This included 38 infill resource holes totalling 12,691.50 m, and 11 exploration drillholes totalling 5,341.40 m. Of the 38 infill holes drilled within Gran Bestia, five holes totalling 2,182.45 m were drilled as a combination of infill/geotechnical drillhole.

10.2 Drill Collar Coordinates

Drillhole collars were initially located using a hand-held Garmin GPS. In 2017, all of the holes at the Cangrejos and Gran Bestia deposits were surveyed by a local contractor, Victor Tobar, using a Trimble differential GPS and base station with a horizontal accuracy of 0.005 m and a vertical accuracy of 0.010 m.

Surveying of drillholes for the 2018-2019 drilling campaign was completed by TopConSurvey CIA. LTDA., a local Ecuadorian company, and for the 2021-2022 drilling campaign, surveying was completed by Ferracerot CIA.LTDA., also a local Ecuadorian company. Both surveys were conducted by Segundo Toledo and utilized a Leica GS14 differential GPS and base station with a horizontal accuracy of 0.005 m and a vertical accuracy of 0.010 m.

10.3 Diamond Drill (DD) Core Logging Procedures

There is no documentation for the logging procedures used in Odin's 2011–2012 drill program. However, except for the introduction of geotechnical logging during the 2014–2015 drill program, procedures were similar to what is currently in place. Procedures for drillhole sampling are described in Section 11.1.

With respect to both the Odin and Lumina drill programs, drill core was logged in the core logging facility located at the Cangrejos exploration camp. Upon receipt from the drill, Lumina field assistants checked the depth and recorded the "FROM_TO" intervals on the outside of the core box. Photos were taken of both dry and wet core. Lumina geologists then examined the core and prepared geotechnical and geological logs. The geotechnical log includes rock quality data (RQD), core recovery, fracture and vein quantity, and vein angles. Density measurements were taken by Lumina staff at 10-m intervals and for the 2017, 2018–2019, and 2021–2022 drill programs, every tenth density sample was shipped to ALS Labs in Lima, Peru for a second density measurement using paraffin-coated samples. Point Load testing of core began in 2018. Two types of tests were conducted: axial and diametral. Axial tests are conducted every 10 m whereby a 25-30 mm sample is cut perpendicular to core axis and is tested parallel to core axis until it failed. Diametral tests are conducted every 10 m whereby a 100 mm sample is cut perpendicular to core axis and is tested perpendicular to core axis until the sample failed, or if the sample reached a maximum pressure rating of 55 kN. Testing was conducted using a GCTS PLT-2W machine and all data including depth, dimensions of sample, sample type, failure code, and pressure were recorded.

All drill data from the Newmont (1999–2000), Odin (2011–2012), (2014–2015), and Lumina (2017 to March 2018) drill programs were compiled in Excel® spreadsheets. In March 2018, Lumina purchased the GeoSpark ACCESS®-based database management system. All previous drill data was imported into GeoSpark. Since March 2018, drill data has been entered directly into GeoSpark's core logging form which includes data validation and pick lists for collar information, downhole surveys, lithology, alteration, mineralization and geotechnical information. Assay sample numbers and intervals were also entered in the field, and, when assay data was received from the lab, they were imported directly into the GeoSpark database.

10.4 Drill Core Storage

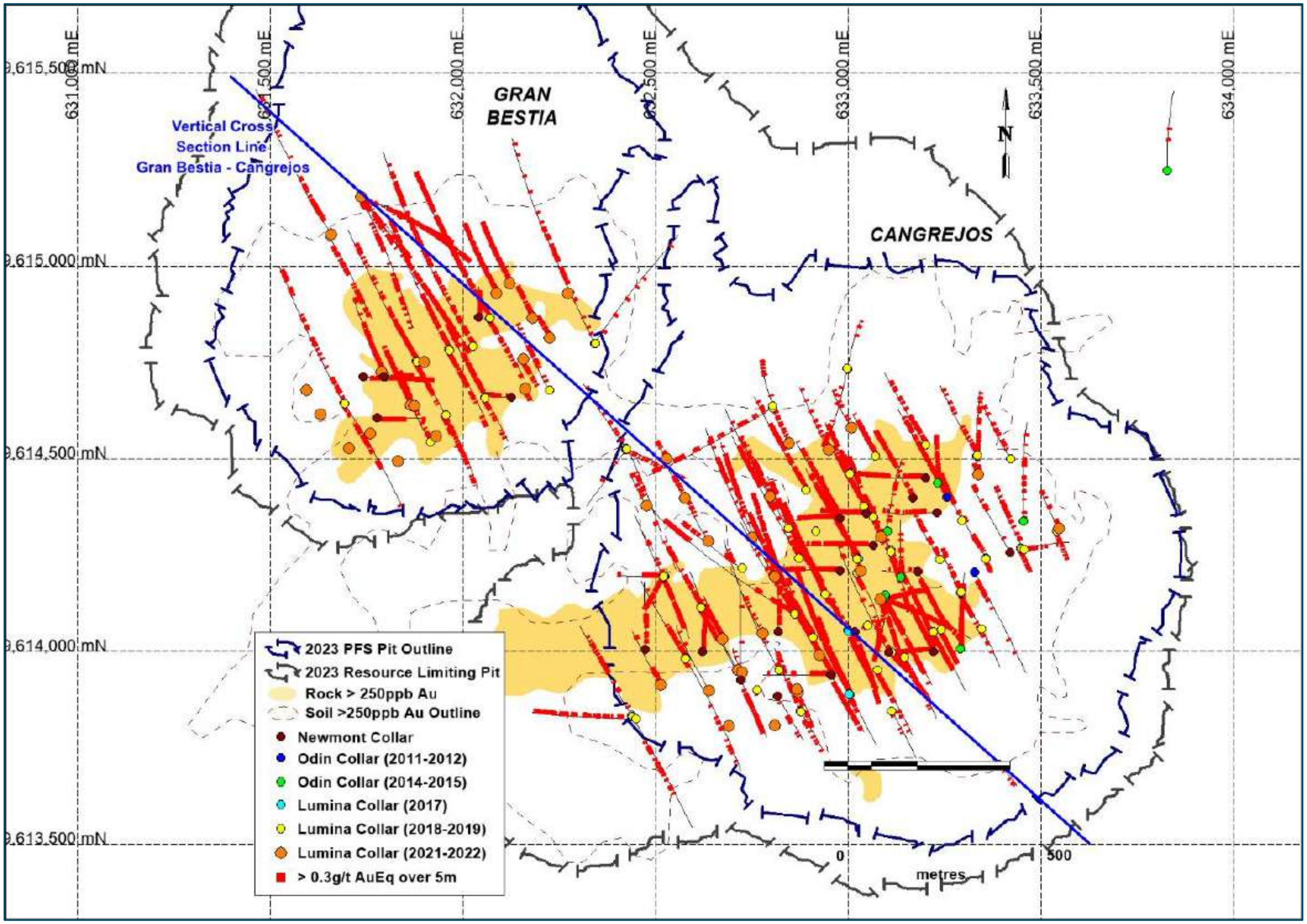
All drill core from the Cangrejos Project is stored in a dry, secure building at Lumina's field camp, located at the project site. The drill core from the 1999 drill program on the Cangrejos 20 concession is stored in Machala at a warehouse owned by the previous concession owner.

10.5 Summary of Drill Results

Drilling at the Cangrejos Project has defined two zones of porphyry-style gold-copper mineralization at Cangrejos and Gran Bestia. While the 2021 and 2022 drilling program focused on infill drilling at both areas, drilling of 11 exploration holes at Gran Bestia was successful at identifying mineralization further to the north and east. The Cangrejos Zone has dimensions of 1,000 m by 700 m and has been tested to depths of at least 600 m. It remains open at depth and marginally to the west and northwest. The Gran Bestia Zone is located approximately 700 m northwest of Cangrejos (Figure 10-2). It has dimensions of 800 m by 700 m and has a vertical extent of 200 m in the south to at least 700 m in the north. Gran Bestia remains open to depth and to the northwest, north, and northeast.

Figure 10-2 on the following page is a plan map showing the two mineralized zones with pit outlines and rock and soil anomalies.

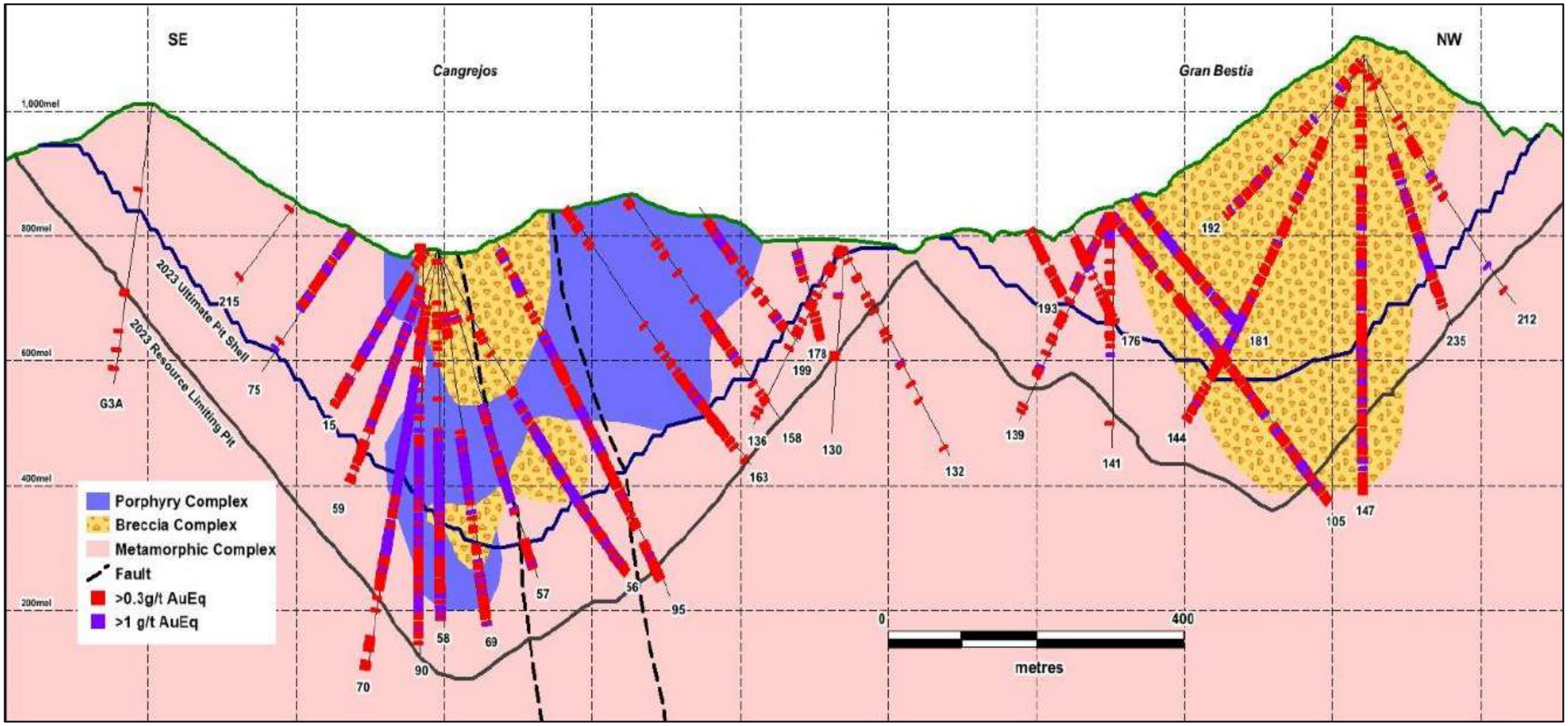
Figure 10-2: Plan Map – Cangrejos, Gran Bestia



Source: Lumina, 2023

Figure 10-3 is a vertical cross-section showing the relationship of the two mineralized zones.

Figure 10-3: Vertical Cross-Section – Gran Bestia to Cangrejos



Source: Lumina, 2023.

10.6 Qualified Person's Opinion on Drilling Procedures

In the QP's opinion, the core handling, logging, sampling, and core storage protocols in place on the Cangrejos Project meet or exceed common industry standards, and the QP is not aware of any drilling, sampling, or recovery factors that could materially impact the accuracy and reliability of these results

11 SAMPLE PREPARATION, ANALYSES AND SECURITY

11.1 Drillhole Sampling

Drillhole sampling, analytical, QA/QC, and security procedures for each of the drilling phases are summarized in the following sections.

11.1.1 Newmont Drilling (1999-2000)

Mayor and Soria (2000) and Potter (2004, 2010) describe the sampling procedures used by Newmont. The core was cut in half using a diamond saw and 2-m samples were sent to Bondar Clegg (now ALS Chemex) for sample preparation in Quito, Ecuador and analysis in Vancouver, Canada. Pulps were analyzed for gold using a fire assay procedure with an atomic absorption (AA) finish using a 30 g charge. Samples with Au > 0.5 g/t were analyzed for copper, lead, zinc, molybdenum, and silver by AA after a four-acid digestion.

Newmont also selected some samples for “blaster” gold analysis. This method is similar to conducting a screen metallic gold assay where the coarse (+150 mesh) and fine (-150 mesh) fractions are analyzed for gold. This method tests for coarse gold. The results from the fire assay and “blaster” analyses were similar, which suggests that, if coarse gold exists, it is not being liberated in the sample preparation process.

Newmont inserted its own standards every 25 samples to control the analytical quality.

There is no record of any special measures taken to monitor the security of the samples during their transportation to the preparation lab in Quito.

Rejects and pulps from this drill program were stored in a house in Santa Rosa, but most of this material was damaged and is no longer available.

11.1.2 Odin Mining Drilling (2011-2012)

Section 11.1.4 (Lumina Drilling) describes core handling procedures that were similar to those used during Odin’s 2011–2012 drill program.

Drill core samples from the 2011–2012 drill program were assayed by Acme Labs (now Bureau Veritas) in Vancouver. Samples were prepared at LAC y Asociados Cia. Ltda. (LAC), which has ISO 9001:2008 accreditation and is Acme Labs’ preparation lab in Cuenca, Ecuador. Pulps were sent to Acme Labs in Vancouver for analysis which had ISO 9001:2008 and ISO 9001:17025 accreditation at the time. All samples were analyzed for gold using a fire assay technique using a 30 g charge. In addition, a 35-element ICP analysis was done using a four-acid digestion.

QA/QC samples were inserted on a random basis, but, generally, insertion averaged every 10 samples. These included six certified standards, a blank, and duplicate samples.

During this drill program, 2,563 samples were analyzed: 83 were blanks, 75 were certified reference materials (CRM), 74 were duplicates, and 2,331 were core samples.

Remaining reject and pulp material from the 2011–2012 drill program was returned to Odin and stored in a secure warehouse located in Quito.

11.1.3 Odin Mining Drilling (2014-2015)

Section 11.1.4 (Lumina Drilling) describes core handling procedures that were similar to those used during Odin's 2014–2015 drill program.

Drill core samples from the 2014–2015 drill program were assayed by Acme Labs (now Bureau Veritas) in Vancouver. Sample shipments were picked up by a representative from LAC and delivered to its lab in Cuenca where the samples were processed. Approximately 250 g of pulverized material was shipped for analysis at Acme Labs. Certified reference standards, purchased from CDN Resource Laboratories Ltd., were hand-delivered to Acme Labs and inserted into each sample batch. All samples were analyzed for gold using a fire assay technique using a 30 g charge. In addition, a 35-element ICP analysis was done using a 4-acid digestion.

Remaining reject and pulp material from the 2014–2015 drill program was returned to Odin and is stored in a secure warehouse located in Quito.

11.1.4 Lumina Drilling (2017-2019)

The core handling and sample procedures described here were used for Lumina's 2017 and 2018–2019 drill programs and all previous drill campaigns by Odin.

The drillers placed the HQ drill core in plastic boxes (four rows; total approximately 2.5 m per box). Wooden tags marked with the downhole depth were placed in the box. Lids were placed on the box and taped shut. The core was then transported by tractor to the nearest road and then trucked to Lumina's core facility at the Cangrejos Project exploration camp. Upon receipt, Lumina field assistants checked the depth and recorded the "FROM_TO" intervals on the outside of the box. Photos were taken of both dry and wet core. Lumina geologists then examined the core and prepared geotechnical and geological logs.

The geologist marked up samples at 2-m intervals and the core was cut in half using a diamond saw. For each 2-m sample, half the core was put into a plastic bag, and the other half was returned to the plastic box and stored on site. Bar-coded sample tags were included in each sample bag and a duplicate sample tag was stapled into the core box. Sample bags were secured with a tamper-proof plastic tag and put into larger mesh sacks which were also tied with a numbered, tamper-proof nylon tie.

These large sample sacks were driven to a secure warehouse in Santa Rosa. When a large batch of samples accumulated in the warehouse or a drillhole was complete, a representative from Carlos Puig & Asociados S.A. (ALS Labs' preparation lab in Quito, Ecuador) picked up the samples from the secure warehouse and drove them directly to the preparation lab in Quito. The secure, tamper-proof plastic tag was checked against a list emailed to the lab. Note: No irregularities were detected in any sample shipment. The samples were then crushed and pulverized. From September 2018 onwards, samples were sent to ALS Corplabec S.A. which is ALS Lab's new preparation lab in Quito.

The core samples were crushed to 70% passing minus 2 mm (ALS procedure CRU-31); a 1 kg sub-sample was split from the crushed material using a riffle splitter and pulverized to 85% passing 75 µm (ALS procedure PLU-32).

For each sample, approximately 250 g of pulverized material was split and placed in a kraft paper bag and shipped to ALS, Lima, Peru for analysis. All samples were analyzed for gold using a fire assay technique using a 30 g charge and atomic absorption spectroscopy (AAS) finish. In addition, a 33-element ICP analysis was done using a 4-acid digestion.

QA/QC samples were inserted after every eight core samples. These include three certified standards (high, medium, and low gold grades) and a coarse blank, fine blank, coarse duplicate, and fine duplicate.

Remaining reject and pulp material from the 2017–2019 drill programs has been returned to Lumina and is stored in a dry secure warehouse in Quito.

11.1.5 Lumina Drilling (2021-2022)

Section 11.1.4 (Lumina Drilling) describes core handling procedures that are identical to those used during Lumina's 2021 and 2022 drill program. The only changes were the laboratories used for analysis of samples.

During the 2021 portion of the drilling program, all analytical work was conducted by Bureau Veritas in Lima, Peru.

Chain of custody protocol remained essentially the same with samples sent to Bureau Veritas as they were with ALS: when a large batch of samples accumulated in the Lumina warehouse in Santa Rosa or a drillhole was complete, a Lumina representative transported the samples from Lumina's secure warehouse directly to Bureau Viertias' preparation lab located in Quito, Ecuador. The secure, tamper-proof plastic tag was checked against a list emailed to the lab. Note: No irregularities were detected in any sample shipment. The samples were then crushed and pulverized.

At the prep lab in Quito, the core samples were crushed to 70% passing minus 2 mm then a 250 g sub-sample was split from the crushed material using a riffle splitter and pulverized to 85% passing 75 µm (Bureau Veritas procedure PRP70-250). Each 250 g pulp was then shipped to Bureau Veritas' lab in Lima, Peru for analysis.

All samples were analyzed for gold using a fire assay technique using a 30 g charge and atomic absorption spectroscopy (AAS) finish (Bureau Veritas procedure FA430). All gold values greater than 10 ppm Au were rerun using Analytical method FA431, which has a 100 ppm Au upper limit using an AAS finish. In addition, a 46-element ICP-ES/MS analysis was conducted using a four-acid digestion (Bureau Veritas procedure MA200). If copper results from the multi-acid analysis returned greater than 10,000 ppm Cu, the sample was rerun using Aqua Regia Digestion and AAS analysis for copper (Bureau Vertias code MA402) which has a 30% Cu upper limit using an AAS finish.

QA/QC samples were inserted by Lumina staff after every eight core samples. These include three CDN Resource Laboratories certified standards (high, medium, and low gold grades), five OREAS CRMs, a coarse blank, fine blank, coarse duplicate, and fine duplicate.

For the 2022 portion of the drilling program, all analytical work was conducted by ALS and the chain of custody, sample prep, analysis, and QA/QC controls remained the same as with the previous 2017-2019 drilling as described in Section 11.1.4 above.

Remaining reject and pulp material from the 2021-2022 drill programs was returned to Lumina and is stored in a dry secure warehouse in Quito.

11.2 Quality Assurance and Quality Control

A review of the QA/QC protocols was conducted prior to drilling and formalized in a detailed QA/QC manual developed by Lumina. Each drilling phase was reviewed by a QP who was on site during the drill program. The procedures for core processing and the insertion of blanks and standards were examined. The QA/QC program was conducted in accordance with industry best practice.

No quality control issues were discovered with the Odin (2011–2012) and Newmont (1999–2000) drill programs.

During the 2014–2015 drill program, 2,139 samples were analyzed: 60 blanks, 60 CRMs, 60 coarse duplicates, 59 fine duplicates, and 1,900 drill core samples. After each batch of analytical results came in, an Odin geologist reviewed the QA/QC samples. Odin's QA/QC consultant also reviewed the data on a regular basis.

QA/QC monitoring of the gold assays from Odin's 2014–2015 drill program indicated that the gold assays were apparently biased consistently high. Based on the Odin QA/QC consultant's recommendation, any sample with greater than 0.1 g/t Au was re-assayed at a second lab. This resulted in 1,215 samples being re-assayed at the ALS Chemex laboratory in Lima, Peru. The re-assayed results replaced the original assays in the project database.

During the 2017 drill program, 4,036 samples were analyzed: 112 blanks, 114 CRMs, 112 coarse duplicates, 112 fine duplicates, and 3,586 drill core samples. After each batch of analytical results was released by the lab, a Lumina geologist reviewed the QA/QC samples. Lumina's QA/QC consultant also reviewed this data.

Lumina's QA/QC consultant indicated that the results from the 2017 drill program were acceptable, and no further action was required.

During the 2018–2019 drill program, 22,036 samples were analyzed: 615 blanks, 619 CRMs, 611 coarse duplicates, 612 fine duplicates, and 19,579 drill core samples. After each batch of analytical results was released by the lab, a Lumina geologist reviewed the QA/QC samples. Lumina's QA/QC consultant also reviewed this data.

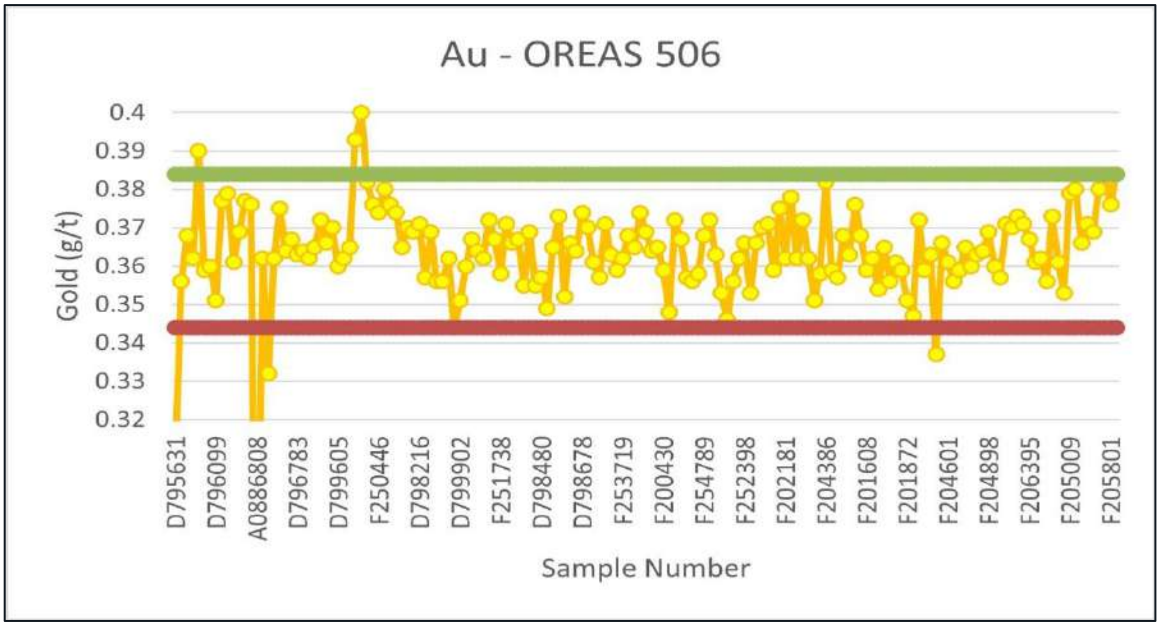
For the 2021-2022 drill program, 20,006 samples were analyzed: 307 coarse blanks, 303, fine blanks, 602 CRMs, 577 coarse duplicates, 287 fine duplicates, and 17,930 drill core samples from the 101 drillholes with assay results. After each batch of analytical results was released by the lab, the QA/QC samples were reviewed by a Lumina geologist. Lumina's QA/QC consultant also reviewed the data.

During the 2021-2022 program, the three CDN standards were phased out and replaced by five OREAS standards with a greater gold range. All standards performed adequately. Figure 11-1 shows an example of a control chart for gold in standard OREAS 506. The failure rate for OREAS 506 is approximately 4%. Results within 2 standard deviations were deemed acceptable.

All failures trigger the assaying of duplicates for three samples immediately before and after the standard failure. The duplicates were submitted for assay, including another sample of the same standard that failed. Averages of the original and duplicate sets were never more than 2% different and the original assays were, therefore, accepted.

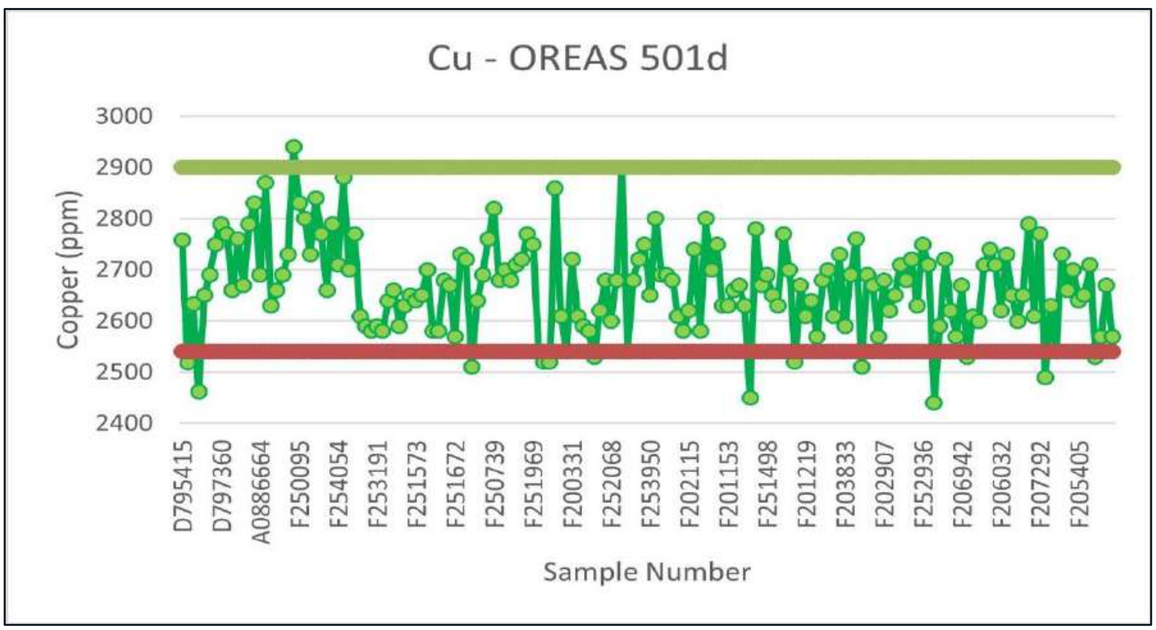
All standards performed well for copper. An example of a control chart for OREAS 501d is shown in Figure 11-2.

Figure 11-1: Au G/T for OREAS 506



Source: Lumina, 2022.

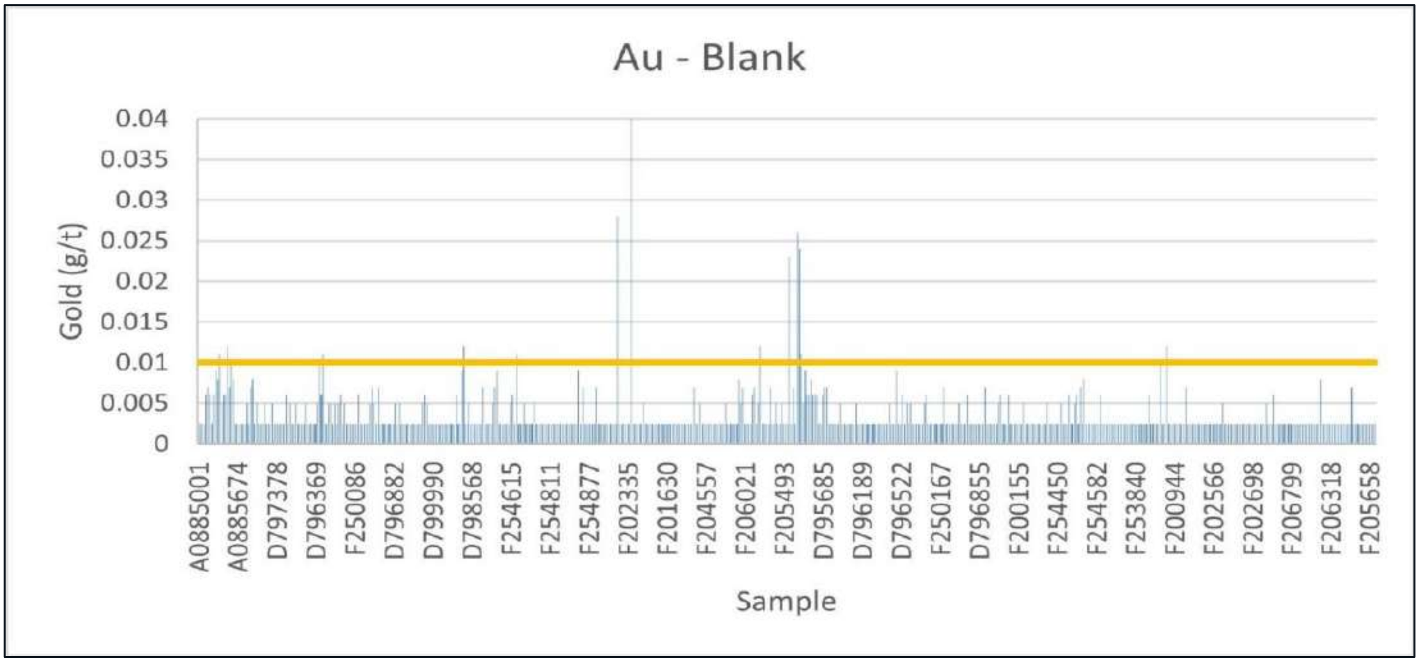
Figure 11-2: Cu PPM for OREAS 501 D



Source: Lumina, 2022.

The control limit for gold in sample blanks is 0.01 g/t (2 times the detection limit of 0.005 g/t). There are very few failures as shown in Figure 11-3 with a 2.6% failure rate. All failures were investigated by assaying duplicates and more blank material. No abnormalities in the preparation or assay processes were identified. Lumina's QA/QC consultant and the QP indicated that the results from the 2021-2022 drill program were acceptable, and no further action was required.

Figure 11-3: Au G/T – Blank



Source: Lumina, 2022.

11.3 Qualified Person's Opinion on Sample Preparation, Analytical and Security Procedures

In the QPs' opinion, the security, sampling, and analytical procedures are appropriate and consistent with common industry practice. The laboratories are recognized as accredited commercial assayers which are independent from Lumina and previous operators. In 2021 Lumina analyzed its samples at Bureau Veritas in Lima, Peru which has NTP-ISO/IEC 17025:2017 accreditation. In 2022, Lumina analyzed its samples at ALS Chemex in Lima, Peru which has ISO 9001: 2008 accreditation. Odin (2011–2012) used Acme Labs (now Bureau Veritas) in Santiago, Chile which had an ISO 9001:2000 accreditation at the time the work was done. Newmont/Odin (1999–2000) used Bondar Clegg (now ALS Chemex) which has an ISO/IEC 17025:2017 accreditation.

The sampling has been carried out by trained technical staff under the supervision of a QP and in a manner that meets or exceeds common industry standards. Samples are properly identified and transported in a secure manner from site to the lab.

A sample bias in the gold assays was identified by the QPs during the review of the drill data and assays for the 2014–2015 drill program. This bias was corrected. There were no significant issues with the assays from the other drill programs.

It is the opinion of the QP that sample preparation, sample security, and analytical procedures are adequate to support the estimation of mineral resources.

12 DATA VERIFICATION

12.1 Database Validation

12.1.1 Collar Coordinate Validation

All drill collars at the Cangrejos and Gran Bestia deposits have been surveyed using a Trimble differential GPS and base station. Collar elevation data are validated by the QP by comparing surveyed elevations with the LiDAR digital elevation model (DEM). Most elevation differences in the collars were less than one meter.

12.1.2 Downhole Survey Validation

The downhole survey data were validated by the QP by identifying any large discrepancies between sequential dip and azimuth readings. No significant discrepancies were found.

12.1.3 Assay Verification

All the collars, surveys, geology, and assays were exported from GeoSpark into Excel® files which were then imported into MinePlan® software. During this process, the QP noted that no identical sample identifications exist; all FROM_TO data are either zero or a positive value; and no interval exceeds the total depth of its hole.

To validate the data, the following checks were confirmed by the QP:

- The maximum depth of a sample was checked against the depth of the hole and no discrepancies were found.
- The QP confirmed that the less-than-the-detection-limit values were converted into a positive number equal to one-half the detection limit. No discrepancies were found.
- In October 2017, all gold values greater than 0.1 g/t from Odin Mining's 2011-2012 and 2014-2015 programs and Lumina's 2017 drill program were compared with the original assay certificates. No errors were found.
- In December 2019, the gold, copper, silver, and molybdenum grades from 5,780 individual samples taken from 12 drillholes were randomly selected and compared to the original assay certificates. No errors were found.
- During the 2021/2022 infill drilling program, 17,930 samples were assayed. From a sample representing 8.6 percent of the assay results, original assay certificates and the Lumina database were compared. No errors were found.

12.2 Geological Data Verification and Interpretation

Several geological variables were captured during core logging. The geological data were verified by the QP by confirming that the geological designations were correct in each sample interval. This process included the following:

- examine FROM_TO intervals for gaps, overlaps, and duplicated intervals
- look for collar and sample identification mismatches
- verify correct geological codes.

A geological legend was provided, and it was used to compare the values logged in the database. The geological model was found to be reasonable and adequate for use in the estimation of mineral resources.

12.2 Mine Engineering Data Reviews

The QP undertakes regular reviews of the economic and engineering factors that affect the estimation of mineral resources. In the opinion of the QP, the engineering data and economic factors are sufficiently reliable for the purposes of estimating mineral resources.

In the opinion of the QP, the data, assumptions, and parameters used to estimate mineral resources are sufficiently reliable for those purposes.

12.3 Metallurgy Data Reviews

The QP regularly reviews the metallurgical results that may impact mineral resource estimation. In the opinion of the QP, metallurgical data and assumptions used for mineral resource estimation are reliable and appropriate for the purpose.

In the opinion of the QP, the data and assumptions used to estimate the metallurgical recovery model for the mineral resource estimates are sufficiently reliable for those purposes.

12.4 Data Adequacy

It is the conclusion of the QP, that the data verified are adequate for all purposes of the PFS.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Introduction

Metallurgical testing programs for this report were performed by Laboratorio Plenge (Plenge) of Lima, Peru, FLSmidth Minerals Testing and Research Center (FLS Testing) of Salt Lake City, Utah, USA, FLSmidth USA, Inc. Ore Characterization & Process Mineralogy Labs (FLS Mineralogy), also of Salt Lake City, Utah USA, Diemme Filtration (Diemme) of Lugo, Italy and Pocock Industrial, Inc. (Pocock) of Salt Lake City, Utah USA between 2015 and March 2023. Results from any prior testing programs were not used in the development of this report and no additional metallurgical testing programs have been completed since this technical report was issued.

Laboratory reports reviewed for this report include:

- Cangrejos Project, Progress Report (Plenge, 2015)
- Comminution, Head Assays and XRD (Plenge, 2018a)
- Saprolite, Saprock and Oxide Screening Tests, Gravity, Cyanidation and Flotation (Plenge, 2018b)
- Comminution, Gravity, Cyanidation and Flotation (Plenge, 2018c)
- Primary Optimization and Variability Oxide and Saprock Progress Report (Plenge, 2019)
- HPGR and Comminution Suite (Rucci, 2019)
- Lumina Gold Cangrejos Mineralogy (Zahn, 2019)
- Cangrejos and Gran Bestia Deposits, Variability and Flotation Piloting Progress Report (Plenge, 2020)
- Sample Characterization & PSA, Flocculant Screening, Gravity Sedimentation, Pulp Rheology and Pressure Filtration Studies (Pocock, 2020)
- Primary, Oxide, SRK and SAP, Settling, Filtration and Flotation (Plenge 2022)
- Test Report, version 1.70, Rev. 1 (Diemme, 2022)
- Primary Ores LOM and Variability, Comminution, Gravity, Flotation and Cyanidation (Plenge 2023).

Based on results of the test programs to date, the optimum mineral processing flowsheet includes:

- primary, secondary and HPGR crushing and screening
- ball mill grinding and cyclone classification
- rougher flotation
- three-staged cleaner flotation with regrinding
- cyclone classification of rougher flotation tails
- flotation of the rougher tails cyclone underflow (sand)
- cyanidation of the cleaner scavenger tails and sand flotation concentrates
- detoxification of the cyanide leach residues

- thickening and filtration of the combined tailings (flotation tails and leach residues)
- deposition of the filtered tailings in the DSTF
- production of salable gold-copper flotation concentrates and gold-silver doré.

13.2 Metallurgical Samples

Samples for the metallurgical test programs completed between 2015 and March 2023 were obtained from 155 drillholes representing various rock types, alterations, lithologies, metal concentrations, and locations within the proposed Cangrejos and Gran Bestia pit areas.

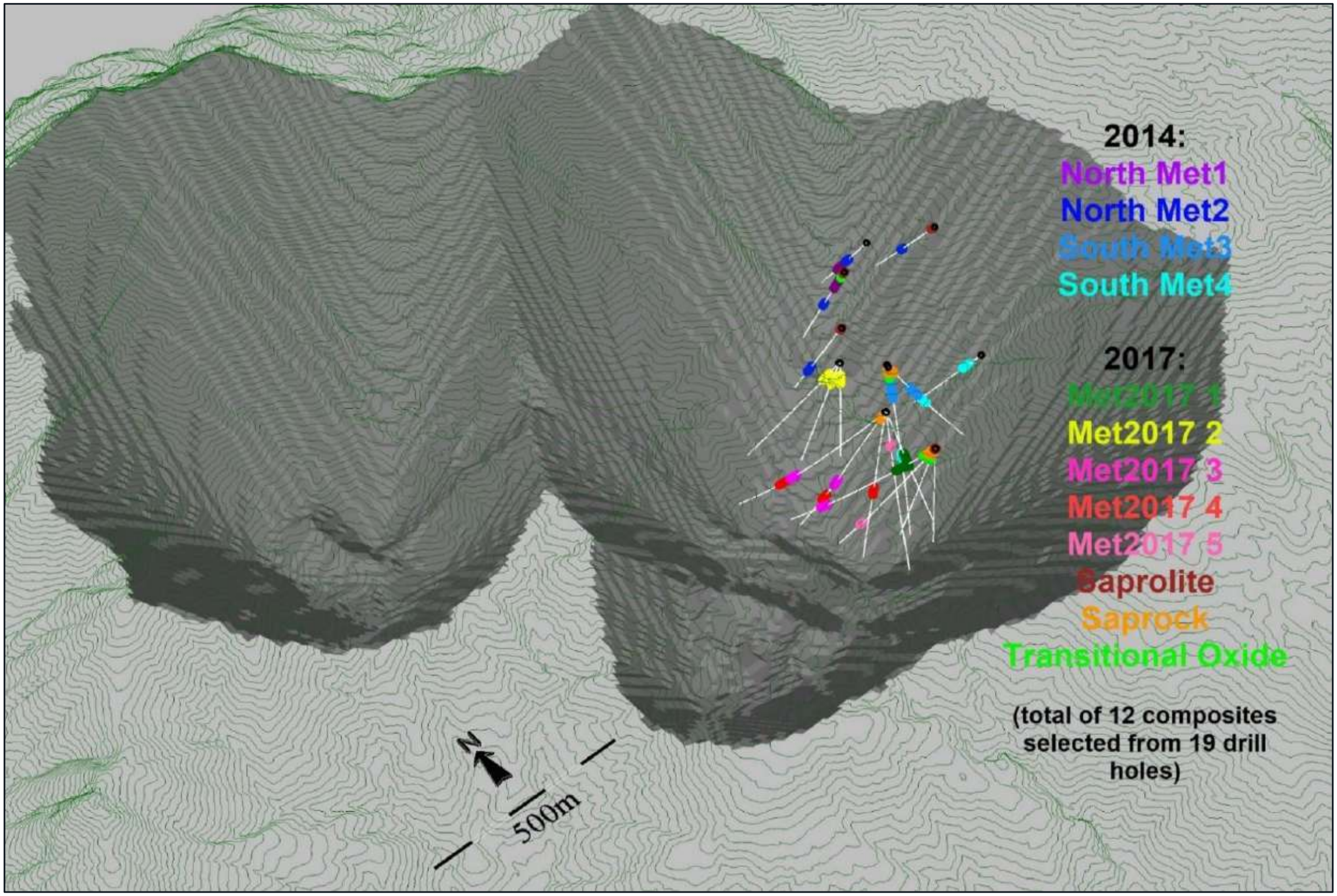
In the opinion of the QP, the test samples are considered representative of the various types and styles of mineralization found in the deposits.

Figure 13-1, Figure 13-2, and Figure 13-3 show isometric views of the metallurgical drillholes in relation to the potential pits.

The predominant lithologies (e.g., rock types) identified by Lumina are:

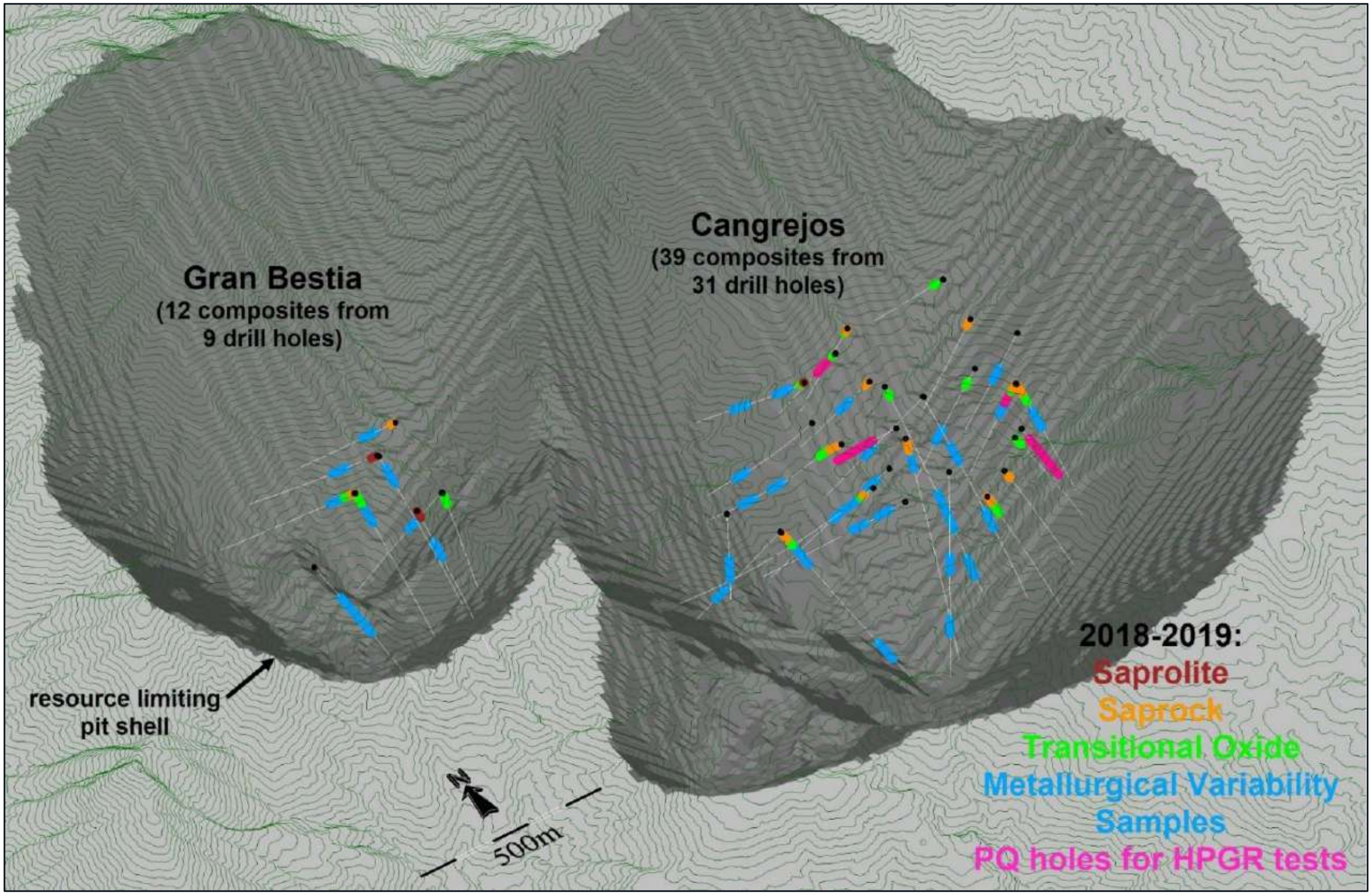
- Hydrothermal Breccia (HBX) or Intrusive Breccia (INBX)
- Equigranular Quartz Diorite (EQD), also as Schistose (SCH), or Foliated Quartz Diorite (EQDF)
- Porphyritic Quartz Diorite (PPQD) or Porphyritic Diorite (POR).

Figure 13-1: Isometric View of the Metallurgical Drillholes in Relation to the PEA Pit (2015 – 2017)



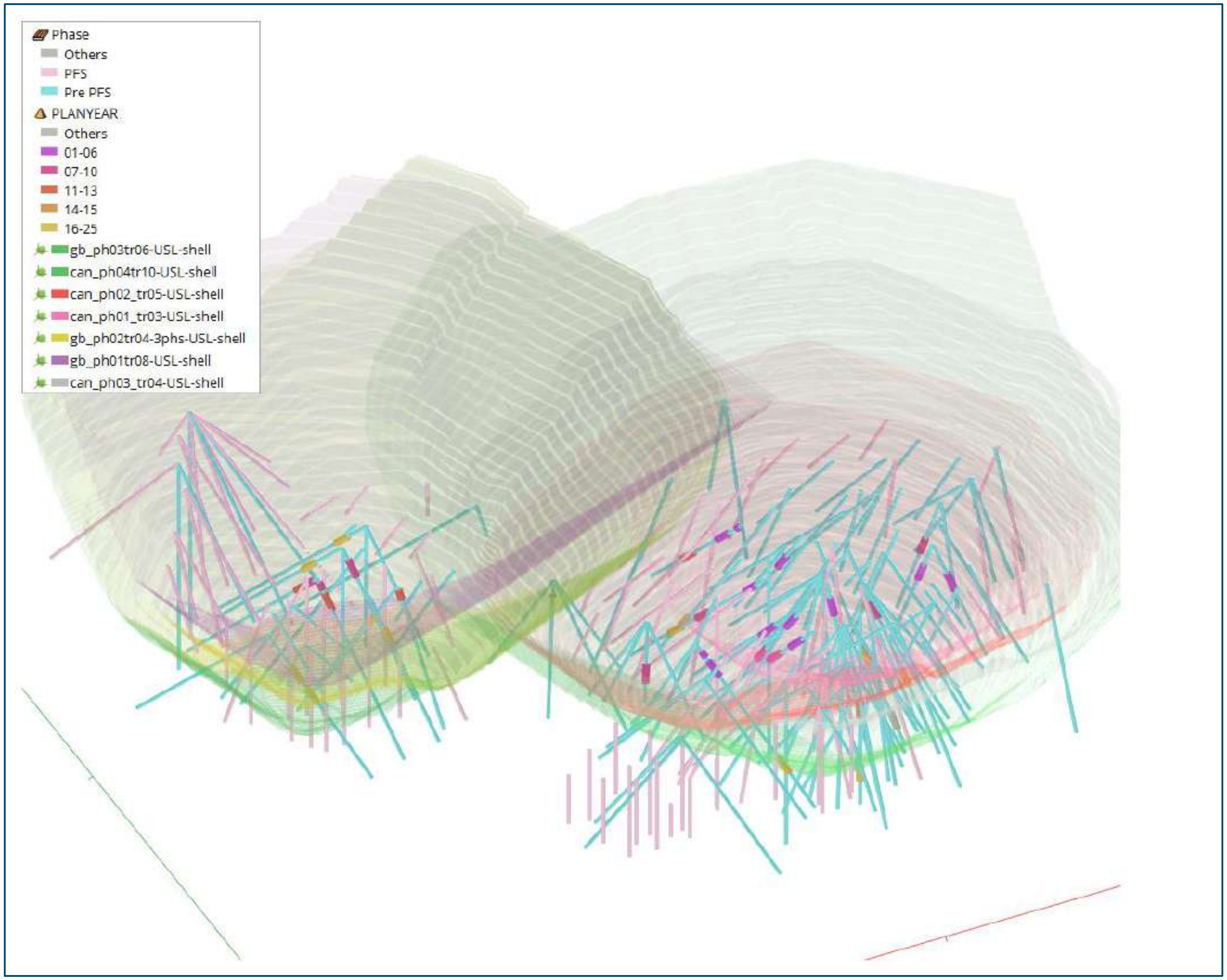
Source: SIM Geological, 2022.

Figure 13-2: Isometric View of the Metallurgical Drillholes in Relation to the PEA Pit (2018-2019)



Source: SIM Geological, 2020.

Figure 13-3: Isometric View of the Metallurgical Samples in Relation to PFS Pit Phase Shells (2022-2023)



Source: Ausenco, 2023.

13.3 Metallurgical Testing

Plenge performed testing from 2015 through March 2023 using 83 composite samples that were prepared from 155 diamond drillholes. Plenge test results are summarized as follows:

- Comminution tests were completed in all the Plenge test programs and indicate that the fresh rock and partially oxidized samples are hard and moderately abrasive with the Bond ball mill work index (BWi) ranging from 13 kWh/t to 17 kWh/t and averaging 16 kWh/t, abrasion indices averaging 0.25 g, JK specific energy values averaging 12 kWh/t and JK A×b values averaging approximately 25. Saprolitic samples are softer and have a BWi ranging from 5 kWh/t to 12 kWh/t.
- In 2017, gravity concentration tests on the fresh rock master composite indicated that 37% of the gold and 9% of the silver were recovered into a gravity gold concentrate that assayed 143 g/t gold. An average of 17% of the gold was recovered by gravity concentration from the saprolite, saprock, and partially oxidized materials.
- In 2019, gravity concentration tests on a master composite of fresh rock recovered 24% of the gold and 17% of the silver into a concentrate that assayed 74 g/t Au.
- In 2017, locked cycle flotation testing of fresh rock gravity tailings produced a copper-gold concentrate that assayed 21% copper. Copper and gold recoveries in the concentrate were 86% and 43%, respectively. Overall gold recovery for this test (gravity plus flotation) was 82%.
- In 2019, locked cycle flotation testing using a fresh rock composite, without prior gravity concentration, produced a copper-gold concentrate that assayed 22% copper. Copper and gold recoveries in the concentrate were 87%, and 73%, respectively. Cyanidation of the cleaner scavenger flotation tailings plus a “sand” flotation concentrate that was produced by flotation of the plus 74 µm size fraction from the rougher flotation tailings recovered an additional 9% of the gold. Overall gold recovery was estimated to be 82%, which is similar to the results achieved during the 2017 test program.
- In late 2019, a continuous mini-pilot flotation plant was operated to separately treat composite samples taken from the Cangrejos and Gran Bestia deposits. Bulk flotation concentrate assays averaged 15% copper with copper and gold recoveries in the final concentrates averaging 86% and 72%, respectively. Cyanidation of the bulk cleaner scavenger tailings plus the “sand” flotation concentrate recovered an additional 10% of the gold into doré for a total gold recovery of 82%, similar to previous results.
- In 2015 and 2022, separate molybdenum concentrates were produced by flotation from bulk copper-gold-molybdenum concentrates. The final, cleaned molybdenum concentrates averaged assays of 46% molybdenum at a recovery of 45%. Production of by-product molybdenum concentrates is not envisioned at this time due to lower than economic levels of molybdenum existing in the mill feed along with high specific operating costs.
- In 2022, gravity concentration tests on a master composite of blended fresh rock and partially oxidized material recovered 29% of the gold and 5% of the silver into a concentrate that assayed 60 g/t gold and 18 g/t silver. Using the extended gravity-recoverable-gold (E-GRG) procedure, gold recovery was 42%.
- In 2023 locked cycle flotation with cleaner tails/sand concentrate cyanidation tests were completed on 14 composites representing various head grades, blends of fresh with partially oxidized rock, mining time periods and rock lithologies from the Cangrejos and Gran Bestia deposits. These tests were performed using optimized reagent addition schemes, longer flotation times and finer regrind sizes than previous test programs to improve metallurgical performance. The flotation concentrate assays averaged 118 g/t silver, 132 g/t gold and 21% copper. Silver, gold and copper recoveries in the final concentrates averaged 61%, 78% and 81%, respectively. Cyanidation of the bulk cleaner scavenger tailings plus the “sand” flotation concentrate recovered an additional

5% of the silver and 7% of the gold into doré for a total salable gold recovery of 85%, an estimated 3% higher than past programs.

- Bulk rougher flotation recoveries were low from saprolite and saprock samples tested in 2017 and 2019 and averaged 60% for gold and 34% for copper. Cleaner flotation of the rougher concentrates also did not produce salable flotation concentrates. Saprolitic materials are not planned for processing due to the poor metallurgical performance and envisioned high specific capital and operating costs.
- Whole-ore cyanide leaching tests of fresh rock samples in all Plenge test programs recovered on average 89% of the gold and 45% of the silver. For near-surface rock (partially oxidized, saprock, and saprolite), gold recoveries were similar; however, silver recoveries increased to 84% likely due to oxidation of sulphide minerals. Whole-ore cyanidation is not the selected processing scheme because copper is not produced.
- Settling tests on samples of flotation concentrates and tailings indicated that underflow densities of over 60% solids by weight can be achieved by using 10 g/t anionic polymer resulting in settling areas of about 0.06 m^2/t/day.
- Pressure filtration tests on the flotation concentrates yielded moistures of 8% by weight and filter ratios of 2.8 m^2/t/h. Filtration of tailings yielded moistures of 13% by weight at a filter ratio also of 2.8 m^2/t/h.
- The selected processing flowsheet produces copper-gold flotation concentrates and precious metal doré that will be shipped off-site for further processing.

13.3.1 Mineralogy

Mineralogy was performed by Plenge using X-Ray Diffraction (XRD) Bulk Mineralogy. The majority of the minerals are noted as Quartz, Anorthite, Albite, Actinolite, Chamosite, Labradorite, Kaolinite, Biotite and Andesine. Additional mineralogical examinations were completed by Eagle Engineering in Butte, Montana USA and the FLSmidth (FLS) Ore Characterization & Process Mineralogy Labs in Salt Lake City, Utah USA.

Mineralogical investigations indicate that the fresh rock materials contain copper primarily as chalcopyrite and bornite with minor amounts of chrysocolla. Gold is mostly free or exposed at a 74-µm grind with gravity concentrates containing gold sizes ranging from 30 µm to 40 µm, flotation concentrates contain gold particle sizes of approximately 20 µm, and flotation tailings contain gold particles encapsulated in non-sulphides at approximately 5 µm in size. Refractory gold exists and is locked in pyrite and pyroxene. Copper mineral liberation is approximately 150 µm for 50% liberation and 36 µm for 100% liberation. Copper mineralization in partially oxidized materials is primarily chalcopyrite with minor amounts of bornite and tenorite (copper oxide). Saprock materials contain copper minerals primarily as copper chlorite.

13.3.2 High-Pressure Grinding Roll (HPGR) Tests

In addition to the comminution tests completed by Plenge, in 2019 the FLS Minerals Testing and Research Center in Salt Lake City, Utah USA performed HPGR testing using a sample that was composited from four PQ (i.e., 85 mm diameter) drillholes. The HPGR test results were reported “very positive, showing a specific energy of 1.8 kWh/t at a recirculating load of 65% to reduce the material from 16.5 mm to below 1 mm” (Rucci, 2019).” The information provided by FLS was used to develop the process design of the HPGR – ball mills circuit.

13.3.3 Solid Liquid Separation Tests

In addition to sedimentation and filtration tests conducted by Plenge, Pocock and Diemme performed sedimentation and pressure filtration tests using blended samples of Cangrejos and Gran Bestia flotation tailings and leach residues.

Pocock's results and recommendations are as follows:

- Recommended conventional thickener design criteria includes feed density of 20% to 25% solids by weight, flocculant dosage of 15 g/t to 25 g/t, maximum underflow density of 67% solids by weight, and a design basis of 0.125 m^2/t/d tails.
- Recommended high-rate thickener design criteria includes feed density of 18% to 22% solids by weight, flocculant dosage of 20 g/t to 25 g/t, maximum underflow density of 67% solids by weight, and a design net feed loading rate of 3.67 m^3/ m^2/h.
- Pressure filtration tests were performed using thickened and diluted tailings slurry for fill times of 0.08 minutes to 0.3 minutes at 552 kPa (80 psi) and air-blowing. The targeted moisture content was 16% by weight in order to minimize the estimated number of filters required.

Diemme received samples that were tails produced at P_{80} grinds of 90 and 120 µm, saprolite leach tails and blends of saprolite with fresh rock tails materials.

- Diemme ran a series of flocculant comparisons on all the samples looking at the optimum floc type, floc dosage, settling rates, floc size and quality, feed concentration and supernatant clarity. Unit settling areas of 0.8 t/h/m^2 were achieved at underflow densities of about 58% solids by weight when using 15 g/t flocculant.
- Pressure filtration tests on the fresh and saprolite blended tails samples all showed excellent filterability with filtration times being relatively short but with air-blowing essential to produce well-formed and transportable cakes. These tests achieved the targeted 15% moisture content at modest air blow rates (below 5,000 NL/h/m^2).
- Filtration of the saprolite sample could not achieve the targeted moisture content due to the high amount of clay content (+33%).

13.3.4 Flotation Concentrate Assays

Average assays of the copper-gold flotation concentrate from the 2023 locked cycle tests show that they are clean and do not contain deleterious elements that are subject to smelter penalties, as follows:

- Gold (Au)....................137 ppm
- Silver Ag) ....134 ppm
- Copper Cu)....................21.8%
- Sulphur S) 27%
- Mercury (Hg) ....1.8 ppm
- Arsenic (As)....................260 ppm
- Bismuth (Bi)....................15 ppm
- Antimony (Sb)....................97 ppm
- Fluorine (F) ....56 ppm

13.4 Projected Metallurgical Performance

The 2019 and 2023 Plenge metallurgical tests were analyzed to create metallurgical models that project the gold, silver and copper recoveries and flotation concentrate grades when processing fresh and partially oxidized rock from the deposits. The tests included open circuit and locked cycle bulk rougher flotation and three-stage cleaner flotation tests of the Cangrejos and Gran Bestia master composites and variability samples to project metal recoveries into a flotation concentrate. Results from cyanide leaching of the combined cleaner scavenger flotation tailings plus the sand flotation concentrates were used to project silver and gold recoveries into a doré product.

Two metallurgical performance models were developed for the PFS by Ausenco. The first was prepared using open-circuit flotation and cyanidation test results from the 2019/2020 Plenge test program. This model has been used to estimate the metallurgical performance during the first three years of plant operations with process design parameters as follows:

- Initial Phase (Initial plant) – 30 kt/d at a primary grind size P_{80} of 90 µm, 12 minutes rougher flotation time and a regrind target size P_{80} of 40 µm in the cleaner flotation circuit.

The second model was prepared using locked cycle flotation and cyanidation test results from the 2022/2023 Plenge test program to determine the metallurgical performance during the remaining twenty-three years of operation with process design parameters as follows:

- Expansion 1 Phase: First expansion of the plant in Year 4 to 60 kt/d at a primary grind size P_{80} of 90 µm, 16 minutes of rougher flotation, additional flotation reagents, a regrind target size P_{80} of 20 µm in an expanded cleaner flotation and cyanidation circuits. These operating conditions improve gold recovery and copper-gold concentrate grade over the Initial Phase design.
- Expansion 2 Phase: Second expansion in Year 7 to 80 kt/d for the duration of operations at a coarser primary grind size P_{80} of 120 µm, but with the flotation and cyanidation circuits operated as in the Expansion 1 plant. Test results indicate that the coarser primary grind reduces gold and copper recoveries by 0.5% and 2%, respectively.

Correlations of the data were established resulting in the following regression formulas and relationships for the two models:

- Model No. 1 – Initial Phase Plant, Years 1 through 3
  - Copper rougher recovery (Cu in feed > 0.04%) = 4.196 X ln (%Cu in feed) + 98.41
  - Copper rougher concentrate grade (S in feed > 0.19%) = 4.45 X (%Cu in feed) ^ 0.6452
  - Copper rougher concentrate grade (S in feed < 0.19%) = 13.58 X (%Cu in feed) + 0.0807
  - Copper clean concentrate recovery (Cu in feed > 0.04%) = 4.76 X ln (%Cu in feed) + 88.44
  - Copper clean concentrate grade (feed S:Cu < 2) = 4.8254 X ln (%Cu in feed) + 31.267
  - Copper clean concentrate grade (feed S:Cu > 2) = -6.503 X ln (S:Cu in feed) + 20.596
  - Gold recoveries in roughers and clean concentrates (based on Cu enrichment ratios)
  - Gold grade in sand rougher tails = 1.2521 X (g/t Au in tails) – 0.0305
  - Gold recovery in sand concentrates = 12.415 X ln (%Cu in rougher tails) + 93.354
  - Gold recovery from leaching of cleaner tails and sand concentrates (Au g/t in residue = 0.1035 X Au g/t in leach feed) – 1% Au recovery for plant losses

  - Copper recoveries derated for oxide content (Cangrejos @ 0.34, Gran Bestia @ 0.77)
- Model No. 2 -Expansion 1 and 2 Phases, Years 4 through 26
  - Copper rougher recovery = 95.133 X (%S in feed) ^ 0.0672
  - Copper rougher concentrate grade = 8.5335 X (%Cu in feed) – 0.102
  - Copper clean concentrate mass = 1.6538 X (%Cu in feed) ^ 0.664
  - Copper clean concentrate recovery = 0.782 X Cu rougher recovery + 12.309
  - Gold grade in rougher tails = 0.1857 X Au g/t in feed
  - Gold grade in cleaner tails = 0.062 X Au g/t in rougher concentrates
  - Gold in leach residues (cleaner tails leach residues = 0.1033 X leach feed Au) (Sand leach residues = 0.1822 X leach feed Au g/t)
  - Silver recoveries assume constant tails grades in roughers, cleaners and leach residues.

Based on the plant feed grades and the metallurgical models the projected life-of-mine recoveries are 85% for gold, 79% for copper and 55% for silver. Flotation concentrates are projected to assay on average 122 g/t gold, 22% copper and 103 g/t silver. Detailed assays of the flotation concentrates also indicate that they do not contain deleterious elements and would not cause smelter penalties.

14 MINERAL RESOURCE ESTIMATES

14.1 Introduction

The mineral resource estimate was prepared under the direction of Robert Sim, P.Geo, with the assistance of Bruce Davis, Ph.D., FAusIMM. The effective date of the mineral resource estimate is January 30, 2023. This section of the report describes the mineral resource estimation methodology and summarizes the key assumptions considered by the QP to prepare the mineral resource model for the gold, copper, silver, molybdenum, sulphur, arsenic, and antimony mineralization at the Cangrejos Project. The previous estimate was generated in November 2019 and was described in two previous PEA technical reports with effective dates of June 8, 2020 and June 1, 2022.

During the last quarter of 2021, Lumina initiated a drilling program primarily designed to provide a consistent distribution of drilling on a nominal 100-m grid pattern in the resources outlined in the 2022 PEA report. This closer-spaced distribution of drillholes allows the upgrading of previously inferred mineral resources to an indicated mineral resource category for mine planning purposes. Additional drilling, of a more exploratory nature, also extended the limits of mineral resources at Gran Bestia towards the north. Since the previous estimate of mineral resources, a total of 55 drillholes were completed on the Cangrejos deposit and an additional 50 holes were completed on the neighboring Gran Bestia deposit.

In the opinion of the QP, the mineral resource estimate reported herein is a reasonable representation of the mineralization found at the Cangrejos Project at the current level of sampling. The mineral resources were estimated in conformity with the CIM Definition Standards for Mineral Resources and Mineral Reserves (2014) and the generally accepted guidelines stated in Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Estimation of Mineral Resources and Mineral Reserves Best Practices Guidelines (November 29, 2019) and are reported in accordance with NI 43-101 (CIM, 2019).

Mineral resources are not mineral reserves, and they do not have demonstrated economic viability. There is no certainty that all or any part of the mineral resources will be converted into a mineral reserve upon application of modifying factors.

Estimations are generated from 3D block models based on geostatistical applications using commercial mine planning software (MinePlan® v15.80-2, formerly called MineSight®). The project limits are based in the UTM coordinate system (Provisional South American Datum 1956, UTM Zone 17S) using a nominal block size measuring 15 m × 15 m × 15 m. Drillholes penetrate the Cangrejos deposit at a variety of orientations to depths approaching 750 m below surface. The mineral resource estimate was generated using drillhole sample assay results and the interpretation of a geological model which relates to the spatial distribution of gold, copper, silver, and molybdenum. Estimates are also generated for the distribution of sulphur and potentially deleterious elements arsenic and antimony. Interpolation characteristics were defined based on the geology, drillhole spacing, and geostatistical analysis of the data. The mineral resources were classified according to their proximity to the sample data locations and are reported, as required by NI 43-101, according to the CIM Definition Standards for Mineral Resources and Mineral Reserves (May 2014).

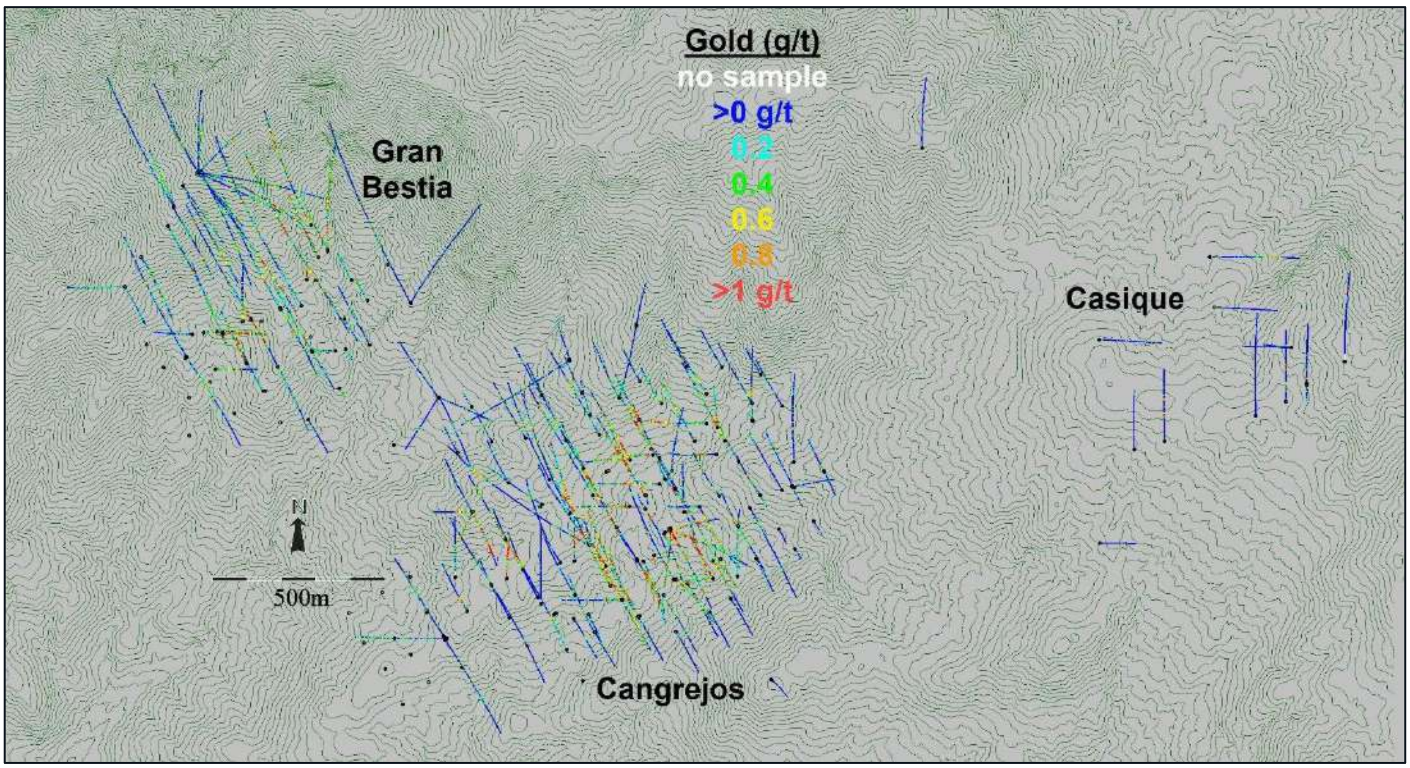
14.2 Available Data

Lumina provided the drillhole sample data for the Cangrejos Project on September 13, 2022. This comprised a series of Excel® (spreadsheet) files containing collar locations, downhole survey results, geologic information, and assay results for a total of 280 drillholes representing 98,759 m of drilling. Of these, 172 drillholes, totaling 62,186 m of drilling, tested the Cangrejos deposit and an additional 81 drillholes, totalling 32,272 m of drilling, were completed in the vicinity of the Gran Bestia deposit. The remainder of the drilling includes 15 holes, totalling 3,940 m, which test the Casique zone, located approximately 1.5 km east of the Cangrejos deposit, plus another 12 geotechnical holes, totalling 25 m, that test areas south and west of the Cangrejos deposit.

All holes are DD (core) holes. Typically, holes are collared using PQ-size or HQ-size core barrels, downsizing as drilling conditions often become more difficult with depth. The majority of drillholes generate HQ-size core (63.5 mm diameter) throughout the mineralized areas of interest in the deposits. The distribution of gold grades in all drillholes is shown in plan view in Figure 14-1.

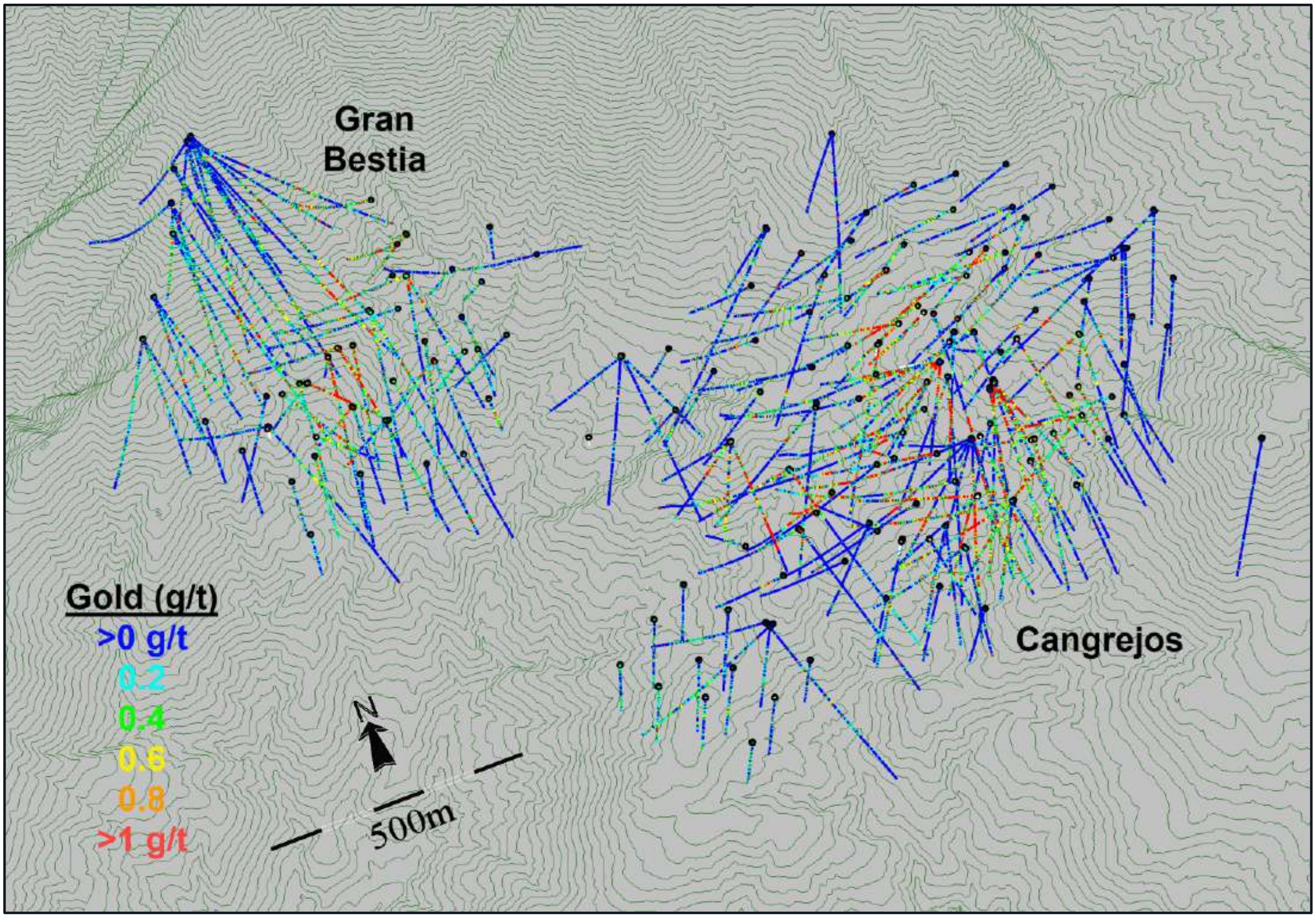
In the opinion of the QP, Lumina has completed sufficient drilling at the Cangrejos and Gran Bestia deposits to support a mineral resource estimate, but there is not enough delineation drilling at Casique to support a mineral resource estimate at this time. The distribution of gold grades in drilling at the Cangrejos and Gran Bestia deposits is shown in an isometric view in Figure 14-2.

Figure 14-1: Plan View of Gold Grades in Drilling



Source: SIM Geological, January 2023.

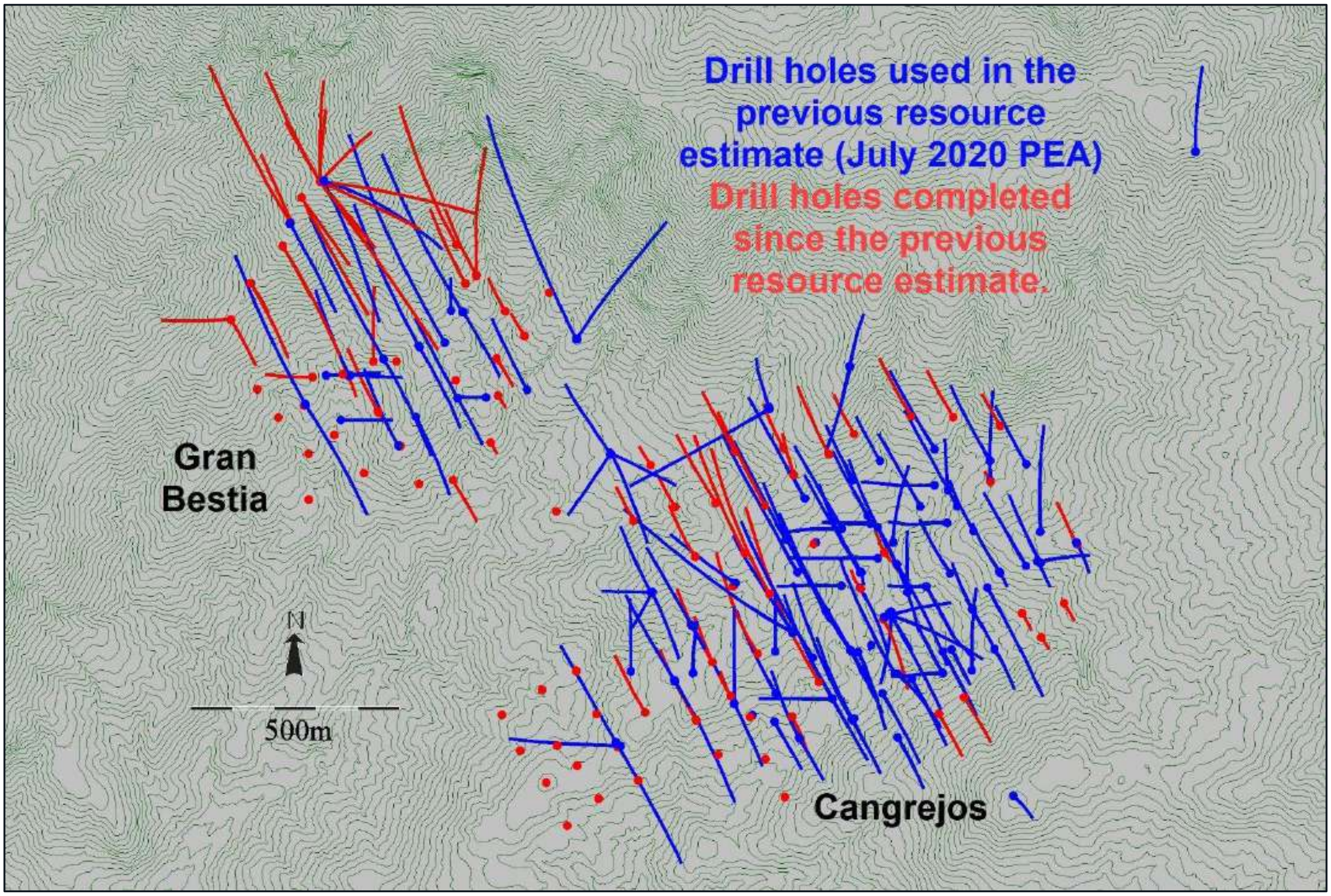
Figure 14-2: Isometric View of Gold Grades in Drilling



Source: SIM Geological, January 2023.

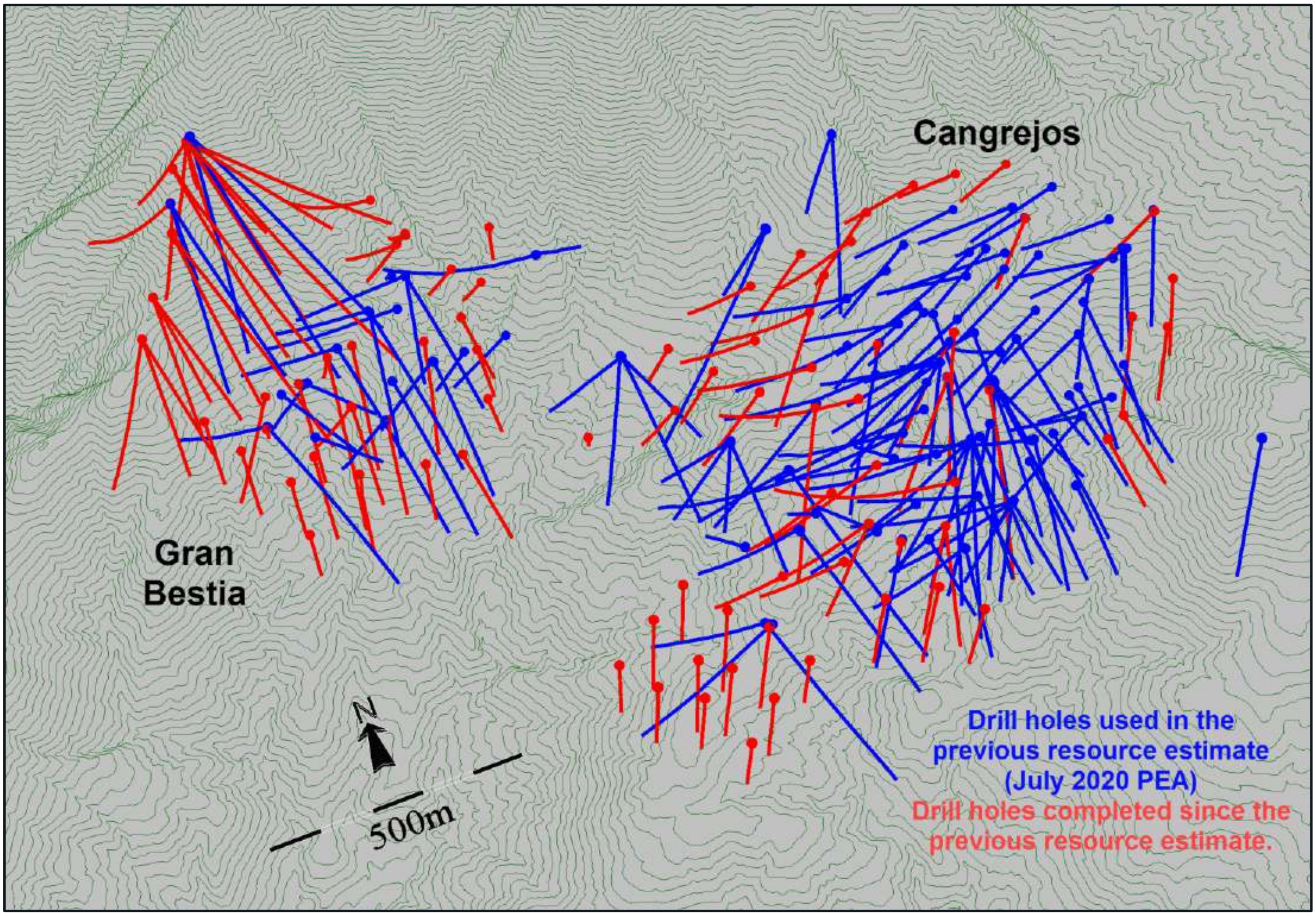
Figure 14-3 is a plan view and Figure 14-4 an isometric view showing the location of drillholes completed on the Cangrejos Project since the previous estimate of mineral resources that was presented in the 2022 PEA. The main objective of the most recent drilling program was to delineate areas that were included in the 2022 PEA mine plan with holes spaced on a nominal 100 m pattern, therefore upgrading any previous inferred mineral resources to a higher confidence, indicated category. The majority of the new drilling on Cangrejos occurred around the perimeter of the deposit and defined the lateral extents of mineralization in the deposit. At Gran Bestia, drilling occurred over the whole deposit area, and successfully tested for extensions of the deposit towards the north and northeast directions. Both deposits remain "open" to potential expansion at depth. The Cangrejos deposit remains "open" to some extent towards the southwest. The Gran Bestia deposit remains "open" to expansion in several directions but primarily towards the north and northwest directions.

Figure 14-3: Plan View of Drilling Completed Since the Previous Estimate of Mineral Resources



Source: SIM Geological, January 2023.

Figure 14-4: Isometric View of Drilling Completed Since The Previous Estimate of Mineral Resources



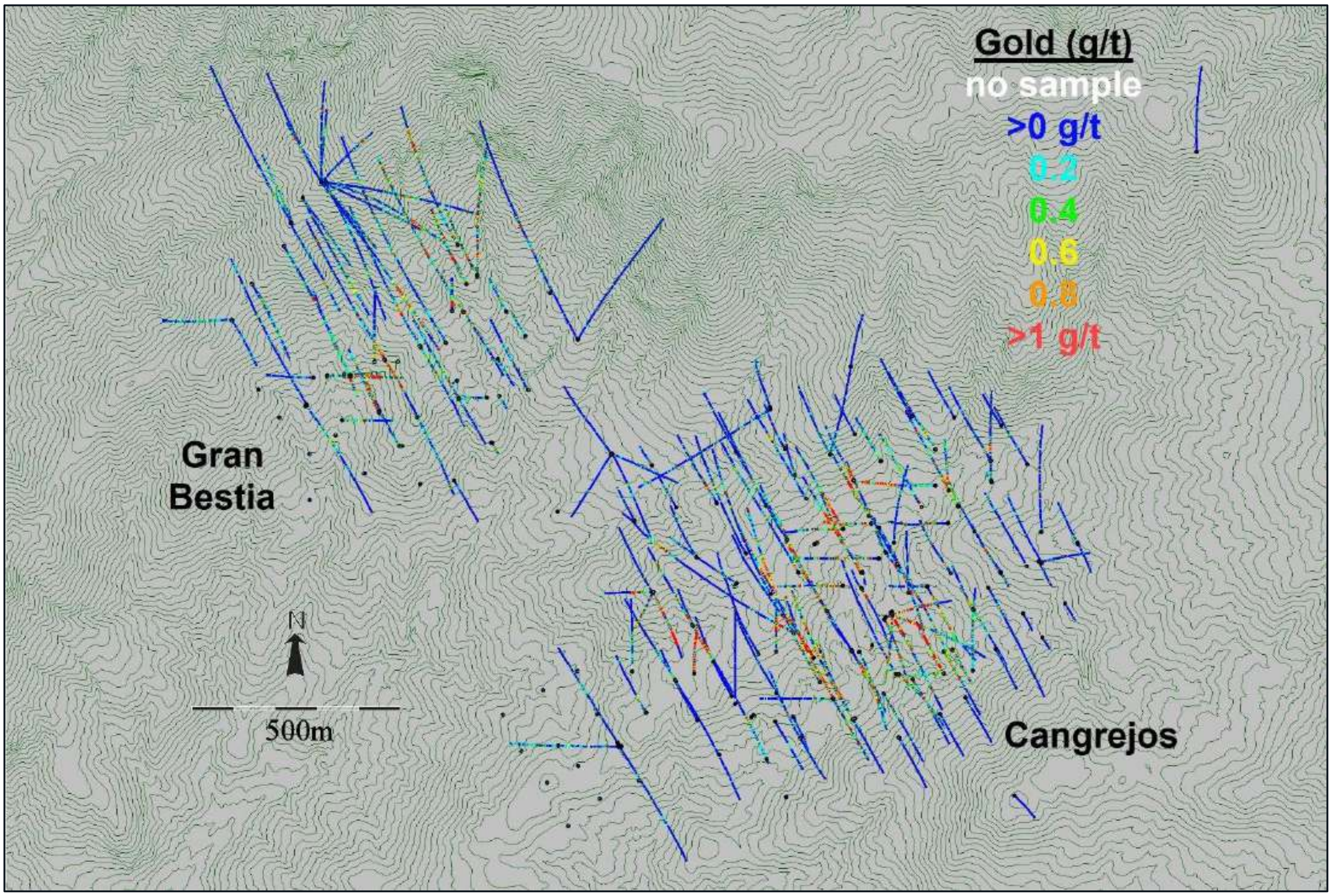
Source: SIM Geological, January 2023.

There are a total of 48,822 individual samples in the project database, the majority of which were analyzed for gold content by fire assay plus a variety of additional elements (as part of a multi-element package). Individual sample intervals range from a minimum of 0.35 m to a maximum of 9 m and average 2 m long, and more than 98% of the samples in the database are exactly 2 m long. Sample data for gold, silver, copper, molybdenum, sulphur, arsenic, and antimony have been extracted from the main database and imported into MinePlan® to develop the mineral resource model.

All cored intervals were sampled and analyzed for gold content except for 1,058 m, which mainly represents intervals of overburden or saprolitic material that were not originally sampled and assayed or represent several holes that were drilled for geotechnical purposes and, as a result, were not sampled and analyzed. In some rare instances, these missing samples represent intervals of poor core recovery. With respect to holes drilled by Newmont in 1999 and 2000, not all samples were analyzed for copper, silver, molybdenum, sulphur, arsenic, or antimony and, as a result, this information is missing (about 4.5% of core intervals in the database are missing copper, silver, and molybdenum data, and about 8% of core intervals are missing sulphur, arsenic, and antimony data). The distributions of gold data and available copper, silver, molybdenum, sulphur, arsenic, and antimony data are shown in plan view in Figure 14-5 through Figure 14-11, respectively.

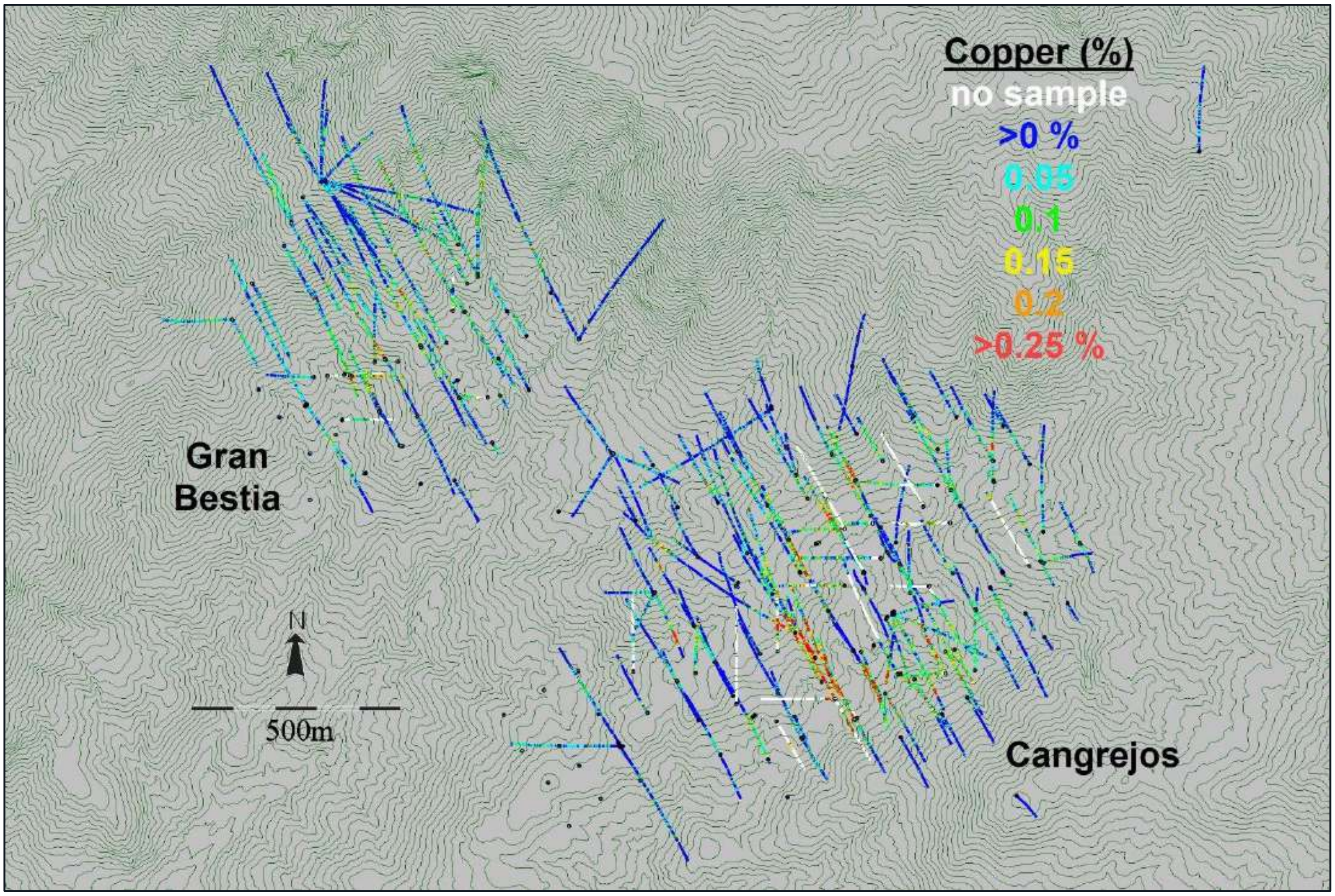
The distribution of core intervals, where sample data are missing, correlates reasonably well with low-grade (copper, silver, and molybdenum) zones encountered in the more recent drilling. It is assumed that these intervals were not sampled because they do not show visible signs of significant mineralization. Based on this assumption, core intervals that have been analyzed for gold, but not for these other elements, were assigned the following default grades: Cu = 0.01%; Ag = 0.1 g/t; and Mo = 5 ppm. No adjustments were made to account for missing sulphur, arsenic, or antimony data. Resampling and analyzing for these missing elements are recommended if core or sample rejects are available.

Figure 14-5: Plan View of Gold Sample Data in Drilling



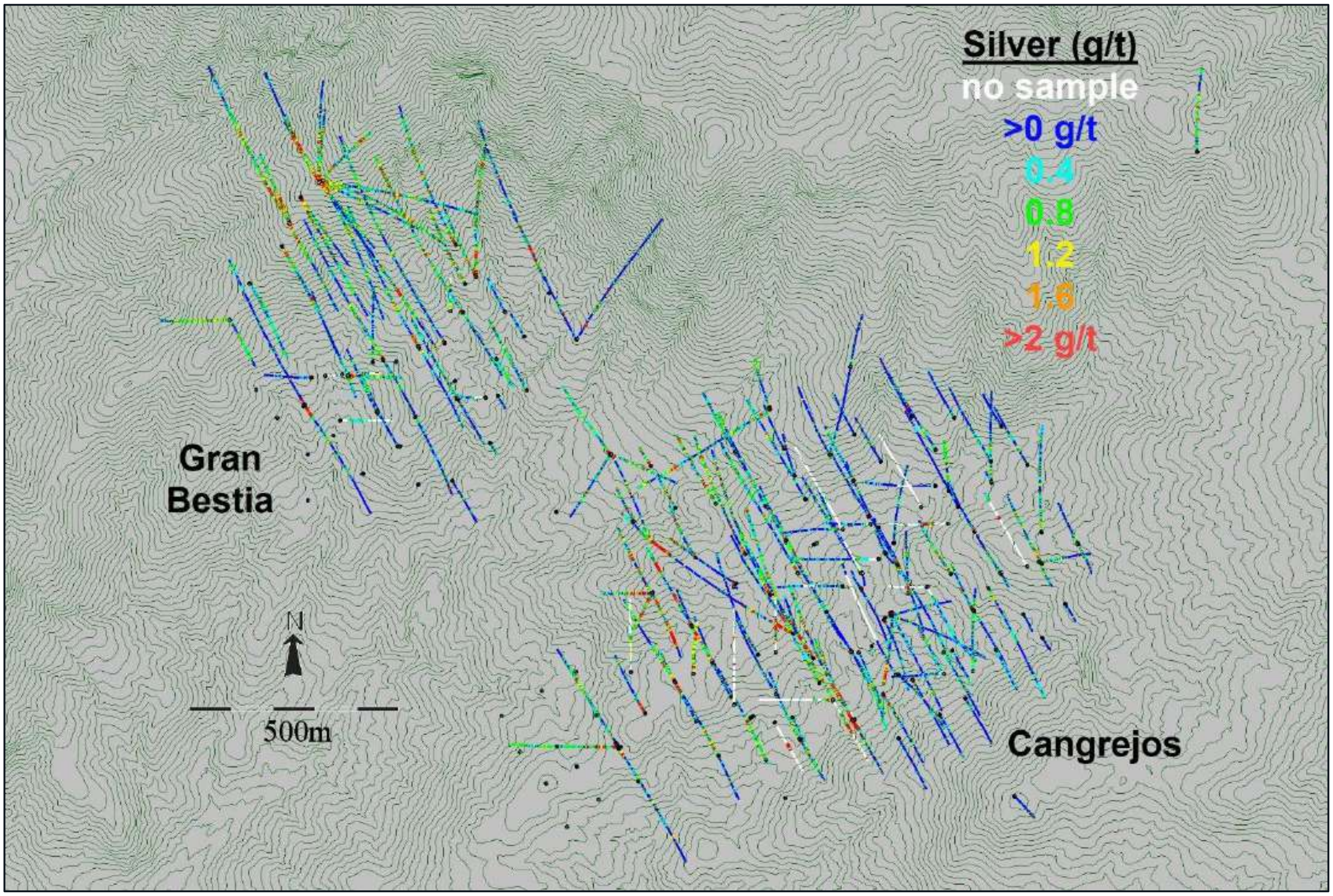
Source: SIM Geological, January 2023.

Figure 14-6: Plan View of Copper Sample Data in Drilling



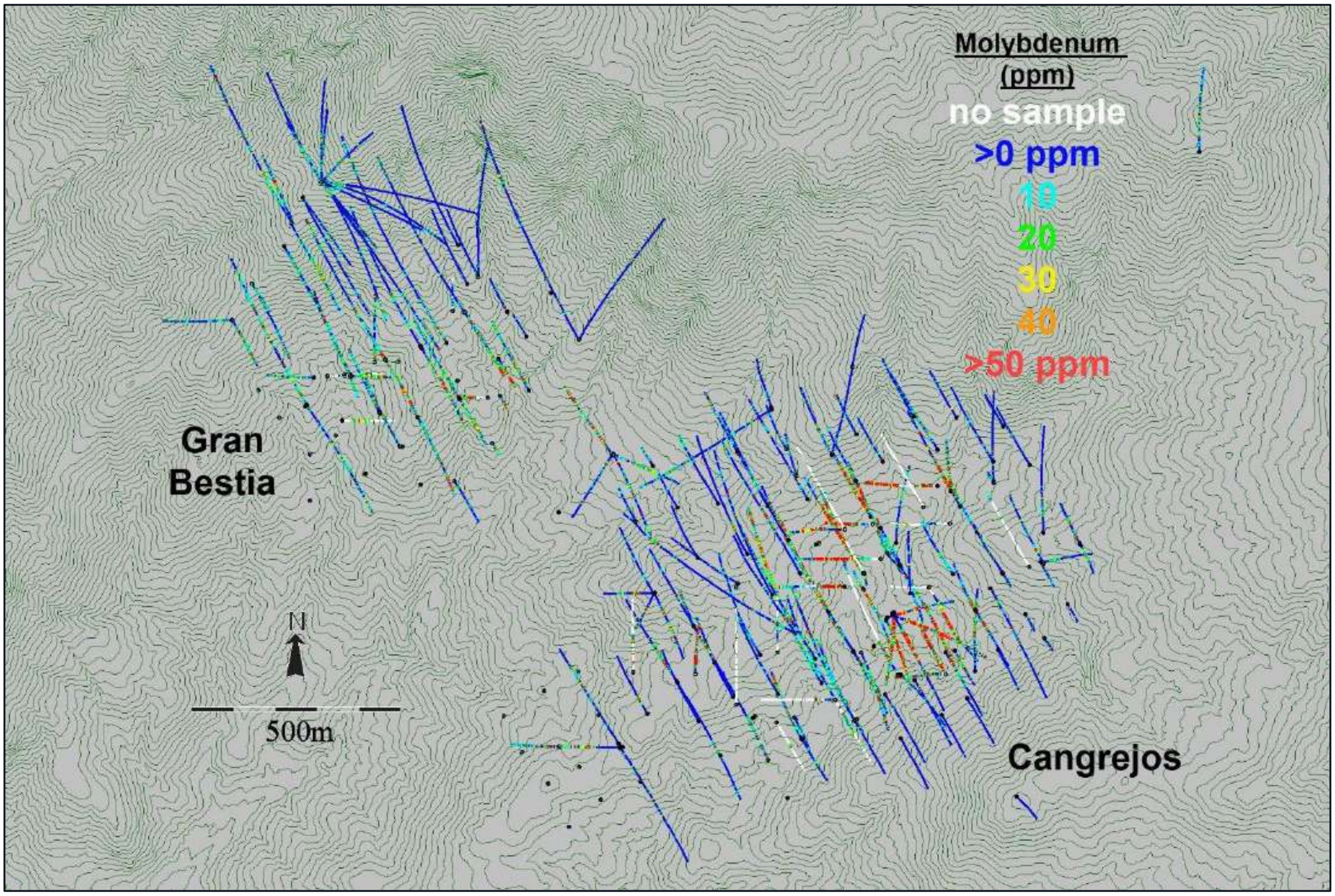
Source: SIM Geological, January 2023.

Figure 14-7: Plan View of Silver Sample Data in Drilling



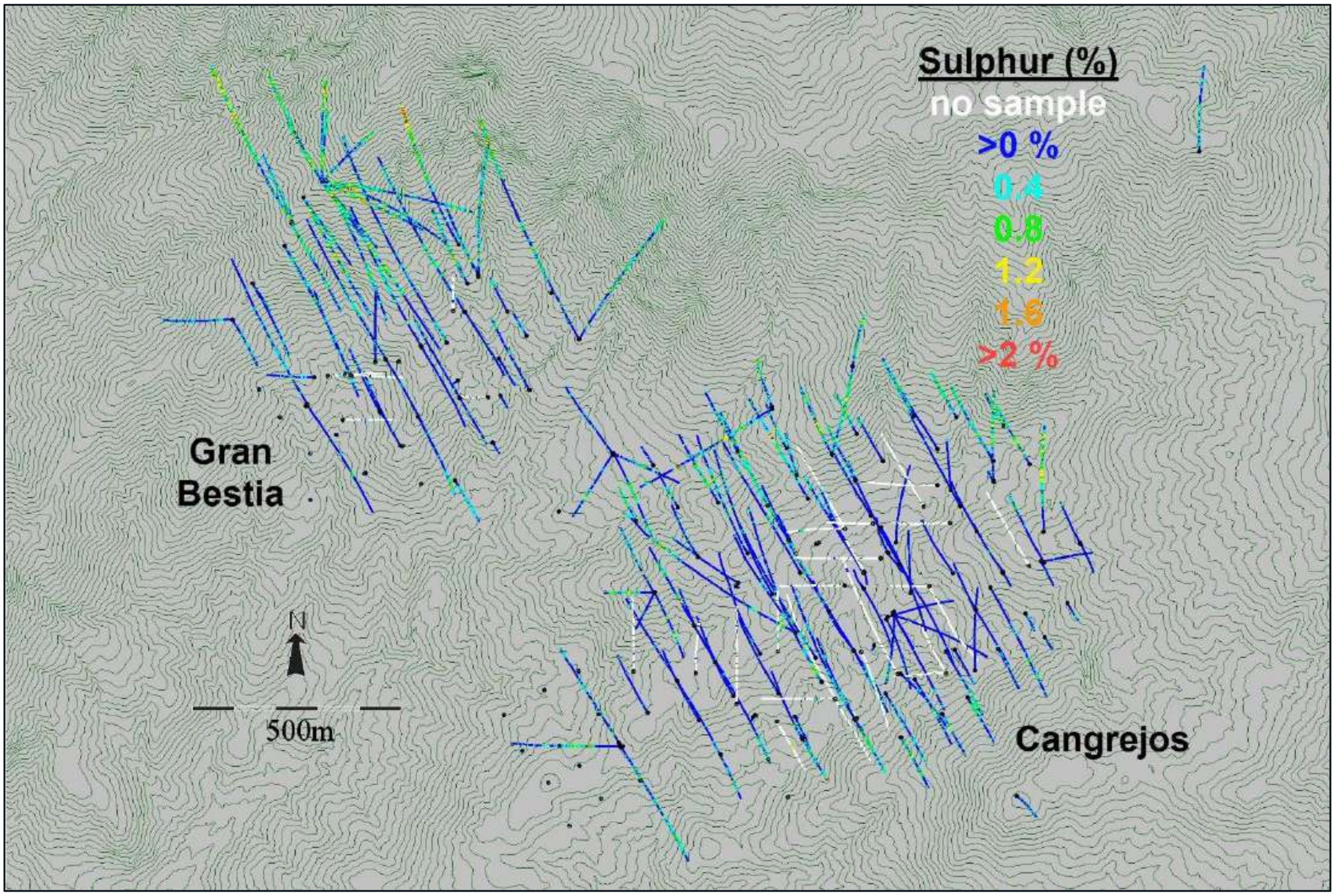
Source: SIM Geological, January 2023.

Figure 14-8: Plan View of Molybdenum Sample Data in Drilling



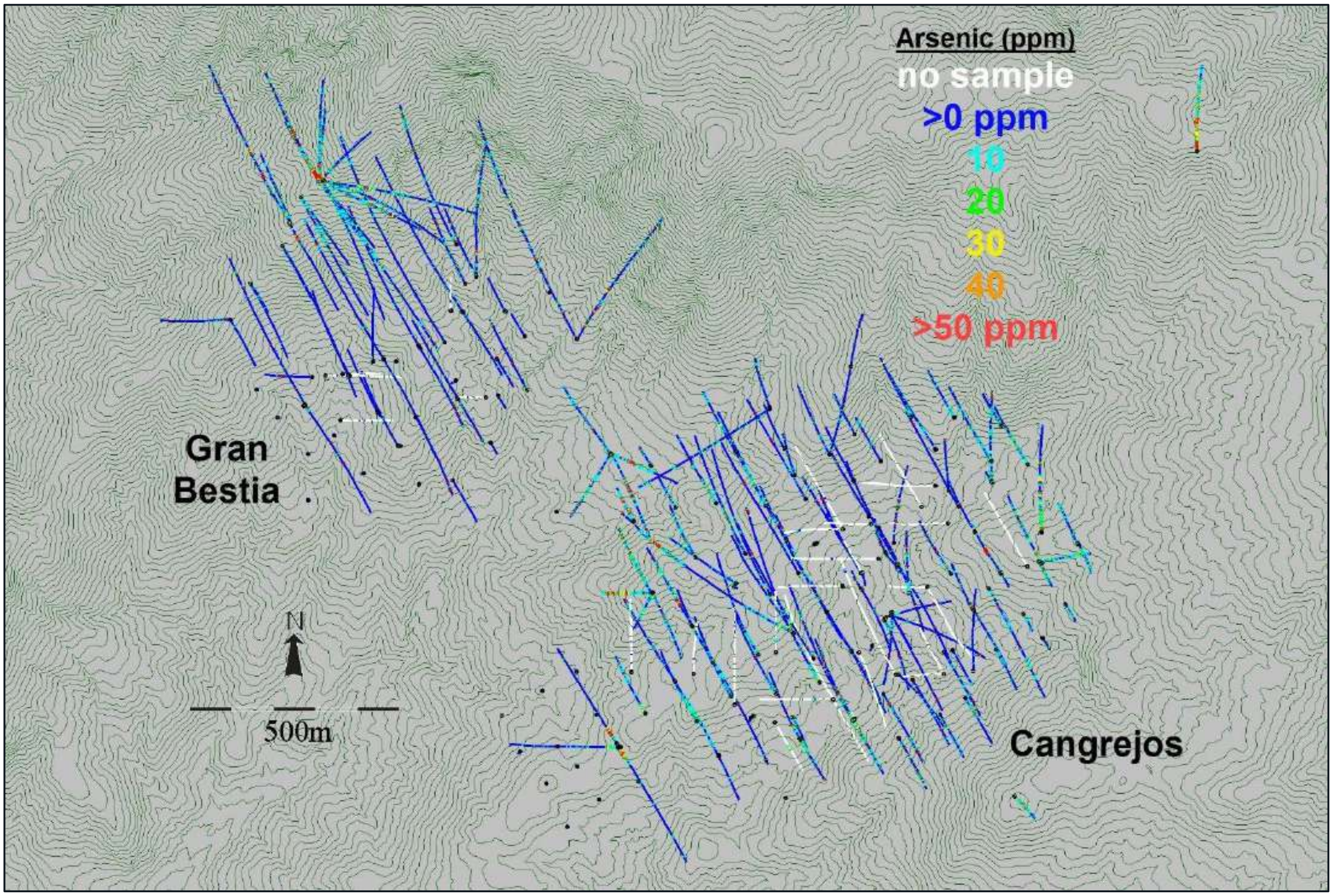
Source: SIM Geological, January 2023.

Figure 14-9: Plan View of Sulphur Sample Data in Drilling



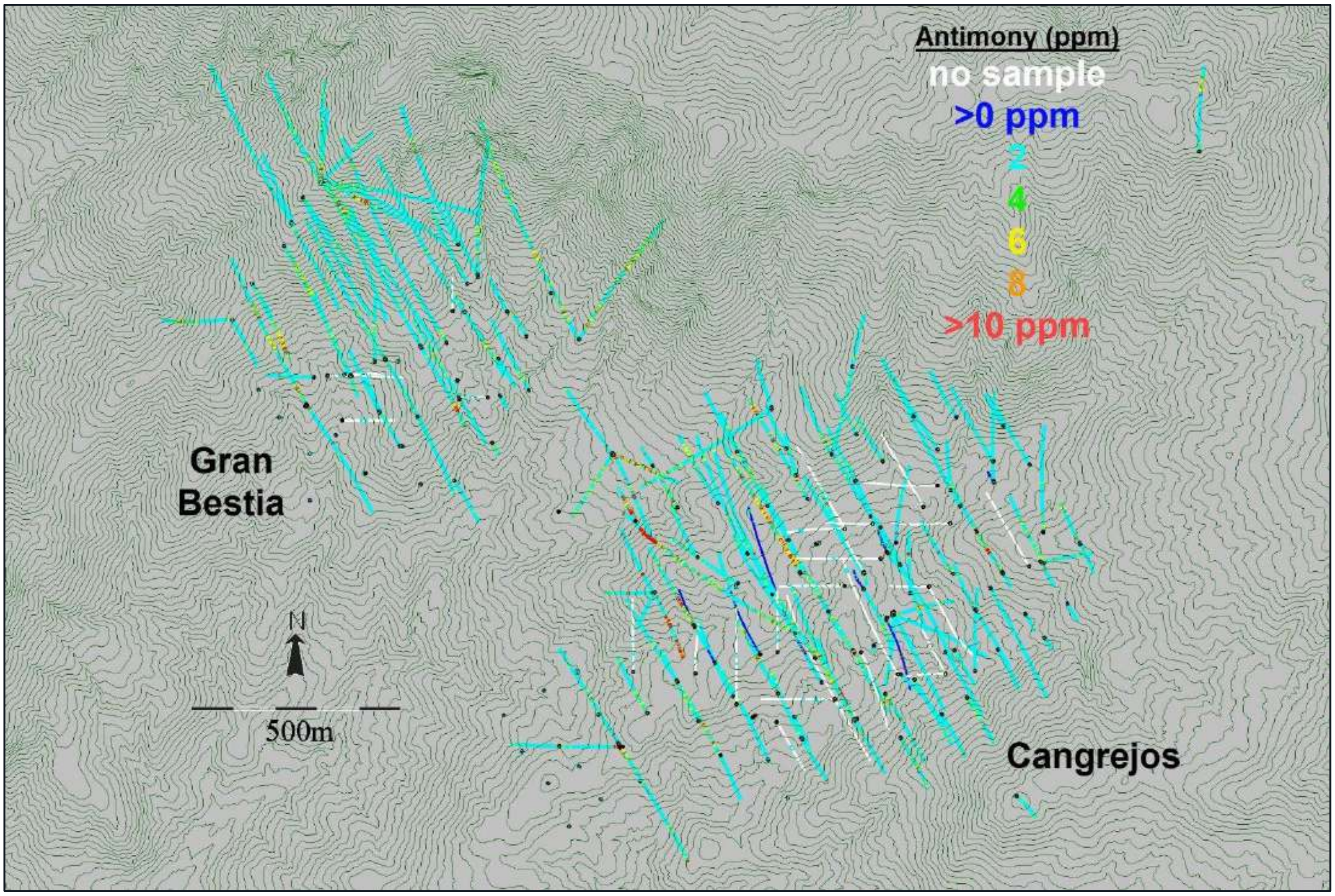
Source: SIM Geological, January 2023.

Figure 14-10: Plan View of Arsenic Sample Data in Drilling



Source: SIM Geological, January 2023.

Figure 14-11: Plan View of Antimony Sample Data in Drilling



Source: SIM Geological, January 2023.

Specific gravity (SG) data are available for 212 holes that were drilled by Lumina and Odin between 2014 and 2022. Newmont did not conduct SG measurements on holes drilled in 1999 and 2000, and Odin also did not conduct SG measurements on holes drilled during the initial drill programs in 2011 and 2012. Samples selected for SG measurements are spaced at 10 m intervals down each drillhole. The volume and distribution of SG data are considered sufficient to interpolate density values in the transitional (partial oxidized) rocks and fresh rocks. There are limited SG measurements recorded for the Saprolite and Saprock zones intersected during DD and this is not enough to support SG estimation in these upper, highly oxidized units. During the geotechnical program, a series of samples of saprolite and saprock were collected using a Shelby Tube, and SG measurements were conducted on these materials, providing average SG values which were assigned to these upper oxidized units.

A LiDAR survey was conducted over the deposit areas at Cangrejos and Gran Bestia in 2019, providing detailed topographic information for these areas. The Lidar survey was expanded in 2021 to include the surrounding areas for use in infrastructure and potential waste rock and tailing storage sites.

Geologic information, derived from observations during core logging, provides lithology code designations for the various rock units present on the property.

The statistical properties of the data in the vicinity of the Cangrejos mineral resource model are shown in Table 14-1; this table shows the statistics for the initial sample data and the statistics for copper, silver, and molybdenum following the assignment of default grades for missing data.

Table 14-1: Summary of Basic Statistics of Data Proximal to The Cangrejos Mineral Resource Model

Element	Number of Samples	Total Sample Length (m)	Min.	Max.	Mean	Std. Dev.	Coefficient of Variation
Gold (g/t)	30,839	61,577	0.002	64.9	0.390	0.8868	2.2733
Copper1 (%)	29,514	58,912	0	4.76	0.079	0.119	1.509
Copper2 (%)	30,839	61,577	0	4.76	0.076	0.118	1.545
Silver1 (g/t)	29,514	58,912	0.1	1,150.00	0.80	7.2	9.05
Silver2 (g/t)	30,825	61,543	0.1	1,150.00	0.77	7.05	9.2
Molybdenum1 (ppm)	29,514	58,912	0	2,696.00	18.7	51.8	2.8
Molybdenum2 (ppm)	30,839	61,577	0	2,696.00	18.1	50.7	2.8
Sulphur (%)	27,922	55,723	0.01	10	0.25	0.337	1.337
Arsenic (ppm)	27,922	55,723	1	10,000.00	12	101.1	8.4
Antimony (ppm)	27,922	55,723	0	1,960.00	3.7	13.8	3.7
SG	5,035	n/a	1.62	3.61	2.75	0.083	0.030

Note: Original sample data are weighted by sample length. The data used in Table 14-1 are restricted to drillholes in the vicinity of the Cangrejos deposit. An Element suffix of “1” denotes initial sample data; a suffix of “2” includes default grades assigned to missing sample data (copper, silver and molybdenum).

Source: SIM Geological, January 2023.

The statistical properties of the data in the vicinity of the Gran Bestia mineral resource model are shown in Table 14-2; this table shows the statistics for the initial sample data and the statistics for copper, silver, and molybdenum following the assignment of default grades for missing data.

Table 14-2: Summary of Basic Statistics of Data Proximal to The Gran Bestia Mineral Resource Model

Element	Number of Samples	Total Sample Length (m)	Min.	Max.	Mean	Std. Dev.	Coefficient of Variation
Gold (g/t)	16,101	32,222	0.003	32.3	0.364	0.73	2.0081
Copper1 (%)	15,885	31,785	0	1.33	0.065	0.062	0.957
Copper2 (%)	16,101	32,222	0	1.33	0.064	0.062	0.966
Silver1 (g/t)	15,885	31,785	0.1	100	0.80	2.05	2.57
Silver2 (g/t)	16,098	32,209	0.1	100	0.79	2.04	2.58
Molybdenum1 (ppm)	15,885	31,785	1	2,170.00	13.1	36.9	2.8
Molybdenum2 (ppm)	16,101	32,222	1	2,170.00	13.0	36.6	2.8
Sulphur (%)	15,663	31,338	0.01	5.93	0.36	0.345	0.954
Arsenic (ppm)	15,663	31,338	3	8,720.00	11.3	118.7	10.5
Antimony (ppm)	15,663	31,338	3	724	3.5	7.1	2
SG	2,841	n/a	1.19	3.54	2.75	0.073	0.027

Note: Original sample data are weighted by sample length. The data used in Table 14-2 are restricted to drillholes in the vicinity of the Gran Bestia deposit. An Element suffix of “1” denotes initial sample data; a suffix of “2” includes default grades assigned to missing sample data (copper, silver and molybdenum).

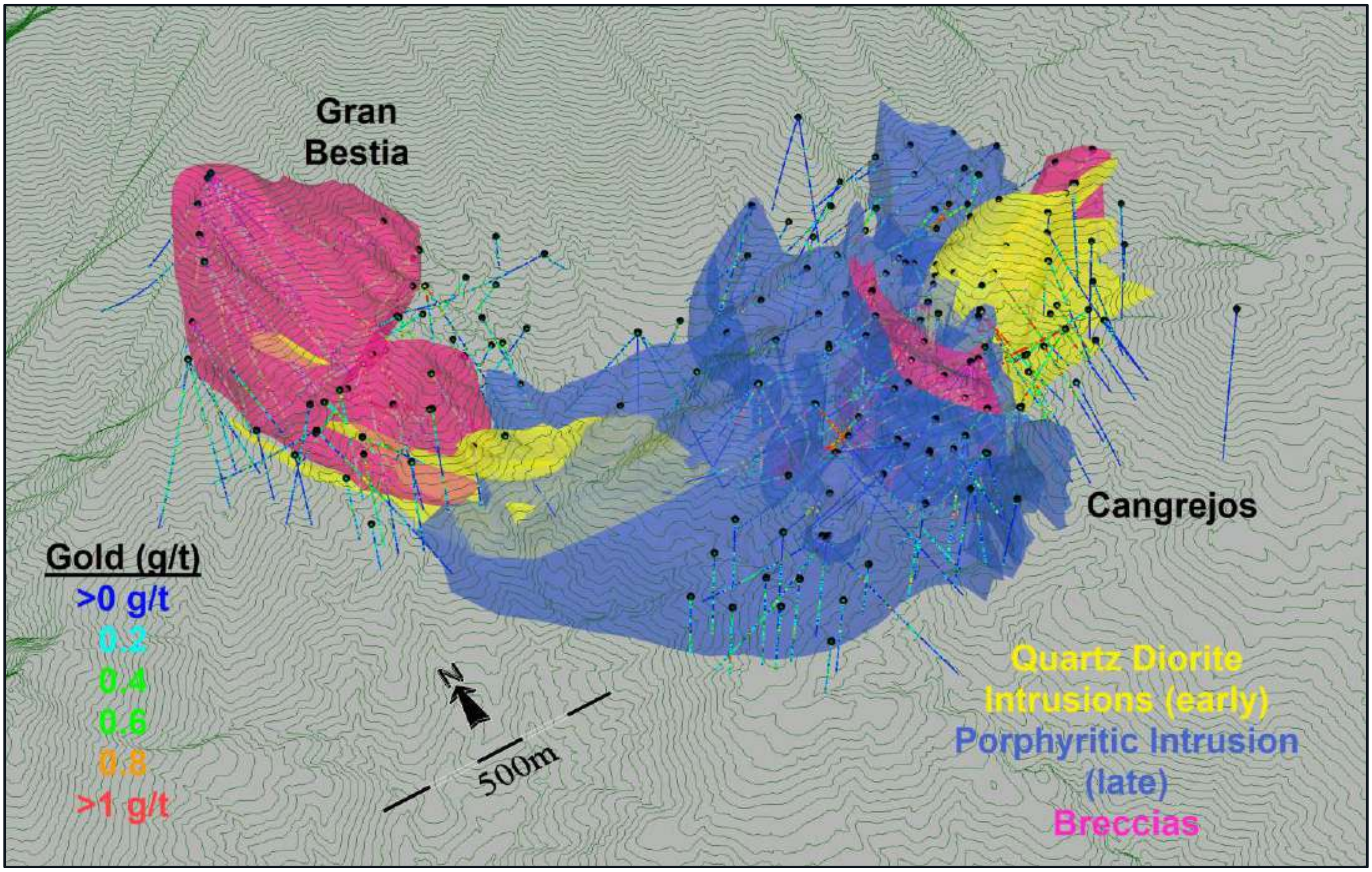
Source: SIM Geological, January 2023.

14.3 Geological Model, Domains, and Coding

The Cangrejos deposit is interpreted as a gold-copper porphyry deposit with mineralization resulting from the intrusion of quartz-dioritic to dacitic rocks in a host of “basement rocks” comprising metamorphosed igneous rocks, most of which are dioritic in composition. A series of brecciated zones generally straddle the contact between the porphyry and the basement rocks. Sulphide mineralization is present in all rock types but is focused near the contact between the porphyritic and metamorphic host rocks.

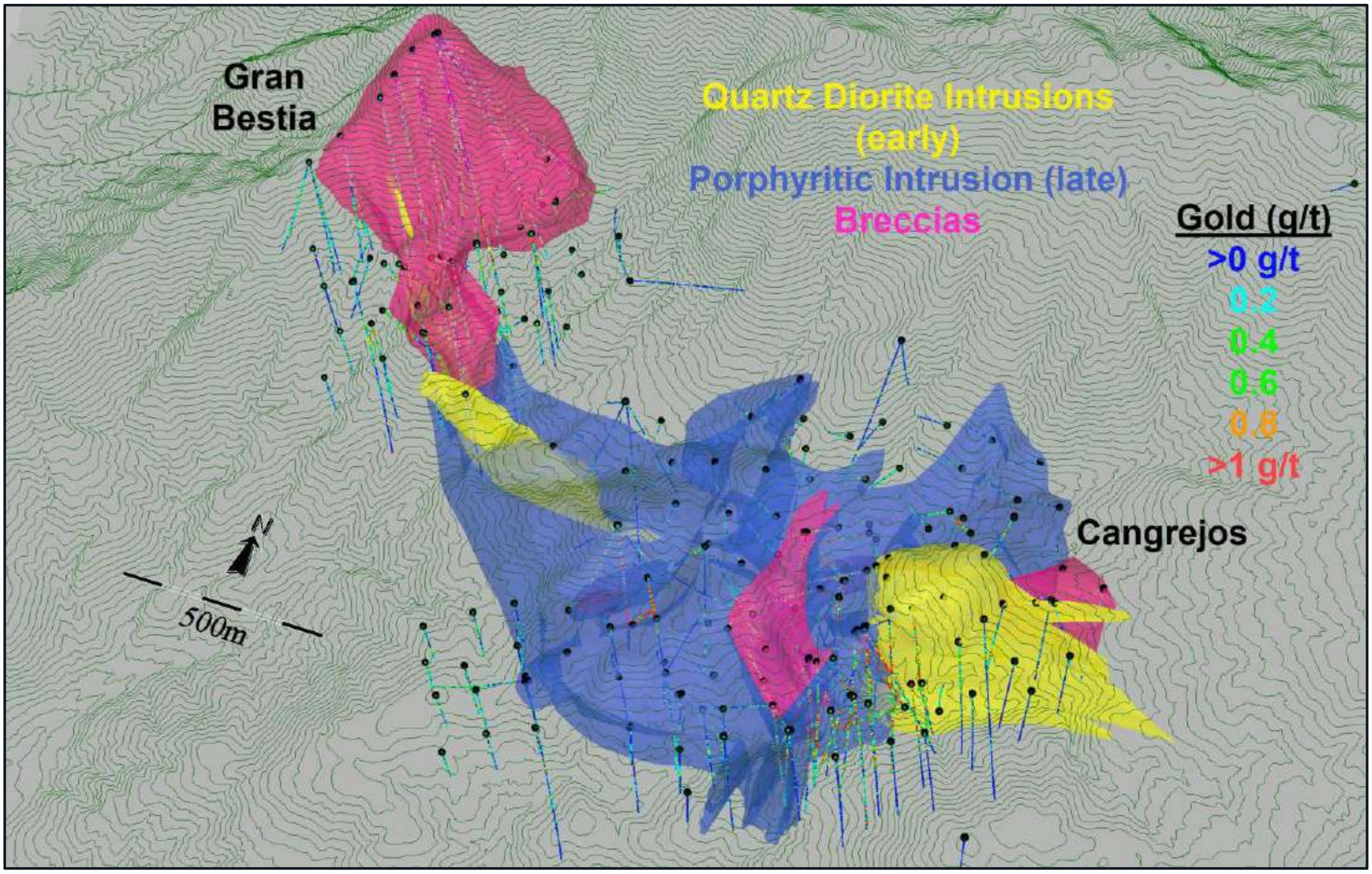
Figure 14-12 and Figure 14-13 show several isometric views of the lithologic domains interpreted in the area of the Cangrejos and Gran Bestia deposits. The yellow domains represent early porphyry phases that are of QD composition. The blue domain is another (late) porphyry complex, also comprised of QD, but differs texturally from the other (yellow) porphyry domains. The magenta domains represent several zones showing moderate to intense brecciation. The rocks surrounding these interpreted domains (not shown on Figure 14-12 and Figure 14-13) represent metamorphosed basement rocks which are a combination of schistose diorites, aplite dykes, granodiorites, breccias, and porphyritic material.

Figure 14-12: Isometric View of Interpreted Lithologic Units in The Cangrejos and Gran Bestia Deposit Areas



Source: SIM Geological, January 2023.

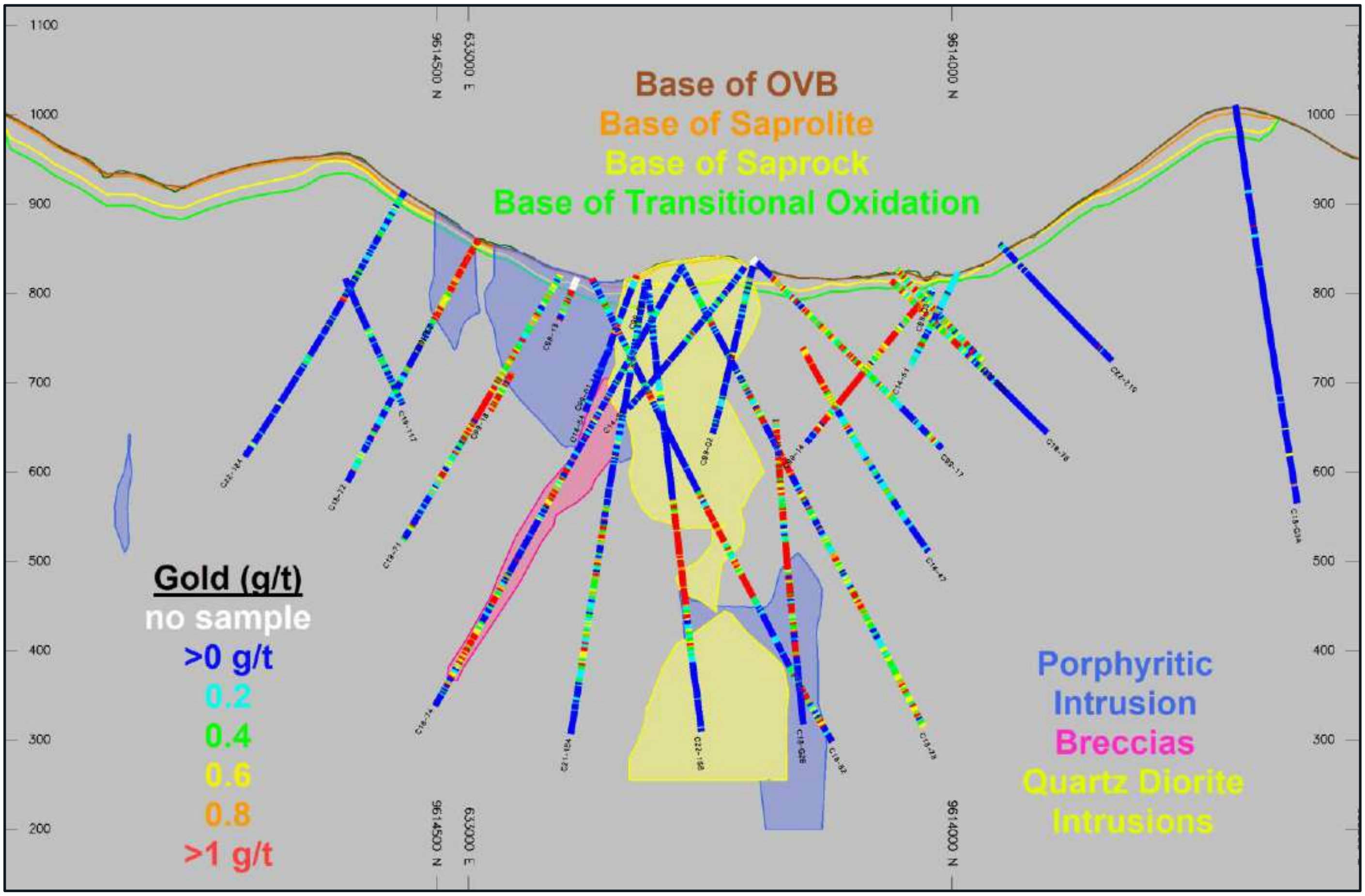
Figure 14-13: Isometric View of Interpreted Lithologic Units in The Cangrejos and Gran Bestia Deposit Areas



Source: SIM Geological, January 2023.

The type of surface oxidation recorded is also based on observations during drill core logging. Saprolite comprises a clay-like texture in which no original textures have been retained. Saprock is partially altered material that contains remnants of the original rock texture in a clay-rich host. Transitional, partially oxidized rocks, Transitional Oxidation, exhibit some signs of minor oxidation, typically along fracture surfaces. There is also a relatively thin layer of organic overburden material on the surface in some locations. Surfaces representing the base of Transitional Oxidation, Saprock, Saprolite, and Overburden were interpreted over the deposit areas. These surfaces are used to assign oxide-material types to model blocks on a majority basis. An example of the oxidation surfaces, relative to the gold grades in drilling and the interpreted lithologic domains, are shown in vertical cross-section in Figure 14-14.

Figure 14-14: Vertical Cross-Section Through The Cangrejos Deposit Showing Oxidation Surfaces and Lithologic Domains Relative to Gold Grades in Drilling



Source: SIM Geological, January 2023.

14.4 Specific Gravity Data

There are 8,061 individual measurements for SG taken from samples in 211 holes drilled by Lumina between 2014 and 2022. SG is measured using the water immersion method (weight in air vs. weight in water) with unwaxed core samples (Note: there is little or no evidence of porosity in the rocks from the Cangrejos Project). During the 2017 drill program, approximately 10% of the samples were sent to ALS Chemex for SG determinations using waxed samples. These results show reasonable comparison with the results obtained by Lumina.

Samples for SG measurement were initially taken at 5-m intervals throughout the length of the drillholes, but this distance was increased to 10-m intervals for the majority of drillholes. SG values range from a minimum of 1.19 to a maximum of 3.61 and average 2.75. A review of the SG data showed that several anomalous high and low SG values were present and, as a result, three samples with SG values less than 1.85 and five samples with SG greater than 3.40 were ignored during estimation of SG in the mineral resource model blocks.

There are relatively few SG measurements taken from the near-surface oxidized units. The volume and distribution of SG data are considered sufficient to support the estimation of SG values in the transitional oxidation and fresh rocks at the Cangrejos and Gran Bestia deposits. However, there is not enough data to support estimation in the Saprolite and Saprock units. During the geotechnical program, a series of samples of saprolite and saprock were collected using a Shelby Tube, and SG measurements were conducted on these materials, providing average SG values which were assigned to these upper oxidized units. These default values are 1.65 for Overburden, 1.75 for Saprolite, and 1.85 for Saprock. Any model blocks defined as Transitional Oxidation or Fresh rocks that are too distant from drilling to have estimated densities are assigned default SG values of 2.70.

14.5 Compositing

Compositing the drillhole samples helps standardize the database for further statistical evaluation. This step eliminates any effect that inconsistent sample lengths might have on the data.

To retain the original characteristics of the underlying data, a composite length was selected that reflects the average, original sample length. The generation of longer composites can result in some degree of smoothing which could mask certain features of the data. A composite length of 2 m was selected for both the Cangrejos and Gran Bestia deposits, reflecting that more than 98% of the original samples were selected on 2 m intervals.

Drillhole composites are length-weighted and were generated down-the-hole; this means that composites begin at the top of each hole and are generated at 2-m intervals down the length of the hole.

14.6 Generation of a Gold Probability Shell Domain

Probability shell domains were generated at Cangrejos and Gran Bestia based on the distribution of gold in the deposits. Indicator values were assigned to 2 m composited sample data based on a threshold grade of 0.15 g/t Au. Probability estimates are generated in model blocks using ordinary kriging (OK). A 3D domain was then produced in which the areas inside the probability shell represent areas where there is a greater than 50% probability that the grade will be greater than 0.15 g/t Au. In areas where gold mineralization is not bounded by drillholes, this shell domain extends for a maximum distance of 200 m from drilling.

The probability shell domains tend to be quite large and extensive both laterally and at depth at both the Cangrejos deposit and in parts of the Gran Bestia deposit because the lateral and depth extents of the mineralization in these grade ranges have not been defined by the current drilling. The probability shell domain does, however, outline low-grade zones in the centers of both the Cangrejos and Gran Bestia deposits.

14.7 Exploratory Data Analysis

Exploratory data analysis (EDA) involves the statistical summarization of the database to better understand the characteristics of the data that may control grade. One of the main purposes of this exercise is to determine if there is evidence of spatial distinctions in grade which may require the separation and isolation of domains during interpolation. The application of separate domains prevents unwanted mixing of data during interpolation and, therefore, the resulting grade model will better reflect the unique properties of the deposit. However, applying domain boundaries in areas where the data are not statistically unique may impose a bias in the distribution of grades in the model.

A domain boundary, which segregates the data during interpolation, is typically applied if the average grade in one domain is significantly different from that of another domain. A boundary may also be applied if there is evidence that a significant change in the grade distribution has occurred across the contact.

14.7.1 Basic Statistics by Domain

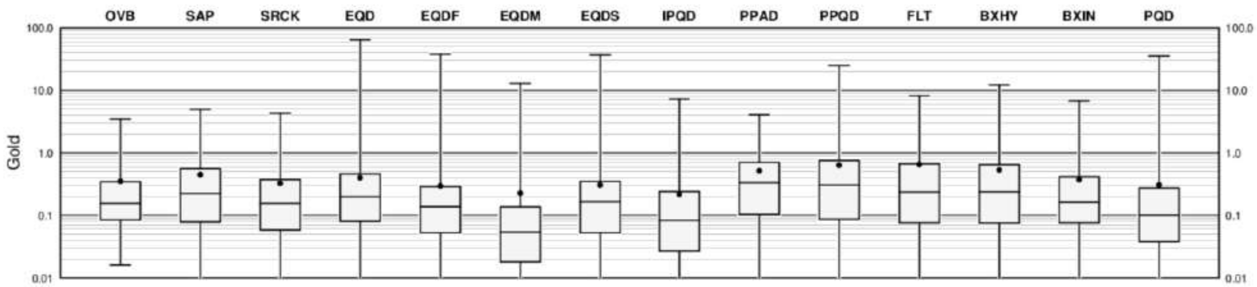
The basic statistics for the distribution of gold, copper, silver, molybdenum, sulphur, arsenic, and antimony were evaluated by reviewing the original, logged lithology and alteration codes and also by evaluating the various interpreted lithologic and oxidation domains shown in Figure 14-12, Figure 14-13, and Figure 14-14.

During core logging, Lumina geologists identified 14 different rock types, including overburden, surface oxidation units saprolite and saprock, and fault zones. The other lithologic units are as follows:

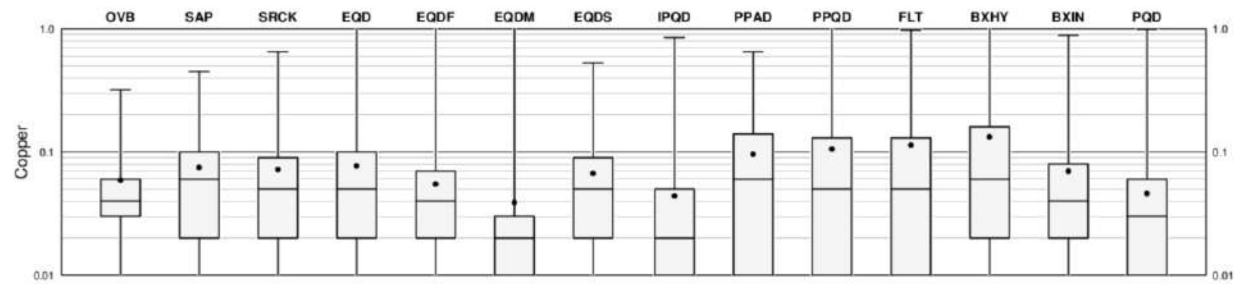
Basement Metamorphic Rocks:	EQD	Equigranular Quartz Diorite
	EQDF	Foliated Quartz Diorite
	EQDM	Micro Quartz Diorite
	SCH	Schistose Quartz Diorite
Porphyritic Rocks:	PPQD	Porphyritic Quartz Diorite
	IPQD	Intermineral Porphyritic Quartz Diorite
	PPAD	Porphyritic Andesite – Basalt
Quartz Diorite Intrusion:	QD	Quartz Diorite
Breccias:	HBX	Hydrothermal Breccia
	INBX	Intrusive Breccia

The boxplots in Figure 14-15 show the distributions of gold and copper contained in the various lithologic units recorded during core logging at the Cangrejos deposit. Grades tend to be similar across most of the basement metamorphic rocks (EQD, EQDF and SCH) and lower in the EQDM, but this rock type is relatively rare. Grades are generally higher in the porphyritic rocks (PPQD, PQD, and PPAD) but lower in the IPQD (as the name suggests, this separate unit is identified as "intermineral" or an "unmineralized" phase of the intrusive porphyry). Similar grade distributions are seen at the Gran Bestia deposit as shown in Figure 14-16.

Figure 14-15: Boxplots of Gold and Copper by Logged Lithology Type at Cangrejos



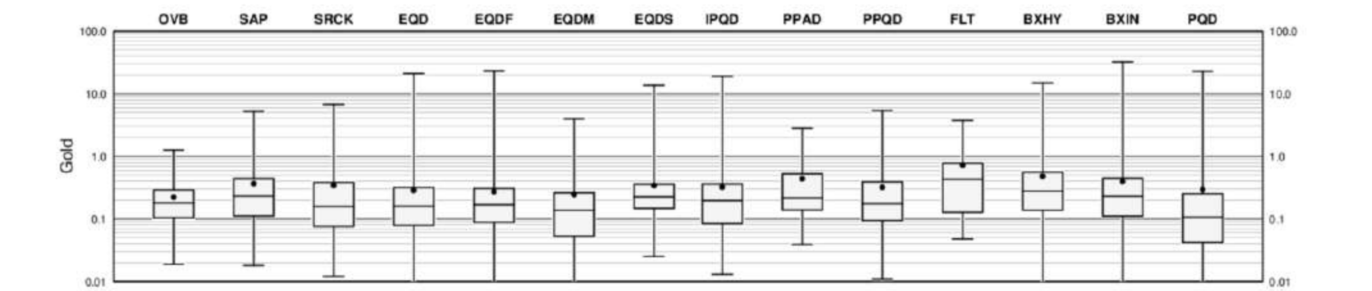
	OVB	SAP	SRCK	EQD	EQDF	EQDM	EQDS	IPQD	PPAD	PPQD	FLT	BXHY	BXIN	PQD	
Number of data	106	665	1108	8459	2999	127	1391	5252	157	3083	196	2940	1083	1772	Number of data
Mean	0.351	0.448	0.325	0.399	0.296	0.226	0.305	0.216	0.519	0.634	0.651	0.533	0.371	0.306	Mean
Variance	0.309	0.372	0.238	0.905	1.047	1.329	1.299	0.132	0.379	1.25	1.269	0.677	0.347	1.306	Variance
Skewness	3.76	2.966	3.492	39.904	22.423	10.396	25.557	4.856	2.645	7.963	3.851	4.236	4.626	20.504	Skewness
Coef of Variation	1.582	1.362	1.499	2.385	3.454	5.102	3.735	1.684	1.188	1.764	1.731	1.544	1.587	3.729	Coef of Variation
Maximum	3.49	5.009	4.31	64.9	38.0	12.85	36.9	7.22	4.09	24.9	8.11	12.15	6.76	35.6	Maximum
Upper quartile	0.345	0.562	0.374	0.46	0.288	0.136	0.35	0.24	0.701	0.755	0.668	0.649	0.415	0.273	Upper quartile
Median	0.154	0.222	0.154	0.198	0.137	0.054	0.165	0.083	0.333	0.306	0.235	0.237	0.162	0.1	Median
Lower quartile	0.084	0.078	0.058	0.08	0.053	0.018	0.053	0.027	0.103	0.086	0.076	0.075	0.076	0.038	Lower quartile
Minimum	0.016	0.006	0.003	0.002	0.003	0.003	0.003	0.003	0.003	0.002	0.003	0.002	0.003	0.003	Minimum



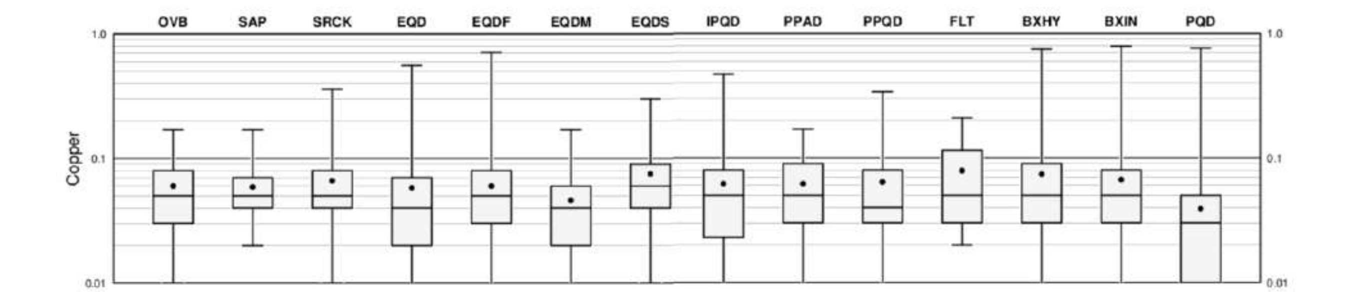
	OVB	SAP	SRCK	EQD	EQDF	EQDM	EQDS	IPQD	PPAD	PPQD	FLT	BXHY	BXIN	PQD	
Number of data	106	665	1108	8459	2999	127	1391	5252	157	3083	196	2940	1083	1772	Number of data
Mean	0.059	0.075	0.072	0.077	0.055	0.039	0.067	0.044	0.096	0.106	0.114	0.133	0.07	0.046	Mean
Variance	0.003	0.005	0.006	0.008	0.004	0.026	0.005	0.005	0.012	0.026	0.027	0.045	0.008	0.004	Variance
Skewness	2.312	1.565	2.764	3.838	5.406	10.504	2.336	3.764	2.184	4.173	2.464	6.33	3.254	6.114	Skewness
Coef of Variation	0.934	0.921	1.039	1.174	1.098	4.113	1.071	1.532	1.161	1.519	1.431	1.599	1.296	1.423	Coef of Variation
Maximum	0.32	0.45	0.65	1.28	1.22	1.8	0.53	0.85	0.65	2.38	0.98	4.76	0.89	0.99	Maximum
Upper quartile	0.06	0.1	0.09	0.1	0.07	0.03	0.09	0.05	0.14	0.13	0.13	0.16	0.08	0.06	Upper quartile
Median	0.04	0.06	0.05	0.05	0.04	0.02	0.05	0.02	0.06	0.05	0.05	0.06	0.04	0.03	Median
Lower quartile	0.03	0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.01	Lower quartile
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Minimum

Source: SIM Geological, January 2023.

Figure 14-16: Boxplots of Gold and Copper by Logged Lithology Type at Gran Bestia



	OVB	SAP	SRCK	EQD	EQDF	EQDM	EQDS	IPQD	PPAD	PPQD	FLT	BXHY	BXIN	PQD	
Number of data	56	96	415	3490	2610	88	459	767	37	282	25	3414	3380	499	Number of data
Mean	0.223	0.367	0.343	0.286	0.273	0.245	0.342	0.323	0.439	0.321	0.725	0.483	0.396	0.296	Mean
Variance	0.038	0.319	0.378	0.355	0.388	0.212	0.486	0.641	0.298	0.215	0.801	0.563	0.725	1.306	Variance
Skewness	2.917	6.687	6.232	17.009	22.962	6.355	15.7	17.775	2.865	5.887	2.053	8.161	21.964	16.229	Skewness
Coef of Variation	0.878	1.537	1.794	2.083	2.283	1.88	2.041	2.476	1.244	1.443	1.236	1.551	2.147	3.865	Coef of Variation
Maximum	1.26	5.22	6.76	21.1	23.2	4.0	13.7	19.0	2.82	5.37	3.77	14.95	32.3	22.9	Maximum
Upper quartile	0.291	0.441	0.383	0.317	0.307	0.263	0.359	0.362	0.526	0.392	0.778	0.557	0.444	0.252	Upper quartile
Median	0.18	0.232	0.158	0.159	0.169	0.138	0.226	0.197	0.216	0.176	0.432	0.279	0.231	0.106	Median
Lower quartile	0.104	0.111	0.076	0.079	0.088	0.053	0.147	0.084	0.139	0.094	0.128	0.138	0.11	0.042	Lower quartile
Minimum	0.019	0.018	0.012	0.003	0.005	0.003	0.025	0.013	0.039	0.011	0.048	0.003	0.003	0.003	Minimum



	OVB	SAP	SRCK	EQD	EQDF	EQDM	EQDS	IPQD	PPAD	PPQD	FLT	BXHY	BXIN	PQD	
Number of data	56	96	415	3490	2610	88	459	767	37	282	25	3414	3380	499	Number of data
Mean	0.06	0.059	0.066	0.058	0.06	0.046	0.075	0.062	0.062	0.064	0.079	0.074	0.067	0.039	Mean
Variance	0.002	0.001	0.002	0.003	0.003	0.001	0.002	0.003	0.002	0.004	0.003	0.005	0.004	0.002	Variance
Skewness	1.024	1.384	2.386	2.724	3.443	1.403	1.758	2.654	0.752	2.113	0.76	2.982	3.334	7.46	Skewness
Coef of Variation	0.669	0.52	0.711	0.892	0.856	0.766	0.635	0.937	0.63	0.996	0.713	0.958	0.995	1.232	Coef of Variation
Maximum	0.17	0.17	0.36	0.56	0.71	0.17	0.3	0.47	0.17	0.34	0.21	0.75	0.79	0.76	Maximum
Upper quartile	0.08	0.07	0.08	0.07	0.08	0.06	0.09	0.08	0.09	0.08	0.115	0.09	0.08	0.05	Upper quartile
Median	0.05	0.05	0.05	0.04	0.05	0.04	0.06	0.05	0.05	0.04	0.05	0.05	0.05	0.03	Median
Lower quartile	0.03	0.04	0.04	0.02	0.03	0.02	0.04	0.023	0.03	0.03	0.03	0.03	0.03	0.01	Lower quartile
Minimum	0.01	0.02	0.01	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.02	0.0	0.0	0.0	Minimum

Source: SIM Geological, January 2023.

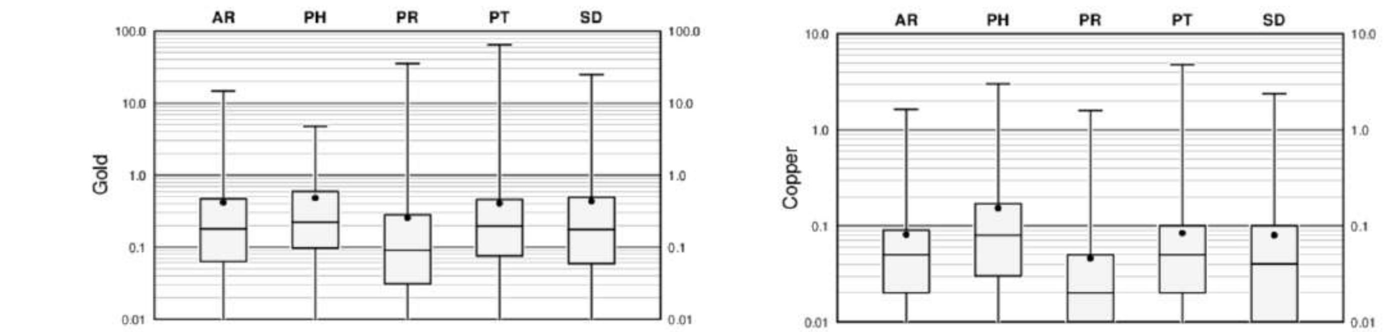
The additional elements—silver, molybdenum, sulphur, arsenic, and antimony—were evaluated by logged lithology type; there are no indications these distributions are controlled by lithology.

Lumina geologists recorded the following alteration types during core logging:

- argillic (AR)
- phyllic (PH)
- propylitic (PR)
- potassic (PT)
- calcium sodic (SD).

Figure 14-17 shows the distribution of gold and copper by alteration type at the Cangrejos deposit. There are slightly lower grades in the Argillic rocks, as these reflect the weathering near the surface over the deposit. Grades are also lower in the propyllitic rocks, as this type of alteration occurs around the perimeter of the deposit, generally outside of the mineralized zone. Grades tend to be higher in the phyllic rocks, but these are relatively rare and irregularly distributed. Similar trends are seen at the Gran Bestia deposit, as shown in Figure 14-18.

Figure 14-17: Boxplots of Gold and Copper by Logged Alteration Type at Cangrejos

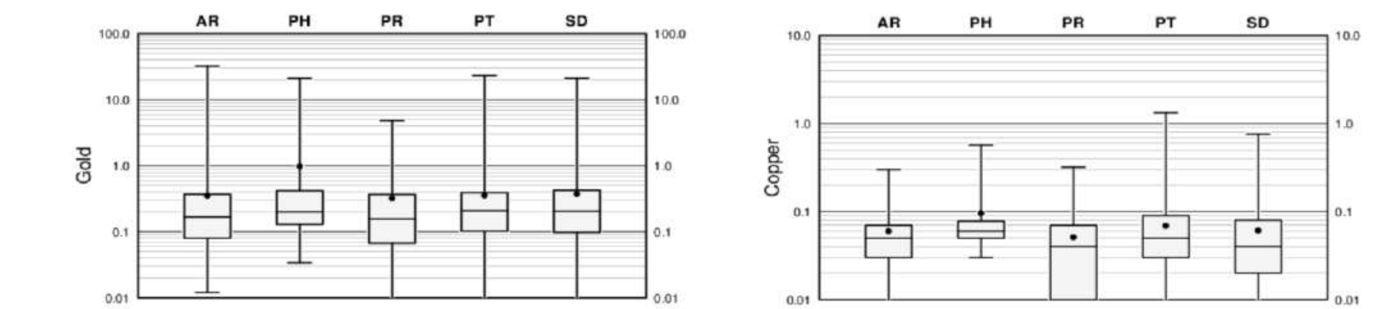


	AR	PH	PR	PT	SD
Number of data	2261	437	5572	12102	9692
Mean	0.416	0.483	0.255	0.406	0.436
Variance	0.597	0.454	0.444	1.028	0.72
Skewness	8.338	2.927	29.381	32.297	8.595
Coef of Variation	1.859	1.394	2.608	2.495	1.948
Maximum	14.7	4.75	35.6	64.9	24.9
Upper quartile	0.471	0.591	0.281	0.46	0.492
Median	0.18	0.222	0.09	0.196	0.175
Lower quartile	0.063	0.097	0.031	0.076	0.059
Minimum	0.003	0.003	0.003	0.002	0.002

	AR	PH	PR	PT	SD
Number of data	2261	437	5572	12102	9692
Mean	0.081	0.153	0.046	0.084	0.08
Variance	0.013	0.054	0.006	0.014	0.015
Skewness	4.663	5.598	5.503	8.494	4.909
Coef of Variation	1.378	1.525	1.758	1.427	1.541
Maximum	1.64	3.0	1.59	4.76	2.38
Upper quartile	0.09	0.17	0.05	0.1	0.1
Median	0.05	0.08	0.02	0.05	0.04
Lower quartile	0.02	0.03	0.01	0.02	0.01
Minimum	0.0	0.0	0.0	0.0	0.0

Source: SIM Geological, January 2023.

Figure 14-18: Boxplots of Gold and Copper by Logged Alteration Type at Gran Bestia



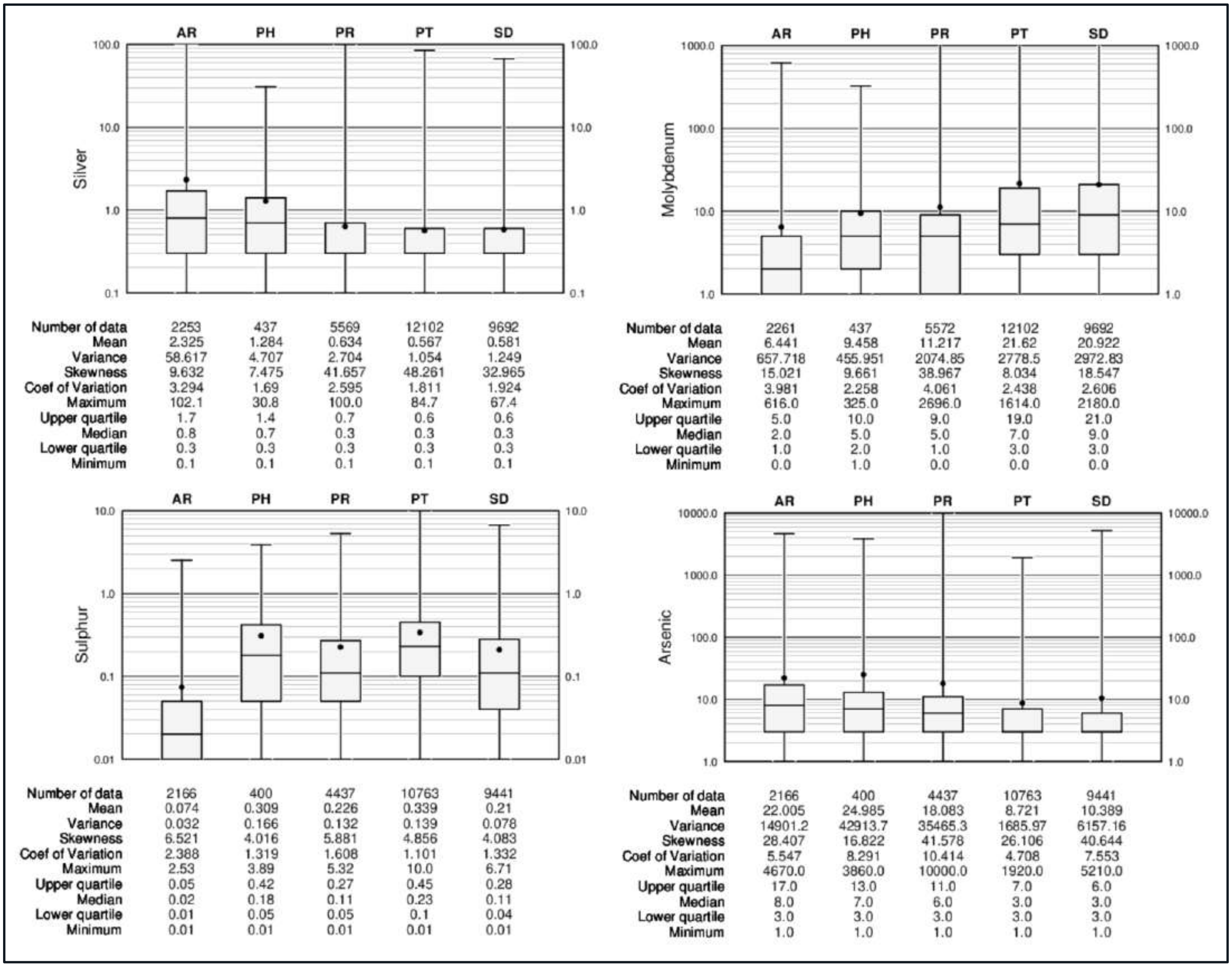
	AR	PH	PR	PT	SD
Number of data	813	35	436	7485	6548
Mean	0.352	0.983	0.321	0.355	0.373
Variance	1.545	12.131	0.247	0.509	0.422
Skewness	21.415	5.496	4.153	15.573	12.371
Coef of Variation	3.527	3.543	1.546	2.011	1.743
Maximum	32.3	21.1	4.83	23.2	21.2
Upper quartile	0.37	0.418	0.368	0.39	0.423
Median	0.168	0.199	0.157	0.207	0.205
Lower quartile	0.08	0.13	0.067	0.102	0.098
Minimum	0.012	0.034	0.003	0.003	0.003

	AR	PH	PR	PT	SD
Number of data	813	35	436	7485	6548
Mean	0.06	0.096	0.051	0.069	0.061
Variance	0.002	0.014	0.003	0.004	0.004
Skewness	1.851	3.015	1.981	4.016	3.201
Coef of Variation	0.654	1.235	1.013	0.931	1.027
Maximum	0.3	0.57	0.32	1.33	0.76
Upper quartile	0.07	0.078	0.07	0.09	0.08
Median	0.05	0.06	0.04	0.05	0.04
Lower quartile	0.03	0.05	0.01	0.03	0.02
Minimum	0.0	0.03	0.0	0.0	0.0

Source: SIM Geological, January 2023.

The additional elements—silver, molybdenum, sulphur, arsenic, and antimony—were evaluated by logged alteration type. The argillic rocks, reflecting the weathered rocks near the surface, tend to have higher silver and lower molybdenum and sulphur contents compared to the other alteration assemblages. Arsenic is lower in potassic and calcium-sodic rocks. Antimony is similar across all alteration types. Examples of silver, molybdenum, sulphur, and arsenic by alteration type at Cangrejos are shown in Figure 14-19. Similar trends for these additional elements are also seen at Gran Bestia.

Figure 14-19: Boxplots of Silver, Molybdenum, Sulphur, and Arsenic By Logged Alteration Type at Cangrejos



Silver

	AR	PH	PR	PT	SD
Number of data	2253	437	5569	12102	9692
Mean	2.325	1.284	0.634	0.567	0.581
Variance	58.617	4.707	2.704	1.054	1.249
Skewness	9.632	7.475	41.657	48.261	32.965
Coef of Variation	3.294	1.69	2.595	1.811	1.924
Maximum	102.1	30.8	100.0	84.7	67.4
Upper quartile	1.7	1.4	0.7	0.6	0.6
Median	0.8	0.7	0.3	0.3	0.3
Lower quartile	0.3	0.3	0.3	0.3	0.3
Minimum	0.1	0.1	0.1	0.1	0.1

Molybdenum

	AR	PH	PR	PT	SD
Number of data	2261	437	5572	12102	9692
Mean	6.441	9.458	11.217	21.62	20.922
Variance	657.718	455.951	2074.85	2778.5	2972.83
Skewness	15.021	9.661	38.967	8.034	18.547
Coef of Variation	3.981	2.258	4.061	2.438	2.606
Maximum	616.0	325.0	2696.0	1614.0	2180.0
Upper quartile	5.0	10.0	9.0	19.0	21.0
Median	2.0	5.0	5.0	7.0	9.0
Lower quartile	1.0	2.0	1.0	3.0	3.0
Minimum	0.0	1.0	0.0	0.0	0.0

Sulphur

	AR	PH	PR	PT	SD
Number of data	2166	400	4437	10763	9441
Mean	0.074	0.309	0.226	0.339	0.21
Variance	0.032	0.166	0.132	0.139	0.078
Skewness	6.521	4.016	5.881	4.856	4.083
Coef of Variation	2.388	1.319	1.608	1.101	1.332
Maximum	2.53	3.89	5.32	10.0	6.71
Upper quartile	0.05	0.42	0.27	0.45	0.28
Median	0.02	0.18	0.11	0.23	0.11
Lower quartile	0.01	0.05	0.05	0.1	0.04
Minimum	0.01	0.01	0.01	0.01	0.01

Arsenic

	AR	PH	PR	PT	SD
Number of data	2166	400	4437	10763	9441
Mean	22.005	24.985	18.083	8.721	10.389
Variance	14901.2	42913.7	35465.3	1685.97	6157.16
Skewness	28.407	16.822	41.578	26.106	40.644
Coef of Variation	5.547	8.291	10.414	4.708	7.553
Maximum	4670.0	3860.0	10000.0	1920.0	5210.0
Upper quartile	17.0	13.0	11.0	7.0	6.0
Median	8.0	7.0	6.0	3.0	3.0
Lower quartile	3.0	3.0	3.0	3.0	3.0
Minimum	1.0	1.0	1.0	1.0	1.0

Source: SIM Geological, January 2023.

Near-surface oxidation is logged based on the following unit descriptions:

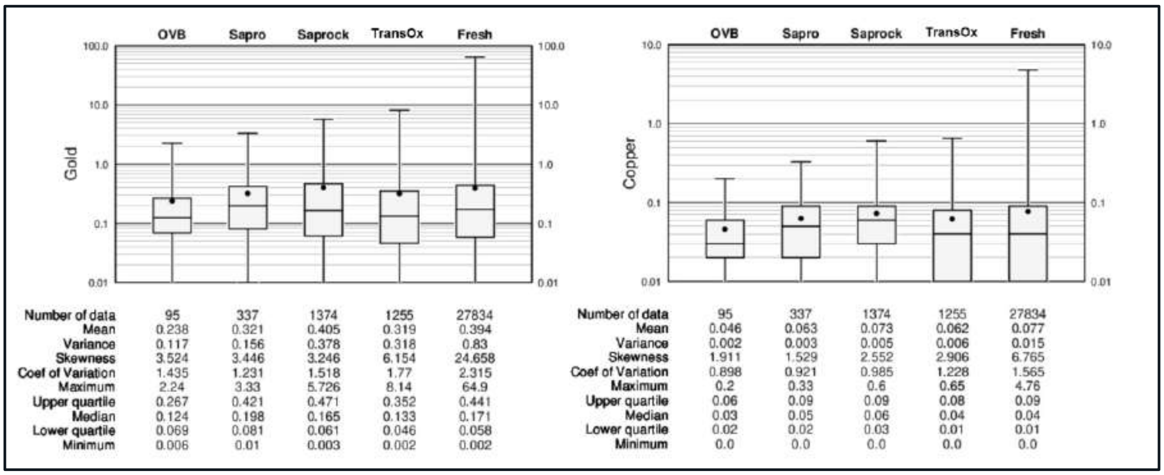
- overburden (OVB)
- saprolite (SAP – highly weathered with no original textures remaining)

- saprock (SRK – highly weathered with internal unweathered remnants)
- transitional oxidation (TransOx – signs of visual oxidation with generally quite weak weathering)
- unweathered rocks (Fresh).

The somewhat restricted sample data from the Overburden shows that gold and copper are present in minor quantities, but it is assumed that none of these metals are recoverable and, as a result, there are no grade estimates in this area of the resource block model, and it is assumed that all overburden material is waste.

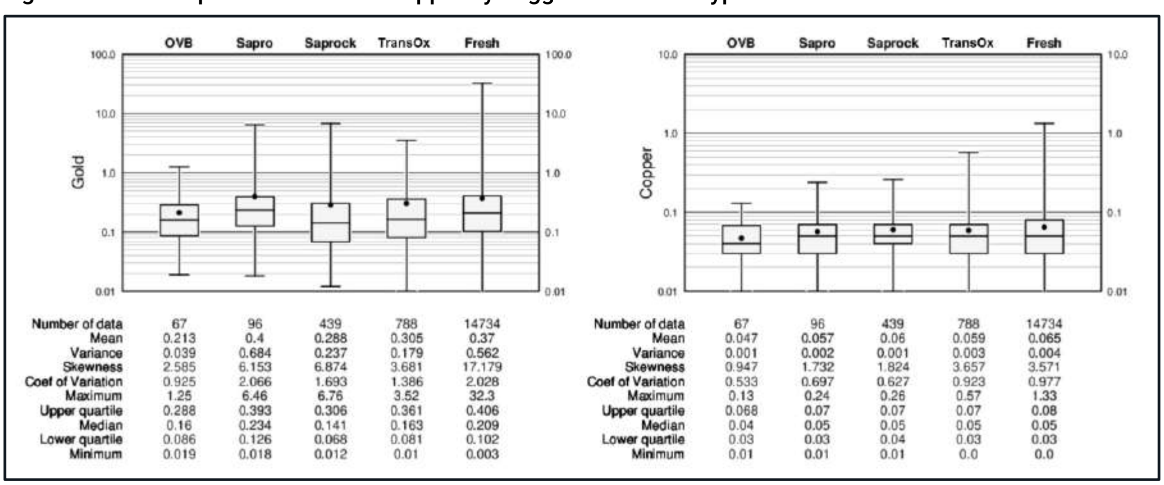
Figure 14-20 shows the distributions of gold and copper contained within the logged oxidation types at Cangrejos. Both gold and copper grades tend to be very similar across all oxidation types. Similar results are seen at Gran Bestia, as shown in Figure 14-21.

Figure 14-20: Boxplots of Gold and Copper by Logged Oxidation Type at Cangrejos



Source: SIM Geological, January 2023.

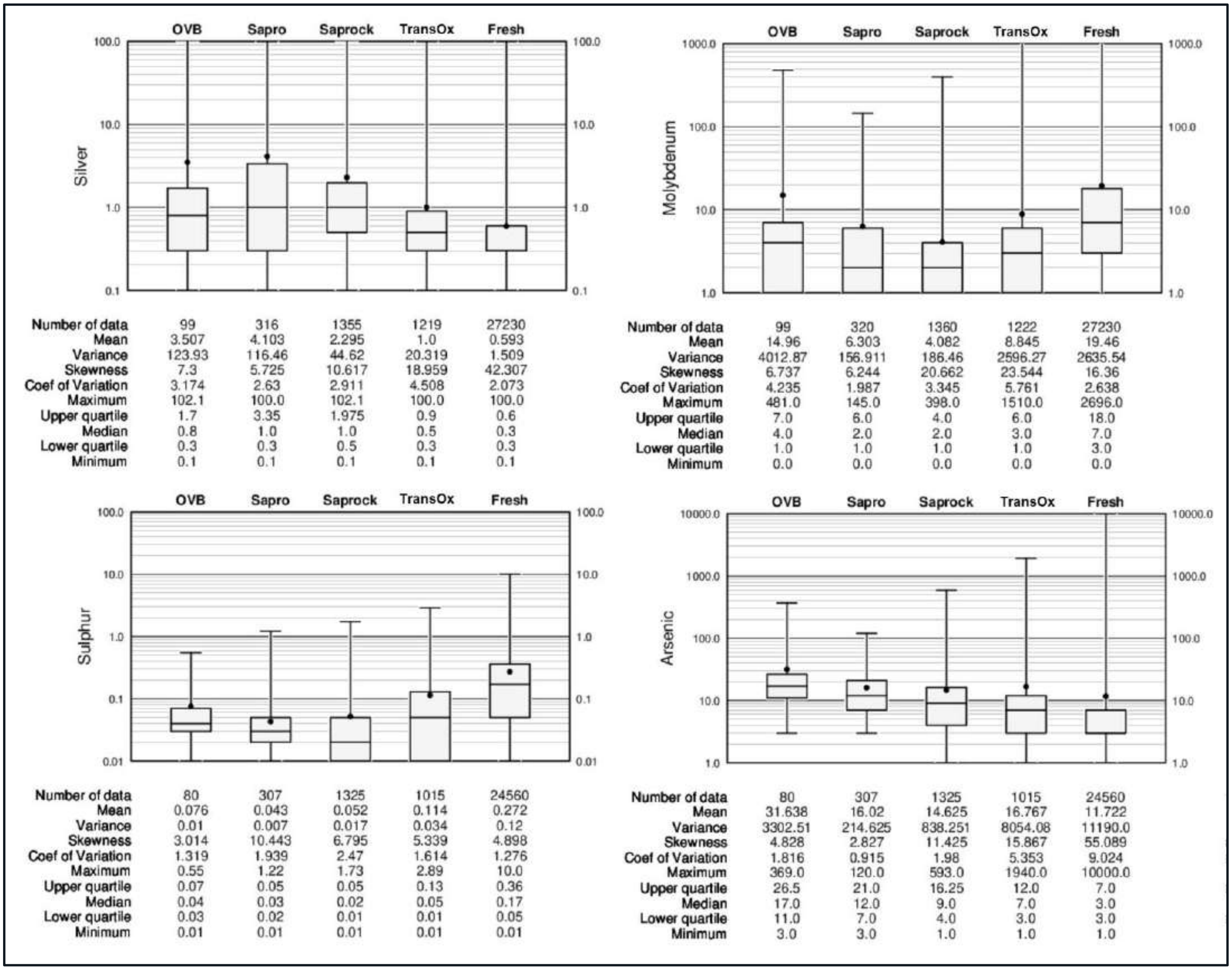
Figure 14-21: Boxplots of Gold and Copper by Logged Oxidation Type at Gran Bestia



Source: SIM Geological, January 2023.

The additional elements—silver, molybdenum, sulphur, arsenic, and antimony—were evaluated by oxidation type. Silver grades are higher, and molybdenum and sulphur grades are lower, in the Saprolite and Saprock rocks compared to the other units. Arsenic grades tend to decrease with decreasing levels of oxidation. Antimony grades remain relatively constant across all oxidation types. Examples of silver, molybdenum, sulphur, and arsenic by oxidation type at Cangrejos are shown in Figure 14-22. Similar trends for these additional elements are also seen at Gran Bestia.

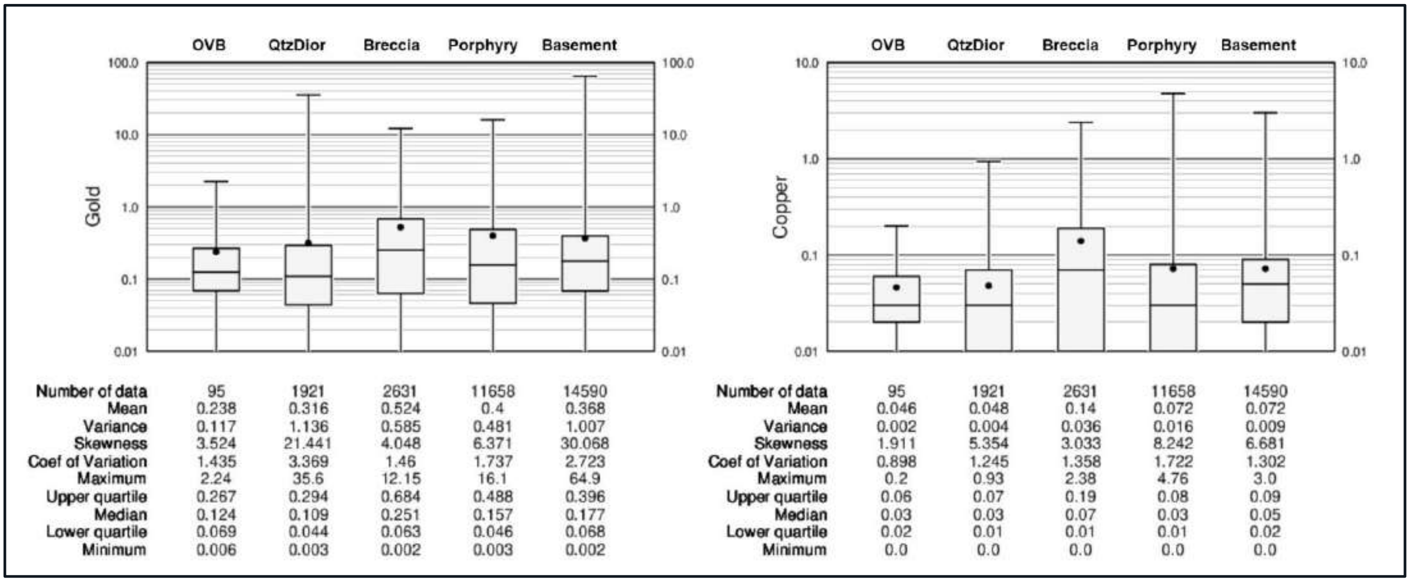
Figure 14-22: Boxplots of Silver, Molybdenum, Sulphur, and Arsenic by Logged Oxidation Type at Cangrejos



Source: SIM Geological, January 2023.

Lithology codes were assigned to the composited sample data using the interpreted lithology domains shown in Figure 14-12 and Figure 14-13. The distributions of gold and copper by interpreted lithologic domain are shown in Figure 14-23 for the Cangrejos deposit. Both gold and copper grades are similar across all domains except in the Breccia zone, where grades are somewhat elevated. Similar trends for these metals are seen at the Gran Bestia deposit (Figure 14-24).

Figure 14-23: Boxplots of Gold and Copper by Interpreted Lithology Domain at Cangrejos

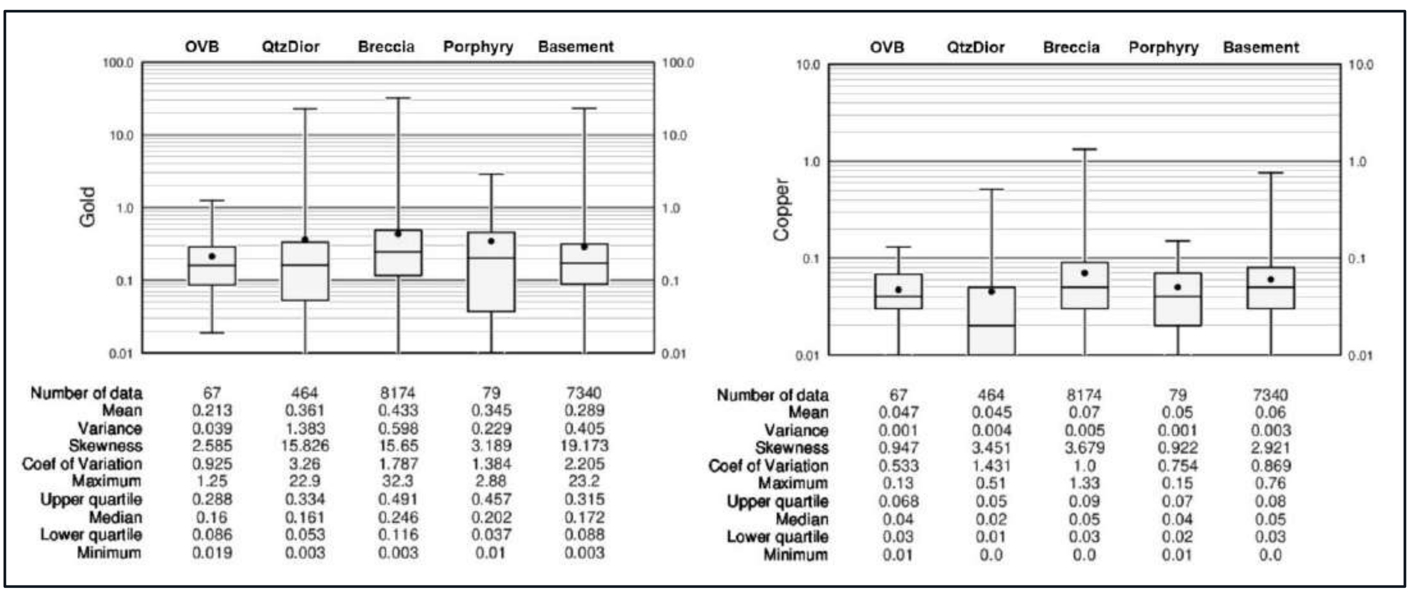


Gold	OVB	QtzDior	Breccia	Porphyry	Basement
Number of data	95	1921	2631	11658	14590
Mean	0.238	0.316	0.524	0.4	0.368
Variance	0.117	1.136	0.585	0.481	1.007
Skewness	3.524	21.441	4.048	6.371	30.068
Coef of Variation	1.435	3.369	1.46	1.737	2.723
Maximum	2.24	35.6	12.15	16.1	64.9
Upper quartile	0.267	0.294	0.684	0.488	0.396
Median	0.124	0.109	0.251	0.157	0.177
Lower quartile	0.069	0.044	0.063	0.046	0.068
Minimum	0.006	0.003	0.002	0.003	0.002

Copper	OVB	QtzDior	Breccia	Porphyry	Basement
Number of data	95	1921	2631	11658	14590
Mean	0.046	0.048	0.14	0.072	0.072
Variance	0.002	0.004	0.036	0.016	0.009
Skewness	1.911	5.354	3.033	8.242	6.681
Coef of Variation	0.898	1.245	1.358	1.722	1.302
Maximum	0.2	0.93	2.38	4.76	3.0
Upper quartile	0.06	0.07	0.19	0.08	0.09
Median	0.03	0.03	0.07	0.03	0.05
Lower quartile	0.02	0.01	0.01	0.01	0.02
Minimum	0.0	0.0	0.0	0.0	0.0

Source: SIM Geological, January 2023.

Figure 14-24: Boxplots of Gold and Copper by Interpreted Lithology Domain at Gran Bestia



Gold	OVB	QtzDior	Breccia	Porphyry	Basement
Number of data	67	464	8174	79	7340
Mean	0.213	0.361	0.433	0.345	0.289
Variance	0.039	1.383	0.598	0.229	0.405
Skewness	2.585	15.826	15.65	3.189	19.173
Coef of Variation	0.925	3.26	1.787	1.384	2.205
Maximum	1.25	22.9	32.3	2.88	23.2
Upper quartile	0.288	0.334	0.491	0.457	0.315
Median	0.16	0.161	0.246	0.202	0.172
Lower quartile	0.086	0.053	0.116	0.037	0.088
Minimum	0.019	0.003	0.003	0.01	0.003

Copper	OVB	QtzDior	Breccia	Porphyry	Basement
Number of data	67	464	8174	79	7340
Mean	0.047	0.045	0.07	0.05	0.06
Variance	0.001	0.004	0.005	0.001	0.003
Skewness	0.947	3.451	3.679	0.922	2.921
Coef of Variation	0.533	1.431	1.0	0.754	0.869
Maximum	0.13	0.51	1.33	0.15	0.76
Upper quartile	0.068	0.05	0.09	0.07	0.08
Median	0.04	0.02	0.05	0.04	0.05
Lower quartile	0.03	0.01	0.03	0.02	0.03
Minimum	0.01	0.0	0.0	0.01	0.0

Source: SIM Geological, January 2023.

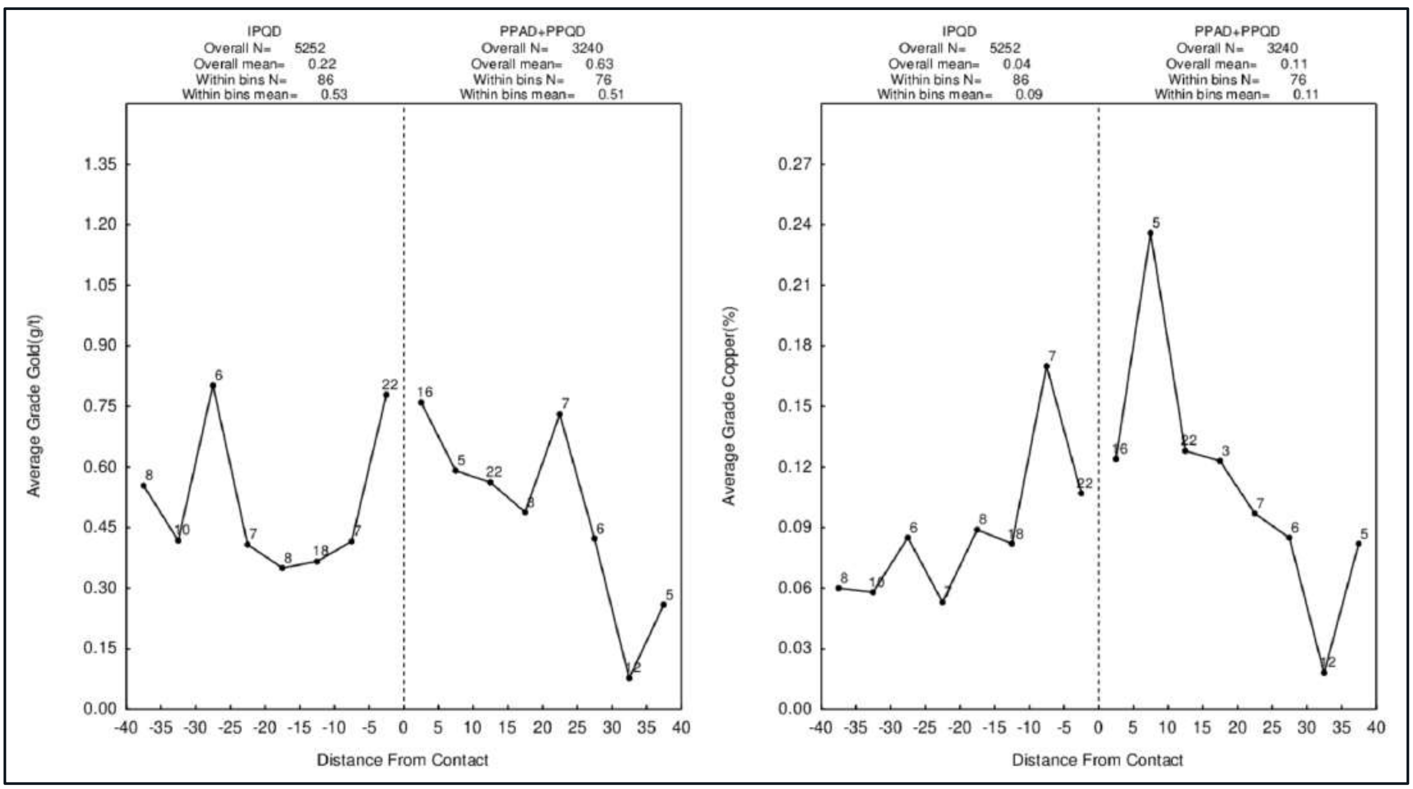
14.7.2 Contact Profiles

Contact profiles evaluate the nature of grade trends between two domains: they graphically display the average grades at increasing distances from the contact boundary. Those contact profiles that show a marked difference in grade across a domain boundary indicate that the two datasets should be isolated during interpolation. Conversely, if a more gradual change in grade occurs across a contact, the introduction of a hard boundary (e.g., segregation during interpolation) may result in a much different trend in the grade model; in this case, the change in grade between domains in the model is often more abrupt than the trends seen in the raw data. Finally, a flat contact profile indicates no grade changes across the boundary; in this case, hard or soft domain boundaries will produce similar results in the model.

A series of contact profiles were produced to evaluate the nature of grade changes across various lithologic, alteration, and oxidation rock units that were identified in boxplots as being potentially distinct or unique.

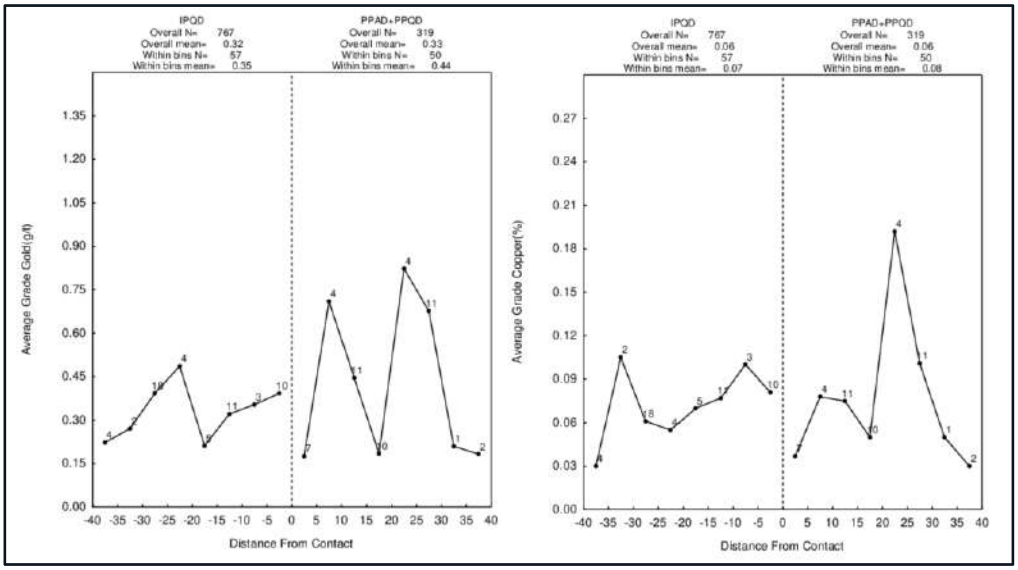
Figure 14-25 shows the gold and copper grades across the boundary of the logged lithology unit IPQD at Cangrejos and in Figure 14-26 at Gran Bestia. As the name suggests, this porphyry unit is "intermineral" or considered weakly mineralized compared to the others (as shown in the boxplots in Figure 14-15 and Figure 14-16). The contact profiles show that, although the IPQD contains less mineralization, the nature of the grade changes at the contact of this rock type is the same or transitional with the surrounding rocks. This is an indication that this rock type is not distinct with respect to the gold and copper content.

Figure 14-25: Contact Profiles for Gold and Copper Samples Between Logged Intramineral PQP (IPGD) and The Other Surrounding Porphyritic Rocks at Cangrejos



Source: SIM Geological, January 2023.

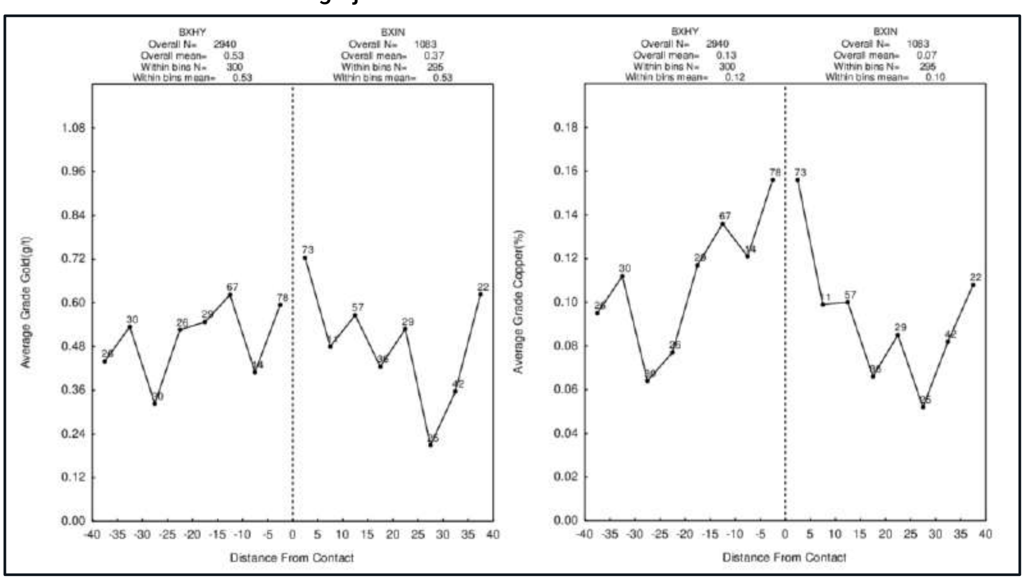
Figure 14-26: Contact Profiles for Gold and Copper Samples Between Logged Intramineral PQD (IPQD) and The Other Surrounding Porphyritic Rocks at Gran Bestia



Source: SIM Geological, January 2023.

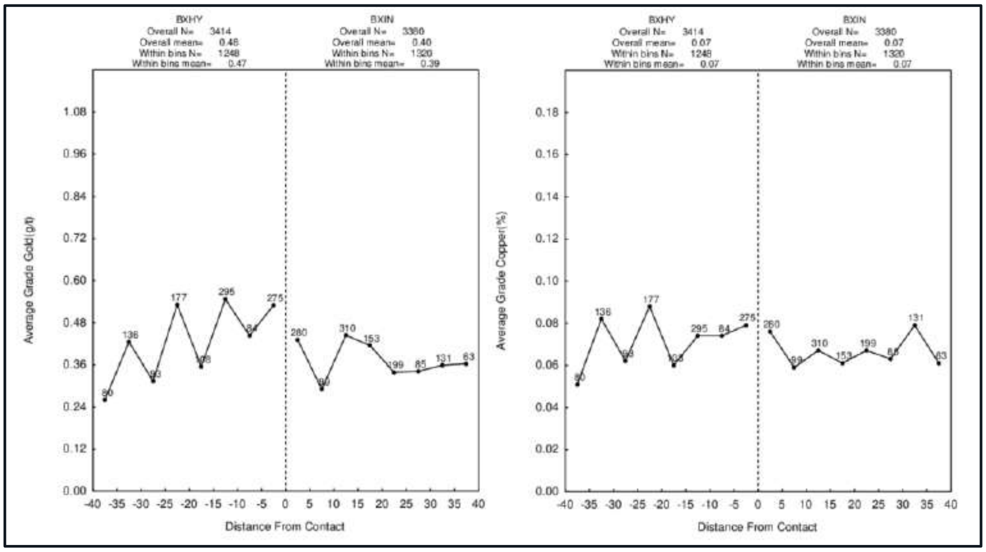
Figure 14-27 and Figure 14-28 compare the gold and copper grades between the two logged breccia types (hydrothermal and intrusive) at Cangrejos and Gran Bestia, respectively. These show that there are no distinct differences in the grades between these rock types and, as a result, they do not need to be segregated during the development of the gold and copper grade models.

Figure 14-27: Contact Profiles for Gold and Copper Samples Between Logged Hydrothermal and Intrusive Breccia Units at Cangrejos



Source: SIM Geological, January 2023.

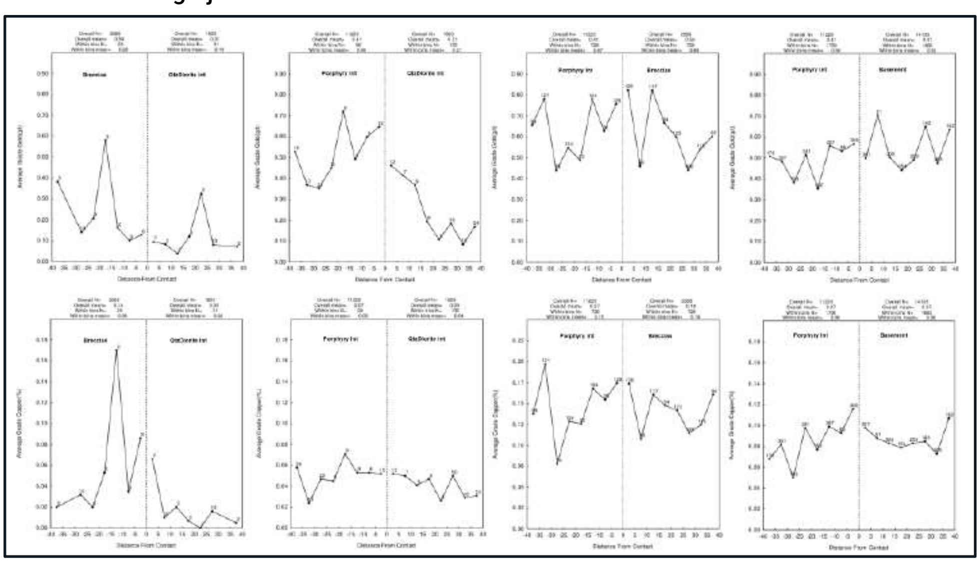
Figure 14-28: Contact Profiles for Gold and Copper Samples Between Logged Hydrothermal and Intrusive Breccia Units at Gran Bestia



Source: SIM Geological, January 2023.

Figure 14-29 shows a series of contact profiles showing the nature of gold and copper grades across the various boundary contacts of the interpreted lithology domains (as shown in Figure 14-12 and Figure 14-13) at the Cangrejos deposit area. All grades either remain constant or are transitional across all domain boundaries, suggesting that none of these act as distinct controls over the distribution of gold or silver in the deposit. Similar results are also seen at the Gran Bestia deposit.

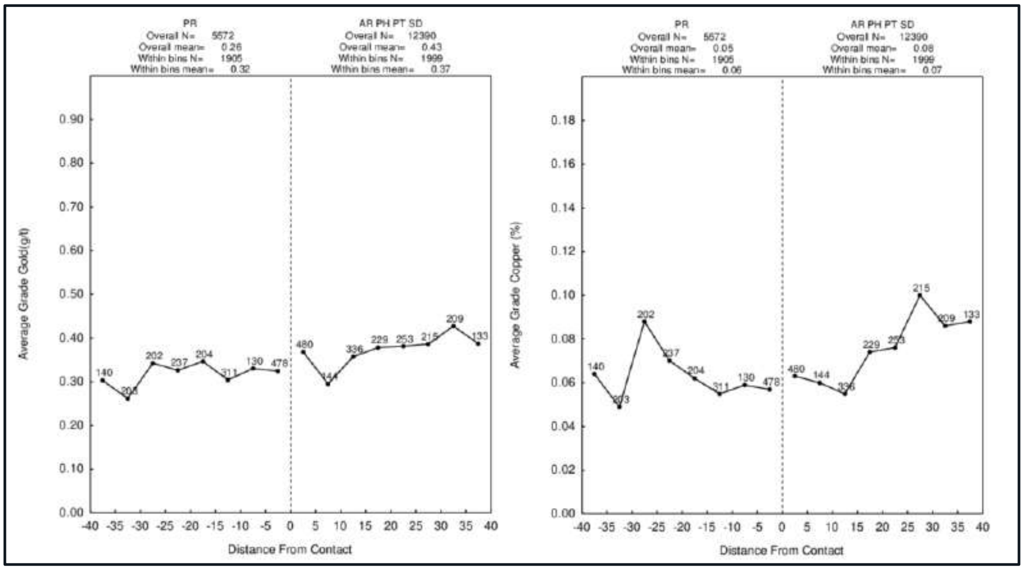
Figure 14-29: Contact Profiles for Gold and Copper Samples Between Interpreted Lithology Domains at Cangrejos



Source: SIM Geological, January 2023.

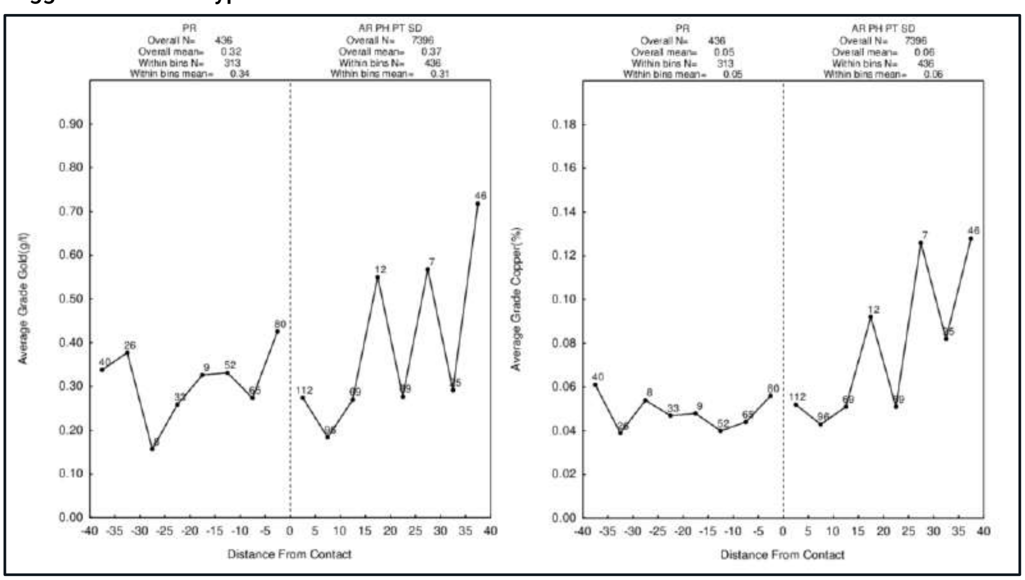
Figure 14-30 and Figure 14-31 show the gold and copper grades across the contact between propylitic versus all other logged alteration types. Although the boxplots in Figure 14-17 and Figure 14-18 indicate that propylitic altered rocks have lower gold and copper grades, these contact profiles show that there are no distinct changes in grades at the boundaries of these domains.

Figure 14-30: Contact Profiles for Gold and Copper Samples Between Propylitic and All Other Logged Alteration Types at Cangrejos



Source: SIM Geological, January 2023.

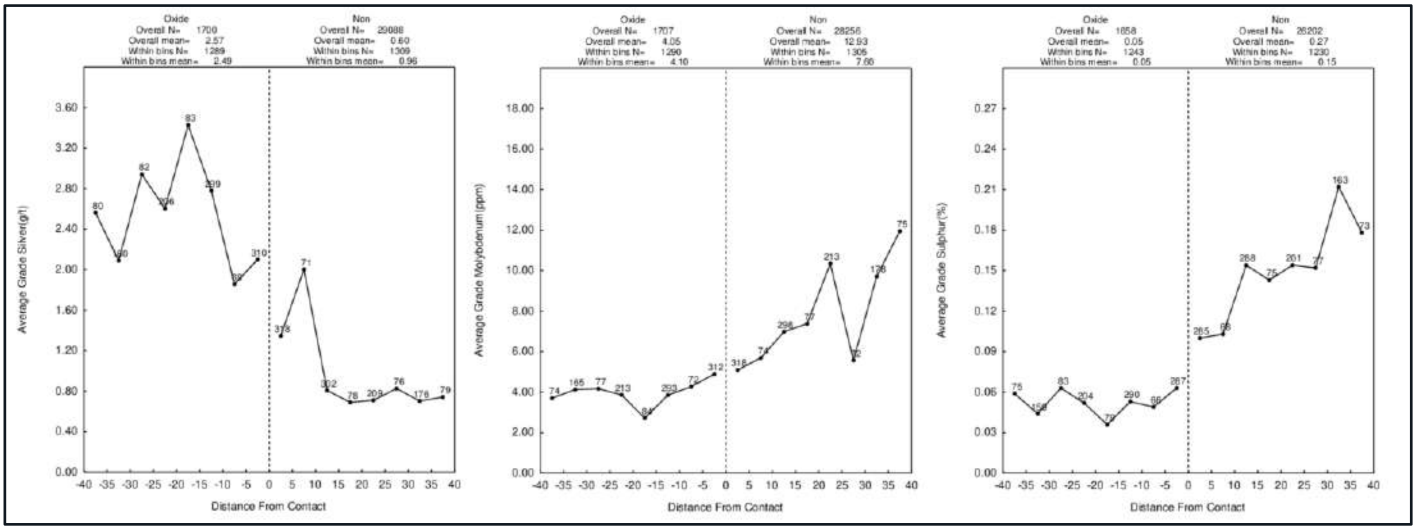
Figure 14-31: Contact Profiles for Gold and Copper Samples Between Propyllitic and All Other Logged Alteration Types at Gran Bestia



Source: SIM Geological, January 2023.

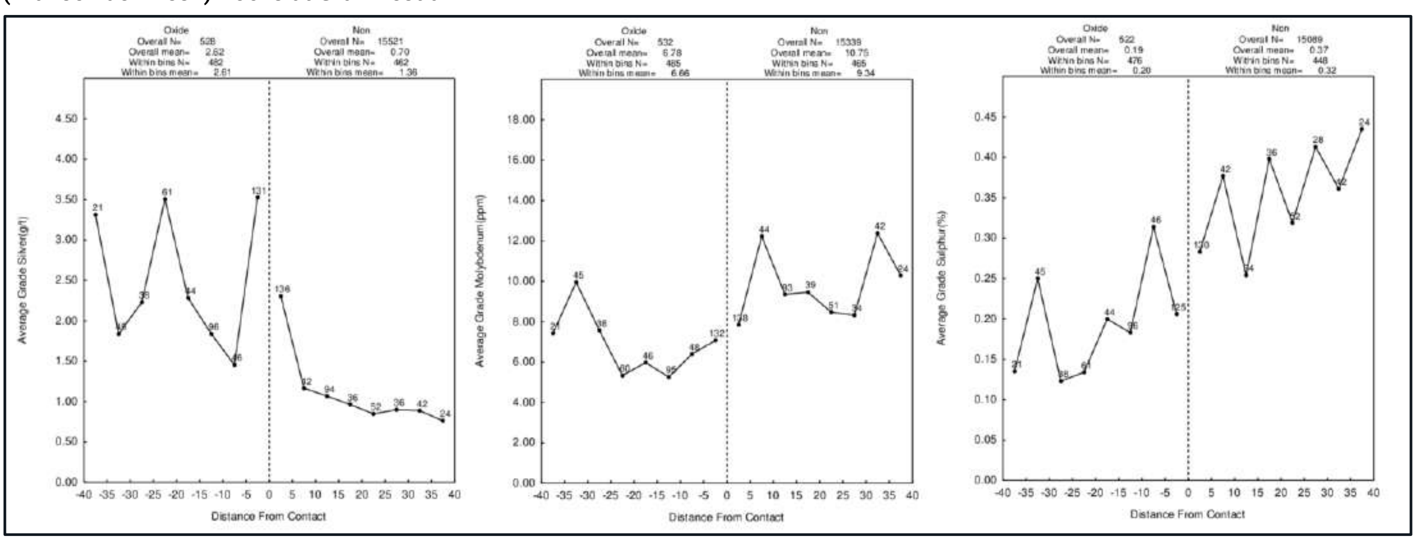
A series of contact profiles were generated to evaluate the nature of grade changes at the boundaries between the oxidation domains. There were no distinct differences in the gold, copper, arsenic, or antimony grades at any of the contacts between these domains. However, the distributions of silver, molybdenum, and sulphur all show rather abrupt grade changes along the contact between highly oxidized rocks (Saprolite + Saprock) compared to the underlying rocks (Transitional Oxidation + Fresh) as shown in Figure 14-32 at Cangrejos and Figure 14-33 at Gran Bestia.

Figure 14-32: Contact Profiles for Silver, Molybdenum, and Sulphur Samples Between Oxidized (Sap+Srk) Vs. Other (Transoxide+Fresh) Rocks at Cangrejos



Source: SIM Geological, January 2023.

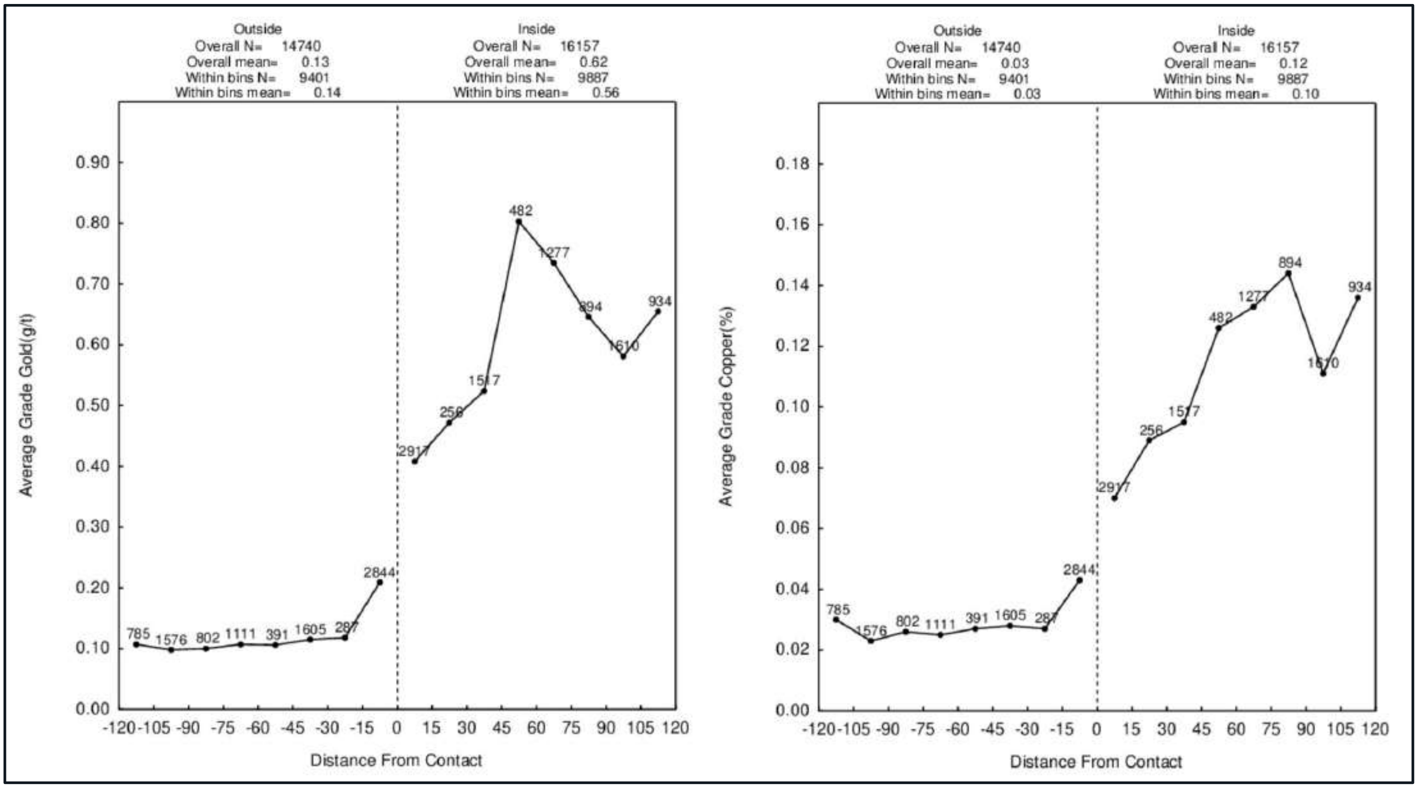
Figure 14-33: Contact Profiles for Silver, Molybdenum, and Sulphur Samples Between Oxidized (Sap+Srk) Vs. Other (Transoxide+Fresh) Rocks at Gran Bestia



Source: SIM Geological, January 2023.

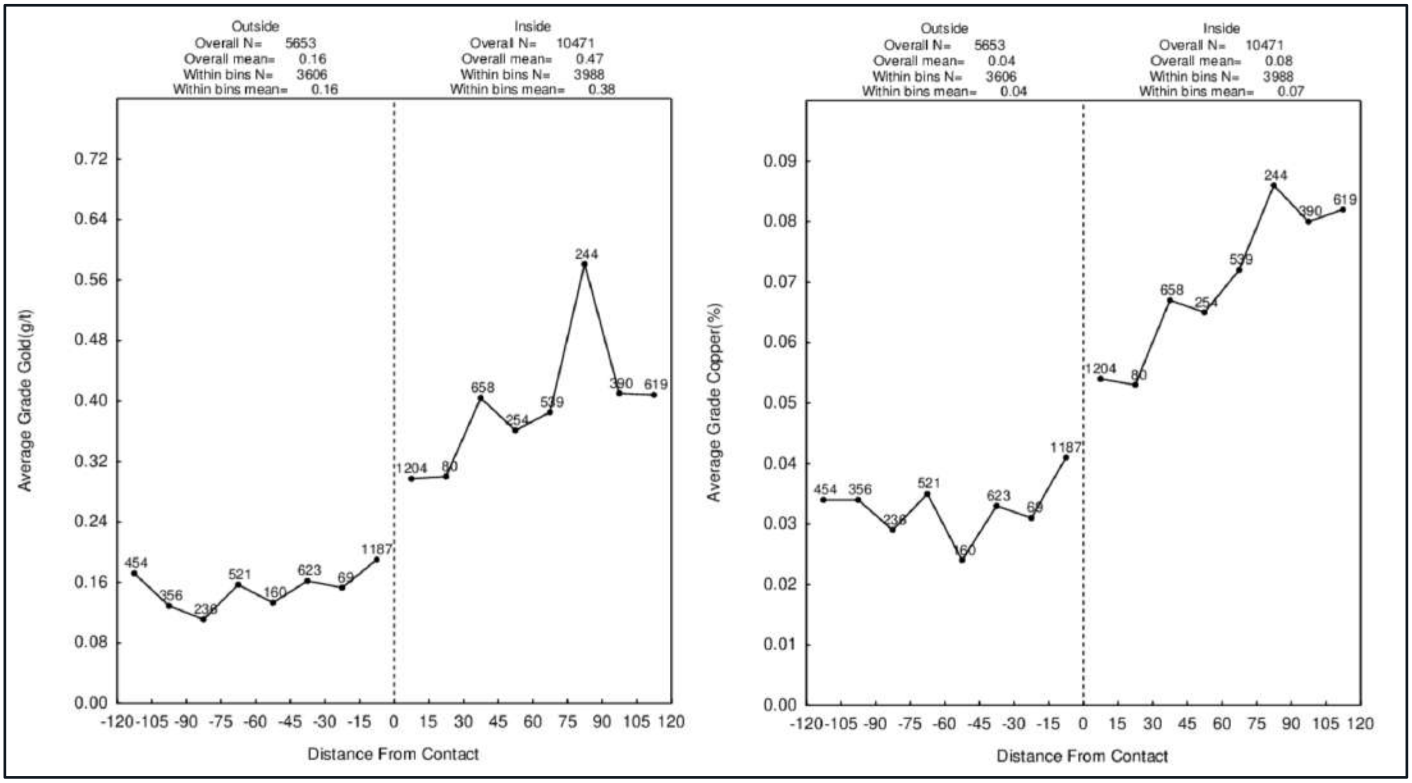
Figure 14-34 and Figure 14-35 show the change in grade for both gold and copper moving across the contact of the grade probability shell domain at Cangrejos and Gran Bestia, respectively. The changes in grade are considered significant. Note that the distributions of gold and copper in the deposits are quite coincident and, as a result, the gold probability shell domain also encompasses areas with elevated copper mineralization. In the absence of geologic controls, the probability shell domain essentially segregates mineralized from unmineralized rocks for estimation purposes of gold and copper. The probability shell does not, however, act as a distinct domain for any of the other elements (i.e., silver, molybdenum, sulphur, arsenic or antimony).

Figure 14-34: Contact Profiles for Gold and Copper Across the Probability Grade Shell Domain at Cangrejos



Source: SIM Geological, January 2023.

Figure 14-35: Contact Profiles for Gold and Copper Across The Probability Grade Shell Domain at Gran Bestia



Source: SIM Geological, January 2023.

14.7.3 Conclusions and Modelling Implications

The results of the EDA indicate that none of the elements included in the mineral resource model are distinctly controlled by either lithology or alteration. This is not that uncommon in porphyry-type deposits where mineralization is often present in both the intrusive (porphyry) as well as the host rocks, and grades tend to be gradational or transitional in nature. The probability shell domain is considered a good approach in defining areas where gold and copper mineralization are likely to be present. The oxidation domains are quite recent events and have little to no influence on the distribution of gold or copper in the deposits.

The distributions of silver, molybdenum, and sulphur are moderately influenced by the presence of the saprolite and saprock layers. These boundaries should be recognized during grade estimation for these elements.

There are no apparent domain controls over the distribution of arsenic and antimony in the deposits.

A summary of estimate domains is shown in Table 14-3.

Table 14-3: Summary of Estimation Domains

Element	Domain	Boundary Type
Gold	ProbShell	Hard
Copper	ProbShell	Hard
Silver	SAP+SRK, TransOxide+Fresh	Hard
Molybdenum	SAP+SRK, TransOxide+Fresh	Hard
Sulphur	SAP+SRK, TransOxide+Fresh	Hard
Arsenic	No controlling domains	n/a
Antimony	No controlling domains	n/a
SG	TransOxide+Fresh only	
(Assign SG to SAP, SRK and OVB)	Hard	

Source: SIM Geological, January 2023.

14.8 Evaluation of Outlier Grades

Histograms and probability plots for the distribution of gold, copper, silver, molybdenum, sulphur, arsenic, and antimony were reviewed to identify the presence of anomalous outlier grades in the composited (2 m) database. Following a review of the physical location of potentially erratic samples in relation to the surrounding sample data, it was decided that these would be controlled during block grade interpolations using a combination of traditional top-cutting and the application of outlier limitations. An outlier limitation controls the distance of influence of samples above a defined grade threshold. During grade interpolations, samples above the outlier thresholds are limited to a maximum distance of influence of 35 m.

The grade thresholds are shown in Table 14-4 for Cangrejos and Table 14-5 for Gran Bestia. These tables also list the reduction in contained metal (as a percentage) resulting from the treatment of anomalous high-grade sample data (loss in contained metal calculated in model blocks within a maximum distance of 100 m from a drillhole). For essentially all elements, these reductions are considered appropriate for projects at this stage of exploration.

The relative loss of contained gold and silver are higher at Cangrejos than Gran Bestia due to several factors: there are more potentially anomalous higher-grade samples at Cangrejos and several of the potentially anomalous gold and silver samples occur very near the end of drillholes, where the impact of surrounding, lower grade samples, is somewhat diminished.

The impact of these restrictions on arsenic is very high in both deposit areas because, in both instances, there are one or two very high-grade samples that occur in relatively isolated locations and, as a result, they have a relatively large impact on the block model. For example, the last sample in drillhole C19-129 has a grade of 10,000 ppm As. Ignoring the effects of this one sample reduces the amount of contained metal lost due to outlier restrictions on the remaining data from -29.6% to -3.8%. Therefore, although the amount of metal lost appears to be excessive, it is felt that the approach taken here is considered appropriate.

Table 14-4: Treatment of Outlier Sample Data at Cangrejos

Element	Domain	Maximum	Top-Cut Limit	Outlier Limit	Contained Metal Lost (%)
Gold (g/t)	Inside Shell	64.900	35	9	-7.9
	Outside Shell	38.000	35	5	
Copper (%)	Inside Shell	4.76	2.50	1.50	-0.8
	Outside Shell	3.00	-	0.50	
Silver (g/t)	SAP+SRK	102.1	-	35	-11.1
	TransOx+Fresh	100	-	20	
Molybdenum (ppm)	SAP+SRK	398	-	50	-5
	TransOx+Fresh	2,696	1,600	600	
Sulphur (%)	SAP+SRK	1.73	-	1	-0.7
	TransOx+Fresh	10	6	3.5	
Arsenic (ppm)	All	10,000	6,000	2,000	-29.6
Antimony (ppm)	All	1,960	600	150	-5.9

Note: Table 14-4 reflects 2 m composited drillhole data. Source: SIM Geological, January 2023.

Table 14-5: Treatment Of Outlier Sample Data At Gran Bestia

Element	Domain	Maximum	Top-Cut Limit	Outlier Limit	Contained Metal Lost (%)
Gold (g/t)	Inside Shell	32.300	-	8	-4.4
	Outside Shell	22.900	-	4	
Copper (%)	Inside Shell	1.33	1	0.6	-1
	Outside Shell	0.61	-	0.3	
Silver (g/t)	SAP+SRK	92.5	-	30	-4.7
	TransOx+Fresh	85.2	-	20	
Molybdenum (ppm)	SAP+SRK	207	-	40	-4.7
	TransOx+Fresh	2,170	1,200	300	
Sulphur (%)	SAP+SRK	1.95	-	0.7	-0.3
	TransOx+Fresh	5.93	-	3.5	
Arsenic (ppm)	All	8,720	5,000	600	-30.9
Antimony (ppm)	All	724	200	100	-3.8

Note: Table 14-5 reflects 2 m composited drillhole data. Source: SIM Geological, January 2023.

14.9 Variography

The degree of spatial variability in a mineral deposit depends on both the distance and direction between points of comparison. Typically, the variability between samples increases as the distance between those samples increases. If the degree of variability is related to the direction of comparison, then the deposit is said to exhibit anisotropic tendencies which can be summarized with the search ellipse. The semi-variogram is a common function used to measure the spatial variability within a deposit.

The components of the variogram include the nugget, the sill, and the range. Often samples compared over very short distances, even samples compared from the same location, show some degree of variability. As a result, the curve of the variogram often begins at some point on the y-axis above the origin: this point is called the nugget. The nugget is a measure of not only the natural variability of the data over very short distances but also a measure of the variability which can be introduced due to errors during sample collection, preparation, and the assay process.

The amount of variability between samples typically increases as the distance between the samples increases. Eventually, the degree of variability between samples reaches a constant, maximum value: this is called the sill and the distance between samples at which this occurs is called the range.

In this report, the spatial evaluation of the data was conducted using a correlogram rather than the traditional variogram. The correlogram is normalized to the variance of the data and is less sensitive to outlier values, generally giving better results.

Variograms were prepared using the commercial software package Sage 2001© developed by Isaaks & Co. Multidirectional variograms for gold, copper, silver, molybdenum, and sulphur were generated from the sample data located inside the pertinent estimation domains. The results are summarized in Table 14-6 and Table 14-7. The gold and copper variograms were generated using sample data located inside the probability shell domain, and these variograms were used to estimate grades both inside and outside of the probability shell domain.

Table 14-6: Variogram Parameters for Cangrejos

Element	Nugget	Sill 1	Sill 2	1st Structure			2nd Structure		
				Range (m)	Azimuth (°)	Dip	Range (m)	Azimuth (°)	Dip
Gold	0.300	0.522	0.178	27	41	79	260	131	62
	Spherical			21	59	-10	233	300	28
				9	149	3	85	32	4
Copper	0.300	0.443	0.257	60	347	-25	875	314	32
	Spherical			42	254	-6	590	177	50
				23	331	64	152	58	22
Silver	0.500	0.432	0.068	36	347	-45	542	153	4
	Spherical			32	71	6	227	342	86
				6	335	45	212	63	-1
Molybdenum	0.226	0.667	0.108	90	44	-10	1600	12	89
	Spherical			27	2	77	310	226	1
				10	132	8	207	136	1
Sulphur	0.300	0.360	0.340	82	348	-26	633	76	-25
	Spherical			34	267	18	553	65	65
				26	28	58	301	344	-4
Arsenic	0.669	0.260	0.071	258	92	23	200	201	22
	Spherical			20	346	32	134	323	52
				7	211	48	57	98	29
Antimony	0.848	0.101	0.051	143	83	42	264	165	31
	Spherical			95	40	-39	79	325	57
				6	330	23	60	69	9

Note: Correlograms were conducted on 2 m composite sample data. Source: SIM Geological, January 2023.

Table 14-7: Variogram Parameters for Gran Bestia

Element	Nugget	Sill 1	Sill 2	1st Structure			2nd Structure		
				Range (m)	Azimuth (°)	Dip	Range (m)	Azimuth (°)	Dip
Gold	0.600	0.282	0.118	43	50	-35	305	19	25
	Spherical			20	355	40	160	72	-52
				7	115	31	129	122	27
Copper	0.550	0.342	0.107	42	355	33	1233	35	64
	Spherical			27	86	2	298	251	21
				26	179	57	180	155	14
Silver	0.650	0.275	0.075	54	3	-46	913	43	60
	Spherical			19	315	33	498	197	28
				11	64	26	269	113	-11
Molybdenum	0.700	0.248	0.052	84	57	-48	2626	272	51
	Spherical			37	323	-4	624	104	38
				12	49	42	323	9	6
Sulphur	0.350	0.437	0.213	199	334	-23	6165	134	60
	Spherical			34	4	64	776	140	-30
				24	249	11	729	49	-3
Arsenic	0.550	0.431	0.019	60	71	-1	788	151	40
	Spherical			28	158	75	608	29	32
				13	341	15	343	95	-34
Antimony	0.684	0.043	0.274	121	66	61	174	351	77
	Spherical			30	318	10	58	192	12
				20	223	27	4	101	4

Note: Correlograms were conducted on 2 m composite sample data. Source: SIM Geological, January 2023.

14.10 Model Setup and Limits

A block model was initialized in MinePlan®, and the dimensions are defined in Table 14-8. This block model covers the extents of both the Cangrejos and Gran Bestia deposits. The selection of a nominal block size measuring 15 m × 15 m × 15 m is considered appropriate with respect to the current drillhole spacing as well as the selective mining unit (SMU) size typical of an operation of this type and scale.

Table 14-8: Block Model Limits

Direction	Minimum	Maximum	Block Size (m)	Number of Blocks
X (east)	631050	633900	15	190
Y (north)	9613300	9616150	15	190
Z (elevation)	0	1500	15	100

Source: SIM Geological, January 2023.

Blocks in the model were coded on a majority basis with the gold probability shell domain and the oxidation domains. During this stage, blocks along a domain boundary are coded if more than 50% of the block occurs within the boundaries of that domain.

The proportion of blocks that occur below the topographic surface is also calculated and stored within the model as individual percentage items. These values are used as weighting factors to determine the in-situ mineral resource estimate for the deposit.

14.11 Interpolation Parameters

The block model grades for gold, copper, silver, molybdenum, and sulphur were estimated using OK. The results of the OK estimation were compared with the Hermitian Polynomial Change of Support model (also referred to as the Discrete Gaussian Correction). This method is described in more detail in Section 14.12.2. SG was estimated using the inverse distance weighting (IDW) interpolation method.

The Cangrejos OK model was generated with a relatively limited number of samples to match the change of support or Herco (Hermitian Correction) grade distribution. This approach reduces the amount of smoothing or averaging in the model and, while there may be some uncertainty on a localized scale, this approach produces reliable estimates of the recoverable grade and tonnage for the overall deposit.

The estimation parameters for the various elements in the mineral resource block model are shown in Table 14-9 for the Cangrejos deposit and Table 14-10 for the Gran Bestia deposit. All grade estimations use length-weighted composite drillhole sample data.

Table 14-9: Interpolation Parameters for Cangrejos

Element	Search Ellipse Range (m)			Number of Composites			Other
	X	Y	Z	Min/Block	Max/Block	Max/Hole	
Gold Inside Prob Shell	500	500	500	8	48	12	1 DH per octant
Gold Outside Prob Shell	500	500	500	8	44	11	1 DH per octant
Copper Inside Prob Shell	500	500	500	8	44	11	1 DH per octant
Copper Outside Prob Shell	500	500	500	8	44	11	1 DH per octant
Silver (Sap+Srk)	500	500	500	8	40	10	1 DH per octant
(TransOx+Fr)	500	500	500	8	40	10	1 DH per octant
Molybdenum (Sap+Srk)	500	500	500	8	44	11	1 DH per octant
TransOx+Fr)	500	500	500	8	44	11	1 DH per octant
Sulphur (Sap+Srk)	500	500	500	8	44	11	1 DH per octant
TransOx+Fr)	500	500	500	8	44	11	1 DH per octant
Arsenic	500	500	500	8	44	11	1 DH per octant
Antimony	500	500	500	8	44	11	1 DH per octant
SG	500	500	500	3	12	3	1 DH per octant

DH = drillhole. Source: SIM Geological, January 2023.

Table 14-10: Interpolation Parameters for Gran Bestia

Element	z	Search Ellipse Range (m)			Number of Composites			Other
		X	Y	Z	Min/Block	Max/Block	Max/Hole	
Gold Inside Prob Shell		500	500	500	8	48	12	1 DH per octant
Gold Outside Prob Shell		500	500	500	8	48	12	1 DH per octant
Copper Inside Prob Shell		500	500	500	8	44	11	1 DH per octant
Copper Outside Prob Shell		500	500	500	8	33	11	1 DH per octant
Silver (Sap+Srk)		500	500	500	8	44	11	1 DH per octant
(TransOx+Fr)		500	500	500	8	44	11	1 DH per octant
Molybdenum (Sap+Srk)		500	500	500	8	44	11	1 DH per octant
TransOx+Fr)		500	500	500	8	44	11	1 DH per octant
Sulphur (Sap+Srk)		500	500	500	8	33	11	1 DH per octant
TransOx+Fr)		500	500	500	8	33	11	1 DH per octant
Arsenic		500	500	500	8	33	11	1 DH per octant
Antimony		500	500	500	8	33	11	1 DH per octant
SG		500	500	500	3	12	3	1 DH per octant

DH = drillhole. Source: SIM Geological, January 2023.

14.12 Validation

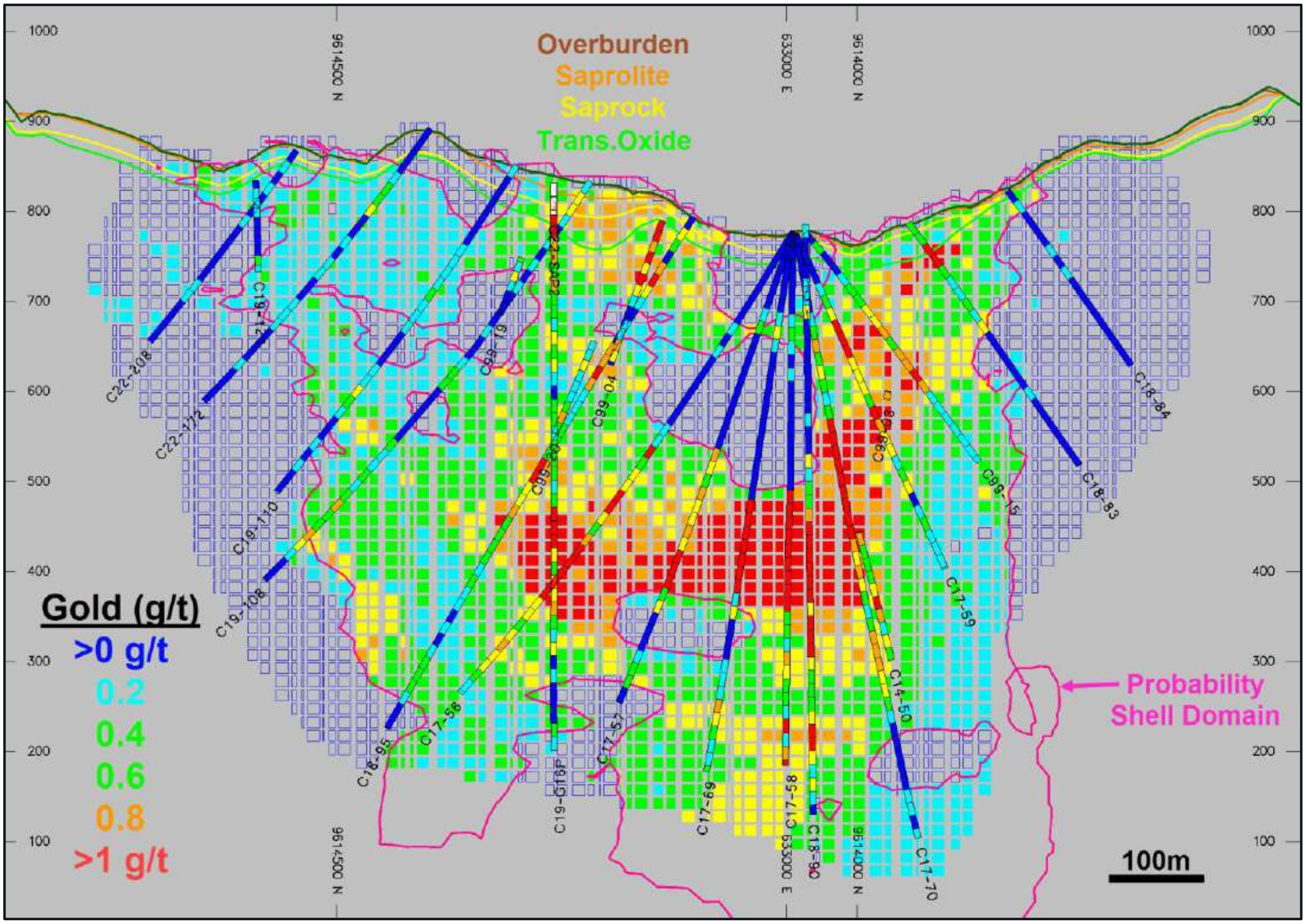
The results of the modelling process were validated using several methods. These include a thorough visual review of the model grades in relation to the underlying drillhole sample grades, comparisons with the change of support model, comparisons with other estimation methods, and grade distribution comparisons using swath plots.

14.12.1 Visual Inspection

A detailed visual inspection of the block model was conducted in both section and plan to ensure the desired results following interpolation. This includes confirmation of the proper coding of blocks within the gold grade probability shell domain. The estimated gold, copper, silver, molybdenum, sulphur, arsenic, and antimony grades in the model appear to be a valid representation of the underlying drillhole sample data.

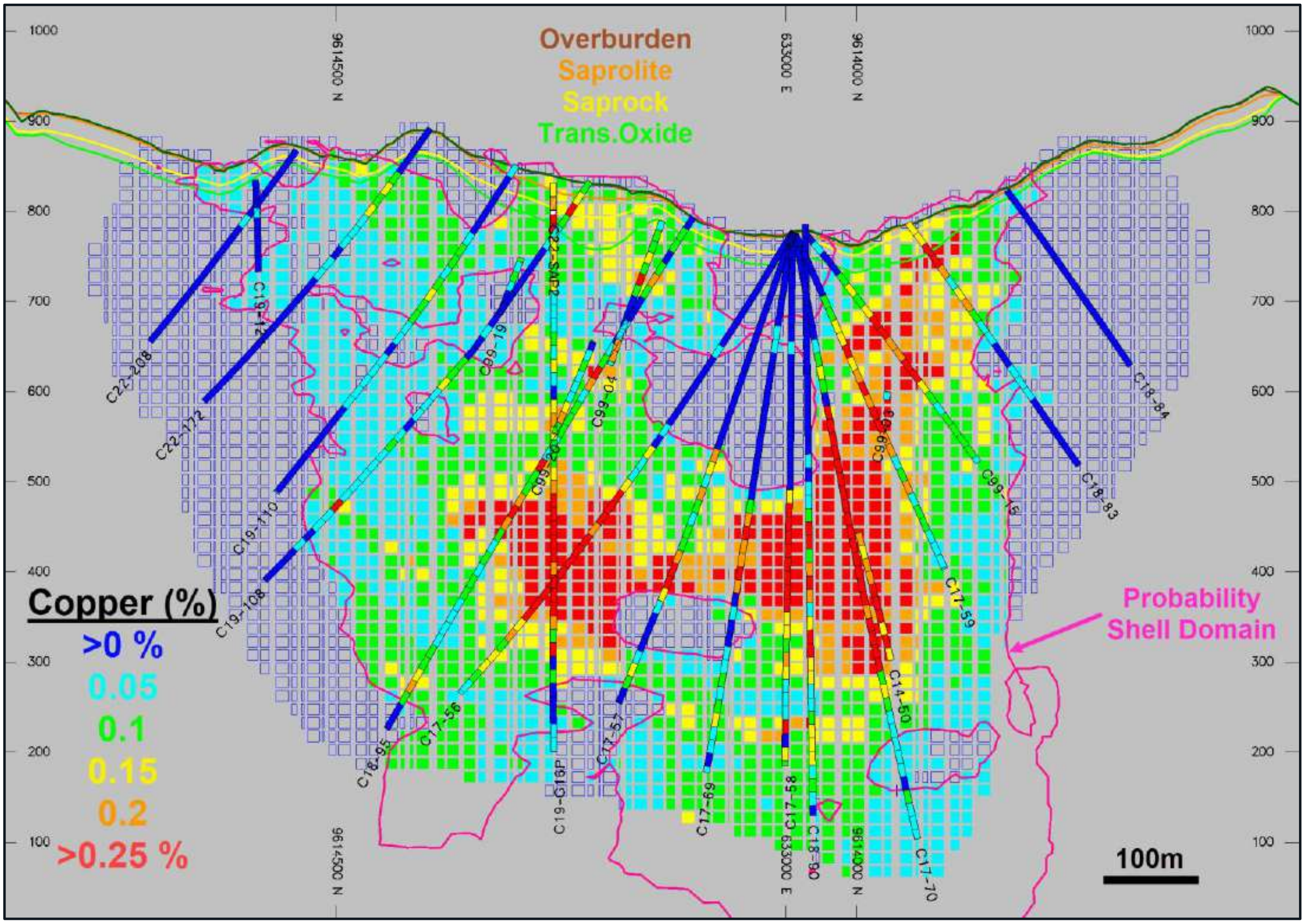
Examples of the distribution of gold and copper grades in model blocks compared to the drillhole sample data at Cangrejos are shown in Figure 14-36 and Figure 14-37, respectively. Examples of the distribution of gold and copper grades in model blocks compared to the drillhole sample data at Gran Bestia are shown in Figure 14-38 and Figure 14-39, respectively.

Figure 14-36: Vertical Cross-Section Showing Gold Grades in Drilling and Block Model at Cangrejos



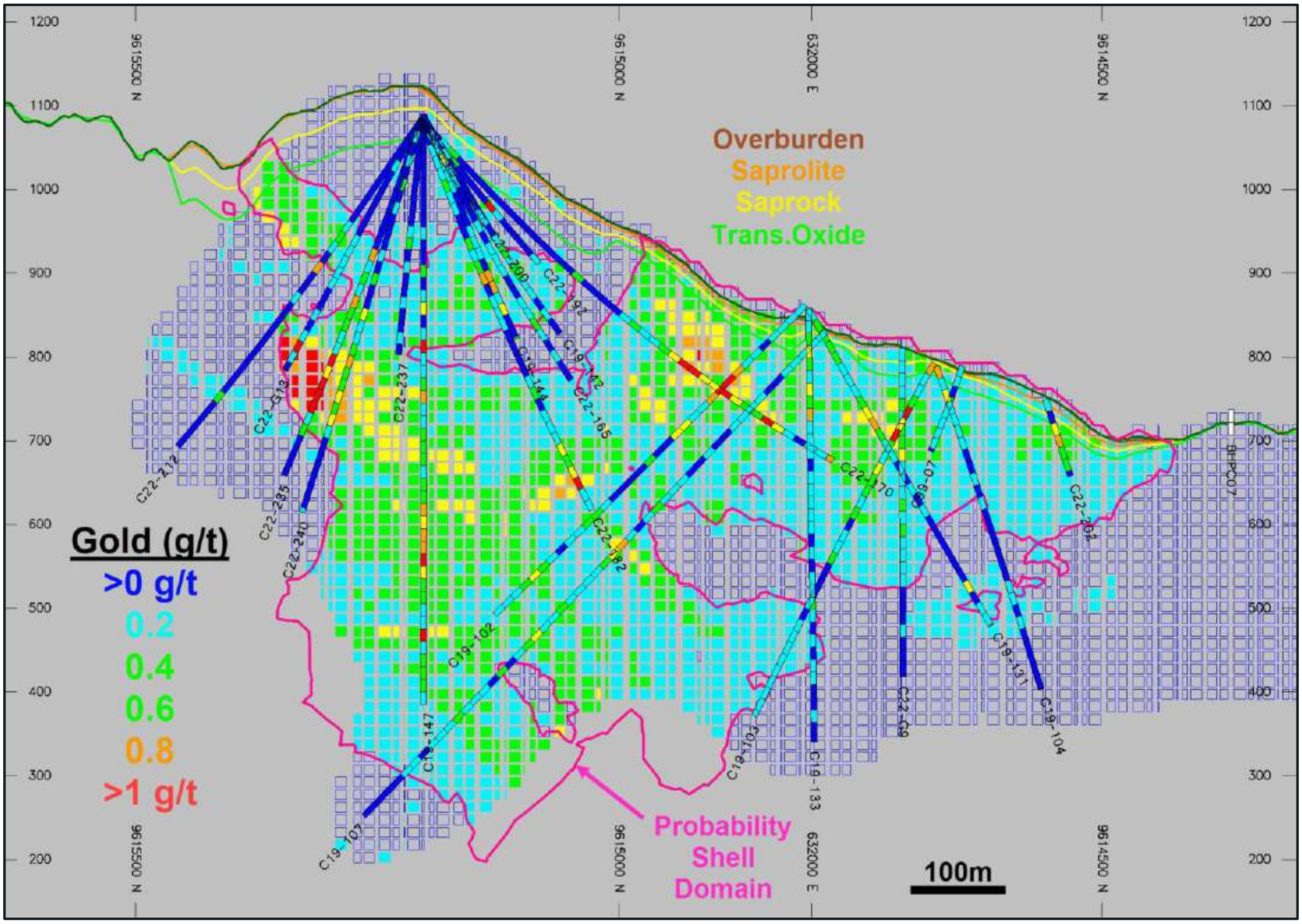
Source: SIM Geological, January 2023.

Figure 14-37: Vertical Cross-Section Showing Copper Grades in Drilling and Block Model at Cangrejos



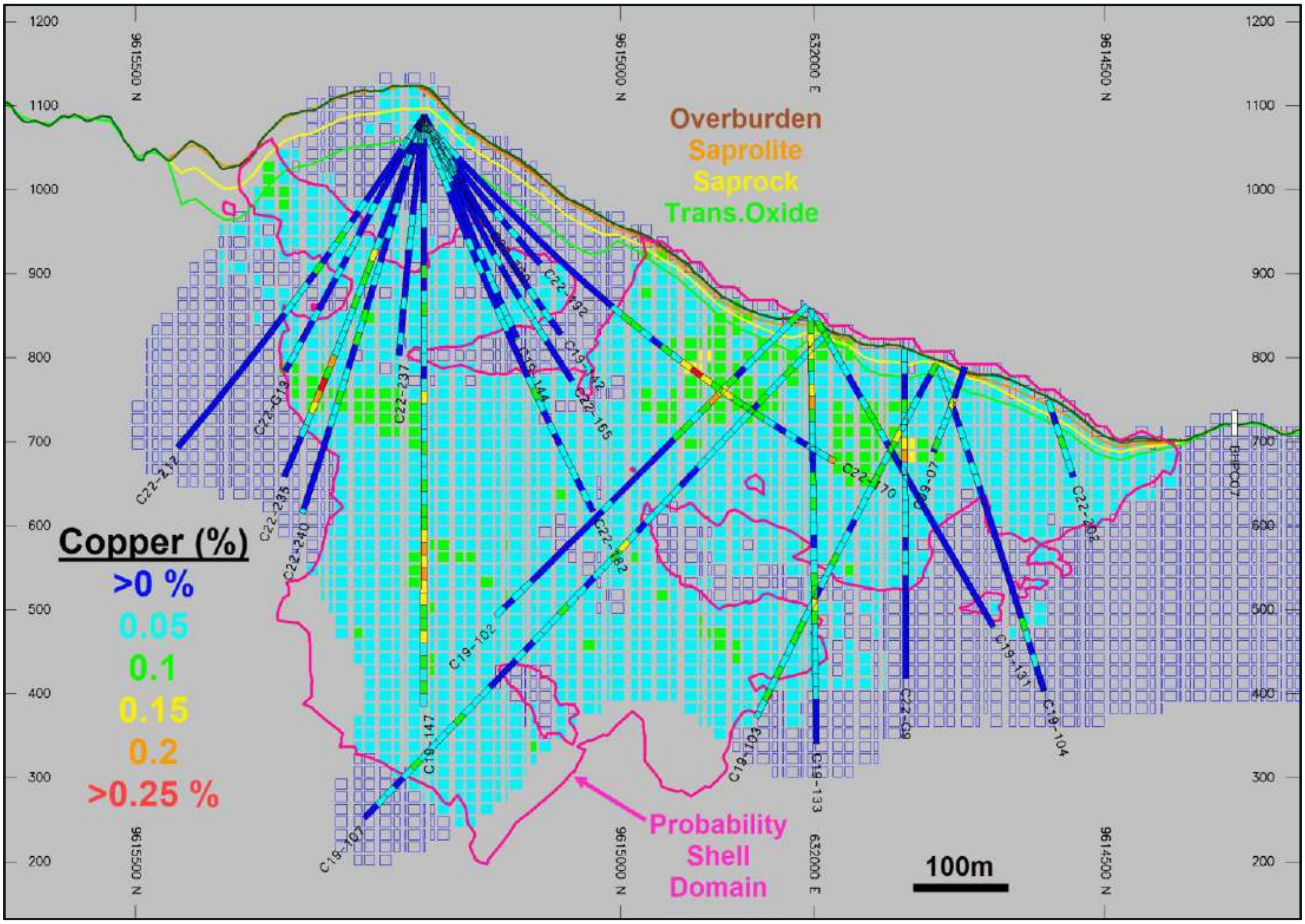
Source: SIM Geological, January 2023.

Figure 14-38: Vertical Cross-Section Showing Gold Grades in Drilling and Block Model at Gran Bestia



Source: SIM Geological, January 2023.

Figure 14-39: Vertical Cross-Section Showing Copper Grades in Drilling and Block Model at Gran Bestia



Source: SIM Geological, January 2023.

14.12.2 Model Checks for Change of Support

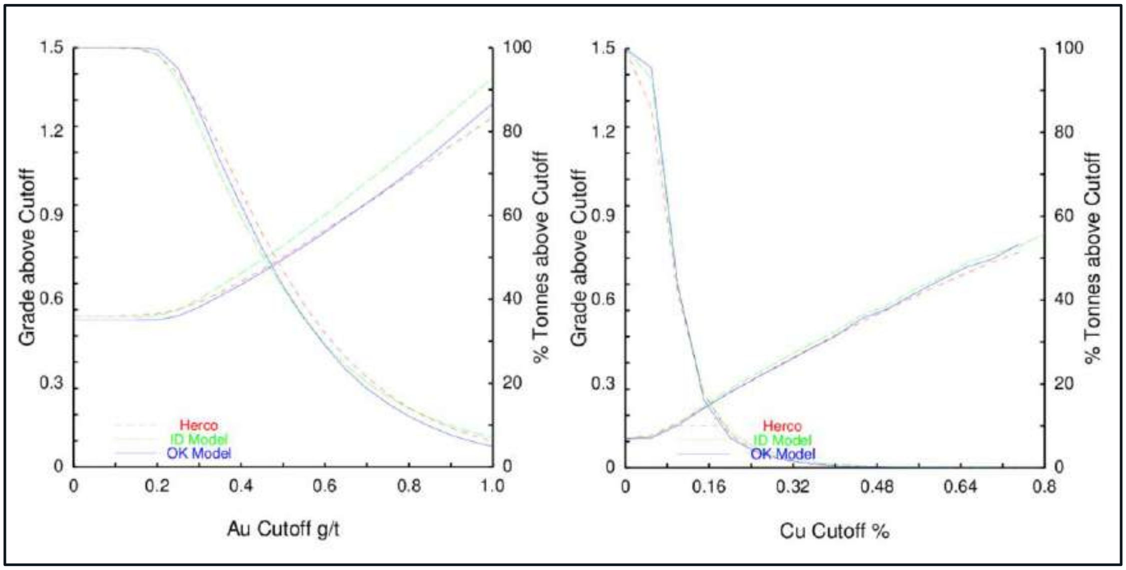
The relative degree of smoothing in the block model estimates were evaluated using the Discrete Gaussian of Hermitian Polynomial Change of Support method (described by Rossi and Deutsch, Mineral Resource Estimation, 2014).

Using this method, the distribution of the hypothetical block grades can be directly compared to the estimated (OK) model using pseudo-grade/tonnage curves. Adjustments are made to the block model interpolation parameters until an acceptable match is made with the Herco distribution. In general, the estimated model should be slightly higher in tonnage and slightly lower in grade when compared to the Herco distribution at the projected cut-off grade. These differences account for selectivity and other potential ore-handling issues which commonly occur during mining.

The Herco distribution is derived from the declustered composite grades which have been adjusted to account for the change in support, going from smaller drillhole composite samples to the large blocks in the model. The transformation results in a less skewed distribution but with the same mean as the original declustered samples.

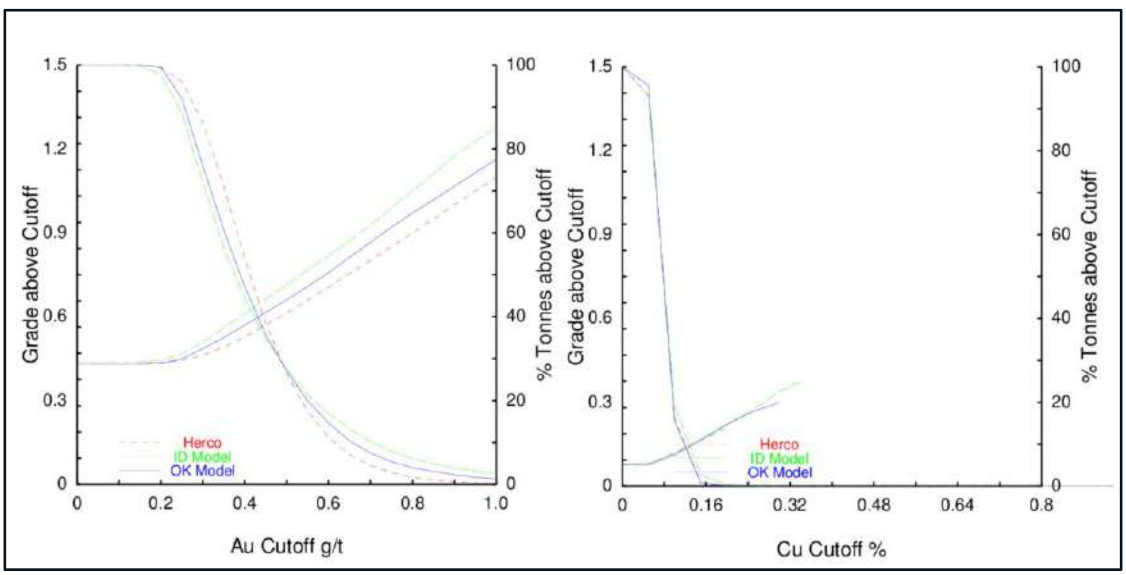
Figure 14-40 shows examples of the distributions of the gold and copper models at Cangrejos. The gold and copper models for Gran Bestia are shown in Figure 14-41.

Figure 14-40: Herco Grade/Tonnage Plot for Gold and Copper Models at Cangrejos



Source: SIM Geological, January 2023.

Figure 14-41: Herco Grade/Tonnage Plot for Gold and Copper Models at Gran Bestia



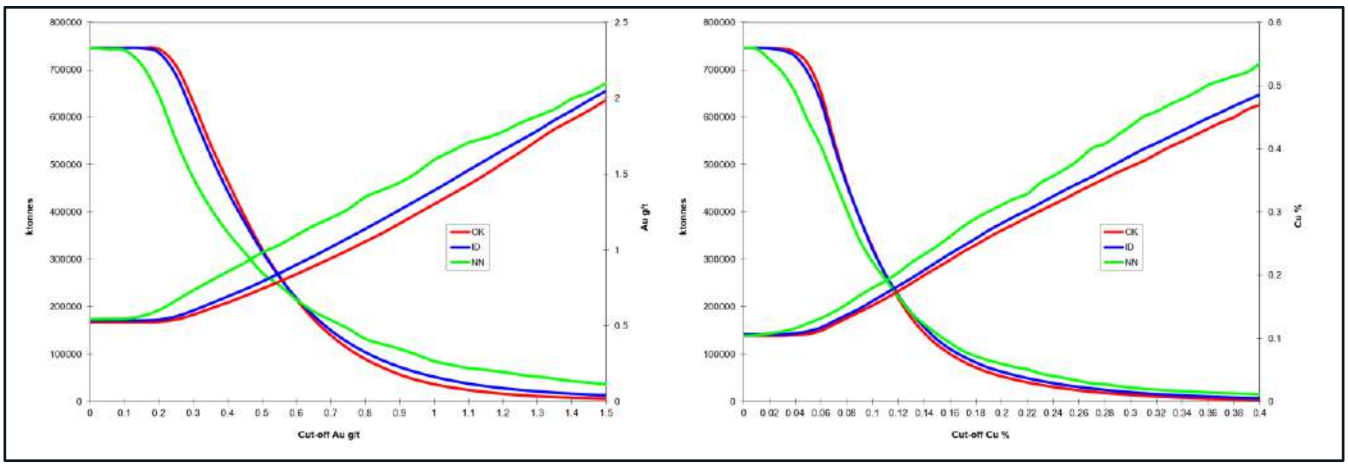
Source: SIM Geological, January 2023.

14.12.3 Comparison of Interpolation Methods

For comparison purposes, additional models for gold, copper, silver, molybdenum, sulphur, arsenic, and antimony were generated using both the inverse distance weighting (IDW) and nearest neighbour (NN) interpolation methods (the NN model was generated using data composited to 15 m intervals).

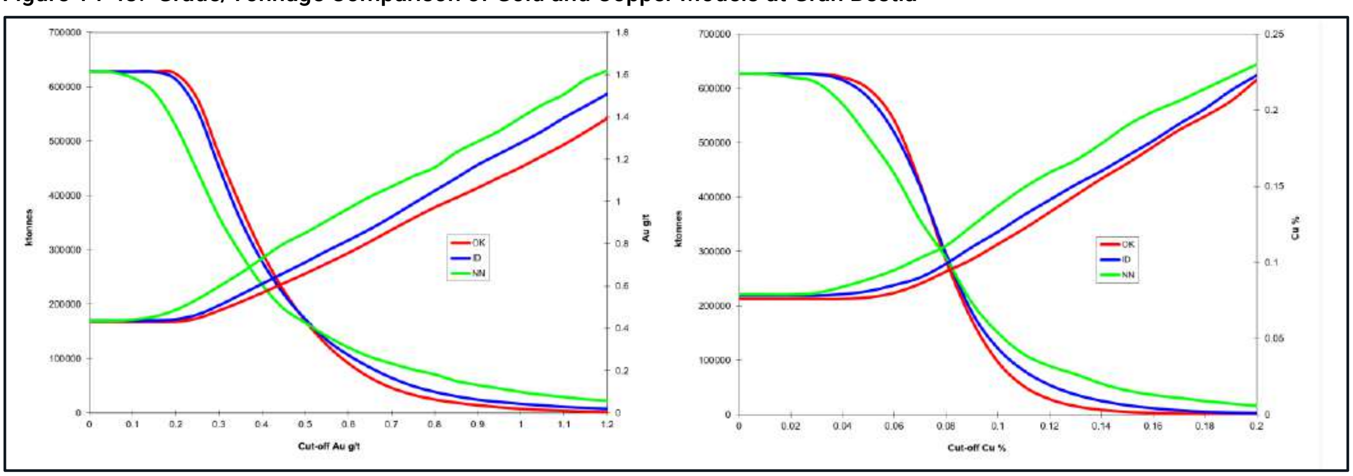
Comparisons are made between these models on grade/tonnage curves. Examples of the grade/tonnage curves for gold and copper at Cangrejos and Gran Bestia are shown in Figure 14-42 and Figure 14-43, respectively. There is good correlation between the OK and IDW models throughout the range of cut-off grades. The NN distribution, generally showing less tonnage and higher grade, is the result of the absence of smoothing in this modelling approach. Similar results were achieved with the silver, molybdenum, sulphur, arsenic, and antimony models. Reproduction of the model using different methods tends to increase the confidence in the overall mineral resource estimate.

Figure 14-42: Grade/Tonnage Comparison of Gold and Copper Models at Cangrejos



Source: SIM Geological, January 2023.

Figure 14-43: Grade/Tonnage Comparison of Gold and Copper Models at Gran Bestia



Source: SIM Geological, January 2023.

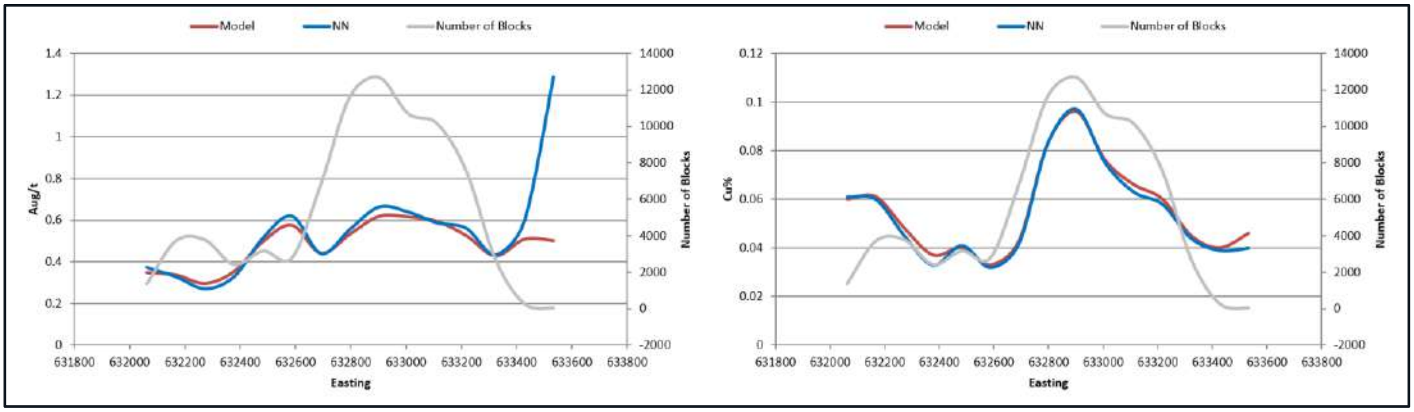
14.12.4 Swath Plots (Drift Analysis)

A swath plot is a graphical display of the grade distribution derived from a series of bands, or swaths, generated in several directions through the deposit. Using the swath plot, grade variations from the OK model are compared to the distribution derived from the declustered NN grade model.

On a local scale, the NN model does not provide reliable estimations of grade, but on a much larger scale, it represents an unbiased estimation of the grade distribution based on the underlying data. Therefore, if the OK model is unbiased, the grade trends may show local fluctuations on a swath plot, but the overall trend should be similar to the NN distribution of grade.

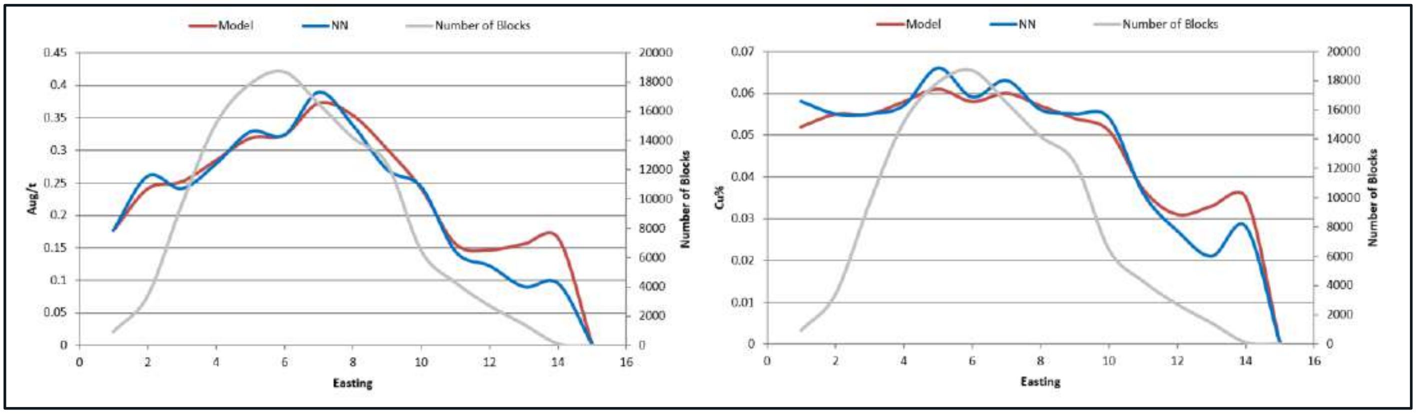
Swath plots were generated in three orthogonal directions for all models. Examples of the gold and copper models in north-south oriented swaths are shown in Figure 14-44 for the Cangrejos deposit and Figure 14-45 for the Gran Bestia deposit.

Figure 14-44: Swath Plots of Gold and Copper OK And NN Models by Easting at Cangrejos



Source: SIM Geological, January 2023.

Figure 14-45: Swath Plots of Gold and Copper OK And NN Models By Easting at Gran Bestia



Source: SIM Geological, January 2023.

There is good correspondence between the models in most areas. The degree of smoothing in the OK model is evident in the peaks and valleys shown in the swath plots. Areas indicating large differences between the models tend to be the result of “edge” effects, where there is less available data to support a comparison. The validation results indicate that the OK model is a reasonable reflection of the underlying sample data.

14.13 Mineral Resource Classification

The mineral resource estimate for the Cangrejos and Gran Bestia deposits was classified in accordance with the CIM Definition Standards for Mineral Resources and Mineral Reserves (May 2014). The classification parameters are defined relative to the distance between gold sample data and are intended to encompass zones of reasonably continuous mineralization that exhibit the desired degree of confidence. These parameters are based on visual observations and statistical studies. Classification parameters are based primarily on the nature of the distribution of gold data as it is the main contributor to the relative value of this polymetallic deposit.

The following criteria were used to define mineral resources in the indicated and inferred mineral resource categories:

- Indicated mineral resources – Mineral resources in the indicated mineral resource category include relatively large volumes that show consistent zones of mineralization and are delineated with drilling spaced at a maximum distance of 100 m.
- Inferred mineral resources – Mineral resources in the inferred mineral resource category include model blocks that are located within a maximum distance of 150 m from a drillhole.

Domains were interpreted to encompass model blocks that are included in the indicated and inferred mineral resource categories. This step ensures consistency of classification across the deposit. Some drillholes were terminated in appreciable mineralization and there are some instances where the lateral extents of mineralization have not been defined with current drilling. In these instances, the lateral extents of mineralization were manually truncated at 100 m or less from drilling, and the depth extent of inferred mineral resources is limited to 50 m vertically below drillholes to ensure that the appropriate level of confidence in the mineral resource is retained.

14.14 Mineral Resources

CIM Definition Standards for Mineral Resources and Mineral Reserves (May 2014) defines a mineral resource as:

> “[A] concentration or occurrence of solid material of economic interest, in or on the Earth’s crust in such form, grade or quality and quantity, that there are reasonable prospects for eventual economic extraction. The location, quantity, grade or quality, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling.”

The “reasonable prospects for eventual economic extraction,” requirement generally implies that quantity and grade estimates meet certain economic thresholds and that mineral resources are reported at an appropriate cut-off grade that takes into account extraction scenarios and processing recovery.

The economic viability of the mineral resource estimate was tested by constraining it within a floating cone pit shell; the pit shell was generated using the following projected economic and technical parameters:

- Mining (Open Pit) $2.15/t
- Processing.. $8.00/t

- General & Administrative (G&A) $1.50/t
- Gold Price $1,600/oz
- Silver Price $21.00/oz
- Copper Price $3.50/lb
- Molybdenum Price $11.00/lb
- Gold Process Recovery .... 82% fresh rock; 80% trans.oxide; 85% SAP&SRK
- Silver Process Recovery .... 70% fresh rock; 60% trans.oxide; 85% SAP&SRK
- Copper Process Recovery .... 86% fresh rock; 50% trans.oxide (no Cu recovered from SAP or SRK units)
- Molybdenum Process Recovery.....50% fresh rock and trans.oxide (no Mo recovered from SAP or SRK units)
- Pit Slope .... 47 degrees
- Royalty 3%

Based on the metal prices and recoveries listed here, recoverable gold equivalent (AuEqR) grades are calculated using the following formulas:

SAP&SRK : $AuEqR = ((Au\ g/t \times 0.85) + (Ag\ g/t \times 0.85 \times 0.0131)) \times 0.97$

Part Oxidized : $AuEqR = ((Au\ g/t \times 0.80) + (Ag\ g/t \times 0.60 \times 0.0131) + (Cu\% \times 0.50 \times 1.50) + (Moppm/10000 \times 0.50 \times 4.71)) \times 0.97$

Fresh Rock : $AuEqR = ((Au\ g/t \times 0.82) + (Ag\ g/t \times 0.70 \times 0.0131) + (Cu\% \times 0.86 \times 1.50) + (Moppm/10000 \times 0.50 \times 4.71)) \times 0.97$

The pit shell is generated using a floating cone algorithm based on the AuEqR block grades. There are no adjustments for mining recoveries or dilution. This test indicates that some of the deeper mineralization may not be economic due to the increased waste stripping requirements. It is important to recognize that these discussions of surface mining parameters are used solely to test the "reasonable prospects for eventual economic extraction," and that they do not represent an attempt to estimate mineral reserves. These preliminary evaluations are used to prepare the mineral resource estimate contained in this report and to select appropriate reporting assumptions.

The estimate of mineral resources, contained within the $1,600/oz Au pit shell, are based on gold equivalent grades (AuEq) calculated using the following formula:

$$AuEq = (Au\ g/t + (Ag\ g/t \times 0.0131) + (Cu\% \times 1.50) + (Moppm/10000 \times 4.71) \times 0.97$$

(Note: there is no contribution from copper or molybdenum in the SAP or SRK units.)

Using the assumed metal prices, operating costs, and metallurgical recoveries, the base case cut-off grade for mineral resources is estimated to be 0.25 g/t AuEq. Table 14-11 shows the mineral resource estimate at Cangrejos. Table 14-12 shows the mineral resource estimate at Gran Bestia. Table 14-13 shows the combined mineral resource estimate at Cangrejos and Gran Bestia. Arsenic and antimony grades remain low in mineral resources, ranging from 7.5 ppm to 11.5 ppm As and 3.3 ppm to 3.5 ppm Sb.

The distribution of the base case mineral resource within the $1,600/oz Au pit shell is shown from a series of isometric viewpoints in Figure 14-46 to Figure 14-49.

There are no known factors related to environmental, permitting, legal, title, taxation, socioeconomic, marketing, political, or other relevant factors which could materially affect the mineral resource estimate contained in this report. Mineral resources in the inferred mineral resource category have a lower level of confidence than that applied to indicated mineral resources and, although there is sufficient evidence to imply geologic grade and continuity, these characteristics cannot be verified based on the current data. It is reasonably expected that the majority of inferred mineral resources could be upgraded to indicated mineral resources with continued exploration.

Table 14-11: Estimate of Mineral Resources at Cangrejos

Type	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Indicated										
SAP+SRK	17.3	0.53	0.52	0.09	2.6	4.4	0.29	34	1.4	0.17
TransOxide	19.2	0.60	0.47	0.09	0.8	13.2	0.29	36	0.48	0.56
Fresh	615.0	0.68	0.52	0.11	0.6	22.3	10.3	1,424	12.5	30.2
Combined	**651.5**	**0.67**	**0.52**	**0.10**	**0.7**	**21.6**	**10.9**	**1494**	**14.2**	**31.0**
Inferred										
SAP+SRK	1.7	0.32	0.30	0.06	2.5	6.1	0.02	2	0.1	0.02
TransOxide	2.3	0.34	0.25	0.06	0.8	9.4	0.02	3	0.06	0.05
Fresh	77.8	0.46	0.35	0.07	0.6	17.5	0.9	125	1.5	3.0
Combined	**81.8**	**0.46**	**0.35**	**0.07**	**0.6**	**17.1**	**0.9**	**130**	**1.7**	**3.1**

Note: The estimates in Table 14-11 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral resources are not mineral reserves because the economic viability has not been demonstrated. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 14-12: Estimate of Mineral Resources at Gran Bestia

Type	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Indicated										
SAP+SRK	6.1	0.48	0.46	0.07	2.3	6.0	0.09	9	0.4	0.08
TransOxide	16.7	0.50	0.40	0.07	0.8	11.4	0.21	25	0.44	0.42
Fresh	405.6	0.54	0.43	0.07	0.7	12.1	5.6	653	9.0	10.8
Combined	**428.4**	**0.54**	**0.43**	**0.07**	**0.7**	**12.0**	**5.9**	**689**	**9.8**	**11.3**
Inferred										
SAP+SRK	1.8	0.39	0.38	0.07	1.9	6.0	0.02	3	0.1	0.02
TransOxide	6.7	0.44	0.33	0.07	1.1	14.1	0.07	10	0.23	0.21
Fresh	205.9	0.52	0.41	0.07	0.8	9.6	2.7	336	5.0	4.4
Combined	**214.4**	**0.52**	**0.41**	**0.07**	**0.8**	**9.7**	**2.8**	**350**	**5.4**	**4.6**

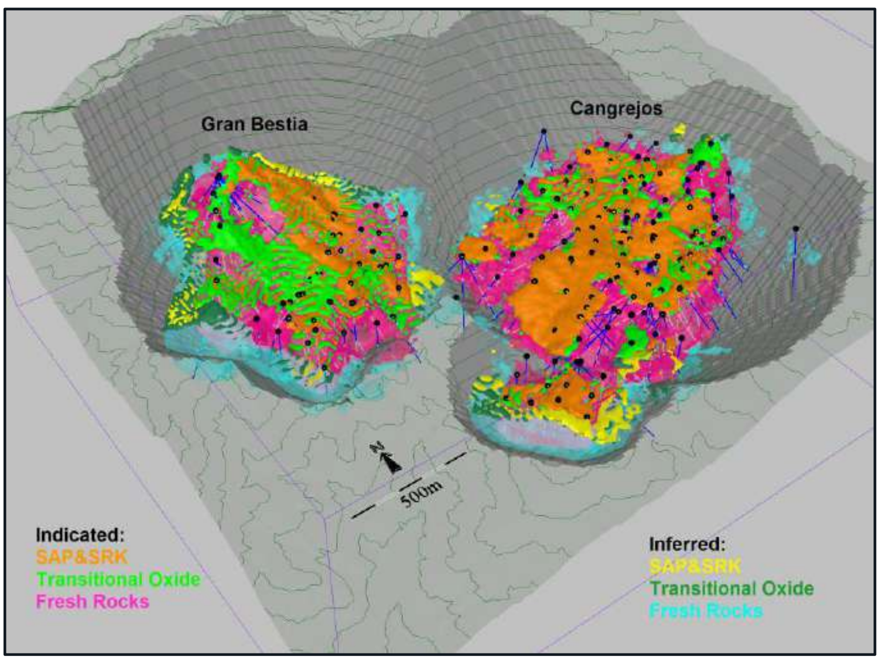
Note: The estimates in Table 14-12 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral resources are not mineral reserves because economic viability has not been demonstrated. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 14-13: Estimate of Mineral Resources at Cangrejos and Gran Bestia

Type	Tonnes (Mt)	Average Grade					Contained Grade			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Indicated										
SAP+SRK	23.4	0.52	0.50	0.08	2.5	4.8	0.38	43	1.9	0.25
TransOxide	36.0	0.55	0.44	0.08	0.8	12.3	0.50	62	0.93	0.98
Fresh	1,020.6	0.62	0.48	0.09	0.7	18.3	15.9	2,070	21.3	41.2
Combined	**1,079.9**	**0.62**	**0.48**	**0.09**	**0.7**	**17.8**	**16.8**	**2166**	**24.3**	**42.4**
Inferred										
SAP+SRK	3.5	0.36	0.34	0.06	2.2	6.0	0.04	5	0.2	0.05
TransOxide	9.0	0.42	0.31	0.07	1.0	12.9	0.09	13	0.29	0.26
Fresh	283.7	0.50	0.39	0.07	0.7	11.8	3.6	463	6.5	7.4
Combined	**296.3**	**0.50**	**0.39**	**0.07**	**0.7**	**11.7**	**3.7**	**483**	**7.0**	**7.6**

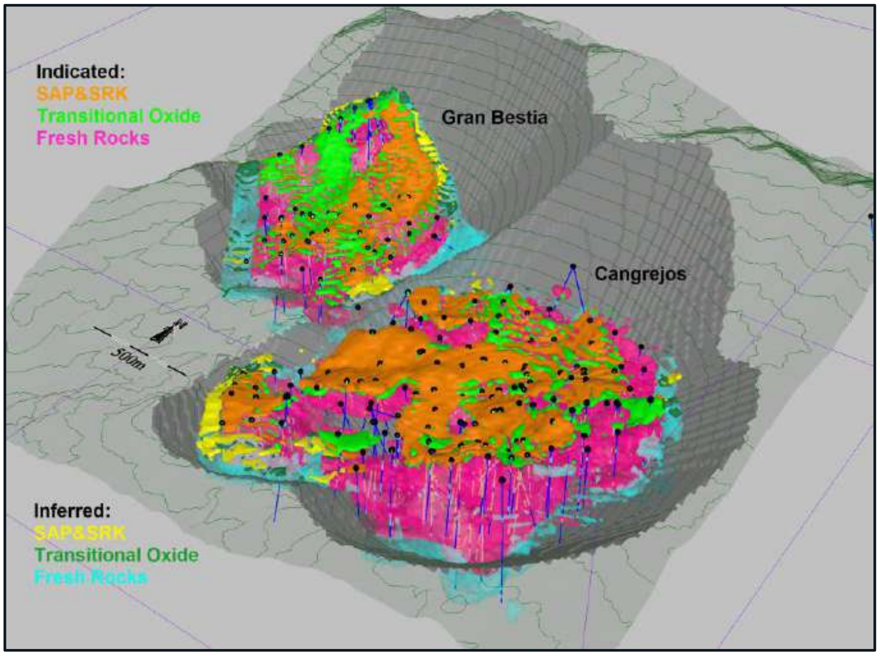
Note: The estimates in Table 14-13 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral resources are not mineral reserves because economic viability has not been demonstrated. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Figure 14-46: Isometric Views of Base Case Mineral Resources with Resource Limiting Pit Shell



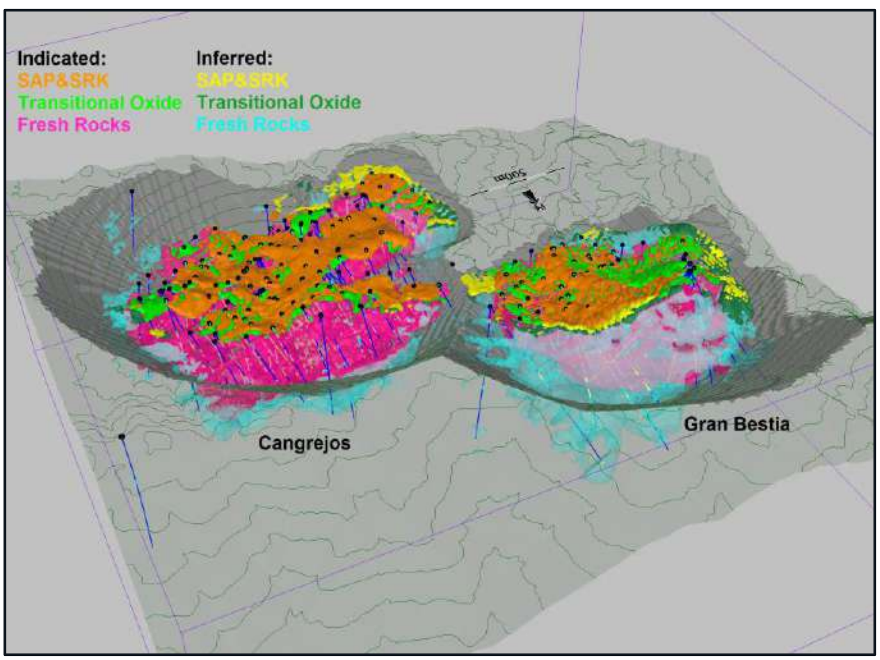
Source: SIM Geological, January 2023.

Figure 14-47: Isometric Views of Base Case Mineral Resources with Resource Limiting Pit Shell



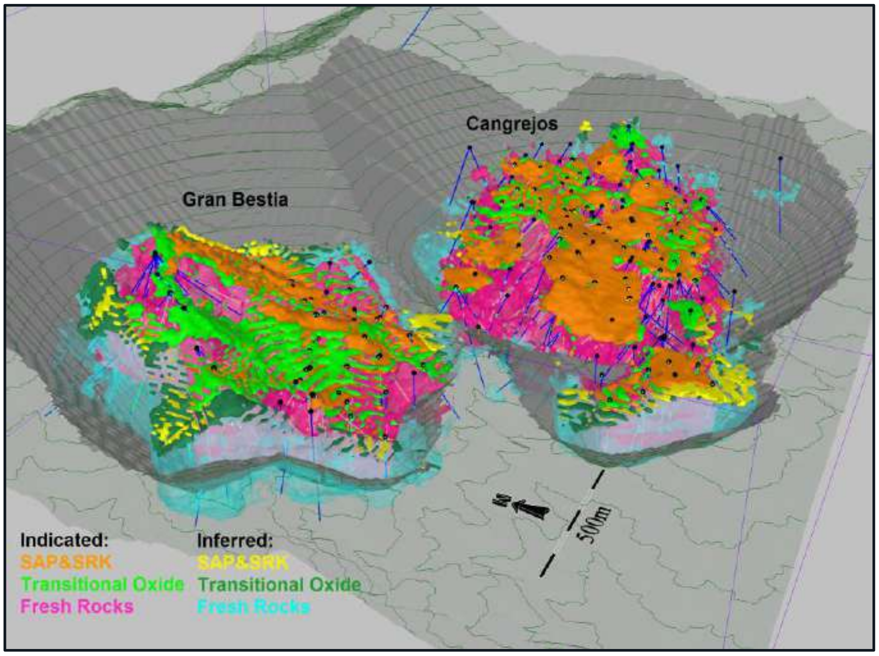
Source: SIM Geological, January 2023.

Figure 14-48: Isometric Views of Base Case Mineral Resources with Resource Limiting Pit Shell



Source: SIM Geological, January 2023.

Figure 14-49: Isometric Views of Base Case Mineral Resources with Resource Limiting Pit Shell



Source: SIM Geological, January 2023.

Table 14-14 and Table 14-15 show the base case mineral resources, at Cangrejos and Gran Bestia, respectively, that include additional modelled elements molybdenum, sulphur, arsenic, and antimony.

Table 14-14: Base Case Mineral Resources at Cangrejos with Additional Elements

Type	Tonnes (Mt)	AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	S (%)	As (ppm)	Sb (ppm)
Indicated									
SAP+SRK	17.3	0.53	0.52	0.09	2.6	4.4	0.06	13.5	3.8
TransOxide	19.2	0.60	0.47	0.09	0.8	13.2	0.19	13.2	3.7
Fresh	615.0	0.68	0.52	0.11	0.6	22.3	0.27	11.20	3.50
Combined	**651.5**	**0.67**	**0.52**	**0.10**	**0.7**	**21.6**	**0.26**	**11.30**	**3.50**
Inferred									
SAP+SRK	1.7	0.32	0.30	0.06	2.5	6.1	0.08	7.4	3.2
TransOxide	2.3	0.34	0.25	0.06	0.8	9.4	0.34	9.6	3.2
Fresh	77.8	0.46	0.35	0.07	0.6	17.5	0.33	10.60	3.20
Combined	**81.8**	**0.46**	**0.35**	**0.07**	**0.6**	**17.1**	**0.33**	**10.50**	**3.20**

Note: The estimates in Table 14-14 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral resources are not mineral reserves because economic viability has not been demonstrated. Mineral Resources are inclusive of Mineral Reserves.
Source: SIM Geological, January 2023.

Table 14-15: Base Case Mineral Resources at Gran Bestia with Additional Elements

Type	Tonnes (Mt)	AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	S (%)	As (ppm)	Sb (ppm)
Indicated									
SAP+SRK	6.1	0.48	0.46	0.07	2.3	6.0	0.08	8.9	3.3
TransOxide	16.7	0.50	0.40	0.07	0.8	11.4	0.35	8.6	3.5
Fresh	405.6	0.54	0.43	0.07	0.7	12.1	0.35	7.30	3.30
Combined	**428.4**	**0.54**	**0.43**	**0.07**	**0.7**	**12.0**	**0.34**	**7.40**	**3.30**
Inferred									
SAP+SRK	1.8	0.39	0.38	0.07	1.9	6.0	0.12	9.8	3.4
TransOxide	6.7	0.44	0.33	0.07	1.1	14.1	0.37	11.6	3.5
Fresh	205.9	0.52	0.41	0.07	0.8	9.6	0.41	7.80	3.40
Combined	**214.4**	**0.52**	**0.41**	**0.07**	**0.8**	**9.7**	**0.40**	**7.90**	**3.40**

Note: The estimates in Table 14-15 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral resources are not mineral reserves because economic viability has not been demonstrated. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

14.15 Sensitivity of Mineral Resource Estimate

The sensitivity of mineral resource estimate to cut-off grade, contained within the $1,600/oz Au pit shell, is demonstrated by listing mineral resources at a series of cut-off thresholds. Table 14-16 and Table 14-17 show the sensitivity of indicated and inferred mineral resources at Cangrejos, respectively. Table 14-18 and

Table 14-19 show the sensitivity of indicated and inferred mineral resources at Gran Bestia, respectively. Table 14-20 and Table 14-21 show the sensitivity of total indicated mineral resources at Cangrejos and Gran Bestia and inferred mineral resources at Cangrejos and Gran Bestia, respectively.

Table 14-16: Sensitivity of Indicated Mineral Resources to Cut-off Grade at Cangrejos

Cut-Off AuEq (g/t)	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
0.15	911.8	0.53	0.41	0.08	0.7	18.5	12.0	1689	19.3	37.2
0.20	754.1	0.61	0.47	0.10	0.7	20.3	11.4	1579	16.2	33.7
0.25 Base case	**651.5**	**0.67**	**0.52**	**0.10**	**0.7**	**21.6**	**10.9**	**1494**	**14.2**	**31.0**
0.30	600.2	0.70	0.55	0.11	0.7	22.2	10.6	1429	13.3	29.4
0.35	558.4	0.73	0.57	0.11	0.7	22.9	10.2	1379	12.4	28.2
0.40	509.6	0.77	0.60	0.12	0.7	23.8	9.8	1314	11.3	26.7
0.45	458.8	0.80	0.63	0.12	0.7	24.9	9.3	1234	10.3	25.2
0.50	412.4	0.84	0.66	0.13	0.7	26.0	8.7	1155	9.4	23.6
0.55	368.5	0.88	0.69	0.13	0.7	27.0	8.1	1081	8.5	21.9
0.60	325.0	0.92	0.72	0.14	0.7	27.8	7.5	996	7.6	19.9

Note: The estimates in Table 14-16 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral resources are not mineral reserves because economic viability has not been demonstrated. All cut-off grades meet the criteria for reasonable prospects of eventual economic extraction. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 14-17: Sensitivity of Inferred Mineral Resources to Cut-off Grade at Cangrejos

Cut-Off AuEq (g/t)	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
0.15	189.2	0.31	0.22	0.05	0.6	13.8	1.4	213	3.6	5.8
0.20	119.0	0.38	0.29	0.06	0.6	16.7	1.1	165	2.4	4.4
0.25 Base case	**81.8**	**0.46**	**0.35**	**0.07**	**0.6**	**17.1**	**0.9**	**130**	**1.7**	**3.1**
0.30	67.1	0.50	0.38	0.08	0.6	17.4	0.8	114	1.4	2.6
0.35	56.2	0.53	0.41	0.08	0.6	18.7	0.7	102	1.1	2.3
0.40	44.1	0.57	0.44	0.09	0.6	20.6	0.6	85	0.9	2.0
0.45	33.0	0.62	0.48	0.09	0.6	22.9	0.5	68	0.6	1.7
0.50	25.2	0.67	0.52	0.10	0.6	25.7	0.4	56	0.5	1.4
0.55	20.9	0.70	0.54	0.11	0.6	27.4	0.4	49	0.4	1.3
0.60	16.4	0.74	0.57	0.11	0.6	28.7	0.3	41	0.3	1.0

Note: The estimates in Table 14-17 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral resources are not mineral reserves because economic viability has not been demonstrated. All cut-off grades meet the criteria for reasonable prospects of eventual economic extraction. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 14-18: Sensitivity of Indicated Mineral Resources to Cut-off Grade at Gran Bestia

Cut-Off AuEq (g/t)	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
0.15	504.6	0.49	0.39	0.07	0.7	12.0	6.3	745	11.4	13.3
0.20	468.2	0.51	0.41	0.07	0.7	12.0	6.1	723	10.7	12.4
0.25 Base case	**428.4**	**0.54**	**0.43**	**0.07**	**0.7**	**12.0**	**5.9**	**689**	**9.8**	**11.3**
0.30	403.1	0.55	0.44	0.08	0.7	12.0	5.7	667	9.2	10.7
0.35	362.5	0.58	0.47	0.08	0.7	11.8	5.4	615	8.5	9.4
0.40	307.0	0.61	0.50	0.08	0.8	11.4	4.9	548	7.4	7.7
0.45	251.4	0.66	0.54	0.08	0.8	11.1	4.3	466	6.3	6.2
0.50	200.9	0.70	0.58	0.09	0.8	10.8	3.7	385	5.3	4.8
0.55	159.5	0.75	0.62	0.09	0.8	10.5	3.2	320	4.3	3.7
0.60	125.0	0.80	0.66	0.09	0.9	10.4	2.7	259	3.5	2.9

Note: The estimates in Table 14-18 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral resources are not mineral reserves because economic viability has not been demonstrated. All cut-off grades meet the criteria for reasonable prospects of eventual economic extraction. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 14-19: Sensitivity of Inferred Mineral Resources to Cut-off Grade at Gran Bestia

Cut-Off AuEq (g/t)	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
0.15	270.8	0.45	0.35	0.07	0.8	9.9	3.1	394	6.7	5.9
0.20	247.5	0.48	0.37	0.07	0.8	9.9	3.0	382	6.1	5.4
0.25 Base case	**214.4**	**0.52**	**0.41**	**0.07**	**0.8**	**9.7**	**2.8**	**350**	**5.4**	**4.6**
0.30	190.5	0.55	0.43	0.08	0.8	9.5	2.7	323	4.8	4.0
0.35	175.6	0.57	0.45	0.08	0.8	9.1	2.5	306	4.5	3.5
0.40	154.1	0.59	0.48	0.08	0.8	8.5	2.4	275	4.1	2.9
0.45	129.4	0.63	0.51	0.08	0.9	7.9	2.1	237	3.5	2.3
0.50	105.5	0.66	0.54	0.09	0.9	7.3	1.8	200	3.0	1.7
0.55	83.1	0.70	0.57	0.09	0.9	6.7	1.5	163	2.4	1.2
0.60	62.6	0.74	0.61	0.09	0.9	6.2	1.2	127	1.8	0.9

Note: The estimates in Table 14-19 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral resources are not mineral reserves because economic viability has not been demonstrated. All cut-off grades meet the criteria for reasonable prospects of eventual economic extraction. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 14-20: Sensitivity of Indicated Mineral Resources to Cut-off Grade at Cangrejos and Gran Bestia

Cut-Off AuEq (g/t)	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
0.15	1,416.3	0.52	0.40	0.08	0.7	16.2	18.3	2436	30.5	50.6
0.20	1,222.3	0.57	0.45	0.09	0.7	17.1	17.5	2317	27.1	46.1
0.25 Base case	**1,079.9**	**0.62**	**0.48**	**0.09**	**0.7**	**17.8**	**16.8**	**2166**	**24.3**	**42.4**
0.30	1,003.3	0.64	0.51	0.10	0.7	18.1	16.3	2101	22.6	40.0
0.35	921.0	0.67	0.53	0.10	0.7	18.5	15.7	1990	20.7	37.6
0.40	816.6	0.71	0.56	0.10	0.7	19.2	14.7	1854	18.6	34.6
0.45	710.2	0.75	0.60	0.11	0.7	20.0	13.6	1707	16.7	31.3
0.50	613.3	0.80	0.63	0.11	0.7	21.0	12.4	1541	14.6	28.4
0.55	528.0	0.84	0.67	0.12	0.8	22.0	11.3	1397	12.9	25.6
0.60	450.0	0.88	0.70	0.13	0.8	23.0	10.2	1250	11.1	22.8

Note: The estimates in Table 14-20 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral resources are not mineral reserves because economic viability has not been demonstrated. All cut-off grades meet the criteria for reasonable prospects of eventual economic extraction. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 14-21: Sensitivity of Inferred Mineral Resources to Cut-off Grade at Cangrejos and Gran Bestia

Cut-Off AuEq (g/t)	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
0.15	460.0	0.39	0.30	0.06	0.7	11.5	4.4	609	10.2	11.7
0.20	366.6	0.45	0.35	0.07	0.7	12.1	4.1	541	8.5	9.8
0.25 Base case	**296.3**	**0.50**	**0.39**	**0.07**	**0.7**	**11.7**	**3.7**	**483**	**7.0**	**7.6**
0.30	257.6	0.53	0.42	0.08	0.7	11.5	3.5	437	6.1	6.5
0.35	231.8	0.56	0.44	0.08	0.8	11.4	3.3	409	5.6	5.8
0.40	198.2	0.59	0.47	0.08	0.8	11.2	3.0	358	5.0	4.9
0.45	162.4	0.63	0.50	0.09	0.8	10.9	2.6	304	4.2	3.9
0.50	130.7	0.66	0.53	0.09	0.8	10.8	2.2	256	3.4	3.1
0.55	104.0	0.70	0.56	0.09	0.8	10.9	1.9	213	2.8	2.5
0.60	78.9	0.74	0.60	0.10	0.8	10.8	1.5	167	2.1	1.9

Note: The estimates in Table 14-21 are limited inside the $1,600/oz Au pit shell. The base case cut-off grade is 0.25 g/t gold equivalent (AuEq). Mineral resources are not mineral reserves because economic viability has not been demonstrated. All cut-off grades meet the criteria for reasonable prospects of eventual economic extraction. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

The sensitivity of mineral resources to varying metal prices was also tested. Three different cases were tested based on the following metal prices:

- Case 1 - $1,500/oz Au, $3.00/lb Cu, $18.00/oz Ag, $10.00/lb Mo
- Case 2 - $1,700/oz Au, $3.75/lb Cu, $21.00/oz Ag, $11.00/lb Mo
- Case 3 - $1,800/oz Au, $4.00/lb Cu, $21.00/oz Ag, $12.00/lb Mo.

During these evaluations, the operating costs and process recoveries remain the same as those used to estimate the base case mineral resources. Each case is constrained within pit shells that are generated using the stated gold price. Individual cut-off grades, estimated for each case based on the metal prices, operating costs, and process recoveries, are 0.27 g/t AuEq for Case 1, 0.23 g/t AuEq for Case 2, and 0.20 g/t AuEq for Case 3. The results are presented, together with the base case estimate of mineral resources, in Table 14-22 through Table 14-27.

Table 14-22: Sensitivity of Indicated Mineral Resources to Metal Prices at Cangrejos

Case	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Case 1	593.2	0.68	0.54	0.11	0.7	22.0	10.3	1399	13.2	28.8
Base Case	**651.5**	**0.67**	**0.52**	**0.10**	**0.7**	**21.6**	**10.9**	**1494**	**14.2**	**31.0**
Case 2	689.9	0.65	0.50	0.10	0.7	21.1	11.1	1521	15.1	32.1
Case 3	766.5	0.61	0.47	0.10	0.7	20.2	11.5	1605	16.5	34.1

Notes: Case 1: $1500/oz Au, $3.00/lb Cu, $18/oz Ag, $10.00/lb Mo, cut-off 0.27 g/t AuEq. Base Case: $1600/oz Au, $3.50/lb Cu, $21/oz Ag, $11.00/lb Mo, cut-off 0.25 g/t AuEq. Case 2: $1700/oz Au, $3.75/lb Cu, $21/oz Ag, $11.00/lb Mo, cut-off 0.23 g/t AuEq. Case 3: $1800/oz Au, $4.00/lb Cu, $21/oz Ag, $12.00/lb Mo, cut-off 0.20 g/t AuEq. Operating costs and process recoveries remain the same as the those used to generate the base case mineral resource estimate. Each case is constrained within a pit shell generated using the stated gold price. Mineral Resources are not Mineral

Reserves because the economic viability has not been demonstrated. All scenarios meet the criteria for reasonable prospects of eventual economic extraction. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 14-23: Sensitivity of Inferred Mineral Resources to Metal Prices at Cangrejos

Case	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Case 1	52.4	0.45	0.35	0.07	0.7	14.8	0.6	83	1.1	1.7
Base case	**81.8**	**0.46**	**0.35**	**0.07**	**0.6**	**17.1**	**0.9**	**130**	**1.7**	**3.1**
Case 2	96.8	0.43	0.33	0.07	0.6	16.6	1.0	147	2.0	3.5
Case 3	137.2	0.39	0.29	0.06	0.6	16.7	1.3	191	2.7	5.0

Notes: Case 1: $1500/oz Au, $3.00/lb Cu, $18/oz Ag, $10.00/lb Mo, cut-off 0.27 g/t AuEq. Base Case: $1600/oz Au, $3.50/lb Cu, $21/oz Ag, $11.00/lb Mo, cut-off 0.25 g/t AuEq. Case 2: $1700/oz Au, $3.75/lb Cu, $21/oz Ag, $11.00/lb Mo, cut-off 0.23 g/t AuEq. Case 3: $1800/oz Au, $4.00/lb Cu, $21/oz Ag, $12.00/lb Mo, cut-off 0.20 g/t AuEq. Operating costs and process recoveries remain the same as the those used to generate the base case mineral resource estimate. Each case is constrained within a pit shell generated using the stated gold price. Mineral Resources are not Mineral Reserves because the economic viability has not been demonstrated. All scenarios meet the criteria for reasonable prospects of eventual economic extraction. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 14-24: Sensitivity of Indicated Mineral Resources to Metal Prices at Gran Bestia

Case	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Case 1	409.0	0.54	0.44	0.07	0.7	11.9	5.8	667	9.5	10.7
Base case	**428.4**	**0.54**	**0.43**	**0.07**	**0.7**	**12.0**	**5.9**	**689**	**9.8**	**11.3**
Case 2	444.1	0.53	0.42	0.07	0.7	12.1	6.0	705	10.1	11.8
Case 3	474.9	0.51	0.40	0.07	0.7	12.2	6.2	733	10.7	12.8

Notes: Case 1: $1500/oz Au, $3.00/lb Cu, $18/oz Ag, $10.00/lb Mo, cut-off 0.27 g/t AuEq. Base Case: $1600/oz Au, $3.50/lb Cu, $21/oz Ag, $11.00/lb Mo, cut-off 0.25 g/t AuEq. Case 2: $1700/oz Au, $3.75/lb Cu, $21/oz Ag, $11.00/lb Mo, cut-off 0.23 g/t AuEq. Case 3: $1800/oz Au, $4.00/lb Cu, $21/oz Ag, $12.00/lb Mo, cut-off 0.20 g/t AuEq. Operating costs and process recoveries remain the same as the those used to generate the base case mineral resource estimate. Each case is constrained within a pit shell generated using the stated gold price. Mineral Resources are not Mineral Reserves because the economic viability has not been demonstrated. All scenarios meet the criteria for reasonable prospects of eventual economic extraction. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 14-25: Sensitivity of Inferred Mineral Resources to Metal Prices at Gran Bestia

Case	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Case 1	157.1	0.54	0.43	0.08	0.8	9.8	2.2	263	4.1	3.4
Base case	**214.4**	**0.52**	**0.41**	**0.07**	**0.8**	**9.7**	**2.8**	**350**	**5.4**	**4.6**
Case 2	257.9	0.49	0.39	0.07	0.8	10.0	3.2	409	6.3	5.7
Case 3	303.3	0.46	0.36	0.07	0.7	10.3	3.5	455	7.2	6.9

Notes: Case 1: $1500/oz Au, $3.00/lb Cu, $18/oz Ag, $10.00/lb Mo, cut-off 0.27 g/t AuEq. Base Case: $1600/oz Au, $3.50/lb Cu, $21/oz Ag, $11.00/lb Mo, cut-off 0.25 g/t AuEq. Case 2: $1700/oz Au, $3.75/lb Cu, $21/oz Ag, $11.00/lb Mo, cut-off 0.23 g/t AuEq. Case 3: $1800/oz Au, $4.00/lb Cu, $21/oz Ag, $12.00/lb Mo, cut-off 0.20 g/t AuEq. Operating costs and process recoveries remain the same as the those used to generate the base case mineral resource estimate. Each case is constrained within a pit shell generated using the stated gold price. Mineral Resources are not Mineral Reserves because the economic viability has not been demonstrated. All scenarios meet the criteria for reasonable prospects of eventual economic extraction. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 14-26: Sensitivity of Indicated Mineral Resources to Metal Prices at Cangrejos and Gran Bestia

Case	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Case 1	1,002.2	0.62	0.50	0.09	0.7	17.9	16.1	2077	22.6	39.5
Base case	**1,079.9**	**0.62**	**0.48**	**0.09**	**0.7**	**17.8**	**16.8**	**2166**	**24.3**	**42.4**
Case 2	1,134.0	0.60	0.47	0.09	0.7	17.5	17.1	2225	25.2	43.8
Case 3	1,241.4	0.57	0.44	0.09	0.7	17.1	17.7	2326	27.1	46.8

Notes: Case 1: $1500/oz Au, $3.00/lb Cu, $18/oz Ag, $10.00/lb Mo, cut-off 0.27 g/t AuEq. Base Case: $1600/oz Au, $3.50/lb Cu, $21/oz Ag, $11.00/lb Mo, cut-off 0.25 g/t AuEq. Case 2: $1700/oz Au, $3.75/lb Cu, $21/oz Ag, $11.00/lb Mo, cut-off 0.23 g/t AuEq. Case 3: $1800/oz Au, $4.00/lb Cu, $21/oz Ag, $12.00/lb Mo, cut-off 0.20 g/t AuEq. Operating costs and process recoveries remain the same as the those used to generate the base case mineral resource estimate. Each case is constrained within a pit shell generated using the stated gold price. Mineral Resources are not Mineral Reserves because the economic viability has not been demonstrated. All scenarios meet the criteria for reasonable prospects of eventual economic extraction. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

Table 14-27: Sensitivity of Inferred Mineral Resources To Metal Prices At Cangrejos And Gran Bestia

Case	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Case 1	209.4	0.51	0.41	0.08	0.8	11.1	2.8	346	5.2	5.1
Base case	**296.3**	**0.50**	**0.39**	**0.07**	**0.7**	**11.7**	**3.7**	**483**	**7.0**	**7.6**
Case 2	354.7	0.48	0.37	0.07	0.7	11.8	4.2	555	8.2	9.2
Case 3	440.4	0.44	0.34	0.07	0.7	12.3	4.8	641	9.9	11.9

Notes: Case 1: $1500/oz Au, $3.00/lb Cu, $18/oz Ag, $10.00/lb Mo, cut-off 0.27 g/t AuEq. Base Case: $1600/oz Au, $3.50/lb Cu, $21/oz Ag, $11.00/lb Mo, cut-off 0.25 g/t AuEq. Case 2: $1700/oz Au, $3.75/lb Cu, $21/oz Ag, $11.00/lb Mo, cut-off 0.23 g/t AuEq. Case 3: $1800/oz Au, $4.00/lb Cu, $21/oz Ag, $12.00/lb Mo, cut-off 0.20 g/t AuEq. Operating costs and process recoveries remain the same as the those used to generate the base case mineral resource estimate. Each case is constrained within a pit shell generated using the stated gold price. Mineral Resources are not Mineral Reserves because the economic viability has not been demonstrated. All scenarios meet the criteria for reasonable prospects of eventual economic extraction. Mineral Resources are inclusive of Mineral Reserves. Source: SIM Geological, January 2023.

The differences in mineral resources presented in Table 14-22 through Table 14-27 are the result of a combination of varying pit shells and varying cut-off threshold grades. Overall, Case 1 has about 5% less contained gold, Case 2 has about 5% more contained gold, and Case 3 has about 10% more contained gold in comparison to the Base Case estimate of mineral resources.

14.16 Comparison with Previous Mineral Resource Estimate

The previous mineral resource estimate was presented in the June 2022 PEA report. Table 14-28 compares the current and previous estimates of mineral resources for the Cangrejos Zone. Table 14-29 compares the current and previous mineral resource estimates for the Gran Bestia Zone, and Table 14-30 compares the estimates for the combined Cangrejos and Gran Bestia Zones. Table 14-31 compares the current and previous technical and economic parameters used to estimate mineral resources.

Table 14-28: Comparison of Current and Previous Estimate of Mineral Resources at Cangrejos

Date	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Indicated										
January 2023	651.5	0.67	0.52	0.10	0.7	21.6	10.9	1,494	14.2	31.0
June 2022	469.7	0.77	0.59	0.12	0.7	22.4	8.9	1,222	10.9	23.2
Inferred										
January 2023	81.8	0.46	0.35	0.07	0.6	17.1	0.9	130	1.7	3.1
June 2022	254.9	0.55	0.43	0.08	0.7	14.8	3.5	472	5.7	8.3

Notes: The current resource is constrained in a $1600/oz Au pit shell and resources are tabulated at a 0.25 g/t AuEq cut-off grade. The previous (June 2022) resource is constrained in a $1500/oz Au pit shell and resources are tabulated at a 0.30 g/t AuEq cut-off grade. Mineral resources are not mineral reserves because economic viability has not been demonstrated. Source: SIM Geological, January 2023.

Table 14-29: Comparison of Current and Previous Estimate of Mineral Resources at Gran Bestia

Date	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Indicated										
January 2023	428.4	0.54	0.43	0.07	0.7	12.0	5.9	689	9.8	11.3
June 2022	101.1	0.58	0.46	0.08	0.6	15.4	1.5	180	1.9	3.4
Inferred										
January 2023	214.4	0.52	0.41	0.07	0.8	9.7	2.8	350	5.4	4.6
June 2022	245.5	0.50	0.40	0.07	0.6	11.3	3.1	368	4.7	6.1

Notes: The current resource is constrained in a $1600/oz Au pit shell and resources are tabulated at a 0.25 g/t AuEq cut-off grade. The previous (June 2022) resource is constrained in a $1500/oz Au pit shell and resources are tabulated at a 0.30 g/t AuEq cut-off grade. Mineral resources are not mineral reserves because economic viability has not been demonstrated. Source: SIM Geological, January 2023.

Table 14-30: Comparison of Current and Previous Estimate of Mineral Resources at Cangrejos and Gran Bestia

Date	Tonnes (Mt)	Average Grade					Contained Metal			
		AuEq (g/t)	Au (g/t)	Cu (%)	Ag (g/t)	Mo (ppm)	Au (Moz)	Cu (Mlbs)	Ag (Moz)	Mo (Mlbs)
Indicated										
January 2023	1,079.9	0.62	0.48	0.09	0.7	17.8	16.8	2,166	24.3	42.4
June 2022	570.8	0.73	0.57	0.11	0.7	21.2	10.4	1,409	12.8	26.7
Inferred										
January 2023	296.3	0.50	0.39	0.07	0.7	11.7	3.7	483	7.0	7.6
June 2022	500.4	0.53	0.41	0.08	0.6	13.0	6.7	838	10.3	14.3

Notes: The current resource is constrained in a $1600/oz Au pit shell and resources are tabulated at a 0.25 g/t AuEq cut-off grade. The previous (June 2022) resource is constrained in a $1500/oz Au pit shell and resources are tabulated at a 0.30 g/t AuEq cut-off grade. Mineral resources are not mineral reserves because economic viability has not been demonstrated. Source: SIM Geological, January 2023.

Table 14-31: Comparison of Current and Previous Technical and Economic Parameters Used to Estimate Mineral Resources

Parameter	January 2023	June 2022
Mining Cost	$2.15/t	$2.00/t
Process Cost	$8.00/t	$8.00/t
G&A Cost	$1.50/t	$1.50/t
Gold Price	$1,600/oz	$1,500/oz
Copper Price	$3.50/lb	$3.00/lb
Silver Price	$21.00/oz	$18.00/oz
Molybdenum Price	$11.00/lb	$7.00/lb
Gold Process Recovery	85% SAP/SRK, 80% Tr.Ox., 82% Fresh	75% SAP/SRK, 80% Tr.Ox., 83% Fresh
Copper Process Recovery	0% SAP/SRK, 50% Tr.Ox., 86% Fresh	0% SAP/SRK, 50% Tr.Ox., 87% Fresh
Silver Process Recovery	85% SAP/SRK, 60% Tr.Ox., 70% Fresh	65% SAP/SRK, 60% Tr.Ox., 60% Fresh
Molybdenum Process Recovery	50% Trans.Ox. and Fresh	50% Trans.Ox. and Fresh
Pit Slope	47 degrees	47.5 degrees
Cut-off Grade	0.25 g/tAuEq	0.30 g/t AuEq

Comments on the comparison of the current and previous estimates of mineral resources:

- A total of 119 new holes, totalling almost 37,000 m, have been drilled since the previous estimate of mineral resources in June 2022. In general, a closer-spaced pattern of drillholes has resulted in the conversion of mineral resources in the inferred mineral resource category to an indicated mineral resource category. At Gran Bestia, drilling has also expanded mineral resources, primarily at depth and on the northern side of the deposit.
- In the combined Cangrejos and Gran Bestia Zones, contained gold in indicated mineral resources has increased by 6.4 Moz and contained gold in inferred mineral resources has decreased by 3 Moz since the previous mineral resource estimate.

- At Cangrejos, there has been an overall decrease of about 0.5 Moz of contained gold in mineral resources. This is primarily the result of new drilling that now defines the limits of mineralization on the north, east, and south parts of the deposit.
- The new drilling at Gran Bestia has expanded the deposit in essentially all directions but primarily towards the north and at depth. This has resulted in almost doubling the amount of contained gold in mineral resources compared to the previous estimate.
- There has been only a marginal increase in mining costs and no change to process and G&A costs compared to the previous estimate. There have also been increases in the projected metal prices, and there are minor changes, both positive and negative, in the projected process recoveries. The pit slope angle has been reduced by 0.5 degrees compared to the previous estimate. Based on the new technical and economic parameters, the base case cut-off grade has been reduced from 0.30 g/t AuEq in 2020 to 0.25 g/t AuEq in the current mineral resource estimate. This results in additional tonnage of mineral resources but overall lower average grades.

14.17 Summary and Conclusions

Based on the current level of exploration, the Cangrejos and Gran Bestia deposits contain total indicated mineral resources of 1.08 billion tonnes at a grade of 0.48 g/t Au, 0.09% Cu, 0.7 g/t Ag and 17.8 ppm Mo containing 16.8 Moz of gold, 2.2 Blbs of copper, 24.3 Moz of silver and 42.4 Mlbs of molybdenum. There is an additional total inferred mineral resource of 296 Mt at a grade of 0.39 g/t Au, 0.07% Cu, 0.7 g/t Ag and 11.7 ppm Mo containing 3.7 Moz of gold, 483 Mlbs of copper, 7 Moz of silver and 7.6 Mlbs of molybdenum.

The main objective of the most recent drilling program was to delineate areas that were included in the 2022 PEA mine plan with holes spaced on a nominal 100 m pattern, therefore upgrading any previous inferred mineral resources to a higher confidence indicated mineral resource category. The majority of the new drilling on Cangrejos occurred around the perimeter of the deposit and defined the lateral extents of mineralization in the deposit. This has resulted in a slight decrease in mineral resources compared to the previous estimate. At Gran Bestia, drilling occurred over essentially all areas of the deposit, expanding the limits of the mineral resources in most directions. The majority of the increases in mineral resources at Gran Bestia are the result of new drilling on the northern part of the deposit.

Both deposits remain "open" to potential expansion at depth. The Cangrejos deposit remains "open" to some extent towards the southwest. The Gran Bestia deposit remains "open" to expansion in several directions but primarily towards the north and northwest directions.

15 MINERAL RESERVE ESTIMATES

15.1 Introduction

Independent Mining Consultants, Inc. (IMC) was requested by Lumina to prepare a PFS-level estimate of mineralized reserves for the Cangrejos Project in southern Ecuador. The QP for this work is Joseph McNaughton P.E., a Senior Engineer at IMC. This section summarizes that work.

The mineralized reserve was developed from a computer block model provided to IMC by Robert Sim of SIM Geological, Inc. (Sim) and delivered to IMC in February 2023. IMC has not audited or verified the block model. IMC has confirmed that its installation and calculations of tonnage and grade from the model match those calculated by Sim Geological, Inc. and is the total of all probable mineral reserve category ore that is planned for processing.

The mine plan that is presented in Section 16 details the development of that mine plan. The mineral reserve estimate was established by tabulating the contained tonnage of the material comprising the measured and indicated mineral resource within the designed final pit geometry at the planned cut-off grade. The model did not contain material comprising the measured mineral resource; therefore, the mineral reserve estimate only reports material comprising the the probable (indicated) mineral reserve. The final pit design and the internal phase (pushback) designs were guided by the results of the pit optimizations.

15.2 Reserve Estimation

15.2.1 Model Transfer

The block model received from Sims Geological was described in Section 14. The model blocks are sized 15 m x 15 m in plan with a bench height of 15 m. The 15 m bench height is appropriate for the production rate and equipment selected to achieve that production rate.

The model as installed by IMC covers the following area:

- North 9,613,300 to 9,616,150 (190 blocks)
- East 631,050 to 633,900 (190 blocks).

Coordinates are: UTM Provisional South America 1956, Zone 17S.

The model variables that were supplied are:

- Gold Grade...g/t
- Copper Grade ....%
- Silver Grade ....g/t
- Molybdenum Grade...ppm
- Sulphur Grade..%

- Equivalent Gold Grade .... g/t
- Oxide .... oxidation domain types
- Lithology .... lithological domains
- Specific Gravity .... sg
- Class .... indicated and inferred mineral resources only
- Topography .... provided by a topographic file on 2 m contours.

IMC installed the model and tabulated the contained tonnage within the resource pit that was developed by Sims. This check on the model installation was completed to confirm proper application and utilization of the block model variables.

Other planning variables were added to the model as required by IMC, including NSR and slope angle information that are discussed in later subsections. The model was expanded an additional 150 m to the east to capture additional waste that might potentially result due to geotechnical constraints.

15.2.2 Pit Optimization

The pit optimizations were developed from the economical pit produced using the Lerch-Grossmann (LG) algorithm. The LG algorithm applies approximate costs and recoveries along with approximate pit slope angles to establish theoretical economic breakeven pit wall locations. All of the pit optimizations and the subsequent sections address material comprising the measured and indicated mineral resource ore only. The model did not contain material comprising a measured mineral resource; therefore, the pit optimizations only included material comprising the indicated mineral resource. Material comprising the inferred mineral resource is treated as waste from this point forward in the project evaluation.

Economic input applied to the LG algorithm is necessarily preliminary as it is one of the first steps in the development of the mine plan. However, the pits generated from the LG should be considered as approximate as they do not assure access or mine equipment operating room. The important result of the LG results is the relative changes in geometry between pits of increasing metal prices. Lower metal prices result in smaller pits which provide guidance to the design of the initial pushbacks. The change in-pit shells as metal prices are increased indicates the best direction for the succeeding phase expansions to the ultimate pit.

Initial design parameters referred to as “ore definition parameters” by Lumina were established by IMC and Lumina working with the entire project team. Those parameters are presented in Table 15-1 and reflect initial estimates of costs and recoveries. These initial estimates may not match the final costs, recoveries, and slope angle specifics that result from this overall study. However, they are sufficiently close to provide guidance for mine planning.

Table 15-1: Cangrejos Project Ore Definition Parameters

Mining Cost				
Direct Mining Cost			$1.95	$/tonne material
Sustaining Mine Capex			$0.19	$/tonne material
			$2.14	$/tonne material
Processing Cost per tonne ore			$ 7.01	$/tonne ore
G&A Cost per tonne ore			$ 0.75	$/tonne ore
Process Recoveries				
Partial Oxidized	Con	Dore	Total	
Gold	60%	20%	80%	
Silver	50%	10%	60%	
Copper	50%		50%	
Fresh Rock	Con	Dore	Total	
Gold	62%	20%	82%	
Silver	50%	20%	70%	
Copper	86%		86%	
Smelting Refining and Freight				
	Con	Dore		
Gold	$7.50	$0.30	/ounce	/ounce
Silver	$0.65	$0.30	/ounce	/ounce
Copper	17	% Con Grade	93.58%	1.2% Smelter Deduct
	77.45	$/t Freight		
	76.92	$/tonne TC		
	0.07	$/lb RC		
Converted to Cost per Pound =			$0.510	/lb
Royalties			3%	of NSR
Base Case Metal Prices for Mine Plan				
Gold			$1,500.00	/ounce
Silver			$18.00	/ounce
Copper			$3.00	/lb
Internal Cutoff, NSR			$ 7.76	$ NSR/ tonne

Source: IMC, 2023.

A series of optimization pits were developed from economic parameters defined in Table 15-1 at multiple metal prices. The pit optimizations incorporated the geotechnical guidelines provided by W&N in Section 16.4.

The pit slopes used for the pit optimizations included an allowance for ramp access and safety berms. The following summarizes the slope angles applied to the pit optimizations.

Overall Slope Angles:

- Bedrock (Variable by Rock type and Sector) –43.5° to 50.3°
- Unconsolidated Soil-like – 31.3°
- Unconsolidated Rock-like & Transitional –42.0°.

IMC has utilized NSR to combine the values of all economic metals at Cangrejos. Simply put, NSR is to the total sales value net of all off-site costs for smelting and refining. Using the metal prices and costs summarized on Table 15-1, the equations for NSR are as follows based on the metal grade units provided in the model.

Gold NSR = Au grade x Recovery x (1-Ecuadorian Royalty) x (Price – Au Refine) x 0.03215

\+ Silver NSR = Ag grade x Recovery x (1-Ecuadorian Royalty) x (Price – Ag Refine) x 0.03215

\+ Copper NSR = Cu grade x Recovery x (1-Ecuadorian Royalty) x (Price- Smelt/lb) x 22.0462

Total NSR in dollars per tonne

The average grades of earlier mine plans indicated that gold makes up over 80% of the value, and copper around 17%. The remaining value is added from silver. The internal cut-off for NSR is $7.76/t, the total of processing and G&A.

The base case NSR was calculated for every block in the model. Then, in order to establish pit design guidance for smaller pits, the NSR was reduced by factoring downward on a percentage basis (revenue factors). Rather than reporting revenue factors for each cone, the resulting gold price from each factor is reported on the summary tables since gold is the most valuable metal of the four.

The pit optimizations were calculated at $50/oz incremental gold prices (copper and silver prices were scaled at the same ratio of price increments) between $350/oz and $1,750/oz. Each of the incremental optimized pits were tabulated at the mineral reserve metal price (aka $1,500/oz gold price) to establish the incremental tonnage, grades and potential net of process income within each of the optimized pits.

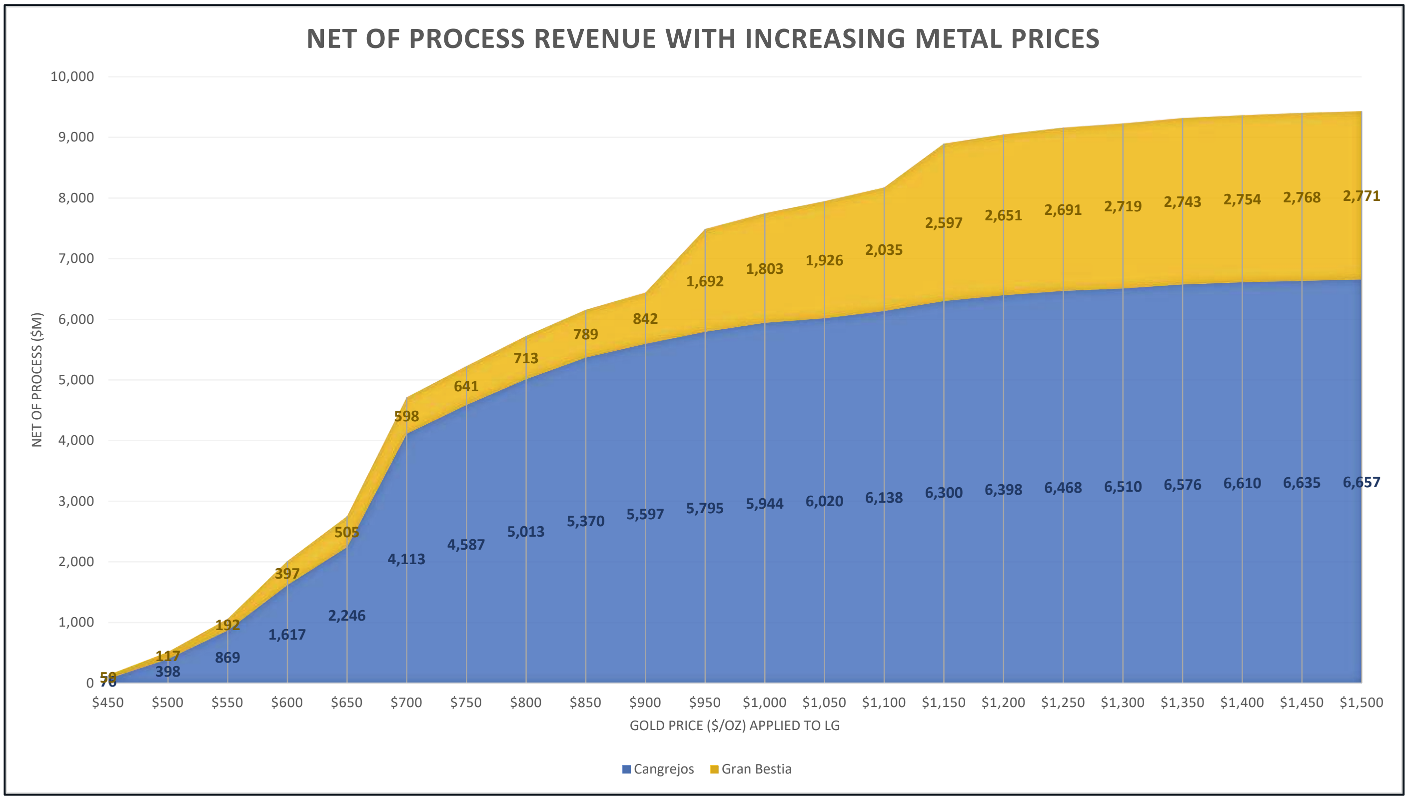
The resulting graphics are presented in terms of metal prices, but the reader should keep in mind that the value of all metals is included in the development of the computer-generated pit geometries. The resulting potential net of process income for each of the cumulative pit optimizations with increasing metal prices is provided in Figure 15-1.

A cost per ounce for each incremental pit optimization was calculated to rank the incremental optimized pits, which was used as a guide to establish pit targets for phase designs and scheduling.

The combined pit shells that resulted in the most economical 18-24 months of ore feed at an elevated cut-off grade were selected as the starting pit target. Each successive pushback was added to the schedule based on the same methodology; however, it also was visually assessed to ensure that it would result in sufficient operating width for equipment (on average). Cut-off grade applied also balanced the amount of mill feed required to establish the subsequent pushback.

Targeted optimized pit shells used for phase designs are detailed in Table 15-2 and the engineered pit designs are detailed in Table 15-3.

Figure 15-1: Cumulative Revenue with Increasing Gold Price



Source: IMC, 2023.

Table 15-2: Optimized Pits Selected for Phase Designs

Optimized LG Phase Target Totals @ Projected Scheduled COG's													
Phasing	Pit Gold Price	NSR COG	Mineralized	Contained Grade				Payable Metal				Cost/Eq. Gold ounce
Target		Applied to Optimized Pit	Potential Mill Feed	NSR	Gold	Silver	Copper	Eq. Gold	Gold	Silver	Copper	
Sequence	($/oz)	($/t)	(kt)	($/t)	(g/t)	(g/t)	(%)	(koz)	(koz)	(koz)	(Mlbs)	($/oz)
Cangrejos 1	550	23.00	31,948	37.2	0.77	0.56	0.14	791	684	327	84	434
Cangrejos 2	650	16.00	70,168	30.9	0.66	0.60	0.13	1,446	1,250	832	147	526
Cangrejos 3	700	12.00	114,527	28.4	0.62	0.55	0.12	2,169	1,835	1,016	243	603
Gran Bestia 1	900	9.90	59,905	24.9	0.42	0.58	0.07	996	882	641	94	601
Cangrejos 4	1,000	7.76	168,945	23.5	0.45	0.63	0.10	2,642	2,196	1,739	316	739
Gran Bestia 2	1,050	7.76	162,783	17.6	0.38	0.66	0.07	1,908	1,614	1,905	208	853
Gran Bestia 3	1,150	7.76	110,088	20.4	0.48	0.79	0.07	1,497	1,313	1,342	134	975
TOTAL			**718,364**	**23.91**	**0.498**	**0.64**	**0.09**	**11,450**	**9,774**	**7,802**	**1,226**	**733**

Note: Eq. Gold (Equivalent Gold Ounces) = Mill Feed Tonnes x NSR / $1,500. Source: IMC, 2023.

Table 15-3: Phase Design Tabulations

Engineered Pit Design Totals @ Scheduled COG's												
Phasing	LG Pit Gold Price	NSR COG	Mineralized	Contained Grade				Payable Metal				Cost / Eq. Gold Ounce
Target		Applied within Schedule	Potential Mill Feed	NSR	Gold	Silver	Copper	Eq. Gold	Gold	Silver	Copper	
Sequence	($/oz)	($/t)	(kt)	($/t)	(g/t)	(g/t)	(%)	(koz)	(koz)	(koz)	(Mlbs)	($/oz)
Cangrejos 1	550	20 to 23	30,057	35.12	0.782	0.63	0.14	704	588	286	69	505
Cangrejos 2	650	15 to 23	71,712	31.40	0.696	0.71	0.12	1,502	1,251	783	148	621
Cangrejos 3	700	14 to 23	62,393	29.29	0.644	0.54	0.12	1,219	1,008	518	126	713
Gran Bestia 1	900	11 to 19	61,336	24.88	0.565	0.66	0.09	1,019	867	610	89	690
Cangrejos 4	1,000	7.76 to 20	159,472	27.87	0.603	0.66	0.12	2,965	2,411	1,624	328	721
Gran Bestia 2	1,050	7.76 to 11	140,920	17.42	0.380	0.73	0.07	1,635	1,343	1,585	168	1,027
Gran Bestia 3	1,150	7.76	132,824	20.68	0.463	0.73	0.07	1,834	1,545	1,510	167	880
TOTAL			**658,714**	**24.76**	**0.546**	**0.68**	**0.10**	**10,878**	**9,014**	**6,916**	**1,095**	**794**

Note: Eq. Gold (Equivalent Gold Ounces) = Mill Feed Tonnes x NSR / $1,500. Source: IMC, 2023.

15.2.3 Engineered Pit Designs

The pit optimization results were used as a guide to develop seven pushbacks or phases for the development of a practical mine plan and schedule: Four phases within the Cangrejos area and three phases within the Gran Bestia area. The inter-ramp slope angles for the phase designs were provided by the geotechnical contractor W&N provided in Section 16.4.

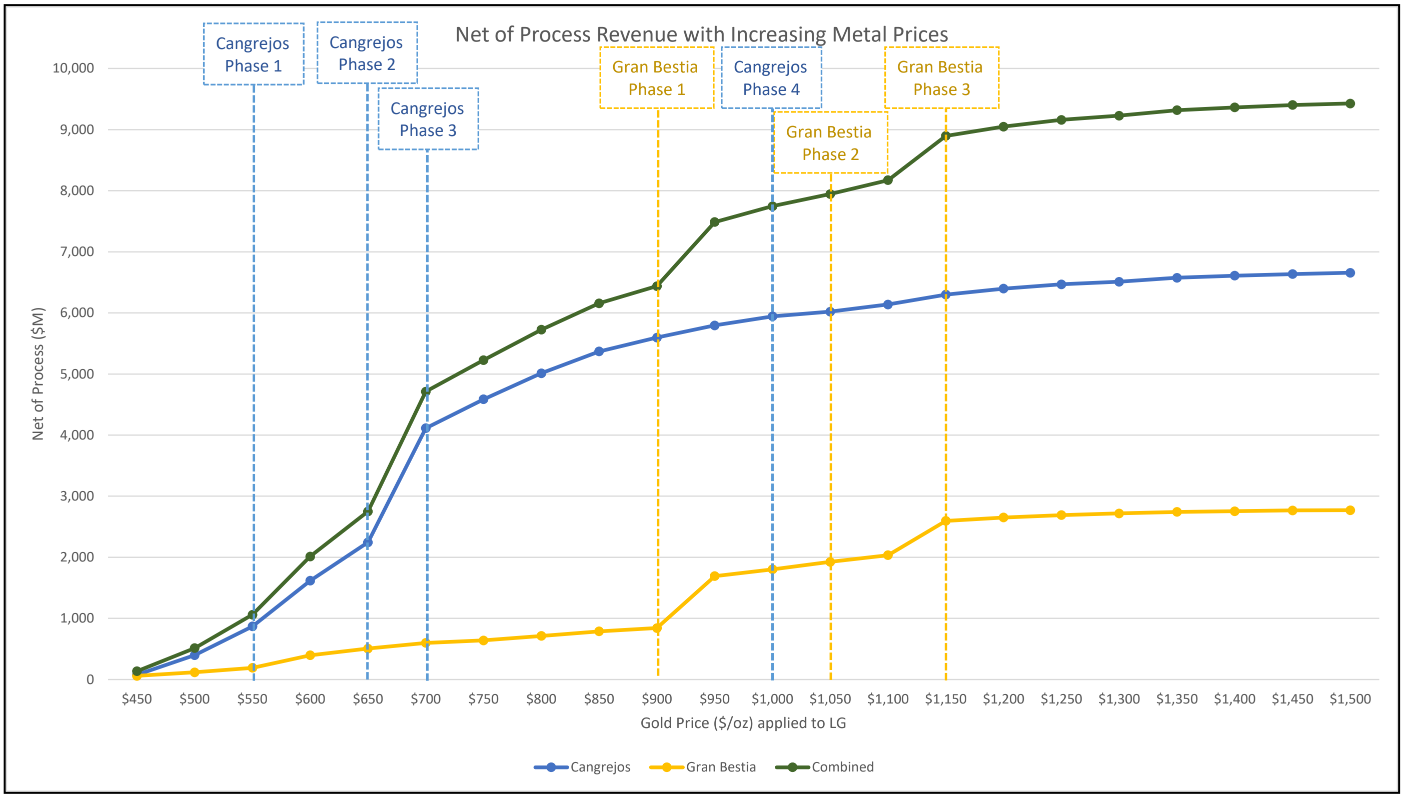
Section 14 reported that the block model is based on 15m by 15m blocks with a 15m bench height. The planned equipment at Cangrejos will be a good match for the 15m bench height. Block model grades were utilized to develop the mine plan. IMC is of the opinion that the model contains sufficient mining dilution for the existing fleet; therefore, no additional mining dilution factors were applied.

The physical parameters used for engineered pit (phase) designs are summarized below:

- Inter-ramp Slope Angles:
  - 47.2° to 53.7° Bedrock (Variable by Rock type and Sector)
  - 31.3° Unconsolidated Soil-Like
  - 42.0° Unconsolidated Rock-Like & Transitional
- Bench Height:
  - 15 m Bedrock
  - 7.5 m Unconsolidated Soil-Like
  - 15 m Unconsolidated Rock-Like & Transitional
- Catch Berm Width:
  - 10.5 m Bedrock
  - 8.0 m Unconsolidated Soil-Like
  - 8.0 m Unconsolidated Rock-Like & Transitional
- Safety Berms:
  - 25 m Width
  - 150 m Vertical Spacing (A Top of Bedrock & Below)
- Haul road width:
  - 33 m Two-way traffic w/ berm
- Haul road grade:
  - 10% Maximum
- Minimum Equipment Operating Width between Pushbacks:
  - 45 m Minimum for Initial Development (Upper Benches)
  - 75 m Minimum for Primary Production Benches

Figure 15-2 shows how the engineered pit phases fit along the cumulative revenue curve previously shown in Figure 15-1.

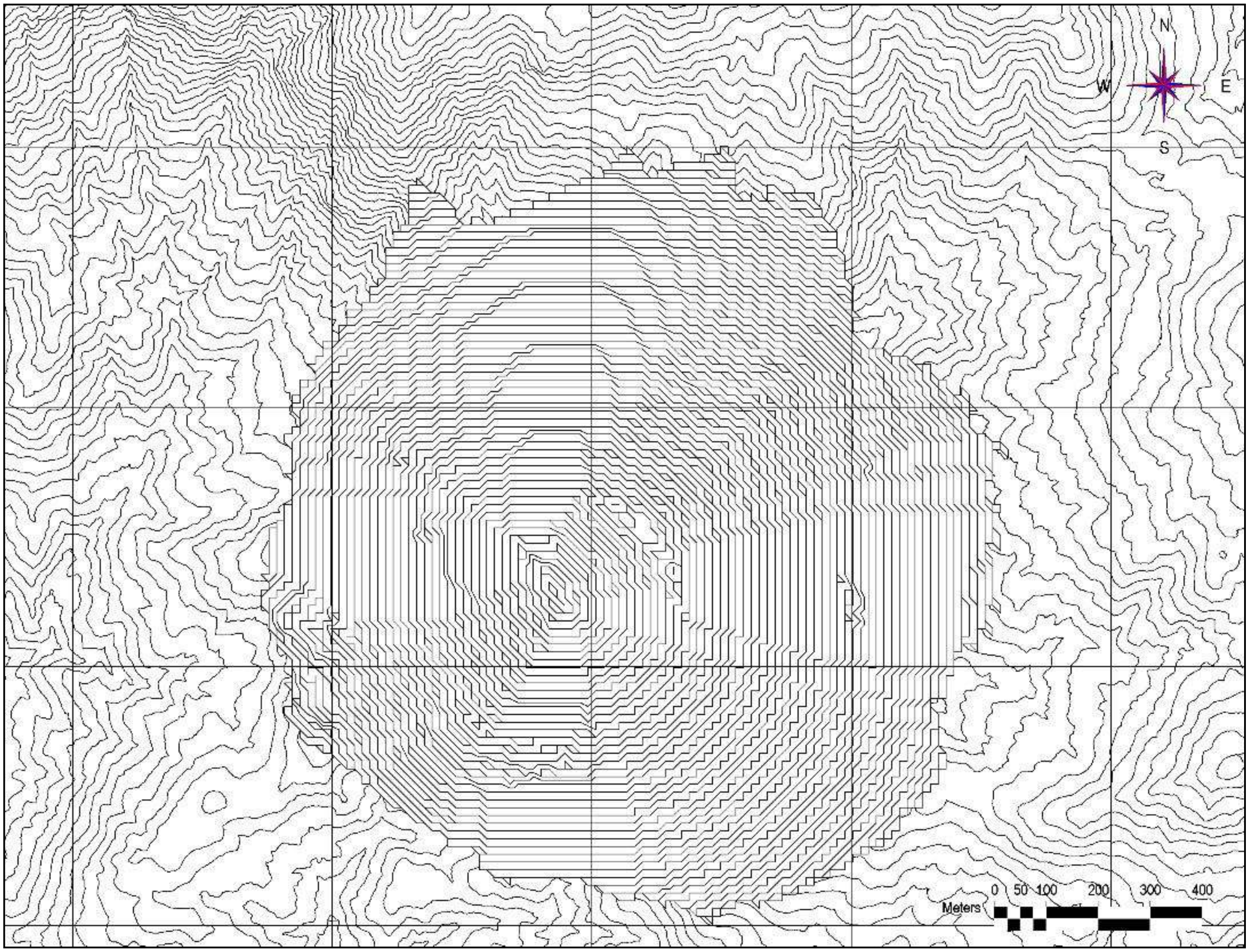
Figure 15-2: Cumulative Revenue with Increasing Gold Price, with Phase Details



Source: IMC, 2023.

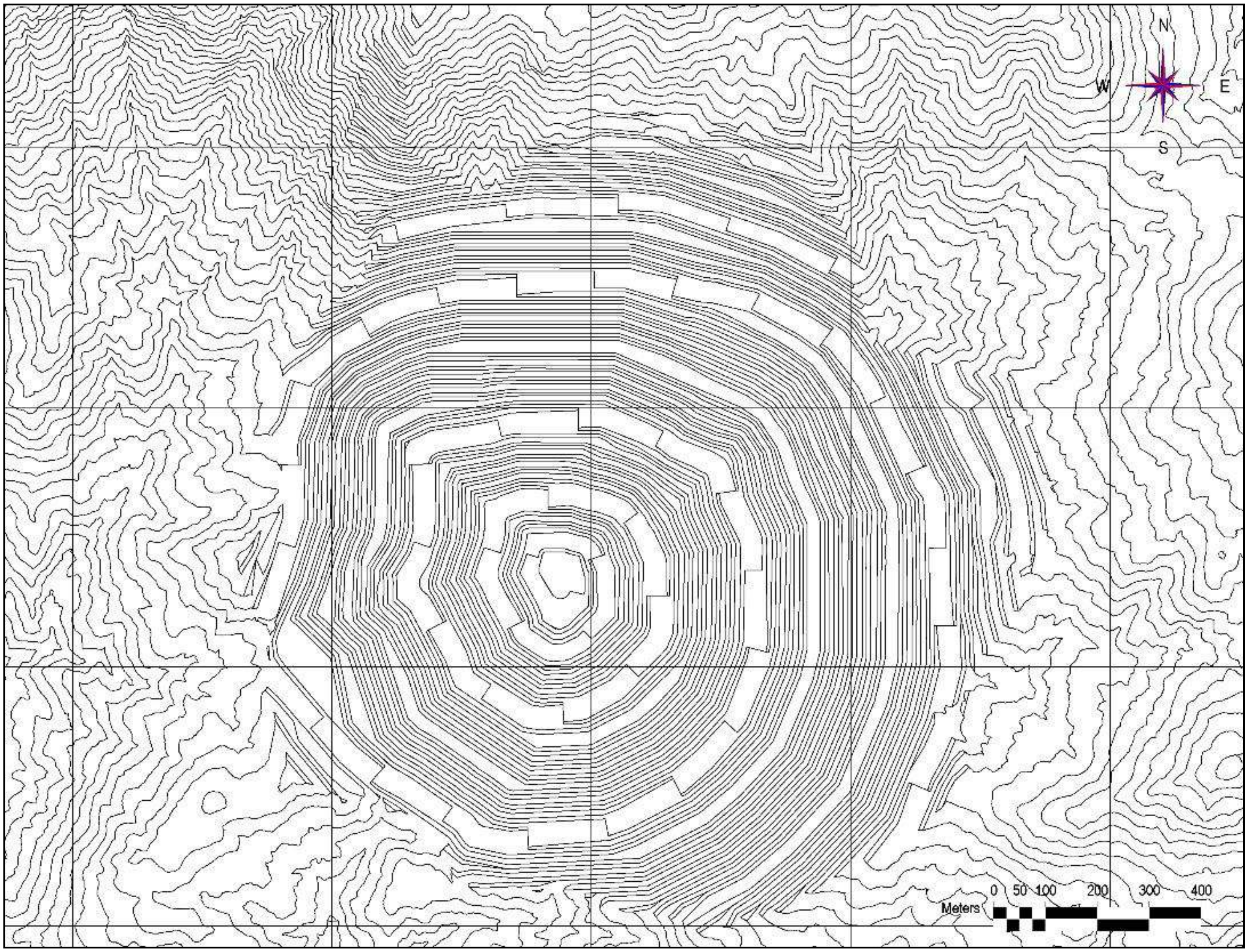
Figure 15-3 below shows the ultimate LG-optimized pit for the Cangrejos pit and Figure 15-4 shows the ultimate engineered pit design for Cangrejos that conforms to the LG-optimized pit.

Figure 15-3: Cangrejos Ultimate LG Optimized Pit (Plan View)



Source: IMC, 2023.

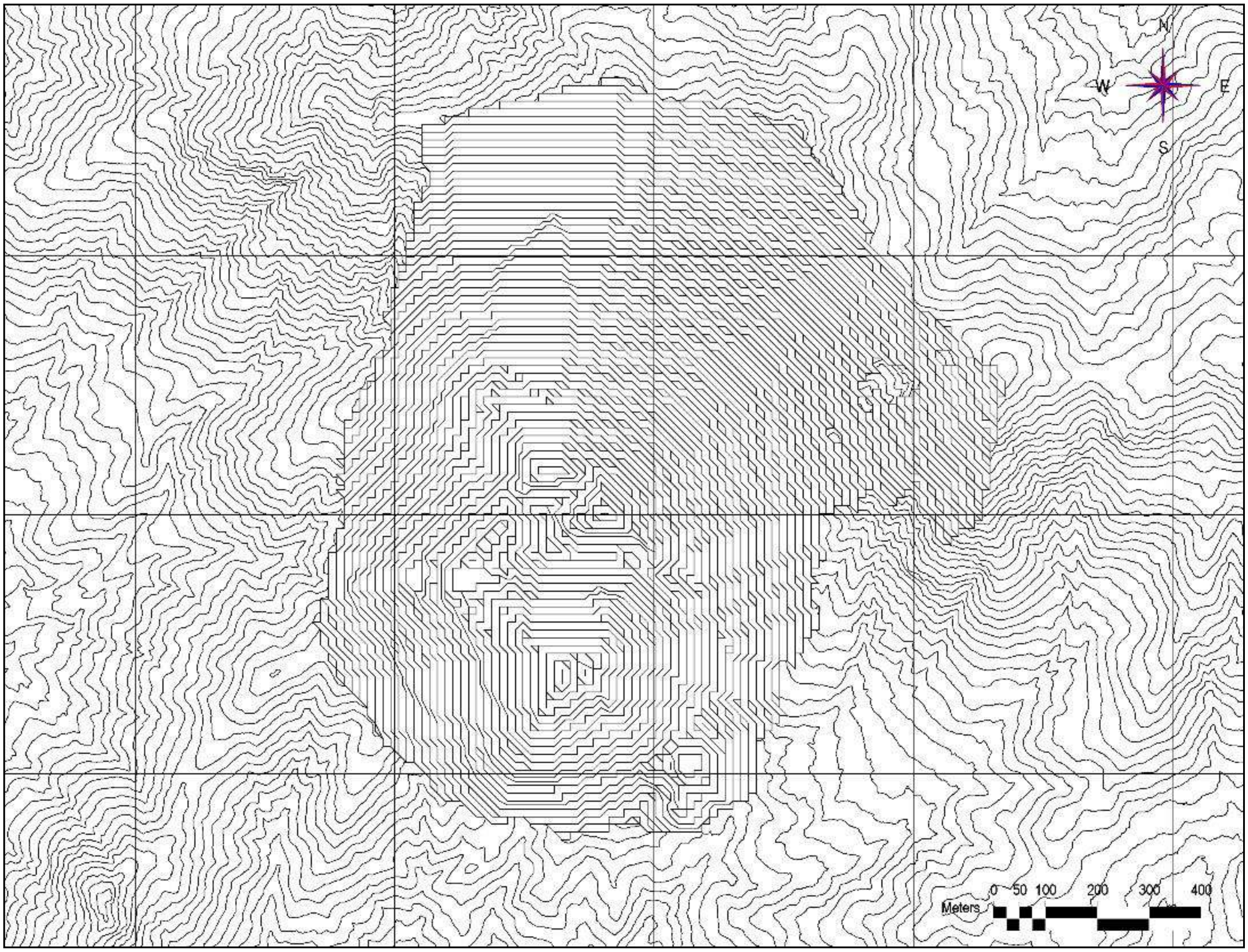
Figure 15-4: Cangrejos Ultimate Engineered Pit Design (Plan View)



Source: IMC, 2023.

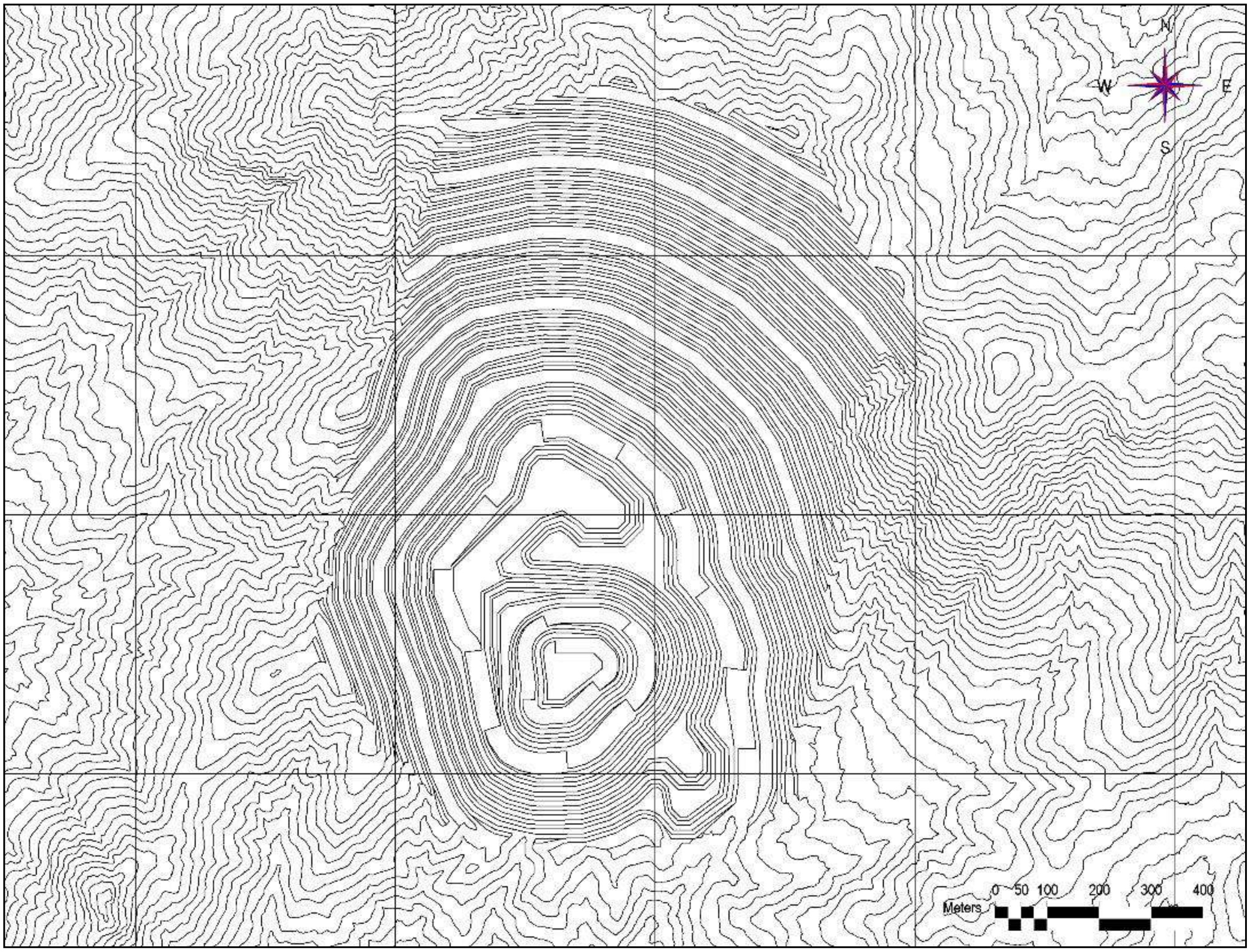
Figure 15-5 below shows the ultimate LG-optimized pit for the Gran Bestia pit and Figure 15-6 shows the ultimate engineered pit design for Gran Bestia that conforms to the LG-optimized pit.

Figure 15-5: Gran Bestia Ultimate LG Optimized Pit (Plan View)



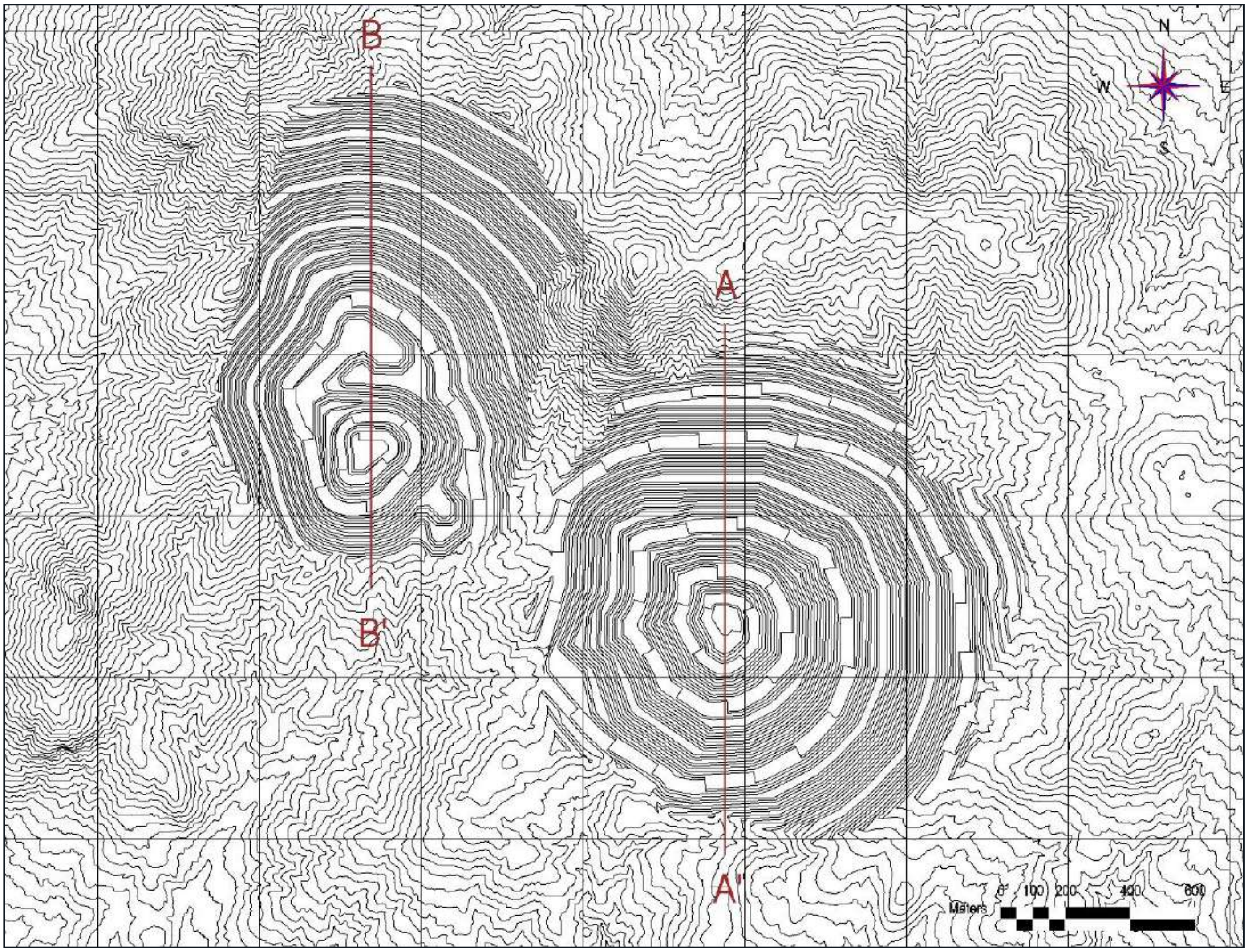
Source: IMC, 2023.

Figure 15-6: Gran Bestia Ultimate Engineered Pit Design (Plan View)



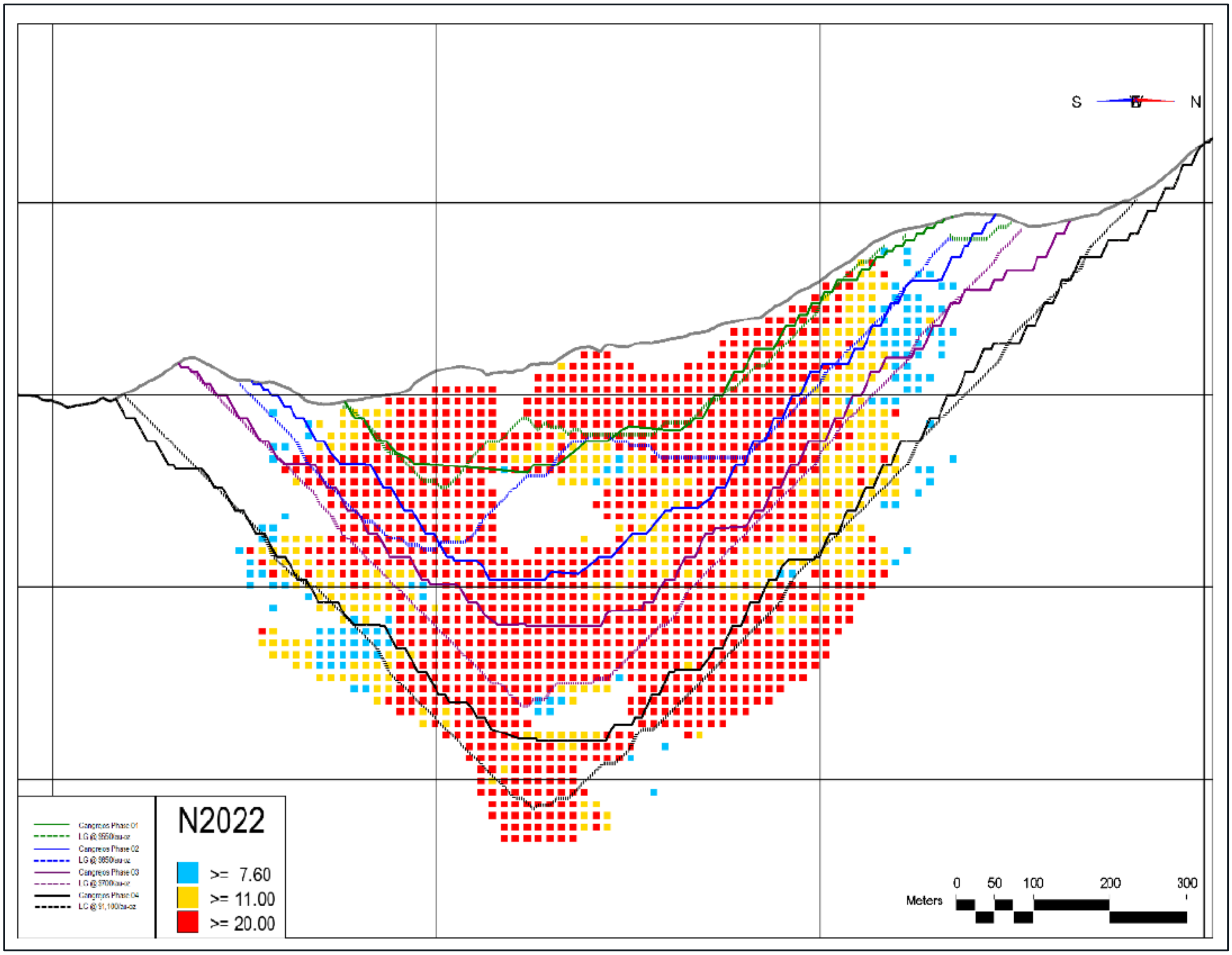
Source: IMC, 2023.

Figure 15-7: Plan View Ultimate Pit with Cross-sections



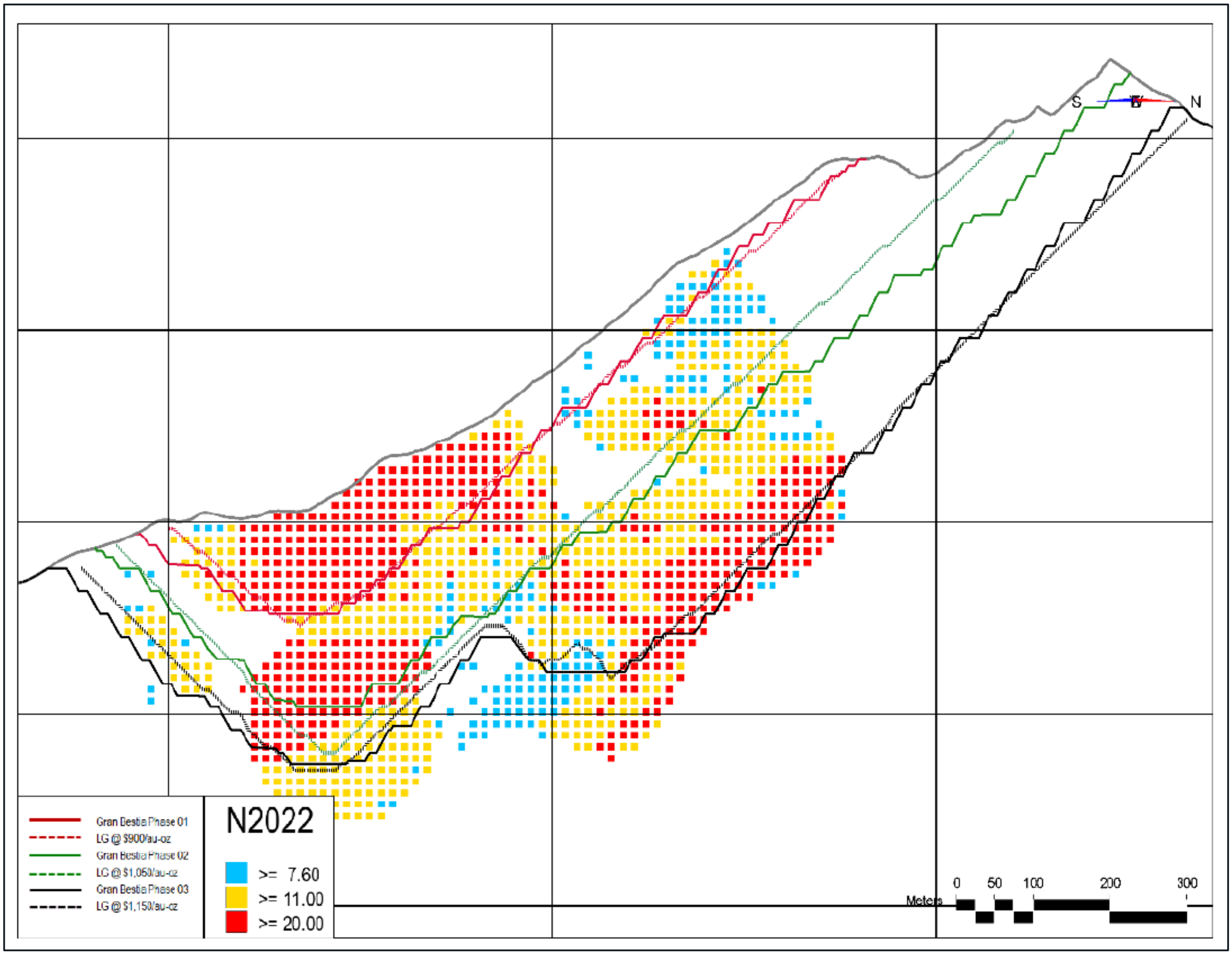
Source: IMC, 2023.

Figure 15-8: Cangrejos Cross-section (A' – A) with Optimized and Engineered Pits



Source: IMC, 2023.

Figure 15-9: Gran Bestia Cross-section (B' – B) with Optimized and Engineered Pits



Source: IMC, 2023.

One will note that the NSR/tonne generally declines from Phase 1 to Phase 7. The cash cost per equivalent ounce generally increases from Phase 1 to Phase 7. The reversal in cost per equivalent ounce at the Gran Bestia Phase 1 is due to the low strip ratio of that phase. However, mining could not start at Gran Bestia because there is insufficient ore on each bench to sustain the process feed without an impractical vertical development rate in the pit.

Equivalent gold is an engineering calculation for simplified comparisons. The NSR value of every block is converted to an equivalent gold grade that would have the same value as the NSR once all recoveries and costs are applied.

The phase designs will not be shown as drawings in this text, other than how they will appear later on the annual mine drawings. At any given time, at least two and sometimes four phases are in operation, so the mine will never look like any one phase design. The annual drawings illustrate the actual mine geometries with multiple phases and ample working room on each bench.

15.3 Reserve Estimates

The seven phase designs provided in the prior sub-section were used as the basis for the mine production schedule. The mine production is provided in the subsequent Section 16 and is used as the basis to define the mineral reserves. The mineral reserves are summarized in Table 15-4.

Table 15-4: Cangrejos Project Mineral Reserve Statement – Effective Date: March 30, 2023

Classification	Mineralized Tonnes (Mt)	Contained Grade			Contained Metal		
		Gold Grade (g/t)	Copper (%)	Silver (g/t)	Gold (Moz)	Copper (Mlbs)	Silver (Moz)
Probable	659	0.55	0.10	0.68	11.56	1,420	14.38
Total Reserves	659	0.55	0.10	0.68	11.56	1,420	14.38

Notes: **1.** The mineral reserve estimate has an effective date of March 30, 2023. **2.** Mineral reserves in Table 1-4 are contained within the mineral resources; mineral resources are not included. **3.** The mineral reserves in this estimate are based on declining NSR cut-off grade between $23.00/t milled to $7.76/milled. **4.** Net smelter return (NSR) values were calculated using the following prices: a gold price of US$1,500 per ounce, a copper price of US$3.00 per pound, and a silver price of US$18.00 per ounce. NSR values are calculated using the following costs & recoveries: Costs of metal in copper concentrate: $7.50/oz Au, $0.51/lb Cu, and $0.65/oz Ag; Costs of metal in dore: $0.30/oz Au and $0.30/oz Ag; recoveries of metal in copper "oxide" rock concentrate: 60% Au, 50% Ag, and 50% Cu; recoveries of metal in copper "fresh" rock concentrate: 62% Au, 50% Ag, and 86% Cu; recoveries of metal in copper "oxide" rock dore: 20% Au and 10% Ag; recoveries of metal in copper "fresh" rock dore: 20% Au and 20% Ag; payables of metal in copper concentrate: 97.5% Au, 60% Ag, and 93.58% Cu; payables of metal in dore: 99.95% Au and 99.5% Ag. Saprolite and saprock are not included in the mineral reserve. **5.** The mineral reserves estimate was calculated with the Canadian Institute of Mining, Metallurgy and Petroleum ("CIM"), CIM Standards on Mineral Resources and Reserves, Definitions and Guidelines prepared by the CIM Standing Committee on Reserve Definitions. **6.** The probable mineral reserves are contained within an engineered pit design that is based on pit optimization associated with a $1,100/oz gold price. **7.** Gold is reported in millions of troy ounces and the gold grade is reported in grams per metric tonne. **8.** Totals may not add up due to rounding**. 9.** The qualified person for the mineral reserve estimate is Joseph McNaughton P.E., a senior engineer at Independent Mining Consultants, Inc. **10.** Lumina is not aware of any legal, political, environmental, or other risks that could materially affect the potential development of the mineral reserves. Source: IMC, 2023.

16 MINING METHODS

16.1 Overview

The Cangrejos Project consists of two adjacent open pit mines referred to as (1) Cangrejos (eastern pit), and (2) Gran Bestia (western pit). Both will be mined with conventional hard rock open pit mining methods. The terrain is steep over both deposits, there is forest vegetation, and saprolitized rock overlying both pit areas. Dealing with the saprolite will present a challenge for mine operations, which has been anticipated with the mine schedule and mine equipment within this report.

Optimization trials were completed that addressed the overall pit size, production rate to the process plant, and mine production schedule. This report will summarize the results of those evaluations but does not report the results of each option studied.

Table 16-1 and Table 16-2 summarize the mine production schedule which has resulted from this work. Figure 16-1 summarizes the mill production schedule. All of the mineralized tonnage to the mill feed minable ore was classified as probable mineral reserves. Additional details of this schedule will be presented later in this section, including monthly time periods during pre-production and illustrative annual drawings of the mine and waste storage plan.

The mine delivers 30 kt/d (10.95 Mt/a) of mineralized mill feed to the plant from mid-Year 1 through Year 3. Production ramps up in Year 4 so that the mine delivers 60 kt/d (21.90 Mt/a) of mineralized mill feed in from Years 5 to 6. Production ramps up a third time in Year 7 so that the mine delivers 80 kt/d (29.20 Mt/a) of mineralized mill feed from Year 8 until the end of mine life. Multiple mill feed ramp-up schedules were evaluated, but the 30-60-80 schedule resulted in the best economics and minimized the initial capital requirements.

Table 16-1: Mine Production Schedule

Year	NSR Cutoff Grade (US$/t)	Mineralized Oxide/Fresh Rock Mined								Waste Material (kt)	Total Mined Material (kt)
		Material To Be Processed (kt)	Contained Metal Grades								
			NSR ($/t)	Gold (g/t)	Silver (g/t)	Copper (%)	Moly (ppm)	Sulphur (%)			
PP	23.00	1,800	31.79	0.734	0.6	0.13	17	0.17		11,481	13,281
1	23.00	6,450	33.73	0.769	0.6	0.13	23	0.17		36,677	43,127
2	23.00	10,950	36.34	0.813	0.7	0.14	31	0.19		33,419	44,369
3	20.00	10,950	27.57	0.609	0.5	0.11	22	0.22		36,417	47,367
4	20.00	19,200	31.83	0.705	0.5	0.12	28	0.20		41,609	60,809
5	19.00	21,900	30.21	0.695	0.7	0.10	24	0.21		38,271	60,171
6	17.00	21,900	32.34	0.721	0.8	0.12	29	0.22		40,096	61,996
7	15.00	28,300	29.69	0.636	0.7	0.13	21	0.21		43,430	71,730

Year	NSR Cutoff Grade (US$/t)	Mineralized Oxide/Fresh Rock Mined								Waste Material (kt)	Total Mined Material (kt)
		Material To Be Processed (kt)	Contained Metal Grades								
			NSR ($/t)	Gold (g/t)	Silver (g/t)	Copper (%)	Moly (ppm)	Sulphur (%)			
8	15.00	29,200	29.11	0.643	0.6	0.12	25	0.25		42,753	71,953
9	14.00	29,200	29.87	0.662	0.7	0.12	20	0.26		42,761	71,961
10	13.00	29,200	24.85	0.556	0.7	0.10	14	0.28		42,325	71,525
11	11.00	29,200	21.72	0.476	0.6	0.09	15	0.31		41,521	70,721
12	11.00	29,200	21.87	0.483	0.6	0.09	15	0.30		42,221	71,421
13	11.00	29,200	21.09	0.461	0.6	0.09	17	0.30		39,800	69,000
14	11.00	29,200	24.39	0.534	0.5	0.10	23	0.23		39,800	69,000
15	11.00	29,200	30.52	0.661	0.6	0.13	28	0.22		38,800	68,000
16	11.00	29,200	41.70	0.892	1.0	0.19	30	0.35		38,800	68,000
17	7.76	29,200	20.29	0.438	1.1	0.09	16	0.38		36,450	65,650
18	7.76	29,200	16.99	0.371	0.8	0.07	11	0.37		36,450	65,650
19	7.76	29,200	18.53	0.409	0.7	0.07	12	0.37		36,352	65,552
20	7.76	29,200	16.22	0.355	0.7	0.07	12	0.36		29,467	58,667
21	7.76	29,200	22.88	0.524	0.9	0.07	7	0.47		11,973	41,173
22	7.76	29,200	23.54	0.533	0.8	0.08	10	0.46		5,750	34,950
23	7.76	29,200	19.26	0.425	0.6	0.08	14	0.34		6,036	35,236
24	7.76	29,200	18.08	0.395	0.5	0.07	15	0.28		6,390	35,590
25	7.76	29,200	19.36	0.426	0.5	0.08	14	0.26		7,042	36,242
26	7.76	11,663	20.54	0.442	0.5	0.09	14	0.23		1,091	12,754
TOTAL		**658,713**	**24.74**	**0.545**	**0.7**	**0.10**	**18**	**0.30**		**827,182**	**1,485,895**

Note: molybdenum and sulphur are not included in the mineral reserves and are not treated as recovered products in this PFS. Source: IMC, 2023.

Table 16-2: Mill Production Schedule

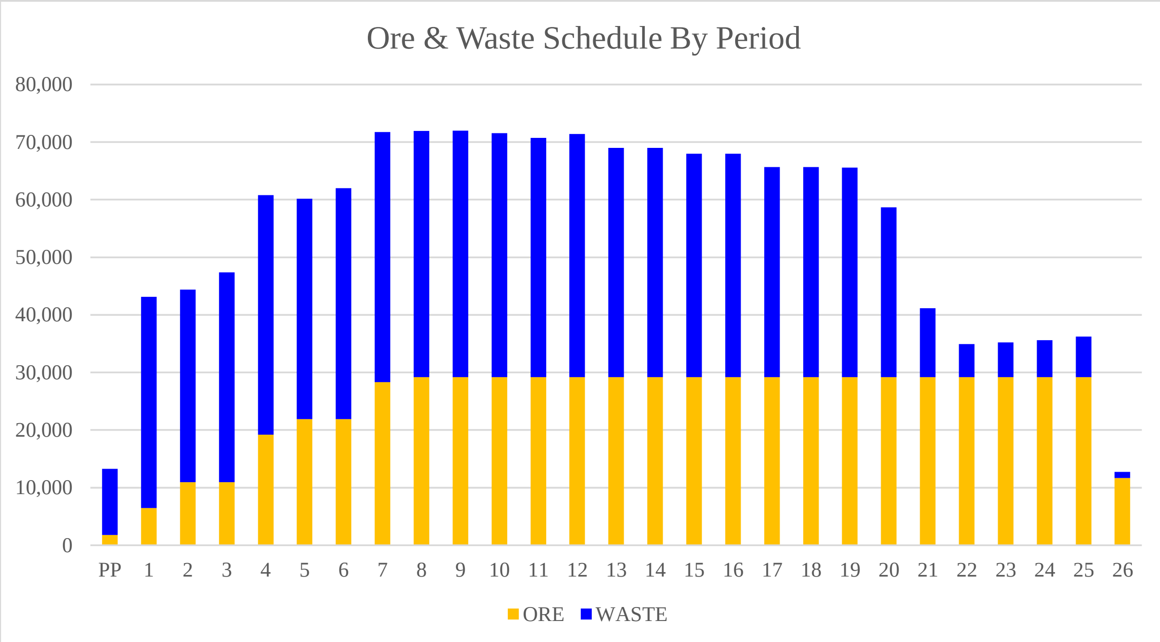
Year	Total Mill Feed				
	Mill Feed (kt)	Contained Metal Grades			
		NSR ($/t)	Gold (g/t)	Silver (g/t)	Copper (%)
PP					
1[1]	8,250	33.30	0.761	0.6	0.13
2	10,950	36.34	0.813	0.7	0.14
3	10,950	27.57	0.609	0.5	0.11

Year	Total Mill Feed				
	Mill Feed (kt)	Contained Metal Grades			
		NSR ($/t)	Gold (g/t)	Silver (g/t)	Copper (%)
4	19,200	31.83	0.705	0.5	0.12
5	21,900	30.21	0.695	0.7	0.10
6	21,900	32.34	0.721	0.8	0.12
7	28,300	29.69	0.636	0.7	0.13
8	29,200	29.11	0.643	0.6	0.12
9	29,200	29.87	0.662	0.7	0.12
10	29,200	24.85	0.556	0.7	0.10
11	29,200	21.72	0.476	0.6	0.09
12	29,200	21.87	0.483	0.6	0.09
13	29,200	21.09	0.461	0.6	0.09
14	29,200	24.39	0.534	0.5	0.10
15	29,200	30.52	0.661	0.6	0.13
16	29,200	41.70	0.892	1.0	0.19
17	29,200	20.29	0.438	1.1	0.09
18	29,200	16.99	0.371	0.8	0.07
19	29,200	18.53	0.409	0.7	0.07
20	29,200	16.22	0.355	0.7	0.07
21	29,200	22.88	0.524	0.9	0.07
22	29,200	23.54	0.533	0.8	0.08
23	29,200	19.26	0.425	0.6	0.08
24	29,200	18.08	0.395	0.5	0.07
25	29,200	19.36	0.426	0.5	0.08
26	11,663	20.54	0.442	0.5	0.09
TOTAL	**658,713**	**24.76**	**0.546**	**0.7**	**0.10**

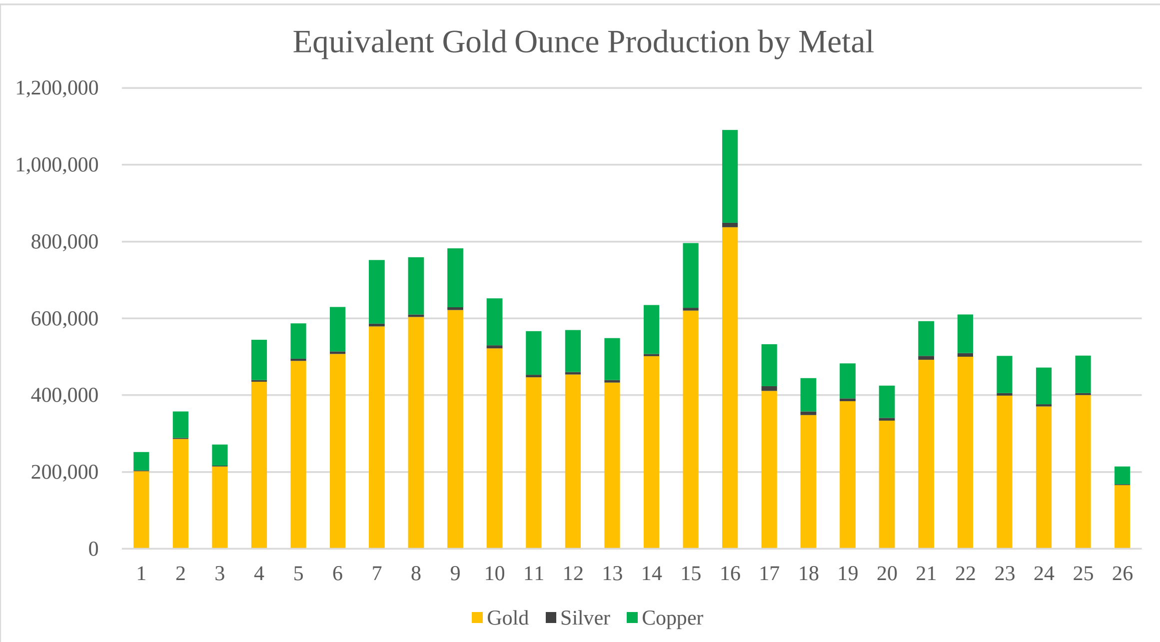
[1] Including Stockpile Reclaim. Source: IMC, 2023.

Figure 16-1: Mine Material Movement and Metal Production

Mine Material Movement



Contained Equivalent Ounces of Gold



Source: IMC, 2023.

16.2 Geotechnical Considerations

16.2.1 Geotechnical Elements

16.2.1.1 Investigations

Geotechnical investigations for the PFS program included 16 hand excavated test pits most with thin-walled tube sampling and grab sampling, a seven-hole dedicated geotechnical core drilling program with acoustic televiewer logging, and supplemental acoustic and geotechnical logging of 12 resource holes. In composite with the 2022 PEA program, 28 holes totaling 11,422 meters were geotechnically logged, of which 10,364 meters were televiewer logged. To further supplement the geotechnical database, 89 resource and infill holes from the PEA and PFS drilling campaigns were also logged to collect geotechnical data and field strength using the point load strength method.

Televiewer logging during PEA and PFS investigations employed acoustic and optical imaging methods and resulted in the collection of some 10,000 orientation measurements for dip and dip direction applicable to structural fabric analyses.

Two laboratories were employed for PFS geotechnical testing. Soil samples were tested by Pontificia Universidad Catolica del Ecuador (“PUCE”) at its facility in Quito and included bulk density (ASTM D7263), Atterberg Limits (ASTM D4318), grain size (ASTM D6913, D422), moisture content (ASTM D4318, D2216) and consolidated undrained triaxial (ASTM D4767). Rock testing was performed by, or under the direction of, the University of British Columbia (“UBC”), Vancouver, Canada and included unconfined compressive strength (ASTM D7012-14) – with and without elastic constants, point load strength (ASTM D5731-16), and direct shear strength of structural fabric defects (ASTM D5607).

16.2.2 Site Geotechnical Model Components

Surficial units consist of colluvium, residual soil, saprolite, saprock, and transition zone in accordance with the geologic zonation adopted by Lumina. Localized pockets of saprolite to 30 m thickness are reported at Cangrejos, with lesser thicknesses to approximately 15 m at Gran Bestia. Maximum saprock thicknesses of 40 m and 30 m are inferred at Cangrejos and Gran Bestia, respectively. Thickness variability is present at both deposits but, in general, steeper topography exhibits lesser thickness.

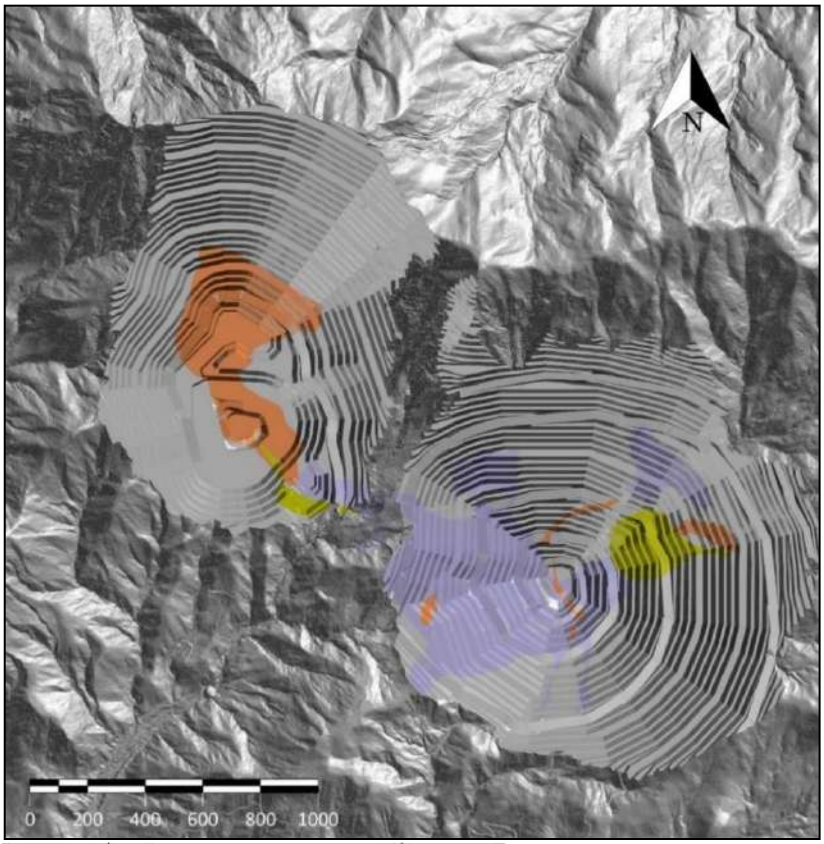
For the purposes of geological and geotechnical modeling, the bedrock lithologies present at the project site have been grouped as follows:

Metamorphic:	Equigranular Quartz Diorite (EQD)
	Foliated Quartz Diorite (EQDF)
	Schist (SCH & GSC)
Intrusive:	Quartz Diorite (QD)
	Porphyritic Dacite (PQD & IPQD)
	Porphyritic Andesite dyke (PAD)

Breccias (BX):	Igneous (IBX)
	Hydrothermal (HBX)
	Magnetite-biotite Hydrothermal (HMBX)

The distribution of these lithologic groups on the ultimate PFS pit walls is shown in Figure 16-2. The overall rock quality at the Project is very good due to high rock strength, lack of phyllic and argillic alteration, low sulphide content, and non-fissile foliation.

Figure 16-2: Lithology Distribution Ultimate PFS Pits



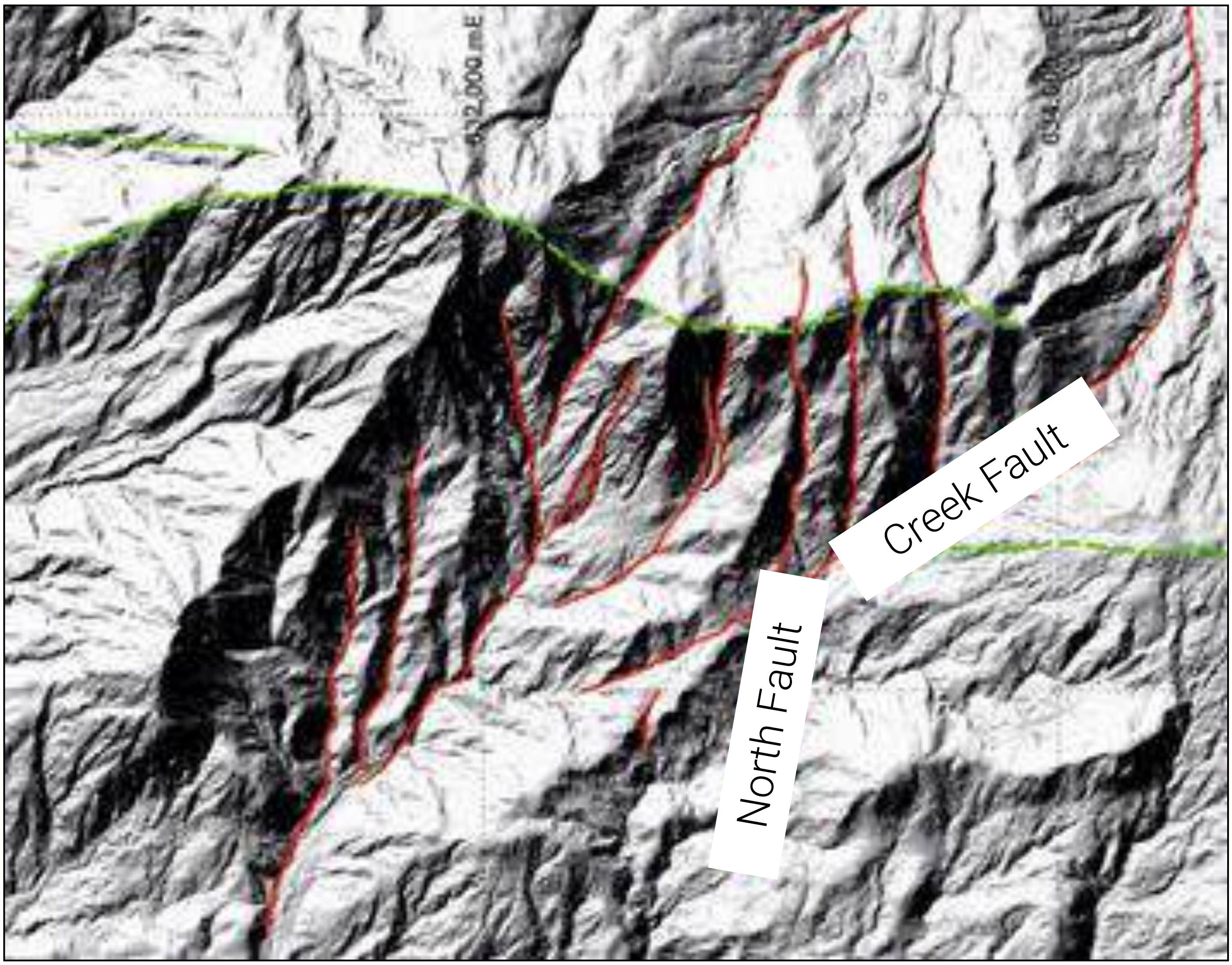
Lithology Group	Composite Lithologies
Intrusive	Quartz diorite (QD)
	Porphyritc quartz diorite (PQD) Porpyritic dacite to dacite-andesite (IPQD) Porphyritic andesitic dyke (PAD)
Breccia	Igneous, hydrothermal breccia (BX)
Metamorphic (unshaded)	Equigranular quartz diorite (EQD) Foliated quartz diorite (FQD) Schist (SCH, GSC)

Source: W&N, 2022.

16.2.3 Structural Analyses

Faults that are traceable between boreholes are rare. Two steeply dipping faults denoted as the Creek and North faults, were inferred to intersect near the center of the Cangrejos deposit. An envelope of reduced rock mass quality was identified proximal to the faults. No major structures were identified within the Gran Bestia deposit, however the level of effort for the interpretation was limited (Pratt, 2022). A repeating pattern of north-south drainage swales along the ridge line above the proposed pits were postulated by Pratt as a possible family of faults sympathetic with the North fault, as shown in Figure 16-3.

Figure 16-3: Structural Interpretation

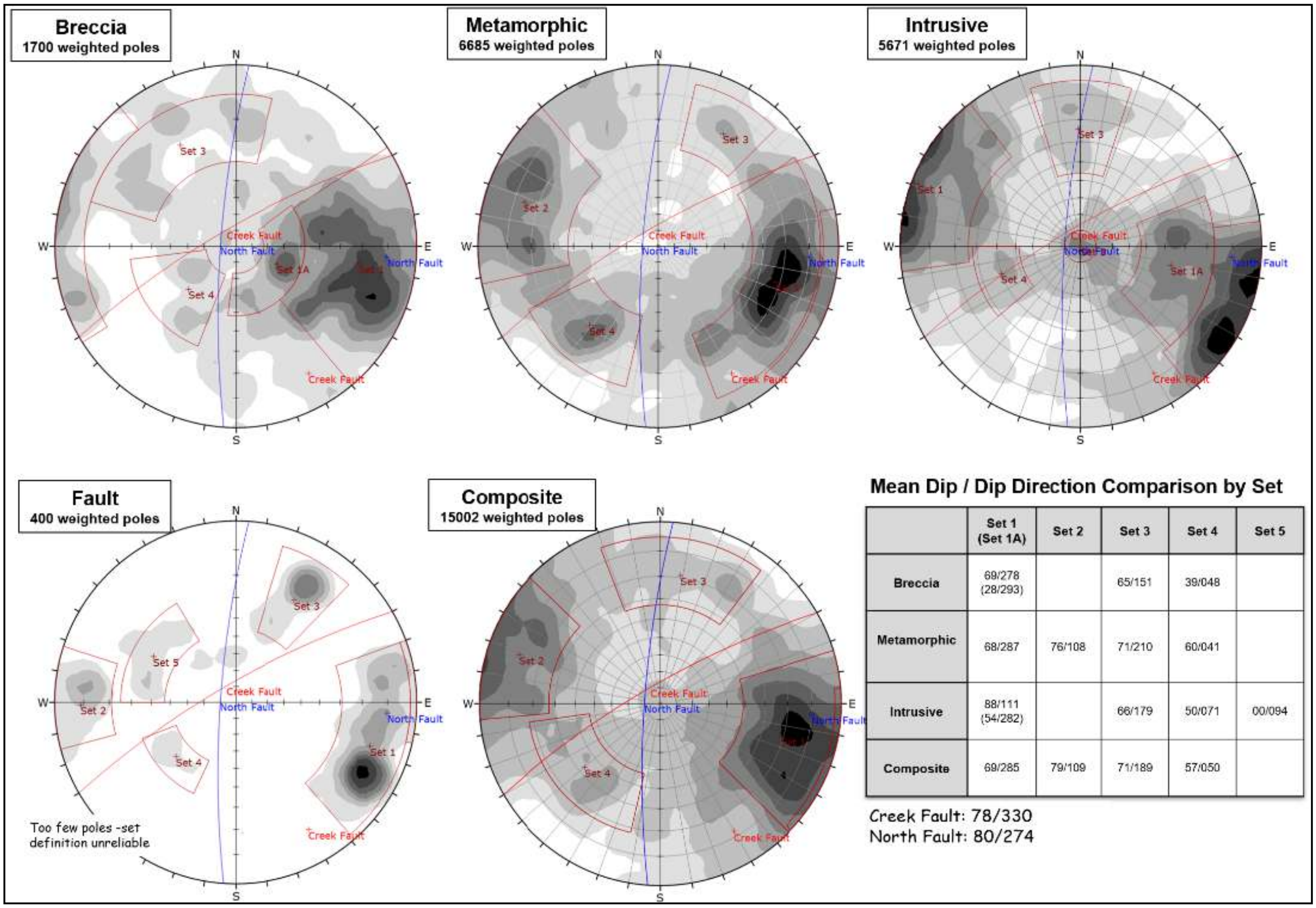


Source: Pratt, 2023.

Structural fabric comprised of joints, veins, contacts and foliation was characterized by televiewer logging methods, resulting in the cataloging of some 10,000 discontinuity orientations relevant to pit slope design studies. Utilizing correction factors to account for borehole orientation (Terzaghi method), stereonet analyses were undertaken to characterize the structural fabric of the primary lithologies at the Cangrejos and Gran Bestia deposits.

For Cangrejos, the dominant rock types are metamorphic and intrusive, and within each the structural fabric is similar, with steeply inclined joints dipping to the northwest and to the southeast. The structural fabric within the less abundant breccia rock type only exhibits the northwest-dipping joints as a dominant set (Figure 16-4).

Figure 16-4: Cangrejos – Structural Analysis

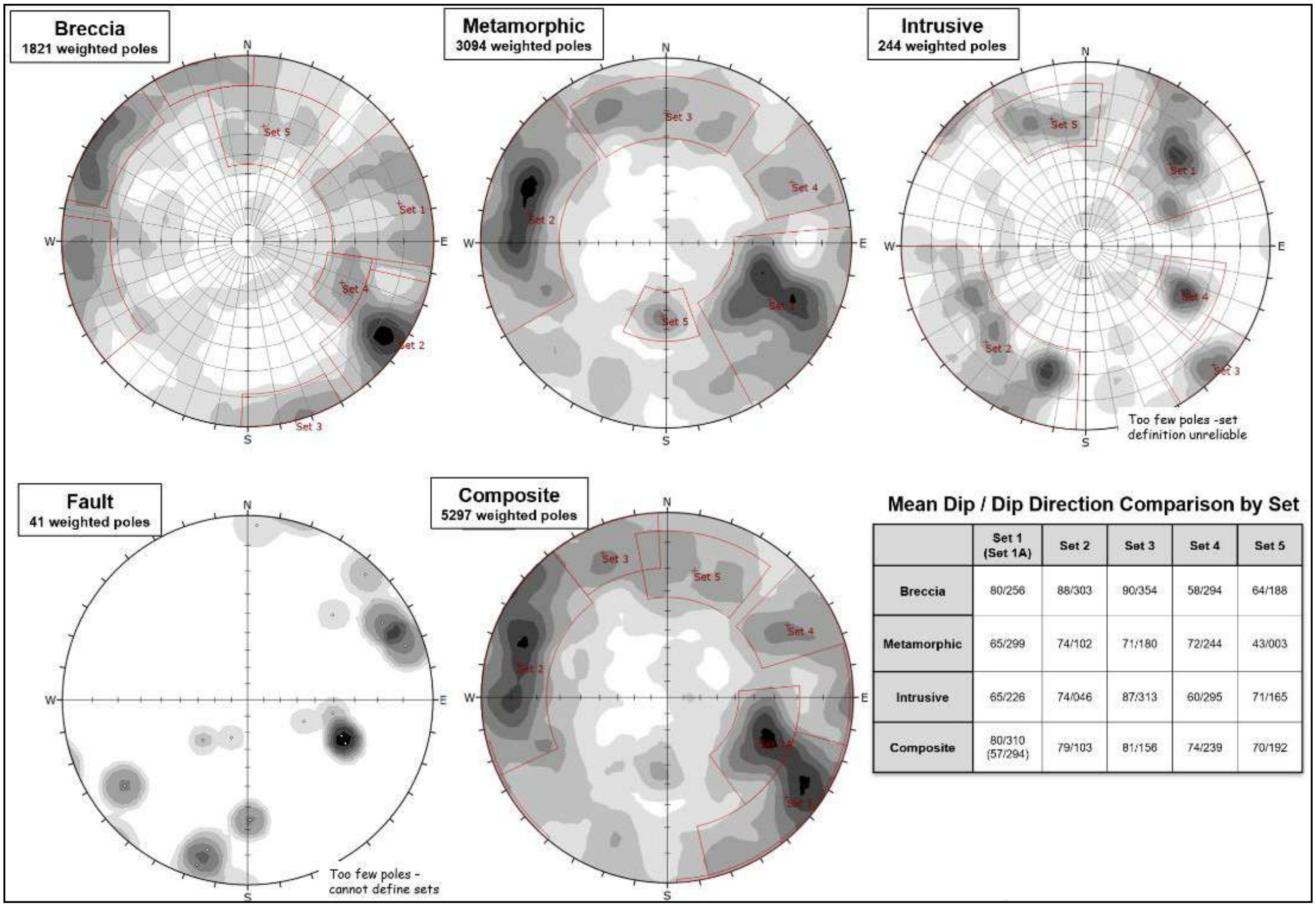


	Set 1 (Set 1A)	Set 2	Set 3	Set 4	Set 5
Breccia	69/278 (28/293)		65/151	39/048	
Metamorphic	68/287	76/108	71/210	60/041	
Intrusive	88/111 (54/282)		66/179	50/071	00/094
Composite	69/285	79/109	71/189	57/050	

Source: W&N, 2023.

Breccia and metamorphic rock types dominate the Gran Bestia deposit. While the dominant southeast- and northwest-dipping joints are also exhibited, greater variation of dip direction for steep joints is reported than is the case for the Cangrejos deposit. Also noteworthy with respect to bench face design is the presence of joint concentrations with intermediate dips, specifically Set 4 for breccia and Set 5 for metamorphic rock types.

Figure 16-5: Gran Bestia – Structural Analysis



	Set 1 (Set 1A)	Set 2	Set 3	Set 4	Set 5
Breccia	80/256	88/303	90/354	58/294	64/188
Metamorphic	65/299	74/102	71/180	72/244	43/003
Intrusive	65/226	74/046	87/313	60/295	71/165
Composite	80/310 (57/294)	79/103	81/156	74/239	70/192

Source: W&N, 2023.

16.2.4 Overburden and Rock Mass and Characterization

Saprolite, saprock and transition zones were logged by the on-site Lumina geologists according to convention specific to the Project. These units were simplified into “Unconsolidated; Soil-Like” (USL) and “Unconsolidated; Rock-Like” (URL) materials for engineering and pit slope stability evaluations. Based on the results of the triaxial and direct shear testing, design mass strength values for the USL were assigned. For the URL, an approach published by Wyllie (2018) that incorporates weathering grade was used to develop Mohr-Coulomb shear strength parameters applicable to the anticipated stress range.

Geomechanical properties suitable to develop Rock Mass Ratings (RMR_{89}) were logged in 69 and 36 boreholes, respectively, for Cangrejos and Gran Bestia. These data were combined with lithologic and alteration logging, and point load testing data to subdivide the rock mass into engineering units for pit slope design. The average RMR_{89} ranges from 75 to 78, depending on lithology, categorizing the rock mass in the upper range of “Good Quality” per standard engineering classification.

16.2.5 Shear Strength of Discontinuities

Using empirical correlations between Plasticity Index and residual friction angle (Mesri and Shehien, 2003), a residual friction angle of 20 degrees was adopted for modeling gouge within fault zones. A degraded rock quality zone of 50 m width adjacent to the major faults was included in the stability evaluations.

Direct shear testing of sawn core samples was used to determine the basic discontinuity friction angle for the primary lithology groups (metamorphic, breccia and intrusive). These data were combined with joint roughness coefficients (JRC) and joint wall compressive strengths (JCS), assumed to be one-half of the intact compressive strength, using the Barton and Bandis (1982) approach to develop discontinuity shear strength envelopes by lithology for stability analyses. These relationships were also used to generate peak friction angles for bench face kinematic analyses from which a value of Φ' = 45° was adopted for all lithologies.

16.3 Hydrogeological Considerations

16.3.1 Overview

Hydrogeology is often a driving factor in pit slope stability. High groundwater levels and pore pressures within pit walls contribute to slope instability. In areas with high precipitation, like the Cangrejos Project, where rainfall often exceeds 2.5 meters per year, seasonal water levels and pore pressures must be considered and evaluated.

GRE conducted a hydrogeologic field investigation of geotechnical boreholes in the future pit walls of the Cangrejos (CG) and Grand Bestia (GB) pits. This included:

- Packer testing to quantify hydraulic conductivity of bedrock formations,
- Installation of vibrating wire piezometers (VWPs) for the long-term monitoring of pore pressures in pit walls.
- Aquifer testing four saprolith groundwater wells to quantify the hydraulic conductivity of the three unconsolidated stratigraphic units which comprise the saprolith (saprolite, saprock, and transition zone).

Using the results of the field investigation, GRE created two-dimensional (2D) transient seepage models calibrated to observed water levels. This model was then subjected to “excavation conditions” whereby GRE simulated the future mine plan sequence to determine the change in pore water pressures and water levels in the saprolith and bedrock over time and under realistic seasonal water variations. See Section 16.4.1.1 for more information.

16.3.2 Summary of Field Work Performed

GRE conducted a hydrogeologic field investigation of geotechnical boreholes in the future pit walls of the Cangrejos (CG) and Grand Bestia (GB) pits. This included:

- Packer testing to quantify hydraulic conductivity of bedrock formations,
- Installation of vibrating wire piezometers (VWPs) for the long-term monitoring of pore pressures in pit walls.
- Aquifer testing four saprolith groundwater wells to quantify the hydraulic conductivity of the three unconsolidated stratigraphic units which comprise the saprolith (saprolite, saprock, and transition zone).

Using the results of the field investigation, GRE created two-dimensional (2D) transient seepage models calibrated to observed water levels. This model was then subjected to “excavation conditions” whereby GRE simulated the future mine plan sequence to determine the change in pore water pressures and water levels in the saprolith and bedrock over time and under realistic seasonal water variations.

16.3.2.1 Summary of Packer Tests

GRE has performed packer tests in approximately 5,870 m of geotechnical boreholes in the Gran Bestia and Cangrejos pits. A total of 81 tests have been performed. Three primary rock types have been defined by W&N, and the breakdown of the packer test statistics is as follows:

Table 16-3: Summary of Packer Tests

Type of Test	Number of Tests	Conductivity (m/s)				No. of Tests at Minimum
		Geometric Mean	Average	Maximum	Minimum*	
All tests	81	$2.2x10^{-9}$	$3.5x10^{-8}$	$4.2x10^{-7}$	$1.00x10^{-11}$	37
Metamorphic Rocks	48	$1.3x10^{-9}$	$2.3x10^{-8}$	$4.2x10^{-7}$		22
Basement Rocks	26	$8.4x10^{-9}$	$5.3x10^{-8}$	$3.4x10^{-7}$		4
Breccia	21	$1.6x10^{-9}$	$4.0x10^{-8}$	$3.0x10^{-7}$		11

Note: Total number of tests is > 81 because some intervals have multiple rock descriptions. *The minimum selected is the lower limit of quantification for packer tests as presented by the manufacturer (Kosorok, 2022). This value was applied to the 45% of packer tests that were non-conductive. Source: GRE, 2023.

In hydrogeology, the geometric mean is used instead of the arithmetic mean because conductivity values often vary by orders of magnitude, making the arithmetic mean inaccurate.

The following comparative conclusions can be drawn from Table 16-3:

- For a PFS, GRE believes that ~5,870 meters of packer test borings with a total of 81 tests is an acceptable level of testing and sampling for a PFS. Indeed, due to the scrutiny on the pit slopes, GRE believes that this is a high number of tested meters and total tests for a PFS.
- Considering that the conductivity of an engineered compacted clay is $1x10^{-8}$ m/s, GRE believes that the overall rock mass exhibits low total conductivity, with a geomean of $2.2x10^{-9}$ m/s. This is further supported by the fact that 45% of packer tests had no measurable conductivity within the limits of the instrumentation (Kosorok, 2022). This testing outcome is in spite of the field-testing protocol in which core was visually reviewed in advance to select test horizons with greatest potential to report meaningful conductivity results.
- The maximum hydraulic conductivity is ~$4.2x10^{-7}$ m/s. It is important to consider that this conductivity range is typically reserved for a fine silt. Uniform fine sand will have ~$1x10^{-5}$ m/s. As a result, GRE believes that even the highest packer test reading is relatively low (for fractured rocks).

The results were notable in that this is the lowest-conductivity rock that Larry Breckenridge, the QP for this work, has tested in a 25-year career in mine pit hydrogeologic investigations.

16.3.3 Summary of Saprolith Aquifer Tests

The Project conducted aquifer tests in four saprolith wells to define the hydrogeologic properties.: The results were in the range of ~ 2x10-6 to 9x10-9 m/s, indicative of low-conductivity saprolith formations (when compared to a compacted engineered clay at ~1x10-8 m/s).

16.3.4 Summary of VWP Data

The Project installed a network of VWPs around the site. 10 VWPs were installed in 2019 and a further 16 were installed in 2022.

Overall, GRE believes that the VWP data supports the conclusion that the majority of the rock mass is low conductivity for the following reasons:

- Two deep VWPs show that joint sets deep in the rock may not be in communication with any groundwater, despite attempts to target conductive fractures.
- Some VWPs show the existence of occasional fracture zones which may be in communication with the water table. However, the occurrences are rare. Very rapid changes in water levels may indicate low-storage (thin) fractures.
- Deep and shallow VWP combinations show that there is no artesian water pressure in deeper fractures.

The results from the pit hydrogeologic investigation were included in the prediction of the optimum pit slopes, which is presented in Section 16.4.

16.4 Pit Slopes

Pit slope design was sequentially evaluated to consider the following design elements:

- pit hydrogeologic model
- bench geometry
- inter-ramp slopes
- overall bedrock slopes
- overburden slopes.

16.4.1.1 Pit Hydrogeologic Model

GRE prepared 2D seepage models of the pit excavation to simulate the impact of pit development on water levels and rock pore pressures. These are the same cross-sections utilized by the pit slope stability model discussed in this section (see Figure 16-6). The objective of modeling this information is to provide input to the pit design, specifically the assessment of slope stability.

The model profiles were built with cross-sections created from the Lumina Gold geologic model and therefore have captured the best-available data on the thickness of the saprolith and the composition of bedrock. Hydraulic properties were assigned based on information gathered about the saprolith and bedrock lithology during the field program (see Section 16.2.1.1). GRE simulated the mining sequence by applying the annual pit shells created by IMC in January 2023.

Modeling showed that the Saprolith units (saprolite and saprock or Unconsolidated Soil-Like and Unconsolidated Rock-Like Materials) remain fully or partially saturated throughout the LOM in response to seasonal recharge. This is a result of the low conductivity saprolith combined with the high seasonal rainfall experienced in the area as well as high humidity.

The model also simulated the change in water levels in the bedrock pit walls. As mentioned above, many of the longest high walls are pre-stripped and have time to drain prior to excavation in earnest. Because the rock is so tight (see Section 16.2.1), it takes many years for the material near the pit to dewater, but also because it is so tight, there is nearly zero groundwater discharge into the pit.

The effect of the faults was analyzed in two cross sectional models (CG1 and CG2 in this section) and found to be minimal with respect to lowering the phreatic surfaces or creating pit seepage owing to their almost vertical orientation and their opposing angle to the ultimate pit slopes. If angled a different direction, the faults could provide a preferential pathway for groundwater flow and a mechanism for applying pore pressure to the pit wall face, but their opposing angle makes them benign. The mine simply digs through them.

Induced depressurization of pit wall rock using gravity drains or pumped wells is a frequent mitigation measure for potentially unstable pit slopes. This option may not be available to the operators of the Cangrejos project. The very low hydraulic conductivity found in packer tests (geomean less than 2.2x10-9 m/s) would likely make slope depressurization ineffective because any vertical or horizontal borings intended to depressurize pit wall rock would produce little water and create negligible pore pressure reduction.

The results of the 2D modeling provided an input to subsequent geotechnical pit slope modeling discussed in this section.

16.4.1.2 Bench Geometry

The vertical operating interval was specified (by others) at 15 m corresponding to the resource model block dimension. Bench heights were selected as multiples of this dimension as shown in Table 16-4.

Table 16-4: Bench Geometry

Material	Bench Height (m)	Bench Width (m)	Bench Face Angle (BFA)
USL (Unconsolidated Soil-Like) – Predominantly Colluvium, Residual Soil and Saprolite)	7.5	8	60°
URL (Unconsolidated Rock-Like – Predominantly Saprock and Transition Zone	15	8	60°
Fresh Bedrock	30	10.5	Varies by lithology and slope aspect

Source: W&N, 2023.

Bench widths followed guidance by Ryan and Pryor (2000) modified for an 8 m minimum width. Bench face angles (BFA) for the USL and URL were selected to minimize erodibility and verified for stability using limit equilibrium analyses.

To determine bench face angles within bedrock, the pits were subdivided into radial segments. Within each segment the potential for planar, wedge and toppling modes of bench face failure was evaluated by rock type. In all cases, planar sliding was determined to be the critical mechanism for which a 70 percent reliability index was targeted using Cumulative Frequency Analysis (CFA) or the equivalent procedure available in the Rocscience software DIPS (Version 7.018). This process resulted in bench face angle recommendations by slope dip direction range and by primary lithology (Table 16-5).

16.4.1.3 Inter-Ramp Slopes

To provide continuous circumferential access on the pit walls, 25 m wide geotechnical benches were specified at 150 m maximum vertical intervals where ramps were not located. This access will facilitate installation and maintenance of slope monitoring instrumentation and groundwater control works and serve as interception and retention locations for small-scale rockfalls.

Each of the deposits has two primary rock types that will be exposed in the pit walls; for Cangrejos metamorphic and intrusive, and for Gran Bestia metamorphic and breccia (refer to Figure 16-2). These rock types will dominate the ultimate pit slope designs. For intermediate phase pits, local areas of less prominent lithology will be present. The design recommendations for BFA and IRA in Table 16-5 and Source: W&N, 2023.

Table 16-6 reflect this categorization.

Table 16-5: Bedrock Bench Face and Inter-ramp Slope Recommendations – Cangrejos

Primary Wall Rock Types: Ultimate Pit						Phase Pits		
Metamorphic (EQD, EQDF, Schist)	BFA (deg)	IRA (deg)	Intrusive (QD, PQD, IPQD, PAD)	BFA (deg)	IRA (deg)	Breccia (BX) & Other	BFA (deg)	IRA (deg)
DDR Range			DDR Range			DDR Range		
000 to 080	61	47.9	000 to 080	61	47.9	000 to 080	60	47.2
080 to 100	Transition		080 to 100	Transition		080 to 100	Transition	
100 to 250	61	52.2	100 to 170	65	50.8	100 to 170	64	50.00
250 to 270	Transition		170 to 190	Transition		170 to 190	Transition	
270 to 360	61	47.9	190 to 360	61	47.9	190 to 360	60	47.2

Source: W&N, 2023.

Table 16-6: Bedrock Bench Face and Inter-ramp Slope Recommendations – Gran Bestia

Primary Wall Rock Types: Ultimate Pit						Phase Pits		
Metamorphic (EQD, EQDF, Schist)	BFA (deg)	IRA (deg)	Intrusive (QD, PQD, IPQD, PAD)	BFA (deg)	IRA (deg)	Breccia (BX) & Other	BFA (deg)	IRA (deg)
DDR Range			DDR Range			DDR Range		
000 to 080	61	47.9	000 to 080	61	47.9	000 to 080	60	47.2
080 to 100	Transition		080 to 100	Transition		080 to 100	Transition	
100 to 250	61	52.2	100 to 170	65	50.8	100 to 170	64	50.00
250 to 270	Transition		170 to 190	Transition		170 to 190	Transition	
270 to 360	61	47.9	190 to 360	61	47.9	190 to 360	60	47.2

Notes: Tables provide recommendations based on the slope dip direction (e.g., 090 DDR = east facing slope). Intrusive lithology group includes porphyry and quartz diorite. Source: W&N, 2023.

16.4.1.4 Overall Bedrock Slopes

Overall slopes were analyzed in two phases. Initially, a parametric study was performed using the highest and steepest overall slopes conceivable, conservative rock mass strength parameters and various combinations of structural fabric and faulting dependent on slope aspect. These first phase analyses were incorporated into guidance provided to IMC for the first iteration PFS pit design. Upon completion of the initial PFS pit shells, two critical cross-sections for each pit were selected and analyzed for section-specific stability margins corresponding to the 10-year and 25-year (ultimate) pit shells as follows:

Limit equilibrium modeling (LEM) using Rocscience software Slide 2 (Version 9.024):

- compound failure mechanisms (structural control and rock mass failure)
- structural fabric incorporated as section-specific anisotropic shear strength
- equivalent joint models for less persistent sets (75% persistent)
- 100% fully persistent joints for sets inferred to be related to North and Creek faults
- static and pseudo-static loading [50% of maximum credible earthquake (MCE) site bedrock acceleration equivalent to a seismic coefficient of 0.2g]
- transient phreatic surfaces at 10 and 25 years as provided by GRE
- rock mass damage due to blasting and stress relief to one-third slope height as predicted by Guzman and Perez (2015)
- for Cangrejos pit, 50 m wide envelopes of degraded rock quality corresponding to the North and Creek faults
- results expressed as factor of safety (FOS).

Finite element modeling (FEM) using Rocscience software RS2 (Version 11.016):

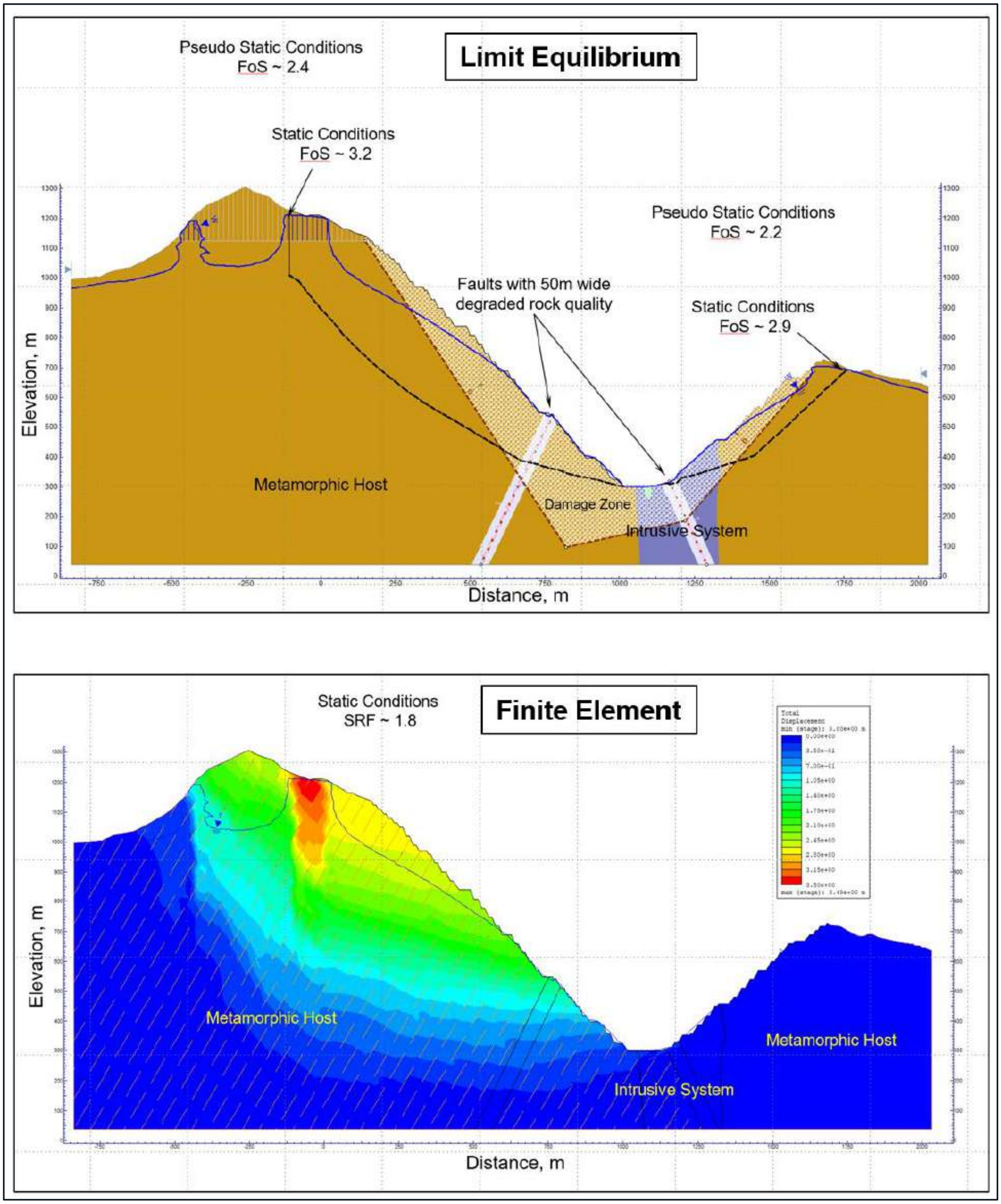
- compound failure mechanisms and toppling, as predicted by the model
- structural fabric incorporated as section-specific anisotropic shear strength
- equivalent joint models for less persistent sets (75% persistent)
- 100% fully persistent joints for sets inferred to be related to North and Creek faults
- joint spacing set at ten times estimated actual spacing to enable deformation kinematics
- static loading only
- transient phreatic surfaces at 10 and 25 years as provided by GRE
- peak and residual strengths included in the models
- for Cangrejos pit, 50 m wide envelope of degraded rock quality corresponding to the North and Creek faults
- results expressed as strength reduction factor (SRF); SRF is considered equivalent to limit equilibrium FOS.

Examples of the LEM and FEM models are shown in Figure 16-6. Project design acceptance criteria (DACs) for overall bedrock slopes were adopted in accordance with Read and Stacey (2009) as follows:

- Minimum FOS Static = 1.3
- Minimum FOS Dynamic = 1.05

For all cases analyzed, DACs for overall slopes were met with noteworthy exceedance.

Figure 16-6: Examples of Analysis Models



Source: W&N, 2023.

16.4.1.5 Overburden Slopes (USL & URL)

Stability recommendations for the overburden slopes were generated by completing LEM stability evaluations using the same design acceptance criteria as for bedrock, except for transient elevated groundwater conditions in the USL and URL materials for which the DAC was a FOS of 1.1. Three natural backslope cases for USL above the pit crests were considered: 0°, 10° and 15°. Results are summarized in Table 16-7.

The URL materials were evaluated assuming a 45 m thickness in this material with an overall slope angle of 45 degrees (Table 16-7). All DACs were met with this wall template.

Table 16-7: Allowable Slope Configurations for Overburden

USL

Bench Face Angle (BFA): 60 deg maximum
Bench height (BH): 7.5 m maximum
Bench width (BW): 8 m minimum

Allowable Overall Slope Heights

Allowable Overall Inclination (deg)	Natural Slope Angle (deg) 0	10	15
45	10.0	10.0	10.0
40	11.9	11.9	11.9
35	14.0	14.2	15.0
30	17.0	17.5	18.0
25	21.0	23.0	25.0

For USL natural back slope angles greater than 15 deg or cut slope overall heights greater than 25 m require retaining structure or removal.

URL

Bench Face Angle (BFA): 60 deg maximum
Bench height (BH): 15 m maximum
Bench width (BW): 8 m minimum
Overall Inclination: 45 deg to maximum height 45 m.

Source: W&N 2023.

16.5 Mine Production Schedule

The schedule was developed using a declining cut-off grade strategy to maximize the project net present value (NPV).

The challenge in this mountainous environment is to schedule sufficient waste removal to assure continuous mill feed throughout the mine life. As each pushback is started, pioneering access must be developed up the steep mountains that surround Cangrejos on the north and east and Gran Bestia on the north. Once access is assured, the mine production rate is somewhat limited until sufficient working room is developed on the pushback. Once developed, the vertical advance rate is limited by practicality. IMC has not exceeded 12 benches per year of vertical advance rate throughout the production schedule.

The resulting mine production schedule summarized in Table 16-1 reported the annualized material moved. The pre-production period was further refined to a monthly schedule for project capital planning and scheduling. Table 16-8 summarizes the monthly tonnage movement that is planned from the pit during the 28-month pre-production period.

The monthly pre-production schedule table also provides the timeline for the deployment of the mining fleet prior to pre-production stripping. The following mining equipment is planned to be deployed during the initial site development: dozers, articulated haul truck, excavators, graders, FEL's, compactor and pioneering drill.

The first four to six months of the 28-month pre-production period develops the initial road access to the site facilities with the existing external roadways using the mining auxiliary fleet equipment. Once access is developed to the site facilities, the mine equipment is used for the bulk earthworks site preparations for the site facilities. After the completion of the site facility bulk earthworks, (starting in pre-production month -18), the mining fleet will begin developing the initial access to the pits and waste storage facilities from the crusher site. The access pioneering to mining areas is estimated to take 5 months to develop. Pioneering continues throughout the period of pre-production mining.

Ore that is encountered during this pre-stripping period is delivered to a stockpile located just east of the crusher location. That stockpile will be rehandled during year one and added to the year one feed to the process plant.

Table 16-8: Monthly Pre-Production Mining Schedule

Monthly Preproduction Schedule			
Monthly Periods	Material To Stockpile (ktonne)	Total Mined (ktonne)	
PP-M28	-	-	
PP-M27	-	-	
PP-M26	-	-	
PP-M25	-	-	
PP-M24	-	-	Access Pioneering for Plant Site and Truck Shop & Bulk Earthworks (PP-M28 to PP-M19)
PP-M23	-	-	
PP-M22	-	-	
PP-M21	-	-	
PP-M20	-	-	
PP-M19	-	-	
PP-M18	-	-	
PP-M17	-	-	
PP-M16	-	-	Access Pioneering for Pit Development (PP-M18 to PP-M14)
PP-M15	-	-	
PP-M14	-	-	
PP-M13	-	10	← Initial Waste Movement
PP-M12	-	35	
PP-M11	-	66	
PP-M10	-	57	
PP-M9	-	72	
PP-M8	1	95	← Mineralized Material First Encounted
PP-M7	6	157	
PP-M6	2	359	
PP-M5	39	871	
PP-M4	101	1,429	
PP-M3	283	2,297	
PP-M2	458	3,463	
PP-M1	910	4,368	
TOTAL	**1,800**	**13,279**	

Source: IMC, 2023.

The schedule on Table 16-7 ramps up the total material mining rate as follows: Years 1 through 3 mine at an average daily tonnage movement of 122 kt/d (45 Mt/a), increasing to a rate of 165 kt/d (67 Mt/a) from Years 4 through 6, and then increasing to a maximum daily tonnage of 197 kt/d (72 Mt/a) by Year 7. The maximum tonnage rate is maintained for several years before it is gradually reduced over the life of the mine. Simply put, this is a large mine that will require large mining equipment to achieve the production requirements set out in the schedule.

The Cangrejos pit is operated continuously from pre-production through Year 17. Gran Bestia phase 1 begins stripping in Year 5 and that phase contributes to the Cangrejos ore feed from Years 7 through 12, then again from Year 15 through the end of the mine production schedule. The final phase of Gran Bestia is started in Year 17 and that phase continues through to the end of the mine plan in Year 26.

Details of the schedule have been provided to project team members detailing the amount of oxidized hard rock and hard rock for process metallurgical calculations. Those rock type breakouts were also developed for equipment productivity calculations and material allocation to the appropriate waste storage area. The rock types are delivered to the processing facility as it is mined. No allowance has been made for blending rock types within the mine production schedule or the development of mining activities.

16.6 Waste Storage

Waste material was reported by the rock types of overburden, saprolite, saprock, oxidized hard rock and fresh rock. During the first 5 years of the mine life, the saprolite and saprock are delivered to a saprolite-saprock storage facility (SRSF) and mineralized saprolite-saprock stockpile facility (MSRSF), which are both located south-southeast of the Cangrejos pit and directly east of the waste rock storage facility.

The hard rock is delivered to the WRSF located south of Cangrejos and the primary crusher. A portion of the saprock is delivered to the WRSF during the first five years. The ratio of hard rock to saprock during pre-production and Year 1 is 4.5:1. The ratio of hard rock to saprock increases to 10:1 by the end of Year 5 and remains above a 10:1 for the remainder of the mine life. After Year 5, all the non-mineralized saprolite and saprock that are also stored in the main waste facility. Refer to Figures 16-8 to 16-18 for details.

The WRSF is built in five stages. The first three stages, WRSF 1, 2, 3 are consecutive designs that build a road to the toe of the WRSF on the 300 m elevation using waste rock. The fourth stage WRSF4 is constructed in lifts from the bottom up starting at 300 m elevation.

The final stage, WRSF5, starts in Year 6 and contains almost all of the waste for the remaining mine life. WRSF4 maintains an access road down the face of the storage facility which is used to deliver material to the toe of WRSF5 on the 285 m to 300 m elevation.

The face angle of WRSF4 is established at an angle of 37 degrees (1.3:1) between the roads. With the multiple switchback road, the overall angle is 16 degrees (3.5:1) for the face of WRSF4. The final geometry of WRSF5 results in an overall angle of 18.4 degrees (3:1).

The SRSF is built in 4 stages. The first stage is a series of cut and fill roads to access the toe of the SRSF so that the initial embankment can be constructed. The second stage is that embankment or toe of the structure started at the 670 m elevation which is built from saprock. The third stage is a placed-in ramp to connect the SRSF with the primary access. Up through Year 5, all saprolite and most of the saprock are delivered to the SRSF. The embankment of the SRSF was constructed from saprock waste material and placed at an overall angle of 21.8 degrees (2.5:1).

The original WRSF placed additional waste over the SRSF embankment. A change was made to the WRSF design late in the study to avoid having rainwater drainage in the waste area releasing into the watershed to the south of the WRSF. As a result of the modification, the SRSF embankment is no longer encapsulated by the WRSF. The impact to the reclamation of SRSF might be impacted and should be evaluated in future work. The SRSF is relatively small; therefore, the impact would not be material to the Project.

The MSRSF is constructed above the SRSF. An embankment is constructed from waste saprock separating the two facilities. All mineralized saprolite and saprock tonnage above a $15.00/t NSR COG is placed in the MSRSF.

The Cangrejos Project is unique in that the waste haulage distances begin to slowly reduce over much of the mine life from Year 15 until just a few years before completion of mine life. This is because the WRSF rises in elevation to meet the exit elevation from the pit.

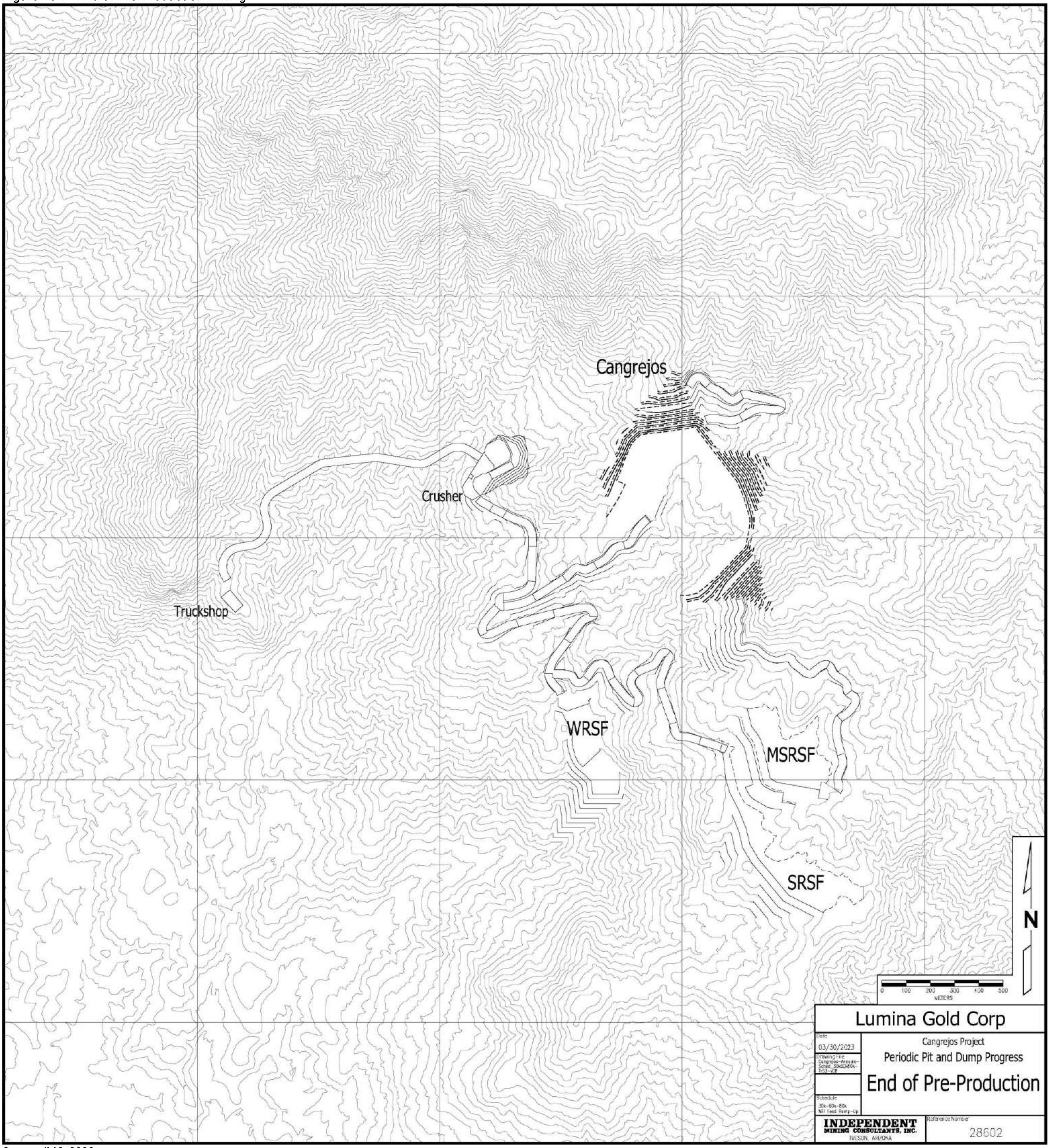
There is a relatively large amount of fill placed as road access for the Gran Bestia phases. The resulting fill will result in additional rehandle tonnage, which has not been factored into the mining schedule or costs. The rehandle that is expected within Gran Bestia is not likely to impact the fleet requirements.

16.7 Annualized Pit and Waste Storage Sequence

The following drawings illustrate the mine and waste storage facilities in selected time periods. Within the pit, the dark lines reflect the benches that have changed since the previous drawing.

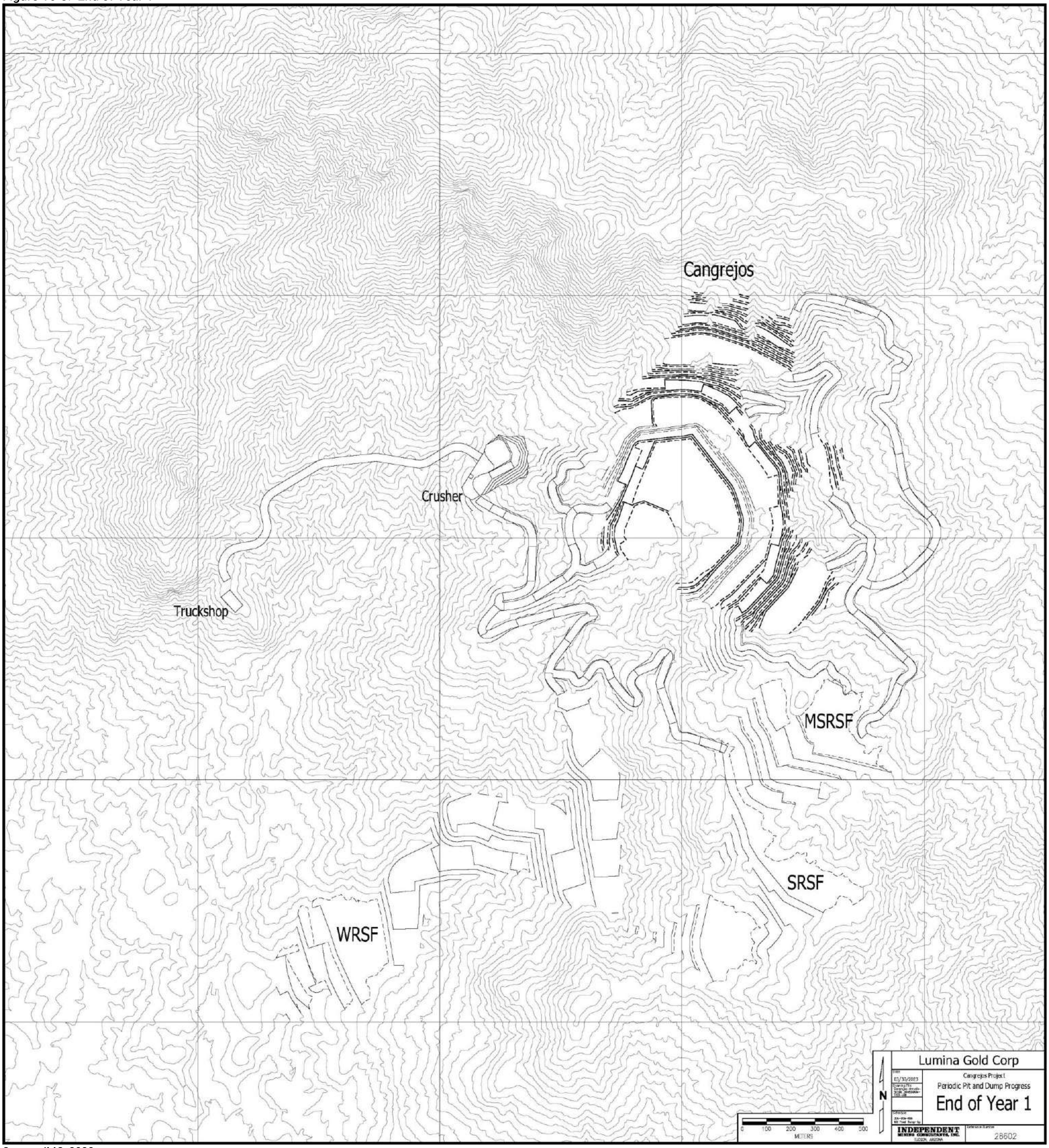
The annual mine plan and dump drawings are provided in Figure 16-7 through Figure 16-17.

Figure 16-7: End of Pre-Production Mining



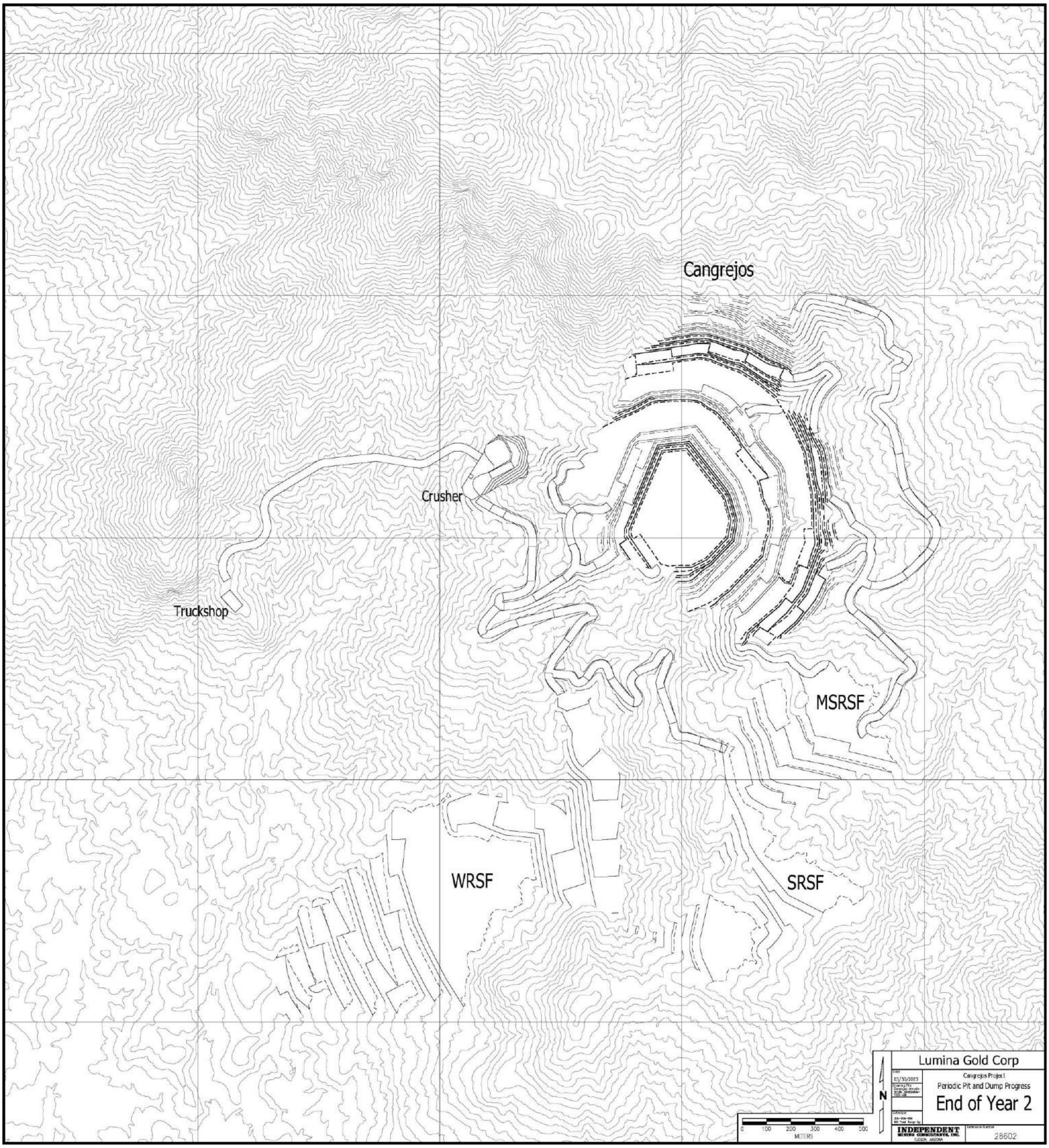
Source: IMC, 2023.

Figure 16-8: End of Year 1



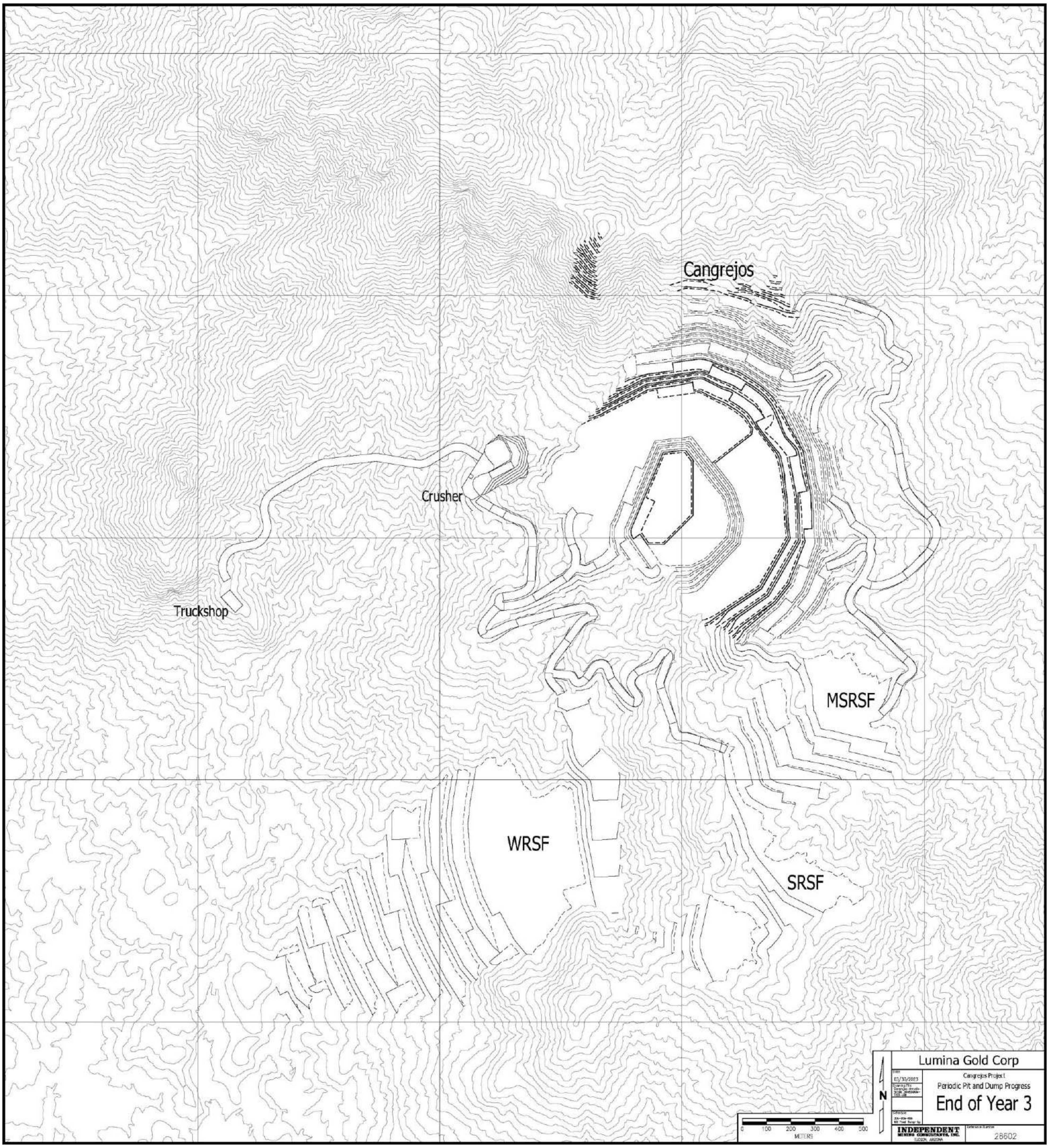
Source: IMC, 2023.

Figure 16-9: End of Year 2



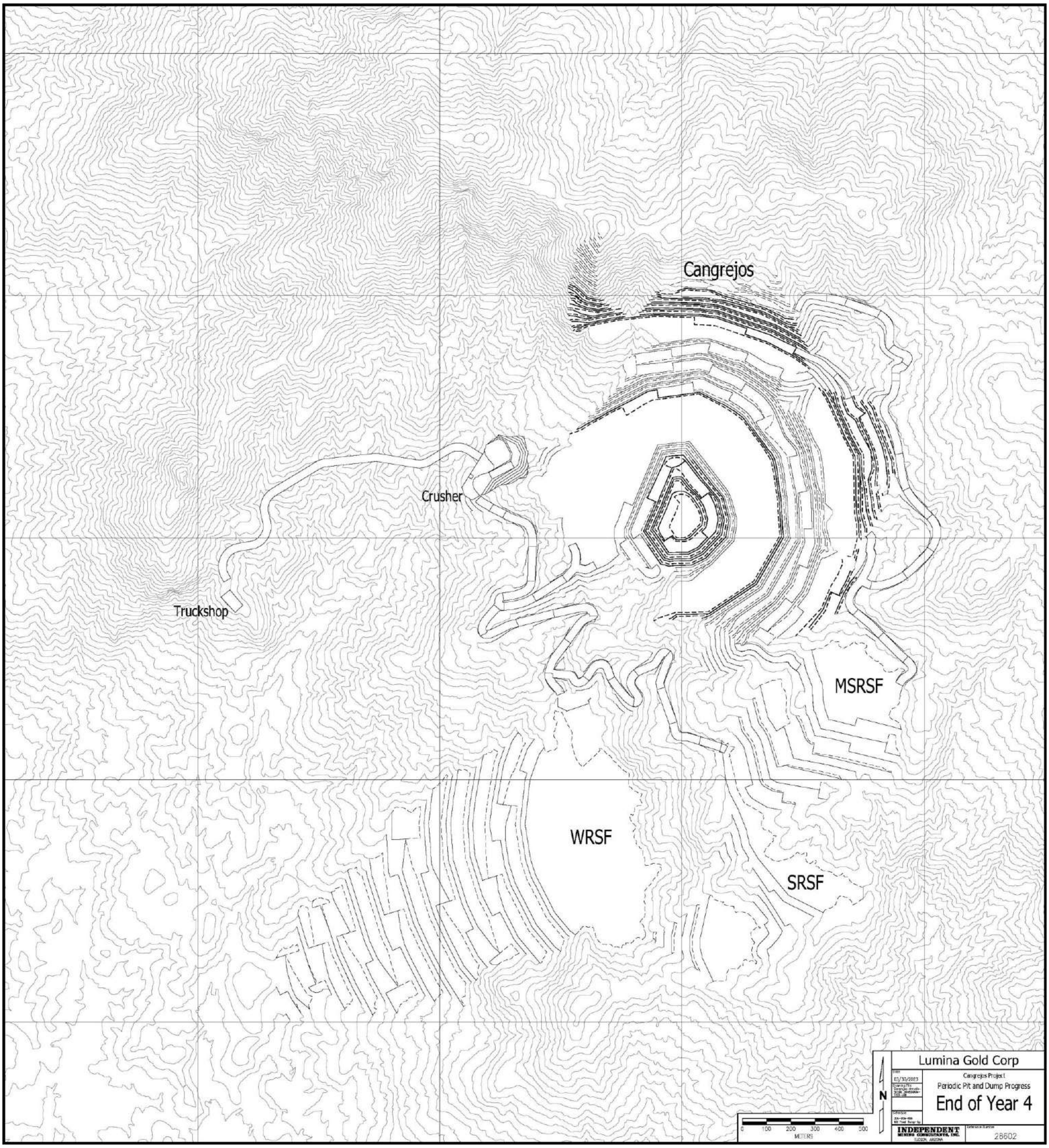
Source: IMC, 2023.

Figure 16-10: End of Year 3



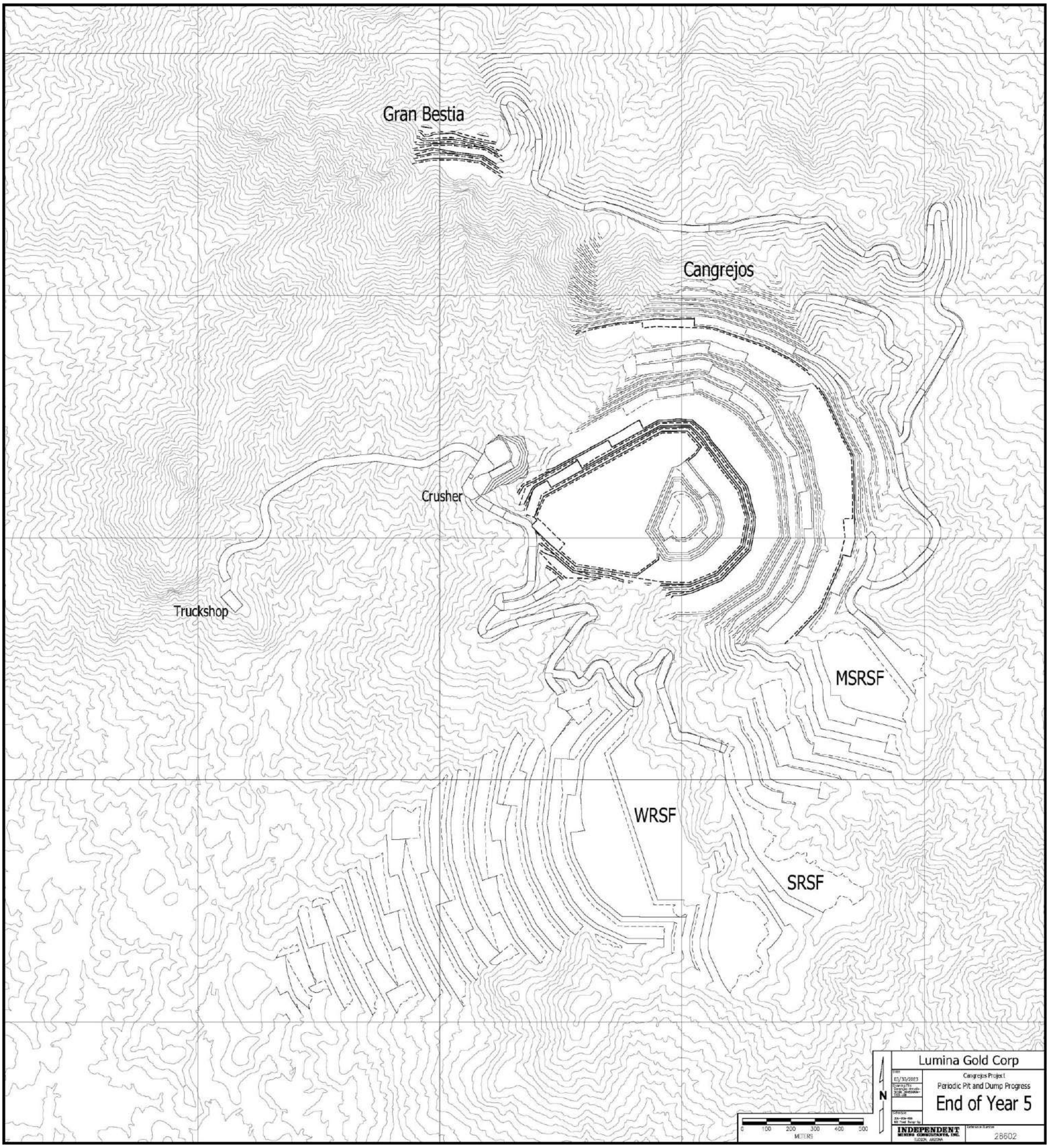
Source: IMC, 2023.

Figure 16-11: End of Year 4



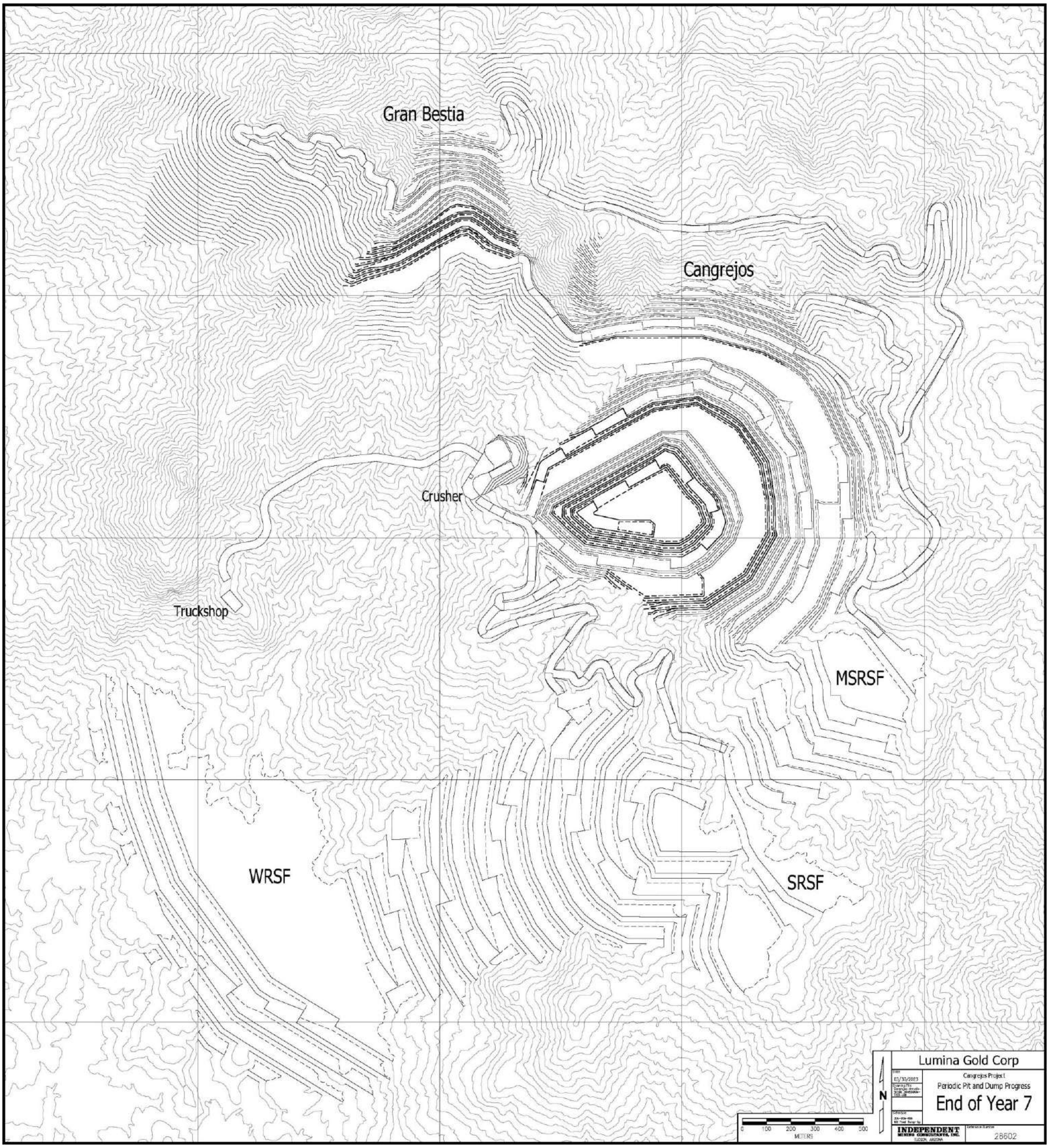
Source: IMC, 2023.

Figure 16-12: End of Year 5



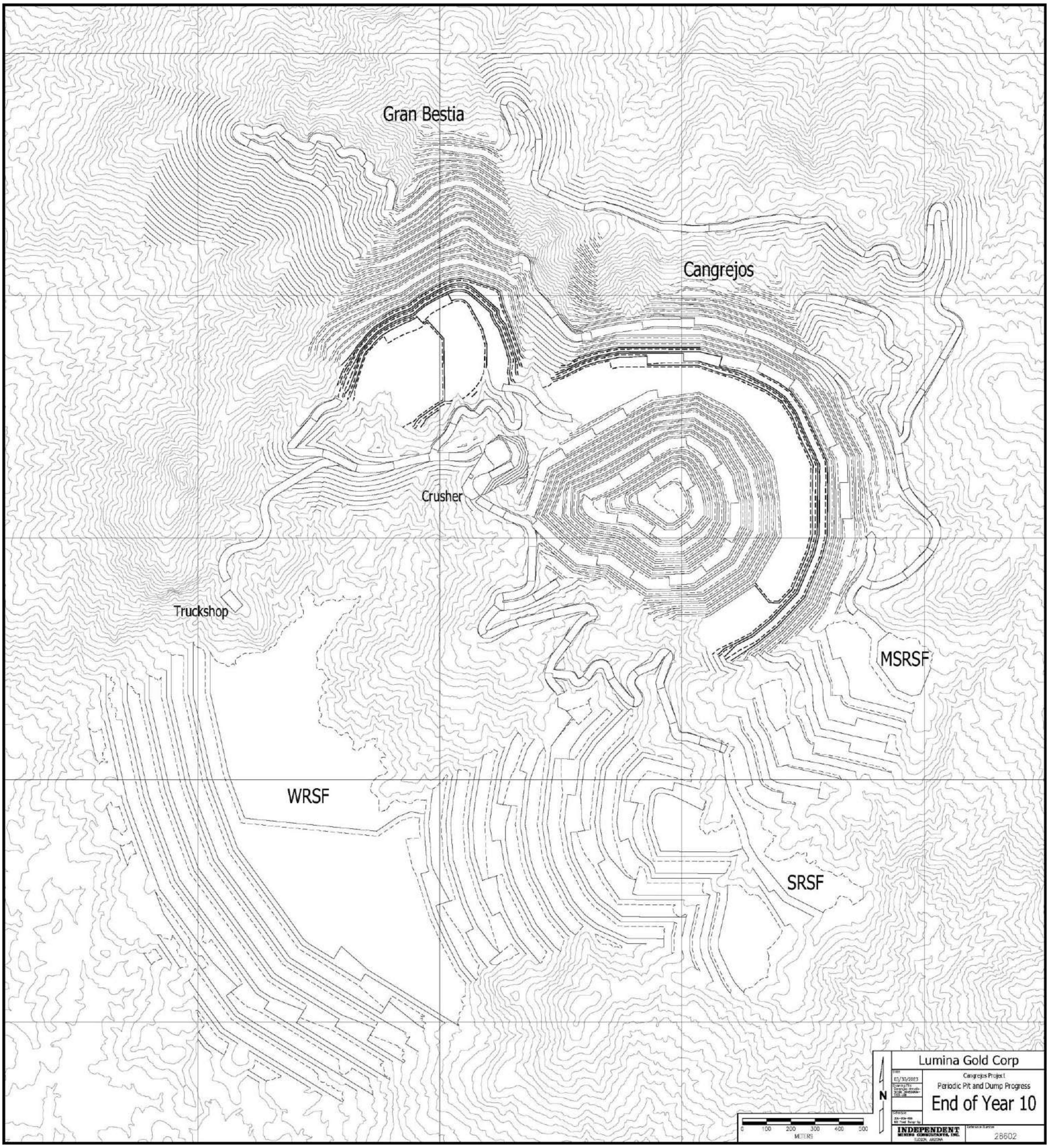
Source: IMC, 2023.

Figure 16-13: End of Year 7



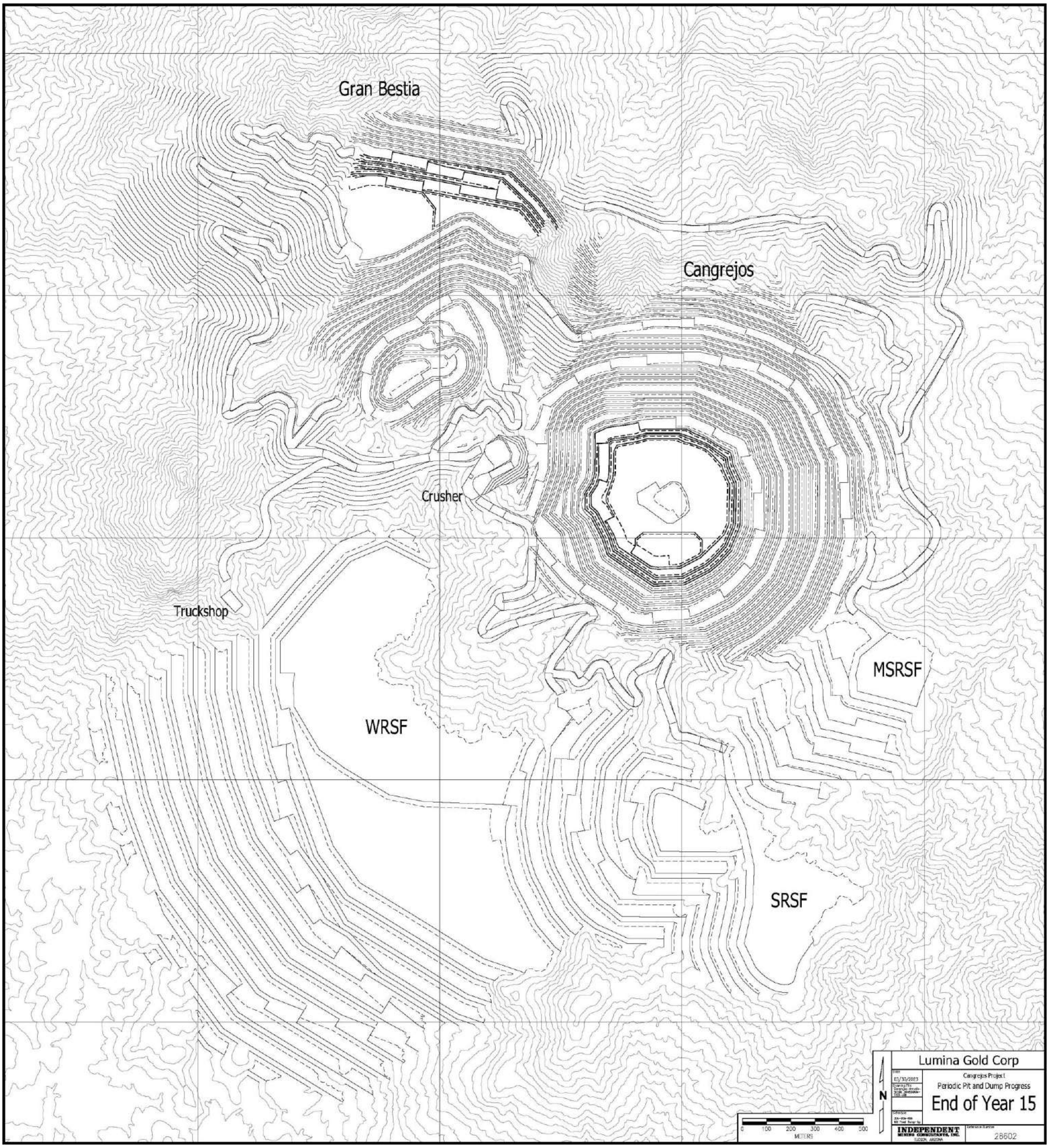
Source: IMC, 2023.

Figure 16-14: End of Year 10



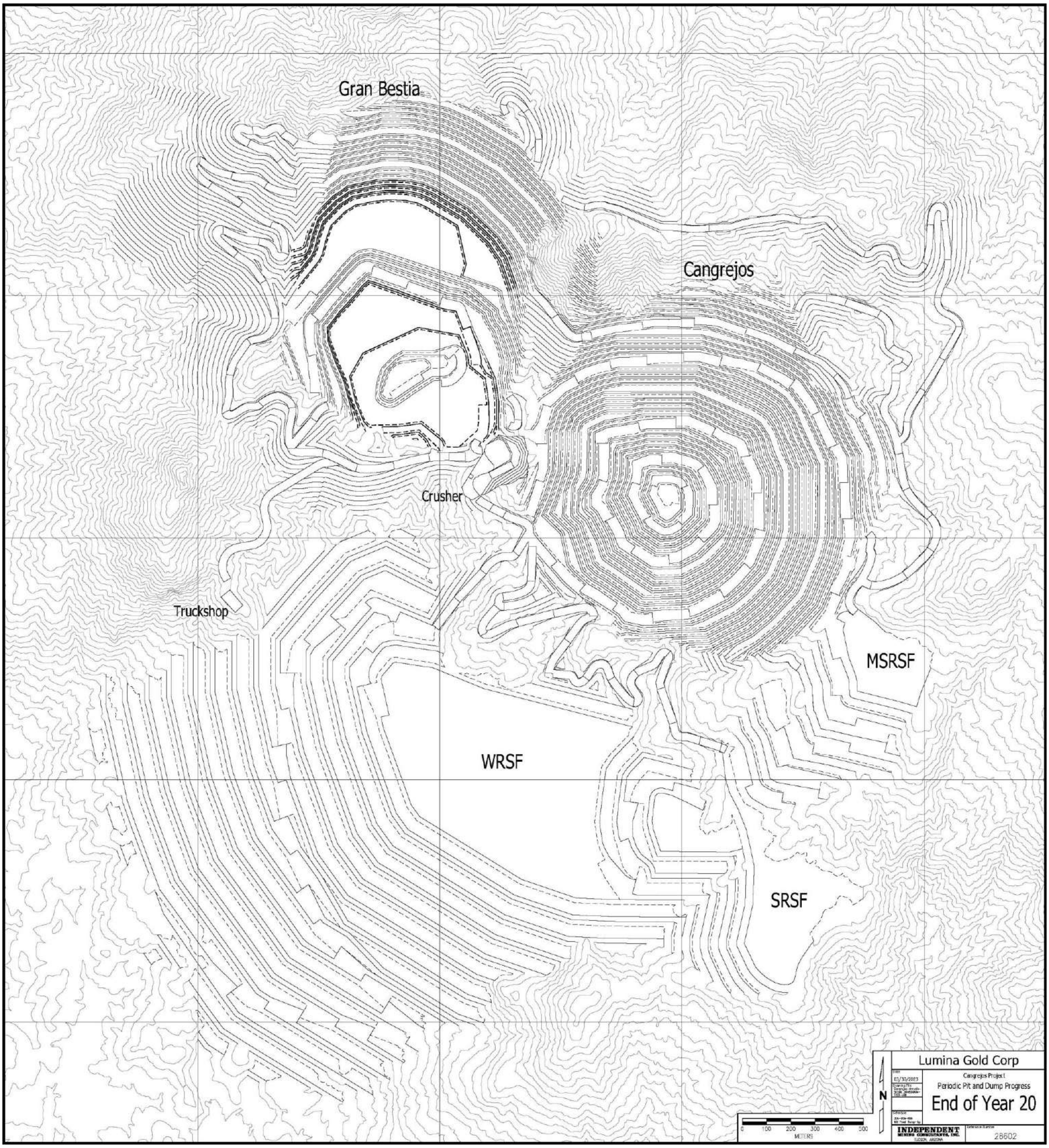
Source: IMC, 2023.

Figure 16-15: End of Year 15



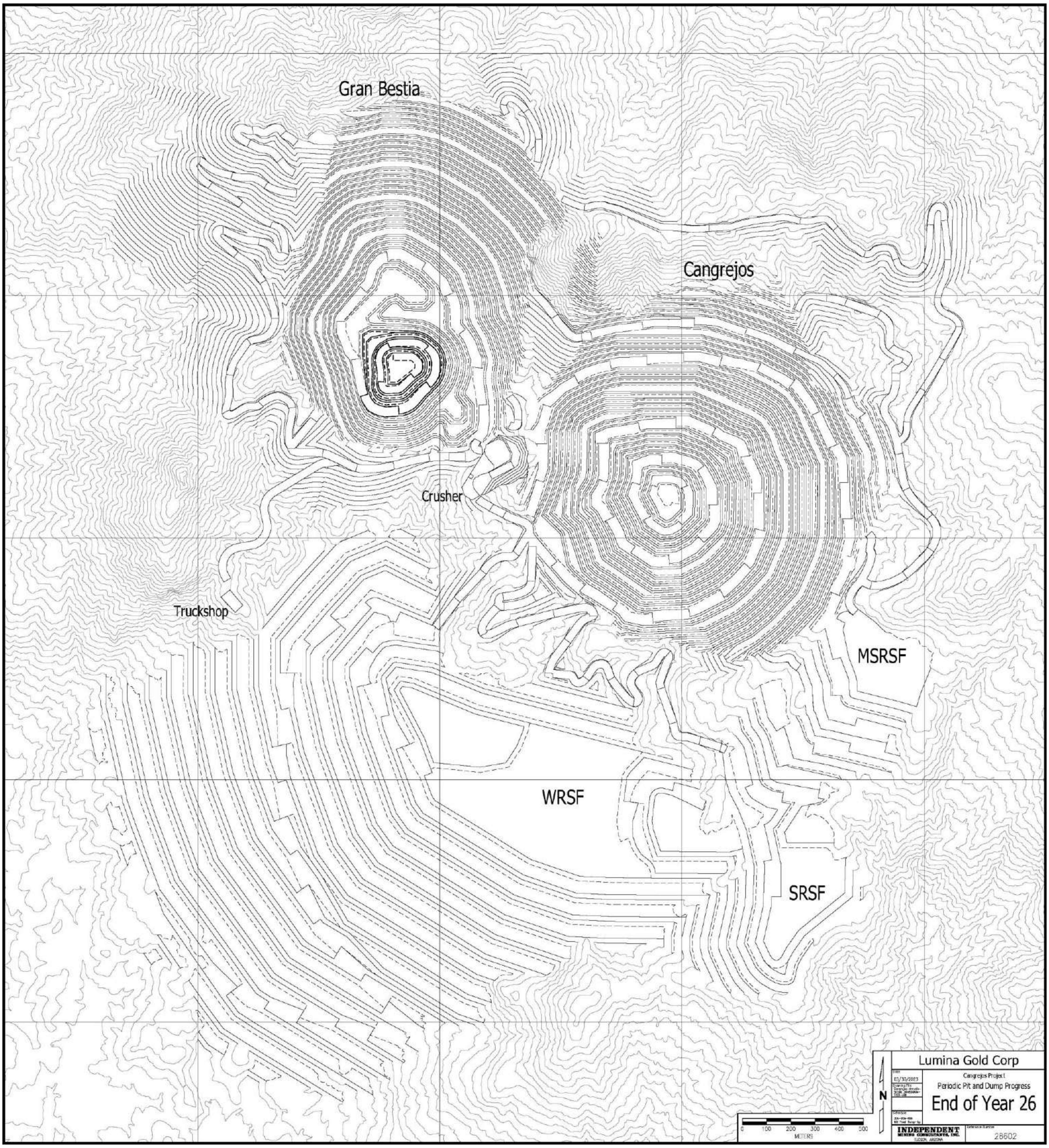
Source: IMC, 2023.

Figure 16-16: End of Year 20



Source: IMC, 2023.

Figure 16-17: End of Mine Life



Source: IMC, 2023

16.8 Mining Equipment

The mine equipment requirements were based on the operating mine plan and the operating conditions at Cangrejos. The steep terrain, saprolite cover, and intense rainfall establish mine operating conditions that can be challenging. Additional equipment is planned to deal with the site-specific needs of Cangrejos.

The mine equipment requirements were calculated based upon the mine production schedule, bench heights and operating conditions at Cangrejos. As in previous evaluations of Cangrejos, IMC has established 3 basic fleets or categories of equipment to open the mine and sustain it. The three fleets at Cangrejos are categorized as – a primary production fleet, a narrow mining fleet and a pioneering fleet. Table 16-9 is a summary of the equipment types and categories of work assignment.

Table 16-9: Categories or Work Groups of Major Mine Equipment

Description	Cost Category Reporting			
	Drilling	Loading	Hauling	Auxiliary
Pioneering Units, Roads and Saprolite				
Epiroc DM 50 Presplit Drill (10 cm bit / 222 kN)	X			
KM PC 500 Excavator Backhoe (3.1 m^3 bucket / 270 kW)				X
KM HM400 Auxiliary Truck (23 m^3 bed / 38 t)				X
KM 825 A2 Motor Grader (4.3 m blade / 165 kW)				X
KM D65 EX Track Dozers (3.3 m blade / 162 kW)				X
Narrow Mining Units, Saprolite and Saprock				
KM WA 1200 Front End Loader (21 m^3 bucket / 1316 kW)		X		
KM PC 500 Excavator Backhoe (3.1 m^3 bucket / 270 kW)				X
KM HD785-7 Haul Truck (63.1 m^3 bed / 91.2 t)			X	
CAT 16J Motor Grader (4.9 m blade / 216 kW)				X
KM 155-5 Track Dozers (3.9 m blade / 264 kW)				X
Primary Mining Equipment				
Epiroc PV 351 Diesel Rotary Drill (34.9 cm bit / 56700 kg pulldown)	X			
KM PC 5500 Hydraulic Shovel (29.0 m^3 bucket / 2-940 kW)		X		
KM 830E Haul Truck (161.5 m^3 bed / 220 t)			X	
CAT 24M Motor Grader (7.3 m blade / 399 kW)				X
KM 375 Track Dozers (4.9 m blade / 455 kW)				X
KM WD800 Wheel Dozer (4.9 m blade / 637 kW)				X
KM HD1500 Water Truck (19000 L tank / 144 t)				X
Additional Auxiliary				
Epiroc DM 50 Pioneering Drill (10 cm bit / 222 kN)				X
KM WA 600-8 Aux Loader (7 m^3 bucket / 293 kW)	X			
CAT CS78B Compactor (153.5 cm / 129.4 kW)				X
KM PC 500 Excavator Backhoe (3.1 m^3 bucket / 270 kW)				X
Other Equipment: Multiple Support Items, Pick Ups, Fuel Lube, Light Plants				

Source: IMC, 2023.

For each of the major units in Table 16-9, the operating cost category that each unit reports to is also listed. These cost allocations will be illustrated within the mine operating costs.

Group 1 pioneering equipment will be used intently throughout pre-production and the early years of the mine operations. This equipment will be used to develop the access roads across the mountainous terrain in order for mine operations to begin waste removal to obtain ore exposure. These units are smaller in size than normally assigned at a mine of this size, but the small size is necessary to work in the tight areas that occur when roads are built along steep terrain.

Group 2 equipment is intermediate in size. Once the pioneering access is open and there is a reasonable amount of saprock exposed, the Narrow Mining Units will be used to expand from road width to full scale operating width. These units were selected to work in areas that are 30 m to 50 m wide. It should be noted that in all cases, these mining groups are not exclusive. They will work wherever they are required. The front-end loader (FEL) would struggle with footing in pure saprolite, particularly when wet. In that case the excavator would load the saprolite until more solid ground conditions are incurred.

Group 3 represents the equipment one would normally associate with large scale hard rock operations. These units will be employed once hard rock is exposed and operating widths begin to reach 75 meters. Equipment from groups 1 and 2 will work with the larger group 3 equipment as required. In particular, the Group 2 FEL will augment the hydraulic shovels to maintain blends and clean out narrow operating areas throughout the mine life. The FEL will require a dozer to push in the 15 m bench height.

The general size of equipment was dictated by the bench height and productive requirements from each mine pushback. The 15 m bench height established by the resource model dictated a hydraulic shovel of the 29 m^3 class or larger in order to reach 15 m. With that minimum size, the potential for larger units was briefly considered. Table 16-10 illustrates the total tonnage of all material types, ore and waste that is scheduled to be mined from each phase during each year of the mine life. For many years of the mine life, 3 phases are active requiring substantial loading capacity in each phase. The annual loading capacity in hard rock for the shovel is summarized at the bottom of the table.

Loading units that are substantially larger than 29 m^3 would not be a good match for mining in the three-phase environment. Electric shovels could be assigned to lower the operating costs; however, it results in a substantially higher capital cost for the units, plus the capital requirement to electrify the pit. In addition, large cable shovels would not have the flexibility required to match the number of working places required in the mine at Cangrejos.

Once the loading size was selected, the truck size selection simply became the largest unit that the shovel could efficiently load.

As noted previously, all equipment units from all groups will be used as required throughout the mine life working together. Their cost reporting is not segregated by the operating group but by the cost categories shown on Table 16-3. The IMC procedure for estimating equipment and workforce requirements as well as mine capital and operating costs is as follows:

1. The productivity of each piece of major mine equipment is calculated for a single operating shift (12-hour shift). For haul trucks, this requires measuring haul profiles and calculating the truck productivity by haul time simulation.
2. The number of operating shifts required to meet production are calculated on a yearly basis. IMC has an estimated 720 work shifts per year.
3. Mechanical availability and a reasonable use of that availability are applied to determine the total fleet number of units required during each year of the plan.
4. The number of those units that will be operated during each shift establishes the number of operators required for each equipment unit.
5. Maintenance labor was set at a typical ratio of 70% of the operating labor.
6. Supervisory labor is added as a separate cost category.
7. Operating costs are developed by estimating the cost for parts and consumables for each equipment unit for each shift. That cost is multiplied by the required operating shifts.
8. Labor cost is estimated by applying the labor rates to the numbers of personnel. Total mine operating cost is the total of parts and consumables plus labor costs.
9. Mine capex is estimated by multiplying the number of fleet units times the purchase price.

10. Sustaining capex is estimated by calculating the accumulated hours on each assigned piece of equipment to determine when it requires replacement.
11. Minor support equipment units are added based on standard requirements at typical mine operations of this size.

Table 16-10: Production Required by Phase to Illustrate Shovel Selection

Year	Total Material Kt	Total Material by Phase							Number of Phases	Phases Needing Shovels	Number of Shovels
		Can1 Kt	Can2 Kt	Can3 Kt	GB1 Kt	Can4 Kt	GB2 Kt	GB3 Kt			
PP	13,281	13,281	0	0	0	0	0	0	1	1	1
1	43,127	11,976	21,407	9,745	0	0	0	0	3	1	1
2	44,369	15,539	4,992	23,838	0	0	0	0	3	2	2
3	47,367	2,481	10,080	33,322	0	1,485	0	0	4	2	2
4	60,809	13,931	13,420	9,431	0	24,027	0	0	4	2	2
5	60,171	0	49,772	0	3,813	6,586	0	0	3	2	2
6	61,996	0	37,525	0	11,859	12,611	0	0	3	2	2
7	71,730	0	32,144	27,661	8,827	3,098	0	0	4	3	3
8	71,953	0	6,519	45,033	11,749	8,652	0	0	4	2	3
9	71,961	0	0	31,194	15,775	24,992	0	0	3	3	3
10	71,525	0	0	0	30,787	40,738	0	0	2	3	3
11	70,721	0	0	0	13,019	57,703	0	0	2	3	3
12	71,421	0	0	0	10,142	54,703	6,576	0	3	3	3
13	69,000	0	0	0	0	67,207	1,793	0	2	2	3
14	69,000	0	0	0	0	42,058	26,942	0	2	2	3
15	68,000	0	0	0	0	38,697	29,303	0	2	2	3
16	68,000	0	0	0	0	29,505	38,495	0	2	2	3
17	65,650	0	0	0	0	8,142	32,170	25,338	3	1	3
18	65,650	0	0	0	0	0	39,525	26,125	2	2	3
19	65,552	0	0	0	0	0	33,194	32,357	2	2	3
20	58,667	0	0	0	0	0	20,367	38,300	2	3	3
21	41,173	0	0	0	0	0	0	41,173	1	2	3
22	34,950	0	0	0	0	0	0	34,950	1	1	3
23	35,236	0	0	0	0	0	17,701	17,534	2	2	3
24	35,590	0	0	0	0	0	20,066	15,524	2	2	3
25	36,242	0	0	0	0	0	7,846	28,396	2	1	3
26	12,754	0	0	0	0	0	0	12,754	1	1	3

Notes: KMPC5500 hydraulic shovel, average 29 m^3 capacity bucket; loading capacity in hard rock – 49,731 tonnes/shift, 27,392 kt/a maximum per shovel; KM830-class haul trucks loaded in four passes with hard rock. Source: IMC, 2023.

The average material densities and properties that were used for equipment productivity calculations are in Table 16-10. The mine work schedule is summarized on Table 16-6. The first two years of pre-production are based on one shift per day operations. The last five months of pre-production and the rest of the mine life are based on two shifts per day and 12 hours per shift. A number of shifts are planned to be lost for weather and other delays as shown on the table.

Table 16-11: Material Properties for Equipment Productivity Calculations

Parameter	Overburden	Saprolite	SapRock	Oxidized Rock	Fresh Rock
Dry Bank Density (mt/cum)	1.650	1.750	1.850	2.758	2.747
Material Handling Swell	40.0%	40.0%	40.0%	40.0%	40.0%
Moisture Content	25.0%	25.0%	25.0%	5.0%	5.0%
Dry Loose Density (mt/cum)	1.18	1.25	1.32	1.97	1.96
Wet Loose Density (mt/cum)	1.47	1.56	1.65	2.07	2.06

Source: IMC, 2023.

Table 16-12: Mine Operations Scheduled Shifts by Period

Mining Period	Scheduled Days	Shifts/ Day	Scheduled Shifts	Lost Shifts[1]	Available Shifts	No. of Crews
PP-M28 to M6	30.4	1	30	0.42	30.0	2
PP-M5 to M1	30.4	2	61	0.83	60.0	4
Year 1 to 25	365	2	730	10.00	720.0	4
Year 26	180	2	360	5.00	355.0	4
Total	9,851		19,308	261	19,047	

Note: 1. Lost shifts include holidays. Source: IMC, 2023.

The maximum availability and use of availability that was applied to the major mining equipment is summarized on Table 16-12. The product of the availability and use of availability is called utilization. These parameters define maximum utilization applied to each piece of major mine equipment.

The specific manufacturers and unit types listed on Table 16-12 are not recommendations of specific units but are indicative of the type of unit that could be applied in each equipment position.

Table 16-13: Major Equipment Availability and Use of Availability

Equipment Type	Machine Life Hours	Mechanical Availability	Use of Availability
Epiroc PV 351 Diesel Rotary Drill (34.9 cm bit / 56700 kg Pulldown)	65,000	85%	90%
KM PC 5500 Hydraulic Shovel (29 m^3 Bucket / 2-940 kW)	90,000	90%	90%
KM 830E Haul Truck (161.5 m^3 Bed / 220 tn)	108,000	85%	90%
Epiroc DM 50 Presplit Drill (10 cm bit / 222 kN)	65,000	85%	90%
KM PC 500 Excavator Backhoe (3.1 m^3 Bucket / 270 kW)	35,000	85%	90%
KM WA 1200 Front End Loader (21 m^3 Bucket / 1316 kW)	75,000	85%	90%
KM HD785-7 Haul Truck (63.1 m^3 Bed / 91.2 tn)	108,000	85%	90%
KM D65 EX Track Dozers (3.3 m Blade / 162 kW)	50,000	85%	80%
KM 155-5 Track Dozers (3.9 m Blade / 264 kW)	50,000	85%	80%
KM 375 Track Dozers (4.9 m Blade / 455 kW)	50,000	85%	80%
KM WD800 Wheel Dozer (4.9 m Blade / 637 kW)	50,000	85%	80%
KM 825 A2 Motor Grader (4.3 m Blade / 165 kW)	45,000	85%	80%
CAT 16J Motor Grader (4.9 m Blade / 216 kW)	45,000	85%	80%
CAT 24M Motor Grader (7.3 m Blade / 399 kW)	45,000	85%	80%
KM HD1500 Water Truck (19000 L Tank / 144 tn)	108,000	85%	75%
KM WA 600-8 Auxiliary Loader (7 m^3 Bucket / 293 kW)	60,000	85%	75%
KM HM400 Auxiliary Truck (23 m^3 Bed / 38 tn)	45,000	85%	90%
Epiroc DM50 Pioneering Drill (10 cm bit / 222 kN)	25,000	85%	75%
KM PC 500 Excavator (3.1 m^3 Bucket / 270 kW)	35,000	85%	80%
CAT CS78B Compactor (153.5 cm / 129.4 kW)	33,000	85%	90%

Source: IMC, 2023.

The availability and use of availability values are applied to the working shifts noted on Table 16-12. Normal production delays are accounted for in estimating the equipment productivity per shift.

Tables 16-14 and 16-15 summarize the major and minor mine equipment on hand at Cangrejos in selected years. The fleet is constant from Year 7 to Year 14. There is another buildup of the haulage fleet starting in Year 14, which is a result of longer haulage profiles associated with the waste stripping of Gran Bestia. The haulage fleet peaks in Year 16. The additional fleet added during this peak period was built up using the smaller 92-tonne haul trucks. The smaller trucks were selected based on capital costs and limited need for the additional truck capacity. Future mine planning might be able to minimize the additional truck requirements during this period by resequencing the waste storage facility after the peak stripping requirement has passed and fewer units need replacement. Tables 16-14 and 16-15 do not necessarily reflect the number of units working every shift. For example, the pioneering units are not heavily scheduled late in the mine life, but they are still available for use if required.

Table 16-14: Major Mine Equipment Fleet On Hand for Selected Years

Equipment Type or Class	End of PP	Years 1 to 5	Max Units
Epiroc PV 351 Diesel Rotary Drill (34.9 cm Bit / 56700 kg Pulldown)	3	3	4
KM PC 5500 Hydraulic Shovel (29 m^3 Bucket / 2-940 kW)	2	2	4
KM 830E Haul Truck (161.5 m^3 bed / 220 tn)	15	19	30
Epiroc DM 50 Presplit Drill (10 cm Bit / 222 kN)	1	1	1
KM PC 500 Excavator Backhoe (3.1 m^3 Bucket / 270 kW)	1	1	1
KM WA 1200 Front End Loader (21 m^3 Bucket / 1316 kW)	1	1	1
KM HD785-7 Haul Truck (63.1 m^3 bed / 91.2 tn)	6	6	19
KM D65 EX Track Dozers (3.3 m Blade / 162 kW)	2	2	2
KM 155-5 Track Dozers (3.9 m Blade / 264 kW)	3	3	3
KM 375 Track Dozers (4.9 m Blade / 455 kW)	2	2	2
KM WD800 Wheel Dozer (4.9 m Blade / 637 kW)	2	3	3
KM 825 A2 Motor Grader (4.3 m Blade / 165 kW)	2	2	2
CAT 16J Motor Grader (4.9 m Blade / 216 kW)	1	2	2
CAT 24M Motor Grader (7.3 m Blade / 399 kW)	1	2	2
KM HD1500 Water Truck (19000 L Tank / 144 tn)	2	3	3
KM WA 600-8 Auxiliary Loader (7 m^3 Bucket / 293 kW)	1	1	1
KM HM400 Auxiliary Truck (23 m^3 bed / 38 tn)	6	6	6
Epiroc DM50 Pioneering Drill (10 cm Bit / 222 kN)	1	2	3
KM PC 500 Excavator (3.1 m^3 Bucket / 270 kW)	1	1	2
Total Major Mine Equipment	53	62	89

Source: IMC, 2023.

Table 16-15: Minor Support Equipment Fleet On Hand for Selected Years

Equipment Type or Class	End of PP	Years 1 to 5	Max Units
Fuel/Lube Truck 13,600 L fuel, 7-380 L Lube	1	2	2
Spare Loader Bucket (17 m^3)	1	1	1
Flatbed Truck (Class 8)	1	1	1
Crane Truck (19 t) - 2017 Terex BT3870	1	1	1
Cat 988 with Tire Handler	1	1	1
Mechanics Truck (5 t Crane, Air Compressor & Welder)	3	3	3
Welding Truck (Combined with Mechanics Truck)	1	1	1
Lowboy (Will Use Spare 91 t Truck)	0	1	1
Shop Forklift (Hyster H100XM)	1	2	2
RT Forklift (Sellick S160-4)	1	1	1
Man Bus	2	2	2
Pickup Truck (4x4)	16	16	16
Light Plants	15	15	15
Mine Radios (Handheld & Fixed Units)	89	129	129
Mine Communications Network	1	1	1
Mine Dispatch System – 80 Unit System	1	1	1
Integrated Tool Carrier (CAT IT62)	1	1	1
Mine Planning Software	1	1	1
Tire Press	1	1	1
Shop Jacks	1	1	1
Hydraulic Hammer	1	1	1
Backhoe Loader (1.1 m^3)	1	1	1
Fuel/Lube Truck 2,500 L Fuel, 3-100 380 L Lube	1	1	1
Total Mine Support Equipment	142	185	185

Source: IMC, 2023.

16.9 Mine Labor and Staffing

The requirements for mine and maintenance labor were established based on the equipment fleet, operating schedule, and work requirements for the mine fleet. Mine salaried labor was estimated based on IMC experience working at other large mine projects of similar size to Cangrejos.

During the first two years of pre-production, the mine is scheduled to work one shift per day. Most of that effort is spent in pioneering access for larger mine equipment to follow.

The last five months of pre-production are scheduled to work two 12-hour shifts per day as the mine begins to ramp up to production. The operating mine life for the 26-year period is scheduled to work two 12-hour shifts per day.

The mine maintenance labor was established to maintain a ratio of maintenance to operating personnel of approximately 70%. That ratio is slightly higher than what might be scheduled in North America where parts and vendor support are nearby. Cangrejos is not necessarily remote, but the major industrial centers of Quito and Guayaquil are some distance away, so the mine will need to rely on their own personnel to maintain the equipment.

The mine salaried staff will be transitioned from expatriates to national staff as the training and experience is locally developed over the first few years of the mine. A few of the personnel are indicated as permanent expatriates and several others are planned to be expatriates (initially), who will phase out and be replaced by trained national staff. The mine and maintenance trainers are typical of the staff members who may start as expatriates and transition to nationals over time.

17 RECOVERY METHODS

17.1 Overview

The Cangrejos Project is designed around three major phases of material throughput. In the Initial Phase, from Years 1 to 3, the plant processes 30 kt/d of material. In the Expansion 1 Phase, from Years 4 to 6, the plant processes 60 kt/d. In the Expansion 2 Phase, from Years 7 to 26, the plant processes 80 kt/d.

Mined material is crushed, ground and processed using flotation to produce a copper concentrate. The concentrate is thickened and filtered before being sold and shipped to market and the tailings from the rougher flotation reports to the sand flotation circuit. The tailings from the cleaner scavenger flotation stage as well as the concentrate from the sand flotation stage are leached using a hybrid carbon-in-leach (CIL) circuit and gold doré is produced after electrowinning and smelting. The gold doré is also sold and shipped to market. The tailings from the sand flotation stage as well as the detoxified tailings from the CIL circuit are thickened and filtered before being deposited in a DSTF on site.

Key considerations for selecting the process flowsheet included the variable mineralogy, feed grades and rock hardness in the deposit, as well as the use of a staged ramp-up of plant throughput in three phases. Multiple trade-off studies were conducted in order to select the optimal process flowsheet, including on throughput sizing, comminution equipment selection, saprolite/saprock processing options, molybdenum circuit assessment, and flotation circuit assessment. Capital and operating costs were minimized without compromising functionality and robustness in the design.

17.1.1 Process Design Criteria

The key process design criteria for the plant are listed in Table 17-1 including grade and recovery data.

Table 17-1: Process Design Criteria

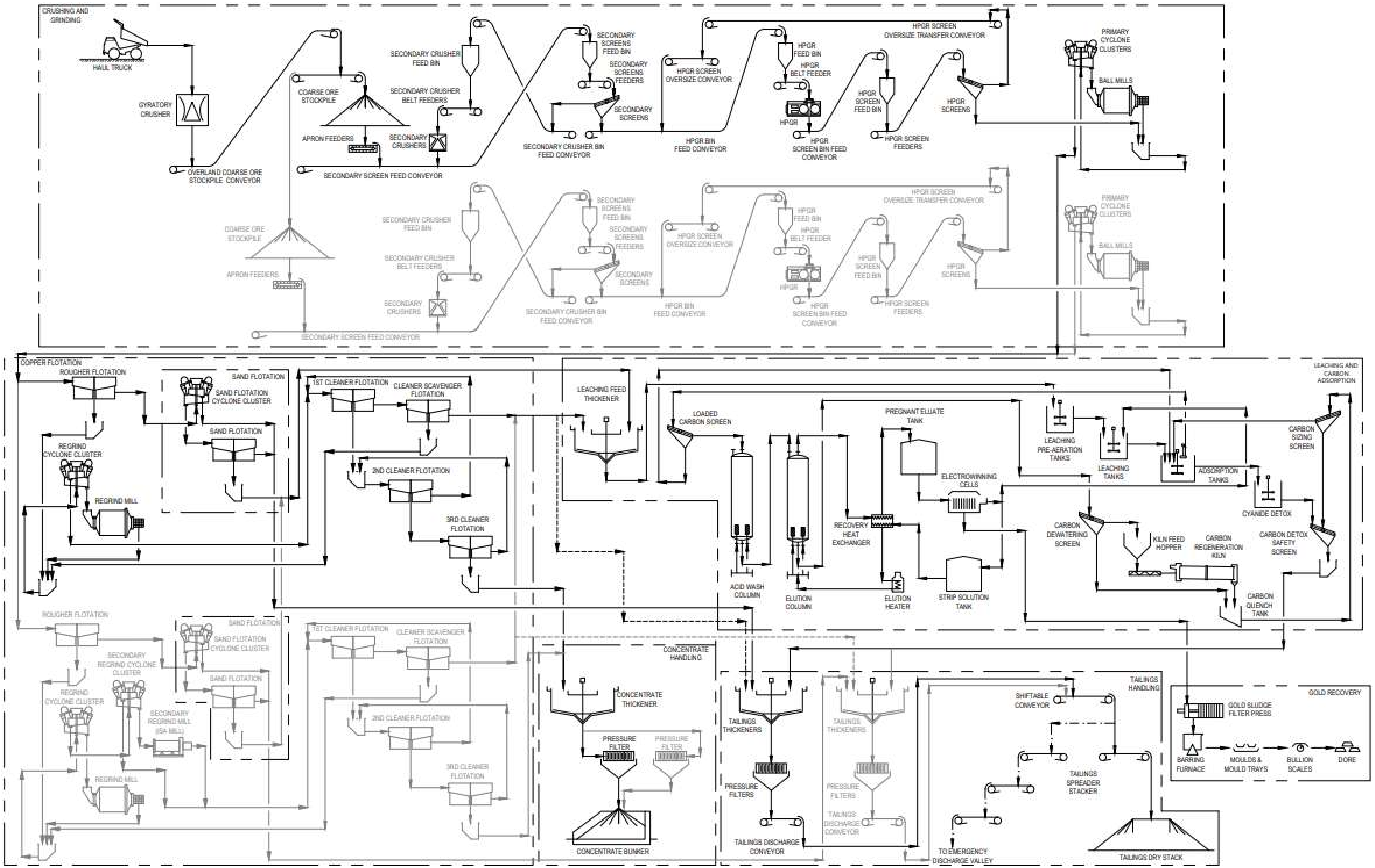
Description	Units	Value
Annual Throughput, Years 1 to 3	Mt/a	10.95
Annual Throughput, Years 4 to 6	Mt/a	21.90
Annual Throughput, Year 7+	Mt/a	29.20
Operating Availability – Primary Crushing	%	75
Operating Availability – Secondary & Tertiary Crushing, Grinding, Flotation	%	90
Operating Availability – Concentrate Handling	%	82.5
Operating Availability – Tailings Filtration	%	75
Bond Crusher Work Index – Design	kWh/t	29.2
Tertiary Crushing Product Size, 80% Passing	mm	4
Grinding Product Size, 80% Passing	µm	90
Bond Ball Mill Work Index – Design	kWh/t	16.2
Life-of-Mine Head Grade, Gold	g/t	0.55
Life-of-Mine Head Grade, Copper	%	0.10
Life-of-Mine Head Grade, Silver	g/t	0.68
Copper Rougher, Stage Mass Pull	%	8.3-16.3
Copper Regrind Product Size, 80% Passing, Years 1 to 3; 4+	µm	40/20
Copper Cleaner, Total Mass Pull	%	3.7
Copper Concentrate Thickener – Unit Area Settling Rate	$t/h/m^2$	0.42
Copper Concentrate Thickener – Underflow Density	% solids (w/w)	65
Copper Filter, Filtration Rate	$kg/m^2/h$	335
Copper Concentrate Moisture Content	% water (w/w)	9.0
Tailings Thickener – Unit Area Settling Rate	$t/h/m^2$	0.24
Tailings Thickener – Underflow Density	% solids (w/w)	60
Tailings Filter, Filtration Rate	$kg/m^2/h$	320
Tailings Moisture Content	% water (w/w)	15.0
Pre-Leach Thickener – Unit Area Settling Rate	$t/h/m^2$	0.24
Pre-Leach Thickener – Underflow Density	% solids (w/w)	45
Mode of Leach – Years 1 to 3; 4+	-	L-CIL/L-CIP
Residence Time	h	24
Operating Density	%w/w	40
Dissolved Oxygen Target	ppm	20
Carbon Concentration	g/L	12
Carbon Loading (Au+Ag)	g/t (Au+Ag)	1,730
Carbon Batch Size	tonnes	4
Cyanide Reduction System	-	SO_2/air
Residence Time	h	4
CN_{WAD} in Feed, Design	mg/L	248
SO_2 Addition, Maximum	g/g CN_{WAD}	4.0
Life-of-Mine Average Recovery, Gold	%	85.0
Life-of-Mine Average Recovery, Copper	%	78.9
Life-of-Mine Average Recovery, Silver	%	54.0

Source: Ausenco, 2023.

17.1.2 Process Flowsheet

An overall process flow diagram showing the unit operations in the process plant is presented in Figure 17-1. The process areas colored grey (such as secondary line of comminution circuit, copper and sand flotation, tailings thickening and concentrate filtration) represent the equipment required for Expansion 1 and 2 phases. The proposed plant layout is presented in Figure 17-1.

Figure 17-1: Process Flowsheet



Source: Ausenco, 2023.

17.2 Plant Design

Given below is a brief description of the process plant. The description focuses on the Initial Phase of the Project; However, where noted, equipment and material streams may be doubled in the Expansion 1 Phase and additional equipment may be added in the Expansion 2 phase. Expansion 2 Phase. This is to facilitate the progressive increase of throughput in Expansion 1 and 2 Phase.

In the comminution circuit, there will be one gyratory crusher sized for 80 kt/d followed by a coarse ore stockpile. In the Initial phase this is followed by a secondary crushing circuit, HPGR and two balls mills. The secondary crushing circuit, HPGR and ball mills are duplicated for phase 2 when the plant capacity increases to 60 kt/d. In phase 3, plant capacity increases to 80,000 tonnes per day with no additional comminution equipment, which is achieved by increasing the product size.

Sand flotation and conventional flotation follows the ball mills installed in Initial phase and Expansion 1 Phase. Additional cells are added in phase 3 to maintain recovery.

The flotation concentrates from all phases feeds into the concentrate handling area whereas the sand flotation concentrate and conventional flotation tails feeds the carbon adsorption, carbon desorption, carbon regeneration, electrowinning, and gold smelting areas. The number of each equipment in these areas is not increased in phase 2 or 3 and all equipment is sized to be able to handle the total amount of material being processed in phase 3.

Final tailings is thickened before being sent to the filtered tailings plant which is expanded in each phase to produce a filtered tailings cake for the dry stack facility.

17.2.1 Initial Phase Design (Years 1 to 3)

17.2.1.1 Primary Crushing and Stockpiling

The primary crushing circuit is designed for an annual operating time of 6,507 hours or 75% availability at a capacity of 30 kt/d in the Initial phase.

ROM material is hauled from the mine and directly tipped into the crusher dump pocket before it is fed into the primary crusher. The primary gyratory crusher is designed to reduce the ore to an 80% passing product size (P_{80}) of 141 mm. The crushed material falls into a discharge vault, or bin. An apron feeder receives the material and dumps it onto a transfer conveyor. A magnet is installed to remove any foreign metallic bodies from the crushed material prior to feeding it onto a stockpile. An overland conveyor and a feed tripper conveyor are used to transport the crushed material to the coarse ore stockpile.

Major equipment in this area includes the following:

- primary gyratory crusher (1,200 kW)
- mobile rock breaker
- primary crusher discharge apron feeder
- primary crusher self-cleaning magnet

- overland coarse ore stockpile conveyor
- coarse ore feed tripper conveyor.

17.2.1.2 Secondary Crushing and Screening

Ore from the coarse ore stockpile is reclaimed using an apron feeder and transferred to the secondary feed conveyor. A dust collection system is used to remove fine particles from the air and deposit the collected solids onto the secondary crusher feed conveyor.

The reclaimed ore is passed through the secondary screen feed bin and fed to the secondary screens via a belt feeder. Oversize from the screen is transferred by the secondary crusher feed conveyor to the secondary crusher feed bin. The conveyor is fitted with a belt magnet as well as a metal detector to remove any remaining metallic foreign bodies from the material. Material from the secondary crusher feed bin is passed over the belt feeder and into the secondary crusher. After secondary crushing, the ore is recirculated to the secondary screen in combination with material from the coarse ore stockpile via the secondary screen feed conveyor.

Undersize from the secondary screen is taken by a conveyor to the HPGR feed bin. The conveyor is equipped with a weightometer to monitor the crushing circuit throughput.

The secondary crusher is designed to reduce the ore to an 80% passing product size (P_{80}) of 70 mm while producing a screen undersize (P_{80}) of 36 mm.

The major equipment in this area includes the following:

- secondary screen belt feeders
- secondary screens (one duty and one standby)
- secondary crusher belt feeders
- secondary cone crushers (one duty and one standby at 600 kW each)

17.2.1.3 Tertiary Crushing and Screening

The undersize material from the secondary screen is deposited onto the HPGR bin feed conveyor. The material on the conveyor falls into the HPGR feed bin. HPGR discharge belt feeder feeds the HPGR feed bin and is crushed by the HPGR crusher, ore can bypass the HPGR and be conveyed directly to screen feed bin. The material crushed by the HPGR is reduced to an 80% passing product size (P_{80}) of 4 mm at the screen undersize.

The product material from the HPGR screen bin feed conveyor falls into the HPGR screen feed bin. A dust collector captures any fine particles in the air and deposits them on the screen feeders. Screen feeders take material from the feed bin and transfer it into the HPGR screens. Process water is sprayed onto the screens to facilitate material passthrough and reduce or eliminate the spread of dust.

The oversized material reports to the HPGR screen oversize transfer conveyor. A magnet removes any foreign metallic bodies, which either deposits it back to the HGPR bin feed conveyor or into an HPGR screen oversize emergency stockpile in the case of HPGR shutdown for maintenance. Material in the HPGR stockpile is reclaimed by FELs and deposited back to the HPGR emergency reclaim hopper. An inclined apron feeder receives material from the hopper and deposits it onto the HPGR bin feed conveyor.

Major equipment in this area includes the following:

- HPGR belt feeder
- HPGR crusher (2.4 m dia x 1.5 m width, 6,000 kW)
- HPGR screen feeders
- HPGR screens

17.2.1.4 Grinding Circuit

The grinding circuit is designed for an annual operating time of 7,884 h or 90% availability. The circuit is sized for a maximum throughput of 46 kt/d and a nominal throughput of 30 kt/d.

The undersized material from the HPGR screens falls into primary cyclone feed pumpboxes. The material in the primary cyclone feed pumpboxes is pumped to two primary cyclone clusters.

The underflow from the primary cyclone clusters flows by gravity to the feed boxes for each of the two ball mills. The ball mill feed boxes also receive collector, process water. The overflow from the primary cyclones flows by gravity through two trash screens into the rougher flotation area.

To feed the ball mill grinding media, FELs feed balls from a storage bunker to charging kibbles. Each kibble opens into feed bins. Mobile feeders receive the grinding media from the openings at the bottom of the ball feed bins and transfer the balls into the ball mill feed boxes.

The circuit is sized based on a grinding circuit product size (P_{80}) of 90 µm. The ball mill product is passed through trommel screens. The oversized material and broken grinding balls are collected for disposal in a scats bunker, while the undersized material flows by gravity back to the primary cyclone feed pumpboxes.

Major equipment in this area includes the following:

- ball mills (dual pinion, 13.5 MW, 7.62 m dia. X 11.7 m ft EGL)
- primary cyclone clusters
- ball mill charging media
- primary cyclone trash screens (32 m^2).

17.2.1.5 Copper Flotation Circuit

The copper flotation circuit comprises six separate stages or areas: rougher flotation, three cleaner stages, a cleaner scavenger stage, and sand flotation. The material from the rougher flotation stage is processed by a regrind mill before the cleaner stages and cleaner scavenger flotation.

Rougher Flotation

The overflow from the primary cyclone cluster passes through trash screen and reports to the rougher cell feed box. Frother (MIBC) and collector (PAX) reagents are added to this feed box. Process water and flotation (low-pressure) air is added to each of the cells to maintain the pulp density of 35% w/w in each cell.

The rougher concentrate is collected from each rougher cell and pumped to regrinding, while the tailings are pumped to the sand flotation circuit.

The regrind circuit consists of a cyclone cluster and regrind ball mill operating in closed circuit. Slurry from the surge tank is pumped to the cyclones to increase the solid density of the feed to the regrind mill. The overflow target product size is 40 µm. The cyclone overflow reports to the copper cleaner circuit while the underflow flows by gravity to the regrind mill. The regrind mill uses 5 mm diameter steel media, and the mill discharge is fed back to the cyclone cluster. Lime is also added to the regrind circuit.

Major equipment in this area includes the following:

- five copper rougher flotation cells (312.8 m^3)
- two copper regrind cyclone cluster
- one copper regrind mill (1.2 MW).

Cleaner Flotation

The copper cleaner circuit consists of three sequential stages of cleaning as well as a stage of cleaner scavenger circuit utilizing banks of conventional forced air tank cells. The first stage is dosed with frother (MIBC), collector (PAX) and lime to promote concentrate recovery. Frother, collector and lime are also dosed to the second flotation stage. The flotation concentrates flow from the first stage through to the third and concentrate from the third stage reports to the concentrate thickener. Flotation tailings flow counter-currently to the concentrate, and the first cleaner tailings are pumped to the cleaner scavenger circuit. The cleaner scavenger concentrate is collected by a launder and is pumped to the cyclone feed pumpbox and the tailings flows to the pre-leach thickener.

Major equipment in this area includes the following:

- three copper cleaner scavenger cells (58 m^3)
- two copper cleaner 1 cells (6.3 m^3).
- two copper cleaner 2 cells (6.3 m^3)

Sand Flotation

Tailings from rougher flotation circuit is pumped to the cyclone cluster in the sand flotation circuit. The overflow from the cyclones reports to the tailings thickener, while the underflow flows by gravity to a conditioning tank.

Along with the cyclone underflow, the agitated conditioning tank is dosed with sulphidizer reagent, two collector reagents (PAX and A-208), frother (MIBC), and diesel fuel oil. The conditioning tank has a residence time of 10 mins. Conditioned slurry then flows by gravity to a bank of conventional forced air tank cells at a nominal density of 35% w/w.

Process water and low-pressure air is pumped into each flotation cell. The tailings are collected by gravity into a pumpbox and pumped to the tailings thickener. The concentrate from each cell is collected by a launder into a pumpbox before being pumped to a pre-leach thickener.

Major equipment in this area includes the following:

- one sand flotation cyclone cluster

- sand flotation agitated conditioning tank
- three sand rougher flotation cells (118.1 m^3).

17.2.1.6 Concentrate Dewatering

The concentrate dewatering circuit consists of thickening and filtration equipment required to dewater the copper concentrate prior to loadout and shipment. The concentrate stream reports to a dedicated high-rate thickener, where flocculant is added to assist in the settling of the solids. The thickener overflow is pumped to the process water tank, while the underflow is fed to a dedicated filter feed tank with a residence time of 24 hours.

The copper thickener underflow reports to a concentrate filter at a nominal pulp density of 65% w/w. The vertical membrane plate and frame filter presses discharge filter cake at a target moisture content of 9%. The filter discharges to bunkers, where the concentrate is reclaimed by a front-end loader and stored in stockpiles.

The concentrate is reclaimed from the stockpile by a front-end loader and loaded into bulk concentrate trucks.

The circuit includes the following major equipment and facilities:

- concentrate thickener
- concentrate filter feed tanks
- concentrate filter press (horizontal plate and frame).

17.2.1.7 Gold Leaching and Adsorption Circuit

The leach-adsorption circuit consists of one leach tank and six CIL tanks. The circuit is fed preleach thickener underflow together with cyanide. The leach and CIL tanks have a total residence time of 24 hours at 40% w/w.

Oxygen is sparged to each tank to maintain dissolved oxygen levels of 20 ppm. Hydrated lime is added to maintain pH to the desired set point. Cyanide solution is added to the leach tank. Barren carbon from the carbon desorption and regeneration circuit is returned to the last tank of the CIL circuit and is advanced counter-currently to the slurry flow by pumping slurry and carbon. Slurry from the last CIL tank gravitates to the cyanide detoxification tanks.

The intertank screen in each CIL tank retains the carbon whilst allowing the slurry to flow by gravity to the downstream tanks. Recessed impeller pumps are used to transfer slurry between the CIL tanks and from the lead tank to the loaded carbon screen mounted above the acid wash column in the elution circuit.

The circuit includes the following major equipment and facilities:

- trash screen
- leach/CIL tanks and agitators
- loaded carbon screen
- intertank carbon screens
- carbon sizing screen.

17.2.1.8 Carbon Acid Wash, Elution and Regeneration Circuit

Carbon Acid Wash

Prior to gold stripping, loaded carbon is treated with a weak hydrochloric acid solution to remove calcium, magnesium and other salt deposits that could render the elution less efficient or become baked on in subsequent steps and ultimately foul the carbon.

Loaded carbon from the loaded carbon recovery screen flows by gravity to the acid wash column. Entrained water is drained from the column and the column is refilled from the bottom up with the hydrochloric acid solution. Once the column is filled with acid, it is left to soak, after which the spent acid is rinsed from the carbon and discarded to the cyanide destruction tank. The acid-washed carbon is then hydraulically transferred to the elution column for gold stripping.

The circuit includes the following major equipment and facilities:

- acid wash carbon column – 5-tonne capacity
- hydraulic acid feed pump
- spent solution discharge sump pump.

Gold stripping (Elution)

The gold stripping (elution) circuit uses the AARL process.

The elution sequence commences with the injection of a set volume of water mixed with cyanide and sodium hydroxide solution to achieve a weak NaOH (2.0% w/w) and weak NaCN (0.2% w/w) solution. Once the prescribed volume has been added, the pre-soak period commences. During the pre-heat and soak, the caustic/cyanide solution is circulated through the column and the elution heater until a temperature of 95°C is achieved.

Upon completion of the pre-soak period, additional water is heated and pumped through the elution column to the pregnant eluate tank at a rate of 2.0 bed volumes (BVs) per hour. At this stage, the temperature of the strip solution passing through the column is increased to 130°C at a pressure of 650 kPa and the gold is stripped off the loaded carbon.

Strip solution flows up and out of the top of the column, passing through the heat exchanger via the elution discharge strainers and to the pregnant solution tank.

Upon completion of the cool down sequence, the carbon is hydraulically transferred to the carbon regeneration kiln feed hopper via a dewatering screen.

The stripping circuit includes the following key equipment:

- elution carbon column – 5-tonne capacity
- strip solution heater (electric) with heat exchangers
- strip eluate, and pregnant solution tanks.

Carbon Reactivation

Carbon is reactivated in an electric rotary kiln. Dewatered barren carbon from the stripping circuit is held in a 7-tonne kiln feed hopper. A screw feeder meters the carbon into the reactivation kiln, where it is heated to 650° to 750°C in an atmosphere of superheated steam to restore the activity of the carbon.

Carbon discharging from the kiln is quenched in water and screened on a carbon sizing screen located on top of the CIL tanks to remove undersized carbon fragments. The undersize fine carbon gravitates to the carbon safety screen, whilst carbon screen oversize is directed to the CIL circuit.

As carbon is lost by attrition, new carbon is added to the circuit using the carbon quench tank. The new carbon is then transferred along with the regenerated carbon to feed the carbon sizing screen.

The carbon reactivation circuit includes the following key equipment:

- carbon dewatering screen
- regeneration kiln (propane) including feed hopper and screw feeder
- carbon quench tank.

17.2.1.9 Electrowinning and Gold Room

Gold is recovered from the pregnant solution by electrowinning and smelted to produce doré bars. The pregnant solution is pumped through one electrowinning cell with stainless steel mesh cathodes. Gold is deposited on the cathodes and the resulting barren solution is pumped to the leach circuit.

The gold-rich sludge is washed off the steel cathodes in the electrowinning cells using high-pressure spray water and gravitates to the sludge hopper. The sludge is filtered, dried, mixed with fluxes, and smelted in an electrical induction furnace to produce gold doré. The electrowinning and smelting process takes place within a secure and supervised gold room equipped with access control, intruder detection, and closed-circuit television equipment.

The electrowinning circuit and gold room include the following key equipment:

- electrowinning cells with rectifiers
- sludge pressure filter
- drying oven
- flux mixer
- induction smelting furnace with bullion molds and slag handling system
- bullion vault and safe
- dust and fume collection system
- gold room security system.

17.2.1.10 Cyanide Detoxification

Leach-adsorption tails at 42.5% w/w solids flow by gravity to the cyanide destruction tank. The water used for acid rinse and carbon transfer is also included in the feed to detoxification circuit. As a result, the percentage solids in the feed to the detoxification circuit is estimated to be closer to 40% w/w solids.

The tank operates with a total residence time of approximately 60 mins to reduce weak acid dissociable cyanide (CN_{WAD}) concentration from 200 ppm to less than 2.0 ppm. Cyanide destruction is undertaken using the SO_2/O_2 method. The reagents required are oxygen, lime, copper sulphate, and sodium metabisulphite (SMBS). The cyanide destruction tank is equipped with oxygen addition points and an agitator to ensure that the oxygen and reagents are thoroughly mixed with the tailings slurry.

From the detoxification tank, the tailings report to the carbon safety screen. Screen undersize feeds the tailings thickener, whilst screen oversize (recovered carbon) is collected in a fine carbon bin for potential return to the CIL circuit.

The main equipment in this area includes:

- cyanide destruction tank and agitator
- oxygen supply system
- carbon safety screen.

17.2.1.11 Tailings Thickening and Disposal

Tailings from the flotation circuits and the CIL circuit report to a tailings thickener, where flocculant is added to promote settling of the solids. The overflow reports by gravity to the process water tank, while the underflow is pumped to a tailings filter feed tank. Thickener underflow slurry, at approximately 60% solids (w/w), will be pumped to an agitated filter feed tank, prior to being pumped to a filtration circuit for further dewatering. The tank will provide a residence time of 24 hours between the thickener and filter.

Filtered solids will be impounded at the designated tailings storage facility. Filtrate will be recycled back to the tailings thickener, where it will be combined with tailings thickener underflow solution that will ultimately report to the process water tank for distribution throughout the process facilities.

The main equipment in this area includes:

- high-rate thickener
- agitated tails filter feed tank
- tails filter press (six units of horizontal plate and frame)
- tails filtrate tank
- associated material handling systems (pumps, pumpboxes and sump pumps).

17.2.1.12 Reagents Handling and Storage

Reagents used in the process plant and associated areas are listed in Table 17-2 and described in the following subsections. Details on handling and storage are given, along with the estimated yearly consumption for each item.

In general, each set of compatible reagent mixing and storage systems is located within containment areas to prevent spillage and contamination of the environment and unintended mixing with other reagents. Storage tanks are equipped with level indicators, instrumentation, and alarms to ensure spillage does not occur during normal operation. Appropriate ventilation, fire and safety protection, eyewash stations and safety data sheets are located throughout the facilities. Sumps and sump pumps are provided in the containment areas for spillage control.

Table 17-2: Reagent Consumption, Initial Phase

Reagent	Unit	Initial Phase Consumption
Collector 1 (PAX)	t/a	442
Frother 1 (MIBC)	t/a	243
Fuel Oil	t/a	124
Collector 2 (A-208)	t/a	228
Frother 2 (DF250)	t/a	193
Quicklime	t/a	2,393
Flocculant	t/a	133
Sodium Cyanide	t/a	2,060
Sodium Hydroxide	t/a	266
Hydrochloric Acid	t/a	200
Propane	ML/a	1.23
Activated Carbon	t/a	40
Sodium Metabisulphite (SMBS)	t/a	3,469
Borax	t/a	9
Silica	t/a	4
Sodium Nitrate	t/a	1
Sodium Carbonate	t/a	1

Source: Ausenco, 2023.

Collector 1 (PAX)

PAX collector is delivered to site as granulated solids in bulk bags. The bulk bags are lifted using a frame and hoist onto a bag-breaker at the top of an agitated mixing tank. A dust collector removes any fine particulates that become airborne after emptying the bag. After opening the bag, the reagent is mixed with raw water from distribution and transferred to a day-tank with a storage capacity of 24 hours. The mixing tank is ventilated using a fan to remove any carbon disulphide gas. PAX is delivered to the flotation circuit using multiple dosing pumps, one for each stage in the circuit.

Frother 1 (MIBC)

MIBC frother is delivered to the site as a liquid in totes or intermediate bulk containers (IBCs). It is stored in a tank and used without dilution. Various dosing pumps deliver it to the various flotation areas.

Fuel Oil (Diesel)

Fuel oil is delivered to a storage tank on site by a tanker truck. In the initial phase, one dosing pump delivers the oil to the sand flotation circuit; from Expansion 1 Phase onwards, two pumps deliver the oil. A sloped oil/water separator is used to collect any spillage from the oil reagent area and the waste oil is stored in a waste oil drum for disposal.

Collector 2 (A-208)

A-208 is a collector reagent that is delivered to site in solid, pellet form in 750 kg bulk bags. The bulk bags are lifted using a frame and hoist onto a bag-breaker at the top of an agitated mixing tank. A dust collector removes any fine particulates that become airborne after emptying the bag. After opening the bag, the reagent is mixed with raw water from distribution and transferred to a day-tank with a storage capacity of 24 hours. The mixing tank is ventilated using a fan to remove any carbon disulphide gas. A-208 is delivered to the flotation circuit using multiple dosing pumps, one for each stage in the circuit.

Frother 2 (DF250)

DF250 frother is delivered to the site as a liquid in totes or intermediate bulk containers (IBCs). It is stored in a tank and used without dilution. Various dosing pumps deliver it to the various flotation areas.

Quicklime

Quicklime is delivered to site as a granulated solid in bulk bags. The bags are lifted using a frame and hoist and emptied into the lime silo. A dust collector removes fine particles and dust from the air from opening the bag. A rotary screw feeder moves the lime into a slaker which grinds the lime and mixes it with raw water. The lime slurry is pumped to an agitated tank for mixing and storage. A lime distribution pump supplies lime slurry to the rest of the process plant. In Expansion 1 and 2 Phases, two mixing/storage tanks and two distribution pumps will be in use.

Flocculant

Flocculant is received on site as a dry powder in 1,000 kg small bags. The bags are lifted using a frame and hoist to a bag-breaker on top of a flocculant bin. A dust collector removes fine particles and dust from the air from the opening of the bag. A screw feeder moves the flocculant to a heated hopper and a blower moves the material into an agitated mixing tank. Raw water is used to mix with the flocculant to create a slurry. A flocculant transfer pump moves the flocculant mixture into a storage day-tank with a capacity of 24 hours. Various dosing pumps supply each of the thickeners with flocculant mixture. Prior to entering each thickener feed box, process water is used to mix with the slurry inside an inline mixer. In the initial phase, one dosing pump is used for the tailings thickener; in expansion 1 and 2 Phases, two dosing pumps are used to supply the two tailings thickeners.

Sodium Cyanide

Sodium cyanide is delivered to site in ISO containers. The containers are connected to the cyanide mixing system and raw water is pumped in. A dust collector removes fine particles and dust released in the area. A transfer pump moves the cyanide solution to a storage day-tank with a capacity of 24 hours. Numerous pumps supply the solution to the leaching tanks, adsorption tanks and the strip solution tank.

An HCN gas detector and alarm system is included in the sodium cyanide reagent area to alert operators to the presence of toxic hydrogen cyanide gas. The sodium cyanide area is located adjacent or inside the alkaline reagent area for easy access to alkaline pH modifiers.

Sodium Hydroxide (NaOH)

Sodium hydroxide, or caustic soda, is delivered to site as a liquid in totes or a bulk box. Three dosing pumps deliver the sodium hydroxide to the strip solution tank, pregnant eluate tank, and sulphidizer scrubber described in Section 17.2.1.5.

Hydrochloric acid (HCl)

Hydrochloric acid is used in the carbon acid wash and elution circuit. The acid will be delivered as a liquid in totes or a bulka box. The reagent is used directly without dilution. A dosing pump delivers hydrochloric acid to the acid wash column.

Propane

Propane is delivered on site to a storage tank by a tanker truck. Various pumps supply propane to the elution heater and the carbon regeneration kiln burner.

Activated Carbon

Activated carbon is delivered on site as a granulated solid in bulk bags. The carbon is supplied to the adsorption tanks.

Sodium Metabisulphite ($Na_2S_2O_5$)

Sodium metabisulphite (SMBS) is used in the cyanide detoxification circuit. It is delivered to site as a powder in bulk bags. The bag is lifted into a bag splitter by a frame and a hoist. A dust collector removes fine particles and dust from the air. The SMBS enters an agitated mixing tank with raw water to dissolve the powder and create a solution. The reagent is supplied to the cyanide detoxification circuit by two dosing pumps in the initial phase, and four dosing pumps in expansion 1 and 2 phases.

Gold Room Smelting Fluxes

Various fluxes are used to smelt gold doré after the electrowinning stage. Borax, silica, sodium or potassium nitrite (“nitre”) and sodium carbonate are delivered as granulated or powdered solids in small bags or plastic containers stored in the plant’s gold room.

17.2.2 Expansion 1 Phase (Years 4 to 6)

The Expansion 1 Phase involves expanding from a throughput of 30 kt/d to 60 kt/d. The additional equipment and circuits necessary to facilitate the expansion are shown in Figure 17-1.

17.2.2.1 Primary Crushing and Stockpile

The primary crusher and associated material handling equipment is sized for the expansion throughput in the Initial Phase. An additional coarse ore stockpile is added to accommodate the increased throughput. The primary gyratory crusher product size (P_{80}) is changed to 163 mm to accommodate the increased throughput.

17.2.2.2 Secondary Crushing and Screening

A full parallel secondary crushing and screening circuit will be added, identical to the circuit installed in Initial Phase. The two systems will operate independently from one another. The secondary crushers are designed to reduce the ore from an 80% passing feed size (F_{80}) of 163 mm to an 80% passing product size (P_{80}) of 36 mm at the screen undersize.

The area includes the following new major equipment and facilities:

- secondary screen belt feeders
- secondary screens (one unit on duty and one on standby)
- secondary crusher belt feeders
- two secondary cone crushers (one duty and one standby at 600 kW each).

17.2.2.3 Tertiary Crushing and Screening

A full parallel tertiary crushing and screening circuit will be added, identical to the circuit installed in the Initial Phase. The two systems will operate independently from one another. The tertiary crushing circuit product size (P_{80}) will be 4 mm.

The area includes the following new major equipment and facilities:

- HPGR belt feeder
- HPGR crusher (2.4 m dia x 1.5 m width, 6,000 kW)
- HPGR screen feeders
- HPGR screens.

17.2.2.4 Grinding and Classification

A full parallel grinding and classification circuit will be added, identical to the circuit installed in the Initial Phase. The two systems will operate independently from one another.

The area includes the following new major equipment and facilities:

- Two ball mills (dual pinion, 13.5 MW, 7.62 m dia. X 11.7 m EGL)
- primary cyclone clusters
- ball mill charging media
- primary cyclone trash screens (32 m^2).

17.2.2.5 Copper Flotation Circuit

Rougher Flotation

An identical and parallel bank of rougher cells will be installed for the purpose of copper flotation of the trash screen discharge from the new grinding circuit. two secondary regrind mills are added to help reach a new grind size of P_{80} 20µm.

The area includes the following new major equipment and facilities:

- nine copper rougher flotation cells (312.8 m^3)
- four copper regrind cyclone cluster
- two copper regrind mills (1.2 MW)
- two regrind Isa mills (2.2 MW).

Cleaner Flotation

An identical and parallel bank of cleaner cells will be installed for the purpose of copper flotation discharge from the new rougher flotation circuit.

The area includes the following new major equipment and facilities:

- eleven copper cleaner scavenger cells (58 m^3)
- two copper cleaner 1 cells (6.3 m^3).
- two copper cleaner 2 cells (6.3 m^3)

Sand Flotation

An identical and parallel bank of rougher cells will be installed for the purpose of sand flotation discharge from the new rougher flotation circuit.

The area includes the following new major equipment and facilities:

- one sand flotation cyclone cluster
- three sand rougher flotation cells (118.1 m^3).

17.2.2.6 Concentrate Dewatering

To accommodate the increased copper production expected in Expansion 1 Phase, a new parallel dewatering circuit will be added. The circuit will operate in the same manner described in the initial phase.

The area includes the following new major equipment and facilities:

- concentrate filter feed tanks
- concentrate filter press (horizontal plate and frame).

17.2.2.7 Tailings Thickening and Disposal

To accommodate the additional tailings throughput expected in Expansion 1, a second parallel tailings circuit will be added. The circuit will operate in the same manner described in the initial phase.

The area includes the following new major equipment and facilities:

- high-rate thickener
- agitated tails filter feed tank
- tails filter press (ten units of horizontal plate and frame)
- tails filtrate tank
- associated material handling systems (pumps, pumpboxes and sump pumps).

17.2.2.8 Reagent Handling and Storage

In the Expansion 1 Phase expansion, the quantity of reagents consumed will double for copper rougher flotation, sand flotation, copper cleaner flotation, leaching and adsorption circuits. All reagent areas will be expanded to double their initial capacity through the addition of parallel mixing, storage, and distribution circuits. See Table 17-3 for annual reagents consumption in Expansion 1.

Table 17-3: Reagent Consumption, Expansion 1

Reagent	Unit	Expansion 1 Consumption
Collector 1 (PAX)	t/a	1,556
Frother 1 (MIBC)	t/a	730
Fuel Oil	t/a	248
Collector 2 (A-208)	t/a	464
Frother 2 (DF250)	t/a	386
Quicklime	t/a	6,650
Flocculant	t/a	266
Sodium Cyanide	t/a	4,121
Sodium Hydroxide	t/a	533
Hydrochloric Acid	t/a	399
Propane	ML/a	2.47
Activated Carbon	t/a	80
Sodium Metabisulphite (SMBS)	t/a	29,811
Borax	t/a	17
Silica	t/a	9
Sodium Nitrate	t/a	1
Sodium Carbonate	t/a	1

Source: Ausenco, 2023.

17.2.3 Expansion 2 Phase (Years 7+)

In Expansion 2 Phase, the daily throughput is increased to 80 kt/d, increasing the production of copper and gold concentrate.

17.2.3.1 Primary Crushing and Stockpile

The primary crusher and associated material handling equipment is sized for the expansion throughput in the initial phase. The primary gyratory crusher product size (P_{80}) is changed to 174 mm to accommodate the higher throughput.

17.2.3.2 Secondary Crushing and Screening

The secondary crushers and associated material handling equipment are sized for the full throughput. The secondary crusher settings are changed to reduce the ore from an 80% passing feed size (F_{80}) of 174 mm to an 80% passing product size (P_{80}) of 40 mm at the screen undersize.

17.2.3.3 Tertiary Crushing and Screening

The HPGR and associated material handling equipment is sized for the expansion throughput in the initial phase and Expansion 1 Phase. The material crushed by the HPGR is reduced from an 80% passing feed size (F_{80}) of 40 mm to an 80% passing product size (P_{80}) of 6.5 mm.

17.2.3.4 Grinding and Classification

The grinding circuit and associated material handling equipment allows for the expanded throughput by relaxing the target grind size. The circuit is sized based on a grinding circuit feed size (F_{80}) of 6.5 mm and a circuit product size (P_{80}) of 120 µm.

17.2.3.5 Copper Flotation Circuit

Rougher Flotation

Additional rougher cells will be installed in each bank of cells for the purpose of copper flotation of the trash screen discharge from the grinding circuit. The regrind circuit power is increased by adding additional regrind mills.

The area includes the following new major equipment and facilities:

- six copper rougher flotation cells (312.8 m^3)
- two regrind Isa mills (2.2 MW).

Cleaner Flotation

Additional cleaner cells will be installed for the purpose of copper flotation discharge from the new rougher flotation circuit.

The area includes the following new major equipment and facilities:

- eight copper cleaner scavenger cells (58 m^3)
- two copper cleaner 1 cells (6.3 m^3)
- two copper cleaner 2 cells (6.3 m^3).

Sand Flotation

Additional rougher cells will be installed for the purpose of sand flotation discharge from the new rougher flotation circuit.

The area includes the following new major equipment and facilities:

- two sand rougher flotation cells (118.1 m^3).

17.2.3.6 Tailings Thickening and Disposal

To accommodate the additional tailings throughput expected in Expansion 2 Phase, a few more filter presses will be installed and used. The circuit will operate in the same manner described in the initial phase.

The area includes the following new major equipment and facilities:

- tails filter press (six units of horizontal plate and frame)
- tails filtrate tank
- associated material handling systems (pumps, pumpboxes and sump pumps).

17.2.3.7 Reagent Handling and Storage

In the Expansion 2 Phase, the quantity of reagents consumed will increase incrementally with production. No additional reagent handling equipment is required. See Table 17-4 for annual reagents consumption in Expansion 2.

Table 17-4: Reagent Consumption, Expansion 2

Reagent	Unit	Expansion 2 Consumption
Collector 1 (PAX)	t/a	2,075
Frother 1 (MIBC)	t/a	973
Fuel Oil	t/a	331
Collector 2 (A-208)	t/a	619
Frother 2 (DF250)	t/a	514
Quicklime	t/a	8,867
Flocculant	t/a	355
Sodium Cyanide	t/a	5,494
Sodium Hydroxide	t/a	639
Hydrochloric Acid	t/a	479

Reagent	Unit	Expansion 2 Consumption
Propane	ML/a	2.96
Activated Carbon	t/a	107
Sodium Metabisulphite (SMBS)	t/a	39,748
Borax	t/a	24
Silica	t/a	12
Sodium Nitrate	t/a	2
Sodium Carbonate	t/a	2

Source: Ausenco, 2023.

17.3 Energy, Water and Process Materials Requirements

Plant services and utilities include air, water, and electricity for the plant and its associated areas. The descriptions of the various services are given below, along with estimated yearly consumption of each type of utility for the plant.

In general, redundant systems are used to ensure availability of the process plant. Appropriate fire and safety protection systems are used, including level indicators, alarms and emergency shutdown switches throughout the plant.

17.3.1 Process and Instrument High-Pressure Air

Process and instrument air is supplied to the plant at 900 kPag using a rotary screw air compressor. The air is first processed by filtration before drying to remove any moisture. A second filtration step is then used before distribution to the required circuits in the plant.

High-pressure drying and blowing air is supplied to the concentrate and tailings filters at 1,250 kPag using a rotary screw compressor. The air is first processed by filtration before drying to remove any moisture. A second filtration step is then used before distribution to the required areas in the plant.

High-pressure pressing air is supplied to the concentrate and tailings filters at 1,850 kPag using a two-stage rotary screw compressor. The air is first processed by filtration before drying to remove any moisture. A second filtration step is then used before distribution to the required areas in the plant.

17.3.2 Low-Pressure Air

Low-pressure air is supplied to the copper flotation circuit at 45 kPa using dedicated air blowers.

17.3.3 Raw Water Supply System

Raw water is supplied from on-site collection of meteoric water to a raw/fire water tank. This water is used for a variety of purposes requiring clean water with low dissolved solids and salt content:

- gland water for pumps

- reagent makeup
- pulp density control for various process plant unit operations
- elution circuit makeup
- supply to the water treatment plant for potable water
- fire water used in the sprinkler and hydrant system
- cooling water for mill motors and lubrication systems.

A portion of the water taken from on-site meteoric water collection is also used as makeup water supplied to the process water tank. The estimated amount of makeup water per year is approximately 0.22 M m^3 in the initial phase (or approximately 24.7 m^3/h), 0.43 Mm^3 in Expansion 1 Phase (49.3 m^3/h) and 1.18 Mm^3 in Expansion 2 Phase (135.1 m^3/h).

The estimated amount of raw water supplied to the process plant for unit operations per year is approximately 1.14 Mm^3 in the initial phase (or approximately 130.6 m^3/h), 2.29 Mm^3 in Expansion 1 Phase (261.2 m^3/h) and 2.44 Mm^3 in Expansion 2 Phase (279.1 m^3/h).

The total estimated amount of raw water used per year is approximately 1.77 Mm^3 in the initial phase (or approximately 202.6 m^3/h), 3.55 Mm^3 in Expansion 1 Phase (404.5 m^3/h) and 4.72 Mm^3 in Expansion 2 Phase (539.0 m^3/h), not including fire water.

17.3.4 Process Water Supply System

Process water supply to the plant consists of recycled overflow streams from the concentrate thickener, leaching feed thickener and tailings thickener, as well as makeup water sourced from on-site collection of meteoric water.

The total amount of process water circulated around the plant is approximately 22.89 Mm^3/a, or roughly 2,613.3 m^3/h in initial phase, 45.78 Mm^3/a (5,226.5 m^3/h) in Expansion 1 Phase and 61.32 Mm^3/a (7,000.4 m^3/h) in Expansion 2 Phase.

17.3.5 Fire Water Supply System

Fire water is sourced from the raw/fire water tank. A pump skid with a dedicated electrical pump, jockey pump, and a diesel-powered pump supplies emergency fire water distribution to the plant.

17.3.6 Potable Water Supply System

Potable water is pumped from the raw/fire water tank to an on-site water treatment plant for filtration and sterilization. The water is stored in a potable water storage tank and is supplied to the plant by two water pumps.

Estimated potable water usage in the initial phase is approximately 0.41 Mm^3/a (approximately 0.9 m^3/h), 0.81 Mm^3/a (1.2 m^3/h) in Expansion 1 Phase and 1.08 Mm3/a in Expansion 2 Phase (1.2 m^3/h).

17.3.7 Gland Seal Water Supply System

Gland seal water is taken from the raw/fire water tank and is distributed by two pumps to the rest of the process plant.

Estimated gland seal water usage in the initial phase is approximately 0.41 Mm^3/a (approximately 46.4 m^3/h), 0.81 Mm^3/a (92.7 m^3/h) in Expansion 1 Phase and 1.08 Mm^3/a in Expansion 2 Phase (123.6 m^3/h).

17.3.8 Projected Process Plant Energy Requirements

The total installed power for the process plant and estimated power consumption for each phase is given in Table 17-5. Further discussion on the operating costs and power consumption for each area of the process plant is given in Section 21.3.5.

Table 17-5: Power Requirements

Phase	Installed Power (MW)	Operating Load (MW)	Power Consumption (MWh/a)
Initial Phase (Years 1-3)	71.6	55.3	416,793
Expansion 1 (Years 4-6)	134.6	104.3	794,555
Expansion 2 (Years 7+)	143.8	124.1	949,168

Source: Ausenco, 2023.

17.4 Process Labor and Staffing

Table 17-6 summarizes the process labor requirements during the different stages of the project.

Table 17-6: Annual Process Labor Headcounts

Process Function	Pre-Production Period	Initial Phase (Years 1-3)	Expansion 1 (Years 4-6)	Expansion 2 (Years 7+)	Life of Mine
Mill Operations	23	139	195	193	187
Tailings Dry-Stacking	4	32	52	60	56
Progressive Closure at DSTF	0	7	10	10	10
Mill Maintenance	9	57	68	68	67
Mill Metallurgy	3	8	11	11	11
Mill Assay Laboratory	7	27	38	38	37
Total Process Labor Headcount	**46**	**270**	**375**	**380**	**367**

Source: Ausenco, 2023.

18 PROJECT INFRASTRUCTURE

18.1 Introduction

The Cangrejos Project is locate near the cities of Machala and Santa Rosa in southwestern Ecuador. The site is accessible by paved roads from Santa Rosa via the village of Valle Hermoso. The site will include the following facilities:

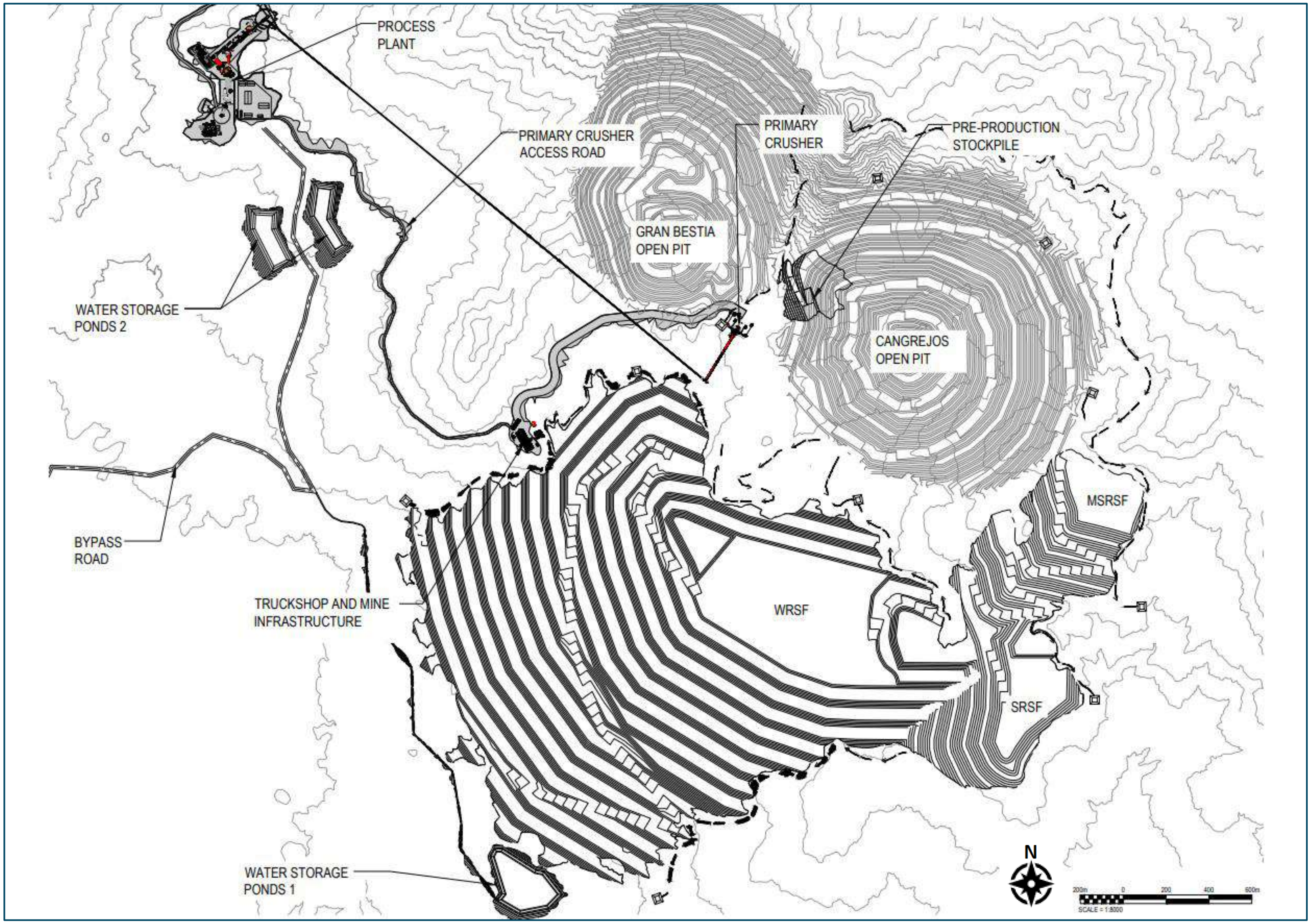
- mine administration offices, truckshop, explosives storage, fuel storage and distribution, ore stockpiles, waste rock storage facility, saprolite saprock storage facility (SRSF), mineralized saprolite saprock storage facility (MSRSF) and truck wash
- process facilities, including the process plant, crushing facilities, the process plant workshop, the assay laboratory, water supply infrastructure, crushed ore conveyors, and tailings pipelines
- the dry-stack tailings filter plant and storage facility
- general facilities, including gatehouses, the site administration building, communications, the site substation, and the truck weight station
- catchments, ponds, and other water management infrastructure.

The locations of site facilities were based on the following criteria:

- locate the rock storage facilities near the mine pits to reduce haul distances
- locate the primary crushing and run-of-mine pad between the open pit and the process plant to reduce haul distances
- locate the process plant to take advantage of the natural topography and avoid watercourses
- avoid the siting of major infrastructure in proximity to local communities, in order to avoid visual and noise issues
- leverage the natural terrain to optimize the DSTF construction requirements.

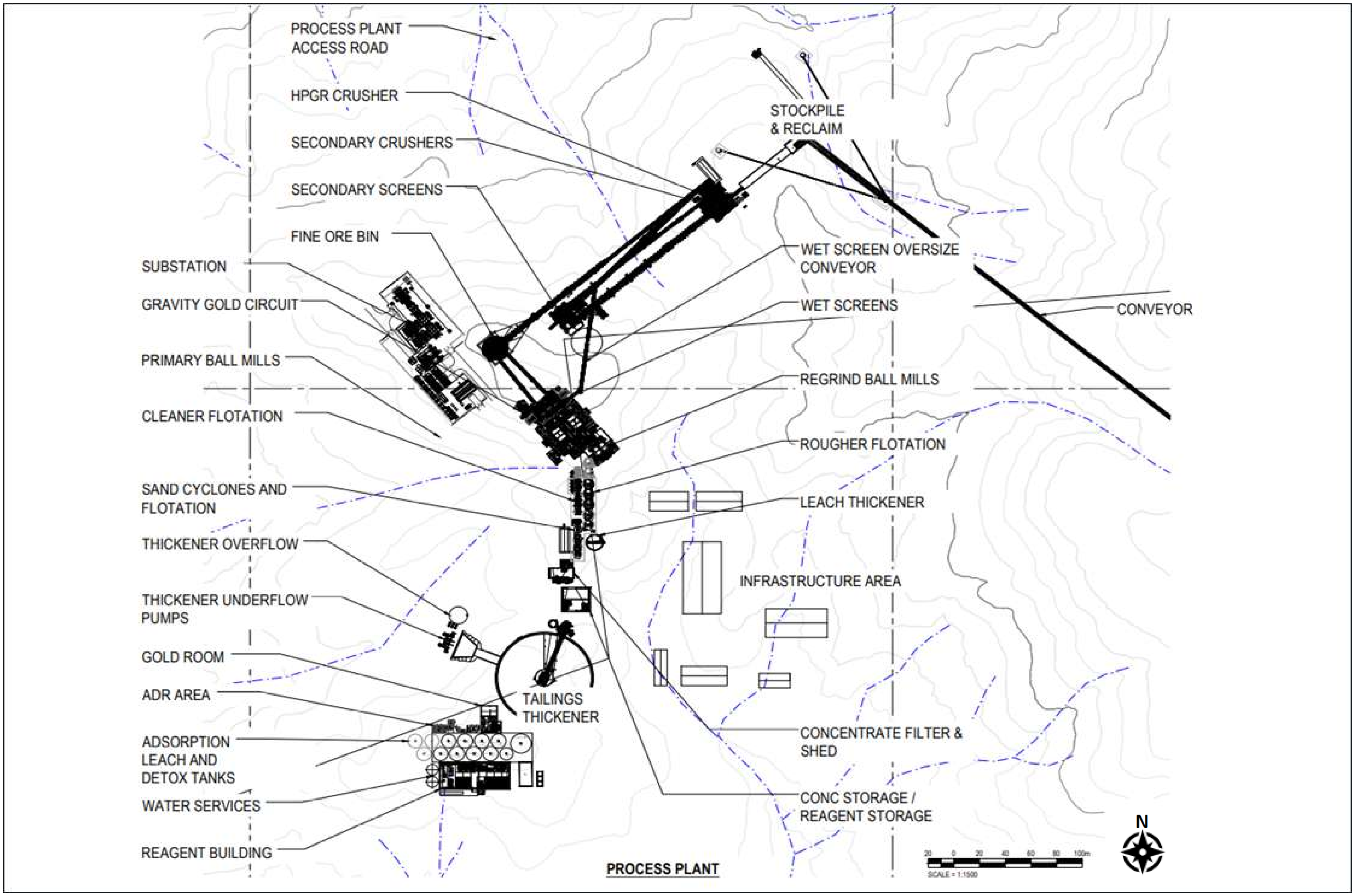
Figure 18-1 shows the infrastructure layout in the general pit and process plant area. Figure 18-2 shows the infrastructure layout for the process plant only. Figure 18-3 shows the infrastructure layout in for the dry-stack tailings filter plant. Figure 18-4 shows the infrastructure layout for the dry-stack tailings storage facility.

Figure 18-1: Infrastructure Layout Plan – Pit/Process Plant Area



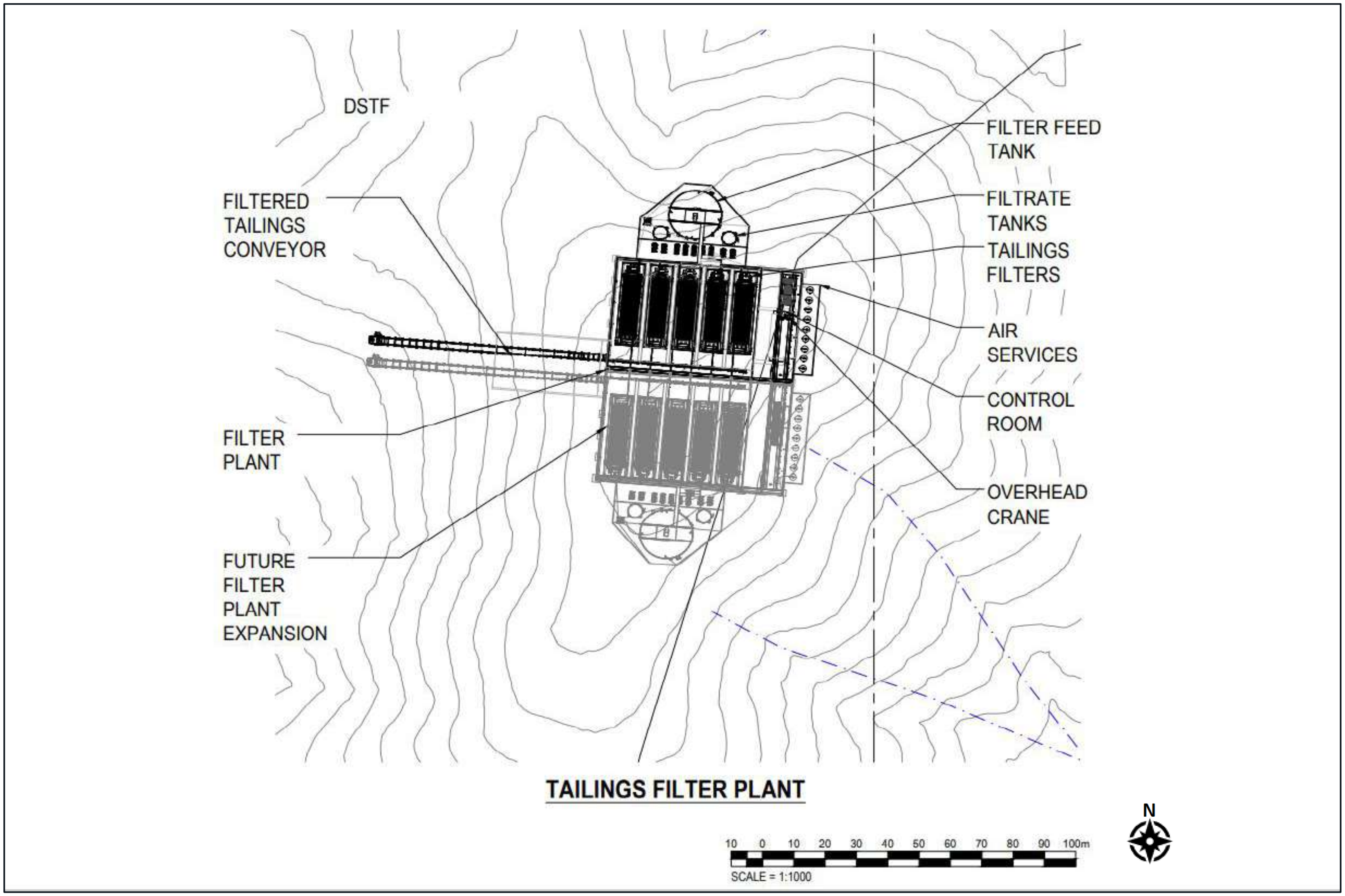
Source: Ausenco, 2023

Figure 18-2: Infrastructure Layout Plan – Process Plant Area



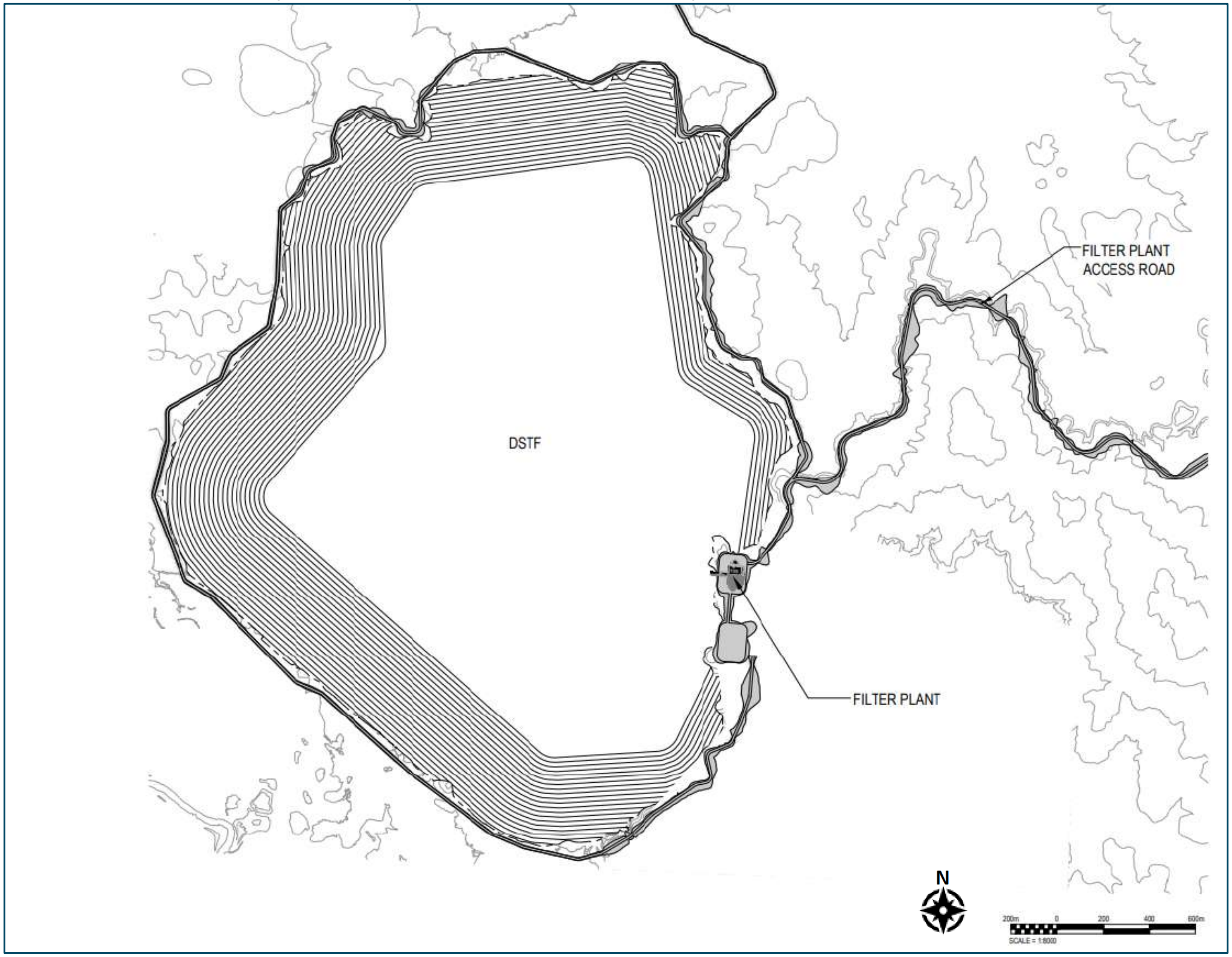
Source: Ausenco, 2023.

Figure 18-3: Infrastructure Layout Plan – Dry-stack Tailings Facility, Filter Plant Area



Source: Ausenco, 2023.

Figure 18-4: Infrastructure Layout Plan – Dry-stack Tailings Storage Facility Area



Source: Ausenco, 2023

18.2 Site Access

The Project will have two access roads: the main access road and the bypass access road. The main access road will be used as the principal road for construction and operations. The second access road just north of Valle Hermoso can be used as an alternative to the main access road.

Access to the main road is by a sealed asphalt public road network from Santa Rosa towards Buenavista. The main road from the paved road is a 10 m wide gravel road designed for 40 t trucks with a maximum travel speed of 40 km/h. The road is approximately 11.3 km from the paved road to the process plant. The road also acts as the connection between the process plant and DSTF, where the tailings slurry line and water reclaim lines run parallel to the road. At the entrance to the gravel road, traffic will be controlled by a security gatehouse and weight station. The road has a collection ditch on one side and safety berm on the other side along with culverts passing runoff from drainages above the road.

The bypass road will be constructed first during construction to gain access to the mine site for construction equipment. Access to the bypass road will be by a sealed asphalt public road network from Santa Rosa to Valle Hermoso. The private gravel road with a security gatehouse will start a few hundred meters north of Valle Hermoso and terminate at the process plant. The road is of similar design and construction as the main access road.

Other site gravel roads will include the following:

- Access road between process plant and mine infrastructure area that is 16 m wide.
- Access road from bypass road to water storage pond 1 that is 4 m wide.
- Perimeter road around DSTF that is 4 m wide.
- Surface water management access roads that are 4 m wide.

18.3 Support Buildings

As shown in the site layout in Figure 18-2, the main plant site area consists of several buildings. The process plant buildings are listed in Table 18-1.

Table 18-1: Description of On-Site Buildings

Name of Building/Structure	Building Type	L (m)	W (m)	H at Eave (m)	Area (m^2)
Truck Warehouse/Workshop	Other	43	45	19.5	1935
Emergency Station	Modular	2.5	6	3.5	15
Plant Warehouse/Workshop	Other	36	18	12	648
Explosive Magazine	Modular				
Primary Crusher Control Room	Modular	2.5	6	3.5	15
Reagent Storage	Modular				
Gold Room	Pre-Engineered	35	14	13	490
Plant Control Room	Modular	2.5	6	3.5	15
Filter Plant Control Room	Modular	2.5	6	3.5	15
Construction Camp	Modular				
Gate House 1 (Valle Hermosa)	Modular	10	4.2	3.5	42
Gate House 2 (DSTF)	Modular	10	4.2	3.5	42
Assay Laboratory	Modular	18	12	3.5	216
Main Administration Building	Modular	45	16	3.5	720
Mine Office/Change House	Modular	48	18	3.5	864

Source: Ausenco, 2023.

18.4 Accommodation

On-site accommodation will be constructed for the initial development phase, with bed capacity for 1250 persons. This accommodation will be converted for use in the operational phase.

18.5 Filter Tailings and Dry-stack Tailings Facility

18.5.1 Overview

During the process of developing the 2022 PFS Study, a new siting study was performed to determine the best location for a tailings storage facility. The siting study evaluated a number of potential tailings storage facility sites and storage methods ranging from slurry tailings to filtered tailings. The majority of these sites were found to be unacceptably close to populated areas or agricultural areas, or they had perennial streams of significant size running through them.

Based on an economic, social, and environmental trade-off study between the various storage sites and technologies, Lumina selected the concept of filtered and dry-stacked tailings as the basis for the PFS, like the 2022 PEA. The filtered tailings concept has distinct advantages over other options. Water usage is significantly reduced and development of a DSTF results in a much smaller environmental footprint. The new location for the DSTF is located in flatter terrain and drier area, improving the overall stability and stacking operations of the facility (see Figure 18-4). In addition, Ausenco updated the initial trade-off design of the DSTF for this PFS with the primary objectives of further reducing the project footprint and deferring initial capital costs where possible.

The selection of the current DSTF site results in a superior site to the one selected during the 2022 PEA for stability, operations, and water management aspects; and because the site will contain all of the scheduled tailings and allow for expansion, if needed. The proposed design accommodates 659 Mt of tailings. The new site's terrain provides superior geotechnical stability compared to the initial site due to flatter terrain and almost half the annual rainfall.

18.5.2 Design Criteria

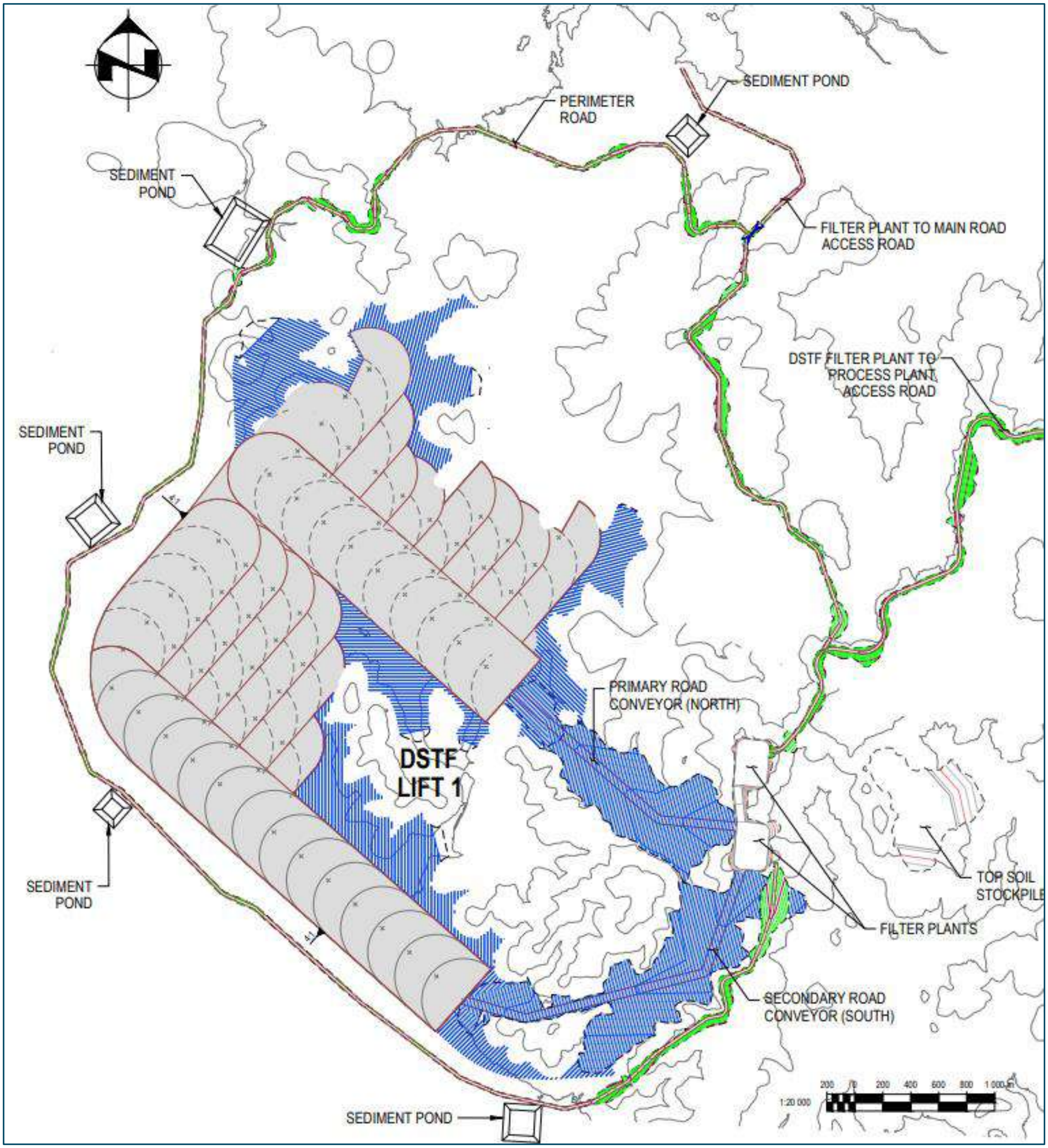
The key design criteria for the DSTF are as follows:

- The DSTF will be designed to the 2019 Canadian Dam Association (CDA) guidelines to provide a safe and environmentally acceptable facility for filtered tailings with a storage capacity of approximately 659 Mt.
- Production rate of 30 kt/d for Years 1 through 3, 60 kt/d for Years 4 through 6, and 80 kt/d for Years 7 through a portion of Year 26.
- This facility has a conservative consequence classification of 'Significant', according to CDA guidelines.
- The filtered tailings are non-acid generating.
- The DSTF involves stacking filtered tailings with a maximum moisture content of 15%.
    - Non-spec tailings (exceeding 15% moisture content) will be stacked in the dry-stack facility in areas that are not geotechnically critical, such as the interior of the facility
- Minimum factor of safety (FOS) will be met and designed for an MCE seismic event, in accordance with CDA guidelines.
- Temporary and permanent non-contact and contact surface water management structures are designed to the following storm events: 1 in 100 years and 1 in 200 years, respectively.
- Enough crest width of each row will be provided to facilitate stacking, spreading, and compaction equipment traffic during operation.
- Water released to the environment from the sediment ponds located at the toe of the facility will be sampled for water quality testing. If water does not meet water quality discharge standards, it will be pumped to the filter plant and returned to the process plant as makeup water, or treated and discharged to the environment.

18.5.3 Deposition Plan

Two conveyor systems will be used to transport the filtered tailings to a discharge point at the DSTF. Initially, the secondary radial telescoping stacker will be used for the first year to reduce capital costs; then in Year 2 the primary spreader stacker for stacking rows will be utilized (see Figure 18-5). The secondary stacker will be used to create the outer compacted stability zone of permanent slopes and for infilling area that the primary stacker cannot reach. Dozers, graders, and compactors will be used to place and compact the filtered tailings to provide trafficable surfaces and stability zones. The permanent exterior slopes will be graded to an overall slope of 4:1 (H:V), based on the stability analysis.

Figure 18-5: DSTF Typical Stacking Plan



Source: Ausenco, 2023.

18.5.4 Water Management

The Ministry of Environmental, Water and Ecological Transition *(Ministerio de Ambiente, Agua y Transición Ecológica, MAATE)* has specific management measures to mitigate, control, and monitor the impacts on water resources in the AOI. The DSTF water management system includes surface water management and non-surface/drainage water management.

The surface water management will include three components:

- non-contact water for the DSTF in open diversion channels that run around the perimeter of the facility
- contact water for the DSTF in open diversion channels that run on the surface of the facility
- non-surface water at the foundation and tailings contact will be captured by an underdrain system of the facility.

The diversion channels will collect non-contact surface runoff from the natural areas surrounding the facility and drain to drainage areas outside the DSTF footprint. The DSTF surface water collection system was designed to collect surface contact runoff and direct the water to the sediment ponds during operation. The DSTF surface water collection channels will become non-contact water collection ditches after closure. The contact water should only contain sediment from the facility and will be directed to sediment ponds and then pumped back to the process plant or discharged to the environment. Water monitoring samples will be taken on a regular basis to ensure water being discharged meets water quality standards. If the water does not meet standards, the water from the sediment ponds will be pumped to the filter plant, then combined with the filtrate water and pumped to the process plant for water makeup, or treated and discharged to the environment. The temporary and permanent channel are designed to convey runoff from the 1-in-100-year and 1-in-200-year storm events, respectively.

The non-surface or drainage water management system will consist of HDPE dual wall pipe and drainage gravel wrapped in a non-woven geotextile to capture near-surface groundwater and seepage from the tailings; capturing these water sources will minimize build-up of the phreatic surface in the base of the tailings facility. In addition, the underdrain system will be utilized to drain surface runoff that is blocked by the DSTF from following its original path. A ring-dyke filter system will be placed around the underdrain inlet to prevent solids from entering and potentially plugging the system.

18.5.5 Design

The DSTF design will be developed by construction of the starter row directly downslope of the filter plant. Associated surface and drainage water management structures will be constructed during operations a minimum of 100 m ahead of the filter tailings toe being stacked, in order to minimize sediment migration from the DSTF by using the grassland as a sediment filter. Vegetation in the rows in contact with natural terrain will be removed; topsoil will be removed and stockpiled for progressive closure; and the foundation, consisting of saprolite and saprock, will be compacted to reduce infiltration into the subgrade from any potential seepage from the DSTF. The underdrains will be placed in trenches that are keyed into subgrade for protection considering the significant loading stress from the facility.

Starter lift 1-row 1 will have enough capacity for filtered tailings until middle of Year 2 operations. The ultimate DSTF is designed for a storage capacity of approximately 659 Mt of dry filtered tailings. The main design features of the DSTF are summarized below:

- The permanent exterior face of the DSTF has a global slope of 4:1 (H:V).

- Some of the underdrains will be used to drain areas blocked by stacked tailings until the area upslope is covered with tailings.
- Flow from the underdrain discharges into sediment ponds.
- The DSTF's construction and operation involves the extension of underdrains, non-contact diversion channels, and contact water channels during operation staying ahead of stacking operations.
- Top surfaces will be compacted to reduce infiltration and provide a trafficable surface.
- Permanent exterior slopes will be compacted in thin lifts to enhance the permanent slope's stability.
- Once a lift's permanent slope is completed, it will be closed with topsoil and vegetative cover to minimize sediment generation.

The foundation soils will be compacted to minimize the impacts of seepage water from the DSTF on the groundwater system and surrounding environment. It is critical that the filtered tailings in the DSTF are unsaturated and provide enough effective strength under both static and seismic loading conditions to meet the design criteria. Sealing of the surface of the tailings and of the underdrains is incorporated in the DSTF design to promote drainage of the filtered tailings, to prevent tailings saturation and loss of effective strength. The proposed material for the underdrains is HDPE dual wall piping and gravel wrapped in non-woven geotextile, where the gravel will be mine waste rock that is cleaned and screened to drainage gravel specifications.

A geotechnical investigation for the DSTF was performed and consisted of eight test pits and three geophysical survey lines. Laboratory tests, including consolidated undrained (CU) triaxial, were carried out on five foundation samples and six tailings samples to identify the geotechnical properties of the foundation and unsaturated tailings including hydraulic conductivity, optimum density, and optimum moisture content. The Atterberg Limit results indicate the tailings are non-plastic. Based on the geotechnical data, the ground conditions encountered at the DSTF consist of a thin topsoil layer with a thickness of up to 0.3 m, and underlying overburden is saprolite and saprock, alluvium underlaid by bedrock. The thickness of the overburden soil layer varies from 3 m to 10 m. The overburden soil is primarily comprised of hard to very stiff clay and clayey silt. A few bedrock outcrops were observed within the DSTF footprint.

Groundwater levels were not observed in the test pits. The site is located within the Andean tectonics region which has 'High' seismic and magmatic activity. In addition, the site-specific seismic hazard analysis carried out for the mine area (Ausenco, 2022) recognized the largest earthquakes generated are from Intraslab seismic events originating in the subducting Nazca Plate. Based on the deterministic analysis, the MCE produced by the subduction is 0.71 g.

A geochemical characterization program on filtered tailings was undertaken during the PEA and PFS, including both static and kinematic tests. These tests concluded that the filtered tailings samples were non-acid generating (NAG).

18.5.6 Stability Analysis

Stability analyses were carried out on three sections of the planned DSTF, the northwest, southwest and southeast sides of the DSTF using both static and pseudo-static analyses for a 'High' seismic zone. Based on a site response analysis, the PGA in the natural base of the DSTF at the foundation, considering Type C soil, is estimated to be 0.98 g. The seismic coefficient was estimated according to the Saragoni method (2022); the seismic coefficient is 21% of the PGA, which is 0.21. The CDA 2019 standards were used for the FOS for a 'high' consequence facility are shown in Table 18-2.

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Table 18-2: Minimum Factor of Safety (FOS)

Loading Conditions	Minimum FOS Required
End of Construction	1.3
Long-Term	1.5
Pseudo-Static	1.0
Post-Earthquake	1.2

Source: CDA, 2019

Limit equilibrium analysis was conducted using peak effective strength soil parameters taken from the laboratory triaxial tests. The analysis results for the DSTF at ultimate configuration indicate satisfactory FOS under static, pseudo-static, and post-seismic conditions.

18.5.7 Instrumentation and Monitoring

The stability of the DSTF will be monitored by vibrating wire piezometers strategically placed within the base of the facility. In addition, inclinometers and prisms will be placed on permanent exterior slopes during operation. Real-time continuous and unattended monitoring will be employed for the geotechnical monitoring. Additionally, water quality monitoring instrumentation will be implemented for monitoring of the surface contact water flows at the sediment ponds collecting surface and underdrain flows around the facility.

18.5.8 Closure Concept

The DSTF will provide long-term storage of filtered tailings and will remain in place beyond mine closure. The DSTF will be progressively closed in stages following the completion of each lift to maintain slope stability, minimize dust, minimize water infiltration, and contaminant migration while being visually compatible with the surrounding area.

The cover system, subject to availability of material, will consist of topsoil with a local vegetation cover and will be designed to reduce future infiltration of surface water into the DSTF. The cover system will allow the DSTF collection channels to transform from collection of contact water during operation to the collection of non-contact water after closure. The collected runoff will be directed to natural waterways after closure. Sufficient topsoil will be stockpiled to allow for closure during operation.

18.5.9 Construction and Operations

The construction of the DSTF is a multi-step process which includes progressive construction of temporary and permanent surface water management structures, foundation preparation, and starter facility construction. Correct planning and scheduling, then careful installation and protection of the various infrastructure and monitoring equipment will be implemented based on the stacking schedule.

An Operation, Maintenance and Surveillance (OMS) Manual will be prepared and available before the operation starts. It will include the requirements for inspection and maintenance, planning and scheduling of construction activities, filtered tailings deposition plans, dust control measures, contact water management structure maintenance, and details of closure.

18.6 Waste Rock Storage Facilities

18.6.1 Introduction

The PFS waste rock storage facility is in the same location as the PEA due to the economics of hauling waste rock. The facility is located directly below the Gran Bestia and Cangrejos pits. The facility will accept overburden (alluvium), saprolite, saprock, oxide rock, and fresh rock. There are two facilities: the WRSF that accepts a blend of overburden, saprolite and saprock, oxide rock, and fresh rock, and the saprolite-saprock storage facility (SRSF) that accepts saprolite and saprock (See Figure 18-6 and Figure 18-7). The facilities are designed to provide secure and permanent storage of approximately 843 Mt of non-economic waste rock and overburden over the 26-year mine life. Non-economic waste rock and overburden produced by mining activities will be placed in the two facilities or used to construct site infrastructure, such as road base, construction and maintenance materials.

18.6.2 Design Criteria

The key design criteria for the WRSF are as follow:

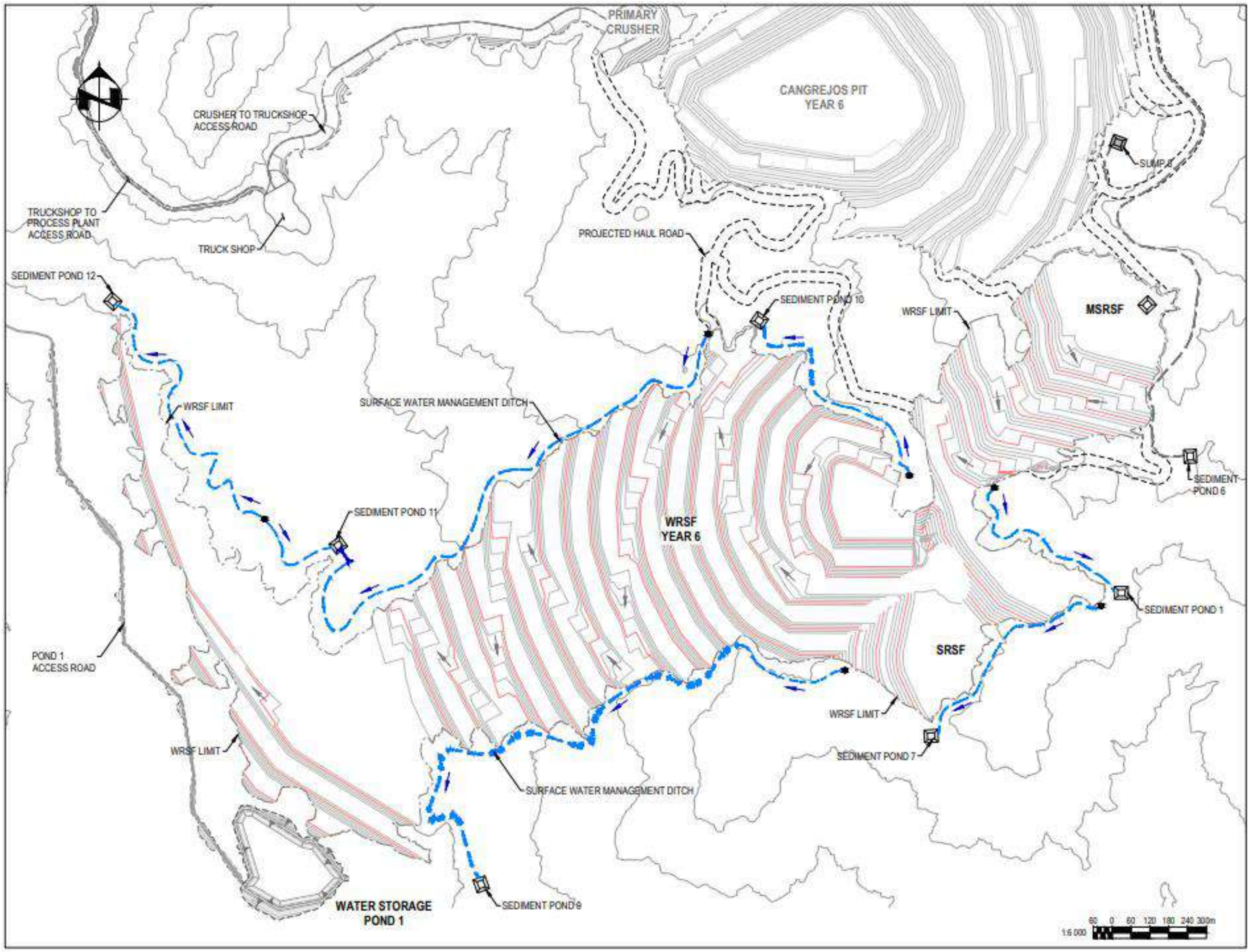
- The waste storage facilities will be designed in accordance with Guidelines for Mine Waste Dumps and Stockpiles (2017) to provide a safe and environmentally acceptable facility for the storage of 843 Mt of waste materials.
- This facility has a 'Moderate' consequence classification, in accordance with the aforementioned guidelines.
- The waste materials are non-acid-generating.
- Minimum FOS will be met and designed for the 1 in 475-year seismic event in accordance with the aforementioned guidelines.
- Temporary and permanent non-contact and contact surface water management structures are designed to the following storm events: 1-in-100-year events and 1-in-200-years, respectively.
- Waste rock lifts are stacked from the bottom up.
- Contact water collected in pond 1 will be used for makeup water or released to the environment. The water will be sampled for water quality testing. If it does not meet water quality discharge standards, it will be pumped to the process plant for treatment and discharged to the environment.

18.6.3 Stacking Plan

Waste materials coming from the open pits will be placed in the two storage facilities. In pre-production through Year 4, saprolite and saprock will be stored in the saprolite and saprock storage facility, utilizing the saprock to buttress the saprolite. Overburden (alluvium), oxide rock, and fresh rock will be stored in the WRSF. In Year 5, there is sufficient volume of overburden, oxide rock and fresh rock to blend saprolite and saprock into the WRSF (i.e., greater 5:1 ratio (overburden-oxide rock-fresh rock to saprolite-saprock). In Year 6, the average ratio for the life of mine jumps to greater than 20:1. The waste materials will be delivered to the facilities in haul trucks. The material will be spread and compact to reduce infiltration and improve stability of the facilities.

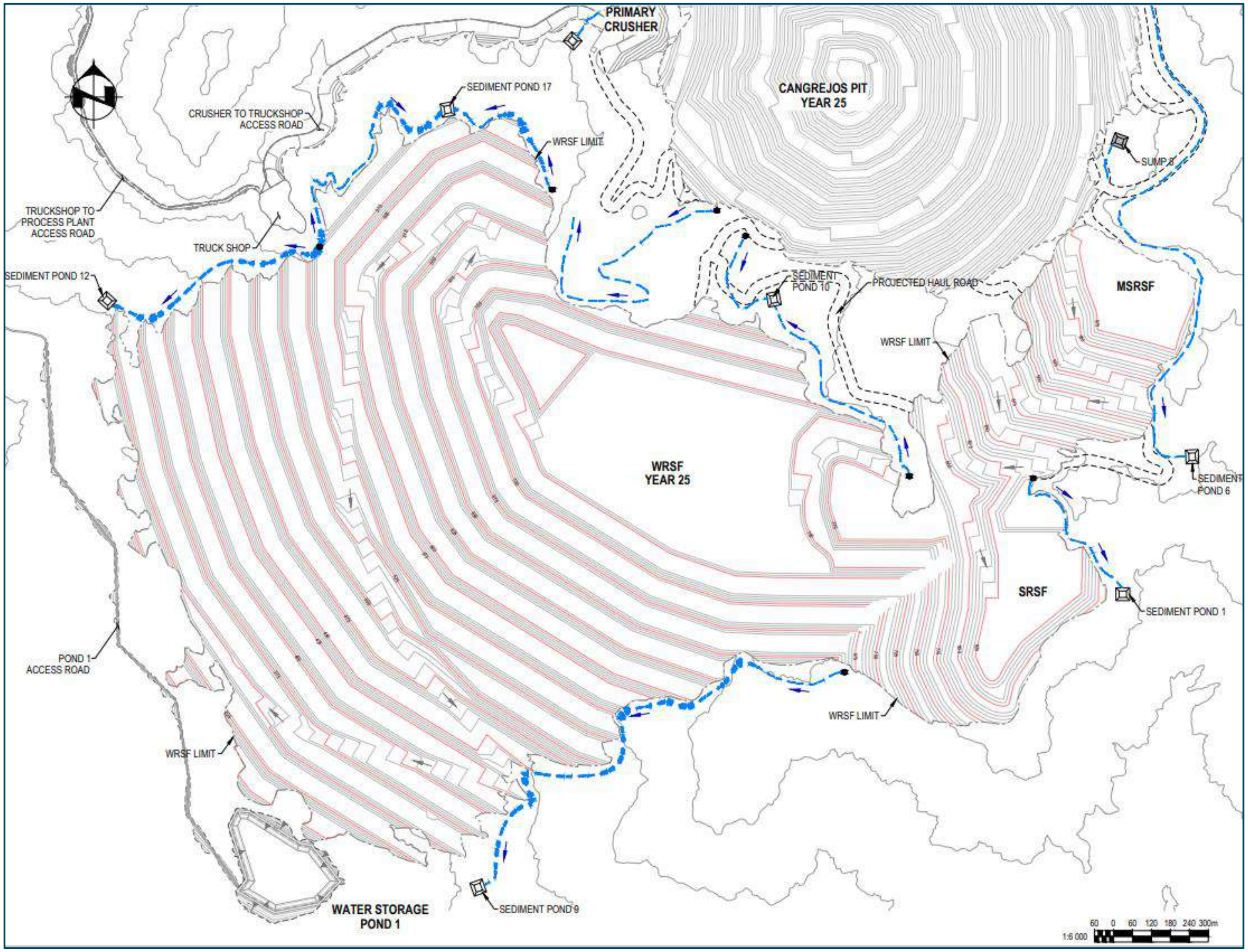
In pre-production through Year 4, mining will build a small portion of the WRSF from the top down to the final pile toe to create a haul road to the bottom. This portion of the WRSF will be buried in the future. Figure 18-6 and Figure 18-7 show the planned progression of the WRSF stacking in years 6 and 25. The WRSF will be stacked in 30 m lifts with 50 m benches for a global slope 3.25:1 (H:V) and SRSF will be stacked in 30 m lifts and 11 m benches for a global slope of 2.5:1.

Figure 18-6: WRSF Stacking Plan, Year 6



Source: Ausenco, 2023.

Figure 18-7: WRSF Stacking Plan, Year 25



Source: Ausenco, 2023.

18.6.4 Water Management

MAATE has specific management measures to mitigate, control and monitor the impacts on water resources in the AOI. The WRSF and SRSF water management system includes surface water management and non-surface/drainage water management. The surface water management includes three components:

- Non-contact water for the WRSF and SRSF in open diversion channels that run around the perimeter of the facilities
- Contact water for the WRSF and SRSF in open diversion channels that run on the surface of the facilities
- Non-surface water at the foundation and waste material contact will be captured by an underdrain system.

The diversion channels will collect non-contact surface runoff from the natural areas surrounding the facility and drain to drainage areas outside the WRSF and SRSF footprint. The WRSF and SRSF surface water collection system was designed to collect surface contact runoff and direct the water to pond 1 during operation. The WRSF and SRSF surface water collection channels will become non-contact water collection ditches after closure. The contact water should only contain sediment from the facility and will be directed to pond 1, and then used for makeup water or discharged to the environment. Water monitoring samples will be taken on a regular basis to ensure water being discharged meets water quality standards. If the water does not meet standards, the water from the ponds will be pumped to the process plant, then treated and discharged to the environment. The temporary and permanent channels are designed to convey runoff from 1-in-100-year and 1-in-200-year storm events, respectively.

The non-surface or drainage water management will consist of HDPE dual wall pipe and drainage gravel wrapped in a non-woven geotextile; near-surface groundwater and seepage from the piles will be captured to recharge old channels below the facilities. In addition, the underdrain system will be utilized to drain surface runoff that is blocked by the WRSF and SRSF from following its original path. A ring-dyke filter system will be placed around the underdrain inlet to prevent solids from entering and potentially plugging the system.

18.6.5 Design

The WRSF and SRSF are designed to be stacked from the bottom up and graded and compacted to improve overall stability of the facilities. Associated surface and drainage water management structures will be constructed during operations a minimum of 100 m ahead of the waste material placement being stacked, in order to minimize sediment migration from these facilities by using the forest as a sediment filter. Vegetation in the expansion of the WRSF and SRSF will be removed, and topsoil will be removed and stockpiled for progressive closure; the foundation consisting of saprolite and saprock will be compacted to reduce infiltration into the subgrade from any potential seepage from these facilities. The underdrains will be placed in trenches that are keyed into the drainages for protection, considering the significant loading stress from the facility.

The ultimate WRSF and SRSF are designed for a storage capacity of approximately 843 Mt of waste materials. The main design features of the WRSF and SRSF are summarized below:

- The permanent exterior face of the WRSF and SRSF have global slopes of 3.25:1 and 2.5:1 (H:V), respectively.
    - The SRSF will be compacted in 1m lifts to achieve the design slope
- Some of the underdrains will be used to drain areas blocked by stacked waste material until the area upslope is covered with waste.

- Flows from the underdrain discharge into pond 1.
- The WRSF and SRSF involve the extension of underdrains, non-contact diversion channels, and the contact water channels during operation staying ahead of stacking operations.
- Top surfaces will be compacted to reduce infiltration.
- Permanent exterior slopes will be compacted to enhance permanent slope stability.
- Once the permanent slope for a lift is completed, it will be closed with low permeability soils, topsoil and vegetation cover to minimize sediment generation.

The foundation soils will be compacted to minimize the impacts of seepage water from the WRSF and SRSF on the groundwater system and surrounding environment. The proposed material for the underdrains is HDPE dual wall pipe and gravel wrapped in non-woven geotextile geotextile, where the gravel will be mine waste rock that is cleaned and screened to drainage gravel specifications.

Two geotechnical investigations for the WRSF and SRSF were performed as part of the 2022 PEA and PFS. They consisted of a number of test pits and boreholes along with geophysical survey lines. Laboratory tests, including CU triaxial, were carried out on foundation samples to identify the geotechnical properties of the foundation along with hydraulic conductivity, and Proctor. Based on the geotechnical data, the ground conditions encountered at the WRSF and SRSF below the heavily forested area consist of a thin topsoil layer with a thickness of up to 0.15 m, and underlying overburden is saprolite and saprock, alluvium long the bottom of the drainages underlaid by bedrock. The thickness of the overburden soil layer varies from 0 m to 24 m. The overburden soil is primarily comprised of hard to very stiff clays and clayey silts along with alluvial deposits. Bedrock outcrops were observed within the WRSF and SRSF footprint.

A geochemical characterization program on waste material was undertaken during the PEA and PFS, including both static and kinematic tests. These tests concluded that the waste was non-acid generating (NAG).

18.6.6 Stability Analysis

Stability analyses were carried out on one section of the WRSF and one section of the SRSF using both static and pseudo-static analyses for a 'high' seismic zone. Based on a site response analysis the PGA in the natural base of the DSTF at the foundation considering Type C soil is estimated to be 0.98 g. The seismic coefficient was estimated according to the Saragoni method (2022), the seismic coefficient is 21% of the PGA which is 0.21. The CDA 2019 standards were used for the FOS for a 'High' consequence facility are shown in Table 18-3.

Table 18-3: Minimum Factor of Safety

Loading Conditions	Minimum FOS Required
Long-term	1.4
Pseudo-static	1.1

Source: Ausenco, 2023.

Limit equilibrium analysis was conducted using peak effective strength soil parameters taken from the laboratory triaxial tests. The analysis results for the WRSF and SRSF at ultimate configuration indicate satisfactory FOS under both static, pseudo-static, post-seismic conditions.

18.6.7 Instrumentation and Monitoring

The stability of the WRSF and SRSF will be monitored by vibrating wire piezometers strategically placed within the base of these facilities. In addition, inclinometers and prisms will be placed in permanent exterior slopes during operation. Real time continuous and unattended monitoring will be employed for the geotechnical monitoring. Additionally, water quality monitoring instrumentation will be implemented for monitoring of the surface contact water flows at the sediment ponds collecting surface and underdrain flows around the facility.

18.6.8 Closure Concept

The WRSF and SRSF will provide long-term storage of waste material and will remain in place beyond mine closure. The WRSF and SRSF will be progressively closed in stages following the completion of each permanent bench to minimize dust, sediment migration, minimize water infiltration and contaminant migration while being visually compatible with the surrounding area.

The cover system, subject to availability of material, will consist of a low-permeability cover; a cover of topsoil with local vegetation will be designed to reduce future infiltration of surface water into the two facilities. The cover system will allow the WRSF and SRSF collection channels to transform from collection of contact water during operation to the collection of non-contact water after closure. The collected runoff will be directed to natural waterways after closure. Sufficient topsoil will be stockpiled to allow for closure during construction.

18.7 Waste Storage Facilities

The Project has two waste storage facilities, one for temporary storage of hazardous waste and one for non-hazardous waste. These facilities are described below.

18.7.1 Hazardous Waste Storage Facility

Hazardous waste generated at the Project will be collected and temporarily stored at the hazardous waste transfer station. The hazardous waste storage facility consists of four 6-meter sea containers placed on a concrete pad with a 0.3 m concrete containment wall to capture and control spills from the sea containers. Hazardous materials that will be stored here include oils, batteries, combustion products, and related materials. Like hazardous materials will be stored in plastic barrels with screw-on lids. Hazardous materials will be picked up by a local certified hazardous waste storage facility operator and disposed of in a hazardous waste store facility located off-site. The hazardous waste facility will be enclosed with chain-link fence along with a gate, which will be locked to prevent unauthorized access. The fence will be offset 10 m from the concrete pad to provide maneuvering room for equipment delivering the waste. An operations manual will be developed prior to construction.

18.7.2 Sanitary Landfill

A sanitary landfill will be constructed on-site for non-hazardous solid waste generated on site. The facility is designed in accordance with EPA 530-R-20-002 Best Practice for Solid Waste Management (2020). The facility is designed to control and mitigate potential surface and groundwater contamination, reduce threats to workers, mitigation of air pollutant emissions, and control vectors. It is designed to accommodate non-hazardous mine waste generated for 1,250 people during construction, 983 people during operations, and 496 people during closure for a total life-of-mine storage capacity of 31,000 m^3 at a rate of 0.74 kg per day per person and a placed density of 250 kg/m^3.

The landfill will be constructed in 1-year cells over the life of the Project. The cells will be excavated 6 m below the existing surface with 3:1 (H:V) slopes. The facility consists yearly cells of:

- dimensions 30 m by 30 m by 3 m deep
- compacted subgrade
- 2.0 mm HDPE geomembrane liner
- leachate collection system (perforated pipes and gravel layer)
- compacted waste
- daily soil cover.

The ultimate size of the landfill will be 75 m by 75 m along with extending above the ground surface 3 m at closure. The ultimate site footprint will be fenced with chain-link with razor wire on top along with a security shack and gate which will be locked to prevent unauthorized access. The fence will be offset 20 m from the ultimate landfill footprint to provide maneuvering room for equipment delivering waste. The entire facility will have a diversion channel around it to prevent surface run-off from entering the landfill. In addition, as part of the leachate system, a tank will be constructed next to the facility to collect leachate from the landfill. The tank will be pumped on a regular basis into a tanker truck, and the leachate will go through the on-site water treat plant.

Operations will consist of placing non-hazardous waste in the current open cell. After placing the waste, a 20 cm soil cover will be placed over the waste to prevent vectors scavenging the site. The cells will be closed on an annual basis with 30 cm of soil. The next cell will be constructed well in advance of the cell being filled in order to be ready to accept waste. The leachate tank will be checked periodically and emptied. An operations manual will be developed prior to construction.

18.8 Electrical Power System

18.8.1 Electrical System Demand

The maximum operating load for the Cangrejos project is estimated at 129 MW. The power demand for each phase is summarized in Table 18-4.

Table 18-4: Total Site Electrical Demand

Phase	Installed Power (MW)	Operating Load (MW)	Power Consumption (MWh/a)
Initial Phase (Year 1-3)	76.9	59.3	449,633
Expansion 1 (Years 4-6)	140.3	108.6	830,386
Expansion 2 (Years 7+)	150.4	129.1	990,975

Source: Ausenco, 2023.

The 230 kV/25 kV outdoor substation will be fed by a single 230 kV incoming line. A single 230 kV/25 kV, 100/133/166 MVA oil-filled power transformer will be installed, capable of supplying the project’s maximum demand. The transformer will power up two 25 kV switchgears in the primary electrical room.

Emergency power for process plant critical loads will be provided by on-site diesel-powered generators. Total emergency operating loads of 1 MW, 1.5 MW, and 1.5 MW, respectively, are expected for the Initial Phase, Expansion 1 and Expansion 2.

18.8.2 Site Power Reticulation

Power will be distributed across the site via 25 kV overhead lines originating from the plant's 25 kV switchgears housed within the primary electrical room near the substation area. Overhead distribution lines will be constructed using aluminum conductor steel-reinforced cable (ACSR) and supported by wooden poles.

The overhead powerlines will provide power from the 25 kW switchgears to the following facilities:

- grinding area
- filter plant/filter plant midpoint station
- leach area
- crusher area
- flotation/concentrate area
- freshwater pond/freshwater pond midpoint station
- mine infrastructure area/truck shop/fuel station
- administration building/security.

18.8.3 Plant Power Distribution

The largest electrical loads at the process plant are the ball mills. Ball mills utilize liquid resistance starters (LRS) and will be supplied via cable circuits from the plant's primary 25 kV switchgear. 4160 V and 480 V motor control centers (MCCs) housed within electrical rooms strategically located throughout the plant area will be provided for process and non-process loads.

Power to the electrical rooms will be supplied by resistance-grounded, secondary substation-type, oil-filled distribution transformers located adjacent to the respective electrical room. All electrical rooms will be adequately rated for the environment and outfitted with lighting and small power transformers, distribution boards, uninterrupted power supply (UPS) systems, fire alarm and detection, and HVAC systems. To reduce installation time, the electrical rooms will be prefabricated modular buildings installed on structural framework above ground level for bottom entry of cables. Additionally, electrical rooms will be located as close as practical to the electrical loads to optimize conductor sizes and minimize cable lengths.

Grounded pad-mounted and pole-mounted transformers will be used to step down the voltages at the truck shop, fuel station and tire storage, freshwater pond and midpoint stations, and filter plant midpoint station, and administration building area. Power will terminate at the local 480 V distribution boards.

18.9 Water Supply and Management

The open pits, WRSF, and process plant are situated in proximity to surface stream drainage. The DSTF has no streams running through the facility. Baseline water quality has been evaluated against standard Ecuadorian hydrological indices. The predominant water quality in the project area is 'Acceptable'.

Non-contact water systems consisting of diversion channels are proposed for the principal mine facilities to maintain an environmental base flow. The channels are provided at the upstream side to divert non-contact surface water away from the process facilities and then discharge to natural drainage courses. Contact water from the open pits and WRSF will be used as makeup water and stored in two water storage ponds. Water storage pond 1 (pond 1) is located below the WRSF and collects runoff and underdrain water from the WRSF. Pond 1 is also used as a sediment control for water discharged to the environment. Water storage pond 2 (pond 2) is located between the mine infrastructure area and the process plant; these receive water from pond 1 and pit dewatering.

The two ponds are sized to take excess water during the rainy season and store for use during the dry season. Therefore, no additional source of water is required based on the water balance, such as water from the surface drainage or groundwater sources. Potable water will come from Ponds 1 and 2 and proceed through a water treatment plant.

18.10 Hazard Considerations

The main geohazards for the Project are landslides along roads, WRSF, and open pits. There have been a number of small landslides in the project area over the years that have blocked access to the site, but these were remediated quickly. Currently, there is no significant infrastructure located along streams exposed to flooding, except roads and the WRSF. These may occasionally flood but can be reopened quickly. Finally, the site is located in a high seismic area (Refer to Section 5.5). The infrastructure has been designed to accommodate the high seismicity for the area, in accordance with local and international standards.

19 MARKET STUDIES AND CONTRACTS

19.1 Market Studies

A market study by H&H Metals Corp (H&H, 2023) formed the basis for the market projections applied in this chapter.

19.1.1 Flotation Concentrate

Smelters apply treatment charges (TCs), refining charges (RCs), and penalties based on the composition of the concentrates they receive. They also normally specify the terms of payment. The economic model calculates the costs for TCs, RCs, and penalties using data from the H&H Cangrejos Marketing Study (2023) and related clarifications and elaborations. These results are based on estimated concentrate composition indicative of the Cangrejos Project which is based on the recovery model.

The H&H study was formulated based on the supply of increasing estimated volumes of gold-copper concentrate during the life of mine, from 49,000 t/a concentrate in initial phase, climbing to 99,000 t/a in expansion 2 phase, and finally reaching an annual output of 131,000 t/a in expansion 2 phase, Years 7 to 25. The optimal market based TCs for this concentrate were reported as the China Smelter Purchase Team (CSPT) benchmark treatment charge less $15 per dry tonne, with refining charges (RC) of benchmark minus $0.015/lb Cu, $7.50 per ounce of gold, and $0.40 per ounce of silver. For purposes of this pre-feasibility study, a benchmark treatment charge of $73 per dry tonne concentrate was applied, and the associated copper refining charge benchmark was $0.08785 per pound of copper.

The payable metal returns for gold-copper concentrate were 98.0% for gold and 90% for silver while the payable metal return for copper was 96.5%. Minimum deductions were applied in the model, with gold's minimum deduction being zero, and silver's minimum deduction 25 g/dmt concentrate. Variable minimum deduct values were applied to copper production as a function of the concentrate grades according to H&H Metals' guidelines, as shown in Table 19-1.

Table 19-1: Concentrate – Copper Minimum Deducts

Concentrate Grade (% Cu)	Minimum Deduct (%)
>20%	1%
18-20%	1.1%
16-18%	1.2%
14-16%	1.3%

Source: H&H, 2023.

19.1.2 Assessment of Concentrates

As part of the metallurgical testing, assays were conducted on the concentrates. The results showed that the concentrates are "clean" and do not contain any harmful contaminants that would incur penalties. As a result, no penalties have been included in the cashflow analysis.

19.1.3 Doré Charges

Doré also incurs treatment charges (TCs) and refining charges (RCs) based on its composition and weight. The economic model calculates these charges based on industry sources relevant to the Cangrejos Project. The estimated TCs for doré are $0.30 per ounce. The payables for doré are 99.95% for gold and 99.5% for silver.

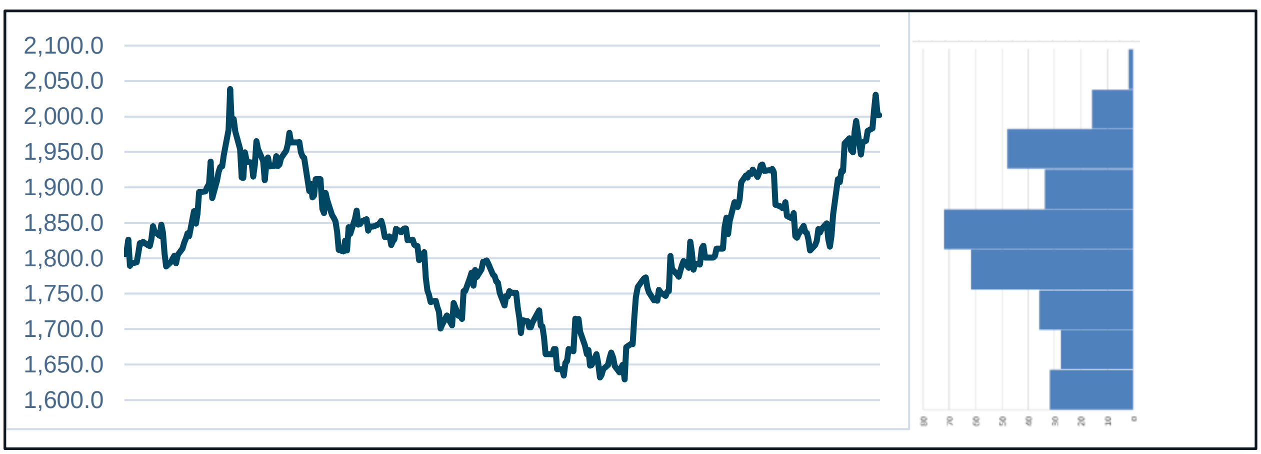
19.2 Commodity Price Projections

To establish commodity price projections for the PFS, the team reviewed current trading values, the H&H forecast market values, long-term market price forecasts from twenty-five financial institutions, and conducted discussions with Lumina and H&H.

19.2.1 Current Trading Values

Gold Current Market Data – The precious metal markets are highly liquid and benefit from terminal markets around the world (e.g., London, New York, Tokyo, and Hong Kong). The London PM fix for gold on April 7, 2023 was $2,002/oz. Figure 19-1 presents the gold price per troy ounce from January 1, 2022, through April 7, 2023. During that time, gold traded between a minimum of $1,629/oz and a maximum of $2,039/oz, and the average price was $1,822/oz, as depicted in Figure 19-1, which shows the gold price trend and frequency distribution over this timeframe.

Figure 19-1: Gold Price ($/oz), January 1, 2022 to April 7, 2023



Source: World Gold Council, 2023, RME, 2023.

Silver Current Market Data – Silver markets are also highly liquid and traded on the same exchanges as gold. The London PM fix for silver on April 7, 2023, was $24.97/oz. During 2022 and through March of 2023, silver traded between $18.05/oz and $25.95/oz.

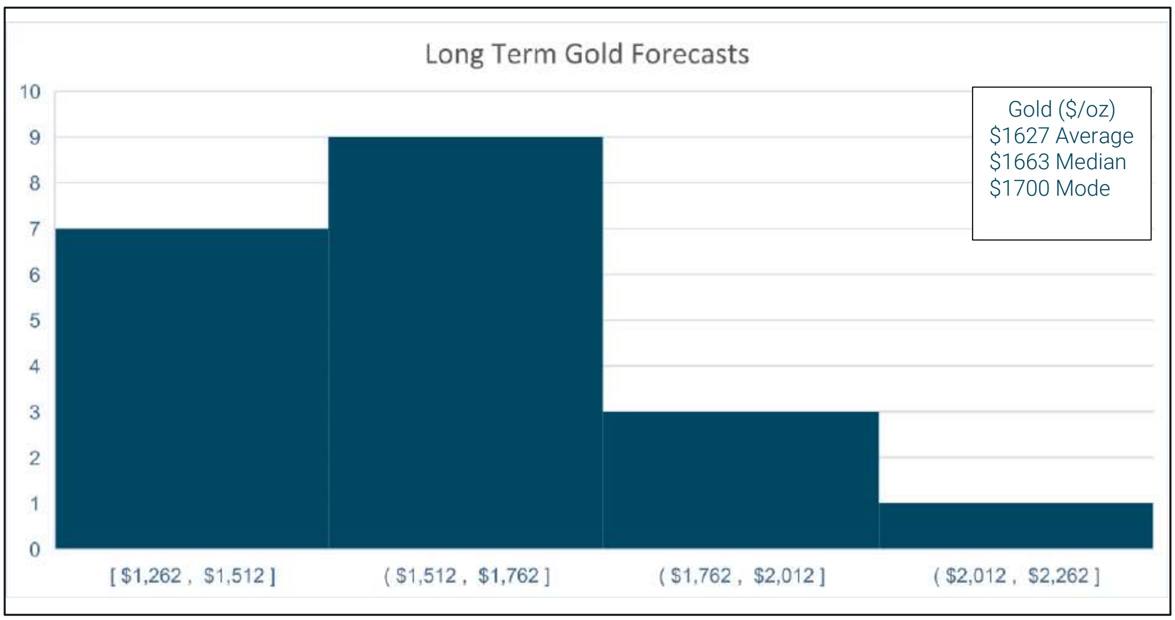
Copper Current Market Data – Copper is one of the most important and widely used metals in the world, with applications ranging from electrical wiring to plumbing to construction. Copper prices are reported daily in financial news outlets such as Bloomberg and the Wall Street Journal. These prices are typically quoted in US dollars per pound and reflect the price at which copper is traded on major exchanges such as the London Metal Exchange (LME) and the New York Mercantile Exchange (NYMEX).

On March 31, 2023, the closing price for copper was $4.09/lb. Copper pricing in 2022-YTD 2023 ranged from $3.23/lb to $4.94/lb.

19.2.2 Long-Term Price Projections

Along with current market data, results of the long-term commodity pricing forecasts by 25 financial institutions informed the commodity price projection. The financial institutions' long-term consensus gold price ranged from $1,627 to $1,700/oz, while consensus silver prices ranged from $20.00 to $21.40. There was a strong consensus on long-term copper prices at $3.75/lb. Frequency distributions and central tendencies for these long-term price forecasts, for gold, silver, and copper, are presented in Figure 19-2, Figure 19-3, and Figure 19-4.

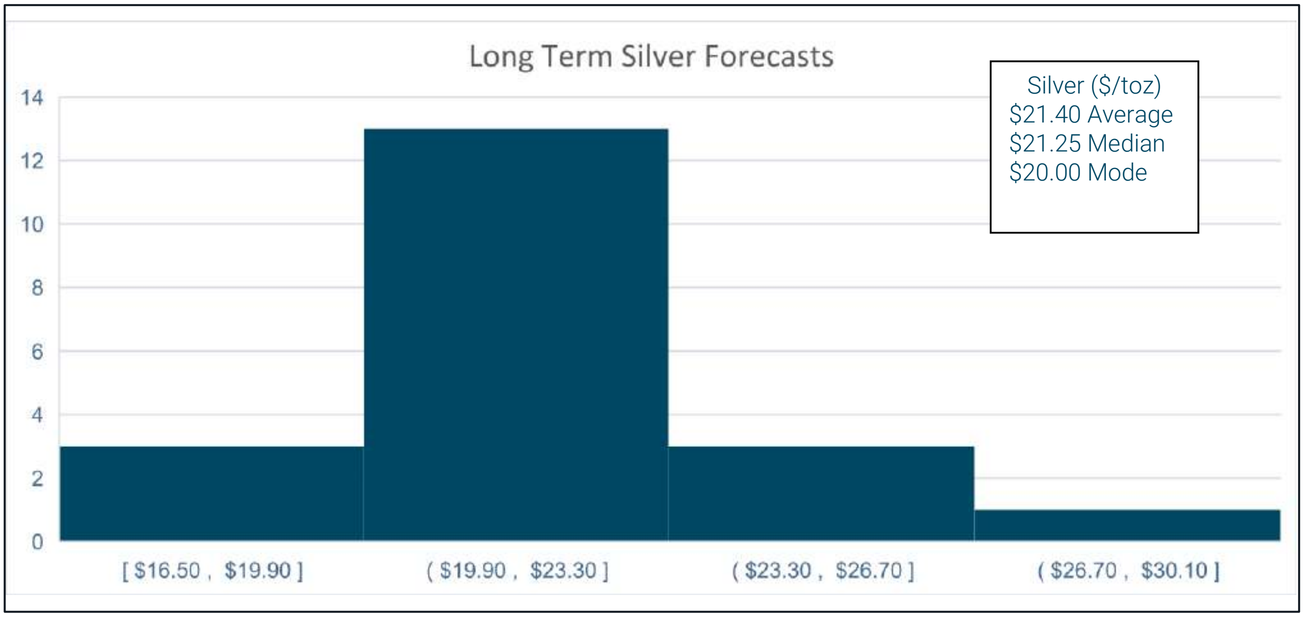
Figure 19-2: Long-Term Gold Forecasts*



Source: RME, 2023.

*Not all institutions submitted forecasts for all metals.

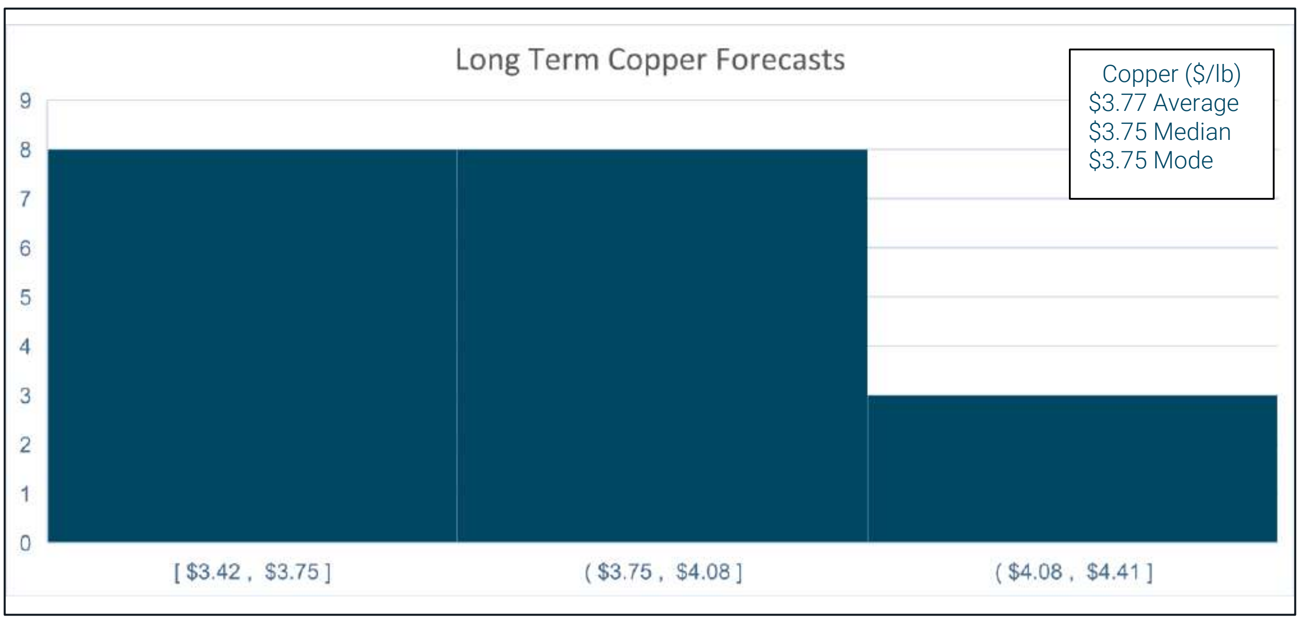
Figure 19-3: Long-Term Silver Forecasts*



Source: RME, 2023.

*Not all institutions submitted forecasts for all metals.

Figure 19-4: Long-Term Copper Forecasts*



Source: RME, 2023.

*Not all institutions submitted forecasts for all metals.

After reviewing current market data, along with the long-term pricing forecasts, the following commodity price projections were selected as the basis for this pre-feasibility discounted cashflow model:

- Gold – $1,650/oz
- Silver – $20.00/oz
- Copper – $3.75/lb.

To calculate gross revenue from mining, the selected metals prices for gold, copper, and silver were applied to corresponding recovered, payable gold and silver troy ounces and copper pounds in the economic model.

19.2.3 Flotation Concentrate Value

At these selected commodity prices, after considering the TC's, RC's, domestic and international freight and handling charges, payables and minimum deductions, the landed Cangrejos flotation concentrate is valued at $7,900 per dry metric tonne on average over the life of mine.

19.3 Contracts

At this pre-feasibility stage of project development, no marketing contracts exist.

The QP for this section has reviewed the marketing studies and analyses and, in the QP's opinion, the results support the assumptions in this technical report.

20 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL AND COMMUNITY IMPACT

20.1 Environmental Considerations

The Project will be located primarily in areas of high-relief evergreen montane and secondary forest, and altered pastoral and agricultural areas in the west-central part of the Cangrejos concessions, as well as adjacent land areas to the west of the concession boundary that will be purchased or leased to support the placement of project infrastructure, but will not be subject to mineral extraction. The Project encompasses several adjacent watersheds drained by a network of small streams.

The environment in the project area has been altered by a wide range of human influences that span centuries, including agriculture, cattle grazing, logging, and small-scale alluvial and underground mining. Archaeological evidence suggests a history of human habitation and influence that dates over a thousand years. No primary forest remains. Current land use in the project area is typically a mixture of cattle grazing and light agriculture (primarily yucca, cacao, and bananas), in cleared plantation areas adjacent to secondary forest "islands"; these patches of secondary forest are usually situated in steep ravines and rugged terrain unsuitable for agriculture or grazing.

The area of impact (AOI) described in this technical report includes specific concession areas required for core mining and processing operations that have been previously evaluated by the focused environmental, archaeological, and social studies defined by the exploration-phase Environmental Impact Study *(Estudio de Impacto Ambiental, EIA)*/Environmental Management Plan *(Plan de Manejo Ambiental, PMA)* process. However, the entire environmental AOI described herein will be re-evaluated in the FS and by a final exploitation phase EIA/PMA, and hence will be fully encompassed by the subsequently issued Environmental License.

There are no villages or significant habitations within the project's environmental AOI, which, for the purposes of this technical report, is defined as those specific areas of the project "footprint" that will be disturbed by mine construction and operation, plus a 100-m buffer/environmental monitoring zone around the footprint perimeter.

Mining haul roads, service roads, and access roads located within the Project's concession boundaries are all considered to be within the Project's environmental AOI. Haul roads from the pits will have a nominal 75-m buffer zone established on either side of the road centerlines; regular access/service roads will be built with 50-m buffers on both sides of their centerlines.

20.1.1 Baseline and Supporting Studies

20.1.1.1 Baseline Studies

Environmental baseline studies were conducted as part of EIA processes for exploration licensing, and monitoring of environmental conditions are ongoing as required by governing PMAs. Baseline studies include the collection of surface water, groundwater, biodiversity, climate, and geochemical data. Odin commissioned an advanced exploration-phase environmental baseline study in the original Cangrejos concession areas. Field work began in July 2007 and culminated in a 2010 EIA/PMA. A similar study was conducted in 2017 as part of an initial exploration-phase EIA for concession C20. In 2020, the C20 EIA/PMA was updated and resubmitted for final regulatory review; Ministry of Environmental, Water and Ecological Transition (Ministerio de Ambiente, Agua y Transición Ecológica, MAATE) approval was received in early 2022.

In addition to the studies and monitoring required by approved EIA/PMAs, supplemental environmental data collection infrastructure (including several permanent surface water flow measurement stations) was constructed in 2019 to support Preliminary Economic Analysis (PEA) level project design needs, over and above the minimum requirements of the applicable PMAs. An additional biodiversity study was also conducted in 2019 to international BMPs as discussed in Section 20.1.1.2. Additional meteorological stations were installed in 2022.

The primary environmental risks and impacts anticipated for the Project are summarized in the following table, which is based on the PFS-level design information presented in this technical report; the environmental impacts identified in the Los Cangrejos and C20 concession EIAs and other baseline studies; the biodiversity studies summarized in Section 20.1.1.2; and prior Lumina/Odin team members' experience with gold and copper mine development in similar environmental settings. Potential management and mitigation measures reflected in the proposed project design and/or overall management approach are also listed for each general risk/impact.

Table 20-1: Environmental Risks/Impacts & Potential Management/Mitigation Strategies

Environmental Risk/Impact	Potential Management/Mitigation Measures
1. Water Consumption	Project designed to minimize impacts to downstream users of surface water; key design features include: • Construction of an innovative DSTF, using pressurized filter plates to extract water from the tails, thereby minimizing water abstraction needs and maximizing water recycling options within the mineral separation process. • Diversion of surface water flows to channels and retention ponds around the mine, mill, WRSF, and DSTF areas, in order to prevent inflow to disturbed surface areas, and to preserve the quality and volume of environmental base flows in associated watersheds. • Maximized capture of contact water (e.g., DSTF and WRSF runoff, stormwater, water from mine dewatering), management in retention ponds, and, to the extent possible, recycling within the mineral extraction process. • Development of groundwater wells as healthful high-quality alternate municipal water supplies for the villages of Valle Hermoso and Bellamaria, to replace or supplement any historical surface water catchments and pipelines remaining within the Project's environmental AOI. • Pit lake spillway overflows are designed to help maintain environmental flows in Gran Bestia and Las Pavas creeks in the post-closure period; potential opportunities also exist to install siphons and pipelines to permit pit water to be directed to augment natural flows in local waterways.
2. Discharged Water Quality	• Design and management of the DSTF, WRSF, and associated retention ponds to capture and recycle stormwater runoff, and, to the extent possible, minimize effluent discharge needs. • Detoxification of cyanide in the tailings stream at the mineral separation plant to below Ecuadorian and International Cyanide Management Code (ICMC) discharge limits, prior to the tailings slurry being piped to the dewatering/ filtration plant at the DSTF.

Environmental Risk/Impact	Potential Management/Mitigation Measures
	• Recycling of filtered tailings water back to the mineral separation plant. • Installation of sedimentation and water management retention ponds at the toes of the WRSF and DSTF, along with engineered energy dissipation structures, is necessary to minimize the erosional impacts of any discharged water on receiving waterways. • Monitoring of surface and groundwater quality in runoff and seepage from the DSTF and WRSF to ensure applicable environmental quality standards are met. • Development of backup pre-discharge treatment approaches in the event discharge quality issues develop over time for specific constituents. • Installation of septic systems for management of sanitary waste from man-camp and administrative/support facilities, including any required discharge treatment systems. • Implementation of water balance/water management and erosion prevention/progressive revegetation programs as elements of a project-specific Environmental and Social Management System (ESMS) meeting the requirements of International Finance Corporation (IFC) Performance Standard (PS) 1, "Assessment and Management of Environmental and Social Risks and Impacts" (IFC, 2012); these programs would typically be documented in a *Water Management Plan*, *DSTF Management Plan*, *WRSF Management Plan, Mine Reclamation and Closure Plan,* and *Biodiversity Monitoring and Management Plan* (BMMP).
3. Air Emissions, Including Greenhouse Gas (GHG) Emissions	• Implementation of dry-season road dust control program using recycled water; environmentally benign surfactants will be added only if unusually dry conditions require their use. • Minimization of dry season dust generation from the DSTF stack face via progressive, "bottom-up" reclamation/revegetation. • Minimization of dry season dust generation from conveyance of dried tails, by locating the filtration plant at the DSTF and by conveyance of detoxified tails to the plant via a conventional slurry pipeline. • Regular preventive maintenance on all stationary and mobile motorized equipment. • Design of open pit blasting program to preferentially direct blast energies to the rock hosting the mineral resource, thereby minimizing the ejection of fly rock and dust. • Minimization of toxic gas generation potential by designing and constructing the cyanide mixing tank, cyanide-in-leach (CIL) circuit, and detoxification circuit to ICMC standards. • Prohibitions on all open burning in on-site sanitary landfill and in environmental clearance actions. • Development of a periodically updated *GHG Minimization and Management Plan,* for the construction and operational phases of the Project, in compliance with (IFC, 2012) and relevant international BMPs, to be managed as an element of the Project's ESMS. • Electrical power to the Project will be from the national grid, which is powered by primarily renewable (hydroelectric) sources.

Environmental Risk/Impact	Potential Management/Mitigation Measures
4. Visual Impacts	• To the extent possible, location of major elements of mine infrastructure in areas that do not have a direct line of sight to local communities. • Planting of fast-growing native balsa *(chroma pyramidale)* trees as a vegetation screen along roadways near the DSTF and other selected locations.
5. Light Pollution	• Installation of low-sodium industrial lighting at the mine and exterior areas of the mineral separation plant, ancillary facilities, and administrative/camp areas; to the extent possible, lighting will be placed to minimize visibility of mine infrastructure at night to local communities.
6. Noise and Vibration	• Preventive maintenance inspection/replacement program for silencers/mufflers installed on all stationary and mobile motorized equipment. • Blasting activities restricted to daylight hours. • Scheduling of deliveries of materials, equipment, reagents, and fuel, concentrate shipment, and other heavy traffic only in daylight hours. • Location of crushers, conveyors, emergency generators, and other industrial equipment several kilometers distant from nearest habitations. • Installation of an innovative tower- suspended conveyor system between the crusher and the mill prevents generation of ground-level noise from a conventional conveyor system. • Strategic placement of noise abatement berms and acoustic barriers. • Workforce hearing protection devices required in industrial areas with ambient noise averaging > 85 dB.
7. Soil Contamination	• Implementation of a systematic spill prevention, control, and countermeasures program and a comprehensive *Emergency Preparedness and Response Plan* as elements of the project ESMS. • Transportation of cyanide in solid briquette form, in purpose-built intrinsically safe stainless steel solid-to-liquid (STL) delivery/mixing tanks ("ISO tanks"). • Management of reagent mixing, high-strength solution storage, and lixiviation processes within competent secondary containments, per ICMC requirements. • Detoxification of cyanide tailings stream to <0.5 mg/l weak acid dissociable (WAD) cyanide, prior to dewatering at the filtration plant and conveyance of dried tails for deposition in the DSTF • Installation of tailings and reclaim pipelines in a geotextile-lined trench, reporting to a lined emergency pond designed to capture potential pipeline spills or leaks. • Installation of secondary containment systems for all fuels, reagents, waste oil, and other hazardous chemicals stored on site in liquid form. • Construction of appropriate stormwater collection, oily water separator, and containment infrastructure for all industrial and administrative facilities.
8. Use of Energy	• Project design assumes connection with Ecuadorian national grid and predominantly hydroelectric power sources. • On-site generation of power using stationary or portable diesel generators will be limited to early construction, emergencies, and remote applications. • Selective use of solar power for remote equipment installations. • Selective use of cost-effective electric vehicles for specific industrial applications.

Environmental Risk/Impact	Potential Management/Mitigation Measures
9. Generation of Mining Waste	• Design and construction of the mineral processing plant, WRSF, filtration plant, DSTF, and ancillary facilities to the requirements of the IFC Environmental, Health and Safety Guidelines for Mining (IFC, 2007), the ICMC, relevant sections of the ICMM *Global Industry Standard on Tailings Management,* and other appropriate international standards and BMPs. • Detoxification of cyanide tailings stream to <0.5 mg/l WAD cyanide prior to dewatering at the filtration plant and conveyance of dried tails for deposition in the DSTF. • Installation of pressure loss/leak detection systems in tailings/reclaim pipelines; placement of tailings and reclaim pipelines in lined trenches; and installation of a spill management pond at the lower end of the pipeline corridor. • Installation of stormwater management/oily water collection systems for mineral separation plant, filtration plant, machine shops, vehicle wash facilities, haul truck ready line, warehouses, WRSF, DSTF, administrative facilities, and other structures. • Construction of natural liner systems and underdrains beneath the WRSF and DSTF, to manage potential seepage to the subsurface. • Installation of groundwater monitoring wells downgradient of the WRSF, DSTF, process plant, CIL/detoxification plant, STL trailer storage pad, tails dewatering facility, fuel storage/dispensing areas, machine shops, and other potential contaminant sources. • Implementation of surface and groundwater monitoring programs, water balance/water management, phased clearances, and phased erosion prevention/progressive revegetation programs for the WRSF and DSTF.
10. Generation of Non-Hazardous Waste	• Implementation of a comprehensive *Waste Management Plan* as an element of the Project ESMS. • Separation and segregation of hazardous/non-hazardous and recyclable/non-recyclable waste streams. • Development of economic recycling options for discrete waste streams. • Construction and operation of a secure, permitted on-site sanitary (non-hazardous) landfill. • Excavation of one or more disposal cells in the WRSF to accommodate unrecyclable inert wastes.
11. Generation of Hazardous Waste	• Implementation of a comprehensive *Waste Management Plan* as an element of the project ESMS. • Separation and segregation of hazardous/non-hazardous and recyclable/non-recyclable waste streams. • Implementation of a systematic spill prevention, control, and countermeasures program as an element of the project ESMS. • Procurement of cyanide reagent exclusively as dry bulk briquettes, delivered in purpose-built stainless-steel ISO-containers (i.e., STL delivery form) in order to eliminate potentially contaminated shipping waste. • On-site storage of unmixed cyanide in dedicated ISO-containers. • Mixing of cyanide reagent in ISO-containers using an air sparging system, and construction and management of high-strength liquid reagent storage tanks and lixiviation processes within competent secondary containments, per ICMC.

Environmental Risk/Impact	Potential Management/Mitigation Measures
	• Detoxification of cyanide tailings stream to <0.5 mg/l WAD cyanide prior to dewatering at the filtration plant and final conveyance of the dried tails for deposition in the DSTF. • Installation of competent and appropriately sized (i.e., at least 110% of largest contained volume) secondary containment systems for all fuels, reagents, and other hazardous chemicals stored on site in liquid form. • Installation of controlled temporary accumulation/storage facilities for containerized hazardous waste with competent secondary containment systems, pending regular off-site disposal at licensed hazardous waste disposal facilities.
12. Impacts to Biodiversity	• Preparation and implementation of a regularly updated BMMP in compliance with IFC Performance Standard 6 (IFC, 2012) and applicable Ecuadorian regulations. • Creation and maintenance of protected environmental corridors and ecological offsets per BMMP recommendations. • Prohibition of agriculture, grazing, logging, hunting, illegal mining, and other intrusive human activity on all concession lands required for the project environmental AOI, environmental corridors, and ecological offset areas. • To the extent possible, location of project infrastructure, roadways, and linear structures to minimize fragmentation of habitats and to enhance faunal access to environmental corridors and designated ecological offset areas; where roads or pipelines must be constructed, install overpasses, culverts, or other engineered structures as viable faunal pathways. • Use of a tower-suspended conveyor system between the crusher and the mill to eliminate the linear barrier to faunal passage that would be created by a traditional ground-based conveyor system. • Implementation of BMMP to preserve connectivity between discrete management units, enhance conservation, and inform the evaluation of cumulative impacts and adaptive management actions. • Performance of population dynamics studies for sensitive species of flora and for faunal species with low mobility and develop/implement faunal relocation protocols designed to minimize stress and mortality during capture and relocation. • Implementation of water balance/water management and erosion prevention/progressive revegetation programs as elements of the project ESMS. • Use of diversion channels to minimize surface water inflow to the pits, minimize onflow to the DSTF and WRSF, and maintain downstream environmental flows. • Management of erosion, including prevention of ponding on roads, placement of sediment traps and refuges/shelters to minimize impacts on aquatic species. • Processing and stockpiling of biowaste/mulch/topsoil from environmental clearance activities, to support progressive reclamation and revegetation actions and final site closure. • Development of test plots and nursery program(s) to assess and evaluate the propagation potential of native species.

Environmental Risk/Impact	Potential Management/Mitigation Measures
	• Proactive revegetation/reforestation of certain areas of modified habitat within or adjacent to designated offsets, in order to enhance their value as ecological corridors.
13. Transportation Accidents/Incidents	• Optimization of access routes and timing of shipments to the Project to minimize impacts of truck traffic on local communities. • Outreach to appropriate authorities to repair or replace damaged or inadequately rated bridges or roadway sections on access routes to the Project. • Shipment of goods and materials preferentially contracted to certified firms with trained and qualified drivers. • Transportation of all cyanide reagent using ICMC certified contractors, in stainless steel ISO-containers. • Preparation and implementation of a comprehensive *Transportation Management Plan* and *Emergency Preparedness and Response Plan* as elements of the project ESMS, in compliance with Ecuadorian regulations, the ICMC, and other international BMPs.

Source: Lumina, 2023.

20.1.1.2 Biodiversity Studies

Like other nations, Ecuador has established a range of laws and regulations to protect its environmental resources. At the same time, the country is seeking to diversify and grow its economy, an increasingly vital component of which is mining. In keeping with Ecuadorian law and international BMPs, mining project proponents must seek a practical and appropriate balance between project economics and environmental protection, including preservation of biodiversity.

In order to better understand the specific biodiversity considerations in the project area and pursuant to Ecuadorian legal requirements, Odin contracted the performance of environmental studies as part of the various exploration-phase EIAs (2010, 2017, and 2022). A desktop biodiversity screening study of the region surrounding the Project was also completed in 2017. Dry and wet season field studies were conducted in 2019 that were focused specifically on biodiversity in and around the initial project environmental AOI, as defined by Odin's 2018 PEA, and a preliminary (Biodiversity Monitoring and Management Plan (BMMP) was prepared (2019). An initial biodiversity monitoring study referenced to the PEA-level design was completed in 2023, in keeping with the requirements of the preliminary BMMP.

These studies have collectively confirmed that the project location is many kilometers from any officially protected environmental areas, and that the Project's concession areas have been significantly impacted by centuries of intrusive human activity. Primary forest no longer exists, and the area of the Project is largely comprised of a mixture of agricultural and grazing clearances and young or mature secondary forest islands. Such types of forest and human alteration are not unique to the project area and can be found in many other locations within the coastal region of Ecuador.

Minor populations of sensitive species of flora and fauna are found in land areas that will be required for mine construction and operation. However, the Project's environmental AOI is adjacent to (and in several cases, Odin already owns) substantial concession areas not required for mining that are forested or minimally altered. These areas can be set aside and/or rehabilitated/revegetated as environmental corridors and ecological offsets to compensate for disturbance or loss of habitat. Establishment of such corridors and offsets, in conjunction with the biodiversity monitoring program outlined by the BMMP, robust adaptive management protocols, and specific management and mitigation measures based on international BMPs, is expected to enable successful permitting of the Project, as well as maintenance of project compliance with all applicable regulatory requirements and potential lender conditions. The aforementioned corridors and offsets, when fully delineated and developed in conjunction with the final FS-level project design, are also expected to contribute to a general goal of no net loss of biodiversity.

The monitoring study completed in 2023 noted that the revegetation/reclamation actions conducted by Odin after the 2021/2022 exploration drilling campaign were generally effective, in that they tended to sustain and improve local observations of biodiversity relative to the 2019 baseline. However, where agricultural or grazing land use has continued in areas within the mining concessions that are currently owned by others, observations of degraded biodiversity tended to persist.

20.1.1.3 Archeological Studies

In 2012, Odin commissioned a detailed archaeological survey of the Los Cangrejos concessions (the C20 concession was not included, as it was not under Odin's control at the time). The survey evaluated 18 areas in 12 discrete concessions that Odin had tentatively identified as having potential mineral interest. In the archaeologists' opinions, the evidence over almost the entire area of study revealed a historical presence of the Milagro culture of the Integration Period (about 500 A.D. to 1500 A.D.), with an association to the Cañar culture and a possible interrelation with the Manteño culture. However, none of the sites sampled in the original 2012 study are in the current environmental AOI for the Project.

Odin commissioned two additional archaeological investigations to support advanced exploration activities in C20 in 2019. No archaeological artifacts were encountered in either study. These observations notwithstanding, Odin implemented a "chance finds" procedure to address the handling and, if necessary, preservation and protection of archaeological resources or artifacts that may be discovered during exploration. No significant cultural resources or artifacts were encountered in any of the drilling campaigns associated with initial exploration or advanced exploration activities, or in subsequent site reclamation and revegetation activities.

20.1.2 Environmental Geochemistry

An evaluation was conducted to determine if the anticipated environmental geochemistry of mine waste rock, dry-stack tailings, or pit wall rocks may impact water quality. This subsection describes the geochemical characterization performed to-date for the Project and presents the potential water quality risk resulting from rock-water interactions [principally Acid Rock Drainage (ARD) and Metal Leaching (ML) risk].

20.1.2.1 Geologic Background

The geologic background of the Project is described in detail in Section 7. As noted therein, "Most of the mineralization consists of finely disseminated chalcopyrite and pyrite with minor bornite, molybdenite and pyrrhotite. Total sulphide content is generally less than 5%".

Alteration has occurred introducing neutralizing potential (carbonates in particular) to the rock that counteract the sulphide minerals. Phyllic/intermediate argillic alteration (see Section 7.5) has resulted in this increased carbonate concentrations which is hosted in veinlets or between clasts in the hydrothermal breccia.

Near the surface, all the rocks mentioned above appear to have weathered in place. Most of the pit area is covered with 0-20 meters of saprolite soil. Saprolite is created by the weathering-in-place of rock into soil; it frequently occurs in tropical and sub-tropical regions where rainfall has been intense for extended periods of time. The saprolite at the Project is fully oxidized and has a distinctive iron-oxide reddish color and the texture of silty clay.

Beneath the saprolite layer lies a saprock zone of oxidized rocks. Saprock is formed by ferrocrete cementation or residual unweathered rocks in the saprolite. Beneath the saprock, there is a discontinuous layer of weathered hard rock (called the transition zone or oxidized hard rock).

Although there are some differences in geology between Gran Bestia and Cangrejos, rock types are generally the same between the pits.

20.1.2.2 Geochemical Sampling

Industry-standard geochemical sampling was conducted, based on the protocols and recommendations included in the Global Acid Rock Drainage (GARD) Guide published by the International Network for Acid Prevention (INAP, 2009). This included the following data sets:

- static and kinetic geochemical tests on rock samples collected from exploration core including:
  - rock that will ultimately be waste rock in the waste rock storage facility (WRSF)
  - rock that will ultimately be post-closure pit wall rock
  - samples from hard rock, saprolite, saprock, and transition zones
- static tests on mine tailings which will be placed in the DSTF
- kinetic tests on mine tailings.

The Project complies with GARD guidelines for a PFS-stage project, as contained in Table 4-2 of the GARD guide.

20.1.2.3 Static Geochemical Samples of Waste Rock and Tailings

The samples were analyzed using the following industry-standard static geochemical testing program:

- acid base accounting (modified Sobek (Lawrence & Wang, 1996)
- whole rock analysis by lithium metaborate fusion with inductively coupled plasma mass spectrometry (ICP-MS) finish
- metals by aqua regia digestion and ICP-MS

- synthetic precipitation leaching procedure (SPLP) (US EPA, 1994).

Waste Rock Samples

To date, the static geochemical sample database for the Project is comprised of 95 samples of predicted waste rock. Fifty-eight waste rock samples were from the area of the Cangrejos pit, and thirty-seven waste rock samples were from Gran Bestia. The sample collection covered the entire range of rock types discovered on site.

Tailings Samples

During the preparation of this technical report, metallurgical testwork produced fifteen different composites coming from the ore variability study (see Section 13.3.1). These fifteen samples were subjected to ABA. A composite of the life of mine tailings was submitted for whole rock, metals by aqua regia digestion, and SPLP analysis.

Four tailings samples were previously collected during the PEA stage of the Project, focused on Cangrejos pit ore. However, variability testing performed as part of this technical report showed that the Life of Mine (LOM) mine tailings will likely have higher pyrite concentrations than what was found in PEA samples. The results from the prior sampling are considered to be representative of the early-phase tailings, which were sourced entirely from the area of the Cangrejos pit.

20.1.2.4 Kinetic Geochemical Sampling of Waste Rock and Tailings

Kinetic cell testing is required to determine if potentially acid-generating (PAG) conditions exist. This can be done in two ways:

- ASTM — standard humidity cell test (ASTM D5744-07e1, 2007) in a laboratory (humidity cell test)
- on-site field testing in barrels (on-site test).

Humidity cells were used for tailings, and on-site tests were used for waste rock.

These tests originally commenced in May 2019 with 10 Cangrejos waste rock samples. Two Gran Bestia samples were added in October 2019. Ten new Gran Bestia waste rock samples began testing during the PFS in March 2023. All kinetic samples were analyzed weekly for pH, electrical conductivity, dissolved oxygen, temperature, and oxidation and reduction potential. Bi-monthly laboratory samples were collected and analyzed for metals, salts, and basic wet chemistry.

20.1.2.5 Static Testing Results: Waste Rock

ABA Tests

As mentioned in Section 20.1.2.3, the site has 95 waste rock ABA tests. In ABA tests, the acid generating potential (AP) and neutralization potential (NP) values are combined to derive a quantitative screening-level estimate of a material's overall acid or neutralizing potential, resulting in the classification of the sample as PAG, "non-potentially acid-generating" (NAG), or "uncertain.” Two formulations are used:

- net neutralization potential (NNP), obtained by subtracting sample AP from NP (NP-AP)
- neutralization potential ratio (NPR), obtained by dividing sample NP by AP (NP/AP).

NNP and NPR values were interpreted using criteria given by the GARD Guide, (INAP, 2009) as presented in Table 20-2.

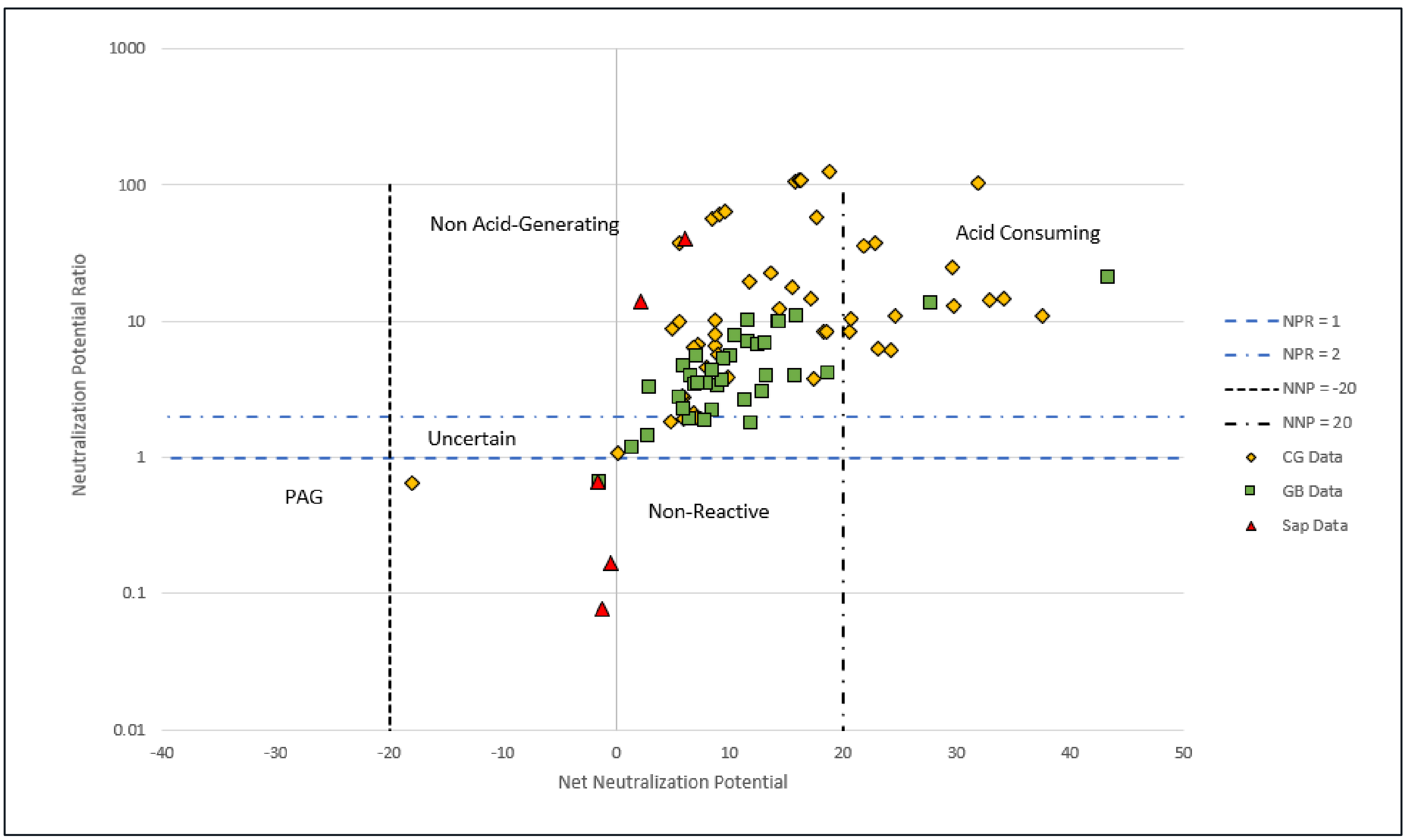
Table 20-2: Screening Guidelines for Acid Generation Potential Prediction

Material Designation	Comparative Criteria	
	NNP ($TCaCO_3/kt$)	NPR
Potentially Acid-Generating (PAG)	< -20	< 1
Uncertain	-20 < NNP < 20	1 < NPR < 2
Non-Potentially Acid-Generating (NAG)	> 20	> 2

Source: INAP, 2019

The results of the ABA testing are presented below in Figure 20-1. Samples have been separated into three groups: saprolite, Cangrejos hard rock, and Gran Bestia hard rock. The horizontal lines and vertical lines in Figure 20-1 represent the different cutoff points shown in Table 20-2 above.

Figure 20-1: Graphic of ABA Results, by Location



Source: GRE, 2023.

Figure 20-1 shows that 83% of the current samples are non-acid generating or acid consuming (NPR >2). Despite the appearance of a distinction between Gran Bestia and Cangrejos-sourced waste rock samples, there is no statistically significant difference between Gran Bestia and Cangrejos sample populations (based on the student t-test, alpha of 95%).

Metals Analysis

Metals analysis of the rock mass can be used to screen out metals for consideration in future water quality analysis. This is best done by comparing the concentration in the rock sample with the average concentration of that metal in the earth's crust. In general, if a rock sample has a concentration of a metal that is greater than five times the crustal average, it can be considered to be "enriched" for that metal. The analysis shows that the following metals may be constituents of concern in future analysis of mine leachate water quality:

- silver
- arsenic (in saprolite)
- copper
- molybdenum
- selenium.

The following metals, frequently problematic in mine leachate water quality, appear to be near or below crustal averages:

- arsenic (in rock)
- cadmium
- chromium
- mercury
- lead
- zinc.

The results of the metals testing are consistent with the geology description of the site (See Section 7). Elevated copper and molybdenum are expected, but sulphides containing arsenic, zinc, and lead are not present.

Short-Term Leaching Tests

Twenty-four short-term leach tests (SPLP tests, see Section 20.1.2.3) were conducted on mine rock to determine if there are any readily soluble elements that could impact water quality. Sulphate concentrations in the leaching tests were at or below the detection limit of 2 mg/L, and all metals concentrations in SPLP leachate were below Ecuadorian environmental discharge limits as defined by TULSMA Table 9 (TULSMA, 2015). These results indicate that ARD and ML are not occurring over short-duration timelines.

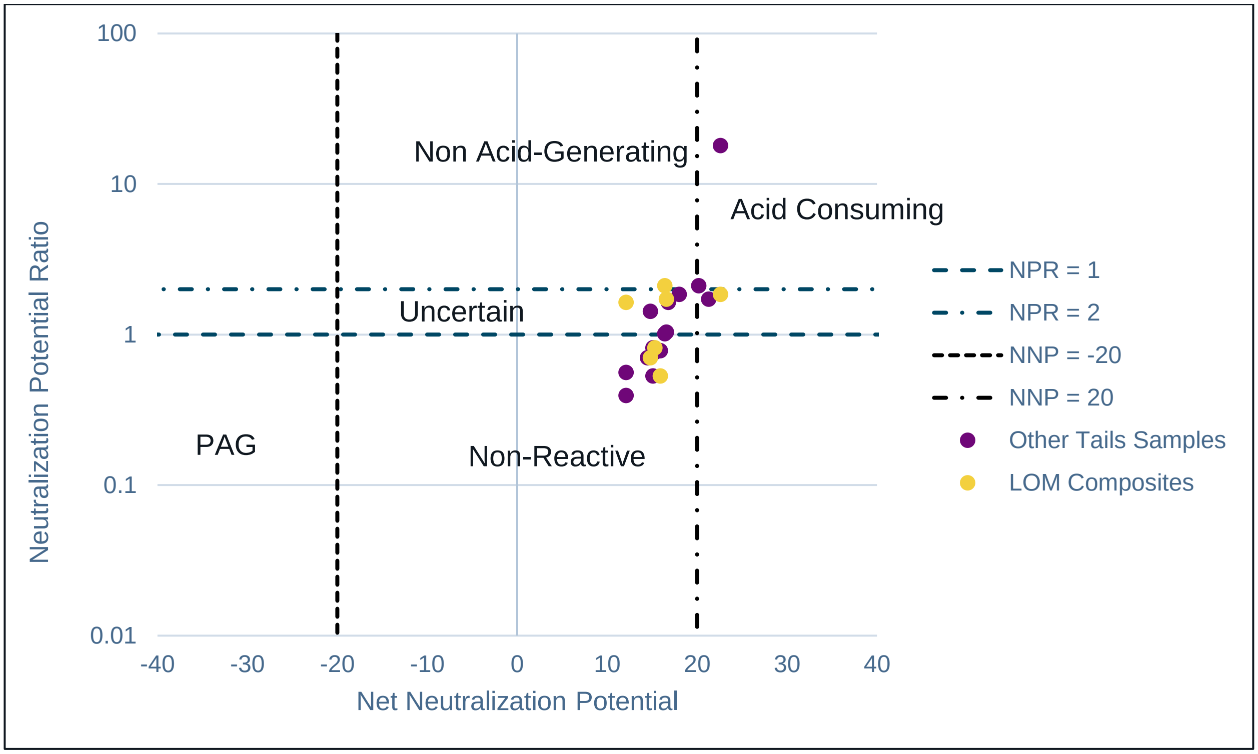
20.1.2.6 Static Testing Results: Tailings

The following sections describe the results of the static sampling of tailings.

ABA Results

The 2022 and 2023 ore variability metallurgical testing (see Section 13.3) produced 15 composite tailings samples. The results of the ABA testing of tailings are shown in Figure 20-2.

Figure 20-2: Graphic of ABA Results of Tailings Samples



Source: GRE, 2023.

The range of samples is between “uncertain” non-acid generating, and “non-reactive”; however, the total sulphide is generally low. This signifies that the total reactivity of the tailings may be low, and the net neutralization potential is generally constant around 15 t/kt $CaCO_3$ equivalent, but that additional testing and analysis may be required to determine if the tailings are PAG.

Metals Analysis

Metals concentrations in the tailings solids were compared to crustal averages. Only molybdenum and selenium were elevated in the tailings samples, which greatly decreases their ML risk.

Short-Term Leaching Tests and Supernatant

Short-term leaching tests were performed on the PEA tailings and on the 2023 LOM composite tailings as part of ore variability testwork. Tests from the PEA and the PFS were consistent, and no analytes, neither metals nor salts, exceeded regulatory standards (TULSMA, 2015). In particular, sulphate concentrations in all samples were less than 20 mg/L, and arsenic concentrations ranged from 0.011 mg/L to 0.0041 mg/L compared to the regulatory standard of 0.1 mg/L.

The mine tailings supernatant solution appears to be largely inert. Metals concentrations are low, and sulphate (which is often problematic in supernatant solutions) has a concentration of 540 mg/L in comparison to a surface water standard of 1000 mg/L (TULSMA, 2015). Therefore, the supernatant appears to be suitable for direct discharge (excluding any potential turbidity or sediment issues).

20.1.2.7 Kinetic Geochemical Testing Results

As mentioned in Section 20.1.2.4 above, the site has over three years of on-site kinetic testing results for waste rock and pit wall rock. The mine also has over three years of humidity cell testing of mine tailings.

Kinetic Testing Results, Waste Rock and Pit Wall Rock

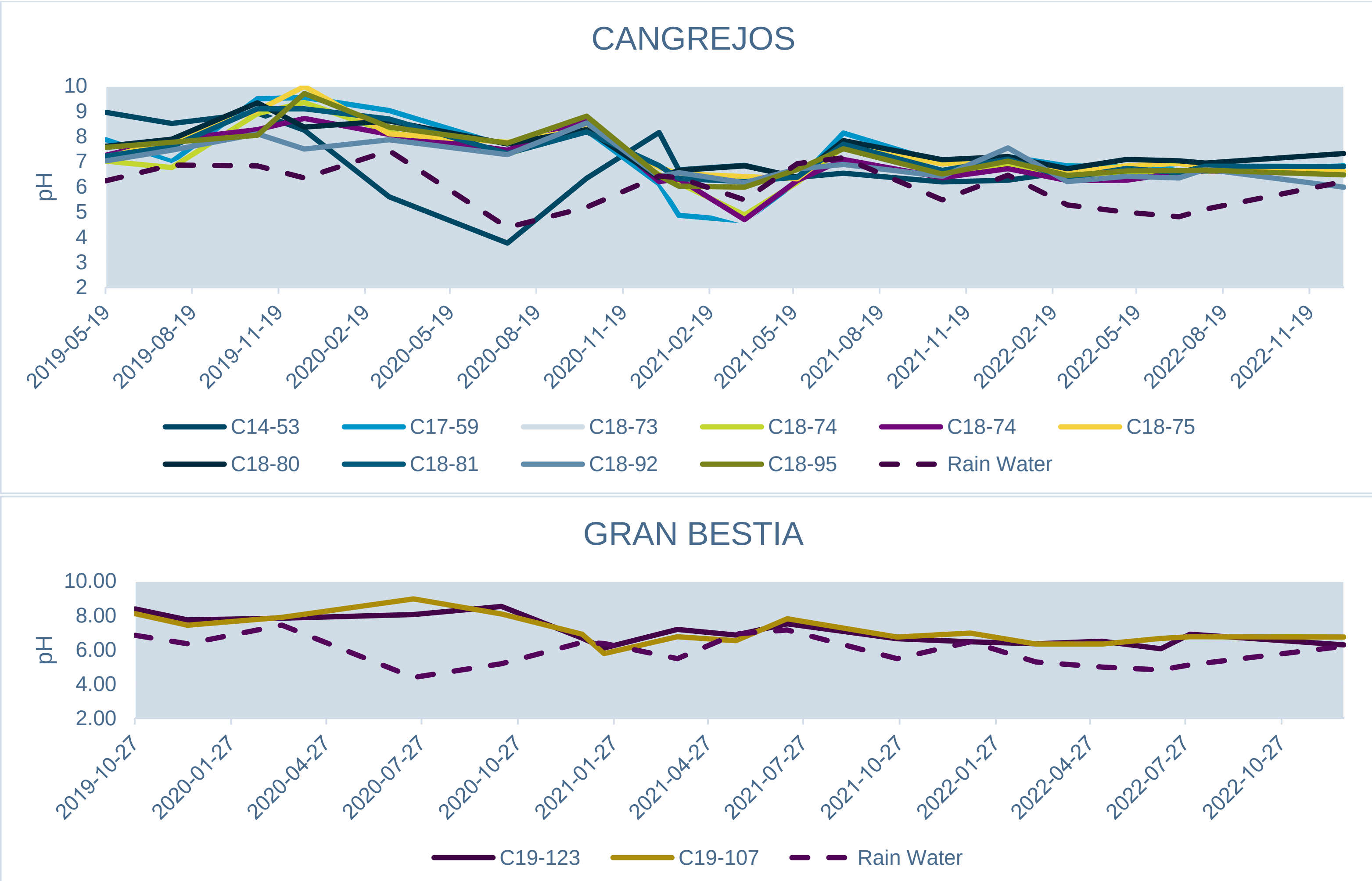
Figure 20-3 shows the results of the pH readings collected from the twelve on-site kinetic cell tests (ten containing Cangrejos pit waste rock and wall rock, and two containing Gran Bestia pit waste rock and wall rock).

The pH values have remained steadily and firmly neutral or slightly alkaline. A general reduction in pH from approximately 115 weeks until the present is because alkalinity has been leached off the rocks, making the leachate more similar to the pH of rainwater.

Bi-monthly leachate samples sent to the laboratory show that no ARD or ML has occurred. Sulphate analysis in the leachate is at or below detection limits (of 2 mg/L), and no metals or chemical parameters have had concentrations above Table 9 surface water standards (TULSMA, 2015). The results of long-duration kinetic testing of waste rock are the strongest evidence of the lack of ARD and ML risk in the future WRSF or pit wall rocks.

For the purposes of this technical report, an additional 10 kinetic cells with Gran Bestia waste rock were added to the ongoing program. These additional cells increase the representation of Gran Bestia-hosted waste rock to a ratio more equivalent to the mine plan’s balance between the two pits. As of the date of this technical report, these additional cells do not have enough samples to be relevant; however, none of them show ARD or ML.

Figure 20-3: On-site Kinetic Cell Leachate, pH Results

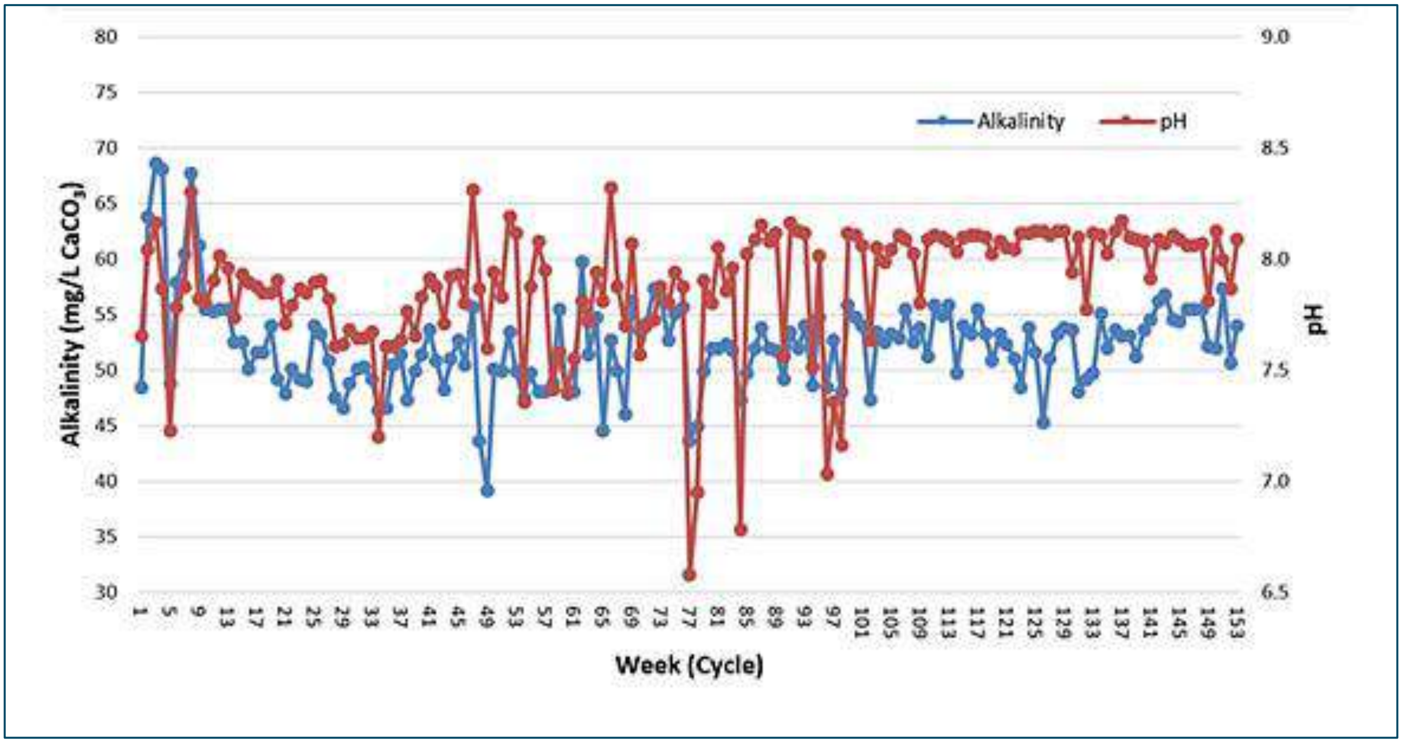


Source: GRE, 2023.

Tailings Kinetic Testing

Approximately three years (153 weeks) of humidity cell testing results have been generated from PEA mine tailings. These are summarized in Figure 20-4.

Figure 20-4: Parameters from Tailings Humidity Cell Test



Source: GRE, 2023.

Humidity cell results continue to show steady alkalinity and pH. An initial downward trend through cycles 1-40 is interpreted as the result of residual alkalinity in the tailings from mineral processing, and it is likely that this alkalinity will be slowly rinsed out even if sulphide oxidation is not occurring. Very low sulphate concentrations (2-3 mg/L in the last several cycles) are indicative of tailings that are geochemically inert. Very low concentrations of leachable metals indicate there is no evidence of metal leaching.

20.1.2.8 Environmental Geochemistry Conclusions

Based on the existing dataset, the geochemical risk from project waste rock and pit wall rock appears to be low to very low. This is due to the following factors:

- ABA testing shows that the waste rock and pit wall rock samples are nearly all non-PAG.
- Some uncertain samples have low total sulphides.
- Short-term metal leaching tests showed low metals concentrations.

- Long-duration (three year running period) on site kinetic testing shows that mine waste and pit wall rock leachate is pH neutral, low in sulphate, and low in metals.

Similarly, the dry-stack tailings appear to be a low geochemical risk due to the following factors:

- ABA testing shows that the tailings have residual neutralization potential and low total sulphides (less than 0.5%).
- Short-term metal leaching tests had low metals concentrations.
- Long-duration humidity cell kinetic testing was performed on tailings derived from the Cangrejos pit and showed no significant ARD production or metal leaching.
- Tailings supernatant appears to be suitable for direct discharge to the environment with only potential sediment control required.

Kinetic testing results of samples collected from both the waste rock and the post-mining pit walls strongly indicate that the post-mining pit lakes will contain water that will not be detrimentally impacted by geochemical reactions. Additionally, because groundwater is of good quality, (see Section 20.1.4.3 of the technical report) it is likely that the water in the post-mining pit lakes will meet surface water discharge standards.

Therefore, based on the information available, waste rock and tailings are assumed to be NAG and will have no significant impact on water quality from ML.

Continued kinetic testing of mine tailings and waste rock is recommended as the Project advances to Feasibility (see Section 26 of this technical report).

20.1.3 Environmental Monitoring

Health, safety, and environment (HSE) specialists routinely conduct environmental monitoring activities over multiple environmental media, in compliance with current exploration-phase EIA/PMA requirements for the C20 and Los Cangrejos concessions. These activities include:

- sampling and analysis of surface water quality from multiple stream locations
- sampling and analysis of effluent water quality from the camp septic system, and, when active, rock core saw operations
- sampling and analysis of water quality and measurement of flow volume for non-potable wash-water supplies from permitted sources, for Cangrejos and La Virtud Camps as well as temporary field camps
- periodic measurements of ambient noise and air quality
- assessment of biota (flora and fauna) in exploration clearance areas
- measurement of abstracted volumes of surface water used to support geological drilling operations
- forest inventories of trees >10 cm diameter requiring removal in order to conduct geological drilling operations
- monitoring of potential erosion conditions and, if required, the ongoing effectiveness of temporary control measures during drilling operations
- sampling and analysis of soils on drilling pads and access trails for potential contamination, prior to authorizing regrading and revegetation using native species
- monitoring of the long-term success of reclamation/revegetation efforts
- general biotic (flora, fauna) and macroinvertebrates monitoring at specific sites (multitemporal monitoring).

Environmental monitoring results are reported to MAATE twice a year. Current EIA/PMAs are also subject to biennial compliance audits by independent, MAATE-approved consultants, that also include sampling of water, soil, air quality, effluent discharges, and the monitoring of biota.

Odin has also conducted additional environmental baseline monitoring activities, over and above Ecuadorian regulatory requirements, to support the Project's initial PEAs as well as the PFS summarized in this technical report. Such activities have included:

- construction and maintenance of permanent flumes to measure streamflow in key hydrological basins and sub-basins potentially impacted by the Project
- additional streamflow measurements in free-flowing streams and rivers, using hand-held flowmeters
- additional water quality sampling and analysis from streamflow measurement locations
- collection of precipitation, humidity, air temperature, wind speed, and/or wind direction data from four meteorological stations
- regular sampling and analysis of water from kinetic cells constructed to assess geochemical properties of various rock types over time
- acquisition of water level measurements from multiple piezometer installations
- a regional ("desktop") biodiversity screening study (2017)
- dry and wet season field biodiversity studies (2019) and preliminary BMMP developed in conformance with IFC Performance Standard 6 (IFC, 2012)
- an initial biodiversity monitoring study (2023), in keeping with the requirements of the preliminary BMMP.

Environmental compliance and baseline monitoring is expected to continue as the Project progresses to a final FS and enters the exploitation phase. An expanded and detailed environmental compliance monitoring program appropriate for the construction and operation of the Project will be proposed and established in the exploitation phase EIA/PMA. Additional environmental monitoring actions may also be undertaken in response to specific lender standards and conditions, and as appropriate for the final project design. Examples of exploitation phase environmental monitoring program elements may include, but are not limited to, regular monitoring of:

- air sparging operations for mixing of high-strength cyanide solution, and the physical integrity of containments, piping systems, and other controls over cyanidation processes
- WAD cyanide values in detoxified tailings slurry
- integrity of tailings slurry and reclaim water pipelines
- physical integrity of stacked tails in the DSTF
- underdrain seepage water quality at the DSTF and WRSF
- groundwater samples from several monitoring wells placed downgradient of the DSTF, WRSF, hazardous materials/fuel storage tanks and containments, CIL/detoxification circuits, sanitary landfill, and other major elements of project infrastructure
- groundwater samples from one or more background monitoring wells located upgradient of the pits
- surface water/stormwater management pond and pit lake water quality
- industrial-, transportation-, and blasting-related noise and vibration

- septic system and other effluents
- potable water quality
- air quality associated with mobile and stationary machinery operation
- air quality associated with dry-season airborne dust from earthworks construction and progressive revegetation activities
- potential biological contaminants in stored fuel
- the relative success of progressive reclamation and revegetation programs
- hazardous and non-hazardous waste segregation and storage areas
- operation and progressive closure of the on-site municipal landfill and inert waste cells established in the WRSF.

20.1.4 Water Management

20.1.4.1 Hydrology

The Cangrejos Project is in the Oro Province. The climate at the site is characterized as tropical savannah (Aw) and warm semi-arid (BSh) according to the Koppen climate classification with two distinct seasons: the wet season January through April and dry season May through December. In general, the region experiences high rainfall, between 800 to 1500 mm per year with 150 to 200 rainy days per year.

Orthographic effects play an important part in the rainfall distribution across the Project with the highest rainfall at the top of the open pits and the lowest rainfall at the DSTF.

The weather stations located at the Project have been in operation for 1 to 5 years gathering data (see Table 20-3Table 20-3). There are a few gaps in the continuous readings. The data from these stations is insufficient to develop long-term meteorological conditions for the site; therefore, other resources were explored. Upon reviewing the National Institude of Meteorology and Hydrology *(Instituto Nacional de Meteorologia e Hydrologia, INAMHI)*'s local weather station data there were a number of gaps in their data set making it unusable for the Project.

Ausenco gathered satellite datasets from POWER-NASA (2022) and RAIN4PE (Climate Hazards Group InfraRed Precipitation). RAIN4PE was utilized since it has higher resolution to develop precipitation data that includes validation with ground-based precipitation. These satellite and model-based products have been shown to be sufficiently accurate to provide reliable solar and meteorological resource data over regions where surface measurements are sparse or non-existent.

According to the regional records reviewed, most of the stations presented precipitation records above average in 1998, when the most significant recent El Niño phenomenon occurred, affecting the Pacific coast of South America, especially Ecuador and Peru. The rainfall increased more than 50% compared to average years. The hydrology assessment results show that the site could be impacted by the El Niño phenomenon and this possibility has been taken into consideration in the precipitation and extreme storm assessment.

Table 20-3: Meteorological Stations

Station name	Cangrejos Alto Station	Cangrejos Bajo Station	Station #1	Station #2	VS 1(1) Satellite	RP 1(2) Satellite	RP 2(2) Satellite
Source	Mine	Mine	Mine	Mine	NASA	Rain4PE	Rain4PE
Elevation (masl)(3)	1140	336	90	331	-	-	-
Years of Available Data	08/21/2017(4) – 07/30/2022	12/31/2019 – 07/01/2022	03/09/2022 – 07/30/2022	05/12/2022 – 07/28/2022	1981 – 2022	01/01/1981 - 12/31/2015	01/01/1981 - 12/31/2015

Source: Ausenco, 2023.

Rainfall data from RAIN4PE was utilized to develop average monthly precipitation and extreme storm events for the Project. Two grid datasets were utilized to represent the project site: RP1 for the mine site and RP2 for the DSTF. Each dataset grid is 11.1 km by 11.1 km where the data is gathered for the area and is averaged. The data for PR 1 was compared to the site, the upper and lower Cangrejos weather station, and scaled appropriately for the lower station, which is at a lower elevation. The average annual and monthly rainfall for the Project is shown in Table 20-4.

Table 20-4: Average Annual and Monthly Rainfall for Cangrejos.

Month	Cangrejos Alto Area-RP1 (mm)			Cangrejos Bajo Area-RP1 (mm)			DSTF-RP2 (mm)		
	Average (mm)	Standard Deviation (mm)	% Annual	Average (mm)	Standard Deviation (mm)	% Annual	Average (mm)	Standard Deviation (mm)	% Annual
Jan	369	209	15	254	143	15	153	95	15
Feb	493	207	20	338	142	20	211	99	21
Mar	550	259	22	377	178	22	235	116	23
Apr	358	181	14	246	125	14	148	81	15
May	157	128	6	108	88	6	64	61	6
Jun	69	46	3	47	32	3	26	20	3
Jul	45	25	2	31	17	2	17	11	2
Aug	34	11	1	23	7	1	12	4	1
Sep	43	23	2	30	16	2	16	9	2
Oct	80	52	3	55	35	3	29	20	3
Nov	100	100	4	68	68	4	37	39	4
Dec	189	163	8	130	112	8	72	74	7
Annual	2,486	764	100	1,707	524	100	1,022	362	100

Source: RAIN4PE, 2023.

The wet and dry years were estimated using probabilistic statistical methods using the data from RAIN4PE. The estimated total annual rainfall values for both wet and dry years for different return periods is based on Log Pearson III distribution model of the datasets. The dry and wet year return periods for 10 to 500 years are presented in Table 20-5.

Table 20-5: Annual Precipitation for Wet and Dry Return Periods

Return Period (years)	Cangrejos Alto Area-RP1 (mm)		Cangrejos Bajo Area-RP1 (mm)		DSTF-RP2 (mm)	
	Dry Year	Wet Year	Dry Year	Wet Year	Dry Year	Wet Year
500	1,023	5,937	703	4,077	386	2,625
200	1,113	5,370	764	3,688	423	2,353
100	1,194	4,945	820	3,396	456	2,150
50	1,290	4,522	886	3,105	496	1,950
20	1,450	3,960	996	2,720	564	1,688
10	1,611	3,525	1,107	2,421	633	1,486

Source: Ausenco, 2023.

The time series data for RP1 and RP2 were used to develop maximum precipitation for storm event over time based on Log Pearson III distribution model of the datasets. Table 20-6 shows the 24-hour maximum precipitation from storms for return periods ranging from 2 to 2,475 years.

Table 20-6: 24-hour Precipitation for Different Return Periods

Return Period (years)	Cangrejos Alto Area-RP1 (mm)	Cangrejos Bajo Area-RP1 (mm)	DSTF-RP2 (mm)
2	139	114	71
5	239	164	102
10	290	199	123
20	341	234	144
50	409	281	172
100	464	318	195
200	520	357	218
500	598	410	250
1,000	661	454	275
2,000	727	499	302
2,475	758	520	315

Source: Ausenco, 2023.

The probable maximum precipitation (PMP) is the greatest amount of precipitation meteorologically possible for a given duration over a basin without taking into account long-term weather trends (WMO, 2009). The PMP is the precipitation that is the range of 100,000 and 1,000,000 years of return period (NRC, 1994).

The PMP was estimated using the Hershfield method (Hershfield, 1965). According to this method, the PMP of a certain duration is equal to the average of the maximum precipitation of the considered duration plus the respective standard derivation multiplied by a growth factor along with a reduction factor according to the catchment area related to the Project.

The PMP was estimated from the data from RP1 and RP 2. The results of PMP for 24-hour event are shown in Table 20-7.

Table 20-7: Probable Maximum Precipitation for a 24-Hour Event

Cangrejos Alto Area-RP1 (mm)	Cangrejos Bajo Area-RP1 (mm)	DSTF-RP2 (mm)
1,222	922	923

Source: Ausenco, 2023.

The mine weather stations have multiple years of temperature data for the Upper and Lower Stations and were used to develop average monthly temperatures for the site (See Table 20-8). Station #1 and Station #2 have too short of a recording period to accurately predict average monthly temperatures. The Santa Rosa weather station was therefore used to predict average monthly temperatures for the DSTF. The historical data for the Cangrejos Alto Station shows that the air temperature ranged from a daily minimum of 15°C in November to a daily maximum of 24°C in August. The Cangrejos Bajo and Alto stations had higher values ranging from a daily minimum of 19°C to a daily maximum of 31°C. The Santa Rosa Station had the highest values ranging from a daily minimum of 21°C to a daily maximum of 32°C.

Table 20-8: Monthly Average Temperature

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cangrejos Alto Station	19	18	19	20	19	19	19	19	19	19	18	19
Cangrejos Bajo Station	26	26	26	27	24	23	22	23	23	23	23	24
Santa Rosa Station	27	27	28	28	27	26	25	25	25	25	25	27

Source: Ausenco, 2023.

Monthly evaporation rates were developed for the Project using site and local weather stations. The Thornwaite method was utilized to develop monthly evaporation values for the Project. This method uses monthly average temperatures along with latitude data for the Project to predict monthly average evaporation for the Project (see Table 20-9).

Table 20-9: Average Monthly Evaporation

Month	Mine Site Higher Elevation (mm)	Mine Site Lower Elevation (mm)	DSTF (mm)
Jan	94	134	141
Feb	86	122	127
Mar	95	137	146
Apr	93	135	141
May	95	119	133
Jun	87	106	120
Jul	90	108	122
Aug	92	110	120
Sep	92	108	117
Oct	92	112	121
Nov	88	107	118
Dec	95	123	138
Annual	1,106	1,433	1,544

Source: Ausenco, 2023.

To determine wind speed and direction at the Project, information from the Cangrejos Alto and Bajo stations was used. There was insufficient data from Station #2 to be useful for the DSTF, therefore data from the weather station in Santa

Rosa was used. The Cangrejos Bajo Station's data shows that the zone is characterized by "calm" winds according to the Beaufort scale, with an average annual speed of 0.3 m/s, in which the predominant wind directions come from the southwest this could be due to the weather station surrounded by forest. The Cangrejos Alto Station shows that zone is characterized by "light air" winds according to the Beaufort scale, with an average annual speed of 1.5 m/s, in which the predominant wind directions come from the north-northeast. The Santa Rosa Station shows that zone is characterized by "fresh breeze" according to the Beaufort scale, with an average annual speed of 9.8 m/s, in which the predominant wind directions come from the north-northeast. The wind speeds are shown in Table 20-10.

Table 20-10: Monthly Average Wind Speed for Mine Stations

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cangrejos Alto Area	1.30	1.40	1.50	1.50	1.50	1.50	1.50	1.80	1.20	1.20	1.10	1.00
Cangrejos Bajo Area	0.23	0.27	0.30	0.24	0.17	0.17	0.28	0.28	0.26	0.30	0.21	0.22
DSTF	10.1	9.8	8.9	8.0	7.9	7.9	8.0	8.8	9.6	10.1	9.8	9.8

Source: Ausenco, 2023.

20.1.4.2 Main Mine Facilities Runoff

The Table 20-11 shows the estimated flow rates of the main mining components for different scenarios. These components consider both the runoff that falls into the component itself and its natural areas as well as the flow that comes from the DSTF.

Table 20-11: Runoff Flow Rates for Main Mining Components

Mine Facilities	Production Rate (t/d)	Drainage Area (km²)	Average Annual Flow (m³/h)			Monthly Maximum Flow (m³/h)		
			Climate Scenario			Climate Scenario		
			10 Yr Dry	Normal Yr	10 Yr Wet	10 Yr Dry	Normal Yr	10 Yr Wet
Cangrejos Pit	30,000	1.27	215.2	332.0	470.8	554.9	856.1	1214.0
	60,000	1.66	279.4	431.1	611.4	720.5	1112.0	1577.0
	80,000	1.88	316.2	487.8	691.8	815.3	1258.0	1784.0
Gran Bestia Pit	30,000	0.02	3.0	4.6	6.5	7.7	11.8	16.8
	60,000	0.18	26.7	41.3	58.5	68.9	106.4	150.8
	80,000	1.28	190.8	294.5	417.6	492.1	759.3	1077.0
DSTF	30,000	4.98	246.0	397.2	577.5	659.8	1065.0	1549.0
	60,000	4.98	246.0	397.2	577.5	659.8	1065.0	1549.0
	80,000	6.87	386.5	624.1	907.4	1037.0	1674.0	2434.0
WRSF & SSP	30,000	1.70	159.5	245.9	348.7	411.2	634.1	899.3
	60,000	3.09	244.3	376.7	534.3	630.0	971.5	1378.0
	80,000	4.70	417.5	643.9	913.1	1077.0	1660.0	2355.0

Source: Ausenco, 2023.

Based on the runoff model, the site is in an excess rainfall area and there is sufficient makeup water available from site contact water to supply all Project needs [i.e., process water and (subject to processing in a wastewater treatment plant) gland water, reagent mixing water, and water for potable use)].

20.1.4.3 Groundwater Impact Model

An evaluation was conducted to determine if the pit dewatering would impact local groundwater resources. This evaluation was performed by creating a transient hydrogeologic predictive model of the development of the Gran Bestia and Cangrejos pits within the Seep 3D modeling platform (GeoStudio, 2021). This is a three-dimensional expansion of the Seep 2D model which was used for the pit dewatering model in support of the pit slope stability modeling efforts (see Section 16.4.1.1). The model domain covered the drainage basins that contain the Cangrejos and Gran Bestia pits downstream as far as the junction with the Rio Biron.

The hydrogeologic data for the 3D model was derived from the hydrogeologic characterization program for the pit (see Section 16.3), and from aquifer tests performed in geotechnical borings at the toe of the WRSF. The model simulated the pit development timeline by migrating through several yearly pit shells: Year 5, Year 15, and Year 25.

The impact to local hydrogeologic resources can be assessed by looking at the following metrics (Anderson & Woessner, 2015):

- Cone of drawdown: This is a rendering of the change in pre-mining water levels that results from the pit development.
- Change in baseflow: In the dry season, streams are at "baseflow" conditions and flow in streams is nearly 100% sourced from groundwater. Thus, potential impacts to the groundwater regime in the project area could decrease baseflow and downstream water availability. Therefore, it is necessary to calculate the percent decrease (if any) in dry season groundwater flow as a function of time and attributable to pit dewatering.

The cone of drawdown for the 3D model was very close to the pit, extending ~200 m. from the pit rim in the downstream direction and ~250 m. from the pit rim in the upstream direction. This narrow cone of drawdown is the direct result of extremely tight bedrock discovered in the packer test program (see Section 16.3)

The change in baseflow was calculated by determining the stream base flow and comparing it to the dewatering volume attributable to groundwater seeping into the pit. Three years of flume data have been compiled to quantify stream baseflow. The PA-05 Parshall flume was installed on a river upgradient from the confluence of the streams draining the project in order to quantify the baseflow at the downgradient edge of the pits and WRSF area. Baseflow in the stream at this location is between 100 and 130 L/s.

Table 20-12 shows the results from the 3D Pit Dewatering Model as a function of Mine Life and season.

Table 20-12: 3D Pit Dewatering Model Results

Mine Life Period	Cangrejos Pit Dewatering Rate (L/s)		Gran Bestia Pit Dewatering Rate (L/s)		Combined Pits (L/s)	
	Wet season*	Dry Season**	Wet season	Dry Season	Wet Season Total	Dry Season Total
0 to 5 years	29	22	18	4	47	26
5 to 15 years	43	21	40	16	83	37
15 to 25 years	48	18	15	2	63	20
*Wet season is average of December-June results						
**Dry Season is the average of July-November results						

Source: GRE, 2023.

The groundwater model predicts the following:

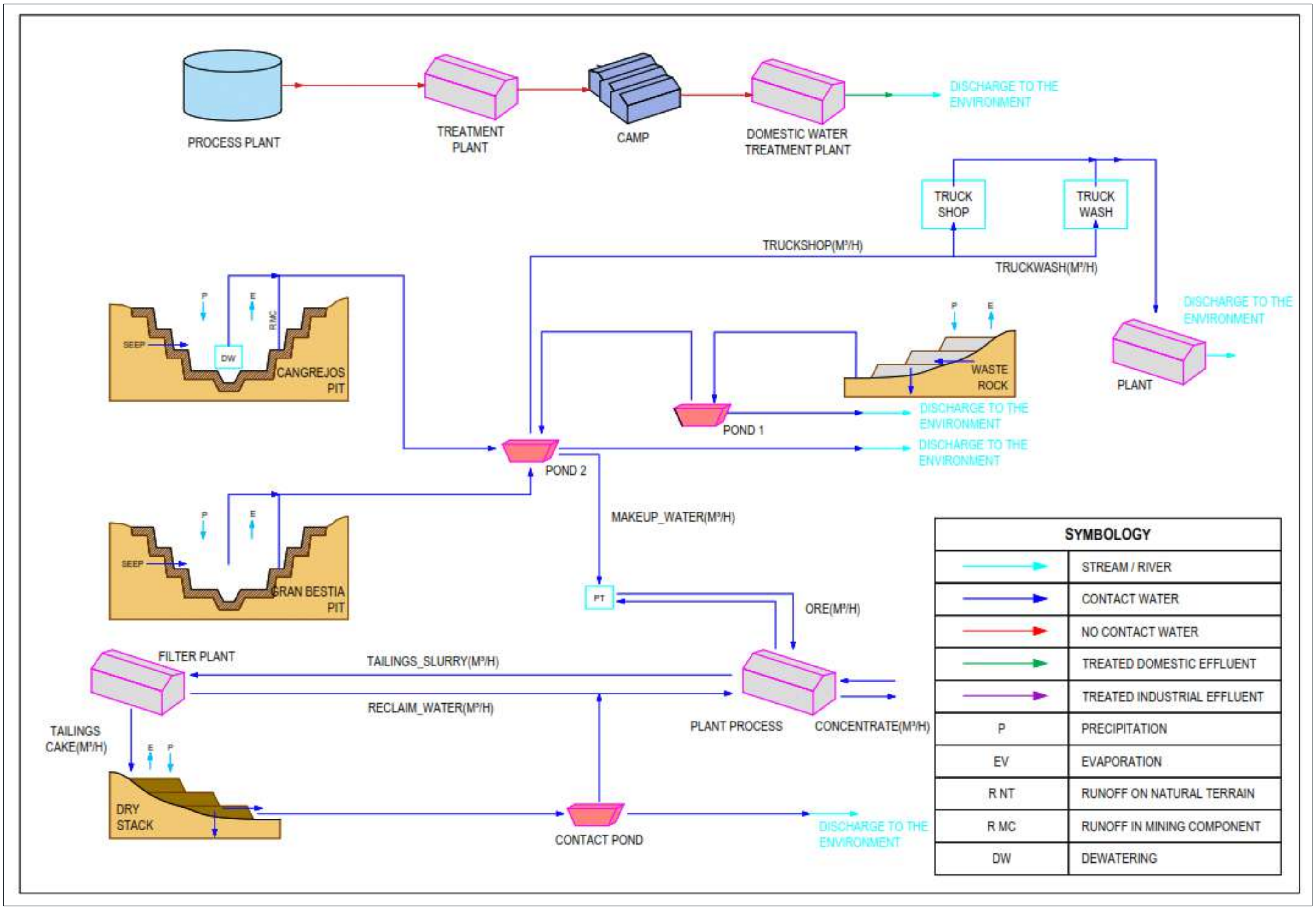
- Dewatering rate has a strong seasonal component resulting from the dewatering rate of the saprolith in a high-recharge environment.
- Later in mine life, there is slightly lower dewatering because the deeper pit does not produce water, and the saprolith formation on the pit rim has been drained out (except for seasonal recharge).
- Overall groundwater-sourced dewatering rates are low considering that the pits have a surface area (2D) of 2.8 km2 , a maximum depth of ~ 500 meters.
- Wet-season direct precipitation on the pits is from between 270 and 380 L/s (see Section 5.2). Wet season dewatering from groundwater is ~15% of total dewatering early in mine life and ~20% of dewatering later in mine life.

The results of the groundwater modeling show that the baseflow impact of dewatering the two pits is generally low. The cone of drawdown is located in the immediate vicinity of the pits and presents no risk to local groundwater resources. This result is attributable to the low-conductivity bedrock and the thin saprolite cover in the pit rim.

20.1.4.4 Site Water Balance

The site water balance model for the Project was developed using the GoldSim© 12.0 (GoldSim Technology Group, 2014) computer modelling platform. This platform allows the simulation of a system, in this case a mine, to understand the factors that affect a system and to make predictions about its future behaviour, such as mine site water balance. Mine water balance focuses on tailings operations since it is one of the largest consumers of water. The model has been developed from climatological information of precipitation and evaporation that can be seen in Section 5.2, data on runoff and evaporation coefficients in Section 20.1.4.1 and mine operation data in Section 16. The flow from each source is illustrated in the water balance schematic (see Figure 20-5). Each solution in the system is called a system embodiment. Each realization represents a possible path of the system through time. The water balance model was developed for different climatological and production rate change scenarios over the life of mine using monthly time-steps.

Figure 20-5: Water Balance Schematic



Source: Ausenco, 2023.

The water balance components for the Project include:

- Cangrejos Pit
  - direct precipitation on the Cangrejos pit
  - seepage from the pit walls
  - runoff from undisturbed areas
  - evaporation
- Gran Bestia Pit
  - direct precipitation on the Gran Bestia pit
  - seepage from the pit walls

- runoff of the undisturbed areas
- evaporation

- WRSF and SRSF
  - direct precipitation on the waste rock and saprolite/saprock surface
  - recharge into old channels below the facilities.
  - runoff of the undisturbed areas
  - evaporation
  - seepage losses to the environment
- Dry-stack Tailing Facility
  - direct precipitation on the DSTF
  - shallow groundwater and seepage from the tailings
  - runoff from the undisturbed areas
  - evaporation
  - seepage loses to environment
- Water Storage Pond 1
  - direct precipitation on the pond
  - evaporation
  - contact water from surface and underdrain water
  - makeup water pumped to pond 2
  - excess water released to the environment
- Water Storage Pond 2:
  - direct precipitation on the pond
  - evaporation
  - water pumped from pond 2
  - Pumped water from pit dewatering
  - excess water released to the environment
- Sediment Ponds:
  - direct precipitation on the pond
  - evaporation
  - runoff from DSTF
  - excess water released to the environment
- Plant Process

- water contained in ore
- water contained in concentrate
- makeup water from filter plant and ponds 1 and 2

- Filter Plant
  - water contained in detoxified slurry taillngs
  - water going to DSTF as part of filter cake
  - water reclaimed as part of filtration process and recycled back to process plant
- Mine Infrastructure Area
  - water consumed for operations
- Campsite
  - water consumed for operations
- Water Treatment Plant
  - water from process water tank
  - potable water to campsite, MIA and filter plant
  - water to gland seal and reagent mixing
- Domestic Wastewater Treatment Plant
  - Black and grey water from camp, MIA and filter plant
  - treated water discharged to the environment.

For the water balance, a system was designed to preferentially utilize contact water from the mine infrastructure. Under normal circumstances, the water balance will perform as a closed-loop system. External resources such as groundwater and abstracted surface water will not be required. Therefore, two large storage water storage ponds were designed to capture contact runoff during the wet season, to be utilized during the dry season for makeup water. The ponds are lined with geomembrane to reduce seepage losses and facilitate sediment removal. Based on the geochemistry of project ore and waste material, there should not be a water quality issue, except sediment, which should be handled by the large ponds and excess water can be directly discharged to the environment. Water quality monitoring will be performed on a regular basis and if the water does not meet discharge standards, it will be pumped to the water treatment plant.

The results of the site water balance give us the average annual flow rates and the average maximum monthly flow rates for each component of the Cangrejos Project.

20.1.4.5 Site Water Balance Results

The site water balance was run for 30 kt/d, 60 kt/d and 80 kt/d considering 10-year dry event, average annual event, and 10-yr wet event. The water balance looked at water demands for various components over the life of the Project, focusing on makeup water, deficit, and excess water to determine sizing of water storage ponds for the Project. Figure 20-6, Figure 20-7, and Figure 20-8Figure 20-6Figure 20-8 show the site's water demands and discharges to the environment across the site for different production rates and climatic conditions. Table 20-13Table 20-13 presents a summary of the average annual and average monthly makeup water flows required for the Project, which serve to size the two water storage ponds shown in Table 20-13 and Table 20-14.

Table 20-13: Results of Makeup Water Requirements

Mine Facilities	Production Rate (t/d)	Average Annual Flow (m³/h)			Monthly Maximum Flow (m³/h)		
		Climate Scenario			Climate Scenario		
		10 Yr Dry	Normal Yr	10 Yr Wet	10 Yr Dry	Normal Yr	10 Yr Wet
DSTF Sediment Ponds	30,000	24.4	18.4	11.6	79.0	75.2	74.5
	60,000	34.9	33.1	25.6	121.4	115.0	108.5
	80,000	45.4	33.4	29.9	129.2	126.0	124.2
Water Storage Pond 1& 2	30,000	177.3	183.4	190.1	201.7	201.7	201.7
	60,000	370.2	368.4	377.7	403.3	403.3	403.3
	80,000	492.4	504.4	507.9	537.8	537.8	537.8

Source: Ausenco, 2023.

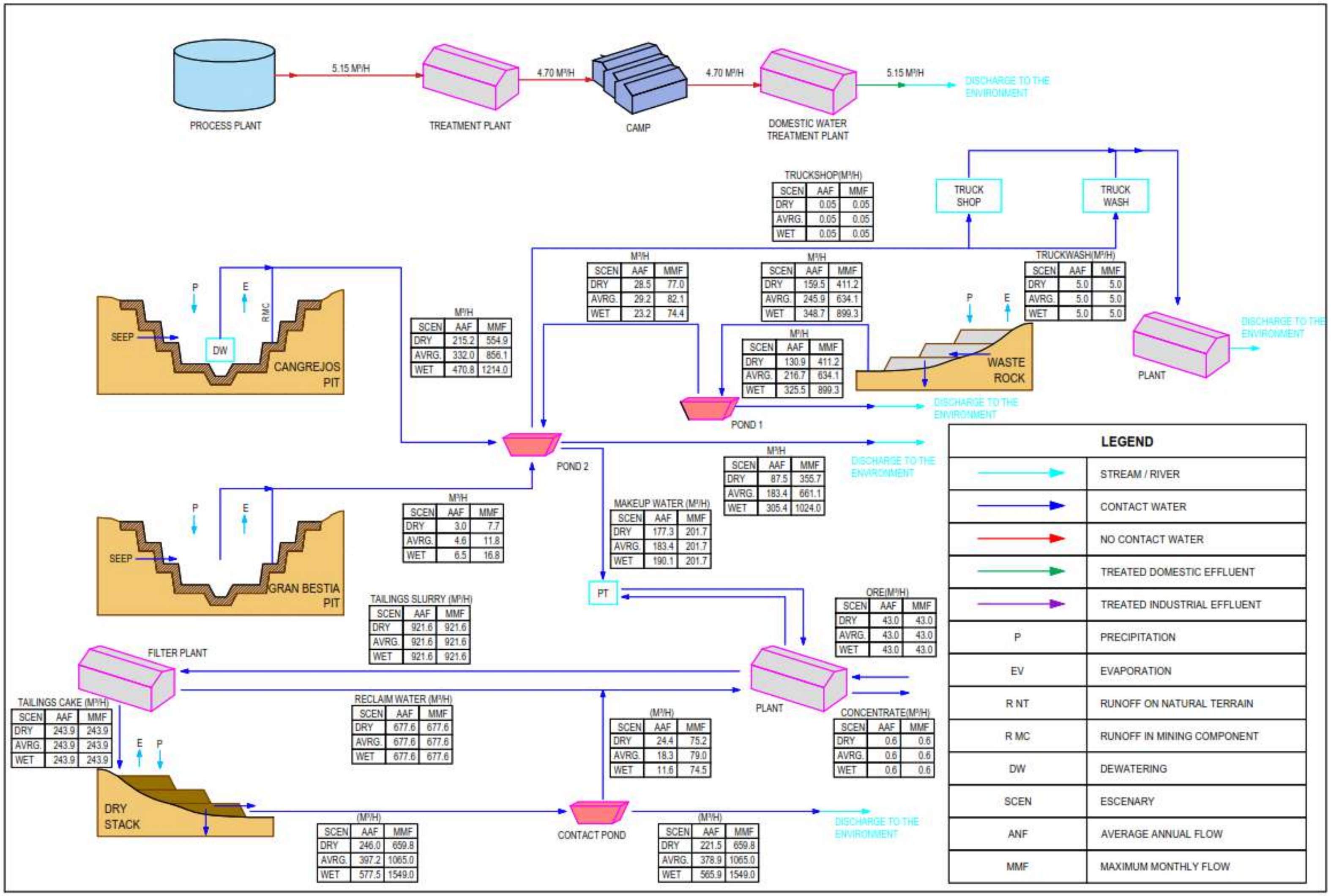
Table 20-14: Water Storage Pond Requirements

Mine Facilities	Production Rate (t/d)	Volume Requirements (Mm³)		
		Climate Scenario		
		10 Yr Dry	Normal Yr	10 Yr Wet
Water Storage Pond 1& 2	30,000	0.2	0.1	0.0
	60,000	0.8	0.4	0.2
	80,000	0.8	0.3	0.1

Source: Ausenco, 2023.

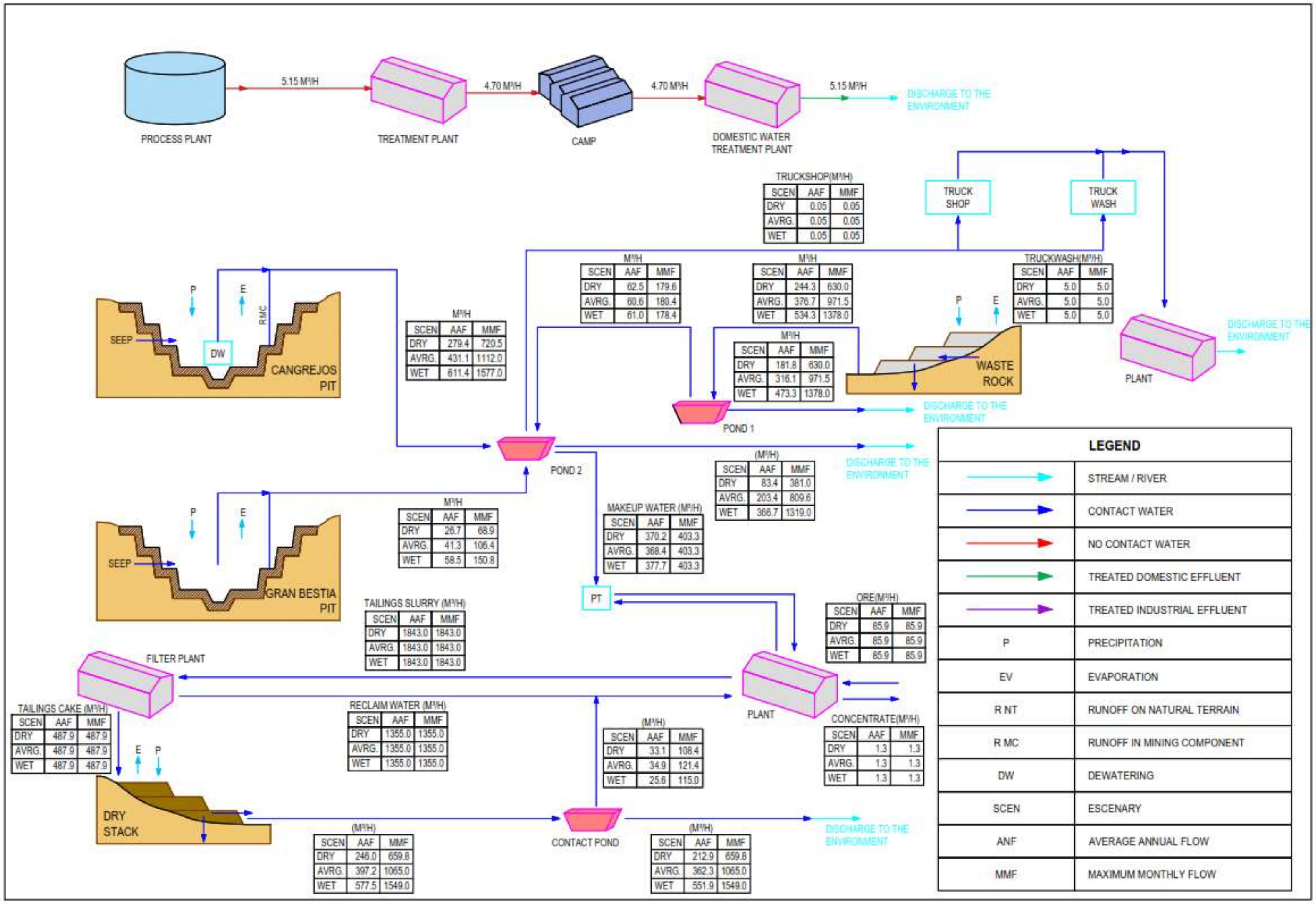
The results show that only a small portion of the surface runoff and underdrain water is required for makeup water from the DSTF contact water and the majority of the flow could be discharged to the environment, if necessary, if tested and, as necessary, treated to meet applicable water quality standards. The major source of makeup comes from the open pits and WRSF and another source of makeup water is may not be required. Potable water will come from treating water from the open pit and WRSF. Based on the monthly makeup requirement during the dry season, both 60 and 80 kt/d phases require water storage facilities with a minimum capacity of 800,000 m^3. The total design storage capacity for Pond 1 and 2 together is 900,000 m3, providing an additional 12% storage capacity.

Figure 20-6: 30 kt/d Water Balance Schematic



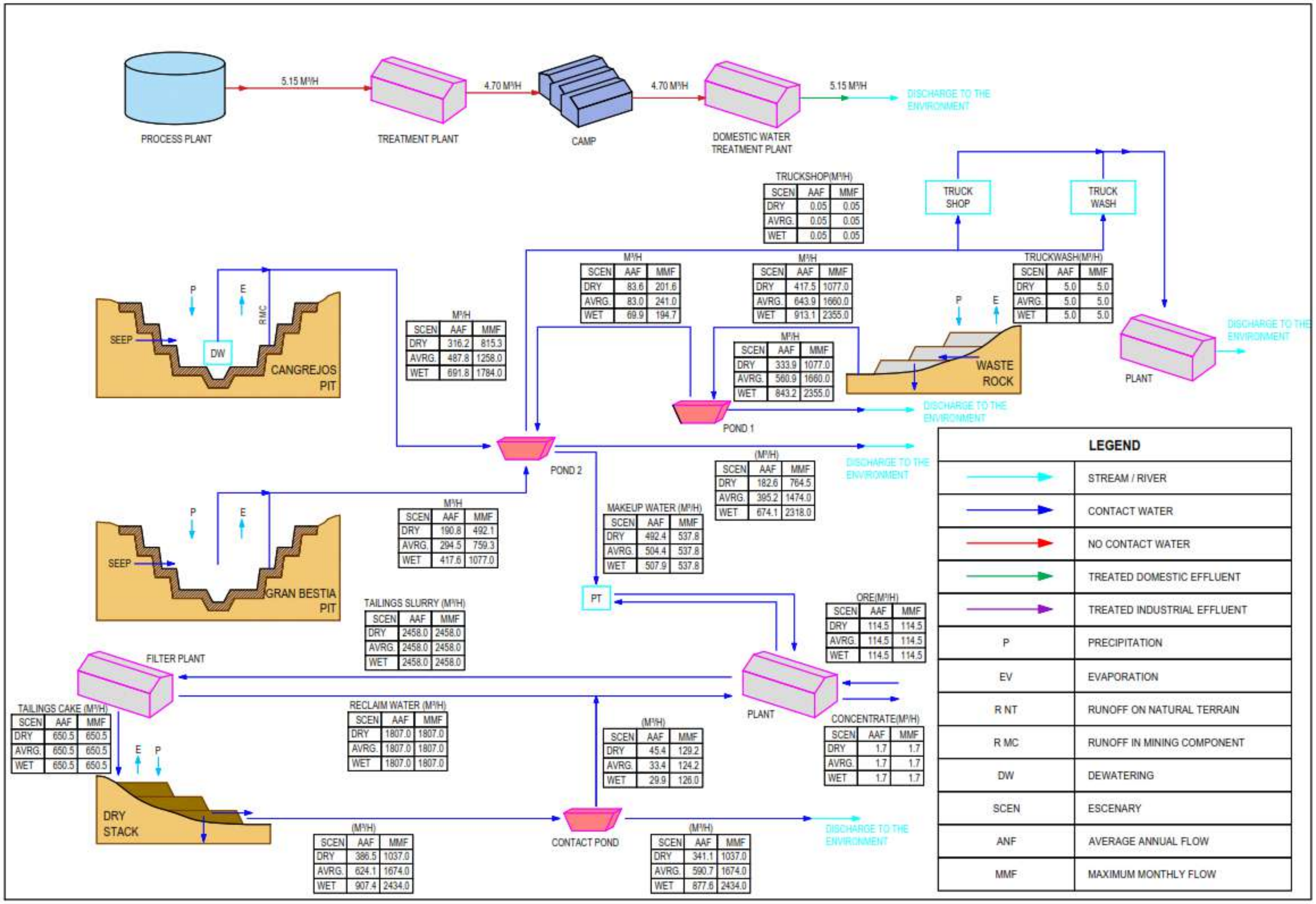
Source: Ausenco, 2023.

Figure 20-7: 60 kt/d Water Balance Schematic



Source: Ausenco, 2023.

Figure 20-8: 80 kt/d Water Balance Schematic



Source: Ausenco, 2023.

The site water balance analysis has been carried out considering different climatological conditions, ranging from a dry, to average to a wet scenario along with different production rates planned in the life of the Project. The results of the water balance demonstrate that the Project is in an excess water climate and that there is sufficient contact water to provide sufficient makeup for all project uses over the life of mine. In some conditions there may be a high volume of contact water that could be discharged directly into the environment, provided that it is tested and, if necessary, treated to meet Ecuadorian water quality standards. In the next FS phase, a water quality model needs to be developed to validate this approach and help refine the design of collection and retention ponds, potential in-pond treatment systems, and engineered discharge structures.

20.2 Closure and Reclamation Planning

20.2.1 Closure and Reclamation Plans

At the present stage of the Project, a conceptual closure strategy has been developed to provide the basis for estimating closure costs. Ecuadorian Mining Law defines mine closure as "…the termination of mining activities and the subsequent dismantling of the facilities used in any of the above-mentioned stages, unless they are of public interest, including environmental remediation in accordance with the closure plan duly approved by the competent environmental authority." It also requires revegetating disturbed areas; ensuring compliance of any water discharged to natural waterways with applicable discharge standards; and recovering the condition of the environmental AOI to a land use generally consistent with pre-mining conditions.

Primary considerations in the development of the Project's closure strategy are presented in the following subsections. This strategy will be adjusted as necessary to accommodate final FS-level design changes, and embodied in the Mine Reclamation and Closure Plan, which will be managed as an element of the project Environmental and Social Management System (ESMS).

20.2.1.1 Mine Waste Management

Tailings and waste rock are the primary waste materials generated in hard-rock mining; for conceptual closure planning purposes, it is assumed that geotechnical slope stability for the DSTF and the WRSF will have been achieved and verified through ongoing monitoring over the years of mine operation. At the time of closure, the physical stabilization of dry-stacked tails and waste rock will require strong focus on the prevention of erosion, which can be accomplished with effective surface water drainage and successful revegetation. Preventing erosion in a high-energy precipitation environment does require limiting the total unbroken slope length and limiting the maximum slope of the storage facilities. The WRSF and DSTF will therefore be progressively regraded from the bottom or toe of each facility to create a series of low-angle slopes and benches. Each bench will have an upstream drainage channel graded to carry precipitation laterally, connecting to engineered channels constructed on both sides of the facility. These channels will be protected from erosion with rock and/or concrete armoring. Regraded slope faces and benches will be progressively covered with a topsoil/mulch cover (reserved in separate stockpiles during the original environmental clearance), and hydroseeded, if necessary, with an appropriate native species seed/mulch blend to augment natural growth from the seed load contained in the reserved mulch.

Chemical stabilization is focused on the management of leachate and/or runoff water quality from the DSTF, WRSF, and pit lakes. The primary potential impact of concern to water quality in closure is acid rock drainage (ARD). As noted in Section 20.1.2.8, the geochemical characterization of mine waste strongly suggests that it will be non-acid generating

(NAG) and will not leach detrimental metals or salts. As a result, it is assumed that implementation of the requirements for physical stabilization and revegetation will also be sufficient to also achieve chemical stabilization.

20.2.1.2 Reclamation and Revegetation

Reclamation and revegetation of the site's environmental clearance areas (less the pit lakes) to approximate pre-mining conditions using native species will be an essential objective of the Project's Mine Reclamation and Closure Plan. Topsoil and/or mulch reserved from environmental clearance activities must be placed over regraded (and as necessary, recontoured) surfaces, and stabilized against erosion until such time as a healthy and sustainable vegetation cover can be established.

20.2.1.3 Haul Roads and Access Roads

The working roadways connecting the open pits, crusher/run-of-mine (ROM) stockpile, the mineral separation facility, DSTF, WRSF, machine shops, camps, and other ancillary facilities will be reclaimed at closure. Primary access roads will be retained to facilitate pos-closure monitoring and will be closed or turned over to the government at the end of the post-closure period. It is also assumed that local stakeholders will wish to preserve an access road to upland areas east of the Project's environmental AOI, near the Cangrejos and La Virtud camps and the original access road from Biron.

Road alignments will be regraded and cross-ditched as needed to properly manage surface water flows. After grading, roadways will be revegetated by scarifying the compacted road surface, placing a thin layer of organic soil/mulch, and re-seeding/replanting the soil with native species. It is expected that a substantial portion of the cut/fill slopes adjacent to the road surface will already be naturally revegetated by the time the mine enters closure.

The tailings/reclaim water pipeline corridor will be reclaimed using the same general design criteria as the haul roads, giving due consideration to the closure phase version of the BMMP for the establishment and maintenance of faunal passageways and environmental corridors to ecological offset areas.

20.2.1.4 Demolition

For the mineral processing facilities, it is generally assumed that there will be a residual salvage or resale value for decommissioned conveyor systems, pipelines, processing equipment, structural steel components, tanks, pumps, motors, generators, and other machinery. Vehicles and heavy equipment are also assumed to have a residual resale value at the end of operations.

Prior to demolition, the air sparging system, high-strength cyanide solution tanks, the CIL, and other elements of cyanidation infrastructure will be rinsed, and the rinsate processed through the cyanide detoxification circuit before controlled discharge. This will permit the scrapping and recycling of metal components and the placement of other non-recyclable detoxified cyanide-management infrastructure demolition waste within inert (non-hazardous) disposal cells in the WRSF.

All site buildings will be razed; no secondary industrial use of any site facilities is currently anticipated. Concrete pads and impoundments will typically be broken up in place to restore the hydrogeologic drainage capabilities of the underlying soil. Foundation footings and piers below grade will be left in place. All disturbed areas will be graded to drain, covered with an appropriate layer of topsoil/mulch, and revegetated.

20.2.1.5 Conceptual Closure Strategy

With the forgoing general points in mind, Table 20-15 presents a compilation of specific conceptual closure strategies based on the current project design that address the physical closure of the open pits, crusher, conveyor systems, aerial conveyor system, mill, tailings and filtration plant reclaim pipelines, DSTF, WRSF, mineral processing plant, CIL circuit, power lines, mining roads, structures, facilities, and other supporting infrastructure. The primary regulatory obligations of the Project at closure are also considered.

Table 20-15: Conceptual Closure Strategy

Facilities/Areas	Conceptual Closure Strategy	Notes/Assumptions
1. Open pits	• Cease dewatering, allow pit lakes to develop to a stable elevation that covers any potential sulphide zones in the pit wall. • Install permanent security berm and fencing around full perimeter of pits to prevent human/ faunal ingress to pit walls and lake areas. • Create engineered spillways and drainage channels to connect pit lakes to natural watercourses at the desired elevation. • Review adequacy of constructed wetland/weir biodiversity refuge areas upgradient of surface water diversion channels for passive management of post-mining conditions, and upgrade as required. • Evaluate any potential for reservation of aquatic habitat in-pit lakes for sensitive local aquatic species, per closure phase BMMP requirements. • Evaluate potential for beneficial diversion of pit water to augment local dry season river flows via passive siphon and pipeline. • Evaluate potential for pit lakes to attract waterfowl and other invasive species and develop appropriate non-lethal untended hazing protocols that can be implemented post-closure.	• Assumes pit lake effluents will meet applicable Ecuadorian discharge standards; if noncomplying conditions are encountered in closure, an appropriate passive effluent capture and treatment system will need to be designed and constructed. • Potentially beneficial uses of pit lake water for augmenting irrigation water supplies will require negotiation with local communities, MAATE, and other responsible agencies.
2. WRSF	• Evaluate economic benefits for limited use of waste rock in local communities as structural fill; if economic, set aside a portion of the WRSF for such ongoing use. • For WRSF areas not set aside, or if economic beneficial use is not possible, close any inert waste cells, regrade WRSF surface to designed closure angle, slope to permit free drainage with no ponding, cover with topsoil/mulch, and revegetate with native species (giving due consideration to BMMP requirements for the establishment of environmental corridors to ecological offset areas). • Review adequacy of constructed wetland/weir biodiversity refuge areas upgradient of diversion channels for passive management of post-mining conditions, and upgrade as required. • Review adequacy of downstream diversion channel convergence/ energy dissipation structures for passive management of post-mining conditions, and upgrade as required.	• Assumes any waste rock borrow areas will be physically separated from non-hazardous inert waste cells constructed in the WRSF. • Schedule WRSF closure after beneficial use options have been examined and after disposal cell receives all concrete rubble/ inert waste from decommissioning. • Assumes no potentially acid generating (PAG) waste rock will exist in the WRSF stockpile. • Assumes that underdrain effluent and runoff from the WRSF surface will not require post-closure treatment in order to meet applicable Ecuadorian effluent standards.
3. DSTF and Water Diversion, Water Management, and Potential Convergence/Discharge Structures	• Regrade DSTF benches to final designed slope angle and to permit free drainage with no ponding, cover with topsoil/mulch, and revegetate with native species (giving due consideration to the BMMP for establishment of corridors to ecological offset areas). • Review adequacy of constructed wetland/weir biodiversity refuge areas upgradient of diversion channels for passive post-mining conditions, and upgrade as required. • Review adequacy of underdrain performance and downstream diversion channel convergence/energy dissipation discharge structures for passive post- mining conditions; upgrade as required.	• Assumes that underdrain effluent and runoff from the stacked tailings mass will not require post-closure treatment in order to meet applicable Ecuadorian effluent standards.
4. DSTF Filtration Plant	• Remove filter press, motors, pumps, and other major equipment items, and sell for reuse. • Disassemble/cut up tanks, piping system components, decking, and machinery support structures, and recycle as scrap metal. • Demolish buildings; sell roofing, doors, other valuable components for reuse or for scrap. • Raze concrete foundations and structures to ground surface, regrade as required, place rubble in waste rock stockpile disposal cells, cover with topsoil/mulch, and revegetate cleared and regraded plant area with native species (giving due consideration to the BMMP for establishment of corridors to ecological offset areas).	• Assumes most major equipment will be functional at closure. • Assumes non-hazardous inert/ demolition material waste cells will be available in the WRSF.

Facilities/Areas	Conceptual Closure Strategy	Notes/Assumptions
5. Tailings and Filtration Plant Reclaim Water Pipelines	• Disassemble/cut up pipelines and piping system components; recycle metallic components as scrap metal. • Remove any synthetic pipeline and liner materials and dispose of in inert waste cell at WRSF. • Regrade pipeline corridor where required, revegetate with native species (giving due consideration to BMMP for establishment of corridors to ecological offset areas).	• Assumes non-hazardous inert/demolition material waste cells will be available in WRSF.
6. DSTF Tailings Conveyor and Stacker	• Remove conveyor system, trestle components, stacker equipment, spare parts, and belting, and sell for reuse. • Raze concrete trestle foundations/structures to ground surface, place rubble in waste rock stockpile. • Regrade tower pads where required, revegetate with native species (giving due consideration to BMMP for establishment of corridors to ecological offset areas).	• Assumes most major equipment will be functional at closure. • Assumes non-hazardous demolition material waste cells will be constructed in WRSF.
7. Crushed Ore Conveyor System / Spare Parts	• Remove conveyor systems, towers, spare parts, and belting, and sell for reuse. • Raze concrete suspension tower foundations to ground surface, place rubble in inert waste cells in WRSF. • Regrade conveyor suspension tower pads where required, and revegetate with native species (giving due consideration to BMMP for establishment of environmental corridors to ecological offset areas).	• Assumes most major equipment will be functional at closure. • Assumes non-hazardous inert/demolition waste cells will be constructed in WRSF.
8. Explosives Magazines	• Sell residual explosives inventory to licensed dealer or return to vendor, as regulations permit. • Remove modular magazine buildings/storage silos and sell for reuse. • Remove fencing and security gates and sell for reuse. • Break up concrete foundations and raze structure to ground surface; place rubble in inert waste cell in WRSF. • Regrade impacted areas, scarify, cover with a layer of topsoil/mulch, and revegetate with native species (giving due consideration to BMMP requirements for establishment of environmental corridors to ecological offset areas).	• Assumes non-hazardous inert/demolition waste cells will be constructed in WRSF.
9. Power Distribution Substation, Transmission Lines, And Emergency Backup Generators	• Disconnect from grid; dismantle substation, power lines, and power line poles and sell for reuse. • Sell backup generators for reuse. • Raze concrete foundations/ structures to ground surface, place rubble in inert waste cell in WRSF. • Regrade impacted areas, scarify, cover with topsoil/mulch, and revegetate with native species (giving due consideration to BMMP requirements for establishment of environmental corridors to ecological offset areas).	• Assumes most major equipment will be functional at closure. • Assumes non-hazardous inert/demolition waste cells will be constructed in WRSF.
10. ROM Stockpile Area	• Process all ROM material remaining after end of mining. • Regrade/scarify empty ROM pad area, cover with topsoil/mulch, and revegetate with native species (giving due consideration to BMMP requirements for establishment of environmental corridors to ecological offset areas).	
12. Fuel Storage Tank Farm, Secondary Containments, and Fueling Station	• Drain and/or collect and sell residual fuel inventory; flush storage tanks and piping system components; sell competent tanks for reuse, or otherwise demolish and recycle scrap metal. • Raze concrete secondary containment to ground surface, break up foundation, place rubble in waste rock stockpile, cover with topsoil/mulch, and revegetate with native species (giving due consideration to BMMP requirements for establishment of environmental corridors to ecological offset areas). • Sell fueling station equipment for reuse.	• Assumes non-hazardous inert/ demolition waste cells will be available in WRSF. • Assumes hydrocarbon- contaminated soil will be treated at on-site "bio-farm." • Assumes decontamination rinsate will be collected and removed off site for disposal at a licensed treatment/disposal facility.
13. Mineral Processing Facilities, including Crushers, Mills, Thickeners, Reagent Processing and Storage Tanks, and Tailings/Reclaim Water Pipelines	• Flush all process solution mixing, transfer, or storage systems, route through detoxification and filtration plants, and convey residual solids to the DSTF via the tailings pipeline. • Remove tailings and reclaim pipelines and trench liner materials and sell for reuse or cut up and dispose of in inert waste cells in WRSF. • Remove crushers, mills, and other major equipment items, motors, and pumps; sell for reuse. • Disassemble/cut up tanks, piping system components, decking, and machinery support structures, recycle as scrap metal. • Demolish buildings; sell roofing, doors, other valuable components for reuse, or for scrap. • Raze concrete secondary containments to ground surface, regrade as required, place rubble in inert waste cells in waste rock stockpile. • Cover regarded processing areas with topsoil/mulch and revegetate with native species (giving due consideration to BMMP for establishment of corridors to ecological offset areas).	• Schedule prior to detoxification plant and DSTF closure. • Assume heavy wall high-density polyethylene (HDPE) will be used for tailings and reclaim pipelines and pipeline trench liners. • Assumes non-hazardous inert/demolition waste cells will be constructed in WRSF.

Facilities/Areas	Conceptual Closure Strategy	Notes/Assumptions
14. Pit Wastewater Accumulation Pond / WRSF and DSTF Sedimentation Ponds	• Discontinue pit dewatering. • Pump down accumulation/sedimentation ponds, remove solids and geomembrane liners, backfill to surface, regrade as necessary to approximate original contours, cover with topsoil/mulch, and revegetate with native species (giving due consideration to BMMP for establishment of corridors to ecological offset areas). • Test sedimentation pond solids for hazardous characteristics and dispose of liner membrane and solids in a licensed off-site disposal facility, as appropriate for the determined waste category.	• Assumes pit and pond wastewater will meet applicable Ecuadorian discharge standards without any treatment; however, if noncomplying conditions are encountered in closure, an appropriate passive effluent capture and treatment system will need to be designed and constructed. • Assumes that WRSF will already have been closed.
15. Mechanical and Maintenance Shops	• Sell shop equipment and tools for reuse. • Demolish buildings; sell roofing, doors, other valuable components for reuse, or for scrap. • Raze concrete structures and foundations to ground surface, place rubble and inert waste in cells in WRSF; cover with topsoil/mulch and revegetate with native species.	• Assumes no shop buildings or building materials will be turned over to local stakeholders. • Assumes non-hazardous inert/demolition waste cells will be constructed in WRSF. • Assumes any hydrocarbon- contaminated soil will be treated at on-site "bio-farm."
16. Warehouses	• Return reagents and other warehoused consumables to vendors for credit or sell to licensed retailers. • Demolish buildings; sell roofing, doors, and other valuable components for reuse, if possible, or for scrap. • Raze concrete structures and foundations to ground surface, place rubble and inert waste in waste rock stockpile; cover with topsoil/mulch and revegetate with native species (giving due consideration to BMMP for establishment of corridors to ecological offset areas).	• Assumes no mine area buildings or building materials will be turned over to local stakeholders. • Assumes non-hazardous inert/demolition waste cells will be constructed in WRSF.
17. "Boneyard"/ Laydown Areas	• Remove all equipment, used belting, pipe, scrap metal, and other unused materials from site and sell for scrap or sell or donate for potential beneficial reuse. • Scarify laydown areas as necessary, cover with topsoil/mulch, and revegetate with native species (giving due consideration to BMMP for establishment of corridors to ecological offset areas).	
18. Permitted Solid Waste Landfill	• Install engineered free-draining cap with layer of topsoil/mulch and revegetate with native species. • Remove security fencing, sell for reuse or for scrap.	• Assumes no residual capacity in landfill that would be of value to local stakeholders.
19. Bio-Farm Soil Treatment Area	• Test treated soil to ensure hydrocarbon contamination has broken down to < hazardous waste disposal standards; removed any untreated soil and disposed of off site as hazardous waste. • Regrade treated soil, cover with topsoil/mulch as required, and revegetate with native species (giving due consideration to BMMP for establishment of corridors to ecological offset areas)	• Schedule after removal of most motorized equipment and decommissioning of fueling facilities.
20. Hazardous Waste Storage Area	• Remove all accumulated hazardous waste and waste containers to a permitted off-site hazardous waste disposal area. • Scarify empty pad area, cover with topsoil/mulch, and revegetate with native species (giving due consideration to BMMP for establishment of corridors to ecological offset areas).	• Schedule after removal of most motorized equipment and decommissioning of fueling facilities.
21. Haul and Access Roads inside Concession Boundary	• Regrade haul roads where necessary for water flow, scarify all mine roadways except for main access road, and hydroseed with local grass species (giving due consideration to BMMP for establishment of corridors to ecological offset areas).	• Assumes local stakeholders will wish to preserve the main access road to upland areas near the Cangrejos and La Virtud camps and the original access road from Biron. • Road closures should be designed to minimize attractiveness to illegal miners.

Facilities/Areas	Conceptual Closure Strategy	Notes/Assumptions
22. Administrative Buildings	• Offer relocation of buildings to local community for beneficial use; alternately, demolish and resell valuable structural elements for reuse. • Dispose of inert waste in cells in WRSF. • Raze concrete structures and foundations to ground surface, place rubble and inert waste in disposal cells in waste rock stockpile; cover with topsoil/mulch and revegetate with native species.	• Assumes non-hazardous inert/demolition waste cells will be constructed in WRSF.
23. Modular Wastewater Treatment Plant and Septic Systems	• Offer to transfer the wastewater treatment plant to local communities; alternately, sell modular wastewater systems for reuse. • Pump septic tanks and dispose of waste in commercial facility. • Remove septic tank covers, backfill with waste rock or borrow materials, cover with topsoil/mulch, and revegetate area with native species.	• Schedule after final closure of administrative buildings, shops, and warehouses. • Assumes modular wastewater treatment plant systems are fully functional at end of mining.
24. Monitoring Wells	• Pull casing, demolish monuments, plug with bentonite, cement grout to surface, cover with topsoil/mulch and revegetate with native species.	• Schedule after completion of post-closure monitoring period. • Closure should be designed to minimize attractiveness to illegal miners.
25. Exploration Boreholes	• Pull casing, demolish monuments, plug with bentonite, cement grout to surface, cover with topsoil/mulch and revegetate with native species.	• Closure should be designed to minimize attractiveness to illegal miners.
26. Vehicle Fleet/Hydraulic Shovels/ Haul Trucks/ Drills, Other Motorized Mining and Ancillary Equipment	• Sell for reuse.	• Assumes equipment will be functional at closure.
27. Perimeter Fencing/Gates	• Demolish and sell for reuse or for scrap value.	• Security fencing and a protective berm will remain installed around perimeter of pits in closure.

Source: Lumina, 2023.

20.2.1.6 Closure Planning

The draft closure strategy presented in Section 20.2.1.5 will be further developed in the final FS and ultimately documented in the project-specific Mine Reclamation and Closure Plan. This plan will be periodically updated to accommodate changes in mine infrastructure or operations, changes in regulations, and/or changing external stakeholder considerations, in keeping with applicable Ecuadorian regulations as well as the international BMPs represented by Section 1.4 of the IFC EHS Guidelines for Mining (IFC, 2007) and applicable sections of the ICMC (ICMI, 2016). The Mine Reclamation and Closure Plan will address progressive, potential interim, and final closure actions. To the extent practicable, these will include:

- actions to restore the site to approximate baseline environmental conditions
- actions to protect biodiversity
- actions to minimize the attractiveness of the closed site for illegal mining or other intrusive human use
- actions to eliminate chemicals and any toxic residues from the site and to prevent future impacts to the environment or public health and safety
- actions to support potentially beneficial uses of land, waste materials, and (potentially) selected elements of mine infrastructure, as may be negotiated with project stakeholders
- interim care and maintenance actions that may be taken in response to any temporary cessation of mining operations
- post-closure inspection and environmental monitoring actions, leading to final closure.

At least one year prior to commencing the closure process, the Mine Reclamation and Closure Plan must be updated to incorporate final edits on closure planning and schedule, and additional levels of procedural detail as necessary to guide all required closure actions.

It should also be emphasized that progressive closure of disturbed environmental areas will be executed wherever possible during mining operations in order to minimize the potential for erosion and dust generation, and to enhance environmental recovery. With respect to major facilities, the DSTF and WRSF are both designed for progressive closure and reclamation. Both facilities are designed to be filled from the bottom upwards, and as a result, lower elevation benches can be progressively recontoured and revegetated as the facility is constructed. The sanitary landfill also be progressively covered and revegetated on a routine basis as the tipping face of the landfill advances.

20.2.1.7 Post-Closure Monitoring and Management

After closure, the operator will be responsible for long-duration surveillance and sampling at the site to ensure that applicable PMA requirements and the objectives of the final Mine Reclamation and Closure Plan are met. For purposes of developing a preliminary closure cost estimate for this technical report, a post-closure voluntary monitoring period of ten years is assumed. During this time, the operator will be required to verify the success of reclamation and revegetation efforts and otherwise ensure that all closure obligations have been retired.

20.2.2 Closure Cost Estimates

The conceptual mine closure strategy presented in Section 20.2.1 has been developed for the purpose of this PFS based on mine closure requirements defined in current environmental regulations for mining activities and international BMPs. Mine operators are obliged to fund the closure of their projects. The overall objective of the closure works is to leave the closed site in safe and physically and chemically stable condition and allow it to return to a natural state for possible use by local stakeholders, or potentially be reserved for wildlife. The closure works would be based on the Mined Reclamation and Closure Plan discussed previously, which would be progressively refined over the life of the Project.

The estimated cost to close the Project at the completion of mining and mineral processing is US$37.6 million. Salvage credits for mining and process equipment is estimated at US$30.5 million. A large portion of the closure cost for the WRSF and DSTF are part of progressive closure costs, which are included in operating costs over the operational phase of the Project. The environmental monitoring activities are integrated within the overall capital cost estimate for the Project.

20.3 Permitting Considerations

20.3.1 Applicable Ecuadorian Legal and Regulatory Requirements

The project is being developed in accordance with the Ecuadorian Constitution; the Mining Law and its Regulations; and many other applicable Ecuadorian norms, standards, laws, and regulations. The most important of the legal and regulatory requirements include, but are not limited to, the following:

- Environmental Organic Code and its Regulation: The Environmental Organic Code and its regulations define the environmental guidelines that must be followed for any activity or project and the environmental authorizations that must be obtained. The Code also includes control and monitoring requirements that must be met by any project during its development.
- Organic Code of Territorial Organization, Autonomy and Decentralization: Once the jurisdiction of a specific project is defined, this Code allows for the definition of local regulations to be considered with respect to the execution of the project, including any required permits.
- Organic Law for Water Resources and Water Use[2]: this Law regularizes the use of surface and underground water resources, as part of the duties of the State. Control and decision-making over this strategic sector is the exclusive responsibility of the MAATE. The Law establishes the obligations, responsibilities, processes, and procedures for obtaining, managing and maintaining the authorizations related to the use and consumption of water in the different phases and activities of a project.
- Organic Law of Citizen Participation: this Law was issued as an instrument to advance the fulfillment of the right to public participation.
- Organic Law of Rural Lands and Ancestral Territories: The guidelines from this law must be considered with respect to the management of rural lands affected by the development areas of the project.

[2] It should be noted that pursuant to Constitutional Court Resolution No. 45, published in Supplement to RO No. 34 on May 6, 2022, this law and its regulations were declared unconstitutional; however, to avoid a regulatory gap, it will remain in force until a new water resources law is passed. This means that within a 12-month period from the ruling's publication, Ecuador's president must draft and submit a new law project to the National Assembly, which has 45 days to analyze the law and issue a report. If the report is positive, the National Assembly will discuss, process, and, presumably, approve the law. Once the new law is passed, the Executive Branch will have to issue the corresponding regulation.

- Organic Law of Land Use and Management: this Law provides guidelines for territorial planning and land use and provides definitions for land categories.
- Organic Law of Culture: this Law requires the National Institute of Cultural Heritage *(Instituto Nacional de Patrimonio Cultural, INPC)* to supervise all research on cultural heritage, which includes the execution of archaeological surveys and, where applicable, the rescue and monitoring of archaeological resources.
- Organic Law of the National Roadway System and Land-based Transport: this Law will apply to the opening of roads and/or accesses, and addresses authorizations for road construction, improvement, extension, and maintenance.
- Organic Health Law: It is governed by the principles of equity, comprehensiveness, solidarity, universality, indivisibility, participation, plurality, quality, and efficiency, with a focus on intercultural, gender, generational and bioethical rights.
- Organic Law of Ground-based Transport, Transit and Roadway Safety: this law guides safe use of all types of project vehicles, including vehicles primarily used for workforce transportation.
- Organic Law for Public Electricity Service: This Law will apply to any required self-generation of electricity during construction, prior to the completion of the new transmission line.
- Organic Law of Energy Efficiency: this Law requires energy consumers to implement energy efficiency protection measures, to optimize energy use in their industrial processes, and seek appropriate opportunities for energy savings.
- Organic Law for the Rationalization, Reuse, and Reduction of Single Use Plastics: this Law must be considered in development of the Waste Management Plan included in the project's exploitation phase PMA.
- Organic Law of Inclusive Circular Economy: This Law must also be considered in the development of the Waste Management Plan included in the project's exploitation phase PMA.
- Law on the Manufacture, Import, Export, Marketing and Possession of Weapons, Ammunition, Explosives, and Accessories: This Law will apply to handling transport, and use of explosives. The technical scope of anticipated blasting operations is subject to review by the Ministry of National Defense through the Comando Conjunto de las Fuerzas Armadas (CC.FF.AA). A favorable report issued by the CC.FF.AA. is required for the Ministry of National Defense to authorize the import and export of explosives for civilian use.
- Code of Labor: The Law addresses requirements for employment-related authorizations and other requirements that must be met by both employers and employees.
- Regulation of the Organic Law of Water Resources and Water Use: This Regulation provides instructions on the application of the Organic Law of Water Resources, especially on use and consumption of water, along with the processes that must be followed in order to obtain authorizations for project development.
- Regulation of the Organic Law of Rural Lands and Ancestral Territories: this Regulation addresses principles, purposes, guidelines of the agrarian land policy, and the rights linked to the ownership of rural land and ancestral territories.
- General Regulation of the Mining Law: this legal instrument establishes the necessary regulations for the application of the Mining Law.

- Environmental Regulation for Mining Activities (*Reglamento Ambiental para las Actividades Mineras*, commonly "RAAM"): This instrument regulates the environmental management of mining activities in all phases of initial or advanced exploration, production, beneficiation, processing, smelting, refining, and mine closure, including partial and total closures, in order to promote the sustainable development of mining. It establishes norms, procedures, processes, and sub-processes that allow for the prevention, control, mitigation, rehabilitation and compensation for the effects of mining activities on the environment and society.
- Regulation of the Organic Health Law: this regulation provides standards for the application of the Organic Health Law.
- General Regulation for the Application of the Organic Law of Ground-based Transport, Transit and Roadway Safety: This norm addresses the conditions and obligations to be observed by drivers, as well as vehicle maintenance.
- Regulations for Workers' Health and Safety and the Improvement of the Work Environment: these regulations provide general requirements from workplace to health and safety issues, and emphasize the prevention, reduction, or elimination of work risks, and an overall improvement of the work environment.
- Unified Text of Secondary Legislation of the Ministry of Environment (*Texto Unificado de Legislación Secundaria del Ministerio del Medio Ambiente*, commonly "TULSMA"): The TULSMA consists of nine books. With respect to the needs of the project, Book III of the Forestry Regime provides guidelines for the clearing of vegetation. Book III also provides guidelines for scientific investigations of biota.

  The following annexes to Book VI (Environmental Quality) are applicable to the project:

  - Annex 1 – Environmental Quality and Effluent Discharge Standard: Water Resource; all effluent discharges from the project, will need to meet Table 9 – Discharge to a Freshwater Body.
  - Annex 2 – Standard for Environmental Quality of Soil Resources and Remediation Criteria for Contaminated Soils.
  - Annex 3 – Air Emissions Standards for Fixed Sources.
  - Annex 4 – Ambient Air Quality Standards.
  - Annex 5 – Maximum Noise Emission Levels, Measurement Methodology for Fixed Sources and Mobile Sources and Maximum Vibration Emission Levels and Measurement Methodology.
  - Annex 10 – Norms on non-ionizing radiation for electromagnetic fields must be also considered in relation to powerline construction.

Book IX also provides information with respect to fees applicable to the Environmental Authorization processes, along with administrative fees charged for services provided by MAATE.

- Mining Safety Regulation: this regulation establishes rules for the application of the Mining Law, in order to protect the life and health of human resources (Art. 2), thus guaranteeing the mining rights of owners in response to their compliance with the regulations (Art. 7) and all obligations of both the owners (Art. 9) and staff (Art. 10), including reporting any risky situations (Art. 11). It constitutes a complete guide on occupational health and safety (OHS) in mining.
- General Regulation to the Organic Culture Law: The regulation requires that all archaeological research be carried out with authorization from the INPC.

- Regulation of the Organic Law of Land Planning, Use, and Management: The regulation requires that the Land Management Plan of every canton include the use of rural land for the exploitation of natural resources; such plans must be updated with each newly elected administration.
- Regulation of the Organic Law for the Public Electricity Service: The regulation addresses the process for obtaining enabling titles from the *Ministerio de Energía y Recursos Naturales No Renovables* (MERNNR).
- General Regulation of the Organic Law of Energy Efficiency
- General Regulation of the Organic Law for the Rationalization, Reuse, and Reduction of Single Use Plastics
- Regulation of the Law on the Manufacture, Import, Export, Marketing, and Possession of Weapons, Ammunition, Explosives, and Accessories
- Regulation of the Organic Law of the National Roadway System and Land-based Transport: this regulation requires that all road infrastructure projects include socio-environmental and road safety impact studies.
- Health and Safety Regulation in Mining Workplaces (ARCERNNR Resolution -013/2020): This regulation is the principal guide on health and safety in the mining industry and is complemented by the provisions from the Regulation on Health and Safety of Workers and Improvement of the Workplace Environment. The regulation establishes standards for the application of the Mining Law in order to safeguard the health and safety of workers in all phases of mining activity. In addition, based on this regulation, the general guidelines for preventing occupational risks associated with each stage or phase of mining activity and process are also provided.
- Environmental Regulations for Hydrocarbon Operations in Ecuador (Ministry of Environment Ministerial Agreement (AM) No. 100-A): This regulation establishes specific standards for the hydrocarbons industry as well as the storage of fuels.
- Regulation of Hydrocarbon Operations (Resolution of the Regulation and Control Agency ARCERNNR 24): It requires that if fuel storage tanks are built, these must be subjected to corrosion control pressure tests, and other technical standards and authorizations.
- Instructions for Exploration and Exploitation Stages of Mining Concessions, Negotiation and Execution of Mining Operations Contracts (Ministry of Mines Ministerial Agreement No. 48): Exploitation contracts must be entered into as provided in this regulation, noting in particular that projects in the production phase may not be larger than 5000 ha.
- Instructions for Accumulation and Material Division of Mining Areas (Resolution No. 001-INS-DIR-ARCOM-2011 of ARCOM): this regulation applies to all holders of mining concessions who need to carry out a process of division or accumulation of mining areas.
- Instructions for the Approval of Projects for the Design, Construction, Operation, and Maintenance of Tailings Deposits for Medium and Large-Scale Mining (Ministry of Mines Ministerial Agreement No. MERNNR-MERNNR-2020-0043-AM): this instruction is applicable to all projects for the design, construction, operation, and maintenance of tailings storage facilities.
- Regulation for Operation of Company Medical Services (Ministry of Public Health Ministerial Agreement No. 1404): this regulation requires that companies must both prevent illness and injury and promote the health of its workforce, avoiding and preventing injuries that could occur due to the common and specific risks of individual work assignments.
- Instructions for the Registration of Hazardous Chemicals and Environmental Obligations (Ministry of Environment Ministerial Agreement No. 099): this regulation establishes regulatory and control measures for the import, storage, transport, and use of hazardous chemical substances.

- Technical Standard to issue the report and pronouncement of environmental viability when a project, work or activity intersects with the national forest heritage (Ministry of the Environment, Water, and Ecological Transition Ministerial Agreement No. MAATE-2022-110): this standard contains the technical procedure for the issuance of the report and pronouncement of environmental viability that determines the feasibility of specific projects. Given the location of the concessions that make up the Cangrejos Project, this standard does not apply, since there is no intersection with any protected area.
- Requirements for the obtention and renovation of permits included in Law on the Manufacture, Import, Export, Marketing and Possession of Weapons, Ammunition, Explosives, and Accessories, and its regulations (Ministry of National Defense Ministerial Agreement No. 194): these regulations contain the requirements for the obtention and the renovation of permits for using explosives according to the referenced Law.

20.3.2 Environmental Permits

As detailed in Section 20.3.1, the Project is being developed in accordance with the Ecuadorian Constitution, the Ecuadorian Mining Law and its Regulations, the Environmental Organic Code and its Regulations, the Organic Law of Water Resources and its Regulations, and other applicable Ecuadorian norms, standards, laws, and regulations. This section details the specific permitting processes that the Project would undergo prior to mine construction and operation.

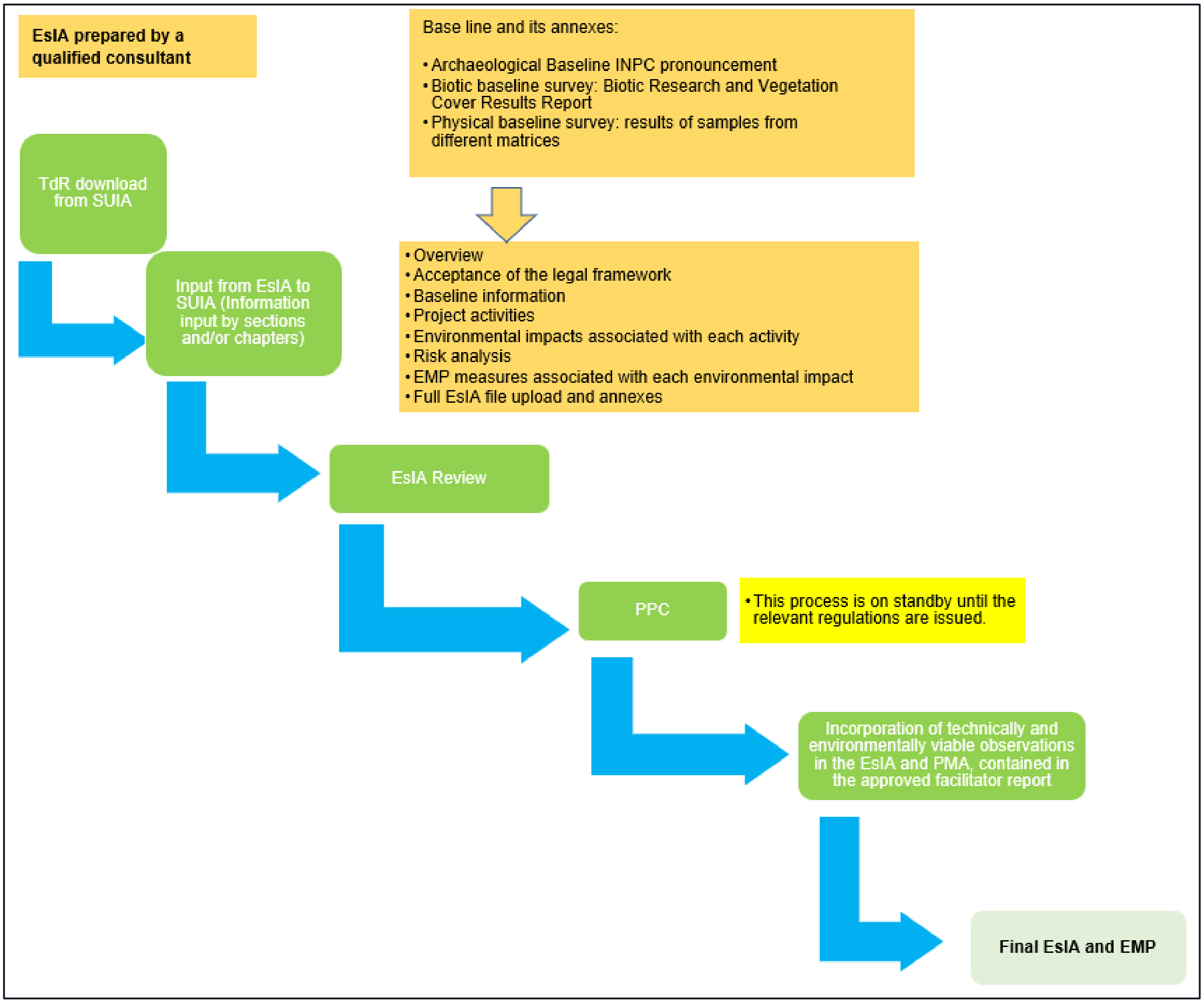
Before the start of mine construction and mineral production operations, the project will be subject to an array of additional permitting and related support actions required by current laws and regulations. It should be emphasized that development of the exploitation phase EIA/PMA and multiple supporting technical studies is required before the Project can be granted an Environmental License. Based on experience with similar-scale projects in Ecuador, it is estimated that, in aggregate, major permitting actions required prior to construction (which exclude certain municipal permits, tax registration, and potential permit requirements for concentrate exports) will take an approximate minimum of 22 months to complete. Several of these actions may be conducted in parallel. A summary of the major permitting actions is presented as follows:

- Mining Phase Change – Permitting for Initiating Production Phase (estimated minimum duration: approximately 12 months): After the end of advanced exploration, the concessionaire may conduct an economic evaluation of the deposit. In order to move to the production phase, the concessionaire must submit an application, supported by a technical report based on guidelines issued by the Mining Regulation and Control Agency (*Agencia de Regulación y Control Minero, ARCOM*) and specific *Ministerio de Energía y Recursos Naturales No Renovables de la República del Ecuador* (MERNNR) instructions for exploration, exploitation, and the negotiation and execution of exploitation agreements. It will also be necessary to negotiate and develop a production contract. Negotiation of approval of the production contract will require at least six months after formal initiation of the production phase.

- Environmental Licensing Process (estimated minimum duration: approximately 22 months): Since under Ecuadorian law the Environmental License applies to specific activities and not the concession per se, the licensing process may commence prior to submitting the petition for exploitation. Registration of the project and its associated production contract in a governmental information management system, Unified Environmental Information System *(Sistema Unico de Informacion Ambiental, SUIA*), formally initiates the change from advanced exploration to exploitation status. A comprehensive, exploitation-phase, Environmental Impact Study/Environmental Management Plan (*Estudio de Impacto Ambiental/ Plan de Manejo Ambiental, EIA/PMA*) will then need to be developed using a team of consultants approved by MAATE. The selected consultants must prepare and upload the proposed Terms of Reference (TOR) for the EIA/PMA and obtain MAATE approval prior to initiation of work. A biotic investigation permit will also be required to conduct an updated biotic and forestry baseline study and supporting fieldwork; biotic samples must be managed in compliance with specific guidelines and all scientific studies must be submitted for approval. An updated archaeological study must be performed in the proposed environmental AOI and submitted for National Institute of Cultural Heritage (*Instituto Nacional de Patrimonio Cultural, INPC)* concurrence, and, if required, authorization for execution of archaeological rescue activities. The EIA/PMA must also be supported by preparation and approval of a detailed water management plan, as well as the technical design report and approved construction permit for the DSTF. The project's forest inventory (FI) must also be separately reviewed and approved.

Figure 20-9 summarizes the major steps in securing EIA/PMA approval:

Figure 20-9: EIA/PMA Approval Process



Source: Permitting Handbook for the Development of the Cangrejos Mining Project, February 2023 (Entrix Latin America, 2023); note that in the figure, "EsIA" represents the consultant's convention for the "Estudio de Impacto Ambiental", referred to elsewhere in this report as "EIA." "EMP" is the Anglicized version of the "PMA" acronym.

Once the draft EIA/PMA documents are prepared in accordance with the approved TOR, they must be uploaded to the SUIA for MAATE review. A documented *Proceso de Participación Pública* (PPP) must also be planned and conducted in accordance with the timing, locations, and scope defined by the TOR. The MAATE will review the results of the PPP, and if acceptable, will issue a favorable pronouncement of approval.

After resolution of MAATE review comments, the final version of the EIA/PMA must be uploaded to the SUIA. Required fees, including ecosystem services loss fees for lands predicted by the FI to be impacted by the mining process must be paid, and a PMA compliance insurance policy or bank guarantee submitted. When these actions are all complete and approved, MAATE will issue the project's exploitation-phase Environmental License.

- Water Permits (estimated minimum duration: approximately 8.5 months): As noted above, the project needs to prepare a detailed technical report describing its overall water management approach, as well as identifying all potential impacts to water bodies and any use of groundwater or surface water for mining processes and other human needs. Abstraction/usage permits must be negotiated with MAATE, in parallel with the early phases of the Environmental Licensing process as previously discussed. Results and specific ongoing water management and monitoring actions must be addressed in the exploitation-phase EIA/PMA.
- Health and Safety Planning Actions (estimated minimum duration: approximately 3 months): An appropriately detailed workplace/occupational health and safety system must be prepared to support mine construction and operation. Local workers must be registered with the Ecuadorian Institute of Social Security (*Instituto Ecuatoriano de Seguridad Social, IESS)*, and a joint (management and workforce) Health and Safety Committee established and registered. An internal Workplace Health and Safety Regulation must be developed and submitted for Ministry of Labor approval. Industrial safety and medical service units must be established within the project's management organization and a comprehensive Emergency Preparedness and Response Plan prepared. These planning actions should also be completed during the early development of the exploitation phase EIA/PMA and results reflected therein.
- General Environmental Permits (estimated minimum duration: approximately 8 months): Other general environmental permits need to be negotiated with MAATE, in parallel and preferably well in advance of the end of the environmental licensing process described above. The project must seek authorization for any stationary emission sources not already addressed in the exploitation phase EIA/PMA. Separate discharge and disposal permits for liquid effluents may also be required if not already addressed in the EIA/PMA. Odin will also need to register as a Hazardous Waste Generator. All reagents and other hazardous chemical substances employed in construction and mineral production must be identified, registered and supported by a Reduction, Elimination, or Replacement Plan for restricted or prohibited substances. Controlled substances subject to periodic inspection need to be registered and transport guides must be prepared. Authorizations are also required for the storage of chemical substances and/or hazardous wastes.
- Electricity Related Permits (estimated minimum duration: approximately 20 months): A separate EIA/PMA will be required to be developed in parallel with the project EIA/PMA, focusing on the construction of the electrical substations and transmission lines required to serve the infrastructure defined by final mine and process plant designs. Approvals will need to be negotiated with the MERNNR and the *Agencia de Regulación y Control Eléctrico* (ARCONEL). In order to properly support the start of construction, such actions should be planned and scheduled so the transmission line EIA/PMA can be completed no later than two to three months from the end of the project's environmental licensing process. Other ancillary electrical permits and authorizations will need to be obtained to support temporary power generation and other electrical needs, as well as activation of the transmission line in the early phases of project construction.
- Transport/Road Related Permits (estimated minimum duration: approximately 2 months): Permits issued by the *Ministerio de Transporte y Obras Publicas* (MTOP) and MAATE will also be required for the construction of roads and the transport of heavy machinery to the project site. Permit application and approval should be completed within three months prior to the end of the environmental licensing process.
- Municipal Permits (estimated minimum duration: approximately 8.5 months): A formal patent from the Municipality of Santa Rosa will be required, along with additional local permits for land use, various aspects of mine construction, and general project operations. An operating permit from the Santa Rosa fire department is also required. Permit applications and approval actions should be completed prior to the end of the environmental licensing process.

- Fuel Permits (estimated minimum duration: approximately 3 months): Permits from the Hydrocarbon Regulation and Control Agency (*Agencia de Regulación y Control de Hidrocarburos, ARCH*) are required for the purchase, transport, and safe controlled storage of fuel. The fuel permit application and approval process should be completed prior to the end of environmental licensing.
- Explosives Permit (estimated minimum duration: approximately 2.5 months): A permit will be required from the Armed Forces of Ecuador (*Fuerzas Armadas del Ecuador, FAE*) Firearms Control Office in Machala for purchase, transport, and safe, secure, and controlled storage and usage of explosives. This permit should be obtained prior to the end of the environmental licensing process.
- Internal Revenue Service Tax Authorizations (estimated minimum duration: approximately 12 months): Internal Revenue Service *(Servicio de Rentas Internas, SRI)* tax registration documents must be updated to accommodate the change to the production phase of operation. Since sale and export of minerals or concentrates may not proceed until these updates are approved, they should be submitted well ahead of the start of production.
- Customs Permits for Outgoing Product (estimated minimum duration: to be determined): Permits for exportation of concentrates related to large-scale mining are not yet defined by the current regulatory framework. Regulatory changes in this area should be monitored and new permitting requirements addressed well in advance of the projected date for shipment of concentrates.
- Telecommunications (estimated minimum duration: approximately 2.5 months): An Enabling Title of Use with the *Agencia de Regulación y Control de las Telecomunicaciones* (ARCOTEL) may be required to support radio communications. Negotiations should be completed as early as possible in parallel with the early phases of Environmental License development.
- Land Purchase or Easements/Rights of Way (estimated minimum duration: approximately 12 months): Negotiation of land purchases or easements with surface property owners that may be required by final mine design should be completed as soon as possible, but no later than in parallel with the early months of the environmental licensing process.

It is expected that as the Project advances to the FS phase and lender engagement and financial support becomes increasingly important, additional international best-management practices applicable to certain aspects of mine design, construction, operation, and closure will be implemented; see Section 4.6.1 for additional detail. Applicable Ecuadorian laws, regulations, norms, and standards will retain legal primacy in the event of any technical conflict; see Section 20.3.1 for additional detail.

20.3.3 Additional Permits and Authorizations

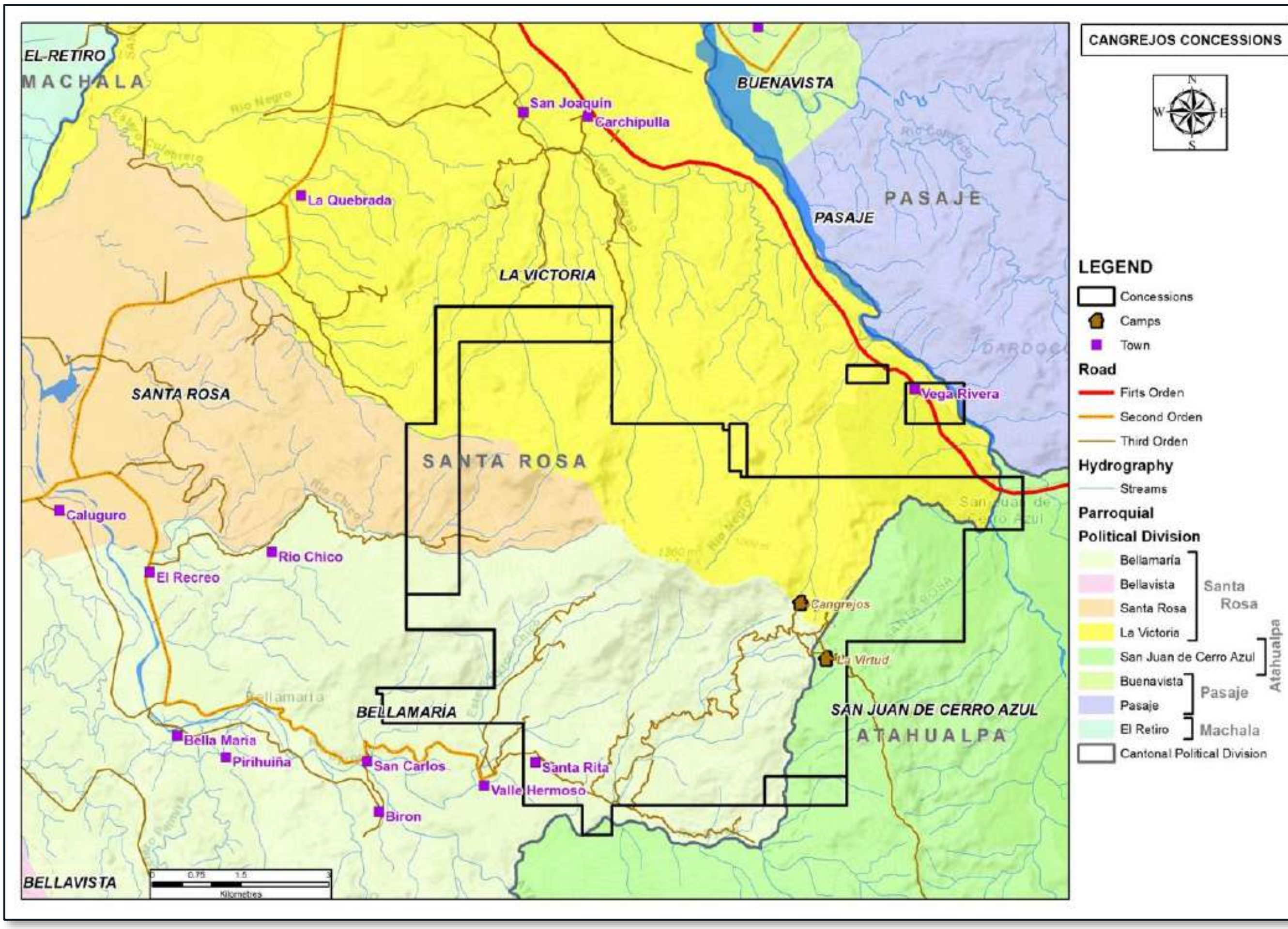
All permits and authorization requirements are presented in Section 4.6, 20.3.1, and 20.3.2.

20.4 Social Considerations

20.4.1 Social Setting

The proposed mine, associated infrastructure, transportation corridor, and port facilities are all located within the coastal province of El Oro. Figure 20-10 shows the project location in relation to the local political divisions.

Figure 20-10: Social Setting – Project Location in Relation to Parish and Canton Areas



Source: Lumina, 2023.

20.4.1.1 Mine and Associated Infrastructure

The location of the Project´s mine infrastructure, DSTF, WRSF, open pits, access roads, and their associated impacts are limited to Santa Rosa and Bellamaria parishes within the canton of Santa Rosa. Only part of the Project's 100 m wide environmental buffer area may extend into La Victoria parish of Santa Rosa canton, and San Juan de Cerro Azul parish in Atahualpa canton[3].

Given this context, the direct area of social influence will include the settlements located in Santa Rosa, Bellamaria, and La Victoria parishes that are closest to the project area (see Table 20-16), as well as any more rural areas that are directly impacted by the project. The nearby town of Santa Rosa (population 48,900[4]) is the capital of Santa Rosa parish (and

[3] The province of El Oro contains 14 cantons, including Santa Rosa and Atahualpa.
[4] According to the 2010 census.

canton) and is considered to be in the indirect area of social influence for the Project. There are no nearby settlements in Atahualpa, nor any that are expected to be impacted by the Project.

This initial social AOI is based on a preliminary understanding of potential impacts on the different localities[5]. As the Project is advanced towards a final FS, updated social baseline information will be collected in a defined study area that can be used to support not only the FS, but also the exploitation-phase EIA/PMA.

Table 20-16: Neighboring Settlements of Santa Rosa, Bellamaria, and La Victoria

Settlements in Santa Rosa parish	Settlements in Bellamaria parish	Settlements in La Victoria parish
• Caluguro (pop. 420) • Estero Medina (pop. 650)	• Bellamaria (pop. 800) • Valle Hermoso (pop. 550) • Santa Rita (pop. 12) • Biron (pop. 190) • San Carlos (pop. 200 • Rio Chico (pop. 240) • El Recreo (pop. 500)	• La Quebrada (pop. 100) • Vega Rivera[6] (pop. 270)

Source: Lumina, 2023.

20.4.1.2 Transportation Corridor

The Project benefits significantly from its proximity to Puerto Bolivar and existing paved highways. And can use either of two existing routes between the Project and this port. The Project is not expected to add significantly to commercial road traffic during production; nonetheless, protocols will be established for managing periodic heavy and oversized loads during all phases of mine life.

It is expected that investment in some associated infrastructure improvements will be required for purposes of safety and to minimize the impacts of transportation for heavy and oversized loads. Potential social impacts of these infrastructure improvements will be assessed on a case-by-case basis during the FS, and specific management actions will be planned as part of the exploitation phase EIA/PMA.

Appropriate safety protocols will also be established for transportation of hazardous materials in compliance with Ecuadorian regulations and international BMPs. These will include emergency response planning, preparation, and engagement with local emergency service providers and related stakeholders.

[5] The area of social influence is set based on the expected level of social impacts on and risks to a given population (e.g., changes in livelihoods, economic opportunities, access to services, social networks, environmental quality, quality of life, public safety or social conflict). The direct area may benefit from positive impacts, but a risk of potentially negatively impacts also exists that must be properly managed. The indirect area may also benefit from positive impacts, but no significant negative impacts are expected.
[6] One of Odin's concessions covers Vega Rivera, so it has historically been considered as within the direct area of influence. However, the current Project does not involve that concession. Therefore, Vega Rivera may eventually not be considered as part of the direct area of influence for the Project if this concession is not involved in the final Project.

20.4.1.3 Port Facility

The Project will use the services of the existing industrial Puerto Bolivar, situated next to Machala, the capital of El Oro Province. The port already supports mining operations and exports copper concentrates. Under the current circumstances, the incremental increase in port services is not expected to generate material social impacts or management issues. This will be reviewed further during the FS.

20.4.1.4 Transmission Lines

The Project will require construction of an electrical transmission line, subject to an EIA/PMA process to be managed in parallel by the electrical contractor. The length will depend on the final route, but it is expected to be between 16 km and 32 km. The power line will lie within Santa Rosa canton. Any social aspects of the transmission lines within the context of the overall project will be reviewed further during the FS as the final route is being selected.

20.4.2 Description of the Social Area of Influence (AOI)

Considering the relatively low social complexity and marginal impacts linked to the transportation corridor and port, the area of social influence is limited to areas in close proximity to the proposed mine and infrastructure. This area includes the 11 settlements listed in Table 20-3 and the town of Santa Rosa:

- The local rural settlements are relatively small and based on traditional activities of livestock and agriculture, but in some cases have significant links with some type of mining activity, including artisanal, illegal, small-scale or large-scale mining either in the canton or elsewhere in the province and country. They typically have fewer education and health resources and infrastructure than available in nearby urban areas. The key socioeconomic aspects of the settlements include:
- Roadways – There are paved roads from the town of Santa Rosa to Bellamaria and La Victoria cantons that are used by passenger buses and private and commercial vehicles. Access to the settlements in Santa Rosa and La Victoria is paved, while access to Bellamaria can involve a combination of paved and unpaved roads. Road maintenance, especially for unpaved roadways, is a continuing challenge during the rainy season.
- Communications – The settlements have limited access to cellular phone and Internet services but have open signal and cable TV and AM/FM radio.
- Education – Only Bellamaria has both primary and secondary schools. The highest level of education achieved by most adults in Bellamaria parish and in La Victoria is primary education. Women slightly outperform men in terms of education and literacy. Students in Caluguro and Estero Medina attend school in Santa Rosa.
- Health Services/Medical Issues – There are health centers in Bellamaria and Valle Hermoso. In Bellamaria parish, gastrointestinal infections are known to be common. These are likely to be related to the presence of fecal coliforms in the household water supplied from the river. Residents in Caluguro and Estero Medina use the health services of Santa Rosa.
- Basic Utilities – The settlements in all three parishes have basic services such as electricity, water distribution, and sanitation. However, a few of the settlements have no more than partial wastewater management coverage, and most have none.

- Economic Activities – The local economy in the lowland settlements is mostly based on agriculture, livestock, commerce, and general services. Household production of poultry and pork are sold in the markets of Santa Rosa and weekly fairs in Bellamaria. There is also some timber production in Biron. Economic activities in the settlement of Vega Rivera include agriculture, general commerce, and more livestock raising. About 16% of the households of these settlements are considered as “Not Poor” using the Unsatisfied Basic Needs methodology.

In the upper reaches of the region, artisanal/small-scale mining is a significant economic activity. A number of entities and individuals have permits to conduct artisanal/small-scale mining, but illegal activities sporadically occur. In Bellamaria parish, there is at times a significant amount of such activity. Based on information obtained via interviews with local authorities, a significant share of the families of the parish receives some income from mining activity, although it is unclear how much of this income is derived from illegal activities and how much is from formal mining in the area, as some family members travel to other areas of the province or country for mining work.

In the areas bordering the Project, significant legal mining operations include Mina Los Ingleses – Sociedad Tucadulomo, Minera Bravo, Los Ingleses-Eminza, Minera Carolina, and Duran. There are at least 14 other entities involved in mining activities in Bellamaria, Valle Hermoso, and Biron. In addition, there are a few small national and international companies doing exploration in the area, including Salazar (Los Santos and Los Osos concessions), Cornerstone (Bellamaria concession), and Challenger Exploration (Colorado V and Guayabo).

At present, no active illegal mining is known to be taking place within the project concessions. However, over the years such work has been an occasional issue and, when encountered, is routinely reported to the Agency for Non-Renewable Natural Resources Regulation and Control (ARCERNNR) for their appropriate action. Several farms in the concessions area have traces of illegal mining activity dating back more than a decade. Environmental liabilities associated with illegal mining works have also been periodically identified and reported.

- According to information from local authorities, at least 90% of the parcels of non-urbanized land and farms in the area are private and have supporting documentation, while the remaining 10% are public (i.e., state-owned). Odin owns most of the surface land over the area required for the mine itself, but less of the land required for the remaining facilities. Many landowners appear to reside in neighboring towns or regional cities. The land appears to support a mixture of livestock grazing and limited agriculture.
- No Indigenous peoples or communities occupy or use land in the Project’s social AOI, nor in proximity to it.
- The local population is predominantly Catholic. There is presently only one ordained priest serving the settlements in the Santa Rosa canton. All the settlements except Santa Rita (pop. 12) have Catholic churches. Bellamaria also has a Protestant church.
- Santa Rosa is the third largest urban area of El Oro Province. The 2010 census registered a population of almost 49,000 people. It is the capital of Santa Rosa canton and parish. Santa Rosa also has significant educational and health infrastructure, including higher education and a regional hospital.

The canton’s economic base is linked to large-scale banana plantations, shrimp farming, cattle, and commerce, among other activities. Downriver from the Project and along the coast, the land flattens out and transforms into far more productive land for agriculture and livestock production; the northwestern portion of Santa Rosa parish is included in this productive coastal area and many of its stakeholders reside in Santa Rosa town. This coastal sector includes productive farms dedicated to permanent crops such as bananas, cacao, oranges, and coffee, with an average of about seven hectares in production. Other less economically important crops include plantain, sugar cane, corn, rice, mango, passion fruit, lemons, and beans. In addition, some of these properties are used to raise cattle, pork, sheep, and poultry. However, processing plants for these products tend to be outside the canton in the cities of Machala, Guayaquil, or Cuenca. There are also significant shrimp farming areas on the coast and on offshore islands of Santa Rosa canton.

20.4.3 Social Context – Risks, Impacts and Mitigation Measures

Table 20-17 presents a summary of the primary sources of social impacts (both positive and negative) and risks anticipated for the Project based on the updated layout and project description, local studies, results of public participation processes, and prior experience. The management and mitigation strategies reflected in the Project's technical design and Lumina's social management approach are also provided for each general category. The table also presents potential management and mitigation strategies to address each of these general categories.

Table 20-17: Social Management/Mitigation Strategies According to Sources of Impacts and Risks

Sources of Social Impacts and Risks	Potential Management/ Mitigation Strategies
Generation of direct employment	Lumina/Odin will: • continue to prioritize providing opportunities in the AOI throughout development, operation, and closure; • work with contractors to improve local capacity to participate in construction and initiate longer training programs to improve capacity to participate in operations; and, • promote a sustained level of employment over the operations.
Generation of supply chain opportunities	Lumina/Odin will: • continue to prioritize opportunities in the area of social influence throughout all project phases; • require lead contractors to identify opportunities and set potential scopes (including standards, budget, and expected bidding date for different potential work packages) that will benefit subcontractors in the AOI and the province of El Oro; and, • promote clear communication with local stakeholders regarding the results of these efforts and seek feedback on how improve performance.
Impact of workforce accommodation	• The workforce from outside the social AOI will reside in camp facilities established inside the Project property. Camp accommodations will also be provided to local employees whenever they are on shift. • Codes of Conduct will regulate social behaviour of Project workers staying at camp to minimize the potential for negative social interactions with local residents. • Contractors will transport their non-local workers out of the direct AOI when they have finished their work rotations.
In-migration of job seekers	The Project will seek to limit significant in-migration of job seekers into the direct area of social influence by only allowing existing local residents to apply for work from within the social AOI.

Sources of Social Impacts and Risks	Potential Management/ Mitigation Strategies
Impact on traffic and access	Odin intends to: • continue to use the existing local road through Bellamaria parish as a secondary access, but install a bypass before Valle Hermoso; • invest in improvements along the route to enable transport of oversized payloads during construction, which will also benefit the highway network; • avoid a significant impact on levels of highway traffic during operations; • implement safety measures and controls in coordination with local stakeholders to promote safety around its primarily daylight logistics; and • locate Project infrastructure and access roads to avoid or minimize impacts to existing local roads.
Land acquisition	In implementing its land acquisition strategy, Odin: • will seek to avoid impacting the most highly productive agricultural lands; and, • will follow the guidance of IFC Performance Standard 5 (IFC, 2012) for land acquisition.
Vulnerable Groups and Human Rights	Odin will: • update the social baseline during the FS to identify the vulnerable groups within the social AOI, identify how the Project might positively or adversely impact them, and establish management actions to address impacts and monitor results; and, • reassess any risks to human rights during feasibility to ensure proper respect of these rights and adequate documentation,
Water management	Odin: • has selected design alternatives that help to minimize and manage water (and other environmental) impacts, including an innovative and intrinsically safer DSTF design that eliminates the need for a conventional tailings dam, and includes measures to ensure downgradient water quantity and quality are not significantly impacted; • benefits from NAG geology, which should allow the establishment of post-closure pit lakes that may potentially serve as reservoirs that can be used to augment natural water flows in unusually dry seasonal conditions; • will share information on water and environmental management with stakeholders and local authorities, and will invite them to make field visits to witness water sampling and other environmental management measures and, as appropriate, include local stakeholders in ongoing environmental monitoring and water management activities; and, • will seek to mitigate erosion through progressive environmental reclamation actions, over the life of the mine.
Presence of illegal mining	There are currently no illegal miners operating within the environmental AOI or overall Project concession boundaries. Odin will: • actively monitor its concessions against any incursions from illegal mining and officially denounce all activities so discovered; and,

Sources of Social Impacts and Risks	Potential Management/ Mitigation Strategies
	• continue to rigorously denounce all illegal mining to responsible regulatory agencies, and communicate Lumina and Odin's broader concerns to local stakeholders and authorities regarding illegal mining in general.
Improvements in living conditions or quality of life due to social investment	Odin will continue to make social investments within the social AOI that promote collaborative local development and the fair distribution of benefits among local stakeholders. Odin will support the development of leadership roles and active participation by directly affected populations in the management of these programs.
Increase in public budget from royalties and taxes	The magnitude of benefits generated by the taxes and royalties within the social AOI will depend on future government decisions on how to best allocate and spend the additional income. Odin will support the efforts of communities in the social AOI to secure such resources from the central government and develop projects to ensure these monies are invested efficiently and effectively.

Source: Lumina, 2023

20.4.4 Legal Requirements for Public Participation

In addition to ongoing stakeholder engagement activities, the Project complies with the MAATE's legal requirements for public participation linked to the revision and approval of applicable EIA/PMAs. As noted previously, EIA/PMA approval was originally granted in 2010 for the Cangrejos concessions to support advanced exploration activities. Approval was granted after completing public presentations in the settlements of Bellamaria and Vega Rivera. The EIA included a Community Relations Plan (CRP) that committed project support to agricultural development, childcare, environmental protection, and local infrastructure. Since the approval of this EIA, the environmental and social performance of the Project has been subject to biennial audits by independent consultants in compliance with MAATE regulations.

In 2018 a public participation process was implemented as part of the requirements for the approval of an EIA/PMA to conduct advanced exploration in the then recently acquired C20 concession. The public participation process involved implementation of a two-week Consultation and Information Office for local residents. In addition, the study was made available via MAATE's website and notifications were issued through the radio and the written press, as well as by the posting of public notices. Over 100 people attended a public presentation of the EIA in the settlement of Valle Hermoso. The presentation was followed by public commentary and a question-and-answer session. In addition, in January 2020 the Project followed a MAATE-mandated public participation process linked to an update for the C20 EIA.

20.4.5 Social Management Policies and Social Management System

Lumina corporate policies guide Odin's management of social and other issues associated with project development. These policies reflect a corporate commitment to conducting mineral exploration and mine development activities in a manner that is fair, ethical, and in conformance with governing laws and regulations. They also reflect a commitment to developing relationships of trust based on communication that is transparent, respectful, and informative. The rights, interests, and cultural heritage of host communities and affected landowners are also specifically considered. These policies also embody a commitment to minimize and mitigate environmental and social impacts, as well as to rehabilitate impacted areas in a manner acceptable to affected stakeholders and regulators.

These policies are implemented in the Project's ESMS and are documented in an overarching Health, Safety, Environmental, and Social (HSES) Management Plan, lower tier management plans [including a Strategic Community Relations Plan (SCRP)], and a suite of standard operating procedures. The HSES Management Plan is periodically revised to keep current with the changes that will occur as the project transitions towards the FS and the exploitation phase.

The SCRP was first approved in April 2017, and was designed to also support the exploration-phase Los Cangrejos and C20 PMAs, implementation of which are monitored by the MAATE. It was also designed to establish the social program structure necessary for future project development.

20.4.6 SCRP Social Management Programs

The SCRP now includes the following five social management programs outlined in the following subsections.

20.4.6.1 Communication Program

Odin's Communication Program has guided years of ongoing engagement with the stakeholders linked to its exploration program. Now that the PFS has established a preferred option, it is recommended that Odin develop a Stakeholder Engagement Program (SEP) to support its FS and the exploitation phase EIA/PMA. This program would include:

- expanding engagement with the exploration program stakeholders to include the issues linked to developing, operating and eventually closing a mine
- engagement of new stakeholders who were outside the AOI of the exploration program on their issues of interest regarding the Project.

20.4.6.2 Local Employment Program

This objective of this program is to ensure that the communities within the social AOI share in the most immediate project benefits linked to employment. The Project seeks to recruit first from among the residents of the direct area of social influence when they possess the necessary skills and are available to meet the project work requirements. The Project has a number of local residents on payroll and has promoted training programs to enable residents to develop skills needed to work with or provide goods or services to the Project. In addition, depending on the location of the work, and the required skills and experience, the Project seeks to hire temporary workers from a database of local candidates. However, unlike some other mining areas where jobs are more scarce, local residents are not always interested in the opportunities that the Project presents.

20.4.6.3 Local Purchasing Program

This program seeks the active participation of local companies in providing goods and services. This commitment to commercial relationships reinforces the positive impacts of the Project, and bolsters Odin's contributions to local development. As with local employment, Odin is interested in acquiring goods and services from within the social AOI when available and when they meet quality standards and are fairly competitive in terms of price. Beyond the area of social influence, the program prioritizes purchasing within the Canton of Santa Rosa and in the province of El Oro. The majority of goods and services linked to managing the camp are now sourced from within the canton.

20.4.6.4 Sustainable Development Support Program

These programs involve collaboration with the population of the Project's social AOI to improve their quality of life and increase opportunities for social and economic growth. Support that has been provided to date includes:

- Construction and implementation of an organic greenhouse in Valle Hermoso to produce a variety of vegetables for the benefit of the community; it was especially helpful during the COVID-19 pandemic. By agreement, management of this facility was recently transferred to the local community with a view to ensuring its long-term sustainability, with continuing advice from the company available as needed. Greenhouses also have been established in Rio Chico and San Carlos area and are providing food to school-age children and their families; a smaller scale, but similar, program has been developed in association with the elementary school in Valle Hermoso.
- With respect to vulnerable groups, support is provided to schools for sports, entrepreneurship training for women and the elderly, and coordination with local organizations to improve productive activities in the area. Food produced from community greenhouses is provided to the elderly and school-age children.
- Strategic alliances have been developed with institutions, such as the *Ministerio de Agricultura y Ganadería* (MAG), *Ministerio de Salud Pública* (MSP), and *Ministerio de Educacion* (ME) to develop training programs on key issues, and to contribute to government programs reaching the social AOI, as well as with the Ministry of Communications on internet connectivity in schools. These programs have served to generate new skills in the communities through training that has been carried out in partnership with government educational institutions.
- Promotion of entrepreneurship initiatives, including "*Pan del Valle*" (women bakers) and "*Llovisna Creativa*" (women artists and handicraft creators). Project contributions have included technical training, equipment donations, and marketing and logistical support to drive sales.
- Implementation of training programs to develop skills and capabilities. Currently a group of young people from several local settlements are participating in an eight-month technical training program on machine maintenance by the Private Technical University of Loja (Universidad Técnica Particular de Loja, UTPL) funded by Odin.

20.4.6.5 Grievance Management Program

In accordance with international BMPs, Odin has also formalized its grievance management process to ensure that it identifies stakeholder grievances, responds in a timely fashion and learns from past experiences. It is expected that the full benefits of implementing this program will be realized as the Project advances to construction and operation, and stakeholders see increasing evidence of Odin's commitment to address their concerns.

With the completion of the PFS, Odin should take additional steps to ensure that an integrated grievance management program is implemented, covering all contractors, suppliers, and any social investment initiatives supported by Odin.

21 CAPITAL AND OPERATING COSTS

21.1 Introduction

The capital and operating cost estimates presented in this PFS provide substantiated costs that were developed for assessing the economics of the Cangrejos Project. The estimates are based on an open pit mining operation; the construction of a phased process plant; an associated DSTF; site infrastructure; and Owner's costs and provisions.

21.2 Capital Costs

21.2.1 Overview

Table 21-1 summarizes the capital cost for the project. Table 21-2 provides a summary of the same capital costs for the Project, categorized by the work breakdown structure (WBS) of the capital cost estimate.

Table 21-1: Capital Cost Summary

Capital Category	Initial Capital (US$M)	Expansion 1 Capital (US$M)	Expansion 2 Capital (US$M)	Sustaining Capital (US$M)	Total Capital (US$M)
Process Plant, Infrastructure & Dry Stack Tailings Storage Facility	604	299	97	161	1160
Equipment (Mining and Ancillary Facilities)	73	0	0	424	497
Pre-production Mine Development	43	0	0	0	43
Other Direct and Indirect Costs, Including Working Capital	96	1	1	11	109
Sub Total	**816**	**300**	**97**	**596**	**1809**
Contingency	101	38	12	0	151
Freight, Duties and Taxes	8	5	1	2	16
Total Capital	**925**	**342**	**111**	**598**	**1976**

Source: Ausenco, 2023.

Table 21-2: Summary of Capital Costs, by WBS Code

WBS Code	WBS Description	Initial Capital (US$M)	Expansion 1 Capital (US$M)	Expansion 2 Capital (US$M)	Sustaining Capital (US$M)	Total Capital (US$M)
1000	Mining Infrastructure	14	0	1	50	65
2000	Site Development	19	3	0	19	40
3000	Process Plant	401	230	73	70	774
4000	On-Site Infrastructure	62	17	6	23	108
5000	Off-Site Infrastructure	4	0	0	0	4
6000	Construction Indirect Costs	30	11	3	0	45
7000	Contracted Indirect Costs	77	38	12	0	127
8000	Owner's Direct Costs	141	0	0	435	576
9000	Owner's Indirect Costs	58	0	0	0	58
10000	Other (Contingency and Freight)	109	43	14	2	167
Working Capital		9	1	1	0	11
Total Capital		**925**	**342**	**111**	**598**	**1976**

Source: Ausenco, 2023.

21.2.2 Basis of Capital Cost Estimate

21.2.2.1 Base Date and Currency

The estimate base date is Q1 2023. The estimate is prepared in United States dollars (symbol: US$).

21.2.2.2 Exchange Rates

The exchange rates used in the capital cost estimate are shown in Table 21-3 and have been determined from XE.com website as of February 3, 2023, and are applied to foreign currency data.

Table 21-3: Exchange Rates

Currency Code	Currency	Exchange Rate
C$	Canadian Dollar	1.00 C$ = 0.728 US$
AU$	Australian Dollar	1.00 AU$ = 0.692 US$
EUR	Euro	1.00 EUR = 1.083 US$

Source: XE.com, 2023.

21.2.2.3 Standard Units of Measure

Metric units of measurement are used throughout the estimate.

21.2.2.4 Ausenco Basis of Estimate

The capital costs estimated by Ausenco align with the requirements of an AACE Class 4 estimate with an accuracy range between -20% and +25% of the final project costs for Ausenco's scope. The capital cost estimate was developed in Q1 2023 US dollars based on budgetary quotations for equipment and construction contracts, as well as Ausenco's in-house database of projects and studies including experience from similar operations.

The capex is a quantitatively-based cost estimate, with engineering developed material take-offs with factored quantities, semi-detailed unit costs and budgetary quotations for major equipment.

The structure of the estimate is a build-up of the direct & indirect cost of the estimated quantities; this includes the installation/construction hours, unit labor rates and contractor distributable costs, bulk and miscellaneous material and equipment costs, any subcontractor costs, freight, and growth.

The methodology applied to develop the estimate is as follows:

- defined the scope of work
- quantified the work in accordance with standard commodities
- organized the estimate structure in accordance with agreed work breakdown structure
- developed a priced mechanical equipment list and electrical equipment list
- determined bulk material pricing
- determined the installation cost for equipment and bulks
- established requirements for freight
- determined and agreed on foreign exchange rates
- determined growth allowances for each estimate line item
- determined/developed indirect costs
- determined the estimate contingency value
- conducted internal reviews

Where the pricing and delivery information for equipment, material, and services were provided by suppliers, the pricing is based on the market conditions and expectations applicable at the time of developing the estimate.

The market conditions are susceptible to the impact of demand and availability at the time of purchase and could result in variations in the supply conditions. The estimate and schedule in this report were based on information provided by suppliers and assumes normal market supply and availability of equipment and services during the execution phase.

The following parameters and qualifications were considered:

- No allowance has been made for exchange rate fluctuations.
- There is no escalation added to the estimate.
- A growth allowance was included.
- Data for the estimates have been obtained from numerous sources, including:
  - PFS mine schedules
  - PFS-level engineering design by Ausenco and IMC
  - geotechnical investigations
  - budgetary equipment quotes from internationally-based suppliers
  - budgetary unit costs from several local contractors for civil, concrete, steel, electrical, piping, and mechanical works
  - data from similar recently completed studies and projects.

Major commodity cost categories (earthworks, concrete, structural steelwork, architectural, mechanical equipment, platework, piping, electrical equipment, electrical bulks, instrumentation, and mobile equipment) were identified and estimated. Percentage of contingency was allocated to each of these categories on a line-item basis based on the accuracy of the data, considering scope, quantification, and pricing. An overall contingency amount was derived in this fashion.

A growth allowance was allocated to each line item in the capital cost estimate to reflect the level of definition of design and pricing strategy. Growth is a provision for additional costs that will be recognized in future project phases that advance the engineered level of detail.

Estimate growth is intended to account for the following:

- items that cannot be quantified based on current engineering status but empirically known to appear
- the accuracy of quantity take-offs and engineering lists based on the level of engineering and design undertaken at a pre-feasibility study level
- pricing growth for the likely increase in cost due to development and refinement of specifications as well as re-pricing after initial budget quotations and after finalization of commercial terms and conditions to be used in the Project

Growth has been calculated on a line-item level by evaluating the status of the engineering scope definition and maturity and the ratio of the various pricing sources for equipment and materials used to compile the estimate. The growth applied was based on guidance aligning to Class 4 AACE estimate and the level of definition of the project scope. The capital cost allowances for design and price growth are shown by commodity in Table 21-4.

Table 21-4: Capital Cost Allowances for Design and Price Growth by Commodity

Commodity	% Design Growth	% Price Growth	% Total Growth
Architectural	1%	4%	5%
Concrete	10%	2%	12%
Earthworks	0%	4%	4%
Electrical Bulks	1%	0%	1%
Electrical Equipment	1%	4%	6%
Field Indirects	0%	0%	0%
Instrumentation	0%	0%	0%
Mechanical Equipment	1%	4%	6%
Mobile Equipment & Ancillaries	1%	6%	7%
Piping And Fittings (A/G) & (U/G)	2%	1%	3%
Platework	2%	6%	7%
Project Delivery	0%	0%	0%
Provisions	0%	0%	0%
Spare Parts / First Fills	0%	0%	0%
Structural Steelwork	9%	4%	13%
Third-Party Estimates	0%	0%	0%

Source: Ausenco, 2023.

Ausenco's basis of estimate was used to estimate capital costs in Sections 21.2.3.1, 21.2.3.5, and 21.2.3.7.

21.2.2.5 IMC Basis of Estimate

Mine capital cost for mobile equipment were developed for the mine equipment listed in Section 16.8. Unit costs for major equipment were based on costs from a global pricing quote provided EMG, LLC and most of the minor (support) equipment were based on similar equipment from the IMC cost library and the 2021 InfoMine Cost Service. The mine major equipment costs were verified with vendor quotes provided to Lumina.

Mine capital costs include the following:

- all mine mobile equipment required to drill, blast, load, and haul the material from the pit to the appropriate destinations
- auxiliary equipment to maintain the mine and material storage areas in good working order as well as construct the mine haul roads and maintain them. If the mine haul trucks use the road, we have sufficient equipment to build and maintain the roads
- equipment to maintain the mine fleet such as tire handlers and forklifts
- light vehicles for mine operations and staff personnel
- an allowance is included for initial shop tools
- an allowance is included for initial spare parts inventory
- mine engineering equipment (e.g., computers, survey equipment) is included.
- mine communication network and system
- equipment replacements as required based on the useful life of the equipment
- units are shown purchased in the year they are needed.

Mine capital costs do not include the following:

- mine office buildings, or shop facilities
- mobile equipment that is not required by the mine (i.e., no mobile units for the plant)
- infrastructure or process plant related costs
- import duties have not been included
- allowance for clearing and grubbing (material handling of topsoil is not included unless sent to waste storage facility)
- equipment salvage value credit
- contingency has not been added.

The mine operating cost is based on a fuel cost of $0.58/L.

IMC's Basis of Estimate was used to estimate capital costs in Sections 21.2.3.2, 21.2.3.3, 21.2.3.5, and 21.2.3.7.

21.2.2.6 Other Estimates

All capital costs not estimated by Ausenco or IMC were provided by Lumina, with support from MTB Enterprises and RME. These costs include Sections 21.2.3.4, 21.2.3.5, 21.2.3.6, and 21.2.3.7.

21.2.3 Capital Cost Categories

21.2.3.1 Process Plant, Infrastructure, and Dry-stack Tailings Storage Facility

WBS 1000 – Mine Infrastructure

The mine infrastructure cost estimate is grouped into the following main categories:

- WBS 1100 – Mine Development Costs
- WBS 1200 – Mine Dewatering Costs
- WBS 1400 – WRSF Development
- WBS 1500 – Ore Stockpile
- WBS 1600 – Mining Equipment
- WBS 1700 – Mine Ancillary Services
- WBS 1800 – Mine Explosives Magazine

The cost breakdown is shown in Table 21-5.

Table 21-5: Direct Costs, Mining

WBS Code	Mining Capital Category	Initial Capital (US$M)	Expansion 1 Capital (US$M)	Expansion 2 Capital (US$M)	Sustaining Capital (US$M)	Total Capital (US$M)
1200	Pit Dewatering – Pumps – Electrical – Piping	0.3	-	-	7.7	8.0
1400	WRSF Development – Detailed Earthwork – Underdrain	1.4	-	-	41.9	43.3
1500	Crusher – ROM Stockpile – Bulk Earthwork – MSE Wall	6.3	-	-	-	6.3
1700	Mine Infrastructure Area – Building Construction	5.9	-	1.4	-	7.3

WBS Code	Mining Capital Category	Initial Capital (US$M)	Expansion 1 Capital (US$M)	Expansion 2 Capital (US$M)	Sustaining Capital (US$M)	Total Capital (US$M)
1800	Mine Explosives Magazine	0.3	-	-	-	0.3
Total Mining Capital		**14.3**	**-**	**1.4**	**49.6**	**65.2**

Source: Ausenco, 2023

WBS 2000 – Site Development

The site development cost estimate is grouped into two main cost categories:

- WBS 2200 – Surface Water Management Structures and Facilities
- WBS 2400 – Bulk Earthworks

The cost breakdown of these categories is shown in Table 21-6.

Table 21-6: Direct Costs, Site Development

WBS Code	Site Development Capital Category	Initial Capital Cost (US$M)	Expansion 1 Capital Cost (US$M)	Expansion 2 Capital Cost (US$M)	Sustaining Capital Cost (US$M)	Total Capital Cost (US$M)
2210	Surface Water Management – Pit	0.5	-	-	1.3	1.8
2220	Surface Water Management – DSTF	0.4	-	-	12.1	12.4
2230	Surface Water Management – WRSF	0.8	-	-	5.6	6.4
2240	Surface Water Management – Infrastructure / Roads	-	-	-	-	-
2420	Plant Site	1.0	2.7	-	-	3.7
2430	Filtration Plant (Includes Bulk Earthwork)	6.2	-	-	-	6.2
2440	Mine Infrastructure Area	0.1	-	-	-	0.1
2450	Internal Roads (Includes Bulk Earthwork And Surface Water Management)	9.7	-	-	-	9.7
2460	Surface Water Management	0.1	-	-	-	0.1
Total Site Development Capital		**18.7**	**2.7**	**-**	**19.0**	**40.4**

Source: Ausenco, 2023.

WBS 3000 – Process Plant

The process plant cost estimate is grouped into seven main cost categories:

- WBS 3100 – Crushing, Stockpiling, and Reclaim
- WBS 3200 – Grinding
- WBS 3300 – Flotation
- WBS 3400 – Concentrate Filtration
- WBS 3700 – Refinery
- WBS 3800 – Reagent & Services
- WBS 3900 – Tailings Filtration and Conveying

The cost breakdown of these categories is shown in Table 21-7.

Table 21-7: Direct Costs, Process Plant

WBS	Process Plant Capital Category	Initial Capital Cost (US$M)	Expansion 1 Capital Cost (US$M)	Expansion 2 Capital Cost (US$M)	Sustaining Capital Cost (US$M)	Total Capital Cost (US$M)
3100	Crushing, Stockpile/Reclaim	99.1	30.3	10.5	-	139.9
3200	Grinding	77.5	65.7	4.9	-	148.1
3300	Flotation	21.9	40.1	25.5	-	87.4
3400	Concentrate Filtration	26.4	4.1	1.5	-	32.0
3700	Refinery	9.5	0.9	0.3		10.7
3800	Reagents and Services	18.4	12.4	0.1		30.9
3900	Tailings Filtration and Conveying	148.6	76.1	30.5	69.5	324.7
Total Process Plant Capital		**401.4**	**229.6**	**73.3**	**69.5**	**773.8**

Source: Ausenco, 2023.

WBS 4000 – On-Site Infrastructure

The on-site infrastructure cost estimate is grouped into six main cost categories:

- WBS 4100 – Power Generation and Distribution

- WBS 4200 – Buildings
- WBS 4300 – Site Services
- WBS 4400 – Mobile Equipment
- WBS 4500 – Dry-stack Tailings Facility
- WBS 4600 – Process Plant Raw Water Ponds

The cost breakdown of these categories is shown in Table 21-8.

Table 21-8: Direct Costs, On-Site Infrastructure

WBS Code	On-Site Infrastructure Capital Category	Initial Capital Cost (US$M)	Expansion 1 Capital Cost (US$M)	Expansion 2 Capital Cost (US$M)	Sustaining Capital Cost (US$M)	Total Capital Cost (US$M)
4100	Power Generation & Distribution	25.0	6.5	-	-	31.5
4200	Buildings	3.2	-	-	-	3.2
4300	Site Services	25.6	9.0	4.5	-	39.1
4400	Mobile Equipment - Process	6.1	1.8	1.8	-	9.6
4500	Dry-stack Tailings Facility	1.0	-	-	22.0	22.0
4600	Process Plant Raw Water Ponds (Dry Season)	0.9	-	-	0.8	1.7
Total On-Site Infrastructure Capital		**61.8**	**17.2**	**6.3**	**22.8**	**108.1**

Source: Ausenco, 2023.

WBS 6000 – Construction Indirects

The construction indirects cost estimate consists of construction indirects for the process plant, on-site infrastructure, and dry-stack tailings facility in the initial and expansion phases of the Project, and is grouped into three main cost categories:

- WBS 6100 – Contractor Indirects
    - Contractor indirects include construction equipment and temporary construction facilities for the initial and expansion phases of the Project
- WBS 6400 – Vendor Representatives
    - Vendor representative costs include installation and commissioning assistance costs from vendors and contractors for equipment, facilities, and site activities at the Project

- WBS 6500 – Spares and First Fills
  - Spares and first fills include commissioning spares, critical spares, construction first fills, and commissioning first fills for equipment and facilities at the Project

The cost breakdown of these categories is shown in Table 21-9.

Table 21-9: Construction Indirects

WBS Code	Construction Indirects Capital Category	Initial Capital Cost (US$M)	Expansion 1 Capital Cost (US$M)	Expansion 2 Capital Cost (US$M)	Sustaining Capital Cost (US$M)	Total Capital Cost (US$M)
6100	Contractor Indirects	9.9	3.0	1.0	0.0	13.9
6400	Vendor Representatives	4.8	3.6	1.1	0.0	9.5
6500	Spares And First Fills	15.8	4.9	1.4	0.0	22.0
Total Construction Indirects		**30.4**	**11.5**	**3.5**	**0.0**	**45.4**

Source: Ausenco, 2023.

WBS 7000 – Contracted Indirects

The contracted indirect cost estimate consists of project delivery costs for the process plant, on-site infrastructure, and DSTF in initial and expansion phases of the Project, and is grouped into four main cost categories:

- WBS 7110 – Engineering and Procurement
- WBS 7120 – Construction and Project Management
- WBS 7130 – EPCM Expenses
- WBS 7310 – Mine Spare Parts

The cost breakdown of these categories is shown in Table 21-10.

Table 21-10: Contracted Indirects

WBS Code	Contracted Indirects Capital Category	Initial Capital Cost (US$M)	Expansion 1 Capital Cost (US$M)	Expansion 2 Capital Cost (US$M)	Sustaining Capital Cost (US$M)	Total Capital Cost (US$M)
7110	Engineering and Procurement	25.9	13.7	4.5	0.0	44.1
7120	Construction and Project Management	36.0	20.7	6.7	0.0	63.4

WBS Code	Contracted Indirects Capital Category	Initial Capital Cost (US$M)	Expansion 1 Capital Cost (US$M)	Expansion 2 Capital Cost (US$M)	Sustaining Capital Cost (US$M)	Total Capital Cost (US$M)
7130	EPCM Expenses	10.4	3.1	1.0	0.0	14.6
7310	Mine Spare Parts	5.0	0.0	0.0	0.0	5.0
Total Contracted Indirects		**77.4**	**37.5**	**12.2**	**0.0**	**127.1**

Source: Ausenco, 2023

21.2.3.2 Equipment (Mining and Ancillary Facilities)

WBS 5000 – Off-Site Infrastructure

The off-site infrastructure cost estimate consists of the cost to construct a high-voltage power line to supply power to the Project. This cost is estimated US$4.1M in the initial phase of the Project, with no expansion phase or sustaining capital costs.

WBS 8120-8170 – Owner's Site Development

The owner's site development cost estimate is grouped into four main categories:

- WBS 8120 – Owner-Contracted Vegetation Suppression, Clearing, and Grubbing, and Top Soil Removal, for all On-Site Facilities (US$2.8M in the Initial Phase)
- WBS 8150 – Owner-Contracted Soft Soil Removal at the DSTF (US$0.4M in the Initial Phase)
- WBS 8160 – Owner-Contracted Sub-Grade Preparation at the DSTF (US$0.4M in the Initial Phase)
- WBS 8170 – Use of Owner Mine Fleet for Bulk Earthworks, Surface Water Management Structures, and Aggregate Delivery (US$8.4M in the Initial Phase)

The monthly pre-production cost distribution of WBS 8170 as scheduled by IMC is shown in Table 21-11.

Table 21-11: WBS 8170 Monthly Costs in the Initial Phase

Pre-Production Month	Owner Mine Fleet Bulk Earthworks Capital Cost (US$k)
PP-M28	604
PP-M27	604
PP-M26	655

Pre-Production Month	Owner Mine Fleet Bulk Earthworks Capital Cost (US$k)
PP-M25	953
PP-M24	953
PP-M23	961
PP-M22	663
PP-M21	663
PP-M20	663
PP-M19	663
PP-M18	149
PP-M17	109
PP-M16	109
PP-M15	109
PP-M14	109
PP-M13	46
PP-M12	37
PP-M11	3
PP-M10	9
PP-M9	23
PP-M8	33
PP-M7	42
PP-M6	54
PP-M5	29
PP-M4	37
PP-M3	30

Pre-Production Month	Owner Mine Fleet Bulk Earthworks Capital Cost (US$k)
PP-M2	37
PP-M1	37
Total Capital for Initial Phase	**8,386**

Source: IMC, 2023.

The total cost estimate for owner's site development in the Initial Phase of the Project is US$12.1M. There are no further costs for the expansion phases or sustaining capital of the Project.

WBS 8200 – Mining Equipment

The mining equipment cost estimate is grouped into five main categories:

- WBS 8211 – Purchased Major Mining Equipment (US$0.2M in the Initial Phase)
- WBS 8213 – Lease Downpayment for Major Mining Equipment (US$32.9M in the Initial Phase)
- WBS 8216 – Lease Principal Payment for Major Mining Equipment (US$7.8M in the Initial Phase)
- WBS 8217 – Lease Interest Payment for Major Mining Equipment (US$4.3M in the Initial Phase)
- WBS 8220 – Mining Support Equipment (US$8.3M in the Initial Phase)
- WBS 8230 – Miscellaneous Mine Support Items (US3.6M in the Initial Phase)

The total mining equipment cost is estimated at US$57.2M in the Initial Phase of the Project. Listings for Major Mining Equipment and Mining Support Equipment included in the costs above can be found in Section 16.8. There are no expansion phase costs for Mining Equipment. Sustaining capital costs for all mining equipment total to US$459.0M over the life of mine, including leasing costs (US$150.4M).

21.2.3.3 Pre-Production Mine Development (WBS 8110)

The pre-production mine development cost estimate consists of capitalized mine operating costs for waste stripping in the Initial Phase of the Project, a total cost of US$43.2M. IMC scheduled these costs on a monthly basis in the pre-production period, as shown in Table 21-12:

Table 21-12: Pre-Production Mine Development Costs

Pre-Production Month	Mine Operating Consumable Costs (US$k)	Mine Fleet Lease Costs (US$k)	Mine Operating Labor Cost (US$k)	Total Mine Operating Cost (US$k)
PP-M28	-	-	-	-
PP-M27	-	-	-	-
PP-M26	-	-	-	-
PP-M25	-	-	-	-
PP-M24	-	-	-	-
PP-M23	-	-	-	-
PP-M22	-	-	-	-
PP-M21	-	-	-	-
PP-M20	-	-	-	-
PP-M19	-	-	-	-
PP-M18	223	-	469	692
PP-M17	252	-	480	732
PP-M16	252	-	480	732
PP-M15	252	-	480	732
PP-M14	254	-	480	734
PP-M13	704	67	533	1,304
PP-M12	722	67	533	1,322
PP-M11	776	67	546	1,388
PP-M10	760	67	546	1,373
PP-M9	770	67	546	1,383
PP-M8	806	67	556	1,428
PP-M7	901	67	560	1,528
PP-M6	1,215	67	590	1,872

Pre-Production Month	Mine Operating Consumable Costs (US$k)	Mine Fleet Lease Costs (US$k)	Mine Operating Labor Cost (US$k)	Total Mine Operating Cost (US$k)
PP-M5	2,178	67	892	3,137
PP-M4	3,070	67	919	4,056
PP-M3	4,301	67	1,001	5,369
PP-M2	5,942	67	1,078	7,086
PP-M1	7,182	67	1,133	8,381
Total Capital for Initial Phase	**30,562**	**867**	**11,820**	**43,248**

Source: IMC, 2023.

21.2.3.4 Other Direct and Indirect Costs, Including Working Capital

WBS 8300 – Office and Engineering Equipment

The office and engineering equipment cost estimate is grouped into two main categories:

- WBS 8310 – Office and Engineering Equipment, Furniture, Cell Phones, and Radios for Mining, including Mine Planning Software (US$0.5M in the Initial Phase)
- WBS 8320 – Office and Engineering Equipment, Furniture, Cell Phones, and Radios for General and Administration (US$0.4M in the Initial Phase)

The total office and engineering equipment cost is estimated at US$0.9M in the Initial Phase of the Project. There are no further costs for the expansion phases or sustaining capital of the Project.

WBS 8400 – Mobile Equipment and Light Vehicles

The mobile equipment and light vehicles estimate is grouped into two main categories:

- WBS 8400 – Mobile Equipment and Light Vehicles for General and Administration (US$1.5M)
- WBS 8410 – Mobile Equipment and Light Vehicle Spare Parts for General and Administration (US$0.7M)

The mobile equipment and light vehicle cost is estimated at US$2.2M in the Initial Phase of the Project. There are no further costs for the expansion phases or sustaining capital of the Project.

WBS 8500 – Medical, Security, and Safety Equipment

Medical, security, and safety equipment capital costs are estimated at US$6.9M in the Initial Phase of the Project. These costs are estimated for a workforce of 1,000 personnel involved in the construction and operation of the Project. Seventy percent of the projected costs for medical and security have been allocated to security infrastructure, which includes fencing, electronic equipment, and software support.

A health clinic serving the camp is planned near the process plant, along with two auxiliary stations at the truck shop and DSTF areas. These facilities will be equipped with standard clinical equipment such as stretchers, examination tables, gurneys, and furniture. Additionally, three emergency stations, two ambulances, a cyanide emergency trailer, and self-contained breathing apparatus (SCBA) will complete the medical infrastructure.

There are no further costs for the expansion phases or sustaining capital of the Project.

WBS 8600 – IT Hardware and Software

The IT hardware and software cost estimate is grouped into two main categories:

- WBS 8600 – IT Hardware and Software for Mine, Process and Administration (US$2.8M)
- WBS 8610 – IT Hardware and Software for Mine Dispatch and Mine Planning Software (US$2.0M)

The total IT hardware and software cost is estimated at US$4.8M in the Initial Phase of the Project. There are no further costs for the expansion phases or sustaining capital of the Project.

WBS 8700 – Operational Camp Facilities

The operational camp facilities cost is estimated at US$10M in the Initial Phase of the Project. During pre-production, a camp that can accommodate 1,250 people will be built over 10 months. The camp will serve both construction and operational crews and will include eight, four, and three-person stacked modular units, a restaurant, a kitchen, a pantry and a recreational facility. The average number of construction workers will be 496, with a peak of 743, while operational crews will average 904, with a peak of 1,063, over the mine's lifespan.

WBS 8800 – Laboratory Costs

The laboratory cost is estimated at US$3.4M in the Initial Phase of the Project. This laboratory cost is for plant wet chemistry and mining grade control assay. There are no further costs for the expansion phases or sustaining capital of the Project.

WBS 9000 – Owner's Indirect Costs

The owner's indirect costs are grouped into 15 main categories, as shown in Table 21-13:

Table 21-13: Owner's Indirect Costs

WBS Code	Owner’s Indirects Capital Category	Initial Capital Cost (US$M)
9110	Preproduction Employment, Recruiting, And Training	19.4
9120	Employee Travel, & Transportation	2.3
9130	Corporate Travel and Services	0.3
9140	Employee Meals, Cleaning, & Laundry	5.2
9150	Project And Construction Management	7.4
9200	Pre-production Power – Owner Facilities	2.6
9310	Land Acquisition	0.0
9320	Legal, Permits, And Fees	3.5
9330	Office Leases, Including Utilities	0.5
9400	Insurance	3.0
9510	Environmental Services & Consumables	1.0
9520	Security Services	2.7
9530	Outside Consultants	2.3
9600	Community Development	6.8
9700	Social Benefits (Corporate Discretion)	1.1
Total Owner’s Indirect Costs		**58.1**

Source: Lumina, 2023.

The US$7.4M estimated for project and construction management (WBS 9150) is based on actual costs provided on behalf of project owners for over 20 years. MTB applied 1.5% to contracted direct costs to estimate project and construction management costs, including labor and expenses. As a check, MTB also reviewed a detailed staffing plan developed for the 2018 Cangrejos PEA. North American expatriate staffing to manage EPCM activities both in the EPCM contractor’s office and at the project site were considered for a pre-production period of 28 months. Six-week rotations were assumed. The labor rates and expenses for the 2018 estimate were escalated by 18% to approximate 2023 labor and expense costs. Both methods of estimating the project and construction management costs yielded reasonably similar results.

Power requirements for pre-production (WBS 9200) were estimated by MTB at US$2.6M, based on the estimated power demands during the 28-month pre-production period. Based on the schedule provided by EPTEC (author of Lumina's power supply study) it is estimated that permanent utility power will be available at the site by month -4 of the pre-production period. Prior to the availability of utility power, power will be supplied by diesel generators for the operations/construction camp, mine ancillary facilities, primarily including the mine truck shop, and administration facilities. A vendor quotation was obtained for rental of eight 2-MW fully fueled and maintained diesel generators mounted in containers. Construction contractors are assumed to supply their own power.

The US$6.7M allocated to community development will be based on the following factors:

- local social development, including education, health, and entrepreneurship
- investment in local infrastructure, including roads, potable water, sewerage, and other critical needs
- training and strengthening of providers of goods and services
- communications activities, including media and institutional relations at the local, provincial, and national levels.

Additionally, a community-based training program estimated to cost US$3.4M has been allocated as part of the community development cost; the program will have three levels. Level 0 is an accelerated high school diploma program aimed at individuals who have not completed their secondary education and wish to be trained in mining operations. The recruiting process will involve the community relations team, social media, and local governments to select 400 people for the program. Once completed, 100 people out of the initial 400 will be selected to move on to Level 1, which is aimed at providing basic mechanical technical training for those with no previous experience in mechanical fundamentals. Level 2 is a more advanced training program that focuses on heavy machinery.

There are no further costs for the expansion phases or sustaining capital of the Project.

Working Capital

Working capital is the maximum shortfall between revenue and expenses that is experienced during the operating period immediately after a capital investment. Working capital is estimated for the initial and expansion phases of the project as follows:

- Initial Phase: US$9.2M, occurring in the 23rd week of production
- Expansion 1: US$1.1M, occurring in the 7th week after the first expansion
- Expansion 2: US$0.8M, occurring in the 3rd week after second expansion

21.2.3.5 Contingency

Contingency is estimated for the initial and expansion phases of the Project, as follows:

- Initial Phase: US$100.5M
- Expansion 1: US$37.9M

- Expansion 2: US$12.4M

21.2.3.6 Freight and Duties (Excluding VAT)

Freight and duties are estimated for the initial and expansion phases of the project as follows:

- Initial Phase: $8.2M
- Expansion 1: US$4.6M
- Expansion 2: US$1.4M

21.2.3.7 Sustaining Capital

The total LOM sustaining capital costs for the Cangrejos Project are US$597.8 million, as presented in Table 21-14.

Table 21-14: LOM Sustaining Capital Costs

Sustaining Capital Category	YR-1	YR-2	YR-3	YR-4	YR-5	YR-6	YR-7	YR-8	YR-9	YR-10	YR-11	YR-12	YR-13	YR-14	YR-15	YR-16	YR-17	YR-18	YR-19	YR-20	YR-21	YR-22	YR-23	YR-24	YR-25	YR-26	Total Sustaining Capital (US$M)
Process Plant, Infrastructure & Dry Stack Tailings Storage Facility	31.0	7.0	44.4	2.4	3.8	7.6	1.5	5.7	0.3	15.4	1.5	0.1	2.0	0.0	10.2	1.3	4.6	0.1	1.0	10.4	2.4	5.8	0.1	0.1	1.9	0.0	160.8
Equipment (Mining and Ancillary Facilities)	25.1	20.7	21.3	28.5	23.4	71.0	46.7	46.7	2.2	2.2	4.3	9.6	19.9	39.9	9.6	36.4	10.9	4.1	0.4	0.8	0.3	0.0	0.0	0.0	0.0	0.0	424.0
Other Direct and Indirect Costs, Including Working Capital	0.3	0.0	0.0	0.8	0.4	0.4	0.3	1.0	0.7	1.8	0.0	0.7	0.8	0.2	0.0	1.0	0.5	0.3	0.5	0.7	0.3	0.0	0.0	0.2	0.0	0.0	11.0
Sub Total	56.4	27.7	65.7	31.7	27.6	79.0	48.5	53.5	3.2	19.4	5.9	10.4	22.7	40.1	19.8	38.8	16.0	4.5	2.0	11.9	3.1	5.8	0.1	0.3	1.9	0.0	595.9
Freight, Duties and Taxes	0.6	0.2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
Total	57.0	27.9	66.7	31.7	27.6	79.0	48.6	53.5	3.2	19.4	5.9	10.4	22.7	40.1	19.8	38.8	16.0	4.5	2.0	11.9	3.1	5.8	0.1	0.3	1.9	0.0	597.8

Source: Ausenco, 2023.

For the Process Plant, Infrastructure, and Dry-Stack Tailings Storage Facility, the main sustaining capital costs consist of additional dry-stack tailings conveyors (US$69.5M), additional pit de-watering pumps (US$7.7M), site earthworks (US$36.7M), and progressive reclamation activities (US$47.0M). For Equipment (Mining and Ancillary Facilities), the main sustaining capital costs consist of mining equipment purchases (US$273.6M) and equipment capital leasing costs (US$150.3M); additional information on mining equipment requirements over the life of mine is provided in Section 16.8. Other direct and indirect sustaining capital costs include medical and safety equipment (US2.7M), camp facilities replacements and upgrades (US$1.5M), office equipment (US$0.9M), IT equipment (US$0.7M), and other items (US$5.2M).

21.2.4 Closure and Reclamation Planning

The total closure cost for the Cangrejos Project is estimated at US$37.6 million. This cost is the Year 26 net present value (NPV) at five percent discount rate of the final closure cost estimate expended over two years, combined with the ten-year environmental monitoring cashflow as estimated by Lumina. The closure cost excludes progressive reclamation, which is included in sustaining capital (see Section 21.2.3.7).

21.3 Operating Costs

21.3.1 Overview

The estimate aligns with the principles of a Class 4 pre-feasibility study level with an accuracy of -20% to +25% according to the Association for the Advancement of Cost Engineering International (AACE International). The average yearly processing operating costs (including G&A costs) differ as the Project undergoes three distinct expansions and operating phases.

Operating costs include the ongoing cost of operations relating to mining, processing, tailings storage, and general administration activities. Table 21-15 provides a summary of the tonnage-weighted average operating costs of throughput phase over the life of mine, based on dollars per tonne milled.

Table 21-15: Operating Cost Summary

Year	LOM	Initial Phase	Expansion 1	Expansion 2	LOM	Initial Phase	Expansion 1	Expansion 2
Operating Costs	**US$M**	**US$M/a**	**US$M/a**	**US$M/a**	**US$/t**	**US$/t**	**US$/t**	**US$/t**
Mining	3,188.1	107.1	131.6	123.6	4.84	10.66	6.27	4.37
Processing	4,998.8	83.6	179.4	210.5	7.59	8.32	8.54	7.44
Site G&A	527.0	22.0	21.9	19.8	0.80	2.19	1.04	0.70
Total	**8,714.0**	**212.7**	**332.9**	**353.9**	**13.23**	**21.16**	**15.85**	**12.51**

Source: Ausenco, 2023.

21.3.2 Base Date and Currency

Common to all operating cost estimates are the following assumptions:

- Cost estimates are based on Q1 2023 pricing without allowance for inflation.
- Costs are expressed in United States dollars (US$).

21.3.3 Exchange Rates

For material sourced in Canadian dollars (C$), an exchange rate of 1.34 C$ per US dollar was assumed. For material sourced in European Euro (EUR or €), an exchange rate of 0.921 EUR per US dollar was assumed.

21.3.4 Mine Operating Costs

Mine operating costs were developed based on first principles for the mine plan and equipment list presented earlier in Section 16. The unit costs for the mine major equipment consumables were derived from the IMC cost library and the 2021 InfoMine Cost Service. The unit costs for labor were provided by the Pierre Laville with P.L. Services Eirelli. The fuel costs were set at US$0.58 per liter.

Pre-production site preparation and bulk earthworks will use the mining fleet and operators. The pre-production site preparation and bulk earthworks will be established 10 months ahead of the pre-production mining period (PP M-28 to PP M-19). Pre-production mining is established to be 18 months in total. The first five months is for developing mine access roads from the crusher pad to each of the working areas. The first 23 months of pre-production (site preparation and mine development) operates at one shift per day; thereafter, the mine is assumed to operate with two 12-hour shifts per day for 365 days per year. Five days (10 shifts) of loss time are assumed due to weather delays.

The mine operating costs include the following:

- Drilling, blasting, loading, and hauling of material from the mine to the crusher or waste storage facilities. Maintenance of the waste storage areas is included in the mining costs. Maintenance of mine mobile equipment is included in the operating costs.
- Mine supervision, mine engineering, geology, geotechnical, surveyors and ore control are included in the mine technical category.
- Operating labor and maintenance labor (including burden) for the mine mobile equipment are included.
- Mine access road construction and maintenance are included. If mine haul trucks drive on the road, their cost and maintenance are included in mine operating costs.
- The small stockpile (1,800 kt) that is generated during pre-production stripping is re-handled to the plant in Year 1.
- A general mine allowance is included that is intended to cover road base cost, assaying, software licenses (dispatch, communication network and mine planning software) and general operating supplies that cannot be assigned to one of the unit operations.
- A general maintenance allowance is included that is intended to cover the general operating supplies of the maintenance group.
- Blasting costs are contracted costs; the contractor costs include blasting materials, labor, supervision and equipment costs.

The mine operating costs do not include the following:

- crushing, conveying or processing
- reclamation or recontouring mine operating costs
- mine safety personnel

- labor benefits and severance pay.

Annual mine operating costs are shown by unit operation in Table 21-16. Mine operations staffing requirements are summarized in Table 21-17 and Table 21-18.

Table 21-16: Summary of Mine Operating Costs by Unit Operations

Mining Year	Total Material Mined (Mt)	Total Mill Feed (Mt)	Drilling (US$M)	Blasting (US$M)	Loading (US$M)	Hauling (US$M)	Auxiliary (US$M)	General Mine (US$M)	General Maint. (US$M)	Mine MTV (US$M)	Bulk Earthworks (US$M)	Total Costs (US$M)	Cost / Tonne Mined	Cost / Tonne Milled
PP	13.28	0.00	1.94	9.38	2.79	9.34	8.95	2.28	1.03	7.53	8.39	51.63	3.89	0.00
Yr 1	43.13	8.25	7.80	22.12	7.56	42.52	13.81	4.04	2.57	6.20	1.51	108.13	2.51	13.11
Yr 2	44.37	10.95	8.80	24.23	7.05	40.87	13.91	4.06	2.55	6.20	0.39	108.06	2.44	9.87
Yr 3	47.37	10.95	9.90	26.40	7.53	33.56	13.82	4.27	2.68	5.63	1.28	105.07	2.22	9.60
Yr 4	60.81	19.20	12.18	31.76	9.18	45.33	13.65	5.20	3.26	5.69	0.16	126.41	2.08	6.58
Yr 5	60.17	21.90	12.48	32.27	9.07	38.69	13.72	5.20	3.23	5.69	1.02	121.37	2.02	5.54
Yr 6	61.99	21.90	13.29	33.84	8.78	62.45	13.52	5.31	3.36	5.82	0.67	147.05	2.37	6.71
Yr 7	71.73	28.30	15.23	38.31	10.16	69.05	15.12	6.01	3.80	5.88	0.17	163.74	2.28	5.79
Yr 8	71.95	29.20	15.40	38.19	10.21	64.76	14.60	6.04	3.81	5.87	0.74	159.63	2.22	5.47
Yr 9	71.96	29.20	15.31	37.60	10.26	70.01	12.78	6.04	3.81	5.87	0.06	161.74	2.25	5.54
Yr 10	71.53	29.20	15.14	37.19	10.37	57.51	12.89	6.00	3.76	5.79	0.06	148.71	2.08	5.09
Yr 11	70.72	29.20	14.98	36.91	10.25	52.46	12.83	5.95	3.71	5.76	0.30	143.15	2.02	4.90
Yr 12	71.42	29.20	15.46	37.95	10.31	54.39	12.79	6.01	3.74	5.76	0.05	146.46	2.05	5.02
Yr 13	69.00	29.20	15.16	37.15	9.82	50.81	12.65	5.86	3.63	5.75	0.26	141.08	2.04	4.83
Yr 14	69.79	29.20	15.14	37.29	10.58	78.19	12.91	5.92	3.77	6.00	0.05	169.84	2.43	5.82
Yr 15	67.61	29.20	14.68	36.23	10.22	75.53	12.79	5.77	3.68	6.00	0.16	165.06	2.44	5.65
Yr 16	67.61	29.20	14.67	36.26	10.47	80.17	11.95	5.78	3.68	6.01	0.05	169.04	2.50	5.79
Yr 17	65.65	29.20	14.30	35.34	10.01	72.16	11.46	5.65	3.55	5.59	0.04	158.09	2.41	5.41
Yr 18	65.65	29.20	14.29	35.33	9.98	63.75	10.01	5.65	3.51	5.49	0.04	148.05	2.26	5.07
Yr 19	65.55	29.20	14.19	35.13	10.01	38.95	9.10	5.64	3.39	5.24	0.04	121.69	1.86	4.17
Yr 20	58.67	29.20	12.77	31.90	7.75	29.99	8.24	5.14	3.02	5.06	0.22	104.08	1.77	3.56
Yr 21	41.18	29.20	9.13	23.60	5.42	19.58	8.28	3.98	2.24	4.90	0.03	77.15	1.87	2.64
Yr 22	34.95	29.20	7.69	20.53	4.72	11.19	7.64	3.57	1.96	4.85	0.02	62.16	1.78	2.13
Yr 23	35.10	29.20	7.75	20.66	4.68	11.74	7.62	3.58	1.96	4.84	0.02	62.86	1.79	2.15
Yr 24	35.59	29.20	7.85	20.92	4.62	14.92	7.55	3.61	1.98	4.83	0.02	66.31	1.86	2.27
Yr 25	36.24	29.20	7.98	21.23	4.70	18.74	7.49	3.65	2.00	4.83	0.02	70.65	1.95	2.42
Yr 26	12.75	11.66	2.94	8.95	1.67	8.69	4.08	1.70	0.88	3.60	0.01	32.53	2.55	2.79
Total	**1485.74**	**658.70**	**316.46**	**806.68**	**218.20**	**1215.36**	**304.16**	**131.89**	**80.54**	**150.69**	**15.80**	**3239.78**	**2.18**	**4.92**
Percent of Mining Costs				9.8%	24.9%	6.7%	37.5%	9.4%	4.1%	2.5%	4.7%	0.5%		

Source: IMC, 2023.

Table 21-17: Mine Labor Requirements, Salaried Personnel

Salaried Job Title	Start Of Production (Year 1)	Full Mill Production (Year 8)	Max Mining Labor (Salaried and Hourly) (Year 16)	LOM Average
Mine Operations:				
Mine Manager (Expat)	1	1	1	1
Mine Superintendent	1	1	1	1
FL Supervisors (Shift Foremen)	8	8	8	8
Drill & Blasting Supervisor (Expat)	1			0
Drill & Blasting Supervisor (Trainee)	1			0
Drill & Blasting Supervisor (National)		1	1	1
Mine Operations Supervisor	1	1	1	1
Mine Trainer (Expat)	2			0
Mine Trainer (Trainee)	8			1
Mine Trainer (National)		8	8	7
Mine Operations Total	**23**	**20**	**20**	**20**

Salaried Job Title	Start Of Production (Year 1)	Full Mill Production (Year 8)	Max Mining Labor (Salaried and Hourly) (Year 16)	LOM Average
Mine Maintenance:				
Maintenance Manager	1	1	1	1
Mine Fleet Superintendent	1	1	1	1
Mine Maintenance General Foreman	2	2	2	2
FL Supervisors Maintenance (Shift Foremen)	8	8	8	6
Maintenance Planners	2	2	2	2
Maintenance Trainer (Expat)	2			0
Maintenance Trainer (Trainee)	8			1
Maintenance Trainer (National)		8	8	7
Mine Maintenance Total	**24**	**22**	**22**	**21**
Mine Engineering:				
Mine Engineering Manager	1	1	1	1
Chief Mining Engineer (Expat)	1			0
Chief Mining Engineer (Trainee)	1			0
Chief Mining Engineer (National)		1	1	1
Junior Mining Engineer	2	2	2	2
Ore Control Engineer	1	1	1	1
Surveyor	4	4	4	4
Samplers	4	8	8	7
Clerk	1	1	1	1
Mine Engineering Total	**15**	**18**	**18**	**17**
Mine Geology:				
Senior Mine Geologist	1	1	1	1
Mine Geologist	1	1	1	1
Geotechnical Engineer	1	1	1	1
Hydrology Engineer	1	1	1	1
Geo Tech - Sampler	2	2	2	2
Mine Geology Total	**6**	**6**	**6**	**6**
Total Salaried Mining Personnel	**68**	**66**	**66**	**64**

Source: IMC, 2023.

Table 21-18: Mine Labor Requirements, Hourly Personnel

Job Title	Start Of Production (Year 1)	Full Mill Production (Year 8)	Max Mining Labor (Salaried and Hourly) (Year 16)	LOM Average
Mine Operations:				
Drill Operator	12	20	20	17
Shovel And Backhoe Operator	12	16	12	12
Loader Operator	4	4	4	4
Haul Truck Driver	83	128	176	94
Track Dozer Operator	24	23	14	18
RTD Operator (Wheel Dozer)	8	8	8	7
Grader Operator	15	13	10	11
Water Truck Operator	7	7	6	6
Utility Equip Operator (Service Crew)	41	32	31	25
Mine Dispatcher	4	4	4	4
Laborer	8	8	8	8
Operations Total	218	263	293	207
Mine Maintenance:				
Senior Maintenance Mechanics	68	85	93	65
Maintenance Technicians	24	30	33	23
Welder / Mechanic	21	26	29	20
Support Maintencance Personnel	21	26	29	20
Fuel & Lube Crew	8	8	8	8
Tire Crew	4	4	4	4
Laborer Maintenance	4	4	4	4
Maintenance Total	**150**	**183**	**200**	**144**
Vs&A At 10%	**37**	**45**	**49**	**35**
Total Labor Requirement	**405**	**491**	**542**	**386**
Maintenance / Operations Ratio	**69%**	**70%**	**68%**	**69%**

Source: IMC, 2023.

21.3.5 Process Operating Costs

The estimate aligns with the principles of a Class 4 pre-feasibility study level with an accuracy of -20% to +25% according to the Association for the Advancement of Cost Engineering International (AACE International). The average yearly processing operating costs (including G&A costs) differ as the Project undergoes three distinct expansions and operating phases.

The three distinct phases of the process plant include:

1. Initial Phase (Years 1 to 3): The process plant is operated at a throughput of 30 kt/d.
2. Expansion 1 (Years 4 to 6): The plant is expanded to process material at a throughput of 60 kt/d.
3. Expansion 2 (Years 7+): The plant is further expanded to process material at a throughput of 80 kt/d.

Table 21-19 summarizes the operating costs for the process plan over different operating periods.

Table 21-19: Overall Operating Costs for Process Plant

Description	Initial Phase	Initial Phase	Expansion	Expansion 1	Expansion 2	Expansion 2
	M$/a	$/t	M$/a	$/t	M$/a	$/t
Labor	7.4	0.7	9.9	0.5	10.0	0.3
Power	30.6	2.8	56.5	2.6	67.5	2.3
Reagents & Consumables	36.1	3.3	98.4	4.5	123.0	4.2
Equipment Maintenance	8.1	0.7	12.5	0.6	13.6	0.5
Vehicle Operation	1.2	0.1	1.7	0.1	1.7	0.1
Pit Dewatering	0.2	0.0	0.3	0.0	1.1	0.0
Total	**83.6**	**7.6**	**179.4**	**8.2**	**216.8**	**7.4**

Source: Ausenco, 2023.

21.3.5.1 Processing Basis of Estimate

The following was used to determine the Project's LOM process operating costs in agreement with the cost definition and estimate methodologies:

- Concentration transportation, treatment and refining and other related costs are not included in the estimate.
- Processing unit operations were developed from first principles and benchmarked against similar or comparable processing plants to ensure their relative accuracy.
- Equipment and materials will be purchased as new.
- Grinding media consumption rates have been estimated based on the average feed material characteristics and regrind mill media consumption rates were estimated from benchmark data.

- Reagent consumption rates have been estimated based on metallurgical testwork and standard operating practices on a nominal basis.
- Process mobile equipment costs include fuel, maintenance and the operating cost for the equipment.

21.3.5.2 Labor

Staffing numbers were developed by Ausenco with input from ND King. The labor costs incorporate requirements for plant operation, such as management, metallurgy, operations, maintenance, site services and assay laboratory operations. The total operational labor averages 270, 375, and 380 employees for the Initial Phase, Expansion 1 phase, and Expansion 2 phase, respectively. Labor rates were estimated by P.L. Services Eirelli, and a burden of 48% for benefits and bonuses was applied as advised by Lumina.

The labor build-up assumes that workers will be, to the extent possible, sourced locally. The labor build-up also considers five expatriates functioning in senior site management roles. Organizational staffing plans outlining the labor requirements for process plant is shown in Table 21-20 and are based on four crews, working 12-hour shifts on rotation schedules of 14 days on followed by 8 days off; day shifters work a five-day work week with two days off. Labor costs amount to US$7.38 million for the Initial Phase, US$9.93 million for Expansion 1 and US$10.01 million for Expansion 2.

Table 21-20: Process Operations Headcount by Role

Role	Initial Phase	Expansion 1	Expansion 2
Executive Assistant	1	1	1
Mill Foreman General	2	1	1
Lead Process Trainer	2	1	1
Process Trainer	8	6	4
Shift Foreman	4	4	4
Control Room Operator	4	8	8
Primary Crushing Operator	4	8	8
Secondary Crushing Operator	4	8	8
Tertiary Crushing Operator	4	8	8
Grinding/Gravity Operator	4	8	8
Flotation Operator	8	12	12
Regrind Operator	4	8	8
Concentrate Thickening Operator	4	8	8
Concentrate Filter Operator	4	8	8
Tailings Thickening Operator	4	8	8
Tailings Filter Operator	8	16	16
Leaching/Desorption Operator	12	16	16
Refining Operator	2	2	2
Cyanide Detox Operator	4	8	8
Reagents Operator	8	12	12
Water Services Operator	4	4	4

Role	Initial Phase	Expansion 1	Expansion 2
Sampler Technicians	4	8	8
Operator Helpers	24	24	24
Laborers and Trainees	12	12	12
Tails Dozer Drivers	9	14	18
Compactors	9	14	18
Graders	2	2	2
Water Truck Drivers	2	2	2
Stack Operators	4	8	8
Conveyor Operators	4	8	8
Equipment Maintenance Mechanic	4	8	8
Loaders	1	2	2
Truck Drivers (40-tonne)	3	4	4
Maintenance General Foreman	2	1	1
Maintenance Planner	2	2	2
Electrical/Instrumentation Foreman	2	2	2
Electrical Planner	1	1	1
Senior Millwrights	8	12	12
Millwrights	12	16	16
Welders	2	2	2
Pipe Fitters	2	2	2
Instrumentation Technicians	2	2	2
Senior Electricians	8	8	8
Electricians	8	8	8
Mobile Equipment Operators	4	8	8
Laborers and Apprentices	4	4	4
Chief Metallurgist	2	1	1
Assay Admin Assistant	1	1	1
Assay Wet Technicians	8	12	12
Assay Fire Technicians	8	12	12
Sample Preparation Technicians	8	12	12
Total	**270**	**375**	**380**

Source: Ausenco, 2023.

21.3.5.3 Power

The power costs of the process plant and ancillary facilities were calculated from the average power utilization in the electrical load list for the equipment used in each phase. Power will be supplied to the site from the local utility via the nearby power line. A power cost of US$0.068/kWh was used, which was based on long-term projections by CENACE for the life of mine. A summary of the costs is provided in Table 21-21 for each phase of operation.

The power costs per tonne of mill feed are US$2.80/t, US$2.58/t, and US$2.31/t for the Initial Phase, Expansion 1 phase and Expansion 2 phase, respectively.

Table 21-21: Power Costs

WBS	Area	Consumption (MWh/a)	Initial Phase Cost (US$M/a)	Consumption (MWh/a)	Expansion 1 Cost (US$M/a)	Consumption (MWh/a)	Expansion 2 Cost (US$M/a)
3100	Crushing	40.9	2.8	52.6	3.6	52.3	3.6
3200	Grinding	251.9	17.2	499.4	34.0	579.0	39.4
3300	Flotation	35.4	2.4	103.2	7.0	172.6	11.8
3400	Concentration Filtration	8.3	0.6	9.4	0.6	9.7	0.7
3700	Refinery	1.3	0.1	1.3	0.1	1.3	0.1
3800	Reagents & Services	13.3	0.9	24.2	1.6	24.2	1.6
3900	Tailings Filtration	65.7	4.5	104.5	7.1	110.1	7.5
4200	Buildings	1.0	0.1	1.0	0.1	1.0	0.1
4300	Site Services	31.9	2.2	34.9	2.4	40.8	2.8
	Total	**449.6**	**30.6**	**830.4**	**56.5**	**991.0**	**67.5**

Source: Ausenco, 2023.

21.3.5.4 Reagents and Consumables

The reagent and consumables consumption rates are summarized in Table 21-22 and Table 21-23 respectively. Reagent consumption rates are derived from testwork outlined in Chapter 13 and vary depending on the average copper and gold feed grade to the plant for the operating phase. Reagent pricing was derived from recent vendor quotations from international and local suppliers, with freight included for delivery to the project site.

Mill media consumption is based on the abrasion properties of the mill feed, as well as the mill throughput for each phase. Maintenance consumables such as liners are based on benchmarks for replacement rates for each mill type. Maintenance consumable unit pricing was obtained from vendor quotations and Ausenco’s internal database of benchmark costs.

Table 21-22: Summary of Reagent Consumption

Item	Unit Rate ($/t)	Initial Phase		Expansion 1		Expansion 2	
		Consumption (t/a)	Total Cost (US$M/a)	Consumption (t/a)	Total Cost (US$M/a)	Consumption (t/a)	Total Cost (US$M/a)
Activated carbon	3,516	40.06	0.14	80.12	0.28	106.83	0.38
Borax	1,703	8.74	0.01	17.47	0.03	24.02	0.04
Collector 1 (PAX)	3,985	442	1.76	1,556	6.20	2,075	8.27
Collector 2 (A-208)	2,943	228	0.67	464	1.37	619	1.82
Crucibles (each)	1,355	3.00	0.00	6.00	0.01	8.00	0.01
Flocculant	3,815	133	0.51	266	1.02	355	1.35
Frother (DF250)	2,619	193	0.50	386	1.01	514	1.35
Frother (MIBC)	3,181	0.16	0.00	0.24	0.00	0.24	0.00
Fuel oil (diesel)	143	124	0.02	248	0.04	331	0.05
Hydrochloric acid	599	200	0.12	399	0.24	479	0.29
Promoter (F-2044)	3,815	-	-	45	0.17	60	0.23
Propane (liters)	0.56	1,233,686	0.70	2,467,372	1.39	2,961,937	1.67
Quicklime (CaO)	117	2,393	0.28	6,650	0.78	8,867	1.04
Silica	575	4.37	0.00	8.74	0.01	12.01	0.01
Sodium carbonate	1,157	0.73	0.00	1.46	0.00	2.00	0.00
Sodium cyanide	2,842	2,060	5.86	4,121	11.71	5,494	15.62
Sodium hydroxide	1,831	266	0.49	533	0.98	639	1.17
Sodium metabisulphite	839	3,469	2.91	29,811	25.02	39,748	33.36
Sodium nitrate	1,146	0.73	0.00	1.46	0.00	2.00	0.00
Total			**13.98**		**50.25**		**66.65**

Source: Ausenco, 2023.

Table 21-23: Summary of Annual Consumable Use

Item	Unit Rate ($/unit)	Unit	Initial Phase		Expansion 1		Expansion 2	
			Consumption (units/a)	Total Cost (US$M/a)	Consumption (units/a)	Total Cost (US$M/a)	Consumption (units/a)	Total Cost (US$M/a)
Primary crusher liners	414,298	set	2.0	0.83	2.0	0.83	2.0	0.83
Secondary crusher liners	94,586	set	3.0	0.28	6.0	0.57	9.0	0.85
Secondary Screen deck panels	8,843	set	3.0	0.03	6.0	0.05	9.0	0.08
HPGR Screen deck panels	8,842	set	2.0	0.02	4.0	0.04	4.0	0.04
HPGR roll consumption	1,294,334	set	0.8	0.97	3.0	3.88	3.0	3.88
Ball mill media	1,521	tonne	10,976	16.69	21,952	33.39	26,305	40.01
Ball mill liners	294,627	set	4.0	1.18	16.0	4.71	16.0	4.71
Cyclone wear parts - primary	51,960	set	2.0	0.10	4.0	0.21	4.0	0.21
Gravity Scalping Screen deck panels	8,805	set	2.0	0.02	4.0	0.04	4.0	0.04
Cyclone wear parts - sand	72,512	set	2.0	0.15	4.0	0.29	4.0	0.29
Regrind mill media	3,771	tonne	141	0.53	283	1.07	377	1.42
Regrind mill liners	121,927	set	1.0	0.12	2.0	0.24	2.0	0.24
Cyclone wear parts - regrind ball mill	17,456	set	1.0	0.02	2.0	0.03	2.0	0.03
Regrind Isa mill media	4,360	tonne	-	-	0.0	0.00	0.0	0.00
Regrind Isa mill liners	121,927	set	-	-	2.0	0.24	4.0	0.49
Cyclone wear parts - regrind isa mill	17,456	set	-	-	2.0	0.03	4.0	0.07
Concentrate Filter plates	17,128	lot	1.0	0.02	2.0	0.03	2.0	0.03
Concentrate Filter cloths	93	each	350	0.03	1,400	0.13	1,400	0.13
Tailings Filter plates - 2.5 x 2.5	102,987	lot	7.0	0.72	14.0	1.44	18.0	1.85
Tailings Filter cloths - 2.5 x 2.5	158	bag	2,800	0.44	5,600	0.88	7,200	1.14
Total				**22.15**		**48.12**		**56.35**

Source: Ausenco, 2023.

21.3.5.5 Maintenance

The process plant annual maintenance cost was derived from the total installed mechanical equipment cost for each phase based on the mechanical equipment list using an average factor of 4%, which varies depending on the process area. The factors were determined from benchmark maintenance costs derived from several recent warm weather concentrators. Table 21-24 shows a summary of the maintenance costs.

Table 21-24: Maintenance Cost for Each Phase

Phase	Mechanical Supply Cost (US$M)	Total Cost (US$M/a)	Unit Cost (US$/t)
Initial Phase	215.0	8.1	0.74
Expansion 1	344.9	12.5	0.57
Expansion 2	373.9	13.6	0.46

Source: Ausenco, 2023.

21.3.5.6 Mobile Equipment

Vehicle costs are based on the scheduled number of light vehicles and mobile equipment. The costs include fuel, maintenance, spares, and tires, annual registration and insurance fees, and equipment operating lease costs. Mobile equipment requirements for plant operations and maintenance result in an annual cost of US$1.2M during the Initial Phase and US$1.7M during Expansions 1 and 2.

21.3.6 General and Administrative Operating Costs

21.3.6.1 Labor Basis

Labor costs were estimated using staffing schedules provided by IMC for mining and Nelson King for processing. PLS developed the staffing schedule for general and administrative labor. Burdened labor costs were estimated by PLS using actual salaries for employees in Ecuador.

Regulatory Framework: Labor costs estimates comply with regulations regarding employee work hours. The standard work week is 40 hours per week, 8 hours per day. Overtime pay is provided for employees who work beyond regular hours. Overtime includes "overtime night" hours, which fall between midnight to 6:00 am, and "extra work" hours, which have a maximum limit of 4 hours per day and 12 hours per week. If employees work during the night shift, which is between 07:00 pm to 06:00 am, they are entitled to overtime pay. Employees receive 15 days of paid vacation after one year of employment within the company, and an extra day is added annually up to a maximum of thirty-days after five years. Additionally, employees contribute 9.45% of their salary towards retained social tax.

Economic Parameters: The estimated costs also account for Ecuadorian economic parameters. The company is assumed to operate on a 14-day shift schedule with 8 days off between each shift. Different rates apply for day and night shifts, with night shifts costing 25% more than day shifts. Overtime night hours have a 100% cost increment, while extra hours have a 50% cost increment. Dismissal pay is calculated at three times the net salary during the first three or fractioned years, then factored by the work years, partial or full. However, this does not apply if the employee voluntarily leaves the company. Severance pay is calculated at 25% of the last salary factored by the work years. Employers contribute 12.15% of the nominal wage, including overtime, towards social tax. Employers also contribute 8.33% of the nominal wage, including overtime, towards a reserve fund after the first year of activity within the company. Monthly contributions are made towards paid vacations, with 1/24th of the monthly nominal plus overtime wages being contributed. Additionally, a 13th-month contribution is made, which is 1/12th of the monthly nominal plus overtime wages. Finally, a 14th-month contribution is made, which is 1/12th of the official minimal wage.

To summarize, labor costs estimates comply with regulations regarding employee work hours and vacation time, and employees are entitled to overtime pay for working beyond their regular hours. Economic parameters include a 14-day shift schedule, different rates for day and night shifts, and various contributions made by the employer towards employee benefits. Dismissal and severance pay are also calculated based on the employee's work years.

21.3.6.2 General and Administrative Costs

The G&A costs for the Project were estimated by PLS and MTB. They are summarized in Table 21-25.

Table 21-25: Summary of G&A Costs

Item	LOM (US$M)	LOM (US$/t processed)
Labor (Burdened)	175	0.270
Social Benefits (Mining, Process and G&A staff)	26	0.039
Employee travel	23	0.035
Corporate travel	3	0.005
Medical, security and safety supplies	17	0.025
Employee meals	74	0.113
Office leases	4	0.006
IT and Communications	5	0.007
Office/Engineering Equipment, Furniture, Cell Phones, Radios	.4	0.001
Training	11	0.016
Camp operation maintenance	3	0.004
Legal-permits and fees	.03	0.000
Insurance	127	0.193
Environmental services and consumables	7	0.011
Security services	11	0.016
Community development	34	0.052
Fuel maintenance light vehicles	8	0.012
Total G&A Operating costs	**527**	**0.799**

Source: Lumina, 2023.

21.3.6.3 General and Administrative Labor

Labor costs were estimated using the staffing schedule provided in Table 21-26.

Table 21-26: Staffing Schedule

Area	Position	Number
Permanent expat positions		
Administration Management	General manager	1
	Marketing Manager	1
National Positions		
Administration Management	Country manager	1
	Legal/Compliance/Governance Manager	1
	Executive assistants	3
Legal/Permitting	Permitting assistant	1
	Legal assistant	1
Administration/Contract	Contract Manager	1
Administration/Marketing	Marketing Assistant	1
Administration- Financial	Financial Manager	1
	Treasurer	1
	Controller	1
	Assistant	2
Administration-Accounting	Accounting Manager	1
	Accountant payables	3
	Accounting Payroll	3
	Accounting assistant	2
Administration/Gov. relations	Liaison officer	1
Administration/ Community Relations	Community relations Manager	1
	Community relations Supervisors	2
	Community relations Assistants	4
Administration- HR	HR Manager	1
	HR Analyst	3
	HR Assistant	2
	Training manager	1
	Lead trainer Shadow	1
	Lead trainer Capacitated	0
	Trainers	2
Administration/HSE	HSE manager	1
	HSE manager Trainee	1

Area	Position	Number
	HSE manager Capacitated	0
Environment	Sr. Biologist	2
	Jr. Biologist	6
	Sr. Environmental Engineers	4
	Environmental technicians	4
Health and Safety	OHS supervisor	2
	OHS Technicians	6
	Doctor	2
	Medics	8
Administration/ Import-Export	Import/Export Manager	1
	Forwarding assistant	1
	Customs/Duties analyst	1
Administration/Purchasing-Warehousing	Purchasing manager	1
	Buyer	1
	Inventory control assistant	1
Inventory control/warehousing/Handling	Warehouse supervisor	1
	Warehouse helpers	9
Administration/Logistics	Logistical Manager	1
	Port Handling Supervisor	1
	Land transportation supervisor	1
	Mechanical maintenance technician	2
	Driver	3
Administration/ Services	Maintenance Supervisor	1
	Maintenance technicians	8
	Helpers- Cleaning	8
Administration/IT	IT Analyst	1
	IT Technician	1
Admin/Security	Security Manager	1
Total		**123**

Source: Lumina, 2023.

21.3.6.4 Environmental Services and Consumables

Estimates were included for environmental services provided by others, including:

- completion of all planning and permitting actions by independent consultants in the pre-production phase that are prerequisites for securing the Project's Environmental License

- biennial independent environmental audits, as is typically required by Environmental License and EIA/PMA conditions
- ongoing sampling and analysis of surface and groundwater, monitoring of noise and air quality, and monitoring and management of biodiversity by independent consultants, also as required by Environmental License and EIA/PMA conditions and/or international BMPs
- soil sample analysis in support of spill response and closure actions
- routine off-site disposal of spill response, medical, and other hazardous wastes
- specialty HSE training support.

Estimates are also included for environmental consumables, including periodic repair/ replacement of meteorological and environmental monitoring equipment and replenishment of spill response supplies. All estimates are projected from the pre-production period through production, closure, and post-closure monitoring.

It should be noted that progressive reclamation of the DSTF and WRSF; management of the non-hazardous waste landfill, management of inert waste cells in the WRSF; and final environmental reclamation of the Project at closure are all considered operational expenses.

22 ECONOMIC ANALYSIS

22.1 Forward-Looking Statement

Certain statements and information herein, including all statements that are not historical facts, contain forward-looking statements and forward-looking information within the meaning of applicable securities laws. With respect to forward-looking statements and information contained herein, the Company has made numerous assumptions including among other things, assumptions about general business and economic conditions; the prices of gold, copper and silver; the accuracy and reliability of technical data, forecasts, estimates and studies; anticipated costs and expenditures; future results of operations; ability to satisfy power infrastructure and water capacity requirements; availability and ability to procure personnel, machinery, supplies, and equipment from local sources where possible; tax rates and royalty rates applicable to the Project; and the success of exploration, development and processing activities. The foregoing list of assumptions is not exhaustive.

22.2 Financial Model Parameters

To assess the economic feasibility of the Cangrejos Project, Robert Michel Enterprises (RME) carried out a pre-feasibility economic evaluation for Lumina. The evaluation aimed to:

- gather information from the project team as outlined in Section 0
- optimize the project components to increase value
- simulate the Project's economic performance over its expected lifetime and determine its potential viability
- assist Lumina's management in making informed project decisions
- serve as a starting point for the next phase of project development.

22.3 General Criteria and Assumptions

The following sections outline the main assumptions and inputs used for the cashflow projections. All amounts are in US dollars and no inflation was considered. Cost estimates were fixed, and cashflow values were discounted to present value (NPV) using a 5% yearly discount rate, starting from the first year after the data date.

Metal prices were determined through discussions with Lumina and H&H Metals, taking into account market conditions up until April 7, 2023, and publicly available price forecasts. Tax rates applied were 15% profit tax, 20% corporate income tax, and 3% royalty to the Ecuadorian government based on NSR. Depreciation was calculated using standard Ecuadorian mining practices. A 12% VAT was applied to all goods and services, excluding labor and power costs. VAT was recaptured annually at a maximum of 12% of exported goods' value after production commenced.

The benefits to the Ecuadorian government were compared with Lumina's profits over the life of the Project to determine if a Sovereign Adjustment Tax was necessary. The base case indicated that no Sovereign Adjustment was required. Financial sensitivity analyses include the Sovereign Adjustment when applicable, which starts at a 120% price deck multiplier and higher based on the Project’s cashflow and taxation profiles.

Summations of key project input data and assumptions are presented in tables extracted from the model. A listing of select model inputs is provided in Table 22-1.

Table 22-1: Economic Model Inputs

Description	Unit	Values
Early Works Construction	Months	28
Process Plant Construction	Months	18
Mine Reproduction Period	Month	18
Mine Life After Pre-production	Years	25.4
LOM Mill Feed	kt	658,713
LOM Payable Gold	koz	9,643
LOM Payable Silver	koz	5,985
LOM Payable Copper	klbs	1,069,720
LOM Grade		
Gold	g/t	0.55
Silver	g/t	0.68
Copper	%	0.10
Average Annual Production		
Gold	koz	371
Silver	koz	230
Copper	klbs	41,143
Market Prices		
Gold	US$/oz	1,650
Silver	US$/oz	20.00
Copper	US$/lb	3.75
Cost and Tax Basis		
Estimate Basis		7-Apr-2023
Inflation		None
Equity Finance Assumption (leases)	%	90
Tax-Federal	%	20
Profit Tax	%	15
VAT (IVA) Recouped with Export	%	12
Depreciation – Initial Capital	Years	5
Sovereign Adjustment Tax		Not Required
Royalty		
Ecuadorian Government	%	3
Advance Royalty Agreement		-
Transportation		
Ecuador Ground Transport	$/wt Au-Cu conc	24.80
Doré Mine to Smelter	$/oz Doré	3.59
Bulk Concentrate Intl. Shipping	$/wt	55.00
Concentrate Payment Terms		
Advance	%	90
Settlement	%	10
Doré Payment Terms		
Advance	%	98
Settlement	%	2

Source: RME, 2023.

The economic model's assumptions and methods are described in more detail in subsequent sections. Technical parameters are included where necessary. The inputs for the model are thoroughly explained in earlier sections of the technical report.

22.4 Economic Analysis

22.4.1 Gross Revenue from Mining

The success of the Cangrejos Project is determined by its ability to generate revenue from the sale of metals and flotation concentrates. To arrive at the most accurate market pricing for economic projections, the project team conducted an extensive review, analyzing H&H Metals' market value forecast, current trading prices, and price predictions from several financial institutions. The team also held discussions with Lumina and H&H.

Precious metals are traded on highly liquid markets with significant demand from major financial centers, such as London, New York, Tokyo, and Hong Kong. The London PM fix for gold on April 7, 2023, was $2,002/oz, while silver closed at $24.97/oz. Gold traded between $1,629 and $2,039/oz over the prior fifteen months (Full Year 2022 through QI 2023). Copper closed recently at $4.09/lb and has traded between $3.23/lb to $4.94/lb over the past fifteen months.

Based on research and investigation, the following metal prices form the basis of the pre-feasibility economic analysis:

- Gold: $1,650 per troy ounce
- Copper: $3.75 per pound
- Silver: $20.00 per troy ounce

Additional analysis and discussion are presented in Section 19.

To estimate the gross revenue from mining, the model applied these metal prices to the amount of recoverable gold and silver ounces, and pounds of copper.

The gross revenue for the Cangrejos Project, based on the results of this PFS, is expected to be $20 billion.

The NSR is a key calculation in determining the royalty payable to the government of Ecuador. This is done by subtracting the transportation costs, treatment charges, and refining charges (TCs and RCs) from the gross revenue. The estimated NSR for the Cangrejos mine over its life is $19.4 billion.

Transportation costs are incurred in moving concentrates to smelters for further treatment. Domestic transportation charges are based on quotes from local providers, while international shipping costs are estimated by H&H Metals. For example, the cost to ship the gold-copper flotation concentrate to China is $55 per wet tonne in addition to $24.80 per wet tonne Ecuadorian transportation and $21.04 port handling charges.

Special handling is required for the doré product due to its value, and typical freight and insurance costs of $3.59 per ounce of doré are estimated to cover transportation and insurance from mine to refinery.

Smelters typically apply TCs, RCs, penalties, and payment terms based on the concentrate's composition. The economic model uses costs from a marketing study and confidential quotation provided by H&H Metals, as referenced in Section 19 of the technical report. For example, the gold-copper concentrate TCs are reported as $73 per wet tonne and RCs of $7.50 per ounce of gold, $0.40 per ounce of silver, and $0.09 per pound of copper.

22.4.2 Doré Treatment and Refining Charges

The economic model applies doré treatment and RCs based on composition and weight. The charges are estimated to be $0.35 per ounce of doré and the payables for gold are 99.95% and for silver are 99.5%.

22.4.3 Royalty

The Federal Government of Ecuador requires a royalty payment on gold produced in the country. Based on expert guidance, a 3% royalty has been applied across the life of the Project using the proceeds paid by smelters minus certain costs, including transport costs to the smelters. This results in a total royalty payment of $583 million and a gross income of $18.9 billion from mining and processing for the Project.

22.4.4 Operating Margin

Gross income minus operating and equipment finance costs equals net profit. Operating costs were described in Section 21.3 and used as inputs to the economic model. Retention taxes were also applied to labor cost estimates as required by Ecuadorian law. Finance costs are for interest on the leased mine equipment totaling $40 million over the life of mine. The net profit is reported as $10.1 billion.

22.4.5 Depreciation and Income Tax

Income taxes are calculated based on Ecuador's federal tax rates and deductions and subtracted from net profit to arrive at taxable income. The federal tax rate of 20% is applied assuming a stability agreement will be in effect for the Project. Initial capital costs have a five-year asset life and are depreciated according to Ecuadorian mining tax practices. Sustaining and expansion capital are depreciated on a unit of production basis, except for vehicles and mining equipment, which have a five-year schedule. Capital lease equipment is depreciated according to IFRS with the NPV of the lease cashflow determining the basis of a seven-year straight line depreciation. The model accounts for a 15% profit sharing tax, any tax loss carried forward, and then the 20% federal income tax on the net income before taxes.

22.4.6 Value Added Tax

A 12% VAT is applied to all goods and services, except labor and power costs. VAT is assumed to be recouped upon product export at a maximum rate of 12% per year. The initial capital VAT is recouped by the end of year four and fully recouped each year thereafter.

22.4.7 Initial and Expansion Capital Costs

The initial and expansion capital cost estimates, described in Section 21.2, provide the basis for the main project investment costs and were used as inputs to the economic model. $21.4 million of the total initial capital is identified as spare parts, consumables, and initial fills and is represented as a separate line item in the cashflow after being deducted from other initial capital costs. $4.9 million for initial mill ball charges is part of the first expansion capital, and $1.4 million for initial fills for the second expansion. All initial fills and spare parts' values are added back into the cashflow at the end of the mine life in Year 26.

22.4.8 Sustaining Capital Costs

Sustaining capital costs are the costs for new assets, increasing capacities, or replacing assets over the life of the Project. The eight categories for the Cangrejos Project are mine equipment leases, mine sustaining cost, mining earthworks, mining mechanical equipment, site development earthworks, process mechanical equipment, on-site infrastructure earthworks, and several categories of owners' sustaining cost. The largest sustaining cost category is estimated to be $274 million for replacement mining equipment, with total life-of-mine sustaining capital costs estimated to be $598 million. Details can be found in Section 21.2.3.7.

22.4.9 Working Capital

Working capital is the maximum shortfall between revenue and expenses that is experienced during the operating period immediately after a capital investment. For initial capital, the largest deficit is expected to occur in the 23rd week of the initial production, amounting to $9.6 million. This deficit was reflected in the Year -1 cashflow model and is expected to be recovered by the end of the Project in Year 26. For the first expansion project, the largest shortfall is estimated to occur in the seventh week, amounting to $1.2 million. This shortfall was reflected in the Year 4 cashflow model and is also expected to be recovered by the end of the Project in Year 26. For the second expansion, the largest shortfall is estimated to occur in the third week, amounting to $0.8 million, reflected in Year 7, and expected to be recovered in Year 26.

22.4.10 Employment Severance Costs

The cashflow model accounts for the severance costs incurred, mainly at the end of the Project in Year 26. These costs are based on Ecuadorian employment practices and are estimated to be $57.4 million over the life of the Project, with $45.1 million estimated in Year 26.

22.4.11 Equipment Salvage Value

The process and mining equipment can be sold for some value after the mine's life is over. The process equipment is expected to have a salvage value of 5% of its original cost of $500 million, or $25 million. The estimated salvage value of the mining equipment is $5.4 million, bringing the total salvage value to $30.5 million, which will be applied to the cashflow in Year 26 to offset some closure costs.

22.4.12 Cashflow Projections

The base case analysis estimates that the initial capital investment will be paid back at the beginning of the fifth year of the Project. The first expansion capital payback is estimated to occur 2.5 years after expanded production begins. The second expansion capital payback is estimated to occur 1.2 years after full production begins.

The base case financial model was developed according to the information described in this section and the results show that the Cangrejos Project will have an estimated post-tax internal rate of return (IRR) of 17.2%. With a 5% discount rate over 25.4 years, the post-tax NPV is estimated to be approximately $2,238 million. Key project results are presented in Table 22-2. The cashflow analysis is shown in Table 22-2.

Table 22-2: Cangrejos Project Key Results

Key Results	Unit	Value
Total Material Produced	Kt	658,713
Gold Grade	g/t	0.55
Silver Grade	g/t	0.68
Copper Grade	%	0.10
Concentrate Copper Content (LOM)	%	22.3%
Gold Recovery	%	85.0%
Silver Recovery	%	54.4%
Copper Recovery	%	78.9%
Gold Price	US$/oz	1,650
Silver Price	US$/oz	20.00
Copper Price	US$/lb	3.75
Gold Payability (Weighted Average)	%	98.2%
Silver Payability (Weighted Average)	%	76.5%
Copper Payability	%	95.4%
Copper-Gold Concentrate landed Value/DMT	US$	7,903
Gold Revenue Split	%	79.4%
Silver Revenue Split	%	0.6%
Copper Revenue Split	%	20.0%
Gross Revenue	US$M	20,043
Initial Capital Cost (including Working Capital, excluding VAT)	US$M	925
First Expansion Capital Cost (incl. Working Capital, excl. VAT)	US$M	342
Second Expansion Cost (incl. Working Capital, excl. VAT)	US$M	111
Sustaining Capital Cost	US$M	598
Mine Operating Costs	US$M	3,188
Process Operating Costs	US$M	4,999
General and Administrative Operating Costs	US$M	527
Total Operating Costs	US$M	8,714
Operating Cash Costs (Gold Equivalent)	US$/oz AuEq	818.31
Post-Tax Payback Time – Initial Capital	Years	5.0
Post-Tax Payback Time – 1st Expansion Capital	Years	2.4
Post-Tax Payback Time – 2nd Expansion Capital	Years	1.2
Cumulative Net Pre-Tax Free Cashflow	US$M	8,105
Pre-Tax IRR	%	21.3%
Pre-Tax NPV (5% Annual Discount Rate)	US$M	3,511
Cumulative Net Post-Tax Free Cashflow	US$M	5,468
Post-Tax IRR	%	17.2%
Post-Tax NPV (5% Annual Discount Rate)	US$M	2,238

Source: RME, 2023.

Table 22-3: Cashflow Analysis

Project Phase			Pre-production			Initial Production			First Expansion			Second Expansion / Full Production																			
Year			-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Production Summary	**Units**	**Total / Average**																													
Material Mined	Mt	1,486			13	43	44	47	61	60	62	72	72	72	72	71	71	69	69	68	68	66	66	66	59	41	35	35	36	36	13
Mill Feed	Mt	659				8	11	11	19	22	22	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	12
Mill Feed Grade – Gold	g/t	0.55				0.76	0.81	0.61	0.70	0.69	0.72	0.64	0.64	0.66	0.56	0.48	0.48	0.46	0.53	0.66	0.89	0.44	0.37	0.41	0.35	0.52	0.53	0.42	0.39	0.43	0.44
Mill Feed Grade – Silver	g/t	0.68				0.64	0.68	0.50	0.55	0.70	0.76	0.66	0.57	0.67	0.66	0.56	0.58	0.56	0.55	0.63	1.02	1.06	0.85	0.66	0.69	0.93	0.83	0.59	0.50	0.49	0.46
Mill Feed Grade – Copper	%	0.10%				0.13%	0.14%	0.11%	0.12%	0.10%	0.12%	0.13%	0.12%	0.12%	0.10%	0.09%	0.09%	0.09%	0.10%	0.13%	0.19%	0.09%	0.07%	0.07%	0.07%	0.07%	0.08%	0.08%	0.07%	0.08%	0.09%
Market Prices																															
Gold	$/oz					1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650
Silver	$/oz					20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Copper	$/lb					3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Contained Metal - Mill Feed																															
Gold	koz	11,557				202	286	214	435	489	508	579	604	621	522	447	453	433	501	621	837	411	348	384	333	492	500	399	371	400	166
Silver	koz	14,382				171	241	178	338	494	537	600	535	634	624	529	546	526	513	588	959	1,000	794	617	648	870	784	552	472	462	172
Copper	Mlb	1,421				24	34	27	52	46	58	83	75	77	61	57	55	55	64	84	121	55	43	46	42	45	50	48	48	49	23
Recovery																															
Doré Gold	%	7.4%				14.0%	14.0%	14.1%	7.0%	7.0%	7.0%	6.9%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	6.9%	6.9%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
Doré Silver	%	1.7%				5.0%	5.0%	5.0%	1.9%	1.5%	1.3%	1.6%	1.8%	1.5%	1.6%	1.9%	1.8%	1.9%	1.9%	1.6%	1.0%	1.0%	1.3%	1.6%	1.6%	1.2%	1.3%	1.8%	2.1%	2.2%	2.3%
Au-Cu Concentrate Gold	%	77.6%				68.6%	68.9%	67.9%	78.5%	78.5%	78.5%	78.5%	78.0%	78.0%	78.1%	78.1%	78.1%	78.1%	78.0%	78.0%	78.1%	78.1%	78.2%	78.2%	78.3%	78.2%	78.2%	78.2%	78.2%	78.1%	78.6%
Au-Cu Concentrate Silver	%	52.7%				50.0%	50.0%	50.0%	41.5%	54.2%	58.0%	51.5%	43.8%	52.5%	51.6%	42.9%	44.6%	42.5%	41.2%	48.9%	68.7%	69.7%	61.7%	50.7%	52.9%	65.0%	61.3%	45.0%	35.7%	34.5%	29.8%
Au-Cu Concentrate Copper	%	78.9%				67.7%	78.1%	79.0%	79.1%	79.3%	79.5%	79.3%	78.1%	78.3%	78.6%	79.1%	78.9%	78.9%	77.7%	77.5%	79.6%	80.0%	79.9%	79.9%	79.8%	81.0%	80.9%	79.5%	78.6%	78.3%	79.7%
Recovered Metal																															
Doré Gold	koz	854				28	40	30	30	34	35	40	42	43	36	31	32	30	35	43	58	29	24	27	23	34	35	28	26	28	12
Doré Silver	koz	242				9	12	9	6	7	7	9	10	10	10	10	10	10	10	10	9	10	10	10	10	10	10	10	10	10	4
Au-Cu Concentrate Gold	koz	8,969				139	197	146	342	384	399	454	471	485	408	349	354	338	391	484	654	321	272	300	261	385	391	312	290	312	130
Au-Cu Concentrate Silver	koz	7,579				85	121	89	140	268	312	308	234	333	322	227	244	223	211	287	659	697	490	313	343	566	480	248	169	159	51
Au-Cu Concentrate Copper	Cu Mlb	1,121				16	27	22	42	36	46	66	58	60	48	45	43	43	50	65	96	44	34	37	33	37	41	38	37	38	18
Total Payable Metals																															
Gold	koz	9,643				164	233	173	365	411	426	485	504	518	436	373	379	361	418	517	698	343	291	321	279	411	418	334	310	334	139
Silver	koz	5,985				67	88	50	84	212	248	221	151	250	255	160	183	157	139	199	542	630	436	258	295	511	420	194	114	98	24
Copper	Cu Mlb	1,070				15	26	20	40	35	44	63	56	57	46	43	41	41	47	63	93	42	33	35	31	35	39	36	35	36	18
Metal Revenues																															
Gold	US$M	15,912				271	385	285	602	678	703	801	831	855	719	616	625	596	690	854	1,152	567	481	530	460	679	690	550	511	551	230
Silver	US$M	120				1	2	1	2	4	5	4	3	5	5	3	4	3	3	4	11	13	9	5	6	10	8	4	2	2	0
Copper	US$M	4,011				57	96	75	149	130	165	237	209	215	172	160	154	155	177	235	349	157	123	130	118	130	145	137	133	137	66
Gross Revenue	**US$M**	**20,043**				**329**	**483**	**361**	**753**	**812**	**873**	**1,042**	**1,043**	**1,076**	**896**	**779**	**783**	**754**	**870**	**1,093**	**1,512**	**736**	**612**	**665**	**584**	**819**	**844**	**691**	**646**	**690**	**296**
Net Smelter Return																															
Subtotal: Freight Cost	US$M	257				4	6	7	9	9	10	14	13	13	11	11	10	11	11	14	18	11	9	9	8	9	10	9	9	10	4
Subtotal: Concentrate Treatment And Refining Charges	US$M	346				5	8	8	12	12	14	19	18	18	15	14	13	14	15	19	26	14	12	12	11	13	14	12	12	13	6
Total Transportation, Treatment And Refining Charges	US$M	603				9	14	14	21	21	24	32	31	31	25	25	23	25	27	33	43	25	21	21	19	22	23	21	21	22	10
Net Smelter Return	**US$M**	**19,440**				**320**	**468**	**347**	**732**	**791**	**849**	**1,010**	**1,013**	**1,045**	**871**	**754**	**760**	**729**	**844**	**1,060**	**1,468**	**711**	**591**	**644**	**565**	**798**	**820**	**670**	**626**	**667**	**286**
Ecuador Royalty On Net Smelter Return	US$M	583	-	-	-	10	14	10	22	24	25	30	30	31	26	23	23	22	25	32	44	21	18	19	17	24	25	20	19	20	9
Operating Margin																															
Operating Cost																															
Mining	US$M	3,188				108	108	105	126	121	147	164	160	162	149	143	146	141	170	165	169	158	148	122	104	77	62	63	66	71	33

Project Phase			Pre-production			Initial Production			First Expansion			Second Expansion / Full Production																			
Year			-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Production Summary	**Units**	**Total / Average**																													
Processing	US$M	4,999				83	84	84	180	179	179	217	216	216	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	217	9
G&A	US$M	527				22	22	22	22	22	22	22	21	21	21	21	20	21	21	21	21	21	20	20	19	19	19	19	19	19	9
Total Annual Operating Cost	**US$M**	**8,714**				**213**	**214**	**211**	**328**	**323**	**348**	**402**	**397**	**399**	**386**	**380**	**384**	**378**	**408**	**403**	**407**	**396**	**385**	**359**	**340**	**314**	**299**	**299**	**302**	**307**	**132**
Unit Operating Costs																															
Mining	$/tonne mined	2.16				2.51	2.44	2.22	2.08	2.02	2.37	2.28	2.22	2.25	2.08	2.02	2.05	2.04	2.46	2.43	2.49	2.41	2.26	1.86	1.77	1.87	1.78	1.78	1.86	1.95	2.55
Mining	$/ore tonne	4.84				13.11	9.87	9.60	6.58	5.54	6.71	5.79	5.47	5.54	5.09	4.90	5.02	4.83	5.82	5.65	5.79	5.41	5.07	4.17	3.56	2.64	2.13	2.15	2.27	2.42	2.79
Processing	$/ore tonne	7.59				10.12	7.64	7.65	9.35	8.19	8.19	7.65	7.41	7.41	7.42	7.42	7.42	7.42	7.42	7.42	7.42	7.42	7.42	7.42	7.42	7.44	7.44	7.44	7.44	7.45	7.72
G&A	$/ore tonne	0.80				2.61	2.02	2.03	1.13	1.00	1.01	0.77	0.73	0.73	0.71	0.70	0.70	0.71	0.72	0.73	0.73	0.72	0.70	0.69	0.66	0.65	0.66	0.65	0.65	0.64	0.76
Total Annual Unit Operating Cost	**$/ore tonne**	**13.23**				**25.84**	**19.53**	**19.28**	**17.07**	**14.73**	**15.91**	**14.21**	**13.61**	**13.68**	**13.23**	**13.02**	**13.14**	**12.96**	**13.96**	**13.80**	**13.94**	**13.55**	**13.19**	**12.28**	**11.65**	**10.74**	**10.23**	**10.25**	**10.36**	**10.51**	**11.28**
Interest Expense, Capital Leases	**US$M**	40.15	0.19	1.09	3.05	9.28	8.12	6.74	5.27	3.69	2.11	0.62	0.00																		
Net Profit (Pre-Tax Income)	**US$M**	**10,103**	**0**	**1**	**3**	**88**	**232**	**118**	**377**	**441**	**473**	**577**	**585**	**614**	**458**	**352**	**353**	**329**	**411**	**625**	**1,017**	**294**	**188**	**266**	**208**	**460**	**497**	**351**	**304**	**340**	**146**
Net Income from Operations (Post-Tax Income)	**US$M**	**7,466**	**0**	**2**	**4**	**87**	**225**	**117**	**334**	**381**	**357**	**423**	**414**	**434**	**328**	**253**	**253**	**235**	**293**	**439**	**708**	**217**	**144**	**194**	**154**	**324**	**349**	**249**	**217**	**242**	**103**
Total Initial Capital (incl. VAT reimbursements)	US$M	890	62	414	526	21	34	10	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31
Total First Expansion Capital	US$M	336				-	134	206	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
Total Second Expansion Capital	US$M	109				-	-	-	-	-	110	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Total Sustaining Capital	US$M	598				57	28	67	32	28	79	49	54	3	19	6	10	23	40	20	39	16	4	2	12	3	6	0	0	2	-
Other Expenditures & Credits																															
Final Mine Closure And Reclamation	US$M	38																													38
Severance	US$M	57	-	0	0	0.01	0.20	0.11	0.36	0.06	0.04	0.09	0.04	0.21	0.13	0.19	0.04	0.13	-	0.20	0.53	0.89	1.80	2.83	1.58	0.79	0.06	0.22	0.27	1.43	45.17
Equipment Salvage Value	US$M	31																													31
Cashflows																															
Annual Pre-Tax Free Cashflow	**US$M**	**8,105**	**63**	**415**	**529**	**52**	**103**	**145**	**362**	**413**	**284**	**527**	**531**	**611**	**439**	**345**	**343**	**306**	**371**	**605**	**978**	**278**	**182**	**261**	**195**	**456**	**491**	**350**	**304**	**337**	**133**
Cumulative Pre-Tax Free Cashflow	**US$M**		**63**	**478**	**1,007**	**955**	**851**	**996**	**635**	**221**	**62**	**589**	**1,121**	**1,731**	**2,170**	**2,516**	**2,858**	**3,165**	**3,535**	**4,141**	**5,119**	**5,396**	**5,578**	**5,840**	**6,034**	**6,490**	**6,982**	**7,332**	**7,636**	**7,973**	**8,105**
Annual Post-Tax Free Cashflow	**US$M**	**5,468**	**63**	**416**	**530**	**51**	**96**	**146**	**318**	**353**	**168**	**373**	**360**	**430**	**309**	**247**	**242**	**212**	**252**	**419**	**669**	**200**	**137**	**189**	**141**	**320**	**343**	**248**	**217**	**239**	**90**
Cumulative Post-Tax Free Cashflow	**US$M**		**63**	**479**	**1,009**	**958**	**862**	**1,008**	**690**	**336**	**168**	**205**	**565**	**995**	**1,304**	**1,551**	**1,793**	**2,004**	**2,257**	**2,676**	**3,345**	**3,544**	**3,682**	**3,871**	**4,012**	**4,332**	**4,675**	**4,923**	**5,140**	**5,378**	**5,468**

Source: RME, 2023.

22.5 Sensitivity Analysis

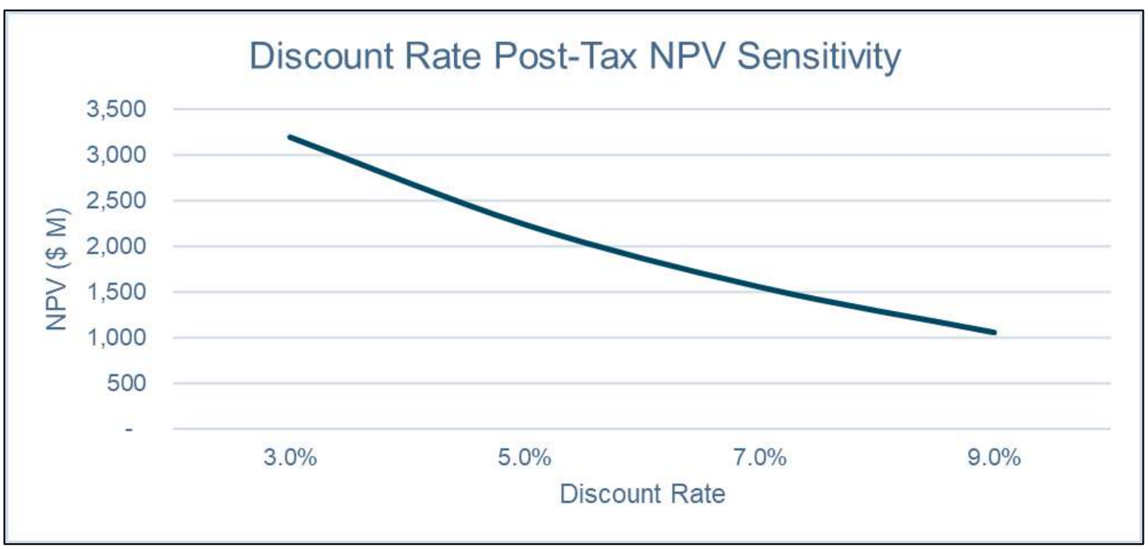
The results presented in the cashflow projections section are based on the base case conditions outlined in the assumptions. Since actual conditions may vary, sensitivity analyses were performed to evaluate the financial results for a range of conditions. The base case discounted cashflow model was evaluated for its sensitivity to changes in selected inputs such as metal prices, capital expenses, metal feed grades, and operating costs, which were evaluated at plus or minus 10% and 20%. The Project's sensitivity to metallurgical recovery was evaluated by varying the recovery by plus or minus 2%. The Project's sensitivity to the discount rate was also evaluated by setting it at 3%, 5%, 7%, and 9%. The base case NPVs for the other discount rates are presented in Table 22-4 and are also shown graphically in Figure 22-1.

Table 22-4: Post-Tax NPV at Various Discount Rates

Discount Rate	NPV $(M)
3.0%	3,199
5.0%	2,238
7.0%	1,551
9.0%	1,050

Source: RME, 2023.

Figure 22-1: Post-Tax NPV Sensitivity at Various Discount Rates



Source: RME, 2023.

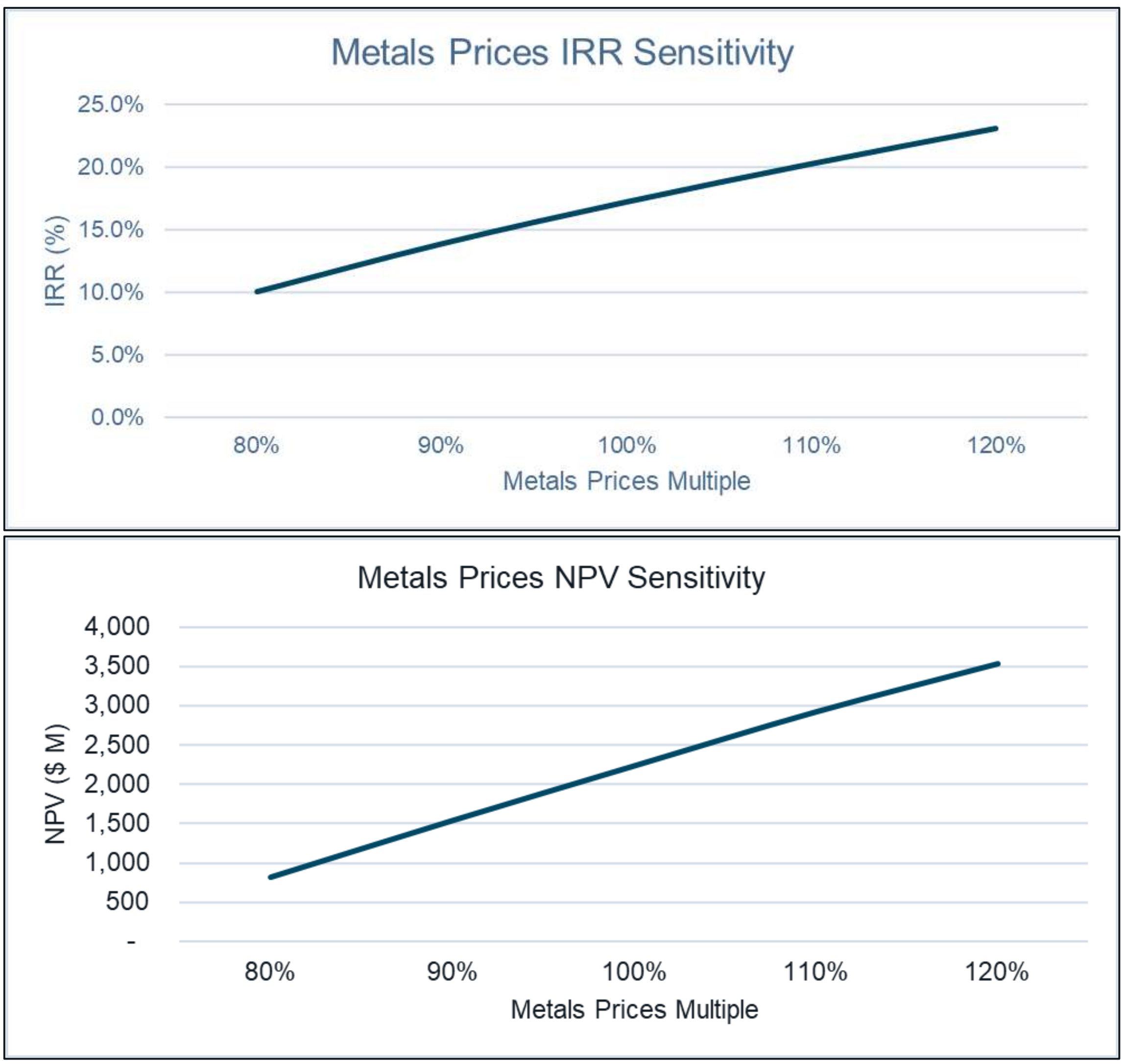
Table 22-5 reflects the sensitivities for IRR and NPV in 10% increments of negative and positive deviation from the base case for the basket of metal prices. The data is shown graphically in Figure 22-2.

Table 22-5: Metal Price Sensitivity

Metals Prices	Gold ($/oz)	Silver ($/oz)	Copper ($/lb)	IRR	NPV (5%) $M
80%	$1,320	$16.00	$3.00	10.0%	$817
90%	$1,485	$18.00	$3.38	13.9%	$1,540
100%	$1,650	$20.00	$3.75	17.2%	$2,238
110%	$1,815	$22.00	$4.13	20.3%	$2,927
120%	$1,980	$24.00	$4.50	23.1%	$3,540

Source: RME, 2023.

Figure 22-2: Metal Price Sensitivity



Source: RME, 2023.

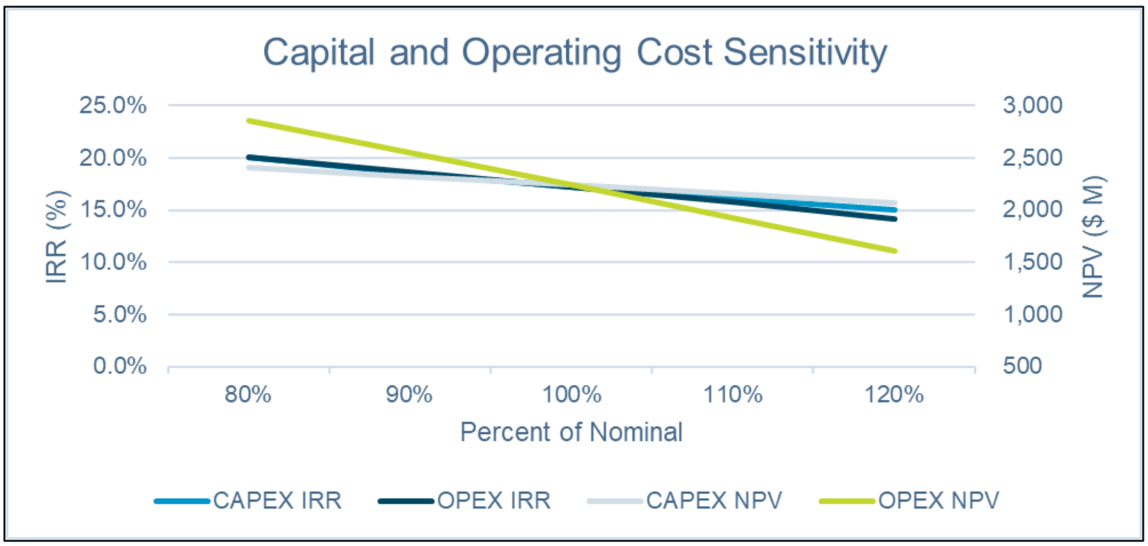
The operating cost and capital cost sensitivity analyses are presented in Table 22-6 and shown graphically in Figure 22-3. From the data, it appears that the Project is more sensitive to operating costs than to capital costs.

Table 22-6: Operating Cost Sensitivity

Operating Cost	OPEX $/t processed	IRR	NPV (5%) $M
80%	10.55	20.0%	2,858
90%	11.87	18.6%	2,548
100%	13.19	17.2%	2,238
110%	14.51	15.7%	1,928
120%	15.83	14.2%	1,609

Source: RME, 2023.

Figure 22-3: Capital and Operating Cost Sensitivity Analyses



Source: RME, 2023.

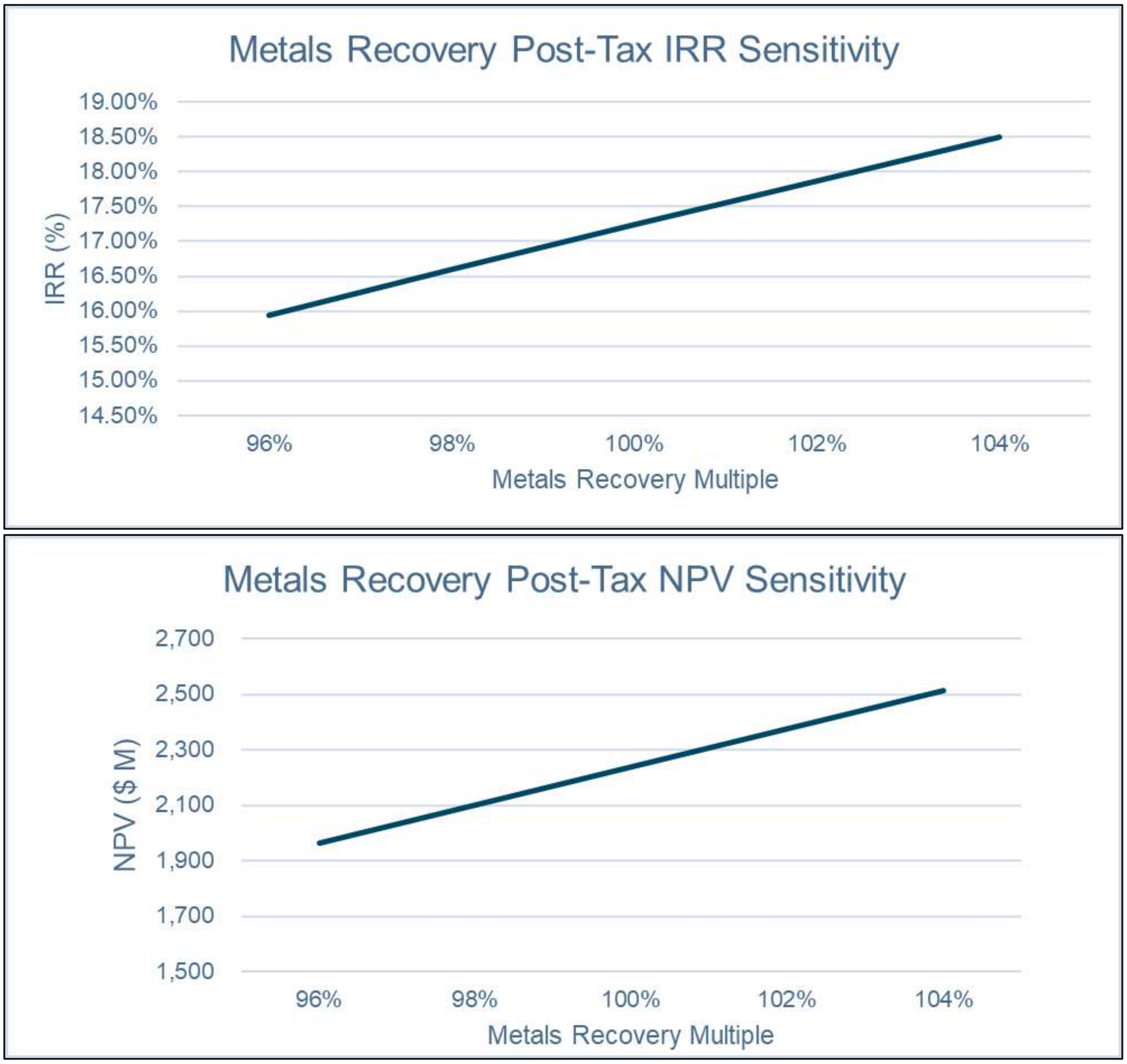
Variances in metallurgical recovery and metal feed grades for the three metals are shown in Table 22-7 and Table 22-8. The data is shown graphically in Figure 22-4 and Figure 22-5.

Table 22-7: Metal Recovery Sensitivity

Metals Recovery	Gold Recovery (%)	Post-Tax IRR (%)	Post-Tax NPV (5%) (US$ M)
96%	82%	15.92%	1,964
98%	83%	16.57%	2,101
100%	85%	17.21%	2,238
102%	87%	17.84%	2,376
104%	88%	18.47%	2,513

Source: RME, 2023.

Figure 22-4: Metal Recovery Sensitivity Analysis



Source: RME, 2023.

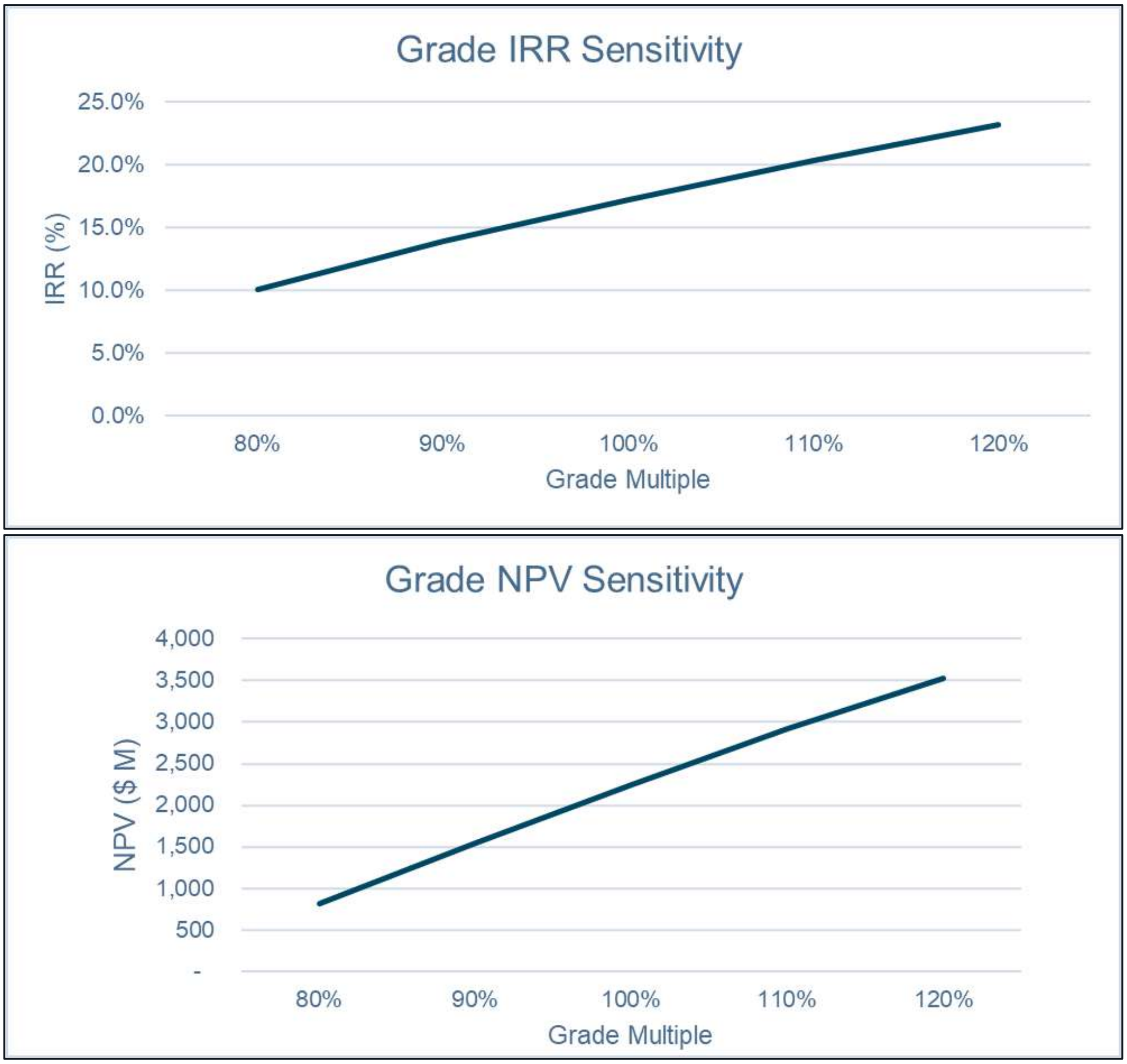
Table 22-8: Feed Grade Sensitivity

Feed Grade	Gold Grade (g/t, Ref)	IRR	NPV (5%) (US$ M)
80%	0.4366	10.0%	820
90%	0.4912	13.8%	1,542
100%	0.5457	17.2%	2,238
110%	0.6003	20.3%	2,924

120%	0.6549	23.1%	3,526

Source: RME, 2023.

Figure 22-5: Feed Grade Sensitivity



Source: RME, 2023.

23 ADJACENT PROPERTIES

Although there are several gold showings and small mines in the area, there are no nearby published mineral reserves. No information from any adjacent properties has been used in the estimate of mineral resources for the Project.

24 OTHER RELEVANT DATA AND INFORMATION

No development or production decision has been made on the Cangrejos Project. The information contained in these sections is not intended to suggest otherwise.

24.1 Project Execution Plan

The Project Execution Plan (PEP) will address the overall project (objectives, scope, strategies, and roles and responsibilities) and provide a comprehensive plan for its development and implementation. The PEP covers the plan for engineering, procurement, construction, start-up, and commissioning of the Project. The implementation strategy assumes an engineering, procurement, construction management (EPCM) implementation with construction packages.

The following subsections summarize the contents of the Cangrejos PEP.

24.1.1 Objectives

Lumina aims to bring the Cangrejos Project into operation while satisfying the following objectives:

- zero harm to personnel involved with construction, operation, and maintenance of the facilities,
- preserve or improve the project value through effective control of project costs and completion of construction and commissioning on or ahead of schedule,
- satisfy quality and performance targets,
- comply with company policies, legislative requirements, environmental permits and licenses, and negotiated benefits agreements, and
- maintain positive community relations.

24.1.2 Execution Strategy

The Project will be delivered with input from the Lumina project delivery team. Lumina will engage an Engineering, Procurement, and Construction Management (EPCM) contractor with expertise in delivering projects of this nature and will also engage several delivery contractors to execute 6 distinct construction scopes of work.

The delivery strategy is summarized as follows:

- Engineering and design for construction will be completed by Lumina’s Selected EPCM. Constructability input will be provided by the construction manager and through early engagement with preferred subcontractors identified during the basic engineering phase.
- Procurement of equipment and materials will be completed by the EPCM. Procurement tasks will be prioritized by equipment delivery time, and to support Engineering progress. Purchase orders for non-critical equipment and materials supplied from Canada, USA, or Europe will include transport to site. Transport of critical goods will be managed by a freight forwarder.

- The EPCM will finalize the contracting strategy for construction of the process plant during Detailed Engineering following a process of contractor evaluations and pricing reviews. Construction Contract tender, evaluation and formation will be done from the Home office. Executed contracts will be managed by the construction team on site.
- The EPCM's site team will report to the project manager. Lumina will provide safety and field supervision who will manage interfaces between the various construction subcontractors working on site and monitor quality and progress. The construction team will be based on site.
- The construction team will be supported from the EPCM's home office for engineering support, cost, schedule and progress reporting, and invoice processing and payment.

24.1.2.1 EPCM Scope Led by Engineering Consultant

The engineering consultant will provide a complete and fully functional process plant, and other on-site infrastructure as per project WBS, by performing the following services:

- Complete all engineering and design required for construction of the facilities. Design for construction will include all engineering disciplines such as civil, structural, architectural, mechanical, piping, electrical, instrumentation and control.
- Procure all materials, goods, and services to construct and commission the process plant, including procurement of commissioning spare parts at the time of equipment procurement. The engineering consultant will obtain a list of operational and capital spare parts and pricing for these parts from each vendor during the procurement process; Lumina will purchase the parts they need.
- Provide logistics management, warehousing and preservation of all procured materials and goods prior to issue to construction subcontractors.
- Implement a project controls system to adequately monitor and report on project progress including adherence to or deviation from the schedule and the budget. Provide weekly flash report and monthly project progress reports to thoroughly explain project progress.
- Manage all work within the defined scope in accordance with the PEP and all other project plans, to achieve the project schedule and budget.
- Submit back-drafted as-built drawings (piping and instrument diagrams, single line diagrams, buried services general arrangement drawings) within 60 days of mechanical completion. This includes the handover of O&M manuals and parts lists on all equipment.
- Provide engineering and supervisory support for the process plant start-up until final completion.

24.1.2.2 EPCM Scope Led by Lumina

Lumina will manage other scope areas not included in the prime EPCM scope.

24.1.2.3 Project Organization

The project team is organized based on an integrated team approach, minimizing the duplication of roles and activities between the Owner's Team and their major delivery partners.

The project team is organized based on an integrated team approach, minimizing the duplication of roles and activities between the Owner's Team and their major delivery partners.

24.1.2.4 Project Alignment

The project alignment strategy aims to create shared understanding of the project vision and strategy to enable Lumina's internal and external stakeholders to achieve the project objectives. The project delivery team operates as one team with defined responsibilities, accountabilities, and authorities. The team is established and supported to deliver "best for project" outcomes in line with Lumina's expectations and critical success factors.

Establishment of the delivery team working relationships and agreeing acceptable desired outcomes will be done in facilitated alignment sessions.

The alignment effort will be concentrated at the front-end of the Project, although ongoing activities are planned throughout to increase overall effectiveness, commitment, and cohesiveness of project team members.

24.1.3 Project Execution Schedule

The project execution schedule is shown in Figure 24-1.

Figure 24-1: Project Execution Schedule

TASK	WORK DAYS
Project Management	1088
EPCM Phase Project Setup and Team Mobilisation	22
Project Management	1088
Permitting	588
Environmental Impact Assessment	261
Environmental License Process	457
Permits Applications and Approval Period	458
Engineering	827
Power Supply Engineering and Permitting	370
Feasibility Study	-
Detail Design	-
Procurement	455
Long Lead Packages	370
Mechanical Packages	284
Electrical Packages	305
General Packages	261
Contracts Packages	392
Early Works Package - Development to Mobilisation	89
Earthworks Package - Development to Mobilisation	88
Concrete Package - Development to Mobilisation	195
Pre-Engineered Buildings Package - Development to Mobilisation	239
Structural-Mechanical-Process Package - Development to Mobilisation	108
Electrical and Instrumentation Package - Development to Mobilisation	88
Construction	478
Engineering Support during Construction and Commissioning	436
Mine Development	217
Site Earthworks Development	217
Process Plant Construction	371
On-Site Infrastructure Construction	347
Off-Site Infrastructure Construction	261
Commissioning	110
C0 - Verification of Plant and Equipment	45
C1 - Dry Commissioning	23
C2 - Wet Commissioning	44
Ramp-Up to Full Phase 1 Production	23

Source: Ausenco, 2023.

24.1.4 Management Plans

The management plans summarized in this section will be utilized to ensure the effective delivery of the Project.

24.1.4.1 Engineering Execution Plan

The Engineering Execution Plan details the strategy, processes, and standards for the delivery of the Engineering deliverables in a manner that enables the Project to achieve all HSEC, schedule, cost and quality objectives. The Plan references the relevant engineering procedures and design systems to be used on the Project.

The purpose of this Engineering Execution Plan (EEP) is to define the engineering and design objectives and strategies for the Cangrejos Project and to outline the processes and procedures that the engineering consultant will employ to execute, monitor, control, and close-out engineering and design activities.

24.1.4.2 Procurement Execution Plan

The main objective for procurement is to purchase the required Equipment and Services for the Project and, in the process, to identify, mitigate and manage procurement risks which may negatively impact the Project. The procurement process has been designed to deliver planned and predictable outcomes with regard to costs and schedule without compromising safety, the environment and quality.

Procurement requirements will be based on engineering design packages listed in Table 24-1 to meet the construction schedule for ROS dates and contracting milestones.

Critical procurement activity relates to securing long lead orders and obtaining certified information from the suppliers. The procurement schedule will be updated as necessary to ensure the following:

- early identification of changes to critical long lead time equipment
- confirmation of critical expediting needs for both vendor data and equipment
- identification of logistics and storage constraints
- selection of purchasing strategies to achieve critical schedule milestones without compromising the Project's overall requirements.

Table 24-1: Procurement Package List

Package Number	Package Name
001	Primary Crusher
002	High-Pressure Grinding Rolls
003	Grinding Mills
004	Vibrating Screens
005	Intertank Screens
006	Regrind Mills
007	Flotation Cells
008	Cyclone Packs

009	Thickeners
011	Filter Presses
012	Conveyors
013	Carbon Circuit Equipment & Refinery Equipment
014	Slurry & Solutions Pumps
015	Agitators
016	Field Erected Tanks
017	Intensive Leach Reactor
018	Gravity Concentrators
019	Feeders
020	Liner Handlers
201	Low- / Medium- / High-Voltage Equipment
203	Outdoor Substation
204	Transformers

Source: Ausenco, 2023.

24.1.4.3 Contracting Execution Plan

The contracting strategy is an integral activity of overall project planning that partitions the project scope into horizontal, vertical, and/or geographical groupings to facilitate manageable allocation of work packages.

The project manager is the owner of the contracting plan; however, engineering and construction teams take a lead in establishing packages and documenting scope. The project controls team provides input into the Contracting Plan through analysis of schedule, scope, and pricing structures. The Contracting Plan is coordinated by the contracts team to ensure no scope is missed or duplicated.

The final product is a clear and defined contractual framework whereby the roles, responsibilities, interfaces, battery limits and deliverables of all parties are defined.

The contracting strategy considers the strengths of local contractors and their ability to provide skilled labor, engineered and bulk materials, and in some instances, equipment.

The contracting strategy aims to:

- zero harm to all personnel involved with the construction of the Project
- consideration of industrial relations risk and risk mitigation measures
- maximizing award of major construction work packages to proven qualified contractors that are located within Ecuador
- where possible maximize employment and subcontracting opportunities for Indigenous individuals and businesses; utilize the local business development officers of the Indigenous groups for lists of qualified Indigenous persons and companies in the region

- ensuring a thorough understanding of responsibilities from the various engineering locations and consultants regarding engineering input, contract formation and construction management of contract
- ensuring value for money and performance to schedule
- allocating commercial risk appropriately

The contract formation cycle is overseen by a project tender committee consisting of the procurement and contracts manager, project director, engineering manager and site manager (as a minimum) with other members as nominated by the project director. Contract formation develops in the following order: contract planning, package development, tender period and contract award.

Engineering, with the assistance of the responsible project engineer, will prepare the scope of work, specifications, drawings, data sheets, and vendor data requirements with construction assisting, or leading the scope of work definition for construction-related contracts listed in Table 24-2.

Table 24-2: Contract Package List

Package Number	Package Name
C1	Early Works
0501* / (C2)	Earthworks
0502 / (C3)	Concrete (Supply & Install)
0503 /(C5)	Structural, Mechanical and Piping (SMP)
0504 / (C6)	E&I
0505 / (C6)	On-site Power Lines Supply & Install
0506 / (C4)	Pre-Engineered Buildings
0507 / (C4)	Camp Construct & Operate*
0508 / (C6)	Main Substation & Switchyard-
0509 / (C4)	Modular Buildings
C6	Client Contract: Water Treatment
C7	Client Contract: Fuel Supply

Source: Ausenco, 2023.

24.1.4.4 Construction Execution Plan

The Construction Execution Plan sets out the project construction scope, objectives, and execution strategies. Interfaces with other project functional groups are also detailed in this plan. The objectives of the plan include:

- zero harm to people, property and zero unintended environmental impacts
- compliance with the project environmental management and monitoring requirements
- where possible maximize employment and subcontracting opportunities for local individuals
- construction delivered on time and under budget
- costs are effectively managed and reported on in timely fashion
- change is minimized
- handover is made smoothly and beats the commercial dates in the Engineering Agreement.

24.1.4.5 Logistics and Materials Management Plan

The materials and equipment management plan covers all aspects from ex-works transport to site, storage and preservation, and issuing of the goods to the contractor.

The objective of the plan is to ensure that:

- goods and materials are loaded ex-works and transported safely and without damage
- goods and material shipments are tracked and received on site when required
- transport and logistics costs are well-managed
- storage and preservation plans are appropriate for the value and nature of the goods and materials
- issue of goods and materials to construction subcontractors are documented.

24.1.4.6 Commissioning Execution Plan

Commissioning covers the formal handover and acceptance of process equipment and commissioning modules between the various commissioning stages, from the completion of installation by construction contractors and suppliers through dry or pre-commissioning to wet commissioning by the commissioning team.

The objectives of formal commissioning are to:

- ensure zero harm is maintained
- ensure commissioning is completed in an orderly manner
- ensure that all permits and isolation systems for transition from ‘plant dead’ to ‘plant live’ are defined and adhered to
- clarify and define the various phases of handover, the different parties involved and their responsibilities at each stage
- assist Lumina to achieve plant performance objectives.

24.1.4.7 Project Controls Execution Plan

The project controls execution plan key objective is to deliver planned and predictable outcomes regarding costs and schedule without compromising safety and quality.

The plan serves to describe the strategies, systems, processes, and responsibilities to achieve the following objectives:

- effective and efficient project controls support for project execution
- early identification of change
- provision of accurate and timely cost, schedule, and progress data together with analysis of trends and deviations
- provision of data and analysis necessary to facilitate informed decision-making by stakeholders
- auditable record keeping and data storage for future estimating and benchmarking.

24.1.4.8 Project Quality Plan

The project Quality Plan identifies management processes, review and audit programs and procedures to assure the quality requirements of the Project.

It is the responsibility of the project team to ensure that the quality outcomes on the Project are in line with the following objective:

- We will provide engineering services that meet or exceed our clients' expectations for quality, reliability, safety, value for money, and timely execution.
- Our products and services will comply with the agreed specifications and appropriate laws and regulations, as well as satisfying contractual and commercial conditions.
- We will implement and continually improve a formal quality management system that is consistent with the requirements of Standard ISO 9001:2015, and that fosters prevention rather than detection.
- The engineering consultant will provide a working environment that supports the philosophy of teamwork and encourages employee involvement in continuous improvement activities.
- All employees will receive relevant training and communications to enable their effective participation in the project quality management program.
- The engineering consultant will seek to develop and nurture relationships with our suppliers that emphasize continuous improvement in product quality and cost.
- The engineering consultant management will communicate and implement these quality objectives by example.

25 INTERPRETATION AND CONCLUSIONS

25.1 Introduction

The QPs note the following interpretations and conclusions in their respective areas of expertise, based on their review of data available for this report.

25.2 Mineral Tenure, Surface Rights, Royalties, and Agreement

25.2.1 Mineral Tenure

The Cangrejos Project currently consists of a group of five mining concessions and one advanced exploration concession totaling 5,682 Ha and held under Lumina Gold Corp. under Odin Mining del Ecuador S.A. (Odin), which is a 100% owned subsidiary of Lumina Gold Corp. Yearly fees for all concessions have been paid and all concessions are in good standing.

25.2.2 Surface Rights

Within or adjacent to the Cangrejos concessions, a total of 1,235 Ha of surface rights and 386 Ha of Mining Easements have been purchased by Lumina through Odin.

25.2.3 Royalties and Agreements

The lands comprising the Cangrejos Project and mining concessions have no royalty requirements beyond the 3% to 8% Ecuadorian Royalty, mandated by and for the Ecuadorian government, which is negotiated once a PFS is completed. Recent agreements signed by other companies in Ecuador indicate a 5% NSR Ecuadorian Royalty; however, negotiation of a 3% NSR Ecuadorian Royalty is considered feasible because of the potential size of the Cangrejos Project. No "back-in" rights or any other encumbrances exist that could affect the Project's title, nor are there any other known impediments or significant risks that could affect the ability to perform mining work on the property.

25.3 Geology and Mineralization

The Cangrejos Project is underlain by Miocene dacite porphyry intrusions which intrude the El Oro metamorphic complex. A large gold-copper soil anomaly is associated with breccia zones located near the contacts of these Miocene intrusions.

Mineralization at both Cangrejos and Gran Bestia consists of porphyry-style, gold-copper-silver-molybdenum mineralization and is comprised of finely disseminated chalcopyrite, pyrite and minor bornite, molybdenite and pyrrhotite. The host rocks exhibit patchy secondary biotite (potassic) alteration and a late-stage, calcic-sodic alteration which is characterized by actinolite, chlorite and albite.

The Cangrejos Zone extends for approximately 1,500 m in a northeasterly direction, has widths ranging from 70 m to 600 m, and has been defined to a depth of at least 600 m. The zone remains open to expansion with further exploration to the west and at depth. For the Gran Bestia Zone, the mineralized zone has approximate dimensions of 700 m by 600 m and has been defined to depths of 700 m. The zone remains open to depth and in all directions except to the southwest.

25.4 Exploration and Drilling

The Cangrejos Project is an advanced exploration project that has seen extensive geological mapping, historical geochemical (streams, soils, top of bedrock soils and rocks) surveys and an airborne magnetic-radiometric and electromagnetic surveys. This work defined several exploration targets and extensive drilling has outlined mineralized zones at Cangrejos and Gran Bestia which has totalled 98,397.33 m of drilling from 269 holes since 1999 with the most recent drilling campaign in 2021-2022 comprising of 35,843.58 m.

25.4.1 Analytical Data Collection in Support of Mineral Resource Estimation

Throughout the multiple drilling campaigns conducted by Lumina, core handling procedures, sampling protocols, chain of custody, and QA/QC procedures were all conducted in a method that is widely acceptable by industry standards. All analytical work was preformed only at laboratories with current ISO accreditations at the time of drilling. Gold was analyzed using a fire assay technique in addition to a multi-element ICP using four acid digestions for other elements. All reject and pulp material from the lab samples is stored by Lumina in a dry secure warehouse in Quito.

25.5 Metallurgical Testwork

Metallurgical test data indicates that economically viable metal recovery processes are available for samples taken from the Cangrejos and Gran Bestia deposits. Data has been analyzed and recovery relationships have been created that have been used to forecast metal recoveries and product quantities and quality based on the life-of-mine ore production schedule.

25.6 Mineral Resource Estimates

Based on the evaluation of the data available from the Cangrejos Project, the authors of this report have drawn the following conclusions:

- At the effective date of this report (April 7, 2023), Lumina holds 100% interest in the Cangrejos Project.
- The Cangrejos deposit forms a relatively continuous zone of gold-copper-silver-molybdenum, porphyry-style mineralization associated with a sequence of breccias and porphyritic Miocene quartz diorite intrusions. The zone extends for approximately 1,000 m in a northeasterly direction, has widths ranging from 70 m to 600 m, and has been defined to a depth of at least 600 m below surface. The Cangrejos deposit remains open to expansion with further exploration to the west and at depth.
- Drilling to date at the Cangrejos deposit has outlined an indicated mineral resource estimate (at a 0.25 g/t AuEq cut-off) of 651.5 Mt of mineralized material at 0.52 g/t Au, 0.10% Cu, 0.7 g/t Ag and 21.6 ppm Mo, which contains 10.9 Moz of gold, 1,494 Mlbs of copper, 14.2 Moz of silver, and 31 Mlbs of molybdenum.

- Drilling to date at the Cangrejos deposit has outlined an inferred mineral resource estimate (at a 0.25 g/t AuEq cut-off) of 81.8 Mt of mineralized material at 0.35 g/t Au, 0.07% Cu, 0.6 g/t Ag and 17.1 ppm Mo, which contains 0.9 Moz of gold, 130 Mlbs of copper, 1.7 Moz of silver, and 3.1 Mlbs of molybdenum.
- The Gran Bestia deposit is located 700 m northwest of the Cangrejos deposit. Porphyry-style gold-copper mineralization at the Gran Bestia deposit is hosted in breccias. The mineralized zone has dimensions of 700 m by 600 m and has been defined to depths of 700 m. The Gran Bestia deposit remains open to the north, west, and at depth.
- Drilling to date at the Gran Bestia deposit has outlined an indicated mineral resource estimate (at a 0.25 g/t AuEq cut-off) of 428.4 Mt of mineralized material at 0.43 g/t Au, 0.07% Cu, 0.7 g/t Ag and 12 ppm Mo which contains 5.9 Moz of gold, 689 Mlbs of copper, 9.8 Moz of silver, and 11.3 Mlbs of molybdenum.
- Drilling to date at the Gran Bestia deposit has outlined an inferred mineral resource estimate (at a 0.25 g/t AuEq cut-off) of 214.4 Mt of mineralized material at 0.41 g/t Au, 0.07% Cu, 0.8 g/t Ag and 9.7 ppm Mo which contains 2.8 Moz of gold, 350 Mlbs of copper, 5.4 Moz of silver and 4.6 Mlbs of molybdenum.
- Based on the current level of exploration, the Cangrejos and Gran Bestia deposits contain a total indicated mineral resource of 1,079.9 Mt of mineralized material at a grade of 0.48 g/t Au, 0.09% Cu, 0.7 g/t Ag and 17.8 ppm Mo containing 16.8 Moz Au, 2,166 Mlbs Cu, 24.3 Moz Ag and 42.4 Mlbs Mo. The deposits contain an additional total inferred mineral resource of 296.3 Mt of mineralized material at a grade of 0.39 g/t Au, 0.07% Cu, 0.7 g/t Ag and 11.7 ppm Mo containing 3.7 Moz Au, 483 Mlbs Cu, 7 Moz Ag and 7.6 Mlbs Mo.
- There are no known factors related to metallurgical, environmental, permitting, legal, title, taxation, socioeconomic, marketing, or political issues which could materially affect the mineral resource estimates contained in this report.

25.7 Mineral Reserve Estimates

Based on the indicated mineral resources estimated by Sim Geological and contained within the engineered pits, the Cangrejos and Gran Bestia deposits contain a mineral reserve estimate of 659 Mt of probable mill feed at a grade of 0.55 g/t gold, 0.10% copper and 0.68 g/t silver, containing 11.6 Moz of gold, 1.4 Blbs of copper and 14.4 Moz of silver with a recoverable 9.0 Moz of gold, 1.1 Blbs of copper and 6.9 Moz of silver. There are additional resources not included within the reserve estimate.

The mineral reserve estimate is constrained by the mine production schedule reported in Section 16. The current reserve estimate's scheduled mine plan is based on a cutoff grade strategy that maximizes the return on investment and limits the initial capital requirements, which were guided by multiple pit optimizations and configurations to size the overall project.

25.8 Mining Methods

25.8.1 Mine Planning

The Cangrejos project is based on a mine production schedule that has been developed on a first-principles approach that incorporates practical mining considerations.

The mine production schedule was developed based on the engineered pits provided in Section 15, guided by the geotechnical slope designs provided by Norm Norrish in Section 16.4 and limited to the production capacity of the mining fleet provided in Section 16.8.

The selected mining fleet is appropriate for the terrain, geotechnical conditions and production requirements. The fleet requirements have been estimated based on expected shifts requirements that take into consideration the extraction, delivery and placement of the identified material types.

The salaried and hourly labor requirements and buildup of trained personnel are consistent with the known available workforce in the district to operate, maintain and manage the mining operation.

The engineered pit designs, mine production schedule, mining fleet and mining personnel requirements have all been inter-coordinated with one another for the mine plan provided in Section 16.

25.8.2 Mine Geotechnical

The Cangrejos Gold-Copper Project has geotechnical conditions favorable to the excavation of high, steep slopes including:

- The rock mass is strong and competent with only minor variability between different lithologies. Mean Rock Mass Ratings (RMR_{89}) for metamorphic host, intrusive system, and breccia for both deposits range from 75 to 78 based on thousands of discrete core interval determinations. Based on the industry standard RMR_{89} scale of 10 to 100, these values categorize the rock mass at the upper range of “Good Quality”, i.e. very near to the highest quality category.
- Only two sub-vertical faults have been correlated between boreholes, both in the Cangrejos deposit. Reduced rock quality envelopes were assigned adjacent to these faults and shear strength parameters consistent with clay gouge assigned to the fault surfaces.
- Minor faults are also present but cannot be correlated beyond single hole intersections. These are characterized in core as broken zones and accounted for in rock mass ratings.
- Intrusive events and contact metamorphism have, for the most part, served to strengthen the rock mass. The overall rock mass quality has been enhanced by widespread high temperature alteration products (biotite, potassic and sodic-calcic). There is no significant widespread clay attributable to argillic or phyllic alteration (Pratt, 2022).

Conversely, and unfavorable to overall slope stability, GRE reports uniformly low hydraulic conductivity values for the rock mass that will inhibit natural slope drainage as the pits are advanced. Accordingly, conservatively high phreatic surface assumptions have been incorporated into slope stability analyses.

Based on the preceding geologic characterization, overall slope stability was analyzed using limit equilibrium and finite element modeling methods that incorporated empirically derived rock mass shear strength modified by lithology-specific structural fabric to account for anisotropic shear strength. Consideration of planar, toppling, wedge and hybrid failure mechanisms demonstrated adequate stability margins to achieve or exceed industry-standard acceptance criteria under static and earthquake induced loading. The analyses indicated feasible overall slope inclinations in the range of 46º (toe-to-crest) for nominal slope heights to 700m within pit segments subject to toppling (southeast or northwest facing), and 50º for nominal slopes to heights of 1000m elsewhere.

Bench geometry, rockfall catchments, i.e., geotechnical safety benches and haul ramps, will reduce these theoretically feasible overall slopes. Allowable bench height and bench width for bedrock slopes are prescribed at 30m and 10.5m, respectively. Bench face angles were established through cumulative frequency analyses of structural fabric inclinations within pit slope dip direction segments such that a 70 percent reliability index was achieved by specific lithology. The integration of bench face angle, bench heights, and bench widths defines inter-ramp angles, and ultimately controls achievable overall slope angles.

The thickness of USL and URL (nominally, saprolite and saprock using geologic classification) on natural slopes is localized and variable but, in general, thicknesses are inversely related to slope steepness. Where present above planned pit walls, hazards include erosion, rockfalls, natural landslides and debris flows related to precipitation. Analyses of cut slopes in these materials generated guidance for bench face and overall slope angles as a function of USL and URL thickness, and upslope inclination. This issue represents a greater geotechnical challenge for phase pits for which combined thicknesses could approach 50m at Cangrejos and 30m at Gran Bestia. These materials will require appropriate bench and slope angles, or be removed or retained, if layback is not feasible. In addition, mitigation measures at the pit crests will potentially include surface water interception and diversion structures or excavations, benches and slope embayments for slide containment, selective upslope scaling and rock removal, and rockfall control measures such as cable fences.

Although the ultimate overall slope angles for the Project provided herein fall into the category of “Pre-Feasibility Level”, it is the QP’s opinion that the works reflect a higher level of geotechnical investigation and quantitative analysis than customarily performed at the PFS stage within the mining industry. However, both deposits suffer the lack of exploration of the upper slopes due to inaccessibility. Accordingly, overall slope angle recommendations should be considered as aggressive, with a ± 5º range, but within the 40 to 60 percent confidence range as suggested by Read and Stacey (2009). Both risks and opportunities are inherent to the slope designs, but these will be refined through subsequent FS design stages.

25.9 Recovery Methods

The recovery methods align with conventional copper-gold processing practices in the industry. Ore comminution, flotation and cyanide leaching recovery of payable metals are achieved through typical processes that are well established in the mining industry for similar projects. Previous studies, coupled with historical and new testwork results, were used to develop the resulting flowsheet suitable for each stage over the life of mine.

The process flowsheet development involves a three-phase expansion approach to appropriately manage the attainment of optimal throughput capacity without incurring excessive capital costs early in the Project. The expansions consider twinned or parallel equipment wherever possible, de-risked brownfield expansion activities, as well as simplified engineering.

25.10 Infrastructure

The DSTF is located northwest of the process plant. Tailings will be slurried to the filter plant next to the DSTF in an HDPE pipeline. The filter plant will dewater the tailings to 15% moisture content and send the water back to the process plant for reuse. The filtered tailings will be stacked using two stacking systems in a facility that has the capacity to store approximately 659 Mt of filtered tailings. The facility is designed in accordance with international standards.

The waste rock storage facility consists of the SRSF and the WRSF. The WRSF will initially be constructed from the top down to create a haul road to the bottom. Then the WRSF will be constructed from the bottom up. The facilities together have a total storage capacity of 843 Mt. The facilities are designed in accordance with international standards.

25.11 Environmental, Permitting and Social Considerations

25.11.1 Environmental and Social Conclusions

The exploration activities that generated the data to support this technical report were conducted with a strong focus on achieving and maintaining compliance with all applicable Ecuadorian regulations, as discussed in Sections 4.6, and 20.1, and 20.3. As the Project advances to the FS phase, in addition to the practices embodied in the exploitation phase PMA, it is anticipated that international BMPs for adaptive management will be employed to address the known and potential environmental and social impacts of the Project, and to continue to maintain full compliance with all applicable local, provincial, and national laws, regulations, and associated permitting requirements. Toward that end, a comprehensive, project-specific ESMS will be prepared, based on the minimum requirements of IFC PS1 (IFC, 2012) and applicable Ecuadorian laws and regulations. As noted in Section 4.6.1, the ESMS will give due consideration to the following international BMPs:

- The Equator Principles (Equator Principles Association, 2013)
- IFC Performance Standards for Sustainable Development (IFC, 2012)
- IFC Environmental, Health, and Safety Guidelines for Mining (IFC, 2007)
- the ICMC (ICMI, 2021)
- potentially applicable elements of the ICMM Global Industry Standard on Tailings Management (ICMM, 2020).

Should other potentially beneficial BMPs arise during the course of the Project, or if new laws, regulations, or modifications thereto are issued by the Government of Ecuador, the ESMS will provide a robust and flexible adaptive management framework by which such new requirements and improved environmental and social practices can be evaluated and integrated into the management of the day-to-day operations of the Project.

In addition to achieving and maintaining compliance with all laws and regulations governing environmental and social performance, the experience Lumina/Odin and its team members have gained in the exploration of the project site and other similar-scale projects enables the prediction of a wide range of the environmental and social risks that are likely to be encountered in the construction, operation, and closure/post-closure phases. As described in Section 20 and other sections of this technical report, due consideration has been given to the identification of and engagement with project stakeholders to support the development of a positive and enduring social license. Conceptual strategies have also been identified for managing, mitigating, and where possible, preventing the occurrence and potential accumulation of associated environmental and social impacts. Should regulatory requirements and final project lending conditions so require, adaptive management structures and management/mitigation plan contents will also be benchmarked to applicable international BMPs.

25.11.2 Environmental Geochemistry

An evaluation was conducted to determine if the anticipated environmental geochemistry of mine waste rock, dry-stack tailings, or pit wall rocks may impact water quality resulting from rock-water interactions [principally Acid Rock Drainage (ARD) and Metal Leaching (ML) risk].

Based on the existing dataset (See Section 20.1.2), the geochemical risk from project waste rock and pit wall rock appears to be low to very low. This is due to the following factors:

- Acid base accounting (ABA) testing shows that the waste rock and pit wall rock samples are nearly all non-potentially acid generating (PAG).
- Short-term ML tests showed low metals concentrations.
- Long-duration (three year running period) on site kinetic testing shows that mine waste and pit wall rock leachate is pH neutral, low in sulphate, and low in metals.

Similarly, the dry-stack tailings appear to be a low geochemical risk due to the following factors:

- ABA testing shows that the tailings have residual neutralization potential and low total sulphides (less than 0.5%).
- Short-term ML tests had low metals concentrations.
- Long-duration humidity cell kinetic testing was performed on tailings derived from the Cangrejos pit and showed no significant ARD production or ML.
- Tailings supernatant appears to be suitable for direct discharge to the environment with only potential sediment control required; however, testing will be conducted and treatment provided as necessary to ensure Ecuadorian discharge standards are met.

Kinetic testing results of samples collected from both the waste rock and the post-mining pit walls strongly indicate that the post-mining pit lakes will contain water that will not be detrimentally impacted by geochemical reactions. Additionally, because groundwater is of good quality, it is likely that the water in the post-mining pit lakes will meet surface water discharge standards.

Therefore, based on the information available, waste rock and tailings are assumed to be NAG and will have no significant impact on water quality from ML.

25.12 Capital Cost Estimates

The capital cost estimate conforms to Class 4 guidelines for a pre-feasibility-level estimate with an accuracy of -20% to +25%, as established by the Association for the Advancement of Cost Engineering International (AACE International). The capital cost estimate was developed in Q1 2023 dollars based on budgetary quotations for equipment and construction contracts, as well as Ausenco's in-house database of projects and studies and experience from similar operations. For more details, refer to Section 21.2.

25.13 Operating Cost Estimates

The operating cost estimate was developed in Q1 2023 dollars from budgetary quotations and Ausenco's in-house database of projects and studies as well as experience from similar operations. Mine operating costs have been estimated from base principles using quotations from local mine equipment vendors plus local supply consumables. The accuracy of the operating cost estimate is between -20% and +25%. The estimate includes mining, processing, and general and administration (G&A) costs. For more details, refer to Section 21.3.

25.14 Economic Analysis

An economic model was developed to estimate the Project's annual pre-tax and post-tax free cashflows, sensitivities, and NPV results using a 5% discount rate.

The pre-tax NPV, discounted at 5%, is $3,511 million, with an internal rate of return (IRR) of 21.3%. Post-tax, the NPV, discounted at 5%, is $2,238 million, with an IRR of 17.2%. The payback period on the initial capital is 5 years.

To further analyze the Project's post-tax NPV and IRR, a sensitivity analysis was conducted on the following variables: metal prices, capital costs, operating costs, metals recovery, and head grades. The sensitivity analysis revealed that changes in revenue drivers, such as metal prices or head grades, have the greatest impact on the Project's profitability. Operating cost changes drive higher sensitivity impacts than changes in capital costs.

Based on the results of the PFS economic evaluation, carrying out additional detailed studies is recommended.

25.15 Risks and Opportunities

25.15.1 Risks

25.15.1.1 Metallurgical Testwork

There is a risk that cyanidation of the low-grade cleaner scavenger tails stream will not viably cover the costs of capital and operation.

25.15.1.2 Mineral Reserve Estimate and Mining Method

The portions of the mineralization within both Cangrejos and Gran Bestia containing large volumes of lower grade mineralization result in higher stripping ratios than other portions of the deposit. This results in waste stripping being advanced earlier in the mine life. The Cangrejos pit begins stripping the north pit wall to the final wall location in year three. An improved definition of mineralization would reduce risk associated with commitment to the final pit walls within the mine life.

The thickness of the soil-like and transitional material is not well defined for the northern and western portions of the Gran Bestia pit. The thickness of this soft material has a significant impact on the Gran Bestia pit geometry and waste stripping requirements. A better definition of the soft rock material will reduce risks associated with commitment to the final pit wall early in the mine life.

Both of the above topics indicate the requirement for additional drilling to provide a more confident definition of mineral geometry and tenor, as well as the geotechnical character of host rocks and overburden.

25.15.1.3 Geotechnical

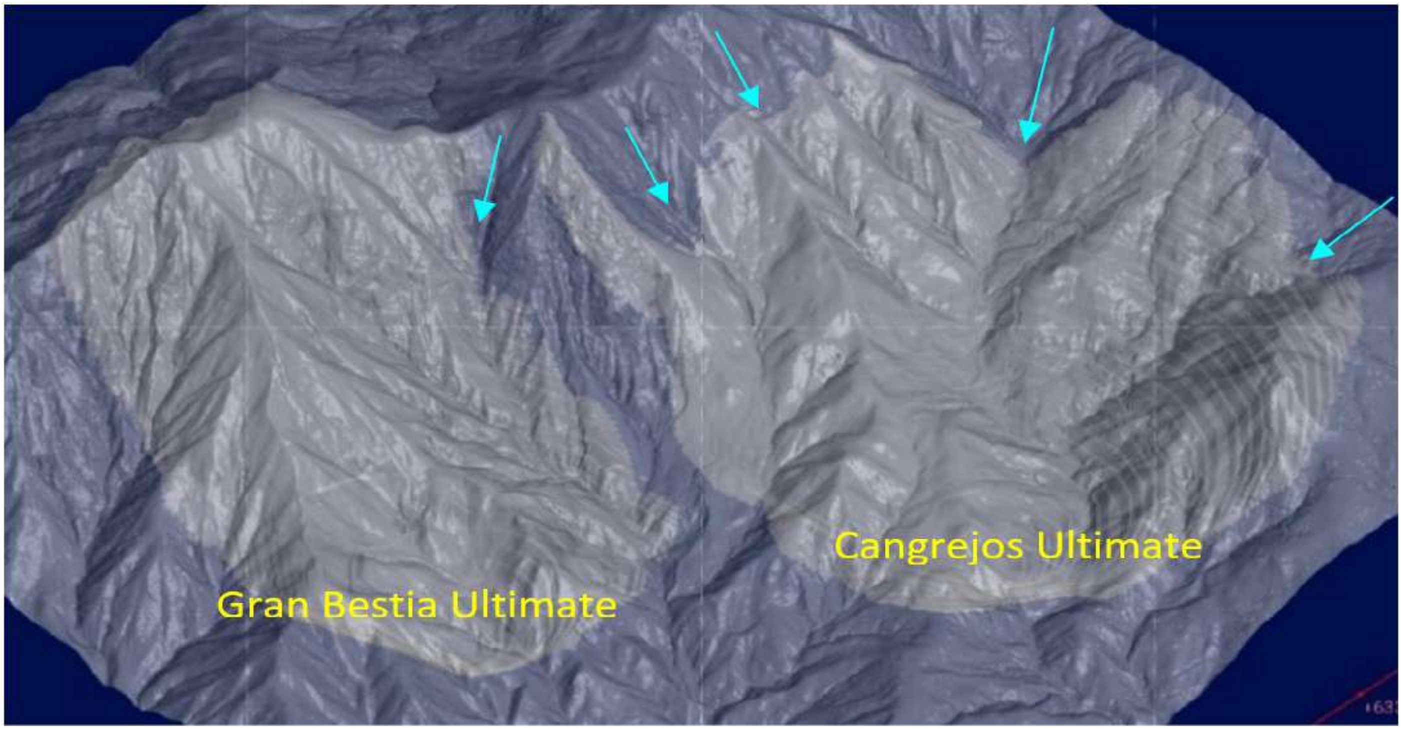
For the narrative that follows, the qualitative probability terminology is as follows:

Low:	Less than 20%
Moderate:	40 to 60%
High:	Greater than 80%

The most significant geotechnical risks to pit slope designs are:

- **Rock Mass Quality:** Based on an evaluation of all available information, this PFS has confirmed a uniform, high-quality rock mass for all slopes. Should there be spatial variation in rock mass quality, as yet undetected or unexplored, slope inclinations could potentially require flattening. Due to differences in drillhole density, the probability of this outcome is considered ***low*** for the Cangrejos deposit and ***moderate*** for the Gran Bestia deposit. The recommended FS geotechnical drilling program includes hole locations at the mid- to upper-pit slope locations, heretofore inaccessible, to ameliorate this unknown.
- **Major Structures:** Persistent, low-shear strength faults with adverse orientations (i.e., intermediate, in-pit inclinations) often control overall and inter-ramp pit slope designs. No such features have thus far been identified, although two steeply dipping faults (denoted the North and Creek Faults) were identified during the PFS at the Cangrejos deposit. A targeted subsurface investigation and ongoing structural interpretation specific to each wall is required to discount the presence of additional major structures at both pits. The probability of persistent faults with adverse orientations is considered ***low*** for Cangrejos and ***moderate*** for Gran Bestia, the latter because of fewer drillholes and less structural interpretation through the PFS effort to date.
- **Surficial Deposits:** Site reconnaissance and explorations of the steep areas upslope and to the north of the pit crests for Cangrejos and Gran Bestia have been limited due to the current lack of access. Hazards identified through the PFS using geomorphic interpretation of topographic features and reconnaissance ground traverses include potential land sliding and debris flows emanating from drainage swales intersected by the pit crests, uncontrolled surface water inflows, as well as potential rockfall, especially related to seismic activity. (Figure 25-1). These potential risks are categorized as ***moderate*** for both deposits, but with the caveat that engineered design features based on FS-level site studies should enable mitigation of these risks.

Figure 25-1: Upslope Drainage Swales



Source: W&N, 2023.

- **Slope Depressurization:** This technique is widely used in the open pit mining industry to enhance slope stability. Typical methods, in ascending order of cost and complexity, include passive drain holes, pumped wells, and drainage tunnels/galleries. For the preferred method of drain holes, the lower the hydraulic conductivity of the rock mass, the more systematic and closely spaced the holes must be. At some limiting minimal conductivity, drain holes become impractical, and pumped wells or more complex tunnel schemes must be employed. For the Cangrejos and Gran Bestia pits, high, steep slopes have been shown to be theoretically feasible, in spite of predicted high phreatic surface levels throughout the mine life. This outcome is directly attributable to the high rock mass strength and favorable structural fabric. At issue is the potential for enhanced depressurization that will maximize the probability that these high, steep slopes can be realized. GRE reports that the overall rock mass exhibits low total conductivity with a geomean in the range of 2 x 10-9 m/s. Thus, the potential risk that the slopes cannot be depressurized with conventional drain holes is probably ***high***. The reader is referred to Section 16.4.1.1 for a definitive statement by GRE on this topic, and for description of recommended FS investigations to determine if favorably oriented, higher conductivity fracture zones could be used as slope drainage conduits.

25.15.1.4 Recovery Methods

The proposed recovery methods for the Project are based on historical work and two major metallurgical test programs carried out on composite samples recently. HPGR comminution, flotation and cyanidation leaching are selected methods which are well-developed with a low technology risk. Variability tests on samples representing the deposit metallurgy and early mine operation years are necessary to verify the current design.

25.15.1.5 Infrastructure

A more in-depth geotechnical and laboratory program needs to be completed for the DSTF in the FS. The results of the program may show different foundation and tailings conditions than assumed in the PFS. This could require modifications to the design that could increase initial capital, sustaining capital, and operating cost.

The filtered tailings after compaction are not trafficable for stacking equipment and grading and compaction equipment during rainy season. The addition of a gravel base may be necessary to support trafficable surfaces for equipment. This would represent an increase in operating costs. Additional laboratory testing also needs to be performed in the next phase to validate the trafficability of the filtered tailings.

In the event that the filtered tailings cannot be stacked in 25 m lifts and instead require thinner compacted lifts, this would require more moves of the equipment and additional spreading and compaction equipment.

The water management structures for the DSTF are designed for the 1 in 100 temporary and 1 in 200 permanent structures. If there is an event greater than these events the facility could see localized erosion that would need to be repaired. Site hydrology needs to be reviewed in the next study phase of the Project to understand the associated risks.

The site water storage facilities have been designed for the 1:10 year dry scenario. Additional review of the site hydrology needs to be performed in the next phase to determine if the water storage facilities need to be increased. There is also additional contact water provided from DSTF underdrain and surface water run-off, which can be sent back to the plant with filtered reclaim water.

The WRSF and SRSF are designed to store 843 Mt non-economic waste. The facilities do not have any significant storage capacity if there are waste tonnes. In such a case, the Project would need an additional facility.

25.15.1.6 Environmental and Social Risks

The primary environmental risks and impacts anticipated for the Project are summarized in Table 20-1, which is informed by the preliminary design information presented in this technical report, the environmental impacts identified in the Los Cangrejos and C20 EIAs and other baseline studies, the biodiversity studies summarized in Section 20.1.1.2, and prior Lumina/Odin team members' experience with mine development in similar environmental settings. Key environmental risks, which are proposed to be mitigated by Lumina, include:

- Discharged water quality and quantity risks from mine development
- Mine waste and tailings management risks
- Sediment and erosion control during peak precipitation events.
- Local biodiversity risks

Known and potential social risks and impacts are presented in Table 20-17, which also presents specific opportunities and strategies for risk elimination, management, and/or mitigation. Key social risks, which are proposed to be mitigated by Lumina, include:

- Impacts from in-migration and local accommodation of the project workforce
- Risks to local vulnerable groups
- Land acquisition risks

25.15.1.7 Geochemistry Risks

Considering the information in the existing geochemical database (see Section 20.1.2) and the results of three years of on-site kinetic testing, the risk that the waste rock or pit wall rock will have a future ARD or ML risk is low.

In addition, the ore variability study (see Section 13) found that the Gran Bestia tailings had higher sulphide concentrations than the Cangrejos tailings, although the total sulphides in Gran Bestia tailings samples were less than 0.5%. This places the Gran Bestia tailings in the “uncertain” (not “clearly NAG”) quadrant of Figure 20-1. This does not imply that the Gran Bestia tailings are PAG, but simply suggests that more testing is warranted; test recommendations are included in Section 26.

25.15.2 Opportunities

25.15.2.1 Metallurgical Testwork

Improving the grade of the cleaner scavenger tails via gravity concentration or reagent scheme changes prior to cyanidation to lower capital and operating costs of this stream is recommended for future testing.

25.15.2.2 Mineral Reserve Estimate and Mining Method

IMC has identified three opportunities that could potentially improve the project economics. These opportunities are: 1) incorporating a low-grade stockpile into the mine plan, 2) processing of the mineralized saprolitized material and, 3) incorporating a fifth pushback to the Cangrejos pit.

Opportunity 1: Low-Grade Stockpile (ROM hard rock)

The current mine plan does not incorporate the stockpiling of low-grade mineralized material for future processing. A low-grade stockpile was not developed because of limited storage space available and limited production capacity. In prior studies, the processing facility was located southwest of the mine, which placed infrastructure along the northern extent of the waste rock facility. Furthermore, the prior location of the DSTF had a limited storage capacity, and the limited mill feed negated the need for developing a low-grade stockpile. The new location of the processing and dry-stack storage facility has resulted in there being a future potential to stockpile and process the low-grade mineralized material at the end of the mine life.

Opportunity 2: Mineralized Saprolite/Saprock Stockpile

The current mine plan does stockpile around 16.5 Mt of mineralized saprolite and saprock material above a $15.00/tonne NSR; however, it is not processed within the current mine plan. Future analysis of potentially processing this material in its own stand-alone facility might be economical. Given the limited production of saprolite tailings, there might exist an opportunity to commingle the saprolite/saprock tailings with the ROM waste or place it as backfill into the Cangrejos pit after Year 17 or Gran Bestia at the end of the mine life.

Opportunity 3: Fifth Cangrejos Pushback

The third opportunity that has been identified is a potential fifth pushback to the Cangrejos pit. Given the initial limitations to processing capacity when scheduling the current mine plan, IMC evaluated the phase design configuration that resulted in the schedule with the highest NPV.

Given the deposition of the body of mineralization within both the Cangrejos and Gran Bestia pits, the incrementally larger pit shells have a relatively higher stripping ratio associated with economically mining lower depth and lower grade material. As a result, during the scheduling and sizing, two final pushbacks were evaluated between Cangrejos and Gran Bestia: a large fifth Cangrejos phase or a large third Gran Bestia phase.

Ultimately, the larger 3rd phase of Gran Bestia was selected, as it produced the best project economics. The fifth phase of Cangrejos containing approximately 124 t of mineralized potential mill feed was not mined.

25.15.2.3 Geotechnical

The most significant geotechnical opportunities related to pit slope design are:

- **Bench Face Optimization:** The BFAs recommended herein have been reconciled with structural fabric by means of a 70% reliability criterion in which not more than 30% of the structurally defined blocks are feasible for failure based solely on orientation relative to the BFA. Cumulative frequency analyses of discontinuity (Note; used interchangeability with term "joint") orientation were used to determine the BFA corresponding to the design performance criterion. Intuitively, the probability of a bench failure is also intrinsically related to the spacing and persistence of the joint population. In the as-built situation, bench face back-break preferentially exploits not only kinematically viable joints, but also joints with greater persistence and lesser spacing. For the Cangrejos Project, persistence data will not be available until initial excavation of bedrock. Spacing data are available through set definition and intersection frequency of joint set members within boreholes. A cursory evaluation of these data suggests an increase in BFA of up to two degrees may be theoretically justified dependent on slope aspect; hence there is a ***low to moderate*** probability that BFA values could be increased.

  Such design changes are subject to confirmation of structural fabric and to a cost-benefit analysis incorporating increased mining costs at the FS stage.

- **Overall Slope Optimization:** There is an inverse relationship between ultimate slope height (or pit depth) and maximum achievable overall slope angle. The current design templates employ inter-ramp angles dependent on the presence or absence of structural control for bench face angles within specific lithologies. The opportunity exists for steeper inter-ramp and toe-to-crest overall slope angles, particularly for the lower height walls on the south and west sides. Because the overall slope designs are largely controlled by bench geometry, the probability of overall slope steepening is categorized as ***low*** for both pits.

25.15.2.4 Recovery Methods

There are several opportunities to further optimize the process flowsheet, as shown below:

- variability analysis of breakage characteristics to determine more accurate design criteria for ore material competency / hardness.
- deferring the installation of the sand flotation circuit to save initial capital cost, as sand flotation performance shows a close relationship with the sulphur in the plant feed ore materials.
- further review to determine if the cyanide leaching of the cleaner scavenger tailings is required at the finer regrind size of 20 µm.
- further investigation of saprolite and saprock processing by introducing fines to the leaching circuit to mitigate material handling cost and risks.

- in-depth understanding of molybdenum distribution across the deposit to determine whether/when a molybdenum flotation circuit should be included.

25.15.2.5 Infrastructure

If additional resources are found from additional exploration, the DSTF can accommodate at a minimum an additional 100 Mt.

25.15.2.6 Environmental and Social Opportunities

Specific opportunities and strategies for eliminating, managing, and/or mitigating the previously mentioned risks are presented in Table 20-1 and Table 20-17. Key opportunities proposed by the Project include:

- Generation of direct local employment
- Local supply chain development
- Local public budget improvements from the Project's tax and royalty payments
- Improvements in local standards of living from Project social investments

25.15.2.7 Pit Hydrogeology

As mentioned in Section 16.3, the pit hydrogeologic characterization program found very low conductivity bedrock. This presents both a risk and an opportunity. If further confirmed by FS level testing, a dry pit (with regards to groundwater inflow) can be assumed, which will continue to exert a positive impact on pit dewatering pumping costs.

There is a low risk that future geotechnical borings (See Section 26.4) may result in the discovery of water-conducting fractures. If conductive fractures are discovered, they will change current dewatering assumptions; however, they would also create the opportunity to use localized mitigation measures such as depressurization borings, to mitigate the inflow or higher pressure.

26 RECOMMENDATIONS

26.1 Introduction

The results presented in the technical report demonstrate that the Cangrejos Project is technically and economically viable. It is recommended to continue developing the Project through additional studies. Table 26-1 summarizes the proposed budget to advance the Project through FS stage.

Table 26-1: Cost Estimate Summary for Recommended Activities

Description	Cost (US$k)
Owner FS Management, Coordination, Administration, and Reporting	1,045
Resource Drilling	6,600
Resource Estimation and QA/QC	54
Mine Design / Planning	300
Mine Geotechnical Drilling and Televiewer Logging	2,650
Mine Geotechnical Engineering	550
Structural Modeling	40
Metallurgical Testing	595
Metallurgical Testing Oversight	100
FS Process and Infrastructure Engineering, Compilation of 3rd Party Studies, and Overall Author FS	2,520
Geotechnical Investigation and Design, Surface Water Management, and Water Balance (Including Drilling and Excavator Rentals Costs)	908
Additional Geotechnical Infrastructure Design Costs	325
Hydrogeology, and Geochemistry	986
Detailed Transportation Study	200
Detailed Marketing Study	120
Environmental Management & Coordination	730

Description	Cost (US$k)
Power Supply Connection and Transmission Line Feasibility Studies, and Connection Permitting / Licensing and Transmission line Rights-of-Way	675
Owner's General and Administrative FS Support	4,574
Detailed Social and Community Relations Study	105
Subtotal	**23,078**
Contingency (15%)	**3,462**
Total Estimated Costs to Complete a Feasibility Study	**26,540**

26.2 Drill Program Recommendations for Future Feasibility Study

In preparation for the next stage of project evaluation, which may include the generation of a Feasibility Study, it is recommended that closer spaced drilling be conducted, over the area of the initial three years of planned production, resulting in the upgrading of mineral resources to measured mineral resource classification status.

A drill hole spacing study completed in February 2019 indicates that production volumes representing one year's production can be estimated with no greater than +/-15% uncertainty and with 90% confidence, when based on drilling spaced on a nominal 100 pattern. This means that in 9 out of 10 production periods, the forecast of tonnes and grade will be within +/-15% of the predicted mine plan. Annual production volumes that exhibit these levels of precision and accuracy are included in the indicated mineral resource category.

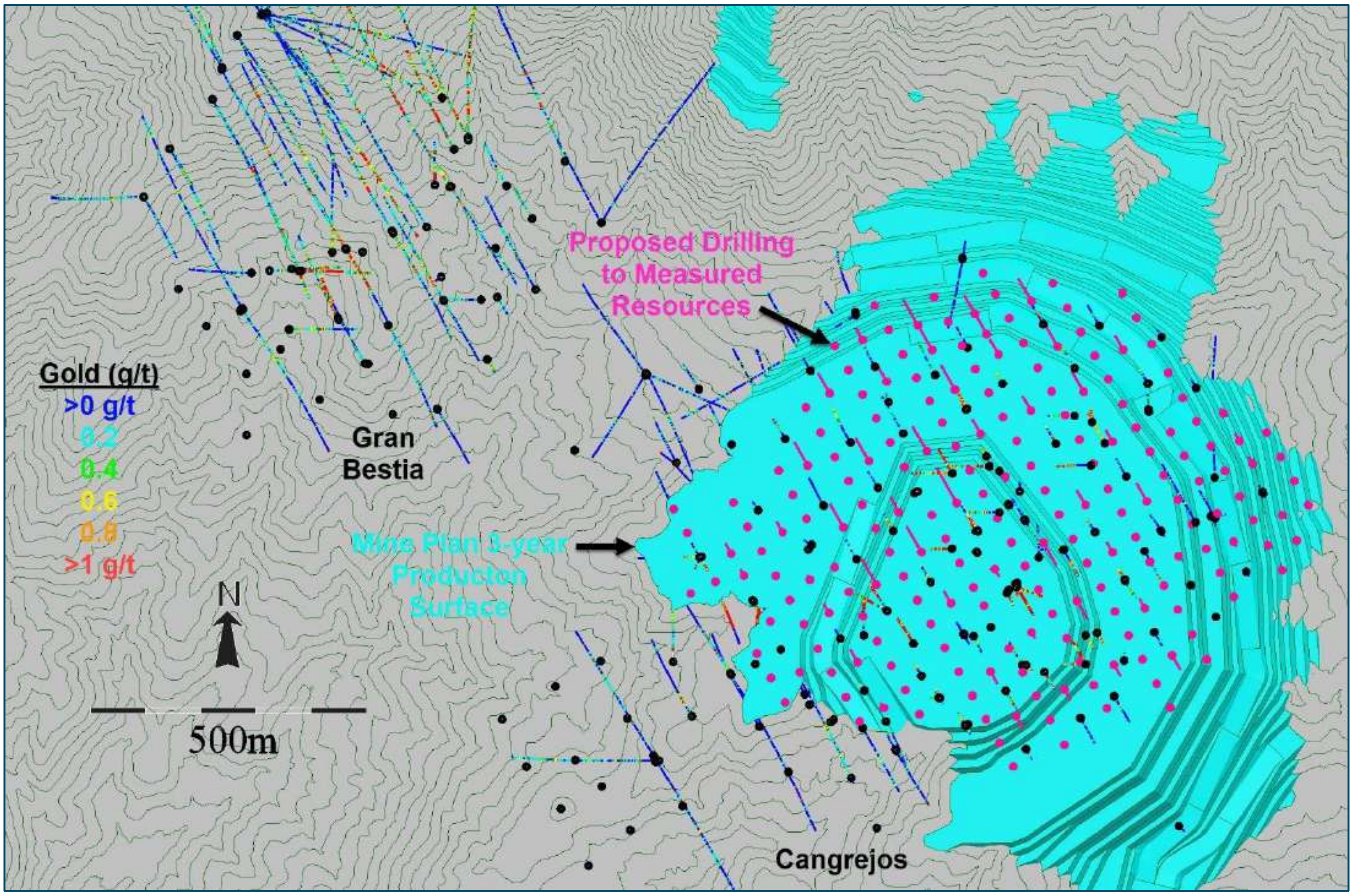
Similarly, volumes representing one quarter of a year's production can be estimated within approximately +/-20% uncertainty with 90% confidence, when drilling is available on a nominal 50 m spaced pattern. Portions of the deposit that meet these criteria are included in the measured mineral resource category.

Mine planning in the PFS suggests that the first three years of production would occur from the top 100-200 m of the Cangrejos deposit.

The proposed drilling includes a combination of inclined and vertically oriented holes that adhere to a nominal 50 m pattern, thus upgrading the area of the first 3 years of production to measured mineral resource status. The proposed program includes a total of 202 individual drill holes for a total of 21,305 m of drilling. Holes range from a minimum of 30 m to a maximum of 200 m in length, with an overall average length of 106 m. Based on previous drilling at the Cangrejos Project, "all-in" drilling costs are projected to average $310/m. The total cost of this program is estimated to be 21,305 m x $310/m = $6.6 million dollars.

Figure 26-1 show the general layout of the drilling in this proposal.

Figure 26-1: Proposed Drilling for Measured Mineral Resources, Cangrejos and Gran Bestia View



Source: SIM Geological, 2023.

26.3 Metallurgy

26.3.1.1 Metallurgical Samples

Metallurgical samples selected for the FS should continue to be representative of the pit areas planned for mining and have variations in ore grades, rock types and lithologies representative of the long-term mining plan.

26.3.1.2 Metallurgical Testwork

Future metallurgical testing should include:

- Tests that continue to include the entire recovery flow scheme: Locked cycle tests that include rougher flotation, fine regrinding and cleaner flotation, flotation of coarse (sand) material from rougher tails and cyanidation of sand concentrates with cleaner scavenger tails.

- Cyanidation tests on sand concentrates and cleaner scavenger tails, including carbon adsorption investigations: leaching kinetics tests, gold loading tests and carbon elution tests.
- Investigation of using a laboratory cyclone instead of a screen prior to sand flotation to determine if gold recovery can be improved.
- Continue tests investigating the potential for gravity concentration prior to flotation.
- Investigate the potential for upgrading the gold in the cleaner scavenger tails stream by gravity concentration or alternate reagent schemes to reduce capital and operating costs for cyanidation of this stream.
- Investigate optimization of sand flotation reagent scheme to potentially improve gold recovery.
- Additional sedimentation and filtration tests on tailings and concentrates, including third-party testing by a contract lab and potential equipment suppliers.
- Produce sufficient flotation concentrates to provide samples to potential smelters.
- Provide representative tailings materials for third-party filtration and geochemical tests.
- Additional flotation tests using the identified site water sources.
- Additional Bond ball mill and abrasion index testing of samples throughout both deposits.
- An additional HPGR pilot test program using representative materials from both deposits.

The cost for the above testing is approximately $595,000.

26.4 Mineral Reserve Estimate and Mining Method

The most significant recommendation for mine planning is to commit to additional drilling to better define the inferred mineral resource category components and lower portion of the mineralization within the PFS mine plan. In the course of this drilling additional geotechnical information regarding the soil-like and transitional near surface material and the character of the hard rock high walls can be gathered as a risk reduction program.

As discussed in Section 25, IMC also recommends evaluating the potential of adding a low-grade stockpile to be processed, adding a standalone processing facility for the mineralized saprolite/saprock, and adding an additional pushback to the Cangrejos pit.

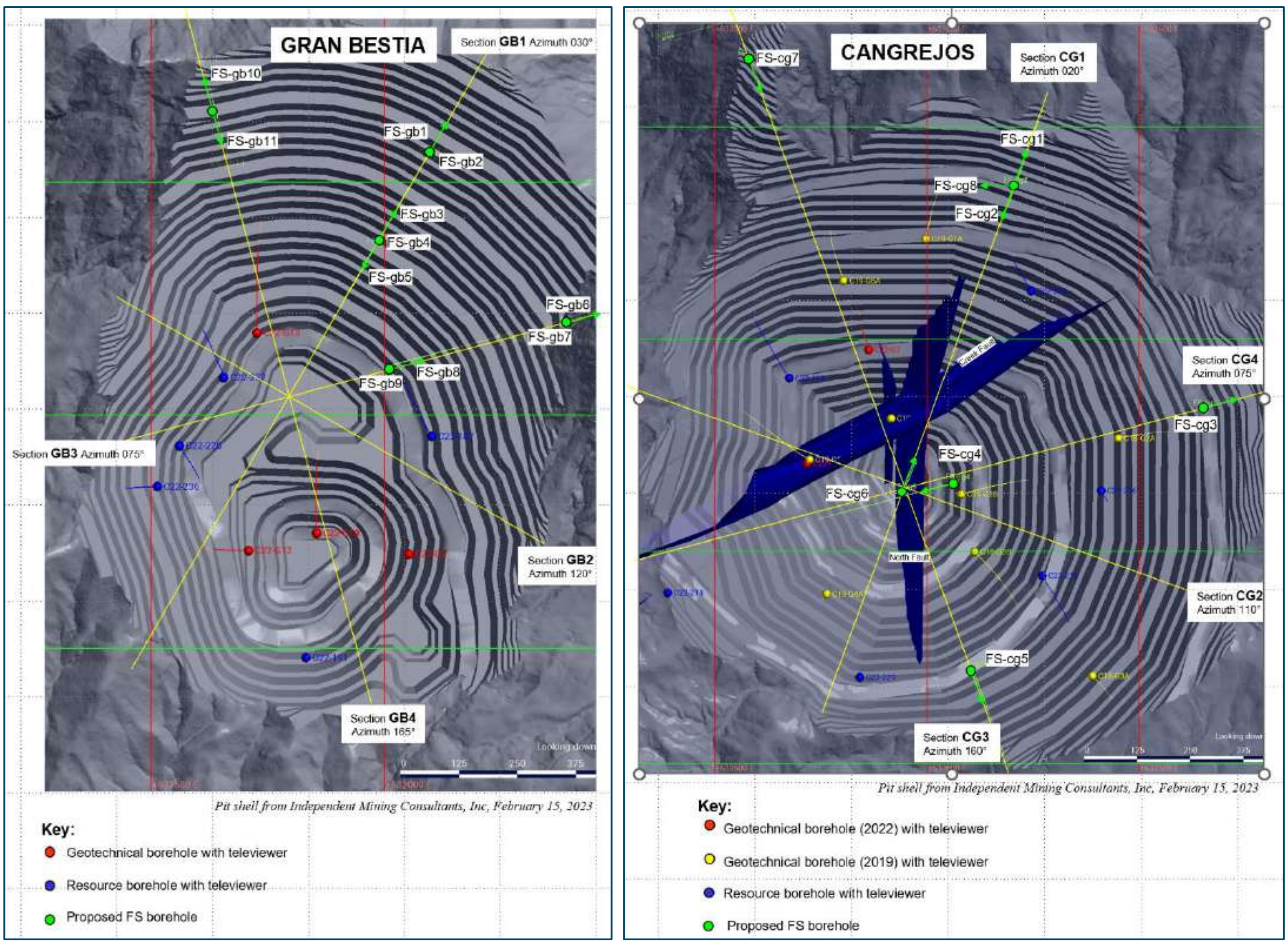
26.5 Geotechnical Recommendations

For the FS work plan, it is strongly recommended that vehicular road access be constructed around the circumference of both pits to facilitate preparation of drilling platforms at heretofore inaccessible sites. In lieu of a circumferential road, an overland road from the north could be considered. This would enable a satellite camp and helicopter staging site to be established from which unitized drill rigs could be transported and placed at steep platform sites using long-line methods. The proposed FS geotechnical drilling program assumes that specified collar locations will be made accessible. It is inevitable that this will not be universally true, and alternative platform locations may have to be developed to reach the intended subsurface targets.

26.5.1.1 Geotechnical Drilling

A 19-hole, 8000 m program is recommended consisting of 8 holes for the Cangrejos deposit and 11 holes at Gran Bestia. The objectives for Cangrejos are to provide geotechnical coverage to the unexplored upper-pit slopes, to characterize and verify the continuity of the North Fault and to investigate the presence of an inferred family of faults sympathetic to the North Fault that were based on image analysis of drainage patterns. For Gran Bestia, the primary drilling objective is to characterize significant portions of the upper slopes that are virtually unexplored due to access difficulties and the absence of mineralized drilling targets.

Figure 26-2: Feasibility Study Geotechnical Drilling Program



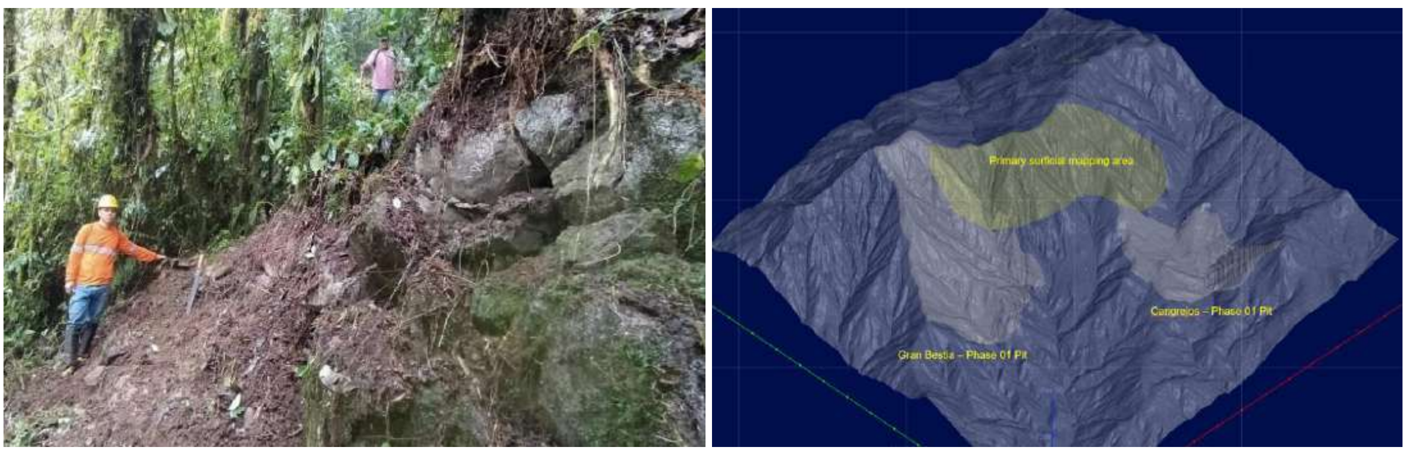
Source: W&N, 2023.

Due to the locations on the upper-pit walls, the geotechnical holes will intersect waste rock and offer little opportunity for dual purpose holes with infill geologic drilling. All holes are to be HQ triple tube cored, with televiewer logging and with the core to be geotechnically logged at the drill sites. Strength profiling by point load testing should also be continued, as per the current practice at the Project. Televiewer logging should include the 8000 m geotechnical drilling program with an allowance for 2000 m of televiewer logging in geologic resource boreholes.

26.5.1.2 Surficial Mapping

New road cuts should be mapped to refine the USL / URL (saprolite / saprock) thickness maps and to update engineering properties as available. During PFS site reconnaissance traverses for test pit siting by Lumina geologists, steep local slopes were identified with the potential to generate rockfalls from the natural slopes above the planned Cangrejos and Gran Bestia north pit crests (Figure 26-3, Left). In anticipation that selective rock removal and/or rockfall protection measures may be required, these slopes should be mapped during the FS program. Difficult access may require rope-assisted methods supplemented with drone imaging. The general locations for this surficial mapping are shown in Figure 26-3, Right.

Figure 26-3: Upslope Mapping Targets



Source: W&N, 2023.

26.5.1.3 Laboratory Testing

The saprolite has been extensively tested for the PEA and PFS programs and no further laboratory strength testing is recommended at FS other than incidental classification tests. For the bedrock, lithologically representative and/or feature-specific samples should be tested for unconfined compression, unit weight, point load and direct shear.

26.5.1.4 Rock Engineering Analyses

The lithologic (overburden and bedrock), alteration and structural models should be updated to incorporate all new geotechnical and resource drilling data available at the time of the FS work. Of particular importance is the continuity of fault intersections between boreholes and correlation to topographic expression. The structural studies at Cangrejos to refine the PFS wireframe models of the North and Creek faults should be extended, as well as implementation of an initial parallel effort at Gran Bestia.

After the new data are available, rock engineering analyses should integrate with the overall geotechnical program summarized as Table 26-2:

- Update the structural fabric database to refine the spatial variability and lithologic correlations.
- Update the rock mass geomechanical parameters and revise the design values, as required.
- Evaluate hazards posed by upslope overburden and weathered rock relative to pit crests and design mitigation measures accordingly. These measures could include targeted rock removal, rockfall control fences or slope drape, and pit crest safety benches. Slope embayments at intersections with drainage swales should be verified for debris slide retention capacity.
- Perform slope stability analyses incorporating updated rock mass and hydrogeological parameters. Implement design optimization by pit slope sector.
- Retain an expert geotechnical review board to provide guidance as to best practices for pit slope design in high-relief, tropical settings.

Table 26-2: Summary Program to Implement FS Geotechnical Recommendations

Item	Description
Geotechnical Drilling	8000 m, 19-hole HQ triple tube coring
Televiewer logging	19 FS geotechnical holes, select resource holes
Surficial Mapping	New access roads and upper steep, difficult access slopes
Laboratory Testing	Primarily rock testing, minor soils index testing
Geological Modeling	Structural, geologic & alteration model updates
Rock Engineering Analyses	Include Review Board

26.6 Recovery Methods

The following trade-off studies and work are recommended:

- Implementation of the expansion flowsheet (20 micron regrind size) from Year 1
- Review cost benefit of intensive leach reactor vs gold payability for gravity concentrate (copper concentrate vs. gold dore)
- Evaluation of the cost-recovery benefit for the cleaner scavenger concentrate leach circuit over the life of mine
- Evaluation to delay the sand flotation circuit from the initial years to a later stage of the mine life
- Evaluation of processing saprolite/saprock materials based on the separation of the finer material directly to the leaching circuit, with the coarser material joining the main plant circuit
- Re-evaluation of the molybdenum circuit after verifying local molybdenum occurrence across the deposit

- Completion of a feasibility study with supporting testwork, contractor and vendor engagement, additional infrastructure focused geotechnical investigation and more definition of engineering.

26.7 Infrastructure

To support the feasibility study, the following work programs are recommended.

26.7.1 Site Geotechnical Field and Laboratory Program

Several of mine site facilities changed location from the PEA, including the DSTF, mine infrastructure area, process plant, filter plant, roads, ponds, and ore conveyor. A gap analysis was performed for the PFS geotechnical program, and the following recommendations are made for site geotechnical and laboratory programs.

- Completion of thirty-two boreholes for a total length of 1,070 m, 99 test pits, and geophysics in the areas of the DSTF, SRSF, and filter plant to investigate and confirm foundation conditions, specifically the extent of the saprolite and colluvium along with depth to groundwater and bedrock.
- Laboratory index testing, including compaction tests, mechanical strength tests, and permeability tests on foundation soils and potential borrow materials.
- Additional laboratory testing to confirm the physical characteristics of the filtered tailings, including cyclic strength, trafficability, and permeability tests at both low and \high confining stresses to represent the height of the DSTF.
- Using the new data to recommend designs for foundations, borrow sources, construction materials for infrastructure, and DSTF, WRSF, filter plant and process plant, along with supporting infrastructure.

The estimated cost is approximately US$908,280, including the drilling and excavator rental.

26.7.2 Design and Analysis of Site Infrastructure

To bring the design and analysis of the DSTF, WRSF, SRSF, mine roads, site surface water management, process plant platform, mine infrastructure area platform, and filter plant platform to a feasibility-study level of detail, the following activities are recommended:

- Acquire additional satellite imagery to fill in additional topography missed in the 2022 program, including the access roads to mine site, mine access, and bypass access.
- Review and update meteorological and hydrology information, updating surface water. and sediment management for the DSTF, WRSF, SRSF and mine roads.
- Update geochemical characterization of tailings, waste rock and construction materials.
- Develop seepage predictions and seepage control measures for the DSTF, WRSF and SRSF.
- Optimize the tailings and waste rock handling and deposition strategy, including trafficability of material handling equipment for the DSTF.
- The stability model should be reviewed and updated, as required, with consideration of the final stacking plan using updated data about the material properties of the waste using laboratory results along with foundations for both the DSTF and WRSF.

- Perform a liquefaction assessment with consideration of updated information on material properties for the tailings along with foundation for both the DSTF and WRSF.
- Solicit additional budgetary quotes for earthworks and geosynthetics (i.e., geomembrane, geotextile, and piping) to get more accurate pricing for the next cost estimates.
- Develop FS level design of DSTF, WRSF (excluding stacking, site surface water management, water storage ponds, mine roads.
- Develop cost estimates (i.e, capital, sustaining capital, and operating costs) for site vegetation suppression, earthworks, WRSF and DSTF, mine roads, and ponds.

The estimated cost for the recommended work is approximately US$325,100.

26.8 Environmental and Social Recommendations

Environmental and social recommendations supporting the completion of the FS are presented as follows; general cost estimates are also provided, assuming an FS duration of approximately 18-24 months.

- Develop a comprehensive noise model for the construction and operations phases, in order to characterize potential auditory impacts on local communities and identify potential mitigation measures that should be included in the FS-level design (e.g., installation of acoustic shielding on sources, construction of earthen berms, placement of mulch/topsoil stockpiles, construction of vegetation barriers).
- Maintain and expand the meteorological, surface water, and groundwater monitoring and kinetic cell testing program as necessary to support FS data needs.
- Complete field studies in the project concession areas with the assistance of a biodiversity consultancy, to support the final delineation and location of environmental corridors and ecological offset areas for incorporation in the FS-level project design and environmental AOI. Develop practical options for locating, designing, and constructing faunal refuge, overpass, and underpass structures across mine roadways/pipelines, for inclusion in the FS-level design.
- Evaluate options for processing environmental clearance mulch/topsoil to serve as an effective growth medium for WRSF, DSTF, and other clearance area substrates, including potential generation and use of biochar as an amendment; develop a plan for the establishment of test plots and location of mulch/topsoil stockpiles.
- Conduct an in-depth social baseline study to examine the results of the 2023 census, the effects of the Covid-19 pandemic, and other factors in order to determine the welfare conditions and needs of local community residents. This work would likely include a household census in the immediate communities and interviews to cover populations further afield.
- Conduct an initial study of the potential viability for drilling, development, and maintenance of groundwater wells to provide a robust and healthful source of water for drinking and washing to local communities.
- Develop the SEP discussed in Section 20.4 for engagement and identification of stakeholders who were outside the exploration-phase social AOI.
- Continue, and, as appropriate, expand community relations program activities during the FS, including the expansion of environmental education, nutrition support, training, and entrepreneurship programs. Engage construction contractors and invoke appropriate contractual requirements for preferential local and regional employment, as well as the purchasing of good and services from local and regional sources. Where appropriate, engage FS contractors as participants in selected social investment initiatives.

26.9 Geochemistry

Up to 200 additional static geochemical samples are recommended in order to fully characterize future waste rock and pit walls, to be acquired from FS exploration drill core. These samples should be focused on improving spatial understanding of geochemical risk within the block model. The analysis of additional samples of mine tailings and supernatant from the FS metallurgical testing program are also recommended.

On-site and laboratory kinetic testing is also recommended through the FS, including the addition of at least 10 additional kinetic cells in the field, and an additional two tailings humidity cell tests in the laboratory.

A geochemical model for potentially mine-impacted water should also be developed. This should include any excess water discharged to rivers and streams, as well as a geochemical model of the post-mining pit lake water quality.

26.10 Hydrogeology

The hydrogeologic characterization for the Project should also be expanded to support the FS.

26.10.1 Packer Testing and VWP Installation in the Pit

Packer testing is recommended in twelve of the borings proposed for the FS pit slope stability work plan (see Table 26-2). Each boring should be packer tested in a manner consistent with prior packer testing (see Section 16.3.2.1). Two Vibrating Wire Piezometers (VWPs) should be installed in each boring after completion. This testing should target potential faults and fractures, and should provide improved characterization of the pit wall rock.

26.10.2 Saprolith Hydrogeologic Characterization in the Pit

An additional five saprolith wells are recommended to be installed for aquifer testing, and other hydrogeologic characterization.

26.10.3 Revised Groundwater Models

Both the 2D (pit stability) and 3D (pit dewatering) models should be updated, using the FS-level database.

26.10.4 Regional Hydrogeologic Program

Site-wide hydrogeologic characterization is also recommended as part of the FS, involving at least four new groundwater wells, and should include aquifer testing). This hydrogeologic characterization is necessary for the updated 3D model described above and should be integrated with the broader environmental monitoring requirements for the FS stage of the Project.

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