



**Society of Economic Geologists Student Chapter**

**Philippine Association of Geology Students**



## **Mindanao Field Trip 2022**

### **Overview**

The SEG Student Chapter - Philippine Association of Geology Students (PAGS) conducted a mine visit to the porphyry copper (Cu-Au) deposit of Silangan Mindanao Mining Company, Inc. and Manila Mining Corporation, both in Surigao del Norte, Philippines, with funding from the Society of Economic Geologists (SEG) Stuart Wallace Funding and Mr. Douglas Kirwin. The visit took place from October 29 to 30, 2022, and it was attended by 23 geology undergraduate and graduate students from Adamson University (AdU), Negros Oriental State University (NorSU), Silliman University (SU), and the University of the Southeastern Philippines (USEP). Associate Professor Jilian Aira Gabo-Ratio, faculty adviser of the SEG Philippines Student Chapter, Ms. Florence Annette C. Labis, Silliman University instructor, and Mr. Christian Paul Escarian, an instructor also from the University of Southeastern Philippines accompanied the students. Students were given tours of the open pit, core house, and mill, as well as lectures. The tour taught students about porphyry copper mineralization, mine operations, mine safety, community relations, and social development.

### **Introduction to Silangan Mindanao Mining Company Inc.**

The Silangan Project, in Surigao del Norte, is made up of two deposits: Boyongan and Bayugo. The Boyongan and Bayugo copper-gold porphyry deposits are located in the Surigao Mineral District on Mindanao Island in the Philippines, about 750 kilometers southeast of Manila. The two major assets of Silangan Mindanao Mining Co. are the deposits, which occur in a single intrusive complex. Inc. (SMMCI), a Philex subsidiary, and is known as the Silangan project.

According to the PMRC, the mineral resources at Boyongan and Bayugo have been classified as measured, indicated, and inferred resources. The entire deposit is mined by underground mining for both deposits. To meet the requirement of "reasonable prospects of eventual economic extraction" in order to declare the Boyongan and Bayugo MRE under the

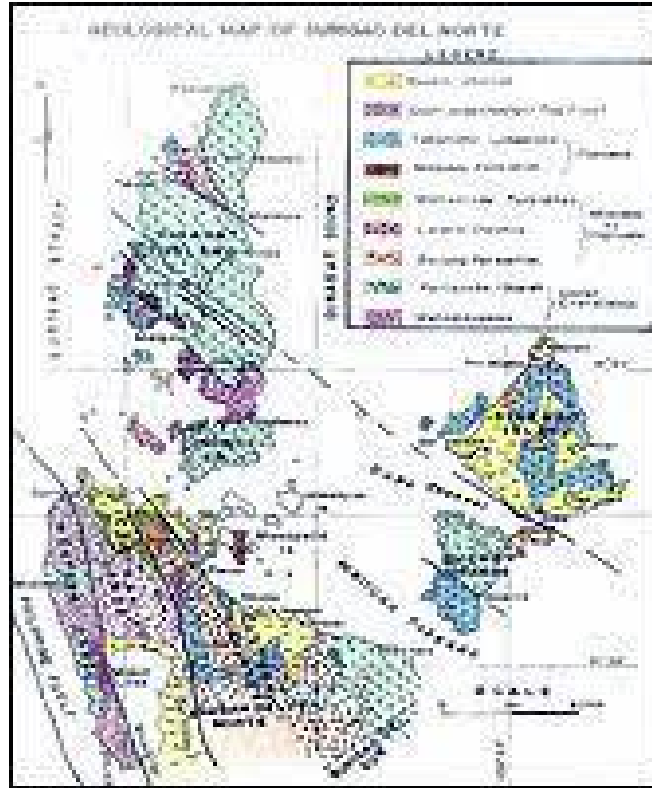
PMRC, the MRE was reported using a cut-off grade assumption of 0.5% CuEq, which assumes a large-scale underground caving operation.

The resource estimation was based on 435 verified diamond drill holes drilled in the deposit. Ordinary kriging was used to estimate copper and gold. The Silangan and Kalayaan projects' exploration programs are professionally managed, and the database is suitable for mineral resource estimation. The Boyongan and Bayugo deposits have robust geological and resource domains that are suitable for estimating mineral resources. Within the established domains, there is excellent continuity for both copper and gold grades, with low nugget effects and wide ranges.

### **Introduction to Manila Mining Corporation**

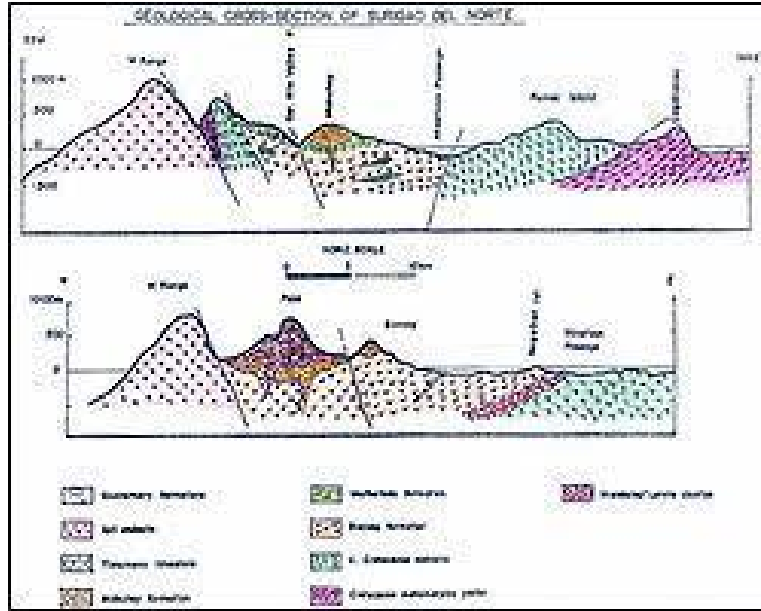
On June 3, 1949, Manila Mining Corporation (MMC) was established with the primary goal of mining and exploring for metals. The Company started mining operations in Placer, Surigao del Norte in 1981, and it currently has two mining lease contracts with the government in Surigao del Norte, as well as three more mineral production sharing agreement applications in Surigao del Norte and Agusan del Norte. MMC, the affiliate of Lepanto Consolidated Mining Company, owns 95% of its subsidiary, Kalaya-an Copper-Gold Resources, Inc., while Philex Mining Corporation owns the remaining 5%.

Surigao del Norte is located on the Eastern Mindanao Ridge, also known as the Eastern Mindanao Island Arc System (EMIAS). The Eastern Mindanao Ridge is commonly thought to be an inactive west-facing arc associated with eastward subduction, with the paleo-trench located west of the Agusan-Davao trough. The Agusan Davao trough is a 50-kilometer-wide, 6-kilometer-thick Eocene Pleistocene sedimentary basin with a NNW-SSE trend. The Philippine Fault has several NNE trending splays to the west of the arc. The three (3) distinct Physiographic-Tectonic-Stratigraphic units of the EMIAS region are the Eastern Highlands, Central Lowlands, and Western Range. These units are moving northwest (Fig. 1).



**Fig. 1** The Geological Map of Surigao del Norte

Placer mine is located within a Tertiary-Quaternary rock sequence. The 1.5 km thick Oligocene to Upper Miocene Bacuag Formation is the oldest rock suite. The lower section is made up of a dense accumulation of basaltic pillow lava and basaltic andesite breccias. The upper section is dominated by a) conglomerates with basalt and limestone clasts, b) well-bedded calcirudite and calcisiltite, and c) thin carbonaceous marks. Basalt lava is augite-phyric and contains chlorite, zeolite, or quartz amygdals. Upper Oligocene to Lower Miocene foraminiferal assemblages are found in limestone that is widely distributed within the basaltic succession. K/Ar whole-rock dating on basalt from the middle of the succession near the Siana Mine yielded a date of 23.11.1 Ma, or early Miocene (Fig. 2).



**Fig. 2** The Geological Cross Section of Surigao del Norte

Lineaments and faults trending NNW are considered first-order structures at MMC's Placer Project, while those trending NNE and NE are considered second-order structures. The primary compressive stress is thought to be directed westward, which corresponds to the direction of the subducting plate (Fig. 3).



**Fig 3.** The Idealized Mineralization Section looking NE from PLDT Tower showing the Kalaya-an MMC mine Mineralized trend with the Occurrences of Economically Significant Gold Copper Mineralization

## **Mine Tour Proper**

Selected students from Adamson University, Negros Oriental State University, Silliman University, and the University of Southeastern Philippines gathered on October 28, 2022, at Parkway Surigao in Surigao City, where they will be staying and where Mr. Douglas Kirwin and other professionals will share their knowledge to the geology students. Ms. Jilian Gabo-Ratio then discussed the itinerary for the entire trip and facilitated a round table introduction for students to build connections before the sun set on that same day. Afterward, Mr. Douglas Kirwin and the Industry Mentor of the fieldwork, Mr. Leo Subang had their evening lecture to discuss geology as a profession (Fig.4).



**Fig 4.** (A) and (B) Roundtable Introduction of geology students. (C) Career talk of Mr. Leo Subang. (D) Photo opportunity

The participants traveled to Silangan Mindanao Mining Company Inc. (SMMCI) in Surigao City the following day, October 29, 2022, at 8:00 a.m., for their first mining visit during their 2-day educational field trip. When the participants arrived on site, they were given a safety briefing as well as an orientation to the company. Mr. Douglas Kirwin then spoke about Porphyry Copper Deposits, followed by Mr. Brandon's presentation on Boyongan-Bayugo Geology and Mineralization. Participants went to see the core sheds, SMMCI's past portal, and the ongoing construction of their open mine pit after hours of discussion. After a full day of exploration at the company's site, the day concluded with a Manila Mining Corporation lecture on the Geology and Mineralization of Placer, followed by Mr. Douglas Kirwin's lecture on Economic Geology (Fig. 5).



**Fig. 5.** (A) Safety induction for mine visitors. (B) Discussion about porphyry copper deposits of Mr. Douglas Kirwin. (C) and (D) Core shed visit. (E) Geology students in front of SMMCI's old portal.

On October 29, 2022, at 8:00 a.m., participants traveled to Manila Mining Corporation (MMC) in Placer City for their final and final visit of their 2-day educational field trip. Upon arrival, the officer in charge of the site explained safety precautions before proceeding to the

drilling site for a brief discussion about andesite porphyry. After an hour, the participants went to MMC's "NTINA deeps". Mining methods were switched from underground to open-cut mining in late 1982, according to the accompanying professionals, and Mr. Leo Subang added a little more information about Placer's structural geology. Following lunch, participants were given the opportunity to inspect the company's core drills as well as the mineral grading and cutting method (Fig. 6).



Fig. 6. (A) Safety induction orientation of mine visitors. (B) Drilling site visit (C) NTINA visit. (D) Geology students identifying core sheds

### **Acknowledgement**

The Society of Economic Geologists Student Chapter - Philippine Association of Geology Students (PAGS-SEGSC) would like to express our heartfelt gratitude to the Society of Economic Geologists (SEG) for the Stewart R. Wallace Fund, which helped fund the initial field trip expenses, and to Mr. Douglas Kirwin for his unwavering support of the organization. As a result of his additional funding, more aspiring geologists were able to join, and they were motivated to work harder in their current field of study. We'd also like to thank Dr. Jillian

Gabo-Ratio, who worked tirelessly with Ms. Florence Annette C. Labis, Mr. Christian Paul Escarian, and Ms. Bernadette Buladaco to guide students through the planning and fieldwork process. We would also like to thank all of the students who participated from Adamson University (AdU), Negros Oriental State University (NorSU), Silliman University (SU), and the University of the Southeastern Philippines (USEP) and trusted the organization to guide them throughout the field trip, and to Mr. Leo Subang for the knowledge-packed discussion

Finally, nothing would be possible without the gracious hospitality of Mr. Noel C. Oliveros, Exploration Officer-in-Charge of the Philex Mining Corporation Boyongan-Bayugo Project, and Mr. Bryan Yap, President of the Manila Mining Corporation Placer Project, as well as the rest of their team and the entire workforce. On behalf of all participants, we would like to express our gratitude to the Silangan Mindanao Mining Company Inc. (SMMCI) and Manila Mining Corporation (MMC) for accommodating the student members and providing an exceptional opportunity to experience and learn about the actual application of all academic learnings. We are extremely grateful for the companies' willingness to share their knowledge and expertise by presenting lectures on the geology and mineralization of both Boyongan-Bayugo and Placer Projects, as well as their Porphyry Cu-Au and andesite porphyry deposits and other related pegmatites.

### **Itinerary**



<b>OCTOBER 28, 2022 (Friday)</b>	
2:00 PM	Estimated Time of Arrival at Parkway Hotel (AH26, Surigao City, Surigao del Norte)
7:00 PM	Evening Lecture by Mr. Douglas John "Doug" Kirwin
<b>OCTOBER 29, 2022 (Saturday)</b>	
7:30 AM	Departure from Parkway Hotel
9:00 AM	Estimated Time of Arrival at Philex Silangan Mining
4:00 PM	Departure from Philex Silangan Mining
5:30 PM	Estimated Time of Arrival at Parkway Hotel
8:00 PM	Evening Lecture by Mr. Douglas John "Doug" Kirwin
<b>OCTOBER 30, 2022 (Sunday)</b>	
8:00 AM	Morning Lecture by Mr. Douglas John "Doug" Kirwin
9:30 AM	Departure from Parkway Hotel
11:00 AM	Estimated Time of Arrival at Manila Mining Corp. Placer Mine
4:00 PM	Departure from Manila Mining Corp. Placer Mine

### **Financial Report**

<b>Particulars</b>	<b>Cost (PhP)</b>
Notarization of Waivers of the Participants	5,500.00
Airfare (Manila-Butuan-Surigao-Manila)	13,844.04
Van Fare (Butuan-Surigao)	1,380.00
Van rental (Parkway Hotel - Philex Silangan Mining/Manila Mining Corp. Placer Mine)	19,500.00
Accommodation (Parkway Hotel)	55, 930.00
Food (Lunch)	6,063.10
<b>Total</b>	<b>102,217.14</b>

### **References:**

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*Structures*. Manila Mining Corporation. <http://www.manilamining.com/placer04.html>