



## EBS201 MINERAL DEPOSITS

### ASSIGNMENT 2

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PROGRAMME: MINERAL RESOURCES  
ENGINEERING

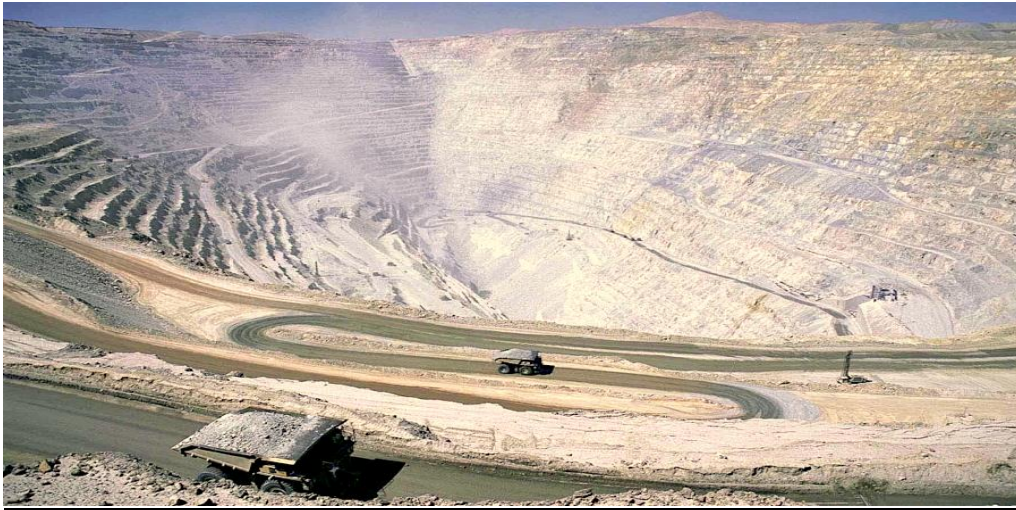
EBS 201 Assignment 2:

Deadline 20 Dec 2020:

Select five big size porphyry copper deposits such as Chuquicamata, Grasberg and others. Explain several aspects of this porphyry copper +/-gold including:

1. Location
2. History or background of mine
3. Mineralogy (main mineral and associate mineral)
4. Resources (tonnes and grade in %) or total production of Copper and gold.

## CHUQUICAMATA



1. LOCATION	Located in the north of Chile, just outside of Calama at 9,350 feet (2,850m) above sea level, 215 km northeast of Antofagasta and 1,240 km north of the capital, Santiago.
2. HISTORY OR BACKGROUND OF MINE	Flotation and smelting facilities were installed in 1952; and expansion of the refining facilities in 1968 made 500,000-ton annual copper production possible in the late 1970s. The mine is owned and operated by Codelco, a Chilean state enterprise, since the Chilean nationalization of copper in the late 1960s and early 1970s. Its depth of 850 metres (2,790 ft) makes it the second deepest open-pit mine in the world (after Bingham Canyon Mine in Utah, USA).
3. MINERALOGY (MAIN MINERAL AND ASSOCIATE MINERAL)	A regional fault zone gave rise to hydrothermal activity which concentrated metal and sulfide minerals. "Pyrite is present everywhere" and chalcocite and covellite appear as both supergene and hypogene minerals. Molybdenite is conspicuous at Chuquicamata, almost all of it carried by quartz veins.
4. RESOURCES (TONNES AND GRADE IN %) OR TOTAL PRODUCTION OF COPPER AND GOLD	The underground mine will be developed at an estimated cost of USD4.2bn and will produce an estimated 140,000 tonnes of ore per day. Estimated reserves at 690 million tonnes grading 2.58% copper.

## BINGHAM CANYON



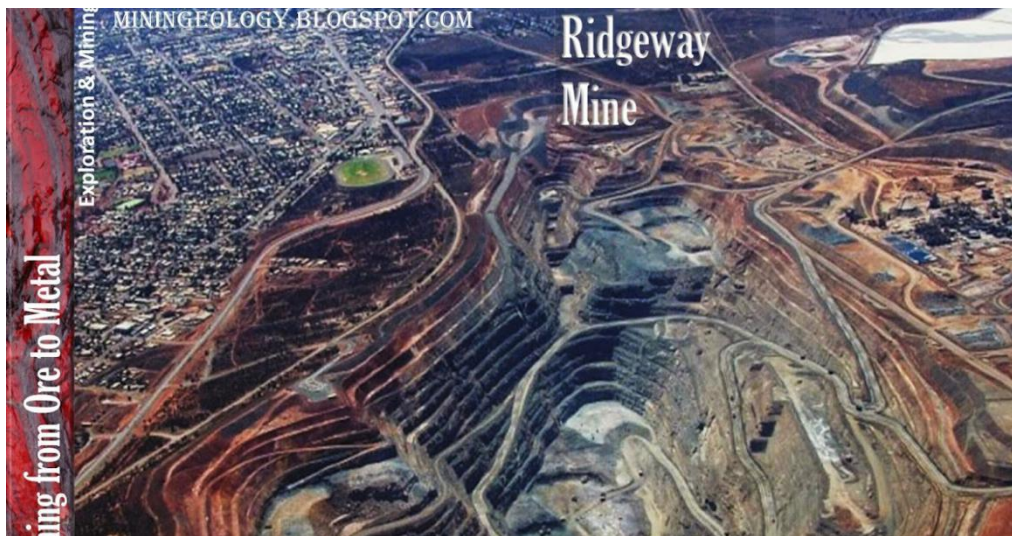
1. LOCATION	Southwest of Salt Lake City, Utah, in the Oquirrh Mountains.
2. HISTORY OR BACKGROUND OF MINE	The mine discovered in 1848 by two brothers Sanford and Thomas Bingham. At 1863, that extraction of low-grade porphyry copper ore began. At 1906, the Kennecott Copper Corporation that operated mine in Kennecott Alaska acquired the company in 1936. The success of Utah Copper in mining the huge but low-grade porphyry copper type ore body at Bingham Canyon was based on Jacklin's 1904 decision to use open-pit mining, steam shovels and the railroad. Bingham's Canyon mine expanded rapidly, and by the 1920s the region was a beehive of activity. In 1986, Kennecott discovered gold in nearby Barney's Canyon.
3. MINERALOGY (MAIN MINERAL AND ASSOCIATE MINERAL)	The Bingham Canyon ore deposits occur in the Bingham nappe. They are a porphyry copper deposit, formed by a quartz monzonite porphyry intruded into sedimentary rocks. They exhibit a concentric alteration pattern and mineralogic zonation around the Bingham stock. These zones include a central core containing magnetite, followed by "a molybdenite zone low in copper, a bornite-chalcocopyrite-gold higher grade copper zone, a pyrite-chalcocopyrite zone, a pyrite zone, and an outermost lead-zinc zone.
4. RESOURCES (TONNES AND GRADE IN %) OR TOTAL PRODUCTION OF COPPER AND GOLD	Has yielded more than 19 million tons of copper and 23 million tonnes of gold. Kenyon mine produces 1/4 millions tons of copper annually

## GRASBERG



<p>1. LOCATION</p>	<p>It is located in the province of Papua in Indonesia near Puncak Jaya, the highest mountain in Papua. It is located 96km north of Timika, at Tembagapura in Irian Jaya- the most easterly of Indonesia's provinces- on the western half of the island of New Guinea.</p>
<p>2. HISTORY OR BACKGROUND OF MINE</p>	<p>The story of the Grasberg mine began in the mid-1930s when Dutch colonists discovered copper deposits in the Jayawijaya Mountain glaciers in the Indonesian part of New Guinea. Mining operations commenced in 1972, however the mine was largely exhausted by the mid-1980s.</p>
<p>3. MINERALOGY (MAIN MINERAL AND ASSOCIATE MINERAL)</p>	<p>Mineralisation is largely disseminated and chalcopyrite dominant, having average grades of 1.2% copper and 0.5g/t gold. The second intrusive stage, the Main Grasberg Stock , is composed of non-fragmental, porphyritic monzodiorites, forming a quartz-magnetite dilational stockwork with veinlet-controlled copper-gold mineralisation. This is a high-grade resource, with averages of 1.5% copper and 2g/t gold.</p>
<p>4. RESOURCES (TONNES AND GRADE IN %) OR TOTAL PRODUCTION OF COPPER AND GOLD</p>	<p>Results to date from its underground mines are positive and in line with long-term plans to reach full production rates. In aggregate from 1990 through 2019, the Grasberg minerals district produced 33 billion pounds of copper and 53 million ounces of gold, including over 27 billion pounds of copper and 46 million ounces of gold from the Grasberg open pit.</p>

CADIA-RIDGEWAY



<p>1. LOCATION</p>	<p>Cadia Mine is a series of large underground and open-cut gold and copper mines located in the Cadia Valley, about 20 kilometres south of the regional city of Orange, New South Wales, Australia.</p>
<p>2. HISTORY OR BACKGROUND OF MINE</p>	<p>The mine has been developed throughout the 1990s and is a major employer in the region with an expected lifespan of several decades. Cadia is the second largest open cut mine in Australia after the Super Pit at Kalgoorlie. The Cadia East deposit occupies a mineralized zone 2.5 km in strike length, 600 m in width and over 1,900 m in vertical extent.</p>
<p>3. MINERALOGY (MAIN MINERAL AND ASSOCIATE MINERAL)</p>	<p>Mineralization is spatially and temporally associated with a swarm of narrow Early Silurian, alkalic monzonite and monzodiorite dykes that intrude the Ordovician Forest Reefs Volcanics, a thick succession of volcanic (lavas and sub-volcanic intrusions) and associated clastic rocks (debris flow volcanoclastics, sandstones, siltstones and minor limestones).</p>
<p>4. RESOURCES (TONNES AND GRADE IN %) OR TOTAL PRODUCTION OF COPPER AND GOLD</p>	<p>In the financial year ending 30 June 2015, Cadia Valley Operations (CVO) produced 667,418 ounces of gold and 73,697 tonnes of copper. Over 8 million ounces has been produced from CVO since commercial production commenced in 1999.</p>

## OYU TOLGOI



1. LOCATION	The Oyu Tolgoi mine is a combined open pit and underground mining project in Khanbogd sum within the south Gobi Desert, approximately 235 kilometres (146 mi) east of the Omnogovi Province capital Dalanzadgad.
2. HISTORY OR BACKGROUND OF MINE	Canadian-based Ivanhoe Mines discovered the gold-copper ore deposit in 2001 in the Gobi Desert of Mongolia. It is in an area known as Oyu Tolgoi (Mongolian for Turquoise Hill), where in the time of Genghis Khan outcropping rocks were smelted for copper. The place was suspected to have mineralization by Mongolian geologists since 1950s. By 2003 there were 18 exploration drill rigs on the property employing approximately 200 people, and Oyu Tolgoi was the "biggest mining exploration project in the world." In January 2013 Oyu Tolgoi started producing concentrate from the mine.
3. MINERALOGY (MAIN MINERAL AND ASSOCIATE MINERAL)	It also contains 1,900 tonnes of silver and 205,000 tonnes of molybdenum. Chalcopyrite and bornite are the main copper sulphide minerals. Predominantly within basalt and quartz monzodiorite.
4. RESOURCES (TONNES AND GRADE IN %) OR TOTAL PRODUCTION OF COPPER AND GOLD	Oyu Tolgoi deposits contain an estimated 2,700,000 tonnes of copper and 1.7 million ounces (48,000 kg) of gold. Production began in 2013 and is scheduled to reach full capacity in 2021. Oyu Tolgoi is scheduled to produce 430,000 tonnes (470,000 short tons) of copper per year, an amount equal to 3% of global production. Oyu Tolgoi is also expected to produce 425,000 ounces (12,000 kg) of gold annually, with "by-product silver and molybdenum".

