

# GOLD MINING. SIMPLY PUT

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## ***Why we wrote this book?***

In investing, information is power. We have been accumulating and sharing information freely for years in print and online. Our articles have found their way to newspapers and sites over the last twenty five years. We felt that the bite sized segments often do not provide enough of the comprehensive information needed to better understand the overall mining process or are somewhat confusing. Perhaps this booklet will help.

## ***Why not simply put this online?***

A funny thing happened on the way to a blog. The Internet is full of useful information and tips. One can find all kinds of interesting ways to understand numerous subjects. The problem is accuracy. There is so much misinformation that it is important to cover this subject from end to end and provide descriptions and data that is accurate. Executives and geologists from several reputable mining firms have reviewed this material and given us their input.

## ***Where did this information come from?***

Our experience analyzing and researching hundreds of mining companies, interviews and feedback from mining executives, geologists and miners that have explored for, developed and operated mines in Canada, the United States, Mexico and South Africa.

## ***The coming period should be positive for gold!***

As we believe that we are in a period that will be very positive for gold and gold mining stocks, we thought that it would be appropriate to create a concise booklet put in an easy progression to better understand the fundamentals of gold mining. The emphasis is to give readers an overview of gold mining in order to understand the basics.

There is a great deal of confusion about gold, mining stocks and the mining industry. We will try to explain some of the key components that are involved in the exploration and mining of gold. This booklet is an overview which will be followed with more detail later. Hopefully, it will give readers useful background information about gold and mining.

We will try to clarify some aspects and explain others. We emphasize that merely understanding gold mining and mining stocks will not necessarily make it profitable. However, when you finish reading this, you will know more about gold mining than well over ninety percent of investors. Also keep in mind that in gold mining, two plus two often does not equal four. We will try to make it easy and enjoyable to read.

### ***WHAT IS GOLD?***

Gold is a metallic element that occurs naturally in a pure form as nuggets, wires, flakes and tiny grains. Countries have stockpiled and fought for it, ships have sailed for it and people have died for it. In western movies, we see stagecoach robbers demanding the strongbox containing the gold. Not much has changed except that some of today's "safekeeping organizations" seem to be modern day stagecoach robbers. For example, a European country recently asked to have its gold that is held in "safekeeping" in New York delivered to them; three years later, only a percentage has been shipped back to the country that had requested it!

### ***WHY INVEST IN GOLD MINING?***

Why do people acquire and invest in Gold? It is a question often asked. If we look back thousands of years, we find that all of the great civilizations were acquirers and users of gold. They still are today, as a matter of fact, the largest amount in

value of any type of reserves held by the world's central banks is in Gold bullion. We can see gold's price quoted and followed minute by minute with gold mining and exploration ongoing on every major continent. We also see gold bullion purchased on an enormous scale by large institutions, private investors and above all by the world's Central Banks. Interest in the precious metals does decline for periods of time, but it always returns with a vengeance. There is more to wealth and economics than just gold but it remains an integral part of the world's economic system and will always have a highly valued status.

Some resent Gold's power and influence such as many of the world's central bankers who print paper money relentlessly and are punished when gold prices climb and the value of their paper currency declines. That decline has always been the history of paper money. Gold is also a warning "barometer" that can force governments and central banks to address their fiscal actions and their manipulations of markets and currencies.

We can look at history and see that gold has always returned to a valued position in the investment world. We feel that gold will have an exalted position soon and that the future of gold and gold mining stocks will be positive with the normal agonizing "pit stops" occurring regularly. The future will be positive; it is the "in between" periods that are frustrating but do offer investors the opportunities for cheap investing.

### ***PAPER MONEY HISTORY***

In today's world of fiat paper and ongoing "money printing," please keep this in mind: One United States dollar in 1940 had a purchasing power of one hundred cents. During the years of the Reagan Administration, the purchasing power of that same dollar had declined to between eight to twelve cents. Today, that 1940 United States dollar has a purchasing power of between six cents to two cents.

An interesting fact is that throughout history, no paper currency has ever survived over the long term-but gold has! Studies show that items that were bought in gold centuries ago can be bought today with essentially the same amount of gold. Paper money has always lost its value over the long term; gold has not lost its value.

### ***WHAT ARE THE NECESSARY INGREDIENTS FOR MINING SUCCESS?***

There are many ingredients involved for successful mining. A company's

successful exploration does not always require a brilliant exploration geologist, superior prospectors or an experienced mining engineer; it is a team effort. Exploration is challenging but we will discuss what exploration teams look for and more importantly what the world investment community wants to see in a gold mining company. Readers should gain a solid overview and useful understanding of gold mining here; again, we will keep it simple. To give unique insight, we also have the knowledge and “input” from successful exploration miners who have passed on to us their experience and knowledge after decades of exploration.

### ***WHERE IS GOLD FOUND?***

Few investors are aware that Gold is found on almost every continent on earth. Despite the fact that gold can be found almost everywhere, there is very little gold compared to other elements on earth. A significant point is that gold is difficult to find in quantities that make it profitable to mine as gold mining is very expensive. How much gold has been found in the world already? In size, all the gold that has ever been produced in the history of mankind, melted down, would form a cube of seventy five meters on each side. The largest deposits of gold are in South Africa which has the largest concentration of gold in one area and was the world’s largest gold producer. Today, several countries produce more gold than South Africa.

### ***HOW ARE GOLD DEPOSITS CREATED? HOW DOES GOLD COME UP THROUGH THE EARTH?***

Gold comes up to the earth’s surface or to levels below the surface that can often be mined successfully. The ore containing gold has moved up through the earth in many different ways and numerous directions. The Gold was buried deeply inside the earth and it required thousands if not millions of years to come up to levels near the surface where it can be possibly mined. It is the mining exploration team’s job to try to determine where it is, its potential and to try to determine the direction (trend) that gold could continue to be found. Keep in mind that we are referring to geological formations that have been evolving over minimally thousands of years.

Making exploration more complicated is the fact that we are examining mineral deposits that are made up of generally valueless ore minerals which contain the gold. And keep in mind that gold is fractionally very tiny as a percentage of the other minerals that it occurs with. While other metals such as copper and iron occur in much larger volume where they are discovered, gold is small. One miner

described it as akin to eating a salted steak, the gold is the “salt.” It is small and again-very difficult to find in sufficient quantities!

### ***HOW DIFFICULT IS GOLD EXPLORATION?***

It is challenging, yet it has been done successfully for thousands of years, well before the advanced exploration and mining technology that is available today. Mining companies are looking for an “ore body” which is a “concentration of minerals” that must be sufficient to justify the enormous total expense of a mining operation. Suffice it to say that initially, on average, it can require over hundreds of drill holes and thousands of meters of drilling before success-if any success at all. Even after all the gold exploration is done, it does not guarantee that gold will be found in sufficient quantity to justify a mining operation. After all, a prospector’s or a company’s exploration is merely the first step. Numerous prospectors have spent their entire lives exploring for gold with little to no success.

***IN WHAT FORM IS GOLD FOUND?*** Gold is found in two kinds of deposits. It generally forms in veins or shears in igneous rocks as it moves up over thousands of years from deep inside the earth to near the surface and to the surface.

### ***THE GOLD PRODUCING COUNTRIES***

The leading Gold producers have changed over the last decade. Recently, the world’s largest producer of gold is Australia, followed by China, the United States, Russia and Peru. Canada is also in the top ten countries for gold production. Gold can be found in sea water as well as at the bottom of streams and rivers. The bottom line is that gold may be everywhere, but it is very difficult to find in amounts that merit actual production due to the cost; we cannot emphasize the cost factor enough. Note that we are not referring to panning by prospectors or individuals who do their own exploration. Yet, few investors truly understand the primary challenge of putting a mine into production is the enormous cost.

### ***HOW MUCH GOLD IS NEEDED TO COMMENCE A MINING OPERATION?***

That is undoubtedly a most important question but it cannot be answered with a simple response as there is no “one size fits all” answer. Let’s start by stating that it depends on how much gold that the exploration team’s drill results indicate is in the exploration area and how much will it cost to mine it. Will it be a surface

mining operation? Or if the drill results show gold deposits that are deep, it would require an underground mining operation? Those are just some of the many factors that make every mining operation different from others. The key ingredient is to have an exploration project that offers solid potential. Above all else a company needs sufficient deposits of gold to commence a mining operation.

### ***JUST SUPPOSE DRILLING RESULTS SHOW...***

Just suppose that a company's exploration results have shown 100,000 ounces of in ground gold reserves. Is that sufficient? It depends on how accessible that gold is among several things. If the gold is near surface, the question is what would be the cost of a mining operation. If it is a deep deposit, 100,000 ounces probably will not be sufficient unless the probability exists that much more gold can be found at depth or in other directions. Mining at deep levels involves much higher costs.

It makes sense that if a mine is two kilometers deep; the production is more costly as a company has to drill deeper and move people and equipment, all which are expensive-very expensive. What must be always emphasized is that the total costs of exploration and putting a mine into production are enormous. Again, keep in mind that every mine is different and so are the costs involved for each mine.

### ***THE "COST" OF MINING GOLD....IT'S NOT CHEAP!***

The cost of pulling an ounce of gold out of a mine and only up to that point of extraction is called the "cash cost" which is merely the mining operation itself. The average cost was approximately \$400 an ounce for the gold mining industry in 2007. Today, the average "cash cost" is much higher at an average of approximately \$700 to \$800 an ounce. The obvious reason is that the gold that was mined in 2007 was easier to find and less expensive to mine. But keep in mind that those are the averages and today there are some mines with cash costs of \$400 or less while other mines have cash costs at over \$1000 per ounce.

The "cash cost" is merely part of the total cost. Like the "peak oil" used in describing the world's oil reserves, "peak gold" is the term used to describe today's belief that the easier to find and extract gold deposits already have been found. Today the exploration is more expensive. But we have to move up to the total cost of an ounce of gold for a mining company; it is termed the "all in cost."

## ***THE “ALL IN COST”***

This is the real cost, the total cost of bringing an ounce of gold out of the earth all the way to the market. It is the true total cost of production. After the gold ore is taken out of the earth-the cash cost, a company has other expenses that such as permits, administration, insurance, salaries, exploration expenses, environment, interest expenses and other costs involved in creating the final gold production. The “all in cost” is the important gauge of costs when analyzing a company. It is much more than just the initial stages of getting gold out of the ground.

## ***THERE ARE MANY FACTORS INVOLVED IN COST***

To begin with, if the cost per ounce of production of a surface mine is estimated to be at \$700 an ounce to mine and the other costs are estimated to be another \$400 per ounce more, it may be worth consideration. If it contains 100,000 ounces of gold, it may seem to be satisfactory and offer the opportunity for profit. However, a key question is the entire cost to set up a mining operation and bringing it through the stages that will produce an actual profitable gold production.

Suppose that it will cost \$50,000,000 to build the entire mining facility and put the mine into production. Note that a \$50 million expenditure would be a very small mine-very small! That could be sufficient if the price of gold bullion is at a certain minimum price level. For example, in August 2016, gold is in the \$1350 range, that is sufficient for many mining companies to operate profitably. The key point is that a moderate move up in the price of gold bullion can change the profitability challenge. But keep in mind there are exceptions to the rule as every mine is different and demands a different approach from other mines.

The other initial cost considerations include drilling, infrastructure needs, line cutting, electricity availability, geophysical surveys, salaries, registrations, equipment, filing fees and on and on. It can add up to hundreds of millions of dollars. It is expensive. For example let's say the cost of producing 100,000 ounces in this example would be \$70,000,000. (For this example, the production cost is \$700 an ounce times 1,000,000 ounces) However that is just the production cost and not the “all in cost.” So it may seem to be a potentially profitable operation if the company can sell the gold for \$1350 an ounce or more, but there are the various other costs that can dramatically raise the “total cost of production.” Yes,

there are other ingredients in the mix where the other parts of the “all in cost” come into play. Yes, it gets complicated.....and very expensive.

### ***LOOKING FOR GOLD***

Let’s address the questions “where do we find gold?” and “how do we look for gold.” To start with, gold explorers look for geological formations that offer the possibility of gold in sufficient quantities and grade to make mining the gold commercially viable. Exploration and mining are expensive so minimum deposit potential and requirements exist. Making it even more challenging is the fact that no two mines are alike. Yes, the independent prospector can do exploration on his own but we are focusing on creating a full scale mine operation.

**Panning?** Although it may prove profitable, it is exploration on a small and personal scale. However, results from panning have in the past led to the discovery of major mines as an individual prospector panning for himself found what led to a large deposit(s).

***WHAT ABOUT THE SIZE?*** Naturally a company wants to find the largest potential deposit possible for a project but there is no real gauge for the ideal size or depth of a property. Suffice it to say that “it depends.” Large mining companies may want a minimum of five million ounces in reserves.

### ***EXPLORATION***

The exploration team searches for geological structures that may contain potential mineral deposits. Specific rocks, other non-gold minerals, anomalies, outcrops and other indicators can provide clues. For example, in basic exploration, the prospector takes a small sample of a large rock formation hopeful that the sample can indicate the large rock formation contains a sufficient amount of gold. If it does, it may indicate that further exploration work is warranted and the process moves forward. Chipping away at rocks and “grab samples” may seem tedious but they are methods of exploration that can lead to commercial gold deposits.

The prospectors’ samples are collected and sent to labs for analysis. An exploration program in an area can continue for years possibly leading to gold production that could carry on for years. Finding gold in sufficient quantity and grade is difficult requiring a great deal of demanding and challenging work-and it is expensive!



Making exploration more complicated is the fact that we are looking through mineral deposits that are made up of generally valueless ore minerals which contain the gold. Again, gold is fractionally tiny as a percentage of the other minerals that it occurs with. While other metals such as copper and iron occur in larger gross volume and percentage volume where they are discovered, gold is small and miniscule in size. As we have said, gold is not easy to find, but when it is found in sufficient grade and quantity, it could become profitable to mine.

### ***HOW DOES PROSPECTING FOR GOLD BEGIN? AND HOW DOES A COMPANY LOOK FOR GOLD?***

First, a company chooses an area of exploration and looks for evidence of mineralization. The exploration can be as basic as looking for specific rocks to the higher technology of an aerial magnetometer. **Trace minerals, certain rock types, specific host rocks, faults, geological structures are all parts of prospecting.** Simply stated, a company will prospect for potential gold deposits and do the initial exploration, we will break it down to basic steps. Here is an overview of some of the steps that an exploration program does for a mining company.

**1-The Gold Company chooses an area for exploration.** Often, it will be in an area of previous mine exploration and mine production offering the possibility of sufficient gold mineralization to justify a mining operation. In many places such as Quebec, there are historic records of exploration results going back decades. Geologists will consult the historical data to learn more about the properties that they are considering. The data provides the exploration team with information about the areas of interest where gold has been found in the past and where gold mining production has taken place. Once the exploration area is chosen, it will require an exploration permit.

**2-The exploration team looks for geophysical “showings”** which are indications of potential mineralization. Basically, the team’s exploration program can range from grab samples and channel sampling to airborne surveys using hi-technology equipment from an airplane. After studying all the data, the exploration team may decide to begin drilling operations.

**3-Drilling will be done by a professional drilling company.** A drilling program can continue for months to many years. The number of holes drilled can range

from a few as 10 holes in an exploration area to 200 or 300 holes-or more. Drilling programs may range from 30 meters in depth to 300 meters in depth and more. In a program, we may see total drilling depth exceeding 30,000 meters or more such as 100 holes of 300 meters each. We will explain the two standard types of drilling done which are diamond drilling and reverse circulation drilling.

While the drilling program is ongoing and when it is done, the decision of whether or not the exploration should be continued based upon the drill results will be made. The drill results are sent to a lab which will determine the grades. Naturally, the company needs sufficient grades of gold to indicate mining potential.

**4-If the drill results from the lab confirm sufficient gold**, the drilling will probably continue on a wider and deeper scale on the project. A company engaged in exploration needs a sufficient amount of potential resources to continue an exploration program. What we are emphasizing is that the profit potential for a mining operation must be there.

**5-A “Pre-feasibility study” is a company’s preliminary due diligence work** in which the company determines whether to proceed with a comprehensive “feasibility study” which is an additional expensive cost. It is an initial appraisal of a mineral resource. It is a sort of “pre-check” where the company looks at all the information collected and determines if more information is necessary. Preliminary estimates of costs, mine size and resources are estimated as well as other factors.

**6-A “Feasibility study” is an in-depth analysis that attempts to determine** whether or not a gold deposit is commercially viable and can be mined profitably. This official study is presented to bankers. Generally, the minimum value of the in ground reserves is determined based upon the drill results. Next, the total estimated costs involved in putting a mine into production are considered. The feasibility study is the **essential document** that may determine whether or not the mining company obtains the financing needed to commence the development of a mine.

***DRILL RESULTS INTERPRETATION*** There is a formula that might give you an idea of how the value of a property is determined. For example, let’s say that we have a property that is 100 meters by 200 meters with a depth of 10 meters. For this example, let’s say that the drill results from the lab show 8 grams of gold per tonne. As there are 31.108 grams in one ounce, we have to convert the 8 grams

of gold per ton into ounces. That gives us approximately .25 ounces per tonne or ¼ of one ounce per tonne. Then we use the value gauge. Try to follow the easy steps.

***A TYPE OF “VALUE GAUGE” IN EASY STEPS... DETERMINING VALUE WORKS THIS WAY:***

1-For example, suppose the size of the area of the prospective gold project is 100 meters by 10 meters by 200 meters deep = 200,000 cubic meters.

2-Multiply the 200,000 cubic meters by the weight of 2.8 tons per cubic meter = 560,000 tonnes (there are approximately 2.8 tons of weight in each cubic meter)

3-So if the project has 560,000 tonnes with .25 ounces per tonne (1/4 of an ounce); it would thus have approximately 140,000 ounces in the project.

4-So, from the amount of gold ounces in the project, in this case 140,000 ounces, a company may decide to proceed with building a mine or continue exploration.

***DRILL RESULTS? ABOVE ALL ELSE, GRADE IS KING!***

A mining company ideally wants a large high grade deposit in a region that has the necessary infrastructure, availability of mining personnel, good location and operating in an area where the government is supportive of mining. A low tax rate makes it even better. A project can have a lower grade deposit but at the same time it will probably need the price of gold bullion to be at a relatively high price level.

**Grade is the most important component of all;** it is underscored by the expression “grade is king.” The question is “how much gold does the project have and what is the potential to add to it.” Is the grade of gold found through the preliminary exploration sufficient to justify continuing exploration which entails drilling and more drilling?

***WHAT IS A HIGH GRADE?***

Then the question is whether or not it could justify a full underground mining operation? We used to assume for example that in Quebec, one would generally want to see a minimum of five grams per tonne of rock, if it is higher, so much the better. Keep in mind that we are speaking of “metric tonnes” which are equal to 2200 pounds. But note that there are some surface mines that have been operating profitably with grades of one gram of gold per tonne.

The reason is simple, if there is sufficient gold at or near surface; it is generally less expensive to mine and process. Usually a surface mine will not have large deposits of gold reserves. **Obviously, a surface mine is cheaper to operate and while it may offer less potential for long term production, there is generally less gold there.** We cannot emphasize enough that every mine is different so there can really be no hard and fast rules for any mine. Moreover, some producing surface gold mines can lead to the development of underground mines if during their surface gold mining production they discover more gold reserves at deeper levels that require an underground mining operation.

### ***METHODS OF DRILLING: “DIAMOND DRILLING” AND “REVERSE CIRCULATION DRILLING”***

Two types of drilling are the most widely used today. The primary method used in Quebec and Ontario is “Diamond drilling” which removes a continuous cylinder of rock similar to the size and shape of small cans of soda or beer piled lengthwise on top of each other in a long cylindrical shape. It uses rotating drill bit that in the process lubricates the drill bit. As the drill rods go down further the cylinder of remaining rock gradually is broken into “segments” that are pulled out in increments which are the “drill cores.” Photographs of drill cores samples can be found all over the internet taken in various companies’ core shacks.

The cores (which are the drilled out rock samples) are logged and are sent to the laboratory for a comprehensive in-depth analysis. Diamond drilling is expensive; it is capable of drilling holes over two kilometers in depth. A drill hole can take days to complete and drill programs can continue for months and even years if gold potential is seen. Naturally with deeper drilling, more time is required and it is more costly.

The cost of drilling has very wide price ranges and varies extensively throughout the world. For example in some areas, drilling can cost \$40 per meter while in other areas such as more inaccessible places it can cost \$200 per meter or more. It depends on several fundamental factors such as the area’s accessibility, distance, moving the drill teams among many things. Again, drilling deeper can add significantly to the costs. As in all businesses, there is a supply and demand factor; when the demand for gold is moving up, the markets demand and cost for drilling goes up. During low gold price periods, there are many drillers out of work.

***REVERSE CIRCULATION DRILLING*** is the other method of exploration drilling in North America. It is rarely used in Canada but is more common in the mining regions of Nevada, Chile and Peru. The drill bit cuts the rock into small fragments which are brought up for analysis. It provides more “granulated” samples unlike the solid core from diamond drilling. As with all drill results, the drill samples are sent to a laboratory for analysis.

After the drilling results are sent to the lab, the company hopes that the results show sufficient Gold that suggests a mining operation should be considered. But note well that the decision is also quite dependent on the price of gold at the time. How do you know if a deposit offers commercial mining potential? The feasibility study should help answer that. Keep in mind that a bank will finance a mining operation based upon the drill results and other details contained in the feasibility study which a bank uses to determine whether or not to finance a mining project.

### ***DRILL RESULTS? GRADE IS KING!***

A mining company wants a large high grade deposit in a region that has the necessary infrastructure, availability of mining personnel, good location and situated in an area that the government is supportive of mining; a low tax rate makes it even better. You can have a lower grade deposit but at the same time it will need the price of gold bullion to be at a relatively higher price level.

**Thus, there are two principal questions, how much gold does the project have and what is the potential to add to it?** Is the grade of gold found through preliminary exploration sufficient to justify continuing the exploration which entails the expense of more drilling?

### ***GRADE***

Then the question is whether or not it could merit a full mining operation? For example we generally would assume that in Quebec, a mining company would want to see a minimum of five grams of gold per tonne of rock in an underground mine. Yet, we can find some surface mines have been operating profitably with grades of one gram of gold per tonne. The reason is simple, if there is sufficient gold at or near surface; it is less expensive to mine and process. As a company has to mine deeper to produce gold, it becomes more expensive. But keep in mind that the price of gold bullion at the time of the exploration is a key determinant. So, with a higher price of gold bullion, a lower gold grade becomes acceptable.

Let's say the company has results that show gold deposits at the exploration area that has been drilled. Then the company must determine just how good the results are. If the results show adequate potential, the company will put together a drilling program to continue the exploration program.

***DRILL RESULTS? YOU MUST UNDERSTAND THIS CONCEPT COMPLETELY!***

Let's suppose that a mining company reports drill results of 31.103 grams per tonne at a drill hole. Does that confirm and verify that the company has a core sample that contains a full 31 grams of gold (there are approximately 31 grams in one ounce) that in today's gold market would sell for approximately \$1350 per ounce? **And does that indicate that the gold contained in that drill core sample is worth \$1350? No! No! No! No! Not at all!**

Keep in mind that the sample that returned the reported 31 grams was from a small segment of a tonne of rock (ore). Thus that sample did not weigh 31 grams but was an "exponential expansion" of if what was found continued throughout the entire tonne of ore. The 31 gram sample was similar to just one pea in a can of peas.

The size of a tonne of rock generally will be approximately 3 feet by 3 feet by 3 feet in size. So if the drill results indicated 31 grams, it would signify that if the amount of gold that was found in the small sample (the 31.103) could be found in that same percentage throughout the entire 3 feet by 3 feet by 3 feet block of the rock, then it could be verified that it does contain a true 31 grams of gold. Most investors do not understand that very important fact. Bottom line? The entire area must be drilled to prove a gold deposit containing a sufficient amount of gold.

What does a core drill result look like? It would look like a long skinny can of soda. If we have a 4.5 meters length of core that was sent to the lab for testing, it would weigh approximately 30 pounds-a far cry to the 2200 pounds that is a ton.

So if it is a 30 pound core sample, it would represent only 30 pounds out of the 2200 pounds tonne. Next, 30 pounds is 1/73rd of the entire tonne. Thus that 1/73 percentage of one ounce of gold would have a dollar value of about \$15 at a \$1200 gold price. **So keep in mind that the reported drill sample is merely a small percentage. That is the reason why a mining company requires a large number of drill holes close to each other with laboratory verified results.**

## ***CLASSIFICATIONS OF GOLD RESOURCES AND GOLD RESERVES***

The decision whether or not to commence a mining operation depends upon the amount of gold that the drilling results indicate to be there. As well, additional gold deposits may be found later when the mine is in operation. Often, mines continue to produce gold long after it was expected that their mines would run out of gold; some mines have continued producing years after it was expected that they would run out of gold. Every mine is different and unanticipated further discoveries indicating more reserves do occur while mining.

### ***GOLD RESOURCES EXPLAINED.....***

Just for a simple answer let's say that resources are what the exploration team thinks that it has after some exploration work. It is the early stage.

**“Inferred Resources”**...can be estimated with a “low level of confidence.” Inferred from geological evidence and assumed but not verified geological and/or grade continuity. It is based on information which is limited or of uncertain reliability. It is to a certain extent the belief that there is gold but one cannot be certain how much or if there is enough to justify further drilling.

**“Indicated Resources”**...can be estimated with a “reasonable level of confidence” and not yet at the level of Measured Resources. The drill holes are more widely spaced than they are for the Measured Resources so one cannot confirm geological and/or grade continuity but are spaced closely enough for continuity to be “assumed.” Thus, the exploration team is seeing results that indicate that there is reason to believe that there could be more gold.

**“Measured Resources”**... These are mineral deposits that can be estimated with a high level of confidence. This is the highest level of resources. The locations are spaced closely enough to confirm geological and grade continuity. The “spacing” between the drill holes is usually required to be between 5 meters to 25 meters to classify the resources as “measured.” The point of closer spaces in the drill holes is to attempt to confirm the amount and density of the gold deposit. Yes, the results show that there is a strong possibility of gold in what could be a sufficient quantity to justify a mining operation. \* Then we move up in quality into “Reserves.”

## ***GOLD “RESERVES” EXPLAINED.....THEY ARE BETTER THAN “RESOURCES”***

\*Reserves are really resources that have been confirmed and have more reliability as to their existence.

**“Reserves”**... are the precise amount and exact grade that can be mined commercially and hopefully be profitable. The drilling results for the project indicate has the gold that has been confirmed and is considered to be sufficient to be commercially viable and offer the opportunity for profitability.

**“Possible Reserves”**...expected reserves from the drilling that has already been done but more drilling and exploration would be required.

**“Probable Reserves”**...a preliminary rough estimate of the reserves but requiring more drilling to confirm the reserves.

**“Proven reserves”**... are the total amount of tonnage and laboratory confirmed grade of the gold that can be mined at the project. These are the exact amounts that could enable a mine to move forward to a fully operating mining operation. This is the “official” amount of reserves that can be mined up to this point. Of course the hope is that even more reserves will be found through more exploration.

## ***CONSTRUCTION OF A MINE***

The construction of a gold mine requires time and effort. The actual structure depends on the type of mine being built. In terms of a gold mine, there are two primary types of mines; the open pit mine (surface) and the underground mine.

Is it an “open pit” (surface) mine or is it an “underground mine”? An Open Pit mining operation is employed if the ore body is found near to the surface. It is less expensive and is able to go into production more quickly than an underground mine. An underground mine requires more digging and construction. For the open pit, holes are drilled in the ground and filled with explosives. After the rock is broken up by blasting, it is taken to a mill for processing. At some places, before the ore leaves the mine area, it is crushed.

Underground mines are constructed for gold deposits that have been located at depths often well below surface. How deep can a gold mine go? A mine in South Africa is over 3 kilometers deep and another in Canada is 3 kilometers deep. The



mine entrances can be straight down vertically which is called a “shaft” or on a decline called a “ramp” that goes down at approximately a 15% decline. Most mines have both shafts and ramps. Keep in mind that some mines produce as both open pit and underground operations.

The mine construction entails planning, permitting, removing overburden, digging, building the structure of the mine among several things. It is not only time consuming but very expensive; there are no short cuts. A priority is to bring the mine safely into operation as soon as possible as investors or lenders eagerly await the gold mine’s production and the sales of the gold production.

### ***PROCESSING THE ORE***

After the ore has been removed from a mine the next step is processing the ore. This can be confusing when one looks at the facilities involved in the processing of the ore. The first part of the process is the crushing of the ore followed by grinding it down.

#### **The following describes what happens in the production of the gold**

1-The ore is fed into crushers and then into grinding mills to reduce the size of the ore particles and expose the gold mineral. Water is also added which turns the ore into slurry. **Slurry** is a mushy mix of the ore and water.

2-The slurry is sent to leaching tanks where cyanide is added to it. The cyanide leaches gold into the solution. This process removes up to 90 percent of the gold. Carbon granules are then added to the solution. The gold is pulled from the solution and attaches to the carbon.

3-Then they "**strip**" the gold from the carbon by washing it with a cyanide solution.

4- The gold-bearing solution is put through electro-winning cells, which extract metals from the solution using an electrical current.

5-After gold has been processed; the leftover waste material is called **tailings**. Tailings contain small amounts of cyanide and other hazardous chemicals, so they must be disposed of in an environmentally safe way. The tailings are stored in

tailings dams, which are lined with impermeable layers. While the cyanide levels in the dam are safe, steps are taken to keep wildlife away from the dams.

**THE SMELTER** They then smelt (cook) the gold, which melts it in a furnace at about 2,100°F.

From there, the liquid gold is poured into molds, creating doré bars. Doré bars are unrefined gold bullion bars containing anywhere from 60% to 95% gold. Next, the bars are sent to a refinery for further processing into “pure gold.” Finally the gold is sold at the prevailing price for gold in the world markets. From the exploration to the final gold bullion sale, it is a long, tedious and expensive process.

### **Epilogue**

As you know, Gold has a long history and remains a major influence and key ingredient in the perplexing worlds of economics, trade and business. It is worth the time and effort for investors to monitor gold and the precious metals markets. All markets are related and the price of gold has a tremendous influence on stock markets, commodities and bond markets. Good luck.

About the authors

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