WORLD MINING COMPETITION

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2016 Case

Diverse Minerals Co.: The Windgate Diamond Mine

This case was prepared for the World Mining Competition by Ken Mark. *The situation described in this case is based on a combination of real and potential events and key identifying details have been disguised.*

Diverse Minerals Co.: The Windgate Diamond Mine

Diverse Minerals Co. (DMC), a fictional mining company, is working on the final version of its mine feasibility study for its Windgate Diamond Mine in Wyndham, Australia. Located close to Rio Tinto's successful Argyle Diamond Mine, DMC's venture is fully-financed, ready to proceed in the next few months.

An opportunity has come up to look at a different model for the mining pit. DMC's current feasibility study envisions a Shallow Pit mine and the engineering consultant has suggested it may be possible to put in a Steep Pit mine.

DMC has hired your team of consultants to assist it in its evaluation of the new option. Your task is two-fold: review the financial and engineering proposal related to the Steep Pit mine design and analyze, in general, DMC's assumptions and model for its Shallow Pit Mine.

Diamond Mining in Australia

Diamonds were first mined in Australia in 1851, in the Bathurst area of New South Wales. Alluvial deposits were found in other parts of New South Wales – in Copeton and Bingara – and mining operations existed there from 1867 to 1922.

While the most significant diamond mine in Australia, the Argyle deposit, produces low gem-quality diamonds, new discoveries made by DMC in the East Kimberely region of Western Australia have led to the potential to produce gem-grade diamonds from open pit mining. At Argyle, a number of small diamond kimberlite pipes have produced higher quality gem stones, but none that have matched the potential deposits as discovered by DMC.

Diverse Mining Co.

DMC is a Vancouver-based company engaged in the acquisition, exploration and development of mineral properties. DMC was involved primarily in nickel and cobalt exploration in Canada and, in 2011, successfully sold a package of four properties to a large European mining firm for $2 billion in cash.

The opportunities at Windgate included four deposits, the most promising of which was the Gibb Deposit. Windgate was located in Wyndham, Australia (see Exhibit 1 for a map of the location) and DMC's involvement in the area dates to 2009 as a result of a meeting with a mutual contact in the diamond mining industry. Three large diamond miners passed on the opportunity, believing the Kimberley area to be of, primarily, low-grade gemstones. With the sale of the four properties, DMC turned its attention to diamond mining, acquiring the mineral claims in the Wyndham area from 2012 to 2014. The mineral claims were valid until 2022. All other exploration programs at DMC were put on hold to allow the Company to focus on managing its Australian project.

The opportunities at Windgate included four deposits, the most promising of which was the Gibb Deposit. Windgate was located in Wyndham, Australia (see Exhibit 1 for a map of the location) and DMC's involvement in the area dates to 2009 as a result of a meeting with a mutual contact in the diamond mining industry. Three large diamond miners passed on the opportunity, believing the Kimberley area to be of, primarily, low-grade gemstones. With the sale of the four properties, DMC turned its attention to diamond mining, acquiring the mineral claims in the Wyndham area from 2012 to 2014. The mineral claims were valid until 2022. All other exploration programs at DMC were put on hold to allow the Company to focus on managing its Australian project.

Various exploration techniques on Wyndham resulted in the decision to move forward with an aggressive 15,000 tonne bulk sample program to recover 2,000 carats of diamonds. By 2015, this sample program was successful, recovering gem-quality stones from the Gibb Deposit. A small processing plant was constructed and commissioned, and a main shaft was sunk to a 250 metre depth. Three additional bulk sample phases were completed in 2015, bolstering DMC's claims about the deposit. In parallel, DMC worked with the regional and state governments in Western Australia to secure the necessary environmental and other permits for the mine.

After spending a significant amount of money exploring the diamond property, DMC had earmarked a portion of its remaining $2 billion in cash to fund the entire development of the Gibb Deposit in Windgate. At present, DMC contemplates injecting $200 million in equity, in cash at Windgate, in total. A preliminary analysis saw the remaining amount required to finance the mine coming from a line of credit that Windgate had secured.

There will be a new corporation set up to hold and operate the Windgate project. This corporation will be 100% owned by DMC. If there are further cash requirements beyond the $200 million, DMC has been given a $3 billion revolving line of credit it can use for the project.

DMC is open to other ways to finance the mine. The most recent information received by DMC's management team suggests that senior bank debt may be available at a rate of 7.0%, and up to $1 billion may be available to DMC. Security for the senior bank debt would be pledged by DMC, on behalf of its Windgate subsidiary.

Due to the proximity of Rio Tinto's Argyle Mine, there was extensive infrastructure already built and DMC had negotiated a deal with EnergyAustralia to provide the necessary power and hydro resources for the mine's development and production.

The Gibb Deposit at Windgate

The project encompassed the Gibb Kimberlite deposit, which straddles a mineral disposition boundary between ground that is completely owned by DMC and partly owned by Rio Tinto. The project will be operated by DMC and will be explored and developed as a single entity. The revised resource estimate is based only on the Gibb Deposit portion owned by DMC. DMC holds an additional 25 mineral claims in the adjacent areas, potentially allowing for three more deposits. The size of these other deposits have not been determined.

The mineral dispositions are located on State land and the State owns all surface rights in the area of the Gibb Deposit and of the other potential three deposits at Windgate. All environmental and other approvals have been received by the State and the project is ready to proceed. There are no issues related to Aboriginal land issues as the area does not lie within traditional Aboriginal territory used for hunting, fishing or trapping.

The project is accessible by paved highways, a grid gravel road system and an extensive network of roads passable to four-wheel drive and high-clearance two-wheel drive vehicles all year round.

The area around Windgate is arid and desert-like. The average annual rainfall in the region is 245mm. However, this value varies greatly due to the potential for torrential rainfall to occur from cyclones. Temperatures in the region remain hot to warm throughout the year. The average high is 31oC and the average low is 18oC.

DMC has gathered some information on Rio Tinto's Argyle Diamond Mine.

Argyle Diamond Mine

Rio Tinto owns and operates the Argyle diamond mine in the remote East Kimberley region of Western Australia. The mine has been operating since 1983 and has produced more than 800 million carats of rough diamonds. It is one of the world's largest suppliers of diamonds and the world's largest supplier of natural coloured diamonds.[2] Exhibit 2 provides information on the Argyle mine. The Argyle diamond deposit, located in the AK1 pipe was mined using conventional alluvial and open pit mining from 1983 to 2013.[3]

The Argyle mine is the first commercial diamond mine dug along an olivine lamproite volcanic pipe rather than a kimberlite pipe. The Argyle volcanic pipe is a diatreme formed by gas or volatile explosive magma which has breached the surface to form a "tuff" (consolidated volcanic ash) cone. The Argyle mine also has alluvial mining operations.

[2] http://www.riotinto.com/australia/argyle-4640.aspx

[3] http://www.riotinto.com/australia/argyle/mining-and-processing-10556.aspx

Argyle Diamond Mine

The Argyle mine is the largest raw diamond producer in the world, but a low percentage of its yield (around 5%) is gem-quality. The worldwide average yield of gem-quality diamonds is around 20%. The remaining 95% of Argyle's production is classified as "near gem quality" and "industrial grade".

Australia's Argyle pipe diamonds are approximately 1.1 billion years old, while the volcano which created the pipe is around 1.5 billion years old. This 400 million year gap represents a relatively short period for diamond formation. The short gestation period could explain the small size and unusual physical characteristics of these diamonds. and The most common inclusions are graphite, crystalline orange garnet, pyroxene, and/or olivine. Most notably, the carbon found in Argyle diamonds mostly organic in origin.[4]

Argyle is owned by Anglo-Australian mining titan, the Rio Tinto Group (60% ownership), which also owns stakes in the Diavik Diamond Mine in Canada and the Murowa diamond mine in Zimbabwe. Ashton Mining had the remaining 40% ownership and Rio Tinto acquired Ashton in 2006.[5] In 1996 Argyle turned the De Beers distribution monopoly on its head by going-it-alone, bypassing De Beers' Diamond Trading Company DTC/ Sightholder wholesale network, selling directly to the Antwerp diamond trade.

Windgate - Engineering [6]

The possibility of mining the Windgate deposit with a steep pit design faces many engineering challenges. The most concerning of which is pit slope stability. The kimberlitic region of the proposed pit is composed of competent rock. Both the steep and shallow pit design's suggest a 45 degree overall pit angle in this domain. However, the lower Colorado formation which overlies the Kimberlites is not ideal for open pit operations. The lower Colorado is composed of mainly shales with interbedded sandstones and siltstones. The drilling program's performed on site determined the formation to be roughly 80 meters thick. With a formation top of 330 metres above sea level (masl) and a base of 250 masl. The material is wet which raises concerns with pore pressures. It was determined that the average angle of friction in the lower Colorado domain is 34 degrees. The shallow pit is designed for an overall pit angle of 18 degrees in the Colorado region which is classified as the Country rock domain. The suggested steep pit design has an overall slope of 26 degrees in this domain.

[4] http://diamond-mines.blogspot.ca/2010/11/australian-diamond-mines.html

[5] http://www.24hgold.com/english/news-company-gold-silver-agrees-to-acquire-shares-of-ashton-mining-of-canada.aspx?articleid=70568

[6] Note that the geology described in this case is fictional – it is not representative of the area being described in Australia.

Pit modeling and scheduling has determined that production will reach the lower Colorado formation in the 4th year of operations in both the proposed shallow and steep designs. A lack of drill hole data in the South East quadrant of the proposed steep pit design has left a gap in the geotechnical modeling. This gap was filled with estimated data entered by both geologists and mine engineers. The model shows the quadrant to be stable. However, engineers modeled a worst case scenario and determined that there is potential for failure which would result in roughly 20 million tonnes of waste that would need to be removed. A failure of this magnitude would halt ore production as the pit ramp would need to be cleared and re-stabilized. There is no option to re-route the ramp to another quadrant of the pit. Although a failure would only occur in a worst case scenario and there has been no studies conducted to predict the probability of this failure, DMC would like to take this into consideration when analyzing the steep pit option. It has been determined that there is no concern with failure in the shallow pit design.

DMC noted that there will be no differences in the total amount of ore recovered from the pit, between the shallow and steep pit designs.

An ideal pit design for DMC would optimize production, profitability and safety. A steep pit design is appealing to DMC as it would reduce the production of waste material. As with any open pit mine, when increasing the slope angles the need for monitoring slope movement increases. A pit wall failure would not only affect production but it could also create a serious safety concern. DMC would like to increase the budget for pit wall monitoring in the steep model. The main reason being is the safety of employees. DMC believes that you cannot put a price tag on safety.

DMC would like to use a variety of instrumentation to monitor slope stability in the steep model if it was the chosen design. Borehole extensometers, 3D LIDAR scanning and slope stability radar (SSR) would all be used extensively. The cost of instrumentation, software and technicians to manage the instrumentation have all been added to miscellaneous operating costs which can be found in Exhibit 4.

Windgate - Valuation

DMC has provided your team with the Shallow Pit cost model (Exhibit 3), the Steep Pit cost model (Exhibit 4), and production models for both Shallow and Steep (Exhibit 5). All details are available in the Excel file the DMC team is sending to you. Do note that the DMC team has tried to estimate the distribution of capital costs across Years 1 through 7, and that these costs may be subject to revision in the future.

Source – A.C.A. Howe International Limited 981 December 21, 2015

The DMC team is sending to you a financial model they have created, which includes the various Shallow Pit and Steep Pit cost models and the Production profiles for both cost models. An estimate of the financial returns for each of the models is indicated in the respective "financial model" tab in the file.

You can modify the information and formulae in any of the cells as you see fit. However, the DMC team suggests you modify only the "blue" shaded cells as part of this exercise. Do take a few minutes and read the accompanying notes in the Excel tabs as some of these notes provide valuable information for the analysis your team is about to conduct.

Please note that some of the formulae rely on iterative calculations. You will see "circular reference" flags – this is normal and the flags should be ignored. In order for the iterative calculation feature to operate smoothly, please ensure that your team opens up "Excel Options", go to the "Formulas" tab and "Enable iterative calculations".

There are two valuation methods presented for your team's review: a discounted cash flow model and an estimate of the internal rate of return to investors.

Included with these is a financial model that will allow your team to analyze the differences between the Shallow Pit and Steep Pit mines' economics.

DMC is estimating that they will be able to achieve a value of $900 per carat mined, on average, for the life of the mine.

All units in the case and exhibits are in metric. Specifically, all tonnes are metric tonnes.

Decision

Your team has been provided with the information to make a decision between the two pit models. DMC's CEO is looking for your recommendation as soon as possible.

Exhibit 1: The Windgate Diamond Mine (near Wyndham, in the north)

Exhibit 2: Rio Tinto's Argyle Diamond Mine

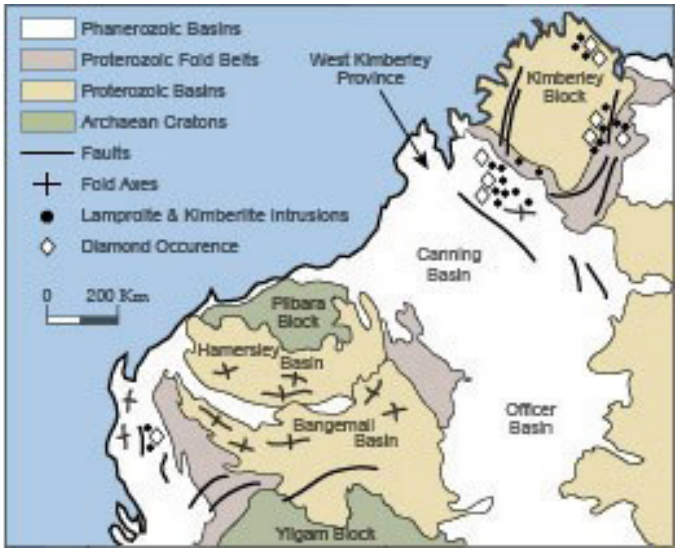

Exhibit 3: Gibb Deposit - Shallow Pit Cost Model

Gibb Deposit - Cost Model

Company: Diverse Minerals Co.
Consultant: WMC Consulting
Mine Type: Open Pit
Location: North Western Australia
Pit Design: Geotechnicaly Conservative

Pit Slopes:	Kimberlite	45 degrees
	Country Rock	18 degrees
	Till	12 degrees

\\All costs listed are in 2016 CAD$. The key design criteria, operating schedule, equipment, personnel, supply requirements and costs are listed below:

COSTS

Production

Stripping Ratio:	Variable					
Ore Production:	45,000	tpd				
Waste Production:	202,950	tpd				
Haul Distance - Ore	3,500	m				
Haul Distance - Waste	4,200	m				
Total Resource	56,337,609	tonnes				
Hours per shift	12	Hr				
Shifts per day	2					
Days per year	350					
Bench height - Ore	15	m				
Bench height - Waste	15	m				
Powder factor - Ore	0.25	kg/mt		Total powder =	11250.00	kg
Powder factor - Waste	0.40	kg/mt		Total powder =	51840.00	kg

Equipment

Type	Number	Size	Unit Cost	Total Cost
Hydraulic Shovels	3.00	43 cu m	$ 18,000,000	$ 54,000,000
Front-end Loaders	3.00	21 cu m	$ 4,500,000	$ 13,500,000
Rear-dump Trucks	24.00	240 mt	$ 4,200,000	$ 100,800,000
Rotary Drills	3.00	20.00 cm	$ 1,800,000	$ 5,400,000
Bulldozers	6.00	375 KW	$ 2,500,000	$ 15,000,000
Graders	2.00	115 kW	$ 750,000	$ 1,500,000
Water Tankers	2.00	9,500 liter	$ 750,000	$ 1,500,000
Service/Tire Trucks	3.00	1,800 kg gw	$ 250,000	$ 750,000
Bulk Trucks	1.00	450 kg/min	$ 600,000	$ 600,000
Light Plants	4.00	8.9 kW	$ 35,000	$ 140,000
Pumps	4.00	100 kw	$ 15,000	$ 60,000
Pickup Trucks	5.00	680 kg	$ 45,000	$ 225,000
				$ 193,475,000

Buildings

Shop	sq.meters	2,400
Dry	sq.meters	500
Office	sq.meters	383
Warehouse	sq.meters	800
Anfo Storage Bin	cu.meters	50

Exhibit 3: Gibb Deposit - Shallow Pit Cost Model (Continued)

Development										
Preproduction Stripping	tonnes	227,890,485								
Haul Road Construction	meters	7,700								
Hourly Personnel Requirments										
Position	**Number**	**Rate**	**Unit**	**Cost/Day**						
Drillers	6.00	$60.48	per hour per man	$ 4,355						
Blasters	6.00	$60.48	per hour per man	$ 4,355						
Excavator Operators	12.00	$60.48	per hour per man	$ 8,709						
Truck Drivers	48.00	$60.48	per hour per man	$ 34,836						
Equipment Operators	28.00	$60.48	per hour per man	$ 20,321						
Electricians	6.00	$72.00	per hour per man	$ 5,184						
Mechanics	24.00	$72.00	per hour per man	$ 20,736						
Laborers/Maintenance	12.00	$57.60	per hour per man	$ 8,294						
	----			$ 106,790						
Total Hourly Personnel	142.00									
Salaried Personnel Requirments										
Position	**Number**	**Salary**		**Cost/Day**						
Manager	1.00	$300,000	per year	$ 1,190						
Superintendent	1.00	$225,000	per year	$ 893						
Foreman	4.00	$175,000	per year	$ 694						
Engineer	2.00	$150,000	per year	$ 595						
Geologist	2.00	$150,000	per year	$ 595						
Supervisor	8.00	$150,000	per year	$ 595						
Safety	4.00	$150,000	per year	$ 595						
Technician	4.00	$105,000	per year	$ 417						
Accountant	2.00	$75,000	per year	$ 298						
Clerk	2.00	$60,000	per year	$ 238						
Warehouse	8.00	$85,000	per year	$ 337						
Secretary	2.00	$60,000	per year	$ 238						
Security	8.00	$75,000	per year	$ 298						
	------			$ 6,984						
Total Salaried Personnel	48.00									
Primary Supply Requirments										
Material	**Unit**	**Quantity**	**Unit Cost**	**Cost/Day**						
Diesel Fuel	liter/day	90,000	$1	$ 90,000						
Electricity	kWh/day	9600	$0.08	$ 768						
Powder	kg/day	63,090	$1	$ 63,090						
Caps	#/day	170	$12	$ 2,040						
Primers	#/day	170	$5	$ 850						
Drill Bits	#/day	4	$3,500	$ 14,000						
Det. Cord	m/day	1200	$2.50	$ 3,000						
Cost Summary				$ 173,748						
Operating Costs										
Supplies & Materials	$/mt ore	$ 3.86								
Hourly Labor	$/mt ore	$ 2.37								
Equipment Operation	$/mt ore	$ 1.67								
Salaried Labor	$/mt ore	$ 0.16								
Miscellaneous	$/mt ore	$ 0.67								

Total Operating Costs	$/mt ore	$ 8.73								
Capital Costs										
				Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Equipment Purchase	$ 193,475,000	start		96,737,500	96,737,500					
Haul Roads / Site Work	$ 14,000,000	whole time		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Pre-production Stripping	$ 378,298,205	percentage		189,149,103	189,149,103					
Buildings	$ 341,000,000	assumption		170,500,000	170,500,000					
Electrical System	$ 32,000,000			16,000,000	16,000,000					
Sustaining Capital	$ 78,000,000			11,142,857	11,142,857	11,142,857	11,142,857	11,142,857	11,142,857	11,142,857
Engineering	$ 25,000,000			25,000,000						
Contingency	$ 106,177,321			15,168,189	15,168,189	15,168,189	15,168,189	15,168,189	15,168,189	15,168,189

Total Capital Costs	$ 1,167,950,526			$ 525,697,648	$ 500,697,648	$ 28,311,046	$ 28,311,046	$ 28,311,046	$ 28,311,046	$ 28,311,046
Total Process Cost	$/mt ore	$ 3.01	includes manpower, plant ops, power and tailings management							
G&A	$/mt ore	$ 1.50	Office overheads, municipal fees and taxes, insurance, no labour							

Exhibit 4: Gibb Deposit - Steep Pit Cost Model

Gibb Deposit - Cost Model

Company: Diverse Minerals Co.
Consultant: WMC Consulting
Mine Type: Open Pit
Location: North Western Australia
Pit Design: Geotechnicaly Aggressive

Pit Slopes:	Kimberlite	45 degrees
	Country Rock	26 degrees
	Till	16 degrees

\\All costs listed are in 2016 CAD$. The key design criteria, operating schedule, equipment, personnel, supply requirements and costs are listed below:

COSTS

Production

Stripping Ratio:	Variable	
Ore Production:	45,000	tpd
Waste Production:	129,600	tpd
Haul Distance - Ore	2,500	m
Haul Distance - Waste	3,200	m
Total Resource	56,337,609	tonnes
Hours per shift	12	Hr
Shifts per day	2	
Days per year	350	
Bench height - Ore	15	m
Bench height - Waste	15	m
Powder factor - Ore	0.25	kg/mt
Powder factor - Waste	0.40	kg/mt

Total powder = 11250.00 kg
Total powder = 51840.00 kg

Equipment

Type	Number	Size	Unit Cost	Total Cost
Hydraulic Shovels	2	43 cu m	$ 18,000,000	$ 36,000,000
Front-end Loaders	2	21 cu m	$ 4,500,000	$ 9,000,000
Rear-dump Trucks	18	240 mt	$ 4,200,000	$ 75,600,000
Rotary Drills	2	20.00 cm	$ 1,800,000	$ 3,600,000
Bulldozers	6	375 KW	$ 2,500,000	$ 15,000,000
Graders	2	115 kW	$ 750,000	$ 1,500,000
Water Tankers	2	9,500 liter	$ 750,000	$ 1,500,000
Service/Tire Trucks	3	1,800 kg gw	$ 250,000	$ 750,000
Bulk Trucks	1	450 kg/min	$ 600,000	$ 600,000
Light Plants	4	8.9 kW	$ 35,000	$ 140,000
Pumps	4	100 kw	$ 15,000	$ 60,000
Pickup Trucks	5	680 kg	$ 45,000	$ 225,000
				$ 143,975,000

Buildings

Shop	sq.meters	2400
Dry	sq.meters	500
Office	sq.meters	383
Warehouse	sq.meters	800
Anfo Storage Bin	cu.meters	50

Exhibit 3: Gibb Deposit - Steep Pit Cost Model (Continued)

Development										
Preproduction Stripping	tonnes	145,153,175								
Haul Road Construction	meters	5,700								
Hourly Personnel Requirments										
Position	**Number**	**Rate**	**Unit**		**Cost/Day**					
Drillers	4	$60.48	per hour per man		$ 2,903					
Blasters	4	$60.48	per hour per man		$ 2,903					
Excavator Operators	8	$60.48	per hour per man		$ 5,806					
Truck Drivers	36	$60.48	per hour per man		$ 26,127					
Equipment Operators	28	$60.48	per hour per man		$ 20,321					
Electricians	6	$72.00	per hour per man		$ 5,184					
Mechanics	20	$72.00	per hour per man		$ 17,280					
Laborers/Maintenance	12	$57.60	per hour per man		$ 8,294					
	----				$ 88,819					
Total Hourly Personnel	118									
Salaried Personnel Requirments										
Position	**Number**	**Salary**		**Cost/Day**						
Manager	1	$300,000	per year	$ 1,190						
Superintendent	1	$225,000	per year	$ 893						
Foreman	4	$175,000	per year	$ 694						
Engineer	2	$150,000	per year	$ 595						
Geologist	2	$150,000	per year	$ 595						
Supervisor	8	$150,000	per year	$ 595						
Safety	4	$150,000	per year	$ 595						
Technician	4	$105,000	per year	$ 417						
Accountant	2	$75,000	per year	$ 298						
Clerk	2	$60,000	per year	$ 238						
Warehouse	8	$85,000	per year	$ 337						
Secretary	2	$60,000	per year	$ 238						
Security	8	$75,000	per year	$ 298						
	------			$ 6,984						
Total Salaried Personnel	48									
Primary Supply Requirments										
Material	**Unit**	**Quantity**	**Unit Cost**	**Cost/Day**						
Diesel Fuel	liter/day	60000.00	$1	$ 60,000						
Electricity	kWh/day	9600.00	$0.08	$ 768						
Powder	kg/day	63090.00	$1	$ 63,090						
Caps	#/day	170.00	$12	$ 2,040						
Primers	#/day	170.00	$5	$ 850						
Drill Bits	#/day	4.00	$3,500	$ 14,000						
Det. Cord	m/day	1200.00	$2.50	$ 3,000						
Cost Summary				$ 143,748						
Operating Costs										
Supplies & Materials	$/mt ore	$ 3.19								
Hourly Labor	$/mt ore	$ 1.97								
Equipment Operation	$/mt ore	$ 1.67								
Salaried Labor	$/mt ore	$ 0.16								
Miscellaneous	$/mt ore	$ 2.75								

Total Operating Costs	$/mt ore	$ 9.74								
Capital Costs										
				Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Equipment Purchase	$ 143,975,000	start		71,987,500	71,987,500					
Haul Roads / Site Work	$ 12,000,000	whole time		1,714,286	1,714,286	1,714,286	1,714,286	1,714,286	1,714,286	1,714,286
Pre-production Stripping	$ 243,352,435	percentage		121,676,217	121,676,217					
Buildings	$ 341,000,000	assumption		170,500,000	170,500,000					
Electrical System	$ 32,000,000			16,000,000	16,000,000					
Maintenance Capital	$ 78,000,000			11,142,857	11,142,857	11,142,857	11,142,857	11,142,857	11,142,857	11,142,857
Engineering	$ 25,000,000			25,000,000						
Contingency	$ 87,532,743			12,504,678	12,504,678	12,504,678	12,504,678	12,504,678	12,504,678	12,504,678

Total Capital Costs	$ 962,860,178			$ 430,525,538	$ 405,525,538	$ 25,361,820	$ 25,361,820	$ 25,361,820	$ 25,361,820	$ 25,361,820
Total Process Cost	$/mt ore	$ 3.01	includes manpower, plant ops, power and tailings management							
G&A	$/mt ore	$ 1.50	Office overheads, municipal fees and taxes, insurance, no labour							

Exhibit 5: Gibb Deposit - Production Models

Steep Pit Production Model

Period	1	2	3	4	5	6	7	
CY	2016	2017	2018	2019	2020	2021	2022	Total
Mining volume, tons	30,000,000	60,000,000	60,000,000	38,676,888	15,066,044	14,527,758	13,550,469	231,821,159
Carats	-	-	-	4,767,163	4,116,788	2,948,818	1,458,108	13,290,877

Shallow Pit Production Model

Period	1	2	3	4	5	6	7	
CY	2016	2017	2018	2019	2020	2021	2022	
Mining volume, tons	30,000,000	60,000,000	60,000,000	61,278,743	15,247,784	14,571,385	13,638,663	254,736,575
Carats	0	0	0	4,767,163	4,116,788	2,948,818	1,458,108	13,290,877