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# **Application of the Net Present Value Profile to Anaconda Mining**

Bell, Peter

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### Abstract

The idea of the NPV Profile, which shows how the net present value of a project changes over the life of the project, can be used in applied settings. For example, it can be used in situations where significant changes are made to the life-of-mine plan for a gold mine. This paper presents such an example with a description of engineering changes required to achieve the change in the mine plan based on the current situation facing Anaconda Mining, a publicly-traded gold mining company in Canada.

*Keywords:* Moving NPV, Mine Planning, Engineering Economics

*JEL Codes:* C00 General; C02 Mathematical Methods; G1 General Financial Markets;

### Application of the Net Present Value Profile to Anaconda Mining

Anaconda Mining (TSX:ANX) is approaching year 10 of production at their open-pit mine in Newfoundland. They put over 1,200 tonnes of rock into the front end of the mill per day, which contains approximately 1.5 grams of gold per tonne. They grind the rock down to 20 microns, put it through the flotation circuit, and then put roughly 40 tonnes per day into the leach circuit.

The gold is in a volcanic-hosted rock, which is known as an altered gabbro. They produce approximately 50 ounces of gold per day and that has yielded enough free cash for the company to survive and expand over the last decade. What will the next ten years look like for Anaconda?

There is certainly a lot to discuss with Anaconda, whether it is the research project for new techniques to mine single vein deposits or the potential for additional acquisitions in the Maritimes. However, the single most important thing may be how to get Goldboro going as soon as possible.

In my recent interview with Mr. Dustin Angelo, President & CEO of Anaconda, he told me that they are considering two approaches to Goldboro: ship whole ore or install a concentrator. Either way is pretty exciting, as you will see in the numbers below. Based on my calculations, the company could double gold production and mine life under either scenario. They could even try to do both at the same time!

All of this is terribly exciting and it has led me to try analyzing the situation using a mathematical technique that I invented called the NPV Profile. It is a simple twist on the basic calculation of net present value. You could think of it as a "Moving NPV", if that helps.

There are certainly unresolved questions about how to use this model with Anaconda. They have generated free cash over the life of the mine so far, but have not really accumulated a large cash reserve. They have reinvested to extend their production profile and that has big implications for my modelling approach. I will not introduce probability into these models, but just keep it simple here in this first attempt.

To begin, I establish my assumptions for a base case. In our first interview (<https://ceo.ca/@Newton/6500-words-with-dustin-angelo-ceo-of-anaconda-mining>), Dustin told me that Anaconda has 3-5 years of mine life based on assets like Pine Cove, Stog'er Tight, and Viking. I assume that the company can maintain current cash flow levels over that period and normalize this value to 100 to simplify comparisons between the various numbers.

After the base case, come the alternative cases. The first alternative is to "ship whole ore" from Goldboro to Point Rouse.

If Anaconda were to ship whole ore from Goldboro, then they could process it at the Pine Cove mill through the existing grinding, floatation, and leach circuits. They operational team at

Anaconda has learned a lot about all of this over the last 10 years and their knowledge will be critical to early success with this.

I assume that this new ore would displace some of current production under this case. Anaconda would continue to mine the Pine Cove pit, but would only put half as much material into the front end of the mill from there. The other half would be ore from Goldboro. The company would do this because the ore from Goldboro would be higher grade. There are costs and risks to consider beyond the scope of this paper.

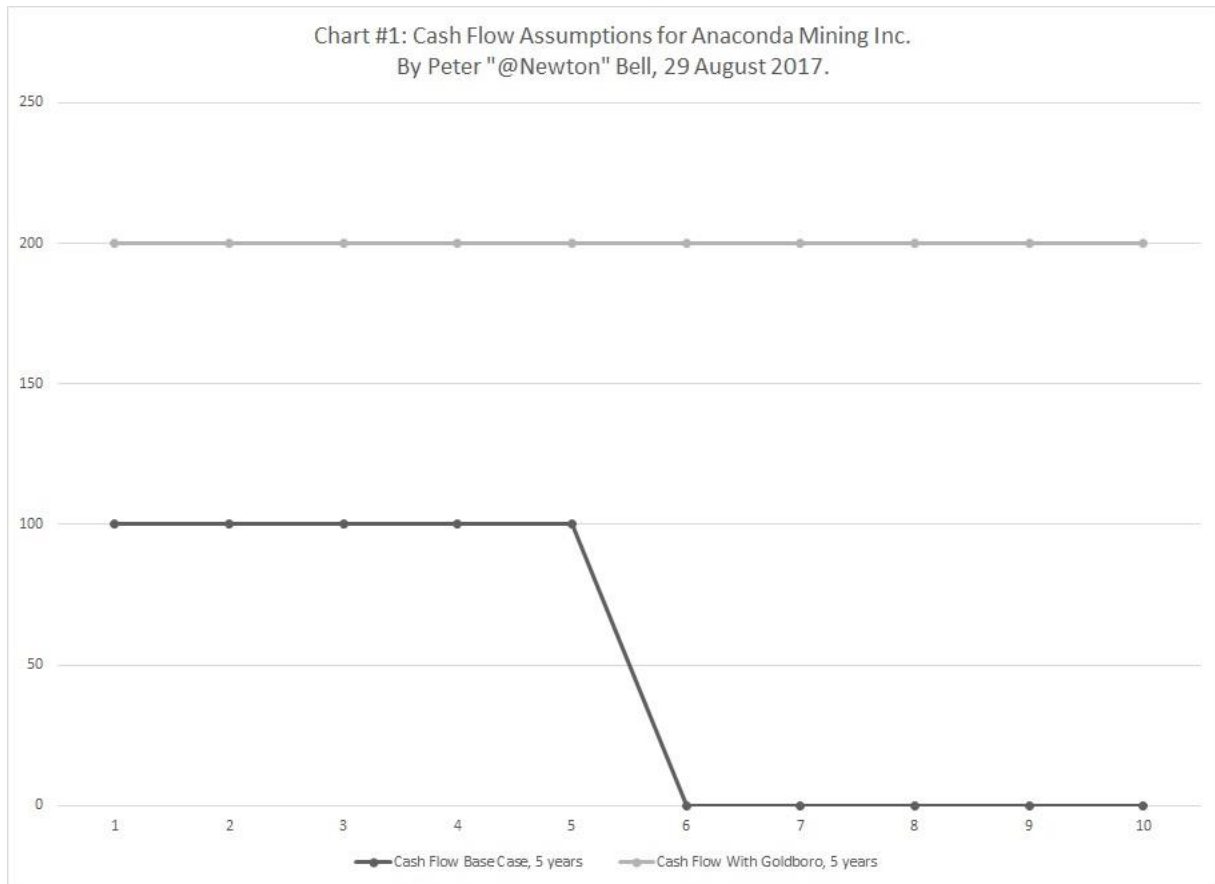
As Dustin told me in our first interview, Anaconda is currently operating the grinding circuit at near capacity of 1,200 tonnes per day. I suppose that Anaconda introduced 600 tonnes per day of ore from Goldboro. That would displace half of the current input material, which has a grade is 1.5 g/t gold.

Based on technical reports that assess the potential of Goldboro as an open pit, I assume material from Goldboro will grade 6 g/t gold. I assume there is no increase in cap-ex for Anaconda and the op-ex to mine Goldboro would be the same as the Pine Cove pit. I consider a new cost for shipping, which is \$50/tonne or 1 g/t gold.

The new production mix at the Pine Cove mill would be 600 tonnes at 1.5 g/t and 600 tonnes at 5 g/t, which is an average of 3 g/t. That is double the current grade and will cause the company to double production and cash flow.

Furthermore, Anaconda can double the life of the Pine Cove pit in this case! That is a double whammy for the NPV profile.

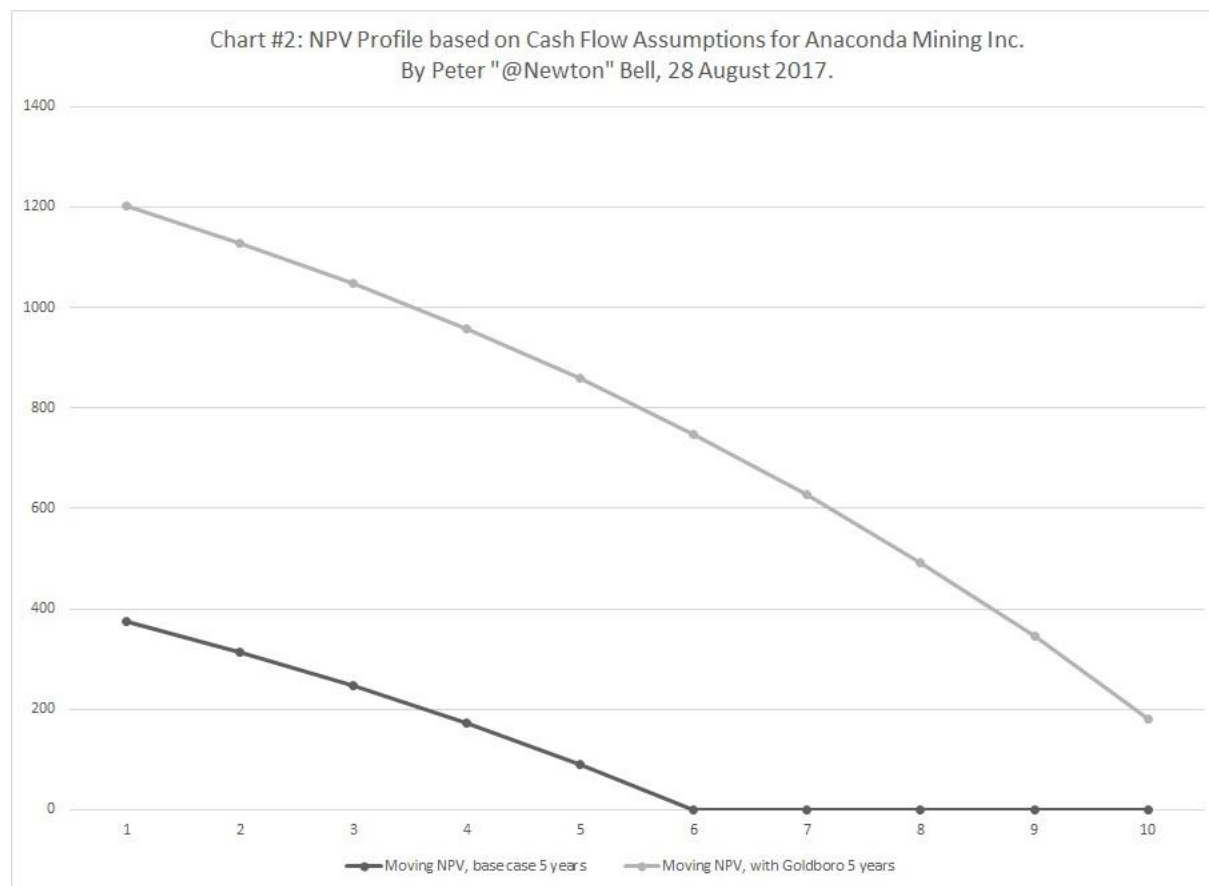
Chart #1 below shows my assumptions for the base case and this alternative case. I refer to this as the Cash Flow Profiles. The base case generates \$100 annual for next 5 years and the alternative case generates \$200 annually for 10 years. I assume there is no capital expenditure required to reach higher level of cash flow and there is no terminal value when the cash flow ends.



There are several important features to note in Chart #2, which shows the NPV Profile for the two cases. For one, the initial valuation is +3-times larger with Goldboro than without. Interesting how doubling cash flow and mine life triples valuation.

For another, you can note that the initial valuation is approximately 4-times larger than annual cash flow for the base case without Goldboro, but approximately 6-times larger with Goldboro. A longer-lived asset certainly deserves a higher multiple.

I will also point out that the value with Goldboro is always larger than without, and only declines to the initial value in in year 9 of production – right near the end of mine life.



In my first interview with Dustin in November 2016, he mentioned that current assets provide basis for 3-5 years production and goal was to get +10 years of mine life on the books. Could Anaconda have achieved that goal already with Goldboro? Yes, it would seem to be the case based on my calculations. And there is much greater upside to Goldboro from what is considered here.

Please note that I assume Goldboro immediately doubles annual cash flow and mine life. That does not allow for any timeline for permitting, which is a strong assumption. I don't know how long permitting might take, but it will be important for Anaconda to determine that and communicate it to the market.

For reference, I would point out the good experience that Atlantic Gold had preparing for production in Nova Scotia. It could be a smooth process for Anaconda, too.

To conclude, I will briefly mention the concentrator. I have discussed this with Dustin several times. Also, Mr. Allan Cramm, VP of Innovation and Development at Anaconda (<https://ceo.ca/@Newton/2-hours-with-mr-allan-cramm-vp-innovation-development-anaconda-mining-anx>) had some helpful comments here. He told me, "Theoretically, we could maintain our current front end at 1,300 tonnes and add to the leach process an additional 30-60+ tonnes of concentrate." A short sentence full of helpful details.

The flow sheet for Goldboro is beyond me, but I believe it is fair to assume that concentrate from Goldboro would have several ounces per tonne of gold. They may even be able to produce this concentrate after putting the ore from Goldboro onto a shaker table.

If they introduce 50 tonnes per day of concentrate with 1 ounce per tonne, then they will produce an additional 50 ounces per day of gold. This will double production by introducing only 50 tonnes into the Pine Cove mill. Another way to double annual production.

Note that they could transport this concentrate by road, as Dustin mentioned in our first interview. Back in November 2016, Dustin described how Anaconda was considering this at the Thor deposit in their Viking Project in Newfoundland.

Please note that when I first mentioned that the grade of Goldboro could be 6 g/t gold, I was using estimates based on mining the deposit as an open-pit. When you consider the bonanza grade gold intercepts found at Goldboro, it could become a different beast altogether.

I do not know about the costs for the concentrator approach, but I trust the Anaconda team to find an effective, low-cost option. They have a history of bootstrapping and optimizing their processes.

And note that Anaconda could do both – they could implement both the whole ore and concentrate scenarios. If they were to bring 600 tonnes per day from Goldboro into the front end of the mill, then they could still have spare capacity in back end of mill where they could feed concentrate from Goldboro. They could double annual production and double mine life first by introducing whole ore from Goldboro at the front end of Pine Cove mill, and then double annual production again by introducing concentrate into the back end. That would result in another doubling of the NPV profile from first principles.

There is much more to be said on all of this, of course. For example, what is the general relationship between changes to cash flow levels, mine life, and valuation? This paper shows an instance where doubling cash flow and mine life causes a tripling of valuation; is that representative of something more interesting going on? Another interesting observation is that the valuation multiple for initial cash flow is 6-times when the mine life is 10 years and 4-times when the mine life is 5 years. Is it always the case that the longer-lived project receives a higher multiple? And, most importantly, how do estimates generated by the NPV Profile compare with observations from financial markets for a situation like Anaconda Mining?

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