

Remarks and updates with newly released “Environmental Assessment Certificate Application”

Our study was completed in Summer 2015 and the report was finished in November 2015. In January, 2016, KGHM Ajax formally submitted an application for an environmental assessment certificate. The application package contains more technical information and also revisions differing from previously released plans. The application documents (see Ajax Project -- Environmental Assessment Certificate Application / Environmental Impact Statement for a Comprehensive Study, January 2016, <https://ajax.projects.eao.gov.bc.ca/public/project/569d3edbbfa11d0c009f92ee>) provide technical details about the construction and operation, and the methodology to assess social and economic effects, as well as environmental and health-related effects. In particular, the air emission assessment uses a technically sophisticated CALMET/CALPUFF model to evaluate changes in air quality in areas near the Project as well the city of Kamloops.

Our investigation was to seek the connections between the economic benefit and the environment sustainability of the project. The assessments included in Ajax’s application focus mainly upon the impact of the project in regard to particular aspects of the environment and community life, and the framework and the methodologies used in our projects and in Ajax’s assessments do not greatly overlap. With the revised development plan and more construction and operating information, we re-ran our model and found that most of our previous conclusions still stand. However, with the current economic and commodity market conditions, several changes do have relatively large impact in Ajax’s bottom line and hence the some of our conclusions. We list the changes with relatively large impact to our investigation below and provide a modified output as a result.

The changes with relatively large impact to our model include:

1. The initial investment in construction period (i.e., project capital cost) is increased from US\$795 million to CND\$1.54 billion (see Section 2.7.2.1).
2. Daily production (i.e., mill throughput) is increased from 60K tonnes to 65 tonnes. Total material movement from the pit is estimated at approximately 90 million tonnes on an average annual basis, and average annual production of the mine is estimated at 140 million pounds of copper and up to 130,000 ounces of gold in concentrate (see Section 3.1.1).
3. Since many revenue or expense figures are in US dollars but many expenses and future purchasing will be in Canadian dollars, we needed a currency exchange rate between the US and Canadian dollars, as well a present value for the Canadian dollar. In the Ajax application, the value is given according to the 2015 Canadian Dollar rate, which is determined by average exchange rate of US Dollars over Jan-April, 2015 (Appendix 7-1-B page 6). This exchange rate is relatively volatile due to the short duration. We decide to

use the annual average of the 2015 exchange rate released by Bank of Canada (US\$1 = 1.279 CND\$) to be the 2015 Canadian Dollar in our computation.

4. In our November Report, we used a copper price of US \$2.40/lb and gold price of US\$1,100/oz in our model for the computation of revenue. Based on the recent market valuation and forecasting from several investment firms, for the near future we chose a copper price of US\$2.20/lb and gold price US\$1,100/oz in this updated report. (Note that Ajax’s anticipated long-term average price is US\$3.21/lb. Copper prices have reached a low of \$2.06, and has been consistently below \$2.15 in the past two months.)
5. Taxes are considered in two phases: construction and operating. For the construction phase, federal tax (Canada-wide) is \$162m, provincial tax is \$115m (within BC) and \$40m (rest of Canada), local tax is \$25m (within BC) and \$12m (rest of Canada). Grand total is \$354 m. However, in our report we only considered the tax contribution for the operating phase. So the annual average of all taxes (Canada-wide) is \$84 million (2015 Cdn\$), or US\$65.67 million.
6. Ajax sets the investment return to 13% ROI (i.e., Return on Investment), so we adjusted the ROI from 15% to 13%.

In our model, we set the profit target at US\$156.53 million (which is 13% ROI, i.e., the amount to recover the initial investment and exceed the amount of this target will be the real profit), wasted water target is 5.2 million m³ (which is typical for existing mines), PM10 target is 2,212.4 tonnes (which is 35% of PM10 discharged by HVC).

With the changes 1-6 listed above, in the first scenario, the optimal total amount of ore to mill is 23.785 million tonnes, the profit is US\$212.91 million, discharged waste water is 4.7237 million cubic metres and PM10 emission is 2455.19 tonnes. The solutions of the twelve scenarios are summarized in the following table:

Table: Solutions of 12 Scenarios of Balance Model

Scenario	Total tonnes to mill (M) (Unit: 10 ⁶ t)	Profit (Unit:10 ⁶ US\$)	Discharge Waste Water (Unit:10 ⁶ m ³)	PM10 Emission (Unit:10 ⁶ g)
1	23.785	212.91 (Exceed by 36.02%)	4.7237 (off target by 9.3%)	2455.19 (Exceed by 11%)
2	23.785	204.40 (Exceed by 30.58%)	4.7237 (off target by 9.3%)	2383.83 (Exceed by 7.74%)
3	23.785	201.78 (Exceed by 28.90%)	4.7237 (off target by 9.3%)	2312/47 (Exceed by 4.52%)
4	23.785	212.00 (Exceed by 35.43%)	4.7237 (off target by 9.3%)	1592.98 (off target by 28.00%)

5	23.785	203.48 (Exceed by 29.99%)	4.7237 (off target by 9.3%)	1521.62 (off target by 31.22%)
6	23.785	200.87 (Exceed by 28.32%)	4.7237 (off target by 9.3%)	1450.27 (off target by 34.45%)
7	23.785	207.50 (Exceed by 32.56%)	4.7237 (off target by 9.3%)	2400.86 (Exceed by 8.52%)
8	23.785	198.98 (Exceed by 27.12%)	4.7237 (off target by 9.3%)	2329.50 (Exceed by 5.29%)
9	23.785	195.40 (Exceed by 24.83%)	4.7237 (off target by 9.3%)	2258.15 (Exceed by 2.07%)
10	23.785	206.58 (Exceed by 31.97%)	4.7237 (off target by 9.3%)	1538.66 (off target by 30.45%)
11	23.785	198.07 (Exceed by 26.54%)	4.7237 (off target by 9.3%)	1467.30 (off target by 33.68%)
12	23.785	195.45 (Exceed by 24.86%)	4.7237 (off target by 9.3%)	1395.95 (off target by 36.90%)

The most environmental-friendly scenario is that of number 12: profit is US\$195.45 million, discharged waste water is 4.7237 million cubic metres and PM10 emissions are 1395.95 tonnes. Therefore, with dust-controlling measures, the Project can achieve its economic target and the pre-defined environmental target (i.e., 35% of HVC PM10 emission) most times.

In the first run of our model, we set the PM10 emission target to be 35% of that of HVC, however HVC is approximately 70 kilometers away from Kamloops and 21 kilometers from the nearest community (Logan Lake) while the proposed Ajax mine would be only a few kilometers away from Kamloops. Considering the amount of dustfall within the three kilometre radius of the HVC mine site, it is clear that even a small percent of dust accumulation such as that of HVC will not be bearable for the residents of the nearby community. Even whether 20% of HVC's PM10 emissions would be tolerable or not is in question. For this reason, we adjusted the standard of PM10 emissions from the proposed Ajax Mine to be 20% of HVC's PM10 emissions (1,264.247 tonnes) as an investigation point. Taking the most environmental-friendly scenario--the 12th scenario--as an example, the comparison of the higher-standard and the original models is shown below:

Table: Comparison of the Higher-standard and the Original Models

	Scenario	Total tonnes to mill (M) (Unit: 10 ⁶ t)	Profit (Unit: 10 ⁶ US\$)	Air Emission (Unit: 10 ⁶ g)
Original Model (35% of HVC)	12	23.785	195.45 (Exceed by 24.86%)	1395.95 (off target by 36.90%)
High-Standard Model (20% of HVC)	12	23.785	195.45 (Exceed by 24.86%)	1395.95 (Exceed target by 10.42%)

As the PM10 emission standard rises to 20% of HVCs, the PM10 emission exceeds the target by 10.42% instead of falling short of 36.90%. This could be a major challenge to Ajax since even with all dust-control measurements discussed in place, PM10 emissions still consistently exceed the target by 10.42%.

Despite the changes mentioned here, our original conclusions are still valid, and we reiterate the following findings:

- With the different methods taken in the different processes, the profit varies. Generally speaking, when the profit is greater, air emissions increase. Moreover, improved blasting techniques are the most cost-effective strategy to reduce pollutants since the cost to reduce air emissions associated with blasting is the lowest.
- When the cost of blasting increases, the total profit decreases proportionally.
- With a low environmental standard (i.e., 35% of HVC PM10 emissions), the proposed Ajax mine would be able to meet the targets of discharged waste water and air emissions with a combination of dust-controlling measures and have a profit of about \$45 million on average in current market conditions, although Ajax's profit will be more sensitive to the price change of copper than that of gold.
- If the standard of air emissions is raised (e.g., 20% of HVC PM10 emission), Ajax will not be able to meet this target of 1,1264.25 tonnes PM10 consistently (exceed by 10.42%) even using all three of the best dust-control methods available. Therefore, with the higher environmental standard, the three dust-control methods studied in this project will be insufficient, and new technologies or more effective dust-control methods would be required to be adopted in the Ajax operation to meet the higher standard.

We conclude this appendix with a remark on the change in air quality provided by the Application:

Regarding air quality, the application's main conclusion is that "Comparing the measured and predicted federal AQHI before and after the Project demonstrates that the Project has little

effect on the overall air quality in Kamloops.” It also states that “the maximum predicted concentrations of TSP, PM10 and PM2.5 are greater than government objectives. These exceedances are predicted to occur for less than seven per cent of the year, ..., area in exceedance for TSP and PM10 extend northeast past the City Development Boundary and cover parts of upper Aberdeen.” Although we do not question the assessment method (i.e., CALPUFF modelling system or dispersion model), the company’s technical analysis and the conclusions could have another interpretation. For example, despite the assertion that air quality in upper Aberdeen is predicted to remain good 94% of time (i.e., TSP and PM10 readings will be below the government’s objective), this area will also experience a significant hike in TSP, PM10 and PM2.5 from the prior project period. For instance, PM2.5 and PM10 will increase 24% and 60%, respectively, on an average annual basis. In the worst cases, PM2.5 and PM10 could go up by 800% and 500% for a few days of each year. Clearly, such changes will have significant impact on the quality of life for the residents of the upper Aberdeen area.