

## Summary of Current Analysis of Constantine Metals PEA

This memo summarizes the major conclusions of the analysis of the Constantine Preliminary Economic Assessment done by Professional Engineer Jim Kuipers.

### **Project Viability: Speculative With High Level of Inherent Risk**

Kuipers finds “The Palmer Project, as described in the PEA, is a speculative mining project” with a “high level of inherent project risk.” Because of issues raised by the PEA and the legal requirements of what a PEA is, Kuipers concludes “the PEA does not demonstrate that the project currently is economically viable.” In fact, the PEA’s authors clearly state the PEA should not be used to demonstrate economic viability. Kuipers also notes “the PEA is highly optimistic in terms of potential environmental impacts and potential costs.” Based on his analysis of costs, anticipated metals prices, and other details in the PEA, Kuipers finds the Palmer “project will have a high likelihood of exceeding the estimated capital and operating costs, potentially by significant amounts (i.e. up to 50%). If that were to occur, the project would most likely not be economically viable.”

The above conclusions were based on the following analysis and findings. It is important to realize these analyses were conducted pre-virus. The economic effects of the pandemic on metals prices and demand and on oil and gas drilling may even further reduce the viability of the Palmer project.

### **The Deposit: Mineral Resources versus Reserves**

It is significant that only Inferred and Indicated Mineral Resources were identified in the PEA. In accordance with the British Columbia NI 43-101 Standards of Disclosure for Mineral Projects the PEA explicitly notes on page 1-32 that “This PEA is preliminary in nature, it includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as Mineral Reserves, and, as such, there is no certainty that the PEA results will be realized. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.”

Kuipers notes a lack of metallurgical testing. “No actual metallurgical testing has been conducted for the AG Zone deposit and the estimate for recovery is entirely based on mineralogical comparison. The actual metallurgical results can only be confirmed through testwork and the risk is further complicated by high lead contents in the AG Zone deposit, which may require additional treatment.”

### **Barite Plan “Highly Speculative”**

Kuipers finds the plan to produce and market barite, normally a waste product at similar mines, to be “highly speculative” and the “PEAs suggestion that the barite contents are marketable is not adequately supported.” This is critical to an understanding of the project, as it fundamentally affects the economics. With barite sales included, the post-tax Internal Rate of Return in the PEA is 21% and pre-tax is 24%. However, Kuipers’ calculations show that without barite sales the post-tax Internal Rate of Return is 14% and pre-tax is 18%. This is very important, as many analysts consider 20% to be the benchmark for new mining projects.

Kuipers finds the plan to market barite “is not adequately supported with information with respect to the future viability of the barite market for the quantity being suggested, the price used in the report, or by contracts for sale of the commodity to potential buyers and/or users. The inclusion of barite as a salable byproduct commodity from the proposed project is highly speculative as it is highly uncertain if the barite produced would be the equivalent of that presently marketed from high-grade primary barite resources.”

Kuipers questions Constantine’s predictions of the barite market. He notes “that the average price for primary barite from domestic mines and plants in the U.S. was \$132 per tonne in 2015, the last year in which data was

available from the USGS. According to industry experts the current barite average price is about \$77/tonne." Yet, the PEA predicts a future price of \$220/tonne, but Kuipers could find no justification for that price increase.

Kuipers notes that if the demand for barite goes up, "there are existing resources of high-grade barite in the U.S. that can be utilized to meet current and future demands." He also points out "despite present demand from North American oil and gas drilling, the Greens Creek Mine in Alaska, which is cited by the report as also being barite rich, has never produced barite as a product, despite being in operation for more than 30 years and similarly producing copper, zinc, gold and silver."

### **Future Metals Demand and Prices**

In addition to the questions he raises about the plan to market barite, Kuipers concludes "the Palmer Project, due to its high dependency on zinc prices, might prove to be uneconomic." In regards to arguments being made about climate change, Kuipers finds "There is not a significant need for the Palmer Project to meet future metals demand related to addressing climate change."

### **Capital and Operating Costs Likely Underestimated**

Kuipers notes costs for mines often increase from the PEA to more advanced feasibility studies and concludes there is "a high likelihood of exceeding the estimated capital and operating costs, potentially by significant amounts (i.e. up to 50%). If that were to occur, the project would most likely not be economically viable."

### **Environmental Risks and Costs Also Likely Underestimated**

Part of the predicted cost increase is due to Kuipers' finding that "The PEA appears to significantly underestimate potential environmental impacts and costs. It also does not evaluate additional costs such as for tailings storage if the barite concentrate is not produced. As a result, the actual project could incur up to several hundred million in additional costs to both prevent and address environmental impacts."

Kuipers notes that "costs relative to both design and reclamation and closure are based on an assumption that the tailings and waste rock facility will not result in a discharge requiring treatment post-reclamation, and that the storage of potentially acid generating (PAG) waste tailings and waste rock underground will mitigate any adverse impacts." But it is important to realize that Kuipers finds "...this [assumption] is based on preliminary information. The Greens Creek mine which is noted as similar elsewhere in the PEA also originally predicted...no long-term water treatment, however today it is recognized that long-term treatment will be required."

Kuipers notes that "no reclamation plan for the project has yet to be developed or cost estimate calculated. The PEA uses a cost estimate based on the 2019 cost estimate for the Greens Creek mine reclamation, excluding long-term water treatment. The Greens Creek estimate is \$102.6M including \$30M in long-term water treatment costs, whereas the Palmer Project PEA uses a scaled estimate of \$30.8M excluding water treatment."

Kuipers concludes that risk and costs, in general, are not adequately analyzed in the PEA. "The PEA identifies numerous site-specific risks including avalanche, portal construction, AG deposit metallurgy, site surface geotechnical conditions, water management, seismicity, geochemistry, dust management and post-closure site-specific risks. The PEA assumes the risks can be mitigated and does not include any additional contingencies or caveats with respect to their potential impact on the project. It is not apparent from the information provided in the PEA that the risks have been adequately assessed, mitigations identified, and residual risk considered relative to impacts to project costs and construction and/or production delays."