

**RFI 059a
Pebble Project EIS**

Request for Information

Title/Subject:	Additional Throughput Option
Requestor:	AECOM
Date Transmitted:	10/11/2018
Recipient:	Pebble Limited Partnership
Response Requested by:	10/17/2018
Rationale:	Cooperating agency comments on draft Appendix B distributed September 2018 request analysis of additional throughput options: <i>Only one option smaller than the proposed throughput of 180,000 tpd was considered, and it was dismissed as not reasonable because it would not provide a reasonable return on investment. We recommend that mine sizes between 50,000 tpd and 180,000 tpd be assessed to determine if there are other smaller mine throughputs that could result in reduced impacts and still be practicable.</i>
Describe the Information Requested and Level of Detail:	Please analyze a throughput option of 115,000 tpd. Additionally, the August 6, 2018 Technical Note on Optimization Studies used a discount rate of 7% to calculate net present value. Please explain how that discount rate was selected.

Recipient Response Form

Date Received from USACE:	Click here to enter text.
Response from Recipient (Describe Information Requested to the Level of Detail Requested; Provide Attachments as Needed):	Click here to enter text.
List Number and Type of Response Attachments:	RFI059a Additional Throughput Option.pdf RFI059a Optimization Study Economic Model.xlsx
Date Returned to USACE:	Click here to enter text.

AECOM Intake Form

Date Response was Received:	10/12/2018
Received by:	AECOM
Describe any Follow-up Related to this RFI:	None at this time



From: James Fuego, Pebble Limited Partnership

To: Shane McCoy, US Army Corps of Engineers

Date: October 11th, 2018

RFI059 a requested:

- 1) Please analyse a throughput option of 115,000 tpd.

To address this the economic model for RFI059 has been expanded to include a 115 thousand ton per day (ktpd) throughput case. The case was developed using the same approach as for the other three cases presented in RFI059, using the Northern Dynasty Minerals Ltd. (NDM) 2011 Preliminary Economic Assessment (PEA) as the basis for costs¹.

Capital information from the PEA is broken into categories that are either fixed in cost or can be scaled by throughput using the six-tenths rule. The results of that analysis are shown in Table 1 for project throughputs of 50 ktpd, 115 ktpd, 180 ktpd (current proposed project), 220 ktpd (PEA and the basis for the scaling), and 320 ktpd. Sustaining capital was assumed to be equal in all cases and was distributed equally across the operating years. This is an assumption that typically benefits the smaller, longer life, cases that require more equipment replacement due to the longer mine life.

Table 1 - Project Capital (\$millions)						
Area	Adjustment	Small (50k) Project	Medium (115k) Project	Proposed (180k) Project	2011 PEA (220k) Project	Big (320k) Project
Mining	6/10 rule	177	292	382	431	539
Process	6/10 rule	435	717	938	1,058	1,325
Moly Separation	Not in Proposed Project	0	0	0	84	0
Secondary Gold Plant	Not in Proposed Project	0	0	0	161	0
Other Infrastructure	Fixed	422	422	422	422	422
Tailings	Fixed	294	294	294	294	294
Concentrate & Fuel (Diesel)	Not in Proposed Project (Required for Big Project)	0	0	0	98	98
Pipelines	Fixed	162	162	162	162	162
Access Road	Fixed	155	155	155	155	155
Port Infrastructure	Fixed	155	155	155	155	155
Port Process	Not in Proposed Project (Required for Big Project)	0	0	0	87	109
Power Generation	50% scaled (powerplant), 50% fixed pipeline	377	448	504	534	601
Total Direct		2,021	2,489	2,856	3,484	3,705
Indirect Costs	40% of Directs	809	996	1,143	1,407	1,482
Contingency	18% of Total	509	627	720	866	934
Total Capital		3,339	4,113	4,719	5,757	6,120

For this evaluation, the operating costs were assumed to consist of 20% fixed costs (land, infrastructure maintenance, environmental, office etc.) and 80% variable costs scaled by throughput. The associated operating costs are shown in Table 2.

Table 2 - Project Operating Cost						
Area	Adjustment	Small (50k) Project	Medium (115k) Project	Proposed (180k) Project	2011 PEA (220k) Project	Big (320k) Project
Opex (\$/t processed)	Assume 20% fixed, 80% scaled by throughput	18.75	13.20	11.66	11.16	10.46

The attached spreadsheet model was utilized to develop financial metrics for the scaled projects. The projects were assumed to mine and process the same size orebody (with the contained metal in the updated PLP proposed project) and thus the ultimate footprints, and therefore direct impacts, would be the same in all cases. The mine life was calculated by looking at the time required to exploit the full orebody at the proposed throughput rate. The model basis is presented below in Table 3.

Table 3 - Model Basis	
Ore (tons)	1,300,000,000
Cu Production (pounds)	6,600,000,000
Mo Production (pounds)	316,000,000
Au Production (oz)	6,900,000
Cu Price \$/pound	3.00
Mo Price \$/pound	8.00
Au price \$/oz	1250

Table 4 presents the financial metrics for the four scaled projects.

Table 4 Financial Metrics				
Metric	Small (50k) Project	Medium (115k) Project	Proposed (180k) Project	Big (320k) Project
Mine Life	71	31	20	11
Cashflow	115,839	6,463,013	7,714,243	8,186,378
NPV(7%)	(2,301,785)	(220,985)	1,028,388	2,257,666
IRR	0%	6%	10%	13%

Based on the above analysis the 115 ktpd project does not have a positive net present value and is therefore not a feasible economic alternative.

- 2) *Additionally, the August 6, 2018 Technical Note on Optimization Studies used a discount rate of 7% to calculate net present value. Please explain how that discount rate was selected.*

Discount rates used in the mining industry can range from as low as 5% up to 10% or more. The discount rate can typically be linked to project risk, which in turn is related to factors such as the level of understanding of the resource (amount of measured, indicated, and inferred material), the level of engineering study (Preliminary Economic Assessment, Preliminary Feasibility Study, Feasibility Study), and sovereign risk. A discount rate of 7% is in the typical range for a copper-gold project with a well-defined resource located in a jurisdiction with low sovereign risk.

As noted in the National Instrument 43-101 compliant 2011 NDM PEA (page 12) that was developed by a third-party engineering consultant (Wardrop) "Market convention generally uses a discount rate of 8% for copper and other base metal projects and 5% for gold and other precious metal projects. Given the large contribution of gold to total revenue at the Pebble Project, a 7% blended discount rate has been selected by Wardrop and is considered appropriate for discounting the Pebble Project cash flows for discounted cash flow analysis purposes."

¹ Northern Dynasty completed a Preliminary Assessment on the Pebble Project in February 2011 and since that time after considering stakeholder feedback, the Pebble Partnership has submitted an application for a CWA 404 permit for the Pebble Project on the basis of a substantially smaller mine facility footprint and with other material revisions. NDM is subject to restrictions under applicable securities laws on what technical information (including any economic analysis) it can put into the public domain about its project. Because the process with the USACE is public, these restrictions apply to this process too.

Prior technical information that is published may, over time, cease to be current for purposes of these applicable securities law rules and thus can no longer be relied upon in an issuer's public disclosure because it needs to be updated. As a result, the

economic analysis included in the 2011 Preliminary Assessment is considered by Northern Dynasty to be out of date. The EIS process currently underway by the USACE will consider alternative scenarios with respect to a number of aspects of the proposed project.

Accordingly, the Company has not completed a current comprehensive economic analysis of the Pebble Project but anticipates that having a complete understanding of, and being able to properly assess all of the proposed alternatives that the USACE will be considering as part of the EIS process will provide additional clarity with respect to the project to be evaluated so that an economic analysis can be completed. Notwithstanding the foregoing, the 2011 Preliminary Assessment can still be utilized as an assumed reference point to respond to this RFI.