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Attention: S. Wade Stogran  
Vice-President of Environmental and Corporate Affairs

**RE: Geochemical Comparison of the Cantung and Mactung Deposits**

## 1.0 INTRODUCTION

EBA Engineering Consultants Ltd. (EBA) was requested to review available geochemical datasets for the Mactung and Cantung deposits and to provide comments on the comparative nature of the two deposits. The two deposits are located approximately 160 km apart near to the Yukon and Northwest Territories border and have similar geological origin. The geochemical characterization program for the Cantung Mine has been conducted by MESH Consulting of Vancouver while characterization of the Mactung deposit is being conducted by EBA. This letter report outlines the results of the geochemical comparison between the two deposits.

This report is limited to a geochemical comparison of the ore grade materials at the Cantung and Mactung properties, and Cantung tailings. The comparison includes a review of sulphur content, neutralization potential, metals concentrations, humidity cell testwork, and process water quality. The Mactung results reviewed for this report are for lithologies intersected by the proposed underground workings. This report does not take into account differences between the two sites that could potentially affect downstream receiving environment water quality. The primary differences between the two sites are the methods of tailings disposal (aqueous disposal versus proposed dry stack), the method of discharge to the receiving environment (groundwater seepage vs proposed surface discharges), and the level of receiving environment dilution occurring below the sites.

## 2.0 GEOCHEMICAL COMPARISON

### 2.1 SULPHUR CONTENT

The acid generation potential in a rock is calculated by measuring the potential of sulphide minerals (pyrite, pyrrhotite, chalcopyrite, etc.) to oxidize into sulphuric acid. The standard

method of determine the acid generation potential of rocks is to calculate it based on the total sulphur content. This method may tend to over-estimate the potential for the rock to generate acid as it also includes very low solubility sulphide mineralization (barite) which does not readily weather. The total sulphur method also does not include consideration of the mineralogy of rock types which may prevent sulphide mineralization from being available for oxidation.

Skarn type Cantung ore was reported by MESH (2006) to have a total sulphur content ranging from <1% to 25.5%. Cantung tailings composites reported by MESH (2008) have a total sulphur content of from 6.6% to 11%. Sulphate sulphur in the skarn ore was higher in the open pit as opposed to the underground but was still minor (a maximum of 0.33% for the open pit areas and 0.08% for underground). Sulphate in the tailings was minor from 0.01 to 0.09%.

These results are comparable to the Mactung deposit although there have been some higher total sulphur content samples reported for the Cantung deposit as compared to Mactung ore samples, which reported total sulphur contents ranging from <1% to approximately 17%. The reported sulphide sulphur concentrations show large variability within each deposit. The available dataset supports the assumption that the sulphide sulphur content of the deposits are comparable or at least in the same range with the MacTung deposit possibly having a lower acid generating potential.

## 2.2 NEUTRALIZATION POTENTIAL

The Sobek neutralization potential method is one of the accepted methods for determining neutralization potential (NP) in British Columbia. A crushed representative rock sample is subjected to a known excess of hydrochloric acid. The temperature of the mixture is raised to ensure a complete reaction. The NP is then determined by measuring the amount of acid remaining through titration with sodium hydroxide. Stoichiometric analysis is then used to calculate the degree to which the sample was able to neutralize the acid. Neutralization potential is primarily derived from carbonate mineralization (calcite) but can also be derived from alumino-silicates such as ankerite and siderite.

The Mesh (2006) report identifies acid base accounting testwork results for the Cantung rock types including pyrrhotite skarn for both the underground and open pit workings. The Sobek-NP for the underground Cantung pyrrhotite skarn ranged from 41.3 to 349.3 kg CaCO<sub>3</sub>/tonne. The open pit pyrrhotite skarn had Sobek-NP values from 5.2 to 324.6 kg CaCO<sub>3</sub>/tonne. Calc-silicate skarn at the Cantung mine had NP values from 191.5 to 287.3 kg CaCO<sub>3</sub>/tonne or 64.7 kg CaCO<sub>3</sub>/tonne for the underground and open pit areas, respectively. The potential ore for the Mactung property is primarily pyrrhotite skarn. The Sobek-NP for the potential ore samples from the Mactung deposit range from 22 to 35 kg CaCO<sub>3</sub>/tonne with a singular sample returning a Sobek-NP over 500 kg CaCO<sub>3</sub>/tonne.

Although the numbers of samples from both the Cantung (16) and Mactung (14) deposits are limited, the Sobek-NP of the Mactung skarn tends to be lower than that of the Cantung skarn, especially from the underground workings. The results indicate that there is less neutralization potential for the Mactung deposit than the Cantung deposit.

The neutralization potential (NP) of the Cantung tailings was reported by MESH (2008) at from 206 to 416 kg CaCO<sub>3</sub>/tonne for the Sobek-NP and from 111 to 332 kg CaCO<sub>3</sub>/tonne for Carbonate-NP. The Sobek-NP for the Mactung deposit appears to be similar to that of the pyrrhotite skarn mineralization of the Cantung deposit. Sobek-NP incorporates the potential for NP contributions from alumino-silicate mineralization within the deposits and so the only unknown NP contributions would be from sodium based reagents used in the milling process (eg. sodium silicate, soda ash, and caustic soda).

## 2.3 METALS CONCENTRATIONS

Metals concentrations for Cantung ore and tailings and Mactung ore samples had the following select metals ranges shown in Table 1, below.

TABLE 1. COMPARISON OF CANTUNG AND MACTUNG METALS CONCENTRATIONS			
Element	Cantung Tailings (16 samples)	Cantung Skarn Ore (16 samples)	Mactung Skarn Potential Ore Grade (14 samples)
Al	0.66 – 1.85%	0.3 – 2.95%	2.4 – 7.6%
Bi	398 – 817 ppm	5 – 2438 ppm	3 – 796 ppm
Ca	3.73 – 8.32%	1 - >15%	3 – 28%
Cd	<1 – 9 ppm	<1 – 54 ppm	0.22 – 0.58 ppm
Cu	1660 – 2809 ppm	55 – 5866 ppm	49 – 5210 ppm
Fe	9.82 – 17.5%	1.1 - >15%	6 – 30%
Mg	1.47 – 3.01%	0.06 – 7%	0.7 – 4.0%
Mn	481 – 963 ppm	312 – 9048 ppm	900 – 9200 ppm
Mo	<2 – <6 ppm	<2 – 9 ppm	2.09 – 328 ppm
Se	<0.1 – 0.1 ppm	<0.1 – 9 ppm	3 – 32 ppm
Zn	77 – 526 ppm	23 – 4540 ppm	48 – 395 ppm

The Cantung and Mactung skarn deposits appear to have similar metals content for most elements identified in Table 1. The Cantung Mine has higher concentrations of bismuth and zinc. The three cadmium concentrations from the Cantung Mine above the 1 pm detection limit were from the calcified-silicate skarn mineralization. The Mactung property appears to have elevated concentrations of aluminum, molybdenum and selenium. Most

metals concentrations vary over several orders of magnitude. Given the low number of samples, they may not be representative for the entire range of metals concentrations in the Cantung and Mactung ore bodies.

It should be noted that the Mactung samples were analyzed using the 4-acid “near total” digestion method as opposed to aqua-regia digestion method used for the Cantung samples. Price (1997) indicates that the results of the 4-acid “near total” digestion method are typically higher than that of the aqua-regia method as a result of the stronger and more selective nature of the dissolution reagents used by the former method. The results are still taken to be comparable for the two deposits despite the different digestion methods used.

The comparison of the potential ore to tailings samples does not take into account the removal of some metals that will be included in the final concentrate. Wardrop Engineering Incorporated (WEI) has estimated an approximate sulphur content of 1% for the concentrate produced at the Mactung property which will result in lower metals concentrations in the final tailings for minerals associated with the sulphide mineralization. No assay results have been provided to EBA to indicate the approximate metals concentration of the final concentrate produced at the Cantung Mine. Metals assay data for the final concentrate from the Cantung Mine should be provided for comparative purposes as it will assist in understanding the characteristics of the final tailings.

## 2.4 HUMIDITY CELL TESTWORK

A humidity cell currently being conducted on a Cantung tailings composite is based on a material composite with an average total sulphur content of 8.98% and a Sobek-NP of 280. The total sulphur content of this composite is within the anticipated range of the Mactung tailings based on feasibility information provided by WEI for the Mactung mill headgrade. The Sobek-NP of the Cantung humidity cell is greater than that of the Mactung materials which has the potential to impact on the applicability of the results of the testwork to the Mactung deposit. No information is available for the geochemical characteristics of the mill feed during the period that the humidity cell tailings were produced.

The Lower Sobek-NP material in the Mactung deposit has the potential to deplete the available neutralization potential more rapidly and as a result generate acidic runoff in a shorter timeframe indicated by the Cantung testwork. To date the 60 weeks of testwork reported by MESH are still representative of neutral drainage and not of acidic conditions which may be expected to potentially occur following mine closure. Leachate from the humidity cell after 60 weeks of operation was elevated above CCME guidelines for both copper (0.00278 mg/L, CCME 0.002 mg/L) and selenium (0.00287 mg/L, CCME 0.001 mg/L)

## 2.5 PROCESS WATER QUALITY

The MESH (2008) report includes water quality data from a singular sample for Tailings Pond #3. This sample is the sole sample that appears to represent potential operational process water (supernatant) that may be expected to occur at the Mactung property once production begins. The total suspended solids concentration of 1,600 mg/L for the Tailings Pond #3 sample supports the evaluation of this sample as representing process water. The dewatering process water from the Mactung site is expected to result in lower TSS than that of the Cantung Mine which utilizes sub-aqueous disposal due to the differences in the final tailings disposition methods. The results of the supernatant water chemistry analysis for this sample compared with MMER guidelines are shown below.

TABLE 2. COMPARISON OF CANTUNG SUPERNATANT TO MMER GUIDELINES		
Element	Concentration (mg/L)	MMER Criteria (grab sample)
As	0.0112	0.5
Cu	<b>2.62</b>	0.3
Pb	0.0375	0.2
Ni	0.0427	0.5
Zn	0.285	0.5

Copper concentrations within the Cantung Pond #3 exceeded the MMER criteria by a factor of about 9 but it should be noted that this is not the final discharge location for the Cantung site. A review of total versus dissolved copper concentrations indicated that the majority of copper is associated with the total metals component. It should be noted that more than one sample of process water is required for comparative purposes; however, the singular sample does provide an indication of the potential water chemistry as a result of processing.

## 3.0 DISCUSSION

The results of the comparison between the Cantung and Mactung deposits indicates that the two deposits are geochemically similar. The deposits appear to have similar total sulphur content but the Mactung deposit appears to have less neutralization potential than that of the Cantung deposit. Metals contents in the two deposits are highly variable over several orders of magnitude but the analyses are based on a limited number of samples. The Mactung deposit appears to have higher concentrations of aluminum, molybdenum, and selenium compared to the Cantung deposit.

An evaluation of the process water in Tailings Pond #3 from the Cantung site indicated that copper concentrations were above the MMER guidelines. This site discharges to the receiving environment through groundwater seepage and at the discharge point the water quality is within MMER criteria. The proposed ageing pond at the Mactung site will have periodic surface discharges to the receiving environment and as such it is anticipated that there may be a need for water treatment prior to discharge. It should be noted that this is based on a singular sample and more sample results would be required in order to confirm these results.

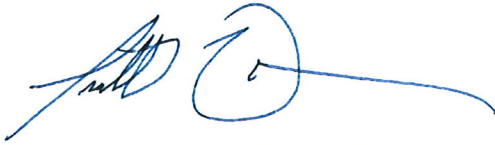
The Cantung humidity cell testwork should be representative of the Mactung deposit tailings given the similarities in geochemistry, mineralogy, and processing; however metallurgical program samples for the Mactung deposit would be required in order to substantiate this. It is the understanding of EBA that NATCL is considering conducting a metallurgical program that would include analysis of tailings and also establishment of a humidity cell on a representative sample of the Mactung tailings.

#### 4.0 CONCLUSION

The comparison of reported geochemical parameters for the Cantung property were compared to the available results for the Mactung deposit. The comparison of the two datasets indicates that the two deposits do appear to be geochemically similar with respect to ARD potential of the mine rock and most metals concentrations in the ore grade materials, although the neutralization potential appears to be lower for the Mactung deposit. The comparison is based on a very limited dataset and additional sample results for the parameters discussed in this report would be required in order to refine the geochemical comparison between the two deposits.

This report has been prepared following current professional standards and is subject to the EBA Environmental Report General Conditions (attached) that form part of this report. Liability limitations for this report are outlined in the attached General Conditions. EBA trusts that the information contained in this report meets your present requirements. If you have any questions or comments, please do not hesitate to contact the undersigned.

Respectfully Submitted,  
EBA Engineering Consultants Ltd.



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## REFERENCES

- MESH (2006). Geochemical Characterization of Mine Rock, Cantung Mine, NWT. Prepared for North American Tungsten Corp. Vancouver, BC.
- MESH (2008). Geochemical Characterization of the Cantung Mine Tailings, NWT. Prepared for North American Tungsten Corp. Vancouver, BC.
- Price, W.A. (1997). Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia, British Columbia Ministry of Energy and Mines, Victoria, BC.



## ENVIRONMENTAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these “General Conditions”.

### 1.0 USE OF REPORT

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA’s client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA’s client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

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### 2.0 LIMITATIONS OF REPORT

This report is based solely on the conditions which existed on site at the time of EBA’s investigation. The client, and any other parties using this report with the express written consent of the client and EBA, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The client, and any other party using this report with the express written consent of the client and EBA, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The client acknowledges that EBA is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the client.

### 2.1 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of this report, EBA may have relied on information provided by persons other than the client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

### 3.0 LIMITATION OF LIABILITY

The client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising out of the presence of those materials. In consideration of these risks, and in consideration of EBA providing the services requested, the client agrees that EBA’s liability to the client, with respect to any issues relating to contaminants or other hazardous wastes located on the subject site shall be limited as follows:

1. With respect to any claims brought against EBA by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to EBA under this Agreement, whether the action is based on breach of contract or tort;
2. With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the client agrees to indemnify, defend and hold harmless EBA from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by EBA, whether the claim be brought against EBA for breach of contract or tort.

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#### 4.0 JOB SITE SAFETY

EBA is only responsible for the activities of its employees on the job site and is not responsible for the supervision of any other persons whatsoever. The presence of EBA personnel on site shall not be construed in any way to relieve the client or any other persons on site from their responsibility for job site safety.

#### 5.0 DISCLOSURE OF INFORMATION BY CLIENT

The client agrees to fully cooperate with EBA with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for EBA to properly provide the service, EBA is relying upon the full disclosure and accuracy of any such information.

#### 6.0 STANDARD OF CARE

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

#### 7.0 EMERGENCY PROCEDURES

The client undertakes to inform EBA of all hazardous conditions, or possible hazardous conditions which are known to it. The client recognizes that the activities of EBA may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency procedures to protect EBA employees, other persons and the environment. These procedures may involve additional costs outside of any budgets previously agreed upon. The client agrees to pay EBA for any expenses incurred as a result of such discoveries and to compensate EBA through payment of additional fees and expenses for time spent by EBA to deal with the consequences of such discoveries.

#### 8.0 NOTIFICATION OF AUTHORITIES

The client acknowledges that in certain instances the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

#### 9.0 OWNERSHIP OF INSTRUMENTS OF SERVICE

The client acknowledges that all reports, plans, and data generated by EBA during the performance of the work and other documents prepared by EBA are considered its professional work product and shall remain the copyright property of EBA.

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Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by EBA shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by EBA shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

The Client recognizes and agrees that electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.