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TECHNICAL MEMO

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To:	Callum Beveridge (A&M) Michael Westlake (CIRNAC) Sam Kennedy (CIRNAC)	**Date:**	November 20, 2018
Cc:		**Memo No.:**	002
From:	Tetra Tech	**File:**	WENW03039-03
Subject:	Implementation of Small Mammal Sampling Program, Cantung Mine Site October 2018		

On behalf of North American Tungsten Corporation Ltd. (NATC) and Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Tetra Tech Canada Inc. (Tetra Tech) is pleased to present this summary of the program to conduct small mammal trapping at the Cantung Mine, NWT. As part of the closure and reclamation planning stage, Tetra Tech initiated a quantitative Human Health and Ecological Risk Assessment (HH/ERA) and site-specific risk assessment in 2017 to help guide remediation decisions. Subsequent to this, biota sampling was undertaken to confirm the results of the food web modeling. Permits for this sampling were secured from the Government of Northwest Territories and from the Aurora Research Institute in accordance with regulations.

A summary of the field work and results is presented below. The results will be used to further study the transfer of potential soil contaminants in small mammals (mice, voles, shews, and/or hares) to human and ecological receptors. These results will also be used to verify the food chain accumulation and exposure to metals modeling that has been developed to date.

On October 15, 2018, a team consisting of Tetra Tech staff and First Nations representatives from Nahanni Butte Dene Band and Liard First Nation traveled to the site. The team systematically trapped for small mammals at nine sampling areas around the mine site for three consecutive nights. Five lethal mouse traps were placed in each sampling area at least two hours before sunset, baited with peanut butter, jam, and bread. Traps were checked two hours after sunset and again the following morning. Once a small mammal was trapped in one of the nine sampling areas, all traps from that sampling area were moved to an area without successful traps, increasing the trapping probability in unsuccessful locations. Sixteen small mammals were captured during the three nights of trapping, 14 voles and 2 shrews. Individuals were identified to the species level when possible. Small mammals were collected from 8 of the 9 sampling locations (Figure 1).

The collected small mammals were frozen after capture and transported on dry ice to AGAT Laboratories (AGAT) in Burnaby, BC for chemical analysis. AGAT processed the whole body of the samples provided and analyzed them for a full suite of metals, including mercury in accordance with methods in the BC MOE Laboratory Manual and EPA 6020A. Samples were received on October 19, 2018 and results were tabulated on October 29. The results are summarized in Table 1.

Certain metals have a higher frequency of detection, which is to be expected if they are more commonly found in the environment or are essential micronutrients (such as zinc). Beryllium, silver, thallium, and vanadium, for example, were not frequently detected in the animal tissue. Capture locations will be compared to environmental media concentrations; the current thinking is that higher tissue concentrations would likely come from areas of higher soil or water concentrations, however this requires more in depth analysis.

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Table 1. Summary of Small Mammal Sampling Results

Chemical	Frequency of detection	Detection limit (ppm)	Minimum detected (ppm)	Maximum detected (ppm)
Antimony	7/16	0.002	0.002	0.019
Arsenic	5/16	0.03	0.03	0.13
Barium	16/16	0.01	0.31	35.1
Beryllium	2/16	0.002	0.002	0.004
Cadmium	16/16	0.002	0.013	0.0823
Chromium	16/16	0.01	0.01	0.13
Cobalt	16/16	0.004	0.018	0.129
Copper	16/16	0.02	1.49	4.45
Lead	16/16	0.004	0.014	0.092
Mercury	7/16	0.005	0.01	0.025
Molybdenum	16/16	0.01	0.01	0.16
Nickel	15/16	0.02	0.03	0.31
Selenium	16/16	0.02	0.09	0.37
Silver	1/16	0.01	0.01	0.01
Thallium	5/16	0.001	0.002	0.005
Vanadium	4/16	0.02	0.03	0.28
Zinc	16/16	0.4	11.8	36.2

These values will be used to validate findings of the food web modeling, and to determine whether the metals in soil have an effect on the body burden of small mammals. In addition, the effect of metal ingestion through ingestion of prey to higher order predators will be evaluated. The concentrations measured in tissue samples are in all cases below the maximum modelled values for metals retained as chemicals of potential concern in the ecological risk assessment (ERA). Additionally, in almost all cases, the maximum detected concentrations are below the average modelled values as well. This indicates that the literature-based bioaccumulation factors (BAFs) that were used in the ERA were conservative as they resulted in tissue concentrations above what is measured at the site. This can be a typical result as the uptake conditions of the site may differ from those of the literature-based BAFs.

Should you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

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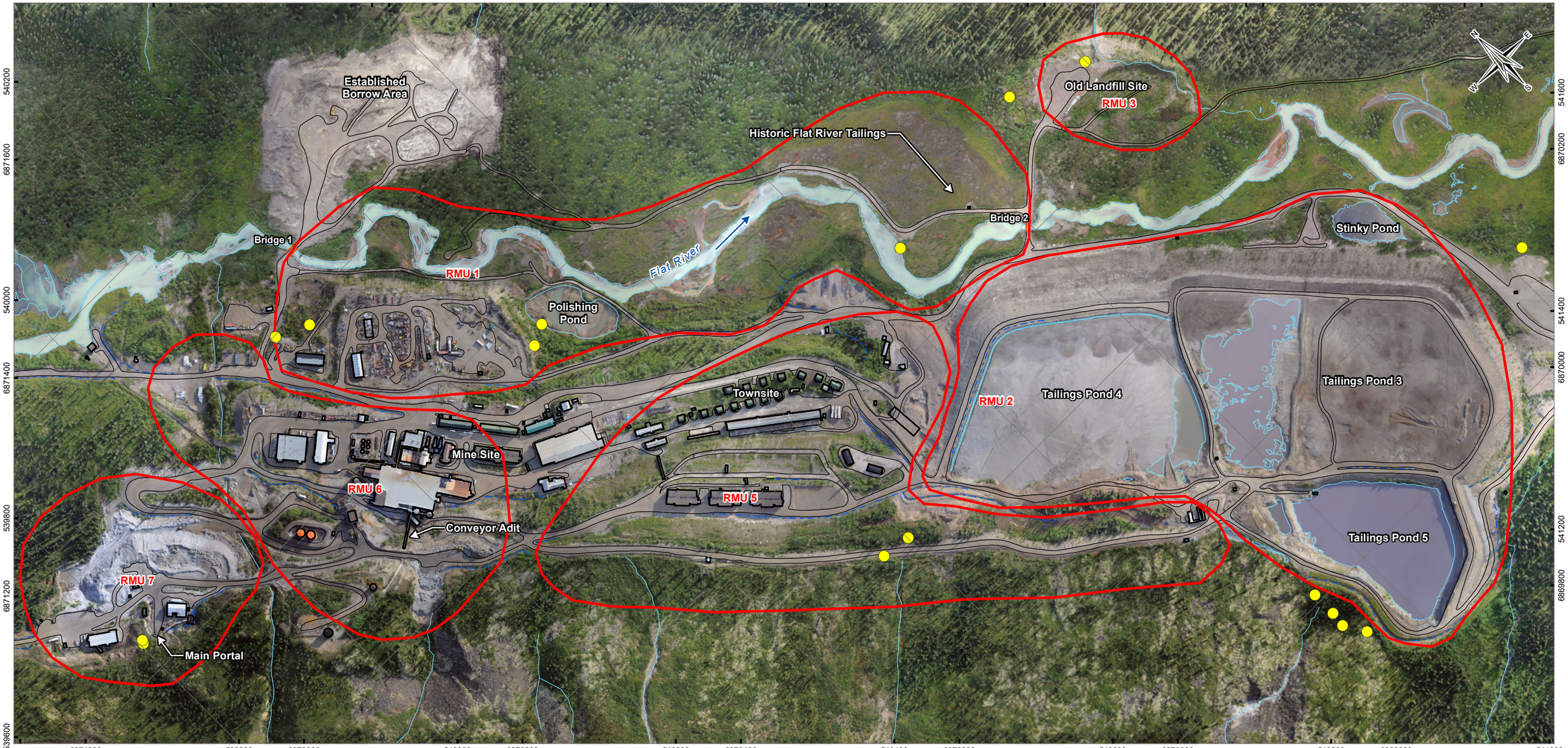

LEGEND

- Small Mammal Trapping Location
- Risk Management Unit (RMU)
- Building
- Road
- Bridge
- Ditch
- Watercourse

NOTES
Base data source:
Data provided by INAC (2013).

STATUS
ISSUED FOR USE

CANTUNG MINE

Small Mammal Trapping Locations

PROJECTION UTM Zone 9		**DATUM** NAD83			**CLIENT** NORTH AMERICAN TUNGSTEN CORPORATION LTD
Scale: 1:5,000 — 100 50 0 100 Metres					TETRA TECH
FILE NO. WENW03039-03_Figure01_SmallMammal.mxd					
OFFICE Tt-VANC	**DWN** SL	**CKD** YL	**APVD** TP	**REV** 0	**Figure 1**
DATE November 13, 2018	**PROJECT NO.** ENW.WENW03039-03				

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