

INTRODUCTION

New geochemical data from re-analysis of archived stream sediment samples have been assessed using weighted sums modeling and catchment basin analysis as described in the methodology report that accompanies this map (Mackie et al., 2015). Both commodity and pathfinder element abundances are evaluated to highlight areas that show geochemical responses consistent with a variety of base and precious-metal mineral deposit types. The results of modeling, completed using two approaches, are presented as a series of catchment maps and associated data files. This release is part of a regional assessment of stream sediment geochemistry that covers a large part of Yukon.

SAMPLING AND ANALYSIS PROGRAMS

Stream sediment and water samples from the Watson Lake and Coal River areas (NTS 105A and 95D, respectively) were collected at a reconnaissance scale in 1995 as part of the Canada-Yukon Mineral Resource Development Cooperation Agreement (Friskie et al., 1999). Field descriptions and initial geochemical data for 1117 sites were released in Geological Survey of Canada (GSC) Open File 3293. New geochemical data from the re-analysis of archive sample material from 824 sites were released in Yukon Geological Survey (YGS) Open File 2012-10 (Jackman, 2012). The reader is referred to these reports for detailed descriptions of sampling techniques, analytical procedures, and quality control measures. The current assessment includes only those samples that have been re-analyzed by inductively coupled plasma mass spectrometry (ICP-MS) and, as such, the eastern half of NTS map sheet 95D is excluded.

MINERAL OCCURRENCES

A variety of types of base and precious-metal mineralization are known to occur in the Watson Lake and Coal River area as shown in Table 1 (Yukon MINFILE, 2015). The most significant deposits are classed as intrusion-related gold (Hyland Deposit), Polymetallic Ag-Pb-Zn manto (producing Mt. Hundere Mine & McMillan deposit) and W-Skarn (Bailey deposit). Other types of mineralization include various Pb-Zn deposits and prospects such as the Ritco (Skarn), Balon (SEDEX), Jeri and Jeri-North (SEDEX or MVT), and Sambo (VMS). The volcanic and sedimentary package that hosts VMS mineralization in the Finlayson Lake district extends into the Watson Lake map area indicating a high prospectivity for this style of mineralization.

WEIGHTED SUMS MODELING

As described in the methodology report (Mackie et al., 2015), two approaches have been used to subdue the influence of background lithological variation and secondary absorption on the composition of stream sediments. One uses data levelled by the dominant geology mapped within each catchment, while the other uses residuals calculated from regression against selected principal components. Weighted sums models

(WSM) have been generated using the processed data. The importance rankings used in WSMs are summarized in Table 2. Each model is optimized for a target deposit type however other deposit types may be represented in a given model due to similarities in elemental abundances and associations.

Weighted sums models were not generated for porphyry Cu-Mo and epithermal Au-Ag deposit types because no such deposits are known to exist in the region and exploratory data analysis revealed no obvious anomalies in the expected commodity and pathfinder elements. Similarly, given a lack of evidence for scavenging of metal ions by secondary Fe or Mn-oxides a WSM for hydromorphic anomalies was also not produced.

Exploratory data analysis using both raw element data and principal components indicate that the distribution of many commodity and pathfinder elements is strongly influenced by lithological variation. The first principal component accounts for ~27% of the total geochemical variation and shows high positive loadings for Cd, Se, Sb, Ba, Hg, Zn and Ag, and negative loadings for, amongst other elements, Rb, Al, Sn, La, Ce and K. Respectively, these groupings form spatial patterns that match the distribution of chert and clastic sedimentary rocks of the Rabbitkettle Formation and intermediate intrusive rocks of the Hyland Suite. The second principal component, accounting for ~13% of the total variation, shows high positive loadings for Co, Fe and Cu, and high negative loadings for Ti, Nb, Ca, Ti, Na and Sr, and forms domains matching the mapped distribution of clastic sedimentary rocks of the Hyland Group and the carbonate rocks of the Rabbitkettle Formation, respectively. Regression analysis of selected metals against the relevant principal component(s) effectively filters these terrane-effects while preserving responses related to known occurrences. Leveling by mapped geology has a more subdued effect on filtering the interpreted lithological control on the distribution of certain pathfinder elements (e.g., Sb, Ba and Cd). In order to reduce the impact this has on the WSM using this approach, certain elements were given low importance rankings or, in some cases, were omitted for certain deposit types.

The effectiveness of historical sampling coverage has been assessed empirically using graphs of WSMs plotted against catchment surface area to determine the ideal maximum catchment size (15 km²). Catchments that cover larger areas (shown on the map with bold outlines) are interpreted to have been under-sampled and thus require further sampling to properly evaluate the area for geochemical anomalies. Given the likelihood that a mineralization 'signal' would be progressively diluted with increasing catchment size, marginally high WSM scores in large catchments may also be of interest.

Table 1: List of Mineral Occurrences for NTS map sheet 105A/95D (Yukon MINFILE, 2015)

Number	Name	Type	Status	Commodities
0950 001	TOOBALLY	Unknown	Anomaly	
0950 002	COUET	Volcanogenic Sulphide - type not determined	Showing	Copper
0950 003	IRA	Unknown	Unknown	
0950 004	ME	Unknown	Unknown	
0950 005	MEI	Sediment-hosted Mississippi Valley Type Pb-Zn (MVT)	Deposit	Barite, Zn, Lead, Copper
0950 006	MELBURN	Manto Polymetallic Ag-Pb-Zn	Showing	Lead, Zn, Silver
0950 007	CHU	Skarn Pb-Zn	Showing	Lead, Zn, Silver
0950 008	MEI	Volcanogenic Sulphide - type not determined	Showing	Copper, Silver, Barium, Lead, Arsenic
0950 009	HYLAND GOLD	Plutonic-hosted Au	Deposit	Gold
0950 010	SKOVLEN	Unknown	Unknown	
0950 011	JALRY	Manto Polymetallic Ag-Pb-Zn	Prospect	Lead, Zn, Silver
0950 012	WATSON	Unknown	Unknown	
0950 013	ASBURY	Manto Polymetallic Ag-Pb-Zn	Anomaly	Lead, Silver, Zinc
0950 014	WATSON	Unknown	Anomaly	Lead, Zinc
0950 015	ASBURY	Unknown	Anomaly	Zinc, Lead
0950 016	SPOROK	Unknown	Unknown	
0950 017	SPOROK	Unknown	Unknown	
0950 018	SPOROK	Unknown	Unknown	
0950 019	BERAPAM	Unknown	Unknown	
0950 020	BERAPAM	Unknown	Unknown	
0950 021	KONDONG	Unknown	Unknown	
0950 022	HERPES	Unknown	Unknown	
0950 023	COU	Unknown	Unknown	
0950 024	SHAFETWO	Coal	Deposit	Coal
0950 025	COU	Sediment-hosted Mississippi Valley Type Pb-Zn (MVT)	Showing	Barium, Lead, Zinc, Silver
0950 026	PLAY	Unknown	Unknown	
0950 027	CLZ	Unknown	Unknown	
0950 028	CLZ	Unknown	Unknown	
0950 029	CLZ	Unknown	Unknown	
0950 030	CLZ	Unknown	Unknown	
0950 031	CLZ	Unknown	Unknown	
0950 032	CLZ	Unknown	Unknown	
0950 033	CLZ	Unknown	Unknown	
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0950 094	CLZ	Unknown	Unknown	
0950 095	CLZ	Unknown	Unknown	
0950 096	CLZ	Unknown	Unknown	
0950 097	CLZ	Unknown	Unknown	
0950 098	CLZ	Unknown	Unknown	
0950 099	CLZ	Unknown	Unknown	
0950 100	CLZ	Unknown	Unknown	

Table 2: Importance rankings for weighted sums models using data levelled by dominant mapped geology.

Target Deposit Type ^a	Other Deposit Types ^b	Mn	Fe	Co	Ni	Cu	Mo	Zn	Pb	Ag	Au	As	Ba	Cd	Sn	Sb	Te	Hg	Tl	Bi	W
Polymetallic Ag-Pb-Zn	SEDEX, VMS (Zn-rich), MVT, Pb-Zn skarn							2	4	3			1	-1			1			-2	
VMS (Zn-rich)	SEDEX, Pb-Zn skarn, MVT, VMS (Cu-rich), Polymetallic Ag-Pb-Zn					2	2	4	3	1					1					1	-2
VMS (Cu-rich)	Cu skarn	1				3				-1	-1										
Porphyry Mo	Porphyry Cu					2	4	-1	1												1
W skarn	Porphyry Mo																				1
Porphyry Mo	Porphyry Cu					2	4	-1	1												1
Porphyry Mo	Porphyry Cu																				1
Intrusion-related Au	Epithermal Au-Ag					1															1

^a Polymetallic Ag-Pb-Zn type includes vein and manto styles; SEDEX = sedimentary exhalative Pb-Zn (Ag); VMS = volcanic-hosted/associated massive sulphide deposits; MVT = Mississippi Valley type Pb-Zn deposits
^b Raw data following a log₁₀ transformation

LEGEND

Weighted sums model (Geology Levelled)

- Mineral Occurrence
- 0-50th percentile
- 50-75th percentile
- 75-90th percentile
- 90-95th percentile
- 95-98th percentile
- 98-100th percentile

Town
 Mineral Occurrence
 Road
 Contour
 River
 Water Body
 Wetland
 Sample Location
 Catchment
 Catchments >15 km²

RECOMMENDED CITATION

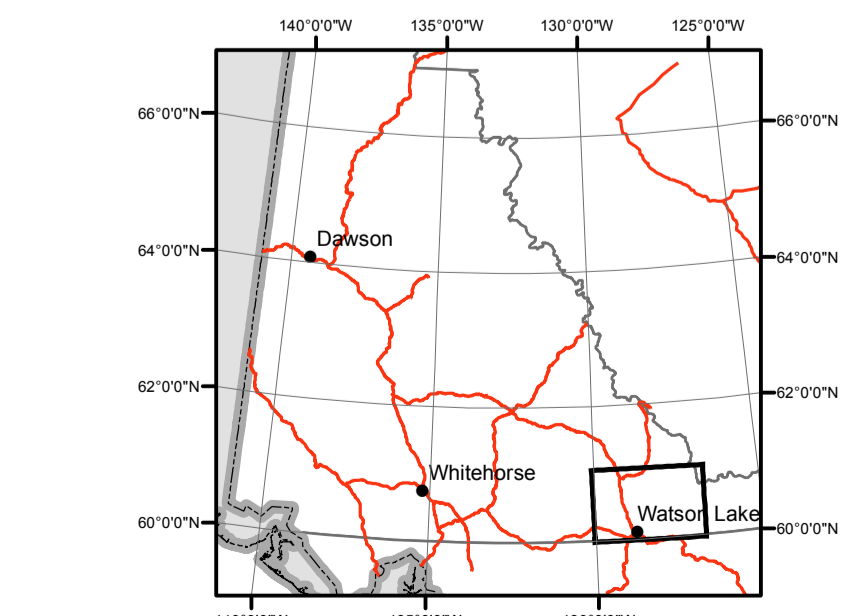
MACKIE, R., ARNE, D. AND PENNIMPEDE, C., 2015. Weighted sums model for VMS Zn-Pb-Cu deposits levelled by geology. In: Enhanced interpretation of stream sediment geochemical data for NTS 95D and 105A. Yukon Geological Survey, Open File 2015-30, scale 1:250 000, sheet 4 of 13.

Catchment basin polygons generated by the Yukon Geological Survey (J. O. Bruce).

Any revisions or additional geological information known to the user would be welcomed by the Yukon Geological Survey.

Paper copies of this map and the accompanying report may be purchased from the Yukon Geological Survey, Energy, Mines and Resources, Government of Yukon, Room 102-300 Main St., Whitehorse, Yukon, Y1A 2B5, Ph. 867-667-3201, Email geology@gov.yk.ca.

A digital PDF (Portable Document File) of this map may be downloaded free of charge from the Yukon Geological Survey website: <http://www.ygeology.gov.yk.ca>.

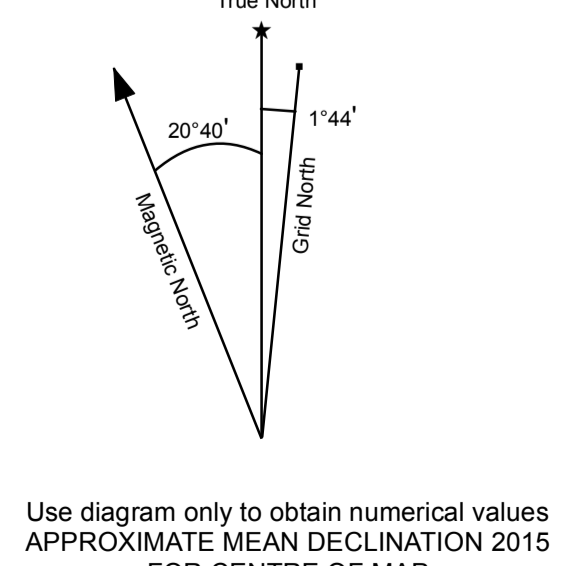
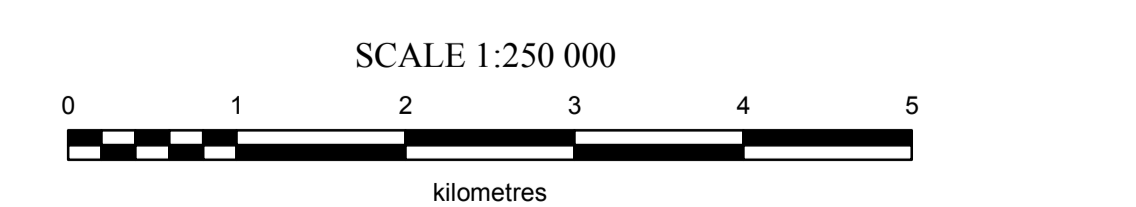


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ONE THOUSAND METRE GRID Universal Transverse Mercator Projection North American Datum 1983 Zone 9

CONTOUR INTERVAL 100 FEET Elevations in metres above Mean Sea Level

VMS Zn-Pb-Cu deposits Weighted sums model (Geology Levelled) Sheet 4 of 13



105G	105H	095E
FINLAYSON LAKE	FRANCES LAKE	FLAT RIVER
105B	105A	095D
WOLF LAKE	THIS MAP	THIS MAP
104P	094M	094N
MCDONNELL	RABBIT RIVER	TOAD RIVER

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Yukon Geological Survey, Energy, Mines and Resources, Government of Yukon

Open File 2015-30

Weighted sums model for VMS Zn-Pb-Cu deposits levelled by geology (NTS 95D and 105A) Sheet 4 of 13

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