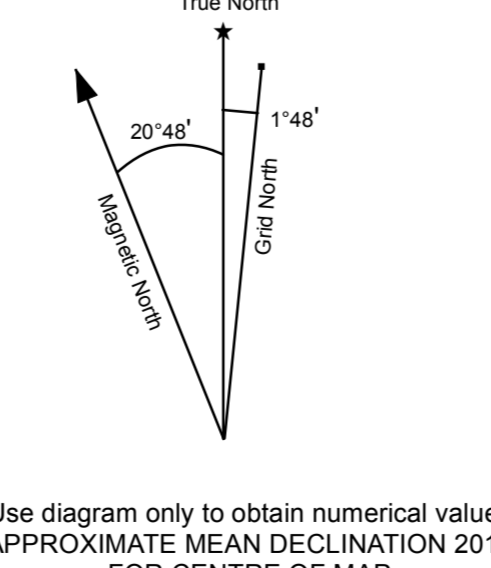
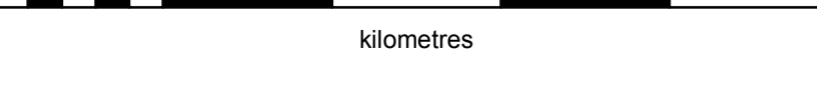


Shale-hosted Ni-Zn-Mo Weighted sums model (Principal Component Residuals) Sheet 14 of 15

SCALE 1:250 000



116F	116G	116H
PART OF 116G	OGLIVE RIVER	HART RIVER
116C	116B	116A
THIS MAP	THIS MAP	LARSEN CREEK
115N	115O	115P
PART OF 115O	STEWART RIVER	MCQUESTEN

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 Dawson area (NTS 116B and part of 116C) were collected as part of the Federal Uranium Reconnaissance Program (Geological Survey of Canada, 1977). Field descriptions and initial geochemical data for 1129 sites were originally released in Geological Survey of Canada (GSC) Open File 520. Archived sample material was re-analyzed in two subsequent projects and the results were released in GSC Open File 2365 and Yukon Geological Survey Open File 2012-6 (Friske et al., 1991; Jackaman, 2012). The reader is referred to these reports for detailed descriptions of sampling techniques, analytical procedures and quality control measures.

MINERAL OCCURRENCES

Various types of base and precious-metal mineralization have been identified in the Dawson area as listed in Table 1 (Yukon MINFILE, 2015). The most significant deposits are classed as intrusion-related Au (Brewery Creek deposit), Au skarn (Mam deposit), Mississippi Valley-type Pb-Zn-Ag (Og and Tart prospects), iron oxide copper-gold (Lala and Wizard prospects) and polymetallic Ag-Pb-Zn-Cu (Spotted Fawn, Blackstone, Silvercity and Index prospects). Other deposit types within the area include sediment-hosted Ni-Zn-Mo (Graps and Talga prospects), Pb-Zn volcanogenic massive sulphide (Fresno and Top of the world prospects) and quartz-vein Au (Vigrin and Ben Levy prospects). Numerous quartz-vein Au prospects occur in the adjacent NTS map area to the south, including the Lone Star deposit, supporting the prospectivity of the region for this type of deposit.

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 of 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.

Exploratory data analysis using both raw element data and principal components indicates that lithological variation exhibits a significant control on the distribution of many commodity and pathfinder elements. Importantly, for this area, much of the variability in the data can also be linked to mineralization. The first principal component accounts for ~27% of the total geochemical variation and shows high positive loadings for Al, Ce, Li, Co, La, Th, Ti, Cr, Sc and Fe; and high negative loadings for Cd, Zn, Mo, Se, Ag, Ti and Ba. Respectively, these groupings correspond to the mapped distribution of Hyland group sedimentary, Dempster formation volcanic rocks and Road River group sedimentary rocks. Mafic volcanic rocks of the Dempster formation are also represented in the second component which has high negative loadings in V, Ni, and Cr. The second component, with high positive loadings in Bi and Pb, shows a spatial match with several Pb-Zn-Ag occurrences and thus is interpreted to represent a mineralization signal. The third component has high positive loadings in Cu, Se, Mo, Ni and Ag; and high negative loadings in Mg and Ca. These groupings correspond to areas mapped as slate and dolomite, respectively.

Regression analysis of selected metals against the relevant principal components¹ effectively filters the interpreted lithological control and consequently enhances responses related to known mineral occurrences. Leveling by mapped geology is less effective at filtering the lithological control for certain elements (e.g., Ag, Zn and Co). In order to reduce the impact this has on the WSM, certain elements were given low importance rankings for certain deposit types. Negative weightings are used to help distinguish between deposit types with similar metal associations.

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 (16 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 2: Importance rankings for weighted sums models using residuals from regression against selected principal components.

Target Deposit Type ²	Other Deposit Types ³	Mn	Fe	Co	Ni	Cu	Mo	Zn	Pb	Ag	Au	As	Ba	Cd	Sn	Sb	Te	Hg	Tl	Bi	W ³	
Polymetallic Ag-Pb-Zn	VMS; SEDEX; Pb-Zn skarn; MVT						1	3	4	2					1	1	1			1		
MVT Pb-Zn-Ag	SEDEX; VMS; Pb-Zn skarn;																					
IOCG	Polymetallic Ag-Pb-Zn																					
Porphyry Cu-Mo	Porphyry Cu; VMS (Cu-rich)																					
Au Skarn	Intrusion-related and orogenic Au; Polymetallic Ag-Pb-Zn																					
Intrusion-related Au	Epithermal Au-Ag																					
Shale-hosted Ni-Zn	SEDEX																					

¹Polymetallic Ag-Pb-Zn type includes vein and matrix styles; SEDEX = sedimentary exhalative; VMS = volcanic-hosted/associated massive sulphide; MVT = Mississippi valley type; IOCG = iron oxide copper gold

²For heavily censored elements and those not strongly controlled by geology as interpreted from principal component analysis, raw data are used following a log₁₀ transformation.

LEGEND

Town

- ▲ Mineral Occurrence
- Road
- Contour
- River
- NTS map sheet
- Water Body
- Wetland
- Sample Location
- ⊃ Catchment > 16 km²

Weighted sums model (PC residuals)

Shale-hosted Ni-Zn-Mo deposits

- Incomplete element suite
- 0-50th percentile
- 50-75th percentile
- 75-90th percentile
- 90-95th percentile
- 95-98th percentile
- 98-100th percentile

RECOMMENDED CITATION

MACKIE, R., ARNE, D. AND PENNIMPEDE, C., 2016. Weighted sums model for Shale-hosted Ni-Zn-Mo deposits using principal component residuals. In: Enhanced interpretation of stream sediment geochemical data for NTS map sheet 116B & 116C. Yukon Geological Survey, Open File 2016-32, scale 1:250 000, sheet 14 of 15.

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 obtained 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) file of this map may be downloaded free of charge from the Yukon Geological Survey website: <http://www.geology.gov.yk.ca>.

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Mackie, R., Arne, D. and Brown, O., 2015. Enhanced interpretation of regional stream sediment geochemistry from Yukon: catchment basin analysis and weighted sums modeling. Yukon Geological Survey, Open File Report 2015-10.

Yukon MINFILE, 2015. Yukon MINFILE – A database of mineral occurrences. Yukon Geological Survey, www.data.geology.gov.yk.ca, accessed May 2015.

Table 1: List of Mineral Occurrences for NTS map sheet 116B & 116C (Yukon MINFILE, 2015)

Number	Name	Type	Status	Commodities
116B 001	BERNARD	Unknown	Abandoned	Vanadium
116B 002	GERMINE	Porphyry Sn	Drifted Prospect	Copper
116B 003	COLLETT	Coal	Past Producer	Coal
116B 004	WAGY	Vein Au-Quartz	Past Producer	Copper, Silver, Mercury, Gold, Lead
116B 005	WILSON	Vein Au-Quartz	Drifted Prospect	Copper, Silver, Zinc
116B 006	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 007	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 008	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 009	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 010	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 011	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 012	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 013	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 014	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 015	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 016	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 017	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 018	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 019	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 020	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 021	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 022	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 023	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 024	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 025	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 026	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 027	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 028	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 029	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 030	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 031	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 032	FRISKE	Vein Au-Quartz	Prospect	Antimony
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116B 038	FRISKE	Vein Au-Quartz	Prospect	Antimony
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116B 071	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 072	FRISKE	Vein Au-Quartz	Prospect	Antimony
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116B 099	FRISKE	Vein Au-Quartz	Prospect	Antimony
116B 100	FRISKE	Vein Au-Quartz	Prospect	Antimony