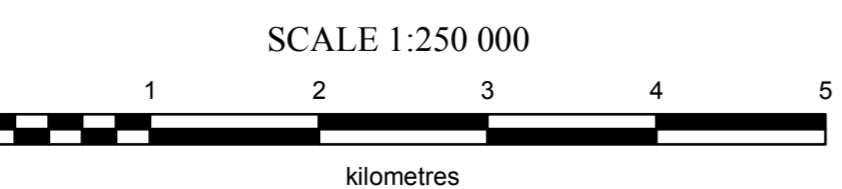


Intrusion-related Au Weighted sums model (Principal Component Residuals) Sheet 3 of 6



Use diagram only to obtain numerical values APPROXIMATE MEAN DECLINATION 2016 FOR CENTRE OF MAP

116A LARSEN CREEK	106D NASH CREEK	106C NADALEEN RIVER
115P MCQUESTEN	105M THIS MAP	105N LANSHING RANGE
115I Carmacks	105L Glenjón	105K Tay River

INTRODUCTION

New geochemical data from re-analysis of archived stream sediment samples have been assessed using weighted sums modeling and catchment basin analysis (Mackie et al., 2015 and Heberlein, 2013). 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 Mayo area (NTS 105M) were collected at a reconnaissance scale in 1987 and 1988 as part of the Canada-Yukon Mineral Development Agreement (Friskie & Hornbrook, 1989). Field descriptions and initial geochemical data for 861 sites were released in Geological Survey of Canada (GSC) Open File 1962. New geochemical data from the re-analysis of archive sample material were subsequently released in Yukon Geological Survey (YGS) Open File 2012-8 (Jackman, 2012). The reader is referred to these reports for detailed descriptions of sampling techniques, analytical procedures and quality control measures.

MINERAL OCCURRENCES

A variety of types of base and precious-metal mineralization are known to occur in the Mayo area as shown in Table 1 (Yukon MINFILE, 2015). The most significant are those of the Keno Hill silver district which are classed as polymetallic Ag-Pb-ZnAu vein deposits. Other deposit types in the area include intrusion-related Au (McQuesten deposit) and W skarn (Newry, Two Buttes and Friesen prospects). The Marg volcanogenic massive sulphide and Dublin Gulch intrusion-related gold deposits occur in the in the adjacent NTS map area to the north (106D) supporting the prospectivity of the region for these types of deposits. The area may also be prospective for sedimentary exhalative Pb-Zn±Ag deposits given the presence of Road River and Earn Group and Rabbitkettle Formation sedimentary rocks which host this type of mineralization elsewhere in Yukon.

WEIGHTED SUMS MODELING

As described in the methodology report accompanying this map (Mackie et al., 2015) and a previously completed pilot study (Heberlein, 2013), 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

(Heberlein, 2013), while the other uses residuals calculated from regression against selected principal components (Mackie et al., 2015). Using the processed data, weighted sums models (WSM) have been generated for different deposit types based on selected commodity and pathfinder elements. 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 the distribution of many commodity and pathfinder elements is strongly influenced by lithological variation. However, for certain elements it appears that mineralization is an important controlling factor. The principal component (PC1) accounts for ~30% of the total geochemical variation. Negative PC1, with high loadings in Cd, Ba, Ag, Se, Mo, Hg, Tl and Zn, forms a spatial pattern that matches the distribution Earn and Road River group sedimentary rocks and is thus interpreted to represent lithological control. Similarly positive PC1, with high loadings in Ce, La, Th, Fe, Al, Mg and Co, appears to relate to Hyland Group sedimentary rocks. This element grouping is similar to that linked with Hyland Group rocks in other map areas. The second component (PC2) has high negative loadings for Sb, Pb, As, Zr, Cu, Mo and Bi and can be linked to polymetallic Ag-Pb-Zn occurrences indicating this component most likely represents a mineralization signal. Conversely positive PC2, with high loadings in Rb, Cr, Sc, V, K and Ti, can be linked to areas mapped as felsic intrusion. Regression analysis of selected metals against the relevant principal component(s) effectively subdues the influence of lithological variation while preserving responses related to known occurrences. In filtering the lithological control, responses in these elements are enhanced elsewhere in the map area and represent new exploration targets.

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 (14 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 principal components residuals.

Target deposit type	Other deposit types	Mn	Fe	Co	Ni	Cu	Mo	Zn	Pb	Ag	Au ¹	As	Ba	Cd	Sn	Sb	Te	Hg	Tl	Bi	W ¹	
Polymetallic Ag-Pb-Zn	SEDEX; MVT; VMS; Pb-Zn skarn; Au-Ag epithermal							1	3	4			2									-2
SEDEX Zn-Pb-Ag	MVT; VMS; Pb-Zn skarn; Polymetallic Ag-Pb-Zn							4	4	1			2	1								-2
Intrusion-related Au	Carlin-style Au							-2	-2	4						2						2
Carlin-style Au	Intrusion-related Au							-2	-2	3	4			-2	2							2
Cu skarn	Porphyry Mo; Porphyry Cu					5	2			1	1											1
W skarn	Intrusion-related Au						1								1							2

¹Polymetallic Ag-Pb-Zn type includes vein and manto styles; SEDEX = sedimentary exhalative; MVT = Mississippi Valley-Type Zn-Pb; VMS = volcanogenic massive sulphide
²Raw data following a log₁₀ transformation.

LEGEND

- Town
 - Mineral Occurrence
 - Road
 - Contour
 - River
 - Water Body
 - Wetland
 - Sample_Location
 - Catchment > 14km²
- Weighted sums model (PC residuals)**
- Intrusion-related Au 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 Intrusion-related Au deposits using principal component residuals. In: Enhanced interpretation of stream sediment geochemical data for NTS map sheet 105M, Yukon Geological Survey, Open File 2016-27, scale 1:250 000, sheet 3 of 6.

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>.

REFERENCES

Friskie, P.W.B. and Hornbrook, E.H.W., 1989. National Geochemical Reconnaissance stream sediment and water geochemical data, central Yukon (105M). Geological Survey of Canada, Open File 1962.

Heberlein, D.R., 2013. Enhanced interpretation of RGS data using catchment basin analysis and weighted sums modeling: examples from map sheets NTS 105M, 105O and part of 105P. Yukon Geological Survey, Open File 2013-16.

Jackman, W., 2012. Regional Stream Sediment Geochemical Data, Mayo Area, central Yukon (NTS 105M). Yukon Geological Survey, Open File 2012-8.

Mackie, R., Arne, D. and Brown, O., 2015. Enhanced interpretation of regional stream sediment (RGS) geochemical data 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.

Yukon Geological Survey
Energy, Mines and Resources
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Weighted sums model for Intrusion-related Au deposits using principal component residuals (NTS 105M) Sheet 3 of 6

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