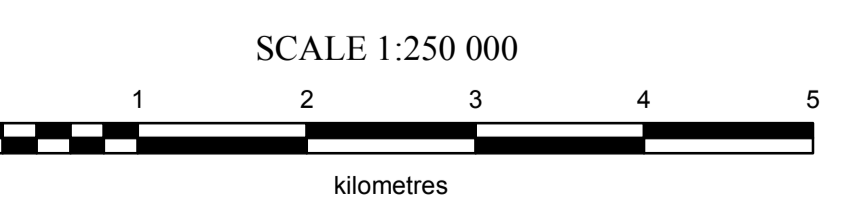


1:250 000-scale topographic base data produced by CENTRE FOR TOPOGRAPHIC INFORMATION, NATURAL RESOURCES CANADA. Copyright Her Majesty the Queen in Right of Canada. ONE THOUSAND METRE GRID. Universal Transverse Mercator Projection. North American Datum 1983. Zone 9. CONTOUR INTERVAL 100 FEET. Elevations in metres above Mean Sea Level.

**Intrusion-related Au Weighted sums model (Principal Component Residuals) Sheet 3 of 7**



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

106C NADALEEN RIVER	106B BONNET PLUME LAKE	106A MOUNT EDWIN
105N LANSING RANGE	<b>THIS MAP</b> 105O	<b>THIS MAP</b> 105P
105K TAY RIVER	105J SHELDON LAKE	105I LITTLE NAHANNI 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 Nidderly Lake area (NTS 1050) were collected at a reconnaissance scale in 1990 under the direction of the Geological Survey of Canada (GSC) as part of the Canada-Yukon Economic Programming Agreement (Friskie *et al.*, 1991). Field descriptions and initial geochemical data for 957 sites were released in GSC Open File 2364. New geochemical data from the re-analysis of archive sample material were subsequently released in Yukon Geological Survey (YGS) Open File 2011-30 (Jackaman, 2011). 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 are known to occur in the Nidderly Lake area as listed in Table 1 (Yukon MINFILE, 2015). The most significant deposits are classed as sedimentary exhalative (Tom and Jason deposits), W skarn (Macung Deposit) and polymetallic Ag-Pb-Zn veins (Inca Deposit). Other types of mineralization include intrusion-related Au (Nidderly and LM prospects), Carlin-type and unclassified Au (Limey Ridge and Oro Main prospects), Mississippi Valley-Type Pb-Zn (Odd prospect) and Cu skarn (Horn and Mehtabel prospects).

**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, while the other uses residuals calculated from regression

against selected principal components. 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. The principal component (PC1) accounts for ~50% of the total geochemical variation. Positive PC1, with high loadings in Fe, Li, Co, Al, Pb, Bi, Th, Cr, Mg, Na and Sc, shows a spatial distribution that matches the distribution of Hyland Group sedimentary rocks and thus is interpreted to represent lithological control. This grouping of elements is similar to that linked with the Hyland Group in other areas. Similarly negative PC1, with high loadings in Cd, Ag, Mo, Ti, Hg, Se, Ba and Sb, can be related to Road River and Earn group sedimentary rocks. The second component shows high positive loadings in Ni, Zn, U and Cu; and high negative loadings in Ca, Rb, Ce, La, F, Tl and K. Respectively, these element groupings can be related to Earn Group sedimentary rocks and felsic intrusions. 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 km<sup>2</sup>). Catchments that cover larger areas (indicated on the map by 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 <sup>1</sup>	As	Ba	Cd	Sn <sup>1</sup>	Sb	Te	Hg	Tl	Bi	W <sup>1</sup>		
Polymetallic Ag-Pb-Zn	SEDEX; MVT; VMS; Pb-Zn skarn; Au-Ag epithermal					1	3	4	2			1				1		-2					
SEDEX Zn-Pb-Ag	MVT; VMS; Pb-Zn skarn; Polymetallic Ag-Pb-Zn					3	4	2			1	1						2	1			-2	
Intrusion-related Au	Carlin-style Au									4	3					2						1	1
Carlin-style Au	Intrusion-related Au							-2	3	4					-1	2		2	1			-1	
Porphyry Mo	Cu skarn; Porphyry Cu					2	4															2	1
Cu skarn	Porphyry Mo; Porphyry Cu					4	2			2	2	1										1	1
W skarn	Intrusion-related Au					1							2		1							2	4

<sup>1</sup> Polymetallic Ag-Pb-Zn type includes vein and mantle styles; SEDEX = sedimentary exhalative; MVT = Mississippi Valley-Type Zn-Pb; VMS = volcanogenic massive sulphide  
<sup>2</sup> Raw data following a log<sub>10</sub> transformation.

**LEGEND**

**Weighted sums model (PC residuals)**

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

Town  
 Mineral Occurrence  
 Road  
 Contour  
 River  
 Water Body  
 Wetland  
 Sample Location  
 Catchment > 14km<sup>2</sup>

**RECOMMENDED CITATION**

MACKIE, R., ARNE, D. AND PENNIPFED, C., 2016. Weighted sums model for Intrusion-related Au using principal component residuals. In: Enhanced interpretation of stream sediment geochemical data for NTS map sheet 1050 and 105P, Yukon Geological Survey, Open File 2016-28, scale 1:250 000, sheet 3 of 7.

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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Yukon Geological Survey  
Energy, Mines and Resources  
Government of Yukon

Open File 2016-28

**Weighted sums model for Intrusion-related Au using principal component residuals (NTS 1050 and 105P) Sheet 3 of 7**

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