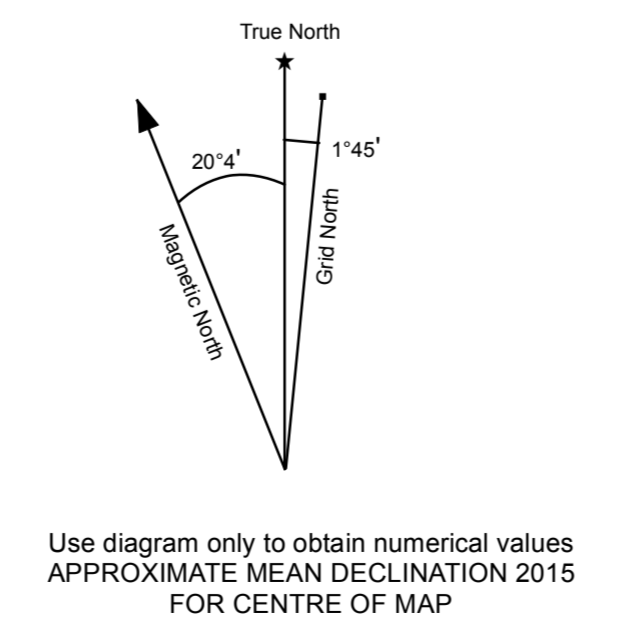
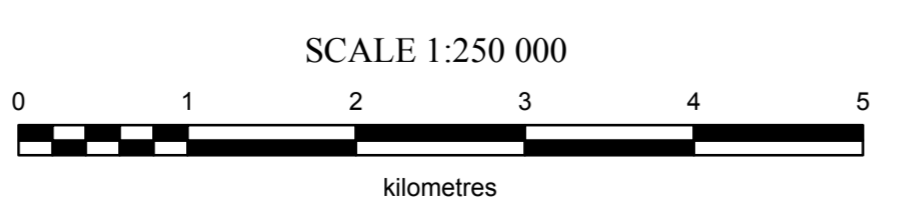


**Orogenic Au deposits  
Weighted sums model  
(Geology Levelled)  
Sheet 4 of 13**



**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 Klunene Lake area (NTS 115F and part of 115G) were collected at a reconnaissance scale in 1980 as part of the Canada-Yukon Mineral Resource Development Cooperation Agreement (Geological Survey of Canada, 1987). Field descriptions and initial geochemical data for 1005 sites were released in Geological Survey of Canada (GSC) Open File 1362. New geochemical data from the re-analysis of archive sample material from 699 sites were released in Yukon Geological Survey (YGS) Open File 2012-15 (Jackman, 2015). The discrepancy in number of sites between the two releases is because samples that occur within present limits of protected areas were not re-analyzed. 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 Klunene Lake area as shown in Table 1 (Yukon MINFILE, 2015). The most significant deposits are classified as Cu-Ni-PGE (Wellgreen and Canalsak deposits), Cu-Mo porphyry (Rockslide and Raft prospects), Cu skarn (Arm and Az prospects), and quartz vein Au (Berdah prospect). The adjacent map area to the east (Ashihik Lake) contains several quartz vein-related Au occurrences (Morn, Shut and Lib prospects) that form a trend that projects towards the southeast corner of the Klunene map area supporting the prospectivity of the region for this type 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.

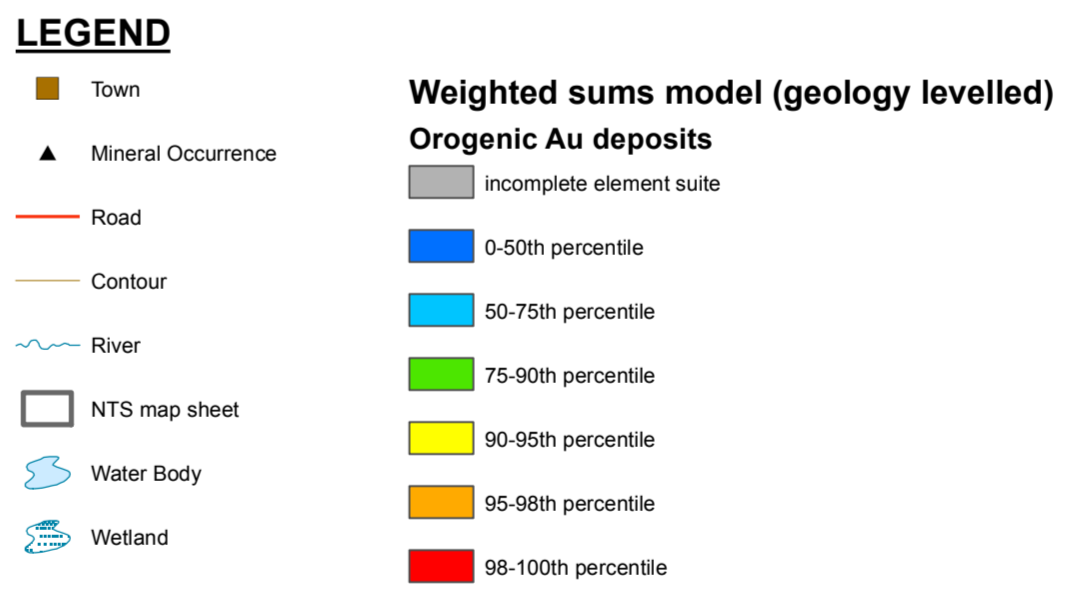
Exploratory data analysis using both raw element data and principal components indicate that the distribution of many commodity and pathfinder elements is strongly influenced by lithological variation. Additionally, there is evidence of scavenging of metals ions by secondary Fe- and Mn-oxides/hydroxides, clays, and/or organic material. The first principal component accounts for ~32% of the total geochemical variation and shows high positive loadings for Co, Mg, Ni and Cr, and high negative loadings for Bi, Pb, U, La, Cd, Y, Th, Ag and Zn. Respectively, these groupings form spatial patterns that match the distribution of mafic-ultramafic intrusions and felsic intrusions. The second principal component shows negative loadings for Hg, Mo, LOI, Cd, Sb and Cu, and, using LOI as a proxy for carbon, is suggestive of scavenging by organic material. This interpretation is supported by the fact that the map pattern of inverse PC2 coincides with low-lying regions where accumulation of organic material and/or clay is likely. Regression analysis of selected metals against the relevant principal component(s) effectively filters these 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. 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 km<sup>2</sup>). 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' will 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 data levelled by dominant mapped geology.**

Target Deposit Type*	Other Deposit Types*	Mn	Fe	Co	Ni	Cu	Mo	Zn	Pb	Ag	Au	As	Ba	Cd	Sb	Te	Hg	Tl	Bi	W
Porphyry Cu-Mo	Cu skarn; Porphyry Mo				2	5	3		1	1	1	1	1							
Polymetallic Ag-Pb-Zn	SEDEX, VMS, Pb-Zn skarn; Epithermal Au-Ag				2	4	3	1	1	1	1	1	1	1	1	1				1
Magmatic Ni-Cu-PGE					2	4	3	1	1	1	1	1	1	1	1	1				
Epithermal Au-Ag	Orogenic Au; Intrusion-related Au				2	4	3	2								1	1			
Orogenic Au	Intrusion-related Au, Epithermal Au-Ag				2			2	4	3	1					2				1
Hydromorphic Anomaly					3	4	2		1	1	1									

\*Polymetallic Ag-Pb-Zn type includes vein and matrix styles; SEDEX = sedimentary exhalative Pb-Zn (Ag); VMS = volcanic-hosted/associated massive sulfide deposits  
\*Raw data following a log<sub>e</sub> transformation  
\*Residual from regression against loss-on-ignition



**REFERENCES**

Geological Survey of Canada, 1987. Regional Stream Sediment and Water Geochemical Reconnaissance Data, Yukon (115F & 115G). Geological Survey of Canada, Open File 1362.

Jackman, W., 2012. Regional Stream Sediment Geochemical Data, Klunene Lake Area, southwest Yukon (NTS 115F and 115G). Yukon Geological Survey, Open File 2012-15.

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](http://www.data.geology.gov.yk.ca), accessed May 2015.

**Table 1: List of Mineral Occurrences for NTS map sheet 115F and 115G (Yukon MINFILE, 2015)**

Number	Name	Type	Status	Commodities
115F 030	SHARPE	Porphyry Cu-Mo-Au	Showing	Copper, Gold, Molybdenum, Silver
115F 031	CALLOPINS	Porphyry Cu-Mo-Au	Showing	Molybdenum
115F 032	ICE FIELD	Porphyry Mo (Low F-Type)	Showing	Copper, Molybdenum
115F 034	GARLIK	Porphyry Cu-Mo-Au	Prospect	Copper, Molybdenum, Platinum, Palladium, Gold
115F 038	HANNIKS	Unknown	Unknown	
115F 037	KOBERLIN	Unknown	Unknown	
115F 038	LIBERTY	Vein Cu-Ag Quartz	Showing	Copper, Gold, Lead
115F 039	GLASCOW	Unknown	Anomaly	
115F 041	CATS AND DOGS	Ultramafic Mafic Gabbro Cu-Ni-PGE	Showing	Copper, Gold, Nickel, Palladium, Platinum
115F 042	MEMCO	Skarn Cu	Showing	Copper
115F 043	POWANADLE	Ultramafic Mafic Gabbro Cu-Ni-PGE	Drilled Prospect	Copper, Nickel
115F 044	SEVENSMA	Ultramafic Mafic Gabbro Cu-Ni-PGE	Anomaly	
115F 045	CANALASK	Ultramafic Mafic Gabbro Cu-Ni-PGE	Drill	Cobalt, Platinum, Palladium, Nickel, Molybdenum, Copper
115F 047	EPIC	Ultramafic Mafic Gabbro Cu-Ni-PGE	Prospect	Cobalt, Molybdenum, Nickel, Palladium, Platinum, Copper
115F 048	ARM	Skarn Cu	Drilled Prospect	Copper, Gold
115F 049	SANPETE	Skarn Cu	Prospect	Copper
115F 050	MEMDAY	Skarn Cu	Prospect	Wollastonite
115F 051	RAI	Skarn Cu	Drilled Prospect	Copper, Gold, Silver
115F 052	MEMOR	Coal	Showing	Coal
115F 054	MEMOR	Coal	Showing	Coal
115F 055	MELELAN	Coal	Showing	Coal
115F 056	RABBIT	Vein Cu-Ag Quartz	Drilled Prospect	Copper, Silver
115F 057	LEP	Skarn Cu	Drilled Prospect	Copper, Silver, Zinc
115F 058	WHITE RIVER	Ultramafic Mafic Gabbro Cu-Ni-PGE	Drilled Prospect	Copper, Silver
115F 059	SHARE	Volcanogenic Sulfide - type not determined	Drilled Prospect	Copper
115F 061	KLETSAN	Vein Cu-Ag Quartz	Showing	Copper
115F 067	CANYON MOUNTAIN	Porphyry Cu-Mo-Au	Showing	Copper, Gold
115F 063	WYESTER	Vein Polymetallic Ag-Pb-Zn-Au	Anomaly	Arsenic, Gold, Silver, Zinc, Lead, Copper
115F 063	HAWLAY	Unknown	Anomaly	Gold
115F 061	ME FALLINE	Sediment hosted bedded Gypsum	Anomaly	Copper, Gypsum
115F 062	STONE	Coal	Prospect	Coal
115F 063	COMBON	Ultramafic Mafic Gabbro Cu-Ni-PGE	Prospect	Cobalt, Nickel, Platinum, Zinc, Copper, Gold
115F 064	MALLER	Porphyry Cu-Mo-Au	Anomaly	Molybdenum
115F 065	DICKSON	Ultramafic Mafic Gabbro Cu-Ni-PGE	Prospect	Copper, Nickel, Platinum, Gold
115F 066	DESTRUCTION	Ultramafic Mafic Gabbro Cu-Ni-PGE	Prospect	Cobalt, Nickel, Platinum, Copper
115F 067	COOPER JOE	Unknown	Unknown	
115F 068	BORRILL	Ultramafic Mafic Gabbro Cu-Ni-PGE	Unknown	
115F 069	WINDGAP	Coal	Prospect	Coal
115F 070	DUKE	Ultramafic-hosted asbestos	Showing	Asbestos, Silver, Gold
115F 071	HOGE	Coal	Prospect	Fluor Carbon
115F 072	AMPHITHEATRE	Coal	Showing	Coal
115F 073	WAKE	Ultramafic Mafic Gabbro Cu-Ni-PGE	Prospect	Copper, Gold, Silver
115F 074	AMP	Porphyry Cu-Mo-Au	Anomaly	Copper
115F 075	ROCK	Porphyry Cu-Mo-Au	Drilled Prospect	Copper, Molybdenum
115F 076	GLEEN	Ultramafic Mafic Gabbro Cu-Ni-PGE	Drilled Prospect	Copper, Nickel, Gold
115F 077	BURWASH	Volcanogenic Massive Sulfide (VMS) Beach Cu Zn	Drilled Prospect	Gold, Zinc, Silver
115F 078	LICHLIDT	Ultramafic Mafic Gabbro Cu-Ni-PGE	Drilled Prospect	Copper, Gold, Silver
115F 079	VAG	Unknown	Unknown	
115F 081	DULE	Ultramafic Mafic Gabbro Cu-Ni-PGE	Drilled Prospect	Copper
115F 082	VERSLIDGE	Ultramafic Mafic Gabbro Cu-Ni-PGE	Drilled Prospect	Copper
115F 083	CALLINAN	Unknown	Unknown	
115F 024	WELLGREEN	Ultramafic Mafic Gabbro Cu-Ni-PGE	Deposit	Copper, Osmium, Cobalt, Ruthenium, Rhodium, Platinum, Palladium, Nickel, Indium, Gold
115F 025	ARWAYS	Ultramafic Mafic Gabbro Cu-Ni-PGE	Drilled Prospect	Copper, Nickel, Platinum, Palladium, Gold
115F 026	MEKREITER	Ultramafic Mafic Gabbro Cu-Ni-PGE	Showing	Copper, Nickel, Platinum, Palladium, Gold
115F 027	SWIDE JOHNSON	Ultramafic Mafic Gabbro Cu-Ni-PGE	Showing	Copper, Nickel, Platinum, Palladium, Gold
115F 028	CEMENT	Coal	Showing	Coal
115F 029	ST. ELIAS	Vein Mo	Showing	Molybdenum
115F 033	SEXSMITH	Ultramafic Mafic Gabbro Cu-Ni-PGE	Drilled Prospect	Copper, Platinum, Gold
115F 035	NOX	Unknown	Anomaly	
115F 052	BOITARD	Unknown	Anomaly	
115F 062	DONKLE	Skarn W	Showing	Tungsten
115F 063	ELEVEN THIRTY	Skarn W	Showing	Tungsten
115F 064	KENNEDY	Skarn W	Showing	Tungsten
115F 065	TINUP	Ultramafic-hosted asbestos	Drilled Prospect	Asbestos
115F 066	NUNATAEA	Ultramafic-hosted asbestos	Anomaly	Asbestos
115F 067	DOOPACK	Unknown	Anomaly	
115F 068	BRICKS	Skarn Mo	Showing	Molybdenum
115F 069	TALBOT	Porphyry Cu-Mo-Au	Showing	Copper
115F 070	RAFT	Porphyry Cu-Mo-Au	Drilled Prospect	Copper, Molybdenum, Tungsten
115F 071	ROCKSLIDE	Porphyry Cu-Mo-Au	Drilled Prospect	Copper, Molybdenum, Tungsten
115F 072	NORTH STAR	Porphyry Mo (Low F-Type)	Anomaly	
115F 073	BED	Porphyry Mo (Low F-Type)	Anomaly	
115F 074	ALASKITE	Porphyry Mo (Low F-Type)	Anomaly	Copper, Molybdenum
115F 075	TRINELL	Porphyry Cu-Mo-Au	Anomaly	
115F 076	DWARF	Porphyry Mo (Low F-Type)	Showing	Copper, Molybdenum
115F 077	BIRCH	Skarn Cu	Showing	Copper, Molybdenum
115F 078	BRUMMER	Unknown	Showing	Copper, Zinc
115F 079	RHYOLITE	Porphyry Cu-Mo-Au	Drilled Prospect	Copper, Molybdenum
115F 080	NICK	Ultramafic Mafic Gabbro Cu-Ni-PGE	Showing	Nickel
115F 081	EASTER	Unknown	Unknown	
115F 082	ALTE	Unknown	Unknown	
115F 083	CULUS	Unknown	Unknown	
115F 084	BOCK	Ultramafic Mafic Gabbro Cu-Ni-PGE	Showing	Cobalt, Gypsum, Copper, Nickel, Platinum, Palladium
115F 085	MAPLE	Sediment hosted bedded Gypsum	Showing	Gypsum
115F 086	COYSLAR	Sediment hosted bedded Gypsum	Showing	Gypsum
115F 088	LYNX CREEK	Unknown	Anomaly	
115F 089	FREIBERG	Volcanogenic Massive Sulfide (VMS) Kurat Cu-Pb-Zn	Showing	Copper
115F 090	ROBERTSON	Unknown	Anomaly	
115F 091	ELIAS	Unknown	Anomaly	
115F 092	BEZDEK	Paleosol	Anomaly	
115F 094	LINDA	Ultramafic Mafic Alaskan-type P14/Cs+Rb+K	Drilled Prospect	Cobalt, Gold, Copper, Indium, Ruthenium, Rhodium, Platinum, Palladium, Osmium, Nickel
115F 095	ARBY	Unknown	Unknown	
115F 096	HUDYK	Unknown	Unknown	
115F 097	LONTH	Unknown	Anomaly	
115F 098	TONY	Ultramafic Mafic Alaskan-type P14/Cs+Rb+K	Showing	Copper, Nickel, Platinum
115F 099	KILLANE	Unknown	Showing	Copper, Platinum, Nickel, Palladium
115F 100	WASH	Ultramafic Mafic Alaskan-type P14/Cs+Rb+K	Drilled Prospect	Copper, Platinum, Palladium, Nickel
115F 101	TAL	Unknown	Unknown	
115F 102	TREMBLAY	Vein Cu-Ag Quartz	Unknown	Copper, Silver, Gold
115F 104	JURJ	Unknown	Anomaly	
115F 105	COFER	Unknown	Unknown	
115F 106	BERDAM	Vein Au Quartz	Prospect	Gold
115F 107	LAKE	Unknown	Unknown	

**RECOMMENDED CITATION**

MACKIE, R., ARNE, D. AND PENNIMPED, C., 2016. Weighted sums model for Orogenic Au deposits levelled by geology. In: Enhanced Interpretation of stream sediment geochemical data for NTS 115F and 115G. Yukon Geological Survey, Open File 2016-13, 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 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](mailto: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>.

Yukon Geological Survey  
Energy, Mines and Resources  
Government of Yukon

Open File 2016-13

**Weighted sums model for Orogenic Au deposits  
levelled by mapped geology (NTS 115F and 115G)  
Sheet 4 of 13**

by  
Rob Mackie, Dennis Arne,  
and Chris Pennimped