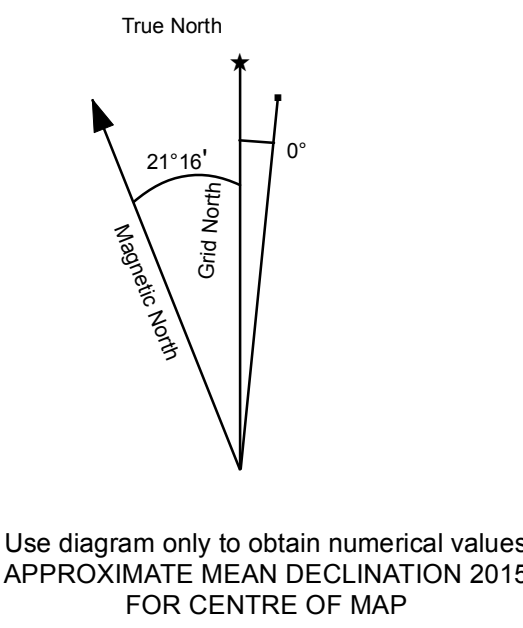
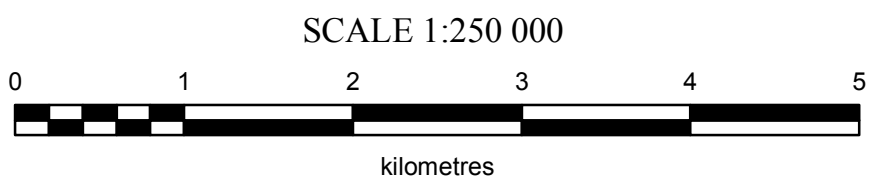


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Zone 9  
CONTOUR INTERVAL 100 FEET  
Elevations in metres above Mean Sea Level

### Hydromorphic Anomaly Weighted sums model (Geology Levelled) Sheet 2 of 17



108N LANSING RANGE	109D NODDERY LAKE	109P SENIOR MOUNTAIN
108K TAY RIVER	109J THIS MAP	109I THIS MAP
108F QUIET LAKE	109G FRANZOSIN LAKE	109H FRANCES LAKE

## 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 Little Nahanni River (105I) and Sheldon Lake (105J) map areas were collected and analyzed in several stages. The Little Nahanni River map area (105I) was sampled at reconnaissance-scale in 1981 (Goodfellow, 1982). Field descriptions and initial geochemical data for 984 sites were released by in Geological Survey of Canada ("GSC") Open File 868. Archived sample materials from this survey were re-analyzed in two subsequent projects as outlined by Friske *et al.* (1999) and McCurdy *et al.* (2009). Only samples located within Yukon are included in the current assessment. The Sheldon Lake map area (105J) was sampled in 1989 (Hornbrook *et al.*, 1990). Field descriptions and initial geochemical data for 886 samples were released in GSC Open File 2173. The re-analysis of archive sample materials is described by Friske *et al.* (2008) in GSC Open File 5694 and Yukon Geological Survey ("YGS") Open File 2008-4. The reader is referred to these open files for detailed descriptions of sampling techniques, analytical procedures, and quality control measures.

## MINERAL OCCURRENCES

A variety of base and precious-metal mineralization deposit types are known to occur in the region as shown in Table 1 (Yukon MINFILE, 2015). Five main deposit types occur within the study area including sedimentary exhalative Pb-Zn (Howards Pass and Anniv deposits), Pb-Zn skarn (Riddell, Hench and Nar prospects), W skarn (Dragon and Clea prospects), Polymetallic Ag-Pb-Zn veins (Norken and Nom prospects), and Cu-Ag veins (Pike Deposit). The Tom and Jason Pb-Zn SEDEX and Mactung W skarn deposits occur in the adjacent map area to the north, further supporting the prospectivity of the region for these types of deposits.

## WEIGHTED SUMS MODELING

As described in the report accompanying this map (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. Weighted sums models (WSM) have been generated using the processed data. Importance rankings used in the WSM for a variety of deposit types are summarized in Table 2. Each model is optimized for a specific deposit type however multiple deposit types may be represented in a given model due to similarities in elemental abundances and associations.

Exploratory data analysis of both raw element data and principal components shows that lithological variation has a strong influence on the distribution of many commodity and pathfinder elements. The first principal component, accounting for 30% of the total variation, shows high positive loadings for Cd, Mo, Ag, Hg, Sb, Ba, Zn and V, and matches the distribution of Road River Group sedimentary rocks that include shale horizons that are likely to be elevated in these metals. The second principal component shows high positive loadings in Ni, As, Zn, Co and Cu, and corresponds to regions of clastic sedimentary rocks of the Earn and Hyland groups. The Hyland Group rocks are also associated with elevated Mn and Fe as indicated by the element groupings in the third principal component. Regression analysis of these metals against the relevant principal component effectively filters the lithological control while preserving, and in some cases enhancing, responses related to know occurrences.

For certain pathfinder elements (e.g., Cd, Mo and Ag), leveling by dominant mapped geology has a more subdued effect on filtering the interpreted lithological control. In order to reduce this effect in the WSM, these elements were given lower importance rankings, or in some cases were omitted. Strong responses for Zn and Pb related to SEDEX mineralization prevented using these elements as pathfinders for other deposit types. In fact, to subdue the contributions related to this style of mineralization, Pb and Zn were given negative importance rankings for other deposit styles. In the case of the WSM for porphyry copper using data levelled by mapped geology, a negative importance was assigned to Zn to minimize responses related to remaining lithological effects.

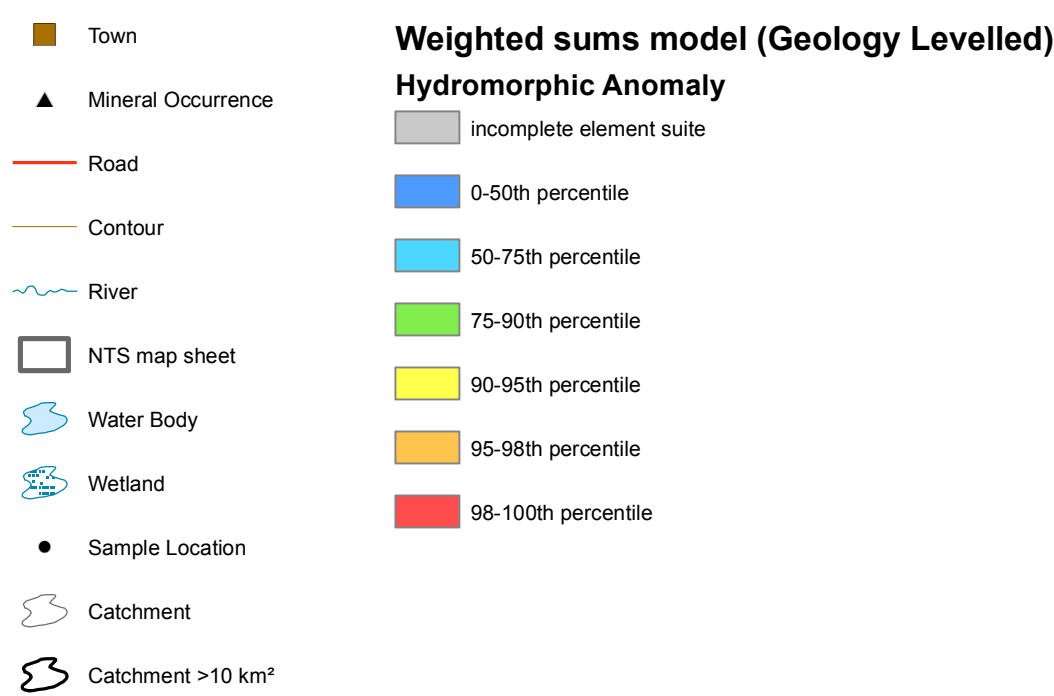
The effectiveness of historical sampling coverage has been assessed empirically using graphs of WSMs plotted against catchment surface area to determine the ideal maximum catchment size (10 km<sup>2</sup>). Catchments that cover larger areas (shown on the map with bold outlines) are interpreted to have been under-sampled and thus require further sampling to properly evaluate the area for geochemical anomalism. Given the likelihood that a mineralization 'signal' would be progressively diluted with increasing catchment size, marginally high WSM scores for samples with large catchments may also be significant.

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

Target Deposit Type <sup>a</sup>	Other Deposit Types <sup>a</sup>	Mn	Fe	Co	Ni	Cu	Mo	Zn	Pb	Ag	Au	As	Ba	Cd	Sn	Sb	Te	Hg	Ti	Bi	W
Polymetallic Ag-Pb-Zn	SEDEX (high Ag); VMS					2	3	3	4		1	1	1	1	1	1	1	1	1	1	1
SEDEX Pb-Zn	Pb-Zn skarn; VMS; Polymetallic Ag-Pb-Zn					-2	3	4					2	2	1	-1	1	1	1	-3	
Sediment-hosted Ni-Mo-Zn					4	2	1														
Intrusion-related Au	Epithermal Au-Ag				-1	-1		4	2							1	1	1	1	1	1
Epithermal Au-Ag	Intrusion-related Au				-1	-1		3	4	1						1	3	1	1	1	1
Porphyry Cu-Mo	Cu-Au porphyry; Cu skarn; Mo porphyry				4	2	-2	1	1												
W skarn							-1	-1	-1										2	3	
Hydromorphic Anomaly		4	4	4							4	2									

<sup>a</sup> Polymetallic Ag-Pb-Zn type includes both vein and manto styles; VMS = volcanic hosted/associated massive sulphide; SEDEX = sedimentary exhalative  
<sup>a</sup> Au data are not levelled by dominant geology, instead log<sub>10</sub> transformed raw data are used.

## LEGEND



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- Friske, P.W.B., Hornbrook, E.H.W., McCurdy, M.W., Day, S.J.A., McNeill, R.J., Lynch, J.J., Durham, C.C., Gross, H. and Galletta, A.C., 2008. Regional stream sediment and water geochemical data, Sheldon Lake area, east-central Yukon (NTS 105J). Geological Survey of Canada, Open File 5694, Yukon Geological Survey, Open File 2008-4.
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Number	Names	Type	Status	Commodities
109 004	NAR	Skarn Pb-Zn	Drilled Prospect	Copper, Silver, Tungsten
109 006	CLEA	Skarn W	Drilled Prospect	Copper, Tungsten
109 007	BIRR	Skarn Cu	Showing	Barite, Copper
109 008	NOM	Vein Polymetallic Ag-Pb-Zn-Au	Drilled Prospect	Copper, Silver, Gold
109 012	XY DEPOSITS	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Deposit	Zinc, Lead
109 020	SUMMIT	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Anomaly	Lead
109 032	HP DEPOSIT	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Deposit	Zinc, Lead, Silver, Vanadium
109 037	ANNIV DEPOSITS	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Deposit	Copper, Cadmium, Nickel
109 038	ABSEY	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Drilled Prospect	Lead, Zinc, Silver
109 040	VINKIE	Unknown	Drilled Prospect	Lead, Zinc
109 041	NESS	Unknown	Anomaly	Lead, Zinc, Nickel
109 042	GAL	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Anomaly	Copper, Zinc, Lead
109 043	DIANNE	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Showing	Barite, Copper, Zinc
109 044	TAM	Sediment hosted Shale-Hosted Ni-Zn-Mo-PGE (Nick)	Anomaly	Copper, Nickel, Silver, Zinc
109 045	OP DEPOSITS	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Deposit	Zinc, Lead
109 046	ROCK	Skarn W	Showing	Copper, Tungsten, Zinc
109 052	BILL	Vein Polymetallic Ag-Pb-Zn-Au	Showing	Copper, Lead, Zinc, Silver
109 053	PIKE	Vein Cu-Ag-Quartz	Deposit	Silver, Copper, Zinc, Gold, Lead
109 054	NORKEN	Vein Polymetallic Ag-Pb-Zn-Au	Drilled Prospect	Copper, Zinc, Lead, Silver
109 056	TAC	Porphyry Mo (Low F-Type)	Anomaly	Copper, Molybdenum
109 057	DRAGON	Skarn W	Drilled Prospect	Arsenic, Copper, Tungsten, Lead, Silver, Gold
109 058	MT SHELTON	Unknown	Showing	Arsenic, Gold, Silver, Tungsten, Tin, Tellurium, Bismuth, Copper
109 059	RIDDELL	Skarn Pb-Zn	Drilled Prospect	Copper, Gold, Silver, Zinc, Lead
109 060	SPEARHEAD	Vein Polymetallic Ag-Pb-Zn-Au	Showing	Copper, Gold, Silver, Zinc, Lead
109 061	IVOR	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Prospect	Copper, Gold, Silver, Zinc
109 062	ROG	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Drilled Prospect	Zinc
109 063	CL VOE	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Prospect	Copper, Zinc, Tungsten, Lead
109 064	PREVOST	Skarn W	Prospect	Tungsten
109 065	GUN	Skarn Pb-Zn	Showing	Barite, Zinc, Copper
109 066	TSI	Manto & Stockwork Sn	Drilled Prospect	Copper, Lead, Tin, Tungsten, Zinc, Silver, Gold
109 067	COSTIN	Vein Polymetallic Ag-Pb-Zn-Au	Showing	Gold, Zinc, Lead, Silver
109 068	CAROLYN	Coal	Unknown	Coal
109 069	VARISCITE	Skarn Cu	Showing	Copper
109 070	RICH	Unknown	Anomaly	Barite, Zinc, Copper, Lead
109 071	PETE	Sediment hosted Stratiform Barite	Drilled Prospect	Barite, Lead, Zinc
109 072	COCO	Sediment hosted Stratiform Barite	Showing	Barite
109 073	ST GODARD	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Showing	Barite
109 074	HENCH	Skarn Pb-Zn	Drilled Prospect	Copper, Silver, Zinc, Lead
109 075	MARYLOU	Skarn Pb-Zn	Prospect	Copper, Silver, Tungsten, Zinc, Lead, Molybdenum
109 076	FORTIN	Unknown	Gold	Copper, Gold, Lead, Molybdenum, Silver, Zinc
109 077	SASK	Skarn Mo	Showing	Copper, Gold, Lead, Molybdenum, Silver, Zinc
109 078	GULF	Skarn W	Showing	Copper, Tungsten
109 079	FLOOD	Epithermal Au-Ag Low Sulphidation	Anomaly	Gold, Silver
109 080	WENDY	Vein Au-Quartz	Showing	Arsenic, Gold, Silver
109 081	NARL	Skarn Pb-Zn	Showing	Copper, Lead, Zinc
109 082	VG	Vein Au-Quartz	Showing	Gold, Silver
109 083	RITZ	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Drilled Prospect	Gold, Silver
109 084	FULLER	Unknown	Anomaly	
109 085	MAKOO	Unknown	Anomaly	
109 086	DYAK	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Anomaly	
109 087	CANOL	Unknown	Anomaly	
109 088	CANDY	Unknown	Anomaly	
109 089	PIKE	Unknown	Unknown	
109 090	BRODEL	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Deposit	Zinc, Lead
109 091	HC DEPOSITS	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Deposit	Zinc, Lead
109 092	DON DEPOSITS	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Deposit	Zinc, Lead
109 093	PELLY NORTH	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Deposit	Zinc, Lead
109 094	ORO	Sediment hosted Stratiform Barite	Drilled Prospect	Barite, Zinc, Lead
109 095	DORITA	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Anomaly	Copper, Zinc, Lead
109 096	GREGG	Unknown	Anomaly	
109 097	TULLY	Unknown	Unknown	
109 098	DG TIMBER	Unknown	Anomaly	
109 099	MACRAE	Unknown	Anomaly	
109 100	BOJO	Unknown	Anomaly	
109 101	THACKASSO	Unknown	Anomaly	
109 102	BLACK GANT	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Anomaly	

## RECOMMENDED CITATION

MACKIE, R., ARNE, D. AND PENNIMPEDE, C., 2015. Weighted sums model for Hydromorphic Anomaly levelled by geology. In: Enhanced interpretation of stream sediment geochemical data for NTS map sheet 105I and 105J. Yukon Geological Survey, Open File 2015-31, scale 1:250 000, sheet 2 of 17.

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](mailto: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.geology.gov.yk.ca>.

Yukon Geological Survey  
Energy, Mines and Resources  
Government of Yukon

Open File 2015-31

## Weighted sums model for Hydromorphic Anomaly levelled by mapped geology (NTS 105I and 105J) Sheet 2 of 17

by

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