Yukon Geological Survey

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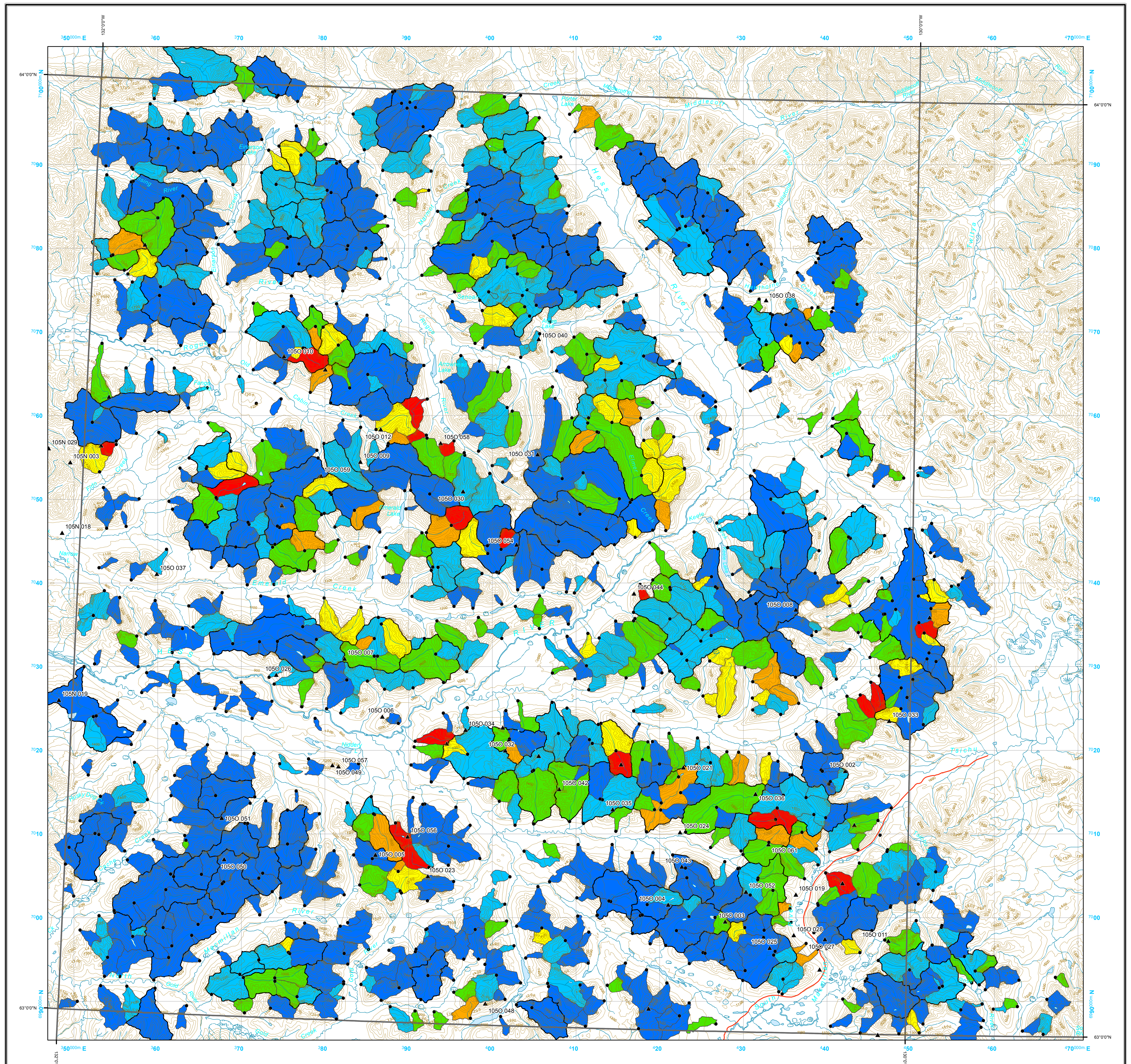
Yukon
Energy, Mines and Resources



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 Niddery Lake area (NTS 105O) 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 (Friske *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 Niddery 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 (Mactung Deposit) and polymetallic Ag-Pb-Zn veins (Inca Deposit). Other types of mineralization include intrusion-related Au (Niddery 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 Mehitabel 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 map areas. Similarly negative PC1, with high loadings in Cd, Ag, Mo, Tl, 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, Ti 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^2). 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 anomalism. 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 1: List of Mineral Occurrences for NTS map sheet 105O & 105P (Yukon MINFILE, 2015)

Number	Name	Type	Status	Commodities
105O 001	TOM	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Deposit	Lead, Zinc, Silver, Barium, Copper, Barite, Antimony
105O 002	MACTUNG	Skarn W	Deposit	Tungsten, Tungsten Trioxide, Copper
105O 003	JEFF	Porphyry Mo (Low F-Type)	Showing	Molybdenum
105O 004	ALP	Vein Au-Quartz	Showing	Gold, Silver
105O 005	NIDDERY	Plutonic Related Au	Prospect	Barite, Cadmium, Copper, Gold, Nickel, Silver
105O 006	SCOT	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Drilled Prospect	Copper, Zinc, Nickel, Silver
105O 007	CYNTHIA	Vein Au-Quartz	Prospect	Antimony, Arsenic, Silver, Gold, Lead, Bismuth, Copper
105O 008	KEELE	Porphyry Mo (Low F-Type)	Showing	Molybdenum
105O 009	EMERALD	Porphyry-related Au	Showing	Bismuth, Copper, Gold, Molybdenum, Silver, Tungsten
105O 010	HORN	Skarn Cu	Prospect	Copper, Gold
105O 011	BEN	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Showing	Lead, Zinc
105O 012	ARROWHEAD	Vein Polymetallic Ag-Pb-Zn±Au	Showing	Copper, Lead, Zinc
105O 013	RACICOT	Sediment hosted Stratiform Barite	Deposit	Barite, Zinc
105O 015	INCA	Vein Polymetallic Ag-Pb-Zn±Au	Past Producer	Silver, Zinc, Lead
105O 016	STANDARD	Vein Polymetallic Ag-Pb-Zn±Au	Showing	Lead, Silver, Zinc
105O 018	ODD	Sediment hosted Mississippi Valley-Type Pb-Zn (MVT)	Drilled Prospect	Lead, Silver, Zinc
105O 019	JASON	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Deposit	Lead, Zinc, Silver, Barite
105O 020	SAMOVAR	Sediment hosted Stratiform Barite	Deposit	Barite
105O 021	WALT	Sediment hosted Stratiform Barite	Deposit	Barite, Silver, Zinc, Copper, Lead
105O 022	TRYALA	Sediment hosted Stratiform Barite	Drilled Prospect	Barite, Lead, Silver, Zinc, Barium, Copper
105O 023	DRIZZLE	Sediment hosted Shale-Hosted Ni-Zn-Mo-PGE (Nick)	Showing	Barite, Lead, Nickel, Vanadium, Zinc, Molybdenum, Copper
105O 024	NIDD	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Drilled Prospect	Barite, Silver, Zinc
105O 025	BREMNER	Unknown	Drilled Prospect	Copper, Zinc, Lead
105O 026	DICKIE	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Unknown	Copper, Molybdenum, Zinc, Lead
105O 027	GARY	Sediment hosted Stratiform Barite	Deposit	Barite
105O 028	FETCH	Sediment hosted Stratiform Barite	Drilled Prospect	Barite, Zinc
105O 029	GOW	Sediment hosted Sedimentary Exhalative Zn-Pb-Ag (Sedex)	Showing	Barite, Thallium, Silver
105O 030	GRIZZ	Porphyry Mo (Low F-Type)	Showing	Gold, Silver, Tungsten, Molybdenum
105O 031	VAN ANGEREN	Porphyry Mo (Low F-Type)	Showing	Molybdenum
105O 032	ORO MAIN	Vein Au-Quartz	Drilled Prospect	Antimony, Zinc, Silver, Gold, Arsenic, Thallium
105O 033	KELVIN	Vein Polymetallic Ag-Pb-Zn±Au	Prospect	Antimony, Gold, Lead, Silver
105O 036	FAN	Unknown	Showing	Barite
105O 037	LONER	Vein Barite	Showing	Barium
105O 038	DUET	Unknown	Anomaly	Zinc
105O 039	OLD CABIN	Vein Polymetallic Ag-Pb-Zn±Au	Showing	Copper, Silver, Molybdenum, Lead, Gold
105O 040	URSA	Unknown	Anomaly	Copper
105O 041	FANGO	Vein Polymetallic Ag-Pb-Zn±Au	Prospect	Antimony, Zinc, Silver, Lead, Gold
105O 043	SIM	Skarn W	Showing	Lead, Zinc, Tungsten
105O 044	NUT	Skarn W	Showing	Copper, Silver, Tungsten, Zinc, Lead
105O 045	STROSHEIN	Sediment hosted Stratiform Barite	Showing	Barite, Gold, Silver, Arsenic, Thallium
105O 046	MINORCO	Sediment hosted Stratiform Barite	Showing	Barite
105O 048	NUKE	Vein Polymetallic Ag-Pb-Zn±Au	Showing	Antimony, Copper, Gold, Silver, Lead, Arsenic, Bismuth
105O 049	FAENZI	Vein Au-Quartz	Showing	Arsenic, Gold
105O 051	CACHE CREEK	Vein Au-Quartz	Drilled Prospect	Gold, Copper, Arsenic, Mercury, Antimony
105O 052	BAILES	Unknown	Unknown	Copper, Lead, Silver, Zinc, Gold
105O 054	ROGUE	Vein Polymetallic Ag-Pb-Zn±Au	Prospect	Gold, Zinc, Lead, Silver
105O 055	CHRISTINA	Porphyry Subvolcanic Cu-Au-Ag (As-Sb)	Showing	Copper, Gold, Silver
105O 057	STUMP	Plutonic Related Au	Showing	Arsenic, Gold, Lead, Silver, Copper
105O 058	LM	Plutonic Related Au	Drilled Prospect	Copper, Gold, Silver
105O 059	SCRONK	Vein Polymetallic Ag-Pb-Zn±Au	Showing	Antimony, Copper, Gold, Silver, Zinc, Bismuth
105P 001	MEHITABEL	Skarn Cu	Drilled Prospect	Gold
105O 056	GOLD	Porphyry Mo (Low F-Type)	Anomaly	
105O 061	FUN	Unknown	Anomaly	Lead, Zinc
105O 042	FAL	Unknown	Unknown	
105O 034	LIMEY RIDGE	Carbonate-Hosted Disseminated Au-Ag (Carlin-type)	Drilled Prospect	Gold, Arsenic, Antimony
105O 035	AREA 51	Carbonate-Hosted Disseminated Au-Ag (Carlin-type)	Drilled Prospect	Antimony, Arsenic, Gold
105O 050	NORTH MACMILLAN	Vein Barite	Showing	

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[1]	Sb	Te	Hg	Tl	Bi	W[1]
Polymetallic Ag-Pb-Zn	SEDEX; MVT; VMS; Pb-Zn skarn; Au-Ag epithermal							1	3	4		2				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

[a]Polymetallic Ag-Pb-Zn type includes vein and manto styles; SEDEX = sedimentary exhalative; MVT = Mississippi Valley-Type Zn-Pb; VMS = volcanogenic massive sulphide

[1]Raw data following a $\log_{10}$ transformation.

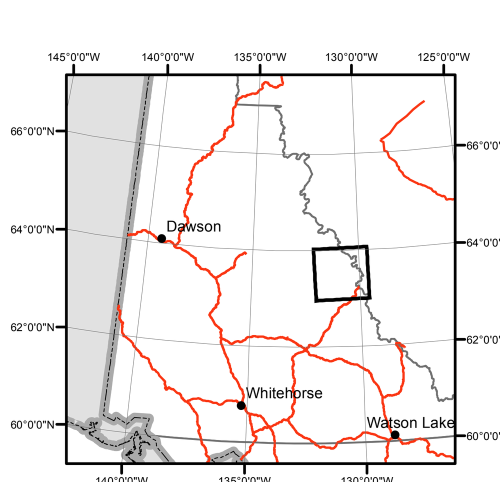
LEGEND

- Town
- Mineral Occurrence
- Road
- Contour
- River
- NTS map sheet
- Water Body
- Wetland
- Sample Location
- Catchment > 14km²

Weighted sums model (PC residuals)

SEDEX Pb-Zn-Ag deposits

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



1:250 000-scale topographic base data produced by CENTRE FOR TOPOGRAPHIC INFORMATION, NATURAL RESOURCES CANADA

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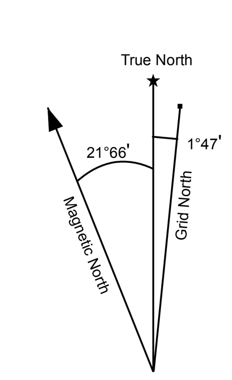
ONE THOUSAND METRE GRID
Universal Transverse Mercator Projection
North American Datum 1983
Zone 9

CONTOUR INTERVAL 100 FEET
Elevations in metres above Mean Sea Level

SEDEX Pb-Zn-Ag
Weighted sums model
(Principal Component Residuals)
Sheet 6 of 7

SCALE 1:250 000

0 1 2 3 4 5
kilometres



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

106C NADALEEN RIVER	106B BONNET PLUME LAKE	106A MOUNT EDUNI
105N LANSING RANGE	105O THIS MAP	105P THIS MAP
105K TAY RIVER	105J SHELDON LAKE	105I LITTLE NAHANNI RIVER

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RECOMMENDED CITATION

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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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Open File 2016-28

Weighted sums model for SEDEX Pb-Zn-Ag deposits using principal component residuals (NTS 105O and 105P) Sheet 6 of 7

by

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