Yukon Geological Survey

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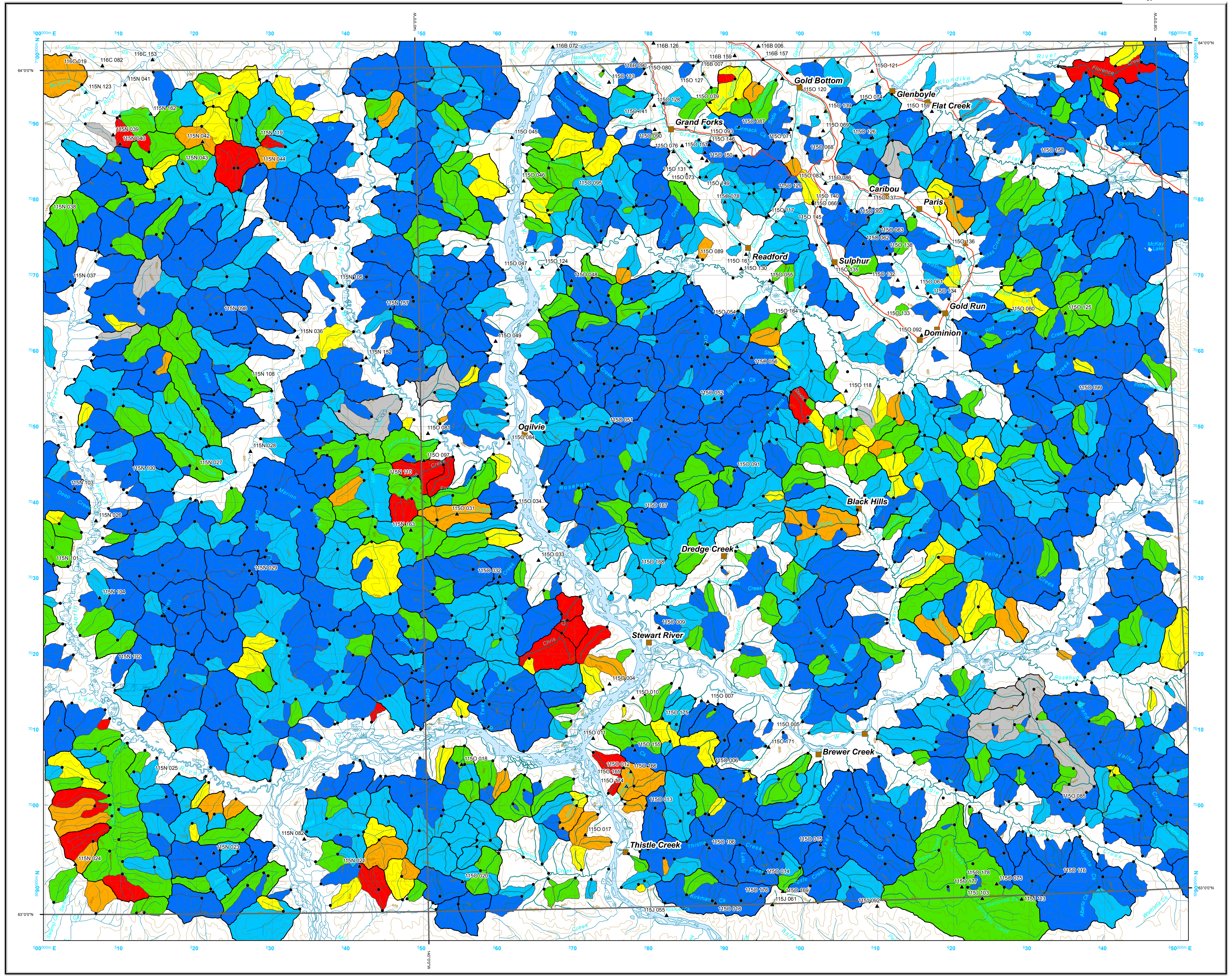

INTRODUCTION

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 Stewart River area (NTS 115O and part of 115N) were collected at a reconnaissance scale in 1986 as part of the Canada-Yukon Mineral Development Agreement (Friske *et al.*, 2001). Field descriptions and initial geochemical data for 1392 sites were released in Geological Survey of Canada (GSC) Open File 1364 and Indian and Northern Affairs Canada, Exploration / Geological Services Division Open File 2001-13D. New geochemical data from the re-analysis of archive sample material were released in Yukon Geological Survey (YGS) Open File 2016-4 (Jackaman, 2016). 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 have been identified in the Stewart River Area as listed in Table 1 (Yukon MINFILE, 2015). The most significant deposits are classed as orogenic Au (Golden Saddle deposit and QV prospect), polymetallic Ag-Pb-Zn (Connaught and Lerner deposits), intrusion-related Au (Moosehorn deposit and Flume prospect), quartz-vein hosted Au (Lone Star and Violet deposits, and Eureka prospect) and Cu-Zn-Pb volcanogenic massive sulphide (Touleray prospect). The Casino Cu-Mo-Au porphyry deposit and Coffee orogenic Au deposit occur in the adjacent map area to the south supporting the prospectivity of the region for these deposit types.

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. The elements and weightings used for the Orogenic Au model are based on the signature observed in streams draining the Golden Saddle and Arc occurrences.

Exploratory data analysis using both raw element data and principal component analysis indicate that lithological variation influences the distribution of many commodity and pathfinder elements. The principal component (PC1) accounts for ~24% of the total variation and shows high positive loadings for Ti, Al, Li and V. Spatially, positive PC1 relates to parts of the Dawson Range Batholith and thus is interpreted to reflect lithological control. Similarly, negative PC1 with high loadings for Cd, Hg, LOI and Ag matches the distribution of the Klondike schist and Snowcap Assemblage metasediments. The second component, which accounts for ~24% of the variation, shows high positive loadings for La, Ce, U, Bi, Pb and Th; and corresponds to areas mapped as Grass River Suite felsic orthogneiss. The third component, with high loadings in Zr, Y, Sr and Na, corresponds to areas mapped as felsic and intermediate volcanic and intrusive rocks and is thus also interpreted to represent lithological control. The fourth component has high positive loadings in Pb, Sb, As, Cu, Cr, Ag and Ni. Spatially, this grouping appears to relate to polymetallic Ag-Pb-Zn and some gold occurrences and is interpreted to represent a mineralization signal.

Regression analysis of selected metals against the relevant component(s) effectively filters lithological controls while preserving responses related to known occurrences. Levelling by mapped geology appears to be less effective at filtering lithological control for certain pathfinder elements. In order to reduce the impact this has on the WSM certain elements were given low importance rankings or, in some cases, were omitted for certain deposit types. Negative weightings were assigned to some elements in order to distinguish deposit types with similar element associations.

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 (16 km^2). 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 in large catchments may also be of interest.

Table 2: Importance rankings for weighted sums models using residuals on principal components.

Target Deposit Type[a]	Other Deposit Type[a]	Mn	Fe	Co	Ni	Cu	Mo	Zn	Pb	Ag	Au[1]	As	Ba	Cd	Sn	Sb	Te	Hg	Tl	Bi	W[1]
Porphyry Cu-Mo	Cu skarn; Porphyry Mo; VMS (Cu-rich)				-2	5	3			2		1							2	1	
Polymetallic Ag-Pb-Zn	VMS; SEDEX; Pb-Zn skarn							1	3	4	1	2	-1			1		-1			
Epithermal Au-Ag	Intrusion-related and orogenic Au; Polymetallic Ag-Pb-Zn					1				3	4	1				2	1	2			
Orogenic Au	Intrusion-related Au; Epithermal Au-Ag						1				3	4	2			2				1	
Intrusion-related Au	Orogenic Au; Epithermal Au-Ag										3	4	-1			1				1	
W skarn	W porphyry; Intrusion-related Au						1					2				-2			1	2	4

[a]Polymetallic Ag-Pb-Zn type includes vein and manto styles; SEDEX = sedimentary exhalative; VMS = volcanic-hosted/associated massive sulphide deposits

[1]For heavily censored elements raw data are used following a log $_{10}$ transformation.

Table 1: List of Mineral Occurrences for NTS map sheet 115N and 115O (Yukon MINFILE, 2015)

Number	Name	Type	Status	Commodities
115N 119	MT. HART	Unknown	Anomaly	Gold
115N 123	BEDROCK	Vein Au-Quartz	Showing	Copper, Gold, Silver
115N 152	SIXTY MILE	Coal	Showing	Coal
115N 163	TR5	Skarn Au	Showing	Gold
115O 014	BLACK FOX	Vein Polymetallic Ag-Pb-Zn±Au	Showing	Gold, Lead, Silver
115O 020	APOLLO	Porphyry Cu-Mo-Au	Anomaly	Copper, Molybdenum
115O 031	CARDIFF	Plutonic Related Au	Prospect	Arsenic, Copper, Gold, Lead
115O 035	TENMILE	Vein Au-Quartz	Showing	Gold
115O 046	PICKERING	Vein Au-Quartz	Prospect	Gold
115O 047	INDIAN	Ultramafic-hosted asbestos	Showing	Asbestos
115O 048	BISHOP	Vein Au-Quartz	Unknown	Gold
115O 049	WOOD	Skarn Cu	Showing	Copper
115O 051	LUCKY JOE	Unknown	Drilled Prospect	Copper, Gold, Silver, Lead, Zinc, Molybdenum, Tellurium
115O 052	BISMARK	Vein Au-Quartz	Anomaly	Gold, Palladium, Platinum
115O 053	HAYSTACK	Coal	Drilled Prospect	Fixed Carbon
115O 054	MCKINNON	Paleoplacer	Drilled Prospect	Gold
115O 055	RAVEN	Volcanogenic Massive Sulphide (VMS) Kuroko Cu-Pb-Zn	Showing	Copper, Silver, Gold
115O 056	FOTHERGILL	Paleoplacer	Anomaly	Gold
115O 061	PAYNE	Vein Au-Quartz	Prospect	Gold
115O 063	GOLD RUN	Vein Au-Quartz	Prospect	Gold, Silver
115O 064	PORTLAND	Vein Au-Quartz	Prospect	Gold, Silver, Zinc, Lead
115O 065	DOMINION	Vein Au-Quartz	Showing	Gold, Lead
115O 066	LLOYD	Vein Au-Quartz	Prospect	Copper, Lead, Gold
115O 067	HUNKER DOME	Vein Au-Quartz	Prospect	Gold, Silver
115O 068	MITCHELL	Vein Au-Quartz	Drilled Prospect	Copper, Lead, Zinc, Gold, Silver, Antimony
115O 069	FAWCETT	Vein Au-Quartz	Prospect	Gold, Silver
115O 070	BUM	Vein Cu±Ag Quartz	Prospect	Copper, Silver
115O 071	BOX CAR	Vein Polymetallic Ag-Pb-Zn±Au	Prospect	Copper, Zinc, Gold, Lead, Silver
115O 072	LONE STAR	Plutonic Related Au	Past Producer	Gold, Silver
115O 073	VIOLET	Vein Au-Quartz	Past Producer	Gold, Copper, Barite, Lead, Silver
115O 074	LEOTTA	Vein Polymetallic Ag-Pb-Zn±Au	Anomaly	Zinc
115O 075	SKOOKUM JIM	Orogenic Au	Drilled Prospect	Gold, Copper, Molybdenum, Bismuth, Antimony
115O 076	HILCHEY	Vein Au-Quartz	Drilled Prospect	Gold, Silver, Lead
115O 077	BUCKLAND	Vein Au-Quartz	Drilled Prospect	Gold, Silver
115O 078	JEN	Unknown	Anomaly	Copper, Molybdenum, Silver, Lead
115O 079	FORK	Vein Polymetallic Ag-Pb-Zn±Au	Anomaly	Arsenic, Gold
115O 081	SESTAK	Vein Barite-Fluorite	Showing	Fluorite
115O 083	GREENBACK	Unknown	Anomaly	Copper, Zinc, Gold, Lead
115O 084	CRUIKSHANK	Coal	Unknown	Coal
115O 085	MCMICHAEL	Porphyry Cu-Mo-Au	Showing	Copper
115O 087	CARMACKS	Plutonic Related Au	Drilled Prospect	Gold, Arsenic
115O 088	TRILBY	Plutonic Related Au	Showing	Gold, Silver
115O 089	TORRANCE	Unknown	Unknown	Gold
115O 090	BALD EAGLE	Ultramafic Mafic Gabbroid Cu-Ni-PGE	Drilled Prospect	Gold, Platinum
115O 092	GRANVILLE	Unknown	Unknown	Gold, Silver
115O 093	FLANNERY	Vein Au-Quartz	Anomaly	Gold
115O 095	GLEESON	Skarn W	Anomaly	Tungsten
115N 021	ARIES	Porphyry Cu-Mo-Au	Anomaly	Arsenic, Silver, Copper, Gold
115N 023	ORION	Unknown	Anomaly	Bismuth, Gold
115N 024	MOOSEHORN	Vein Au-Quartz	Past Producer	Gold, Arsenic, Copper, Zinc, Mercury, Molybdenum, Silver, Antimony, Lead
115N 026	LADUE	Porphyry Cu-Mo-Au	Showing	Copper, Molybdenum
115N 027	SANTA	Vein Polymetallic Ag-Pb-Zn±Au	Showing	Lead, Tin, Silver
115N 028	SVENN	Coal	Anomaly	Coal
115N 029	PAX	Porphyry Cu-Mo-Au	Anomaly	Copper, Molybdenum
115N 038	CRAG	Uranium	Anomaly	Uranium
115N 039	LERNER	Vein Polymetallic Ag-Pb-Zn±Au	Past Producer	Gold, Lead, Silver
115N 041	PER	Vein Polymetallic Ag-Pb-Zn±Au	Drilled Prospect	Gold, Mercury, Silver, Zinc, Lead
115N 042	BUTLER	Porphyry Cu-Mo-Au	Drilled Prospect	Antimony, Copper, Lead, Silver, Molybdenum, Gold, Arsenic
115N 043	FIFTY	Skarn Cu	Anomaly	Copper
115N 082	PROSPECT	Unknown	Anomaly	Copper
115N 098	JOVE	Uranium	Drilled Prospect	Uranium
115N 100	BORED	Volcanogenic Massive Sulphide (VMS) Kuroko Cu-Pb-Zn	Anomaly	Copper, Zinc, Lead
115N 108	SON	Uranium	Anomaly	Uranium
115N 110	FLUME	Porphyry-related Au	Prospect	Arsenic, Gold
115O 097	THIRTEEN	Unknown	Anomaly	Arsenic, Gold
115O 106	HAKONSON	Vein Au-Quartz	Unknown	Gold, Silver, Lead
115O 113	BRONSON	Volcanogenic Massive Sulphide (VMS) Kuroko Cu-Pb-Zn	Anomaly	Copper, Lead, Manganese
115O 116	PYROXENE	Ultramafic Mafic Podiform Chromite	Anomaly	Chromium, Gold, Copper, Nickel, Palladium, Platinum
115O 117	BLANCHE	Unknown	Unknown	Gold
115O 118	ARMENIUS	Vein Au-Quartz	Prospect	Gold, Silver
115O 121	ASBESTOS BLUFF	Ultramafic-hosted asbestos	Showing	Asbestos
115O 124	HOBBS	Limestone	Prospect	Calcium, Silica
115O 127	LINDOW	Vein Au-Quartz	Showing	Arsenic, Gold, Silver
115O 128	ORO FINO	Vein Au-Quartz	Showing	Copper, Zinc, Lead
115O 129	SCHRAMM	Unknown	Drilled Prospect	Gold
115O 130	GRANT	Vein Au-Quartz	Drilled Prospect	Gold
115O 131	CULLEN	Vein Au-Quartz	Showing	Gold
115O 132	DEVINE	Vein Au-Quartz	Prospect	Copper, Silver, Gold
115O 133	SULPHUR	Unknown	Drilled Prospect	Silver, Gold
115O 134	CARON	Vein Au-Quartz	Drilled Prospect	Gold, Silver
115O 135	SUL	Unknown	Drilled Prospect	Silver, Gold
115O 136	GATENBY	Unknown	Drilled Prospect	Silver
115O 137	DOM	Unknown	Prospect	Gold, Silver, Tin
115O 138	COWAN	Unknown	Prospect	Barium, Gold, Silver
115O 139	HUN	Vein Au-Quartz	Drilled Prospect	Silver, Gold
115O 140	BRADY	Unknown	Drilled Prospect	Gold
115O 141	GONZALES	Volcanogenic Massive Sulphide (VMS) Kuroko Cu-Pb-Zn	Showing	Copper, Zinc, Lead
115O 146	VICTORIA	Plutonic Related Au	Drilled Prospect	Gold, Lead, Arsenic
115O 147	PARNELL	Vein Au-Quartz	Showing	Gold
115O 148	ROBIN EGG	Vein Au-Quartz	Drilled Prospect	Gold
115O 149	ROACH	Vein Au-Quartz	Showing	Gold
115O 150	PIONEER	Vein Au-Quartz	Drilled Prospect	Gold
115O 151	AMANDA	Vein Cu±Ag Quartz	Showing	Gold
115O 158	HOT	Unknown	Anomaly	Lead, Silver
115O 160	HEN	Unknown	Anomaly	Arsenic, Gold
115O 164	MATGAN	Ultramafic Mafic Alaskan-type Pt±Os±Rh±Ir	Prospect	Gold, Palladium, Platinum
115O 062	BRIMSTONE	Unknown	Unknown	
115O 086	GOLDEN ROD	Unknown	Unknown	
115O 017	JACK	Unknown	Anomaly	
115O 125	MELBA	Unknown	Anomaly	
115N 025	MILBURN	Unknown	Anomaly	
115N 040	CONNAUGHT	Vein Polymetallic Ag-Pb-Zn±Au	Past Producer	Gold, Lead, Silver
115N 044	ENCHANTMENT	Paleoplacer	Showing	Copper, Gold
115O 011	TEACHERS SHOWING	Plutonic Related Au	Prospect	Antimony, Gold, Arsenic
115O 057	EUREKA	Vein Au-Quartz	Drilled Prospect	Silver, Gold, Arsenic
115O 060	BURNHAM	Unknown	Anomaly	
115O 155	FRISCO	Unknown	Unknown	
115N 036	HOYLE	Unknown	Unknown	
115N 162	PEAK	Volcanogenic Massive Sulphide (VMS) Kuroko Cu-Pb-Zn	Showing	
115O 005	COOPER	Vein Au-Quartz	Unknown	
115O 153	DONNA	Unknown	Unknown	
115N 157	TYR	Unknown	Unknown	
115O 161	READFORD	Volcanogenic Massive Sulphide (VMS) Kuroko Cu-Pb-Zn	Showing	
115O 165	GOLDEN SADDLE	Orogenic Au	Deposit	Gold, Silver
115O 166	ARC DEPOSIT	Orogenic Au	Deposit	Gold, Silver
115O 167	LJS	Unknown	Anomaly	Gold, Zinc, Lead
115O 168	HENDERSON	Unknown	Anomaly	Copper, Gold
115O 006	SCOTCH	Unknown	Unknown	Gold
115O 015	AGATE	Vein Au-Quartz	Anomaly	Gold
115O 169	THISTLE MOUNTAIN	Vein Au-Quartz	Showing	Gold
115O 032	EXCELSIOR	Unknown	Showing	Gold
115N 037	MAG	Unknown	Unknown	
115O 045	MONTE CHRISTO	Unknown	Unknown	
115N 104	BINGHAM	Plutonic Related Au	Unknown	
115O 007	THREE SISTERS	Unknown	Unknown	
115N 105	HECTOR	Unknown	Unknown	
115O 012	RYANS SHOWING	Vein Au-Quartz	Drilled Prospect	Gold, Silver, Copper, Zinc
115O 171	SIMMONS	Unknown	Anomaly	Arsenic, Gold
115O 172	BRC	Unknown	Anomaly	Gold
115O 173	KODIAK GOLD	Plutonic Related Au	Anomaly	Antimony, Gold, Arsenic, Nickel
115O 145	BLUE SKY	Unknown	Unknown	
115N 102	RICE	Unknown	Unknown	
115O 013	MCKINNON	Porphyry-related Au	Drilled Prospect	Gold, Silver, Antimony
115O 174	DONAHUE	Porphyry-related Au	Drilled Prospect	Gold, Silver, Antimony
115O 175	GOLD CAP	Unknown	Anomaly	Gold, Arsenic
115O 176	Touleary	Volcanogenic Sulphide - type not determined	Drilled Prospect	Copper, Silver, Gold, Zinc
115O 177	Rum Run	Orogenic Au	Drilled Prospect	Gold, Bismuth, Copper, Arsenic
115O 178	BIG ALEX	Orogenic Au	Anomaly	Gold, Antimony, Molybdenum
115O 016	NONPAREIL	Unknown	Unknown	
115N 103	DEEP	Unknown	Unknown	
115O 099	ABNER	Unknown	Anomaly	
115O 019	WOLVERINE LEDGE	Unknown	Unknown	
115O 004	QV	Vein Au-Quartz	Deposit	Gold, Silver, Bismuth, Barium, Tellurium, Mercury, Molybdenum, Lead
115O 034	COMET	Unknown	Unknown	
115O 009	BURIAN	Unknown	Unknown	
115O 091	HRKAC	Unknown	Unknown	
115N 115	THE	Vein Au-Quartz	Unknown	
115N 101	BLAKESTAD	Unknown	Unknown	
115O 126	ALL GOLD	Vein Au-Quartz	Showing	
115O 018	PEARSON	Unknown	Unknown	
115O 033	GOLDIKE	Unknown	Unknown	
115O 120	ENVOLDSEN	Ultramafic Mafic Gabbroid Cu-Ni-PGE	Unknown	
115O 010	TREVA	Vein Cu±Ag Quartz	Anomaly	
115O 159	FLAT	Unknown	Unknown	
115O 080	HILKER	Unknown	Unknown	

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Friske, P.W.B., Day, S.J.A. and McCurdy, M.W., 2001. Regional stream sediment and water geochemical reconnaissance data, western Yukon (NTS 115N and 115O). Geological Survey of Canada, Open File 1364 / Indian and Northern Affairs Canada, Exploration and Geological Services Division, Open File 2001-13(D).

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Yukon MINFILE, 2015. Yukon MINFILE – A database of mineral occurrences. Yukon Geological Survey, www.data.geology.gov.yk.ca, accessed May 2015.

LEGEND

- Town
- Mineral Occurrence
- Road
- Contour
- River
- NTS map sheet
- Water Body
- Wetland
- Sample Location
- Catchment > 16km²

Weighted sums model (PC residuals)

Orogenic 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

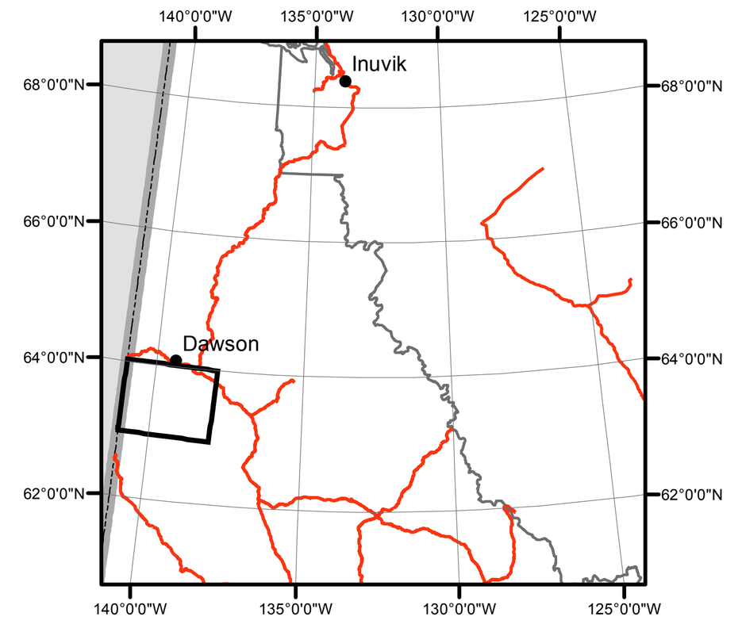
MACKIE, R., ARNE, D. AND PENNIMPEDE, C., 2016. Weighted sums model for Orogenic Au deposits using principal component residuals. In: Enhanced interpretation of stream sediment geochemical data for NTS map sheet 115N and 115O. Yukon Geological Survey, Open File 2016-30, scale 1:250 000, sheet 9 of 13.

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.

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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ONE THOUSAND METRE GRID
Universal Transverse Mercator Projection
North American Datum 1983
Zone 7

CONTOUR INTERVAL 100 FEET
Elevations in metres above Mean Sea Level

Orogenic Au
Weighted sums model
(Principal Component Residuals)
Sheet 9 of 13

SCALE 1:250 000

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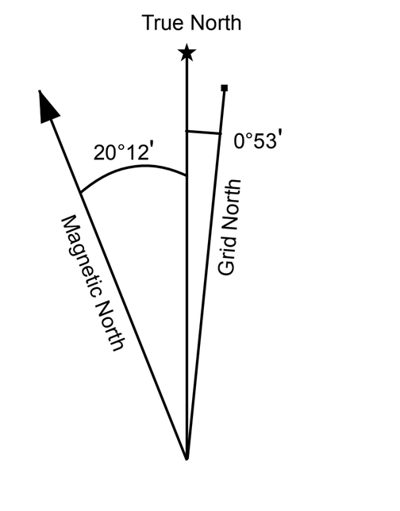
kilometres



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

116C PART OF 116B	116B DAWSON	116A LARSEN CREEK
115N THIS MAP	115O THIS MAP	115P MCQUESTEN
115K PART OF 115J	115J STEVENSON RIDGE	115I CARMACKS

Yukon Geological Survey
Energy, Mines and Resources
Government of Yukon

Open File 2016-30

Weighted sums model for Orogenic Au deposits using principal component residuals (NTS 115N & 115O) Sheet 9 of 13

by

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and Chris Pennimpede