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Summary

This report releases whole-rock geochemical assay results of 102 samples collected by the Geological Survey of Canada (GSC) and Yukon Geological Survey (YGS) from four Carlin-type gold zones (Conrad, Sunrise, Osiris and Anubis) in the Nadaleen Trend, Yukon. The geological setting and characteristics of these gold zones can be found in Pinet and Sack (2019) and Pinet et al. (2020a and b). A single sample from the Venus zone, east of the Nadaleen trend, is also released.

Most samples (N=99) were collected in 2016 and 2017 from drill cores. Four outcrop samples complement the dataset.

Samples were collected for three purposes: 1) 70 of the 77 samples collected by the GSC aim to document geochemical variations along 5 borehole intervals (2 in Conrad, 1 in Sunrise and 2 in Anubis) that include both barren and mineralized rocks; 2) 14 samples collected by the YGS were re-assayed using the same analytical methods as *ATAC Resources*, but with smaller sample intervals to refine understanding of which lithologies host gold; 3) 12 samples of igneous rocks collected by the YGS (including the one from the Venus zone) were analyzed to characterize their geochemical signature.

Contents

This report includes three Excel spreadsheets.

The **'Sample location and description'** file summarizes the information pertaining to the location of the samples (diamond drill hole number, gold zone, easting/northing, depth interval, and geographic location), the rock unit and the Au grade (assay) of the interval in which the samples were taken (from *ATAC Resources*), and a description of the sample.

The **'Drill hole summary'** file presents an overview (from *ATAC Resources*) of lithological units encountered in the 5 boreholes for which several samples have been collected to study geochemical variations from barren to mineralized zones.

The **'Whole-rock geochemistry'** file presents the geochemical data. Analyses are divided into three spreadsheets: 1) the *GSC spreadsheet* presents data that were mainly collected to document the transition from barren to mineralized intervals; 2) the *YGS re-assay spreadsheet* presents data on three short (< 4 m) intervals, and 3) the *YGS intrusive* spreadsheet presents data on igneous rocks both in drill core and outcrop samples.

In addition to the Excel files, the folder **'Sample pictures'** includes the scanned images of the 64 samples collected by the GSC in 2017.

Analytical methods- GSC samples and YGS intrusive samples

Whole-rock analyses were performed at Activation Laboratories Ltd. in Ancaster, Ontario, using a combination of their standard preparation and analytical packages, the details of which can be found at https://actlabs.com/geochemistry/. Methods and detection limits are reported in lines 3 and 4 of the 'whole-rock geochemistry' spreadsheets 'GSC' and 'YGS intrusive'. Method abbreviations appear in *italics* below.

Samples were initially dried (60°C) and crushed to at least 90% (<2mm) in a steel jaw crusher. A mechanically split fraction was pulverized in a chromium-free steel mill until 95% of the sample material passed through a 74 µm mesh. Major elements were determined by lithium metaborate-tetraborate fusion followed by inductively coupled plasma mass spectrometry (*FUS-ICP*; *FUS-MS*). Trace and rare earth elements were determined by a combination of lithium metaborate-tetraborate and total digestion (four acid) followed by inductively coupled plasma mass spectrometry (*FUS-MS; TD-MS*) and inductively coupled plasma atomic emission spectrometry (*FUS-ICP*). FeO was determined by titration using a cold acid digestion (ammonium metavanadate and hydrofluoric acid) in an open system (*TITR*).

For chalcophile elements, a four-acid digestion ICP-MS (*TD-MS*) method was preferred. Aqua regia (*AR-MS*) digestion coupled with ICP-MS was chosen to analyze As, Sb, Bi, Se and Te. GSC samples with % levels of As were also measured by instrumental neutron activation analysis (*INAA*).

Boron was determined by gamma neutron activation analysis (*PGNAA*).

Analytical method for Au in GSC samples collected in 2016 were analyzed by a combination of INAA and ICP-MS. Analytical method for Au in GSC samples collected in 2017 include the combination of fire assay preparation and atomic absorption (*FA-AA*) analysis. High-grade ore zone samples were re-analyzed with a combination of fire assay and gravimetry (*FA-GRAV*).

Silver was measured by using lithium metaborate-tetraborate fusion (*FUS-MS)* or near total four-acid digestion (*TD-MS*) combined with ICP-MS.

CO_2 and Total (S) were determined by combustion infrared analysis (*IR*).

Mercury was measured by cold vapor-atomic absorption using a flow injection mercury system (*FIMS*) after aqua regia digestion.

Cl was measured by neutron activation analysis INAA.

Actlabs reports LOI, LOI2, Total and Total 2. Loss-on-ignition (LOI) is determined by weighing a small amount of the sample before and after ignition. However, because FeO was measured, it is possible to adjust LOI to take into account the weight gain resulting from oxidation of FeO to Fe_2O_3. This adjusted value of LOI is LOI2.

Analytical methods- YGS reassay samples

Samples corresponding to short core intervals analyzed using the same analytical techniques as *ATAC Resources* were prepared at ALS Global's preparation facility in Whitehorse, Yukon and processed at their analytical facility in Vancouver, British Columbia, using the following methods.

Samples were crushed to at least 90% (<2mm) and a 250-g split fraction was pulverized until 85% of the sample material passed through a 75 µm mesh. Gold content was determined by fire assay using the Au-AA26 analytical package, which decomposes a 50 g aliquot of pulverized sample with lead flux, a preparation equivalent to total fusion. After preparation, the gold content is measured with atomic absorption spectroscopy with a lower detection limit of 0.05 ppm Au and an upper limit of 100 ppm Au. Mercury content was determined by the Hg-MS42 analytical package, which uses an aqua regia digestion followed by ICP-MS analysis.

Major and trace element contents were determined using the ME-MS61 analytical package, a four acid digestion followed by inductively-coupled plasma–atomic emission spectrometry (ICP-AES) and inductively-coupled plasma–mass spectroscopy (ICP-MS) analysis.

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References

Pinet, N. and Sack, P.J., 2019. Macroscopic control on Carlin-type gold mineralization in north-central Yukon; in Targeted Geoscience Initiative: 2018 report of activities, (ed.) N. Rogers; Geological Survey of Canada, Open File 8549, p. 89–103. https://doi.org/10.4095/313644

Pinet, N., Sack, P., Mercier-Langevin, P., Colpron, M., Lavoie, D., Dubé, B., and Brake, V.I., 2020. Neoproterozoic-hosted Carlin-type mineralization in central Yukon, part 1: Regional- to prospect-scale geological controls; in Targeted Geoscience Initiative 5: Contributions to the Understanding of Canadian Gold Systems, (ed.) P. Mercier-Langevin, C.J.M. Lawley, and S. Castonguay; Geological Survey of Canada, Open File 8712, p. 281–297. https://doi.org/10.4095/326045

Pinet, N., Sack, P., Mercier-Langevin, P., Davis, W.J., Lavoie, D., Haeri-Ardakani, O., Komaromi, B.A., Dubé, B., Cline, J.S., Petts, D.C., Jautzy, J., Jackson, S.E., Percival. J.B., Savard, M.M., and Brake, V.I., 2020. Neoproterozoic-hosted Carlin-type mineralization in central Yukon part 2: Mineralization; in Targeted Geoscience Initiative 5: Contributions to the Understanding of Canadian Gold Systems, (ed.) P. Mercier-Langevin, C.J.M. Lawley, and S. Castonguay; Geological Survey of Canada, Open File 8712, p. 299–314. https://doi.org/10.4095/326047