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Supplemental Material

Figure S1. Detailed map of the main stripped area of the Cheechoo pluton with the position of the photographs presented in Figures S2 and S3.

Figure S2. Representative facies of the Cheechoo pluton. Where applicable, the diameter of the drill core is ~4.7 cm and the dashed arrows indicate the bottom of the drill cores. (A) down-dip L_2 lineation in metawacke; (B–C) strongly foliated biotite-bearing pluton. The S_2 foliation is underlined by biotite; (D) massive quartz-albite-altered pluton injected by Qtz-Fsp-Di vein; (E–H) albite-amphibole-diopside±titanite-altered pluton. Albite phenocrysts are locally present. Note the presence of Qtz veins in this facies, and the banding parallel to S_2 ; (I) strong pervasive chlorite alteration; (J) representative example of a mafic dike showing strong deformation as a S_2 schistosity underlined by biotite porphyroblasts.

Figure S3. SE-NW cross section across the Cheechoo pluton passing through the drill cores investigated in this study (modeled from drill core data by Sirios Resources Inc.). The trace of the cross section is represented in Fig. 1C. The gold grades are represented on the drill cores along with the vein density and average number of connections per branch (C_B parameter) for Qtz veins. Note the decrease of gold grade background values in the albite-amphibole-diopside-altered pluton.

Figure S4. Structural transects carried out on the main stripped area of the Cheechoo pluton, showing a dextral reorientation of veins from SW to NE. The trace of each transect is reported in Fig. 2A.

Figure S5. Ternary diagrams of Au-bearing vein networks from the Cheechoo pluton. A-B: density of node types for Qtz-Fsp-Di veins and Qtz veins measured in (sub-)fresh facies; C-D: density of node types for Qtz-Fsp-Di veins and Qtz veins measured in altered facies. The size of dots refers to the gold grades of the corresponding drill core interval. The number of intervals represents the number of drill cores intervals investigated for each facies. The number of veins represent the total number of veins counted in the corresponding facies.

TABLE S1. Structural measures obtained on the main stripped area of the Cheechoo Pluton.

TABLE S2. Structural measurements carried out on each stations of structural transects 1, 2 and 3 from the main stripped area of the Cheechoo Pluton represented on Fig. DR5. the position of the transects is reported in Figure 2A.

TABLE S3. Facies, alteration index, ore mineralogy, gold grade, vein density and topology of the CH16-059, CH16-040, CH17-094, CH17-126 and CH16-092 drill cores from the Cheechoo Pluton obtained in this study. Complementary data from the CH16-059 and CH17-126 drill cores are available in Turlin et al. (2019b).

TABLE S4. Topological measurements of representative zones of the main stripped area of the Cheechoo Pluton.

Figure S1. Detailed map of the main stripped area of the Cheechoo pluton with the position of the photographs presented in Figures S2 and S3. Abbreviations: Amp—amphibole; Chl—chlorite; Di—diopside; Fsp—feldspar; Qtz—quartz..

LITHOLOGIES AND FACIES

Cheechoo intrusion

The Cheechoo tonalite to granodiorite (further designated as granodiorite for the purpose of this article), shows several facies that range from massive quartz-albite dominated (Fig. S2D) to several types of more or less penetrative hydrothermal alteration (Fontaine et al., 2018; Turlin et al., 2019b). Three main facies have been recognized in three zones of the main outcrop:

- (i) The southwestern and southern parts are composed of the albite-amphibole-diopside-altered intrusion (Ab-Amp-Di) that shows a solid-state banded structure subparallel to the S_2 foliation underlined by mafic minerals (Figs. 2A and S2H).
- (ii) The central part is composed of a massive facies that appears less altered and dominated by quartz and albite (Qtz-Ab) with no banding and a poorly developed S_2 foliation (Fig. S2D).
- (iii) The northeastern part is composed of a strongly solid-state foliated biotite-bearing (Bt) facies with a well-developed S_2 foliation following the contact with the wacke (Figs. 2A, 6 and S2B).

The dominant alteration is represented by quartz-albite (Fig. S2D) that appears to be associated with Qtz-Fsp-Di veins, and to a minor extent with Qtz veins, that show albitic alteration halos (Fig. 4A). Therefore, this alteration appears to be early in the history of the hydrothermal system and to be subsequently overprinted by the later vein types.

The albitic alteration is locally associated with the presence of diopside, amphibole and in some places with titanite porphyroblasts (Fig. S2E-G). These porphyroblasts are a common feature of gold deposits in amphibolite facies conditions (Eilu et al., 1999). A potassic alteration locally overprints the albite alteration. It is characterized by the growth of randomly oriented biotite porphyroblasts (Fig. S2C), and interstitial microcline. This potassic alteration is spatially related to K-rich pegmatites. Chloritization (Fig. S2I) is the latest alteration feature. It is locally developed and coeval with the development of thin, straight and undeformed chlorite-coated fractures that crosscut earlier hydrothermal alteration, structural fabrics and veins (Fig. 4J).

Mafic dikes

Mafic dikes crosscut the intrusion and are locally intruded along the contact with the wacke (Figs. 2A, 3 and 5). They show asymmetric F_2 folding with an axial plane (sub-)parallel to the S_2 foliation. Folds show a wavelength of 10-100 m (Figs. 2A, 3 and 5) and a penetrative S_2 schistosity underlined by amphibole porphyroblasts pseudomorphosed to biotite (Figs. 2A, 3, 5 and S2J). Locally, the elongation of these porphyroblasts highlights the down-dip L_2 lineation (Figs. 6 and S2A). They are crosscut by subsequent hydrothermal veins and dikes described below (Figs. 2A, 3 and 5).

Figure S2. Representative facies of the Cheechoo pluton. Where applicable, the diameter of the drill core is ~4.7 cm and the dashed arrows indicate the bottom of the drill cores. (A) down-dip L_2 lineation in metawacke; (B–C) strongly foliated biotite-bearing pluton. The S_2 foliation is underlined by biotite; (D) massive quartz-albite-altered pluton injected by Qtz-Fsp-Di vein; (E–H) albite-amphibole-diopside±titanite-altered pluton. Albite phenocrysts are locally present. Note the presence of Qtz veins in this facies, and the banding parallel to S_2 ; (I) strong pervasive chlorite alteration; (J) representative example of a mafic dike showing strong deformation as a S_2 schistosity underlined by biotite porphyroblasts. Abbreviations: Ab—albite; Amp—amphibole; Bt—biotite; Calcsil.—calcsilicate; Chl—chlorite; Di—diopside; Fsp—feldspar; Qtz—quartz; Ttn—titanite.

Figure S3. SE-NW cross section across the Cheechoo pluton passing through the drill cores investigated in this study (modeled from drill core data by Sirios Resources Inc.). The trace of the cross section is represented in Fig. 1C. The gold grades are represented on the drill cores along with the vein density and average number of connections per branch (C_B parameter) for Qtz veins. Note the decrease of gold grade background values in the albite-amphibole-diopside-altered pluton. Abbreviations: Ab—amphibole; Amp—amphibole; Di—diopside; Qtz—quartz.

Figure S4. Structural transects carried out on the main stripped area of the Cheechoo pluton, showing a dextral reorientation of veins from SW to NE. The trace of each transect is reported in Fig. 2A. Abbreviations: Di—diopside; Fsp—feldspar; Qtz—quartz.

Structural cross section no. 2: From SW to NE

Figure S4 (suite).

Structural cross section no. 3: From SW to NE

Figure S4 (end).

Figure S5. Ternary diagrams of Au-bearing vein networks from the Cheechoo pluton. A-B: density of node types for Qtz-Fsp-Di veins and Qtz veins measured in (sub-)fresh facies; C-D: density of node types for Qtz-Fsp-Di veins and Qtz veins measured in altered facies. The size of dots refers to the gold grades of the corresponding drill core interval. The number of intervals represents the number of drill cores intervals investigated for each facies. The number of veins represent the total number of veins counted in the corresponding facies. Abbreviations: Di—diopside; Fsp—feldspar; Qtz—quartz.