RESULTS: TWIN BONANZA

TABLE 2. PETROGRAPHIC/MINERAGRAPHIC SUMMARY: TWIN BONANZA

Sample	Comment	Lithology and Replacement	Deposition
26020.02 BURC17E 135.9 m	Hematite inclusion trails crosscut or follow carbonate, chlorite and sericite veinlets. Hematite inclusions are also present in carbonate. Earliest alkali feldspar veinlets with arsenopyrite and tennantite/tetrahedrite merge with carbonate veins containing chalcopyrite, arsenopyrite and tennantite/tetrahedrite.	Biotite syenogranite porphyry 1.sericite/muscovite, carbonate, chlorite, pyrite, arsenopyrite, rutile, chalcopyrite 2.hematite	1.(veinlet) alkali feldspar, chalcopyrite, pyrite, gold, tennantite/tetrahedrite; carbonate 2.(veinlet) carbonate, chlorite, sericite, arsenopyrite, chalcopyrite, tennantite, bismuthinite
26020.03 BURC17E/ 136.8 m	Strong phyllic alteration of a granitoid. The primary feldspar composition is not resolvable. The phyllic alteration is associated with a strong superimposed strain fabric. Earliest copper mineralisation is associated with the primary rock. CO_2 fluid inclusions may be relict from an early stage of hydrothermal fluids.	Granitoid porphyry 1.muscovite, sericite, pyrite, rutile, pyrite, arsenopyrite, carbonate, chalcopyrite, tourmaline	1.(veinlet/cavity) carbonate, tennantite/tetrahedrite, chalcopyrite, pyrite, arsenopyrite, bismuthinite
26020.06 BURC17E 143.5 m	A strong arsenic-copper-bismuth association within the domains of carbonate deposition genetically associated with strong sericite alteration. Strong sericite alteration is associated with strong deformation of the host rock. Strongest mineralisation is concentrated within a domain of intersecting carbonate veinlets and sericite alteration.	Granitoid porphyry 1.muscovite; sericite, carbonate, pyrite, arsenopyrite, chalcopyrite, tennantite/tetrahedrite, chlorite	1.(veinlet) carbonate, sericite, chlorite, quartz, pyrite, chalcopyrite, tennantite/tetrahedrite; chalcocite 2.(cement/vein) sericite, quartz, carbonate, arsenopyrite, pyrite, chalcopyrite, tennantite/ tetrahedrite, gold, rutile, bismuthinite
26020.16 BURC17E 126.7 m	Alkali feldspar and quartz span the boundary between wallrock and vein. Secondary fluid inclusions in vein quartz relate to secondary quartz along grain boundaries and carbonate, sericite and chlorite also formed along grain boundaries and microfractures.	Syenogranite 1.muscovite, carbonate, pyrite, arsenopyrite, rutile 2.quartz, sericite, carbonate, pyrite 3.hematite	1.(vein) quartz, alkali feldspar; carbonate, arsenopyrite, pyrite, bismuth/sulphide/tellurides 2.(shear/cavity) quartz, sericite, carbonate, pyrite, arsenopyrite, chalcopyrite, rutile
26020.12 BURC16E 146.35	Preferred orientation of sericite and rotation/attenuation of feldspar crystals/grains define a strong strain fabric. Fluid inclusions are contained along annealed microfractures and microshears, which relate to the strain fabric. Iron-sulphide minerals occur as sub-rotated porphyroclasts within the strain fabrics in some places.	Granitoid porphyry 1.muscovite; sericite, quartz, carbonate, chlorite, rutile, pyrite, arsenopyrite	1. (shear/cavity/veinlet/ carbonate, sericite

26020.13 BURC16E 155-155.3	A notable lack of arsenopyrite amongst the sulphide minerals. Fluid inclusion trails have same structural patterns and orientation to some carbonate veinlets. Quartz and carbonate form part of the strain shadow assemblages formed about pyrite grains.	Granitoid porphyry 1.quartz, sericite, carbonate, rutile, pyrite, arsenopyrite, chalcopyrite	1.(veinlet) quartz, carbonate, chlorite
26020.15 BURC16E 132.6 m	A thermal/contact metamorphosed quartz-rich siltstone. Weathering in this rock is represented only by the single hematite veinlet. Muscovite has a sub-preferred orientation.	Laminated siltstone 1.(met) quartz, muscovite, chlorite, biotite, apatite, ilmenite, rutile, pyrrhotite	1.(veinlet) hematite
26020.17 TBRC06 128-129m	Gold has been mobilised from an early quartz vein assemblage into a secondary quartz + muscovite/sericite, chlorite + pyrite + arsenopyrite + carbonate association. Fluid inclusions spatially associated with early gold comprise co-existing gas-rich and aqueous liquid rich types. Earliest gold is in early quartz veins, but has been locally mobilised.	Granitoid 1.sericite, carbonate, quartz, rutile, pyrite, arsenopyrite, chalcopyrite, allanite	1.(veinlet) biotite (→ chlorite, quartz 2.(vein) quartz, carbonate, biotite (→ chlorite) pyrite, gold; quartz 3.(shear/cavity) quartz, carbonate, sericite, pyrite, arsenopyrite, native gold
26020.18 TBRC06/ 129-130m	Early biotite veinlets represent weak potassic alteration. Early quartz veining is deformed and overprinted by carbonate and sericite together with the wallrock lithology. Sericite has formed preferentially after plagioclase. Hematite impregnation of alkali feldspar post-dates carbonate veining and related sericite + carbonate replacement.	Syenogranite porphyry 1.muscovite, carbonate, rutile 2.sericite, carbonate, chlorite, pyrite, epidote 3.hematite	1.(veinlet) biotite, quartz 2.(vein) quartz, pyrite, biotite; carbonate, sericite, quartz, pyrite 2.(veinlet) carbonate, sericite, chlorite
26020.25 TBRC06/ 179-180m	Arsenopyrite is genetically related to a generation of CO_2 bearing fluid inclusions. Early arsenopyrite is associated with very subtle sericite/muscovite and carbonate alteration, the arsenopyrite apparently almost part of the late magmatic mineralogy. Early arsenopyrite, muscovite/sericite, chlorite and carbonate predate weak deformation.	Biotite syenogranite 1.muscovite; sericite, carbonate, chlorite, rutile, pyrite, arsenopyrite, chalcopyrite, tennantite/ tetrahedrite 2.hematite	1.(veinlet) alkali feldspar, chalcopyrite 2.(cavity/shear) muscovite/ sericite, carbonate, rutile, arsenopyrite 3.(veinlet) chlorite, sericite, carbonate
26020.20 TBRC11/ 178-179m	There is differential alteration of plagioclase and alkali feldspar: plagioclase is altered to sericite. Biotite is partly preserved in some places, and at one location is host to a possible gold inclusion.	Biotite syenogranite 1.muscovite/sericite, chlorite, carbonate, rutile, pyrite 2.hematite	1.(veinlet) carbonate, sericite

26020.21 TBRC11 179-180m	Hematite inclusion trails within alkali feldspar are continuous with low-temperature, aqueous-rich (including active vapour-bubble) in adjacent quartz. Early chalcopyrite and molybdenite mineralisation is associated with early sericite/muscovite, carbonate, chlorite and pyrite.	Biotite syenogranite 1.muscovite; sericite, chalcopyrite, pyrite, rutile, molybdenite, chlorite, carbonate, arsenopyrite 2.hematite	1.(veinlet) biotite (→ chlorite), muscovite/sericite) 2.(veinlet) quartz, muscovite/sericite, alkali feldspar, chalcopyrite, carbonate 3.(shear/cavity) chlorite, carbonate, sericite, pyrite, rutile, chalcopyrite
26020.22 TBRC14/ 163-164m	The gold-bearing quartz + alkali feldspar + pyrite/arsenopyrite + carbonate + muscovite quartz veining is associated with sericite/muscovite + carbonate + pyrite/arsenopyrite alteration in the wallrock. Fluid inclusions apparently associated with the gold bearing vein formation comprise CO_2-bearing gas-rich and aqueous-rich inclusions.	Biotite syenogranite 1.muscovite; sericite, carbonate, rutile, chlorite, pyrite, arsenopyrite 2.hematite	1.(vein) quartz, alkali feldspar, pyrite; carbonate, pyrite, arsenopyrite, native gold, tennantite/tetrahedrite, chalcopyrite, bismuthinite, sphene, monazite/xenotime, muscovite/sericite, chlorite, rutile 2.(vein) quartz, carbonate; quartz
26020.23 TBRC14/ 177-178m	The abundance of quartz borders on 20 to 25% of the rock. Biotite comprises 20% of the primary assemblage, a minor part of the early secondary assemblage, and magnetite is part of the primary assemblage. Oxidation of the rock is represented by hematite after magnetite, biotite and chlorite as well as widespread impregnation of alkali feldspar.	Biotite syenogranite/quartz syenite 1.biotite, K-feldspar 2.muscovite; sericite, chlorite, carbonate, pyrite 3.hematite	1.(veinlet) alkali feldspar; carbonate 2.(veinlet) sericite, carbonate, chlorite 3.(veinlet) hematite
26020.24 TBAC16/ 65-67 m	A biotite quartz syenite to syenogranite porphyry. An oxidised primary assemblage, on the basis of abundance of biotite and presence of magnetite. Sericite and pyrite dominate the hydrothermal alteration assemblages. Gold is associated with the pyrite + sericite.	Quartz syenite/syenogranite porphyry 1.alkali feldspar, biotite, magnetite, rutile 2.muscovite; sericite, chlorite, carbonate, rutile, pyrite, native gold 3.hematite	1.(vein) quartz; quartz 2.(shear) carbonate, chlorite, sericite, quartz, chalcopyrite, arsenopyrite
26020.19 TBRC09E 154-155m	Gold is associated with a strong phyllic overprint centred upon penetrative shears, formed parallel to and within early quartz veining. The gold is closely associated with arsenopyrite overgrowths to euhedral pyrite. Gold appears to have been mobilised, together with arsenic, within the phyllic overprint. Chalcopyrite is associated with the primary lithology.	Granitoid porphyry 1.sericite, quartz, pyrite, arsenopyrite, carbonate	1.(veinlet) quartz; quartz, muscovite, carbonate, pyrite, arsenopyrite, native gold 2.(veinlet/cavity/shear) quartz, carbonate, pyrite, arsenopyrite, chalcopyrite, rutile, arsenopyrite, native gold

26021.01a TBRC09E/ 300.1 m	Muscovite is a late-stage magmatic silicate and early magmatic hydrothermal minerals, as is biotite, the latter apparently aggregated after possible primary amphibole. Muscovite and biotite are primary and secondary minerals. Biotite, arsenopyrite, muscovite/sericite, carbonate, rutile, quartz and some K-feldspar comprise the early hydrothermal mineralogy.	Biotite syenogranite porphyry 1.biotite, arsenopyrite, pyrite, 2.muscovite, rutile, carbonate; sericite, carbonate, chlorite, pyrite, arsenopyrite, chalcopyrite, tennantite/tetrahedrite 3.hematite	1.(veinlet) biotite, muscovite 2.(veinlet/shear) carbonate, chlorite, sericite, pyrite, arsenopyrite, chalcopyrite
26021.01b TBRC09E 300.1 m	Arsenopyrite pre-dates the strong sericite and carbonate alteration and strain fabric. There has been some recrystallisation of pyrite and arsenopyrite, and local mobilisation of arsenic to form secondary arsenopyrite, finer grained, intergrown with sericite.	Biotite syenogranite porphyry 1.muscovite; sericite, carbonate, quartz, rutile, chlorite, pyrite, arsenopyrite, chalcopyrite, pyrrhotite	1.(veinlet) chlorite 2.(veinlet) sericite, carbonate, chlorite
26021.02a TBRC09E 321.3 m	There is also a temporal transition from muscovite to later sericite. The spatially differentiated alteration is represented by muscovite after biotite and chlorite after biotite. The chlorite and muscovite domains are isochronous, with arsenopyrite more abundant in the muscovite domain. Mo and Cu associated with primary rock.	Biotite syenogranite porphyry 1a. chlorite, carbonate, rutile, muscovite; sericite, pyrite, arsenopyrite 1b.muscovite, pyrite, arsenopyrite; sericite, quartz, arsenopyrite, pyrite, carbonate 2.hematite	1.(veinlet) carbonate, chlorite, pyrite, rutile, arsenopyrite
26021.02b TBRC09E 321.3m	Early muscovite is deformed/attenuated and degraded to sericite. Arsenopyrite is deformed by way of fracturing and fragmentation within the mainly ductile strain dominated by plastically deformed domains of sericite after feldspar.	Biotite syenogranite porphyry 1.muscovie, sericite, quartz, pyrite, arsenopyrite, rutile, carbonate, chlorite	1.(veinlet) chlorite, carbonate 2.(vein/veinlet) carbonate, chlorite 3.(veinlet) pyrite
26021.03 BURC05E 106.1 m	There has been fluidisation and milling of granitoid porphyry and early quartz + feldspar vein/cement. There has been subsequent fragmentation, milling and fluidisation a quartz + K-feldspar + pyrite cement in which comminuted framework clasts is >> quartz + sericite + pyrite cement. Gold/bismuth minerals are associated with at least two stages of hydrothermal cement/replacement, as inclusions in pyrite.	Quartz + K-feldspar cemented, granitoid and quartz vein lithic hydro-thermal breccia 1.sericite, quartz, pyrite, arsenopyrite, native gold 2.hematite	1.(cement) quartz, alkali feldspar (→ sericite), pyrite, arsenopyrite, native gold, bismuth sulphides/ bismuth 2.(vein) quartz, apatite, pyrite, bismuthinite/bismuth, native gold 3.(cavity/cement) sericite, quartz, pyrite, arsenopyrite, gold, bismuth minerals. 4.(veinlet/shear) quartz, sericite, chalcedonic quartz, pyrite
26021.04 BURC05E 137.5m	Intergrowths of pyrite, arsenopyrite, muscovite and carbonate in the groundmass and after biotite and plagioclase phenocrysts, is a feature of the rock. Hematite occurs as inclusions in wallrock and vein alkali feldspar. Muscovite and carbonate post-date quartz and K-spar in the vein.	Biotite syenogranite porphyry 1.muscovite, pyrite, arsenopyrite, rutile, carbonate; sericite, rutile, pyrite, arsenopyrite, chalcopyrite 2.hematite	1.(vein) quartz, alkali feldspar, pyrite; muscovite, carbonate, pyrite, chalcopyrite, tennantite/tetrahedrite, native gold, bismuth minerals 2.(veinlet) carbonate, chalcopyrite, galena

RESULTS: TWIN BONANZA

ROCK TYPES

TABLE 2. PETROLOGICAL SUMMARY: TWIN BONANZA DIAMOND HOLE SAMPLES (THIS STUDY)

26011.04a BURC020/ 124 m	Early potassic alteration of the granitoid wallrock, represented by domains of secondary biotite, appears to be associated with the early voluminous quartz veining.	Biotite granitoid -biotite -sericite/illite, pyrite, As-pyrite, rutile -hematite	-(vein) quartz -(veinlet/cavity) quartz, carbonate, sericite/illite, pyrite, As-pyrite; carbonate
26011.04b BURC020/ 124 m	The central parts of dominated by Type B quartz that encloses what appear to be fluidised wallrock fragments and early quartz vein fragments.	Biotite granitoid -biotite -quartz, sericite/illite, chlorite, rutile, pyrite, carbonate -hematite	-(veinlet) biotite (→ sericite/illite, chlorite) -(vein) quartz -(vein/cement) quartz, carbonate; sericite/illite, pyrite, chalcopyrite
26011.05 BURC020/ 129 m	Pervasive "phyllic" alteration represented by sericite/illite, chlorite, carbonate, quartz and pyrite is centred upon the intense but discrete shearing and deformation.	Biotite granitoid -biotite -sericite/illite, carbonate, chlorite, rutile, pyrite, chalcopyrite -hematite	-(veinlet) quartz, biotite (→ sericite/illite, chlorite) -(vein) quartz, carbonate -(shear/cavity) quartz, carbonate, pyrite, rutile, sericite/illite, chalcopyrite
26011.06 BURC05/ 108m	Strong shearing of a porphyry lithology and early quartz + feldspar veining in association with pervasive sericite + quartz + pyrite/As-pyrite alteration. Native gold is associated with pyrite and "epithermal" style quartz of the late shearing and alteration.	Biotite syenogranite porphyry -biotite -sericite/illite, rutile, pyrite -hematite	-(vein/cement) quartz, alkali feldspar , biotite (→ sericite), pyrite -(shear/cavity) quartz, pyrite, native gold, arsenopyrite, As-pyrite, galena/BiTeS minerals
26011.07a BURC016/ 147.5 m	There is no distinction between primary framework quartz and vein quartz at vein-wallrock boundaries. Gold appears to be associated with the pervasive sericite alteration within the wallrock, although this could have been remobilised from an early biotite association.	Biotite granitoid -biotite -sericite/illite, rutile, pyrite, chlorite, As-pyrite, chalcopyrite, native gold	-(veinlet) quartz, biotite (→ sericite/illite) -(vein/cement) quartz, biotite (→ sericite/illite), carbonate; sericite/illite, chalcopyrite
26011.07b BURC016/ 147.5 m	An almost granophyric textured granitoid, possibly syenogranite. Biotite was a significant component of the primary framework assemblage. Primary and secondary biotite is altered to chlorite and sericite/illite.	Biotite granitoid -biotite -sericite/illite, chlorite, rutile, pyrite, As-pyrite, chalcopyrite	-(vein/veinlet) quartz, biotite (→ sericite/illite, chlorite) -(veinlet) quartz, carbonate; sericite/illite, chalcopyrite
26011.08 BURC017/ 127.2 m	The wallrock and early "mesothermal" style quartz veining were deformed simultaneously, and the resulting network of microfractures and cavities filled with "epithermal" style quartz, carbonate and sericite.	Biotite granitoid porphyry -quartz, sericite/illite, rutile, pyrite	-(vein) quartz -(shear/veinlet/cavity) quartz, sericite, carbonate, pyrite, arsenopyrite; carbonate -(veinlet) carbonate