

Samples: A0027 Series: 024, 062, 077, 078, 087
BB-01, BB18-01E, BB18-03D; JSWPT-053, JSWPT-054; PR1, PR-01, PR-02

Summary:

Sample A0027024 is of hypabyssal porphyritic quartz-bearing latite that contains phenocrysts of plagioclase (altered slightly to completely to sericite-calcite), phenocrysts of biotite (altered completely to pseudomorphic chlorite with much less muscovite, calcite, plagioclase/quartz, and Ti-oxide) and minor ones of quartz; these are set in bimodal groundmass dominated by plagioclase-K-feldspar-(quartz-chlorite) with disseminated patches 0.5-1.0 mm across of plagioclase. Disseminated patches are of magnetite-(ilmenite), of pyrite, and of chlorite-(muscovite).

Sample A0027062 is of porphyritic biotite granodiorite that contains phenocrysts of plagioclase (altered slightly to moderately to sericite), and lesser ones of biotite (altered slightly to locally moderately to chlorite), K-feldspar, and quartz; these are set in a groundmass of generally much finer grained K-feldspar, quartz, and plagioclase, with accessory biotite, less abundant chalcopyrite and pyrite, and minor ilmenite and apatite.

Sample A0027077 is of hypabyssal porphyritic biotite granodiorite that contains phenocrysts of plagioclase (altered slightly to moderately to sericite), phenocrysts of biotite (altered slightly to moderately to pseudomorphic chlorite), and minor phenocrysts of quartz; these are set in a groundmass of plagioclase, K-feldspar, quartz, chlorite, and biotite, with disseminated patches of pyrite and minor apatite and epidote.

Sample A0027085 is of hypabyssal porphyritic biotite granodiorite that contains phenocrysts of plagioclase (relatively fresh), K-feldspar, quartz, and biotite (altered slightly to chlorite); these are set in a groundmass of finer grained plagioclase (commonly altered moderately to sericite-semi-opaque) and much finer grained K-feldspar-quartz intergrowths with lesser plagioclase, accessory biotite, and scattered grains and clusters of magnetite-(ilmenite), locally with chalcopyrite. A vein is of quartz and minor plagioclase.

Sample A0027087 is of hypabyssal porphyritic biotite granodiorite that contains phenocrysts of plagioclase (fresh to altered moderately to sericite and dusty semi-opaque), quartz, K-feldspar, and biotite (fresh to altered moderately to pseudomorphic chlorite); these are set in a groundmass of plagioclase (altered slightly to moderately to sericite and dusty semi-opaque), K-feldspar and quartz, with accessory biotite and scattered patches of pyrite and of chalcopyrite.

Sample BB-01 contain patches up to 2 cm across of meta-dacite(?) consisting of extremely fine grained quartz/plagioclase with scattered coarser grains of quartz and disseminated grains and clusters of grains of tourmaline. This was replaced by and cut by veinlets and veins of quartz-tourmaline with a patch of pyrite-arsenopyrite(?). A sheared seam is of granulated tourmaline and minor pyrite. A late veinlet is of limonite.

Sample BB18-01E is of extremely fine grained mudstone with several patches with coarser detrital grains near one end. Irregular replacement patches are dominated by chlorite with lesser, commonly much coarser grains of quartz, and locally arsenopyrite or muscovite(?). Most patches have sharp to diffuse contacts with the host rock, whereas a few patches have an alteration envelope in which biotite was replaced by chlorite. A large vein and a few smaller veinlets are of quartz-

dolomite. Several veinlets are of dolomite. A few veinlets are of tourmaline. A few discontinuous veinlets are of biotite/muscovite.

Sample BB18-03D is dominated by tourmaline with scattered patches of quartz, the margins of some of which are loci for precipitation of chalcopyrite. The rock was brecciated, with the matrix being mainly granulated tourmaline with scattered patches of sulphides and of quartz. Numerous veinlets are of one or more of pyrite, chalcopyrite, arsenopyrite, and limonite(?). Age relations among veinlets are ambiguous. A late breccia zone has a matrix of granulated tourmaline and abundant pyrite with accessory chalcopyrite and arsenopyrite.

Sample JSWPT-053 is mainly of cherty quartz/plagioclase with slightly coarser grained patches dominated by quartz, and moderately coarser grained patches and veinlets of quartz and of plagioclase. Three large zoned veins are of two types of tremolite/actinolite with lesser tourmaline and quartz. A lens is of tremolite/actinolite at one end and plagioclase-biotite/chlorite at the other.

Sample JSWPT-054 contains five main zones. Zone A is of banded quartz-tourmaline with lenses and seams with abundant chlorite. Zone B is dominated by quartz-plagioclase with much less abundant tourmaline and with patches of pyrite-biotite. Zone C is a replacement(?) patch of tremolite/ actinolite with lesser biotite and minor tourmaline, chlorite, and quartz. Zone D is of patchy quartz-plagioclase with minor tourmaline. Zone E is of finely banded quartz-plagioclase-tourmaline that was cut obliquely by a few bands of tourmaline-chlorite-(quartz).

Sample PRI is of hypabyssal porphyritic hornblende-biotite granodiorite that contains phenocrysts of plagioclase (fresh to altered slightly to sericite), of K-feldspar, of quartz, of hornblende (locally altered to patches of biotite or of calcite), and of biotite (locally altered slightly to chlorite); these are set in a groundmass of finer grained plagioclase (altered slightly to moderately to sericite) and much finer grained quartz and K-feldspar, with scattered grains of biotite, hornblende, and magnetite, and minor sphene.

Sample PR-01 is of hypabyssal porphyritic biotite-hornblende granodiorite that contains abundant phenocrysts of plagioclase (fresh to altered moderately to sericite) and accessory phenocrysts of K-feldspar, quartz, biotite (fresh to locally altered slightly to chlorite), and hornblende (fresh to altered completely to chlorite-biotite-[epidote]); these are set in a very fine grained groundmass of plagioclase, quartz, and K-feldspar, with minor to accessory biotite, hornblende, magnetite, and ilmenite, and trace chalcopyrite and pyrite. A discontinuous veinlet is of massive chalcopyrite.

Sample PR-02 is of slightly porphyritic potassic quartz diorite. It is dominated by medium grained plagioclase (fresh to altered moderately to sericite) with interstitial patches of chlorite and of quartz and K-feldspar, mainly in intimate intergrowths. Chalcopyrite forms numerous irregular patches intergrown finely with silicates. Pyrite with trace inclusions of chalcopyrite forms one large patch intergrown intimately with plagioclase and lesser biotite/chlorite.

Photographic Notes:

The scanned section shows the gross textural features of the sections; these features are seen much better on the digital image than on the printed image. For the photographs, sample numbers are shown in the upper left corner, photo numbers are shown in the lower left corner, and the letter in the lower right corner indicates the lighting conditions: plane polarized incident light (= P); incident light in crossed nicols (= X); reflected light (= R); reflected light in nearly crossed nicols and incident light in crossed nicols (= ~RX). Locations of photographs are shown on the scanned section. Descriptions of the photographs are at the end of the report.

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Sample A0027024 Hypabyssal Porphyritic Quartz-bearing Latite

Phenocrysts of plagioclase (altered slightly to completely to sericite-calcite), phenocrysts of biotite (altered completely to pseudomorphic chlorite with much less muscovite, calcite, plagioclase/quartz, and Ti-oxide) and minor ones of quartz are set in bimodal groundmass dominated by plagioclase-K-feldspar-(quartz-chlorite) with disseminated patches 0.5-1.0 mm across of plagioclase. Disseminated patches are of magnetite-(ilmenite), of pyrite, and of chlorite-(muscovite).

mineral	percentage	main grain size range (mm)
phenocrysts		
plagioclase	17-20%	0.5-2
biotite	3- 4	0.5-1 (a few up to 1.5 mm long)
quartz	0.3	0.2-0.4
groundmass		
plagioclase	45-50	0.02-0.05
K-feldspar	15-17	0.02-0.03
quartz	3- 4	0.05-0.2
chlorite	2- 3	0.02-0.03
magnetite	1- 2	0.1-0.5
pyrite	1- 2	0.3-0.7
ilmenite	0.3	0.05-0.08 (one patch 1.2 mm long)
apatite	0.1	0.1-0.25
calcite	0.1	0.02-0.03
chalcopryrite	trace	0.01-0.025; one grain 0.1 mm long
zircon	trace	0.05-0.1

Plagioclase forms subhedral prismatic phenocrysts that were altered moderately to strongly to sericite and generally lesser calcite, with scattered patches up to 0.2 mm across of muscovite.

Hornblende forms subhedral to euhedral prismatic phenocrysts that were altered completely to calcite and lesser chlorite.

Biotite forms equant to slender subhedral phenocrysts that were altered completely to pseudomorphic, light green chlorite (with an anomalous bright blue interference colour), with patches of plagioclase/quartz, of calcite, and minor lenses of muscovite-Ti-oxide. A few contain abundant inclusions of magnetite.

Quartz forms anhedral phenocrysts and a few clusters of grains that grade texturally into groundmass quartz.

The groundmass (gm1) is mainly an intergrowth of extremely fine grained plagioclase and lesser K-feldspar, with minor patches of quartz and disseminated patches of calcite.

Numerous leucocratic patches (gm2), mainly from 0.5-1 mm in size have a different texture than the main groundmass; these are dominated by extremely fine grained plagioclase with scattered slightly coarse subhedral equant grains (altered slightly to sericite).

Quartz forms anhedral grains, commonly interstitial to feldspars.

Magnetite and much less abundant ilmenite occur together in a few patches up to 2 mm across; boundaries between the two minerals commonly are along cleavage/crystallographic planes. Much more commonly, the minerals occur in anhedral patches from 0.03-0.1 mm in size. Ilmenite(?) forms a "subhedral" patch up to 1.2 mm in size that was altered completely, in part to leucoxene and in part to rutile intergrown with sericite and lesser quartz/plagioclase.

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Pyrite forms clusters of several anhedral grains, many of which contain accessory inclusions of silicates and of magnetite (0.01-0.05 mm) and a few of which contain minor inclusions of chalcopyrite (0.01-0.025 mm). Pyrite is concentrated moderately in a lens ~1 cm long near one end of the section. A few pyrite grains were altered slightly inwards from grain borders to hematite.

Chalcopyrite also forms one slightly elongate grain that was altered slightly to hematite in a thin rim along its margin.

Apatite forms subhedral to euhedral prismatic grains.

Zircon forms euhedral stubby prismatic grains.

A few patches up to 0.3 mm across are of hydrothermal chlorite and minor muscovite. Some of these patches are adjacent to patches of magnetite-(ilmenite).

Sample A0027062 Porphyritic Biotite Granodiorite
Alteration: Sericite-Chlorite
Replacement: Chalcopyrite, Pyrite

Phenocrysts of plagioclase (altered slightly to moderately to sericite), and lesser ones of biotite (altered slightly to locally moderately to chlorite), K-feldspar, and quartz are set in a groundmass of generally much finer grained K-feldspar, quartz, and plagioclase, with accessory biotite, less abundant chalcopyrite and pyrite, and minor ilmenite and apatite.

mineral	percentage	main grain size range (mm)	
phenocrysts			
plagioclase	17-20%	0.7-1.5	(a few up to 3 mm long)
biotite	4- 5	0.7-1.5	
K-feldspar	3- 4	0.7-1	(a few from 2- 4 mm long)
quartz	1- 2	0.5-1	(a few 1-1.3 mm)
groundmass			
K-feldspar	20-25	0.07-0.4	
quartz	12-15	0.05-0.15	(a few from 0.5-1 mm)
plagioclase	17-20	0.07-0.3	
biotite	2- 3	0.1-0.7	
chalcopyrite	1- 2	0.15-0.5	(a few up to 0.7 mm)
pyrite	1	0.3-1	
ilmenite/leucoxene	0.3	0.2-0.7	
apatite	0.1	0.1-0.4	

Plagioclase forms subhedral to euhedral prismatic phenocrysts, some of which show weak to moderate concentric growth zoning near their margins from more-calcic towards the core to more-sodic towards the rim, with some oscillatory zoning. Grains were altered slightly to locally moderately to sericite; in some grains, alteration is most intense in a thin zone (0.05 mm) near the rim; this may have been a more-calcic growth zone that was more susceptible to sericite alteration than the remainder of the crystals.

Biotite forms anhedral to subhedral phenocrysts with pleochroism from light to medium brown. Most were altered slightly to strongly to pseudomorphic pale to light green chlorite with locally accessory lenses from 0.1-0.3 mm long of sphene or of epidote along a cleavage plane.

K-feldspar forms anhedral, equant, fresh phenocrysts.

Quartz forms anhedral to locally subhedral phenocrysts, many of which have overgrowths of groundmass quartz in optical continuity with the core.

The groundmass is dominated by an intergrowth of K-feldspar and quartz, with lesser plagioclase (altered slightly to sericite) and biotite (altered slightly to moderately to pseudomorphic chlorite).

Pyrite forms anhedral interstitial grains and clusters up to 0.7 mm across of similar grains. Near one side of the section, pyrite was weathered moderately to strongly to hematite.

Chalcopyrite forms disseminated anhedral patches, mainly away from pyrite grains. Near the weathered surface, some chalcopyrite grains were altered slightly to moderately inwards from their margins to hematite.

Ilmenite (altered strongly to leucoxene) forms anhedral patches.

Apatite forms anhedral equant and subhedral prismatic grains.

Sample A0027077 Hypabyssal Porphyritic Biotite Granodiorite

Phenocrysts of plagioclase (altered slightly to moderately to sericite), phenocrysts of biotite (altered slightly to moderately to pseudomorphic chlorite), and minor phenocrysts of quartz are set in a groundmass of plagioclase, K-feldspar, quartz, chlorite, and biotite, with disseminated patches of pyrite and minor apatite and epidote.

mineral	percentage	main grain size range (mm)
phenocrysts		
plagioclase	15-17%	1- 3
biotite	2- 3	0.5-1
quartz	1	0.3-0.7
groundmass		
plagioclase	30-35	0.03-0.07
K-feldspar	20-25	0.03-0.07
quartz	10-12	0.03-0.05
chlorite	3- 4	0.03-0.07
biotite	1- 2	0.03-0.08
pyrite	1- 1.5	0.1-0.5
chalcopryrite	0.2	0.1-0.3
apatite	0.1	0.1-0.2
epidote	minor	0.03-0.07
sphene	minor	0.05-0.15

Plagioclase forms subhedral to euhedral phenocrysts that were compositionally zoned slightly, especially towards their margins. Alteration to sericite ranges from slight to locally moderate, with a thin growth zone near the margins of many grains being altered strongly to sericite. A few grains also contain patches of secondary calcite.

Biotite forms scattered phenocrysts with pleochroism from light to medium brown. Alteration commonly is slight to locally moderate to pseudomorphic chlorite and locally to patches of epidote.

Quartz forms a few anhedral phenocrysts that were slightly intergrown with groundmass quartz with the same optical orientation.

The groundmass is mainly an intergrowth of equant plagioclase (altered slightly to sericite), K-feldspar, and quartz, with disseminated flakes of biotite and patches of chlorite (in part secondary after biotite).

Chlorite forms larger patches that probably represent non-pseudomorphic alteration of biotite phenocrysts.

Pyrite forms anhedral, in part skeletal grains and aggregates up to 0.7 mm across. Many grains contain accessory silicate inclusions. One patch is intergrown intimately with ilmenite/leucoxene and contains a patch of hematite (probably secondary after pyrite).

Chalcopryrite forms equant to irregular patches, none of which is spatially associated with pyrite.

Apatite forms scattered subhedral to euhedral prismatic grains.

Epidote forms scattered anhedral grains and patches of a few grains.

Sphene forms disseminated patches, in part associated with biotite.

Sample A0027085 Hypabyssal Porphyritic Biotite Granodiorite
Alteration: (minor) Sericite-Chlorite

Phenocrysts of plagioclase (relatively fresh), K-feldspar, quartz, and biotite (altered slightly to chlorite) are set in a groundmass of finer grained plagioclase (commonly altered moderately to sericite-semi-opaque) and much finer grained K-feldspar-quartz intergrowths with lesser plagioclase, accessory biotite, and scattered grains and clusters of magnetite-(ilmenite), locally with chalcopyrite. A vein is of quartz and minor plagioclase.

mineral	percentage	main grain size range (mm)
phenocrysts		
plagioclase	25-30%	0.7-3
biotite	4- 5	0.7-1.5
K-feldspar	4- 5	0.7-1.5 (a few up to 2.5 mm across)
quartz	3- 4	0.5-2
hornblende	0.2	0.7-1.2
groundmass		
K-feldspar	20-25	0.05-0.15
quartz	15-17	0.07-0.25
plagioclase	15-17	0.1-0.5
biotite	2- 3	0.15-0.5
magnetite	1- 2	0.1-0.3
apatite	0.1	0.03-0.1 (locally up to 0.3 mm)
chalcopyrite	trace	0.02-0.12
zircon	trace	0.05
vein		
1) quartz-(plagioclase) 2		0.1-0.3

Plagioclase forms subhedral to euhedral prismatic phenocrysts, some of which show slight compositional growth zoning. Most are relatively fresh to altered slightly to sericite. Some, mainly smaller anhedral phenocrysts are altered moderately to sericite and dusty semi-opaque. In a few grains, alteration is moderate to strong in a thin concentric growth ring about 2/3 of the way from the core to the rim.

Biotite forms equant phenocrysts with slightly to moderately ragged ends. Pleochroism is from light to dark brown. Grains range from fresh to locally altered slightly to moderately to pseudomorphic chlorite with minor lenses of Ti-oxide. A few clusters are associated with patches of pyrite.

Quartz forms anhedral phenocrysts that commonly are surrounded by groundmass quartz and K-feldspar. Some are in optical continuity with adjacent groundmass quartz.

K-feldspar forms anhedral phenocrysts, some of which are altered slightly to sericite and dusty semi-opaque. Near the margins of some are abundant inclusions of groundmass quartz.

Hornblende forms ragged prismatic phenocrysts that were altered to pseudomorphic tremolite/actinolite (pleochroism from pale to very light green) and patches of chlorite and sphene.

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In the groundmass, K-feldspar and quartz form intergrowths of anhedral equant grains.

Plagioclase forms coarser anhedral to subhedral grains that commonly are altered slightly to moderately to sericite and in some to dusty semi-opaque. It also forms finer grains (fresh to altered slightly to sericite) intergrown with K-feldspar and quartz.

Biotite forms anhedral grains and a few clusters up to 2 mm in size of grains (0.1-0.5 mm), some of which were altered slightly to completely to partly pseudomorphic chlorite).

Magnetite forms disseminated grains and is concentrated strongly in a few clusters with ilmenite (altered partly to leucoxene), and in one large cluster with biotite. One patch of magnetite-(ilmenite) contains several small patches of chalcopyrite.

Apatite forms subhedral to euhedral prismatic grains, in part included in plagioclase phenocrysts. It also is concentrated in a patch up to 0.5 mm across of anhedral grains associated with biotite.

Zircon forms an equant grain included in biotite.

A vein up to 0.7 mm wide is of fine grained quartz and minor plagioclase.

Sample A0027087 Hypabyssal Porphyritic Biotite Granodiorite

Phenocrysts of plagioclase (fresh to altered moderately to sericite and dusty semi-opaque), quartz, K-feldspar, and biotite (fresh to altered moderately to pseudomorphic chlorite) are set in a groundmass of plagioclase (altered slightly to moderately to sericite and dusty semi-opaque), K-feldspar and quartz, with accessory biotite and scattered patches of pyrite and of chalcopyrite.

mineral	percentage	main grain size range (mm)
phenocrysts		
plagioclase	20-25%	0.5-2
quartz	7- 8	0.7-2
K-feldspar	5- 7	2- 3 (one grain 7 mm across)
biotite	3- 4	0.7-3
groundmass		
plagioclase	17-20	0.1-0.5
K-feldspar	17-20	0.05-0.3
quartz	15-17	0.05-0.3
biotite	3- 4	0.1-0.3
pyrite	0.3	0.2-0.5
chalcopyrite	0.2	0.1-0.6
ilmenite	0.1	0.05-0.2
magnetite	minor	0.03-0.05
calcite	trace	0.05-0.1
apatite	trace	0.05-0.1

Plagioclase forms subhedral to euhedral prismatic phenocrysts, some of which show moderate concentric compositional growth zoning. Grains range from relatively fresh to slightly and locally moderately altered to sericite.

Quartz forms equant anhedral to locally subhedral phenocrysts that are intergrown slightly along their margins with groundmass quartz that is in optical continuity with the phenocryst.

K-feldspar forms anhedral to subhedral phenocrysts, many of which contain abundant inclusions of very fine grained (= groundmass) quartz near their margins. One phenocryst is a Carlsbad twin. One megacryst 7 mm long contains a phenocryst of plagioclase and a few patches of plagioclase, of quartz, and of biotite (marked on scanned section by two "Kf"s).

Biotite forms anhedral to subhedral phenocrysts with pleochroism from light to medium/dark brown. Some were altered slightly to moderately to pseudomorphic chlorite and minor to accessory patches of sphene or minor epidote.

The groundmass consists of intimate intergrowths of quartz and K-feldspar with coarser grained, mainly anhedral plagioclase (commonly altered moderately to sericite and dusty semi-opaque).

Biotite forms anhedral equant flakes, some of which were altered moderately to pseudomorphic chlorite. A few patches of very fine grained chlorite-calcite probably are secondary after biotite.

Pyrite forms a few anhedral grains and irregular clusters of grains; a few grains contain trace/minor inclusions of chalcopyrite (0.01-0.03 mm) and of magnetite (0.03-0.05 mm). The largest patch is intergrown finely with a phenocryst of biotite (altered strongly to pseudomorphic chlorite).

Chalcopyrite forms disseminated irregular patches, mainly away from pyrite.

Ilmenite (altered moderately to leucoxene) forms patches up to 1 mm in size, one of which also contains accessory disseminated pyrite.

Apatite forms anhedral equant grains.

Sample BB-01**Meta-Dacite****Replacement: Quartz-Tourmaline****Seam: Tourmaline-Pyrite****Veinlet: Limonite**

The sample contain patches up to 2 cm across of meta-dacite(?) consisting of extremely fine grained quartz/plagioclase with scattered coarser grains of quartz and disseminated grains and clusters of grains of tourmaline. This was replaced by and cut by veinlets and veins of quartz-tourmaline with a patch of pyrite-arsenopyrite(?). A sheared seam is of granulated tourmaline and minor pyrite. A late veinlet is of limonite.

mineral/rock	percentage	main grain size range (mm)
dacite(?)		
quartz/plagioclase	35-40%	0.005-0.01 (qz/pl); 0.2-0.5 (qz)
tourmaline	4- 5	0.03-0.3
replacement, veins		
quartz	50-55%	0.3-0.8
tourmaline	7- 8	0.03-0.1 (several 0.3-0.5 mm long)
pyrite	0.3	0.1-0.2
veinlets, seams		
1) tourmaline-pyrite	0.5	0.005-0.03
2) limonite	1- 2	

The host rock is of extremely fine grained quartz/plagioclase (0.005-0.015 mm) with scattered coarser grains of quartz grains and diffuse clusters of grains of tourmaline. A few patches up to 1 mm in size are of slightly coarser grained quartz aggregates (0.02-0.03 mm).

Replacement patches and veins are mainly of quartz with open clusters and dense patches of tourmaline intergrown with minor to moderately abundant quartz.

Quartz occurs mainly as medium grained anhedral equant aggregates. Some patches are relatively free of tourmaline inclusions, and others contain minor to accessory disseminated wispy acicular tourmaline grains.

Tourmaline is concentrated moderately to strongly in clusters of unoriented prismatic grains. Pleochroism is from pale to medium greenish brown and locally, especially in larger grains, from pale to light, slightly bluish green.

Pyrite is concentrated occurs in a few patches up to 2.5 mm across intergrown with subhedral tourmaline grains.

A seam 0.1-0.25 mm wide is of extremely fine grained tourmaline with patches of pyrite; textures suggest that it was formed by shearing and granulation of coarser grains.

A veinlet 0.05-0.1 mm wide contains abundant patches of limonite.

Sample BB18-01E**Meta-Mudstone (Plagioclase-Biotite), Patches of Siltstone
Replacement: Chlorite-Epidote-Quartz-(Arsenopyrite-Muscovite(?))
Veins, Veinlets: Quartz-Dolomite; Dolomite; Tourmaline; Biotite**

The sample is of extremely fine grained mudstone with several patches with coarser detrital grains near one end. Irregular replacement patches are dominated by chlorite with lesser, commonly much coarser grains of quartz, and locally arsenopyrite or muscovite(?). Most patches have sharp to diffuse contacts with the host rock, whereas a few patches have an alteration envelope in which biotite was replaced by chlorite. A large vein and a few smaller veinlets are of quartz-dolomite. Several veinlets are of dolomite. A few veinlets are of tourmaline. A few discontinuous veinlets are of biotite/muscovite.

mineral	percentage	main grain size range (mm)	
detrital(?) grains			
plagioclase	0.2%	0.07-0.15	
quartz	minor	0.05-0.1	
groundmass			
plagioclase	70-75%	0.003-0.005	
biotite	5- 7	0.003-0.01	
ilmenite	0.1	0.03-0.1	(a few up to 0.15 mm long)
pyrite	minor	0.01-0.03	(a few up to 0.05 mm)
chalcopyrite	trace	0.02-0.05	
replacement patches			
chlorite	7- 8	0.1-0.3	(locally up to 0.5 mm)
quartz	4- 5	0.5-1.5	
epidote	0.5	0.2-0.4	
arsenopyrite	0.2	0.2-0.5	
vein, veinlets			
1) quartz-dolomite	5- 7	0.5-1	
2) dolomite	0.2	0.1-0.4	
3) tourmaline	0.1	0.015-0.05	(locally up to 0.1 mm)
4) biotite/muscovite	minor	0.02-0.05	

Near one end, the section contains patches up to 1.7 mm across of meta-siltstone that contain disseminated detrital grains of plagioclase and of quartz in a sparse to moderate matrix of plagioclase-(biotite).

In the meta-mudstone, plagioclase(?) forms anhedral equant grains that are too small for optical identification.

Biotite forms disseminated grains and locally is concentrated moderately in patches; pleochroism is from pale to light brown.

Ilmenite forms disseminated grains and clusters of up to a few grains. Larger grains commonly are subhedral and tabular in habit; smaller grains are mainly equant and anhedral.

Pyrite forms disseminated small anhedral grains and a few coarser euhedral grains.

Chalcopyrite forms disseminated anhedral grains and clusters of a few grains intergrown with plagioclase(?).

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Replacement patches up to a few mm across are of chlorite and/or quartz, with locally abundant epidote and, in a few patches, muscovite or dolomite. Locally, bordering chlorite-rich replacement patches, groundmass biotite was altered to chlorite.

Arsenopyrite is concentrated moderately in a few clusters of several anhedral, equant grains and as a few disseminated grains, mainly enclosed in chlorite.

A vein up to 1.5 mm wide is of quartz and dolomite, with quartz commonly concentrated in the core and dolomite on the margins. The main vein has a cavity in its core. Several, in part irregular, much smaller veinlets (0.01-0.1 mm) are of dolomite.

A few veinlets from 0.015-0.05 mm wide are of tourmaline.

A few discontinuous veinlets up to 0.1 mm wide are of biotite.

Sample BB18-03D**Brecciated Tourmaline-(Quartz-Pyrite-Chalcopyrite) Replacement
Veinlets: Pyrite-Chalcopyrite-Arsenopyrite-Limonite**

The sample is dominated by tourmaline with scattered patches of quartz, the margins of some of which are loci for precipitation of chalcopyrite. The rock was brecciated, with the matrix being mainly granulated tourmaline with scattered patches of sulphides and of quartz. Numerous veinlets are of one or more of pyrite, chalcopyrite, arsenopyrite, and limonite(?). Age relations among veinlets are ambiguous. A late breccia zone has a matrix of granulated tourmaline and abundant pyrite with accessory chalcopyrite and arsenopyrite.

mineral	percentage	main grain size range (mm)
tourmaline	82-85%	0.03-0.05 (locally up to 0.1 mm)
quartz	5- 7	0.01-0.03 (locally 0.05-0.2 mm)
pyrite	1- 2	0.03-0.1
chalcopyrite	1- 2	0.02-0.15
veinlets		
1) pyrite-limonite-(arsenopyrite-chalcopyrite)	2- 3	0.02-0.5 (py), 0.02-0.1 (cp), 0.1-0.3 (ap),
2) chalcopyrite-arsenopyrite	0.5	0.02-0.05 (co), 0.1-0.3 (ap)

Tourmaline forms a massive aggregate of anhedral equant and less commonly subhedral stubby prismatic grains with pleochroism mainly from pale to light/medium, slightly greenish brown to locally light, slightly bluish green.

Quartz forms disseminated patches, mainly less than 1 mm in size that are concentrated locally in patches that are enclosed in tourmaline. The margins of some of the quartz patches are loci for precipitation of abundant chalcopyrite.

Pyrite and chalcopyrite each forms disseminated irregular replacement patches, some of which also contain arsenopyrite.

The rock was brecciated moderately to strongly, with angular fragments of tourmaline-rich rock cemented by a matrix of granulated tourmaline and moderately abundant replacement patches of pyrite and lesser ones of chalcopyrite.

A major later breccia zone on the right-hand side of the section (see scanned section) contains fragments of tourmaline-(quartz) in a matrix of granulated tourmaline with abundant sulphides, dominated by pyrite with lesser chalcopyrite and accessory arsenopyrite.

Veinlets are variable in composition, commonly consisting of anhedral pyrite with scattered patches of subhedral to euhedral pyrite and/or arsenopyrite, and local zones with abundant chalcopyrite. Some pyrite-rich veinlets contain zones of isotropic light orange limonite. Several veinlets are dominated by chalcopyrite with scattered commonly coarser grains of arsenopyrite.

Sample JSWPT-053**Chert****Veins: Tremolite/Actinolite-Tourmaline-(Quartz)**

The sample is mainly of cherty quartz/plagioclase with slightly coarser grained patches dominated by quartz, and moderately coarser grained patches and veinlets of quartz and of plagioclase. Three large zoned veins are of two types of tremolite/actinolite with lesser tourmaline and quartz. A lens is of tremolite/actinolite at one end and plagioclase-biotite/chlorite at the other.

mineral	percentage	main grain size range (mm)	
quartz/plagioclase	80-83%	0.003-0.01	
ilmenite	0.3	0.03-0.12	
patches, veinlets			
plagioclase-quartz-(chlorite)	2- 3	0.03-0.05 (pl, qz); 0.05-0.1 (cl)	
veins, veinlets			
1) tremolite/actinolite	5- 7	0.1-0.5	(locally up to 1.5 mm long)
tourmaline	2	0.05-0.3	(locally up to 1 mm long)
quartz	0.2	0.05-0.2	(locally up to 1 mm long)
2) tremolite/actinolite-plagioclase-biotite/chlorite-ilmenite			
	0.3	0.05-0.1 (pl); 0.1-0.3 (bi), 0.05-0.2 (il)	

The host rock is dominated by cryptocrystalline to locally extremely fine grained quartz/plagioclase, with scattered patches of slightly coarser grains (probably mainly quartz) and patches up to 1.5 mm in size of quartz and of plagioclase. A few plagioclase-rich patches contains a few grains of pale green chlorite.

Ilmenite forms disseminated anhedral to subhedral grains.

A few discontinuous veinlets up to 0.1 mm wide are of quartz.

A few discontinuous veinlets up to 0.3 mm wide are of plagioclase-(quartz).

Three veins up to 3 mm across are of tremolite/actinolite, lesser tourmaline, minor quartz, and trace ilmenite. Tremolite/actinolite is pleochroic from pale green to light/medium greyish green. Tourmaline is pleochroic from pale green to dark green or blue; some grains are zoned with a broad blue core and a thin green rim. The vein at the top end (see scanned section) has a broad core(?) of very fine grained, very pale green tremolite/actinolite, and an outer zone of darker green tremolite/actinolite, with abundant quartz and very fine grained tourmaline along the outer margin. In the vein in the middle, tourmaline is concentrated moderately towards the margins and tremolite/actinolite in the core, which also contain a few large elongate prismatic tourmaline grains with deep blue pleochroism in their cores.

A lency veinlet several mm long is of plagioclase, biotite (fresh to altered moderately to pseudomorphic chlorite), chlorite, and a patch of ilmenite. A few small patches are of plagioclase and fresh biotite.

Sample JSWPT-054 Zoned Quartz-Plagioclase-Tourmaline-Tremolite/Actinolite-Biotite-Chlorite-Pyrite Rock

The sample contains five main zones. Zone A is of banded quartz-tourmaline with lenses and seams with abundant chlorite. Zone B is dominated by quartz-plagioclase with much less abundant tourmaline and with patches of pyrite-biotite. Zone C is a replacement(?) patch of tremolite/actinolite with lesser biotite and minor tourmaline, chlorite, and quartz. Zone D is of patchy quartz-plagioclase with minor tourmaline. Zone E is of finely banded quartz-plagioclase-tourmaline that was cut obliquely by a few bands of tourmaline-chlorite-(quartz).

mineral	percentage	main grain size range (mm)	
quartz	20-25%	0.03-0.1	(a few up to 0.3 mm)
quartz/plagioclase	25-30	0.005-0.02	
tourmaline	25-30	0.05-0.3	(a few up to 0.7 mm long)
tremolite/actinolite	8-10	0.1-0.5	
chlorite	4- 5	0.05-0.3	
biotite	3- 4	0.3-1.5	
pyrite	0.5	0.3-1	(one grain 2 mm long)
ilmenite	0.2	0.05-0.1	

Zone A is mainly of slightly banded quartz-tourmaline with banding defined by variation in the ratio of quartz to tourmaline. In basal sections, tourmaline shows strong compositional growth zones with broad blue cores to thin green rims.

Chlorite (pale green with first-order white interference colours) forms lenses up to a few mm long and 0.5 mm wide that are elongated parallel to compositional banding. It is concentrated strongly in a few fairly continuous bands up to 0.7 mm wide in which it is intergrown mainly with lesser tourmaline.

Zone B forms diffuse to sharply defined bands, most of which are dominated by extremely fine grained quartz/plagioclase and a few of which are dominated by cryptocrystalline quartz/plagioclase. One band contains a few coarse grains of pyrite (fractured and altered slightly to moderately to limonite) and fine to coarse flakes of biotite (pleochroism from pale to light brown, in part altered to pseudomorphic colourless to very pale green chlorite). Other diffuse bands contain moderately abundant tourmaline and chlorite, and others contain accessory tremolite/actinolite.

Zone C is a patch up to 1.5 cm across that is dominated by tremolite/actinolite with lesser tourmaline and quartz (mainly near the margins), and biotite (mainly in the core; fresh to altered strongly to pseudomorphic chlorite). Pyrite forms an elongate euhedral grain 2 mm long. Ilmenite forms a cluster of a few anhedral grains

Zone D is dominated by a patchy intergrowth of cryptocrystalline plagioclase and extremely fine grained quartz, with scattered grains and patches of each of tourmaline, tremolite/actinolite, biotite/chlorite, and ilmenite. Bordering Zone D against Zone E is a coarser grained replacement/vein lens of quartz-tourmaline.

Zone E is finely banded as in Zone A and mainly is dominated by extremely fine grained quartz and cryptocrystalline plagioclase (as in Zone D) with thin wispy seams parallel to foliation containing tourmaline and minor chlorite and ilmenite. A few patches up to a few mm across of tourmaline-chlorite cut obliquely across foliation.

Sample PRI**Hypabyssal Porphyritic Hornblende-Biotite Granodiorite
Alteration (weak): Sericite-Chlorite-(Calcite)**

Phenocrysts of plagioclase (fresh to altered slightly to sericite), of K-feldspar, of quartz, of hornblende (locally altered to patches of biotite or of calcite), and of biotite (locally altered slightly to chlorite) are set in a groundmass of finer grained plagioclase (altered slightly to moderately to sericite) and much finer grained quartz and K-feldspar, with scattered grains of biotite, hornblende, and magnetite, and minor sphene.

mineral	percentage	main grain size range (mm)	
phenocrysts			
plagioclase	17-20%	0.7-2	(a few up to 4 mm long)
K-feldspar	5- 7	0.7-2	(one 5 mm long)
quartz	4- 5	0.7-1.5	(one 2 mm across)
biotite	4- 5	0.7-1.2	(a few up to 2 mm long)
hornblende	4- 5	0.7-1.7	
groundmass			
plagioclase	20-25	0.2-0.5	
quartz	12-15	0.07-0.15	
K-feldspar	10-12	0.07-0.2	
magnetite	1- 2	0.05-0.2	(a few up to 2 mm)
biotite	1- 2	0.07-0.2	
hornblende	1- 2	0.1-0.3	
sphene	0.2	0.3-0.7	
ilmenite	minor	0.1-0.3	
pyrite	trace	0.02	
chalcopryite	trace	0.02-0.03	

Plagioclase forms subhedral prismatic phenocrysts, many of which show moderate compositional growth zoning from more-calcic cores to more-sodic rims, with moderate oscillatory zoning. Alteration ranges from fresh to slightly to very locally moderate to sericite.

K-feldspar forms anhedral phenocrysts with irregular outlines; some larger grains contain inclusions of plagioclase.

Quartz forms anhedral equant phenocrysts, many of which are intergrown along their margins with groundmass feldspars and quartz.

Biotite forms equant phenocrysts with pleochroism from light to medium brown; a few were altered slightly to locally moderately to pseudomorphic chlorite.

Hornblende forms slender to stubby prismatic phenocrysts with pleochroism from pale to light green. One was altered moderately to patches of chlorite and a lens of sphene.

In the groundmass, plagioclase forms anhedral, stubby prismatic grains that were altered slightly to locally moderately to sericite.

K-feldspar and quartz form very fine grained sugary intergrowths.

Biotite and hornblende each forms anhedral grains. One hornblende grain was altered moderately to calcite, another moderately to chlorite and a patch of sphene. A few biotite grains were altered slightly to chlorite, locally with a patch of sphene.

Magnetite forms anhedral grains, including one 2 mm across, and a few clusters of a few grains.

Sphene forms anhedral grains, a few of which contain minor cores of ilmenite. Ilmenite also forms a few tabular grains (altered slightly to leucoxene), mainly associated with biotite.

Chalcopryite and pyrite occur together as anhedral grains.

Sample PR-01**Hypabyssal Porphyritic Biotite-Hornblende Granodiorite
Veinlet: Chalcopyrite**

Abundant phenocrysts of plagioclase (fresh to altered moderately to sericite) and accessory phenocrysts of K-feldspar, quartz, biotite (fresh to locally altered slightly to chlorite), and hornblende (fresh to altered completely to chlorite-biotite-[epidote]) are set in a very fine grained groundmass of plagioclase, quartz, and K-feldspar, with minor to accessory biotite, hornblende, magnetite, and ilmenite, and trace chalcopyrite and pyrite. A discontinuous veinlet is of massive chalcopyrite.

mineral	percentage	main grain size range (mm)
phenocrysts		
plagioclase	25-30%	1-2.5
K-feldspar	4- 5	1-4
biotite	3- 4	0.7-1
quartz	3- 4	0.7-1.5
hornblende	3- 4	0.7-1.5
groundmass		
plagioclase	20-25	0.2-0.7
quartz	12-15	0.1-0.3
K-feldspar	10-12	0.1-0.3
biotite	2- 3	0.1-0.5
hornblende	1- 2	0.3-0.5
magnetite	1- 2	0.1-0.5
ilmenite	0.2	0.05-0.1
chalcopyrite	trace	0.05-0.15
apatite	trace	0.05-0.07
pyrite	trace	0.5
sphene	trace	0.02-0.05
rutile	trace	0.03-0.04
veinlet(?)		
chalcopyrite	0.3	?

Plagioclase forms subhedral to euhedral prismatic phenocrysts that show slight to locally moderate compositional growth zoning from more-calcic cores to more-sodic rims with abundant oscillatory zoning. Alteration ranges from none to moderate to sericite, with locally minor patches of muscovite (0.03-0.05 mm); in general, the largest phenocrysts are the freshest.

K-feldspar forms a few anhedral megacrysts with scattered small inclusions of plagioclase, hornblende, and quartz.

Quartz forms anhedral equant phenocrysts with borders intergrown with groundmass minerals.

Biotite forms mainly equant phenocrysts with pleochroism from light to medium brown. Most are fresh, with few altered slightly to pseudomorphic chlorite and locally epidote at one or both ends.

Hornblende forms anhedral, slightly to moderately elongate phenocrysts with pleochroism from pale yellowish green to light brownish green. A few contain grain of biotite and one contains a similar grain of chlorite. Two elongate hornblende(?) phenocrysts were altered completely to secondary chlorite, biotite and minor epidote, with a patch of chalcopyrite or of magnetite.

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In the groundmass, plagioclase forms equant, anhedral grains that commonly show compositional growth zoning and commonly are altered slightly to moderately to locally strongly to sericite.

Quartz and K-feldspar form intergrowths of very fine grains along with lesser plagioclase of the same grain size.

Biotite forms anhedral grains and clusters of a few grains that range from fresh to locally altered strongly to chlorite. A few patches of chlorite are not pseudomorphic after biotite.

Magnetite forms disseminated, equant anhedral grains. Locally associated with magnetite are grains of ilmenite rimmed by sphene.

Hornblende forms anhedral equant to slightly elongate grains with pleochroism from pale to light green.

Chalcopyrite forms disseminated equant patches.

Pyrite forms one anhedral grain intergrown with magnetite.

A patch 0.6 mm long is of an intimate intergrowth of ilmenite, sphene, and rutile.

Apatite forms anhedral to subhedral grains concentrated moderately with groundmass biotite.

A discontinuous veinlet 0.15-0.2 mm wide contains lenses up to several mm long of chalcopyrite.

Sample PR-02**Slightly Porphyritic Potassic Quartz Diorite**

The sample is dominated by medium grained plagioclase (fresh to altered moderately to sericite) with interstitial patches of chlorite and of intimate intergrowths of quartz and K-feldspar. Chalcopyrite forms numerous irregular patches intergrown finely with silicates. Pyrite with trace inclusions of chalcopyrite forms one large patch intergrown intimately with plagioclase and lesser biotite/chlorite.

mineral	percentage	main grain size range (mm)
plagioclase	70-75%	0.3-1 (a few 1.5-3 mm long)
chlorite/(biotite)	8-10	0.1-0.5
quartz	7- 8	0.05-0.5
K-feldspar	5- 7	0.05-0.1 (a few up to 0.7 mm)
chalcopyrite	2- 3	0.05-1
pyrite	0.7	0.3-0.7
sphene	0.5	0.05-0.15
ilmenite/leucoxene	0.1	0.05-0.1 (one patch 0.8 mm)

Plagioclase forms scattered, subhedral elongate prismatic grains that range from fresh to altered moderately to sericite.

Quartz forms anhedral grains and is more common in graphic intergrowths with K-feldspar.

K-feldspar forms scattered anhedral grains (0.3-0.5 mm). It is more common in graphic intergrowths with quartz.

Chlorite forms anhedral grains interstitial to plagioclase.

Chalcopyrite forms disseminated grains and open clusters of grains intergrown with silicates; many grains were altered slightly inwards from their margins to hematite.

Pyrite (fractured slightly and altered along fractures to hematite) forms a cluster up to 3 mm across of anhedral grains that are intergrown coarsely with plagioclase and minor chlorite/biotite.

Sphene forms anhedral grains associated with chlorite.

Ilmenite (altered moderately to strongly to leucoxene) forms a patch up to 0.5 mm across and several disseminated tabular grains up to 0.1 mm long.

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Photo	Section	Description
01	A0027024	lower left: subhedral plagioclase phenocryst (altered moderately to sericite and accessory calcite; groundmass shows two distinct but gradational textures, with patches of gm2 (leucocratic, a few equant euhedral plagioclase grains in a matrix of finer grained plagioclase plagioclase) enclosed in more common gm1 (subhedral, equant plagioclase with interstitial plagioclase-K-feldspar with disseminated magnetite and minor chlorite and calcite; both contain interstitial patches of quartz; interstitial patch of hydrothermal chlorite.
02	A0027024	biotite phenocryst (altered completely to pseudomorphic chlorite and lenses of calcite and Ti-oxide/ilmenite), plagioclase phenocryst (altered strongly to sericite-calcite); groundmass is mainly gm1 (plagioclase-K-feldspar with minor magnetite and chlorite) with a local patch of a finer grained variation (gm1f); patch of gm2 dominated by plagioclase; two patches of quartz, the larger one probably is a phenocryst with an overgrowth of later quartz; small round patch of chlorite-(calcite) of uncertain origin.
03	A0027024	intergrowth of magnetite (light brownish grey) and ilmenite (pale grey) with interstitial patches of silicates.
04	A0027024	cluster of anhedral pyrite grains with inclusions of silicates, of magnetite, and minor ones of chalcopyrite.
05	A0027062	euhedral plagioclase phenocryst showing compositional growth zoning near its margin; alteration is slight to moderate to sericite, and strong to sericite in a thin growth zone near the margin of the grain; ragged biotite phenocryst; matrix of quartz and much less plagioclase (altered slightly to sericite).
06	A0027062	phenocryst of biotite and of quartz (with overgrowths of groundmass quartz) and small plagioclase phenocrysts (altered slightly to sericite) in a groundmass of K-feldspar and quartz with lesser anhedral plagioclase (altered slightly to sericite) and accessory biotite (mainly near the biotite phenocryst).
07	A0027062	patches of chalcopyrite intergrown with feldspars and quartz, near a grain of biotite.
08	A0027077	euhedral plagioclase phenocryst (slight to locally moderate alteration to sericite, except strong in a thin compositional growth zone along the margin of the crystal) in a groundmass of K-feldspar, quartz, plagioclase, and chlorite; small replacement patch of subhedral to euhedral pyrite.

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Photo	Section	Description
09	A0027077	small plagioclase phenocrysts (altered slightly to dusty sericite/semi-opaque) patches of biotite-chlorite-(calcite-quartz-apatite) and chlorite-(quartz) in a groundmass of plagioclase-K-feldspar-quartz with a few small patches of chlorite.
10	A0027077	cluster of pyrite grains (some with silicate inclusions) and ilmenite (altered partly to leucoxene), with a patch of hematite (probably secondary after pyrite); enclosed in silicates (mainly feldspars).
11	A0027085	K-feldspar phenocryst (with patchy dusty semi-opaque alteration and with abundant inclusions near its margin of quartz as in the groundmass), plagioclase phenocrysts (patchy alteration to sericite and dusty semi-opaque), groundmass dominated by quartz with much less abundant plagioclase, K-feldspar, and biotite.
12	A0027085	phenocrysts of plagioclase (relatively fresh) and of quartz; finer grained plagioclase (commonly altered moderately to sericite and dusty semi-opaque), groundmass of quartz, K-feldspar, and plagioclase (relatively fresh), a few grains of biotite (fresh to altered completely to chlorite).
13	A0027085	cluster of magnetite, lesser ilmenite (altered moderately to leucoxene) and chalcopyrite surrounded by feldspars, quartz, and biotite/hornblende(?).
14	A0027087	phenocrysts of plagioclase (altered moderately to sericite-dusty semi-opaque), quartz, and biotite (altered slightly to moderately to pseudomorphic chlorite), finer grained plagioclase (altered moderately to sericite-dusty semi-opaque), K-feldspar, and quartz, very fine grained quartz, K-feldspar, and trace apatite.
15	A0027087	phenocrysts of quartz, K-feldspar (with inclusions of "groundmass" quartz near its margin), and of plagioclase (altered moderately to sericite and dusty semi-opaque), two small phenocrysts(?) of biotite (altered moderately to chlorite) in a groundmass of K-feldspar, quartz, and minor plagioclase (altered moderately to sericite).
16	A0027087	a cluster of chalcopyrite (with biotite/chlorite?) and a cluster of pyrite with lesser chalcopyrite and magnetite (also with biotite/chlorite); subhedral plagioclase grains (altered slightly to moderately to sericite and dusty semi-opaque) with patches of quartz-K-feldspar.
17	BB-01	patch of dacite (quartz/plagioclase), partly replaced, mainly along its margin by tourmaline; enclosed in replacement quartz with patches of tourmaline.
18	BB-01	patch of granular pyrite with two adjacent subhedral grains of arsenopyrite and disseminated stubby to elongate prismatic grains of tourmaline intergrown with fine to medium grained quartz.

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Photo	Section	Description
19	BB-01	above: dacite (quartz/plagioclase) cut by vein of massive tourmaline with trace quartz; below: quartz-tourmaline replacement.
20	BB-01	narrow sheared zone of granulated tourmaline (tmz) and accessory quartz (qzz) separates a quartz-rich zone below from a quartz-tourmaline zone above.
21	BB18-01E	detrital grains of plagioclase and quartz and a detrital(?) grain of ilmenite in a groundmass of plagioclase with minor to moderately abundant biotite and disseminated grains of ilmenite.
22	BB18-01E	meta-mudstone: plagioclase-biotite; diffuse replacement patch dominated by chlorite with minor biotite, with an alteration envelope in which groundmass biotite was replaced completely by chlorite; one relic ilmenite grain in the alteration envelope.
23	BB18-01E	on the periphery: meta-mudstone: plagioclase-(biotite); replacement patch of chlorite-arsenopyrite with patches of chlorite-muscovite(?) near the margins of the replacement zone and scattered small relic patches of partly altered host rock.
24	BB18-01E	at right and bottom centre-left: patches of meta-mudstone (plagioclase with lesser biotite); centre and lower right and lower left: replacement patches of chlorite-epidote with a few coarser grains of quartz; upper left; vein of quartz-dolomite with cavity in its core.
25	BB18-03D	tourmaline-rich rock with patches of quartz (one with a grain of chalcopyrite); crackle-brecciated with a matrix of granulated tourmaline (tmz) and minor quartz; wispy irregular veinlet of pyrite cut by a fracture that was partly filled with limonite.
26	BB18-03D	massive tourmaline with a few patches of interlocking quartz grains bordered by pyrite and chalcopyrite; vein of massive pyrite (stained in diffuse patches) with a euhedral grain of arsenopyrite and irregular patches of chalcopyrite; at lower right: veinlet of limonite(?).
27	BB18-03D	massive tourmaline with a few patches of quartz; associated with and near the largest patch of quartz are abundant replacement patches of chalcopyrite; N-S vein of massive anhedral to locally euhedral pyrite, a cluster of euhedral arsenopyrite grains, and a few patches of chalcopyrite, mainly intergrown finely with anhedral pyrite; SW-NE vein is of pyrite with a later fracture along the vein filled partly by limonite(?).
28	BB18-03D	strongly granulated tourmaline (tmz) and moderately granulated tourmaline (tm-z) with minor/accessory quartz; cut by three subparallel, irregular veinlets of chalcopyrite with scattered coarser grains of arsenopyrite.

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Photo	Section	Description
29	BB18-03D	upper left: tourmaline-quartz; lower left: band of strongly granulated tourmaline (tmz) cut by pyrite veinlets; to the right: breccia zone with fragments of granulated tourmaline (tm) and patches of pyrite in a matrix of limonite(?).
30	JSWPT-053	cherty quartz/plagioclase with a patch of tourmaline-ilmenite and a few disseminated grains of ilmenite; two discontinuous veinlets, one dominated by plagioclase with minor quartz and the other of quartz.
31	JSWPT-053	vein of tremolite/actinolite (pale green in core and lower contact, medium green near upper contact), tourmaline (concentrated near lower contact, including the large fan-textured aggregate, and scattered grains near the upper contact) and a large grain of quartz; host rock is cherty quartz-plagioclase with a few slightly coarser grains of quartz.
32	JSWPT-053	vein: from core (top right) to margin: very fine grained, pale green tremolite/actinolite; coarser grained pale to light green tremolite/actinolite; grading into margin that contains abundant quartz and minor tourmaline intergrown with very pale and light/medium green tremolite/actinolite; lower right: wall rock is cherty quartz/plagioclase with scattered grains of light/medium green tremolite/actinolite.
33	JSWPT-054	Zone A: bands of tourmaline-(quartz) with lenses of chlorite interstitial to tourmaline, and a thin quartz-rich band.
34	JSWPT-054	Zone B: quartz-(plagioclase)-rich band with a variable ratio of extremely fine grained quartz and cryptocrystalline plagioclase and with minor disseminated tourmaline; two large pyrite grains (altered slightly to limonite) and associated clusters of biotite.
35	JSWPT-054	Zone C: massive light to medium green tremolite/actinolite with disseminated anhedral flakes of biotite and trace quartz.
36	JSWPT-054	Zone D: upper right: plagioclase-rich zone with accessory disseminated, concentrically zoned tourmaline and minor quartz; upper left to centre/lower middle: quartz-plagioclase band with minor disseminated tourmaline; lower left: recrystallized(?) zone of coarser grained quartz and strongly concentrically zoned tourmaline.
37	JSWPT-054	Zone E: upper left: finely banded quartz-plagioclase with seams of tourmaline-(ilmenite); lower right: patch of massive tourmaline-(chlorite-quartz) cuts obliquely across the banded zone.
38	PRI	K-feldspar megacryst (with inclusions of plagioclase and minor quartz [near its margin]); anhedral phenocryst of plagioclase (fresh to altered moderately to sericite); phenocryst of biotite (altered to pseudomorphic chlorite at one end) in a groundmass of plagioclase (fresh to altered slightly to moderately to sericite) and quartz, with lesser K-feldspar and minor biotite and magnetite.

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Photo	Section	Description
39	PRI	plagioclase phenocryst showing growth zoning from a more-calcic core to a more-sodic rim with significant oscillatory zoning; fresh to altered slightly to sericite, concentrated in certain growth zones); small biotite phenocryst; groundmass of plagioclase (fresh to altered slightly to sericite), quartz, lesser K-feldspar and hornblende, and minor biotite.
40	PRI	phenocrysts of quartz, biotite, K-feldspar, zoned plagioclase, and hornblende with a sparse groundmass of quartz, plagioclase, and K-feldspar, with minor biotite and magnetite.
41	PR-01	plagioclase phenocrysts (fresh to altered moderately in patches to sericite), K-feldspar phenocryst (with slight alteration to dusty sericite-semi-opaque), and hornblende(?) phenocryst (altered completely to chlorite-[biotite]), with a patch of chalcopyrite and two grains of apatite; sparse groundmass is of quartz, K-feldspar and plagioclase (altered slightly to sericite),
42	PR-01	phenocrysts of hornblende, of biotite, and of quartz in a groundmass of plagioclase (altered slightly to moderately to sericite), quartz, and K-feldspar, with lesser magnetite, hornblende, and biotite.
43	PR-01	plagioclase phenocryst (fresh to altered slightly to moderately in patches to sericite), small biotite phenocryst; groundmass of plagioclase (altered slightly to sericite) and finer grained quartz and K-feldspar, with minor biotite and chlorite; discontinuous veinlet of chalcopyrite.
44	PR-02	anhedral plagioclase (altered slightly to sericite and a few patches of chlorite) with interstitial intimate intergrowths of K-feldspar and quartz, with trace chlorite (after biotite), calcite, and epidote.
45	PR-02	plagioclase phenocryst (altered slightly to sericite and calcite), moderately smaller plagioclase grains (altered slightly to locally moderately to sericite); interstitial patches of chlorite with lesser quartz, K-feldspar, and calcite, with minor sphene (altered slightly to leucoxene); replacement patch of chalcopyrite.
46	PR-02	subhedral plagioclase grains (altered slightly to sericite) with an irregular interstitial patch of chlorite and chalcopyrite, with minor ilmenite (altered moderately to leucoxene) and an elongate euhedral grain of apatite.
47	PR-02	irregular cluster of pyrite grains (with minor inclusions of chalcopyrite; altered to hematite along its outer edge); intergrown finely with plagioclase (in part altered slightly to sericite) and accessory biotite/chlorite.
48	PR-02	detail of chalcopyrite grains in pyrite-(hematite) in Photo 47.