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MINERALOGY – PETROLOGY · SECTION PREPARATION

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MINERALOGICAL REPORT No. 9763

by Alan C. Purvis, PhD

August 30th, 2010

TO :	John Fabray Exploration Manager Western Desert Resources PO Box 83 GOODWOOD SA 5034
YOUR REFERENCE :	Your letter 29/7/10
MATERIAL :	Nineteen drill cores, East Rover Project, Tennant Creek
IDENTIFICATION :	Drill hole numbers ERRC002EXT, ERRC005EXT, ERRC006EXT
WORK REQUESTED :	Section preparation, description and report with comments as specified.
SAMPLES & SECTIONS :	Returned to you with this report.
DIGITAL COPY :	Emailed 1/9/10 to: <john.fabray@wdrl.com.au>

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SUMMARY COMMENTS

The nineteen core samples described in this report are from three drillholes into magnetic anomalies in the East Rover Project area near Tennant Creek in the Northern Territory. These samples include six each from drillholes ERRC002EXT and ERRC005EXT, with seven samples from ERRC006EXT. They were made into seventeen thin sections and one polished thin section each from ERRC005EXT (at 237.44m) and ERRC006EXT (at 384.8m.). Field notes provided are included in the individual descriptions.

The magnetic anomalies were interpreted as representing Tennant Creek style ironstone bodies, but the petrography of these cores indicates mostly foliated and poorly preserved partly fragmental volcanics and volcaniclastics and minor probable intrusives, largely consistent with your field notes. These contain accessory disseminated iron oxide grains, conceivably originally mostly magnetite but not extensively altered/oxidised, most obviously in the thin section to leucoxene ± secondary (non-magnetic) Fe-oxides.

These volcanic/volcanic-derived facies are extensively altered to various combinations of (schistose) sericite/clay, quartz, carbonate, chlorite, hematite, leucoxene and (rarely) pyrite. Epidote occurs in four samples from ERRC006EXT (143.37m, 167.54m, 221.72m and epidote-hosted breccia at 230.11m).

The sample from ERRC006EXT at 308.18m is probably an intrusive (gabbro or diorite) with albitised coarse plagioclase as well as schistose chlorite, carbonate and disseminated leucoxene ex-opaque oxide. The sample from ERRC005EXT at 237.44m has coarse chalcopyrite in a vein with quartz, carbonate and chlorite, sparse hematite and rare pyrite.

The core segments were tested with a hand-held magnet and none showed any significant magnetism. As noted above, the only opaque oxides are accessory disseminated original magnetite grains, now extensively oxidised/altered to leucoxene. This means that the petrology of these core samples does not explain the source of the reported magnetic anomalies referred to in your covering notes.

INDIVIDUAL DESCRIPTIONS

ERRC002EXT **245.9 - 246.2m**	**Quartz-sericite schist with lenses of quartz ± albite, plagioclase which is albitised and microfissured, also opaque oxide grains altered to leucoxene ± hematite. Local veins with quartz, calcite and chlorite. Interpreted as a sheared volcanic or volcanoclastic facies. [Not magnetic.]**

Field Note: ***Altered volcanic***

This is a schistose sample with the following components:

	Component	Relative Abundance
*	Schistose sericite ± quartz with a primary planar schistosity (S_1) and a second schistosity, partly a crenulation cleavage (S_2), at 30º to the main schistosity.	Dominant
*	Lenses, laminae and possible fragments of fine-grained quartz ± albite ± chlorite, partly pulled apart with interstitial sericite ± quartz parallel to S_1.	Common/abundant
*	Microfissured albitised plagioclase phenocrysts to 1.5mm long, commonly parallel to S_2.	Minor
*	Leucoxene ± earthy hematite derived from grains and aggregates of titanomagnetite.	Minor
*	Sericite-rich microshears, subparallel to S_1, with lenticular quartz veinlets	Very minor
*	Crosscutting veins to 2mm wide with quartz ± carbonate ± chlorite.	Minor/common
*	Irregular oblique carbonate-rich veins with minor carbonate	Very minor
*	Shear-related veins with quartz, carbonate and chlorite, terminating or offsetting crosscutting veins by as much as 8mm and oblique veins by a few millimetres.	Minor

This sample may represent highly deformed volcanic or volcanoclastic facies, with veins of various types. It is not magnetic in hand specimen.

ERRC002EXT **269.22 - 269.43m**	**Sheared and heterogeneous mass of sericite-clay-quartz-leucoxene-hematite-chlorite. The petrography indicates relict igneous, probably volcanic components, including fine-grained quartz-rich domains, vein-quartz and sericite ± leucoxene in shears.**

Field Note: ***Sheared volcanic***

This sample is clay-rich and heterogeneous, with various rather poorly defined domains to several centimetres in length, also largely widespread foliations. Some lenses and lamellae are rich in probable sericite, locally with irregularly disseminated leucoxene ± limonite or hematite derived from opaque oxide grains to 1mm in grainsize. Some areas also contain abundant sericite-clouded probable quartz about 0.5mm in grainsize and other areas have abundant comminuted probable quartz as well as sericite or clay. All of these areas contain very minor chlorite. Lenses and boudins of clear granular possible vein-quartz to 10mm long are scattered with associated minor chlorite. Anastomosing sericitic shear laminae and foliae are decorated with leucoxene.

The presence of leucoxene ex-titanomagnetite is largely the evidence for a precursor igneous (and probably volcanic) component. It is unclear however whether the original lithology was coherent or fragmental as it tends to be dominated by shears, mixed with blocky masses of vein-quartz and variously sericite-rich and quartz-rich domains of uncertain origin.

ERRC002EXT **185.25 - 285.4m**	**"Volcanic material", sheared and fairly extensively altered to fine quartz-sericite-chlorite-leucoxene. Contains relict fragments or xenoliths and boudinaged quartz-rich veins**

Field Note: ***Altered volcanic***

This sample is dominated by fine sericite-rich schist with anastomosing lamellae of relatively concentrated sericite in several orientations, mostly at a low angle to each other. Much of the thin section may also contain extremely fine microcrystalline quartz, but this is difficult to resolve optically. Some areas are stained reddish by earthy hematite, others are greenish possibly reflecting phengite or minor chlorite. Lenses or fragment to 6mm long are partly rich in sericite and chlorite and partly quartz-rich with sericite, chlorite and leucoxene ± hematite partly derived from titanomagnetite. Several quartz-rich lenses and probable boudins seem to partly represent disrupted veins, locally with segments containing chlorite.

This sample is interpreted to represent sheared and altered volcanic material with relict fragments or xenoliths and boudinaged quartz-rich veins. The handspecimen does not attract a suspended magnet.

ERRC002EXT **354.5 - 355.2m**	**Partly a fine clay-sericite-quartz schist, with dispersed fine leucoxene ± limonite interpreted as a sheared volcanic. In contact with a heterogeneous vein of quartz-carbonate-chlorite.**

Field Note: ***strongly chloritised igneous rock***

Part of this thin section is a clay-sericite-rich schist with elongate shredded and cellular networks of sericite within a clouded foliated matrix. Lenses of more concentrated sericite-rich material (± quartz) may represent phenocrysts and there are sparse leucoxene ± limonite replicas replacing former fine-grained titanomagnetite. Parallel veinlets contain chlorite and quartz. This rock is interpreted as a sheared felsic volcanic.

This schist has a sharp contact against a large lens of heterogeneous vein material, with various and mixed proportions of granular and columnar quartz, to 2mm in grainsize, granular carbonate and lenses and foliae of Fe-Al-rich chlorite. The vein margin in the thin section is parallel to the foliation.

ERRC002EXT **374.71 - 374.88m**	**Clay-sericite-quartz-albite schist (sheared volcanic). Includes altered probable plagioclase phenocrysts, scattered oxidised opaque oxide grains and quartz-rich veins ± chlorite, also a quartz-carbonate vein.**

Field Note: ***Altered volcanic***

This clay-sericite-quartz schist has scattered albitised and microfissured or fractured and fragmented plagioclase phenocrysts to 2mm long, all in a partly hematite-stained matrix with anastomosing lamellae of sericite. Sparse fine-grained opaque oxide grains are mostly oxidised. Abundant quartz veinlets locally enclose lenses of Fe-rich chlorite. A large vein includes massive granular carbonate to 6mm wide as well as quartz-rich zones. Veinlets extending from this vein are filled with quartz. The core is not magnetic.

ERRC002EXT **434.1 - 434.2m**	**Clay-sericite-chlorite schist with relict altered phenocrysts ± fragments, altered oxide microphenocrysts. Numerous fractures and veins with quartz ± chlorite ± sericite.**

Field Note: ***Altered volcanic***

This clay-sericite-quartz schist has abundant sericite-albite ± chlorite-altered pre-existing phenocrysts (plagioclase ± mafic), also lenses of sericite-clouded quartz or albite to 5mm long, and scattered microphenocrysts of opaque oxide altered to limonite, hematite or leucoxene. Veins to 2mm wide include threads of quartz-filled microfractures and veins to 2mm wide with clear and clouded quartz accompanied by sericite and chlorite. Some of the polycrystalline lenses in this thin section may represent xenoliths but basically the rock is identified as schistose altered volcanic material.

ERRC005EXT **237.44 - 237.6m**	**Weakly foliated fragmented rock, tuff or volcaniclastic, altered to clay-sericite-quartz-leucoxene. Veins of quartz-carbonate-chlorite ± sulphide (chalcopyrite and rare pyrite).**

Field Note: ***Chloritised igneous rock?***

The host rock in this thin section is weakly foliated and composed of clay-sericite/phengite ± quartz with scattered small fragments of quartz and polycrystalline fragments of quartz and/or sericite. Leucoxene has replaced disseminated small opaque oxide grains. Veins of mostly columnar quartz are abundant and include carbonate and zones of granular quartz in the widest vein, which is more than 10mm wide. Other veins from 0.2mm to 5mm wide contain carbonate and/or chlorite as well as columnar quartz. Several veins are laminated suggesting multiple opening events, rarely incorporating fragment of host rock. One vein caries coarse chalcopyrite, 4-5mm long and 2.5-3mm wide, with very minor hematite and trace fine-grained pyrite.

This sample may be interpreted as an extensively clay-sericite-altered possible tuff or volcanoclastic with veins containing quartz, carbonate and chlorite and local coarse chalcopyrite. This handspecimen is not magnetic.

ERRC005EXT **251.24 - 251.38m**	**Schistose tuff, extensively altered to sericite-chlorite-quartz-albite-carbonate and chlorite. Possibly andesitic.**

Field Note: ***Volcaniclastic***

Lenses and laminae to 5mm thick are abundant in this thin section, mostly composed of sericite-quartz schist or sericite schist, including some with microbands of sericite and chlorite. Small lenses of carbonate and/or chlorite are present in these schistose areas. Many of these lenticular layers contain albitised plagioclase phenocrysts, locally with carbonate, and separate patches of carbonate, suggesting that they represent sheared ash and lapilli in an original tuff. A single fragment, 5mm in diameter, has retained its original volcanic texture with albitised plagioclase phenocrysts and chloritised mafic phenocrysts in an albite-rich groundmass with minor dispersed chlorite and leucoxene. This sample seems to represent a sheared tuff of andesitic composition. The rock is not magnetic.

ERRC005EXT 308.13 - 308.33m	**Sheared tuff or agglomerate of mostly plagioclase porphyritic lava fragments, with sericite-quartz-chlorite-carbonate alteration and fractures healed by veinlets of carbonate, chlorite and quartz.**

Field Note: ***Porphyry***

This sample is heterogeneous with large fragments composed of different proportions of albite ± sericite-altered plagioclase phenocrysts to 2mm in diameter ± quartz-chlorite-altered mafic phenocrysts (pyroxene or amphibole?). One clearly defined fragment is 20mm long and 10mm wide and has sparse altered plagioclase and mafic phenocrysts in a groundmass with abundant clouded granular quartz as well as sericite and microphenocrysts of opaque oxide.

Other fragments contain more altered plagioclase phenocrysts, ± altered mafic phenocrysts in foliated sericite-quartz-rich groundmass areas with disseminated altered small opaque oxide grains. Darker fragments are dominated by fine chlorite ± opaque oxide-rich groundmasses. One large fragment has folded lamellae of chlorite, possibly representing flow layering. Another fragment has a single quartz phenocrysts or xenocryst. Narrow fractures contain carbonate ± chlorite ± quartz.

This sample is interpreted as an agglomerate or coarse lapilli tuff of andesite fragment.

ERRC005EXT 333.53 - 333.68m	**Sheared agglomerate with quartz-sericite-chlorite-carbonate alteration ± leucoxene, including fragments of dacitic lava ± ignimbrite.**

Field Note: ***Sheared volcanic***

This thin section contains three fragments. One fragment has sparse quartz phenocrysts and microphenocrysts as well as microfissured albite-sericite-altered plagioclase phenocrysts, accessory magnetite microphenocrysts and small lenses of chlorite in a matrix of heterogeneous quartz-sericite schist. The host schist also has lenses of schistose sericite set within fine quartz-rich material.

The adjacent fragment is 8-10mm wide and 25mm long and has relict fiamme now composed of schistose sericite and albite-carbonate-altered sparse plagioclase phenocrysts. Microphenocrysts of oxide are less abundant than in the fragment described above. The matrix or groundmass in this second fragment is a homogeneous quartz-sericite schist.

The third fragment has sparse resorbed quartz phenocrysts to 1.5mm in size, also abundant albite-sericite-carbonate-altered flow-oriented plagioclase phenocrysts to 1mm long. Chloritised mafic phenocrysts are up to 1.5mm long and disseminated leucoxenised or fresh oxide microphenocrysts are more abundant than in the other two fragments. The groundmass is again quartz-sericite schist.

This sample is classified as a sheared agglomerate with extensive quartz-sericite-chlorite-carbonate alteration ± leucoxene replacing disseminated opaque oxide grains, and incorporating fragments of dacitic lava and ignimbrite.

ERRC005EXT **383.6 - 383.71m**	**Sheared tuff of probable andesitic and dacitic composition, altered to quartz-sericite-albite-carbonate-chlorite-leucoxene and rare pyrite.**

Field Note: ***Volcaniclastic***

Definite and other poorly defined probable fragments in this sample are largely schistose and elongate parallel to the foliation. Most of these are less than 3mm wide and variably from 1mm to more than 25mm long. They contain various proportions of schistose sericite, microcrystalline quartz, albite-carbonate-altered plagioclase locally with sparse quartz phenocrysts. Chlorite ± carbonate-altered mafic phenocrysts and partly leucoxenised opaque oxide microphenocrysts are only very rare. One very small fragment contains pyrite.

This sample seems to represent mixed ash and lapilli tuff, with fragments of andesite and dacite.

ERRC005EXT 388.41 - 388.6m	**Tuff or ignimbrite, with sericite-quartz-carbonate-albite-leucoxene alteration and sparse fresh or oxidised disseminated magnetite.**

Field Note: ***Volcaniclastic***

Most of this sample consists of weakly hematite-stained quartz-sericite schist with irregular laminae of schistose sericite. Minor albite ± carbonate patches represent former plagioclase phenocrysts, and there are sparse chlorite ± carbonate ex-mafic microphenocrysts and leucoxene ± limonite/hematite replicas after original disseminated oxide microphenocrysts. Rare fresh magnetite may be present but the rock is not magnetic. Small aggregates of fluffy leucoxene are also disseminated.

Some areas have small fragments rich in albite-carbonate-altered plagioclase and there are elongate fragments to 12mm long. The larger fragments have partly hematite-stained albite ± carbonate ex-plagioclase as well as sericite, fine-grained quartz and leucoxenised opaque oxide in various proportions, with or without chlorite. The longest fragment lacks chlorite, and one fragment is carbonate-rich.

This sample may represent a tuff or ignimbrite, with sericite-quartz-carbonate-albite-leucoxene alteration and sparse fresh or oxidised magnetite.

ERRC006EXT 143.37 - 143.47m	**Probable lapilli tuff or agglomerate with numerous plagioclase-porphyritic fragments (andesite?) and rare quartz phenocrysts. The fragments are not schistose but are extensively altered to sericite/clay, albite, quartz, chlorite, carbonate, epidote. Minor disseminated opaque oxide grains may be fresh and/or oxidised/leucoxenised.**

Field Note: ***Volcaniclastic***

This sample has fragments from 1mm to more than 25mm long with different phenocryst abundances and different groundmass textures. Some of the smaller fragments are aphyric but most fragments have plagioclase phenocrysts to 1.5mm in grainsize altered to albite and sericite ± chlorite ± carbonate ± epidote, but these vary in abundance and size between fragments. Other fragments are altered to carbonate ± chlorite possibly derived from mafic microphenocrysts and there are rare quartz phenocrysts in small fragments. Accessory small opaque oxide grains have been partly replaced or rimmed by leucoxene some may be fresh but this handspecimen is not obviously magnetic. Groundmasses in fragments are mostly rich in sericite/clay ± albite, locally with disseminated microcrystalline or very fine-grained quartz, possibly in very small amygdales. Sparse chlorite is disseminated in many fragments.

Sparse microfractures with sericite, chlorite, epidote and quartz occur and a vein variously 0.4mm to 1mm wide contains carbonate, epidote and chlorite.

This sample may represent lapilli tuff or agglomerate, with largely plagioclase-porphyritic fragments (andesite?) and rare quartz phenocrysts. The fragments are not schistose but have abundant sericite/clay as well as albite, quartz, chlorite, carbonate, epidote, leucoxene and fresh or oxidised opaque oxide.

ERRC006EXT 167.54 - 167.68m	**Albite-clay/sericite-chlorite-quartz-epidote-altered andesite, with small xenoliths and fractures with epidote, chlorite and carbonate. Not magnetic.**

Field Note: ***Altered volcanic***

Abundant albite-sericite ± chlorite-altered plagioclase phenocrysts in this thin section (~35%), are mostly less than 2mm in size and occur independently or in small clusters. Small aggregates of chlorite ± epidote ± carbonate ± leucoxene appear to represent mafic phenocrysts, and accessory apparently oxidised microphenocrysts of magnetite are disseminated. The rock is not obviously magnetic, however sparse apatite is attached to some of the altered opaque oxide microphenocrysts, which is not unusual in andesites.

The groundmass is mostly microcrystalline with sericite/clay and quartz, but some areas have clouded granular quartz apparently of low temperature hydrothermal origin. Laminae rich in sericite, chlorite, epidote and leucoxene seem to define original flow laminations but include fractures partly cutting phenocrysts. Patches of quartz and/or chlorite ± carbonate may partly represent small amygdales.

Small xenoliths to 3mm long are scattered. One has abundant microcrystalline quartz as well as clay ± albite ex-plagioclase and minor chlorite. Another fragment has quartz-filled amygdales and clouded quartz replacing groundmass material, with other small fragments rich in clouded fine-grained quartz, clays and rare chlorite. There is also a fragment with abundant microcrystalline epidote as well as sericite/clay and minor microcrystalline quartz.

Fractures occur with chlorite, epidote and carbonate in various proportions.

This sample seems to represent altered andesite with sparse altered xenoliths and microfissures.

ERRC006EXT **221.72 - 222.9m**	**Tuff or ignimbrite with largely hematite-stained fragments of andesitic composition in an andesitic lava or tuff matrix. Extensive albite-sericite-quartz-carbonate-epidote-chlorite alteration, ± hematite, and a carbonate-epidote vein. Not obviously magnetic.**

Field Note: ***Volcaniclastic***

Hematite-stained ash and lapilli are abundant in this thin section and are elongate parallel to a foliation in the host rock. The fragments range from 1mm long to possibly more than 25mm long and 10mm wide. Most fragments contain abundant albitised plagioclase phenocrysts to 2mm long with minor sericite, epidote and calcite in various proportions. Accessory disseminated opaque oxide microphenocrysts are partly altered to leucoxene and oxidised. The rock is not obviously magnetic. Groundmasses in fragments are altered to sericite/clay, quartz, possible albite and earthy hematite. A few hematite-free fragments have similarly altered plagioclase phenocrysts, chloritised mafic phenocrysts also altered opaque oxide microphenocrysts. The groundmasses are rich in ct/clay and microcrystalline quartz.

The host rock has albite-sericite-altered plagioclase phenocrysts to 2mm long, sparse mafic phenocrysts altered to chlorite ± carbonate ± leucoxene and disseminated possibly leucoxene-hematite-altered opaque oxide microphenocrysts. The whole rock groundmass or matrix is laminated quartz-sericite schist with clouded lenses of clays and microcrystalline quartz parallel to the foliation.

At one end of the thin section there is a vein 3mm wide with carbonate and abundant irregularly disseminated epidote, passing into a zone with quartz, carbonate and epidote.

This sample may be interpreted as a fragmental volcanic such as tuff or ignimbrite, or a lava with fragments partly of oxidised flow-top material.

ERRC006EXT **230 - 230.11m**	**Epidote-albite-hosted breccia of partly hematite-stained andesite and possible dacite fragments. Not magnetic.**

Field Note: ***Hematitic breccia***

Abundant fragments to 6mm long in this thin section are partly hematite-stained. Most of these have albitised plagioclase phenocrysts with or without aggregates of fine-grained granular epidote in a microgranular or flow-textured albitised groundmass with leucoxene ex-opaque oxide. Some fragments have quartz as microphenocrysts and groundmass areas may have quartz as well as albite, suggesting dacite as well as andesite. There are also minor scattered albitised plagioclase phenocrysts as separate fragments to 3mm long and smaller epidote-rich fragments. Interstitial clouded epidote is abundant as well as clouded fine-grained epidote that seems to be separate from the granular epidote in patches and fragments.

Some fragments are well-defined and some are poorly defined, but this sample seems to represent epidote-albite-hosted breccia of partly hematite-stained andesite together with possible dacite fragments.

ERRC006EXT 308.18 - 308.36m	**Sheared gabbro or diorite, with abundant albite replacing inequigranular plagioclase and leucoxene-rich altered opaque oxide grains, all in a sericite-chlorite schist matrix. Cut by carbonate veins with quartz and/or albite. This handspecimen is not magnetic.**

Field Note: ***Volcaniclastic***

Abundant albitised plagioclase laths in this thin section are partly pulled apart and veined by chlorite, sericite and/or carbonate in various proportions. These laths are from 0.5mm to 10mm long and may represent phenocrysts or components of a piece of sheared coarse-grained intrusive rock.

Interstitial material is schistose and irregularly laminated with sericite/phengite and green moderately iron-rich chlorite alteration. Lenses of leucoxene ± sericite ± chlorite to 1.5mm long seem to replace former titanomagnetite, with smaller lenses stained by hematite. There are also lenses of fine-grained partly fractured and fragmented albite. Irregular carbonate-rich veins cut across the foliation, locally with en-echelon offsetting and with segments containing quartz and/or albite.

This rock is interpreted as a sheared and altered diorite or gabbro.

ERRC006EXT **376.55 - 376.69m**	**Possible agglomerate or flow-top breccia, with extensive sericite-quartz-chlorite alteration and a schistose matrix of sericite, quartz and carbonate. Local carbonate-chlorite veins with opaque oxide. This rock is not magnetic.**

Field Note: ***Sheared volcaniclastic***

Blocky and elongate fragments from 1mm long to more than 25mm are abundant in this thin section, all within a schistose matrix variously rich in sericite and very fine-grained quartz. Some fragments are hematite-stained. The largest apparent fragment is at one end of the thin section, allowing it to represent part of a coherent lava flow. The variably definite and possible fragments are mostly not schistose, but are rich in sericite and microcrystalline quartz, locally with small albitised plagioclase phenocrysts. Some fragments also have disseminated fine-grained opaque oxide and the largest fragment has rare quartz-filled amygdales and small patches of quartz. Minor carbonate occurs within and between fragments and there are irregular veins with carbonate > chlorite and minor opaque oxide.

This sample is interpreted as an inequigranular fragmental volcanic, or a flow-top breccia.

ERRC006EXT **384.8 - 384.9m**	**Hematite-stained probable fragmental volcanic. Includes one quartz-clay/ poorly defined sericite-hematite-altered fragment, locally with albitised plagioclase phenocrysts and accessory oxidised opaque oxide grains. Also patches and veins of carbonate and/or quartz scattered throughout. Not magnetic.**

Field Note: ***Hematitic volcanic***

This thin section consists of hematite-stained, foliated, quartz-clay/sericite-altered volcanic material, apparently a fragmental rock with elongate fragments on a millimetre to centimetre scale. Some of the fragments have albitised plagioclase phenocrysts to 0.8mm long, but most are aphyric. A few fragments show flow laminations but most are massive and unlaminated. Accessory small hematite grains are disseminated, as well as leucoxene and rare pyrite. Patches, lenses and veinlets that contain or consist of quartz and/or carbonate are common throughout, with carbonate more abundant and widespread than quartz. Skein-like carbonate-rich lenses and veins are locally up to 10mm long.