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PACMINEX PTY. LIMITED

A MINERALOGICAL EXAMINATION OF HEAVY MINERAL CONCENTRATES AND PETROGRAPHIC SURVEY OF ROCK TYPES E.L. 15/76 DUNDAS, TASMANIA

PMR 215/77

SYDNEY

January, 1978

P.J. Curtis

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COPY NO. 4

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CONTENTS

		PAGE NO.
1.	INTRODUCTION	1
2.	SUMMARY	2
3.	PETROGRAPHIC NOTES	7
4.	REFERENCES	38

APPENDICES

1 MEMORANDUM FROM P.M. MACNAMARA TO P.J. CURTIS DATED 6/10/1977 AND ENTITLED "HEAVY MINERAL SEPARATES PANNED CONCENTRATES, E.L. 15/76, DUNDAS

2 MEMORANDUM FROM P.M. MACNAMARA TO P.J. CURTIS DATED 26/9/1977 AND ENTITLED "THIN SECTIONS, E.L. 15/76, DUNDAS, TASMANIA".

3 TABLE 1, HEAVY MINERALS CONTENT, SPECIMENS FROM E.L. 15/76, DUNDAS.

4 CENTRAL MINERALOGICAL SERVICES PTY. LTD. REPORTS: CMS 77/10/26 (DATED 24TH OCTOBER, 1977) AND CMS 77/11/16 (DATED 8TH NOVEMBER, 1977).

5 LOCATION MAP (DRAWING NO. K555/6) SPECIMENS . (ALLUVIAL AND ROCK) FROM E.L. 15/76, DUNDAS.

LIST OF ILLUSTRATIONS

FIGURES		FACING PAGE NO.
1	602524 : METAPYROXENITE CUMULATE ROCK, CUNI AREA, DUNDAS.	9
2	602528R : SULPHIDE RICH PYROXENITE SHOWING CUMULATE SULPHIDES, CUNI AREA, DUNDAS.	10
3	602438 : SLUMPED BANDED SANDSTONE:ARGILLACEOUS SILTSTONE WITH TOURMALINE AND CASSITERITE. SITE 602435M ON CARBINE GRID NEAR 50'N/350'N (TEXIN GRID)	25
4	602452F : SPILITE SELVAGE. SITE 602450M ON TEXIN-CARBINE GRID AT 50'N/50'E	26
5	602482R : MUSCOVITE-QUARTZ-CARBONATE SCHIST. ORIGINALLY A BANDED SHALE. ON WALKING TRACK BETWEEN THE END OF THE SOUTHERN ROAD TO MONTEZUMA GRID AND THE WESTERN BASE-LINE AT 10N.	29
6	602570R : ALTERED PORPHYRITIC BASALTIC ANDESITE. ON ZEEHAN-QUEENSTOWN HIGHWAY IN ROAD-CUTTING JUST SOUTH OF WHERE EWART CREEK CROSSES THE HIGHWAY ON THE SOUTH MARGIN OF E.L. 15/76.	36

KEYWORDS

TASMANIA
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MINERALOGY
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TIN
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SULPHIDES
1977

1. INTRODUCTION

This report is divided into two parts.

Firstly, 165 heavy mineral concentrates for mineralogical analysis with emphasis on searching for tin and nickel and their associated minerals. The mineral concentrates were examined for all mineral species and the results are included in Appendix 3. For lack of time available, no general comments, correlations, etc., have been made at present.

For the second part of the project, a petrographic study was made of 30 thin sections and 2 polished sections of rocks from the Dundas prospect. The specimens were taken mainly from the Cuni and Montezuma Falls-Dundas area. Rock types, mineralogy, metamorphic features (particularly hornfelsing) are noted.

2. SUMMARY

2.1 Cuni Area

602522R

A much altered metapyroxenite cumulate, shows arrangement of unoriented chlorite pseudomorphs of approximate similar size to original pyroxene crystals. Unlike 602523R and 602524R where some relict primary clinopyroxene remains. There is a close textural relation between the three ultramafic rocks with uniform alteration becoming less as one progresses from 602522R to 602524R.

602523R

Altered hornblende metapyroxenite cumulate, similar events to 602522R but alteration was less complete. Hydrothermal sulphides of arsenopyrite and pyrite are present in traces.

602524R

Altered metapyroxenite cumulate, shows layering of silicates and similar apparent layering of some sulphides, pyrite, arsenopyrite and chalcopyrite - though the latter also shows replacement characteristics.

602528R

Mainly sulphides, showing cumulate layering and trapped silicates. Possibly the chalcopyrite present is not part of the cumulate sequence, though other sulphides - pyrrhotite, pentlandite and pyrite show a mutual cumulate relationship.

602529R

Fine-grained andesite-tuff-flow, layered, alternates with rhyolite tuff bands. The bands are cut by oxidised pyrite:quartz:carbonate veins. There is no apparent

relationship to other igneous rocks in the series.

602530R

An altered ultramafic lava flow, veined by a later coarser grained igneous differentiate(?).

602531R

Altered ultramafic tuff flow. Similar but finer grained than for an ultramafic tuff sectioned from Rosedale, Queensland (Ref. 2).

602532R

Dolerite intrusive rock. No relationship to specimen 602522 and 602523, but possibly a later less basic dyke phase (see Carr Boyd notes - Ref. 1).

2.2 Dundas Tramway-Montezuma Falls

602537R

Quartz porphyry, altered (sericitised). Includes some tourmaline.

2.3 Montezuma-Carbine-Ainslie Grids

602308R

A cataclased argillaceous siltstone. Shows strong shear dislocation. No hornfelsing effects are observed, but a high level of leucoxene is present.

602309R

Argillaceous, feldspathic sandstone. Cataclased and sheared. No hornfelsing is observed.

602349R

Chloritic shale contains sandy bands of brecciated quartz. No evidence of hornfelsing is seen. Similar to specimens

602308 and 602309. Like 602517 but the latter contains no chert.

602387R

Mudstone or shale, sheared and tourmalinised. No direct evidence of contact metamorphic effects are seen. No carbonate is detected.

602388R

Quartz arenite/sandstone, brecciated; introduced pneumatolytic tourmaline is present. Incipient hornfelsing is present.

602395R

Calcilutite (carbonate sediment), pyritiferous, sheared. No contact metamorphism is seen.

602402R

Pyritiferous carbonate shale, shows two cleavages crossing at 60^{o}. Introduced (pneumatolytic) tourmaline follows the second weaker cleavage. No hornfelsing is observed.

602411R

Quartz wacke sediment. Possible incipient hornfelsing is observed.

602414R

Quartz wacke sediment, sheared. No carbonate is present and there is an absence of hornfelsing.

602418R

Andesitic tuff flow. No hornfelsing is seen.

602426R

Cherty carbonate sediment, shows slump/breccia structures of alternating, chert:carbonate bands. Possible incipient hornfelsing occurs.

602438

Sandstone:argillaceous siltstone slumped bands, with tourmaline, and some fine cassiterite is present. There is slight contact metamorphic recrystallisation.

602452F

Spilite selvage; chloritised, carbonatised and argillised welded structures occur. A probable volcanic unit at upper contact of Oonah Quartzite?

602462F

Argillaceous quartzite or quartz wacke, mineralised, sheared, then hornfelsed.

602468R

Silicified acid volcanic breccia. No hornfelsing is observed.

602470R

Fine carbonate breccia, hornfelsed. Fractures are filled with secondary calcite.

602482R

Banded shale (muscovite-quartz-carbonate schist). Minor carbonate is present. Much sheared. Some tourmaline was introduced.

602488R

Greywacke-quartz-dolomite conglomerate. Tourmalinisation and hornfelsing of some fragments is indicated.

602511R

Banded pyritiferous siltstone/sandstone rock. Pyrite present could have been syngenetic with sediment. Clay and chlorite are minor components.

602515R

Quartz wacke with a mainly carbonate/kaolinite matrix. Thought to be Oonah Quartzite after comparison with known Oonah Quartzite. Some hornfelsing is observed.

602517R

Argillaceous banded sandstone now a quartz-sericite-schist which shows crenulation cleavage. Likely a member of the Concert Schist unit.

2.4 Queenstown Highway

602570R

Altered porphyritic basaltic andesite. Possibly related to Oonah Formation basalt 600719 but the latter is much more amygdaloidal and glassy.

3. PETROGRAPHIC NOTES

3.1 Cuni Area

(a) 602522R

Location: Mine dump, North Cuni area.

Field Description: Dark green, apparently ultramafic chloritised rock - no feldspar apparent in hand specimen. Minor sulphide-pyrite? A tuff/flow/intrusive.

Special Requests: To check the affinities with 602523, 602524, etc.

Petrographic Identification: Altered pyroxenite, texturally similar to some metapyroxenite rocks at Carr Boyd.

Mineralogy:	Volume Percent
Chlorite	75
Albite?	2
Ilmenite	5
Rutile (after ilmenite)	2
Limonite	3
Quartz (secondary veining)	5
Antigorite	8

Texture: Pseudomorphed equigranular pyroxene shapes of basal and prismatic sections. Scattered skeletal ilmenite shapes occur, commonly associated with fine groups of rutile granules. Penninite chlorite pseudomorphs pyroxene shapes as parallel growths of the fibrous mineral. Smaller radiate groups of fluffy antigorite occupy the interstices. Patchy quartz has begun the process of silicification. Antigorite occurs, rarely pseudomorphing pyroxene shapes. Veins of quartz traverse the specimen.

Alteration: Serpentinisation after metamorphism.

Metamorphism: Retrograde, of pyroxene to chlorite rock.

(b) 602523R

Location: Site of 602522R, mine dump.

Field Description: Dark greyish-green rock with small mottled light-green (clayish?) patches, possibly altered plagioclase. Possibly an altered dolerite. Sulphide (pyrite?) blebs.

Special Requests: Rock name? Tuff/flow/intrusive?

Petrographic Identification: Metapyroxenite. Ultramafic cumulate of hornblende pyroxenite altered to a chlorite:actinolite rock followed by retrograde alteration to serpentine.

Mineralogy	Volume Percent
Diopsidic augite	15
Hornblende	5
Chlorite	30
Tremolite	15
Antigorite (+ talc?)	30
Ilmenite + spinel mineral	5
Arsenopyrite > pyrite specks	<1

Texture: Clinopyroxene shapes (~ 65% of rock) show some layering and are part altered to chlorite and antigorite along irregular fractures. Some unaltered shapes are of a diopsidic augite. Hornblende is present as smaller euhedral prisms, which is a faintly brownish pleochroic variety showing obvious six-sided basal sections, and these are patchily altering to tremolite: actinolite. Oblong laths of altered olivine (or orthopyroxene) contain fine fibrous decussate growths of tremolite and short fibrous chlorite and abundant talc and antigorite. Altered pyroxene grains are of approximate equal grain size. Coarse, somewhat altered, scattered secondary opaque mineral, part pseudomorphs pyroxene grains; otherwise irregular masses of pyrite occupy 'vugs' associated with serpentine mineral and chlorite, flanked by tremolite and talc. Pyrite part replaces silicates.

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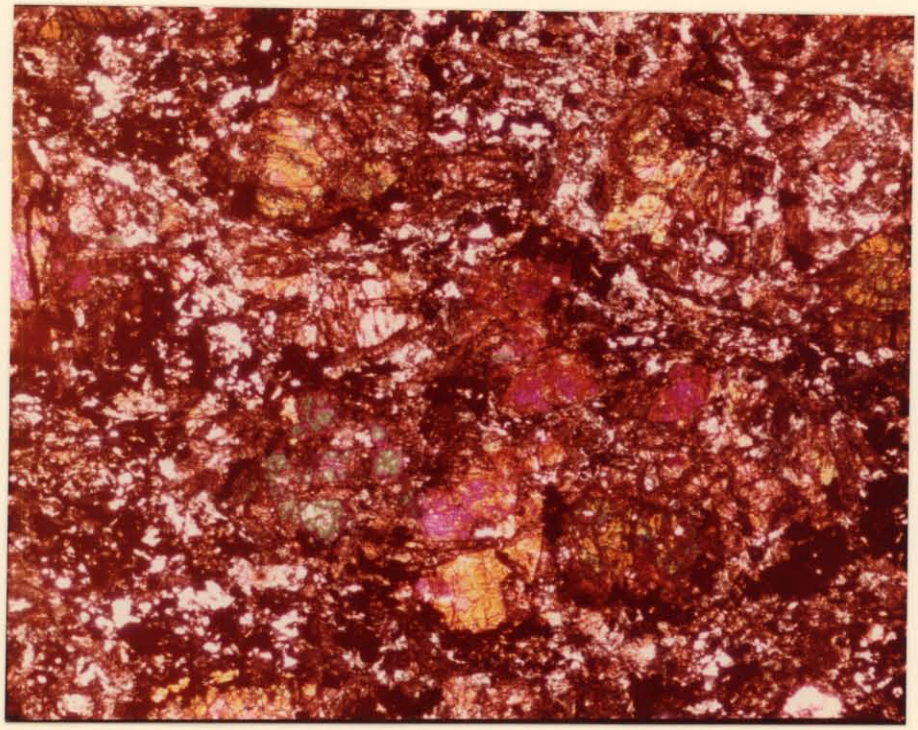

FIGURE 1: Altered metapyroxenite cumulate, Cuni Area, Dundas (602524)

Augite (magenta, yellow, blue and green) shows alteration to antigorite (white), tremolite (pale blue, etc.), and chlorite (dark green). Abundant sulphides (black) occur interstitial to the silicate grains.

Crossed nicols Magnification x 16

Metamorphism: Mild greenschist prior to serpentinisation.

Alteration: To serpentine minerals, more intense than for 602522R but some pyroxene remains unaltered, i.e. metamorphism and serpentinisation are seen to have been separate events.

(c) 602524R (Figure 1)

Location: 602522R - mine dump.

Field Description: Fresh, dark, grey-green dolerite/microgabbro-like rock with abundant sulphides (pyrite, etc.).

Special Requests: Check against 602522-602533. Tuff or flow/intrusive?

Petrographic Identification: Metapyroxenite.

Mineralogy	Volume Percent
Augite	27
Tremolite	14
Chlorite	5
Antigorite	29
Quartz	5
Hornblende	2
Magnetite euhedra	4
Chalcopyrite	8
Arsenopyrite	4
Pyrite (porous variety)	2

Texture: Very similar to 602523R, but 602524R shows fresher unaltered pyroxene and opaque minerals in abundance. Scattered coarse relicts of euhedral to subhedral augite as squat prisms show layering of mineral grains and alteration along irregular fractures to antigorite and chlorite, and smaller grains or external zones of coarse grains have become amphibolitised to tremolite, then altered to chlorite. Serpentinised/chloritised pyroxene laths occur as interstitial grains throughout. Traces of sheaf-like colourless chlorite occur in the matrix and patchy secondary quartz (a break-

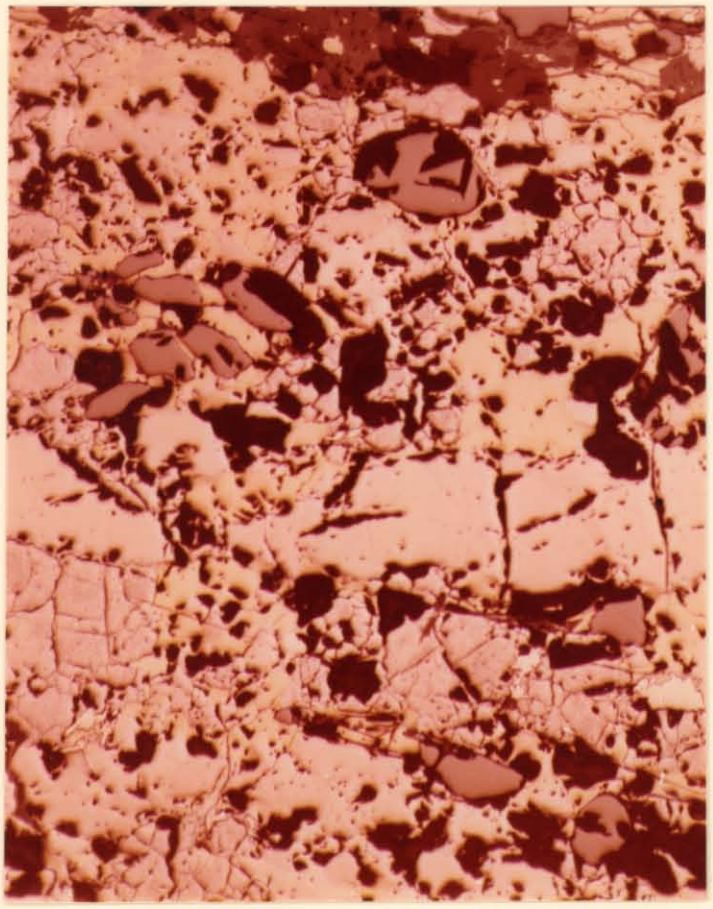

Figure 2: Sulphide rich pyroxenite, Cuni Area, Dundas (602528R)

Cumulate pyrrhotite (pink) and magnetite (blue-grey). Chalcopyrite (yellow) the last sulphide to crystallize appears to have replaced interstitial silicates and part-replaced earlier formed sulphides. Pentlandite (creamy-white) has both exsolved from and crystallized simultaneously with pyrrhotite - see right bottom corner of photograph.

Plain light Magnification x 77

down product of augite is seen). Sulphides entering fractures late have replaced silicates. Sulphides present are seen to be chalcopyrite:arsenopyrite intergrowths. Chalcopyrite apppears to have entered the system later than arsenopyrite and has part replaced the latter mineral and magnetite which has mutual boundaries with the arsenopyrite. Massive arsenopyrite occurs as variable sized wedge-shaped anisotropic crystals in mosaics. Many of these grains have been replaced entirely by the later chalcopyrite. 'Porous' pyrite (as seen associated with pentlandite in nickel sulphide occurrences, see report Kambalda, Ref. 3). occurs massively interstitially. Possible paragenesis :-

magnetite → pyrite / arsenopyrite → chalcopyrite

Alteration: Serpentinisation.

Metamorphism: Mild to greenschist grade prior to serpentinisation.

(d) 602528R (Figure 2)

Location: ?Melbourne Cuni Mine at intersection of Melba Creek with the North Cuni Road (old tramway?).

Field Description: Banded pyrite?- pyrrhotite? nickel sulphide rocks in mine dump below an old(?) smelter.

Special Requests: Check sulphide types and banding with respect to silicates (if any present) - replacement versus settling of sulphide textures?

Mineralogy	Volume Percent
Pyrrhotite	35
Pentlandite	10
Chalcopyrite	23
Magnetite	7
Pyrite - porous variety	10
Silicates	15

Texture: There appears to be a cumulate layering of sulphides and magnetite with parallel arrangement of sulphides of elongate aspect, though chalcopyrite may itself not be part of the layered sequence since it appears to encroach by replacement into pyrite and pyrrhotite grains. The chalcopyrite was last to crystallise; thus this would account for its replacive nature. Pyrite also shows some replacement by neighbouring pyrrhotite on a limited scale. Silicates are present as fine and medium-sized irregular particles and were probably carried down by the sulphides and trapped during crystallisation. Crystal forms of pyrrhotite which form the thickest, most continuous layers show vertical columnar type growths perpendicular to the layers. Scattered finer crystals show more irregular mosaics. Porous pyrite shows a crumbling fine regular mosaic of individual crystals.

(e) 602529

Location: As for 602528R.

Field Description: Medium, blue-grey banded(?) igneous rock, minor sulphide (pyrite). Tuff or chilled intrusive?

Special Requests: Check affinities with other basalt/microgabbro rocks in suite, especially the coarser bands.

Petrographic Identification: Andesite tuff flow alternates with rhyolite tuff in bands. Cut by pyrite:quartz:carbonate veins.

Mineralogy:

		Volume Percent
Lateral fine bands		
Potash feldspar/sericite fragments -	vary	1 to 35
Quartz	up to	1 to 10
Glass	up to	90
Leucoxene + opaque oxide	up to	10
Central coarse bands		
Carbonate		20
Albite		8
Chlorite		67
Pyrite		5

/....

Veining		Volume Percent
Pyrite (now limonite)	)	approx. equal
Quartz	)	amounts of all
Carbonate	)	minerals

Texture: The specimen is divided into a number of bands, several millimetres in width. Beginning from the lowermost, these are as follows :-

1) Graded fine fragments of potash feldspar and less quartz occur in glassy mesostatis, becoming more glassy to top of band.
2) Followed abruptly by a narrow calcic glassy chilled contact band.
3) The calcic glassy band is followed by a coarse ungraded andesite tuff lava of poikiloblastic albite fragments containing flecks of carbonate, bright green chlorite clusters, anhedral carbonate and pyrite.
4) Narrow calcic chilled band of glass.
5) Graded rhyolite tuff lava of fine potash feldspar fragments, quartz fragments in glass and abundant flecks of leucoxene.

The bands above are all veined by cross-cutting pyrite (now limonite), quartz and carbonate as irregular grains. Microfaulting of glassy bands occurs.

Alteration: Hydrothermal, causing :-

1) sericitisation and carbonatisation of feldspars
2) chloritisation of ferromagneisan minerals

Remarks: No affinity could be established between this tuffaceous rock and other lavas/tuffs in the series.

(f) 602530R

Location: As for 602528.

Field Description: Greenish-black aphanite, possibly a micro/gabbro basalt chilled margin or a hornfelsed shale, or even a fine-grained ultramafic.

Special Requests: To determine rock type.

Petrographic Identification: Veined, altered ultramafic lava flow.

Mineralogy	Volume Percent
Fine phase	
Chlorite	30
Actinolite	55
Opaque oxides/leucoxene	15
Coarse intrusive phase	
Brown and green decussate chlorite	95
Limonite	5

Texture: The main part of the rock is of fine unoriented acicular actinolite with interstitial chlorite and abundant specks of magnetite(?)/leucoxene. This is irregularly veined by coarse brown-green chlorite growths streaked with limonite, which diffuse into the primary mass in places. No chilled contacts are observed, so was intruded whilst primary rock mass was still hot. All primary textures were destroyed. Differential chlorite concentration indicates a possible relict flow.

Alteration: Chloritisation of an ultramafic groundmass has occurred and this was veined by a coarser rather more basic(?) phase.

Metamorphism: -

(g) 602531R

Location: As for 602528.

Field Description: Dark-blue and green-grey banded(?) tuffaceous rock with silty(?) bands. Tuffaceous siltstone or intrusive/extrusive?

Special Requests: Check basalt/microgabbroic affinities.

Petrographic Identification: Ultramafic tuff flow. Now a chlorite:actinolite, glassy rock.

Mineralogy	Volume Percent
Chlorite	12
Actinolite	8
Cherty glass	60
Leucoxene	15
Opaque minerals	5

Texture: Fine-grained with fine blebs of chlorite indicating fragments of ultrabasic minerals (altered pyroxenes?) in subparallel formation showing flow. These blebs are situated in a fine actinolite:cherty matrix specked throughout by leucoxene and also by parallel euhedra opaque laminae. Differentiation is noted where a sharp textural boundary cuts off a part of the rock containing larger blebs of chlorite and more abundant leucoxene.

Metamorphism: Retrograde chloritisation.

Alteration: Amphibolitisation followed by retrograde chloritisation of an ultramafic tuff (cf. Rosedale ultramafic tuff flow, A47127, Ref. 2). Possible green schist metamorphism.

(h) 602532R

Location: As for 602528.

Field Description: Blue-grey and greenish grey micro-gabbroic/basaltic rock from dump. Possibly the typical igneous rock of the area. Tuffaceous or flow/intrusives.

Special Requests: Check affinities with the series 602522-602532.

Petrographic Identification: Dolerite intrusive, medium grained.

Mineralogy	Volume Percent
Plagioclase (argillised to kaolinite)	50
Pyroxenes (chloritised)	40
Magnetite > ilmenite (includes limonite < leucoxene)	10

/....

Texture: Typical subophitic dolerite texture, but plagioclase and pyroxene are altered and chlorite (after pyroxene) shows purple-green and pink-magenta polarisation colours. The chlorite does not define the original forms of the altered pyroxene as does kaolinite define the plagioclase laths present. Scattered clots of leucoxene and limonite pseudomorph octahedral magnetite and some skeletal ilmenite forms. No amygdules are seen.

Alteration: Green schist retrograde metamorphism of an intrusive dolerite rock.

Remarks on the Cuni Area

An ultramafic/basic rock association. As seen at Carr Boyd (ultrabasic section of an ophiolite sequence?). Ultramafic lavas and tuffs are associated with pyroxenite sills and later(?) gabbroic and dolerite intrusives. Some irregular nickel and copper sulphide mineralisation is present (cf. Carr Boyd).

3.2 Dundas Tramway-Montezuma Falls

602537R

Location: Outcrop on NE Dundas Tramway, several hundred metres south of Confidence Saddle towards Montezuma Falls.

Field Description: Pale grey porphyritic (quartz-feldspar) rock with acicular black prismatic minerals (Fe:Mg?, tourmaline?). A possible extension of the quartz porphyry on Pine Hill (i.e. Dqp). An aphanitic porcellanite rock is nearby.

Petrographic Identification: Altered quartz porphyry.

Mineralogy	Volume Percent
Porphyritic phase	
Quartz	7
Sericitised orthoclase (< 1% remains)	5
Tourmaline	1
Hornblende (limonitised/argillised kaolinite)	3

/....

Groundmass	Volume Percent
Quartz	50
Sericite (with patchy coarse muscovite in radiate bundles)	32
Muscovite	2

Texture: Typical quartz porphyry rock of part resorbed quartz, orthoclase and hornblende phenocrysts irregularly distributed in a fine quartz-sericitised feldspar groundmass. Tourmaline was introduced during high temperature hydrothermal alteration.

Alteration: Hydrothermal sericitisation.

3.3 Montezuma-Carbone-Ainslie Grids

(a) 602308R

Location: Site of 602306M, S.E. of South Montezuma grid.

Field Description: Dark grey siltstone shale.

Special Requests: Check for hornfelsing and volcanic affinities.

Petrographic Identification: A cataclased, argillaceous siltstone.

Mineralogy:	Volume Percent
Cherty quartz	65
Sericite	25
Leucoxene	7
Limonite	3

Texture: A finely cataclased siltstone with lenticular sericite matrix. Very fine-grained ruptured cherty quartz lenticles and sericite flakes are oriented in one shear direction. Homogeneous mineral composition, but thin unoriented cross-cutting veins of limonite (weathered pyrite?) occur.

Metamorphism: A strong shear dislocation is noted.

Remarks: No hornfelsing is observed.

(b) 602309R

Location: SE of South Montezuma grid. More quartzitic variety of 602308.

Field Description: A grey-green quartzitic siltstone.

Special Requests: Check hornfelsing.

Petrographic Identification: Cataclased argillaceous feldspathic sandstone.

Mineralogy	Volume Percent
Quartz	10
Fine chert	52
Sericite	20
Chlorite	2
Tourmaline	<1
Sphene	1
Leucoxene	7
Limonite	3
Potash feldspar	5

Texture: Quartz and feldspar shows augen structures in a cataclased, feldspathic argillaceous sandstone. Matrix between porphyroblasts is fine and cherty intermingled with thin chlorite laminae and interstitial blebs and fine and coarse sericite. Quartz flour formed during cataclasis has recrystallised as fine chert. Scattered fine leucoxene is present. Tourmaline was introduced and is not detrital - occurs as fresh unworn prisms.

Metamorphism: Cataclased, sheared dislocation type.

Remarks: No hornfelsing has occurred. Similar to 602308R but is a coarser grained rock.

(c) 602349R

Location: Dundas grid west of Mt. Dundas

Field Description: Banded grey-green(?) chloritic siltstone/shale.

Special Requests: Check hornfelsing (also against the other banded siltstone, i.e. 502531? etc.).

/....

Petrographic Identification: Chloritic shale with sandy bands of brecciated quartz.

Mineralogy	Volume Percent
Sandy Bands	
Quartz	25
Chert	4
Brown chlorite	5
Green chlorite	55
Sericite	3
Opaque oxides	1
Leucoxene	7
Fine silty clay	
Quartz porphyroclasts	2
Chert	36
Chlorite	50
Sericite	5
Leucoxene	7

Texture: Banded sandy and argillaceous mixed and argillaceous rock of quartz breccia and fine lenticular micaceous minerals with chlorite and some chert filling spaces between quartz (sandy bands) and it being schistose (fine silty clay bands), shows sharply differentiated fine and coarse bands with some sandy lenticles in clay near sandy bands/silty clay contact.

Metamorphism: Dislocation/shear but not as much as for 602308.

Remarks: No evidence of hornfelsing and similar to both 602308 and 602309 in types of mineral assemblages present and metamorphism. The specimen 602531 is not quartzose.

(d) 602387R

Location: Ainslie Grid.

Field Description: Pale green crenulated siltstone.

Special Requests: Check carbonate content and for hornfelsing.

/....

Petrographic Identification: Tourmalinised sheared mudstone or shale.

Mineralogy:	Volume Percent
Sericite	67
Cherty quartz	20
Quartz augen	5
Tourmaline	2
Leucoxene	4
Pyrite	2

Texture: Fine-grained sheared, illitic clay (altered to sericite) and scattered quartz (rock and mineral grains) augen and en echelon disposed thin lenticles of pyrite; also scattered leucoxene (after titanomagnetite). Introduced fine and coarse granules and prisms of tourmaline.

Alteration: Some tourmalinisation of mudstone followed shear/cataclasis of sedimentary quartz.

Metamorphism: Shear/cataclasis in limited quartz bands and pyrite.

Remarks: No evidence of contact metamorphism but some evidence of pneumatolysis is seen. No carbonate is identifiable.

(e) 602388R

Location: Road cutting near Comet-Maestries Mines, Ainslie Grid.

Field Description: Typical Oonah Quartzite and Slate variety of pale-grey(?) indurated quartzitic siltstone, with white mica flakes. Taken as a typical Oonah sample.

Special Requests: Check for hornfelsing (although this may not show very well due to the type of mineralogy.

Petrographic Identification: Quartz arenite sandstone. Shows brecciation.

Mineralogy:	Volume Percent
Quartz	89
Illite	2
Kaolinite	5
Tourmaline	1
Leucoxene (after magnetite)	2
Sphene	1

Texture: Quartz grains of sand size occur in sutured mosaics separated by recrystallised irregular vein-like quartz of fine and coarse subangular > angular quartz and cherty quartz. Fresh angular to prismatic coarse tourmaline is present but is not confined to the alteration 'veins' and is situated in silicified quartz mosaics. Scattered leucoxene pseudomorphs of magnetite(?), and sphene occur throughout. Parallelity of elongate quartz grains indicate bedding.

Alteration: Vein systems as noted above, with tourmaline introduced locally.

Metamorphism: Tectonic brecciation of quartzite preceded recrystallisation. Localised recrystallisation of quartz grain boundaries followed, with clarity of quartz mosaics - incipient hornfelsing.

Remarks: Incipient hornfelsing is observed.

(f) 602395R

Location: Ainslie Grid - left hand tributary of Comet Creek, approximately 300 m upstream of Judith Creek.

Field Description: Dark blue-grey shaley siltstone with fine disseminated pyrite.

Special Requests: Check hornfelsing and mineralogy.

Petrographic Identification: Sheared pyritiferous sediment - a calcilutite.

Mineralogy:	Volume Percent
Quartz	15
Calcite	78
Pyrite	5
Carbonaceous(?) matter	2

/....

Texture: Finely sheared calcite with scattered fine quartz and some coarse augen of quartz; the latter being associated with euhedral pyrite. Fine pyrite present in abundance suggests that after shear pyrite recrystallised to euhedral forms under low pressure. Distribution of pyrite as scattered grains and association with fine lenticles of carbonaceous(?) matter may suggest pyrite present to have been syngenetic.

Alteration: Some recrystallisation after shear.

Metamorphism: Dislocation/shear.

Remarks: No hornfelsing took place (checked for in quartz mosaics of larger augen). Recrystallisation took place at low temperatures.

(g) 602402R

Location: Ainslie Grid-Judith Creek, 100 m upstream from Comet Creek.

Field Description: Blue-grey slate.

Special Requests: Check for hornfelsing.

Petrographic Identification: Tourmalinised, pyritiferous pelitic carbonate sediment.

Mineralogy	Volume Percent
Calcite	63
Sericite	20
Quartz	10
Tourmaline	2
Pyrite	5

Texture: A finely sheared mixture of carbonate, sericite and quartz. The latter is present as fine but variably sized fragments. Two shear directions are noted with an apparent angle of 60° between them. The first directs the orientation of clasts of quartz and pyrite, and a later weaker shear traverses and orientates the direction of sericite and calcite fragments. A crenulation cleavage

has therefore developed in the carbonate clay matrix. Tourmaline is a later phase. The 'c' axes of the tourmaline prisms parallel the second cleavage of calcite:sericite.

Alteration: Some tourmalinisation.

Metamorphism: Shear/dislocation.

(h) 602411R

Location: South Montezuma Grid.

Field Description: Hornfelsed quartzitic rock (Pu0) or dyke.

Special Requests: Check for mineralogy and hornfelsing (if a hornfels). Rock source?

Petrographic Identification: Quartz wacke sediment.

Mineralogy:	Volume Percent
Quartz	84
Illite	4
Kaolinite	3
Carbonate (some with limonite)	9
Rutile	<1

Texture: Mainly equigranular sand-sized subangular quartz in recrystallised sutured mosaics or more commonly with pockets of ferruginous > clear calcite and other pockets filled with mixed fine illite and kaolinite. No banding is apparent. Clarity of quartz is noted, coarsening of illite and local recrystallisation of quartz boundaries occurs.

Alteration: Some low temperature diagenesis.

Metamorphism: Possible incipient hornfels.

(i) 602414

Location: South Montezuma grid at site of 602414M.

Field Description: Float sample of pale grey-green crenulated banded siltstone.

Special Requests: Check for carbonate; hornfelsing.

Petrographic Description: Sheared quartz wacke sediment.

Mineralogy:	Volume Percent
Quartz	74
Sericite	4
Chlorite	15
Rutile	3
Limonite	1
Tourmaline	2
Sphene	1

Texture: A much sheared quartz wacke with thin parallel laminae of quartz alternating with sheared lenticles of chlorite > sericite. Cross-cutting fractures have filled with recrystallised quartz and chlorite of the rock itself. Authigenic greenish overgrowths of tourmaline cover chunky pale green grains of plucked mineral. Rutile has recrystallised to sphene. Tourmalinisation was pre-shear.

Alteration: -

Metamorphism: Shear/dislocation.

Remarks: No carbonate is present and hornfelsing has not occurred.

(j) 602418R

Location: South Montezuma Grid (60'E/4'S)

Field Description: Reddish-purple siltstone veined with blue-green chlorite at 62430MN/2990ME.

Special Requests: Check mineralogy, hornfelsing and rock type.

Petrographic Identification: Andesitic tuff flow.

Mineralogy	Volume Percent
Feldspar	35
Quartz	4
Kaolinite (after feldspar) - white	2

/....

Mineralogy (continued)	Volume Percent
Chlorite (after ferromagnesian minerals, green glass)	41
Magnetite/ilmenite	6
Leucoxene (with limonite)	12

Texture: A typical andesite tuff flow, though much altered. Medium grain size, irregular fragments of chlorite/chloritic clay, kaolinised feldspar and a little quartz are oriented into flow patterns of chlorite and limonite-stained leucoxene and fragmentary opaque oxides (magnetite/ilmenite). The grain size is fairly regular and presumably therefore the source of tuff was not from the immediate proximity. Later chlorite veins cut across the tuff and are themselves locally cut by fine ferruginous oxide/chloride stringers. Much of the primary texture has been destroyed.

Alteration: How much is due to weathering and how much to late stage hydrothermal activity during cooling of the flow is difficult to say, though chlorite veins are probably due to late deuteric/hydrothermal activity.

Metamorphism: -

Remarks: -

(k) 602426R

Location: Site 602183M and 602424M.

Field Description: Pale blue-grey to purplish-brown pyritic dolomitic siltstone of cherty appearance. Positive CO_2 to HCl.

Special Requests: Check mineralogy, hornfelsing and rock type.

Petrographic Identification: Banded cherty carbonate sediment showing slump and breccia structures.

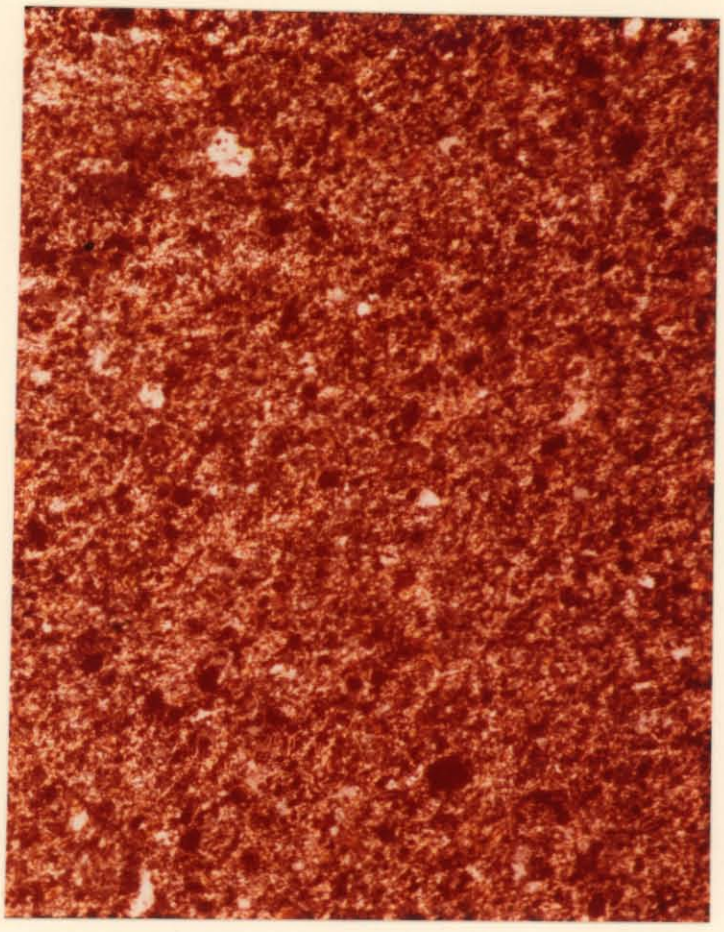

FIGURE 3: Part tourmalinised argillaceous siltstone, Carbine Grid, Dundas (602438)

Abundant muscovite flakes and quartz show slight hornfelsing. Tourmaline (orange-green) appears as prisms scattered through the groundmass. Dispersed cassiterite grains are present (grey brown and near black with a faint glimmer of bright polarisation colours).

Crossed nicols Magnification x 70

Mineralogy:	Volume Percent
Calcite	66
Sericite	5
Recrystallised chert	20
Quartz (coarse, detrital)	5
Rutile	2
Limonite, Fine opaque mineral	2

Texture: Slumped cherty bands alternate with brecciated carbonate bands. The chert bands have fragmented and the pieces have a pinched appearance but maintain their linear orientation to bedding. Carbonate shows fine brecciation and recrystallisation. Secondary calcite fills fine fractures diagonal to bedding. Fine scattered opaques and rutile occur throughout.

Alteration: Mobilisation of carbonate into chert bands has resulted in relict quartz fragments becoming incorporated into present carbonate bands.

Metamorphism: There is evidence of recrystallisation which followed slump and brecciation but nothing distinctly contact altered, only recrystallisation.

(1) 602438. (Figure 3)

Location: Site 602435M on Carbine Grid near 50'N/350'N (Texin Grid).

Field Description: Variegated siltstone at mouth of nearby adit. Limonite masses associated.

Special Requests: Check for hornfelsing, mineralogy and rock type.

Petrographic Identification: Slumped banded sandstone: argillaceous siltstone, showing introduction of abundant tourmaline and cassiterite.

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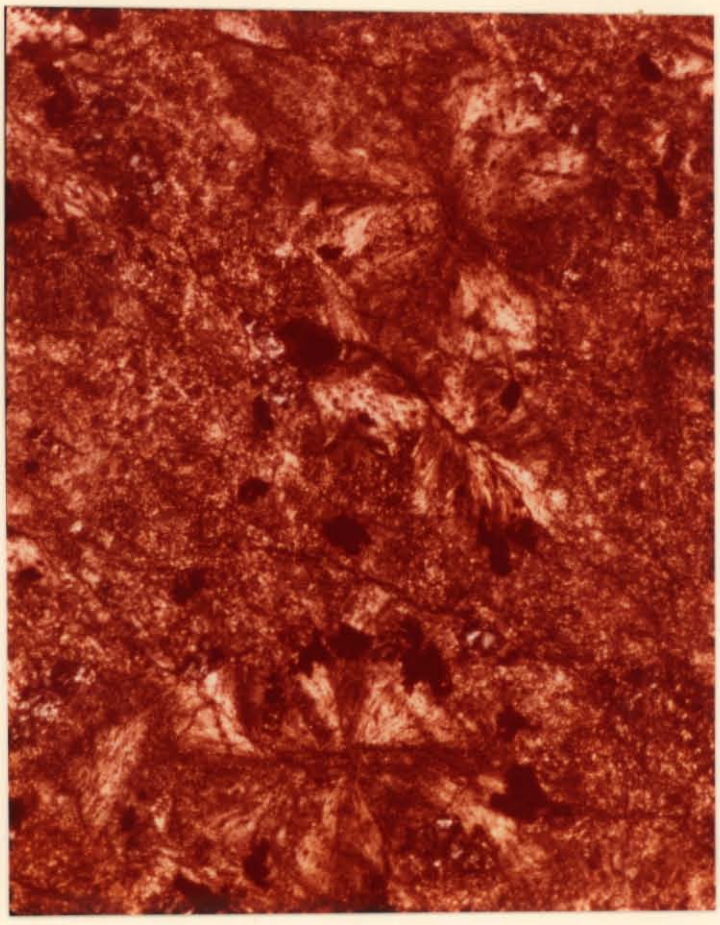

FIGURE 4: Spilitic selvage, Texin Cabine Grid, Dundas (602452)

Hyaline, feathery structures are abundant. The remainder of the rock between the feathery pillow structures is altered to chlorite (blue-grey) and carbonate (buff, bright colour specks).

Crossed nicols Magnification x 29

Mineralogy			Volume Percent	
Quartz	)		60	
Muscovite	)	bands,	30	
Limonite	)	lenses	2	
Tourmaline			5	
Cassiterite			3	} locally
Tourmaline (schorlite)	)		20	}
Cassiterite	)	alternate	5	
Limonite	)	slumped bands	1	
Quartz	)	of fine	15	
Muscovite	)	minerals	59	

Texture: Slumped and pinched-out bands of coarse quartz and muscovite contain heterogeneously distributed fine fresh schorlite with adjoining blebs of cassiterite. A great abundance of schorlite and cassiterite as similar sized grains are seen spread evenly through the interveining slumped argillaceous bands of finer muscovite and silty quartz. Polygonal textures of coarse quartz mosaics in coarser bands and sharply differentiated clear quartz/mica of fine bands suggests hornfelsing to have taken place.

Alteration: A tourmalinised slumped sandstone:silty clay sediment shows evidence of pneumatolysis with introduction of cassiterite.

Metamorphism: There is evidence of contact/recrystallisation of quartz bands.

(m) 602452F (Figure 4)

Location: Site 602450M on Texin-Carbone Grid at 50'N/50'E.

Field Description: Boulder in creek but of variegated appearance and variable texture - red, cherty, and grey-green coarser(?) carbonate material.

Special Requests: Check hornfelsing, mineralogy, rock type and structures. Any analogy to the Pu0/Ec contact rocks?

/....

Petrographic Identification: Spilite selvage.

Mineralogy	Volume Percent
Glassy spherulitic structures	75
Glass, sericitised/chloritised	5
Chlorite	7
Carbonate	5
Limonite	2
Quartz	1
Rutile	5

Texture: Glassy pillow-like feathery crystalline masses are welded together and show patchy alteration to sericite and calcite. Vugs and fractures in rock are filled with fibrous chloritic clay mineral, pale chlorite or to massive calcite. Black patchy ferruginous staining of feathery structures is evident. A tuffaceous fragment in thin-section shows quartz fragments and glassy shards in an argillised and carbonatised groundmass of volcanic fragments.

Alteration: The sericite and carbonate present may be partly due to differential weathering of the spilite. Tuff fragments present show abundant argillisation and carbonatisation.

Remarks: No hornfelsing is observed. No potassic material present, only calcic (stain method). Upper Oonah Quartzite volcanic unit.

(n) 602462F

Location: Site 602460M and 602218M.

Field Description: Boulder in creek draining northwards from the southern road to Montezuma Grid. Pyritic shale float below waterfall possibly locally derived as similar float is not evident some distance above the waterfall. Associated with a drainage SnO_2 anomaly.

Special Requests: Check mineralogy, hornfelsing and rock type.

Petrographic Identification: Argillaceous quartzite, mineralised, sheared, then hornfelsed.

/....

Mineralogy:	Volume Percent
Glass (devitrified to fine sericite: chert:quartz:carbonate intergrowths	67
Quartz (in fractures)	5
Carbonate - massive dolomite	25
Sphene	3
Magnetite	<1

Texture: Silicified acid volcanic breccia. Shows fragmentation of acid volcanic material followed by devitrification and carbonatisation of interstitial finely crushed matrix. Where not carbonatised, the interstitial 'glass' is seen to be darker with a greater chert:sericite ratio. Possible flow banding is indicated by fine trains of opaque particles in devitrified rhyolite fragments; these are converted to carbonate > quartz.

Alteration: Hydrothermal, with sericitisation followed by later carbonatisation and silicification.

Metamorphism: No hornfelsed textures are seen.

(p) 602470R

Location: On track at point 'WT 2900 ft' in eastern part of Montezuma Grid near the Moores Pimple tract. approximately line 34N.

Field Description: Dark blue-grey carbonate(?) siltstone, quartz veined. Contains carbonate. Carbonate bed in the Crimson Creek Formation.

Special Requests: Check hornfelsing, mineralogy and rock type.

Petrographic Identification: Fine carbonate rock, hornfelsed and brecciated.

Mineralogy:	Volume Percent
Calcite	96
Magnetite	3
Limonite	<1

/....

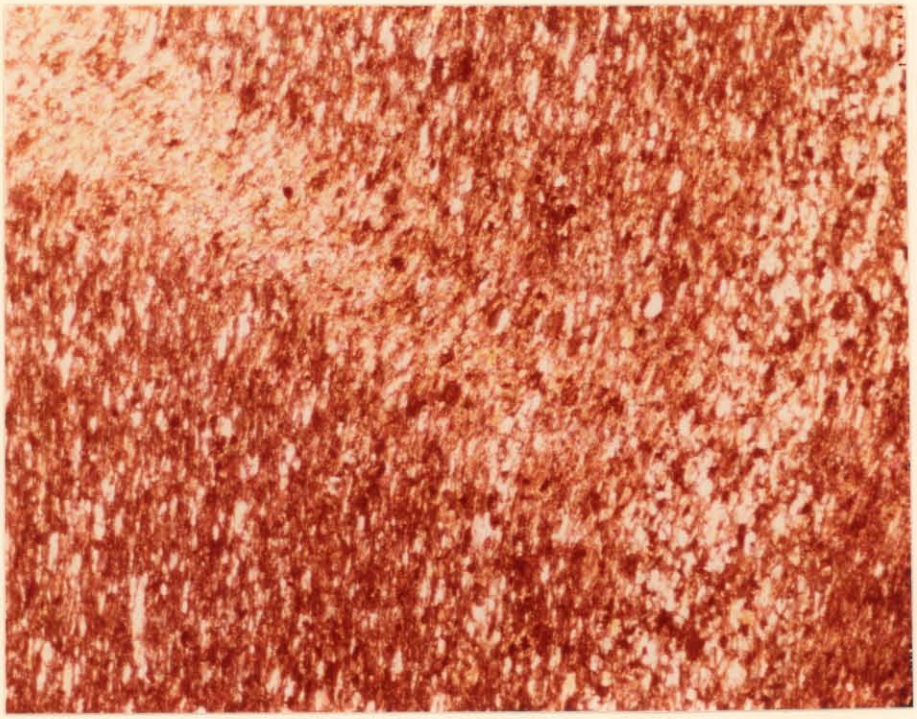

FIGURE 5: Muscovite-quartz-carbonate-schist-
Montezuma - Carbine Grid (602482R)

Sheared shale rock shows a crenulation cleavage resisted by a silty band (trending WNW-ESE, bottom of photograph). The crenulation cleavage reappears below the silt band. Muscovite appears (bright coloured specks), quartz (white) and carbonate (buff specks). Main (first) cleavage trends WNW-ESE in photograph.

Crossed nicols Magnification x 36

Texture: A remarkably pure carbonate rock apart from the very fine magnetite dust present in the main mass of silt size carbonate granules. Carbonate grains vary in size to 0.04 mm but median size is around 0.02 mm. Even grained, with many polyhedral and rhomb shapes in mosaics. Many sutured grain margins suggest a later low temperature recrystallisation. Present carbonate is the result possibly of decomposition of an ankerite to less iron rich calcite with exsolution of iron (now magnetite) to grain margins. Recrystallised pure calcite forms veins of polyhedral mosaics through the mass of carbonate grains which are of coarser texture compared to those of the main carbonate mass.

Alteration: Ankerite to calcite.

Metamorphism: Partly recrystallised hornfelsed texture.

Remarks: Hand specimen indicates that some coarse brecciation may have occurred prior to recrystallisation. This is not shown in the slide.

(q) 602482R (Figure 5)

Location: On walking track between the end of the southern road to Montezuma Grid and the western baseline at 10N.

Field Description: Pale yellowish brown Concert Schist with two schistosities.

Special Requests: Check hornfelsing, carbonates and mineralogy of the rock type (a fairly typical Concert Schist specimen).

Petrographic Identification: Muscovite-quartz-carbonate schist. Originally a banded shale.

Mineralogy:	Volume Percent
Muscovite	74
Carbonate (dolomite?)	3
Quartz (may occur to 80% in bands at expense of muscovite)	20
Tourmaline	2

/....

Mineralogy (continued)	Volume Percent
Sphene	1
Pyrrhotite(?)	<1

Texture: A sheared quartzose shale rock showing crenulation cleavage at well-spaced intervals along the main schistosity plane. Augen present are of quartz and carbonate (dolomite) and scattered tourmaline grains occur as fresh undamaged prisms; less sphene and traces of pyrrhotite occur. Where quartz occurs more concentrated in bands there is a less marked shear effect. Post-shear hornfelsing is not seen here, the quartz mosaics show curved and sutured boundaries between grains. As would be expected the quartz shows deformation strain characteristics.

Alteration: -

Metamorphism: Only dynamo-shear type. The presence of traces of pyrrhotite are the only indication of possible hornfelsing activity.

(r) 602488R

Location: Outcrop on track of Montezuma Grid at Texin location 16.20N at (?) 230E (230'W) west of 60E baseline.

Field Description: Grey, black cherty(?) hornfelsed banded shaley rock with carbonate and pyrite plus pyrite-carbonate breccia bands or lenses. Possibly Maestries Dolomitic Conglomerate. Carbonate reaction positive with HCl.

Special Requests: Check hornfelsing, mineralogy and rock type.

Petrological Identification: Quartz-dolomite conglomerate of greywacke type. Evidence of tourmalinisation and hornfelsing in some clasts.

Mineralogy:

		Volume Percent (constituent minerals in clasts)	
1)	Cherty carbonate	(a)	(b)
	Quartz	30	5
	Ankerite*		
	Carbonate	67	82
	Opaque mineral	3	3
	Tourmaline		10
	Zircon		<1
	Apatite		<1

Some 1(a) clasts show quartzose banding.

2) Small fragments

i) cherty fragments of (b) > (a) above.

ii) ankerite*

iii) subangular and rounded quartz (unstained) of variable sand size contain 'whorls' of tourmaline prisms.

Most abundant are 2) iii).

3) Heterogeneous mixture of chert:kaolinite with magnetite, matrix.

Probably there is overall 10 volume percent of matrix(3) present.

Texture: A heterogeneous (polymict) conglomerate of mainly fine grained cherty carbonate clasts of large size (several mm's to cms). Some are of regular silt grain size (1a) and others are very irregular in size with cherty quartz-carbonate and tourmaline present.

Alteration: Peculiar 'decussate', etc. textures of some carbonate clast probably carbonatised volcanic clasts. Recrystallised.

Metamorphism: Quartz mosaics in some (but not all) fragments show hornfels characteristics.

Remarks: A greywacke type of conglomerate, shows abundant clay matrix. When formed was rapidly sedimented. Most grains are not all that well rounded.

* Proved by staining technique.

/....

(s) 602511R

Location: Sb-Sn prospect at end of the northern road to Montezuma Grid about 48N/3E.

Field Description: Host rock of black thinly bedded(?) graphitic shale with bands of (?) quartzitic dolomite(?) siltstone. Carbonate is present (test).

Special Requests: Check especially for signs of horn-felsing and/or any syngenetic sulphide features. Check carbonate bands, and for any tuffaceous component. Rock type?

Petrological Identification: Sheared pyritiferous siltstone/sandstone bands with minor clay and carbonate. Probably pyrite present was syngenetic.

Mineralogy:	Volume Percent	
	Slide A	Slide B
Pyrite	80	2
Quartz	10	70
Sericite	5	3
Carbonate	5	10
Chert	-	4
Kaolinite	-	7
Chlorite	-	1
Bitumen	?	3

Texture: Slide A - Sheared, fractured pyrite in quartz. The former mineral shows recrystallisation and the latter shows parallel extreme shear as it occupies a 'vein network' between the pyrite. Below the massive pyrite where more quartz occurs this too is sheared but less so than that above and is accompanied by sheared-out lenticles of sericite and carbonate. An abrupt boundary with sheared quartz, carbonate, sericite and a little pyrite is next encountered somewhat similar to that seen in Slide B. A thin pyrite rich band occurs in this less pyritiferous sandstone or pyrite, limonite and sheared carbonate and sericite (+bitumen?). Quartz does not change size when passing from the lower pyrite rich band to the poorly

pyritiferous sandstone. The association of the pyrite with carbonate, sericite (altered clay mineral) and bitumen(?) suggests a syngenetic origin for the pyrite. Shear has been only moderate for quartz in most bands so that reduction to similar size by great pressure does not follow. However, the upper pyrite rich horizon was of mobilised quartz and a shear plane separates it from the lower, less sheared part which changes abruptly to an almost pyrite-depleted phase of sandstone.
Slide B - shows a coarser sandstone size than for lower part of 'A' but still shows mild shear effects with fragmentation and angularity of many quartz grains. Shearing-out of bituminous sericite and sericite bands is seen as well as intergrowths between quartz and sericite due to shear. Some carbonate augen occur and carbonate has been forced into perpendicular (to bedding/shear) tension cracks and has taken pyrite splinters with it.

Alteration: -

Metamorphism: Dynamometamorphism. No evidence of hornfels texture.

Remarks: The concentration of pyrite into bands with clay and carbonate which are approximately conformable except where intense mobilisation has taken place suggests that the pyrite is in fact syngenetic. Nothing tuffaceous is seen and no hornfelsing is observed.

(t) 602515R

Location: Site of 602407M; Montezuma Grid, Texin survey point 00.38'N/3'W.

Field Description: Dark blue-grey(?) hornfelsed pyritic quartzite with thin quartz-carbonate veins. Possibly Oonah but appears darker and harder than typical Oonah Formation.

Special Requests: -

Petrographic Identification: Quartz wacke with a mainly carbonate/kaolinite matrix.

Mineralogy		Volume Percent
Quartz mineral grains Quartz rock fragments	not vein	84
Carbonate (matrix)		5
Kaolinite#		8
Illite		1
Tourmaline		1
Zircon		<1
Magnetite		1

#Present partly as rectangular shale fragments.

Additional quartz and carbonate veins.

Texture: Mainly fine subangular ≫rounded quartz grains of finer sandstone size (0.05 to 0.3 mm, median 0.1 mm) which shows recrystallisation and resorption of quartz grain boundaries into the rock matrix. Abundant clay (mainly kaolinite) is associated with carbonate present as small rhombohedra (probably dolomite or ankerite) in narrow channelways and pockets. Some clay flakes occur as blocky detrital shale fragments. Coarse (to sand size) partly worn grey-green tourmaline and some zircon are present. Possibly some illite is detrital, occurring as large flakes. A coarse pure quartz vein shows hornfelsed mosaics and a fracture/microfault perpendicular to vein cutting and displacing quartz is filled with calcite. There is a vague banding to the rock shown by elongate quartz grains arranged in a subparallel pattern. A stylolite horizon occurs in the section, filled with residual opaque matter, illite and some heavy minerals.

Alteration: -

Metamorphism: Hornfelsed textures are shown by quartz vein and may be partly masked by matrix of main sandstone, though there is evidence of resorption at edges of quartz grains indicating some recrystallisation and it is impossible to differentiate between quartz mineral grains and rock fragments because of this recrystallisation.

Remarks: Very similar in texture to 602388, a typical Oonah Quartzite. Presence of carbonate in interstices of

602515R is the main difference and this is the only factor which could cause the specimen 602515R to be darker.

(u) 602517R

Location: Outcrop at 602513M on the northern road to Montezuma Grid, west of the grid.

Field Description: Crenulated, interbedded blue, grey shale and white siltstone. Concert Schist or Oonah Quartzite and Slate?

Petrographic Identification: Quartz sericite schist showing crenulation cleavage.

Mineralogy	Volume Percent
Quartz	73
Sericite	20
Leucoxene	2
Tourmaline	3
Zircon	<1
Sphene	2
Cassiterite?	trace

Texture: A quartz:sericite schist, shows a crenulation cleavage in addition to the main cleavage. Shear of quartz and sericite is well marked and has resulted in much of original leucoxene conversion to sphene. Tourmaline (green-brown) is fresh and is unworn prismatic with very few grains showing overgrowths. Zircon is rounded and detrital. An acicular geniculate twin of cassiterite(?) was seen once. Since the heavy minerals form within the quartz fabric they were deposited during a previous sedimentation as detrital grains, not far removed from a pneumatolytic source.

Alteration: -

Metamorphism: Shear. Dynamometamorphism only.

Remarks: Petrographically this rock appears to occupy a half-way position between Oonah Quartzite (602388) and

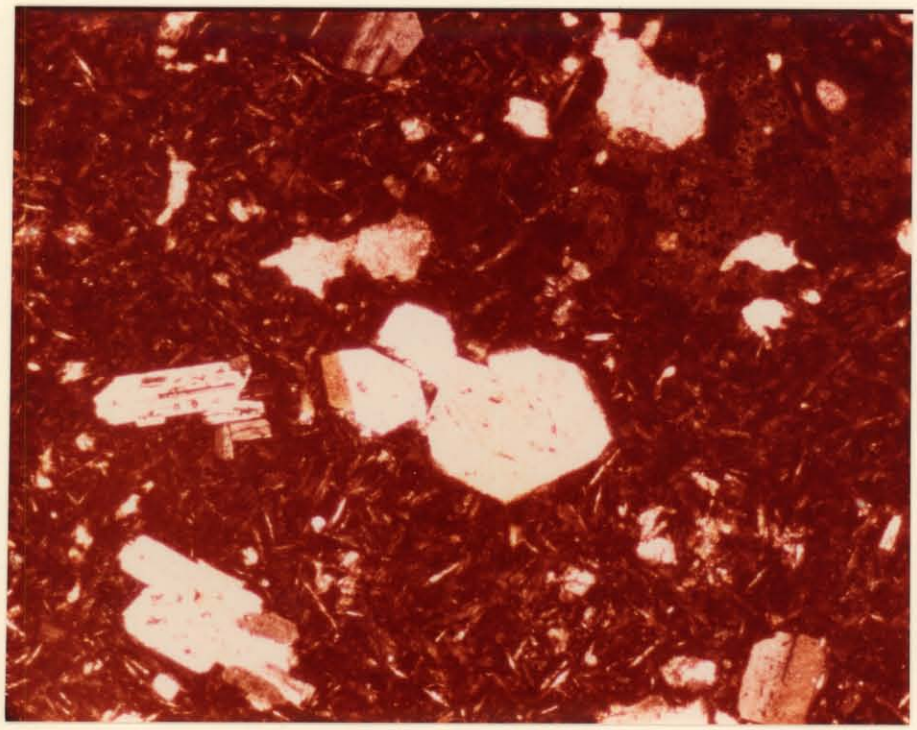

FIGURE 6: Altered porphyritic basaltic andesite, Zeehan-Queenstown Highway (o02570R)

Plagioclase phenocrysts (white in section, are seen to be lamellar twinned but twinning was deliberately lost in printing to bring up groundmass of altered microlites). Microlites are set in a chloritic glass.

Crossed nicols Magnification x 37

Concert Schist (602482) but the great abundance of mica and schistose matrix would favour placing it with the Concert Schist.

3.4 Queenstown Highway

602570R (Figure 6)

Location: On Zeehan-Queenstown highway in road cutting just south of where Ewart Creek crosses the highway on the south margin of E.L. 15/76.

Field Description: Amygdaloidal fine grained, greenish(?) basalt with feldspar phenocrysts and amygdules lined with black crystals.

Special Requests: Compare with top of the Oonah Formation basalt 600719R from volcanics near Zeehan western on the old Corinna Road.
N.B. Mapped as Dundas Group - unassigned.

Petrographic Identification: Altered porphyritic basaltic andesite.

Mineralogy:	Volume Percent
Albite (matrix)	3
Uralite (replacing plagioclase microlites and altered pigeonite)	7
Chlorite (as groundmass; less with carbonate in amygdules)	67
Plagioclase (An_{39}, andesine)	15
Magnetite (specks in matrix but some occur in carbonate amygdules)	2
Augite (phenocrysts) - residual	1
Carbonate (in amygdules and altered plagioclase)	5

Texture: In appearance an intersertal basalt of plagioclase microlites set in a chloritised glass. The plagioclase microlites appear uralitised and carbonatised and fine pigeonite(?) crystals have been chloritised to enclose radiate fibres of the mineral. Large plagioclase

phenocrysts and intergrowths of such contain particles of uralite and chlorite but still show some lamellar and simple twinning and are fairly easily identifiable. Carbonate amygdules are the only other large crystalline phase present but these are not abundant.

Alteration: Retrograde, hydrothermal.

Metamorphism: ?

Remarks: Consistency of plagioclase composition of various phenocrysts suggests little alteration of these grains in the rock's history. The groundmass of 600719 is similar in being intersertal but numerous amygdules occur in the latter containing quartz, chlorite and carbonate and phenocrysts present are fewer and much smaller. Possibly the basalts are related but are of a different species.

4. REFERENCES

1. Miscellaneous Notes on Petrography of Ultramafics and Associated Rocks, Carr Boyd Complex, May 1971.

2. Memorandum from P.J. Curtis to K.F. Wigglesworth, dated 13/2/76, entitled "Miscellaneous Rock Specimens from Rosedale, Qld., and Kempsey, N.S.W. for Petrographic Identification".

3. Rock and Ore Specimens from Kambalda, Western Australia. Report No. 1764, dated 2nd October, 1967, Mount Gunson Mines Ltd. Technical Services Dept.

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APPENDIX 1

050

275051

PACMINEX PTY. LIMITED

MEMORANDUM TO: P.J. CURTIS OUR REF: PMM/MD:602

FROM: P.M. MACNAMARA DATE: 6.10.1977

HEAVY MINERAL SEPARATES : PANNED CONCENTRATES

E.L. 15/76, DUNDAS

A brief scan of the heavy mineral bromoform separates might consider the following aspects.

(1) mineral species especially heavy silicates which may not report in subsequent emission spectrographic or A.A.S. analyses and which could be of interest.

Attention could be paid to contact metamorphic aureole minerals which indicate granitic aureoles in the drainages sampled (i.e. garnets and other hornfels minerals).

(2) volume of h.m. (in cc's?) as a guide to the amount in the sediment.

(3) any gold particles (gold is a useful mineralisation indicator mineral).

(4) Alluvial gravels containing granitic and quartz-tourmaline boulders could be present in the drainage basins as remnant cappings. These often contribute cassiterite, gold, tourmaline etc. to the drainage and may be difficult to distinquish from contributions from in situ rocks. A high proportion of tourmaline could be indicative of alluvial gravel capping erosion.

(5) A high proportion of limonitic pebbles could be indicative of chemical (versus detrital) transport of any subsequently indicated (by AAS or emission spec.) copper, lead, zinc etc. anomalies.

(6) any other features that might be useful or suggest themselves during the course of the examination.

for P.M. MACNAMARA

c.c. J.H. Rattigan
R.W. Gersteling

APPENDIX 2

602 : THIN SECTIONS

1. CUNI AREA : 602522 - 532

602522R (T.S.)

Mine Dump, North Cuni Area. Dark green apparently ultramafic chloritized rock - no felspar apparent in hand specimen. Minor sulphide-pyrite?

Check affinities with 602523-524 etc. Tuff/flow/intrusive?

602523R (.T.S.)

Site of 602522R - mine dump. Dark greyish green rock with small mottled light green (clayish?) patches possibly altered plagioclase. Possibly an altered dolerite. Sulphide (pyrite?) blebs. Tuff/flow/intrusive? Rock name?

602524R (T.S., P.S.)

Location 602522R - mine dump. Fresh dark grey green dolerite/microgabbro-like rock with abundant sulphides (pyrite, etc.). Check against 602522-523. Tuff or flow/intrusive? Rock name.

Check orientation of sulphides with respect to silicate minerals; any banding? Any evidence of syngenetic versus replacement in the sulphides.

602528R (P.S.)

Site of (?) Melbourne Cuni Mine at intersection of Melba Creek with the North Cuni Road (old tramway?).

Banded pyrite - ?pyrrhotite - ?nickel sulphide rock in mine dump below an old (?) smelter. Check sulphide types and banding w.r.t. silicates (if any present) - replacement versus settling-of-sulphide textures?

602529R (T.S.) Location 602528

Medium blue-grey banded (?) igneous rock, minor sulphide (pyrite). Check affinities with other basalt/microgabbro rocks in suite, especially the coarser bands. Tuff or (chilled?) intrusive.

602530R (T.S.) Location 602528

Greenish black aphanite, possibly a microgabbro/basalt chilled margin or a hornfelsed shale or even a f.g. ultramafite.

602531R(T.S.) Location 602528

Dark blue and green grey banded (?) tuffaceous rock with (?) silty bands. Check basalt/microgabbro affinities. Tuffaceous siltstone or intrusive/extrusive?

602532R (T.S.) Location 602528

Blue grey and greenish grey microgabbroic/basaltic rock from dump. Possibly the typical igneous rock of the area. Check affinities with the series 602522-602532. Tuffaceous or flow/intrusive?

2. DUNDAS TRAMWAY - MONTEZUMA FALLS

602537R (T.S.)

Outcrop on N.E. Dundas Tramway several hundred metres south of Confidence Saddle towards Montezuma Falls. Pale grey porphyritic (qtz-felspar) rock with a acicular black prismatic minerals (FeMg? tourmaline?). Possible extension of the quartz porphyry on Pine Hill (i.e. Dqp). Aphanitic or procellanite rock nearby.

3. MONTEZUMA-CARBINE-AINSLIE GRIDS

602308R (T.S.)

Site of 602306M S.E. of South Montezuma grid. Dark grey siltstone/shale. Check for hornfelsing and volcanic affinities.

602309R (T.S.)

S.E. of South Montezuma grid. More quartzitic variety of 602308 - a grey green quartzitic siltstone. Check hornfelsing.

602349R (T.S.)

Dundas grid west of Mt. Dundas. Banded grey green (?) chloritic siltstone/shale. Check hornfelsing (also against the other banded siltstones, i.e. 502531 etc.).

602387R (T.S.)

Ainslie grid. Pale green crenulated siltstone. Check carbonate content and for hornfelsing.

602388R (T.S.)

Road cutting near Comet - Maestries Mines, Ainslie grid.

Typical Oonah Quartzite and Slate variety of pale grey (?) indurated quartzitic siltstone, with white mica flakes.

Taken as a typical Oonah sample. Check for hornfelsing (although this may not show very well due to the type of mineralogy).

602395R (T.S.)

Ainslie grid - L.H. tributary of Comet Creek c.300 m upstream of Judith Creek.

Dark blue grey shaley siltstone with fine disseminated pyrite.

Check hornfelsing and mineralogy.

602402 (T.S.)

Ainslie grid - Judith Creek 100 m upstream from Comet Creek.

Blue grey slate. Check for hornfelsing.

602411R (T.S.)

South Montezuma grid.

Hornfelsed quartzitic rock (Puo) or dyke. Check for mineralogy and hornfelsing (if a hornfels). Rock name?

/....

602414 (T.S.)

South Montezuma grid at site of 602414M. Float sample of pale grey green crenulated banded siltstone. Check for carbonate; hornfelsing.

602418R (T.S.)

South Montezuma grid (60'E/4'S). Crimson Creek Formation? - reddish purple siltstone veined with blue green chlorite at 62430MN/2990ME. Check mineralogy, hornfelsing and rock type.

602426R (T.S.)

Site 602183M and 602424M.

Pale blue grey to purplish brown pyritic dolomitic siltstone of cherty appearance. Positive CO_2 to Hcl.

Check mineralogy, hornfelsing and rock type.

602438 (T.S.)

Site 602435M on Carbine Grid near 50'N/350'E (Texin grid) : Variegated siltstone at mouth of nearby adit. Limonite masses associated. Check for hornfelsing, mineralogy and rock type.

602452F (T.S.)

Site 602450M on Texin Carbine Grid at 50'N/50'E.

Boulder in creek bed of variegated appearance and variable texture - red cherty and grey green coarser (?) carbonate material.

Check hornfelsings, mineralogy, rock type and structures. Any analogy to the Pu0/Ec contact rocks.

602462F (T.S.)

Site 602460M and 602218M

Boulder in creek draining northwards from the southern road to the Montezuma Grid. Pyritic shale float below waterfall possibly locally derived as similar float is not evident some distance above the waterfall. Associated with a drainage SnO_2 anomaly.

Check mineralogy, hornfelsing and rock type.

602468R (T.S.)

Location 602466M Montezuma Grid on Texin grid 9N/60E (i.e. 62830mN/2990mE).

Rock chip, from costean in gully, of carbonate (?) veined siltstone with sulphide.

Check hornfelsing and rock type.

602470R (T.S.)

Location on track at point "WT 2900 ft" in east part of Montezuma Grid near the Moores Pimple tract approx line 34N.

Dark blue-grey carbonate (?) siltstone, quartz veined. HCl yielded CO_2. Carbonate bed in the Crimson Creek Formation.

Check hornfelsing mineralogy and rock type.

602482R (T.S.)

On walking track between the end of the southern road to Montezuma Grid and the Western baseline at 10N.

Pale yellowish brown Concert Schist, with two schistosities.

Check hornfelsing, carbonates, and mineralogy of the rock type (a fairly typical Concert Schist specimen).

602488R (T.S.)

Outcrop on track of Montezuma Grid at Texin location 16.20N at (?) 230E (230'W?) west of 60E baseline.

Grey black cherty (?) hornfelsed banded shaley rock with carbonate and pyrite plus pyrite-carbonate breccia bands or lenses. Possibly Maestries Dolomitic Conglomerate. CO_2 given with Hcl.

Check hornfelsing, mineralogy and rock type.

602511R (2 x T.S.)

Sb-Sn prospect at end of the northern road to Montezuma grid about 48N/3E.

Host rock of black thinly bedded (?) graphitic shale with bands of (?) quartzitic dolomitic (?) siltstone. Hcl gives CO_2 reaction.

Check especially for signs of hornfelsing and/or any syngenetic sulphide features. Check carbonate bands, and for any tuffaceous component. Rock type.

602515R (T.S.)

Site of 602407M : Montezuma grid Texin survey point 00.38'N/3'W.

Dark blue-grey (?) hornfelsed pyritic quartzite with thin quartz-carbonate veins. Possibly Oonah but appears darker and harder than typical Oonah Formation.

602517R (T.S.)

Outcrop at 602513M on the northern road to Montezuma Grid, west of the grid.

Crenulated interbedded blue grey shale and white siltstone. Concert Schist or Oonah Quartzite and Slate?

Check for hornfelsing.

4. QUEENSTOWN HIGHWAY

602570R (T.S.)

On Zeehan-Queenstown Highway in road cutting just south of where Ewart Creek crosses the highway on the south margin of E.L. 15/76.

Amygdaloidal f.g. greenish (?) basalt with felspar phenocrysts and amygdales lined with black crystals.

Compare with top-of-the Oonah Formation basalt 600 719R (T.S.) from volcanics near Zeehan western on the old Corinna Road.

Mapped as Dundas Group - unassigned.

APPENDIX 3

HEAVY MINERALS CONTENT

EL 15/76

DUNDAS, TASMANIA

APPENDIX 3 PMR 214/77

Minerals Present (columns Actinolite – Hypersthene)

Sample Numbers	Rock / Misc. Types Present	Approx. Wt. of Concentrate (G)	Actinolite	Anatase	Andalusite	Anglesite	Anhydrite	Anthophyllite	Antigorite	Apatite	Arsenopyrite	Augite/Pigeonite	Axinite	Baryte	Biotite	Bismuthinite	Bornite	Cassiterite	Cerussite	Chalcopyrite	Chlorite	Chrome Mica	Chrysotile	Cordierite	Corundum	Cummingtonite	Dolomite	Epidote	Fluorite	Galena	Garnet	Gold	Haematite *	Hemimorphite	Hornblende	Hypersthene
004	C/Mj	0·1									Tr							Mn									Mn				Tr	Tr				
017	D/Mj; E/Mj	0·5									Tr							Mn	Tr	Mn																
024	E/Mj	0·4																Mj/30																		
026	L/Mj (20), E/Mj (30)	0·3																Mj/40																		
028	L/Mj (40)	4·0	Mj							Tr								Mn													Tr					
031	A/Mj	2·0																Mj/5																		
034	L/Mj (20)	1·0																Mj/2	Tr	Tr					Tr						Tr					
035	L/Mj (40)	4·0	Mj									Mj							Tr						Tr			Mn			Mj/5					
038	K/Mj	2·0										Mj/40															Tr	Mn/2			Mj					Mj/30
041	E/Mj (20)	0·06																Mn/1									Tr				Mn/2					
044	E/Mj (40)	0·2																Tr													Mn/2					
047	E/Mj (60), L/Mj (15)	0·1						Mn										Tr																		Mj
052	A, I, C, Mj, B/Tr	0·03																Tr									Tr									
053	I/Mj	0·5																					Mn													
056	B/Mj (>70), A/Mj (>20)	0·2																							Tr											
063	A/Mj, F, B/Mn.	0·3																		Tr							Tr				Tr					
065	B/Mn, A/Mj (>70)	4·0																		Tr			Tr													
061	C, D, E, L/Mj, B/Mn.	0·3																			Mn						Tr									
068	D/Mj, B/Tr.	0·2																																		
071	M/Mn, A, D/Mj (>95)	1·0																			Mn															
075	D, O/Mj, M, J/Mn	1·0																		Mn											Mn					
076	J/Mj, R/Mn, B/Tr	0·05																																		
080	B/Mj	0·15																Mn			Mn										Mn					
082	B/Mn	1·0																													Mn	Tr				
089	E/Mj, (>75), J/Tr	0·1												Tr						Mn							Tr				Mn					
092	E/Mj	<0·05																													Mn					Tr
095	E/Mj, D/Mj	30·0	Mn									Mj		Tr						Tr																Mn
098	T/Mj, D/Mn	5·0	Mn					Mn				Mj																								Mn
100	T/Mj	30·0	Mn					Mj				Mj											Mn													Mn
102	T/Mn	2·0	Mj									Mj																								Mn
104	J, G/Mj	<0·03	Mj									Mn													Mn											Mn
106		0·2												Tr																						
108	J/Tr	2·0							Tr																											
110	B/Tr	10·0						Tr	Tr			Mn																								Tr
115	B/Mn	<0·05	Mn																						Tr	Mn										Tr
117	O/Mj, E/Mj	0·2	Mn					Tr	Tr			Mn													Tr	Mn										Mj/5
118	B/Mn, G/Mj	0·1	Mn									Tr														Mn										Mn
120	B/Mj	0·2	Tr									Tr								Mn						Tr						Tr				Tr
122	G/Mn	5·0																Mn									Mn									
124	G/Mn	0·1	Mn							Tr																					Tr					
126	R/Tr	<0·05									Tr									Tr											Tr					
128	D/Mj	0·1	Mj					Tr										Tr								Mn	Mj									
130	E, G/Mj	0·1	Mn							Tr		Mn						Mn								Mn	Mn									
132	L/Mj	0·05								Tr								Mn										Tr								
134	A/Mj, B, J/Mn	0·1								Mn														Mn							Tr					
136	B/Tr, J/Mj	0·05																		Tr					Tr											
138	C, L/Mj	0·1							Tr																											
141	B/Tr, A/Mj	0·05										Tr																Tr								
143		5·0	Mj									Tr																								
145	A/Mj	7·0	Mj					Mj																												Tr
147	A/Mj, J/Mn	0·1	Mj									Mn														Tr										
149	T/Mj (>40),	10·0										Mn														Tr										
151	A/Mj, J/Mn, T/Mj (>50)	2·0																													Tr					
153	B/Mj, J/Mn	12·0																																		
155	B/Mn, J/Mn	1·0																																		
157	B/Mn, A/Mj	1·0																																		
158	B/Tr, F, D/Mj	<0·02																																		
160	A/Mj (>90), T/Tr, B/Mn, M/Mn	7·0	Tr																									Tr								
162A	C, R/Mj	<0·02																																		
162B	A/Mj	4·0																		Tr																
164	T/Mn, A/Mj	1·0	Mn						Tr																		Tr				Tr					
167	"D/Mj, J/Mn	4·0									Tr									Tr																
169	B/Tr, A, C/Mj	1·0																										Mn								
172	B/Tr, C, R, D/Mj (>95)	10·0																																		
176	B/Tr, A, J, G/Mj	0·3																Tr																		
178	O, G, /Mj	0·1	Mj																												Mn					
180	B/Tr, E, G, V/Mj	3·0	Mj																																	
182	O, G, E/Mj	0·1	Mj																																	
184	D, O/Mj	0·1	Mn														Mn			Mn							Mj				Mn					
186	E, G/Mj (>95)	0·1	Mj																	Tr											Mn					
189	E/Mj (>95)	2·0	Mn																								Mn				Mn					
191	O, E, J/Mj	2·0																									Mj				Mn					
194	E (>70), J/Mj	2·0																															Mn			
196	W, E/Mj (>60) J/Mj	4·0																																		
198	W, M/Mj (>95)	1·0																																		
200	A, G/Mj (90)	0·05	Mj																																	
202	A/Mj (>80), X/Mj (>5)	2·0																						Tr									Mj/10			
204	D/Mj (>80), G, M/Mj	1·0	Mj																																	
206	A, X/Mj (~20), A/Mj (~70)	0·1	Mj																																	
208	D/Mj (>70)	0·1	Mj/>5									Tr															Mn						Mj			
210	L/Mj, V/Mj (>80)	1·0																		Tr								Tr			Mn					
212	D, A, Q/Mj	0·5							Mj			Mn																								
215	E/Mj, V/Mn	7·0	Mj																	Tr											Tr		Mj			
217	A/Mj, L/Mn	1·0										Mn																					Mj			
219	L/Mj	0·1													Tr																					
221		5·0											Tr																		Mn		Mj		Mn	Mn
223	A/Mj (>90)	0·2																													Mn					
225	A/Mj	0·5	Mn									Mj																								
227	G/Mn (3), E/Mj (>95)	0·5	Mn																																	
229	G, O, E/Mj (>90)	0·2	Mj									Mn																								
231	L/Mn, D, E/Mj (>97)	0·5	Mn																																	
233	L/Mn, D, E/Mj (50)	0·5	Mn						Tr			Mn														Mn		Mj/30			Mn					
235	A/Mj (50)	0·2																									Mn				Mn					
239	L/Mj (60), E, O/Mj (30)	1·0										Tr																			Mn					
242	E, O/Mj (>90)	2·0																																		
245	E/Mj (>80)	0·05			Tr																						Mn				Tr					
247	A, E/Mj (>70), O, G/Mj (10)	0·05	Mj													Tr				Mn/2											Tr	Tr				
249	G/Mj, A, E/Mj (>80)	0·15	Mj																																	
251	G/Mj (>70)	0·05	Mn			Tr														Tr			Mn								Mn	Tr				
253	D/Mj (60), L/Mj (30)	0·05													Tr								Mn													
255	Z/Mj (>80), E, A/Mj (10)	0·05																																		
257	A, Z/Mj (>80) A/Mj (10)	0·1																					Tr								Mn					
260	E/Mj (>95)	0·1																Mn													Tr					
262	E/Mj (>95)	0·1																Tr		Tr																Tr
264	E/Mj (70), Y/Mn	0·05							Mn																							Tr?				
266	E/Mj (35), L/Mj (35)	0·05																		Tr												Tr?				
268	A, R, P/Mj (>90)	0·1									Mn			Mn	Mn		Tr	Mn							Mn											
271	E, A, G/Mj (>98)	1·0																																		
273	E, A, G, P/Mj (>98)	1·0	Mj																																	
275	R, Q, E/Mj (>90)	0·07										Mn												Tr							Mn					
277	E/Mj (>90)	1·0	Tr?																								Mn							Tr		
279	D, E, /Mj (>79)	4·0										Mn																								
281	D, E/Mj, T/Mn	1·0																				Tr														
284	E/Mj	6·0																									Mj									
286	E/Mn	1·0																																		
288	D, E/Mj (>85)	2·0							Tr													Tr	Mn													
290	C, E/Mj (>70)	0·15							Tr														Mn													
292	I, E/Mj (88)	2·0	Tr						Tr														Tr													
294	D, E/Mj (90)	0·1																																		
296	E/Mj (>90)	0·04							Tr	Tr										Tr			Mn													
298	E/Mj (>85)	1·0	Mn						Mn											Mn/1			Tr													
300	D, E/Mj (>90)	1·0																																		
302	E/Mj (10)	15·0																		Mj/10							Mj/30									
304	R/Mn, B/Tr, E/Mj (>90)	0·2																																		
307	D/Mj (10), J/Tr.	3·0										Mn																								Mj/50
310	G/Mn (2), E/Mj (10)	5·0										Mn/3										Tr														Mj/50
315	B, J, B, R, E/Mj (>30)	0·1										Mj/20					Mn																			Mj/15
323	C, E/Mj (>70)	1·0																										Tr								
334	E/Mj (20)	0·08																													Tr					Mj/10
350	E/Mj (~50), J, K/Mj (~10)	0·07		Tr																											Tr					
352	E/Mj (20)	0·1		Mn				Tr																		Tr										Mj/25
361		1·0						Tr																		Tr										Mj/55
358	A/Mn (3), L/Mn (2), E/Mn (4)	1·5									Tr	Mj/10																			Mn					Mj/10
360		0·1		Mn								Tr									Tr							Mn/2							Tr	Mj/55
394	G/Mj (>80)	6·0										Mj/10																								Mj/5
403	C, L, J/Mj (>90)	1·0								Tr							Mn							Tr												
423	R, L/Mj (>95)	0·2					Tr				Tr								Tr							Tr					Tr					
425	E, L/Mj (>95)	3·0																							Tr		Tr		Tr		Tr					
451	E, L, /Mj	0·2	Mn																																	
461	L/Mj (>90), E/Mn	0·1									Mn						Mn	Tr		Mn										Tr						
544	E, Z, /Mj	4·0										Mn													Tr		Mj	Tr								Mj/20
546	L/Mj (30),	1·0																																		Mj/60
557	E/Mj (20), L/Mj (25)	1·0																										Tr			Tr					Mj/50
561	L/Mj (35)	0·1	Mj	Mn/2								Mj/20																Mn								Mj/50
584	Q/MJ (49)	10·0										Mj																			Tr					Mj/30
564		20·0	Mn					Mj/20				Mj/10														Mn		Mn/3							Mn	Mj/60
566	E/Mj (~25)	4·0		Tr																		Tr									Tr					Mj/50
620		50·0		Mn							Mn																									Mj/>85
622		10·0																													Mn/1					Mj/>90
McC.		3·0	Mj/5									Mj/5						Mn		Mn/2																Mj/47

Minerals Present (columns Ilmenite – Zoisite), Visual Appearance and Grain Size

Sample Numbers	Ilmenite	Leucoxene	Limonite *	Magnetite	Magnesite	Marcasite	Monazite	Metallic Iron	Olivine	Orthopyroxene ✱	Pyrite	Pyrrhotite	Pyrolusite	Pyromorphite	Rutile	Siderite	Specularite	Sphalerite	Sphene	Spinel	Staurolite	Steatite	Topaz	Tourmaline	Tremolite	Vanadinite	Vermiculite	Zircon	Zoisite	Visual Appearance	Grain Size
004	Mj/12		Tr	Mj/8										Tr	Mn					Mn				Tr						br, bl	m
017	Mj		Mj	Mj							Tr	Tr																		br, bl	c
024			Mn	Mn											Tr													Mn		gr, bl	m
026	Mn			Mn											Mn									Tr						gr, bl	c
028	Mn	Mn	Mn	Mj											Mn								Tr	Mj						y, bl, gr	c
031			Mj/90	Tr				Tr																						y, br	c
034	Mj/30			Mj/40							Mn				Tr					Mn				Mn				Tr		dk	f
035	Mj/20		Tr	Mn											Mn							Mn/4		Tr				Tr		bl, wh	c
038	Mn/3		Mn/2	Mj/12											Tr									Mn				Mn		y, br	f-m
041	Mj/10		Mj	Mj/60																Tr				Mn				Mn		br, bl	m
044	Mn/5		Mj	Mj/40											Mn/1					Tr								Mn/3		y, bl	c
047	Mj/20			Mn	Tr							Tr			Mn					Mj		Tr		Mn				Mn		bl, gn	m
052	Mn			Mn							Mn				Mn									Mn				Mn		y, bl	f
053	Mj			Mn																Mj								Mn		y, bl	c
056	Mn														Mn															y, bl	m-f
063				Mj							Tr				Tr			Mn										Tr		y, gr	m-f
065						Mn									Mn													Tr		y, br	c
061	Mn	Mj		Mj											Tr													Tr		y, wh, gr	c
068				Tr																								Tr		y, bl	m-f
071	Mn			Mn																								Tr		y br	c-f
075	Mj			Mj							Mn				Mn													Mn		bl, br	m-f
076	Mn	Mj		Mj											Tr															bl, wh	c
080	Mn	Mn		Mj											Mj													Tr		bl, wh	c
082	Mj			Mj											Mn									Tr				Mn		bl, y	m
089	Mn	Mn		Mn							Mn			Tr	Mn			Tr												bl, wh	c
092														Mn	Tr													Mn		gr	f
095	Mj			Mj																					Mn					bl, wh	c-m
098	Mj			Mj				Tr																						bl, wh	m
100	Mj/60			Mj/20																					Tr					bl	m
102			Mj	Mj																										bl	m
104	Mn			Mj																										gr, wh	f-c
106	Mj	Mj		Mj											Mn							Tr			Tr			Mn		bl, wh	m-f
108	Mn		Mj/>95	Mn																		Mn						Mn		bl, br	c
110	Mj/>75			Mj/>20																										bl	m
115	Mj/>70			Mj/>20																										bf, bl	f
117	Mn			Mj	Tr						Mn				Mn					Tr					Mn			Mn		mv, br	f
118	Mj	Mn	Mj	Mn							Tr														Mn					y, bl	f
120				Mj		Mn					Mn					Mj								Tr	Mn					br	m
122	Mj/>95			Mn											Mn													Mn		bl	m
124	Mj/>95			Tr							Tr			Tr	Mn									Tr	Tr			Mj		bl	c
126	Mj			Mn							Mn				Mn										Mn			Mn		bl	f
128	Mn			Mj																Mn					Mn			Tr		bl, wh	m
130	Mj			Mn							Mn				Mn															bl, wh	m-c
132	Mj		Mj	Mn											Mj				Mn					Tr				Mn		y, bl	f
134	Mj			Mn											Mn					Mn								Mn		bl,	m
136				Mn											Mj													Mn		gr, wh	c-f
138	Mn			Mj											Mn				Tr									Tr		bl, br	m
141	Mn			Mj							Tr				Mn										Mj					bl	m
143	Mj/>95			Mj											Tr										Mj			Tr		bl, wh	m
145	Mj			Mn																					Mj					gr, bl	c
147	Mj			Mn											Mn										Mj			Tr		y	f
149	Mj/30			Mn																					Mn					bl	c
151	Mn																													gr	m-f
153	Mj	Mj	Mj												Mn													Tr		br	c-f
155	Mj/>70	Mj													Mn															bl, bf	m-f
157	Mj	Mj		Mn							Tr				Tr															gr, br, o	c-f
158	Mj	Mj		Mn				Tr																						gr, y	c-f
160															Mn													Tr		br, bl	c
162A	Mj	Mj		Mn																					Mn					bl, bf	m
162B	Mj	Mj		Mn											Mn										Mn					bl, bf	m-c
164	Mj	Mj		Mn											Mj									Tr	Mn			Mn		bl, gr	m-f
167				Tr							Mj																			br	c
169				Tr											Tr															y, br, bl	c
172											Mn/2				Mn															br, y	c
176															Mn									Tr						br, y	c-m
178				Tr							Mn																			gr, y, br	c-f
180				Tr				Tr			Mn	Tr																		br, y	c-f
182	Mn			Tr								Tr			Mn									Mn						br, y	m-f
184	Mj										Mn							Mn				Mn			Mn					dk. br, y	c-m
186	Mn	Mj		Tr							Mn				Tr															br, wh	c-m
189	Mn	Mj									Tr				Mn															br, bl	c-m
191		Mj		Mn							Mn																			br, wh	c-m
194	Mn	Mj		Tr											Tr															br, bl	c-f
196	Tr														Tr															br, bl	c-f
198	Mn			Tr											Mn									Tr						br, y	c-f
200	Mn		Mj	Tr								Tr			Tr									Mj				Mn		y, wh	c-f
202	Mj		Mj	Tr							Mn				Tr									Mn				Tr		br	m
204		Mn										Mn			Tr									Mn						br, y	c-f
206			Mj	Tr											Tr									Mn				Mn		Lt. br, wh	c
208	Mn/3																							Mn						dk. br, y	c-m
210				Tr													Tr											Mn		dk. br, y	c-m
212	Tr									Mj												Tr		Tr						Lt. br	c-m
215	Mj			Tr						Mj							Mn					Tr		Tr						dk. br, y	c
217	Mn			Tr											Mj				Mn					Tr				Tr		dk. br, y, wh	c-m
219				Tr							Tr				Mn		Tr							Mn				Tr		dk. br, wh	c-f
221	Mn	Mn																						Tr						y, br	m
223	Mn	Mn	Mj	Mn						Mn	Tr																			y, br, wh	c-f
225	Mj	Mn	Mj			Tr			Mn	Mj					Tr									Tr						Lt. br, y	m-f
227	Mn/3			Tr							Mn	Tr																		dk. br, wh	c-m
229	Mn/3			Tr						Mn					Tr		Mn								Mj					dk. br, Lt. br, y	m-f
231	Mn			Tr																		Tr								y, br	c-m
233	Mn/3			Tr											Mn		Mn					Tr								bl, y	c-f
235	Mn		Mj							Mj/40	Mn			Tr										Mn						dk. br, wh	m-f
239	Mn		Tr	Tr						Mn							Tr											Tr		bl, br, wh	c-m
242	Mj			Mn								Tr			Mn						Mn			Tr						dk. br, wh	c-f
245				Tr							Tr				Mn				Tr			Mn		Mn						dk. br, wh	m-f
247				Tr							Mn/3		Mj/10		Mn		Mj	Mn								Tr				y	c-m
249	Mj			Mn		Tr				Mj/>10	Mn																			Lt. br, y	c
251	Mn			Mn		Tr		Tr																Mn/3	Mj/>10					Lt. br, wh	m-f
253				Tr											Mn		Mn							Mn/3						dk. br,	c-f
255	Mn							Tr							Tr									Mn/3						br, bl, wh	c-f
257	Mn/2		Mj	Tr											Mn/2					Mn				Mn						dk. br, wh	m-f
260	Mn/3		Mn	Mn		Mn					Tr			Tr										Tr				Mn		Lt. br, wh	c
262	Mn/2										Mn				Mn			Tr						Tr				Mn		Lt. br, wh	c-m
264			Mn	Mj/>25							Mn			Tr	Tr									Mn				Tr		dk. br.	c-f
266	Mn			Mj/25																				Mn	Mj					Lt. br	c
268	Tr			Mn							Mn				Tr									Tr	Mj			Tr		Lt. br	m-f
271			Tr	Tr							Mn														Mj					y, bl	c-m
273	Mn		Mn	Mn			Mn			Mn	Tr																			dk. br	c-m
275	Mj		Tr	Tr																				Mn				Mn		y, br	m-f
277			Tr	Mn											Mn					Mn				Mn				Mn		dk, Lt br	c-m
279	Mj	Mj/20	Tr	Tr																				Mn						bl, br, wh	c-m
281	Mj/40			Mj/5												Tr				Mj				Tr				Mn		Lt. br, dk. br	c-m
284	Mj			Mn	Mj						Mj/15			Tr		Mn		Mn												dk. br, wh	m
286	Mj		Tr	Mj/5						Mn										Mj										bl	m
288	Mj/5	Tr	Tr									Mn						Mn										Mn		y, br	c
290	Mj/25														Tr					Mj								Mn		bl, wh	c
292	Mj/5										Mj/10																			Lt. dk br	c-m
294	Mj/5										Mn				Mn/2				Mn					Tr				Mn/2		Lt. dk br	m
296	Mj			Tr							Mn								Tr					Mn/2						dk. br	m-f
298	Mj/5			Mn							Mn				Mn/3	Tr									Mn			Mn/2		dk. br	c
300	Mj			Mn											Mn/2									Tr				Tr		dk. br	c-m
302	Mj/10			Mn							Mj/30	Mn			Mn			Mn												dk. br, wh	c-m
304	Mj/5			Tr							Mn				Mn/2															Lt. dk br	c-m
307	Mj/15			Tr					Mj/10						Mn										Mj/10					gn, wh	f
310	Mj/15			Tr					Mj/10		Tr														Mj/10					gn, gr	f
315	Mj/5			Mn					Mj/5		Mn	Tr										Mn		Tr	Mj/10			Mn		bl, wh	m-f
323	Mj/20			Mj/4								Tr			Mn				Mn	Mj?				Tr				Mn/4		dk. br, bl	m-f
334	Mj/20			Tr											Mj/10									Mn				Mn	Mj/30	y, bl, wh	m-f
350	Mj			Mn								Tr			Mj/30										Mn/2			Mn		gr, Lt. br	m-f
352	Mj/30			Tr							Mn				Mn/4									Mn						br, wh	c
361	Mj/15			Mn/1					Mj/10						Tr									Tr				Tr		y, bl	m
358	Mj/10			Tr							Tr				Mn									Tr				Tr		gn, bl, wh	m
360	Mj/20			Mj/20																				Tr				Tr		bl, gn	c-m
394				Tr																										dk, Lt. br,	c
403	Mn			Tr							Tr				Tr			Tr						Tr				Mn		dk. Lt. br	c
423	Mn			Tr							Mn				Mn									Tr	Mn			Tr		dk. Lt br.	c
425	Mn/3			Tr							Mn				Tr									Tr	Mj			Tr		dk. br.	c
451	Mn/3			Mn							Mn	Tr			Tr										Mn			Tr		Lt. br	c
461				Mn							Mn													Mj/10	Mj			Mn		Lt. br	c-f
544	Mj/10			Mn/4											Mn									Tr				Tr		dk. br, wh	m
546				Tr <1											Mj/5									Mn	Mj					bl, wh	c-m
557				Tr											Tr									Mn	Mj					y, bl	c-f
561															Mn			Tr					Tr	Mn				Mn/2		br, wh	c
584		Mj/10		Mj/5			Mn								Mj/5							Mn/2		Mn/3				Mj/6		gr, wh	m-f
564				Mn/3			Tr																	Tr				Tr		y, bl	c-f
566	Mj	Mj/5		Tr											Mj/3							Mn/1		Mn/2				Mj/7		bl, wh	m-f
620		Mn					Tr								Mj/10									Mn/3						bl	m
622				Tr															Mn/3									Mn/3		bl	c-f
McC.			Mn	Mj/25		Mn/1					Mn/2											Mn/1		Mn/2			Mn/2	Mn/3		bl, br	c-m

* Earthy

✱ Enstatitic hypersthene

REFERENCE

Rock Types Represented

- A Limonitic aggregates
- B Limonitic magnetite aggregates
- C Limonitic micaceous aggregates
- D Limonitic pitted cherts
- E Limonitised quartzite and quartz pebbles
- F Limonitised shale
- G Actinolite / tremolite schist
- I Sandy (quartzose) micaceous aggregates
- J Chlorite schist
- K Calc silicate rock
- L Amphibolite schist
- M Chlorite schist, pyrite
- N Pyroxene chlorite rock
- O Limonitised schist
- P Pyritic carbonaceous shale
- Q Pyroxenite fragment
- R Mica schist
- S Chert
- T Magnetite pseudomorphic (of amphibolites)
- V Limonitised pyrite aggregates
- W Hematite pebbles
- X Pyritic actinolite schist
- Y Serpentiferous rock
- Z Talc schist (?)

Terms of Quantity

- Mj major (5 volume per cent or more)
- Mn minor (1 to 5 volume per cent)
- Tr traces (less than 1 volume percent)
- Mj/20 ← approx. volume percentages

Abbreviations for Colours of Mineral Particles

- bf buff
- bl black
- br brown
- gn green
- gr grey
- mv mauve
- o orange
- y yellow
- wh white
- dk dark
- lt light

Grain Size

- f fine grained
- m medium grained
- c coarse grained

275061

HEAVY MINERALS CONTENT

EL 15/76

DUNDAS, TASMANIA

APPENDIX 3 PMR 214/77

APPENDIX 4

062

275063

Central Mineralogical Services Pty. Ltd.

231 Magill Road
Maylands, S.A. 5069
Telephone 42 5659

24th October 1977

Mr. P.J. Curtis,
Geologist,
Pacminex Pty. Ltd.,
Box R221, ROYAL EXCHANGE P.O.,
SYDNEY. N.S.W. 2000

REPORT CMS 77/10/26

YOUR REFERENCE: Order No. 16876

DATE RECEIVED: 21st October 1977

SAMPLE NOS.: 247P 249P

SUBMITTED BY: Mr. P.J. Curtis

WORK REQUESTED: Mineralogy

H.W. Fander

H.W. Fander, M.Sc.

063

275064

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 24.10.77

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
247P 249P
PYRITE CRYSTALS

Job No. CMS 77/10/26 Date Received: 21.10.77

Reference Order No. 16876

Sample No. 247P 249P

Nature of Sample: Mineral Grains

DESCRIPTION **SECTION No. -**

a. Hand Specimen:

-

b. Microscopic:

The crystals were examined microscopically, and were then crushed.

Their identity as pyrite was confirmed; most of the crystals show characteristic striated faces (each set of striations at right angles to that of the adjacent faces). They are combinations of cubic and pyritohedral forms, sometimes distorted.

When the crystals were crushed it was found that the goethite was only superficial, as oxidation surfaces on fresh pyrite with characteristic hardness, color and subconchoidal fracture. An XRD analysis was not considered to be necessary.

H.W. Fander, M.Sc.

H&J 65652

064

275065

Central Mineralogical Services Pty. Ltd.

231 Magill Road
Maylands, S.A. 5069
Telephone 42 5659

8th November 1977

Mr. P.J. Curtis,
Pacminex Pty. Ltd.,
Box 221, Royal Exchange,
SYDNEY. N.S.W. 2000

REPORT CMS 77/11/6

REFERENCE:	Order No. 16881
DATE RECEIVED:	7th November 1977
SAMPLE NOS.:	315P and 352P
SUBMITTED BY:	Mr. P.J. Curtis
WORK REQUESTED:	Mineralogy

H.W. Fander, M.Sc.

065

275066

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 8th November 1977

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
315P, 352P
PYROXENES, (PIGEONITE, HYPERSTHENE)

Job No. CMS 77/11/6 Date Received: 7.11.77

Reference Order No. 16881

Sample No. 315P, 352P

Nature of Sample: Mineral grains

DESCRIPTION **SECTION No.** -

a. Hand Specimen:

-

b. Microscopic:

It was decided to examine the grains by conventional optical methods first, and to follow this by XRD if necessary. The preliminary examination showed that optical methods would yield more satisfactory results. They are as follows :

315P: Pigeonite, subordinate hypersthene.

352P: Hypersthene, subordinate pigeonite.

Since in hand specimen (under the stereobinocular microscope) these two minerals were very similar, it would not have been possible to hand-pick pure samples. Their XRD powder patterns are very close, (as are other pyroxenes), and could not be distinguished or even specifically identified with confidence. Hence optical methods were better, and this often applies where a subspecies in a closely-related group is to be identified, especially amongst the pyroxenes, amphiboles and feldspars.

H.W. Fander, M.Sc.

APPENDIX 5

REFERENCE

QUATERNARY	Q	Qra	Alluvium
		Qrg	Gravels
		Qt	Conglomerate talus
		Qtc	Dolerite talus
		Qrs	Older alluvium marsh deposits, downwash etc.
		Qpf	Fluvioglacial & lacustrine deposits
		Qpm	Moraine
PERMIAN	P	Pt	Zeehan Glacial Formation
DEVONIAN	D	Db	Bell shale
		Df	Florence quartzite
SILURIAN	S	Sac	Austral Creek siltstone
		Sk	Keel Quartzite
		Sa	Amber slate
		Sc	Crotty quartzite
		S	Unassigned
ORDOVICIAN	O	Og	Gordon limestone
		Om	Moina sandstone
		Oz	Mt Zeehan conglomerate
CAMBRIAN	€	€m	Misery conglomerate
		€cl	Climie Formation
		€f	Fernflow Formation
		€co	Comet Formation
		€fe	Fernfields Formation
		€b	Brewery Junction Formation
		€ra	Razorback conglomerate
		€h	Hodge slate
		€r	Red Lead conglomerate
		€d	Dundas Group unassigned
		€c	Crimson Creek Formation
		€	Cambrian unassigned
PROTEROZOIC	P	Puo	Oonah quartzite & slate
		Pc	Concert schist
		Pw	Whyte schist

IGNEOUS ROCKS

JURASSIC		Jdl Dolerite
DEVONIAN	D	Dqp Quartz porphyry
CAMBRIAN	€	€g Gabbro, norite and dolerite
		€s Serpentinite and pyroxenite

- ● Stream sediment (M)
- ○ Panned concentrate (P)
- □ Rock chip, Float (R, F)
- ■ Limonite (L)

275068

5 cm

PACMINEX PTY. LIMITED

DRAINAGE SAMPLE NUMBERS

E. L. 15/76 – North Sheet
DUNDAS, WEST TASMANIA

SCALE	1 10000
DRAWN	P.M.M / P.H
DATE	
REVISED	

K 555-6