DESCRIPTIONS OF POLISHED THINSECTIONS ARAFURA RESOURCES

Note: information is presented under the following headings:-
Sample no, composition, fabric (texture/microstructure), rock name, origin

JN 2
50% epidote
25% quartz
15% cloudy cryptocrystalline ?sericitised plagioclase
10% green amphibole (?actinolite)
1% limonite (after sulfide?)
tr sphene

heterogeneous at 5cm scale – mostly very fine grained (less than 0.05mm) hornfels-like texture, massive, with some coarser somewhat poikiloblastic epidote-rich domains, and with sparse, crudely concentrically banded epidote-rich segregations (pisolite-like) – a most unusual feature

epidote-rich calcsilicate rock

possibly derived from an impure limestone by low to medium grade ?thermal metamorphism and possibly minor metasomatism (possibly related to JS 2, also a fine-grained epidote-bearing calcsilicate rock)

JN 3

15% plagioclase (phenocrysts, completely sericitised)
30% sericitised plagioclase (groundmass)
50% green amphibole (hornblende?)
5% magnetite (+ hematite lamellae)
ilmenite (mostly leucoxenised)
chlorite (from ?biotite)
epidote
tr sulfide (chalcopyrite?)

massive /no preferred orientation, homogeneous at 1-2 cm scale, glomeroporphyritic clusters (2-3 mm) of sericitised plagioclase phenocrysts occur in a fine grained 0.5 mm groundmass with relict plagioclase laths and granular amphibole completely replacing former pyroxene (i.e. relict doleritic texture)

amphibolitic metadolerite

originally a mafic ?dyke which has experienced medium grade low-strain metamorphism, probably followed by partial retrogressive metamorphism/alteration (similar to JN 6)

JN 4

50% plagioclase (An 60 approx., slightly sericitised)
45% green amphibole (actinolite +/- minor hornblende?)
2% biotite + chlorite
2% Fe-Ti oxides (partly leucoxenised ilmenite)
1%quartz

massive – lacking preferred orientation, homogeneous at about 5 cm scale with clusters of pale green amphibole up to 20mm wide (mostly 5mm) with thin rims of darker green amphibole, all in a matrix of relict plagioclase laths (1-3mm), thus representing a relict gabbroid texture in which original pyroxene has been amphibolised

amphibolised metagabbroid (amphibolitic metagabbronorite?)

probably part of a layered mafic (+/- ultramafic?) intrusion that has been incompletely altered/metamorphosed at low to medium grade and low strain

JN 5

50% plagioclase (strongly sericitised)
40-45% green amphibole (actinolite +/- hornblende?)
3% biotite
3% epidote
1% ilmenite + leucoxene
tr quartz
tr chalcopyrite?

massive – lacks preferred orientation, homogeneous at 5 cm scale, amphibole-rich clusters up to 15 mm,but grains mostly less than 5mm, thin darker green amphibole rims with a partial rim of minor biotite, and relict plagioclase laths 2-3mm i.e. well-preserved relict gabbroid texture (amphibolised pyroxene), very similar to JN 4

amphibolised metagabbroid (amphibolitic metagabbronorite)

origin similar to JN 4 (alteration more intense in JN 5)

JN 6

55% amphibole (mostly green, some darker – hornblende?)
40% plagioclase (completely sericitised)
5% magnetite (minor hematite lamellae) + leucoxenised ilmenite
tr pyrite?, epidote

homogeneous at 1cm scale, massive/structureless, relict dolerite or chilled microgabbro equigranular texture with 0.3mm relict outlines of plagioclase laths and granular hornblende replacing original pyroxene

amphibolitic metadolerite (similar to JN3 but aphyric)

origin as for JN3 – medium grade, low strain metamorphism and alteration of mafic ?dyke

JN 7

60% plagioclase (partly sericitised)
30% quartz
5-10% biotite (+ minor chlorite)
1% magnetite + leucoxenised ilmenite
tr epidote, apatite

homogeneous at 1-2 cm scale, weakly layered with alternating lenses or layers of strained quartz alternating with feldspar-richer layers 1-2 mm thick, the latter with wavy, schistose biotite flakes at a low angle to the gneissic layering (some plagioclases somewhat lathlike suggesting an igneous parent rock)

felsic gneiss (biotite quartz plagioclase gneiss)

probably derived from a granodioritic intrusive parent rock by medium grade regional metamorphism under high strain, followed by further high stain deformation and some retrogression

JS 1

35% microcline
30% Ca pyroxene (salite)
10-15% plagioclase
10%quartz
7% scapolite
5% green amphibole (hornblende or actinolite)
sphene, tourmaline

homogeneous at 1cm scale, massive/structureless, uniform fine grained (0.5mm or less), granoblastic granular assemblage

calcsilicate granulite

medium to high grade metamorphism of an impure limestone parent rock, possibly with some metasomatic modification of bulk composition (e.g. scapolite); parent rock may have been similar to other calcsilicate rocks JS 2, JN 2 (but JS 1 represents higher grade metamorphism)

JS 2

35% epidote
25% quartz
20% carbonate (calcite?)
15% plagioclase
5% green amphibole (actinolite?)

very finegrained (0.1-0.2mm) granular, hornfels-like texture with very weak preferred orientation (amphibole); section shows a wavy contact between two very similar compositional domains, one richer in carbonate and poorer in plagioclase (paler coloured domain)

calcsilicate rock (?hornfels)

probably derived from an impure limestone by low to medium grade, possibly thermal metamorphism (broadly similar to JN 2)

JS 3

50% green amphibole (hornblende?)
40% sericitised plagioclase
7% magnetite + leucoxenised ilmenite
3% chlorite (after biotite?)

homogeneous at cm scale, weakly schistose with random to aligned amphibole variably overprinting weak relict doleritic texture

amphibolitic metadolerite

probably represents a mafic dyke? which has been metamorphosed at low to medium grade metamorphism and moderate strain (sericitisation of groundmass plagioclase simultaneous, or due to later alteration?)
similar to JN3 and JN 6 but more deformed (somewhat schistose)

HH 1

60% limonite, ?clay, ?chalcedony etc
20% quartz (mainly in vein)
15% talc?
3% chlorite
2% magnetite, hematite etc
tr chromite or Cr spinel

relict mesh texture or boxwork pattern of fractured and serpentinised olivine preserved in limonitic material, with aligned patches or lenses of talc, cut at a high angle by a 7mm wide low temperature quartz vein showing crystals with growth zoning growing normal to the vein walls
relict, rounded cores of relict chromite or Cr spinel probably occur in about four or five magnetite grains (submitted for electron beam analysis)

silicified serpentinised metaperidotite

olivine-rich ultramafic intrusion (perhaps part of a layered intrusion) that has been altered and metamorphosed (serpentinised), and subsequently deeply weathered and silicified)

HH 6

90% chalcedony + quartz
10% ?talc, yellow phyllosilicate, ?vermiculite, limonite etc

mostly very fine grained cherty quartz and chalcedony (less than 0.01mm grainsize) containing some relict phyllosilicates and related textures, multiply and irregularly veined by more crystalline quartz; relatively homogeneous compositionally but variable texturally

silicified weathered ?ultramafic rock

originally an ultramafic rock – probably olivine-rich and similar to HH 1, and subsequently deeply weathered and strongly leached and metasomatised with silica at low temperature

HH 7

90% hornblende (mostly pale brownish)
7% plagioclase
3% rutile

relatively homogeneous at cm scale, massive/structureless – no preferred orientation, coarse grained 1-5mm ragged granoblastic hornblende, localized 3-8mm patches of fine granular hornblende and plagioclase

hornblendite or hornblende-rich amphibolite

parent rock uncertain – possibly an ultramafic rock (?pyroxenite), perhaps in a layered ultramafic +/- mafic layered intrusion that has been regionally metamorphosed (possibly at relatively high pressure)

SUMMARY

The 19 samples in this batch fall roughly into the following broad categories, listed in approximate possible order of relative geological ages:

1. felsic gneisses JN7 CCD3 CCD7 CCE2

2. mafic granulites CCD8 CCE1 CCE5

3. calcsilicate rocks JN2 JS2 (lower grade) JS1 (higher grade, in group 2?)

4. ultramafic intrusives HH1 HH6 (highly weathered metaperidotites) HH7?

5. metagabbroids JN4 JN5 ; CHD2 (older?)

6. metadolerites JN3 JN6 JS3

Assuming these rocks come from a similar regional area and are broadly related (may not apply as two batches of samples), the following tentative ideas can be suggested about their possible relationships.

The oldest rocks probably represent older metamorphic basement composed of felsic gneisses (possibly originally granodioritic intrusions into unknown country rocks) and mafic granulites (precursors uncertain), the latter probably including JS1. CHD2 may represent part of an anorthositic intrusion, older than the metagabbroids. All these rocks experienced high grade regional metamorphism (amphibolite to granulite facies). The relationship of the lower grade calcsilicate rocks JS1 and JN2 is uncertain – they may not belong to this older metamorphic group.

The metagabbroids may be younger than the high grade metamorphic rocks discussed above, and may intrude them and be associated with the ultramafic rocks in a composite ?layered ultramafic/mafic intrusion. Dolerite dykes may have intruded some or all of the previous rocks, followed by a low to medium grade ?regional metamorphism and alteration affecting most of the rocks in groups 4,5, and 6, and perhaps also some of the older rocks.

Obviously, this is only one possible interpretation, and takes no account of actual field relationships.

Charter Mathison
29 June 2004

INVOICE

TO:

Arafura Resources NL
PO Box 394
SOUTH PERTH WA 6151

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Charter Mathison
SEGS – geology M006
University of WA
35 Stirling HighwayCRAWLEY WA 6009

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