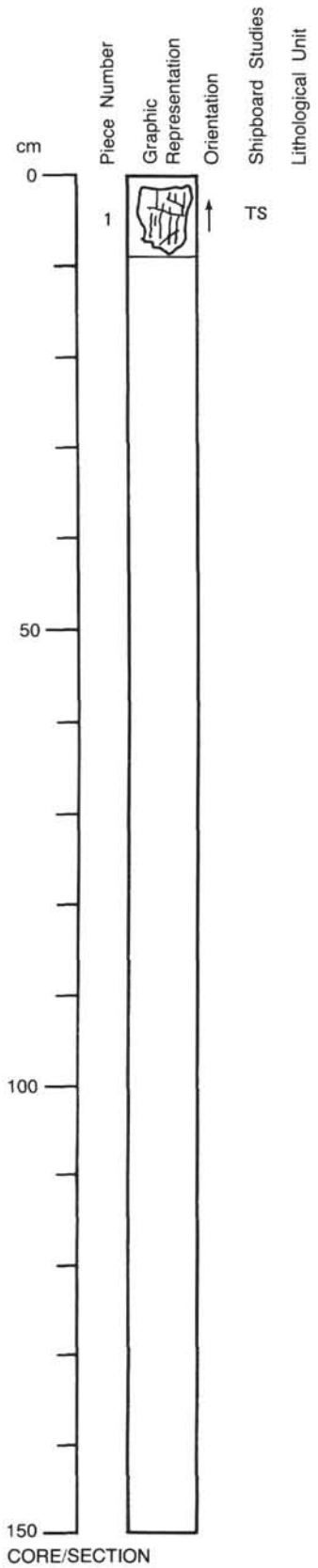


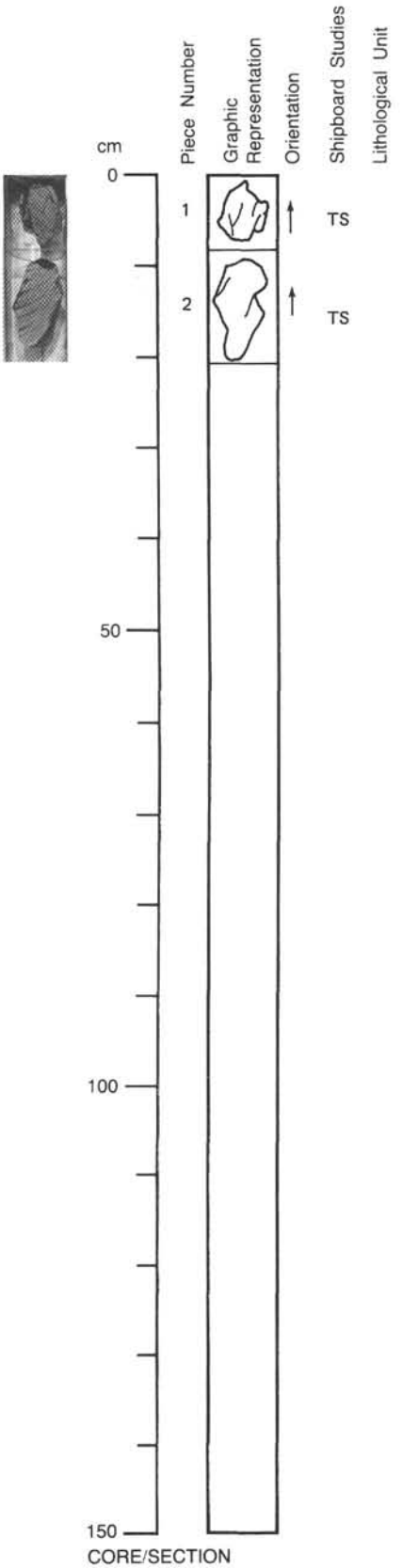
118-733B-1D-1

UNIT 1: RUBBLE

Piece 1

Piece 1: Metagabbro-Amphibolite

COLOR: Gray green.
LAYERING: None.
DEFORMATION: Lineation defined by elongate plagioclase porphyroclasts and by alignment of amphibole grains and clots. Plagioclase porphyroclasts, 2-4 mm. Amphibole 2 mm to very small grains.
PRIMARY MINERALOGY:
Plagioclase—Mode: Not determined.
Crystal size: 1-3 mm.
Crystal shape: In porphyroclasts.
Preferred orientation: In lineation.
Percent replacement: 90% by albite and epidote(?).
SECONDARY MINERALOGY:
Total percent: 95%.
Texture: Lineated amphibole about 70%. Plagioclase porphyroclasts with fine intergranular albite or plagioclase—really a tectonite fabric. Probably some chlorite, maybe epidote.
Percent vein material: 2%.
Vein material: <1 mm veins cutting lineation. Possibly contain prehnite(?).
COMMENTS: The rock is completely recrystallized except for plagioclase. There is a tectonite fabric. The rock was probably a pyroxene gabbro.



118-733C-1D-1

UNIT 1: RUBBLE

Pieces 1 and 2

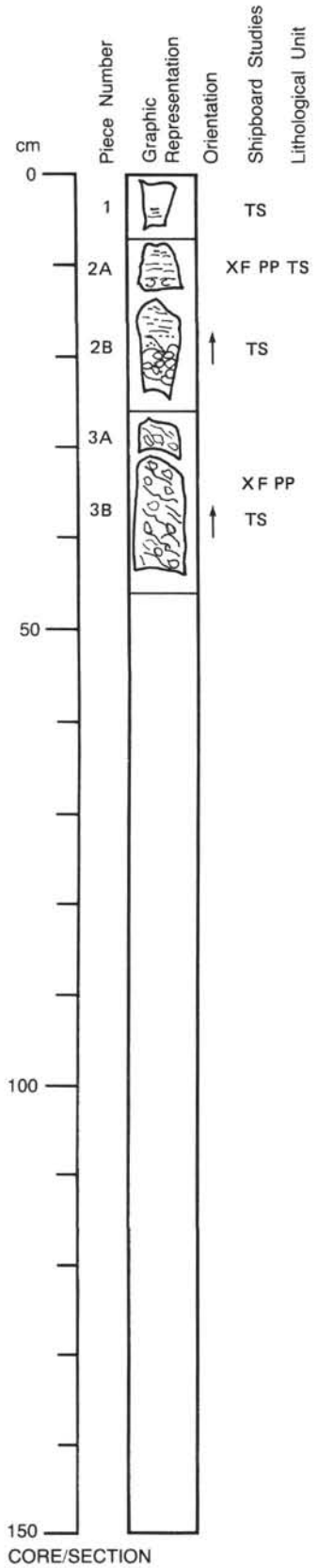
Piece 1: Metabasalt/Amphibolite

COLOR: Dark gray.
LAYERING: None.
DEFORMATION: None.
PRIMARY MINERALOGY:
Plagioclase—Mode: 1%.
Crystal size: 1-1.5 mm.
Crystal shape: Euhedral.
Preferred orientation: None.
Percent replacement: Fresh.

Clinopyroxene—Mode: 1%.
Crystal size: 1 mm.
Crystal shape: Subhedral.
Preferred orientation: None.
Percent replacement: Altered to amphibole.
SECONDARY MINERALOGY:
Total percent: 50%.
Texture: Amphibole replaces clinopyroxene and groundmass, particularly along thin veins.
Percent vein material: Not determined.
Vein material: Not determined.
COMMENTS: Primary mineralogy: Plagioclase and clinopyroxene as phenocrysts.

Piece 2: Foliated Metagabbro

COLOR: Dark gray.
LAYERING: Not determined.
DEFORMATION: Well developed foliation dipping at 28°.
PRIMARY MINERALOGY:
Plagioclase—Mode: Not determined.
Crystal size: 0.5-1 cm porphyroclasts.
Crystal shape: Anhedral.
Preferred orientation: Not determined.
Percent replacement: Fresh(?).
SECONDARY MINERALOGY:
Total percent: Not determined.
Texture: Secondary minerals are amphibole and feldspar.
Percent vein material: Not determined.
Vein material: Amphibole.
COMMENTS: Rock is medium-grained.



118-733D-1D-1

UNIT 1: GNEISS

Pieces 1-3B

Medium-Grained Gneiss

Pieces 1-3B

COLOR: Gray.

LAYERING: Piece 1 is medium-grained. Pieces 2A and 2B form a transition to more coarse-grained gneissic textures developed in Pieces 3A and 3B.

DEFORMATION: Foliation dips at 44° from horizontal. Fabric consists of numerous pyroxene(?) augen in a matrix of feldspar forming a well developed gneissic texture.

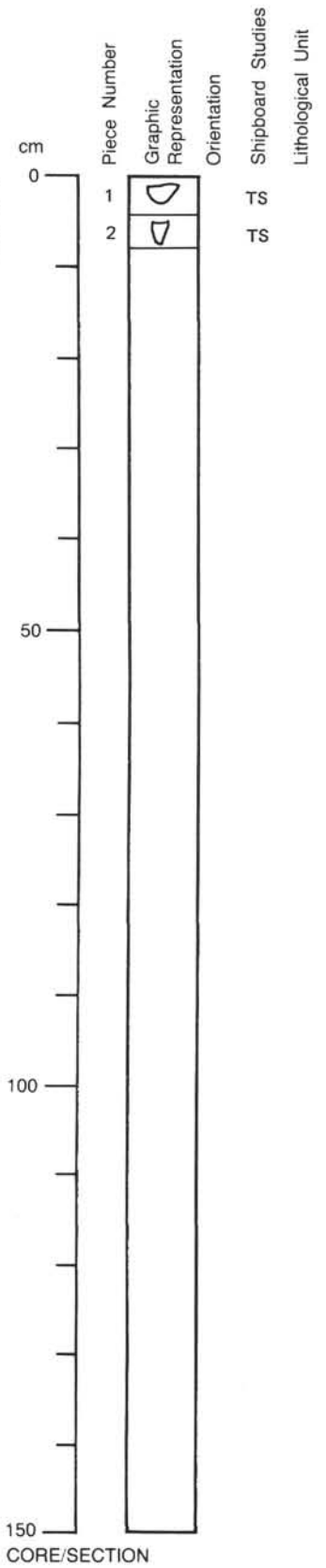
PRIMARY MINERALOGY:

Feldspar—Mode: 60%.
Crystal size: Not determined.
Crystal shape: Highly deformed, occasional euhedral augen are present.
Preferred orientation: Not determined.
Percent replacement: Cloudy white—may be altered.

Pyroxene—Mode: 40%.
Crystal size: 1-10 mm.
Crystal shape: Augen.
Preferred orientation: Not determined.
Percent replacement: Chlorite or actinolite rims.

SECONDARY MINERALOGY:

Total percent: Not determined.
Texture: Black veins, 0.2 mm thick, inclined at 60° from subhorizontal and subparallel to mineral foliation in Pieces 3A and 3B are filled with chlorite or actinolite. Piece 2B: Thin white vein, 0.3 mm thick crosses the sample at about 15° from horizontal. Pyroxene augen appear to have chloritic rims (or actinolite). Feldspar appears cloudy white and may be altered.



118-733D-2D-1

UNIT 2: RUBBLE

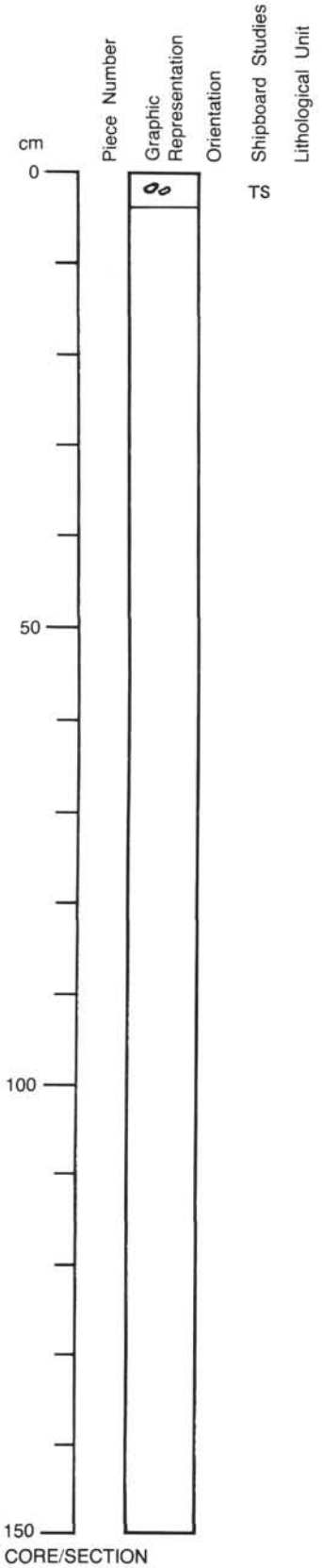
Pieces 1 and 2

Piece 1: Foliated Metagabbro

No description.

Piece 2: Foliated Amphibolite

No description.



118-733D-3B-1

UNIT 2: RUBBLE

Piece 1

Piece 1: Chlorite-Serpentinite Chips

COLOR: Gray green.
LAYERING: None.
DEFORMATION: Weakly foliated—defined by chlorite alignment.
PRIMARY MINERALOGY: None, completely replaced.
SECONDARY MINERALOGY:
Total percent: 100%.
Texture: Chlorite-serpentine—no percentages can be determined. Orange surface staining.
Percent vein material: Not determined.
Vein material: Not determined.

THIN SECTION DESCRIPTION

118-733B-1D-1 (Piece 1, 1-4 cm)

ROCK NAME: Foliated metagabbro

WHERE SAMPLED:

TEXTURE: Porphyroclastic

GRAIN SIZE: Fine to coarse

OBSERVER: KEM/CAN

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
Plagioclase	40	50	0.05-0.20			Granulated edges. Recrystallized to an equigranular mosaic. Partially replaced by actinolite ± chlorite.
Clinopyroxene	—	47				Completely replaced by amphibole.
Fe-Ti oxides	1	3				Partially altered to sphene.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Actinolite	27	Hbd, plag	Replacing amphibole and plag, and in fracture.
Hornblende	30	Cpx	Altered to actinolite ± chlorite.
Chlorite?	Tr?	Plag, hbd	
Sphene	2	Oxides	

COMMENTS: Thin section is perpendicular to foliation.
This rock was probably first metamorphosed to greenschist/amphibolite facies (gabbro metamorphosed into metagabbro). Shearing then produced the foliation. Both amphibole and plag are sheared and granulated. Shearing ends in cataclasis in the actinolite facies. Relict brown amphibole in the green hbd porphyroblasts suggests that original metamorphism was in the amphibolite facies; it is, however, possible that the brown amphibole is igneous.

THIN SECTION DESCRIPTION

118-733C-1D-1 (Piece 1, 0-3 cm)

ROCK NAME: Metabasalt

WHERE SAMPLED:

TEXTURE: Porphyritic

GRAIN SIZE: Fine

OBSERVER: KEM

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	—	2	0.5-1.0		*Euhedral*	*Completely replaced by amphibole + sphene.*
Plagioclase	10	10	0.5-3.0		Subhedral	Fractures filled with amphibole, replacing primary melt inclusions in some plag phenocrysts.
Clinopyroxene	<1	1	1.5		Anhedral	Cpx is partially replaced by actinolite.
GROUNDMASS						
Plagioclase	32	40			Subhedral	Short, stubby crystal engulfed in mass of acicular amphibole.
Clinopyroxene	—	45				Completely altered to actinolite.
Magnetite	2	2			Equant	

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Actinolite	55	Cpx, ol, plag	Anhedral crystals replacing groundmass ol(?), cpx, and fractures in plag. Fills veins.
Sphene	Tr	Ol	

COMMENTS: Percentages based on 1200 point counts.

THIN SECTION DESCRIPTION

118-733D-1D-1 (Piece 2, 10-12 cm)

ROCK NAME: Foliated metagabbro

WHERE SAMPLED:

TEXTURE: Porphyroclastic

GRAIN SIZE: Very fine to medium (<0.01–2.00 mm)

OBSERVER: BLM/HEB

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
Plagioclase	15	58(?)	0.1–1.0		Anhedral	Porphyroclasts replacing primary plag. Deformation twins, shattered margins, granulated into smaller granoblasts.
Cpx	—	40	1–4		Anhedral	Entirely replaced by green amphibole or chlorite.
Opx(?)	—	2(?)	1		Anhedral	Entirely replaced by green amphibole (and cummingtonite ?).
Oxide	2	2		Magnetite		

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Chlorite	4	Amphibole	Occurs along fractures and in patches. Pseudomorphs after cpx.
Actinolite	10	Plag, amphibole	Light green. Some patches are pleochroic brown to yellow; these are probably recrystallized brown hbd. Occurs along fractures in plag and amphibole, and along grain boundaries. These amphiboles are deformed, sheared. Large grains are deformed and infiltrating plag grains. Some fibrous crystals.
Hornblende	15	Cpx, opx(?)	Anhedral crystals, 0.1–2.0 mm in size. Deformed porphyroclasts. Some brown amphibole fragments.
Hornblende	24	Hbd	Recrystallized to <0.01–0.10 mm anhedral crystals.
Plagioclase	30	Plag	Irregular, anhedral crystals, <0.01–0.10 mm in size. Extensive recrystallization.
Magnetite	<1	Amphibole	Enclosed in amphibole, as strings, idiomorphic grains or veinlets oriented in the foliation plane.

COMMENTS: Thin section is oriented perpendicular to foliation.
Lensoid amphibole, plag with extensive granulation and recrystallization. High temperature metamorphism to amphibolite. Subsequent bending and fractures, cataclasis and recrystallization. Late replacement of amphibole by actinolite and chlorite. One or two very fine-grained, 2–3 mm wide mylonitic zones present. Intense shearing is composed of chlorite + fibrous actinolite and deformed actinolite grains.
Point count: plag (>0.1 cm) 18.1; plag (<0.1 cm) 21.8; amphibole (>0.1 cm) 19.2; amphibole (<0.1 cm) 35.8; opaque 0.6; chlorite 0.7; actinolite 3.6 (counted an arbitrary distance from fine amphibole).

THIN SECTION DESCRIPTION

118-733D-1D-1 (Piece 1, 2-5 cm)

ROCK NAME: Foliated metagabbro

WHERE SAMPLED:

TEXTURE: Porphyroclastic

GRAIN SIZE:

OBSERVER: STA/MEY

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
Plagioclase	12.2	55	1–2		Ovoid	Porphyroclasts. Undulatory extinction.
Clinopyroxene	14.9	39	0.8–1.0		Anhedral	Relict cleavage, replaced by cpx and hbd.
Hornblende	2.0	2	0.5		Anhedral	Red-brown. Rims altered to amphibole. Inclusions in cpx.
Orthopyroxene	0.5	4	≈1.0		Elongate	Elongate porphyroclasts. Partially replaced by amphibole

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Chlorite	1.0	Plag, opx	Associated with actinolite?
Actinolite	18.0	Px	Pale green. Undeformed. Preferentially replaces unrecrystallized px.
Hornblende	1.0	Hbd(?)	Brown-green. In recrystallized mosaic.
Plagioclase	42.3	Plag	0.02–0.10 mm recrystallized crystals.
Clinopyroxene	6.9	Cpx	0.01–0.02 mm in size.
Rutile	Tr	Ilmenite	Deep red.
Magnetite	1.2	Cpx(?)	

COMMENTS: Abundant hbd in px recrystallization zones.
Late veins, filled with green amphibole.
Red inclusions in px may be rutile.

THIN SECTION DESCRIPTION

118-733D-1D-1 (Piece 2A, 12-14 cm)

ROCK NAME: Foliated metagabbro

WHERE SAMPLED:

TEXTURE: Gneissic layering

GRAIN SIZE: Coarse

OBSERVER: STA

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
Plagioclase	25	50	2-5		Anhedral	Relict porphyroclasts. Strained. Recrystallized.
Clinopyroxene	18	21			Anhedral	Mechanical twinning. Slip zones. Recrystallized.
Spinel	2	2		Ilmenite		
Orthopyroxene	12	21			Elongate	Elongate, spindle crystals. Also recrystallized in mortar.
Hornblende	3(?)	6			Anhedral	Clear, red-brown in cpx. Optically indistinguishable from secondary hbd.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	1	Px(?)	Late celadonite mixed with hematite.
Actinolite	3	Hbd	Late, replacing hbd.
Hornblende	(?)	Cpx, veins	Green-brown in cross cutting veins. Replacing cpx.
Plagioclase	25	Plag	Mosaic of recrystallized neoblasts.
Magnetite	1	Opx, ilmenite	In veins in opx.
Talc(?)	2	Opx	Possibly cummingtonite. Veins in opx.
Cummingtonite	5	Opx	Replacing opx. Undeformed.
Clinopyroxene	3	Cpx	Recrystallized in mortar. Neoblasts.
Opx	Tr	Opx	Recrystallized neoblasts.

COMMENTS: Late fractures through opx are filled with magnetite and fine-grained mineral which is possibly talc or cummingtonite.
Plag and cpx recrystallized neoblasts, elongate opx crystals, and recrystallized opx neoblasts are a product of high temperature plastic deformation.
Metamorphic fluids formed hbd + cummingtonite (or talc) + actinolite.

THIN SECTION DESCRIPTION

118-733D-1D-1 (Piece 2B, 15-23 cm)

ROCK NAME: Foliated metagabbro

WHERE SAMPLED: Medium-grained portion of thin section (see following description)

TEXTURE: Granoporphyroclastic

GRAIN SIZE: Medium (0.5-3.0 mm)

OBSERVER: HEB

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE RANGE (mm)	APPROX. COMPO-SITION	MORPHOLOGY	COMMENTS
Plagioclase	10	50	0.3-2.0	An 50	Euhedral, lensoid	Included in cpx and opx. Deformed twin planes.
Clinopyroxene	25	30	0.2-1.8	Augite	Subhedral, irregular	Contain opx exsolution, brown hbd patches. Strained.
Orthopyroxene	17	20	0.5-2.0	Hypersthene	Irregular	Deformed, strained. Contain cpx exsolution. Slight replacement by actinolite and cummingtonite.
Amphibole	Tr	Tr	0.03-0.05		Irregular	Inclusions in cpx. Associated with small ilmenite grains.
Ilmenite	Tr	Tr	0.04-0.08		Irregular	Included in cpx.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Actinolite	3	Opx, cpx	Pale green, very small needles at opx and cpx margins. Also in very thin veinlets of very late stage metamorphism. Both are interrelated. May grade into hbd in veinlets or at actinolite margins. Possibly forming pseudomorphs after cpx.
Plagioclase	40	Plag	Neoblasts, 0.01-0.30 mm in size. Polygonal crystals with abundant triple junctions. Surrounding plag.
Clinopyroxene	5	Cpx	Polygonal neoblasts, 0.04-0.20 mm in size. Around or near cpx.
Cummingtonite	Tr	Opx	Small needles at outer rims of opx.

COMMENTS: This description is valid for the medium-grained, more mafic part of the large thin section (see following description).
Starting assemblage: plag + cpx + opx
Indication that cumulus plag precedes both px crystallization.
High temperature deformation: porphyroclasts and neoblasts develop. The foliation is more regular and as neoblasts are not very abundant, it is suggested that the grain size was smaller than the other part of the thin section.
Low temperature alteration of the same type described for the coarse grained portion of the rock.