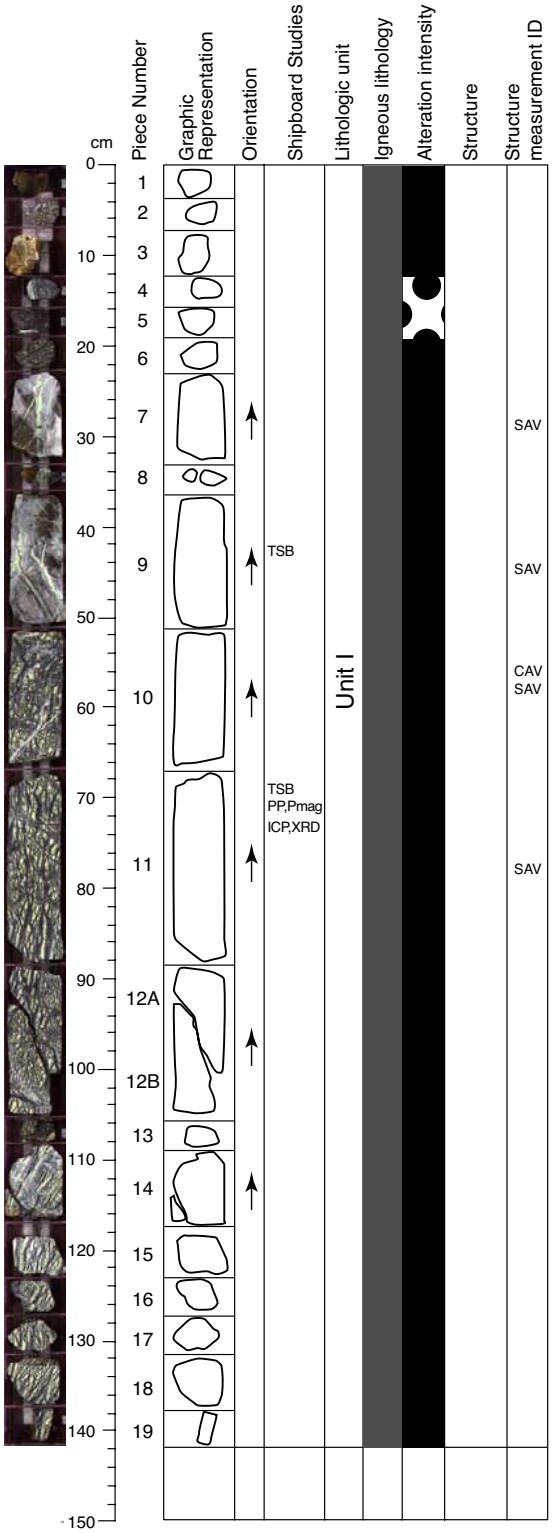
Core Photo



209-1271A-1R-1 (Section top: 0.00 mbsf)

UNIT I: Dunite

Pieces 1–19

COLOR: Yellow to green to black

PRIMARY MINERALOGY:

Olivine	Mode 98%–99%
Spinel	Mode 1%

COMMENTS: The bulk of this section has been too severely altered to identify the primary mineral assemblage. The lack of ghost orthopyroxene may indicate either complete alteration or primary absence before alteration. On the basis of trains of granular spinels (1-3 mm) in Pieces 2 and 4 the primary lithology may be dunite. In Piece 3 gabbroic breccia is present within serpentinite. Gabbroic dikes in Pieces 7 and 9 enclose large clinopyroxene crystals as large as 7 cm in diameter.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 90-100
The first six pieces of this section are very highly to completely altered dunite. Piece 4 and 5 have light gray, hard patches of probable relict orthopyroxene and traces of fresh olivine in the shadows of orthopyroxenes. Piece 3 is a breccia of completely altered dunite clasts cemented by carbonate. The lower 90 cm of this section consists of uniform black and green to yellow striped completely serpentinized dunite with subvertical mm-wide black serpentine and magnetite veins that give the rock a striped appearance. The dunite consists only of serpentine, magnetite and some hematite (determined by thin section microscopy in the interval 68-70 cm (Piece 11). Pieces 7 and 9 are mainly composed of very highly altered gabbro that invaded the dunite and encloses areas of relatively fresh dunite with diffuse, talc-rich contacts to the gabbro. A thin section of interval 42-45 cm (Piece 9) reveals that the gabbroic material is completely altered to chlorite, amphibole, talc, and secondary plagioclase.

VEINS:
This section is intensely veined with up to seven different types of vein: 1) Anastomosing serpentine veins are volumetrically the most abundant vein type and account for ca. 10 Vol% of the core; 2) discrete dark green serpentine veins; 3) talc-tremolite veins; 4) calc-silicate +/- tremolite +/- zeolite veins; 5) green picrolite veins; 6) white picrolite veins; and 7) white chrysotile veins. Crosscutting relationships are: V3 and V4 crosscut V1 and V2, V2 crosscuts V1, and V7 crosscuts 1 and 4. Green and white picrolite veins are developed in Pieces 6 to 8 only. White veins and oxides cut green veins.

THIN SECTIONS: Samples 1271A-1R-1, 42-45 cm and 1271A-1R-1, 68-70 cm

STRUCTURE:
The section consist of highly altered dunite (Pieces 1-3, 6-7, 10-19), wehrlite Pieces 4 and 5 and pyroxene-rich gabbro (Pieces 7-9). The dunite is so highly altered that no primary mineralogy or crystal-plastic structure can be observed. Wehrlite appears little deformed and the small pieces suggest that it may be vein material. Pyroxene-rich gabbro are in igneous contact with dunite in Piece 7 and although altered appear little effected by crystal-plastic deformation. Piece 5 is a semi-brittle shear zone comprising tremolite and talc filling voids in shear fractures. Pieces 7, 8, and 9 have variable densities of late, subvertical shear/tension fractures filled by serpentine veins. Pieces 1,2,3 and 6 show black serpentine net veining. Pieces 2 and 3 have carbonate veins (Piece 3 shows brecciation). Pieces 7, and 9 show extensive talc-tremolite alteration, 2-3 generations of crosscutting serpentine veins and late oxide veins. Pieces 10-19 show distinctive and pervasive subvertical anastomosing black serpentine-magnetite veins. All of Pieces 10-19 are cut by rare aragonite veins. Piece 14 also contains pyrite within veins.

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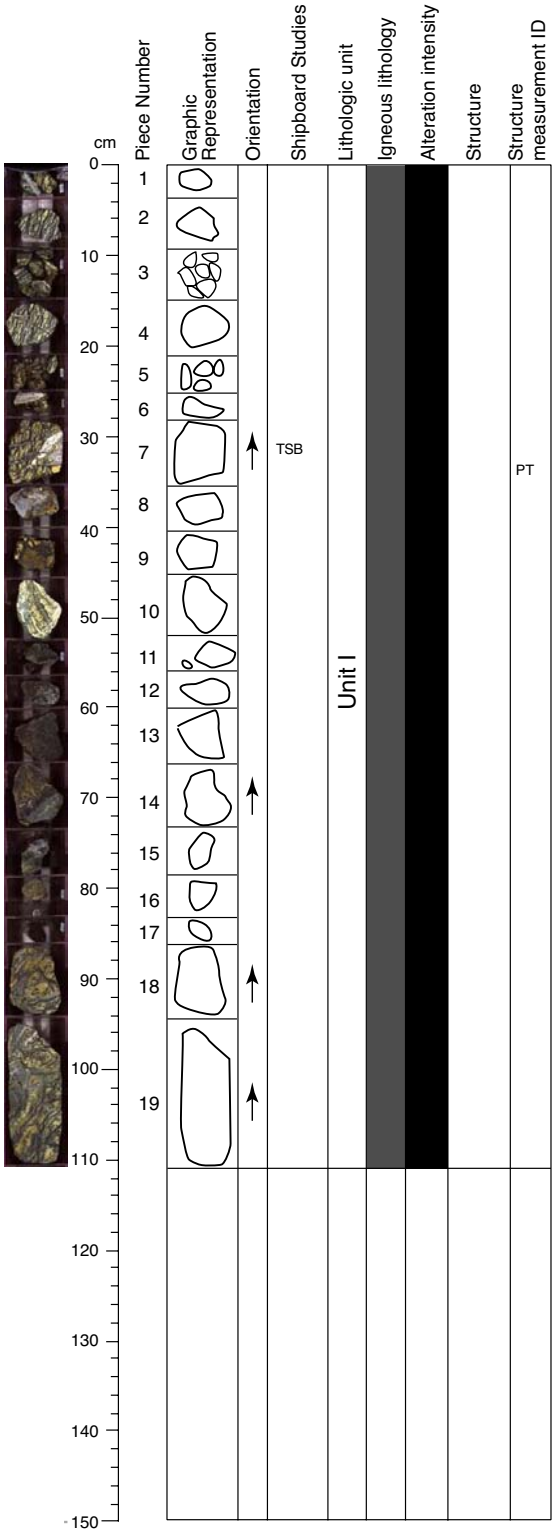

209-1271A-1R-2 (Section top: 2.53 mbsf)

UNIT I: Dunite

Pieces 1–19

COLOR: Yellow to gray to black

PRIMARY MINERALOGY:

Olivine	Mode 98%–99%
Orthopyroxene	Mode 1%
Spinel	Mode 1%

COMMENTS: This section consists of altered peridotite. No primary mineral is present except some relict spinel grains. Lack of ghost orthopyroxenes may indicate either complete alteration or primary absence.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 98-100
Most of the section is composed of mainly green to yellow striped completely altered dunite (to serpentine, carbonates and clays) similar to Section 1271A-1R-1. A thin section of Piece 7A (31-34 cm), which includes a gabbroic vein dissected by shear fractures, indicates that the gabbroic material is entirely replaced by carbonate, while the shear fractures are filled with white mica, talc, carbonate, chlorite, and hematite.

VEINS:
This section is strongly veined. Two early generations of veins, one composed of serpentine-magnetite and one of picrolite, were crosscut by thin sigmoidal wispy chrysotile veins. In the top 40 cm of this section tremolite-talc and Ca-silicate-tremolite-zeolite-carbonate veins are developed. Piece 10 has two distinct serpentine vein generations. Green picrolite veins are cut by chrysotile veins. In Piece 7 a network of white mica-talc-carbonate-chlorite-hematite veins was identified in proximity to the contact to the gabbro.

THINS SECTIONS: Sample 1271A-1R-2, 31-34 cm

STRUCTURE:
The section consists of dominantly, highly altered dunite (Pieces 1-7, 9, and 16-19), harzburgite (Pieces 10), and pyroxenite or pyroxene-rich gabbro, often mixed with dunite (Pieces 8, and 11-15). In most of the latter, the altered pyroxenite or pyroxene-rich gabbro has is in contact with dunite. The contacts appear undeformed and feathery as if igneous rock is in reaction relation with the dunite host (e.g., Piece 12 and 13). Contacts are preserved in Pieces 8, and 11-14. No crystal-plastic deformation could be observed because of the alteration states in the dunites that are characterized by distinctive and extensive, dark serpentine-magnetite veins that pervasively effect most of the dunite pieces. Pieces 1-5, in particular, are similar to those in Section 1272A-1R-1 showing distinctive, anastomosing black serpentine-magnetite veining cut by rare carbonate veins. Piece 2 contains a minor fault with approximately 0.2 cm offset. Piece 7 is cut by a normal fault with approximately 1 cm offset. The fault trace is offset across a calcite filled tension gash. Pieces 18 and 19 are cut by many late subvertical tension/shear fractures with traces generally less than 5 cm. Piece 6 contains an aragonite vein. Piece 7 shows excellent crosscutting relations: serpentine, cut by talc-tremolite veins, cut by carbonate vein similar to Piece 5. Pieces 10, 11, 12, and 14 show serpentine crosscutting relationships. Pieces 18 and 19 show three generations of serpentine veins cut by oxide and hematite veins and by small crysotile veins. The third generation of serpentine vein in Piece 12 fills orthogonal tension cracks in a magmatic vein.

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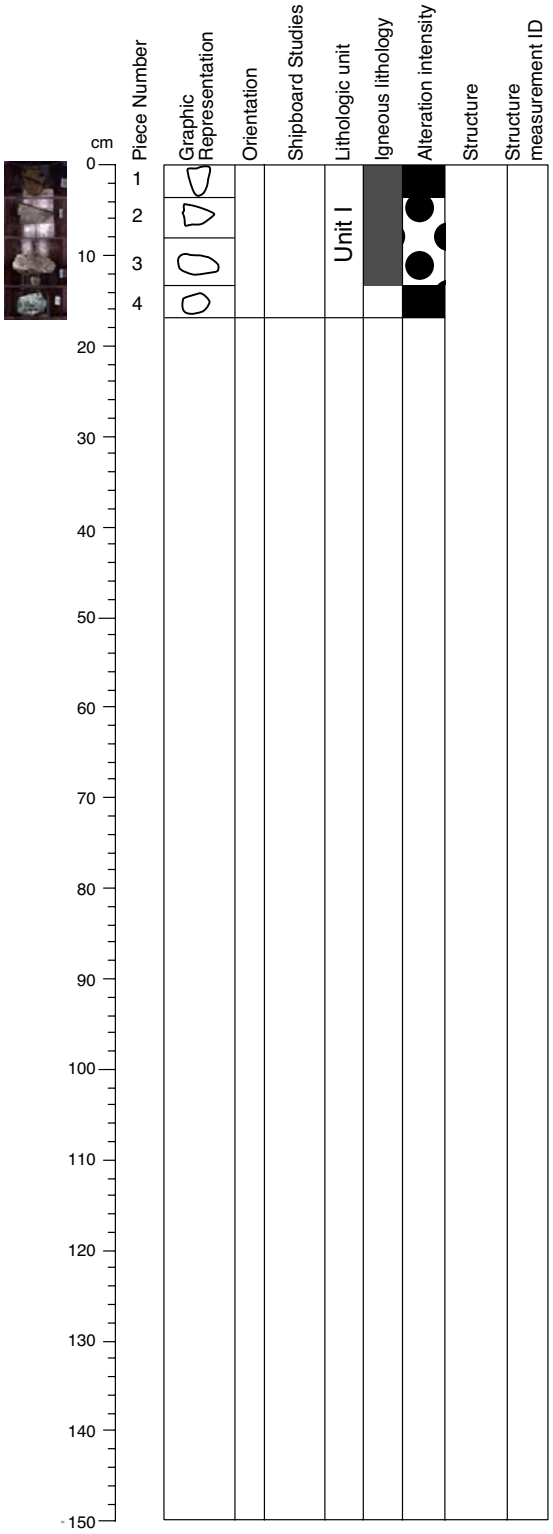

209-1271A-2R-1 (Section top: 13.90 mbsf)

UNIT I: Dunite

Pieces 1–4

COLOR: Yellow to gray to black

PRIMARY MINERALOGY:

Olivine	Mode 84%–99%
Orthopyroxene	Mode 15%
Spinel	Mode 1%

COMMENTS: This short section consists of altered peridotite. No primary mineral is present except local presence of relict spinel grains and rare ghost orthopyroxenes. Ghost orthopyroxenes only appear at 14-17 cm in Piece 4. Because of rare presence of ghost orthopyroxene the primary lithology of this section is likely to be dunite.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 92-100
The section comprises completely altered pebbles of dunite (Pieces 1 and 4) and very highly altered gabbro (Pieces 2 to 3).

VEINS:
This section consists only of four small pieces. Piece 1 has serpentine-magnetite and tremolite-talc veins similar to those in Section 1271A-1R-2.

STRUCTURE:
The section consist of four small pieces, which include serpentinized dunite (Piece 1), altered pyroxenite or pyroxene-rich gabbro (Pieces 2 and 3), and a serpentinized harzburgite (Piece 4). It was not possible to observe crystal-plastic deformation features in either dunites or the small harzburgite piece. Pieces 2 and 3 were little effected by crystal-plastic deformation. Piece 3 contains irregular shaped bands of high density fracturing and incipient brecciation, probably related to dilatancy and hydrothermal activity rather than shear deformation. Piece 1 shows three generations of serpentine veins and crosscutting relationships.

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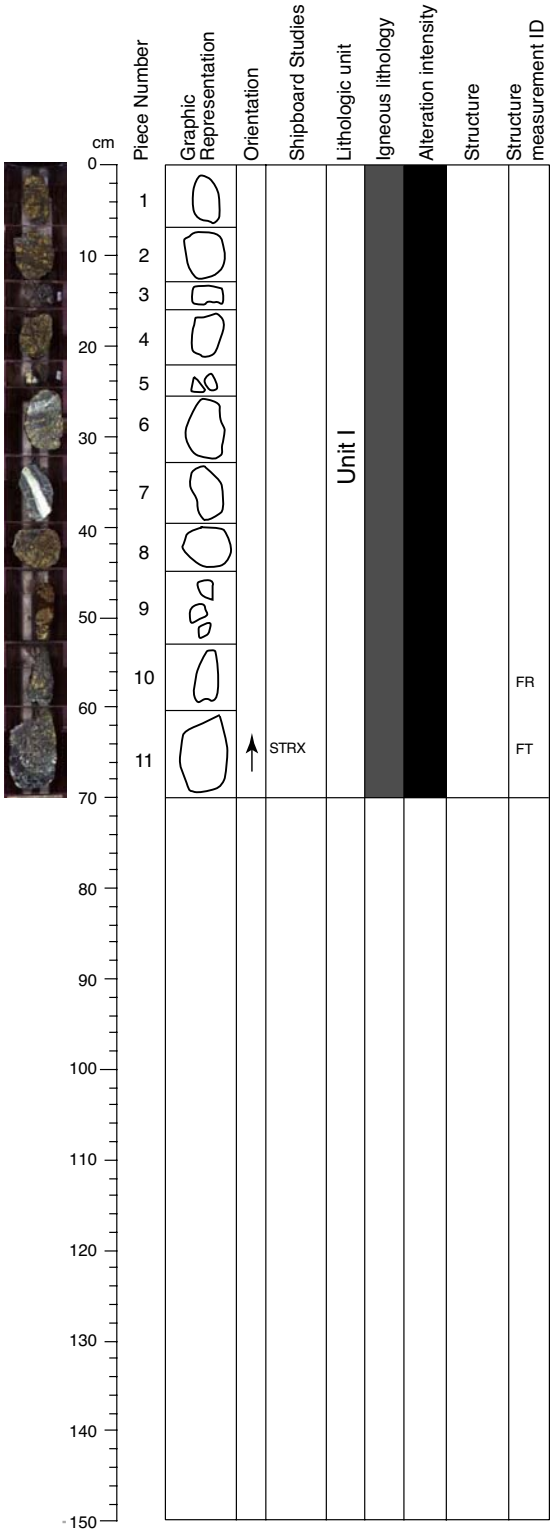

209-1271A-3R-1 (Section top: 18.90 mbsf)

UNIT I: Dunite

Pieces 1–11

COLOR: Green to brown

PRIMARY MINERALOGY:

Olivine	Mode 95%–97%
Spinel	Mode 3%–5%

COMMENTS: This section consists of altered peridotite. No primary mineral is present except some relict spinel grains. Granular spinels as large as 3 mm locally form trains. Ghost orthopyroxenes are not present indicating either complete alteration or primary absence.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 96-100
This section includes different types of brown and green, completely altered dunite. Serpentine and magnetite are the main secondary phases. Olivine that did not alter to serpentine was replaced by clay during later low-temperature alteration. Spinel, where it is present, seems to be fresh.

VEINS:
This section is strongly veined by black serpentine-magnetite veins, which were cut first by green picrolite and then by white chrysotile veins. Piece 7 is to 35% composed of a single tremolite-talc cross-fiber vein.

STRUCTURE:
The section consist of serpentinized dunite (Pieces 1-6, and 8-9) in which there are no crystal-plastic strain markers. Piece 7 consists of altered veins material (either pyroxenite or pyroxene-rich gabbro). A large chrysotile serpentine vein (>1cm thick) also cuts Piece 8, obscuring and altering the probable material. Section has experienced moderate brittle deformation. Pieces 1 and 2 are cut by small faults with approximately 0.5 cm offset. Piece 6 exhibits zones of very dense shear fracturing and incipient brecciation locally. Pieces 10 and 11 are cut by numerous shear fractures with between 0.1 and 0.2 cm offset and Piece 11 also shows brecciation near its base. Slickenfibers on one small fault on the boundary of Piece 11 indicate strike slip motion. Pieces 3, 4, 5, and 7-9 exhibit arrays of randomly oriented shear fractures with less than 0.1 cm offset. Pervasive dark serpentine magnetite veins effect most pieces. Pieces 1, 2, 4-6, and 8-11 exhibit an intense network of at least two generations of crosscutting serpentine veins. Pieces 3, 5, 10 and 11 are cut by serpentine slickenfibers and Pieces 6 and 8 have large cross-fibered chrysotile veins.

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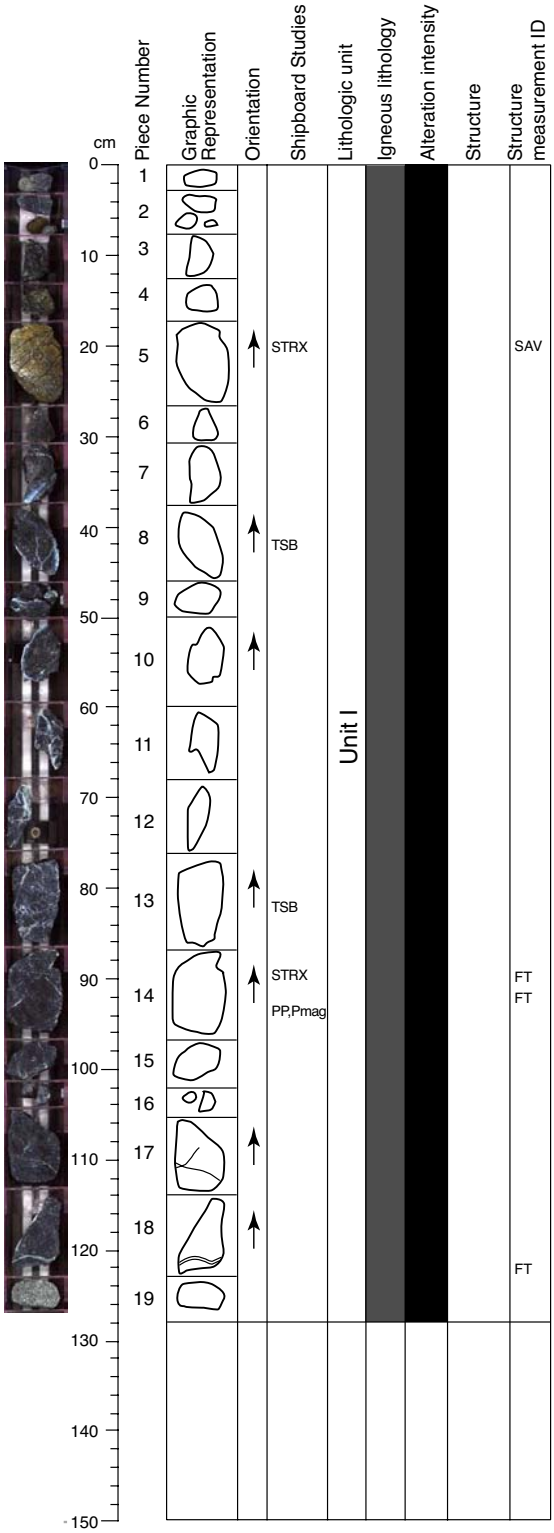

209-1271A-4R-1 (Section top: 28.50 mbsf)

UNIT I: Dunite

Pieces 1–19

COLOR: Yellowish green to dark gray

PRIMARY MINERALOGY:

Olivine	Mode 98%?
Spinel	Mode 2%
	Size <3 mm
	Shape/Habit Euhedral

COMMENTS: This section consists of altered dunite with euhedral large spinel grains (< 3 mm). Mode of spinel is up to 3% (1-3%, 2% average). There is no obvious orthopyroxene.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 80-100
This section is composed of dunite that is completely altered to serpentine and magnetite. Within the dunite, a fine, diffuse network of chlorite-talc veins and talc-chlorite patches are developed. These formations make up 5 to 10% of the rock and may represent impregnation of the dunite by melt. Variable proportions of euhedral, weakly altered chromite, which may contain inclusions of fresh silicates, occur in several intervals (especially in Pieces 11 to 14). Chromites are fresh and may contain inclusions of fresh silicates. Chromites are commonly surrounded by the talc-chlorite vein network.

VEINS:
The first six pieces of this section (0 to 31 cm) host early black serpentine-magnetite veins, which are cut by later, green, massive picrolite veins. Late chrysotile veins crosscuts both earlier generations. Except for Piece 19, which is black serpentine-magnetite and picrolite veined, the lower part of this section contains four vein generations: 1) Early black serpentine-magnetite veins, 2) talc veins, 3) picrolite veins with traces of sulfides and 4) chrysotile-talc veins (in particular in Piece 18), which postdate all other generations.

THIN SECTIONS: Samples 1271A-4R-1, 40-43 cm and 1271A-4R-1, 80-83 cm

STRUCTURE:
The section consists dominantly of highly altered spinel-rich serpentinized dunite, except for Piece 1, which is a harzburgite with modest pyroxene content. The dunite is cut be numerous serpentine-magnetite veins. Pieces 14, 15, 16, 17, and 18 are cut but numerous small-offset faults (<0.5 cm). Where visible, slickenfibers indicate normal and strike-slip deformation. Slickenfibers visible on vein surface on Pieces 7, 8, 10, 12, and 18. Beginning in Piece 7, thin interstitial veneers of material surrounding olivine and spinel grains that are similar to interstitial melt textures are observable in the cut face. These textures are better visible in Piece 8, where the spinel grains are completely surrounded by a thin veneer of this interstitial material that is now completely altered. The interstitial material is unevenly distributed and the original mineralogy is unknown given the current state of alteration. The spinel grains are equant, rounded to square in shape and considerably more abundant than in harzburgite. Pieces 11, 12, and 13 show the greatest abundance of interstitial material, but in more irregular shapes and larger (vein-like) patches. Towards the bottom of Piece 14 very little of the interstitial material remains. Pieces 15 and 17 have a few isolated patches. Pieces 1-18 exhibit a network of intense black serpentine veining cut by later green serpentine. Large green serpentine visible in Piece 18. Piece 13 has a faulted green serpentine vein. Piece 19 shows only a black serpentine-magnetite network.

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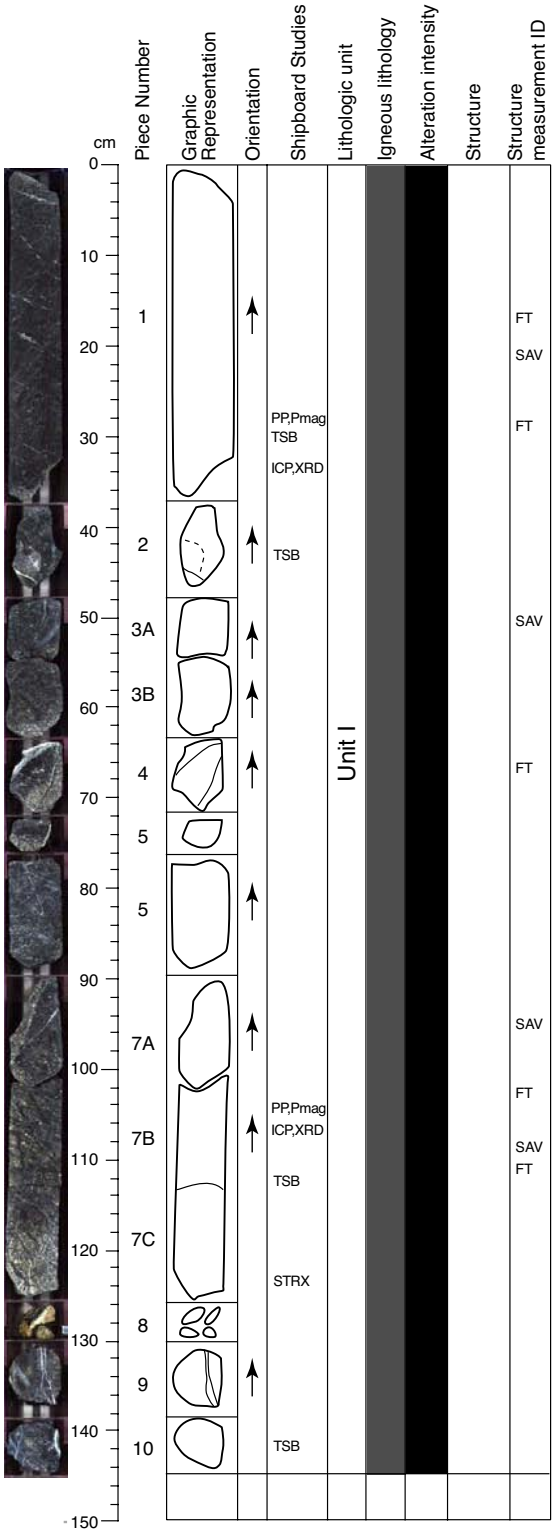


209-1271A-4R-2 (Section top: 29.77 mbsf)

UNIT I: Dunite

Pieces: 1–10

COLOR: Gray to bluish black

PRIMARY MINERALOGY:

Olivine	Mode 98%?
Spinel	Mode 2%
	Size < 3 mm
	Shape/Habit Euhedral

COMMENTS: This section consists of altered dunite with euhedral large spinel grains (< 3mm). Mode of spinel is as much as 3% (1%-3%, 2% average) and there is no obvious orthopyroxene as in Section 1271A-4R-1. A chromitite pod (~ 3 cm) is present in Piece 2. A gabbroic dikelet cuts the top of Piece 4 (64-67 cm). Piece 8 (126-130 cm) is breccia. A chromitite pod (~ 3 cm) is present in Piece 2.

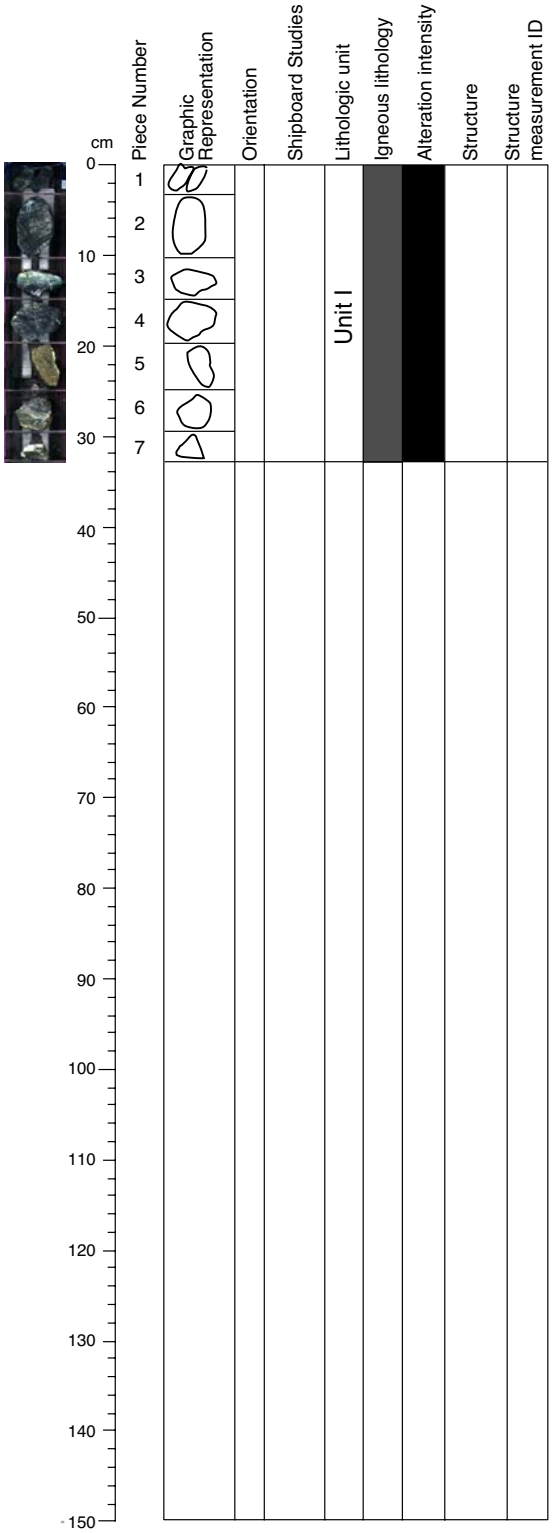
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 80-99
This section is composed of dunite that is completely altered to serpentine, brucite, and magnetite. Identification of brucite was made by XRD and thin section microscopy. Brucite contents in Pieces 1, 2, 7B, and 20 range between 5 and 20%. Magnetite occurs as selvages along chrysotile vein networks (thick veins are recorded in the vein log). Most chromites are fresh, although some do have coronas of secondary oxides (in particular in Piece 2). Bin 8 contains four pieces that represent various proportions of serpentinized dunite and altered gabbro. Many pieces of chromitite, especially below 100 cm contain talc-chlorite pseudomorphs of possible plagioclase. Locally, the talc-chlorite network and patches can make up to 10%-15% of the rock.

VEINS:
This section is strongly veined. Black serpentine-magnetite veins are cut by wispy chrysotile, massive picrolite, and talc veins. Crosscutting these veins are gray carbonate veins in Pieces 5 and 9.

THIN SECTIONS: Samples 1271A-4R-2, 29-31 cm, 1271A-4R-2, 43-48 cm, 1271A-4R-2, 111-114 cm, and 1271A-4R-2, 141-144 cm

STRUCTURE:
The section consists of serpentinized dunite. Piece 2 contains a podiform chromitite with bulbous ends facing downward between 42 and 46 cm. A pyroxenite magmatic vein cuts Piece 4, but it is highly altered and riddled with serpentine veins. All pieces are cut by a pervasive network of dark serpentine alteration veins (SAV1). Most pieces are cut by later green serpentine (SAV2) with crosscutting relationships in Pieces 3 and 10. Prominent late green serpentine alteration veins cut Pieces 2-10. Green serpentine veins in Pieces 1 and 3 show orthogonal tension cracks filled with chrysotile. Pieces 1-5 are cut by several small normal faults with between 0.5 and 1.5 cm. Faults have consistent orientation and shear displacement, and are spaced on 3 cm to 10 cm intervals down the core. Faults are filled with serpentine and carbonate, and where slickenfibers are visible indicate dip-slip motion. Piece 7 is cut by normal faults similar in nature to those higher in the section but with significantly steeper dips. Piece 8 contains pebbles cut by semi-brittle shear zones in which fibrous carbonate fills fracture voids. Pieces 9 and 10 are cut by several en-echelon shear fractures filled by carbonate and serpentine.

Core Photo



209-1271A-5R-1 (Section top: 38.10 mbsf)

UNIT I: Dunite

Pieces 1–7

COLOR: Dark gray to brown

PRIMARY MINERALOGY:

Olivine	Mode 98%?
Spinel	Mode 2%
	Size < 3 mm
	Shape/Habit Euhedral

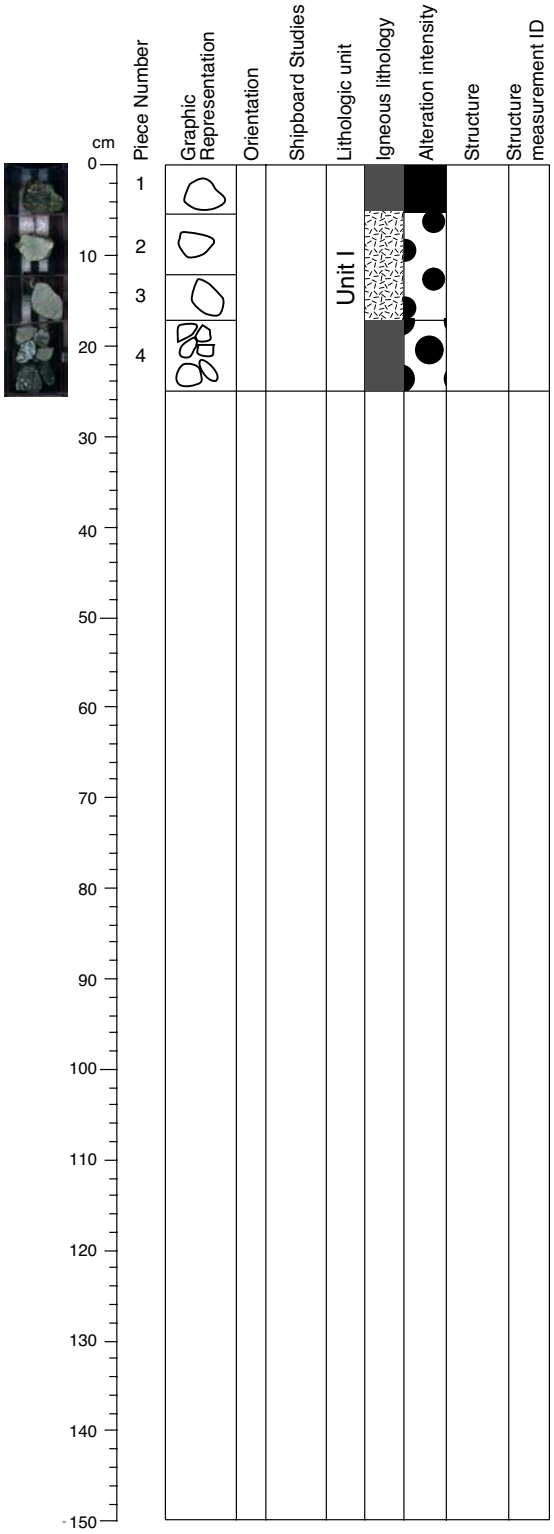
COMMENTS: This section consists of altered dunite with large euhedral spinel grains (< 3mm) in Pieces 1, 2 and 4. There is no obvious orthopyroxene.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 98-99
This section is composed of dark gray and brown dunite that is completely altered to serpentine along the walls of black serpentine-magnetite veins (Pieces 1 to 4). Pieces 5 to 7 are brown serpentinite with noticeable alteration of olivine to clay.

VEINS:
This section is strongly veined. Serpentine-magnetite veins are present in Pieces 1, 2, and 4. Massive green picrolite veins seem to be the latest generation, except in Piece 7 where carbonate veins seem to represent the latest veining event. Chrysotile, talc, and tremolite-talc veins predate picrolite and carbonate veining.

STRUCTURE:
The section consists of serpentinized dunite with high spinel content. Pieces are not oriented. No pyroxene crystal plastic strain markers are present within the dunites. Spinel does not show preferred orientation and appear large and subhedral compared with harzburgite. All pieces are cut by a network of serpentine magnetite alteration veins and later prominent green to white serpentine alteration veins. Pieces 1, 2, 3, 4, and 6 are cut by several high-density zones of serpentine-filled shear fractures. Piece 6 is intensely fractured. Pieces 2 and 3 show two generations of green serpentine and slickenfibers. Piece 7 contains serpentine cut by a late carbonate vein.

Core Photo



209-1271A-6R-1 (Section top: 42.80 mbsf)

UNIT I: Dunite

Pieces 1–4

COLOR: Light gray to brown

PRIMARY MINERALOGY:

Olivine	Mode 98%?
Spinel	Mode 2%
	Size < 3 mm
	Shape/Habit Euhedral

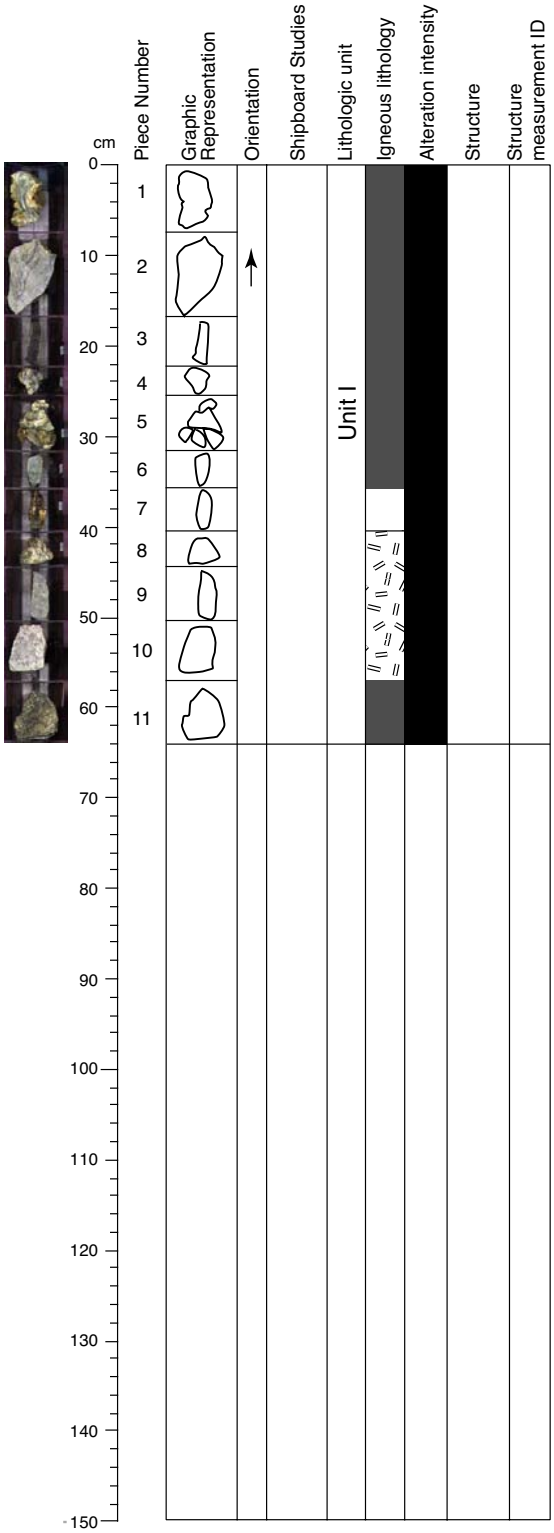
COMMENTS: Piece 1 of this section is altered dunite with euhedral large spinel grains (<3 mm). There is no obvious orthopyroxene. Pieces 2 and 3 are microgabbro and Piece 4 is a mixture of pebbles of microgabbro and serpentinite.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 90-100
This section includes pebbles of a variety of rock types. Brown dunite (Pieces 1 and pebbles in bin 4) are completely replaced by serpentine and magnetite and contain some clays formed during late alteration processes. Pieces 2 and 3 are light gray, highly altered microgabbros.

VEINS:
Piece 1 shows early serpentine-magnetite veins and late chrysotile veins. Piece 2, a microgabbro, contains a single prehnite(?) vein.

STRUCTURE:
The section consist of serpentinized harzburgite (Piece 1), fine-grained microgabbro or diorite (Pieces 2 and 3) and mixtures of both with no contact relationships (Piece 4 pebbles). Piece 1 is cut by arrays of fine serpentine-magnetite veins and later chrysotile-filled en-echelon shear fractures.

Core Photo



209-1271B-1R-1 (Section top: 0.0 mbsf)

UNIT I: Dunite/Gabbro

Pieces 1–3, 5–6, 11

COLOR: Green

PRIMARY MINERALOGY: Dunite

Olivine	Mode 98%–99%
Orthopyroxene	Mode 0%
Spinel	Mode <1%–2%

COMMENTS: Totally altered peridotite; no orthopyroxene ghosts.

Piece 7

COLOR: Light gray to gray to black

PRIMARY MINERALOGY: Harzburgite

Olivine	Mode 80%
Orthopyroxene	Mode 20%
Spinel	Mode <1%

COMMENTS: Totally altered peridotite. On the basis of amount of ghost orthopyroxene the lithology may have contained about 20% orthopyroxene

Pieces 4, 8–10

COLOR: Light gray to brown

PRIMARY MINERALOGY: Gabbro

Plagioclase	Mode unknown
Clinopyroxene	Mode unknown

COMMENTS: Totally altered gabbroic rocks. Primary mineralogy may be plagioclase plus clinopyroxene.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 99–100
Completely altered and variably weathered lithologies are represented in this section. Pieces 1, 2, 5, 6, and 8 are serpentinized and talc-altered harzburgite and dunite, whereas Pieces 4, and 8 to 10 are talc-altered gabbro. Weathering is indicated by brown orange iron-oxyhydroxide coatings and clays (Pieces 7 and 11).

VEINS:
Veining in this section is talc dominated in Pieces 1 and 2 and serpentine dominated in the remaining part of the section. Gabbros (Pieces 4, and 8 to 10) host no veins. Three generations of serpentine veins are present in this section: 1) Black serpentine-magnetite veins 2) rare, white, sigmoidal chrysotile veins, and 3) late, white to green picrolite veins.

STRUCTURE:
The section consists of a series of cataclasized rock types including serpentinite (Piece 1 and 5) and highly altered dunite (Pieces 3, 7 and 11), gabbro (Pieces 4, 6, 9, and 10) and assorted highly altered fault rocks. Gabbros do not appear to have undergone crystal plastic deformation as igneous textures appear preserved. There is a very high degree of brittle to semi-brittle deformation in this section. Pieces 1, 2, 5, and 8 are semi-brittle shear zone rocks in which cataclastic fractures and breccia zones are annealed by growth of fibrous greeenschist alteration minerals (likely serpentine and/or talc). Pieces 2 contains serpentine fibers in the shearing direction and Piece 3 and 5 contain slickenfibers. These zones may have accommodated significant degree of brittle shear. Pieces 4 contains dense arrays of shear fractures with incipient brecciation. Pieces 6, 9, 10, and 11 contain shear fractures with minor offset.

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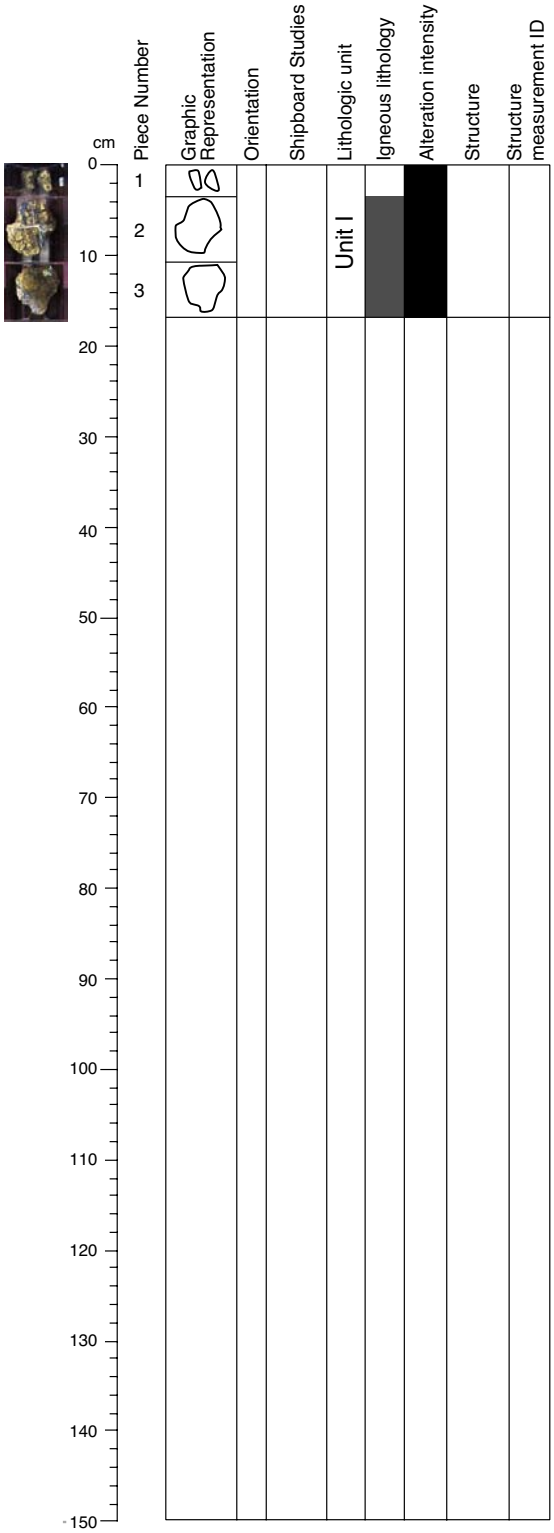


209-1271B-2R-1 (Section top: 12.00 mbsf)

UNIT I: Dunite/Gabbro

Pieces 1–3

COLOR: Orange to brown

PRIMARY MINERALOGY: Dunite

Olivine	Mode 85%–99%
Orthopyroxene	Mode 0%–15%
Spinel	Mode <1%–10%
	Size <2 mm
	Shape/Habit Anhedral

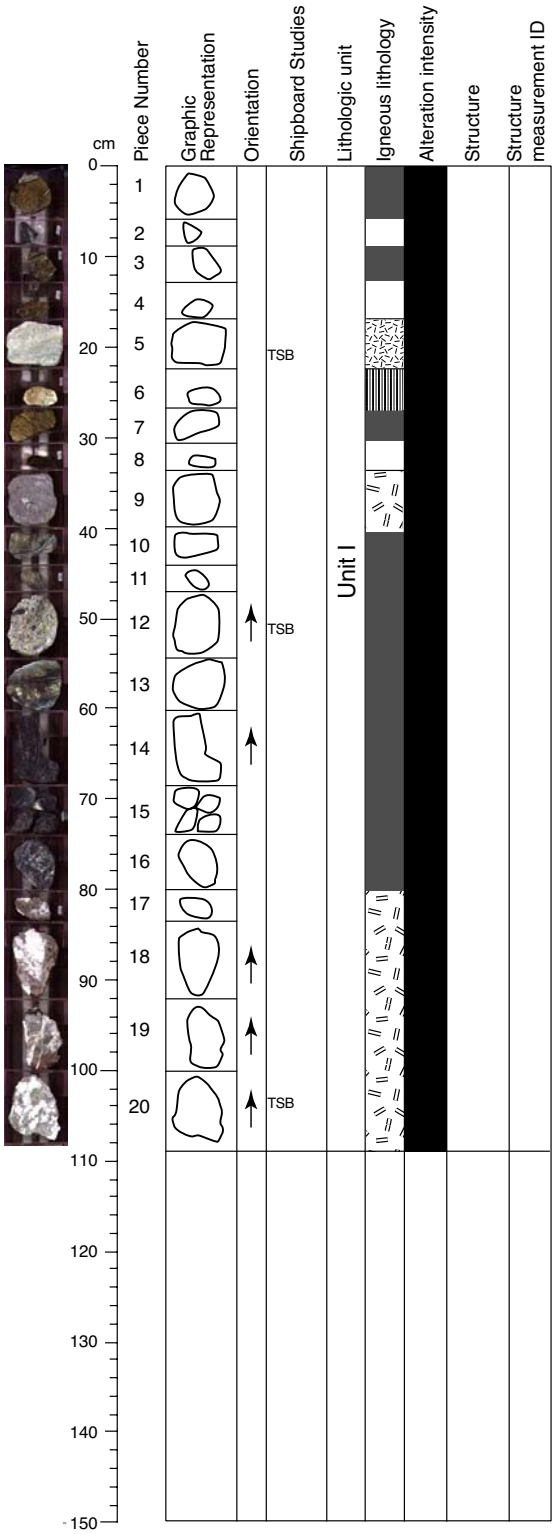
COMMENTS: This short section consists of three pebbles of altered peridotite (Pieces 2-4) and a single cobble of altered harzburgite (Piece 1). Piece 3 is a dunite with as much as 10% spinel.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 99–100
This section consists of brown to orange, clay-rich, completely serpentinized and weathered harzburgite

VEINS:
This section contains two generations of serpentine veins. An early black serpentine vein generation with trace amounts of magnetite is crosscut by later chrysotile veins. Vuggy, white aragonite veins with prismatic to acicular coarse-grained aragonite crosscut both serpentinite vein generations.

STRUCTURE:
The section consist of serpentinized dunite. None of the pieces are oriented nor do they show crystal plastic deformation markers. Spinel does not show a fabric, but often align in arrays that are not planar. Pieces 1 and 3 contain minor shear fractures a small amount of offset. In Piece 3, a serpentine vein is offset. Piece 2 contains a small fault with approximately 2 cm offset. The fault is approximately 0.3 cm wide and is host to as many as three generations of veins. Some veins within the fault comprise fibrous minerals parallel to the trace of the fault.

Core Photo



209-1271B-3R-1 (Section top: 17.00 mbsf)

UNIT I: Dunite/Gabbro

Pieces 1–4, 7–8, 10–11, 13–16

COLOR: Orange to brown

PRIMARY MINERALOGY: Dunite

Olivine	Mode 75%–99%
Orthopyroxene	Mode 10%–25%
	Size < 1–5 mm
	Shape/Habit Anhedral
Spinel	Mode 1%–5%
	Size < 1–2 mm
	Shape/Habit Anhedral

COMMENTS: This section consists of rounded pebbles of altered dunite (Pieces 1, 3, 7, 10-11, and 13-16) with some harzburgite (Pieces 2, 4, and 8). The dunite in Piece 16 is rich in spinel (as much as 5%). The dunite in Pieces 1 and 16 have intergranular gabbroic material that is now totally altered.

Pieces 5, 9, 17–20

COLOR: White and brown

PRIMARY MINERALOGY: Gabbro

Plagioclase	Mode 50%
	Size 1–3 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode 5%–35%
	Size <5–30 mm
	Shape/Habit Anhedral - Euhedral
Amphibole	Mode 45%–15%
	Size <7–35 mm
	Shape/Habit Anhedral

COMMENTS: Coarse-grained amphibole gabbro with large variation in mode and grain size. Plagioclase and clinopyroxene have been totally altered.

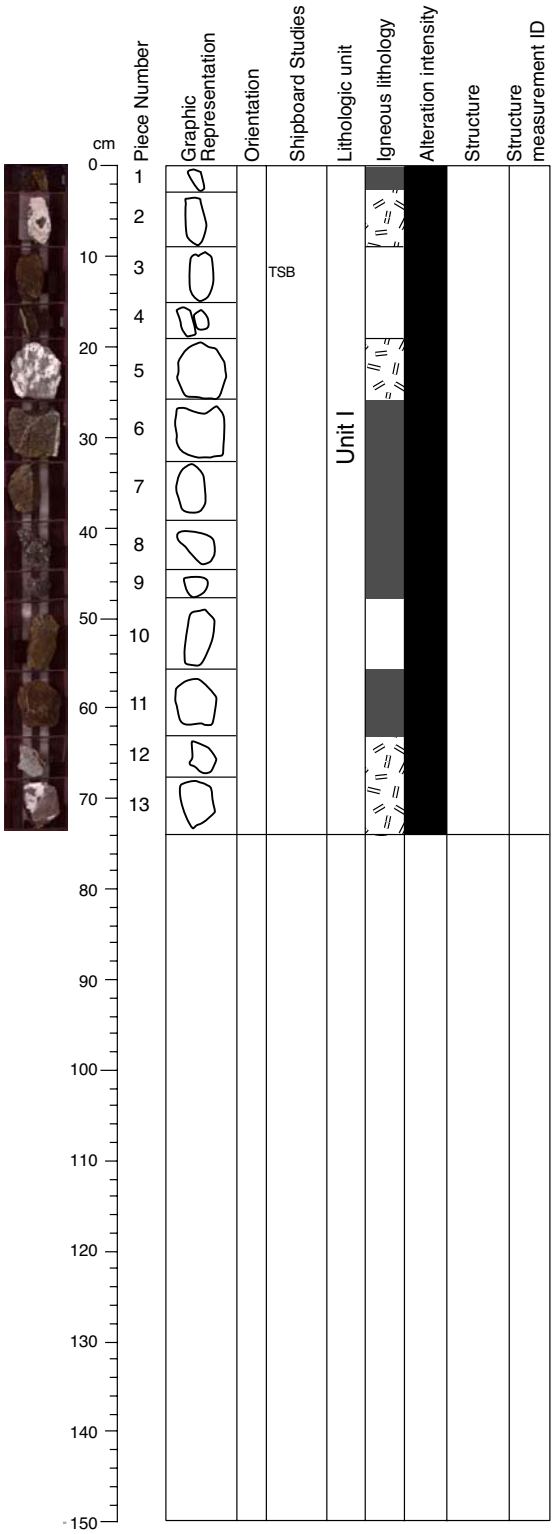
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 80-100
Most of this section consists of variably serpentinized (dark green to black) and weathered (light gray and orange) dunite. Piece 5 is a completely talc-tremolite altered schist. A thin section from Piece 5 (19-22 cm) indicates that the schist is composed of tremolite (55%), talc (35%), and chlorite (10%). Pieces 9, 11, and 18 to 20 are brown to white highly altered gabbro. A thin section of Piece 20 (102-107 cm) reveals that plagioclase is highly altered to secondary plagioclase, sericite, chlorite, and quartz. Pyroxenes are pseudomorphed by amphibole with minor chlorite and talc. Piece 12 is a fault breccia with completely serpentinized dunite clasts in a carbonate matrix with minor green clay

VEINS:
The top of the section down to Piece 16 has early serpentine-magnetite veins that were crosscut by composite black (rim) and green (center) serpentine-magnetite veins and later green picrolite veins. Piece 2 has a straight talc-rich vein. Piece 4 shows tiny, wispy chrysotile veins that crosscut earlier black and green serpentine-magnetite veins. The brown amphibole gabbro shows vuggy quartz veins (Pieces 17 and 19).

THIN SECTIONS: Samples 1271B-3R-1, 19-22 cm, 1271B-3R-1, 51-54 cm, and 1271B-3R-1, 102-107 cm

STRUCTURE:
The section consists of a diverse mixture of rock types ranging from serpentinized dunites, to metagabbros to metagabbroic pegmatites and various types of fault effected and cataclasized rock. Pieces 1-4, 6-11, and 13-16 consist of serpentinized dunite and Pieces 5, 9, and 17-20 are gabbroic rocks. The remainder are fault rocks. Piece 16 is a dunite that contains a thin band of chromitite. Piece 9 is a gabbro which contains a thin ductile shear band cutting igneous textured metagabbro. Piece 14 maybe a high temperature mylonite, but overprinted by cataclasis. Dunite in Piece 13 is cut by pyroxenite magmatic vein that is undeformed with respect to crystal plastic deformation. The gabbroic rocks contain a bronze fibrous amphibole that appears to replace mafic phases and certain veins as a static overprint. The plagioclase has also been complete altered. This section contains rock that has undergone a high degree of brittle deformation. Pieces 1, 5, 6, and 12 are or contain cohesive cataclastic breccias. Pieces 1 and 12 are carbonate-matrix, matrix-supported breccias with subangular to rounded lithic clasts (0.1 cm to 1 cm diameter) of various morphologies of serpentinized peridotite. Piece 5 is an intense semi-brittle shear zones in which cataclastic fracturing is annealed by growth of schistose zones of fibrous serpentine and/or talc. Piece 6 is a fine-grained cataclasite in which subrounded to rounded lithic clasts (0.1 cm to 0.3 cm diameter) are supported by a orange-colored matrix of unknown composition. Pieces 1, 3, 4, 7-11, 13, and 14 contain randomly oriented arrays of shear fractures with little or no offset. Piece 19 contains bands of hydrothermal breccia that fill anastomosing shear fractures that range in width from 0.2 cm to 1 cm wide.

Core Photo



209-1271B-4R-1 (Section top: 26.60 mbsf)

UNIT I: Dunite/Gabbro

Pieces 1, 3–4, 6–11

COLOR: Orange to light green and black

PRIMARY MINERALOGY: dunite

Olivine	Mode 84%–98%
Orthopyroxene	Mode 10%–15% Size <1–5 mm Shape/Habit Anhedral to Euhedral
Spinel	Mode <1%–2 % Size <1–2 mm Shape/Habit Anhedral

COMMENTS: This section consists of rounded pebbles of altered dunite (Pieces 1, 6, 7-9, 11) and harzburgite (Pieces 3-4, 10). The dunite in Piece 6 and harzburgite in Piece 3 is may be impregnated by plagioclase but it is now totally altered.

Pieces 2, 5, 12–13

COLOR: Brown and white

PRIMARY MINERALOGY: Gabbro

Plagioclase	Mode 60% Size 1–3 mm Shape/Habit Anhedral
Clinopyroxene	Mode 25% Size <2–10 mm Shape/Habit Anhedral
Amphibole	Mode 15% Size <1–7 mm Shape/Habit Anhedral

COMMENTS: Coarse to medium-grained amphibole gabbro with variation in mineral mode. Plagioclase and clinopyroxene have been totally altered.

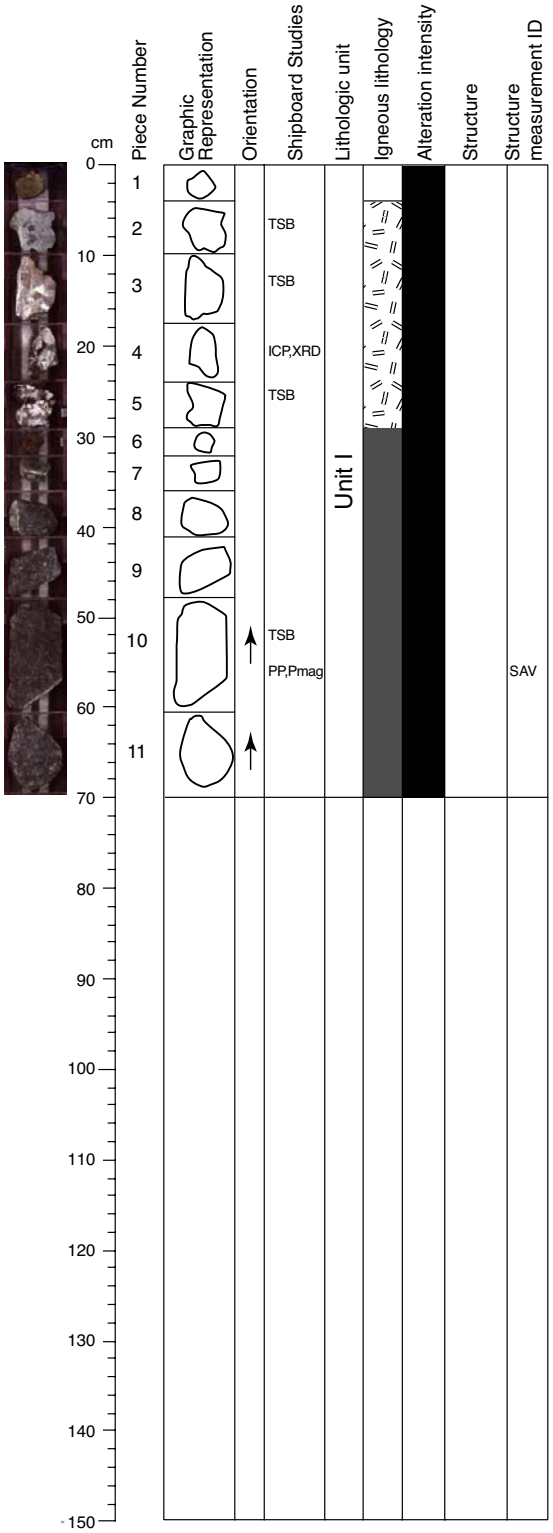
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 90–100
This section consists mainly of completely altered dunite and harzburgite. Pieces 1, 3, 4, 10, and 11 show brown to orange colors due to the replacement of relict olivine by clay minerals and iron-oxyhydroxides. In thin section (Piece 3, 11-14 cm), weathering is indicated by the presence of brown clay or talc and carbonate (5-10%), as well as carbonate-clay veins and late Fe-oxyhydroxide veinlets. Orthopyroxene relics are present in the harzburgite (about 5-10%). Piece 8 is largely unaffected by weathering and shows 1% of brucite in thin section (interval 40-43 cm) along with a few percent of chlorite-talc veins and patches that are thought to represent melt impregnation. Pieces 2, 5, 12, and 13 are completely altered gabbros with clinopyroxene being generally replaced by brown amphibole. In Piece 5, pyroxenes were replaced by amphibole and chlorite, and in Piece 11 some pyroxenes were replaced by talc.

VEINS:
This section shows early serpentine-magnetite veins that were crosscut by composite black (rim) and green (center) serpentine-magnetite veins and later green picrolite veins. Tiny, wispy chrysotile veins crosscut earlier black and green serpentine-magnetite veins and were crosscut by late, gray, vuggy veins of prismatic aragonite with minor clay. The brown amphibole gabbro contains no veins.

THIN SECTIONS: Sample 1271B-4R-1, 11-14 cm

STRUCTURE:
The section consists of a variety of rock types including serpentinized dunite (Pieces 1,2, 3, and 6-11), metagabbro (Piece 2, 5, and 13) and pyroxenite (Piece 12). The metagabbroic rocks have very coarse to pegmatitic grain sizes. The gabbroic rocks have been overprinted generally by static replacement of mafic phases with bronze fibrous amphibole and total alteration of plagioclase. The metagabbro of Piece 5, however, has a high temperature ductile fabric that has been overprinted by the same type of static alteration, followed by cataclasis. All other metagabbroic rocks preserve their igneous textural characteristics. Pieces 1- 3 and 5-10 show network veining of black serpentine cut by later green serpentine veins. Late carbonate veins in Pieces 1, 6, 7, 10, and 11. Pieces 3, 6, and 7, contain concentrations of fine (<0.05 cm wide) shear fractures with minimal or no lateral offset. Piece 4 contains a 0.5-cm-wide fracture filled by a composite vein with two generations of chrysotile fibers grown perpendicular and then oblique (40 degrees) to fracture walls. The fracture may have accommodated up to 0.5 cm of lateral offset. A carbonate cemented and brecciated shear zone cuts Piece 7.Pieces 6, 7, and 8 are cut by prominent serpentine alteration veins.

Core Photo



209-1271B-5R-1 (Section top: 27.70 mbsf)

UNIT I: Dunite/Gabbro

Pieces 1, 6–11

COLOR: Orange and brown to dark green and black

PRIMARY MINERALOGY: Dunite

Olivine	Mode 90%–97%
Orthopyroxene	Mode 0%–10% Size <1–5 mm Shape/Habit Anhedral - Euhedral
Spinel	Mode <1%–2.5% Size <1–4 mm Shape/Habit Anhedral

COMMENTS: This section consists of altered dunite with some relict spinel. The dunite in Piece 6 may be impregnated by plagioclase that is now totally altered.

Pieces 2–5

COLOR: Gray (Piece 2), brown and white (Pieces 3-5)

PRIMARY MINERALOGY: Gabbro

Plagioclase	Mode 60%–80% Size 1–3 mm Shape/Habit Anhedral
Clinopyroxene	Mode 13% Size <2–10 mm Shape/Habit Anhedral
Amphibole	Mode 7%–27% Size <1–10 mm Shape/Habit Anhedral

COMMENTS: The pieces are coarse to medium-grained amphibole gabbro with variation in mineral mode. The plagioclase is totally altered.

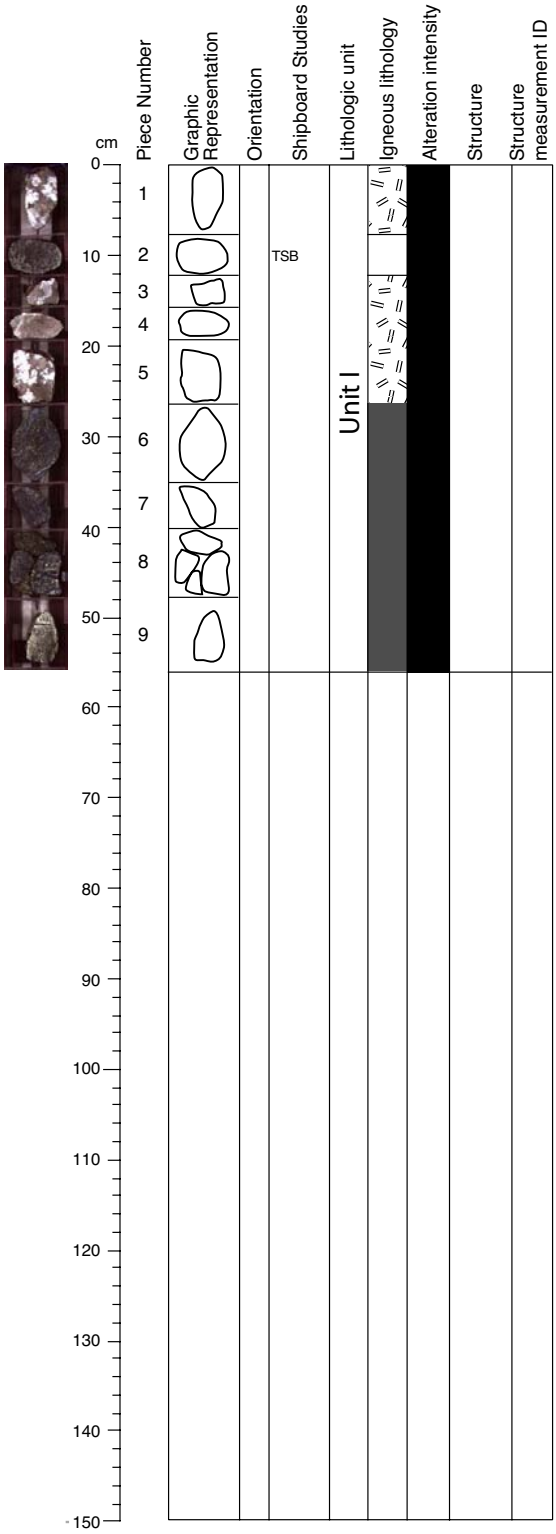
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 30-99
Pieces 3 to 5 are white to brown amphibole-rich, coarse-grained gabbro. Plagioclase is altered to a white, hard secondary mineral assemblage that was identified by thin section microscopy to consist of quartz, sericite, and secondary plagioclase. In a thin section of Piece 3 (12-14 cm) the extent of alteration was observed to be 95%, with clinopyroxene replacement by amphibole, and quartz-sericite rich assemblages replacing plagioclase. A quartz-amphibole-rutile vein makes up 15% of Piece 3. Piece 5 (thin section from interval 24-27 cm) is a highly altered gabbro, with similar secondary mineral assemblages and 1% rutile. Piece 2 is also gabbro, but the extent of alteration is lower (30%), and pyroxene has been partly replaced by talc and amphibole, while plagioclase was partly replaced by amphibole, sericite, talc, and chlorite (thin section of interval 5-7 cm). Pieces 6, 7, and 11 are completely serpentinized dunite. Pieces 1 and 6 are rubble of completely serpentinized and weathered dunite.

VEINS:
This section shows early serpentine-magnetite veins that were crosscut by composite black (rim) and green (center) serpentine-magnetite veins and later green picrolite veins. Tiny, wispy chrysotile veins crosscut earlier black and green serpentine-magnetite veins and were crosscut by late, gray, vuggy veins of prismatic aragonite with minor clay. The brown amphibole gabbro contains white, vuggy quartz-zeolite veins.

THIN SECTIONS: Samples 1271B-5R-1, 5-7 cm, 1271B-5R-1, 12-14 cm, 1271B-5R-1, 24-27 cm, and 1271B-5R-1, 52-53 cm

STRUCTURE:
The section consists of serpentinized dunite (Pieces 1 and 6-11), meta-olivine gabbro (Piece 2) and amphibolitized metagabbro (Pieces 2-5) with the same bronze colored fibrous amphibole statically replacing mafic phases. Although completely altered, all gabbroic rocks are characterized by gabbroic igneous textures. Pieces 8-11 have abundant spinel that appears to have a foliation. Rock from this section has experienced only minor brittle deformation. Piece 1 contains concentrations of fine shear fractures with little or no lateral offset. Piece 3 contains 0.5 cm thick bands of quartz-filled hydrothermal breccias filling anastomosing fractures that range in width from 0.1 cm to 1.5 cm with little or no lateral offset. Pieces 7-11 display poorly developed cross-fiber serpentine foliation. Pieces 8-11 display the ubiquitous network veining of black serpentine cut by later prominent green serpentine alteration veins and then rare carbonate.

Core Photo



209-1271B-6R-1 (Section top: 32.20 mbsf)

UNIT I: Dunite/Gabbro

Pieces 2, 6–9

COLOR: Light to dark green

PRIMARY MINERALOGY: dunite

Olivine	Mode 80%– 98%
Orthopyroxene	Mode 0%–20%
	Size <1–5 mm
	Shape/Habit Anhedral to euhedral
Spinel	Mode <1%
	Size < 2 mm
	Shape/Habit Anhedral

COMMENTS: Piece 2 is harzburgite. Pieces 6-9 are dunite. The rocks are totally altered except spinel. Piece 9 has well-developed spinel-rich layers. Spinel is as large as 4 mm in grain size. The dunite in Piece 6 is may be impregnated by plagioclase now totally altered.

Pieces 1, 3–5

COLOR: Brown and white

PRIMARY MINERALOGY: Gabbros

Plagioclase	Mode 50%–60%
	Size 2–15 mm
	Shape/Habit Anhedral
Amphibole	Mode 40%–50%
	Size <1–10 mm
	Shape/Habit Anhedral
Oxide	Mode <5%

COMMENTS: Coarse to medium-grained amphibole gabbro.

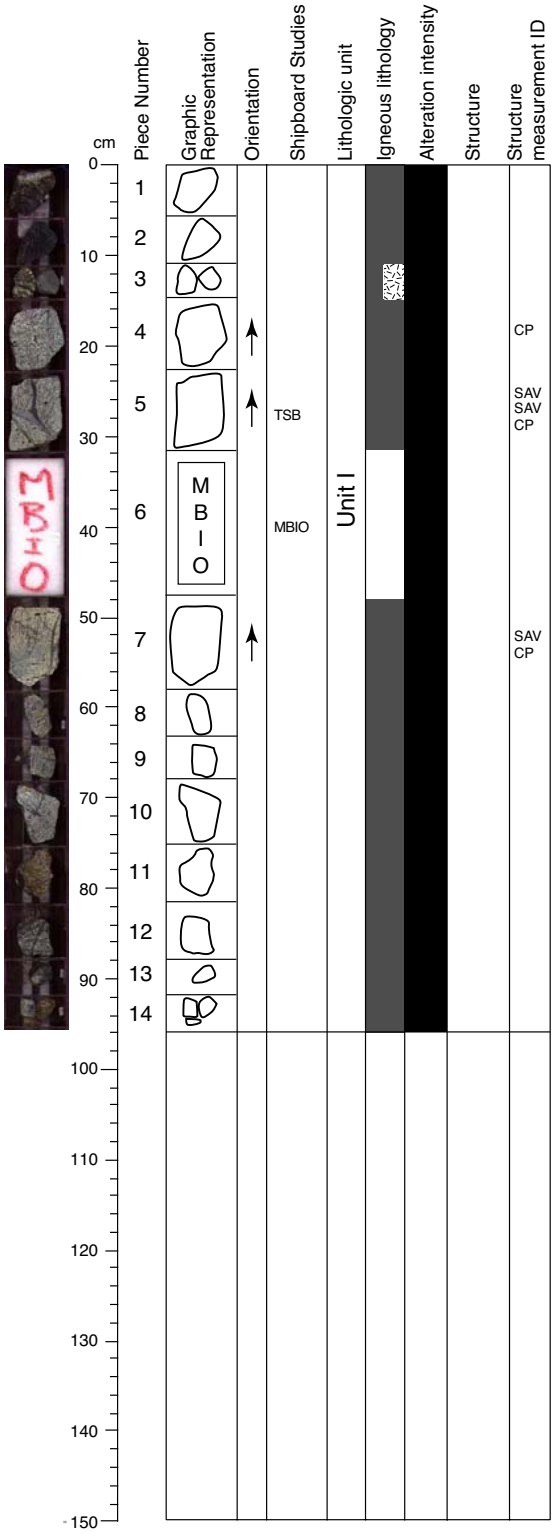
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 98–100
This section consists of completely serpentinized light to dark green dunite and harzburgite and completely altered, coarse-grained gabbro with brown amphibole and white secondary plagioclase (with variable amounts of quartz and sericite). A thin section of Piece 2 reveals the presence of brucite (5%), forming brown aggregates in the centers of a serpentine mesh-rim texture.

VEINS:
The completely serpentinized harzburgite and dunite of this section contain early black anastomosing serpentine-magnetite veins. Black and green serpentine-magnetite veins cut this early serpentine vein generation and were themselves cut by wispy chrysotile veins. Piece 2 contains early chrysotile veins cut by later serpentine-magnetite veins. The brown amphibole gabbro is not veined.

THIN SECTION: Sample 1271B-6R-1, 8-11 cm

STRUCTURE:
The section consists of coarse grained to pegmatitic metagabbro (Pieces 1-6) that is amphibolitized with bronze fibrous amphibole replacing former mafic phases, as found in previous sections of the core. The metagabbros retain their igneous textures as the metamorphism involved static replacement. Pieces 7-10 consist of dunite. Piece 6 has a similar spinel foliation as in Section 1271B-5R-1, Pieces 8-11. Pieces 7-9 contain coarser spinel that does not define a foliation. This section has experienced only minor brittle deformation. Piece 6 contains 2 serpentine-filled shear fractures that vary in thickness along strike between dilatant and non-dilatant zones from 0.1 cm to 0.6 cm. Veins filling fractures have fibers grown oblique to walls indicating possible lateral offset, but are themselves cut by 0.1 mm chrysotile filled orthogonal tension gashes. Pieces 3 and 4 have small white (quartz) veins. Pieces 6 to 9 show network veining of black serpentine cut by later green serpentine.

Core Photo



209-1271B-7R-1 (Section top: 36.20 mbsf)

UNIT I: Dunite/Gabbro

Pieces 1–14

COLOR: Green

PRIMARY MINERALOGY: Dunite

Olivine	Mode 95%–97%
Spinel	Mode <1%–5%
	Size <1–3 mm
	Shape/Habit Anhedral to euhedral

COMMENTS: This section consists of altered dunite (Pieces 1-14) and a piece of microgabbro (Piece 3). In Pieces 1-2 and 4 anastomosing gabbroic dikelets cut the dunite. Pieces 1, 4-5, and 7-12 are rich in spinel (as much as 5%) which is concentrated in thin layers.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 96-100
This section consists mainly of black and light green, completely serpentinized dunite.

VEINS:
This section shows three generations of veins. Black anastomosing serpentine-magnetite veins, were cut by black and green picrolite-magnetite veins. In Pieces 5 to 10, gray carbonate (aragonite) veins post-date the two serpentine vein generations.

THIN SECTION: Sample 1271B-7R-1, 26-26 cm

STRUCTURE:

The section consists of serpentinized dunite with more abundant chrome spinel grains than within harzburgite in the section. Piece 1 is cut by a gabbroic magmatic vein (contact exposed in the Piece). Chrome spinel occurs within the dunite along the margin of the vein. Piece 2 appears to show melt impregnation textures. The impregnating minerals are highly altered. Pieces 4-13 are spinel rich dunite. Some spinels show elongate shape habits. This section has experienced weak to moderate brittle deformation. Piece 1 contains a band of dense shear fractures near the margins of a gabbro dike. These fractures may have accommodated up to 1 cm offset. Pieces 5, 8, 9, and 10 contain anastomosing shear fractures between 0.2 and 1 cm wide filled by carbonate veins. Some fractures have accommodated 2 cm lateral offset. Pieces 11-14 contain fine variable densities of fine shear fractures with little or no offset. Pieces 7-10 display weakly developed cross-fiber serpentine foliation and Pieces 4-10 are cut by sparse green chrysotile veins reusing earlier serpentine filled fractures.

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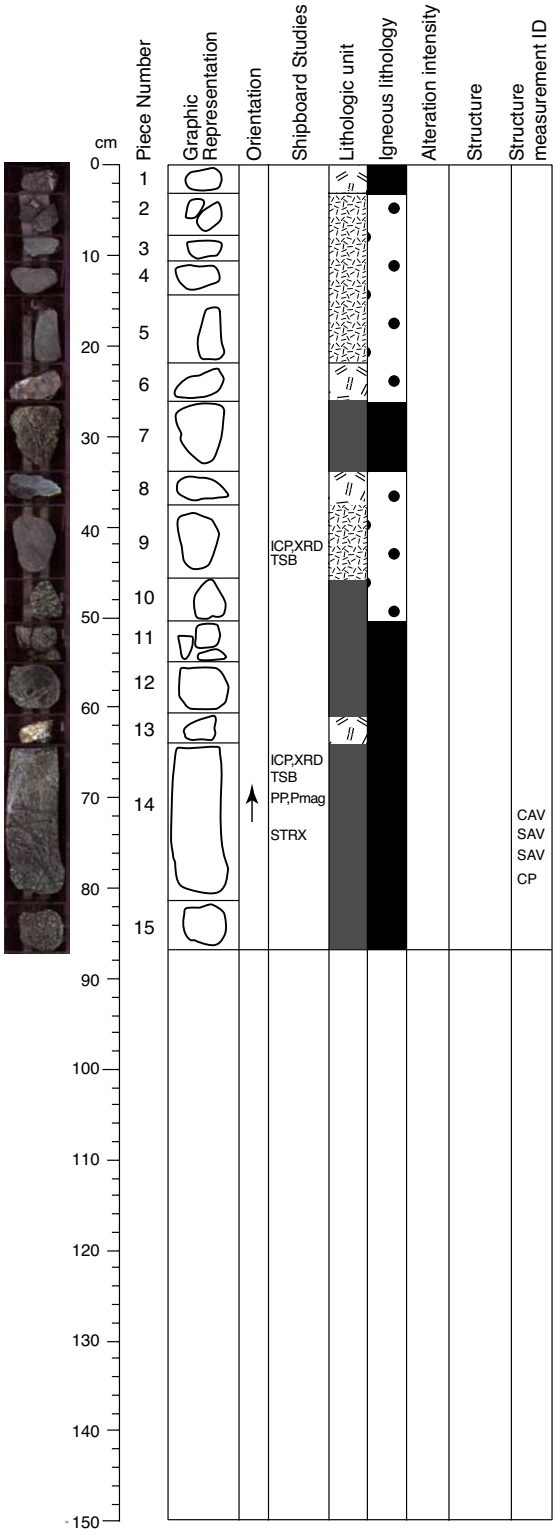


209-1271B-8R-1 (Section top: 40.70 mbsf)

UNIT I: Dunite/Gabbro

Pieces 1–6, 8–9 and 13

COLOR: Brown and white (gabbro) gray (microgabbro)

PRIMARY MINERALOGY: Gabbro

Plagioclase	Mode 40%–45% Size <1-5 mm Shape/Habit Anhedral
Amphibole	Mode 55% Size 1–5 mm Shape/Habit Anhedral
Oxide	Mode 2%–5%

COMMENTS: Coarse-grained amphibole gabbros with large variation in mode and grain size. The plagioclase is totally altered and Piece 8 is highly deformed. Pieces 2-5 and 9 consist of amphibole bearing microgabbro. The mineral assemblage is same as the coarse-grained gabbro.

Pieces 7, 10-12, 14-15

COLOR: Light green and black

PRIMARY MINERALOGY: Serpentinized Dunite

Olivine	Mode 98%
Spinel	Mode 2 %

COMMENTS: This section consists of rounded pebbles of altered dunite (Pieces 7, 10-12 and 14-15) impregnated with gabbroic material along grain boundaries and filling microfratures. The impregnation is more abundant to the bottom of the section. The lower part of Piece 14 contains a few mm wide gabbroic dikelets, with diffuse contacts all oriented in the same direction. The gabbroic impregnation is made of plagioclase and clinopyroxene that is now totally altered.

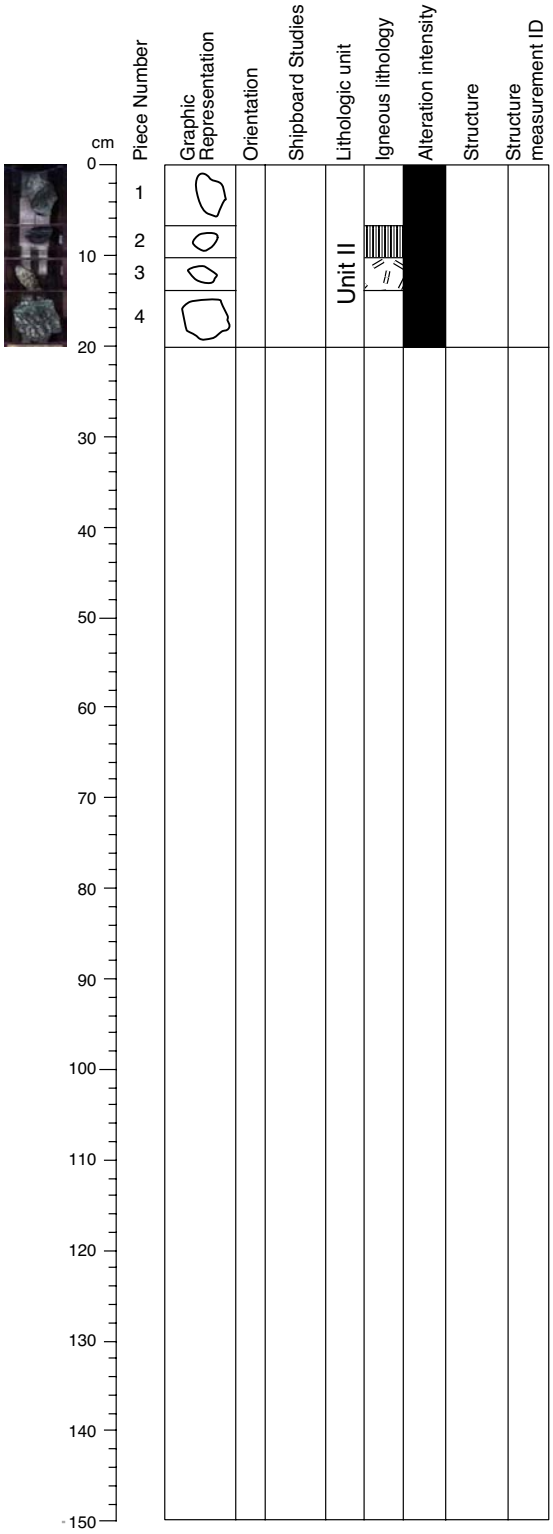
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 25–99
The upper part of this section is dominated by gray, moderately altered microgabbro (Pieces 2, 5, 6, and 9). Pieces 1 and 6 are coarse-grained completely altered brown amphibole-rich gabbros with white, hard secondary plagioclase (with quartz and sericite). Piece 8 is a strongly sheared serpentinized dunite. Piece 13 is an approximately 1-cm wide completely altered gabbroic veinlet. The lower part of this section consists of completely serpentinized, strongly veined, spinel-bearing dunite (Pieces 7, 10, 11, 12, 14, and 15).

VEINS:
The serpentinized dunite of this section contains three generations of veins. Early serpentine-magnetite veins were cut by later picrolite-magnetite and chrysotile veins. The microgabbro in Pieces 2 to 5 and the brown amphibole gabbro of Piece 1 show no veins.

THIN SECTIONS: Samples 1271B-8R-1, 43-45 cm and 1271B-8R-1, 65-68 cm

STRUCTURE:
The section consists of serpentinized dunite (Pieces 7-12, 14 and 15), amphibolitized metagabbro (Piece 1) with the same bronze colored fibrous amphibole statically replacing mafic phases, fine-grained gabbro-microgabbro (Pieces 2-6), and a folded carbonate cataclastite (Piece 13). Although completely altered, all gabbroic rocks are characterized by gabbroic igneous textures. The fine-grained gabbro is less altered than the amphibolitized gabbro and may not have experienced as extensive high temperature alteration. Serpentinited dunites in this section contain moderate degrees of brittle deformation. There is a 2 cm wide semi-brittle shear zone in Piece 8 that comprises fibrous serpentine defining a strong foliation and form tails on fractured porphyroclasts. Serpentine fibers appear folded. Serpentinite in Piece 10 is cut into phacoidal shear polyhedra (dimensions roughly 1 cm by 3 cm) by anastimosing magnetite-filled fractures. Piece 10 comprises a probable semi-brittle shear zone dominated by fibrous carbonate surrounding fractured talc porphyroclasts. Pieces 7- 12, 14 and 15 show network veining of black serpentine cut by later green serpentine often reusing earlier serpentine filled fractures. Piece 13 is part of a thick carbonate vein and probably a fault rock based on the extent of cataclasis.

Core Photo



209-1271B-9R-1 (Section top: 45.70 mbsf)

UNIT II: Harzburgite/Dunite

Pieces 1–4

COLOR: Green/black and white/brown

PRIMARY MINERALOGY:

Olivine	Mode 99%
Orthopyroxene	Mode 0 %
Spinel	Mode 0.5 %

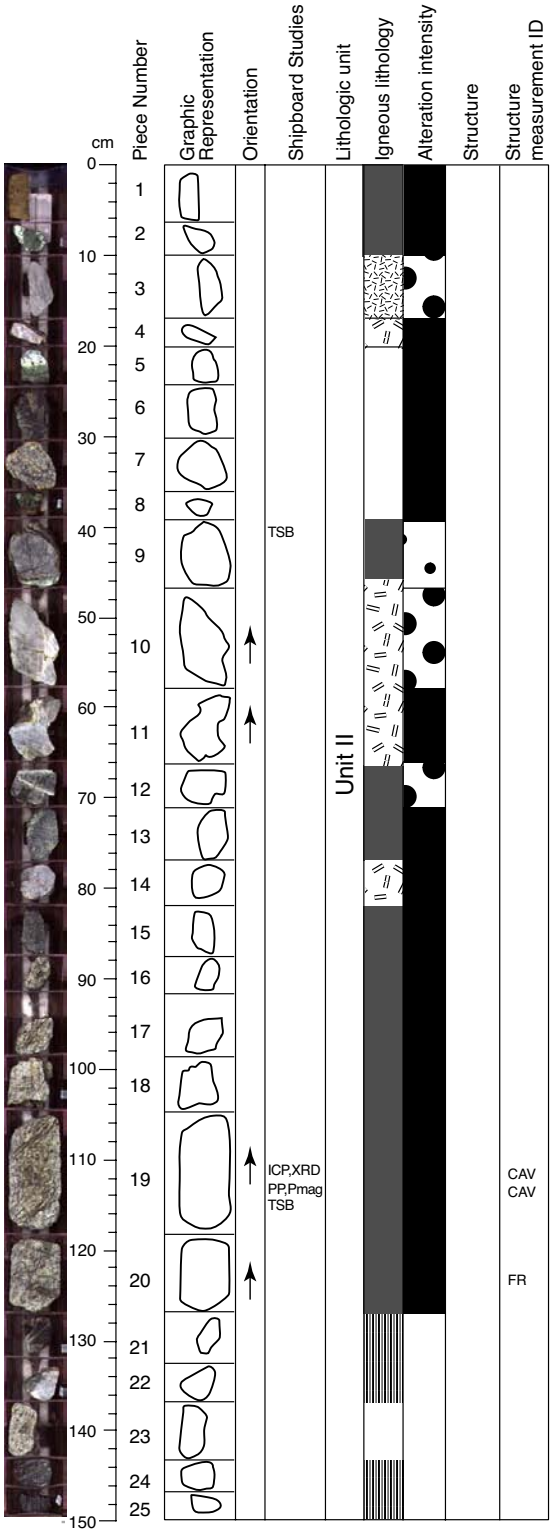
COMMENTS: The first two pieces are totally altered. Piece 1 may be an altered harzburgite but the protolith to Piece 2 is not determinable. Piece 3 is an altered gabbro and Piece 4 is an altered dunite (see mode above).

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 100
This section consists of gray green completely altered and serpentinized harzburgite and a small rubbly piece of white brown completely altered gabbro (Piece 2).

VEINS:
The veining of this section is composed of serpentine veins. Cross-cutting between two different generations of serpentine veins is well developed in Piece 4. An earlier generation of green massive picrolite veins, possibly with talc, is faulted and than cross-cut and faulted by a late generation of cross-fiber and massive picrolite veins.

STRUCTURE:
The section consists of four pieces of dunite, lacking evidence of crystal plastic deformation and markers which provide evidence of strain. The long axis of large spinel grains do not show preferred orientation. Piece 1 contains a large green serpentine alteration vein. Piece 4 has poorly developed cross fiber serpentine foliation. Piece 4 contains two generations of crosscutting green serpentine veins, the second generation showing cross fibers. The second generation is cut by small late chrysotile veins filling orthogonal tension cracks. This section has not experienced significant brittle shear deformation.

Core Photo



209-1271B-10R-1 (Section top: 50.50 mbsf)

UNIT II: Harzburgite/Dunite

Pieces 1–25

COLOR: Green/black and white/brown

PRIMARY MINERALOGY:

Olivine	Mode 83%–97%
Orthopyroxene	Mode 0%–15%
	Size 4–7 mm
	Shape/Habit Anhedral
Spinel	Mode 1%–3%
	Size 2 mm
	Shape/Habit Subhedral/layers

COMMENTS: This unit consists of altered harzburgite, dunite, and brown-amphibole gabbro. Pieces 2, 12, 21-22 and 24-25 are totally altered dunite(?). Harzburgite contain up to 15% orthopyroxene. A contact between harzburgite and gabbro is preserved in Piece 9. Pyroxene grains are identified in Pieces 15-20, although they are totally altered. Large spinel grains in dunite form layers. Pieces 9, 10-11, and 14 are coarse-grained (grain sizes >3 cm), brown-amphibole gabbro similar to those described in structurally higher pieces. Pieces 3 and 4 are a microgabbros.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 30–100
This section includes variably altered dunite, microgabbro, and pegmatitic gabbro. Piece 1 is a dunite, completely altered to dark brown serpentinite. Pieces 2, 5, 8, and part of Piece 6 are talc-altered. Pieces 3 and 4 are variably altered microgabbros. Pieces 9 and 12 are moderately to highly serpentinized dunites, with serpentinization limited to halos along cracks, joints, and serpentine veins. A thin section of Piece 9 (interval 40-43 cm) confirms the relatively low extent of alteration identified in hand specimen. About 30% of the olivine are altered to serpentine and magnetite that form a mesh texture. Rare orthopyroxene is completely replaced by talc. Anastomosing veinlets of chlorite-talc-amphibole may represent melt. impregnation. Pieces 6, 7, and 13 to 25 are completely serpentinized dunite and harzburgite with characteristic black serpentine-magnetite veins. A thin section of Piece 19 (interval 114-116 cm) indicates that orthopyroxene is completely altered mainly by talc, while olivine is completely altered to serpentine and abundant magnetite.

VEINS:
In this section different types of serpentine veins are present, some with up to 40% talc. The completely altered dunites at the bottom of this section (Pieces 17 to 20) host veins of carbonate and clay, crosscutting serpentine-magnetite veins related to the serpentinization. The metagabbros host rare epidote (Piece 10) and amphibole (possibly tremolite) veins.

THIN SECTIONS: Samples 1271B-10R-1, 40-43 cm and 1271B-10R-1, 114-116 cm

STRUCTURE:
The section consists of mixed lithologies of serpentinized dunite (Pieces 1, 6-9, and 11-25), fine-grained gabbro (Pieces 2 and 3), and coarse oxide gabbro to metagabbro (Pieces 9, 10,11, 12 and 14). The gabbro is rich in pyroxene and oxides at the contacts with dunite. Pieces 9, 11 and 12 show intrusive contacts between this gabbro and dunite. Piece 9 also shows a thin brown amphibole-plagioclase vein cutting at the contact between gabbro and dunite. All gabbroic rocks have igneous textures. Dunites have large spinel grains lacking well-defined preferred orientation. Pieces 23, 34, and 25 show poorly developed cross fiber serpentine foliation. Piece 12 exhibits a tight fold of composite serpentine veins, which are cut by a later generation of green serpentine. This piece shows three generations of serpentine veins with the last one crosscutting the first generations. Pieces 16-20 contain rare green serpentine veins and are cut by late brittle carbonate/oxide veins. Piece 13 shows crosscutting serpentine veins. Piece 23 contains crosscutting green serpentine veins cut by small late crysotile veins filling orthogonal tension cracks. This section has experienced moderate brittle shear deformation. There is a 1-cm-wide, high-intensity semibrittle shear zones on the upper margin of Piece 9. Cataclastic brecciation is partially annealed by growth of syntectonic serpentine and/or talc. Pieces 10-12, 21, and 22 contain brittle shear zones with serpentine/talc slickenfibers exposed on fracture surfaces. Pieces 17- 19, and 20 display poorly developed cross fiber serpentine foliation and contain anastomosing shear fractures parallel to and partially overlapping serpentine foliation.
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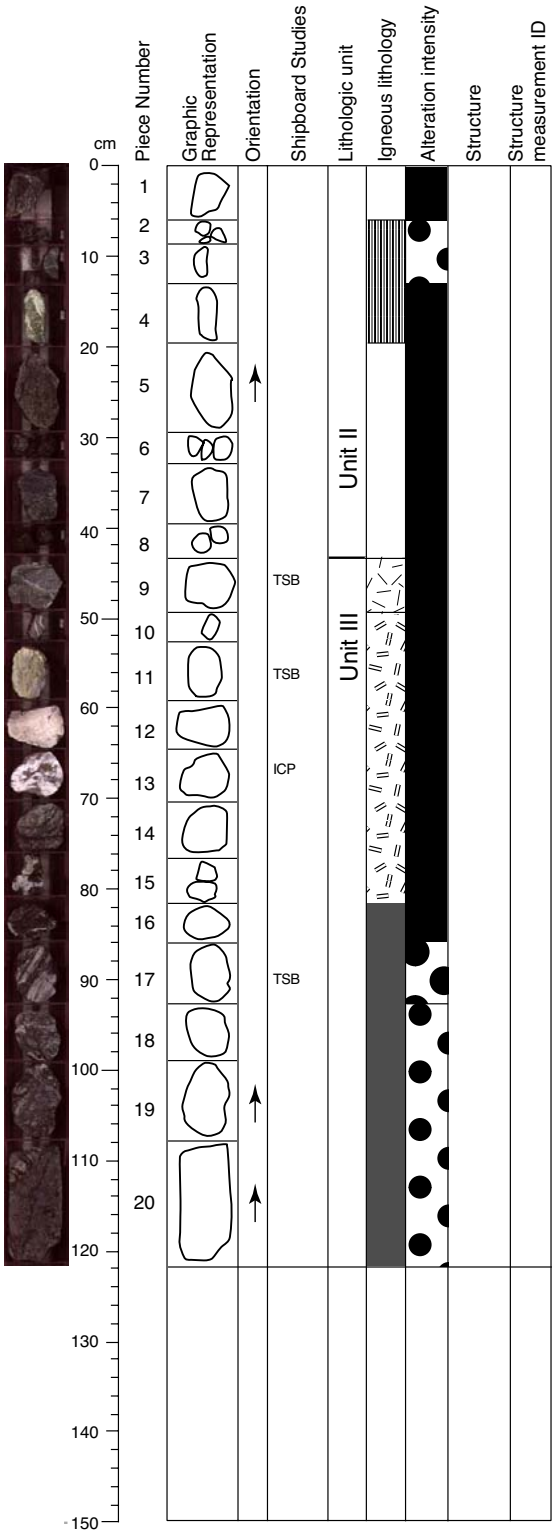
Core Photo



209-1271B-11R-1 (Section top: 55.50 mbsf)

UNIT II: Harzburgite/Dunite

Pieces 1–8

COLOR: Gray to black

PRIMARY MINERALOGY:

Olivine	Mode 85%–90%
Orthopyroxene	Mode 5%–15%
	Size 2–7 mm
	Shape/Habit Anhedral
Spinel	Mode 1%–2%
	Size 2–5 mm
	Shape/Habit Subhedral

COMMENTS: This section of core is composed of altered harzburgite and some pieces that are too altered to discern their original mineralogy.

UNIT III: Gabbro/Troctolite/Dunite

Pieces 9–20

COLOR: Green and brown to white

PRIMARY MINERALOGY:

Plagioclase	Mode 45%
	Shape/Habit Anhedral
Amphibole	Mode 50%
	Shape/Habit Subhedral to anhedral

COMMENTS: The lower part of this section is characterized by higher gabbro content in the peridotites. Anastomosing gabbroic material cuts the harzburgite in Pieces 9, 14, and 16-19. Also present are coarse-grained, brown-amphibole gabbros and microgabbro (Piece 3) with the same assemblage.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 40–100
This section represents a profile from serpentinized dunite through a sheared dunite and gabbro unit back into dunite that is cut by gabbroic-pyroxenitic dikes. The gabbros show alteration to brown amphibole and white secondary plagioclase (plus quartz and sericite) that is typical for the coarse-grained gabbros in Hole 1271B. Extent of serpentinization was high to complete in the dunite and harzburgite of the upper part of this section (Pieces 1 to 8). The lower part of the section is composed of variably deformed and altered dunite and gabbro. In Piece 9 (thin section from interval 44-46 cm), 60 % of the primary olivine is left. Gabbroic(?) material intruded the dunite in Piece 9 is completely replaced by green amphibole. Piece 11 is a tremolite-talc-chlorite schist that appears to contain prehnite and hydrogrossular intergrown with tremolite (thin section of interval 55-57 cm). Piece 17 is a highly deformed highly serpentinized harzburgite with amphibolite shear bands (thin section of interval 88-91 cm).

VEINS:
The upper part of this section is composed of completely serpentinized and altered dunites that show a dense network of serpentine-magnetite veins (Pieces 1 to 8). The middle part of this section contains gray metagabbroic rocks with rare serpentine-magnetite veins. The bottom of the section contains variably altered dunites/gabbros variably veined by dark green picrolite veins and late light green serpentine veins.

THIN SECTIONS: Samples 1271B-11R-1, 44-46 cm, 1271B-11R-1, 55-57 cm, and 1271B-11R-1, 88-91 cm

STRUCTURE:
The section consists of a wide variety of rock types and structural relationships between serpentinized dunite (Pieces 1-8, 15, 17-20), amphibolitized metagabbro (Pieces 10-14, 16) with the same bronze colored fibrous amphibole statically replacing mafic phases, pyroxenites (Piece 3), wehrlite (Piece 15), and dynamically metamorphosed and mylonitized mixed dunite and evolved metagabbro (Piece 18), and a tremolite-talc-chlorite schist (Pieces 11). Although completely altered, all metagabbroic rocks are characterized by gabbroic igneous textures, except Pieces11 and 18). Piece 18 appears to show the same static replacement of mafic phases by bronze fibrous amphibole. Thus mylonitization must have been at a higher temperature than lower amphibolite facies. A pyroxenite/dunite contact is preserved in Piece 3, wehrlite - feldspathic wehrlite/dunite contact in Piece 15, and similar contacts between dunite and gabbroic to pyroxenitic lithologies in Pieces 19-20. Pieces 19 and 20 appear to have been impregnated by gabbroic to pyroxenitic magmatic veins. Other than in Pieces 11 and 18, no other evidence of crystal-plastic deformation was observed. This section, however, is host to several low-temperature semibrittle and brittle shear zones. Pieces 4 and 11 are high-intensity semibrittle shear zone dominated by schistose tremolite, talc, and chlorite. A small serpentine- filled fault in Piece 11 offsets the schistose fabric by approximately 1 cm perpendicular to the shear foliation. Pieces 5-8 contain numerous conjugate sets of magnetite-filled shear fractures with less than 0.5 cm offset. Piece 9 is brecciated with two generations of serpentine. Piece 16 exhibits irregular-shaped open shear fractures and green serpentine veins cut by chrysotile veins. Pieces 19 and 20 show network veining of black serpentine cut by later green serpentine and late oxide/carbonate veins.

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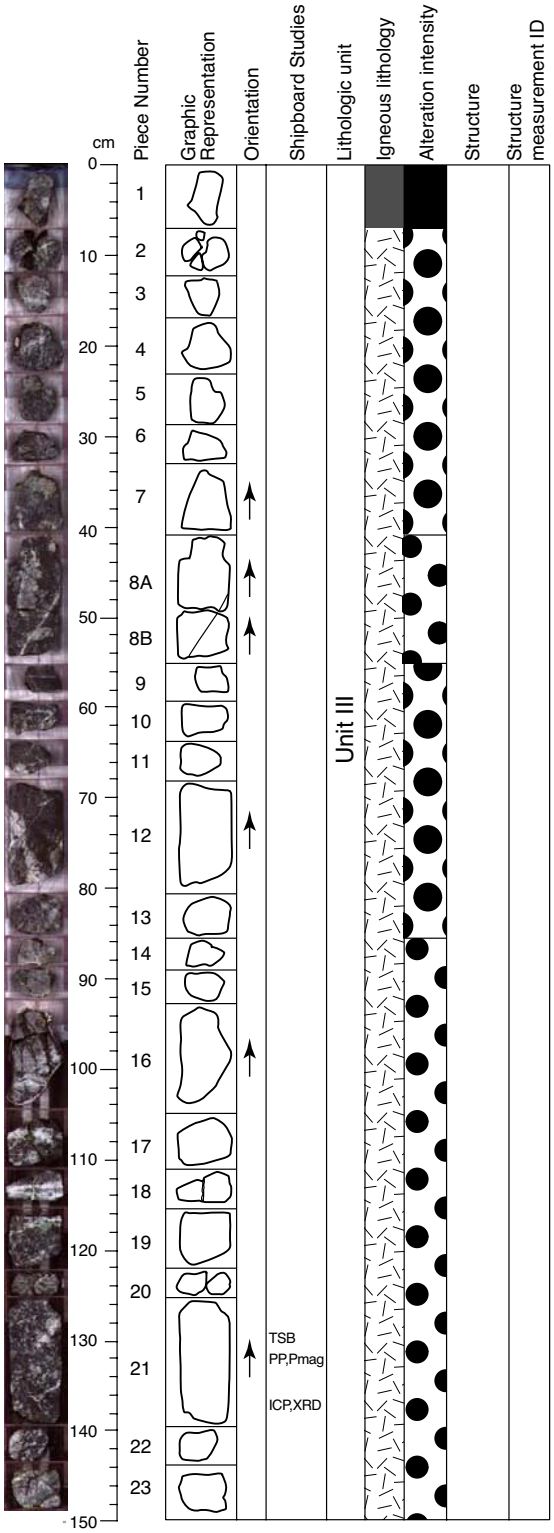

209-1271B-12R-1 (Section top: 60.10 mbsf)

UNIT III: Gabbro/Troctolite/Dunite

Pieces 1–23

COLOR: Gray to black

PRIMARY MINERALOGY:

Olivine	Mode 60%–94%
Plagioclase	Mode 5%–40%
Clinopyroxene	Mode 5%–20%

COMMENTS: This section consists of mainly of dunite with impregnated with gabbroic material. The proportion of gabbroic material varies substantially from less than 10% to more than 50%. Pieces 8 and 12 show continuous gradation from gabbro into dunite with intergranular gabbroic material.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 70–95
Except Piece 1, which is a highly altered harzburgite with abundant fresh olivine with amphibolite veinlets, this section is composed of highly to very highly altered amphibole-bearing dunite. Olivine is altered to serpentine and magnetite. The black domains may contain some fresh olivine. Abundant fresh olivine is preserved in patches (Pieces 7 and 11). The section has variable amounts of gabbroic patches and veins within the dunites. The gabbroic material is completely altered to amphibole and commonly shows deformation and amphibole veining into the dunite.

VEINS:
This section is composed of weakly veined dunites/gabbros similar to Section 1271A-11R-1. Rare serpentine and serpentine-chlorite veins may contain some carbonates (e.g., Piece 16).

THIN SECTIONS: Sample 1271B-12R1, 126-131 cm

STRUCTURE:
The section consists of many mixed rock types, dominantly variably altered dunite, troctolitic gabbro, and gabbro. Pieces 1-7 consists of dunite with veins or contacts with gabbro. Pieces 1–23 all show varying degrees of magmatic brecciation associated with infusion of gabbroic melt along grain boundaries. Pieces 8 has a massive blocky looking pyroxenite or gabbro within dunite that is associated with what looks like melt impregnation texture into the adjacent dunite with altered gabbroic material outlining the shapes of olivine grains. Piece 9 is a dunite and all remaining Piece are dunites with veins or contacts with gabbroic rocks or melanocratic troctolitic gabbro with high proportions of both clinopyroxene and olivine. Piece 17 contains a massive amount of gabbroic material infiltrating dunites. All gabbros show minor ductile deformation. Olivine grain size in the dunites can reach 25 mm and large as 0.5 cm in Pieces 22 and 23, also indicating little crystal plastic deformation of the section. There is only minor brittle shear deformation within this section. Pieces 1–23 all show varying degrees of magmatic brecciation associated with infusion of gabboic melt along grain and crystal boundaries. Piece 3 contains a 1 cm wide semi-brittle shear zone in which primary gabbro minerals are fractured and replaced by tremolite and/or talc. Pieces 1-2, and 16-20 clearly show prominent green serpentine veins crosscutting the melt impregnation network. Piece 4 shows white chrysotile veins cut by later green serpentine veins. Piece 5 has a serpentine filled shear zone. Pieces 5 to 20 show very little alteration veining. Piece 22 shows two generations of green serpentine veins. Serpentine slickenfibers are present in Piece 23.

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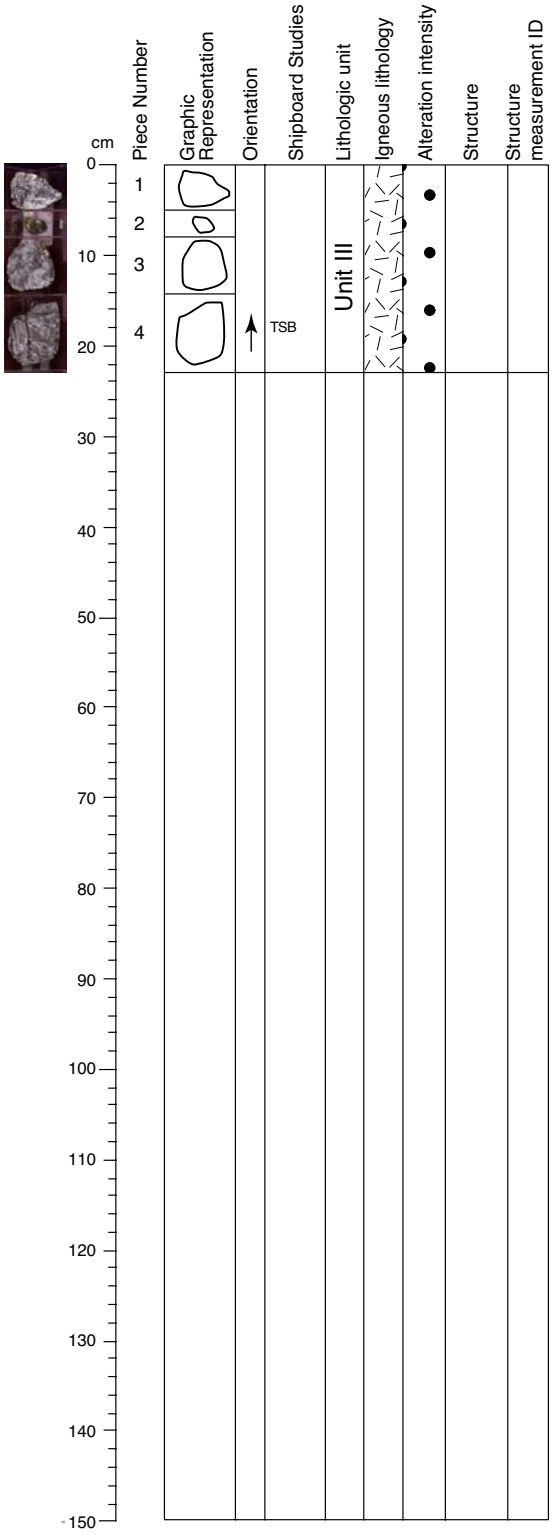

209-1271B-12R-2 (Section top: 61.60 mbsf)

UNIT-III: Gabbro/Troctolite/Dunite

Pieces 1–4

COLOR: Gray to black

PRIMARY MINERALOGY:

Olivine	Mode 50%–60%
Plagioclase	Mode 40%–50 %
	Shape/Habit Anhedral

COMMENTS: This section consists of dunite that has intergranular gabbroic material.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 20–40
Like Section 1271B-12R-1, this section consists of amphibole-bearing dunite, but the intensity of alteration is much lower (about 25% total). Olivine is slightly altered to chlorite and amphibole, except along cracks where it is altered to serpentine. A thin section of Piece 4 (interval 16-19 cm) shows that the gabbroic material is completely altered to amphibole and commonly shows deformation and amphibole veining into the dunite. Olivine is this thin section is 80% fresh.

VEINS:
Early black serpentine-magnetite veins are cut by white, sigmoidal chrysotile veins.

THIN SECTIONS: Sample 1271B-12R-2, 16-19 cm

STRUCTURE:
The section consists of olivine gabbro to troctolitic gabbro, possibly with melt impregnation or brecciation texture. The textures appear igneous and undeformed by crystal plastic deformation. There is a minor ductile to semi-brittle shear zone within a gabbro vein in Piece 3. The exact degree of strain within this shear zone accommodated by brittle vs. ducitle shear zone could not be determined in hand specimen. Piece 4 is cut by black serpentine veins and a single pyrite vein.

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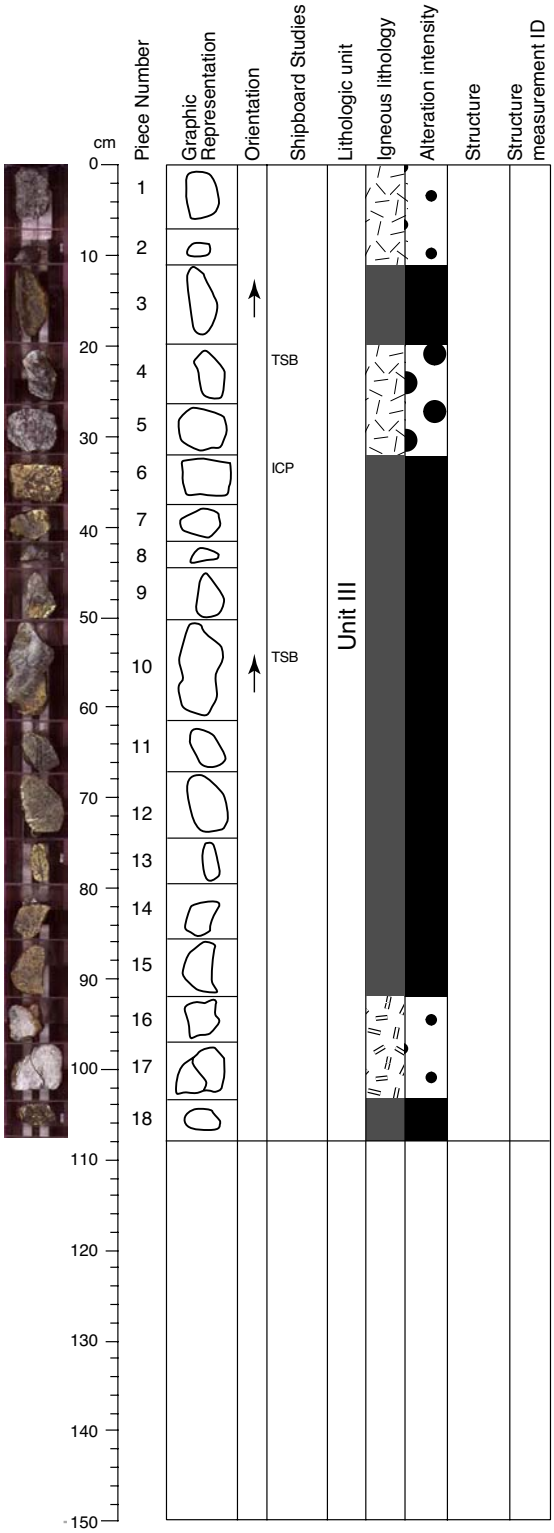

209-1271B-13R-1 (Section top: 65.10 mbsf)

UNIT III: Gabbro/Troctolite/Dunite

Pieces 1–18

COLOR: Green to black

PRIMARY MINERALOGY:

Olivine	Mode 60%–94%
Plagioclase	Mode 5%–40%
Spinel	Mode 1%–35%
	Shape/Habit Anhedral

COMMENTS: This section contains a variety of rock types but is composed primarily of dunite with gabbroic impregnation (Pieces 1-5, and 7-15). Spinel is abundant in most of the peridotite (up to 7%) and chromite makes up nearly half of Piece 6. Gabbroic dikes cut the dunite in Pieces 9 and 10.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 40–80
The top of this section consists of moderately (Pieces 1 and 2) and highly altered dunite with gabbro (Pieces 4 and 5). Olivine is mostly fresh, except for some serpentinization and alteration to amphibole near the contact to the amphibolite (thin section of Piece 4, 20-24 cm). The lower part of the section is composed of completely altered and picrolite-veined dunite (Pieces 3, 6, 7, 11 to 15, and 18), moderately altered chromitite with chromite rims altered to secondary oxide (Piece 6), gabbro-impregnated dunite (Pieces 8-10), and two pieces of amphibolite (Pieces 16 and 17), one of which (Piece 16) shows inclusions of fresh olivine.

VEINS:
Most of this section is composed of chromite-bearing dunite with talc-amphibole-chlorite veins that could be breakdown products of plagioclase-bearing magmatic veinlets. Some serpentine veins also occur in this section (e.g., Piece 10). In Piece 6, talc-amphibole veins intersect a chromitite-pod.

THIN SECTIONS: Samples 1271B-13R-1, 20-24 cm and 1271B-13R-1, 52-59 cm

STRUCTURE:
The section consists of a variety of rock types including altered olivine gabbros (Pieces 1, 3, and 4) similar to those contained in Section 1271B-12R-2, dunites with contacts with gabbros (Pieces 2, 10, 16, and 17) and serpentinized dunites without gabbroic intrusions (Pieces 3, 6-9, 22-25, and 18). Dunite Piece 6 contains a chromitite pod and most dunites are spinel rich. Piece 16 contains a gabbroic contact with dunite that is interfingering suggesting melt wall rock reactions. Pieces 5 and 10 (olivine gabbro) have a slight crystal plastic fabric locally within each piece. Semi-brittle shear zones in which schistose tremolite and/or talc grow during fracturing of igneous minerals overprint ductile deformation in gabbro veins in Pieces 5, 10, and 17. Piece 12 displays moderately well developed cross fiber serpentine foliation. Pieces 7, 9, 10, 12, 13, 14, and 18 have serpentine veins cut by later oxide veins. Piece 18 also has late crosscutting carbonate veins. Pieces 11 and 13 shows extensional tension cracks cutting serpentine veins. Piece 8 shows a green serpentine vein crosscutting earlier chrysotile veins. This relationship is uncommon.

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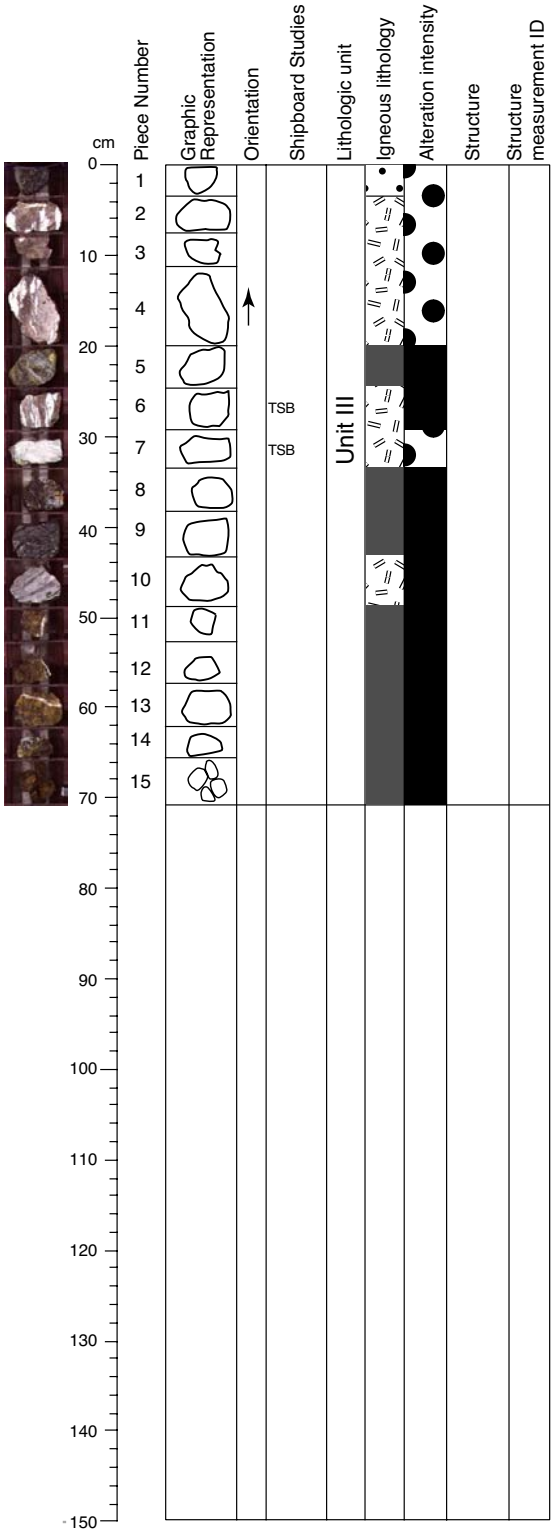

209-1271B-14R-1 (Section top: 69.80 mbsf)

UNIT III: Gabbro/Troctolite/Dunite

Pieces 1–15

COLOR: Green or orange to brown

PRIMARY MINERALOGY:

Olivine	Mode 80%–100%
Orthopyroxene	Mode <1%
	Size 2–5 mm
	Shape/Habit Anhedral
Plagioclase	Mode <20%
	Size 5 mm
	Shape/Habit Anhedral
Spinel	Mode <3%

COMMENTS: The section consists of a mixture of cobbles that include altered dunite with variable amounts of gabbroic impregnation, troctolite and amphibole gabbro. The troctolite (Piece 1) contains subhedral olivine grains (0.5-3 mm in size) enclosed by plagioclase matrix and has a cumulus texture. A large plagioclase as large as 0.5 cm occurs in the same piece. Piece 5, 8 and 9 are dunite with either anastomosing gabbroic material or plagioclase-rich patches. Piece 7 is totally altered but preserves a 5 mm band of oxides (former spinel?) near one end of the piece. Pieces 11-15 are altered dunite with very little orthopyroxene (<1%). Brown-amphibole gabbro with as much as 30% oxides is found in Pieces 2-4. The texture of these gabbros varies from pegmatitic in Pieces 2-4 to fine-grained gneissic or mylonitic in Piece 10.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 30–100
Pieces 11 to 15 are strongly weathered dunites similar to Pieces 8 to 14 in Section 1271B-15R-1. These are probably in situ. The rest of the section is a mix of completely altered gabbro with quartz-epidote-zeolite veins (Pieces 2 to 4), dunite/gabbro (Piece 1), chlorite-veined dunites (Piece 5), protomylonitic white to brown gabbros (Piece 6), weakly weathered serpentinized dunites (Pieces 8 and 9), and pyroxenites with spinelite (Piece 7). Quite possibly, these pieces fell down the hole and represent a mix of lithologies from shallower intervals of Hole 1271B.

VEINS:
The section is composed of serpentinized dunites and metagabbros. The metagabbros display occasional quartz-epidote-zeolite veins (e.g., at the top of Piece 2). The dunites show a network of serpentine-magnetite veins. The completely serpentinized harzburgites and dunites at the bottom of the section show late carbonate veins.

THIN SECTIONS: Samples 1271B-14R-1, 25-29 cm and 1271B-14R-1, 32-35 cm

STRUCTURE:
The section consists of a wide variety of rock types. Piece 1 and 5 appear to have impregnation texture in which gabbroic material wets grain boundaries of olivine, eventually crystallizing as mafic to felsic interstitial phases. Amphibolitized metagabbro (Pieces 1,2, 3, 4, and 7) with the same bronze colored fibrous amphibole statically replacing mafic phases as seen in previous sections also are present. All appear statically altered with fibrous amphibole and have igneous textures preserved, except for Piece 6, which has undergone mylonitization prior to the static overprint. Piece 10 is a gabbroic rock without severe amphibolitization. Pieces 4, 7, and 11-15 consist of dunite with high amounts of spinel relative to harzburgites in the core and Piece 7, although severely altered, contains a spinel band. Pieces 11-15 contain dense arrays of black serpentine filled shear fractures with minimal offset. These highly altered pieces also contain sparse crosscutting late green serpentine and more conspicuous carbonate/oxide veins. Quartz-albite veins cut rodingsitized gabbro in Pieces 2-4. Piece 5 contains melt impregnation veins cut by green serpentine veins and late oxide veins.

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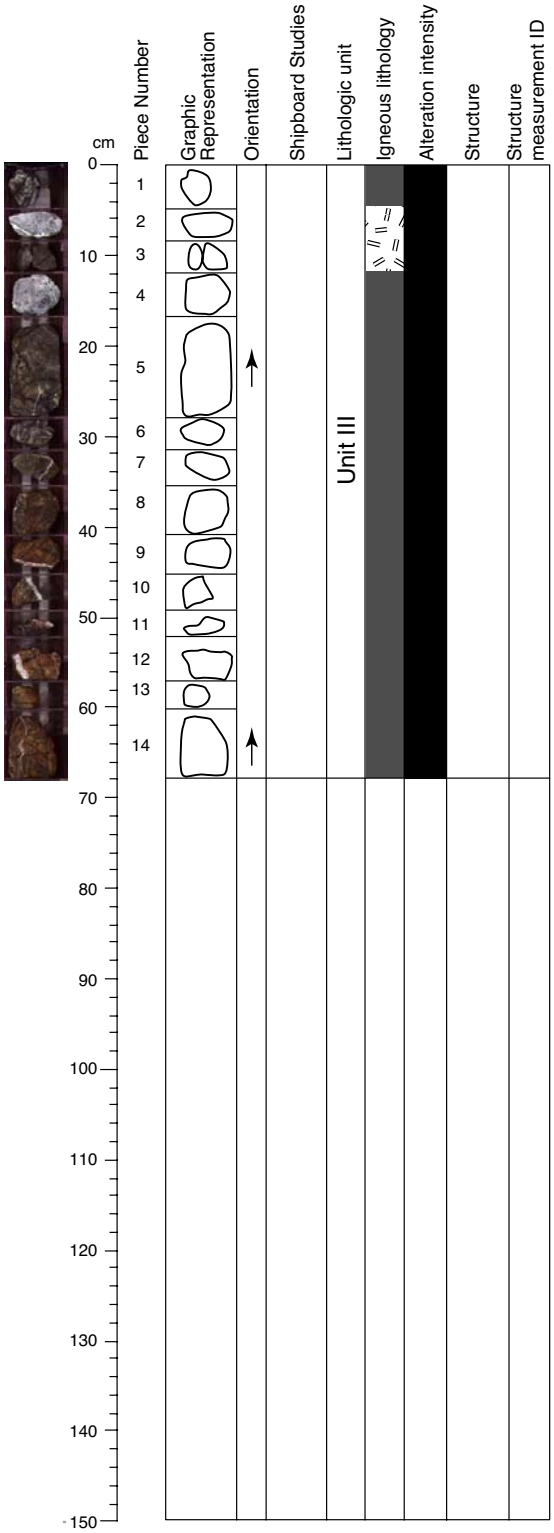


209-1271B-15R-1 (Section top: 74.80 mbsf)

UNIT III: Gabbro/Troctolite/Dunite

Pieces 1–14

COLOR: Light green to black

PRIMARY MINERALOGY:

Olivine	Mode >99%
Spinel	Mode <1%

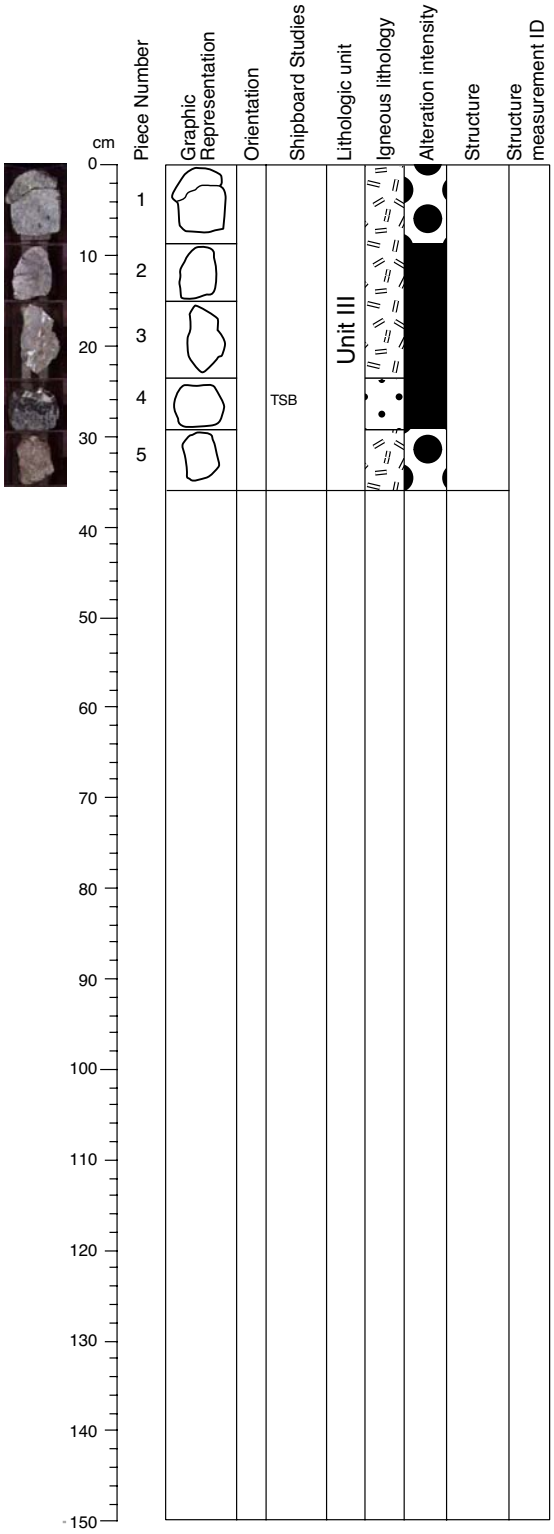
COMMENTS: This section consists of altered dunite in Pieces 1, and 5-14, and altered gabbroic rock in Pieces 2-4.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 80–100
This section contains completely serpentinized dunite (Piece 1 and part of Piece 3), highly to completely altered metagabbro (Pieces 2 and 4) and completely altered harzburgite. The harzburgite is highly weathered and aragonite-veined in Pieces 8 to 14. Even in the weathered section, black serpentine-magnetite veins persist.

VEINS:
The section is composed of completely serpentinized dunites and harzburgites with a set of serpentine-magnetite veins that were crosscut by rare, white, cross-fiber chrysotile veins (e.g., Piece 5). These two generations of veins are cut by thick, coarse grained, white aragonite veins.

STRUCTURE:
The section consists of a variety of rocks types including serpentinized dunite (Pieces 1, 3, and 5-14) and metagabbro (Pieces 2 and 4). Piece 4 is amphibolitized metagabbro with the same bronze colored fibrous amphibole statically replacing mafic phases as observed in prior sections. Piece 7 contains a gabbroic contact with dunite. In general, the section shows the effects of only minor crystal plastic deformation. Brittle-ductile deformation is observed in a gabbro vein in Piece 2 and is overprinted by brittle shear fracturing and incipient brecciation with calc-silicate veins. Pieces 5 and 6 have a dense dark serpentine network cut by late green serpentine and carbonate veins. Pieces 7 and 8 contain dense shear fractures with small offsets around the margins of ductilely deformed gabbro veins. Pieces 9-15 have dense arrays of shear fractures filled with magnetite that have little or no offset. These pieces contain sparse crosscutting late green serpentine and more conspicuous carbonate/oxide veins. Piece 4 shows two generations of green serpentine.

Core Photo



209-1271B-16R-1 (Section top: 79.50 mbsf)

UNIT III: Gabbro/Troctolite/Dunite

Pieces 1–5

COLOR: Black to brown

PRIMARY MINERALOGY:

Olivine	Mode 80% Size 0.2–10 mm Shape/Habit Anhedral
Plagioclase	Mode 20% Size 0.2–0 mm Shape/Habit Anhedral

COMMENTS: Gabbro makes up the bulk of this section (Pieces 1-3 and 5). It is the same brown-amphibole gabbro found throughout Hole 1271B. It has a minor amount of oxide and the grain sizes that vary from fine to medium. A gneissic texture is developed in Piece 3. Piece 4 is a troctolite that has fine-grained olivine surrounded by plagioclase.

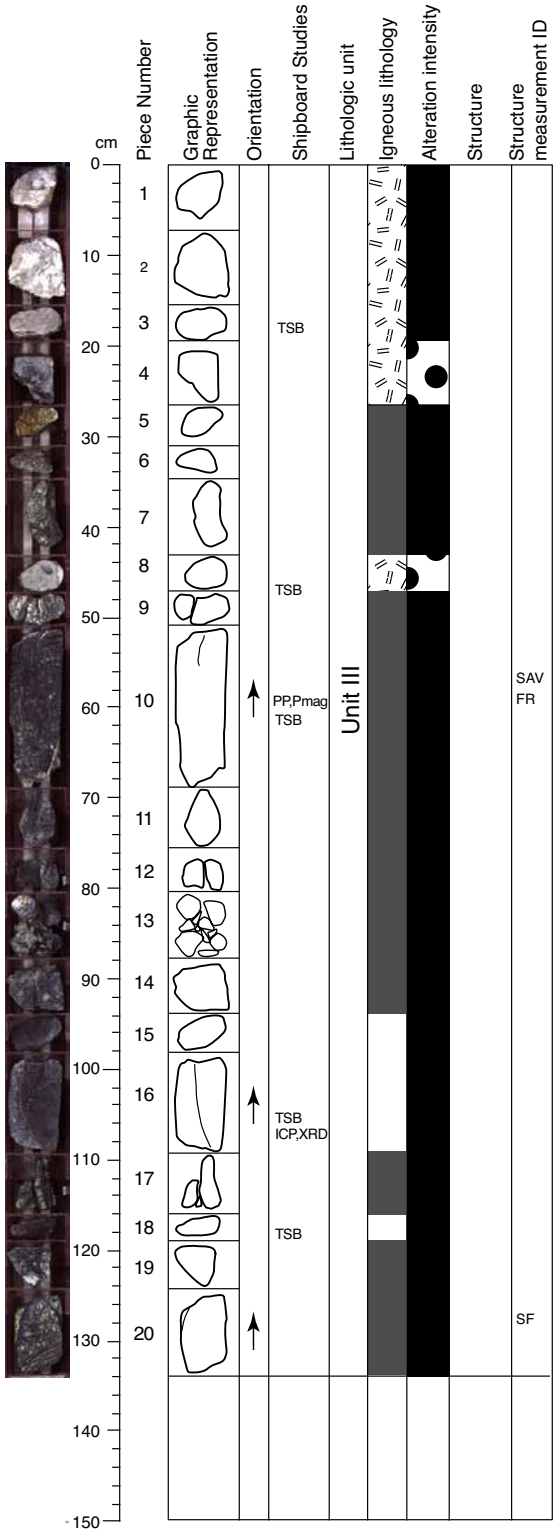
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION
This section consists of gray gabbro (Pieces 1, 2, and 5) and white to brown gabbro with brown amphibole and white secondary plagioclase (plus quartz and sericite; Piece 3). Piece 4 is the contact between a highly amphibole-altered gabbro and a highly serpentinized dunite. A thin section of Piece 4 (interval 24-27 cm) suggests that plagioclase in the gabbro is largely fresh, while clinopyroxene has completely reacted to amphibole. Gabbroic veinlets invade the dunite. Presumed plagioclase in veins is altered to chlorite.

VEINS:
The gabbro of this section is weakly veined by serpentine and talc veins. The dunite fragments within the gabbro-intruded interval host serpentine-magnetite veins.

THIN SECTIONS: Sample 1271A-16R-1, 24-27 cm

STRUCTURE:
The section consists of a variety of rock types. Piece 1 is a foliated gabbro with olivine augen with aspect ratios of 4 or 5:1. Piece 2 is amphibolite schist, which include ductile high strain zones. The high strain zones are cut by serpentine veins. Piece 3 consist of a coarse to fine flaser gabbro, where mafic phases have been statically altered to fibrous amphibole after crystal plastic deformation. Ghost pyroxene with recrystallized neoblast tails and good shear sense indicators are present in the piece, however, the piece is not oriented. Piece 4 is a troctolite with large olivine enclosed in a matrix of plagioclase and clinopyroxene. Olivine grains are 1 cm or more in diameter. A contact with plagioclase-rich gabbro also exists in the sample. Piece 5 consists of an amphibolitized metagabbro with some igneous textures preserved, although cut by a ductile shear zone. The ductile shear zone in Piece 4 has a very minor brittle overprint. Pieces 3-5 have green serpentine veins.

Core Photo



209-1271B-17R-1 (Section top: 84.50 mbsf)

UNIT III: Gabbro/Troctolite/Dunite

Pieces 1–20

COLOR: Brown to white and green

PRIMARY MINERALOGY:

Olivine	Mode 82%–95% Size 0.2–10 mm Shape/Habit Anhedral
Orthopyroxene	Mode 2%-10%
Spinel	Mode <3%

COMMENTS: The bulk of this section is comprised of altered dunite (Pieces 5-7, 9-14, 19-20) and lesser amount of altered harzburgite (Pieces 15-16). The altered dunite in Pieces 19 and 20 has gabbroic impregnations. The beginning of the core is composed of brown-amphibole gabbro with a pegmatitic texture and altered plagioclase (Pieces 1-4 and 8).

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 50–99
This section starts with variably altered white to brown gabbro (Pieces 1 and 2) and completely amphibolized gabbro in contact to dunite (Piece 3). Piece 4 is a highly altered dunite with notable amounts of fresh olivine. The lower part of the section consists of highly to completely serpentinized dunite with gabbroic impregnations. Piece 8 is an amphibolite with a cm-sized dunite inclusion. Pieces 15 and 16 are partly melt-impregnated harzburgites, in which presumed plagioclase is altered to chlorite and talc. Thin sections of Pieces 10, 16, and 18 reveal trace to minor amounts of brucite.

VEINS:
The gabbro in the top of this section (Pieces 1 to 3) is poorly veined and shows abundant wispy serpentine veins in Piece 3. The lower part of the section contains early serpentine-magnetite veins that are cut by green picrolite (magnetite) veins. White, wispy chrysotile veins are the latest generation of veins in this section. In Piece 10 the chrysotile veins form subparallel ribbon veins.

THIN SECTIONS: Samples 1271B-17R-1, 17-19 cm, 1271B-17R-1, 45-48 cm, 1271B-17R-1, 104-108 cm, and 1271B-17R-1, 118-120 cm

STRUCTURE:
The section consists of amphibolitized metagabbro (Pieces 1-3) with the same bronze colored fibrous amphibole statically replacing mafic phases. Piece 2 has a pegmatitic grain size with ghosts of sector zoning in the altered plagioclase indicative of igneous textures. Pieces 3 and 8 appear to be altered pyroxenite with bronze fibrous amphibole. Piece 4 consists of gabbroic material enclosing very coarse olivine and finer grained olivine across a contact. Pieces 5-7, and 10-20 consist, at least in part, of serpentinized dunite. Pieces 15 and 16 are in contact with altered gabbroic or pyroxenitic material, which appears to impregnate dunitic olivine. Although altered, all gabbroic rocks are characterized by gabbroic igneous textures. Dunitic samples have abundant spinels with no clear crystal plastic fabric and large grain sizes indicative of low-stress conditions. A semi-brittle, talc and tremolite dominated shear zone, approximately 0.5 cm thick cuts ductile fabric in Piece 3. Pieces 10 and 11 contain sets of late subvertical shear fractures filled by talc veins. Piece 20 displays poorly developed serpentine foliation. Pieces 7, 10, 17, 19 and 20 show green serpentine veins crosscutting black serpentine networks. Pieces 10 and 19 have two generations of green serpentine and show crosscutting relationships. Piece 17 has a large (0.5 cm wide) green serpentine vein showing dilatational cross fibers.

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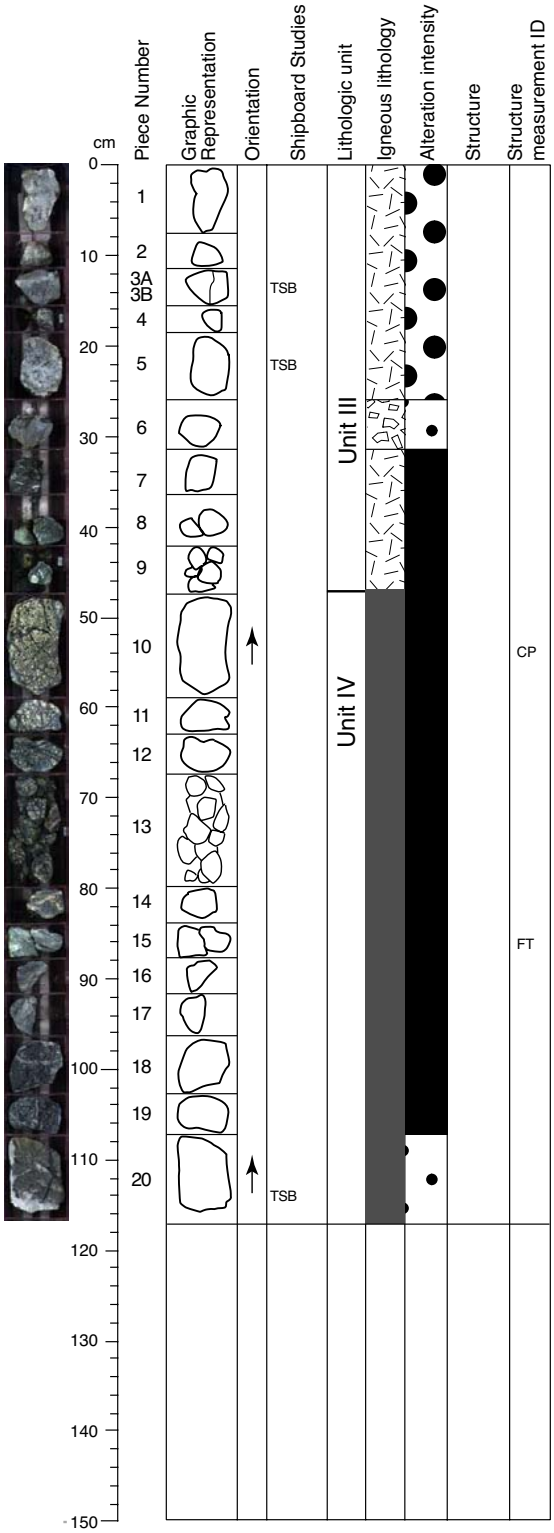


209-1271B-18R-1 (Section top: 89.10 mbsf)

UNIT III: Gabbro/Troctolite/Dunite

Pieces 1–9

COLOR: Dark gray to orange to white

PRIMARY MINERALOGY:

Olivine	Mode 40%–60%
Clinopyroxene	Mode 15%–40% Size up to 15 mm Shape/Habit poikilitic
Plagioclase	Mode 15%–20% Size up to 3 mm Shape/Habit Subhedral to euhedral

COMMENTS: Pieces 1 – 9 of this section are moderately altered olivine gabbros. They contain a significant proportion of fresh olivine that is often enclosed in poikilitic clinopyroxne and associated with subhedral to euhedral plagioclase.

UNIT IV: Dunite

Pieces 10–20

COLOR: Green and gray to black

PRIMARY MINERALOGY:

Olivine	Mode 90%–99%
Spinel	Mode 1%–10%

COMMENTS: This section of the core is altered dunite with variable amount of gabbroic impregnation. Piece 10 is very enriched in spinel. Pieces 14 to 17 are totally altered serpentinites with gabbroic dikes.

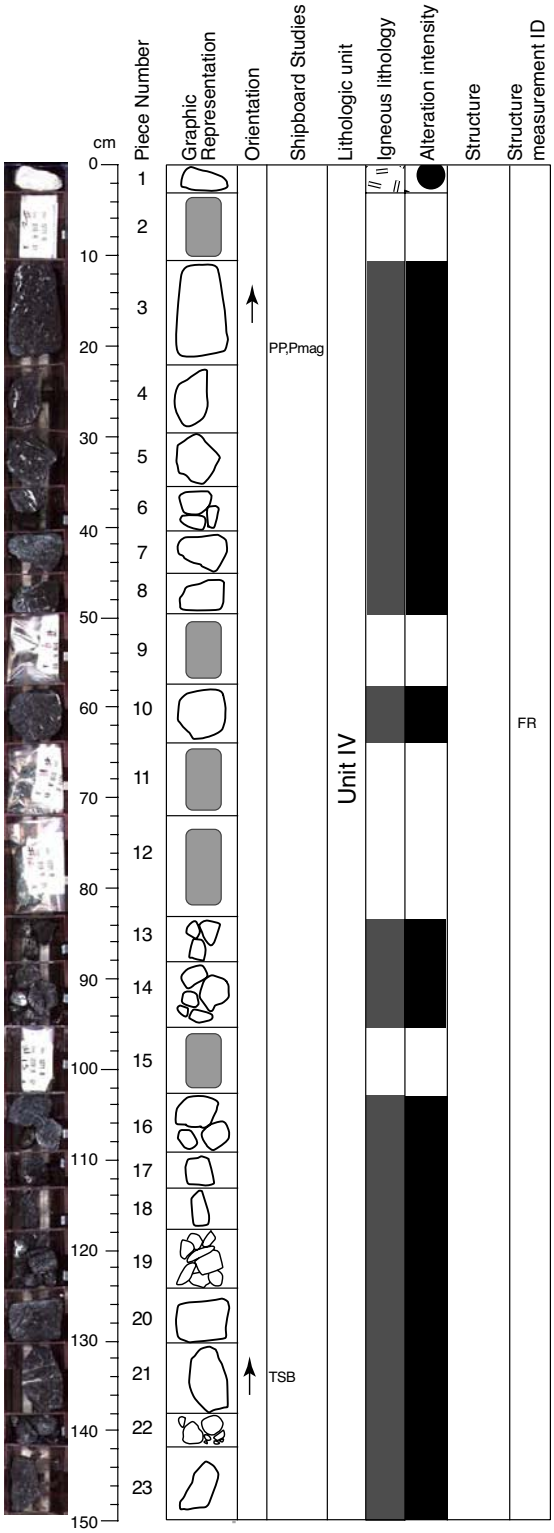
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 30–99
This section consists of variably serpentinized and weathered dunite, harzburgite, and wehrlite that were intruded by gabbro and gabbroic dikes that are variably altered to brown amphibole and white secondary plagioclase. Gabbro veins in Pieces 14 to 17 appear rich in tremolite, those in Pieces 18 and 19 are talc-rich, and those in Piece 20 are altered to chlorite-amphibole-talc. Pieces 6 and 20 are relatively fresh dunites with serpentinization limited mainly to veins. Olivine shows minor low-temperature alteration to red-green clay.

VEINS:
The top of this section (Pieces 1 to 6) shows serpentine-magnetite and talc veins (the latter only in Pieces 1, 2, 4, and 5). Pieces 7 to 9 host only white serpentine veins. Pieces 10 to 13 contain serpentine-magnetite veins that are cut by composite talc-serpentine veins. Pieces 18 to 20 contain one generation of serpentine-magnetite veins.

THIN SECTIONS: Samples 1271B-18R-1, 13-16 cm, 1271B-18R-1, 20-23 cm, and 1271B-18R-1, 114-117 cm

STRUCTURE:
The section consists of a variety of rock types. Pieces 1-6 are patchy olivine to troctolitic gabbro that tend to have large and small olivine grain sizes. Pieces 8-13 and 18-19 are dunite and Pieces 7 and 14-17 are cataclasized gabbro. Piece 20 is a mixture of olivine and clinopyroxene, with some plagioclase, possibly a feldspathic wehrlite, similar to a part of Piece 6. All gabbroic and pyroxene bearing rocks appear to contain igneous textures. Olivine grain sizes in dunite appear coarse and spinel is abundant in the dunites, but lacks preferred orientation. Pieces 17 and 18 are dunites that have gabbroic melt impregnation textures and are cut by a dense black serpentine network. The section contains a high intensity semi-brittle shear zones within Pieces 14-17. Fibrous serpentine and/or talc filling fractured voids define the strong foliation within this shear zone. There is a low-intensity semi-brittle shear zone in Piece 7. Fibrous serpentine and talc fill fractured voids and define a weak foliation. Pieces 8 and 9 have two generations of crosscutting green serpentine veins. Pieces 10 to 13 also show dense black serpentine network, cut by rare green serpentine/talc veins. Slickenfibres are visible on Piece 10.

Core Photo



209-1271B-19R-1 (Section top: 94.10 mbsf)

UNIT IV: Dunite

Pieces 1–23

COLOR: Gray to black

PRIMARY MINERALOGY:

Olivine	Mode 95% Size 5–15 mm
Spinel	Mode 5% Size 2–3 mm

COMMENTS: The top of this core is an altered gabbro and the remainder consists of altered dunite impregnated with gabbroic material. The shapes of the olivine in the dunite can be readily discerned because the grain boundaries are revealed by the gabbroic impregnation. Original grain sizes are in the 5-15 mm range, and textures are protogranular. Spinel is abundant and relatively coarse (1-2 mm), subhedral to rounded. The spinel is located at olivine grain junctions, or included in the olivine. Locally, spinel grains are concentrated in layers, 2 to 4 mm thick. The gabbroic material was made of plagioclase and clinopyroxene, but now is largely altered into amphibole. The gabbro melt followed several directions of <1-mm-wide microfractures that are now filled by the minerals, and extended along olivine and, more particularly along spinel grain boundaries. Millimeters wide patches of plagioclase / clinopyroxene crystallized at triple junctions. Percentage impregnation varies with pieces, from1 to 10 %, and is irregularly distributed. Pieces 3-6 are the most impregnated and contain larger (2 mm wide) gabbroic veins.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 85–99
This section consists mainly of completely serpentinized gray to black dunite. Thin section observations (Piece 21, 133-136 cm) indicate minor amounts of brucite, along with serpentine and a few percent of magnetite and talc. Gray-silver dikelets that are interpreted as melt impregnation and are composed mainly of chlorite after plagioclase. Bins 2, 9, 11, 12, and 15 contain serpentine mud.

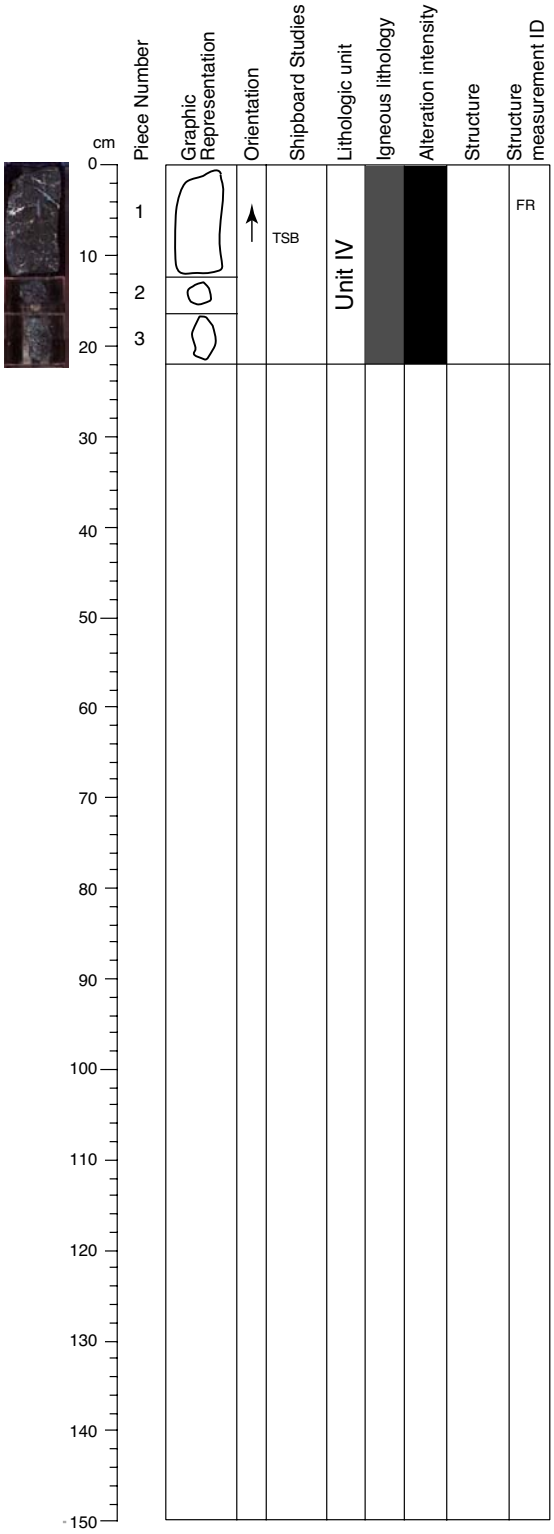
VEINS:
This section contains early serpentine-magnetite veins that were crosscut by green, massive picrolite veins. Pieces 13 and 14 have chrysotile-talc veins.

THIN SECTIONS: Sample 1271B-19R-1, 133-136 cm

STRUCTURE:
The section consists dominantly of dunite showing possible melt impregnation textures defined by alteration minerals. The alteration minerals have apparently formed statically replacing crystallization products (clinopyroxene or plagioclase) of melt channels interstitial to coarse olivine grains (up to 2 cm in grain size). The narrow melt channels appear to have wetted grain boundaries and now serve to define the olivine grain shapes visible of the cut face of the core. The large grain sizes indicate a low stress environment and low amounts of crystal plastic strain in the dunites. Piece 1 is a highly altered pyroxenite or gabbro. This section has experienced very high degrees of brittle deformation, which includes five intervals of uncohesive fault gouge that are present in Pieces 2, 9, 11, 12, and 15. These gouges are matrix-supported breccias with gray, clay- and/or serpentine-rich matrices. Clasts are subrounded to angular altered serpentinite ranging in size from 0.1 cm to 0.8 cm. Intervals of core bordering gouge zones are all variably fractured with planar to slightly anastomosing magnetite-filled shear fractures defined with conjugate sets having <0.2cm offset. Piece 7 contains a narrow fault, which truncates a green serpentine vein, but no offset could be measured. All other pieces are similar and show black serpentine networks cut by sparse green serpentine and later talc. Pieces 13 and 14 show slickenfibers and Piece 3 shows oblique shear fibers in a green serpentine vein. All these pieces also show melt impregnation.

NOTE: In this section, "white" color in "Igneous Petrology" and "Alteration intensity" columns represents intervals not describe.

Core Photo



209-1271B-19R-2 (Section top: 95.60 mbsf)

UNIT IV: Dunite

Pieces 1–3

COLOR: Gray to black

PRIMARY MINERALOGY:

Olivine	Mode 95% Size 5–15 mm
Spinel	Mode 5% Size 2–3 mm

COMMENTS: This short core consists of three pieces of altered dunite impregnated with gabbroic material, and is similar to the previous core 209-1271B-19R1.The amount of impregnation is about 10 to 15% for Piece 1 and about 2% for Pieces 2 and 3.

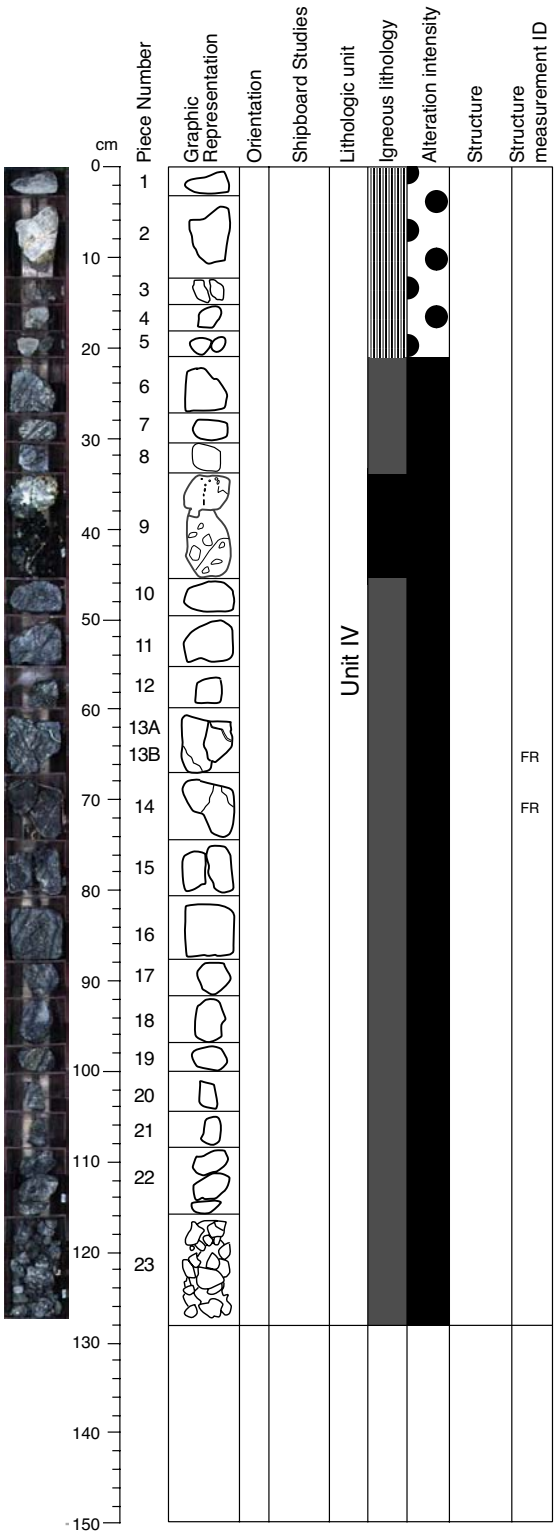
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 99
The three pieces of this section are completely serpentinized gray to black dunite similar to section 1271B-19R-1. A thin section of Piece 1 (4-10 cm) reveals high amounts of brucite along with serpentine, magnetite, and minor chlorite-talc veinlets. In hand specimen and thin section, brucite seems to be enriched in bluish-black halos along late serpentine veins.

VEINS:
Rocks in this section contain early serpentine-magnetite veins and younger massive, green picrolite veins

THIN SECTIONS: 1271B-19R-2, 4-10 cm

STRUCTURE:
The section consists of dunite showing possible melt impregnation textures defined by alteration minerals. They have apparently formed statically replacing crystallization products (clinopyroxene or plagioclase) of melt channels interstitial to coarse olivine grains (up to 2 cm in grain size). The narrow melt channels appear to have wet grain boundaries and now serve to define the olivine grain shapes visible of the cut face of the core. The large grain sizes indicate a low stress environment and low amounts of crystal plastic strain in the dunites. Piece 1 contains parallel oriented sets of planar shear fractures with <0.2 cm offset. Pieces 2 and 3 contain variable densities of planar magnetite-filled shear fractures with no measurable offset. Pieces 2 and 3 contain sparse green serpentine and talc.

Core Photo



209-1271B-20R-1 (Section top: 98.80 mbsf)

UNIT IV: Dunite

Pieces 1–23

COLOR: Gray to black

PRIMARY MINERALOGY:

Olivine	Mode 95% Size 5–15 mm
Spinel	Mode 5% Size 2–3 mm

COMMENTS: The altered dunite with gabbroic impregnation found in Core 1271B-19R is also found in this core. The amount of impregnation is about 3%. Piece 11 contains a 4-mm-thick spinel layer that runs for about 4 cm. Pieces 1 to 5 are completely altered.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 95–99
This section consists of completely serpentinized gray to black dunite similar to Sections 1271B-19R-1 and 19R-2. Gray-silver dikelets are interpreted as melt impregnation and are now composed mainly of chlorite after presumed plagioclase. Brucite is possibly present, but its identification was not confirmed by thin section or XRD analysis.

VEINS:
The dunites of this section hosts early black serpentine-magnetite veins and a later green picrolite veins. Gabbros (Pieces 1 to 4) host serpentine and serpentine-talc-oxide veins.

STRUCTURE:
The sections consist dominantly of dunite showing possible melt impregnation textures defined by alteration minerals. They have apparently formed statically replacing crystallization products (clinopyroxene or plagioclase) of melt channels interstitial to coarse olivine grains (up to 2 cm in grain size). The narrow melt channels appear to have wet grain boundaries and now serve to define the olivine grain shapes visible of the cut face of the core. The large olivine grain sizes indicate a low stress environment and low amounts of crystal plastic strain in the dunites. Pieces 1 and 2 are highly altered gabbro cut by serpentine alteration veins. This section has experienced moderate to high intensity brittle deformation. Piece 9 is a fault gouge and matrix-supported breccia of 0.1 cm to 5 cm subrounded to subangular serpentine clasts in a clay-rich matrix. A ductile shear zone in Piece 1 is overprinted by a narrow 1-cm) semi-brittle shear zone comprising fibrous serpentine and talc filling fracture voids. All other pieces in this section contain variable but generally low densities of planar to slightly anastomosing magnetite-filled shear fractures with less than 0.01 cm offset. Piece 10 shows a faulted green serpentine vein. Piece 19 is a black net veined dunite and all other dunite pieces are similar and show black serpentine networks cut by sparse green serpentine and later talc.

THIN SECTION:	**209-1271A-1R-1, Piece 9, 42-45 cm**	**TS#110**	**Observer: NA, WB**
ROCK NAME:	**PEGMATITIC OLIVINE GABBRO DIKE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	14	15	10	Anhedral	Full of fluid inclusions, strongly kinked.
Clinopyroxene	0	70		Subhedral	Replaced by tremolite.
Plagioclase	0	10		Anhedral	Replaced by chlorite.
Orthopyroxene	0	2	10		
Spinel	0	<1	1	Anhedral	

GENERAL COMMENTS Hard to estimate primary mineralogy, though several grains of primary olivine are still preserved

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Chlorite	23	?	Fibrous	In patches
Amphibole	50	?	Prismatic	
Plagioclase	15	?	Anhedral	Along amphibole
Pyrite	Trace	?	Anhedral	
Talc	2	?	Fibrous	Mainly around olivine
Epidote	Trace	?	Prismatic	Rare along chlorite and green amphibole

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**

A mm-thick chlorite vein is cut by a brown clay vein. Both vein types are cut by thin Fe-oxyhydroxide veins.
Possible gabbro intruding peridotite.

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation, minor shear bands in olivine but no recrystallization.

Brittle:
Several late fractures filled with serpentine.

Crosscutting Relationships (as are apparent in thin section): 1) High temperataure ductile deformation
2) late alteration and veining.

THIN SECTION:	**209-1271A-1R-1, Piece 11, 68-70 cm**	**TS#111**	**Observer: NA/WB**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	100?			
Spinel	1	1	<0.3	Subhedral	In serpentine-magnetite veins, reddish brown.

GENERAL COMMENTS Highly altered. No primary mineralogy is observed except for spinel.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	97	Olivine		Non-pseudomorphic.
Chlorite	Trace	Olivine		
Magnetite	1	Olivine		
Pyrite	Trace	Olivine		
Hematite	1	Magnetite		In halos along serpentinte-magnetite veins.
Carbonate	Trace	Olivine		In small patches.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine-magnetite veins	8		Some talc and chlorite in centers.
Chlorite vein	Trace	Fibrous	Cuts serpentinte-magnetite veins, is cut by chrysotile veins.
Chrysotile veins	1	Fibrous	En echelon.
Aragonite veins	2	Prismatic to blocky	Cut all other veins.

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Several late fractures filled with carbonate.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins
3) Talc-filled shear fractures

	209-1271A-1R-2, Piece 7, 31-34 cm	**TS#112**	**Observer: NA, WB**
ROCK NAME:	**DUNITE with RODINGITIC GABBRO DIKE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Dunite					
Olivine	0	100			
Gabbro dike					
Plagioclase	0	80			
Clinopyroxene	0	20?			

GENERAL COMMENTS Hard to define the primary mineralogy because of the severe alteration.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	80	Olivine		Entirely non-pseudomorphic, low birefrigence.
Brown clay (talc?)	5	Olivine		Along veins
Carbonate	13	Olivine, possibly orthopyroxene		Big angular blotches.
Talc	Trace	Olivine		
Iron oxides	1	Olivine		Mainly in vein halos.
Chlorite				

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Network of white mica-talc-carbonate-chlorite-hematite veins.			Carbonate crystals are elongate to the point where an entire vein is composed of a single carbonate crystal.

STRUCTURE

Crystal Plastic: None visible in thin section.

Brittle:
Sample is cut into phacoidal-shaped shear polyhedra by fractures/microfaults with undetermined amount of slip (likely < 0.2 cm).
Fractures are discrete planes where unfilled, or zones 0.1-0.4 mm wide where filled by veins.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins
3) Shear fracturing

THIN SECTION:	**209-1271A-4R-1, Piece 13, 80-83 cm**	**TS#113**	**Observer: NA/WB**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Protointergranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	90		Anhedral	
Plagioclase	0	3		Anhedral	Impregnated into grain boundaries, in places surrounding spinel.
Orthopyroxene	0	6	6	Anhedral	
Spinel	0.5	<1	0.5	Subhedral	

GENERAL COMMENTS Plagioclase- impregnated dunite

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	90	Olivine		Very low birefringence -> antigorite(?).
Chlorite	5	Olivine, plagioclase(?)	Fibrous	In patches and in diffuse vein network.
Talc	5	Olivine, plagioclase(?)	Fibrous	In patches and in diffuse vein network.
Magnetite	1	Olivine, spinel		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins			

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
None visible in thin section.

Impregnation Textures:
Several locations where plagioclase appears to have impregnated peridotite along grain boundaries.

Crosscutting Relationships (as are apparent in thin section):
1) Plagioclase impregnation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1271A-4R-2, Piece 1, 29-31 cm**	**TS#114**	**Observer: NA, WB**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:			
TEXTURE:	**Granular**		

MODE (Visual estimate)

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	MORPHOLOGY	COMMENTS
Olivine	0	97		Anhedral	
Plagioclase	0	<1		Anhedral	Impregnated.
Spinel	0	2	0.2-2	Subhedral	

GENERAL COMMENTS
Peridotite too altered to estimate original grain size.
Slightly impregnated with plagioclase

SECONDARY MINERALS	PERCENT PRESENT	REPLACING	MORPHOLOGY	COMMENTS
Serpentine	78	Olivine, serpentine		Interlocking texture.
Brucite	20	Olivine		Brown patches encircled by serpentine.
Magnetite	1	Spinel		
Hematite	Trace	Spinel		
Talc	Trace	Olivine		Small patches in serpentinite.
Chlorite	1	?	Fibrous, coarse	In patches (after plagioclase(?)), around spinel grains.

VEIN / FRACTURE FILLING	PERCENT PRESENT	MORPHOLOGY	COMMENTS
Chlorite-oxide veins			Earliest veins.
Serpentine-magnetite veins			Using chlorite vein.
Chrysotile veins			Cutting other veins.

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Late conjugate shear fracture sets are filled with serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins
3) Shear fractures

THIN SECTION:	**209-1271A-4R-2, Piece 2, 43-48cm**	**TS#115**	**Observer: NA, WB**
ROCK NAME:	**DUNITE and CHROMITITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Dunite					
Olivine	0	99		Anhedral	
Spinel	0.8	1	0.5-1	Euhedral	Mineral inclusions.
Chromitite					
Spinel	70	75	0.1-6	Subhedral to euhedral	Inclusions.
Plagioclase	0	8			Chromitite matrix.
Clinopyroxene	0	12			Chromitite matrix.
Olivine	0	5			Chromitite matrix.
Rutile	<1	<1	< 0.05		Along with chromite grain.

GENERAL COMMENTS Cumulus chromitite pod in dunite.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	50	Olivine, brucite		Non-pseudomorphic.
Brucite	5	Olivine		
Talc	7		Fibrous	Interstitial between chromite grains.
Magnetite	1	Chromite, olivine	Anhedral	
Chlorite	7	Interstitial between chromite grains	Fibrous	Interstitial between chromite grains.
Pyrite	Trace	Olivine	Anhedral	
Smectite	3	Interstitial between chromite grains	Microfibrous	Interstitial between chromite grains, brown color, higher birefringence than chlorite.
Secondary oxides	5	Chromite	Anhedral	Breakdown of chromite to unidentified oxides.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine-talc-chlorite vein			5-mm thick, appears to truncate chromitite pod.
Serpentine-magnetite veins			
Serpentine veins			Cut serpentine-magnetite veins.

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Late conjugate shear fracture sets are filled with serpentine, talc chlorite veins.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins
3) Shear fractures

THIN SECTION:	**209-1271A-4R-2, Piece 7B, 111-114 cm**	**TS#116**	**Observer: NA, WB**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	95		Anhedral	
Plagioclase	0	2		Anhedral	Impregnated into dunite. Sometimes surrounding spinel.
Spinel	1	3	1-3	Subhedral	Mineral inclusions.

GENERAL COMMENTS Plagioclase- impregnated dunite

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	77	Olivine, brucite		Transitional texture, serrate veins.
Brucite	20	Olivine		Brown domains (under XPL) encircled by serpentine.
Magnetite	1	Olivine	Anhedral	Mostly in vein halos.
Chlorite	1	Plagioclase(?)		Concentrated around spinel grains.
Talc	1	Plagioclase(?)		Concentrated around spinel grains.
Iron oxides	Trace			

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chlorite-talc veins	2	Fibrous	Melt impregnation?
Serpentine-magnetite veins	4	Network	
Serpentine veins	2	2 mm -wide, late	Oxides in selvages.

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Late conjugate shear fracture sets are filled with serpentine, talc-chlorite veins.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins
3) Shear fractures

THIN SECTION:	**209-1271A-4R-2, Piece 10, 141-144 cm**	**TS#117**	**Observer: WB, NA**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Equigranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	93		Anhedral	
Spinel	2.5	3	0.1-1.5	Subhedral to euhedral	
Plagioclase	0	4		Anhedral	Interstitially impregnated into dunite, surrounding spinel grains.

GENERAL COMMENTS
Plagioclase-impregnated dunite.
Spinel rich. Spinel has some inclusions.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	90	Olivine		Relict mesh-texture.
Magnetite	1	Olivine	Anhedral	
Chlorite	4	Plagioclase(?)	Fibrous	Concentrated along spinel grains and in veins.
Brucite	5	Plagioclase(?), olivine	Fibrous	Individual patches within serpentine, with chlorite, locally neighboring spinel.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine-magnetite veins	5		

STRUCTURE
Crystal Plastic:
None visible in thin section.

Brittle:
Late conjugate shear fracture sets are filled with serpentine, talc-chlorite veins.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins
3) Shear fractures

THIN SECTION:	**209-1271B-3R-1, Piece 5, 19-22 cm**	**TS#118**	**Observer: WB**
ROCK NAME:	**MICROGABBRO? (TREMOLITE-TALC-CHLORITE SCHIST)**		
GRAIN SIZE:	**Very fine-grained**		
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
GENERAL COMMENTS	Totally altered without any primary minerals.				

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Tremolite	55	?	Acicular to prismatic	
Talc	35	?	Fibrous	Intergrown with tremolite.
Chlorite	10	?	Fibrous	Intergrown with tremolite, and chlorite-rich patch near bottom of thin section.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Rare talc-serpentine veinlets with trace oxide.			

STRUCTURE

Crystal Plastic:
Strong ductile/semibrittle deformation results in schistose textures.

Brittle:
Rock is comprised of schistose/fibrous tremolite and chlorite with strong foliation,
probable deformation mechanisms were diffusive mass transfer and grain boundary sliding during greenschist facies metamorphosis/alteration.

Foliation:
Strong foliation defined by schistose tremolite and chlorite.

Crosscutting Relationships (as are apparent in thin section): 1) Intense shear deformation during greenschist grade metamorphosis

THIN SECTION:	**209-1271B-3R-1, Piece 12, 51-54 cm**	**TS#119**	**Observer: WB,ET**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	99			
Spinel	1	1	0.1-12	Subhedral to anhedral	**Large grains in and out of dunite.**

GENERAL COMMENTS The color of spinel is reddish brown. High transparency.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Clasts:				
Serpentine	97			
Magnetite	1			
Talc	2			Along margins
Cement:				
Carbonate	95		In part prismatic	Probably aragonite (habit).
Green clay	5		In patches	Probably smectite.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins cut by carbonate veins in clasts.			

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Sample is a non-foliated, cohesive fault breccia.
Angular to sub-rounded clasts of serpentinite in addition to rare plagioclase and chrome spinel; clasts size is 0.1 to 1.5 cm.
Clasts are supported by a carbonate matrix that includes fine grained, fibrous/schistose carbonate in addition to sparite overgrowths.
Calcite spar overgrowths in matrix contain deformation twins.

Foliation:
Faint foliation in matrix defined by preferred orientation of schistose carbonate crystals.

Crosscutting Relationships (as are apparent in thin section):
1) Breccation in fault zone
2) Static overgrowth of zones of matrix to produce calcite spar
3) Slight deformation of calcite spar to form deformation twins

THIN SECTION:	**209-1271B-3R-1, Piece 20, 102-107 cm**	**TS#120**	**Observer: WB, WM**
ROCK NAME:	**GABBRO**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Clinopyroxene	0	40	1-3	Subhedral	
Amphibole	3	5	2-3	Anhedral	Magmatic replacement after clinopyroxene.
Plagioclase	2.5	55	1-3	Subhedral	Some crystal are kinked.
Zircon	<0.1	<0.1	0.02	Subhedral	Two grains of zircon near one of the rutile patches.

GENERAL COMMENTS

This slide contains a significant amount of brown amphibole. It is clear that some formed as a late magmatic phase.
Much of the amphibole is of ambiguous origin.
Relict plagioclase is kinked but not otherwise strongly deformed.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Albite	8	Plagioclase	Anhedral	
Quartz	1	Plagioclase	Anhedral	Along cracks in plagioclase.
Zeolite	Trace	Plagioclase	Fibrous-prismatic	With quartz, probably stilbite or scolecite.
Amphibole	40	Clinopyroxene, plagioclase	Prismatic-blocky	
Sericite	10	Plagioclase	Fibrous	
Chlorite	2	Clinopyroxene, plagioclase	Fibrous	Along cracks.
Rutile	0.5	Ti-magnetite?		
Talc	1	Pyroxene	Fibrous	Rare, along margins.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Clay veins	1		

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation; bent cleavage, deformation twins, and subgrain domains in large plagioclase grains, no recrystallization.

Brittle:
Minor brittle shear fractures cut plagioclase and amphibole; Discrete fracture surfaces with little brecciation along their margins, offset <1 mm.

Crosscutting Relationships (as are apparent in thin section):

1) Minor crystal plastic deformation
2) Minor brittle deformation

THIN SECTION:	**209-1271B-4R-1, Piece 3, 11-14 cm**	**TS#121**	**Observer: ET, WB**
ROCK NAME:	**Serpentinized harzburgite**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	Trace	83		Anhedral	
Orthopyroxene	2	15	1-4	Anhedral	With smoothly curved grain boundary.
Spinel	0.5	1	0.2-1	Subhedral to anhedral	Disseminated and vermicular with orthopyroxene, mineral inclusions.
Plagioclase	0	1			

GENERAL COMMENTS
Possible impregnation of plagioclase (altered)
Vermicular spinel rarely forming intergrowth with olivine at orthopyroxene grain boundary

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	90	Olivine, orthopyroxene		Non-pseudomorphic, ribbon textures.
Talc	6	Orthopyroxene	Fibrous	Patchy.
Carbonate	1	Orthopyroxene		Along cleavage planes.
Magnetite	1	Olivine, orthopyroxene		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins	0.5	Cross-fiber	
Carbonate-clay veins	3	Network	
Late hematite veinlets	0.2		

STRUCTURE
Crystal Plastic:
Very minor crystal plastic deformation, slightly bent cleavage in pyroxene and minor kink banding.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins
4) Talc veins

THIN SECTION:	**209-1271B-5R-1, Piece 2, 5-7 cm**	**TS#122**	**Observer: ET, WB, WM**
ROCK NAME:	**GABBRO**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Clinopyroxene	12	25	1 - 13 mm	Ophitic	
Plagioclase	70	75	1 - 12 mm	Euhedral	

GENERAL COMMENTS

All the pyroxene is interpreted as clinopyroxene because the heavily altered grains grade into optically continuous clinopyroxene.
The largest plagioclase grains in the section are greater than 30 mm in maximum dimension.
Plagioclase compositions estimated by albite-twin extinction angles are An = 67.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Green amphibole	4	Plagioclase, clinopyroxene	Fibrous	In patches.
Chlorite	3	Plagioclase	Fibrous	In patches.
Talc	15	(Ortho?)pyroxene, plagioclase	Fibrous	Pseudomorphic orthopyroxene(?) could be clay.
Sericite	2	Plagioclase	Fibrous	Along cracks.
Pyrite	1	Pyroxene		With talc/clay.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chlorite-talc veins	0.3		

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation, slight undulose extinction and deformation twins in plagioclase.
Many plagioclase grains preserve igneous twins.

Brittle:
Minor shear fracturing, several discrete fractures with <0.1 mm offset.

Crosscutting Relationships (as are apparent in thin section):

1) Minor ductile deformation
2) Minor shear fracturing

THIN SECTION:	**209-1271B-5R-1, Piece 3, 12-14 cm**	**TS#123**	**Observer: WB, WM**
ROCK NAME:	**GABBRO**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	4	50			
Amphibole	42	48	up to 20		
Rutile	1	1	1 - 4	Euhedral	Stubby crystals.
Oxides	.5	1	3		

GENERAL COMMENTS

The large amphibole in this rock could be magmatic. In one place a cluster of stubby rutile crystals is included in the amphibole.
Broken rutile crystals are also found in the quartz veins.
The quartz veins are not obvious in hand-sample.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Amphibole	40	Clinopyroxene?	Pseudomorphic, prismatic	
Quartz	10	Plagioclase	Anhedral	Along cracks, intergrown with sericite.
Secondary plagioclase	5	Plagioclase		
Sericite	20	Plagioclase	Fibrous	Intergrown with quartz.
Rutile	2	FeTi-oxides	Equant, four- and six-sided	Pseudomorphing Ti-magnetite? rutile and quartz partly replace ilmenite.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Quartz-amphibole-rutile vein	15		Mosaic quartz.

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation, slight undulose extinction and deformation twins in remnant plagioclase.

Brittle:
Minor shear fracturing, several discrete fractures with <0.1 mm offset.

Crosscutting Relationships (as are apparent in thin section):

1) Minor ductile deformation
2) Minor shear fracturing
3) Greenschist-grade alteration

THIN SECTION:	**209-1271B-5R-1, Piece 5, 24-27 cm**	**TS#124**	**Observer: WB, WM**
ROCK NAME:	**GABBRO**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Massive**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	10	35	6 - 13	Subhedral	
Amphibole	50	57	5 - 12	Subhedral	
Oxides	0	8	2 - 5		

GENERAL COMMENTS

Some of the amphibole is large and very primary in appearance while other patches are clusters of radiating crystals that appear to be replacement.
Some amphibole occurs as a lattice-work in the plagioclase that appears to be late and a replacement.
Oxide grains contain rutile with corundum(?) around their margins suggesting a unmixing of a complex oxide composition.
Amphibole pleochrosim is more pronounced (deeper shade of brown) adjacent to oxides.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Secondary plagioclase	10	Plagioclase		Replacing plagioclase instead of sericite and quartz. Thin section contains no more than 5% fresh plagioclase.
Sericite	10	Plagioclase		Finely intergrown with quartz.
Quartz	5	Plagioclase		Finely intergrown with sericite.
Amphibole	60	Clinopyroxene(?), plagioclase		Rare after plagioclase.
Rutile	1	FeTi-oxide		Common in centers of large FeTi-oxide aggregates.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins			

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation, slight undulose extinction and deformation twins in remnant plagioclase.

Brittle:
Minor shear fracturing, several discrete fractures with <0.1 mm offset.

Crosscutting Relationships (as are apparent in thin section):

1) Minor ductile deformation
2) Minor shear fracturing
3) Greenschist-grade alteration

THIN SECTION:	**209-1271A-4R-1, Piece 8, 40-43 cm**	**TS#125**	**Observer: NA, CG**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	92	<12	Anhedral	
Spinel	1.5	2	0.1-5	Subhedral to euhedral	
Plagioclase	0	6		Anhedral	Interstitially impregnating grain boundary, surrounding spinel grains.
Clinopyroxene	0	2?			With plagioclase.

GENERAL COMMENTS Impregnated dunite.
Spinel rich. Spinel has some inclusions.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	90	Olivine, plagioclase	Interlocking texture	Very fine-grained.
Chlorite / Talc	0.5	Plagioclase		Chlorites riming crystalline talc (or white mica) in spherical aggregates.
Magnetite	0.5	Olivine, spinel		
Brucite	1	Olivine		In patches within serpentine, locally adjacent to spinel.
Chlorite/Serpentine	6			In veins of former plagioclase.
Talc	2	Serpentine, chlorite		Dusty talc.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins			

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Minor semi-brittle shear in chlorite-serpentine veins, schistose growth of these minerals within narrow (<0.5 mm veins).

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Semibrittle deformation within veins

THIN SECTION:	**209-1271B-5R-1, Piece 10, 52-53 cm**	**TS#126**	**Observer: JH, NA**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Equigranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	93		Anhedral	
Spinel	2.5	3	0.1-1.5	Subhedral to euhedral	Reddish brown, but high transparency.
Plagioclase	0	4		Anhedral	Along grain boundaries, surrounding spinel grains.

COMMENTS

Impregnated dunite
Spinel rich. Spinel has some inclusions. The color of spinel is reddish brown.
The transparency is higher than that in similar dunite in Hole 209-1271A.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	99	Olivine		Relict mesh-texture, some degraded core and rim structures
Magnetite	1	Olivine		Present along former grain boundaries, occasionally replaces spinel.
Chlorite	trace?			<<1% finely disseminated in background alteration, sometimes present around spinel rims.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile		Fibrous	Sample not particularly heavily veined. Single large chrysotile vein with low density of whispy sigmoidal veins.
Magnetite		Anhedral	

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Slightly fibrous and disjointed nature of serpentinite textures suggests possible deformation during serpentinization.

Crosscutting Relationships (as are apparent in thin section):

1) Serpentinization
2) Serpentine veins

THIN SECTION:	**209-1271B-6R-1, Piece 2, 8-11 cm**	**TS#127**	**Observer: WB, NA**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	79			
Orthopyroxene	0	20	0.2-0.6	Anhedral	
Spinel	1	1		Anhedral	Vermicular grains in and around orthopyroxene.

GENERAL COMMENTS Vermicular spinel in orthopyroxene pseudomorphs.
Too altered to reconstruct the size of the grains.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	93	Olivine, orthopyroxene	30% bastite	Transitional texture with serrate veins.
Brucite?	5	Olivine		Brown aggregates within serpentine mesh.
Magnetite	2	Olivine	Anhedral	In serpentine-magnetite vein network.
Talc	Trace	Orthopyroxene	Fibrous	Rare along bastite margins.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins cutting serpentine-magnetite network			

STRUCTURE
No deformation textures visible in thin section.

Foliation:
Very faint foliation defined by ribbon texture serpentine in portions of thin section.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins

THIN SECTION:	**209-1271B-8R-1, Piece 9, 43-45 cm**	**TS#128**	**Observer: WG, WM**
ROCK NAME:	**GABBRONORITE**		
GRAIN SIZE:	**Fine- to medium-grained**		
TEXTURE:	**Foliated**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	45	55	3 - 5	Euhedral	
Clinopyroxene	10	35	2	Subhedral to euhedral	
Orthopyroxene	2	8	2	Subhedral to euhedral	
Oxides	2	2	1	Interstitial	

COMMENTS

This sample has a moderately well-developed igneous foliation. It has seen little deformation but enough to destroy polysynthetic twinning.
There is a small amount of interstitial oxides many with amphibole associated with them.
Brown amphibole is present and may be alteration or late-stage magmatic (or both).

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Green amphibole	20	Clinopyroxene, Orthopyroxene		
Chlorite	5	Plagioclase, clinopyroxene		
Albite	10	Plagioclase		
Quartz	2	Plagioclase		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins.			

STRUCTURE

Crystal Plastic:
Minor crystal plastic deformation; Undulose extinction, deformation twins and minor recrystallization of amphibole.
Kink banding in several pyroxene grains.

Brittle:
Minor brittle shear fractures cut plagioclase and amphibole; Discrete fracture surfaces with little brecciation along their margins, offset <1 mm.

Foliation:
Faint foliation defined by shape preferred orientation of pyroxene and plagioclase grains.

Magmatic Fabric:
Shape preferred alignment of pyroxene and plagioclase grains may be result of magmatic deformation.

Crosscutting Relationships (as are apparent in thin section):

1) Weak crystal plastic deformation
2) Minor ductile deformation
3) Minor greenschist facies alteration

THIN SECTION:	**209-1271B-10R-1, Piece 9, 40-43 cm**	**TS#129**	**Observer: NA, JH, DG**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	60	90?	<6	Subhedral to anhedral	Some notable kink banding.
Orthopyroxene	0	5	0.2-2		
Spinel	2	2	<0.01-0.2	Irregular	More concentrated near serpentine reaction fronts.
Plagioclase	0	4		Anhedral	Impregnation into dunite.
Clinopyroxene	0	2		Anhedral	Impregnation into dunite.

COMMENTS

Serpentinized dunite with anastamosing gabbroic dikelets.
Serpentine reaction front separates fresh from serpentinized section.
Extremely fresh olivine, notable small fluid inclusions disseminated throughout.
Orthopyroxene pseudomorphs are commonly surrounded by vermicular spinel.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	30	Olivine	Ribbon texture	No net texture, no core and rim reaction front stops abruptly with no transition, no magnetite boundary between fresh and altered similar to TS 133.
Iron oxides	2	Olivine/spinel	Anhedral stringers	Form ribbon boundaries, commonly replacing streaked out spinel.
Talc	3	Former plagioclase?	Microgranular pseudomorphic	Replaces subhedral former grains (of plagioclase?).
Sericite	2	Former plagioclase?	Microgranular pseudomorphic	replaces subhedral former grains (of plagioclase?).
Amphibole	1	Former plagioclase?	Microgranular pseudomorphic	Replaces subhedral former grains (of plagioclase?).

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile		Cross fibers	At least three generations of chrysotile veins. One before talc and at least two afterward.
Magnetite		Anhedral	
Talc		Fine granular/anhedral to lath-like	Appears shear aligned throughout veins but amorphous in relict former (plagioclase?) grains.
Sericite		Fine granular/anhedral to lath-like	Appears shear aligned thoughout veins but amorphous in relict former (plagioclase?) grains.
Amphibole		Fine-grained, anhedral	

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation, slight undulose extinction and shear bands in olivine, no recrystallization or grain size reduction.

Brittle:
Serpentine along one edge of thin section has granulite, slightly fibrous texture with a weak foliation in some locations; possible brittle deformation during serpentinization
Late en-echelon dilational shear fractures are filled with fibrous talc, parallel to fracture opening direction.
Possible shear offset across wider talc veins with schistose fabric.

Foliation:
Weak foliation within serpentinite, subparallel to late serpentine and talc veins in shear fractures.

Cross Cutting Relationships (as are apparent in thin section):

1) Weak ductile deformation
2) Serpentinization during possible brittle deformation
3) Shear fractures filled with fibrous talc

THIN SECTION:	**209-1271B-10R-1, Piece 19, 114-116 cm**	**TS#130**	**Observer: CG, NA**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Porphyroclastic**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	93			
Orthopyroxene	0	6	0.5-10	Anhedral	Included in and/or surrounded by vermicular spinel.
Spinel	0	1	0.01-0.6	Anhedral	

GENERAL COMMENTS
Very altered harzburgite.
Vermicular spinel aggregates in orthopyroxene pseudomorphs.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	75	Olivine, orthopyroxene		Transitional textures replacing olivine. Non-pseudomorphic replacement of orthopyroxene.
Magnetite	5	Olivine, spinel		in veins and dispersed
Chlorite	Trace	Spinel?		Small patches with flakes of chlorite.
Talc	15	Olivine, orthopyroxene		Pseudomorphic of orthopyroxene, and dusty talc.
Clay minerals	5	Serpentine		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Vein 2 - Serpentine - Magnetite		Irregular	Crosscut by carbonate and chrysotile veins.
Vein 1 - Chrysotile veins		Cross-fiber	Crosscut by carbonate veins.
Vein 1 - Carbonate veins		Irregular	Coarse-grained carbonates

STRUCTURE
Crystal Plastic:
Very minor crystal plastic deformation, kink banding and bent cleavage in remnant orthopyroxene porphyroclasts.

Crosscutting Relationships (as are apparent in thin section):
1) Weak ductile deformation
2) Serpentinization
3) Serpentine and carbonate veins

THIN SECTION:	**209-1271B-11R-1, Piece 9, 44-46 cm**	**TS#131**	**Observer: NA, MS, CG**
ROCK NAME:	**OLIVINE GABBRO**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Massive**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	30	40			
Orthopyroxene	0	4		Anhedral	
Spinel	1.5	2		Anhedral	
Plagioclase	0	24			
Clinopyroxene	0	30			

COMMENTS

Olivine xenocrysts occurring either as isolated crystals or in clumps of a gabbroic matrix.
Vermicular spinel included in orthopyroxene pseudomorph.
Possible hybrid rock (assimilation of peridotite by gabbroic melt)

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Dunite and Veins (gabbro?)				
Amphibole	20	Clinopyroxene?	Equant	
Amphibole	50	Plagioclase(?), amphibole	Fibrous, aggregates	Replacing equant amphibole; Inclusions within olivine breakdown to amphibole along cracks.
Chlorite	5	Plagioclase(?), amphibole		Patches and microboudins within sheared bands.
Serpentine	10	Olivine	Interpenetrating, fibrous	
Talc	2	Amphibole		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins.			

STRUCTURE

Crystal Plastic:
Moderate to high intensity crystal plastic deformation; Olivine is weakly deformed with kink banding, but no significant recrystallization.
Orthopyroxene porphyroclasts are strongly kinked, folded and partially recrystallized.
Amphibole porphyroclasts have a shape preferred alignment in bladed crystals that is folded.

Brittle:
Strong semi-brittle deformation; sample is cut by several apparent shear zones filled with schistose chlorite and possibly antigorite(?).
Schistose zones have undetermined total offset.
Several late serpentine veins may be folded into schistose shear zones, but it is also possible that the direction of crack propagation changed at the boundary between undeformed rock and the shear zone.

Foliation:
Strong foliation within schistose shear zones defined by fibrous chlorite.

Crosscutting Relationships (as are apparent in thin section):

1) Ductile deformation
2) Semi-brittle deformation in veins / partial serpentinization of peridotite
3) Serpentine veins

THIN SECTION:	**209-1271B-11R-1, 55-57 cm, Piece 11**	**TS#132**	**Observer: NA / CG**
ROCK NAME:	**AMPHIBOLE-CHLORITE SCHIST or AMPHIBOLITE(?)**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
GENERAL COMMENTS	No primary mineralogy preserved.				

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	MORPHOLOGY	COMMENTS
Chlorite	9	Former amphibole-plagioclase?	Flakes	In patches and pressure shadow around larger fibrous amphiboles.
Amphibole	55	Former amphibole?	Fibrous streams and aggregates	
Serpentine	1	Olivine?		
Hydrogrossular (Prehnite?)	35	Plagioclase		Fine highly reflective intergrowths of isotropic aggregates with fibrous amphibole.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins.			

STRUCTURE

Crystal Plastic:
No minerals present to preserve crystal plastic deformation textures.

Brittle:
Strong semi-brittle deformation; has strong schistose alignment of fibrous chlorite, slight boudinage and folding of grains.

Foliation:
Strong schistose foliation defined by fibrous chlorite.

Crosscutting Relationships (as are apparent in thin section):	1) Strong schistose; diffusive mass transfer deformation

THIN SECTION:	**209-1271B-11R-1, Piece 17, 88-91 cm**	**TS#133**	**Observer: NA / CG**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:	**Coarse- to fine-grained**		
TEXTURE:	**Porphyroclastic**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Peridotite					
Olivine	40	90-98	0.1-10	Anhedral	Some elongated ribbon porphyroclasts.
Orthopyroxene	2	0-5	0.1-0.6	Anhedral	Large porphyroclasts.
Spinel	1.5	2	< 0.01-.0.8	Anhedral to Euhedral	Spinel are concentrated along the grain boundaries of large sub- to euhedral grains of olivine and pyroxene.
Gabbroic dike					
Plagioclase	35	45			
Clinopyroxene	45	55			
Amphibole	10	10			Primary amphibole?
Monazite? (Zircons? CG)	<1	<1			

GENERAL COMMENTS Highly deformed. Partly mylonitic associated with gabbroic dike.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Amphibole	10	Amphibole	Fibrous, subhedral	
Chlorite	10	Former amphibole, plagioclase?		
Serpentine	10	Olivine		Boudins and veinlets.
Magnetite	1	Olivine		Dispersed and mainly in veinlets subparallel to foliation.
Talc	1	Orthopyroxene, olivine		Also in late veins crosscutting serpentine.

GENERAL COMMENTS Contain inherited zircons in amphibolitic and chlorite patches (after former gabbroic rocks?). The rock contains amphibolitic-chlorite patches (after former amphibole?) and amphibole-hydrogrossular (after plagioclase(?)) after former gabbroic rocks sheared with peridotites.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins.			

STRUCTURE

Crystal Plastic:
Extreme crystal plastic deformation; olivine and pyroxene are recrystallized into fine (0.03 to 0.05 mm) polygonal neoblasts with strong foliation.
Olivine and pyroxene porphyroclasts are elongated to the shear foliation and show core and mantle texture.
Average of rock: 85% recrystallized matrix, 15% porphyroclasts; true mylonite to ultramylonite.

Brittle:
Strong semi-brittle deformation; zones of amphibole show strong schistose alignment parallel to crystal plastic foliation.
May be more of a brittle feature in this rock.
Very little late brittle overprint of ductile and semi-brittle deformation.

Foliation:
Strong foliation within schistose shear zones defined by fibrous chlorite.

Crosscutting Relationships (as are apparent in thin section):
1) Ductile deformation
2) Schistose deformation of amphibole zones
3) Serpentinization
4) Serpentine veins

THIN SECTION:	**209-1271B-12R-1, Piece 21, 123-131 cm**	**TS#134**	**Observer: WB**
ROCK NAME:	**DUNITE with GABBRO**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	40	92	5		
Orthopyroxene	0	2-5?			
Spinel	2	2	2		

COMMENTS This over-size section contains a small apophysis of gabbroic material in a dunite.
Modes are for the dunite. Gabbroic material is badly altered but likely was a mixture of plagioclase and clinopyroxene.
Some fresh clinopyroxene remains in the gabbroic portion.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Chlorite	10	Plagioclase, pyroxene	Fibrous	In schistose bands, in small patches within serpentinite.
Green amphibole	10	Olivine, pyroxene, plagioclase		In schistose bands.
Serpentine	30	Olivine, orthopyroxene		Interlocking texture.
Talc	4	Olivine	Coarse, fibrous	In small patches within serpentinite.
Carbonate	Trace	?	Anhedral	In rare patches.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Carbonate veins	0.2		Latest.
Serpentine veins	0.2		Cut chlorite-amphibole shear bands.
Chlorite-amphibole veins	1		

STRUCTURE

Crystal Plastic:
Strong ductile deformation; crystal plastic deformation and dynamic recrystallization of olivine to fine neoblasts within and on the margins of gabbroic dikes.

Brittle:
Very strong semibrittle deformation within zones of gabbroic dikes; High temperature deformation manifested as alignment of brown amphibole porphroclasts and possible recrystallization.
Fine tremolite, chlorite and talc schists have strong foliation that anastomose around amphibole porphyroclasts.

Foliation:
Strong foliation defined by schistose tremolite and chlorite.

Crosscutting Relationships (as are apparent in thin section):
1) Ductile deformation during gabbroic vein intrusion
2) Strong semi-brittle deformation during greenschist grade alteration and metamorphosis
3) Serpentinization; serpentine textures indicate dominantly static serpentinization
4) Serpentine veins

THIN SECTION:	**209-1271B-12R-2, Piece 4, 16-19 cm**	**TS#135**	**Observer: CG**
ROCK NAME:	**DUNITE with interstitial gabbroic material**		
GRAIN SIZE:	**Coarse- to medium-grained**		
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	55	70	5 to 8		
Clinopyroxene	0	25		Interstitial	
Plagioclase	0	5			

GENERAL COMMENTS

This sample is a dunite that is being desegregated along olivine grain boundaries by gabbroic material.
In this section, much of the gabbroic material has crystallized to poikilitic clinopyroxene.
Very few of the olivine grains show grain-grain contacts.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	5	Olivine		Interlocking texture.
Amphibole	10	Olivine, orthopyroxene	Acicular to fibrous	In diffuse vein net work and pockets and partly replacing olivine.
Talc	5	Olivine, orthopyroxene	Fibrous	In diffuse vein net work and pockets.
Chlorite	5	Olivine, orthopyroxene	Fibrous	In diffuse vein net work and pockets.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine	2		Several generations, in part ribbon veins earlier generation crosscuts fresh olivine and is subsequently cut by the amphibole incursions.

STRUCTURE

Crystal Plastic:
Weak ductile deformation, kink banding and undulose extinction in olivine, no recrystallization or grain size reduction.
Possible minor deformation during formation of amphibole between olivine grains; slight shape preferred orientation of amphibole grains.

Foliation:
Very weak foliation defined by shape preferred orientation of amphibole.

Crosscutting Relationships (as are apparent in thin section):

1) Ductile deformation of olivine
2) Formation of amphibole and chlorite between olivine grains
3) Partial serpentinization and serpentine veining; possibly concurrent with amphibole formation

THIN SECTION:	**209-1271B-13R-1, Piece 4, 20-24 cm**	**TS#136**	**Observer: JH**
ROCK NAME:	**GABBRO with olivine xenocrysts**		
GRAIN SIZE:	**Coarse- to medium-grained**		
TEXTURE:	**Massive**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	38	45	2 to 7	Equant	
Orthopyroxene	0	5	5	Equant	
Clinopyroxene	0	30			
Plagioclase	0	18			
Spinel	2	2	2		

GENERAL COMMENTS

This section contains a piece of an olivine-rich (dunite?) peridotite that contains interstitial gabbroic material.
Several crystals of olivine have been isolated in the gabbroic matrix but others remain together.
The gabbroic material is badly altered obscuring the grains size and original mineralogy.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	30	Olivine, orthopyroxene	Locally ribbon texture, some interpenetrating fibers occasional bastite pseudomorphs after orthopyroxene	Where present serpentinization is complete.
Magnetite	3	Olivine	Anhedral	Forms outline of net-texture in otherwise fresh olivine. Disseminated throughout sample, occasionally subhedral.
Amphibole	25	Olivine	Often euhedral, occasionally patchy.	Commonly aligned along narrow conduits interfingering with fresh olivine only separated but a narrow magnetite band.
Chlorite	<1%		Fibrous, patchy	Associated with amphibole although not often seen near to replaced olivine.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine		Early chrysotile/magnetite, later granular, final(?) chrysotile	At least one generation predates amphibole incursion (granular serpentine).
Iron oxides		Anhedral	Fine branching veins that crosscut all later, features and die out in margins of fresh olivine, commonly contain some chrysotile.

GENERAL COMMENTS

Amphibole alteration generally confined to areas of fresh olivine. Rarely extends into serpentinized areas. Where present, serpentinization is complete and commonly a sharp boundary between fresh and serpentinized dunite is present (although not as well developed as that seen in 1271B TS#129). However in patches the transition is gradual (i.e., across the width of a grain ca.100 microns).
Magnetite and iron oxides are uncommonly abundant. They form the outlines of the net-texture within the fresh dunite and small oxidized veinlets that die out within the fresh olivine.
Rare former grain boundaries (picked out by their original magnetite rim) have been subsequently replaced and completely overprinted by pervasive amphibole incursion.

STRUCTURE

Crystal Plastic:
Weak ductile deformation, kink banding and undulose extinction and subgrain formation in olivine, no recrystallization or grain size reduction.

Brittle:
Possible ductile to semi-brittle deformation during formation of amphibole; Moderate shape preferred orientation and foliation in tremolite;
Also several brittle shear are filled with fibrous amphibole and/or serpentine.

Foliation:
Weak to moderate foliation defined by shape preferred orientation of amphibole.

Crosscutting Relationships (as are apparent in thin section):

1) Ductile deformation of olivine
2) Formation of amphibole and chlorite between olivine grains
3) Partial serpentinization and serpentine veining; possibly concurrent with amphibole formation

THIN SECTION:	**209-1271B-14R-1, Piece 6, 25-29 cm**	**TS#137**	**Observer: JH, WM, WB**
ROCK NAME:	**OXIDE AMPHIBOLE GABBRO**		
GRAIN SIZE:	**Very fine-grained (see below)**		
TEXTURE:	**Strongly deformed**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	0	50			
Amphibole	15	45			
Oxide	4	5			Spinel + Magnetite

GENERAL COMMENTS
This rock is a highly deformed amphibole gabbro.
The deformation has completely obscured the original texture and grain size.
The amphibole is inferred to be magmatic based on analogy with undeformed samples.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Secondary plagioclase	55	Plagioclase	Pseudomorphic	Clusters of small grains pseudomorphing former large plagioclase grains. Aggregates break down to small grains in shear zones.
Sericite	5	Plagioclase	Fibrous	Causes cloudiness of plagioclase.
Chlorite	<1	Plagioclase	Fibrous	Small pockets within clusters of plagioclase.
Amphibole	36		Smeared out porphyroblasts	Small finer grains aligned in shear zones.
Magnetite/iron oxides	3	Spinel	Anhedral	Streaked out parallel to shear zones, amorphous in unstrained areas.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Quartz		Occasional vein with chlorite	Crosscut all deformation fabrics and mineralogies.
Chlorite		Lath-like	Laths completely fill narrow areas adjacent to plagioclase patches.

STRUCTURE

Crystal Plastic:
Intense crystal plastic foliaton; amphibole gabbro mylonite.
Altered completely recrystallized plagioclase into fine grained neoblasts with rare porphyroclasts; Bands of plagioclase are segregated from bands of fine grained amphibole.
Amphibole is fine grained, but does not form polygonal neoblasts; amphibole has shape preferred orientation with inferred c axes parallel to shear foliation.
Fe-Ti oxides have undeformed ilmenite exsolution lamallae, suggesting high temperature deformation.

Foliation:
Strong foliation defined by mylonitic banding and crystal plastic shear foliation.

Cross Cutting Relationships (as are apparent in thin section):
1) Intense ductile deformation
2) Formation of ilmenite exsolution lamellae in oxides
3) Static alteration

THIN SECTION:	**209-1271B-7R-1, Piece 5, 26-29 cm**	**TS#138**	**Observer: NA/MS / CG**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	98			
Spinel	1.5	2	<4	Subhedral to euhedral	React with melt?
Plagioclase	0	1	<0.1	Anhedral	In reaction rim.

GENERAL COMMENTS
Impregnated dunite; intergranular film of altered plagioclase (+clinopyroxene(?)) totally altered.
Reddish spinel.
Large spinel grains are surrounded by reaction rim with vermicular spinel and Plagioclase.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Magnetite	3	Olivine		Rimming chrysotile veins and dispersed in serpentinite.
Amphibole?	17	Olivine		In veins and replacing core of serpentine mesh textures. Low birefringence but display amphibole-like sections.
Serpentine	79	Olivine		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Vein 1: Chrysotile veins		Cross-fiber	

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Possible semi-brittle deformation; Schistose carbonate replaces serpentine along possible shear zone.

Foliation:
Weak foliation defined by schistose carbonate.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Minor semi-brittle deformation during carbonate alteration

THIN SECTION:	**209-1271B-13R-1, Piece 16, 93-96 cm**	**TS#139**	**Observer: NA/MS/CG**
ROCK NAME:	**AMPHIBOLITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Clinopyroxene	0	>90			
Plagioclase		?			Altered patches.

GENERAL COMMENTS
Contact with peridotite at the border of the thin section:
Relics of peridotite (olivine grains with possible former orthopyroxene still in contact), surrounded by amphiboles
Two kinds of amphibole; one clearly replacing clinopyroxene

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Amphibole	68	Primary?		Partly recrystallized from former large amphibole crystals.
Amphibole	30	Amphibole	Fibrous	Replacing larger amphibole into fibrous intergrowths.
Chlorite	10	Amphibole		
serpentine	2	Olivine		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins.			

STRUCTURE

Crystal Plastic:
Weak crystal plastic deformation; remnant olivines have undulose extinction and kink bands, no dynamic recrystallization or grain size reduction preserved.

Brittle:
Weak to moderate semi-brittle deformation during amphibole alteration; Shape preferred alignment of amphibole grains and several brittle shears suggests alteration during deformation.
Total degree of strain is impossible to determine.

Foliation:
Moderate foliation defined by schistose tremolite and chlorite.

Crosscutting Relationships (as are apparent in thin section):
1) Ductile deformation
2) Minor semibrittle deformation
3) Serpentine veins

THIN SECTION:	**209-1271B-14R-1, Piece 7, 32-35 cm**	**TS#140**	**Observer: MS+NA / CG**
ROCK NAME:	**AMPHIBOLITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Clinopyroxenite					
Clinopyroxene	0	95		Subhedral	Preserved pseudomorphs.
Plagioclase	0	5		Subhedral	Some interstitial.

GENERAL COMMENTS
Cumulus chromitite 3 mm thick within former clinopyroxenite.
Plagioclase fills up cracks in spinel after the grain cleaved and diminished in size.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	2	-	Subhedral	Fluid inclusions.
Quartz	2	-	Subhedral	Fluid inclusions.
Amphibole	71	Primary?	Subhedral to anhedral	
Amphibole	20	Amphibole	Fibrous intergrowths	
Chlorite	5	Plagioclase		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Clinozoisite		Equant, polysynthetic twins	Veinlets crosscutting amphibole.

STRUCTURE

Crystal Plastic:
Undetermined amount of crystal plastic deformation; minor crystal plastic deformation of amphibole (undulose extinction), spinels are not deformed.

Brittle:
Strong semi-brittle deformation of amphibole; minor fracturing with strong schistose growth of fibrous amphibole.
Wide range of grain size in amphibole; coarse grained areas have weak shape preferred orientation; fine grained amphiboles have very strong shape preferred orientation

Foliation:
Strong foliation defined by shape preferred orientation of amphibole.

Crosscutting Relationships (as are apparent in thin section):
1) Alteration of primary minerals to amphibole?
2) Strong semi-brittle deformation
3) Late fracturing and vein fill

THIN SECTION:	**209-1271B-16R-1, Piece 4, 24-27 cm**	**TS#141**	**Observer: MS+NA/JH**
ROCK NAME:	**TROCTOLITE**		
GRAIN SIZE:	**Medium- to coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	40	45	20	Anhedral to subhedral	
Plagioclase	5	40		Subhedral	In clusters.
Clinopyroxene	0	5			
Oxides	2	10	0.05-1	Euhedral	Spinel euhedral grains in the rim and melt embayed part. Some magnetite.

GENERAL COMMENTS

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	20	Olivine	Net texture, ribbon texture	Net texture in margins of olivine breakdown grades into ribbon texture away from fresh olivine.
Magnetite/iron oxides	6	Olivine	Commonly euhedral	
Talc	10	Plagioclase		
Chlorite	Trace	Plagioclase	Fibrous	Associated with antigorite patches.
Antigorite	1%	Olivine	Lath-like,	Low relief, straight extinction.
Amphibole	10		Lath-like, subhedral	Associated with talc and traces of chlorite.
Secondary(?) plagioclase	5		Subhedral clusters	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine		Granular	Irregular veining through areas of serpentine. Are crosscut by later metamorphic overprint.
Iron oxides		Massive	Crosscut amphibole/chlorite/talc overprint.

STRUCTURE

Crystal Plastic:
Minor crystal plastic deformation; kink banding and undulose extinction of olivine.

Brittle:
Very weak semi-brittle deformation during amphibole/talc alteration; rare zones of discrete shear with aligned amphibole and talc.

Crosscutting Relationships (as are apparent in thin section):
1) Weak ductile deformation
2) Greenschist alteration and serpentinization
3) Serpentine veins

THIN SECTION:	**209-1271B-17R-1, Piece 3, 17-19 cm**	**TS#142**	**Observer: MS / CG**
ROCK NAME:	**AMPHIBOLITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Clinopyroxene	0	?		Replaced by amphibole?	
Plagioclase	0	5		Interstitial	
Oxides	2	2			

GENERAL COMMENTS
Contact with dunite at the border of thin section.
This sample is inferred to have been a clinopyroxenite but could be from a single pyroxene crystal from a coarse-grained gabbro.
A few grains of epidote were found in a single cluster.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Amphibole	85	Primary?	Subhedral to anhedral	Likely tremolite; simple twins.
Plagioclase	1	-	Subhedral	Fluid inclusions.
Amphibole	8	Amphibole	Fibrous; long fiber intergrowths	
Chlorite	6	Plagioclase(?)		Interstitial, patches and veinlets with amphibole.
Ilmenite	Trace	Primary?		
Other opaque minerals	Trace			
Talc	Trace	Plagioclase(?)		
Zircon (?)	Trace		Subhedral	Inclusion in large amphibole.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Carbonates		Twin bands: altering amphiboles.	veinlets crosscutting amphibole

STRUCTURE

Crystal Plastic:
Minor crystal plastic deformation of amphibole; undulose extinction and bent cleavage.

Brittle:
Weak to moderate intensity semibrittle deformation during amphibole and talc alteration.
Localized zones within amphibole aggregates have strong shape preferred orientation and schistose texture.
Strain may have been localized onto several vein systems, which have strong schistose fabric.

Foliation:
Moderate foliation defined by schistose tremolite and chlorite.

Crosscutting Relationships (as are apparent in thin section):
1) Amphibole alteration
2) Serpentine veins / concurrent the amphibole alteration and deformation
3) Late carbonate veins

THIN SECTION:	**209-1271B-17R-1, Piece 8, 45-48 cm**	**TS#143**	**Observer: NA, WB**
ROCK NAME:	**AMPHIBOLITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Clinopyroxene	0	100		Replaced totally by amphibole?	
Plagioclase	0	?			
Olivine	75	100	15	Anhedral	A large single crystal included in the amphibolite. Surrounded by reaction rim (inner and outer).

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Amphibole	78	?	Large xenomorphic crystals	Smaller crystals are prismatic to acicular.
Serpentine	5	Olivine, Amphibole		Along olivine inclusion.
Chlorite	2	Amphibole		In patches.
Talc	2	Olivine	Fibrous	Along olivine inclusion.
Chlorite	3	?		In a patch, scaly aggregates of radiating fibers.

GENERAL COMMENTS

The dunite is a single olivine crystals that is altered to very low birefringent serpentine along its margins.
The contact of the serpentine to the amphibolite shows quench growth of amphibole needles perpendicular to the contact or fibers of amphibole protruding into the serpentine. Amphibole is altered to serpentine along serpentine veins.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins that turn into talc veins where they cut the fresh olivine.			
Chlorite-talc veins			

STRUCTURE

Crystal Plastic:
Weak crystal plastic deformation; remnant olivines have undulose extinction and kink bands, no dynamic recrystallization or grain size reduction.
Minor crystal plastic deformation of amphibole, bent cleavage and undulose extinction.

Brittle:
Weak to moderate semi-brittle deformation during amphibole alteration; shape preferred alignment of amphibole grains and several brittle shears suggests alteration during deformation, several zones of fine grained schistose amphibole.

Foliation:
Moderate foliation defined by schistose tremolite and chlorite.

Crosscutting Relationships (as are apparent in thin section):

1) Ductile deformation
2) Amphibole alteration and partially serpentinization during semi-brittle deformation
3) Serpentine veins

THIN SECTION:	**209-1271B-17R-1, Piece 16, 104-106 cm**	**TS#144**	**Observer: NA/JH/WB**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	89			
Orthopyroxene	0	10	0.5-5	Anhedral	
Spinel	0.5	1	0.01-0.1	Anhedral	Vermicular shape, around or included in orthopyroxene.

GENERAL COMMENTS Serpentinized harzburgite

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	90	Olivine/orthopyroxene	Mixed - see comments	Section is sharply divided - core and rim textures in unsheared half interpenetrating texture with intense chrysotile veining in other half.
Iron oxides	3	Olivine/spinel	Anhedral	Pick out grain boundaries in core and rim sections, within chysotile veins in sheared section. Skeletal where replacing spinel.
Chlorite	<1	Former pyroxenes(?)	Fibrous	
Brucite	6	Olivine	Fibrous	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile		Fibrous	Accompanies magnetite and in ribbon veins.
Magnetite		Anhedral	

GENERAL COMMENTS Textbook chrysotile ribbon veins are developed along the left side the thin section. In this area, brucite is enriched. A single chrysotile vein that is oriented perpendicular to the orientation of the ribbon veins and sigmoidal chrysotile veins can be traced throughout the entire thin section. It is cut by the ribbon and sigmoidal veins.

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation; kink bands in pseudomorphed pyroxene.

Brittle:
Horizontal sets of parallel microfaults offset serpentine veins within one zone of thin section.

Foliation:
Weak foliation in zone of thin section defined by parallel sets of serpentine veins; These are cut by late microfaults.

Crosscutting Relationships (as are apparent in thin section):
1) Weak ductile deformation
2) Serpentinization
3) Serpentine veins
4) Minor microfaulting
5) Late serpentine veins

THIN SECTION:	**209-1271B-17R-1, Piece 18, 118-120 cm**	**TS#145**	**Observer: NA, WB**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	89			
Orthopyroxene	0	10	0.5-5	Anhedral	
Spinel	0.5	1	0.01-0.1	Anhedral	Vermicular shape, around or included in orthopyroxene.

GENERAL COMMENTS Serpentinized harzburgite (same as TS #144)

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	98	Olivine, orthopyroxene	10% bastite	Transitional textures with serrate veins.
Talc	Trace	Orthopyroxene	Fibrous	
Tremolite	Trace	Orthopyroxene	Fibrous	
Magnetite	1	Olivine	Anhedral	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins			

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation; kink bands in pseudomorphed pyroxene.

Brittle:
None visible in thin section.

Crosscutting Relationships (as are apparent in thin section):
1) Weak ductile deformation
2) Serpentinization

THIN SECTION:	**209-1271B-18R-1, Piece 5, 20-23 cm**	**TS#146**	**Observer: MS+MS, WB**
ROCK NAME:	**WEHRLITE with olivine xenocrysts**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Poikilitic**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	1	8		Subhedral	In clusters.
Clinopyroxene	0	35			
Olivine	30	55		Anhedral	
Oxides	1	2	0.05-1		Spinel and magnetite.

GENERAL COMMENTS Olivine grains (interpreted as xenocrysts) are enclosed in altered clinopyroxene oikocrysts. Rock similar to Sample 209-1271B-16R-1, 24-27 cm.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Chlorite	6	Plagioclase, olivine	Fibrous	
Amphibole	45	Olivine, pyroxene	Fibrous to prismatic	
Talc	7	Plagioclase, olivine	Fibrous	
Serpentine	5	Olivine		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins crosscutting olivine and metagabbroic material			

STRUCTURE

Crystal Plastic:
Minor crystal plastic deformation; Kink banding and undulose extinction in olivine.

Brittle:
Minor fracturing; very little brittle deformation.

Cross Cutting Relationships (as are apparent in thin section):
1) Ductile deformation
2) Greenschist alteration / serpentinization
3) Serpentine veins

THIN SECTION:	**209-1271B-18R-1, Piece 3A, 13-16 cm**	**TS#147**	**Observer: MS+ NA, WB**
ROCK NAME:	**GABBRO with olivine xenocrysts**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Massive**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	40	50	4		
Clinopyroxene	25	35	15	Oikocrystic	
Plagioclase	10	15	4	Euhedral	
Oxides	1	1	2		Spinel (+ magnetite?)

COMMENTS Hybrid rock: coarse-grained protogranular harzburgite intruded and reacted with gabbro. Poikilitic clinopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Chlorite	5	Plagioclase, olivine		On plagioclase-olivine grain boundaries and after plagioclase along cracks.
Amphibole	20	Clinopyroxene, plagioclase, olivine		On plagioclase-olivine grain boundaries and after clinopyroxene.
Talc	3	Olivine, plagioclase		On plagioclase-olivine grain boundaries, after olivine and plagioclase along cracks.
Secondary plagioclase	1	Plagioclase		
Pyrite	Trace			With talc, amphibole, and chlorite after olivine.
Chalcopyrite	Trace			With talc, amphibole, and chlorite after olivine.
Hematite	Trace			With talc, amphibole, and chlorite after olivine.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins			

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation, minor shear bands in olivine but no recrystallization.

Brittle:
Minor late shear fractures.

Crosscutting Relationships (as are apparent in thin section):
1) Ductile deformation
2) Greenschist alteration and serpentinization

THIN SECTION:	**209-1271B-18R-1, Piece 20, 114-117 cm**	**TS#148**	**Observer: NA/MS,WB**
ROCK NAME:	**DUNITE impregnated with gabbro**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Dunite					
Olivine	80	95	5-15	Subhedral	A large single crystal cut by gabbroic dike
Orthopyroxene	0	3	16	Subhedral	include spinel aggregate
Spinel	2	2			Some euhedral grains in the rim and melt embayed part.
Gabbro impregnation					
Plagioclase		30			
Clinopyroxene		70			

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Dunite				
Serpentine	14	Olivine		Along vein network
Talc	2	Olivine		At contact to amphibolite
Magnetite	2	Olivine		Along vein network
Gabbro impregnation				
Amphibole	95	?	Prismatic	
Chlorite	5	Plagioclase?	Fibrous to scaly	In patches, mainly near contact to dunite

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**

Three generations of veins in a moderately altered dunite adjacent to a gabbroic intrusion. A first generation of serpentine(+magnetite and pyrite) veins with needle-shaped serpentine (antigortie?) is cut by an amphibole vein.
Both vein types are cut by late chrysotile veins. In others parts of the thin section these amphibole veins can be traced back to the amphibolite (gabbro intrusion?) developed at the bottom of the thin section.

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation, minor shear bands in olivine but no recrystallization.

Brittle:
Minor semi-brittle deformation within certain zones of thin sections; Shape preferred orientation suggests growth of grains suggests growth during deformation.

Foliation:
Weak foliation defined by shape preferred orientation of amphibole grains.

Crosscutting Relationships (as are apparent in thin section):
1) High temperataure ductile deformation
2) Amphibole alteration during minor deformation
3) Late serpentine veins

THIN SECTION:	**209-1271B-19R-1, Piece 21, 133-136 cm**	**TS#149**	**Observer: HP, AC**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	94			
Orthopyroxene	0	1			
Spinel	4	5	0.2-3	Subhedral to euhedral	

GENERAL COMMENTS Spinel enriched in layers.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	96			
Magnetite	2			
Chlorite	2			

GENERAL COMMENTS The serpentine appears as an almost isotropic groundmass. Locally there are brown kernels within the serpentine relict mesh texture which may be brucite.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Amphibole-chlorite	5		Sharp, locally magnetite-lined margins to serpentinized dunite
Serpentine	3		One vein penetrating through the middle of amphibole-chlorite vein.
Carbonate	1	Wispy	Crosscutting and displacing serpentine vein. Tentative mineral identification.

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Veins filled with talc and amphibole have schistose texture; possible sites of minor semi-brittle strain localization.
Serpentine has unusual isotropic texture; May be a result of deformation during serpentinization???

Foliation:
Foliation within amphibole-talc veins; fibrous crystals oriented parallel to vein walls.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins
3) Amphibole talc veins during minor deformation

THIN SECTION:	**209-1271B-8R-1, Piece 14, 65-68 cm**	**TS#150**	**Observer: hp**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	95	5-12		
Spinel	4	5	0.2-3	Subhedral to euhedral	

GENERAL COMMENTS Spinel enriched in layers.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	90	Olivine		
Brucite	Trace	Olivine		Within kernels surrounded by serpentine
Magnetite	4	Olivine		
Chlorite	1	Olivine		
Clay minerals	5	Serpentine		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile-magnetite veins.	10	Fine, paragranular to locally transgranular, magnetite on vein margins.	
Massive serpentine veins.	3	Up to 2 mm-wide, locally includes chlorite and clays.	

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Minor foliated texture in slightly fibrous serpentine grains; Fibers appear to have been imparted over mesh texture.
Mesh cells are still visible but serpentine within them appears to have been recrystallized; possible deformation textures.

Foliation:
Very faint foliation defined by serpentine fibers.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins
3) Possible minor late deformation

THIN SECTION:	**209-1271B-13R-1, Piece 10, 52-59 cm**	**TS#151**	**Observer: WB**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
GENERAL COMMENTS	No primary mineralogy is preserved. Altered spinel is enriched in layers.				

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	30	Olivine		Very low birefringence.
Talc	10	Olivine, (?)	Fibrous	
Amphibole	20	Olivine, (?)	Fibrous	
Chlorite	20	Olivine, (?)	Fibrous	
Brown clay	15	Olivine, (?)		Could be talc.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Talc-chlorite vein network in serpentinite			
5-mm wide banded serpentine talc vein			Cross-fractures to gabbro vein.
Chlorite-amphibole vein			Cross-fractures to gabbro vein.

STRUCTURE

Crystal Plastic:
Compositional banding and strong foliation suggest sample underwent intense ductile deformation; but pervasive alteration obscures all texture.

Brittle:
Possible minor deformation during greenschist alteration; Minor schistose texture to chlorite in some locations.
Most of alteration appears to have occurred under static conditions.

Foliation:
Strong foliation defined by compositional banding in alteration minerals; possibly reflected compositional banding in primary phases.

Crosscutting Relationships (as are apparent in thin section):
1) Ductile Deformation
2) Greenschist chlorite alteration
3) Serpentine veins

THIN SECTION:	**209-1271B-17R-1, Piece 10, 60-62 cm**	**TS#152**	**Observer: CG, AC**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	95			
Orthopyroxene	0	3			
Spinel	1.5	2	0.2-3	Subhedral to euhedral	

GENERAL COMMENTS Spinel enriched in layers.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	93	Olivine, olivine		Interpenetrating texture; non-pseudomorphic replacement of orthopyroxene.
Magnetite	2	Olivine, orthopyroxene, spinel		Around veins, mesh textures and replacing orthopyroxenes.
Amphibole	3	Orthopyroxene		
Chlorite	Trace	Spinel, orthopyroxene		Small patches rimming spinel and orthopyroxene.
Clay minerals	2	Serpentine		Halos of serpentine veins; core of serpentine mesh textures,
Brucite	5	Olivine		Center of mesh textures near to serpentine textures.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Vein - Chrystolite and magnetite		Cross-fiber and banded.	shows wavy extinction

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Minor foliated texture in slightly fibrous serpentine grains; Fibers appear to have been imparted over mesh texture.
Mesh cells are still visible but serpentine within them appears to have been recrystallized; possible deformation textures.

Foliation:
Very faint foliation defined by serpentine fibers.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins
3) Possible minor late deformation

THIN SECTION:	**209-1271B-19R-2, Piece 1, 4-10 cm**	**TS#153**	**Observer: CG, AC**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:	**Coarse?**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	98			
Spinel	0.5	1	0.5-1		

GENERAL COMMENTS Totally altered except for few spinel grains.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	66	Olivine		Interpenetrating texture.
Magnetite	2	Olivine		Rimming serpentine veins.
Brucite	31	Olivine		Pervasive and commonly rimming serpentine veins.
Ferro-chromite	1	Spinel		Porous rims surrounding spinels.
Chlorite	1	Spinel		Rimming spinels.
Veins:				
White micas	10	Chlorite, plagioclase		
Chlorite	90	Plagioclase		

GENERAL COMMENTS Small equant grains in veins may be relic plagioclase (some grains display twinning).

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chlorite and white mica veins			Likely after former plagioclase vein.
Chrysotile veins		Cross-fiber	Display wavy extinction.

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Minor foliated texture in slightly fibrous serpentine grains; Fibers appear to have been imparted over mesh texture.
Mesh cells are still visible but serpentine within them appears to have been recrystallized; possible deformation textures.
Parallel sets of en-echelon shear fractures are filled with serpentine.

Foliation:
Very faint foliation defined by serpentine fibers.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins
3) Possible minor late deformation