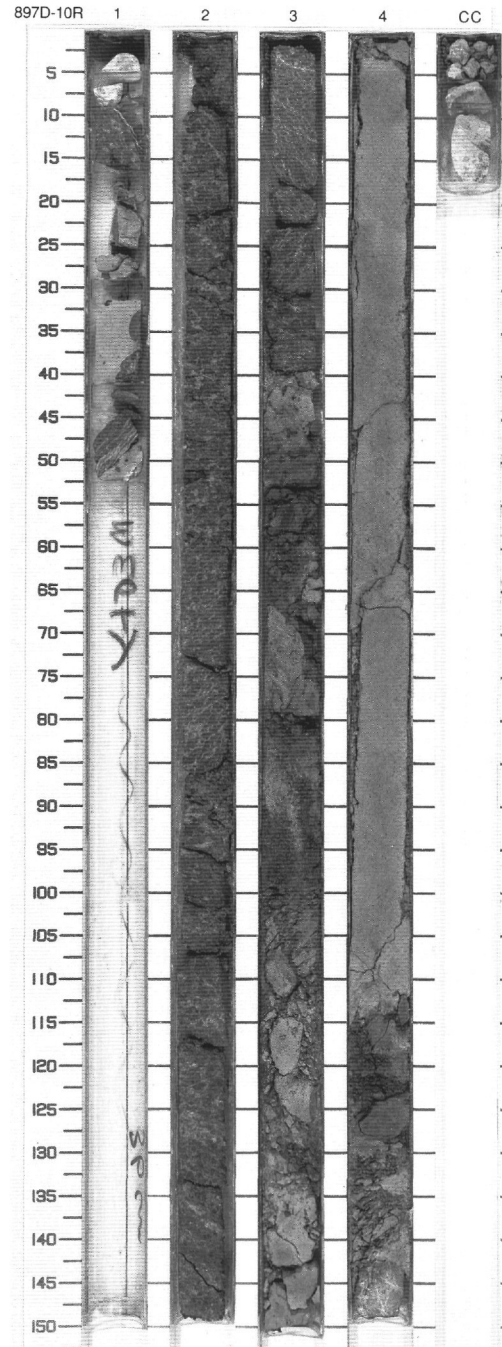


SITE 897 HOLE D CORE 10R

CORED 684.3 - 693.8 mbsf

Meter	Graphic Lith.	Section	Age	Structure	Disturb	Sample	Color	Description
0-1	[Pattern]	1	Early Cretaceous			S	N6	<p>NANNOFOSSIL FORAMINIFER CHALK and CALCAREOUS CHALK</p> <p>Major Lithologies: NANNOFOSSIL FORAMINIFER CHALK is pale red (5R 6/2), structureless, and constitutes about 40% of the cored sedimentary rock. Medium dark gray (N4) to dark gray (N3) CALCAREOUS CHALK makes up about 30% of the sedimentary rocks.</p> <p>Minor Lithologies: Structureless, light olive brown NANNOFOSSIL CHALK represents about 10% of the sedimentary rocks in the core. Light olive brown CLAYSTONE (5Y 5/6) and pale brown (5YR 5/2) SILTY CLAYSTONE occur only in Section 4 and together make up less than 10% of the sedimentary sequence. The CONGLOMERATE exhibits a maximum clast size of about 8 cm, and is dominated by a medium light gray (N6) limestone with floating coarse grains of serpentinite. Clasts of serpentinite also occur in the conglomerate. At least two clasts (at 10 and 35 cm, Section 1) in the CONGLOMERATE contain contacts between the limestone and the serpentinite.</p> <p>General Description: The basement igneous rock in the core is serpentinite. The serpentinite is present as coherent blocks (Section 2) and as individual fragments in Sections 1 and 3.</p>
1-2	[Pattern]	2				P		
2-3	[Pattern]	3				S		
3-4	[Pattern]	4				P		
4-5	[Pattern]	4	S	5Y 6/2 To 5Y 5/6				
5	CC	CC				M		

897D-11R THROUGH 25R HARD ROCKS



UNIT 1: ALTERED SERPENTINITE

SUBUNIT 1A

Pieces 1-12

COLOR: Mottled yellowish brown (10YR 5/4).

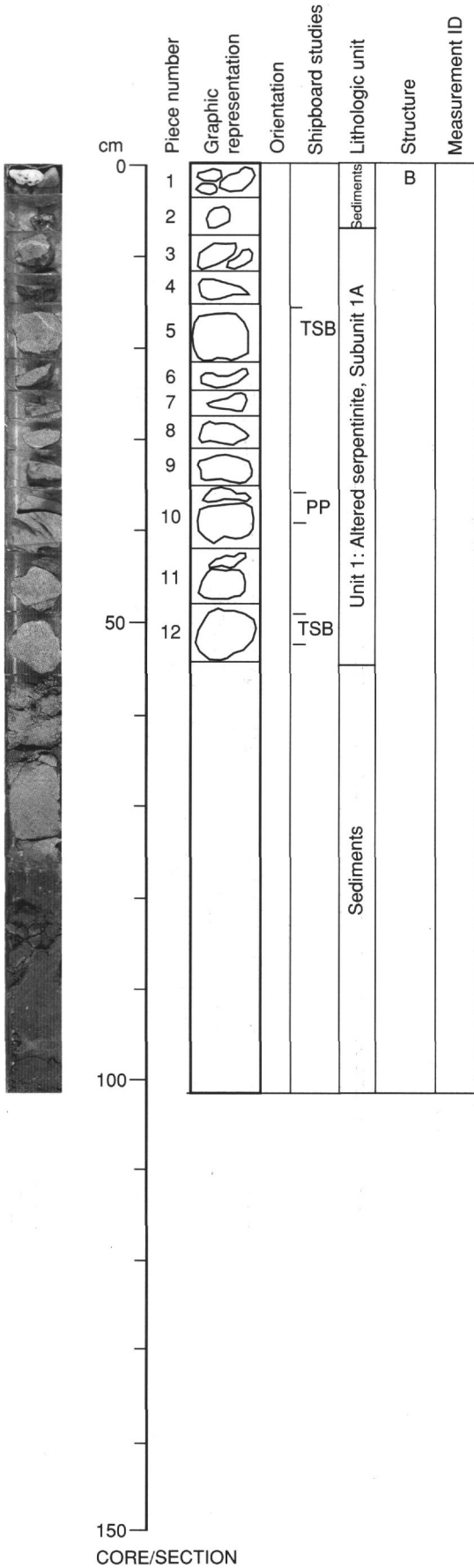
LAYERING: None.

DEFORMATION: None

PRIMARY MINERALOGY: Destroyed by serpentinization and subsequent oxidation and carbonation.

SECONDARY MINERALOGY: Limonitic alteration and serpentine.

ADDITIONAL COMMENTS: See Section 149-897C-65R-3, Pieces 3 and 4. Pieces 3-12 are interpreted as pebbles of serpentinite from a sedimentary unit. The lowest sedimentary intercalation recovered is from Section 149-897C-65R-2.

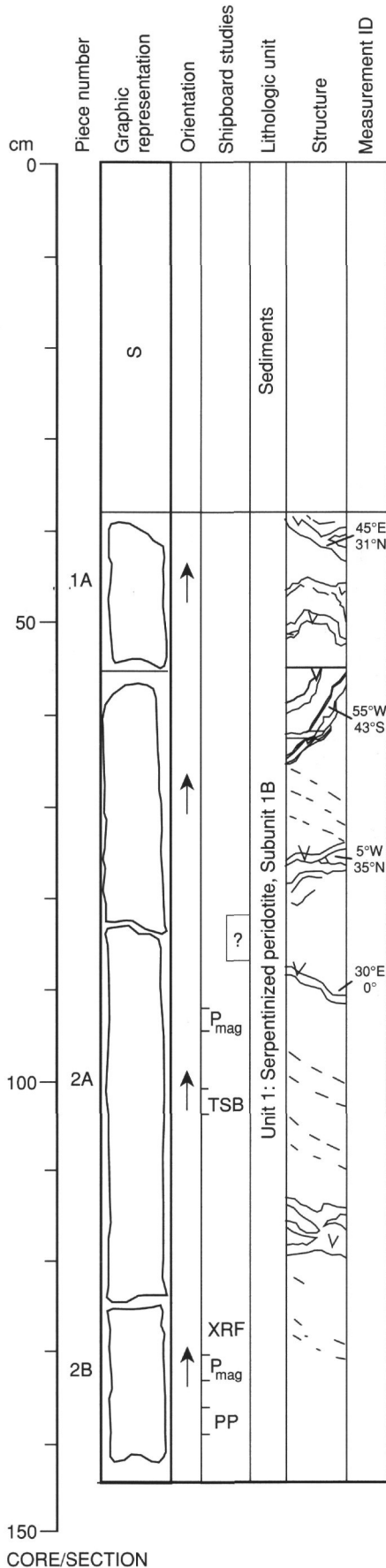


149-897C-63R-2

UNIT 1: SERPENTINIZED PERIDOTITE

SUBUNIT 1B

Pieces 1A-2B

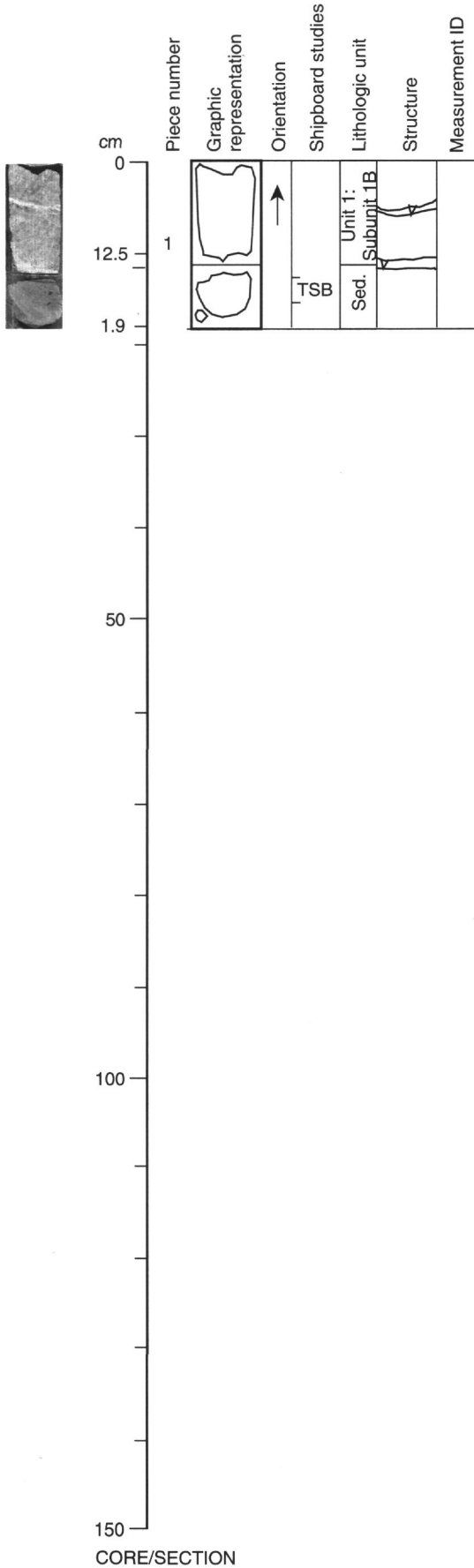


COLOR: Dark greenish gray (5GY 4/1) with bluish white (5B 9/1) veins.
LAYERING: Unit shows no obvious primary igneous layering, which may have been obscured by serpentinization.
DEFORMATION: Brittle deformation expressed by abundant late-stage fractures filled with calcite. Locally a fracture cleavage is developed. No obvious evidence of earlier high temperature deformation.
PRIMARY MINERALOGY: Primary mineralogy largely obscured by serpentinization.
 Olivine - Mode: 75%–90%.
 Comments: No primary olivine present.
 Pyroxene - Mode: 12%–25%.
 Crystal size: 1–5 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Comments: The pyroxene is at least partially altered to serpentine.
 Spinel - Mode: 1%.
 Crystal size: ~1 mm.
 Crystal shape: Euhedral and "holly-leaf."
 Crystal orientation: None.
SECONDARY MINERALOGY:
 Total percent: 90%.
 Texture: Mesh serpentinite cut by complex network of carbonate veins.
 Vein material: Vein complex between 59–68 and 116–124 cm. Veins are less abundant in Piece 2B.
ADDITIONAL COMMENTS: Subunit is interpreted as a large block of serpentinite with sediments above and below. Unit continues in Section 149-897C-63R-CC.

UNIT 1: SERPENTINIZED PERIDOTITE

SUBUNIT 1B

Piece 1



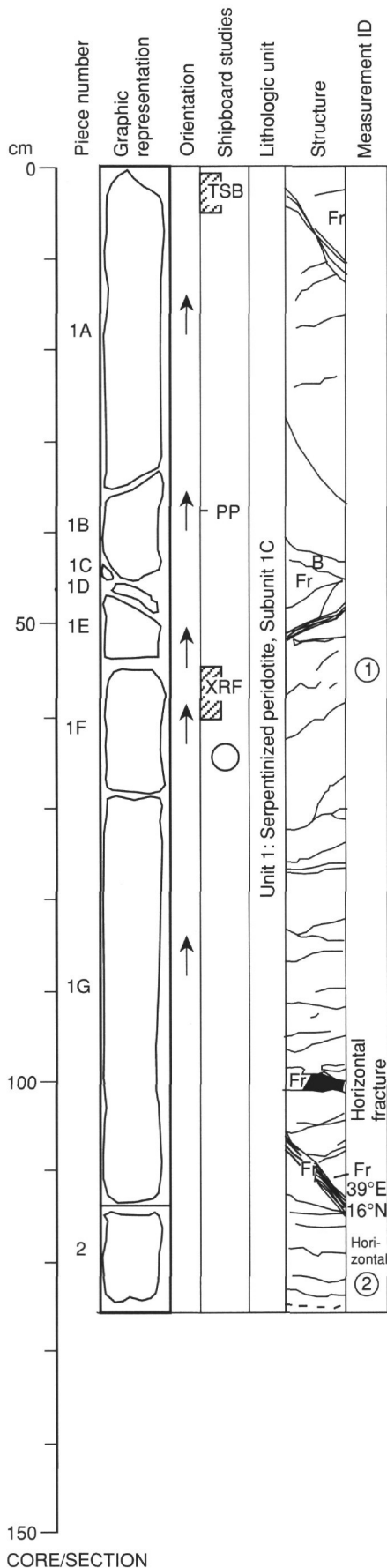
COLOR: Dark greenish gray (5GY 4/1) with bluish white (5B9/1) veins.
LAYERING: Unit shows no obvious primary igneous layering.
DEFORMATION: Deformed and cut by calcite veins associated with brittle deformation. No obvious evidence of earlier high temperature deformation.
PRIMARY MINERALOGY: Largely obscured by serpentinization.
 Olivine - Mode: 75%–90%.
 Comments: Olivine is replaced by serpentine.
 Pyroxene - Mode: 12%–25%.
 Crystal size: 1–5 mm.
 Crystal shape: Anhedral.
 Crystal orientation: None.
 Comments: The pyroxene is at least partially altered to serpentine.
 Spinel - Mode: 1%.
 Crystal size: ~1 mm.
 Crystal shape: Euhedral and "holly-leaf".
 Crystal orientation: None.
SECONDARY MINERALOGY:
 Total percent: >90%.
 Texture: Mesh serpentinite cut by complex of calcite veins.
 Vein material: 5 cm, 3 mm-thick calcite; 11 cm, 7+ mm, calcite.
ADDITIONAL COMMENTS: Subunit continues from Section 149-897C-63R-2 and is terminated by a sediment (Piece 2). Contact relations unknown.

149-897C-64R-3

UNIT 1: SERPENTINIZED PERIDOTITE

SUBUNIT 1C

Pieces 1A-2



COLOR: Dark greenish gray (5GY 4/1) with white calcite veins.

LAYERING: Unit shows no obvious primary igneous layering.

DEFORMATION: No obvious high-temperature deformation fabric, late brittle deformation represented by fractures infilled with calcite/serpentine.

PRIMARY MINERALOGY: Sometimes spinel is associated with pyroxene.

Olivine - Mode: 90%.

Crystal size: ?

Crystal shape: ?

Crystal orientation: ?

Pyroxene - Mode: 10%.

Crystal size: 5-10 mm.

Crystal shape: Poikilitic.

Crystal orientation: None.

Spinel - Mode: 2%.

Crystal size: <1 mm.

Crystal shape: Subhedral.

Crystal orientation: None.

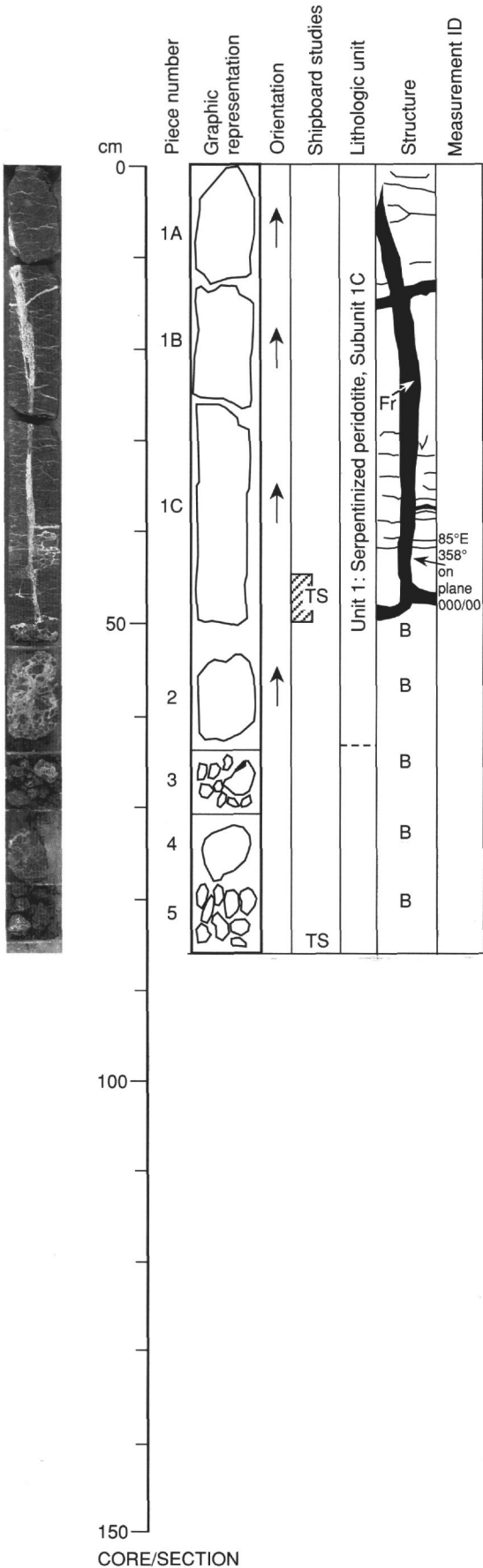
SECONDARY MINERALOGY:

Total percent: >90%.

Texture: Mesh serpentinite.

Vein material: Calcite and/or serpentine. Locally dark serpentine is associated with sulfides and calcite in veins (107-112 cm).

ADDITIONAL COMMENTS: Unit continues into Section 149-897C-64R-4. Nature of upper contact against overlying sediments is uncertain. Subunit 1C is interpreted as a block, at least 2 m in diameter, within the sedimentary unit.



UNIT 1: SERPENTINIZED PERIDOTITE

SUBUNIT 1C

Pieces 1A-5

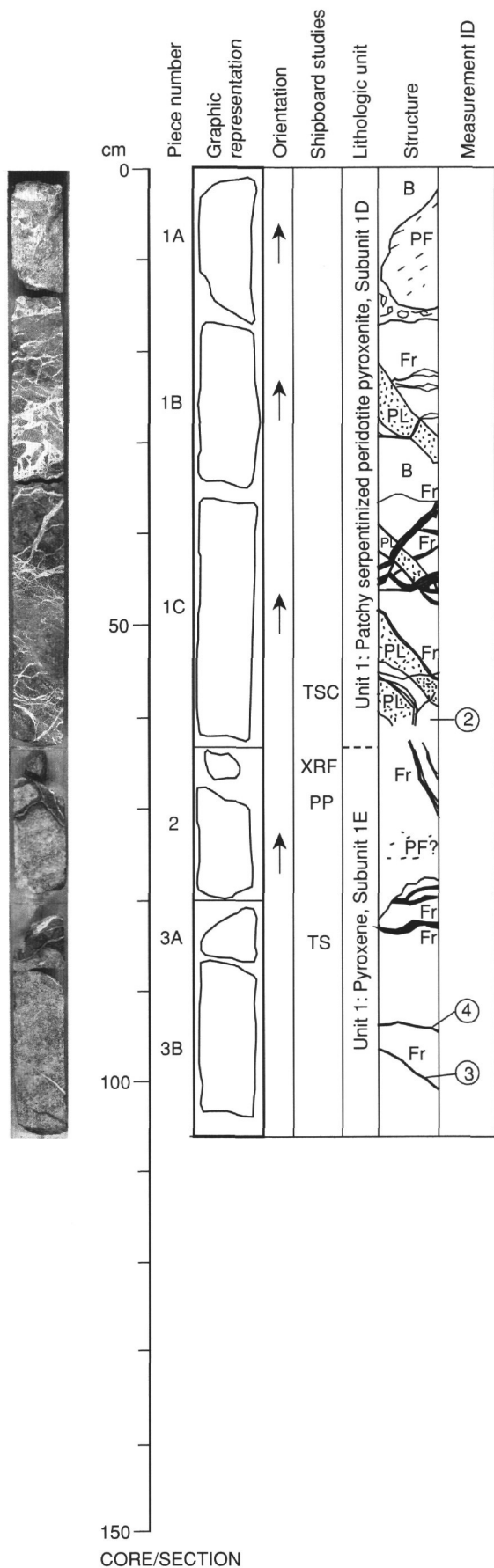
COLOR: Dark greenish gray (5GY 4/1) with white calcite veins.
LAYERING: Unit shows no obvious primary igneous layering.
DEFORMATION: No obvious high temperature deformation fabrics, late brittle deformation represented by fractures infilled with calcite/serpentine, resulting in the brecciation of the rock in Pieces 2-5.
PRIMARY MINERALOGY: Sometimes spinel is associated with pyroxene.
 Olivine - Mode: 90%.
 Crystal shape: ?
 Crystal orientation: ?
 Pyroxene - Mode: 10%.
 Crystal size: 5-10 mm.
 Crystal shape: Poikilitic.
 Crystal orientation: None.
 Spinel - Mode: 2%.
 Crystal size: <1 mm.
 Crystal shape: Subhedral.
 Crystal orientation: None.
SECONDARY MINERALOGY:
 Total percent: >90%.
 Texture: Mesh serpentine.
 Vein material: Large vein penetrates the length of Pieces 1B and 1C. This vein is dominantly calcite and up to 1 cm thick. This late-stage vein cuts numerous earlier small veins.
ADDITIONAL COMMENTS: This subunit continues from Section 149-897C-64R-3. The unit is transitional to the next lower subunit (1D), with increasing brecciation from 52 to 87 cm. The boundary is drawn between Sections 149-897C-64R-4 and -5.

149-897C-64R-5

UNIT 1: PATCHY SERPENTINIZED PERIDOTITE AND PYROXENITE

SUBUNIT 1D

Pieces 1A-1C



COLOR: Dark gray (N3) to dark greenish gray (5GY 4/1).
LAYERING: Well-developed primary igneous banding is present in Pieces 1B and 1C, consisting of 4 parallel zones of pyroxenite separated by peridotite. In pyroxenite bands: pyroxene = 70%, spinel = 5%.

DEFORMATION: No obvious ductile deformation; late brittle deformation with fractures filled with calcite/serpentine are common. Locally the rock is brecciated (0-16 and 26-37 cm).

PRIMARY MINERALOGY: Modal percentage of minerals varies markedly downsection with the position relative to the primary layering. Sometimes spinel is associated with pyroxene.
 Olivine - Mode: 20%-90%.
 Crystal shape: ?
 Crystal orientation: ?
 Crystal orientation: ?

Pyroxene - Mode: 15%-30% (except in pyroxenite layers).
 Crystal size: 10-20 mm.
 Crystal shape: Poikilitic.
 Crystal orientation: ?

Spinel - Mode: 3%.
 Crystal size: 1 mm.
 Crystal shape: Anhedral, "holly-leaf" some elongated.
 Crystal orientation: Alignment of elongated spinels(?).

Plagioclase : Mode 10%, rimming spinel or in veinlets.
 Crystal size: 1-2 mm.
 Crystal shape: Anhedral.
 Crystal orientation: ?

SECONDARY MINERALOGY:
 Total percent: 90%.
 Texture: Mesh serpentine.
 Vein material: Calcite and/or serpentine, pyrite(?), and magnetite.

ADDITIONAL COMMENTS: None.

UNIT 1: PYROXENITE

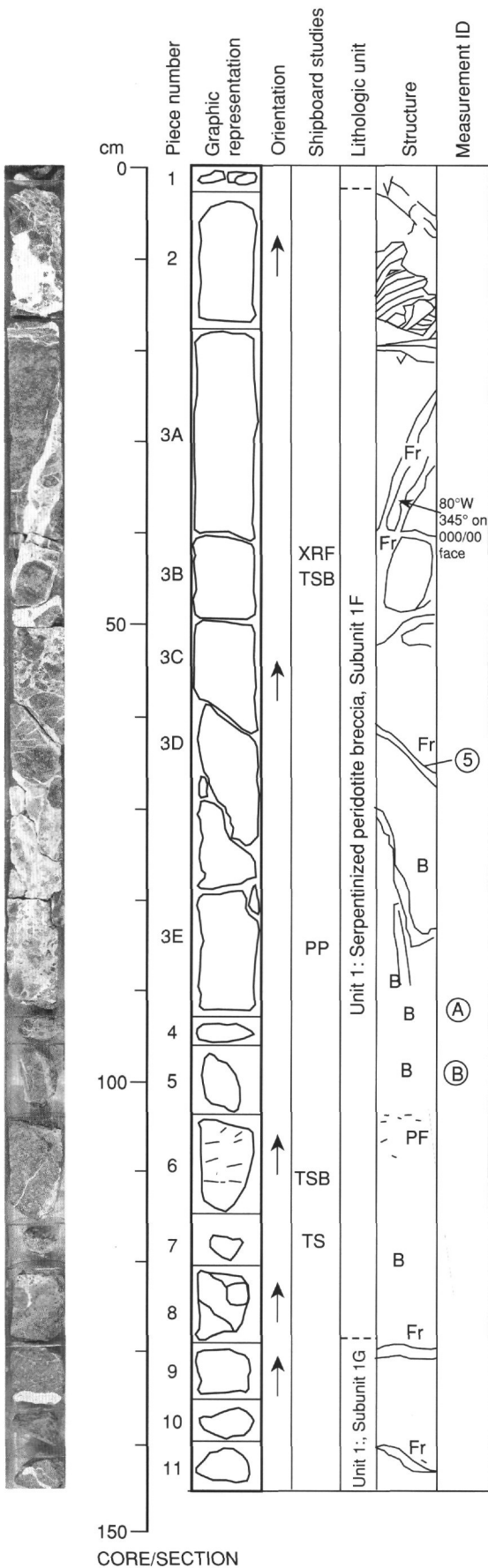
SUBUNIT 1E

Pieces 2 and 3B

COLOR: Dark gray (N3).
LAYERING: None.
DEFORMATION: None.
PRIMARY MINERALOGY: Modal percentage of minerals varies markedly downsection with the position relative to the primary layering. Sometimes spinel is associated with pyroxene.
 Olivine - Mode: 20%-40%.
 Pyroxene - Mode: 60%-70%.
 Spinel - Mode: 3%.
 Crystal size: 1 mm.

SECONDARY MINERALOGY:
 Total percent: 90%.
 Texture: Mesh serpentine.
 Vein material: Calcite and/or serpentine, pyrite(?), and magnetite.

ADDITIONAL COMMENTS: None.



UNIT 1: SERPENTINIZED PERIDOTITE BRECCIA

SUBUNIT 1F

Pieces 1–8

COLOR: Medium gray (N5) with white irregular patches and veins.
LAYERING: No obvious primary igneous layering.
DEFORMATION: Unit is a breccia of serpentinized peridotite.
PRIMARY MINERALOGY: Pieces 3A, 3B, and 6 are serpentinized plagioclase-bearing peridotite, with 30% olivine, 30% altered plagioclase, 5% spinel, and 35% pyroxene. Pieces 7 and 8 are pyroxenite with spinel 2%, clinopyroxene 60%, and orthopyroxene 30%(?).
SECONDARY MINERALOGY:
 Total percent: 80%.
 Texture: Mesh serpentinite.
 Vein material: Breccia is composed of multiple blocks in a calcite/serpentinite matrix. Veins are from 1 mm to 5 cm thick.
ADDITIONAL COMMENTS: Piece 1 is dropstones of white limestone(?) and serpentinite. The overlying Subunit in Section 149-897C-64R-5 is a less brecciated, but otherwise similar. Subunit extends in this section to 130 cm.

UNIT 1: SERPENTINIZED PERIDOTITE

SUBUNIT 1G

Pieces 9–11

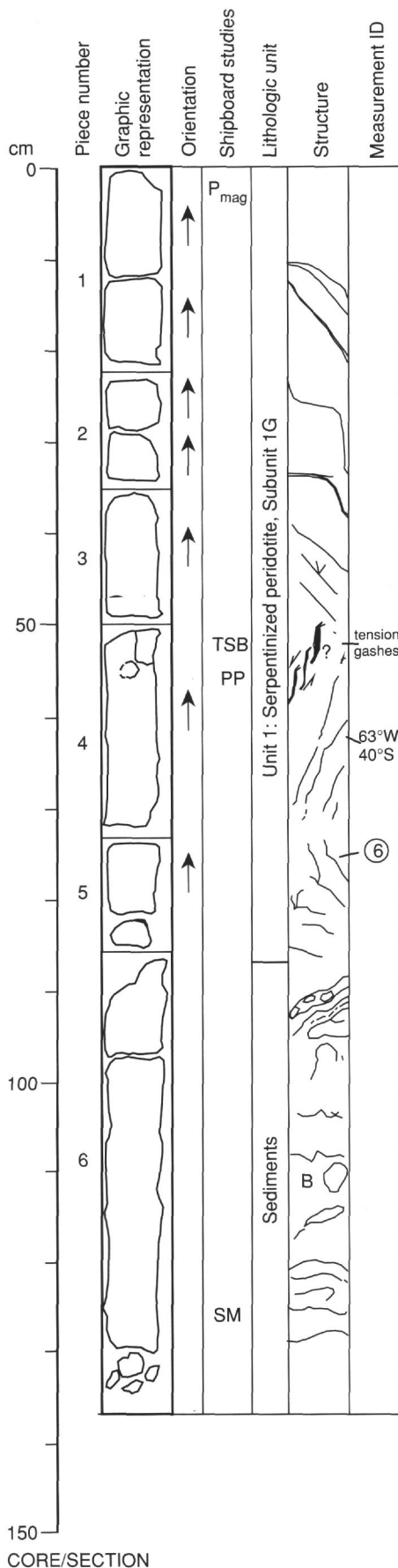
COLOR: Dark greenish gray (5GY 4/1).
LAYERING: No obvious primary igneous layering.
DEFORMATION: Locally brecciated and crosscut by veins filled with calcite and/or serpentine. No obvious evidence of earlier high temperature deformation.
PRIMARY MINERALOGY: No obvious plagioclase but may be obscured by serpentinization.
 Olivine - Mode: 90%.
 Pyroxene (orthopyroxene(?)) - Mode: 10%.
 Crystal size: <10 mm.
 Crystal shape: Subhedral (poikilitic).
 Spinel - Mode: 1%.
 Crystal size: <1 mm.
 Crystal shape: Euhedral.
 Crystal orientation: None.
SECONDARY MINERALOGY: Serpentine + magnetite are derived from olivine, pyroxenes, and spinel. Pyrite(?) also present.
 Total percent: 80%.
 Texture: Mesh serpentinite.
 Vein material: 1 cm at the base of Piece 9; irregular 1–4 mm calcite vein in Piece 11.
ADDITIONAL COMMENTS: Subunit continues in Section 149-897C-65R-2.

149-897C-65R-2

UNIT 1: SERPENTINIZED PERIDOTITE

SUBUNIT 1G

Pieces 1-6



COLOR: Dark greenish gray (5GY 4/1).

LAYERING: No obvious primary igneous layering.

DEFORMATION: Local brecciation; cut by fractures filled with calcite and or serpentine. No obvious evidence of earlier high-temperature deformation.

PRIMARY MINERALOGY: Olivine and most pyroxene is altered to serpentine.

Olivine - Mode: 85%.

Pyroxene - Mode: 10%.

Crystal size: 2-6 mm.

Crystal shape: Anhedral (poikilitic).

Crystal orientation: None.

Spinel - Mode: 1%.

Crystal size: ~1 mm.

Crystal shape: Euhedral.

Crystal orientation: None.

Plagioclase - Mode: 2%.

Crystal size: 1-3 mm.

Crystal shape: Anhedral.

Crystal orientation: None.

Comments: Rims spinels or forms veinlets.

SECONDARY MINERALOGY:

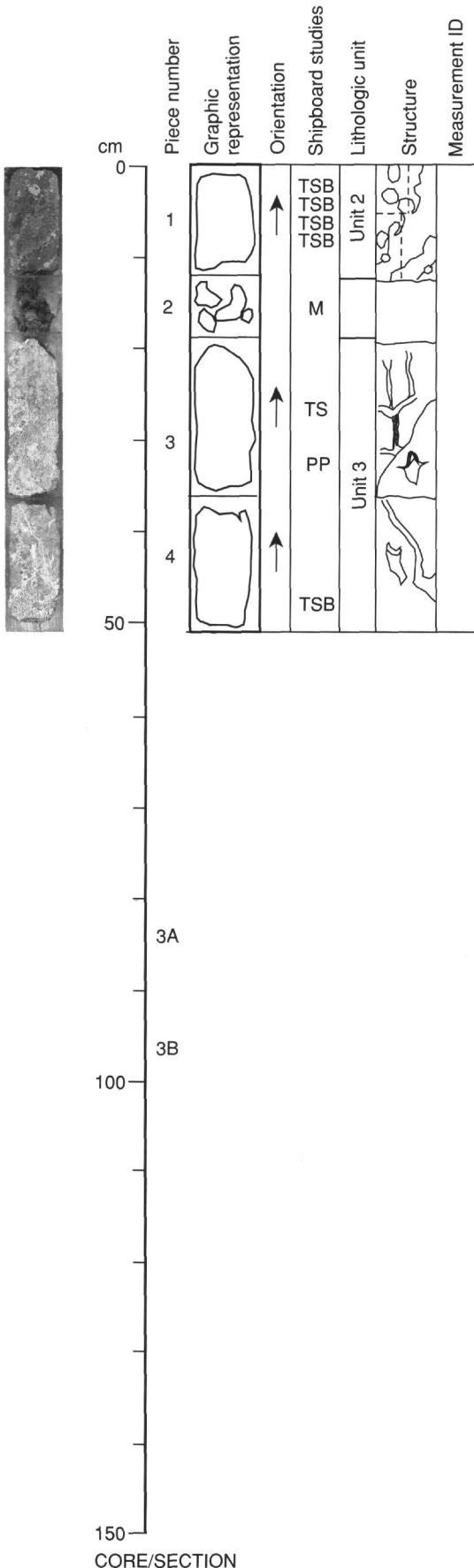
Total percent: 98%.

Texture: Mesh serpentine.

Vein material: 5 cm thick vein of calcite/serpentine breccia cuts Pieces 1 and 2. In contrast Pieces 3, 4, and 5 are cut by more millimeter-size network of irregular branching veins of calcite, and serpentine showing weak or no orientation.

ADDITIONAL COMMENTS: This unit continues from the previous Section (149-897C-65R-1).

Piece 5 here contains more plagioclase (about 8%) and spinel (5%?) than other parts of the unit. Subunit 1G ends at 88 cm. It is separated from Unit 2 (Section 149-897C-65R-3) by a short interval of highly disturbed sediment (89-138 cm) rich in serpentine debris and containing nanofossils.



UNIT 2: VOLCANIC(?) BRECCIA

Pieces 1 and 2

COLOR: Light greenish gray (10GY 7/2) and medium gray (N5).

LAYERING: None.

DEFORMATION: Breccia with no superimposed deformation.

PRIMARY MINERALOGY:

- Feldspar phenocryst(?) - Mode: 1%.
- Crystal size: 1-2 mm.
- Crystal shape: Laths.
- Crystal orientation: None.
- Feldspar phenocryst(?) - Mode: <1%.
- Replaced by serpentine.

SECONDARY MINERALOGY:

- Total percent: 98%.
- Vein material: None.

ADDITIONAL COMMENTS: Fine-grained breccia composed of two distinct facies separated by an irregular boundary - one pale greenish gray, the other pale brown. Both contain fragmental material up to 2 cm in diameter. Fragments include shale, feldspathic diabase, and feldspar phenocrysts. Transition with the next unit is a soft sedimentary breccia (Piece 2.)

UNIT 3: ALTERED SERPENTINITE BRECCIA

Pieces 3 and 4

COLOR: Mottled yellowish brown (10YR 5/4).

LAYERING: None.

DEFORMATION: Unit is a breccia of angular fragments (mean size 1 cm in diameter) in a calcite matrix.

PRIMARY MINERALOGY: All destroyed by serpentinization and subsequent oxidation, carbonation.

SECONDARY MINERALOGY: Limonite and carbonate alteration and serpentinization.

- Total percent: 100%.
- Texture: Mesh serpentinite with superimposed carbonate alteration.
- Vein material: Irregular calcite veins make up about 5% of the two pieces.

ADDITIONAL COMMENTS: These two pieces of altered serpentinite are the only examples in Hole 897C where there is widespread limonitic(?) alteration of serpentinite.