

SITE 1067 HOLE A CORE 1R

CORED 648.0-657.6 mbsf

1067A-1R

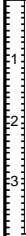
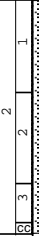



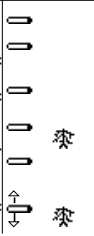

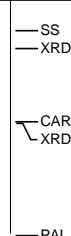
METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
								<p>gn GY lt GY</p>	<p>CALCAREOUS CLAYSTONE and CLAYSTONE</p> <p>AGE: middle Eocene</p> <p>Major Lithologies: The core consists of ~60% greenish gray (5G 6/1 to 5GY 6/1) CALCAREOUS CLAYSTONE and ~30% grayish green (10G 4/2) CLAYSTONE.</p> <p>Minor Lithology: Light gray (N7) CALCAREOUS SILTSTONE forms ~10% of the core.</p> <p>General description: The core consists of upwards-darkening sequences, 5 to 25 cm thick, of CALCAREOUS SILTSTONE, CALCAREOUS CLAYSTONE and CLAYSTONE. CALCAREOUS SILTSTONE typically occurs at the base of each sequence, but is sometimes absent (e.g., Section 1, 74 cm, Section 2, 55 cm, Section 3, 63 cm and 66 cm). The CALCAREOUS SILTSTONES are massive, wavy laminated or lenticular bedded, and sometimes cross bedded. The middle interval of each sequence is typically comprised of CALCAREOUS CLAYSTONE and the upper interval of CLAYSTONE. Bioturbation, including individual Planolites(?) burrows, is greatest at the transition between the CALCAREOUS CLAYSTONE and the overlying CLAYSTONE.</p>



SITE 1067 HOLE A CORE 2R

CORED 657.6-667.3 mbsf

1067A-2R

METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
								gn GY gy GN	<p>CALCAREOUS SILTY CLAYSTONE and CLAYSTONE</p> <p>AGE: middle Eocene</p> <p>Major Lithologies: The core consists of ~60% greenish gray (5G 6/1 - 5GY 6/1) CALCAREOUS SILTY CLAYSTONE and ~30% grayish green (10G 4/2) CLAYSTONE.</p> <p>Minor Lithology: Light gray (N7) CALCAREOUS SILTSTONE forms ~10% of the core.</p> <p>General description: The core consists of upward-darkening sequences, 3 to 15 cm thick, of CALCAREOUS SILTSTONE, CALCAREOUS SILTY CLAYSTONE and CLAYSTONE. CALCAREOUS SILTSTONE 0.5 to 3 cm thick, typically occurs at the base of each sequence. The CALCAREOUS SILTSTONES are massive, wavy or planar laminated, or lenticular bedded, and rarely cross bedded. The middle interval of each sequence is typically comprised of CALCAREOUS CLAYSTONE and the upper interval of CLAYSTONE. Within each sequence the contacts between the CALCAREOUS SILTSTONES and the overlying CALCAREOUS SILTY CLAYSTONES are sharp planar or wavy. Bioturbation increases in intensity near the top of the CALCAREOUS SILTY CLAYSTONE intervals; burrows (Planolites?) penetrate down from the overlying darker CLAYSTONE intervals.</p>

SITE 1067 HOLE A CORE 3R

CORED 667.3-676.9 mbsf

1067A-3R

METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
									<p>CALCAREOUS SILTY CLAYSTONE and CLAYSTONE</p> <p>AGE: middle Eocene</p> <p>Major Lithologies: The core consists of ~60% greenish gray (5G 6/1 to 5GY 6/1) CALCAREOUS SILTY CLAYSTONE and ~30% grayish green (10G 4/2) and pale brown (5YR 5/2) CLAYSTONE.</p> <p>Minor Lithology: Light gray (N7) CALCAREOUS SILTSTONE forms ~10% of the core.</p> <p>General description: The core consists of upwards-darkening sequences, 5-20 cm thick, of CALCAREOUS SILTSTONE, CALCAREOUS SILTY CLAYSTONE and CLAYSTONE. CALCAREOUS SILTSTONE 0.5 to 3 cm thick, typically occurs at the base of each sequence. The CALCAREOUS SILTSTONES are massive, parallel laminated, wavy laminated, lenticular or convolutedly bedded. The middle interval of each sequence is typically comprised of CALCAREOUS CLAYSTONE and the upper interval of CLAYSTONE. The contact between the CALCAREOUS SILTSTONES and the overlying CALCAREOUS SILTY CLAYSTONES are sharp planar or wavy. Bioturbation increases in intensity near the top of the CALCAREOUS SILTY CLAYSTONE intervals; burrows (Planolites?) penetrate down from the overlying darker CLAYSTONE intervals. From Section 2, 28 cm to the base of Section CC, the CLAYSTONES are more brownish in color than sediment in the uppermost portion of the core.</p>

SITE 1067 HOLE A CORE 4R

CORED 676.9-686.5 mbsf

1067A-4R

METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
							<p>CAR CAR XRD PH PH</p>	<p>pal gn GY pal gn GY gy GN pal gn GY pal gn GY pal gn GY pal gn GY pal gn GY pal gn GY pal gn GY</p>	<p>CALCAREOUS SILTY CLAYSTONE and CLAYSTONE</p> <p>AGE: middle Eocene</p> <p>Major Lithologies: The core consists of ~70% greenish gray (5G 6/1 to 5GY 6/1) CALCAREOUS SILTY CLAYSTONE and ~25% grayish green (10G 4/2) and pale brown (5YR 5/2) CLAYSTONE.</p> <p>Minor Lithology: Light gray (N7) CALCAREOUS SILTSTONE forms ~5% of the core.</p> <p>General description: The core consists of upwards-darkening sequences, 3-20 cm thick, of CALCAREOUS SILTSTONE, CALCAREOUS SILTY CLAYSTONE and CLAYSTONE. CALCAREOUS SILTSTONE typically occurs at the base of each sequence. The middle interval of each sequence is typically comprised of CALCAREOUS CLAYSTONE and the upper interval of CLAYSTONE. However, upward-darkening sequences are less complete compared to those observed in Cores 1067A-1R and 1067A-2R in that CALCAREOUS SILTSTONE and/or CLAYSTONE intervals are sometimes missing. The CALCAREOUS SILTSTONES are either massively bedded, lenticular bedded, planar laminated, or wavy laminated. Possible cross bedding in CALCAREOUS SILTSTONE occurs in Section 2, 93-95 cm and 127-128 cm. The contact between CALCAREOUS SILTSTONE and the overlying CALCAREOUS SILTY CLAYSTONE in each interval is typically sharp planar or wavy (e.g., Section 2, 94-96 cm), however gradational contacts also occur (e.g., Section 2, 85-90 cm). Bioturbation increases in intensity near the top of the CALCAREOUS SILTY CLAYSTONE intervals; burrows (Planolites?) penetrate down from the overlying darker CLAYSTONE intervals. The CLAYSTONES are more brownish in color towards the base of the core.</p>

SITE 1067 HOLE A CORE 5R

CORED 686.5-696.1 mbsf


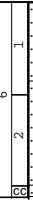



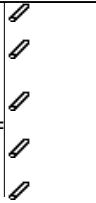

1067A-5R

METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
1.0 0.8 0.6 0.4 0.2 0.0	1 2 3						<ul style="list-style-type: none"> XRD CAR med BR <ul style="list-style-type: none"> SS XRD CAR <ul style="list-style-type: none"> XRD CAR TSB TSB PAL 	gn GY med BR	<p>CALCAREOUS CLAYSTONE and CLAYSTONE</p> <p>AGE: middle Eocene</p> <p>Major Lithologies: The core consists of ~60% greenish gray (5G 6/1 to 5GY 6/1) CALCAREOUS CLAYSTONE and ~25% grayish green (10G 4/2) to moderate brown (5YR 4/4) CLAYSTONE.</p> <p>Minor Lithology: Light gray (N7) CALCAREOUS SILTSTONE forms ~15% of the core.</p> <p>General description: The core consists of upwards-darkening sequences, 5 to 20 cm thick, of CALCAREOUS SILTSTONE, CALCAREOUS CLAYSTONE and CLAYSTONE. CALCAREOUS SILTSTONE typically occurs at the base of each sequence. The middle interval of each sequence is typically comprised of CALCAREOUS CLAYSTONE and the upper interval of CLAYSTONE. The tops of individual sequences are slightly to moderately bioturbated, including Planolites(?) burrows. The CALCAREOUS SILTSTONES are massive, wavy laminated, ripple cross laminated or lenticular bedded.</p>

SITE 1067 HOLE A CORE 6R

CORED 696.1-705.8 mbsf

1067A-6R

METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
							CAR XRD SS CAR TSB SS PAL	gn GY lt GY	<p>CLAYSTONE and CALCAREOUS CLAYSTONE</p> <p>AGE: middle Eocene</p> <p>Major Lithologies: The core consists of ~40% greenish gray (5G 6/1 to 5GY 6/1) CALCAREOUS CLAYSTONE and ~40% grayish green (10G 4/2) to moderate brown (5YR 4/4) CLAYSTONE.</p> <p>Minor Lithology: Light gray (N7) CALCAREOUS SILTSTONE forms ~20% of the core.</p> <p>General description: The core consists of upwards-darkening sequences, 5 to 25 cm thick, of CALCAREOUS SILTSTONE, CALCAREOUS CLAYSTONE and CLAYSTONE. CALCAREOUS SILTSTONE typically occurs at the base of each sequence. The middle interval of each sequence is typically comprised of CALCAREOUS CLAYSTONE and the upper interval of CLAYSTONE. The tops of individual sequences are slightly to moderately bioturbated, including Planolites(?) burrows. The CALCAREOUS SILTSTONES are massive, wavy laminated, ripple cross laminated or lenticular bedded.</p>

SITE 1067 HOLE A CORE 7R

CORED 705.8-715.5 mbsf

1067A-7R

METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
							CAR XRD SS PAL	gn GY dk gy GN	<p>CALCAREOUS CLAYSTONE, CALCAREOUS SILTSTONE, and NANNOFOSSIL CLAYSTONE</p> <p>AGE: middle Eocene</p> <p>Major Lithologies: The core consists of ~40% greenish gray (5G 6/1) to grayish green (10G 4/2) CALCAREOUS CLAYSTONE, ~30% light gray (N7) CALCAREOUS SILTSTONE, and ~25% grayish green (10G 4/2) NANNOFOSSIL CLAYSTONE.</p> <p>Minor Lithology: Grayish green (10G 4/2) CLAYSTONE form ~5% of the core.</p> <p>General Description: The core primarily consists of upwards-darkening sequences, 2-15 cm thick, of CALCAREOUS SILTSTONE, CALCAREOUS CLAYSTONE, and NANNOFOSSIL CLAYSTONE. CALCAREOUS SILTSTONE typically occurs at the base of each sequence. The middle interval of each sequence is typically comprised of CALCAREOUS CLAYSTONE and the upper interval of NANNOFOSSIL CLAYSTONE. CLAYSTONE sometimes occurs in place of the NANNOFOSSIL CLAYSTONE. However, frequently sequences are not complete, missing one of the three lithologies. The CALCAREOUS SILTSTONES are commonly wavy laminated and may contain mud drapes and/or cross bedding. The contact between CALCAREOUS SILTSTONES and overlying CALCAREOUS CLAYSTONES are either gradational, or sharp planar or wavy. Bioturbation is most common in the transition between the CALCAREOUS CLAYSTONES and the overlying grayish green NANNOFOSSIL CLAYSTONES.</p>

SITE 1067 HOLE A CORE 8R

CORED 715.5-725.2 mbsf

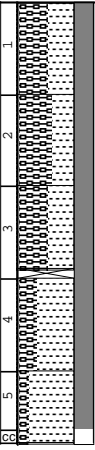
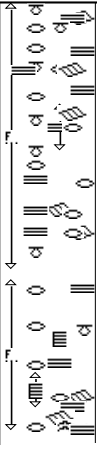
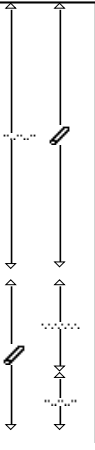
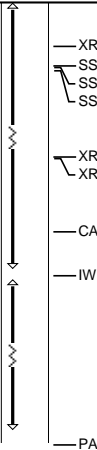
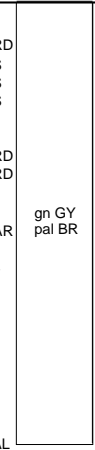
1067A-8R

METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
							<p>TSB</p> <p>XRD CAR</p> <p>gy GN mit GY</p> <p>XRD CAR</p> <p>gy GN</p> <p>gy GN</p> <p>gy GN</p> <p>PAL</p>	<p>CLAYSTONE and CALCAREOUS SILTY CLAYSTONE</p> <p>AGE: middle Eocene</p> <p>Major Lithologies: The core consists of ~40% greenish gray (10GY 5/2) CALCAREOUS SILTY CLAYSTONE and ~40% grayish green (10GY 4/2 to 10G 4/2) and pale brown (5YR 4/4) CLAYSTONE.</p> <p>Minor Lithology: Light gray (N6) CALCAREOUS SILTSTONE forms ~20% of the core.</p> <p>General description: The core consists of upwards-darkening sequences, 3-15 cm thick, of CALCAREOUS SILTSTONE, CALCAREOUS SILTY CLAYSTONE and CLAYSTONE. CALCAREOUS SILTSTONE typically occurs at the base of each sequence. The middle interval of each sequence is typically comprised of CALCAREOUS SILTY CLAYSTONE and the upper interval of CLAYSTONE. These sequences are less complete compared to those observed in Cores 1067A-1R and 1067A-2R in that CALCAREOUS SILTSTONE and/or CLAYSTONE intervals are sometimes absent. The CALCAREOUS SILTSTONES are either massively bedded, lenticular bedded, planar laminated, or wavy laminated. Ball and pillow structure occurs in Section 1, 129-130 cm. Bioturbation is rare. The greenish gray CLAYSTONES are more brownish in color (5YR 4/4) in Sections 3, 4, and Section CC.</p>	

SITE 1067 HOLE A CORE 9R

CORED 725.2-734.8 mbsf


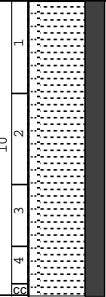
1067A-9R

METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
0.1 0.2 0.3 0.4 0.5 0.6	1 2 3 4 5						XRD SS SS SS XRD XRD CAR IW PAL	gn GY pal BR	<p>CLAYSTONE and CALCAREOUS SILTY CLAYSTONE</p> <p>AGE: early Eocene</p> <p>Major Lithologies: The core consists of ~55% pale brown (5YR 4/4) CLAYSTONE and ~40% greenish gray (10GY 5/2) CALCAREOUS SILTY CLAYSTONE.</p> <p>Minor Lithology: Light gray (N6) CALCAREOUS SILTSTONE forms ~5% of the core.</p> <p>General description: The core consists of upwards-darkening sequences, 3-25 cm thick, of CALCAREOUS SILTSTONE, CALCAREOUS SILTY CLAYSTONE and CLAYSTONE. Basal CALCAREOUS SILTSTONES are sometimes absent in the sequences. They are either massively bedded, lenticular bedded, planar laminated, wavy laminated, or rarely cross laminated. The CALCAREOUS SILTY CLAYSTONES show planar laminae, and sometimes contain disrupted siltstone laminae (due to burrowing or load casting). Thin bedded intervals are present instead of the upwards-darkening sequences in Section 4, 80-110 cm, and Section 5, 0-32 cm and 41-60 cm.</p>

SITE 1067 HOLE A CORE 10R

CORED 734.8-739.6 mbsf

1067A-10R

METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
							<p>CAR XRD</p> <p>XRD CAR</p> <p>PAL</p>	<p>med BR gy GN</p>	<p>CLAYSTONE and SILTY CLAYSTONE</p> <p>AGE: early Eocene</p> <p>Major Lithologies: The core consists of ~75% moderate brown (5YR 4/4 to 5YR 3/4) CLAYSTONE and ~20% grayish green SILTY CLAYSTONE.</p> <p>Minor Lithologies: Light gray (N6) CALCAREOUS SILTSTONE forms ~5% of the core.</p> <p>General Description: The core consists of upwards-darkening sequences, 2-10 cm thick, of CALCAREOUS SILTSTONE, SILTY CLAYSTONE and CLAYSTONE. CALCAREOUS SILTSTONE typically occurs at the base of each sequence and is either massively bedded, lenticular bedded, planar laminated, or wavy laminated. The SILTY CLAYSTONES show planar laminae, and sometimes contain disrupted siltstone laminae (due to burrowing or load casting). Bioturbation is most common in the transition between the SILTY CLAYSTONES and the overlying moderate brown CLAYSTONES. Thin bedded intervals are present instead of the upwards-darkening sequences in Section 1 and Section 2, 0-30 cm.</p>

SITE 1067 HOLE A CORE 11R

CORED 739.6-744.5 mbsf


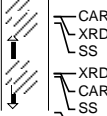
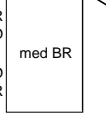
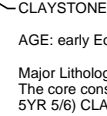
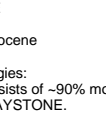
1067A-11R

METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
0 1 2 3 4 5 6							CAR XRD	med BR gy GN	<p>CLAYSTONE</p> <p>AGE: early Eocene</p> <p>Major Lithologies: The core consists of ~85% moderate brown (5YR 4/4 to 5YR 5/6) CLAYSTONE</p> <p>Minor Lithologies: Grayish green SILTY CLAYSTONE forms ~15% of the core and light gray (N6) CALCAREOUS SILTSTONE forms ~5%.</p> <p>General Description: The core consists of thinly bedded intervals, 2-10 cm thick, of SILTY CLAYSTONE and CLAYSTONE. Bioturbation is most common near the contacts between the SILTY CLAYSTONES and the overlying moderate brown CLAYSTONES. The 1 mm to 1 cm thick CALCAREOUS SILTSTONE intervals are either lenticular bedded, planar laminated, or wavy laminated. The SILTY CLAYSTONES show planar laminae, and sometimes contain disrupted siltstone laminae (due to burrowing or load casting). Some upwards-darkening sequences of CALCAREOUS SILTSTONE, SILTY CLAYSTONE, and CLAYSTONE occur in Sections 2, 3, 4 and CC. A pebble-size apatite piece occurs in moderate brown CLAYSTONE in Section 3, 79-80 cm.</p>

SITE 1067 HOLE A CORE 12R

CORED 744.5-754.2 mbsf

1067A-12R

METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
12 2 1 0							CAR XRD SS med BR XRD CAR SS PAL		<p>CLAYSTONE</p> <p>AGE: early Eocene</p> <p>Major Lithologies: The core consists of ~90% moderate brown (5YR 4/4 to 5YR 5/6) CLAYSTONE.</p> <p>Minor Lithologies: Grayish orange (10YR 4/4) CALCAREOUS CLAYSTONE forms 5% of the core, as does greenish gray (5GY 6/1) CALCAREOUS SANDY SILTSTONE.</p> <p>General Description: The core is dominated by moderate brown CLAYSTONE, within which are thin beds of CALCAREOUS CLAYSTONE and CALCAREOUS SANDY SILTSTONE. Upwards-darkening intervals are sometimes present in the CLAYSTONE. The CALCAREOUS SANDY SILTSTONES are either lenticular bedded, planar laminated, or cross laminated. The CALCAREOUS CLAYSTONES are bioturbated.</p>

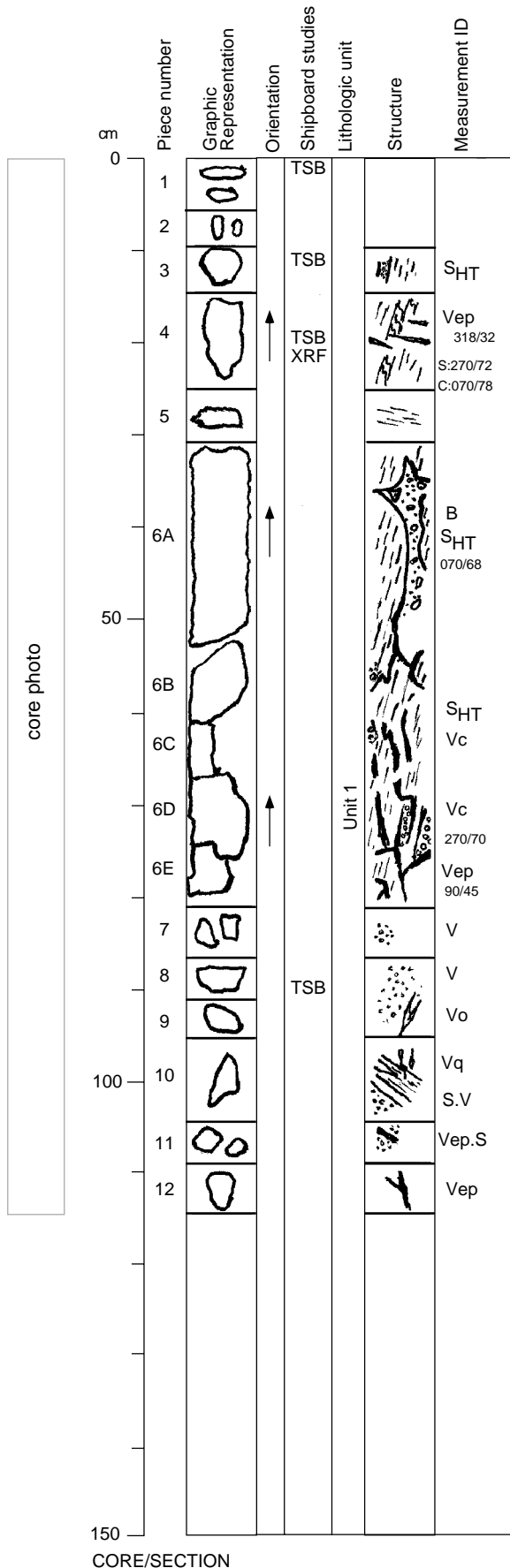
SITE 1067 HOLE A CORE 13R

CORED 754.2-763.8 mbsf

1067A-13R

METERS	CORE AND SECTION	LITHOLOGY	BIOTURBATION INTENSITY	PHYSICAL STRUCTURES	ACCESSORIES	CORE DISTURBANCE	SAMPLES	COLOR	REMARKS
13 12 11 10 9 8 7 6 5 4 3 2 1	13 12 11 10 9 8 7 6 5 4 3 2 1						CAR XRD SS SS SS TSB PH TSB SS PAL TSB	mdk gn GY dk gn GY med BR	<p>NANNOFOSSIL CLAYSTONE and CLAYSTONE</p> <p>AGE: early(?) to late Paleocene</p> <p>Major Lithologies: The core consists of ~60% dark greenish gray (5GY 4/1) to greenish gray (5GY 6/1) NANNOFOSSIL CLAYSTONE and ~30% dark greenish gray (5GY 4/1) to moderate brown (5YR 4/4) CLAYSTONE.</p> <p>Minor Lithologies: Light greenish gray (5GY 8/1) CALCAREOUS SANDY SILTSTONE forms 10% of the core. A 1.5 cm thick CONGLOMERATE occurs in Section 1, 125-127 cm.</p> <p>General Description: Lithologic contacts are indiscernible because of strong core disturbance. Section 1 consists of NANNOFOSSIL CLAYSTONE and CALCAREOUS SANDY SILTSTONE, which is either lenticular bedded, planar laminated, or wavy laminated. In Section 1, 125-127 cm, a matrix supported CONGLOMERATE occurs, which contains pebbles (1-5 mm) of very pale orange (10YR 8/2) limestone (and two black pebbles in the working half of the core). Section 2 and Section CC contain CLAYSTONE, showing low to no bioturbation.</p>

173-1067A-14R-1



CLAYSTONE and CALCAREOUS SANDY SILTSTONE

Pieces 1, 2A,B

COLOR: Light greenish gray (56Y 8/1), dark greenish gray (5GY 4/1) and moderate brown (5YR 4/4).
ADDITIONAL COMMENTS: Similar to sediments in Unit IIB.

UNIT 1: TONALITE GNEISS

Pieces 3, 7-9

COLOR: Mottled pale red (10R6/2) and greenish black (5BG3/1).
IGNEOUS STRUCTURES: None.
METAMORPHIC STRUCTURES: Discontinuous mineralogical and textural banding, feldspar micro-augen, and ribbon quartz.
MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50-60	~1	anhedral	porphyroblastic
quartz	20-40	<1	anhedral	ribbons elongated parallel to foliation polycrystalline in pressure shadows dark coloured
groundmass	5-30			

VEINS: 1% (of rock) <2 mm wide epidote and Fe-stained calcite veins, some with drusy calcite.
ADDITIONAL COMMENTS: Piece 3 contains a discrete cryptocrystalline mafic band with rounded amphiboles.

UNIT 1: FOLIATED AMPHIBOLITE

Pieces 4, 5, 6A-E, 7, 10-12

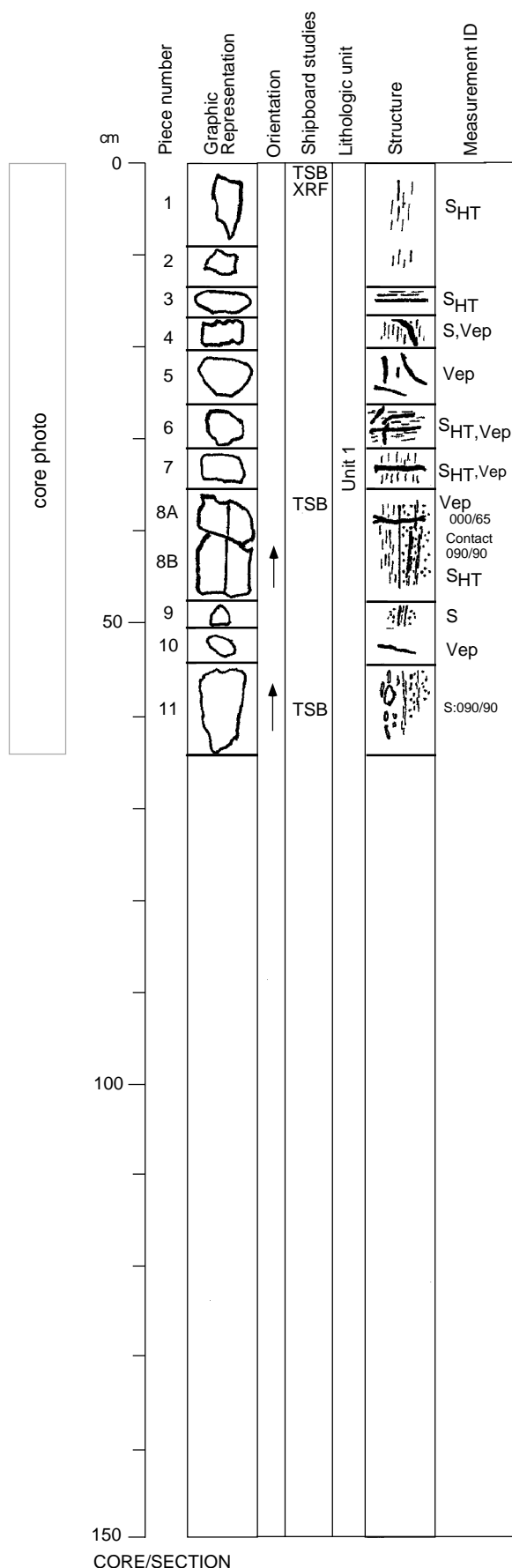
COLOR: Greenish black (5BG 3/1).
IGNEOUS STRUCTURES: None.
METAMORPHIC STRUCTURES: Strong foliation defined by plagioclase and amphibole.

MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
Plagioclase	50	<0.5-2	anhedral	elongated parallel to foliation
Amphibole	50	<0.5-2	acicular	elongated parallel to foliation
Epidote	0-10	<0.5	anhedral	locally replaces plagioclase

VEINS: 1-5% (of rock) locally anastomosing epidote veins, calcite, quartz and quartz + plagioclase veins. Veins cross cut foliation. Some veins contain drusy calcite. Maximum vein width is ~1.5 cm.

173-1067A-15R-1



UNIT 1: TONALITE GNEISS

Pieces 1, 2, 5, 9-11

COLOR: Mottled pale red (10R 6/2) and greenish black (5BG 3/1).

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Discontinuous mineralogical and textural banding. Piece 11 contains plagioclase augen in coarse-grained bands surrounded by quartz pressure shadows. Rare amphibolite bands are present.

MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50-60	1-15	anhedral	elongated parallel to foliation, coarse plagioclase augen in Piece 11
quartz	20-40	<1-3	anhedral	coarse quartz in pressure shadows in Piece 11
groundmass	5-30	<<1		dark-colored

VEINS: ~1% (of rock) epidote veins.

UNIT 1: FOLIATED AMPHIBOLITE

Pieces 4-7

COLOR: Greenish black (5BG 3/1).

IGNEOUS STRUCTURES: None

METAMORPHIC STRUCTURES: Strong foliation defined by plagioclase and amphibole.

MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
Plagioclase	60	1-4	anhedral	elongated parallel to foliation
Amphibole	40	1-3	acicular	elongated parallel to foliation

VEINS: 5% (of rock) epidote veins.

UNIT 1: Contact between TONALITE GNEISS and FOLIATED AMPHIBOLITE

Pieces 3, 8

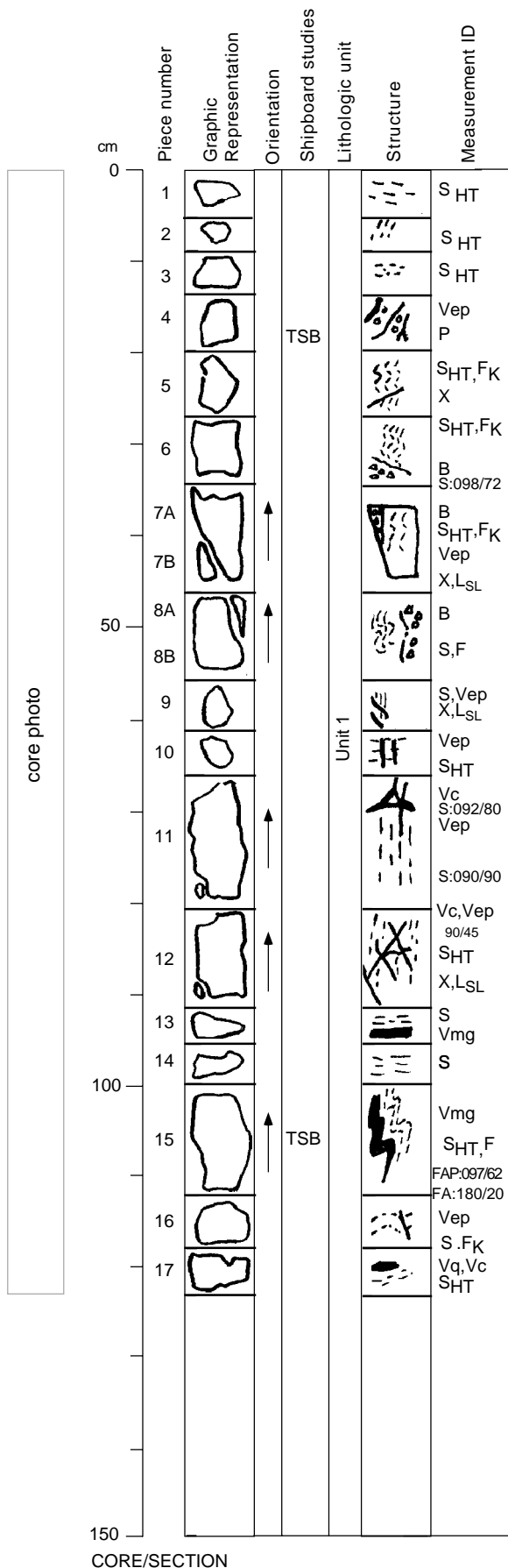
COLOR: Tonalite gneiss: mottled grayish orange pink (10R 6/2) and dark grayish green (5BG 3/1). Amphibolite: greenish black (5BG 3/1).

IGNEOUS STRUCTURES: Possible intrusive contact.

METAMORPHIC STRUCTURES: Strong foliation in amphibolite, epidotized contact zone, gneissose foliation in tonalite is defined by banding of grain size and mineralogy, foliation is slightly oblique or subparallel to contact.

VEINS: 1-5% (of rock) epidote veins.

ADDITIONAL COMMENTS: See above for mineralogical descriptions of tonalite gneiss and amphibolite.



UNIT 1: TONALITE GNEISS

Piece 4

COLOR: Mottled pale red (10R 6/2) and greenish black (5BG 3/1).

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Discontinuous banding defined by variations in mineralogy and grain size.

MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
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Plagioclase 60 <1-10 anhedral

Quartz 20 <1 anhedral

groundmass 20 <<1 dark-colored

VEINS: 1% (of rock) randomly oriented epidote veins and some Fe-oxyhydroxide stains.

UNIT 1: FOLIATED AMPHIBOLITE

Pieces 1-3, 5-17

COLOR: Greenish black (5BY 3/1).

IGNEOUS STRUCTURES: Tonalite intrusion?

METAMORPHIC STRUCTURES: Foliation in amphibolite and concordant tonalite vein/dike are tightly folded.

MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
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Plagioclase 50 1-3 anhedral elongated parallel to foliation

Amphibole 50 1-3 acicular elongated parallel to foliation

VEINS: <5% epidote, calcite and quartz+plagioclase veins. Calcite veins cross cut epidote veins; epidote veins cross cut tonalite. Some chlorite associated with epidote veins.

ADDITIONAL COMMENTS: Pieces 6-9 have pervasive Fe-oxyhydroxide staining. Tonalite vein (coarse-grained, crystal size 1-5 mm) is composed of approximately 50% plagioclase and 50% quartz.

173-1067A-16R-2

UNIT 1: FOLIATED AMPHIBOLITE

Pieces 1-4

COLOR: Greenish black (5BY 3/1).

IGNEOUS STRUCTURES: None.

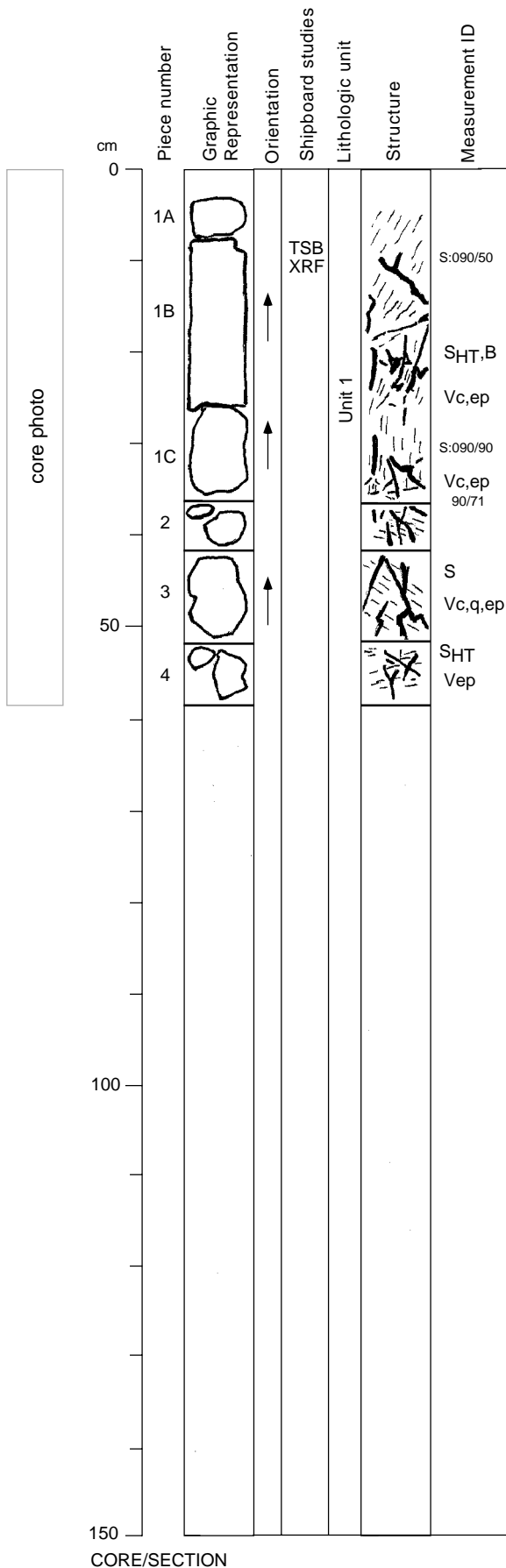
METAMORPHIC STRUCTURES: Foliation defined by plagioclase and amphibole.

MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
Plagioclase	50	1-3	anhedral	elongated parallel to foliation
Amphibole	50	1-3	acicular	elongated parallel to foliation
Epidote	0-10	<1	anhedral	sporadically replaces plagioclase

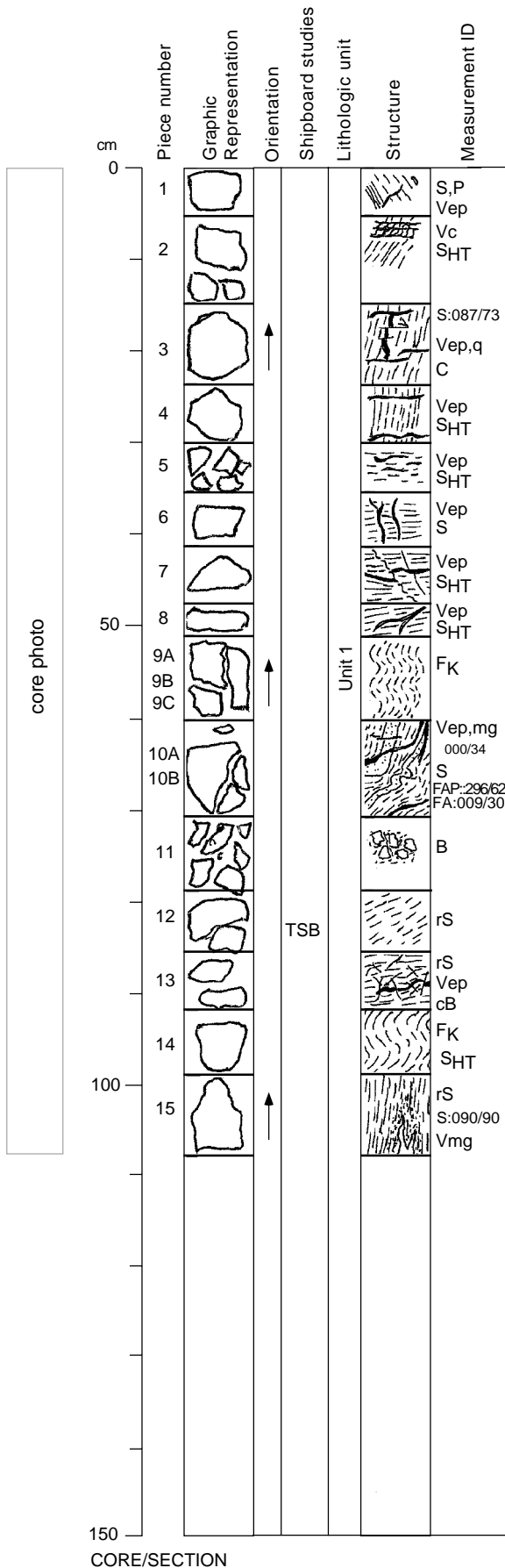
VEINS: 5% 3 mm wide, anastomosing veins of epidote, calcite and Fe-oxyhydroxide some with drusy calcite.

ADDITIONAL COMMENTS: Epidote wall rock alteration adjacent to some veins.



CORE/SECTION

173-1067A-17R-1



UNIT 1: FOLIATED AMPHIBOLITE

Pieces 1-10, 13-15

COLOR: Amphibolite: dark greenish gray to greenish black (5G 4/1 - 5G2/1)

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Foliation defined by elongated plagioclase and amphibole in Pieces 2-4, 6-10, 13, and 14; strong foliation defined by elongated plagioclase and amphibole in Pieces 1, 5, and 15.

MINERALOGY:

Amphibolite: 95% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
amphibole	60-70	3-5	elongate	elongated parallel to foliation
plagioclase	15-25	1-10	granular to elongate	elongated parallel to foliation
chlorite	0-5	1-2	platy	replacement after amphibole
quartz	0-5	3-15	equigranular	in coarse-grained layers in Pieces 10 and 15
epidote	0-2	1-2	granular	replacement after plagioclase

VEINS: 5% (of rock) veins of epidote and pyrite. Veins are discordant to subconcordant with foliation in Pieces 3, 4, 5, 7, 8, and 10.

ADDITIONAL COMMENTS: Piece 15 - Epidote is overprinting foliation into a vein filled with plagioclase and quartz (20 mm wide that branches and narrows to 2 mm wide).

UNIT 1: EPIDOSITE

Pieces 11 and 12

COLOR: Dusky yellow green (4GY 5/2)

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Foliation.

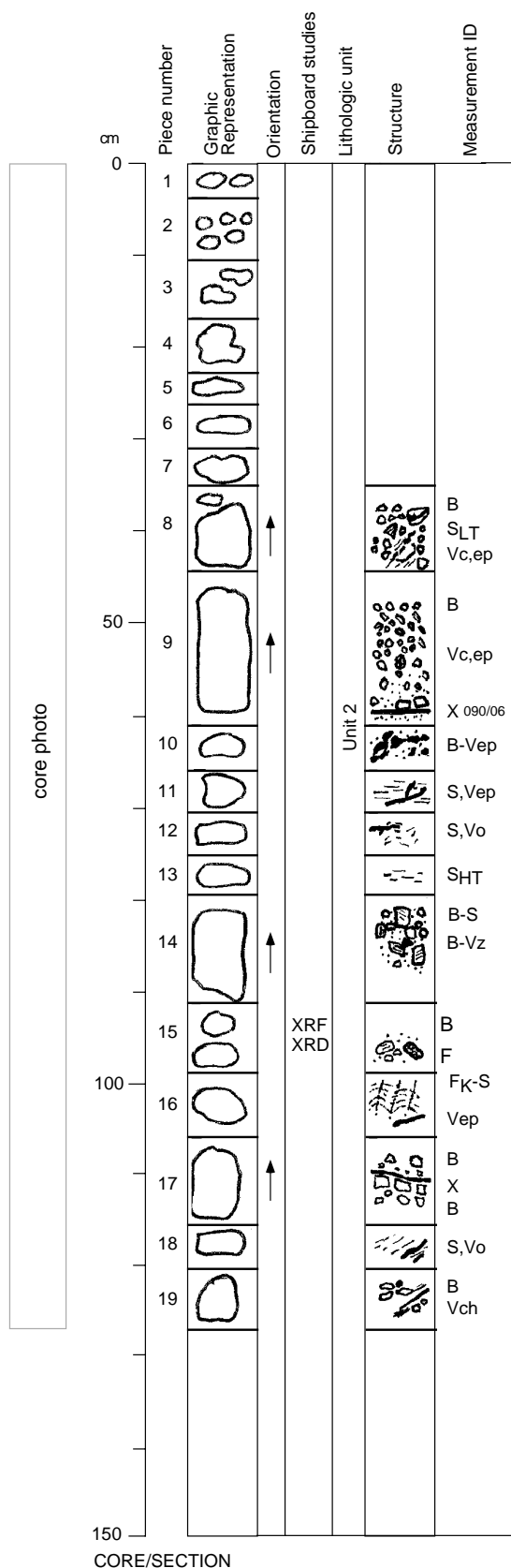
MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
epidote	75	1-2	granular	elongated parallel to foliation to elongate
quartz	20	1-5	granular	
plagioclase	<1	1-2	elongate	elongated parallel to foliation
chlorite?	<1	2-3	elongate	
pyrite	<1			

VEINS: 5% (of rock) Small veins and veinlets (≤ 1 mm wide) of chlorite and quartz.

ADDITIONAL COMMENTS: The initial rock was probably a mixture of feldspar and quartz (tonalite?). Piece 11 consists of pebbles of epidosite and amphibolite similar to other amphibolite in this section.

173-1067A-18R-1



EXOTIC FRAGMENTS: CALCAREOUS CLAYSTONE AND CLAYSTONE

Pieces 1-7

COLOR: Greenish gray (5GY 6/1) and pale reddish brown (10R 5/4).

MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
Clay	5			
Calcite	25			

ADDITIONAL COMMENTS: Similar to sediments in Unit IIB, and must have been introduced during a wiper trip that was made to clean the hole (i.e., not in place).

UNIT 2: AMPHIBOLITE MATRIX-SUPPORTED BRECCIA

Pieces 8-10, 14, 15, and 17

COLOR: Amphibolite: greenish black (5BG 3/1). Matrix: light olive brown (5Y 5/6).

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Matrix-supported breccia.

MINERALOGY:

MINERALOGY:

Amphibolite Clasts: 100%

Mineral	Mode (%)	Size (mm)	Shape	Comments
amphibole	50-90	1-6	elongate	elongated parallel to foliation
plagioclase	10-50	1-4	granular	elongated parallel to foliation
chlorite	0-10	<1	platy	replacement of amphibole
epidote	0-10	1	granular	replacement of plagioclase

Matrix: 30-70% of rock

Chlorite, oxyhydroxides, finely-ground host rock(?), ± microcrystalline calcite.

VEINS: Veins of epidote and quartz-plagioclase within the clasts (<0.5 mm wide). Epidote veins formed before brecciation.

ADDITIONAL COMMENTS: Poorly-sorted matrix-supported breccia. Also present are clasts of carbonate and feldspar (<2% of rock). All clasts are angular in shape and <1 mm to 4.5 cm in size.

UNIT 2: FOLIATED AMPHIBOLITE

Pieces 11-13, 16, 18, and 19

COLOR: greenish black (3G 3/1).

IGNEOUS STRUCTURES: None.

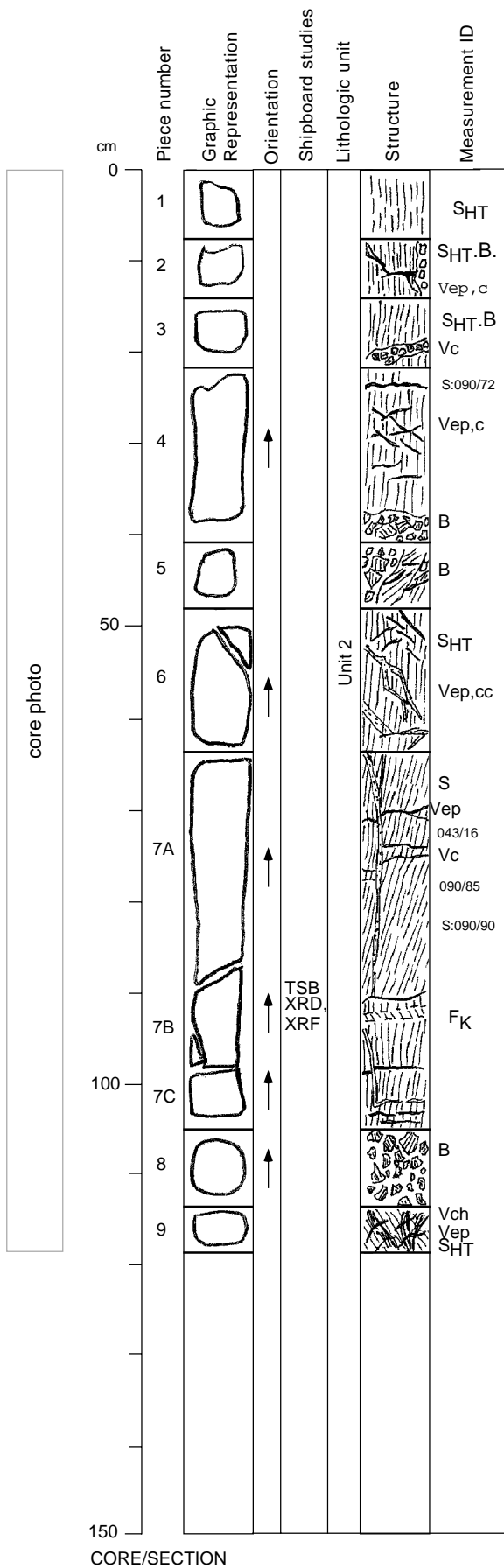
METAMORPHIC STRUCTURES: Foliation defined by elongated plagioclase and amphibole in Pieces 11, 13, 16, 18, and 19; strong foliation defined by elongated plagioclase and amphibole in Piece 12.

MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
amphibole	60	1-5	elongate	elongate parallel to foliation
plagioclase	35	1-4	elongate	elongate parallel to foliation
epidote	3	1-2	granular	
chlorite	2	<1	platy	

VEINS: Plagioclase-quartz veins in Pieces 16 and 18 (0.5-1.0 mm wide). Epidote veins in Piece 12 (0.5 mm wide). Also pyrite and oxyhydroxide is found in epidote veins.

ADDITIONAL COMMENTS: Pyrite occurs as disseminated grains in Piece 19.



UNIT 2: FOLIATED AMPHIBOLITE TO BRECCIATED AMPHIBOLITE

Pieces 1-7, and 9

COLOR: Greenish black (3G 3/1).
IGNEOUS STRUCTURES: None.
METAMORPHIC STRUCTURES: Strong foliation defined by elongated plagioclase and amphibole into the foliation plane in Pieces 1-3, 6, 7, and 9; matrix-supported breccia in Pieces 4 and 5..
MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
amphibole	50	3-6	elongate	elongate parallel to foliation
plagioclase	35	1-5	elongate	elongate parallel to foliation
chlorite	5	1-2	platy	replacement of amphibole

VEINS: Calcite veins (0.5-2.0 mm wide) in Pieces 4-7; epidote veins (0.5 mm wide) in Piece 7C. Epidote veins formed earlier than calcite veins.
ADDITIONAL COMMENTS: Piece 5 is a matrix-supported breccia containing angular foliated amphibolite clasts. Veins cutting the breccia are filled with feldspathic material associated with quartz. Fragments (clasts) are 2 mm to 1 cm in size. Percentage of clasts is 60% and percentage of matrix is 40%.

UNIT 2: AMPHIBOLITE/META-ANORTHOSITE/TONALITE MATRIX-SUPPORTED BRECCIA

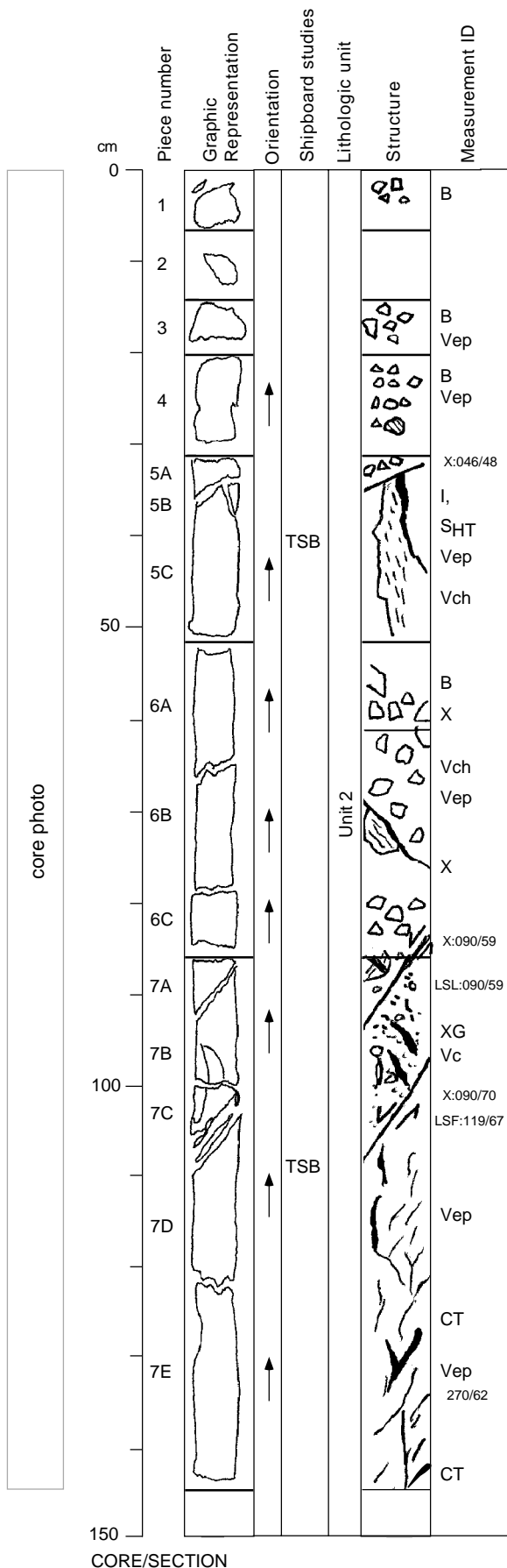
Piece 8

COLOR: Greenish black (3G 3/1).
IGNEOUS STRUCTURES: None.
METAMORPHIC STRUCTURES: Matrix-supported breccia.
MINERALOGY:
Clasts: 50% of rock (size: <1 mm to 2.5 cm, shape: subangular):

Mineral	Mode (%)	Size (mm)	Shape	Comments
Amphibolite 60%				
amphibole	90			
plagioclase	10			
Anorthosite/Tonalite 40%				
plagioclase	80			
quartz	20			
epidote	<2			

Matrix: 50% of rock
 Microcrystalline calcite, clays or finely-ground host rock(?).
VEINS: Veins of epidote (<1 mm wide) within the clasts that formed before brecciation.
ADDITIONAL COMMENTS: Foliation orientation of clasts is random.

173-1067A-19R-1



UNIT 2: MATRIX-SUPPORTED BRECCIA

Pieces 1, 2, 3, 4, 5A, 6, 7A

COLOR: Matrix: Greenish gray (5GY 6/1). Clasts: pale green (5G 7/2, rare), greenish black (5BG 3/1) and white (N9).

METAMORPHIC STRUCTURES: Foliated amphibolite clasts.

CLASTS: 30% of rock: 90% amphibolite, 3% epidosite, 6% chlorite-rich rock, 1% quartz.

MATRIX: 65% of rock: Microcrystalline calcite, chlorite, plagioclase, amphibole (identified by XRD), finely-ground host rock ?

VEINS: 5% of rock: anastomosing veins of epidote, quartz, chlorite and calcite veins. Amphibolite clasts contain veins of epidote.

ADDITIONAL COMMENTS: Matrix contains sparse euhedral sulfides (1 mm). Piece 6A contains discontinuous Fe-oxyhydroxide banding.

UNIT 2: FOLIATED AMPHIBOLITE

Pieces 5B,C

COLOR: Amphibolite: greenish black (5BG 3/1). Anorthosite: white to pale green (N9 to 5G 7/2)

METAMORPHIC STRUCTURES: Foliation defined by plagioclase and amphibole.

MINERALOGY: 50% plagioclase, 50% amphibole.

VEINS: 20% (of rock) veins of epidote and deformed veins of quartz + plagioclase ± chlorite.

ADDITIONAL COMMENTS: Foliated amphibolite is probably a clast in a matrix supported breccia. Pods containing ~ 100% weakly chloritized plagioclase are probably anorthosite.

UNIT 2: CALCITE-RICH FAULT GOUGE

Pieces 7A(in part), B-C

COLOR: Matrix: light greenish gray (5GY 8/1). Clasts: greenish black (5BY 3/1) and dusky yellow green (5GY 5/2).

UNIT 2: TONALITE-AMPHIBOLITE BRECCIA

Pieces 7D-E

COLOR: Dark greenish gray (5G 4/1), pale greenish yellow (10Y 8/2). **IGNEOUS STRUCTURES:** None.

METAMORPHIC STRUCTURES: Some poorly defined foliation in amphibolite clasts. Also contains clasts of unfoliated tonalite gneiss.

MINERALOGY:

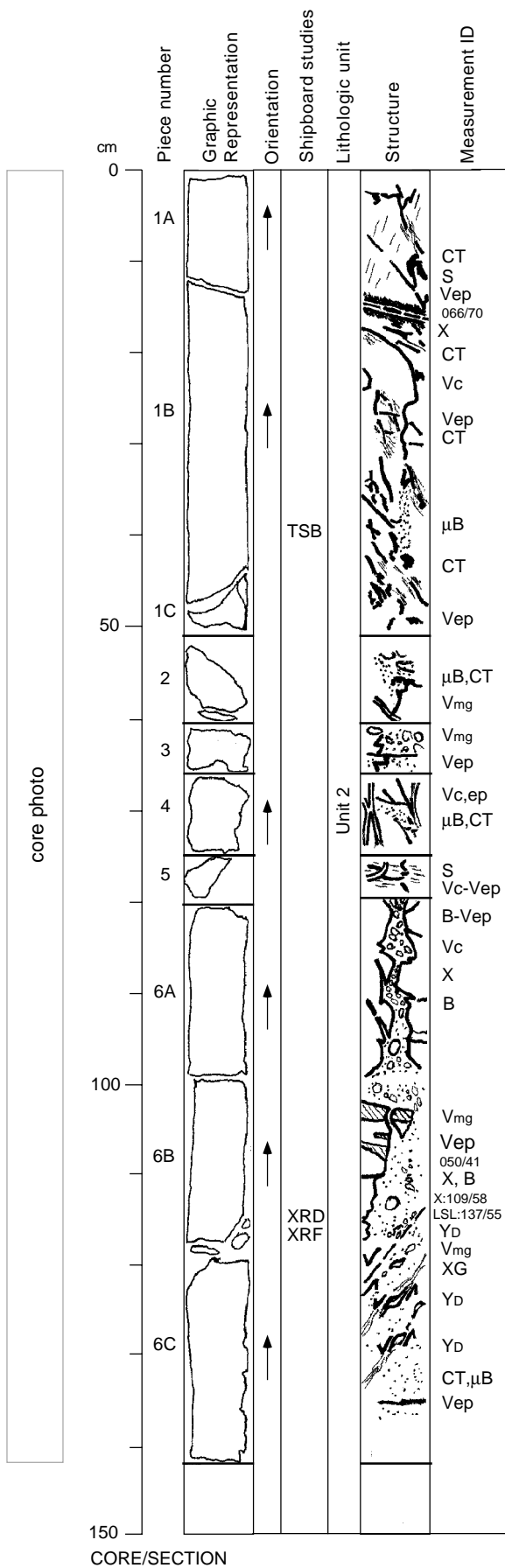
Tonalite gneiss: 40-65% of rock: 45% plagioclase (augen?), 55% dark (quartz-bearing?) groundmass.

Amphibolite: 5-30% of rock: 50% plagioclase, 50% amphibole.

VEINS: 3% (of rock) variably deformed, anastomosing veins of epidote and calcite.

ADDITIONAL COMMENTS: Margins of clasts obscured by anastomosing veins and extensive epidotization and chloritization of the clasts.

173-1067A-19R-2



UNIT 2: TONALITE-AMPHIBOLITE BRECCIA

Pieces 1A-C, 2, 3

COLOR: Amphibolite: dark greenish gray (5G 4/1). Tonalite: pale greenish yellow (10Y 8/2).

METAMORPHIC STRUCTURES: Amphibolite clasts have poorly defined foliation.

MINERALOGY:

Tonalite gneiss: 40% of rock: 45% plagioclase (augen?), 55% dark (quartz-rich) groundmass.

Amphibolite: 20% of rock: 50% plagioclase, 50% amphibole.

VEINS: 40% of rock: variably deformed, anastomosing epidote and calcite veins.

ADDITIONAL COMMENTS: Difficult to discriminate margins of clasts due to anastomosing vein networks and extensive epidotization and chloritization of the clasts.

UNIT 2: BRECCIATED AMPHIBOLITE

Pieces 4, 5, 6A

COLOR: Amphibolite: greenish black (5BG 3/1). Veins: light gray (N7).

METAMORPHIC STRUCTURES: Clasts of foliated amphibolite are variably rotated by brecciation.

CLASTS: 60% of rock: 85% amphibolite, 15% epidosite.

VEINS: 40% of rock: anastomosing veins of calcite, transitional with underlying fault gouge (19R-1, Pieces 7A-C).

UNIT 2: BRECCIA-FAULT GOUGE

Piece 6B

COLOR: Pale greenish yellow (10Y 8/2), dark greenish gray (5G 4/1), greenish black (5BG 3/1) and very pale orange (10YR 8/2).

METAMORPHIC STRUCTURES: Clasts of foliated amphibolite are variably rotated by brecciation.

CLASTS: 50% of rock: 70% amphibolite, 30% quartzofeldspathic (aggregates or lenses).

VEINS: 50% of rock: veins of epidote, chlorite and calcite. Epidote veins are brecciated and rotated by calcite veins.

ADDITIONAL COMMENTS: Breccia grades from clast to matrix-supported with depth and proximity to fault gouge.

UNIT 2: FAULT GOUGE-BRECCIA

Pieces 6C-D

COLOR: Pale greenish yellow (10Y 8/2), dark greenish gray (5G 4/1), greenish black (5BG 3/1), pale orange (10YR 8/2) and discontinuous bands of pale brown (5YR 5/2).

METAMORPHIC STRUCTURES: Relict foliation within amphibolite clasts.

CLASTS: 30% of rock: 50% quartzofeldspathic (porphyroclastic), 35% amphibolite, 15% epidosite.

MATRIX: 70% of rock: Microcrystalline calcite, chlorite, plagioclase and amphibole (determined by XRD), finely-ground host rock ?

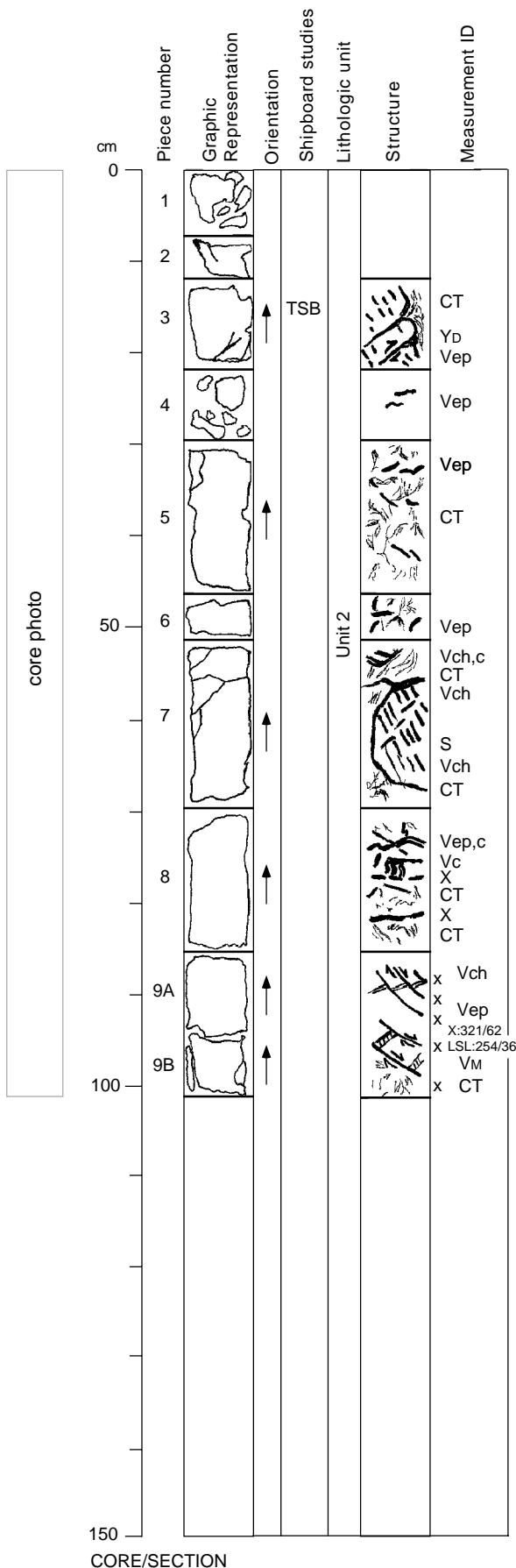
VEINS: 2% (of rock) dissected epidote veins.

ADDITIONAL COMMENTS: Plagioclase locally replaced by calcite. Slickensides contact with underlying rock (6b). Faulted Fe-oxyhydroxide band.

173-1067A-19R-3

UNIT 2: AMPHIBOLITE-ANORTHOSITE BRECCIA

Pieces 1-9



COLOR: Chlorite veins: mottled pale green (5G 7/2 and 10Y 6/2). Amphibolite: greenish black(5BG 3/1). Anorthosite: very pale orange (10YR 8/2). Fe-oxyhydroxide bands and veins: pale red (10R 6/2).

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Amphibolite clasts are variably foliated or unfoliated.

MINERALOGY:

Amphibolite: 65% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50	1-4	anhedral	variably replaced by epidote
amphibole	50	<2	anhedral	variably replaced by chlorite

Anorthosite: 25% of rock

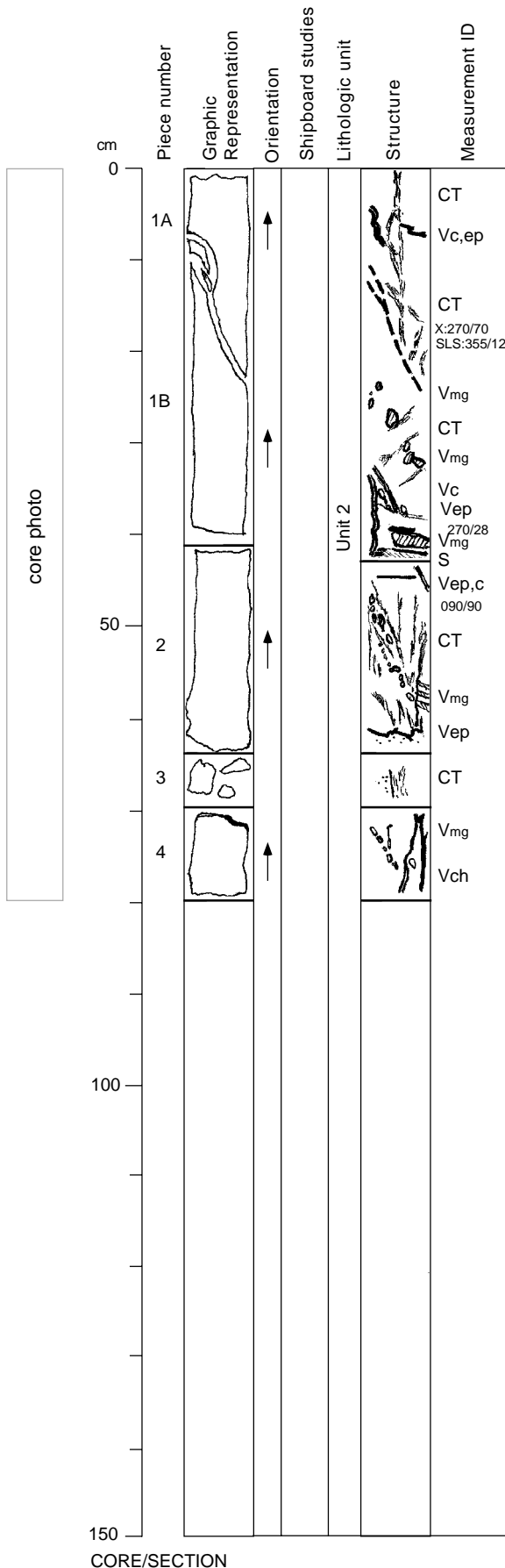
Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50-90	1-4	anhedral	some porphyroclastic
quartz	50	<2	anhedral	
amphibole	10-30	<3	anhedral	

VEINS: 20% (of rock) locally anastomosing veins of Fe-oxyhydroxide, chlorite, epidote and rarely, calcite.

ADDITIONAL COMMENTS: Some amphibolites have textures reminiscent of an allotriomorphic igneous texture. Some anorthosites may be quartz-poor tonalites.

UNIT 2: AMPHIBOLITE-ANORTHOSITE BRECCIA

Pieces 1-4



COLOR: Greenish black (5BG 3/1). Chlorite veins: mottled pale green (5G 7/2 and 10G 6/2). Anorthosite: very pale orange to white (10YR 8/2). Patchy Fe-oxide staining: pale red (10R 6/2).

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Amphibolite is variable foliated and shows significant reorientation across Fe-oxyhydroxide stained fractures and faults.

MINERALOGY:

Amphibolite: 75% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50	<1-2	anhedral	elongated parallel to foliation
amphibole	50	<1-2	acicular	elongated parallel to foliation

Anorthosite: 20% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50-90	1-10	anhedral	
quartz	0-20	1-10	anhedral	

VEINS: 5% (of rock) veins of calcite, Fe-oxyhydroxide and epidote. Calcite and Fe-oxide veins cross cut epidote veins. Significant displacements across Fe-oxide veins is accompanied by formation of slickensides.

ADDITIONAL COMMENTS: Some anorthosites may be quartz-poor tonalites.

173-1067A-20R-1

UNIT 2: AMPHIBOLITE-ANORTHOSITE BRECCIA

Pieces 1-4,5A,11

COLOR: Chlorite veins: mottled greenish gray (5G 6/1). Amphibolite: greenish black (5BG 3/1). Patchy Fe-oxyhydroxide staining: pale greenish yellow (10Y 8/2).

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Angular, variably foliated amphibolite clasts are variably rotated by brecciation.

MINERALOGY:

Amphibolite: 75% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50	0.5-4	anhedral	elongated parallel to foliation
amphibole	50	0.5-4	anhedral	elongated parallel to foliation

Anorthosite: 15% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	80-100	0.5-5	anhedral	possibly porphyroclastic
quartz	0-20	0.5-5	anhedral	

VEINS: 10% (of rock) veins of chlorite, epidote and Fe-oxides.

ADDITIONAL COMMENTS: Breccia is cross cut by 3 cm chlorite vein (suspected chloritized fault gouge) at 21-25 cm. Anorthosite occurs as irregular patches and pods. Some anorthosites may be quartz-poor tonalites.

UNIT 2: AMPHIBOLITE (METAGABBRO)

Pieces 5B-D,6-9,10A-B

COLOR: Greenish black (5BG 3/1)

IGNEOUS STRUCTURES: Hypidiomorphic and/or sub-ophitic textures are locally preserved.

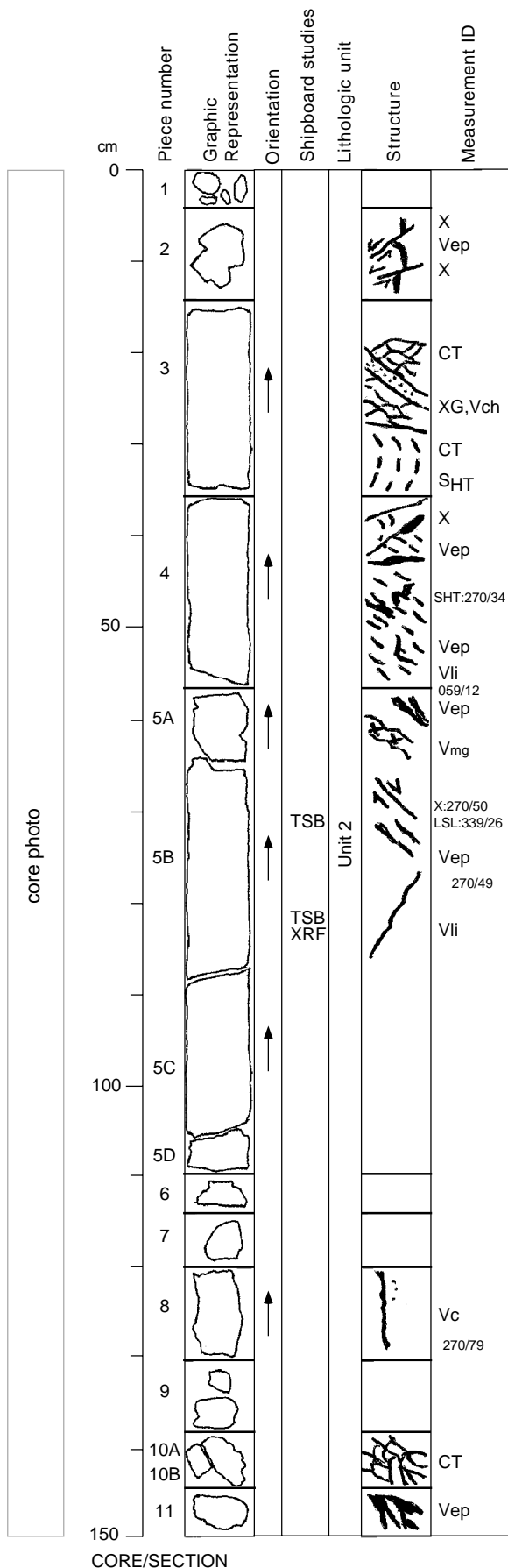
METAMORPHIC STRUCTURES: Locally developed, weak foliation.

MINERALOGY:

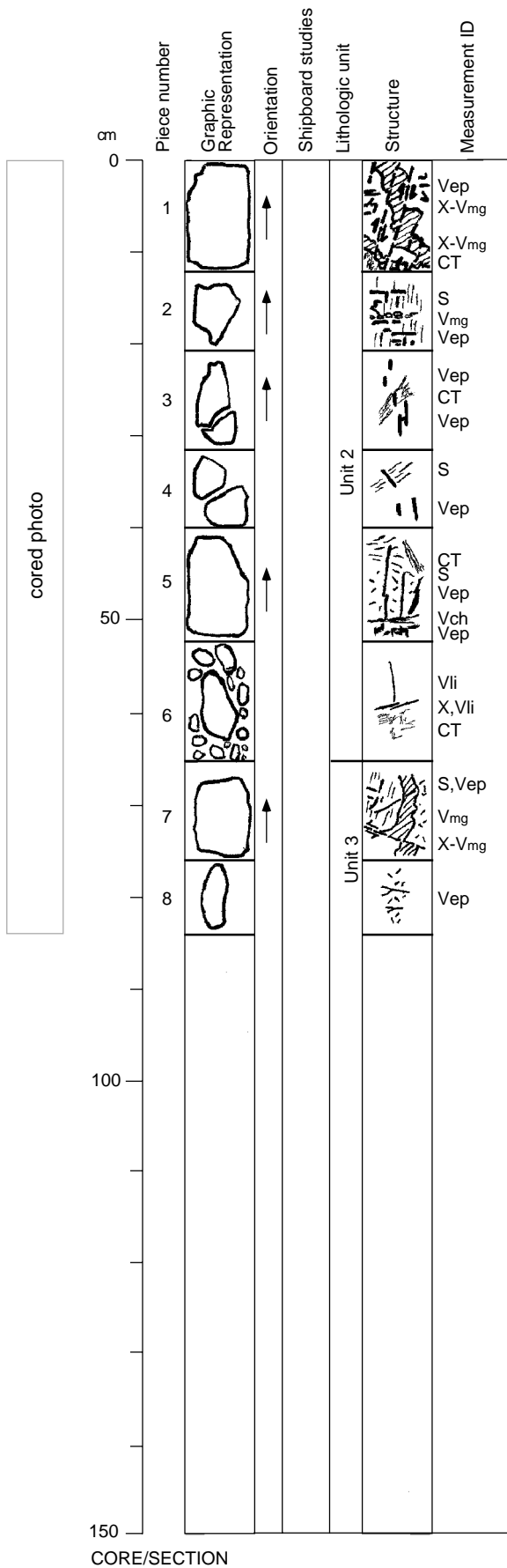
Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50	0.5-3	anhedral	
amphibole	50	<0.5-3	anhedral	

VEINS: 2% (of rock) veins of epidote and minor Fe-oxyhydroxide.

ADDITIONAL COMMENTS: Veining is localized to the top and bottom of this interval, suggesting that it represents a single clast within the breccia, which is unusually well preserved and undeformed.



CORE/SECTION



UNIT 2: AMPHIBOLITE-ANORTHOSITE BRECCIA

Pieces 1-6

COLOR: Chlorite vein: mottled greenish gray (5G 6/1). Amphibolite: greenish black (5BG 3/1). Patchy Fe-oxyhydroxide staining: pale greenish yellow (10Y 8/2).

IGNEOUS STRUCTURES: Hypidiomorphic to sub-ophitic textures are locally preserved in the amphibolite.

METAMORPHIC STRUCTURES: Variably foliated amphibolite clasts are variably rotated by brecciation.

MINERALOGY:

Amphibolite: 60% of clasts:

Mineral	Mode (%)	Size (mm)	Shape	Comments
Plagioclase	50	0.5-3	anhedral	
Amphibole	50	0.5-3	anhedral	

Anorthosite: 30% of clasts:

Mineral	Mode (%)	Size (mm)	Shape	Comments
Plagioclase	90-100	0.5-20	anhedral	
Amphibole	0-10	1-2	anhedral	

VEINS: 10% (of rock) locally anastomosing epidote and chlorite veins.

ADDITIONAL COMMENTS: Anorthosite occurs in irregular <1-5 cm patches and pods.

UNIT 3: ROCK NAME: AMPHIBOLITE (METAGABBRO) WITH ANORTHOSITE

Pieces 7, 8

COLOR: Black (N2) and white (N9). Epidote: dark greenish yellow (10Y 4/4)

IGNEOUS STRUCTURES: Hypidiomorphic to sub-ophitic textures are preserved in the amphibolite.

METAMORPHIC STRUCTURES: Locally developed, weak foliated

MINERALOGY:

Amphibolite: 70% of clasts:

Mineral	Mode (%)	Size (mm)	Shape	Comments
Plagioclase	40	0.5-	anhedral	turbid, some replacement by epidote
Amphibole	60	0.5-3	anhedral	

Anorthosite: 30% of clasts:

Mineral	Mode (%)	Size (mm)	Shape	Comments
Plagioclase	100	0.5-20	anhedral	partly replacement by epidote

VEIN ASSEMBLAGE: 1% (of rock) epidote and chlorite veins.

ADDITIONAL COMMENTS: Anorthosite pod shows dextral offset across chloritized vein.

173-1067A-21R-1

UNIT 3: FOLIATED AMPHIBOLITE

Pieces 2, 3, 6, 7, 9-13, 16, and 17

COLOR: Greenish black (5GY 2/1).

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Foliation, late microfracturing, and folding of foliation. Foliation is defined by elongation of amphibole and plagioclase into the foliation plane.

MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
amphibole	60	1-5	elongate	elongate parallel to foliation
plagioclase	35	1-5	elongate	elongate parallel to foliation
epidote	5	1	granular	replacement of plagioclase
chlorite	1-2	1	platy	replacement of amphibole

VEINS: Epidote in veins; late microfractures are filled with chlorite; some Fe-oxyhydroxides in veins.

UNIT 3: FOLIATED AMPHIBOLITE WITH IRREGULARLY DISSEMINATED FELDSPATHIC MATERIAL IN PATCHES AND VEINS

Pieces 1, 5, 8, 14, 15, and 21

COLOR: Dark greenish gray (6GY 4/1).

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Foliation is defined by elongation of amphibole and plagioclase into the foliation plane. Some feldspathic crystals are not elongated into the foliation plane.

MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
amphibole	40-65	<10	elongate	elongate parallel to foliation
plagioclase	20-50	<10	elongate	elongate parallel to foliation
epidote	3	0.5	granular	replacement of plagioclase
chlorite	2	0.5	platy	replacement of amphibole

VEINS: Vein material: 2 sets of veins: (1) Epidote-plagioclase-chlorite cutting amphibolite and tonalite; and (2) Dark chlorite veins cutting amphibolite and tonalite.

ADDITIONAL COMMENTS: Pieces 15 and 21 exhibit discrete layers of plagioclase, 1 cm in thickness. In all pieces 5 to 30 % of the plagioclase is not aligned into the foliation plane.

UNIT 3: FOLIATED AMPHIBOLITE BRECCIA WITH DISSEMINATED FELDSPATHIC MATERIAL

Pieces 4, 18, 19, and 20

COLOR: Piece 4: Grayish olive (10Y 3/2) and Pieces 18-20: Brownish gray (6YR 4/1).

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Some poorly defined foliation in amphibolite clasts. Also contains clasts of unfoliated tonalite gneiss.

MINERALOGY:

Foliated Amphibolite: 20-50 % of rock

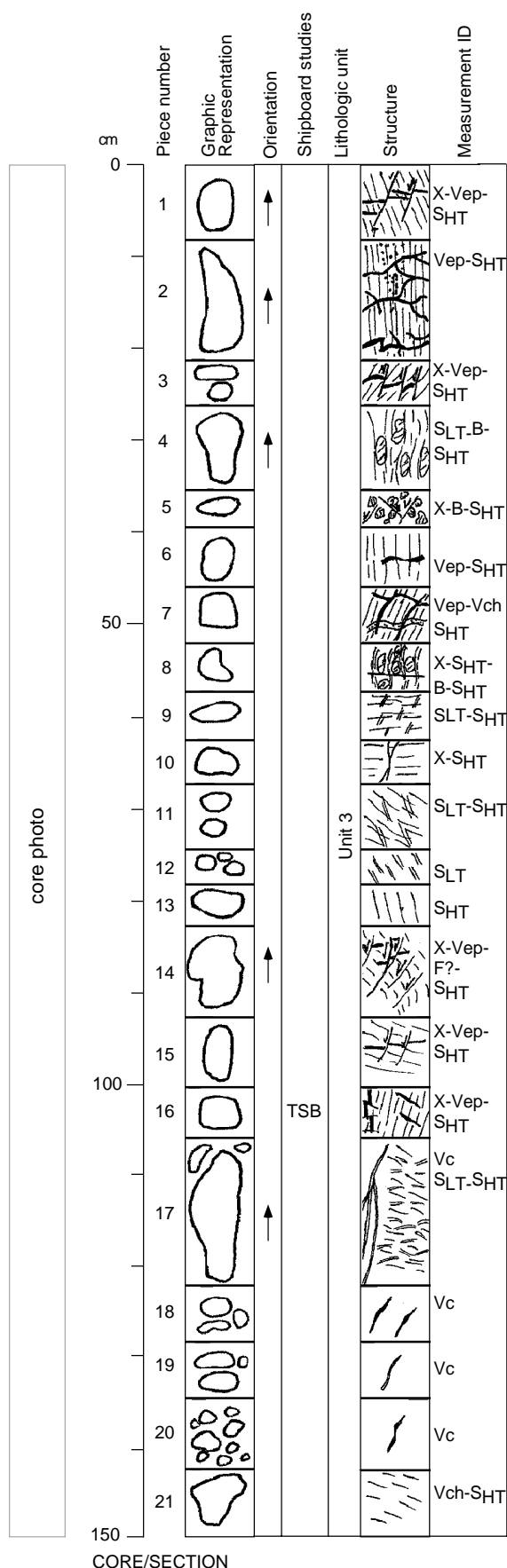
Mineral	Mode (%)	Size (mm)	Shape	Comments
amphibole	75	1-5	elongate	elongate parallel to foliation
plagioclase	20-30	1-5	elongate	elongate parallel to foliation
epidote	5	1	granular	replacement of plagioclase

Feldspathic Material: 20-30% of rock

Matrix: 20-60% of rock

Finely-ground host rock(?), oxyhydroxides (<2%).

VEINS: Vein material: Plagioclase patches in pieces 19 and 20 similar to those found in Pieces 1, 5, 8, 15, and 21. The sizes of clasts are ranging 2 mm- 1 cm; feldspathic material. Feldspathic material varies on average from 20-30%, but locally band 1 cm in width contains up to 100% plagioclase.



CORE/SECTION

UNIT 3: NONFOLIATED TO WEAKLY FOLIATED AMPHIBOLITE WITH DISSEMINATED FELDSPATHIC MATERIAL

Pieces 1-10

COLOR: Greenish black (5GY 4/1).

IGNEOUS STRUCTURES: Large plagioclase grains not aligned into the foliation plane.

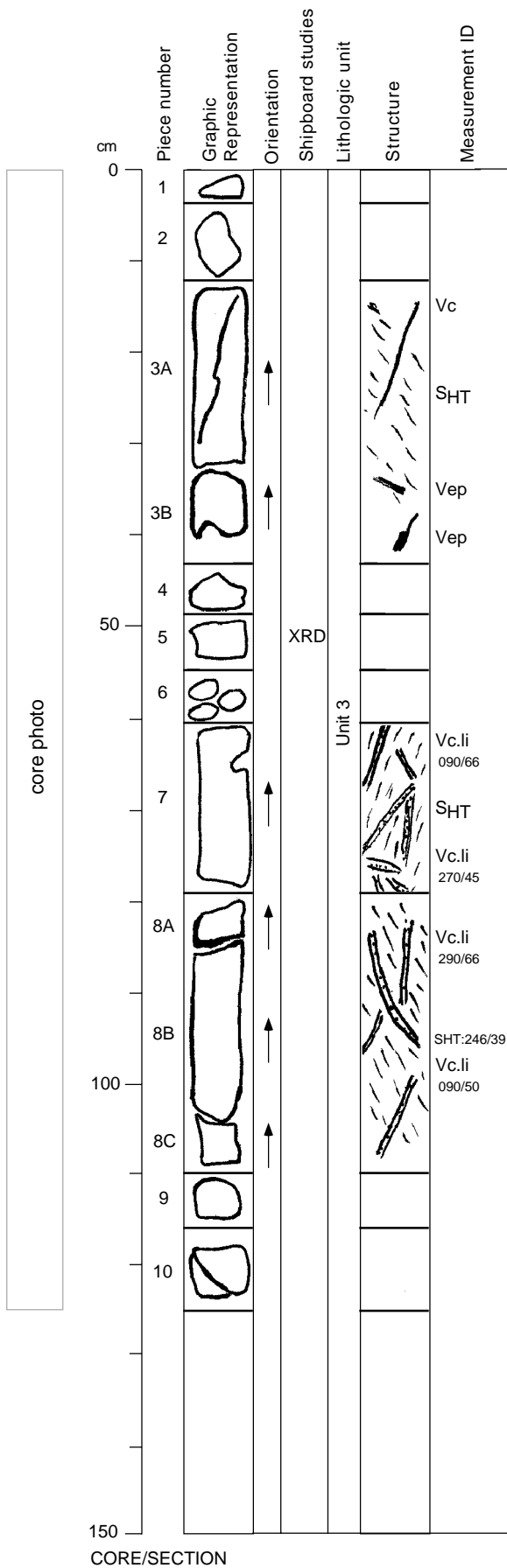
METAMORPHIC STRUCTURES: Nonfoliated to weakly foliated; locally developed brecciation, abundant fractures in Pieces 7 and 8. Foliation is defined by elongation of amphibole and plagioclase.

MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
amphibole	70	1-2	equigranular	elongate parallel to foliation
plagioclase	25	1	equigranular	elongate parallel to foliation
epidote	5	0.5	granular	replacement of plagioclase

VEINS: Vein material: Drusy calcite in veins (3 mm wide) which crosscut foliation and disseminated feldspath. Also oxyhydroxides line calcite veins.

ADDITIONAL COMMENTS: Brittle faulting in Pieces 4, 5, and 6. Amphibolite is 60-70% of rock.



173-1067A-22R-2

UNIT 3: NONFOLIATED TO WEAKLY FOLIATED AMPHIBOLITE WITH DISSEMINATED FELDSPATHIC MATERIAL

Pieces 1-9

COLOR: Greenish black (5GY 4/1).

IGNEOUS STRUCTURES: None.

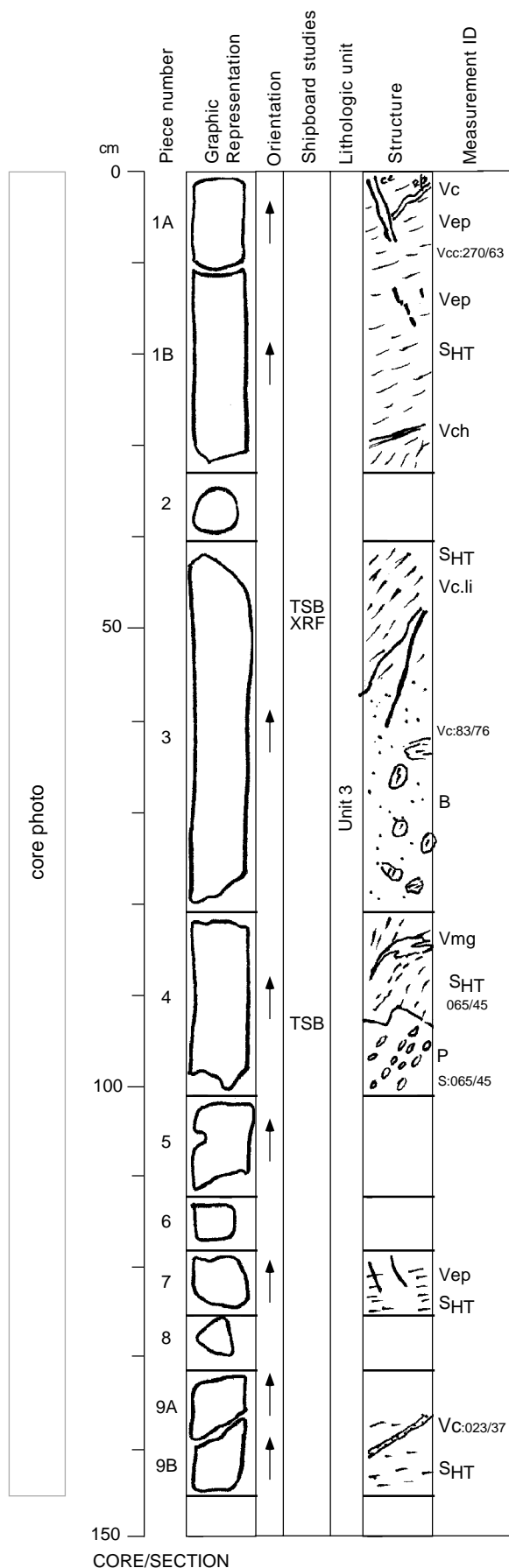
METAMORPHIC STRUCTURES: Weakly foliated.

MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
amphibole	50-70	1-3	elongate	elongate parallel to foliation
plagioclase	30-50	1-2	equigranular	elongate parallel to foliation

VEINS: Vein material: Drusy calcite occurs in veins up to 5 mm wide with some open space within the large vein in Piece 1A. Calcite veins also occur in Pieces 3, 4, and 9. Oxyhydroxides line the calcite vein walls. Epidote veins are 0.5 to 2.0 mm wide.

ADDITIONAL COMMENTS: Amphibolite is 60-100% of rock. Epidote comprises < 2% of total rock. Occurs in veins and disseminated throughout this section. Epidote is more common in areas of higher feldspar content. Some brecciation within piece 3 which is almost matrix supported in that area. Isolated amphibolite clasts within feldspathic material in Pieces 5, 8, and 9A. Pervasive retrograde alteration has formed epidote and chlorite. Piece 5 (from 94-100 cm) and 6 are weakly foliated amphibolites where 5 to 20% of non-oriented plagioclase, up to 3 mm in size, is observed. Disseminated feldspathic material form patches or anastomosing veins isolating the amphibolite from other parts of the rock (Pieces 8 and 9).



CORE/SECTION

UNIT 3: NONFOLIATED TO WEAKLY FOLIATED AMPHIBOLITE WITH DISSEMINATED FELDSPATHIC MATERIAL

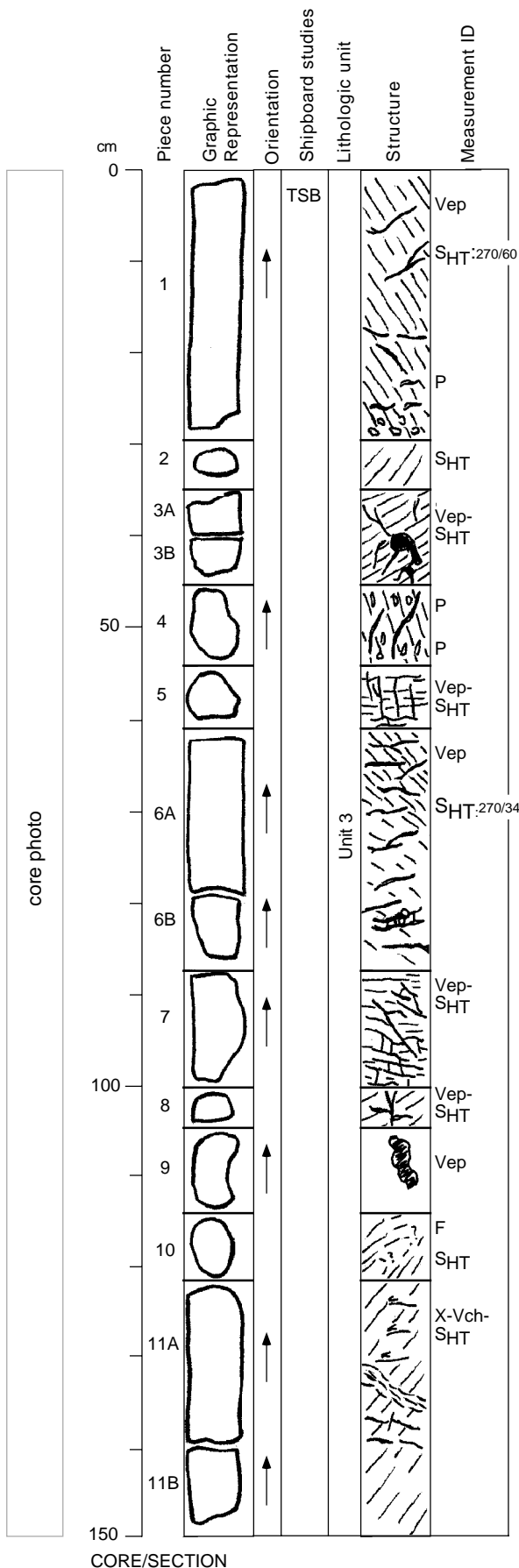
Pieces 1-11

COLOR: Greenish black (5GY 4/1).
IGNEOUS STRUCTURES: None.
METAMORPHIC STRUCTURES: Weakly foliated. Foliation is defined by preferred orientation of amphibole and plagioclase.
MINERALOGY:

Mineral	Mode (%)	Size (mm)	Shape	Comments
amphibole	70-80	1-3	elongate	elongate parallel to foliation
plagioclase	20-30	<1	equigranular	elongate parallel to foliation
garnet	<1	<1	equigranular	

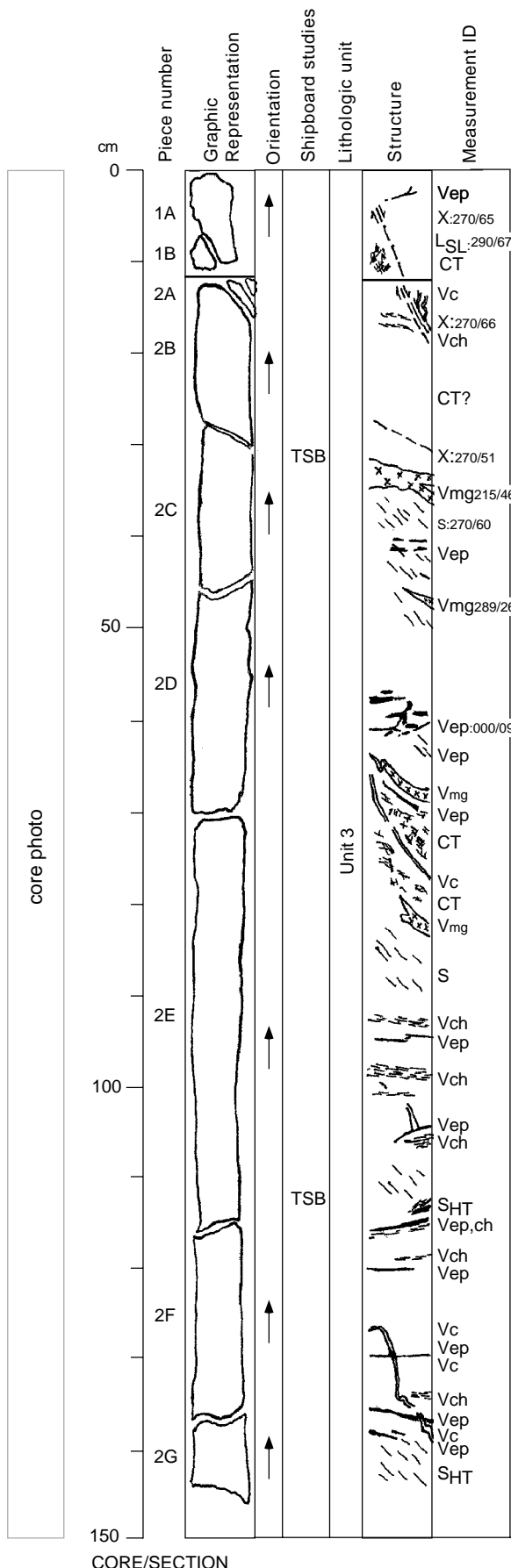
VEINS: Vein material: Pervasive epidote veins (< 0.5-23.0 mm wide) throughout the section which are associated with brittle deformation. One calcite vein occurs in Piece 11A with oxyhydroxide lining the wall.

ADDITIONAL COMMENTS: Piece 6A is a garnet-bearing weakly foliated amphibolite. Epidote is typically <5% of the total rock; however epidote locally occurs as patches in piece 9 comprising 30 % of this rock. Pieces 1-4, 6A, 10, 11A, and 11B all exhibit dissemination of feldspathic material within the amphibolite. Some discrete bands of greenish white feldspar-rich bands are observed in Pieces 6A (interval 62-65 cm) and 11B (interval 141-144 cm). In these bands feldspar accounts for 80% of the mode, the remaining 20% is composed of a mixture of chlorite and amphibole.



CORE/SECTION

173-1067A-23R-1



UNIT 3: AMPHIBOLITE (METAGABBRO) WITH ANORTHOSITE PODS

Pieces 1, 2C-G

COLOR: Greenish black (5G 2/1).

IGNEOUS STRUCTURES: Relict igneous texture.

METAMORPHIC STRUCTURES: Sporadically developed weak to moderate foliation.

MINERALOGY:

Amphibolite (Metagabbro): 95% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50	1-4	subhedral	elongated parallel to foliation
amphibole	50	1-5	subhedral	replacing plagioclase
garnet (?)	<1	<1-3	anhedral	equant?

Anorthosite: 5% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	100	1-10	anhedral	partly replaced by chlorite
quartz	0-20	1-10	anhedral	

VEINS: 2% (of rock) anastomosing subhorizontal epidote and chlorite veins. Locally drusy 1-3 cm calcite veins cross cut epidote veins.

ADDITIONAL COMMENTS: Generally weakly deformed. Anorthosite occurs as irregular pods and patches. Pods are locally elongate parallel to foliation.

UNIT 3: AMPHIBOLITE-ANORTHOSITE BRECCIA

Pieces 2A-B

COLOR: Mottled greenish gray (5G 6/1) and greenish black (5GY 2/1).

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Foliated amphibolite clasts are rotated during brecciation

MINERALOGY:

Clasts: 30% of rock

Amphibolite: 25% of rock:

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50	<3	anhedral	elongated parallel to foliation
amphibole	50	<4	anhedral	elongated parallel to foliation

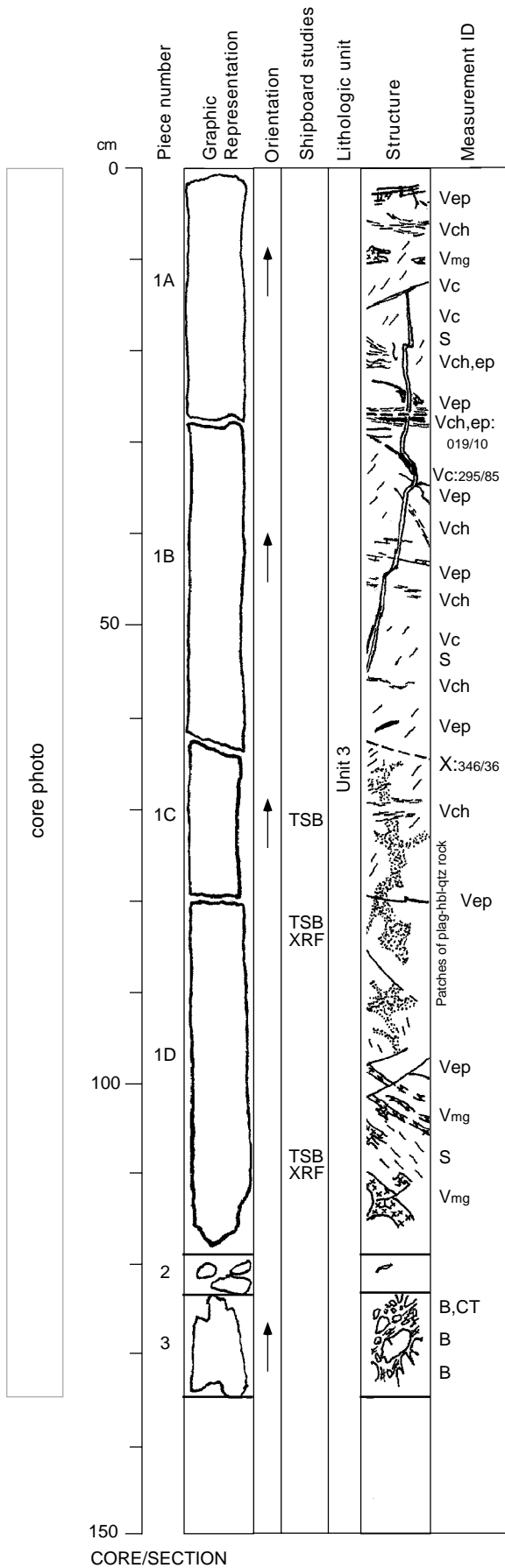
Epidosite: 5% of rock.

Matrix: 70% of rock: Microcrystalline chlorite and epidote.

ADDITIONAL COMMENTS: Brecciated and epidote-veined anorthosite zone at margin of breccia.

UNIT 3: AMPHIBOLITE (METAGABBRO) with ANORTHOSITE pods and patches

Pieces 1A-D, 2, 3



COLOR: Greenish black (5G 2/1).

IGNEOUS STRUCTURES: Irregularly shaped leucocratic patches and associated patches of melanocratic metagabbro may be late magmatic.

METAMORPHIC STRUCTURES: Moderately foliated to non-foliated.

MINERALOGY:

Amphibolite (Metagabbro): 85% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50	1-5	subhedral	random or elongated parallel to foliation
amphibole	50	0.5-6	mostly anhedral	

Anorthosite: 10% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	100	<10	anhedral	

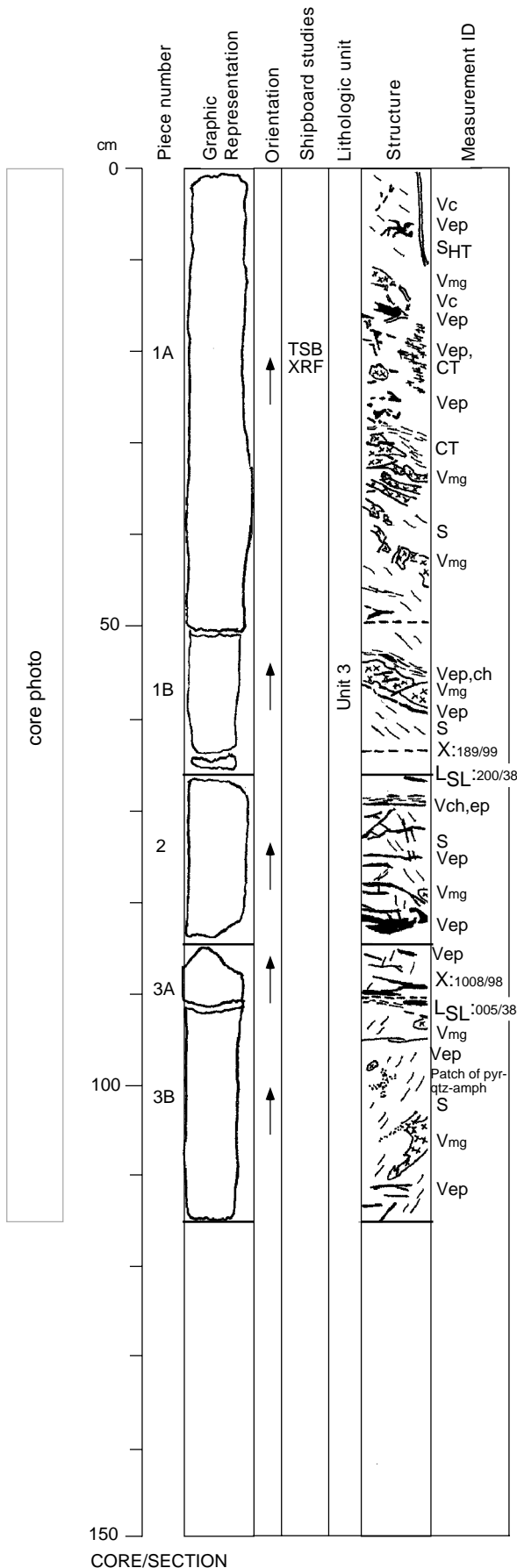
VEINS: 5% (of rock) <1-3 cm locally anastomosing veins of epidote and chlorite, particularly near the top of the interval. Steep inclined calcite veins cross cut all other veins. Local Fe-oxyhydroxide stains.

ADDITIONAL COMMENTS: Marked variation in crystal size and color index. Slickensides between pieces 1D and 2. Anorthosite occurs in irregular pods and patches; pods are elongated parallel to foliation.

173-1067A-23R-3

UNIT 3: AMPHIBOLITE (METAGABBRO) WITH ANORTHOSITE PODS AND PATCHES

Pieces 1, 2, 3



COLOR: Greenish black (5G 2/1)

IGNEOUS STRUCTURES: Locally preserved igneous texture.

METAMORPHIC STRUCTURES: Moderately foliated to non-foliated.

MINERALOGY:

Amphibolite (Metagabbro):85% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50	1-5	subhedral	elongated parallel to foliation
amphibole	50	0.5-6	mostly anhedral	random or elongated parallel to foliation

Anorthosite: 10% of rock

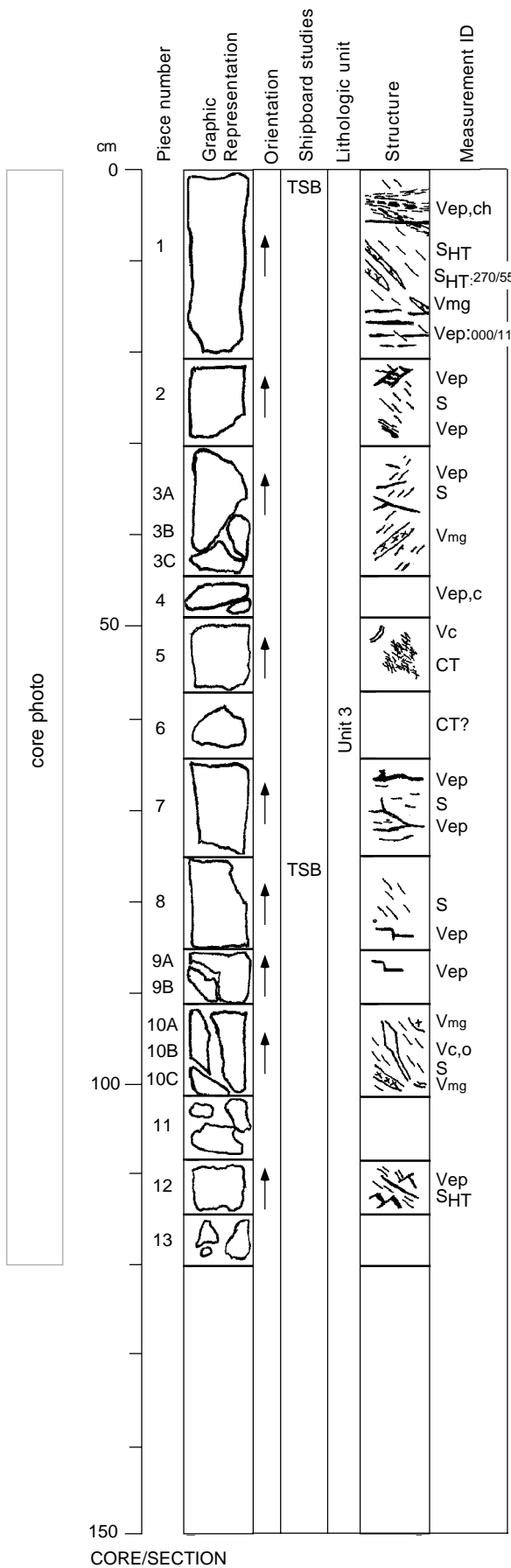
Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	100	<10	anhedral	

VEINS: 5% epidote, calcite, chlorite and Fe-oxyhydroxide veins. Calcite veins cross cut all other vein types, but are locally offset across epidote and Fe-oxyhydroxide veins.

ADDITIONAL COMMENTS: Anorthosite occurs in irregular pods and patches, pods elongated parallel to foliation.

UNIT 3: AMPHIBOLITE (METAGABBRO) WITH ANORTHOSITE PODS AND PATCHES

Pieces 1-13



COLOR: Greenish black (5G 2/1).
IGNEOUS STRUCTURES: Locally preserved igneous texture
METAMORPHIC STRUCTURES: Mostly moderately to strongly foliated.
MINERALOGY:

Amphibolite (Metagabbro): 85% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50	1-5	subhedral	elongated parallel to foliation
amphibole	50	0.5-6	mostly anhedral	random to elongated parallel to foliation

Anorthosite: 10% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	100	<10	anhedral	

VEINS: 4% (of rock) locally anastomosing epidote veins
ADDITIONAL COMMENTS: Anorthosite patches and pods contain plagioclase crystals up to 1.3 cm in length, part of the largest of which appears to have euhedral crystallographic faces. Anorthosite pods are elongated parallel to foliation. Pieces 9-13 are more intensely altered and veined and chloritized. Pieces 10A-C have variably Fe-oxyhydroxide staining and drusy calcite growth on uncut surfaces.

173-1067A-23R-5

UNIT 3: AMPHIBOLITE (METAGABBRO)

Pieces 1-4

COLOR: Greenish black (5G 2/1); dark yellow orange (10YR 6/6) where extensively veined by epidote

IGNEOUS STRUCTURES: None.

METAMORPHIC STRUCTURES: Piece 1 strongly foliated and this foliation is generally stronger than in the other amphibolites in unit 3.

MINERALOGY:

Amphibolite (Metagabbro): 85% of rock

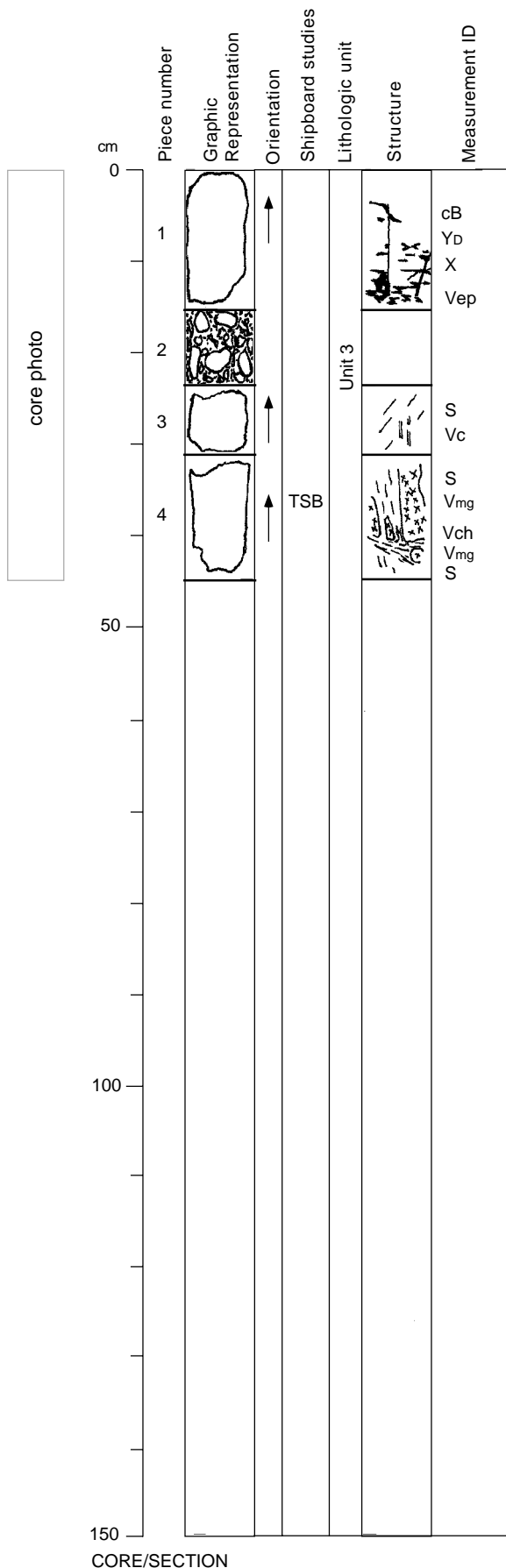
Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	50	1-5	subhedral	elongated parallel to foliation, partly epidotized
amphibole	50	0.5-6	mostly anhedral	random or elongated parallel to foliation

Anorthosite: 10% of rock

Mineral	Mode (%)	Size (mm)	Shape	Comments
plagioclase	100	<10	anhedral	

VEINS: 30% of Piece 1 and 1% of Piece 4 are epidote veins. In Piece 1: epidote veins are cross cut by micro-faults.

ADDITIONAL COMMENTS: Pieces 2A and B contain mafic minerals >1.5 cm in length. Anorthosite pods are elongated parallel to foliation.



CORE/SECTION