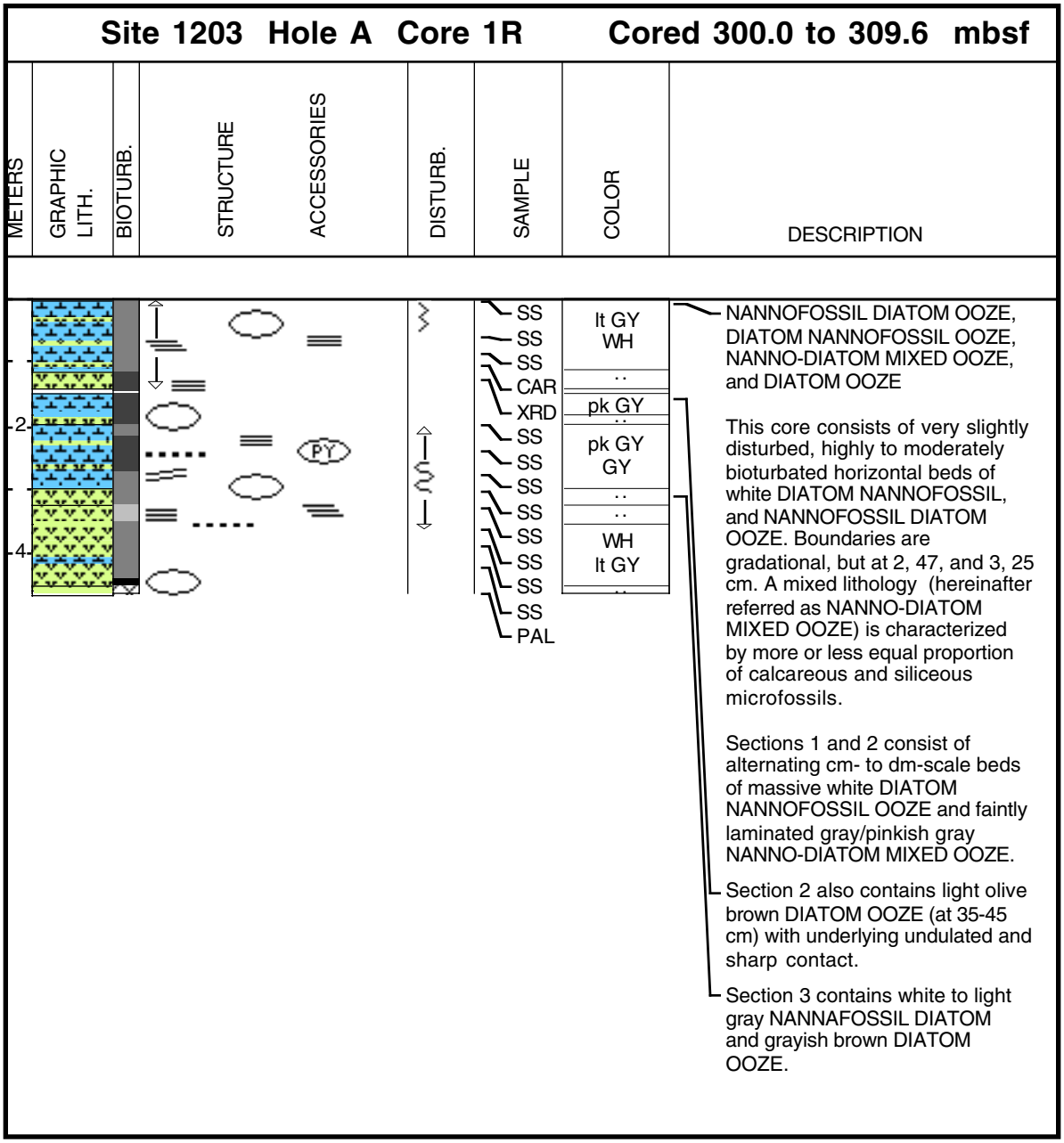
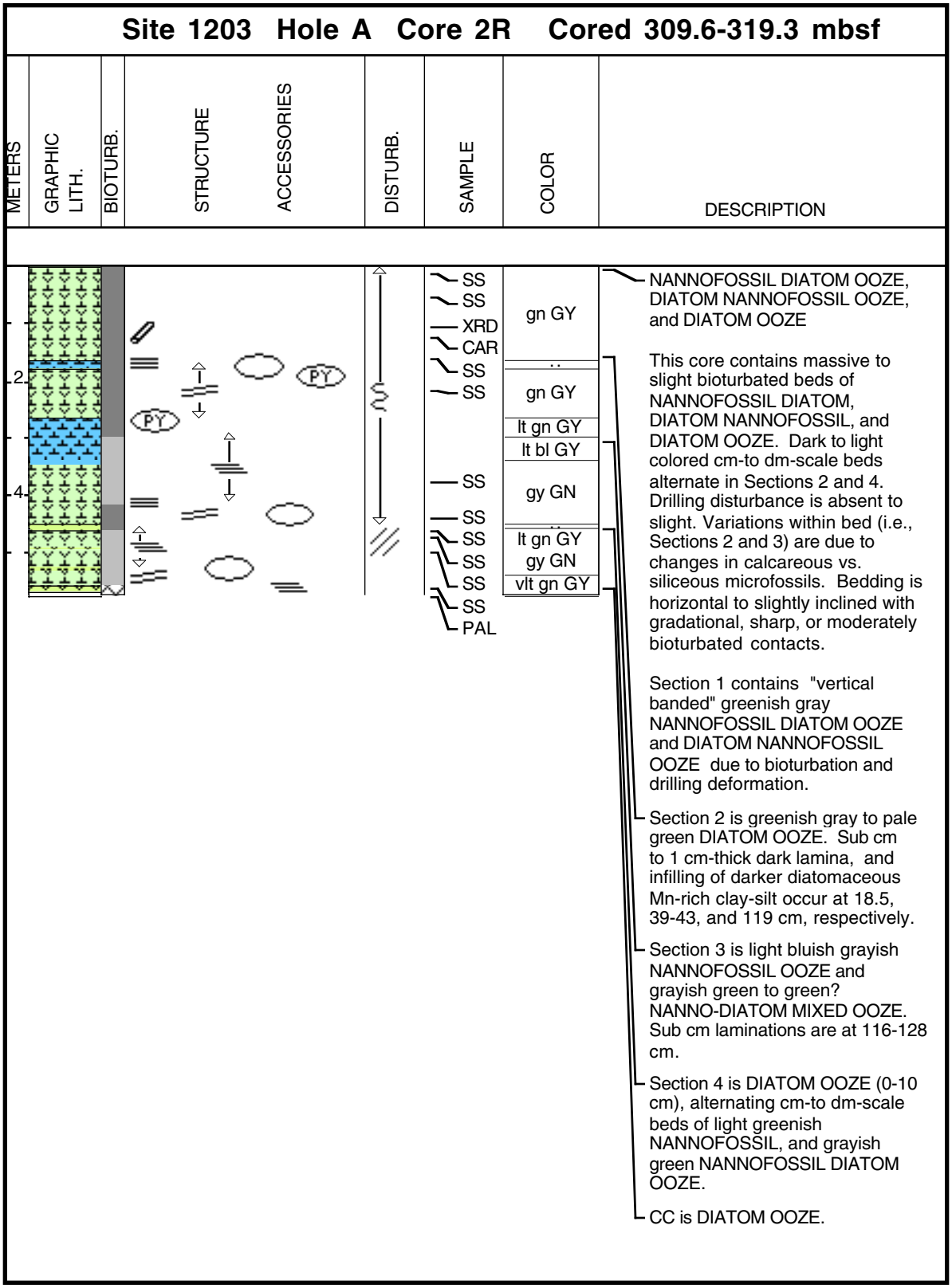
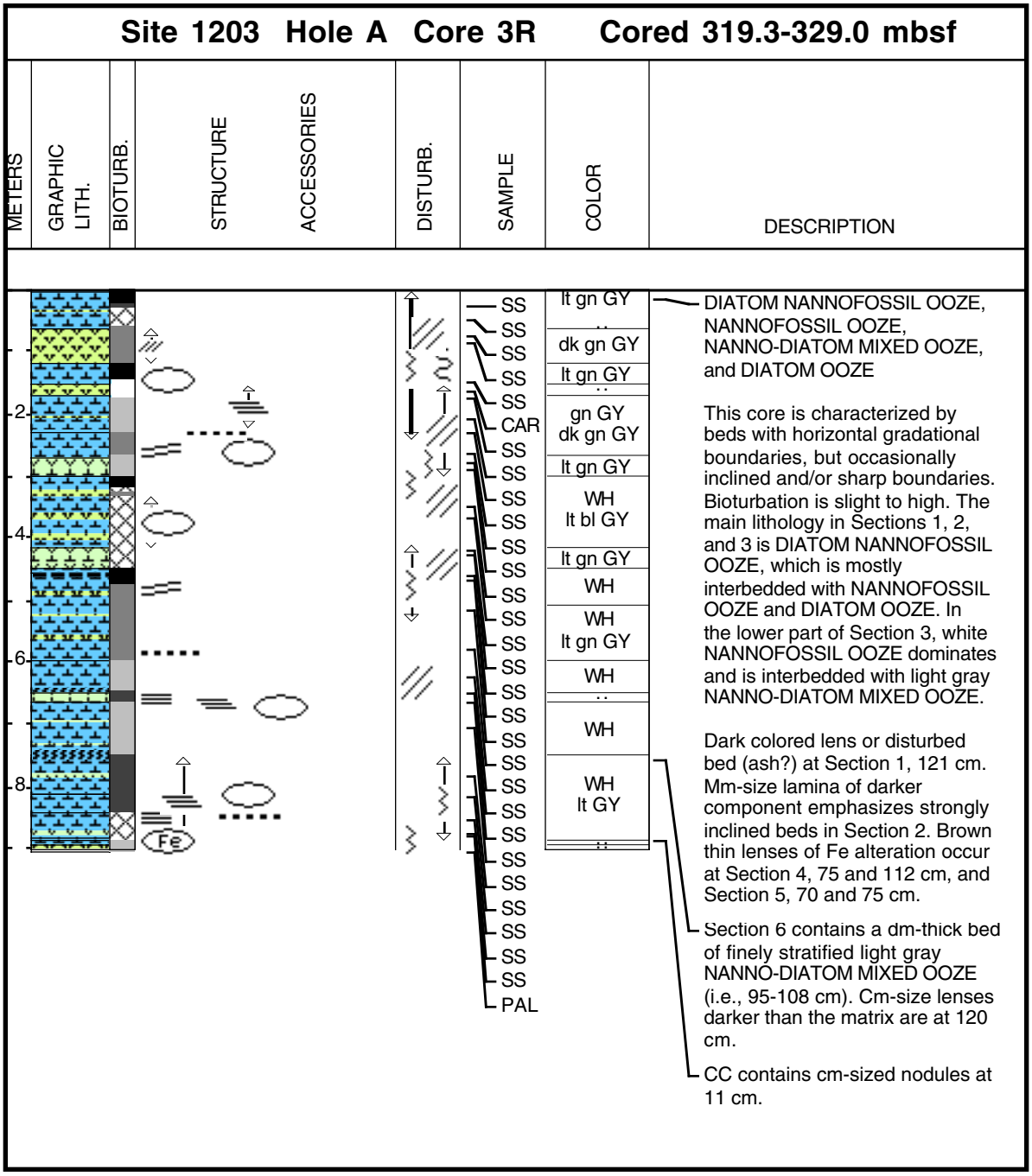
Core Photo


Site 1203 Hole A Core 1R Cored 300.0 to 309.6 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
4
PY
SS
SS
SS
CAR
XRD
SS
SS
SS
SS
SS
SS
SS
SS
PAL
lt GY
WH
pk GY
pk GY
GY
WH
lt GY
NANNOFOSSIL DIATOM OOZE, DIATOM NANNOFOSSIL OOZE, NANNO-DIATOM MIXED OOZE, and DIATOM OOZE
This core consists of very slightly disturbed, highly to moderately bioturbated horizontal beds of white DIATOM NANNOFOSSIL, and NANNOFOSSIL DIATOM OOZE. Boundaries are gradational, but at 2, 47, and 3, 25 cm. A mixed lithology (hereinafter referred as NANNO-DIATOM MIXED OOZE) is characterized by more or less equal proportion of calcareous and siliceous microfossils.
Sections 1 and 2 consist of alternating cm- to dm-scale beds of massive white DIATOM NANNOFOSSIL OOZE and faintly laminated gray/pinkish gray NANNO-DIATOM MIXED OOZE.
Section 2 also contains light olive brown DIATOM OOZE (at 35-45 cm) with underlying undulated and sharp contact.
Section 3 contains white to light gray NANNAFOSSIL DIATOM and grayish brown DIATOM OOZE.

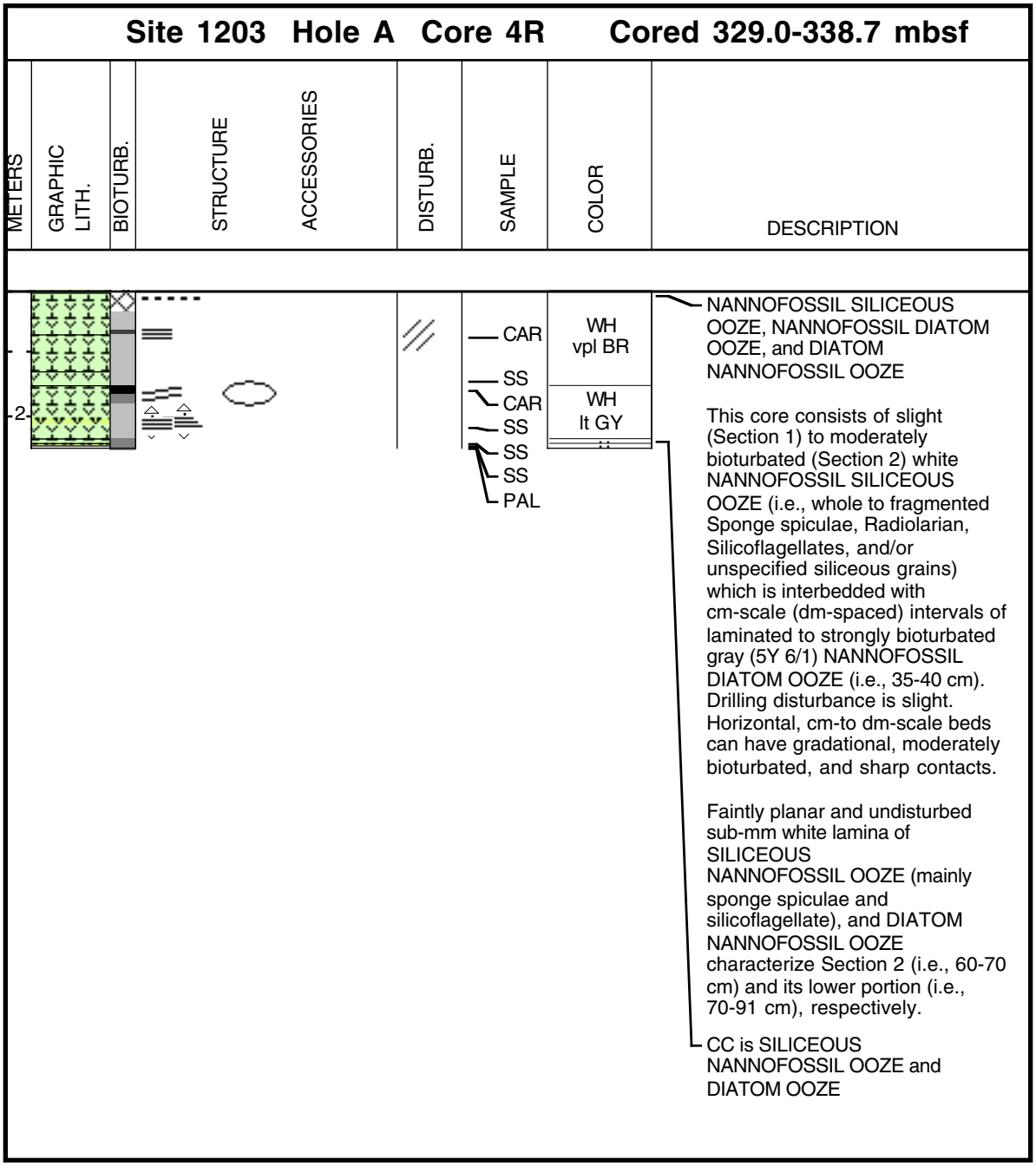
Core Photo


Site 1203 Hole A Core 2R Cored 309.6-319.3 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
4
PY
PY
SS
SS
XRD
CAR
SS
SS
SS
SS
SS
SS
SS
PAL
gn GY
gn GY
lt gn GY
lt bl GY
gy GN
lt gn GY
gy GN
vlt gn GY
NANNOFOSSIL DIATOM OOZE, DIATOM NANNOFOSSIL OOZE, and DIATOM OOZE
This core contains massive to slight bioturbated beds of NANNOFOSSIL DIATOM, DIATOM NANNOFOSSIL, and DIATOM OOZE. Dark to light colored cm-to dm-scale beds alternate in Sections 2 and 4. Drilling disturbance is absent to slight. Variations within bed (i.e., Sections 2 and 3) are due to changes in calcareous vs. siliceous microfossils. Bedding is horizontal to slightly inclined with gradational, sharp, or moderately bioturbated contacts.
Section 1 contains "vertical banded" greenish gray NANNOFOSSIL DIATOM OOZE and DIATOM NANNOFOSSIL OOZE due to bioturbation and drilling deformation.
Section 2 is greenish gray to pale green DIATOM OOZE. Sub cm to 1 cm-thick dark lamina, and infilling of darker diatomaceous Mn-rich clay-silt occur at 18.5, 39-43, and 119 cm, respectively.
Section 3 is light bluish grayish NANNOFOSSIL OOZE and grayish green to green? NANNO-DIATOM MIXED OOZE. Sub cm laminations are at 116-128 cm.
Section 4 is DIATOM OOZE (0-10 cm), alternating cm-to dm-scale beds of light greenish NANNOFOSSIL, and grayish green NANNOFOSSIL DIATOM OOZE.
CC is DIATOM OOZE.

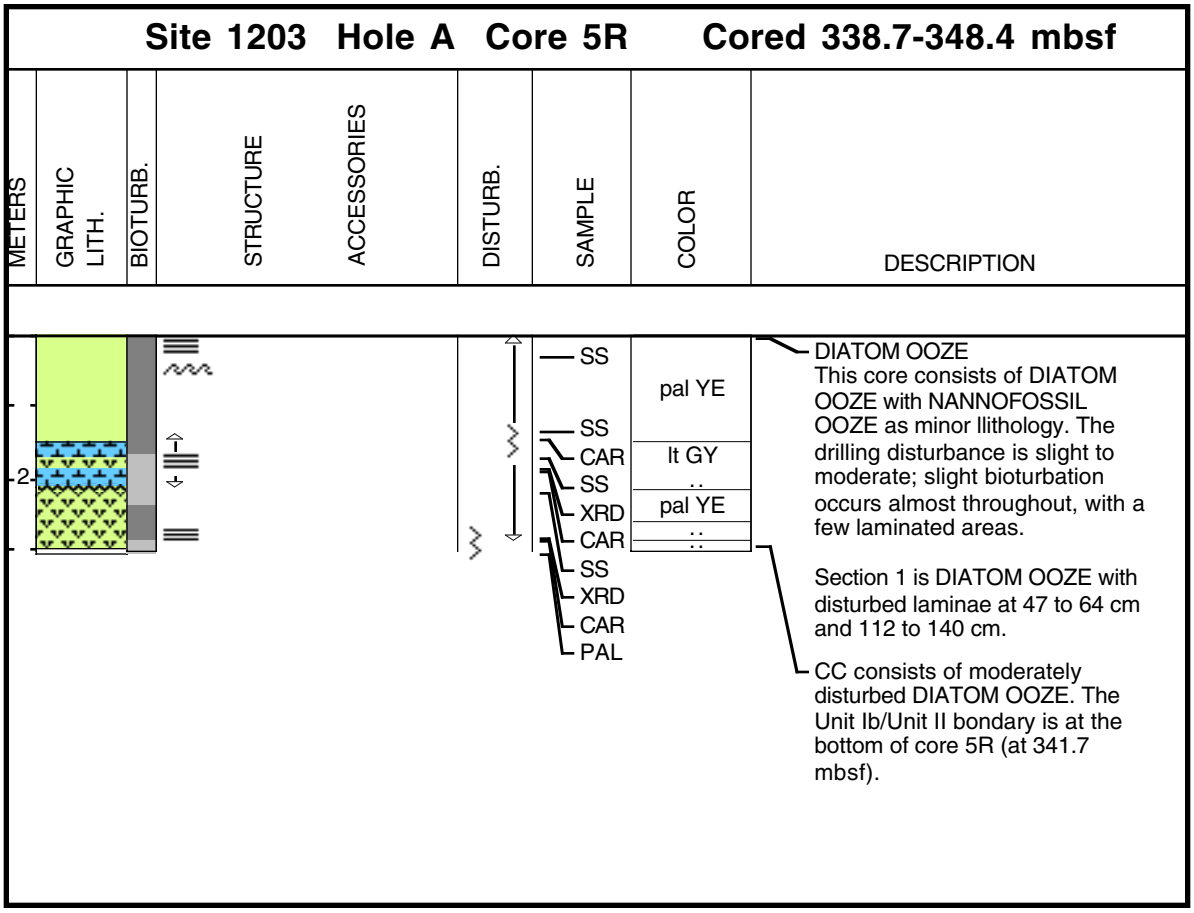
Core Photo


Site 1203 Hole A Core 3R Cored 319.3-329.0 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
4
6
8
Fe
SS
CAR
PAL
lt gn GY
dk gn GY
gn GY
WH
lt bl GY
lt gn GY
WH
WH
lt gn GY
WH
WH
lt GY
DIATOM NANNOFOSSIL OOZE, NANNOFOSSIL OOZE, NANNO-DIATOM MIXED OOZE, and DIATOM OOZE
This core is characterized by beds with horizontal gradational boundaries, but occasionally inclined and/or sharp boundaries. Bioturbation is slight to high. The main lithology in Sections 1, 2, and 3 is DIATOM NANNOFOSSIL OOZE, which is mostly interbedded with NANNOFOSSIL OOZE and DIATOM OOZE. In the lower part of Section 3, white NANNOFOSSIL OOZE dominates and is interbedded with light gray NANNO-DIATOM MIXED OOZE.
Dark colored lens or disturbed bed (ash?) at Section 1, 121 cm. Mm-size lamina of darker component emphasizes strongly inclined beds in Section 2. Brown thin lenses of Fe alteration occur at Section 4, 75 and 112 cm, and Section 5, 70 and 75 cm.
Section 6 contains a dm-thick bed of finely stratified light gray NANNO-DIATOM MIXED OOZE (i.e., 95-108 cm). Cm-size lenses darker than the matrix are at 120 cm.
CC contains cm-sized nodules at 11 cm.

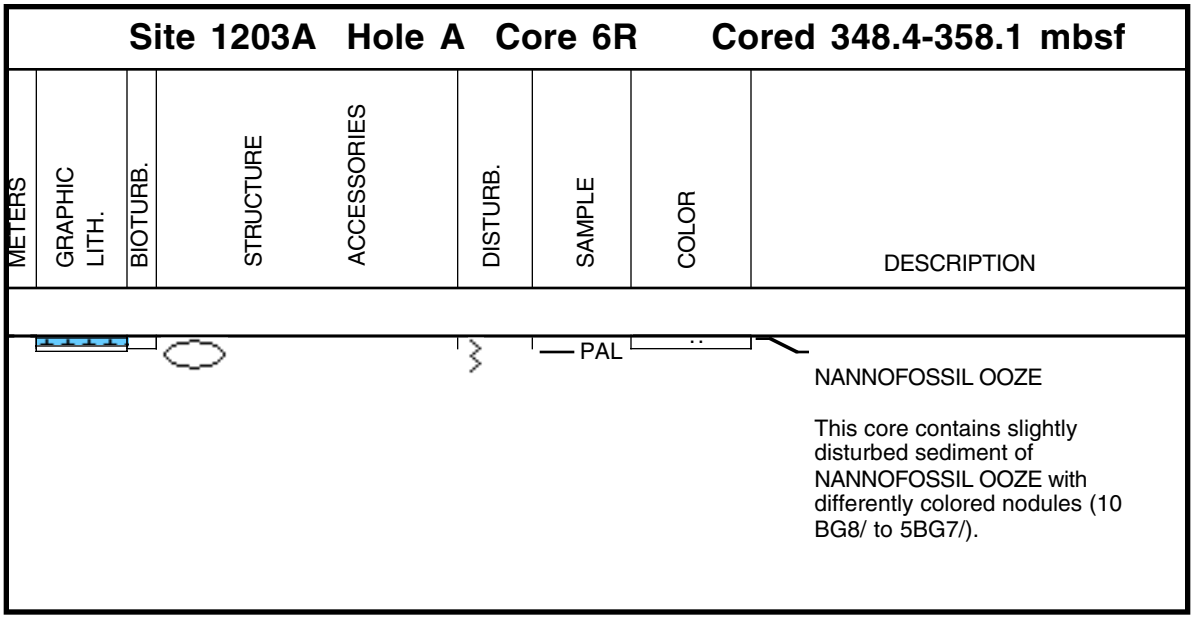
Core Photo


Site 1203 Hole A Core 4R Cored 329.0-338.7 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
CAR
SS
CAR
SS
SS
SS
PAL
WH
vpl BR
WH
lt GY
NANNOFOSSIL SILICEOUS OOZE, NANNOFOSSIL DIATOM OOZE, and DIATOM NANNOFOSSIL OOZE
This core consists of slight (Section 1) to moderately bioturbated (Section 2) white NANNOFOSSIL SILICEOUS OOZE (i.e., whole to fragmented Sponge spiculae, Radiolarian, Silicoflagellates, and/or unspecified siliceous grains) which is interbedded with cm-scale (dm-spaced) intervals of laminated to strongly bioturbated gray (5Y 6/1) NANNOFOSSIL DIATOM OOZE (i.e., 35-40 cm). Drilling disturbance is slight. Horizontal, cm-to dm-scale beds can have gradational, moderately bioturbated, and sharp contacts.
Faintly planar and undisturbed sub-mm white lamina of SILICEOUS NANNOFOSSIL OOZE (mainly sponge spiculae and silicoflagellate), and DIATOM NANNOFOSSIL OOZE characterize Section 2 (i.e., 60-70 cm) and its lower portion (i.e., 70-91 cm), respectively.
CC is SILICEOUS NANNOFOSSIL OOZE and DIATOM OOZE

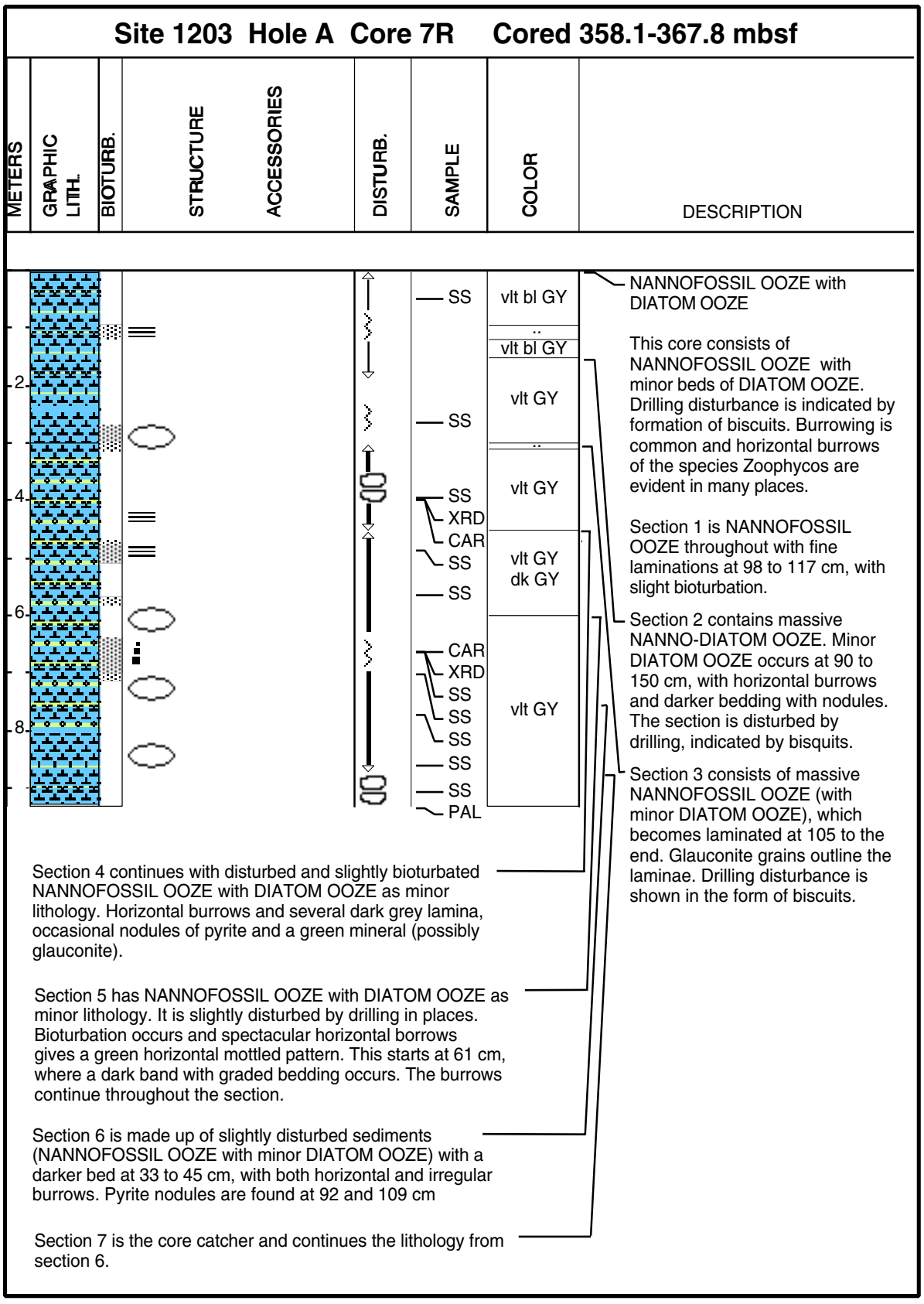
Core Photo


Site 1203 Hole A Core 5R Cored 338.7-348.4 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
SS
SS
CAR
SS
XRD
CAR
SS
XRD
CAR
PAL
pal YE
lt GY
pal YE
DIATOM OOZE
This core consists of DIATOM OOZE with NANNOFOSSIL OOZE as minor llithology. The drilling disturbance is slight to moderate; slight bioturbation occurs almost throughout, with a few laminated areas.
Section 1 is DIATOM OOZE with disturbed laminae at 47 to 64 cm and 112 to 140 cm.
CC consists of moderately disturbed DIATOM OOZE. The Unit Ib/Unit II bondary is at the bottom of core 5R (at 341.7 mbsf).

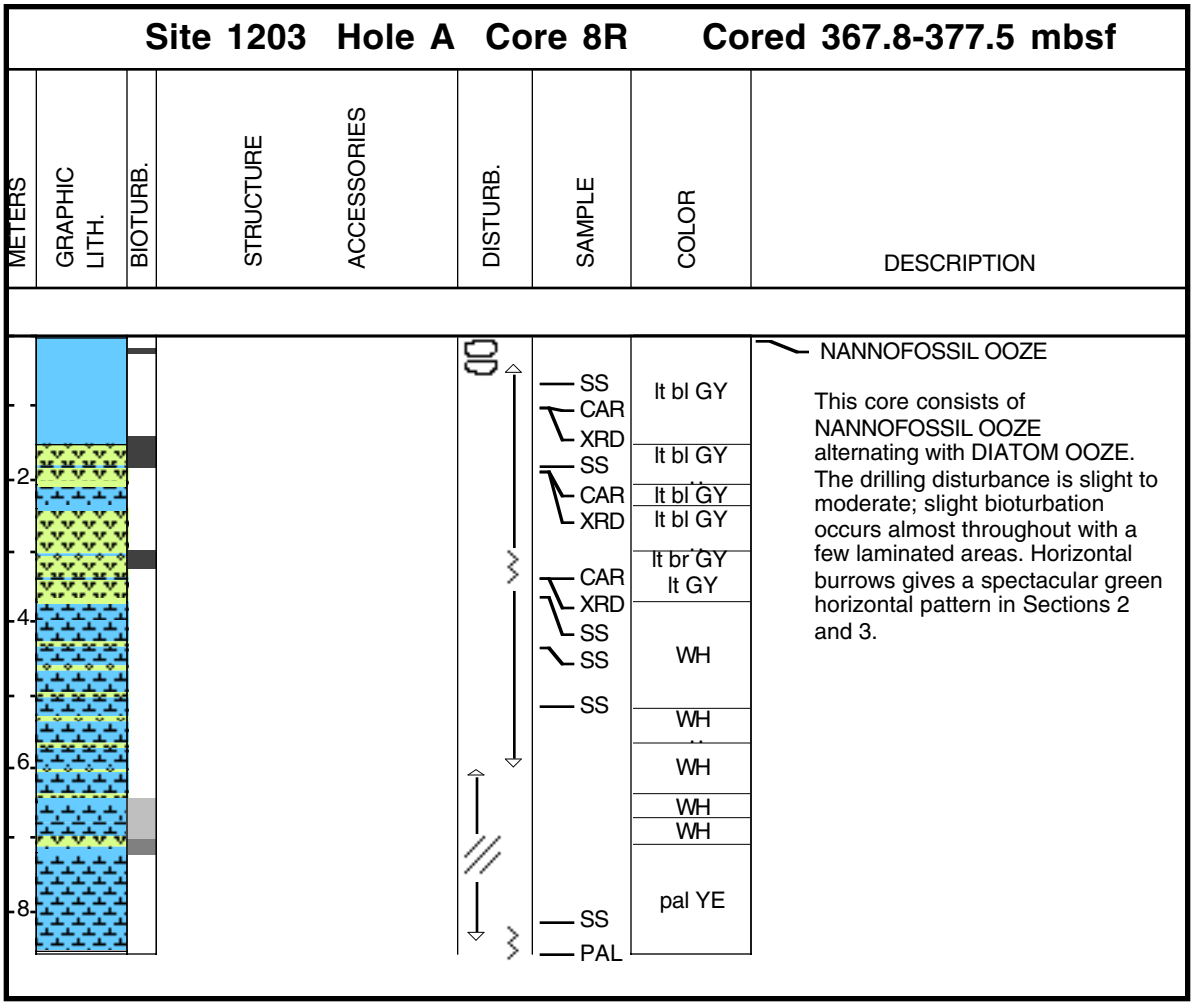
Core Photo


Site 1203A Hole A Core 6R Cored 348.4-358.1 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
PAL
NANNOFOSSIL OOZE
This core contains slightly disturbed sediment of NANNOFOSSIL OOZE with differently colored nodules (10 BG8/ to 5BG7/).

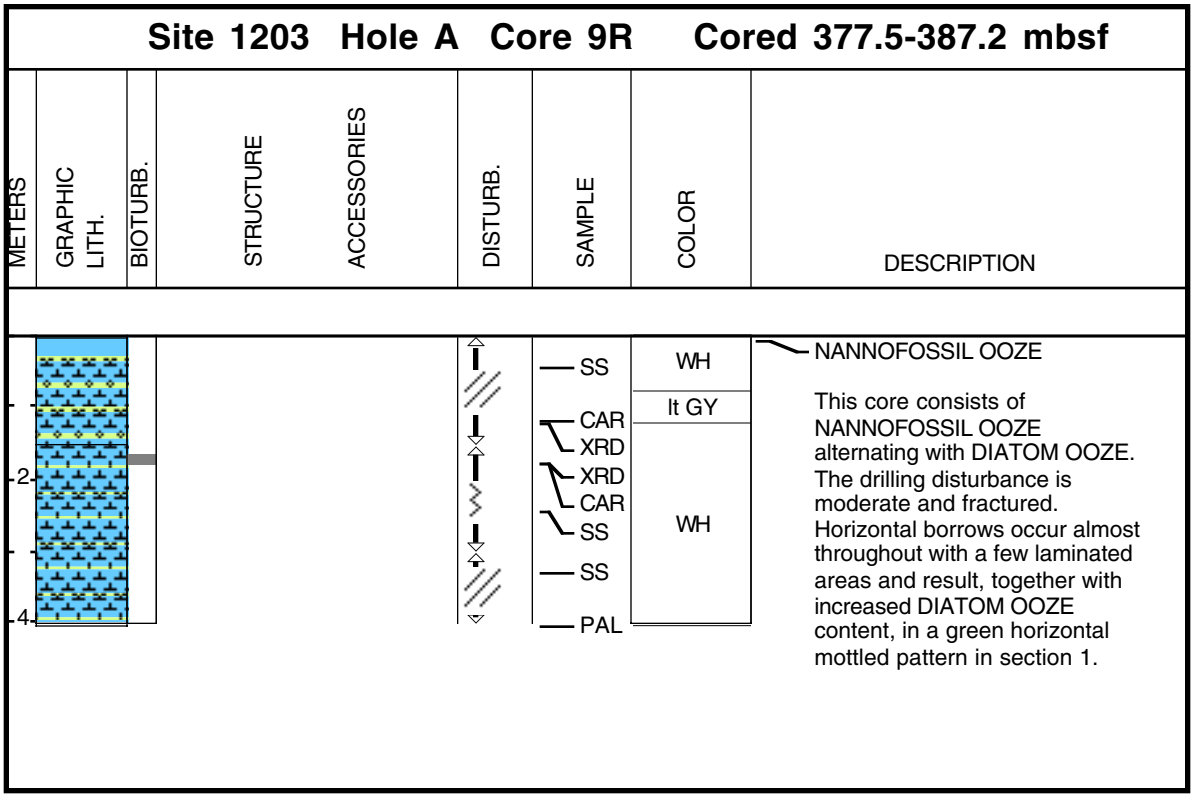
Core Photo


Site 1203 Hole A Core 7R Cored 358.1-367.8 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
4
6
8
SS
XRD
CAR
PAL
vlt bl GY
vlt GY
dk GY
NANNOFOSSIL OOZE with DIATOM OOZE
This core consists of NANNOFOSSIL OOZE with minor beds of DIATOM OOZE. Drilling disturbance is indicated by formation of biscuits. Burrowing is common and horizontal burrows of the species Zoophycos are evident in many places.
Section 1 is NANNOFOSSIL OOZE throughout with fine laminations at 98 to 117 cm, with slight bioturbation.
Section 2 contains massive NANNO-DIATOM OOZE. Minor DIATOM OOZE occurs at 90 to 150 cm, with horizontal burrows and darker bedding with nodules. The section is disturbed by drilling, indicated by bisquits.
Section 3 consists of massive NANNOFOSSIL OOZE (with minor DIATOM OOZE), which becomes laminated at 105 to the end. Glauconite grains outline the laminae. Drilling disturbance is shown in the form of biscuits.
Section 4 continues with disturbed and slightly bioturbated NANNOFOSSIL OOZE with DIATOM OOZE as minor lithology. Horizontal burrows and several dark grey lamina, occasional nodules of pyrite and a green mineral (possibly glauconite).
Section 5 has NANNOFOSSIL OOZE with DIATOM OOZE as minor lithology. It is slightly disturbed by drilling in places. Bioturbation occurs and spectacular horizontal borrows gives a green horizontal mottled pattern. This starts at 61 cm, where a dark band with graded bedding occurs. The burrows continue throughout the section.
Section 6 is made up of slightly disturbed sediments (NANNOFOSSIL OOZE with minor DIATOM OOZE) with a darker bed at 33 to 45 cm, with both horizontal and irregular burrows. Pyrite nodules are found at 92 and 109 cm
Section 7 is the core catcher and continues the lithology from section 6.

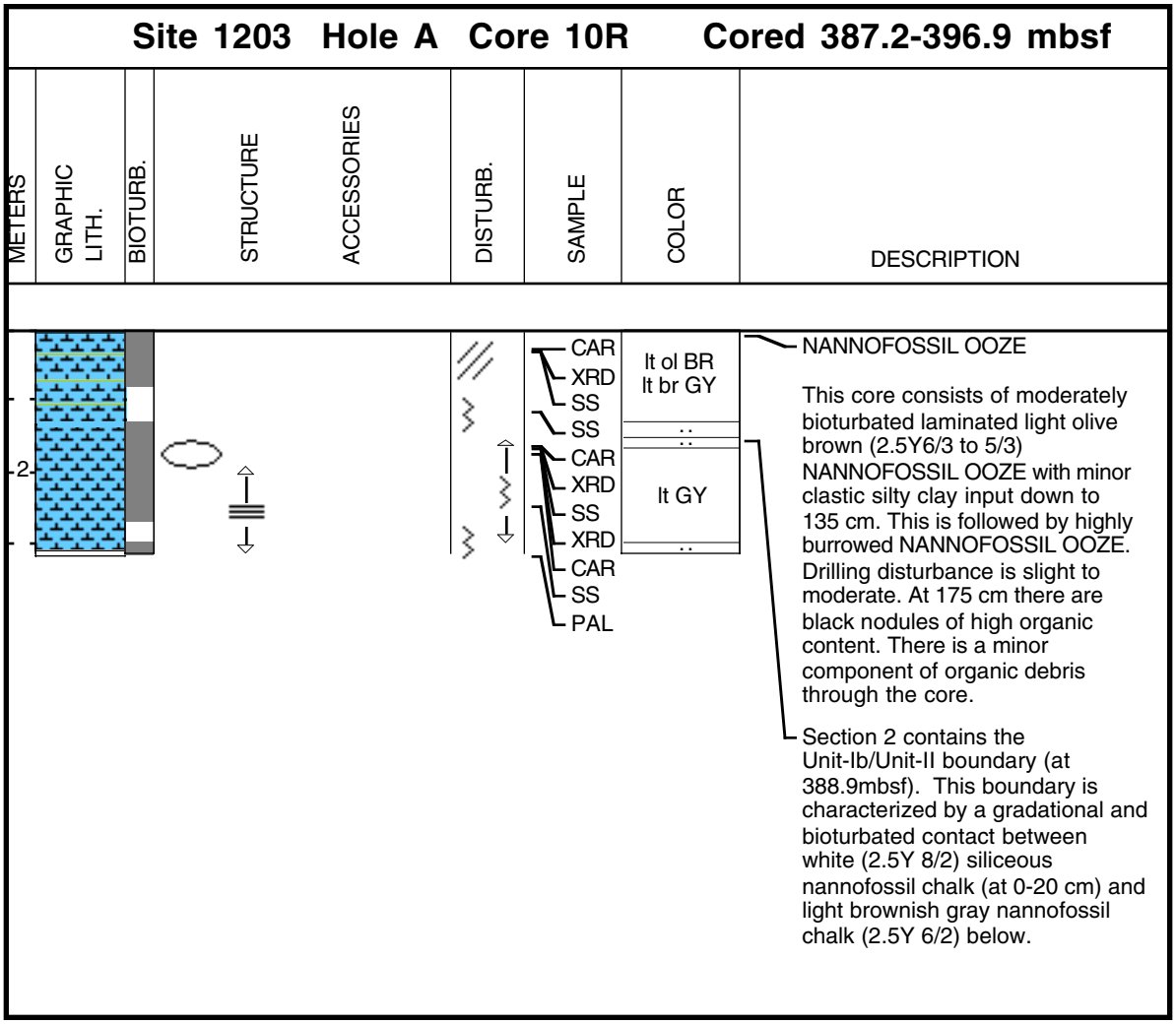
Core Photo


Site 1203 Hole A Core 8R Cored 367.8-377.5 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
4
6
8
SS
CAR
XRD
SS
CAR
XRD
CAR
XRD
SS
SS
SS
SS
PAL
lt bl GY
lt bl GY
lt bl GY
lt bl GY
lt br GY
lt GY
WH
WH
WH
WH
WH
pal YE
NANNOFOSSIL OOZE
This core consists of NANNOFOSSIL OOZE alternating with DIATOM OOZE. The drilling disturbance is slight to moderate; slight bioturbation occurs almost throughout with a few laminated areas. Horizontal burrows gives a spectacular green horizontal pattern in Sections 2 and 3.

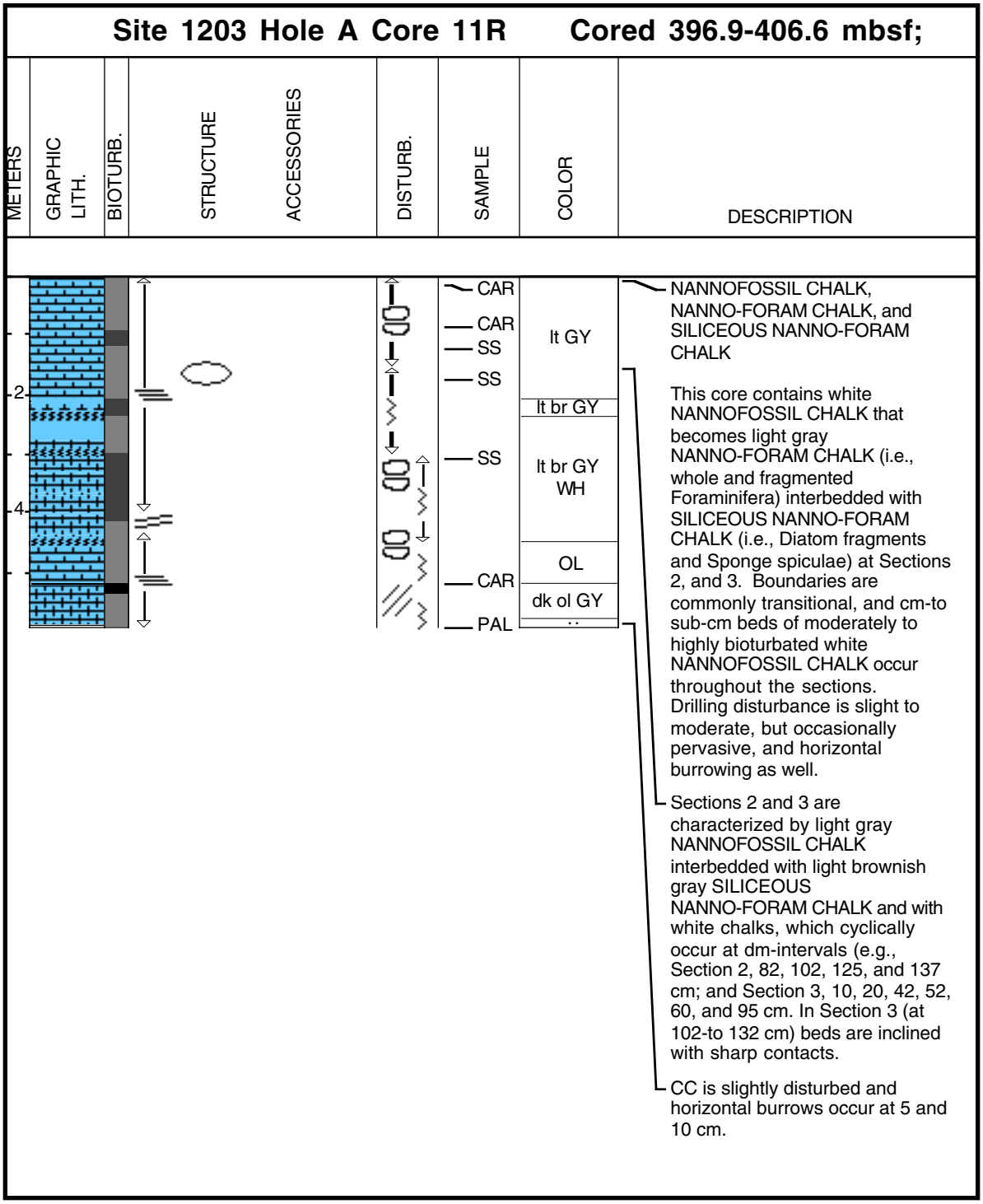
Core Photo


Site 1203 Hole A Core 9R Cored 377.5-387.2 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
4
SS
CAR
XRD
XRD
CAR
SS
SS
PAL
WH
lt GY
WH
NANNOFOSSIL OOZE
This core consists of NANNOFOSSIL OOZE alternating with DIATOM OOZE. The drilling disturbance is moderate and fractured. Horizontal borrows occur almost throughout with a few laminated areas and result, together with increased DIATOM OOZE content, in a green horizontal mottled pattern in section 1.

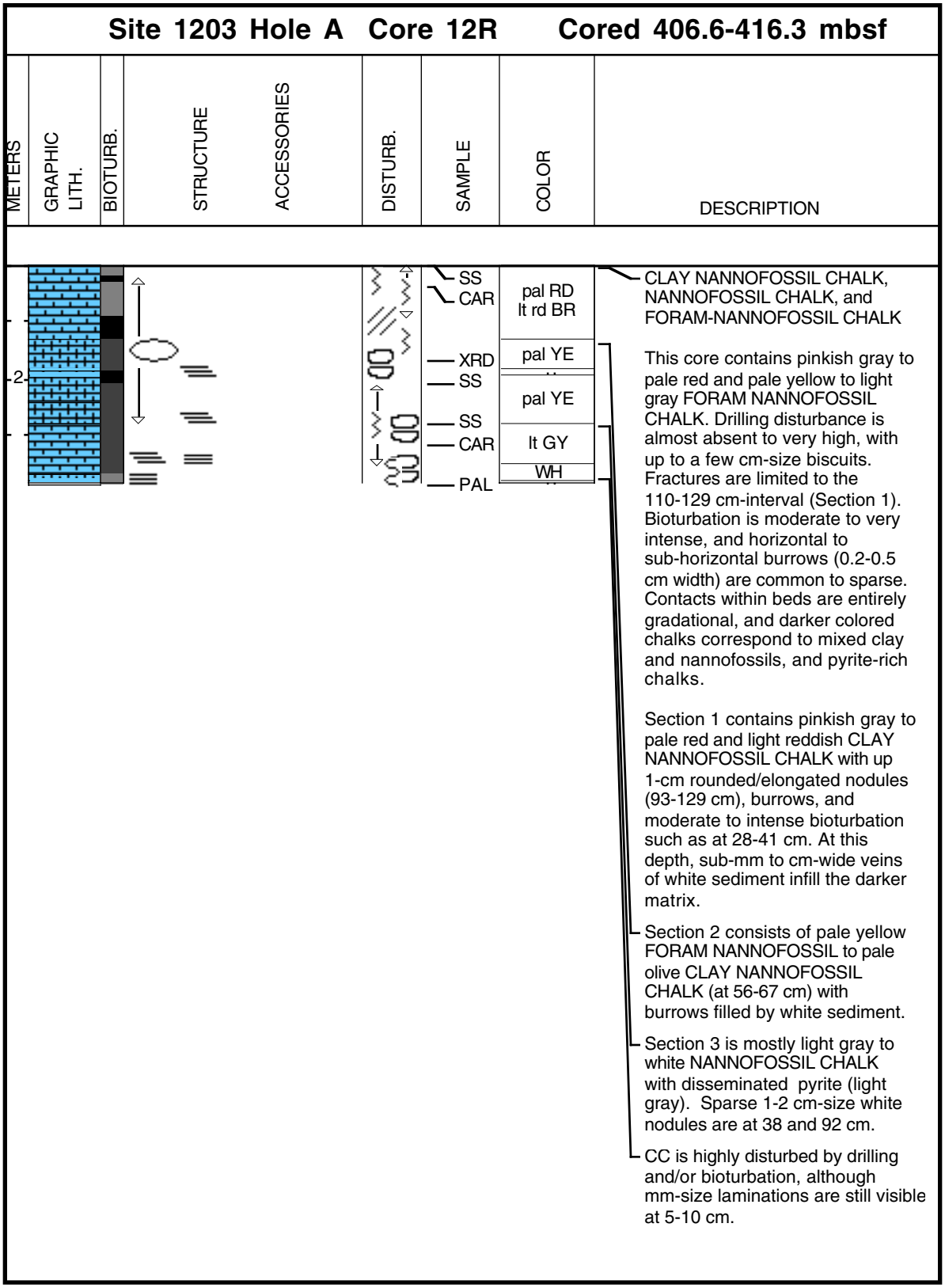
Core Photo


Site 1203 Hole A Core 10R Cored 387.2-396.9 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
CAR
XRD
SS
SS
CAR
XRD
SS
XRD
CAR
SS
PAL
lt ol BR
lt br GY
lt GY
NANNOFOSSIL OOZE
This core consists of moderately bioturbated laminated light olive brown (2.5Y6/3 to 5/3) NANNOFOSSIL OOZE with minor clastic silty clay input down to 135 cm. This is followed by highly burrowed NANNOFOSSIL OOZE. Drilling disturbance is slight to moderate. At 175 cm there are black nodules of high organic content. There is a minor component of organic debris through the core.
Section 2 contains the Unit-Ib/Unit-II boundary (at 388.9mbsf). This boundary is characterized by a gradational and bioturbated contact between white (2.5Y 8/2) siliceous nannofossil chalk (at 0-20 cm) and light brownish gray nannofossil chalk (2.5Y 6/2) below.

Core Photo

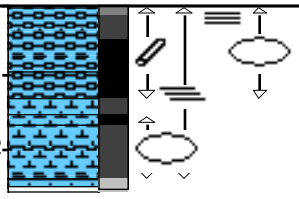
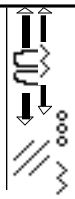

Site 1203 Hole A Core 11R Cored 396.9-406.6 mbsf;
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
4
CAR
CAR
SS
SS
SS
CAR
PAL
lt GY
lt br GY
lt br GY WH
OL
dk ol GY
NANNOFOSSIL CHALK, NANNO-FORAM CHALK, and SILICEOUS NANNO-FORAM CHALK
This core contains white NANNOFOSSIL CHALK that becomes light gray NANNO-FORAM CHALK (i.e., whole and fragmented Foraminifera) interbedded with SILICEOUS NANNO-FORAM CHALK (i.e., Diatom fragments and Sponge spiculae) at Sections 2, and 3. Boundaries are commonly transitional, and cm-to sub-cm beds of moderately to highly bioturbated white NANNOFOSSIL CHALK occur throughout the sections. Drilling disturbance is slight to moderate, but occasionally pervasive, and horizontal burrowing as well.
Sections 2 and 3 are characterized by light gray NANNOFOSSIL CHALK interbedded with light brownish gray SILICEOUS NANNO-FORAM CHALK and with white chalks, which cyclically occur at dm-intervals (e.g., Section 2, 82, 102, 125, and 137 cm; and Section 3, 10, 20, 42, 52, 60, and 95 cm. In Section 3 (at 102-to 132 cm) beds are inclined with sharp contacts.
CC is slightly disturbed and horizontal burrows occur at 5 and 10 cm.

Core Photo

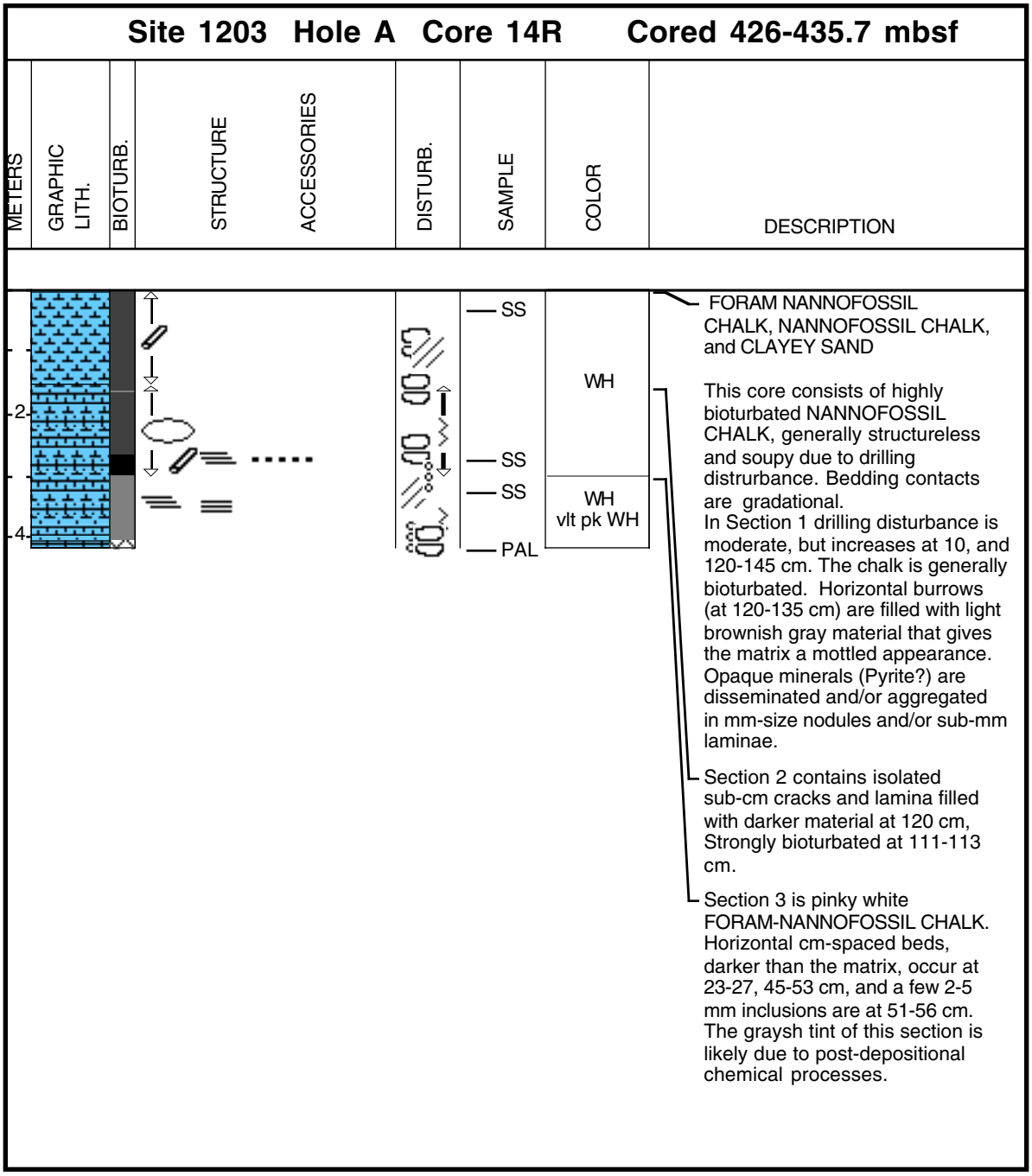

Site 1203 Hole A Core 12R Cored 406.6-416.3 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
SS
CAR
XRD
SS
SS
CAR
PAL
pal RD
lt rd BR
pal YE
pal YE
lt GY
WH
CLAY NANNOFOSSIL CHALK, NANNOFOSSIL CHALK, and FORAM-NANNOFOSSIL CHALK
This core contains pinkish gray to pale red and pale yellow to light gray FORAM NANNOFOSSIL CHALK. Drilling disturbance is almost absent to very high, with up to a few cm-size biscuits. Fractures are limited to the 110-129 cm-interval (Section 1). Bioturbation is moderate to very intense, and horizontal to sub-horizontal burrows (0.2-0.5 cm width) are common to sparse. Contacts within beds are entirely gradational, and darker colored chalks correspond to mixed clay and nannofossils, and pyrite-rich chalks.
Section 1 contains pinkish gray to pale red and light reddish CLAY NANNOFOSSIL CHALK with up 1-cm rounded/elongated nodules (93-129 cm), burrows, and moderate to intense bioturbation such as at 28-41 cm. At this depth, sub-mm to cm-wide veins of white sediment infill the darker matrix.
Section 2 consists of pale yellow FORAM NANNOFOSSIL to pale olive CLAY NANNOFOSSIL CHALK (at 56-67 cm) with burrows filled by white sediment.
Section 3 is mostly light gray to white NANNOFOSSIL CHALK with disseminated pyrite (light gray). Sparse 1-2 cm-size white nodules are at 38 and 92 cm.
CC is highly disturbed by drilling and/or bioturbation, although mm-size laminations are still visible at 5-10 cm.

Core Photo

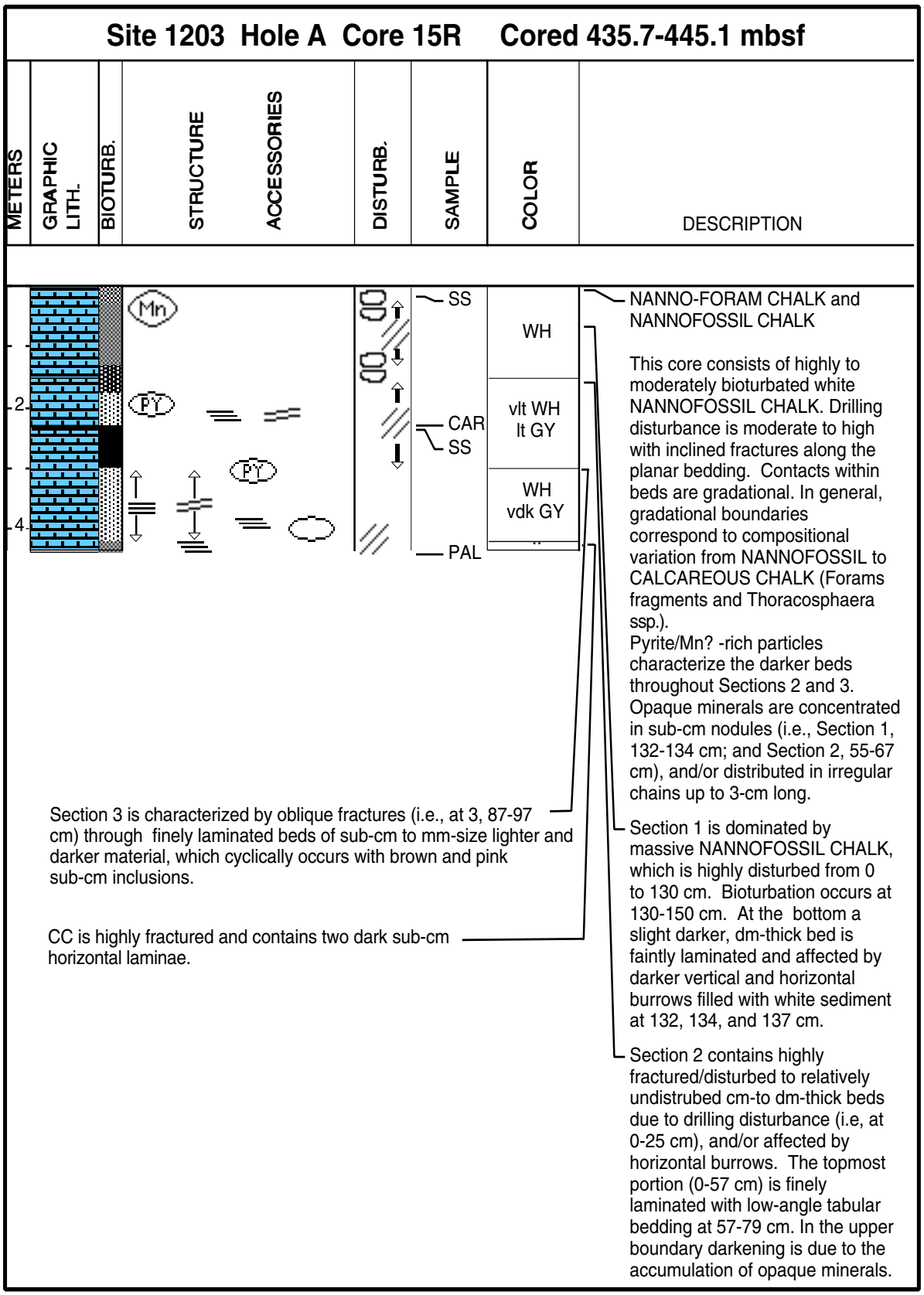
Site 1203 Hole A Core 13R Cored 416.3-426.0 mbsf

METERS	GRAPHIC LITH.	BIOTURB.	STRUCTURE	ACCESSORIES	DISTURB.	SAMPLE	COLOR	DESCRIPTION
1						CAR SS SS SS SS PAL	ol BR ol YE lt br GY WH WH lt GY	CALCAREOUS NANNOFOSSIL CHALK, NANNOFOSSIL CHALK, and CLAY NANNOFOSSIL CHALK This core contains olive brown to olive yellow CALCAREOUS NANNOFOSSIL CHALK and white to light gray NANNOFOSSIL CHALK. Bioturbation is moderate to high. Drilling disturbance is moderate to high with cm-to dm-size biscuits (Sections 1 and 2), fractures and soupy intervals dominating Section 2. Contacts within beds are always gradational, except at Section 1, 127 cm, and Section 2, 12 cm where they are sharp. Darker color corresponds to different amount of calcareous microfossils and progressive dilution with opaque minerals, organic debris, and altered feldspars. Section 1 contains nodules and burrows in the interval 50-120 cm, while moderate bioturbation is present above. Traces of sub-cm white lamination occur at 12-17 cm. An abrupt change in lithology (white color and texture) occurs at 127 cm and downcore to Section 2, 17 cm. Section 2 is a white NANNOFOSSIL CHALK to lighter gray CLAY NANNOFOSSIL CHALK, and contains several horizontal burrows darker (above 12 cm) to-ligther (below 12 cm) than the matrix. Burrows are filled with organic matter and chalk containing pyrite. A cm-thick dark bed (at 9-12 cm) is organic-rich CLAYEY SILT-SAND with coccoliths. CC is highly disturbed by drilling, but laminations and burrows occur at 9-12 cm.
2								

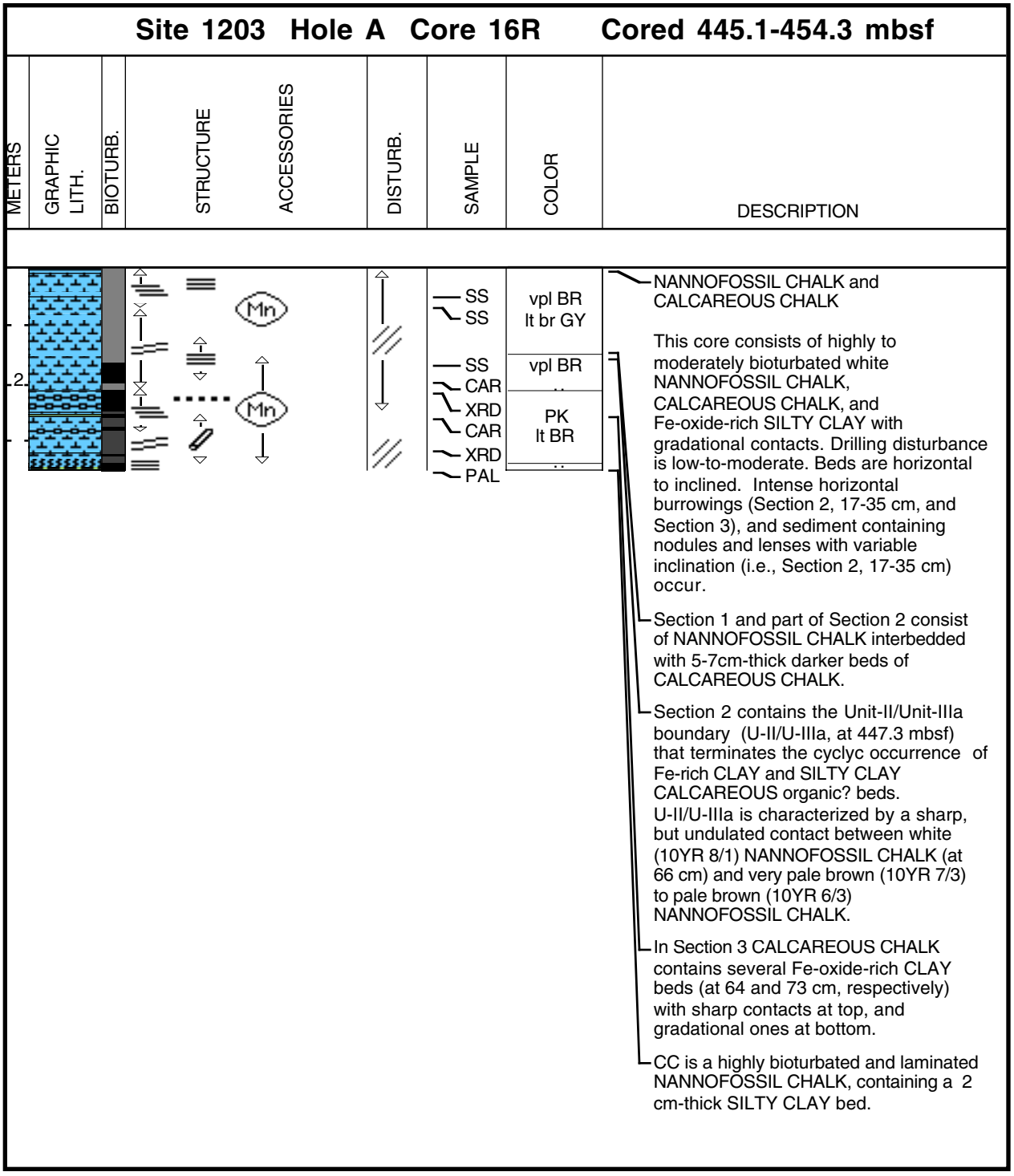
Core Photo


Site 1203 Hole A Core 14R Cored 426-435.7 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
4
SS
SS
SS
PAL
WH
WH
vlt pk WH
FORAM NANNOFOSSIL CHALK, NANNOFOSSIL CHALK, and CLAYEY SAND
This core consists of highly bioturbated NANNOFOSSIL CHALK, generally structureless and soupy due to drilling distrurbance. Bedding contacts are gradational.
In Section 1 drilling disturbance is moderate, but increases at 10, and 120-145 cm. The chalk is generally bioturbated. Horizontal burrows (at 120-135 cm) are filled with light brownish gray material that gives the matrix a mottled appearance. Opaque minerals (Pyrite?) are disseminated and/or aggregated in mm-size nodules and/or sub-mm laminae.
Section 2 contains isolated sub-cm cracks and lamina filled with darker material at 120 cm, Strongly bioturbated at 111-113 cm.
Section 3 is pinky white FORAM-NANNOFOSSIL CHALK. Horizontal cm-spaced beds, darker than the matrix, occur at 23-27, 45-53 cm, and a few 2-5 mm inclusions are at 51-56 cm. The graysh tint of this section is likely due to post-depositional chemical processes.

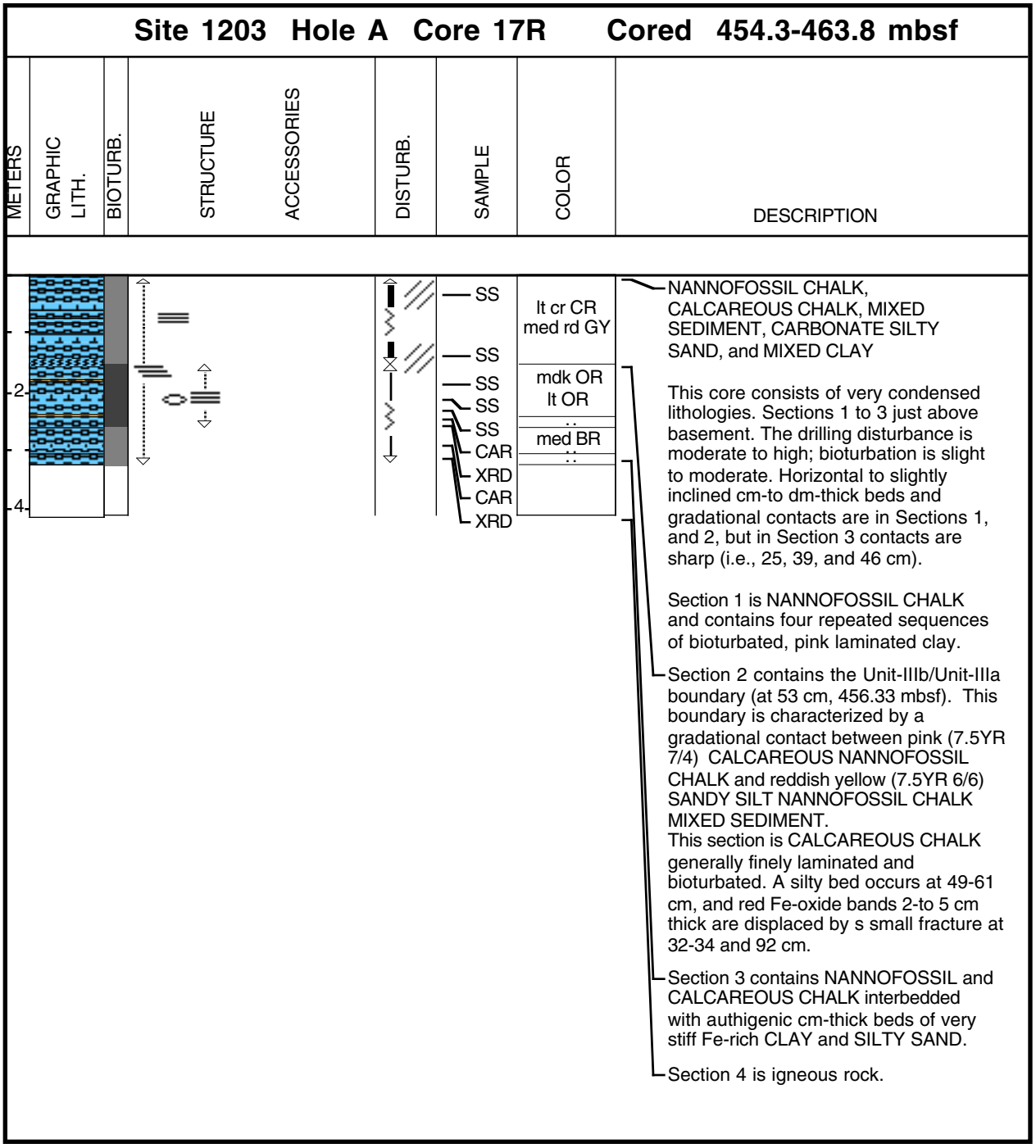
Core Photo


Site 1203 Hole A Core 15R Cored 435.7-445.1 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
4
Mn
PY
PY
SS
CAR
SS
PAL
WH
vlt WH
lt GY
WH
vdk GY
NANNO-FORAM CHALK and NANNOFOSSIL CHALK
This core consists of highly to moderately bioturbated white NANNOFOSSIL CHALK. Drilling disturbance is moderate to high with inclined fractures along the planar bedding. Contacts within beds are gradational. In general, gradational boundaries correspond to compositional variation from NANNOFOSSIL to CALCAREOUS CHALK (Forams fragments and Thoracosphaera ssp.).
Pyrite/Mn? -rich particles characterize the darker beds throughout Sections 2 and 3. Opaque minerals are concentrated in sub-cm nodules (i.e., Section 1, 132-134 cm; and Section 2, 55-67 cm), and/or distributed in irregular chains up to 3-cm long.
Section 3 is characterized by oblique fractures (i.e., at 3, 87-97 cm) through finely laminated beds of sub-cm to mm-size lighter and darker material, which cyclically occurs with brown and pink sub-cm inclusions.
Section 1 is dominated by massive NANNOFOSSIL CHALK, which is highly disturbed from 0 to 130 cm. Bioturbation occurs at 130-150 cm. At the bottom a slight darker, dm-thick bed is faintly laminated and affected by darker vertical and horizontal burrows filled with white sediment at 132, 134, and 137 cm.
CC is highly fractured and contains two dark sub-cm horizontal laminae.
Section 2 contains highly fractured/disturbed to relatively undistrubed cm-to dm-thick beds due to drilling disturbance (i.e, at 0-25 cm), and/or affected by horizontal burrows. The topmost portion (0-57 cm) is finely laminated with low-angle tabular bedding at 57-79 cm. In the upper boundary darkening is due to the accumulation of opaque minerals.

Core Photo


Site 1203 Hole A Core 16R Cored 445.1-454.3 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
2
Mn
Mn
SS
SS
SS
CAR
XRD
CAR
XRD
PAL
vpl BR
lt br GY
vpl BR
PK
lt BR
NANNOFOSSIL CHALK and CALCAREOUS CHALK
This core consists of highly to moderately bioturbated white NANNOFOSSIL CHALK, CALCAREOUS CHALK, and Fe-oxide-rich SILTY CLAY with gradational contacts. Drilling disturbance is low-to-moderate. Beds are horizontal to inclined. Intense horizontal burrowings (Section 2, 17-35 cm, and Section 3), and sediment containing nodules and lenses with variable inclination (i.e., Section 2, 17-35 cm) occur.
Section 1 and part of Section 2 consist of NANNOFOSSIL CHALK interbedded with 5-7cm-thick darker beds of CALCAREOUS CHALK.
Section 2 contains the Unit-II/Unit-IIIa boundary (U-II/U-IIIa, at 447.3 mbsf) that terminates the cyclyc occurrence of Fe-rich CLAY and SILTY CLAY CALCAREOUS organic? beds. U-II/U-IIIa is characterized by a sharp, but undulated contact between white (10YR 8/1) NANNOFOSSIL CHALK (at 66 cm) and very pale brown (10YR 7/3) to pale brown (10YR 6/3) NANNOFOSSIL CHALK.
In Section 3 CALCAREOUS CHALK contains several Fe-oxide-rich CLAY beds (at 64 and 73 cm, respectively) with sharp contacts at top, and gradational ones at bottom.
CC is a highly bioturbated and laminated NANNOFOSSIL CHALK, containing a 2 cm-thick SILTY CLAY bed.

Core Photo


Site 1203 Hole A Core 17R Cored 454.3-463.8 mbsf
METERS
GRAPHIC LITH.
BIOTURB.
STRUCTURE
ACCESSORIES
DISTURB.
SAMPLE
COLOR
DESCRIPTION
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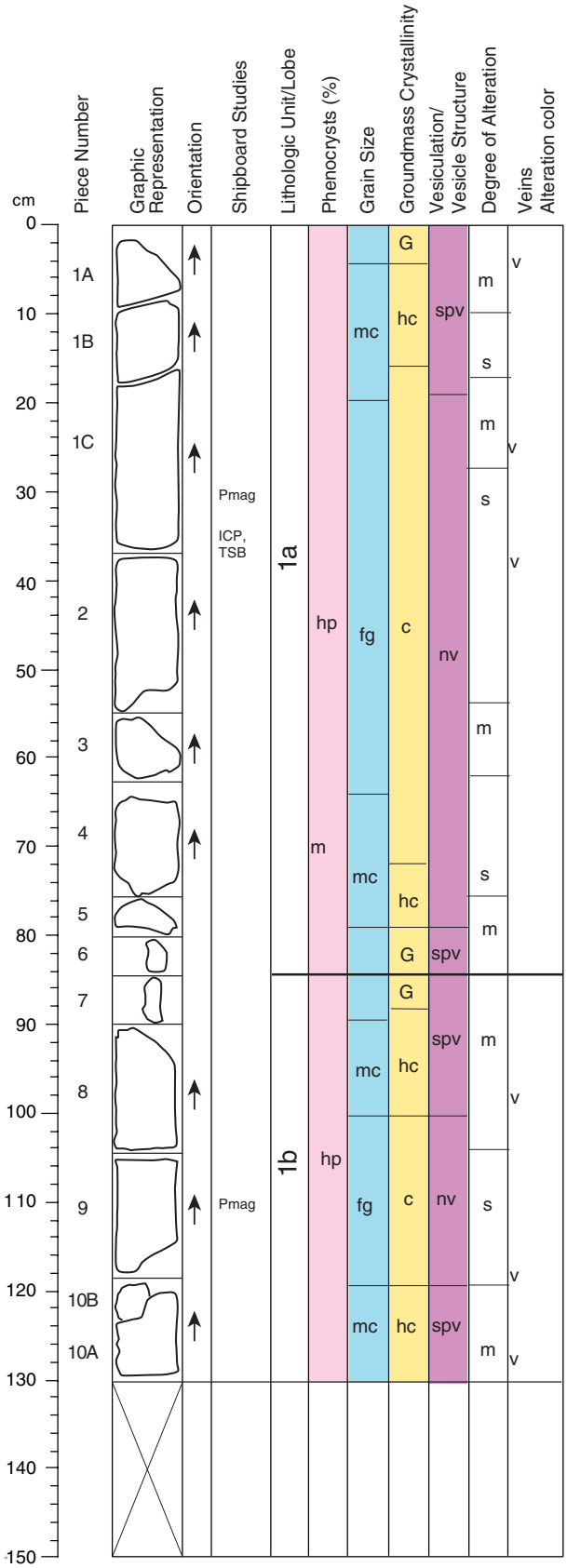
NANNOFOSSIL CHALK, CALCAREOUS CHALK, MIXED SEDIMENT, CARBONATE SILTY SAND, and MIXED CLAY
This core consists of very condensed lithologies. Sections 1 to 3 just above basement. The drilling disturbance is moderate to high; bioturbation is slight to moderate. Horizontal to slightly inclined cm-to dm-thick beds and gradational contacts are in Sections 1, and 2, but in Section 3 contacts are sharp (i.e., 25, 39, and 46 cm).
Section 1 is NANNOFOSSIL CHALK and contains four repeated sequences of bioturbated, pink laminated clay.
Section 2 contains the Unit-IIIb/Unit-IIIa boundary (at 53 cm, 456.33 mbsf). This boundary is characterized by a gradational contact between pink (7.5YR 7/4) CALCAREOUS NANNOFOSSIL CHALK and reddish yellow (7.5YR 6/6) SANDY SILT NANNOFOSSIL CHALK MIXED SEDIMENT.
This section is CALCAREOUS CHALK generally finely laminated and bioturbated. A silty bed occurs at 49-61 cm, and red Fe-oxide bands 2-to 5 cm thick are displaced by s small fracture at 32-34 and 92 cm.
Section 3 contains NANNOFOSSIL and CALCAREOUS CHALK interbedded with authigenic cm-thick beds of very stiff Fe-rich CLAY and SILTY SAND.
Section 4 is igneous rock.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-17R-4 (Section top: 458.56 mbsf)

UNIT 1: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-10

CONTACTS: None. The boundary between Unit 1 and the overlying sediment is inferred to be at the top of Section 17R-4.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10-20	10	<1	1.5	Subhedral; laths to equant
Olivine:	1-5	3	0.5	1.5	Euhedral; equant

GROUNDMASS: Fine grained to aphanitic near glassy lobe margins (e.g., Piece 6). Immediately inside glassy selvages the lobe margins are characterized by well-developed variolitic texture. Lobe interiors exhibit intersertal to intergranular texture.

VESICLES: Nonvesicular. More abundant (5%) near lobe margins where vesicles coalesce to form juvenile pipe vesicles. In massive lobe interiors, vesicles are sparse (<1%) and round. Often filled with dark brown clay minerals and carbonate.

MODE: 1%-5%.

COLOR: Medium light gray (N6) to light gray (N7) in interiors, light brownish gray (5YR 6/1) at fine grained lobe margins.

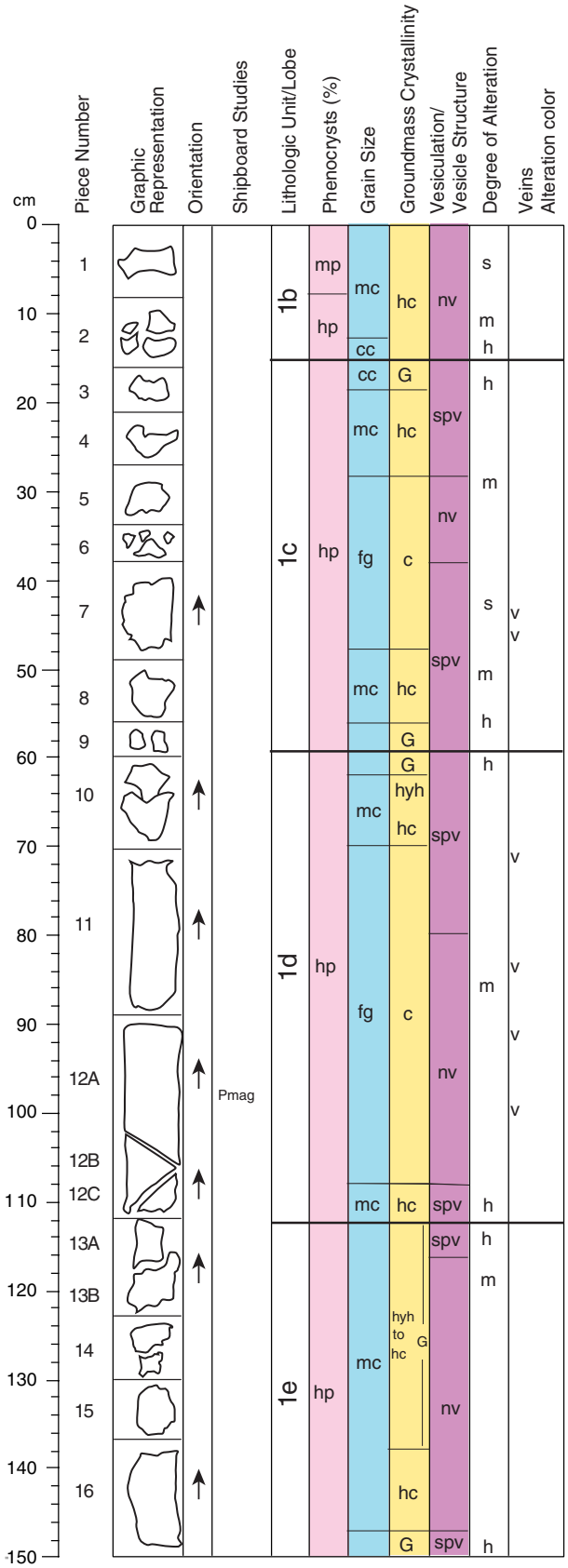
STRUCTURE: Lobed. Individual lobes are defined by presence of glassy lobe margins or by changes in crystallinity and vesicularity.

ALTERATION: Slight, to moderate along veins. Orange brown Fe-oxyhydroxide alteration is present around glassy lobe margins and veins. Olivine is completely replaced by dark red clays and carbonate.

VEINS/FRACTURES: Some areas of polygonal fractures (e.g., Pieces 10A and 10B). Veins are filled with carbonate, Fe-oxyhydroxide and clay minerals.

COMMENTS: On the basis of the small size and overall low vesicularity of lava lobes and the presence of smooth glassy lobe margins, along with variolitic texture near lobe margins, we interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-18R-1 (Section top: 463.8 mbsf)

UNIT 1: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-16

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	5-12	2	<1	1.5	Subhedral; laths to equant
Olivine:	1-7	3	0.5	1.5	Euhedral; equant

GROUNDMASS: Fine grained, aphanitic at lobe margins. Immediately inside glassy selvages the lobe margins are characterized by well-developed variolitic texture. Lobe interiors exhibit intersertal to intergranular texture.

VESICLES: Nonvesicular. Vesicles are more abundant (>5%) near glassy lobe margins where they coalesce to form juvenile pipe vesicles, <1.5 mm in size. In massive lobe interiors, vesicles are sparse (<1%) and round.

MODE: 1%-6%

COLOR: Varies from medium light gray (N6) in interior to light brownish gray (5YR 6/1) at fine grained lobe margins.

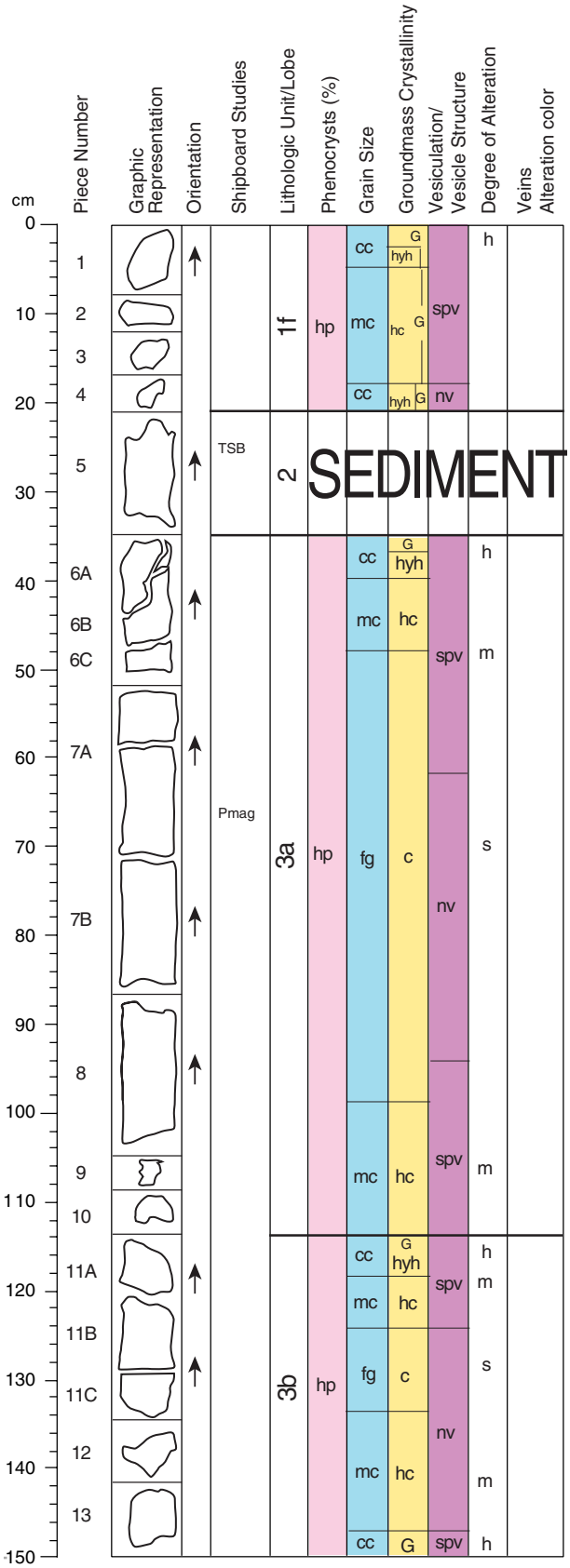
STRUCTURE: Lobed. Individual lobes are defined by presence of glassy lobe margins or by changes in crystallinity and vesicularity.

ALTERATION: Slight, increasing to moderate at lobe margins. Vesicles are filled with carbonate and brown clays. Olivine phenocrysts are pseudomorphed by clays, white carbonate and talc.

VEINS/FRACTURES: Sparsely veined throughout. Filled with amorphous brown material (clays and carbonate). Some polygonally oriented veins (e.g., Piece 11) <4 mm wide.

COMMENTS: We interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-18R-2 (Section top: 465.3 mbsf)

UNIT 1: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-5

CONTACTS: Sharp glassy nonplanar contact at base with underlying carbonate sediment at approximately 25 cm.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-10	2	<1	1.5	Subhedral; lath-like to equant
Olivine:	2-4	4	0.5	1.5	Euhedral; equant. Some bladed?

GROUNDMASS: Fine grained, aphanitic at margins.

VESICLES: Nonvesicular. Vesicles present and more abundant (>5%) near glassy lobe margins where they coalesce to form juvenile pipe vesicles, <1.5 mm in size. In massive interiors, vesicles are sparse (<1%) and round, and filled with dark brown clay minerals and carbonate.

MODE: 1%-5%.

COLOR: Varies from medium light gray (N6) in interior to light brownish gray (5YR 6/1) at fine grained lobe margins.

STRUCTURE: Lobed. Individual lobes are defined by presence of glassy lobe margins or by changes in crystallinity and vesicularity.

ALTERATION: Slight, increasing to moderate at margins and along veins. Vesicles are filled with carbonate and clays. Olivine phenocrysts are pseudomorphed by clays, white carbonate and talc.

VEINS/FRACTURES: Sparsely veined throughout. Filled with amorphous brown material (clays) and white carbonate.

COMMENTS: We interpret the unit as a pillow lava.

UNIT 2: CALCAREOUS INTERBED.

Pieces: 5

CONTACTS: Sharp undulating dipping (60˚) contact with overlying basalt at 25 cm, and subhorizontal contact at base at 34 cm. 1-4 mm carbonate vein separates sediment and glass selvages.

UNIT STRUCTURE: Consists of two sub units:
Layer 1: Siliciclastic sand with carbonate matrix.
Layer 2: Carbonate mudstone with two discontinuous mm-thick siliciclastic laminae near base.

COLOR: Pale creamy white (N9) to very light gray (N8).

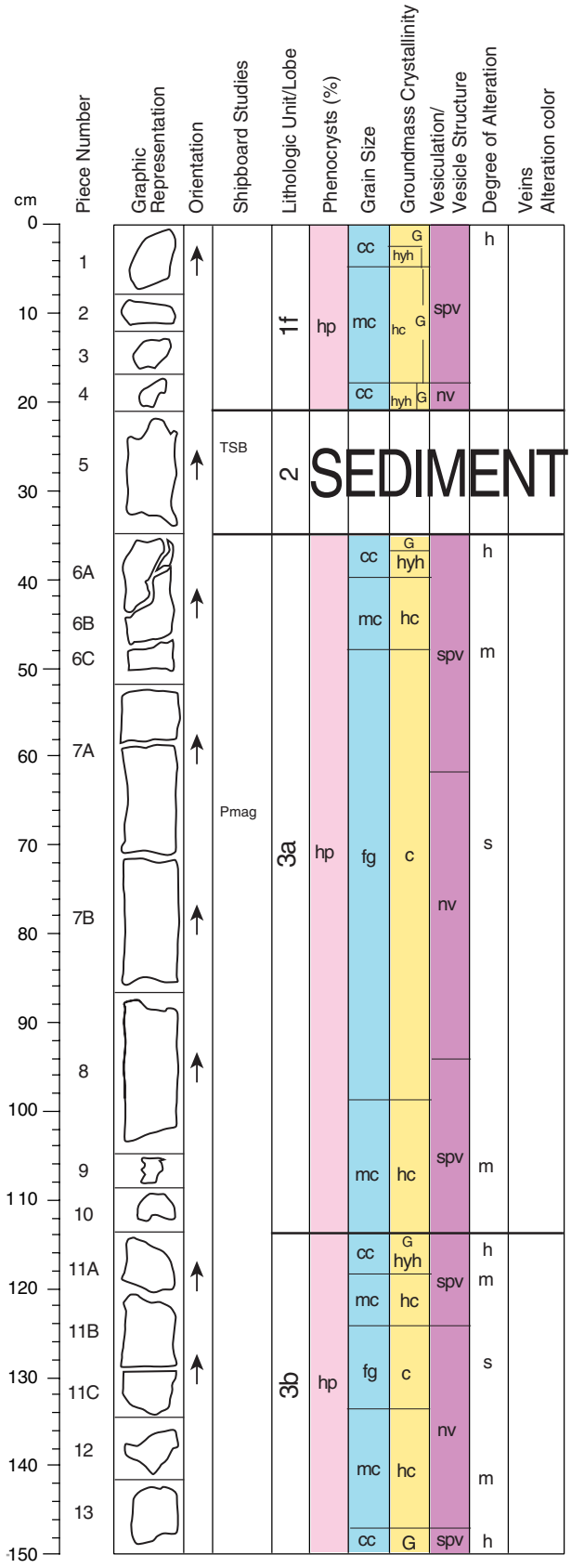
ALTERATION: Layer 1: Clasts altered to pale reddish brown (5YR 5/8) to dark brown (10YR 3/2) clay minerals. Layer 2: Large (1-2 mm) clusters of sub-mm sized goethite crystals disseminated throughout.

VEINS/FRACTURES: Sub-mm thick veins of silica cut though carbonate mudstone, forming a complex dendritic pattern.

COMMENTS: Layer 1 may contain components formed by disintegration of underlying lava lobe.

(Continued to page 2)

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION
197-1203A-18R-2 (cont'd)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 5-13

CONTACTS: Sharp subhorizontal contact with glassy lobe margin in contact with overlying sediment at 34 cm.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10-15	2	<1	1.5	Subhedral; lath-like to equant
Olivine:	2-5	4	0.5	1.5	Euhedral; equant

GROUNDMASS: Fine grained, aphanitic at lobe margins.

VESICLES: Nonvesicular. Vesicles are more abundant (>5%) near glassy lobe margins where vesicles coalesce to form small tube-shaped vesicles, <5 mm in size (e.g., Piece 11). In massive interiors, vesicles are sparse (<1%) and round, and filled with dark brown clay minerals and carbonate.

MODE: 1%-6%.

COLOR: Varies from medium light gray (10YR 5/1) in interior to light brownish gr (5YR 5/3) at fine grained lobe margins.

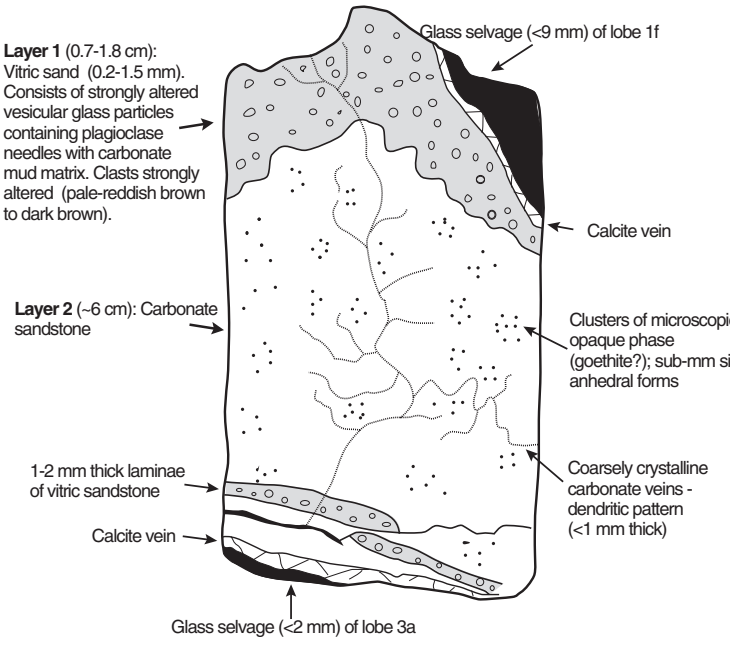
STRUCTURE: Lobed. Individual lobes are defined by presence of glassy lobe margins or by changes in crystallinity and vesicularity.

ALTERATION: Slight, increasing to moderate at margins and along veins. Vesicl are filled with carbonate and clays. Olivine phenocrysts are pseudomorphed by clays, white carbonate and serpentine.

VEINS/FRACTURES: Highly veined and fractured. Filled with carbonate and cla

COMMENTS: On the basis of the small size and overall low vesicularity of lava

1023A-18R-2, Piece 5



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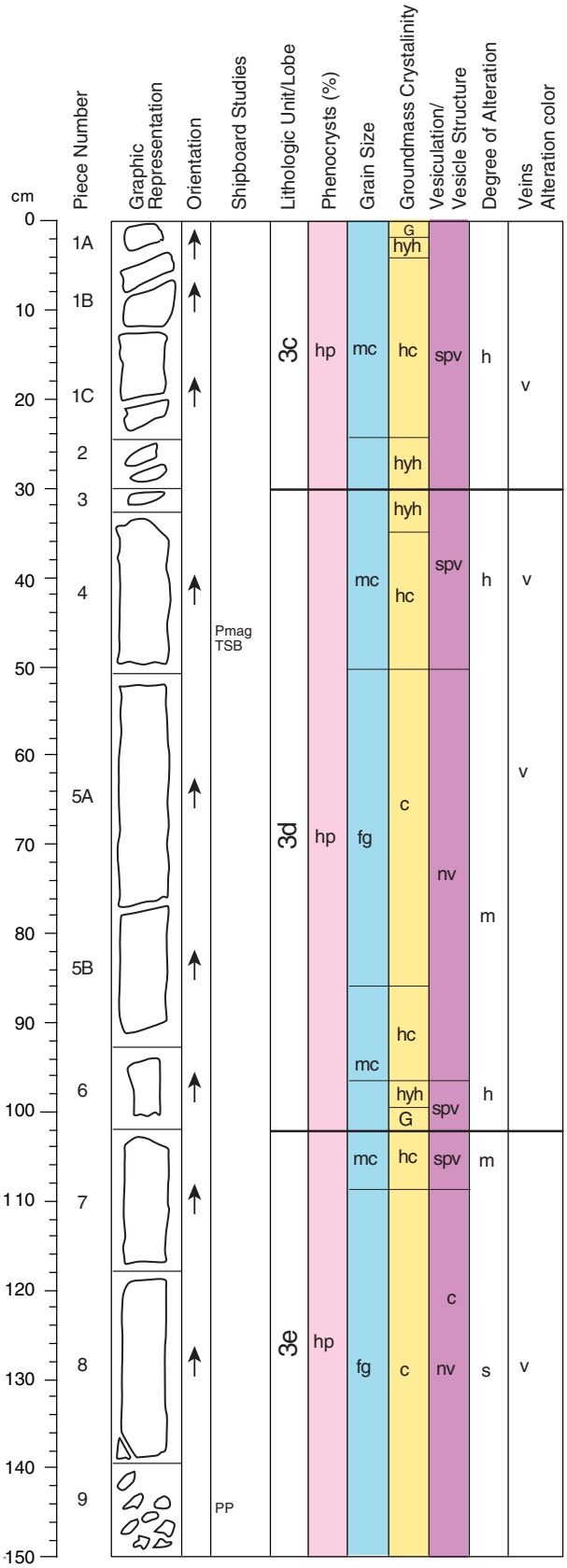


IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-18R-3 (Section top: 466.8 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-6

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10-20	2	<1	1.5	Subhedral; lath-like to equant
Olivine:	1-7	2	0.5	1.5	Euhedral; equant

GROUNDMASS: Fine grained, aphanitic at lobe margins.

VESICLES: Nonvesicular. Vesicles are more abundant (>5%) near glassy lobe margins. In massive interiors, vesicles are sparse (<1%) and round, and filled with carbonate and dark brown clays.

MODE: 1%-6%.

COLOR: Varies from medium light gray (N6) in interior to light brownish gray (5YR 6/1) at fine grained lobe margins.

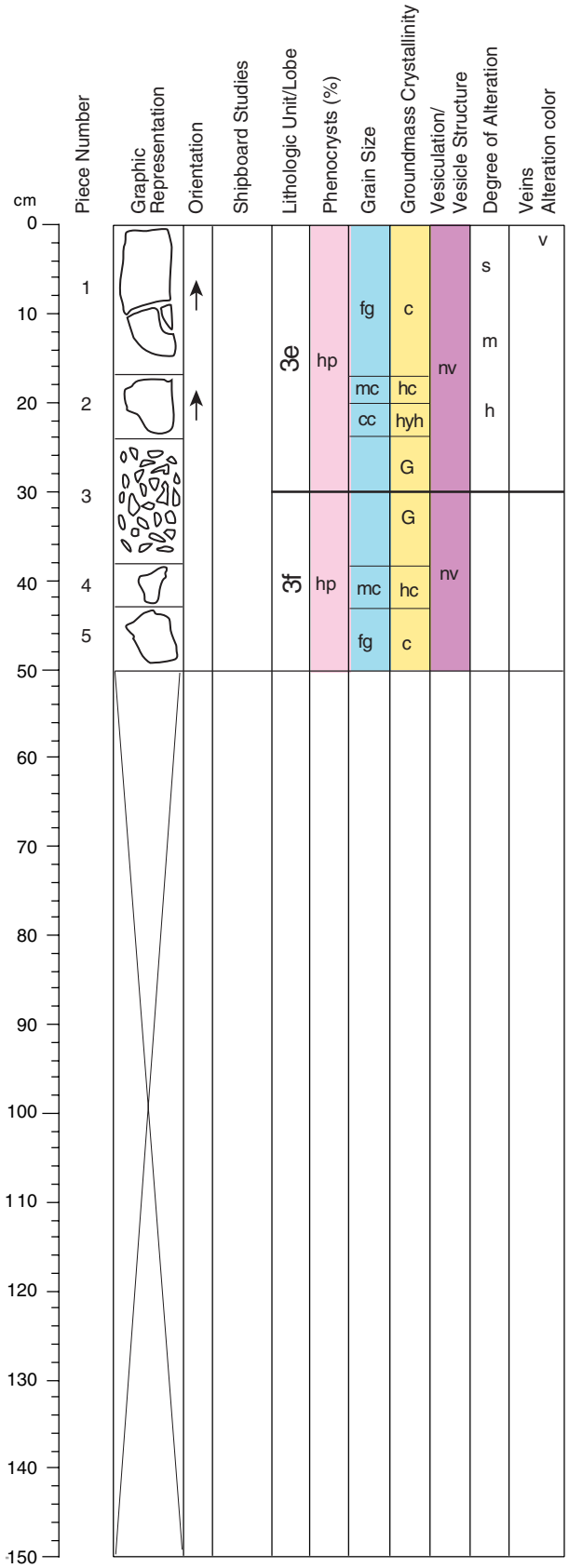
STRUCTURE: Lobed. Individual lobes are defined by presence of glassy lobe margins or by changes in crystallinity and vesicularity.

ALTERATION: Slight, increasing to moderate at margins and along veins. Vesicles are filled with carbonate and clays. Olivine phenocrysts are pseudomorphed by clays, white carbonate, and talc.

VEINS/FRACTURES: Sparsely present throughout. Filled with amorphous brown material (clays) and white carbonate.

COMMENTS: We interpret the unit as pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-18R-4 (Section top: 468.3 mbsf)

UNIT 3: HIGHLY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-5

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10-15	2	<1	1.5	Subhedral; lath-like to equant
Olivine:	1-3	2	0.5	1.5	Euhedral; equant

GROUNDMASS: Fine grained, aphanitic at lobe margins.

VESICLES: Nonvesicular. Vesicles are more abundant (>5%) and coalesced near glassy lobe margins. In massive interiors, vesicles are sparse (<1%) and round, and filled with carbonate and dark brown clays.

MODE: 1%-6%.

COLOR: Varies from medium light gray (N6) in interior to light brownish gray (5YR 6/1) at fine grained lobe margins.

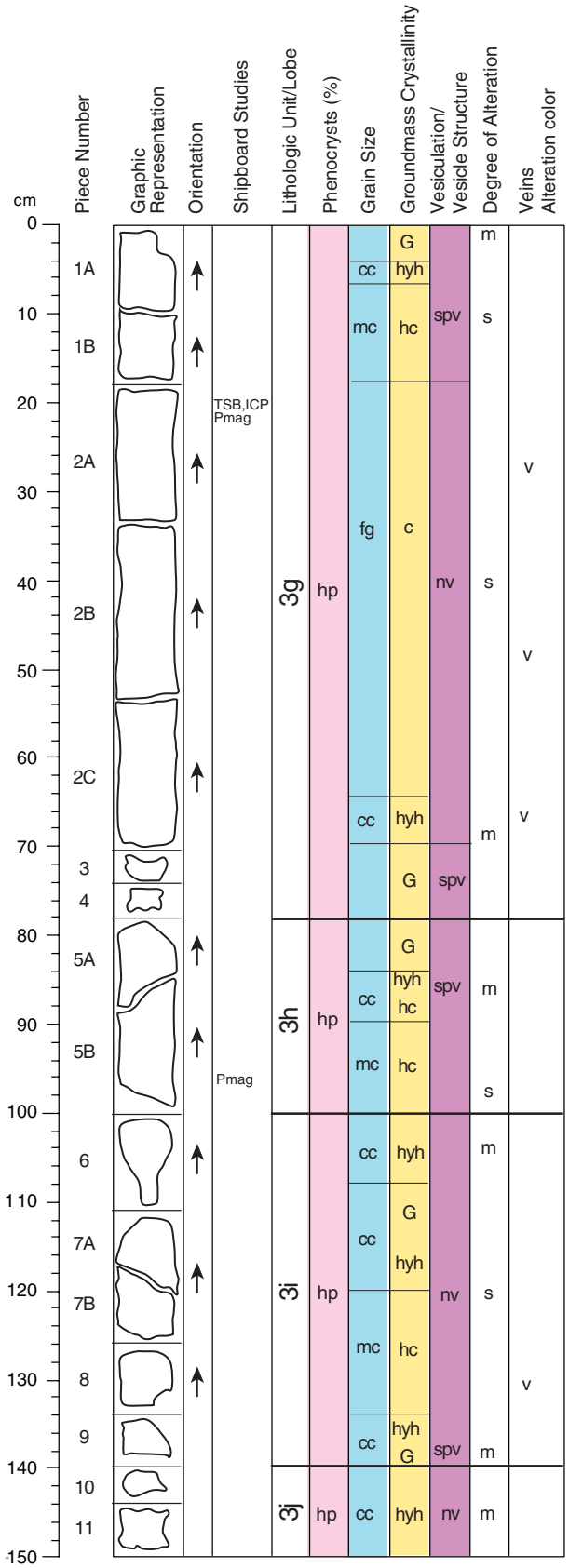
STRUCTURE: Lobed.

ALTERATION: Slight, increasing to moderate at margins and along veins. Vesicles are filled with carbonate and clays. Olivine phenocrysts are pseudomorphed by clays, white carbonate, and talc.

VEINS/FRACTURES: Sparsely veined. Filled with amorphous brown material (clays) and white carbonate.

COMMENTS: We interpret the unit as pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-19R-1 (Section top: 473.4 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-11

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-15	2	0.2	0.5	Euhedral
Olivine:	3-5	5	1	2	Euhedral to subhedral

GROUNDMASS: Aphanitic (lobe margins) to fine grained (lobe interiors) with variolitic to intergranular texture. The fine-grained regions contain plagioclase, clinopyroxene, black oxides, and glass.

VESICLES: Nonvesicular. Rare vesicles near lobe margins are filled with dark greenish black clay(?) minerals.

MODE: 1%-5%.

COLOR: Medium light gray (N6) to light gray (N7). Medium yellowish brown (10YR 5/4) where altered.

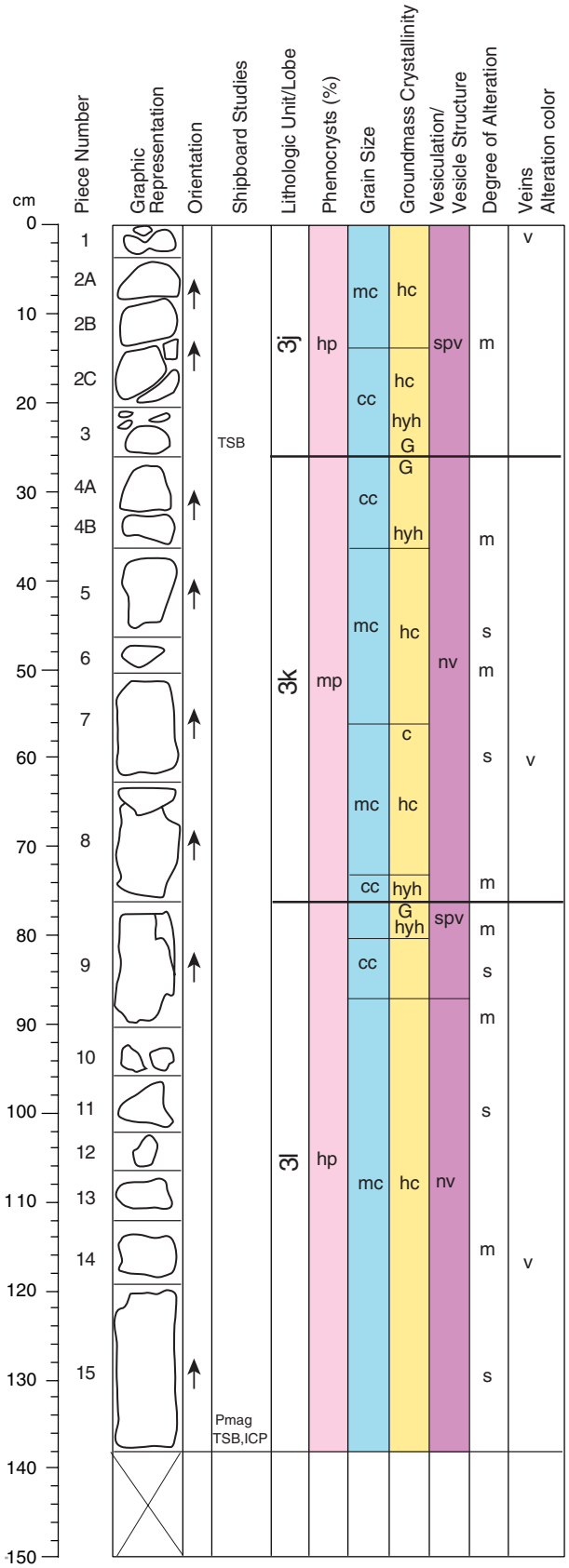
STRUCTURE: Lobed. Individual lobes are defined by presence of glassy lobe margins or by changes in crystallinity and vesicularity.

ALTERATION: Slight to moderate. Orange brown Fe-oxyhydroxide alteration is present adjacent to lobe margins and veins. Olivine is completely replaced by dark clays and carbonate.

VEINS/FRACTURES: Sparsely veined. Subvertical to subhorizontal veins filled with white carbonate, Fe-oxyhydroxide, and black minerals.

COMMENTS: We interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-19R-2 (Section top: 474.9 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-15

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-10	2	0.5	1	Subhedral
Olivine:	3-5	4	0.6	2	Euhedral to subhedral

GROUNDMASS: Aphanitic (lobe margins) to fine grained (lobe interiors) with variolitic to intergranular texture. The fine-grained regions contain plagioclase, clinopyroxene, black oxides, and glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Sparsely to nonvesicular	1-5	2	0.5	1	Round to irregular

COLOR: Very light gray (N7) to pale yellowish brown (10YR 6/2) and moderate yellowish brown (10YR 5/4) where altered.

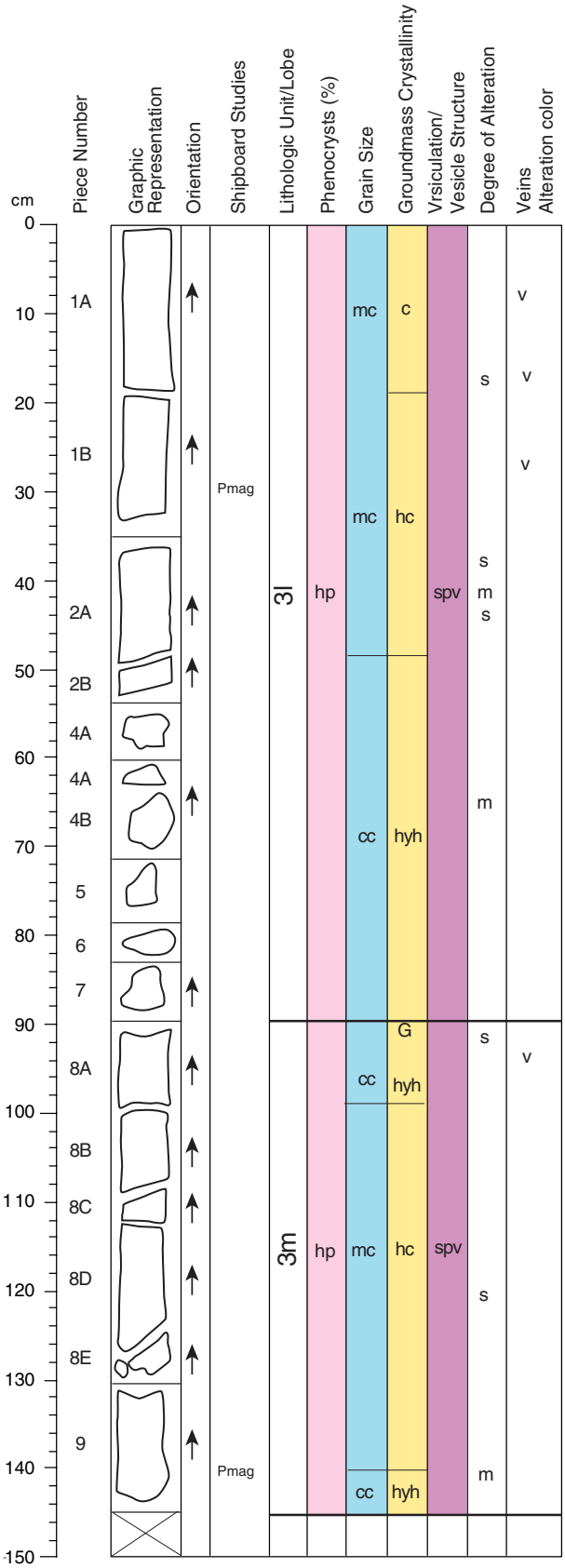
STRUCTURE: Lobed. Individual lobes are defined by presence of glassy lobe margins or by changes in crystallinity and vesicularity.

ALTERATION: Slight to high. Orange-brown Fe-oxyhydroxide alteration is present adjacent to lobe margins and veins. Many of the olivine phenocrysts are replaced by white carbonate and can be mistaken for plagioclase. Olivine is also replaced by Fe-oxyhydroxide and dark greenish black clay.

VEINS/FRACTURES: Sparsely veined. Veins are vertical to subhorizontal and are present throughout. They are between 0.1-0.5 cm wide and are filled with white carbonate and Fe oxyhydroxide.

COMMENTS: We interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-19R-3 (Section top: 476.29 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-9

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-10	3	1	1.5	Euhedral to subhedral; prismatic
Olivine:	3-4	2	0.5	0.8	Euhedral to subhedral; equant

GROUNDMASS: Aphanitic (lobe margins) to fine grained (lobe interiors) with variolitic to intergranular textures. The fine-grained regions contain plagioclase, clinopyroxene, black oxides and glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Sparsely vesicular	2	3	0.5	1	Round

COLOR: Medium light gray (N6) to light brownish gray (5YR 6/1) where altered.

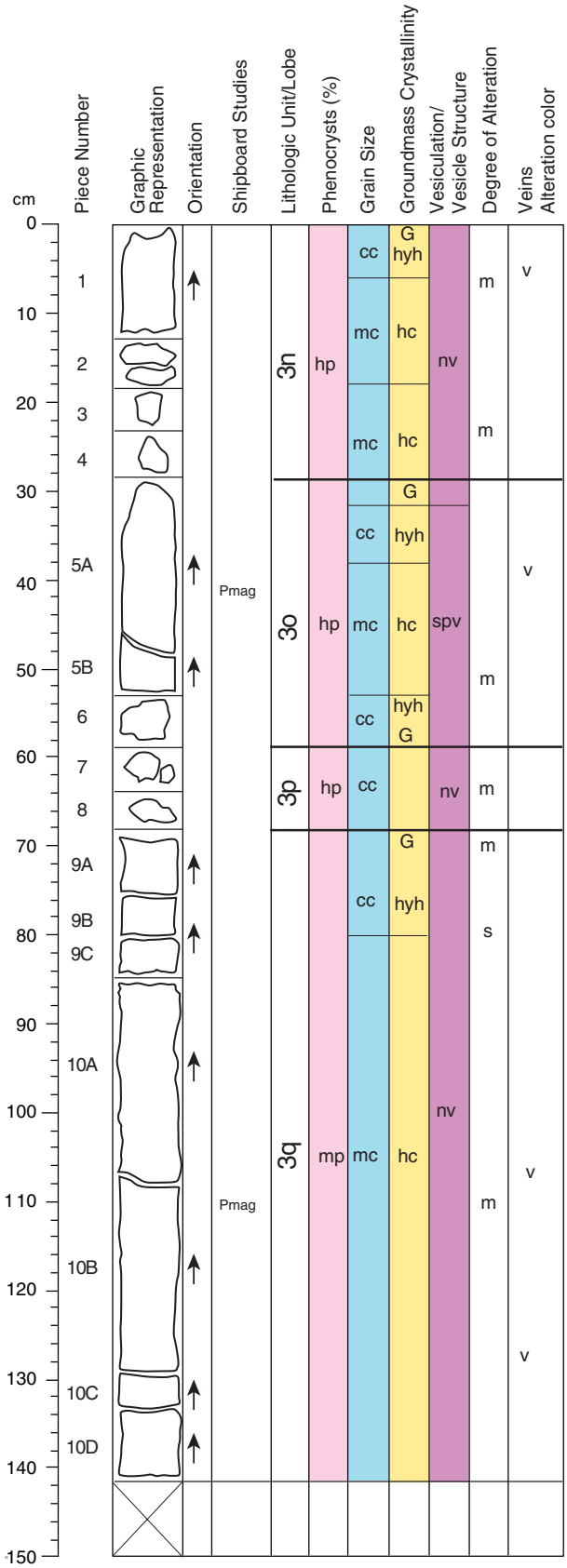
STRUCTURE: Lobed. Individual lobes are defined by presence of glassy lobe margins or by changes in crystallinity and vesicularity.

ALTERATION: Moderate. More intense alteration close to veins and adjacent to glassy lobe margins. Vesicles are filled with carbonate and green clay. Adjacent phenocrysts are completely replaced by Fe-oxyhydroxide and/or white carbonate.

VEINS/FRACTURES: Sparsely veined. Veins are between 0.1 mm and 3 mm wide, randomly oriented and filled with white carbonate and Fe-oxyhydroxide. They are most abundant in Piece 1.

COMMENTS: We interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-19R-4 (Section top: 477.76 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-10

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	5	4	1	2	Euhedral to subhedral
Olivine:	5	3	1	2	Subhedral

GROUNDMASS: Aphanitic (lobe margins) to fine grained (lobe interiors) with variolitic to intergranular textures. The fine-grained regions contain plagioclase, clinopyroxene, black oxides and glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Near margins:	2-5	3	0.5	1	Subrounded to irregular
Interior:	<1-3	1	0.5	0.7	Round

COLOR: Light brownish gray (5YR 6/1) within 2 cm of fractures and veins, but light gray (N7) >2 cm from fractures and veins.

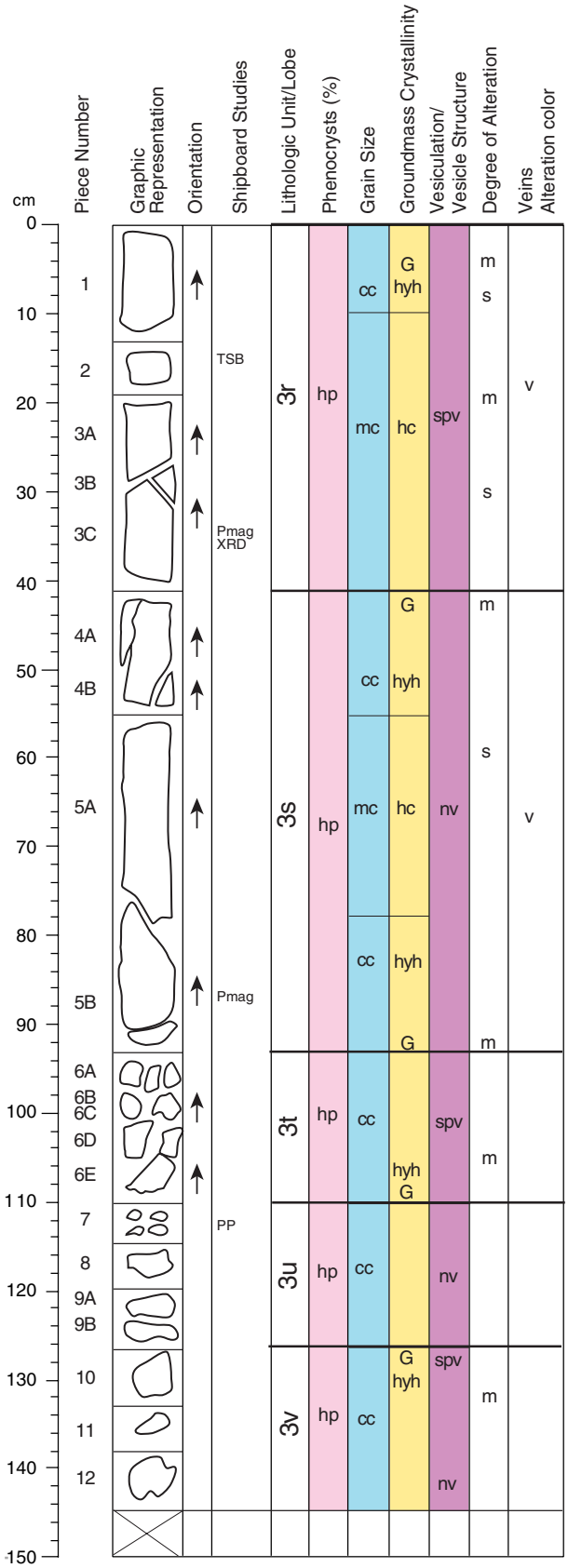
STRUCTURE: Lobed. Individual lobes are defined by presence of glassy lobe margins or by changes in crystallinity and vesicularity.

ALTERATION: Moderate to high. Highly altered <2 cm away from veins and fractures, and moderately altered >2 cm away from veins and fractures. Glass is unaltered to moderately altered. Olivines are completely replaced by reddish brown Fe-oxyhydroxide near fractures and greenish clay away from fractures. Plagioclase is moderately altered to green clay near fractures and slightly altered elsewhere. Groundmass is also moderately altered near fractures and slightly altered elsewhere.

VEINS/FRACTURES: Sparsely veined in lobe interiors, and almost no veins near glassy margins. Veins are 2-4 mm wide in lobe interiors and 1-2 mm wide near lobe margins, and filled mostly with white (carbonate?) minerals, but also some black, reddish brown, greenish yellow, and gray minerals.

COMMENTS: We interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-19R-5 (Section top: 479.18 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-12

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	5-10	5	<0.5	1	Euhedral to subhedral
Olivine:	3-7	4	<0.5	1	Euhedral; equant

GROUNDMASS: Aphanitic (lobe margins) to fine grained (lobe interiors) with variolitic to intergranular textures. The fine-grained regions contain plagioclase, clinopyroxene, black oxides and glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	<1-3			0.5	Irregular

COLOR: Light gray (N6) to moderately yellowish brown (10YR 5/4).

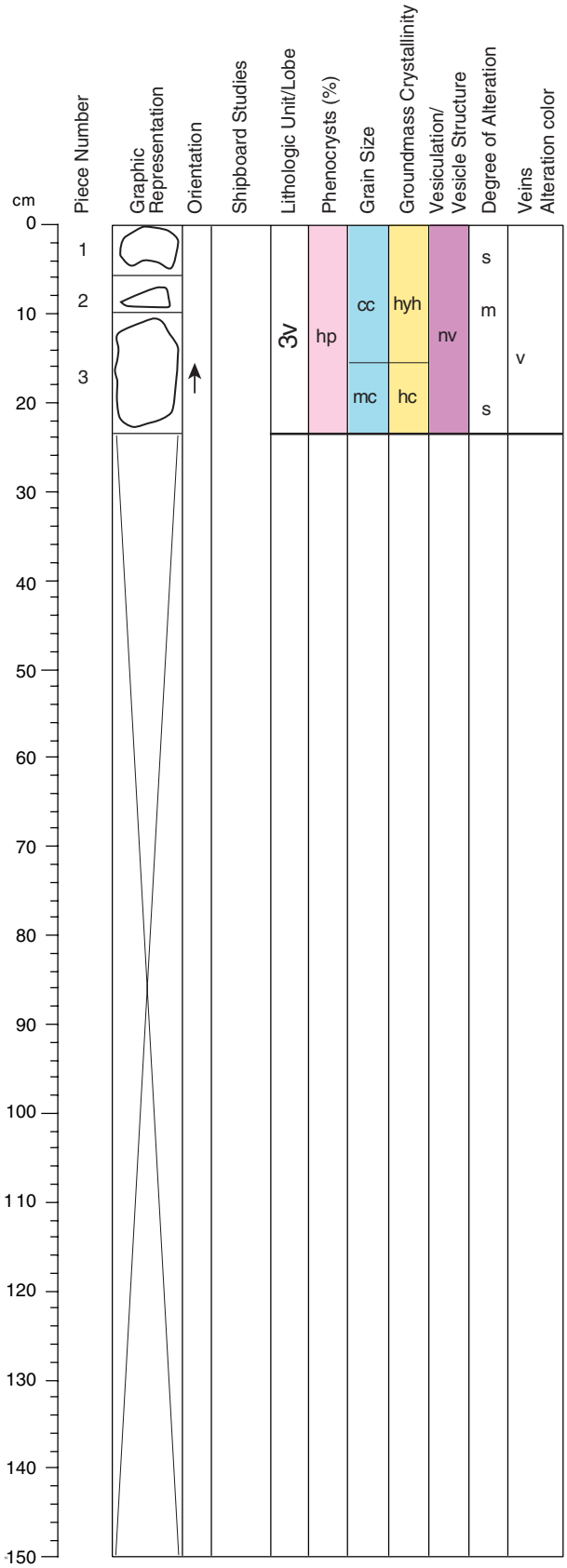
STRUCTURE: Lobed.Individual lobes are defined by presence of glassy lobe margins or by changes in crystallinity and vesicularity.

ALTERATION: Slight to moderate. Olivine is completely altered to Fe-oxyhydroxide and white carbonate. Rare irregularly shaped vesicles are filled with dark greenish black clay(?) minerals. Fe-oxyhydroxide alteration is pervasive and concentric around lobe margins. A large area in Piece 5A (2 cm x 3 cm) is filled with white carbonate, Fe-oxyhydroxide and dark green clay.

VEINS/FRACTURES: Sparsely veined. Veins are filled with white carbonate, Fe oxyhydroxide, and black minerals.

COMMENTS: We interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-19R-6 (Section top: 480.64 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-9

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10	3	0.5	1.2	Subhedral; tabular
Olivine:	4	2	0.8	1	Subhedral; equant

GROUNDMASS: Aphanitic (lobe margins) to fine grained (lobe interiors) with variolitic to intergranular textures. The fine-grained regions contain plagioclase, clinopyroxene, black oxides and glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	<1	0.5	0.1	0.2	Round

COLOR: Medium light gray (N6).

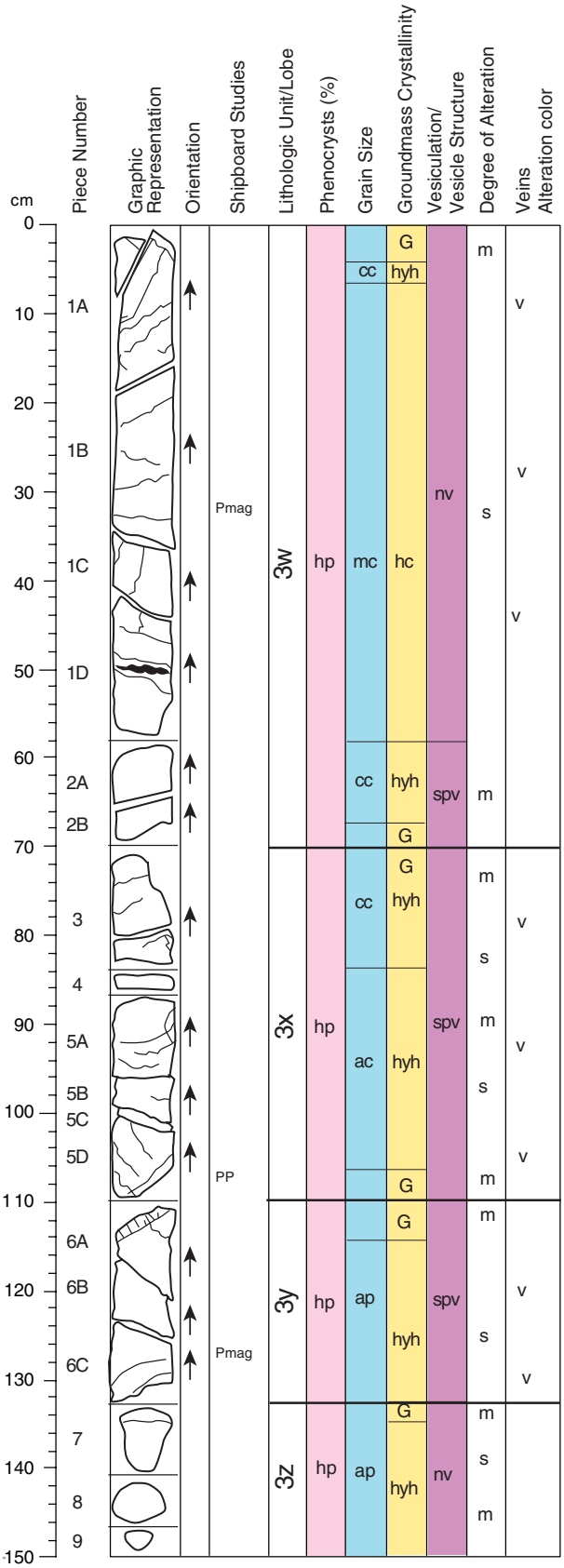
STRUCTURE: Lobed.

ALTERATION: Moderate. Olivine phenocrysts are completely replaced by Fe-oxyhydroxide and/or white carbonate. Vesicles are filled with green-brown clay.

VEINS/FRACTURES: Sparsely veined. Veins occur in Pieces 1 and 3 and are 1-3 mm wide. They are filled with white carbonate and are randomly oriented.

COMMENTS: We interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-20R-1 (Section top: 483.0 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-9

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-10	2.5	0.5	1.2	Euhedral to subhedral
Olivine:	3-5	2.5	0.5	0.8	Euhedral; equant

GROUNDMASS: Fine grained to aphanitic adjacent to glassy lobe margins. Fine-grained regions contain plagioclase, clinopyroxene, black oxides and glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	1-3	2	0.5	1.2	Round to irregular

COLOR: Medium light gray (N6). Pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/4) where altered.

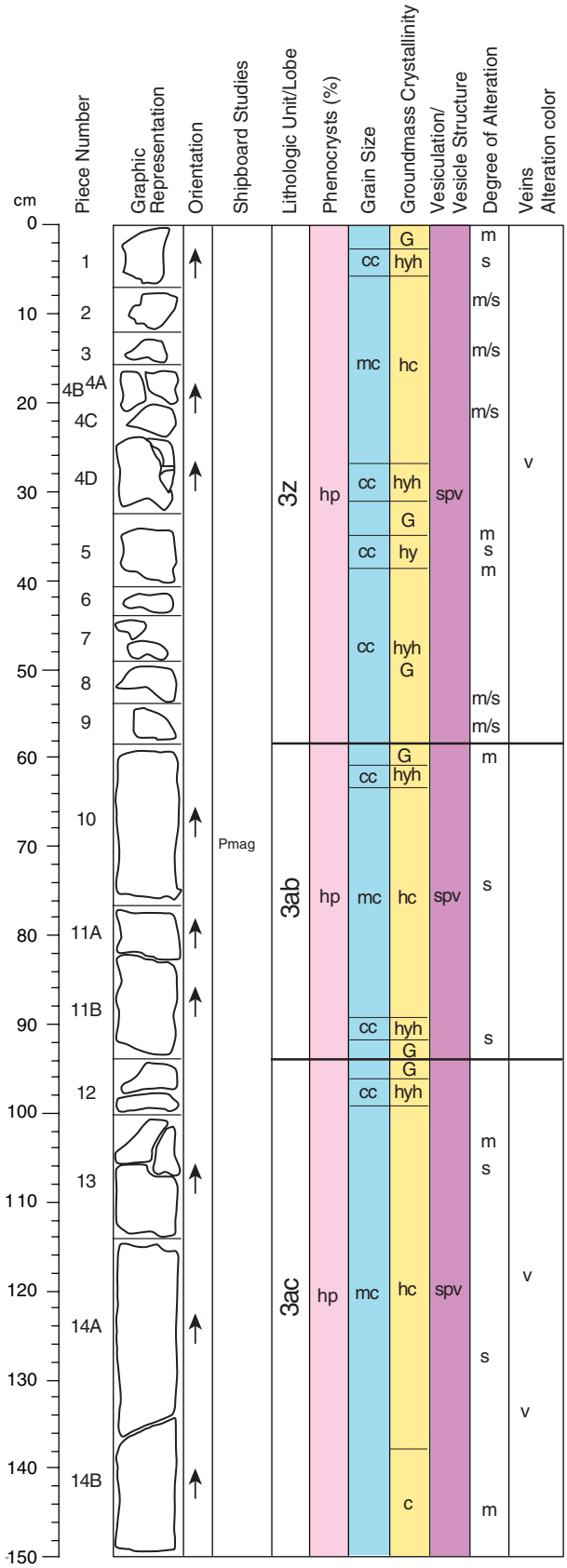
STRUCTURE: Lobed. Individual lobes are defined on the basis of grain size variations and the presence of glassy lobe margins.

ALTERATION: Slight to moderate. Fe-oxyhydroxide is pervasive through the core section and is most prominent at the lobe margins. Glassy lobe margins contain white carbonate and Fe oxyhydroxide alteration. Olivine is completely replaced by white carbonate and/or Fe oxyhydroxide and dark green clay. Rare vesicles are filled with white carbonate and dark greenish black clay.

VEINS/FRACTURES: Sparsely veined. Veins are <0.1-2 mm wide and randomly oriented, but are generally perpendicular to the lobe margins. The veins are filled with carbonate, Fe-oxyhydroxide, and black minerals.

COMMENTS: We interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-20R-2 (Section top: 484.5 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-14

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10-15	3	<0.5	1	Euhedral to subhedral
Olivine:	3-5	1	0.2	1	Euhedral

GROUNDMASS: Aphanitic (lobe margins) to fine grained (lobe interiors) with intermediate variolitic to intergranular textures. The fine-grained regions contain plagioclase, clinopyroxene, black oxides and glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	3-5			1	Round to irregular

COLOR: Medium light gray (N6) to moderate yellowish brown (10YR 5/4) where altered.

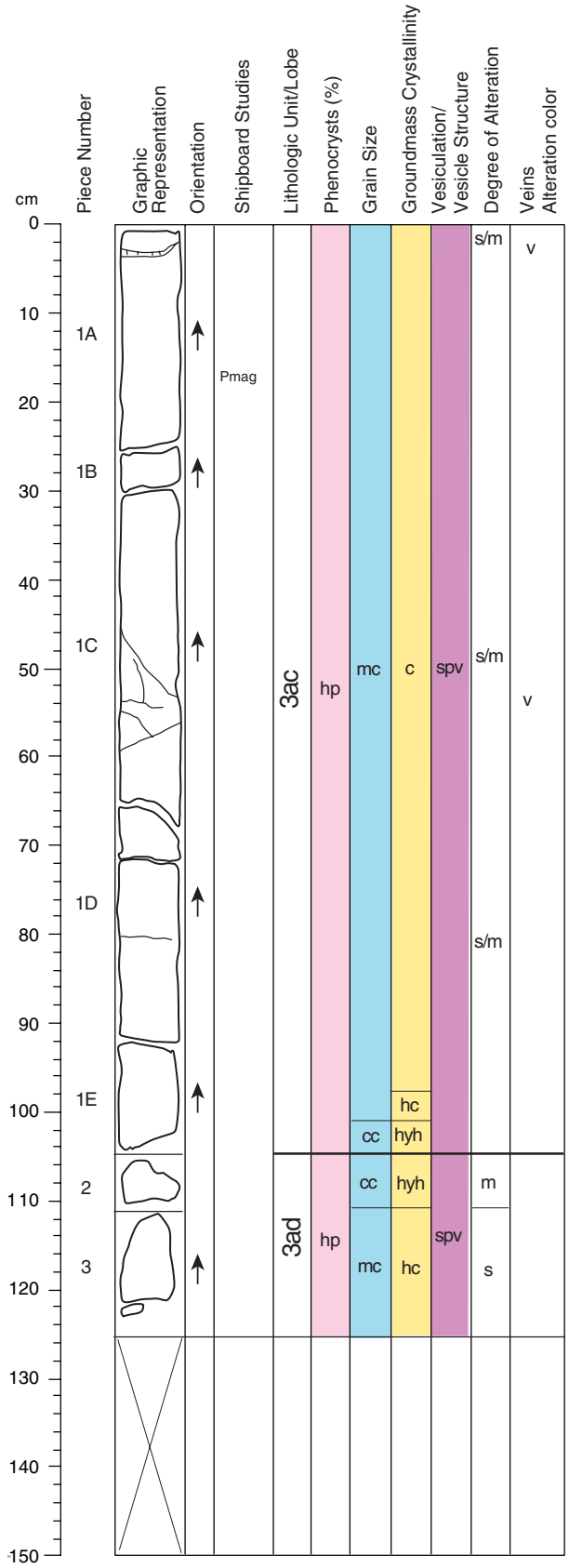
STRUCTURE: Lobed. Individual lobes are defined by presence of glassy lobe margins or by changes in crystallinity and vesicularity.

ALTERATION: Slight to moderate. Fe-oxyhydroxide is pervasive throughout the core section. Alteration is moderate adjacent to lobe margins and around veins, and slight in the more massive lobe interiors. Olivine is completely replaced by Fe-oxyhydroxide, white carbonate, and dark greenish black clay(?).

VEINS/FRACTURES: Sparsely veined. Veins are ~2 mm wide and filled with white carbonate ± black minerals. One vein in Piece 4D is concentrically filled with dark green clay minerals and white carbonate.

COMMENTS: We interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-20R-3 (Section top: 486.0 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-3

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10-15	3	0.5	1	Subhedral; prismatic
Olivine:	3-5	3	1	1.5	Subhedral to euhedral; equant

GROUNDMASS: Aphanitic lobe margins) to fine grained (lobe interiors) with variolitic to intergranular textures. The fine-grained regions contain plagioclase, clinopyroxene, black oxides and glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Sparsely vesicular	1-5	2	0.5	1	Round

COLOR: Medium light gray (N6) from 2 cm to 71 cm. Light brownish gray (10YR 6/1) to moderate brownish gray (10YR 5/4) from 0 cm to 2 cm and 71-126 cm.

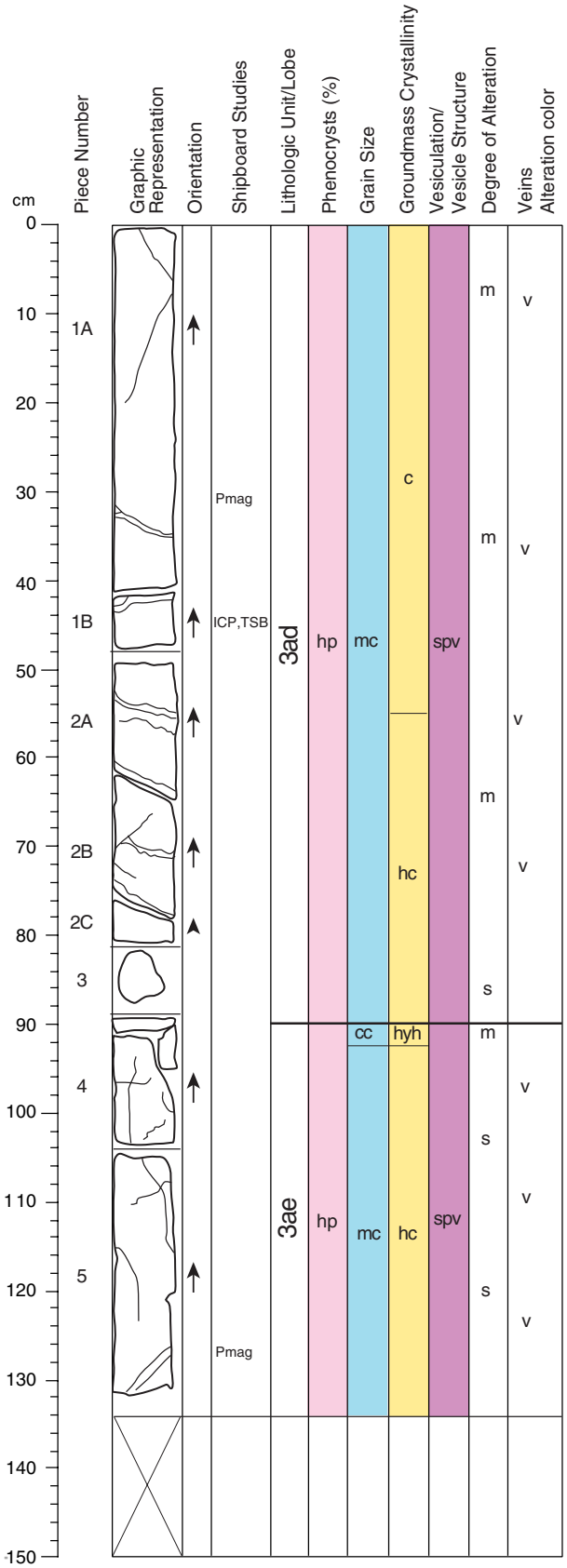
STRUCTURE: Lobed. A lobe inferred is present at 105 cm.

ALTERATION: Moderate to high. From 0-71 cm alteration is moderate; 71-126 cm alteration is moderate to high. Color changes in this core section reflects changes in alteration minerals. Fe-oxyhydroxide is pervasive in the light to moderate brownish yellow sections, whereas dark green-blue clay is present in the medium light gray areas. Olivine phenocrysts are completely replaced by carbonate and Fe-oxyhydroxide.

VEINS/FRACTURES: Sparsely veined. The interval 4-45 cm is free of veins. The veins are 0.5-5 mm wide, randomly oriented, and contain white carbonate.

COMMENTS: We interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-20R-4 (Section top: 487.26 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-5

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10-12	4	0.5	1.5	Subhedral to euhedra
Olivine:	3-5	3	0.5	0.8	Subhedral

GROUNDMASS: Aphanitic (lobe margins) to fine grained (lobe interiors) with intermediate variolitic textures. The fine-grained regions contain plagioclase, clinopyroxene, black oxides and glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	2-3	1	0.5	1	Round

COLOR: Dark yellowish brown (10YR 4/4) except in zone between 20-55 cm where it is medium gray (N5) with a bluish green tint.

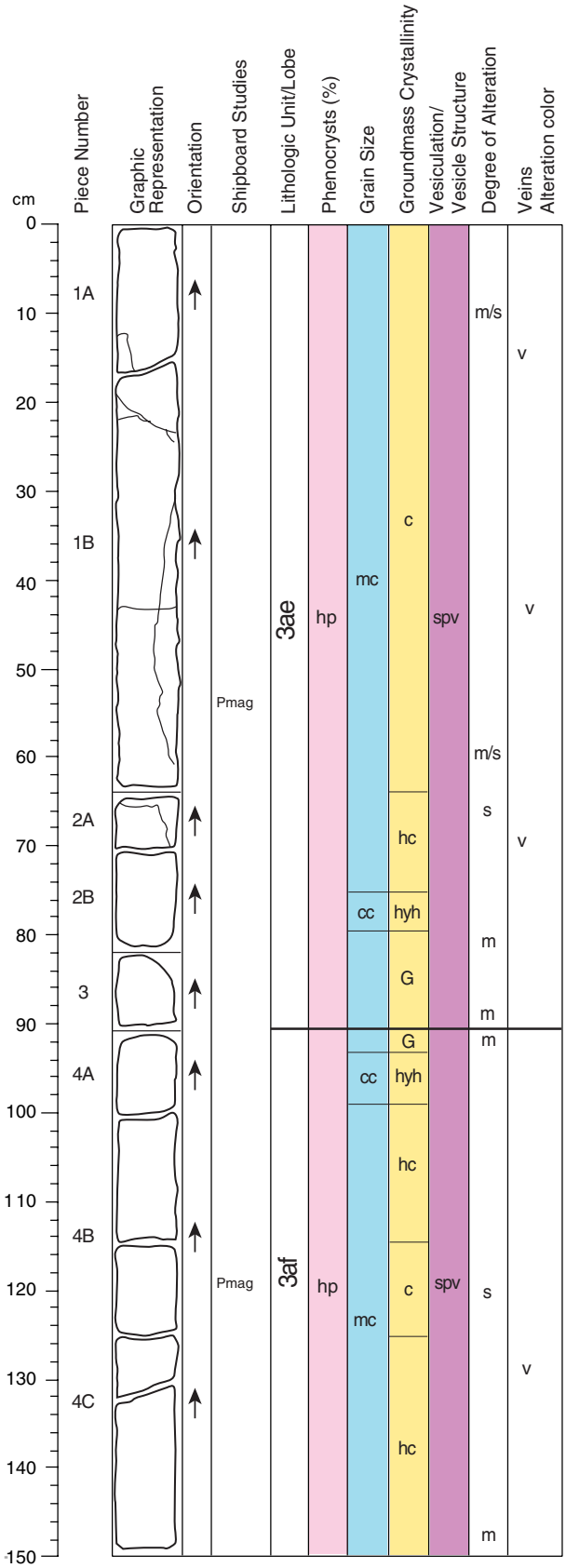
STRUCTURE: Lobed. Individual lobes are defined on the basis of a glassy lobe margin and grain size variations.

ALTERATION: Moderate. Olivine is completely replaced by Fe-oxyhydroxide and yellowish green clay, except between 20-55 cm olivine is replaced by bluish-green, gray, and white minerals. Plagioclase and groundmass are moderately to slightly altered. Vesicles are filled with white carbonate and darl greenish black clay.

VEINS/FRACTURES: Sparsely veined. Veins are 2-3 mm wide, randomly oriented, and filled with white, gray, and Fe-oxyhydroxide minerals, except between 20-55 cm the veins are filled with white, gray, bluish green, and sulfide minerals.

COMMENTS: A glassy lobe margin is present on the top of Piece 4, but note that most of the glass is in the working half. We interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-20R-5 (Section top: 488.59 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-4

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10-15	3	0.5	1	Subhedral; prismatic
Olivine:	3	4	0.8	1.2	Subhedral; equant

GROUNDMASS: Aphanitic (lobe margins) to fine grained (lobe interiors) with intermediate variolitic textures. The fine-grained regions contain plagioclase, clinopyroxene, black oxides and glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Sparsely vesicular	2	3	0.5	1	Round to irregular

COLOR: Medium light gray (N6) to moderate yellowish brown (10YR 5/4) in more altered regions.

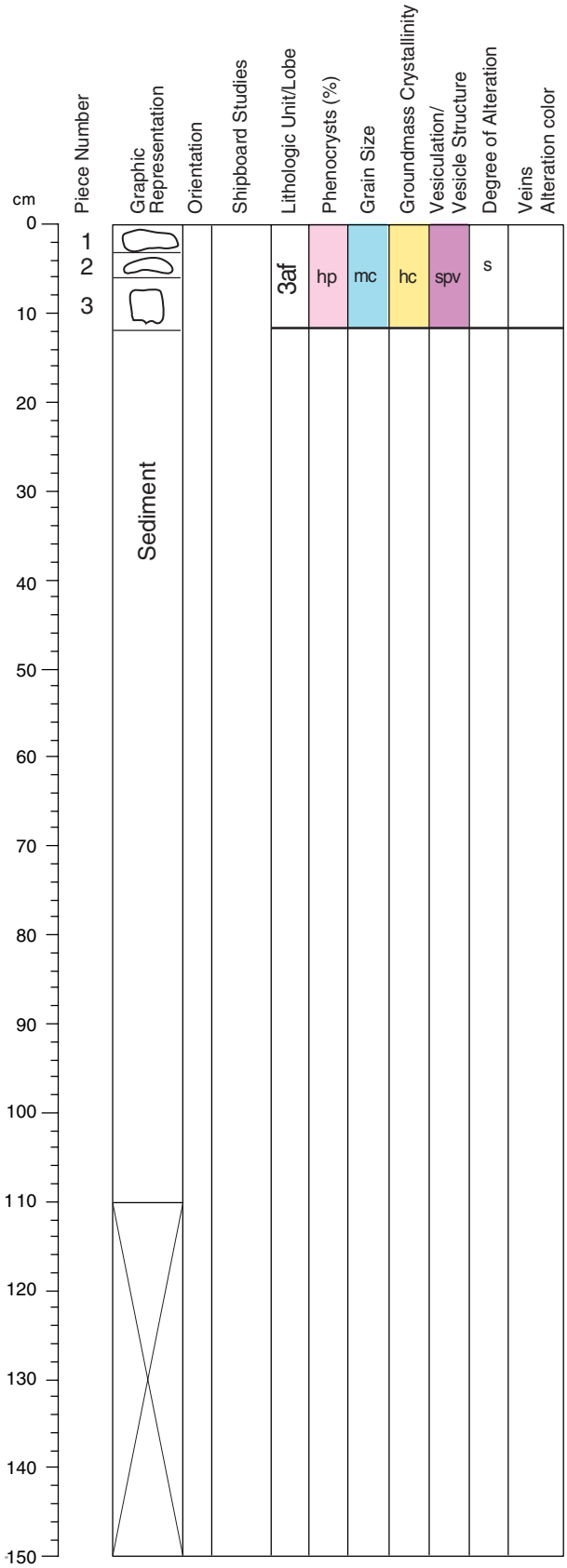
STRUCTURE: Lobed. Individual lobes are defined on the basis of a glassy lobe margin and grain size variations.

ALTERATION: Moderate. Most intense alteration is within 2 cm of the glassy lobe margins. Olivine phenocrysts are completely replaced by Fe-oxyhydroxides and/or white carbonate.

VEINS/FRACTURES: Sparsely veined. Veins occur throughout the section, but are most abundant in Piece 1. Veins are <0.5-4 mm wide and are filled with white carbonate.

COMMENTS: We interpret the unit as a pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-20R-6 (Section top: 490.09 mbsf)

UNIT 3: PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-3

CONTACTS: None observed. Contact between Units 3 and 4a is inferred to be between Pieces 3 and 4 at 12 cm.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10	2	0.5	1	Subhedral to euhedral
Olivine:	3	1	0.5	1	Subhedral

GROUNDMASS: Aphanitic.

VESICLES: Nonvesicular.

COLOR: Dark yellowish-brown (10YR 4/4).

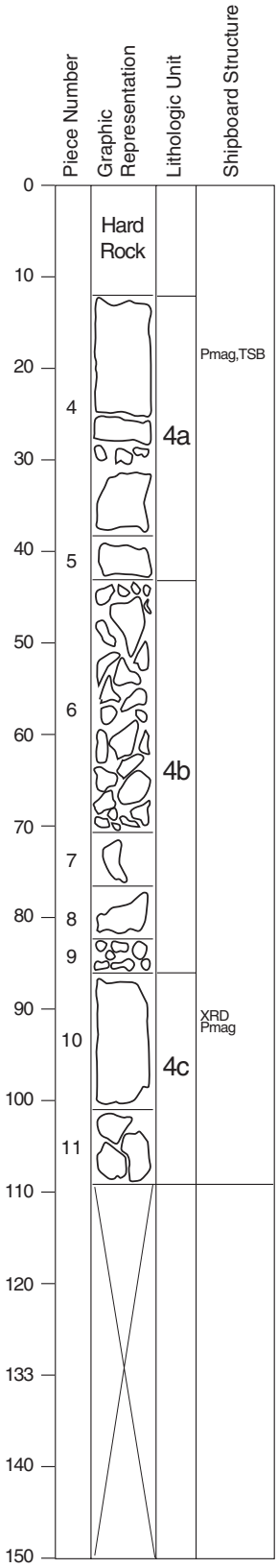
STRUCTURE: No structure evident, but these pieces are assumed to be part of the lobe present at the bottom of Section 30R-5.

ALTERATION: Moderate. Fe-oxyhydroxide is the dominant alteration mineral. Olivine is completely replaced by Fe-oxyhydroxide and yellowish green clay. Plagioclase and groundmass are moderately to slightly altered.

VEINS/FRACTURES: None.

COMMENTS: We interpret the unit as a pillow lava.

Core Photo



VISUAL CORE DESCRIPTION
SEDIMENTS/SEDIMENTARY ROCKS

197-1203A-20R-6 (Section top: 490.09 mbsf)

UNIT 4a: NANNOFOSSIL-SILTY-CHALK.

Pieces: 4-5

CONTACTS: None observed. Contact between Units 3 and 4a is inferred to be between Pieces 3 and 4 at 12 cm. Contact between Units 4a and 4b is inferred to be between Pieces 5 and 6 at 43 cm.

GENERAL DESCRIPTION: Thinly laminated, with cross-bedded laminations and internal erosional contacts at 30 cm.

COLOR: Yellowish brown (10YR 5/4) to yellowish pale brown (10YR 7/3).

COMPONENTS:
75%: Carbonate
10%: Clay
10%: Glass shards (Altered to palagonite and greenish clay)
5%: Dolomite

SEDIMENTARY TEXTURES: Grain size: silt.

SEDIMENTARY STRUCTURES: Bioturbated between 15 cm and 25 cm. An erosional contact is present at ~31 cm with black nodules deposited along it.

UNIT 4b: RESEDIMENTED BASALT-TUFF.

Pieces: 6-9

CONTACTS: None observed. Contact between Units 4a and 4b is inferred to be between Pieces 5 and 6 at 43 cm.

GENERAL DESCRIPTION: Yellow sandstone with nodules (~0.5 mm) of hematite. At ~48 cm a 1 cm thick zone of veins (1-3 mm wide) is present, filled with carbonate.

COLOR: Brownish yellow (10YR 6/6) in upper part to reddish yellow (7.5YR 6/8) in lower part.

COMPONENTS:
85%: Poorly to moderately vesicular glass fragments and shards.
10%: Lithic fragments.
5%: Crystal fragments.
Cement: cemented by calcite.

SEDIMENTARY TEXTURES: Non-graded.

SEDIMENTARY STRUCTURES: Finely-laminated.

COMMENTS: Unit consists predominantly of altered (palagonitized) basalt glass fragments, indicating origin by resedimentation of basalt tephra.

UNIT 4c: BASALT-TUFF(?).

Pieces: 10-11

CONTACTS: None observed. Contact between Units 4b and 4c is inferred to be between Pieces 9 and 10 at 85 cm.

GENERAL DESCRIPTION: Massive, moderately sorted tuff consisting of coarse ash to fine lapilli.

COLOR: Strong brown (7.5YR 4/6) in upper part, to red (2.5YR 5/8) in lower part.

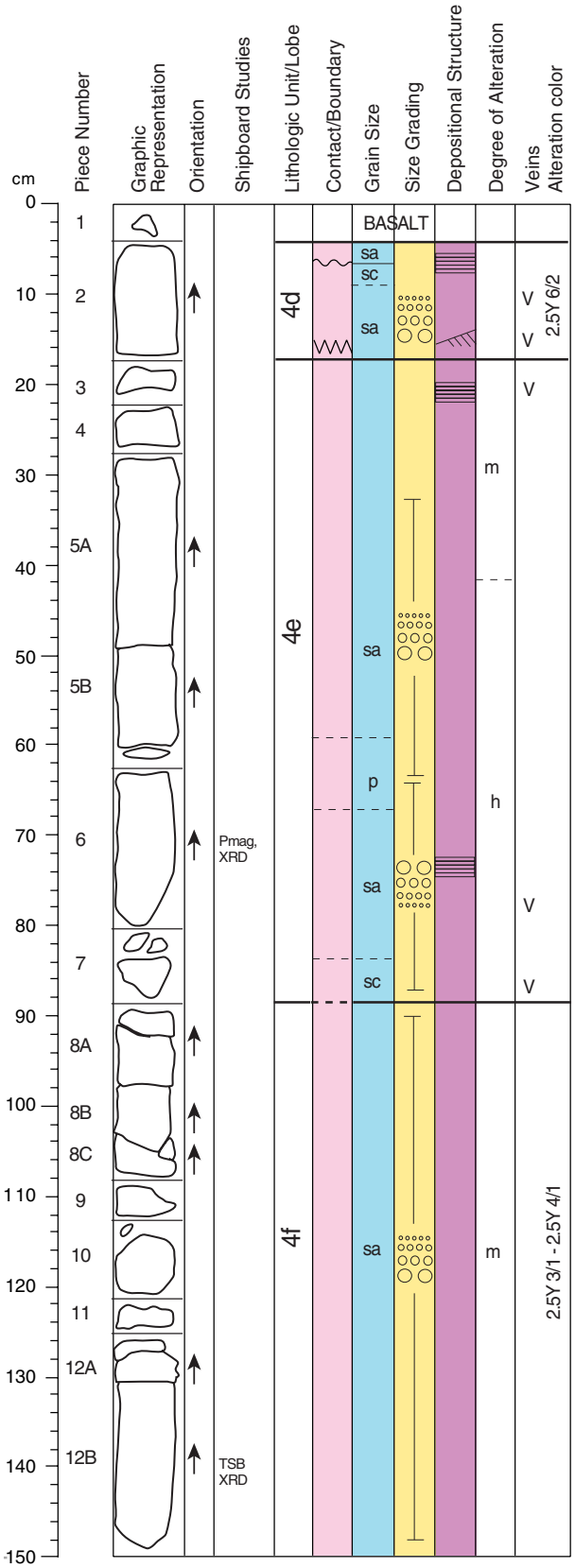
COMPONENTS: Palagonitized moderately to highly vesicular basaltic ash particles, in a carbonate cement.

SEDIMENTARY TEXTURES: Unit is moderately sorted, with grain size varying from coarse ash to fine lapilli.

SEDIMENTARY STRUCTURES: None.

COMMENTS: Unit is a strongly altered basaltic tuff that may represent a primary fall deposit that accumulated in water.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-21R-1 (Section top: 492.6 mbsf)

UNIT 4d: RESEDIMENTED BASALT-TUFF.

Pieces: 1-2

CONTACTS: Upper contact not recovered. Lower contact at 19 cm is gradational.

GENERAL DESCRIPTION: Subunit 4d (6-19 cm) is a cross-bedded to massive, moderately sorted basalt tuff composed of relict basalt shards and vesicular ash-size particles cemented by carbonate. It also contains a 1 cm thick layer of calcareous mud at 7-8 cm. The subunit is normally graded from coarse to fine ash.

COLOR: Pale brown (2.5Y 6/2).

COMPONENTS:
>90%: Variably vesicular (0-60%) basaltic shards and ash-size particles.
<10%: Feldspar crystals and other undetermined components.
Cement: carbonate (calcite).

SEDIMENTARY TEXTURES: Fine to medium ash (<0.5 mm) at top (8-11 cm) grading downward into coarse ash (0.5-1.0 mm) at bottom (15-19 cm).

SEDIMENTARY STRUCTURES: 1 cm thick calcareous mudstone(?) layer at 7-8 cm. Interval 7-10.5 cm contains ghosts of dispersed (1%-5%) vesicular basalt tephra clasts (1-4 mm). Distinct cross bedding is present in interval 15-19 cm.

COMMENTS: We interpret the cross bedding and intercalated calcareous mudstone layer to indicate origin as resedimented volcaniclastic. Presence of dispersed, 1-4 mm vesicular basalt particles near the top (7-10 cm) along with cross bedding, indicate origin by density current.

UNIT 4e: RESEDIMENTED-SYNVOLCANIC BASALT-TUFF.

Pieces: 3-7

CONTACTS: Upper contact at 19 cm is gradational. Lower contact not recovered.

GENERAL DESCRIPTION: Interval 19-88 cm consists of massive, moderately to poorly sorted basalt tuff. The deposit consists almost entirely of vesicular basalt glass particles. Particle vesicularity ranges from 10% to >70%, typically microvesicular in size and spherical in shape. The ghost particles are exceptionally well preserved and show classic basalt ash particle morphology. The unit exhibits symmetric grading, reverse to normal, and is capped by a laminated interval of fine ash.

COLOR: Greenish grey (5BG 5/1).

COMPONENTS:
>90%: Relict shards, ash and lapilli particles; highly vesicular (20% to >70%).
<10%: Feldspar crystals.

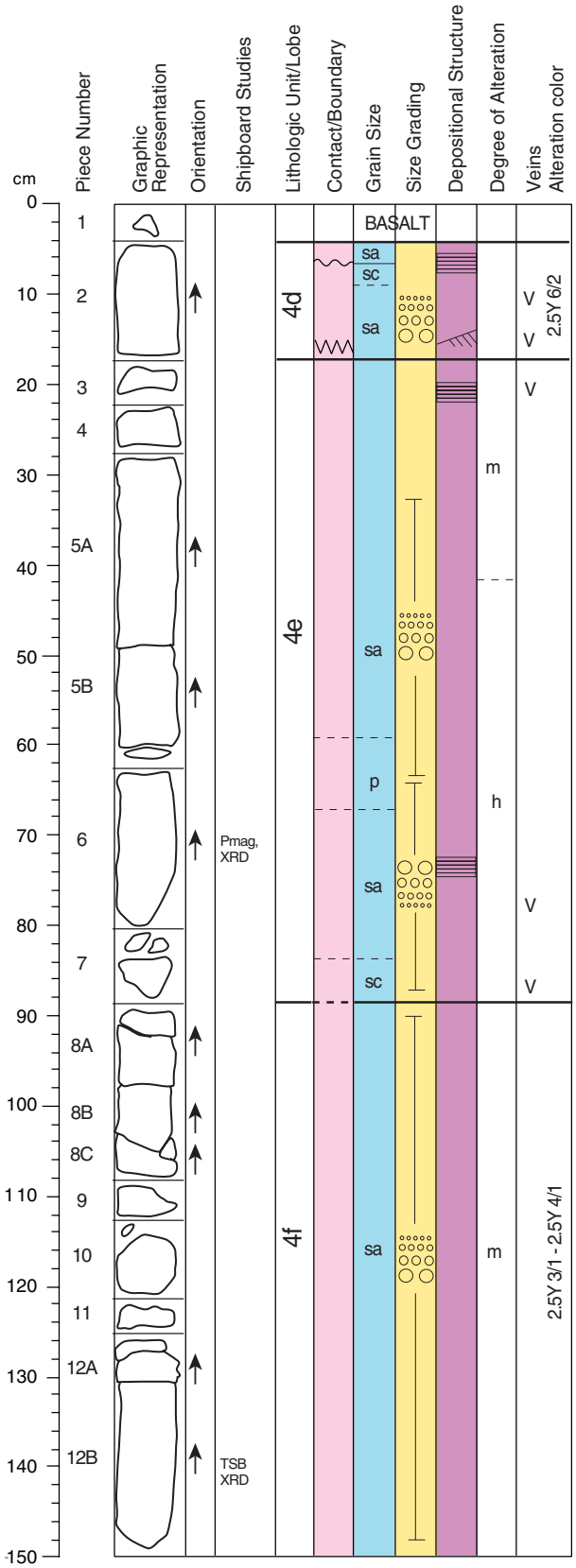
SEDIMENTARY TEXTURES: Symmetric size grading, reverse to normal, with coarse fraction (1-5 mm vesicular basalt lapilli) concentrated in interval 45-67 cm.

SEDIMENTARY STRUCTURES: Distinct lamination at top across interval 19-29 cm; laminae <1 mm to 2 mm thick. No depositional structures discernible from 29-77 cm. The very fine grained ash interval from 77-88 cm exhibits indistinct, fine (sub-mm) lamination.

COMMENTS: On the basis of structure and dominance of well preserved vitric basalt particles we interpret Subunit 4e to be a synvolcanic density current.

(Continued on next page.)

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION 197-1203A-21R-1 (cont'd)

UNIT 4f: BASALT-TUFF.

Pieces: 8-12

CONTACTS: None observed. Contact between Units 4e and 4f is inferred to be between Pieces 7 and 8 at 89 cm.

GENERAL DESCRIPTION: Interval 88-150 cm consists of moderately sorted basalt-tuff. It consists of at least four 60-110 cm thick subunits, each exhibiting normal size grading from very coarse/coarse ash to fine/very fine ash. The tuff consists of vesicular (10% to >70% vesicles) basalt glass particles that often feature smooth lobate (fluidal) outlines. Shards tend to be nonvesicular, but larg ash size clasts typically contain 40%-70% spherical vesicles. The interval from 135-141 cm contains dispersed 5-12 mm clasts, including reticulite-like clasts (vesicularity >95%). Clasts show no evidence of abrasion.

COLOR: Dark gray to very dark gray (2.5Y 4/0 to 2.5Y 3/0).

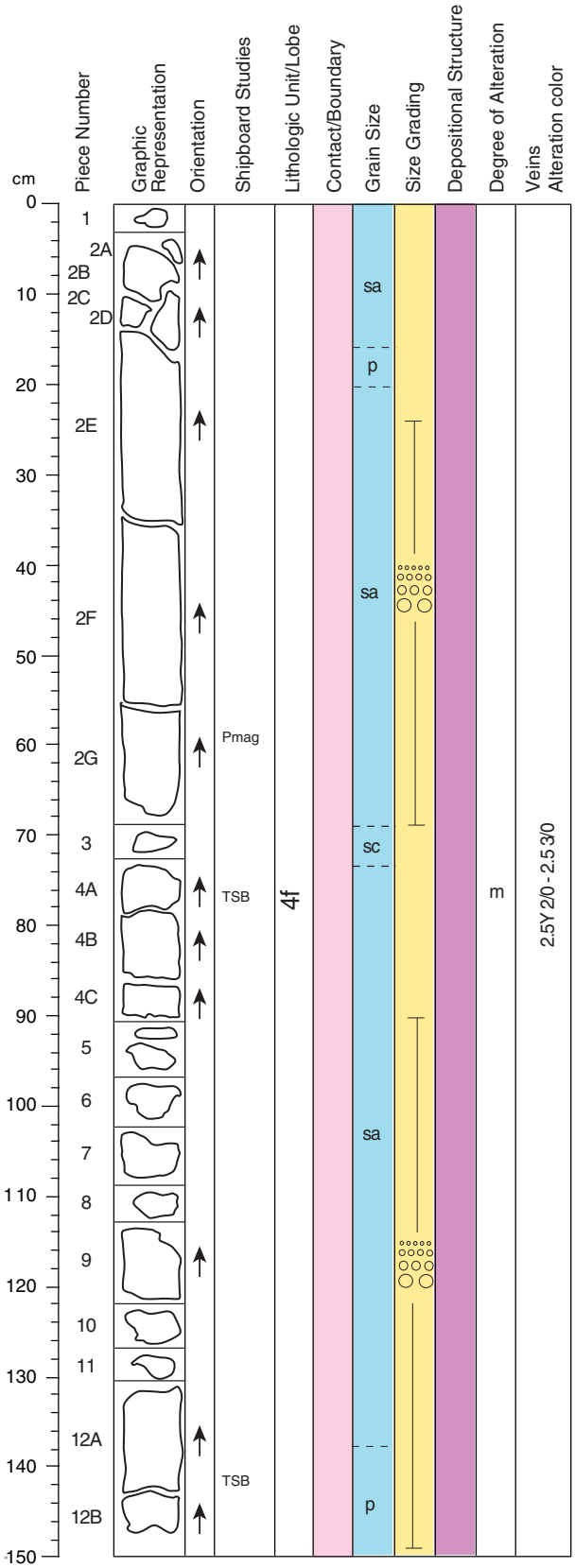
COMPONENTS:
>90%: Altered basalt glass shards, ash and lapilli particles.
<10%: Feldspar crystals and other unidentified components.
Cement: silica.

SEDIMENTARY TEXTURES: Grain size is very coarse to coarse ash (0.5-2 mn to fine/very fine (<0.25 mm) ash. It displays moderate sorting and normal gradin

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: Preservation of delicate glass particles (especially reticulite-like particles), along with normal size grading of intervals within the unit is suggestiv of origin as airborne ash fall deposit, which was probably deposited in water. Subunit continues in Section 21R-2, 0-150 cm and Section 21R-3, 0-107 cm.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-21R-2 (Section top: 494.1 mbsf)

UNIT 4f: BASALT-TUFF.

Pieces: 1-12

CONTACTS: None.

GENERAL DESCRIPTION: Moderately sorted basalt tuff, featuring two normally graded intervals, separated by a sharp contact. At 69 cm there is a sharp boundary caused by loading(?). The tuff consists of vesicular (10% to >70%) basalt glass particles. Shards tend to be nonvesicular, but larger ash size clasts typically contain 40%-70% spherical vesicles.

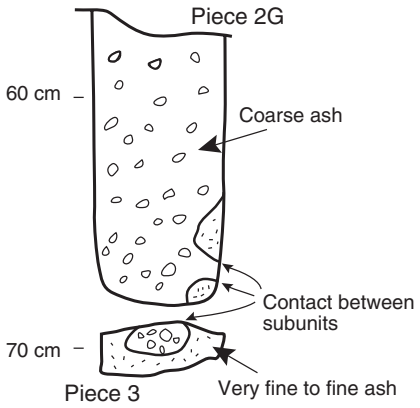
COLOR: Dark gray to very dark gray (2.5Y 4/0 to 2.5Y 3/0).

COMPONENTS:
>90%: Altered basalt glass shards, ash and lapilli particles.
<10%: Feldspar crystals and other unidentified components.
Cement: silica.

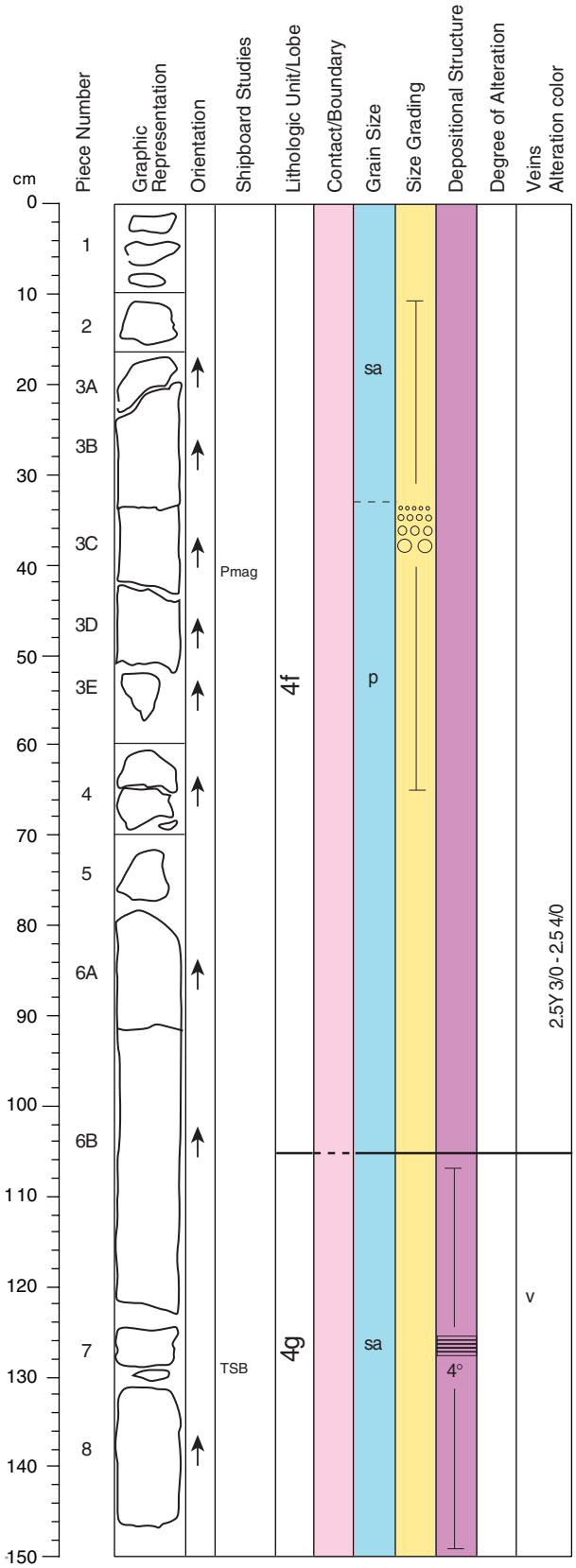
SEDIMENTARY TEXTURES: Grain size is very coarse to coarse ash (0.5-2 mm) to fine/very fine (<0.25 mm) ash. It displays moderate sorting and normal grading.

SEDIMENTARY STRUCTURES: Boundary at 69 cm is convoluted and it can be traced in pieces 2G and 3 as shown on sketch below. This boundary suggests deformation from loading.

COMMENTS: Preservation of delicate glass particles (especially reticulite-like particles as found in Section 21R-1), along with normal size grading of intervals within the unit is suggestive of an origin as an airborne ash fall deposit which was probably deposited in water. This subunit continues into Section 21R-3. It consists of at least four 60-110 cm thick subunits, each exhibiting normal size grading from very coarse/coarse ash to fine/very fine ash.



Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-21R-3 (Section top: 495.6 mbsf)

UNIT 4f: BASALT-TUFF.

Pieces: 1-6

CONTACTS: Lower contact at 107 cm is gradational.

GENERAL DESCRIPTION: The tuff consists of vesicular (10% to >70% vesicles) basalt glass particles. Shards tend to be nonvesicular, but larger ash size clasts typically contain 40% 70% spherical vesicles.

COLOR: Dark gray to very dark gray (2.5Y 4/0 to 2.5Y 3/0).

COMPONENTS:
>90%: Altered basalt glass shards, ash and lapilli particles.
<10%: Feldspar crystals and other unidentified components.
Cement: silica.

SEDIMENTARY TEXTURES: Grain size is very coarse to coarse ash (0.5-2 mm) to fine/very fine (<0.25 mm) ash. It displays moderate sorting and normal grading.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: Preservation of delicate glass particles, (especially reticulite-like particles in section 21R-1), along with normal size grading of intervals within the unit is suggestive of origin as airborne ash fall deposit, which was probably deposited in water.
This subunit continues from 0-107 cm. The entire subunit consists of at least four 60-110 cm thick subunits, each exhibiting normal size grading from very coarse/coarse ash to fine/very fine ash.

UNIT 4g: LAMINATED BASALT-TUFF.

Pieces: 6-8

CONTACTS: Upper contact at 107 cm is gradational.

GENERAL DESCRIPTION: This unit, present from 107-146 cm, is a thinly bedded to laminated basaltic tuff. It consists of well to moderately sorted, highly vesicular ash particles and glass shards cemented by silica.

COLOR: Dark gray to very dark gray (2.5Y 4/0 to 2.5Y 3/0).

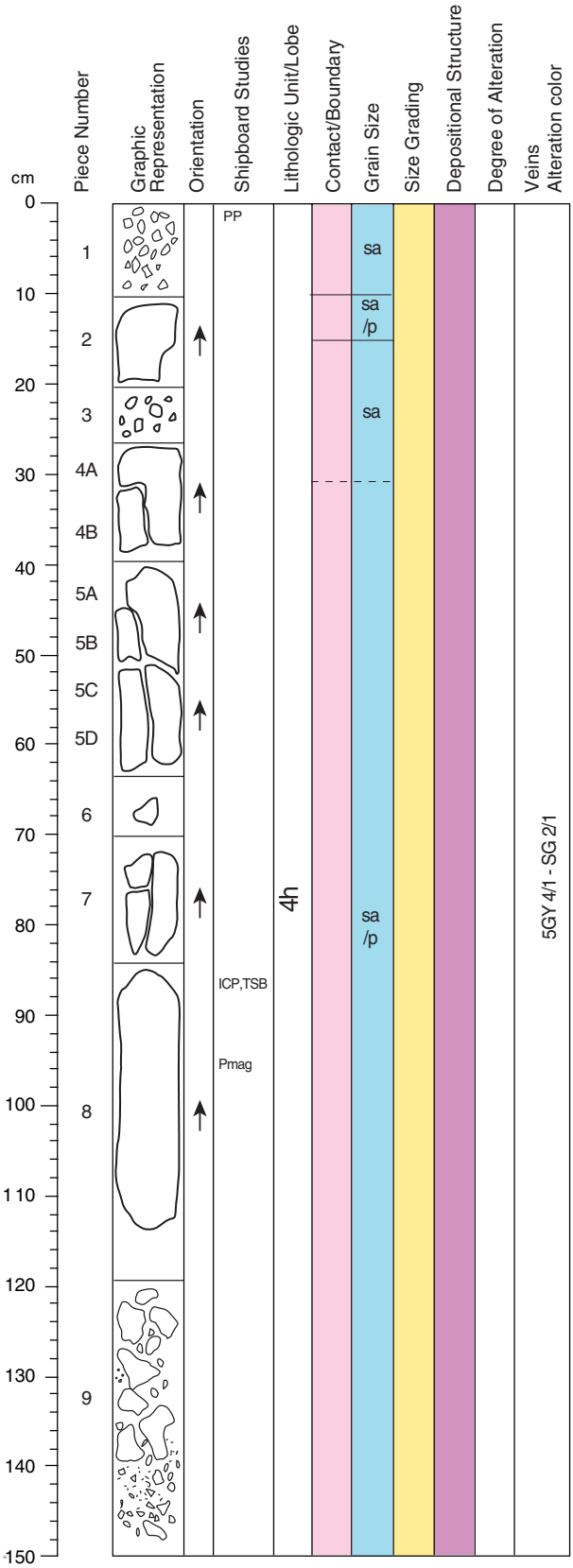
COMPONENTS:
>90%: Altered basalt glass shards, ash and lapilli particles.
<10%: Feldspar crystals and other unidentified components.
Cement: silica.

SEDIMENTARY TEXTURES: Well sorted fine ash with a few dispersed 0.5-1 mm particles.

SEDIMENTARY STRUCTURES: Finely laminated throughout; bed thickness ranges from <1 to 4 mm.

COMMENTS: We interpret the unit as representing a succession of small subaerial air-fall deposits, possibly deposited in water(?)

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-21R-4 (Section top: 498.6 mbsf)

UNIT 4h: BASALT-TUFF.

Pieces: 1-9

CONTACTS: None observed. The upper boundary of Unit 4h is taken to be at the top of the core section.

GENERAL DESCRIPTION: This section consists of a massive, moderately sorted basaltic tuff. The deposit is comprised of highly vesicular ash particles and glass shards cemented by silica.

COLOR: Dark gray to very dark gray (2.5Y 4/0 to 2.5Y 3/0).

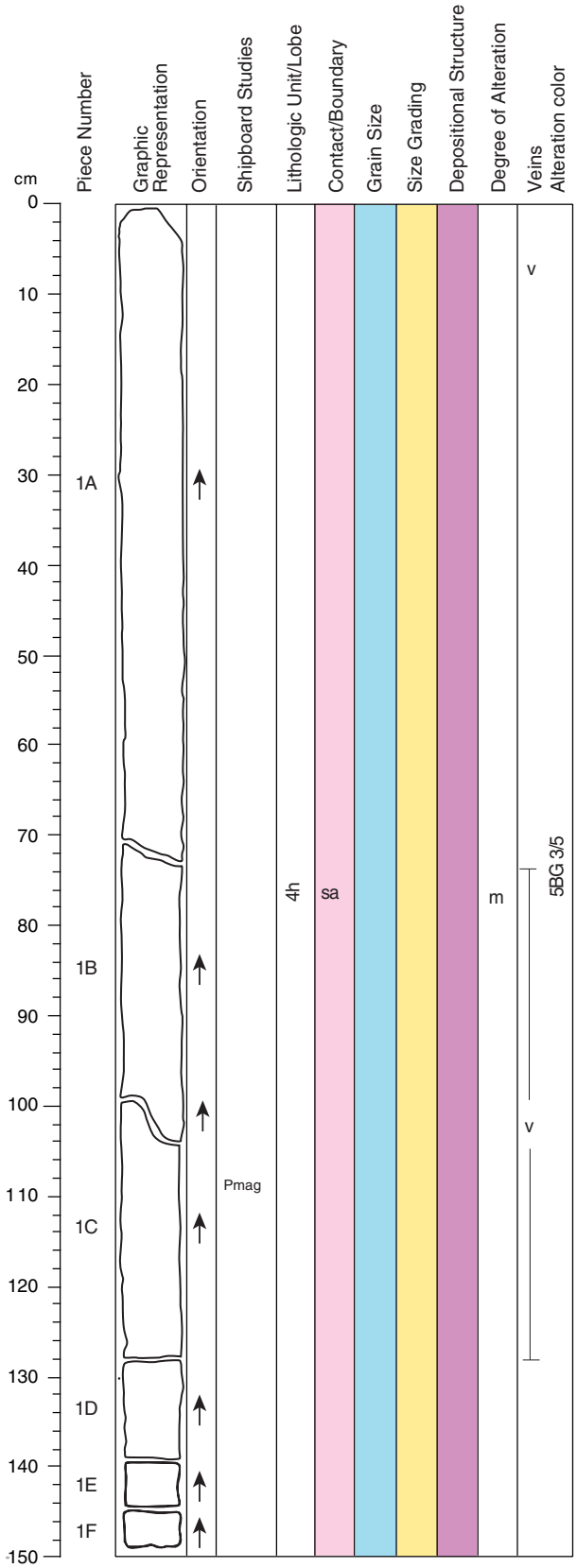
COMPONENTS:
>90%: Altered basalt glass shards, ash and lapilli particles.
<10%: Feldspar crystals and other unidentified components.
Cement: silica.

SEDIMENTARY TEXTURES: Well to moderately sorted medium to coarse ash with a few dispersed 1-2 mm particles.

SEDIMENTARY STRUCTURES: Finely laminated throughout; bed thickness ranges from <1 to 4 mm.

COMMENTS: Preservation of delicate particle features and size sorting indicate that this subunit formed as a subaerial air fall deposit, possibly deposited in water.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-22R-1 (Section top: 502.2 mbsf)

UNIT 4h: BASALT TUFF.

Pieces: 1

CONTACTS: None.

GENERAL DESCRIPTION: This section consists of a massive, moderately sorted basaltic tuff. The deposit is comprised of highly vesicular ash particles and glass shards.

COLOR: Dark gray to very dark gray (2.5Y 4/0 to 2.5Y 3/0).

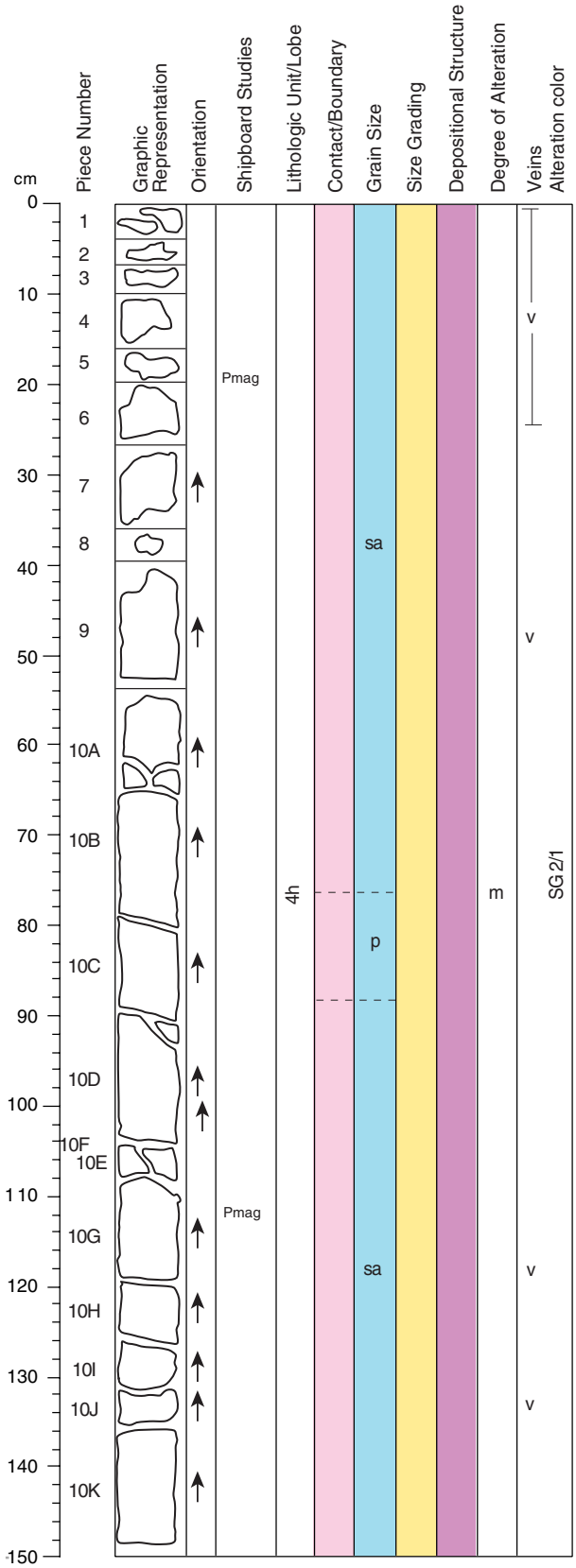
COMPONENTS:
>90%: Altered basalt glass shards, ash and lapilli particles.
<10%: Feldspar crystals and other unidentified components.
Cement: zeolites.

SEDIMENTARY TEXTURES: Well to moderately sorted medium ash with a few dispersed 2–10 mm particles. Displays intervals with normal size grading.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: We interpret this unit to be a tephra fall deposit.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-22R-2 (Section top: 503.7 mbsf)

UNIT 4h: BASALT TUFF.

Pieces: 1–10

CONTACTS: None.

GENERAL DESCRIPTION: This section consists of two normally graded of intervals of well to moderately sorted vitric basaltic tuff. The deposit is comprised of highly vesicular ash particles and glass shards.

COLOR: Dark gray to very dark gray (2.5Y 4/0 to 2.5Y 3/0).

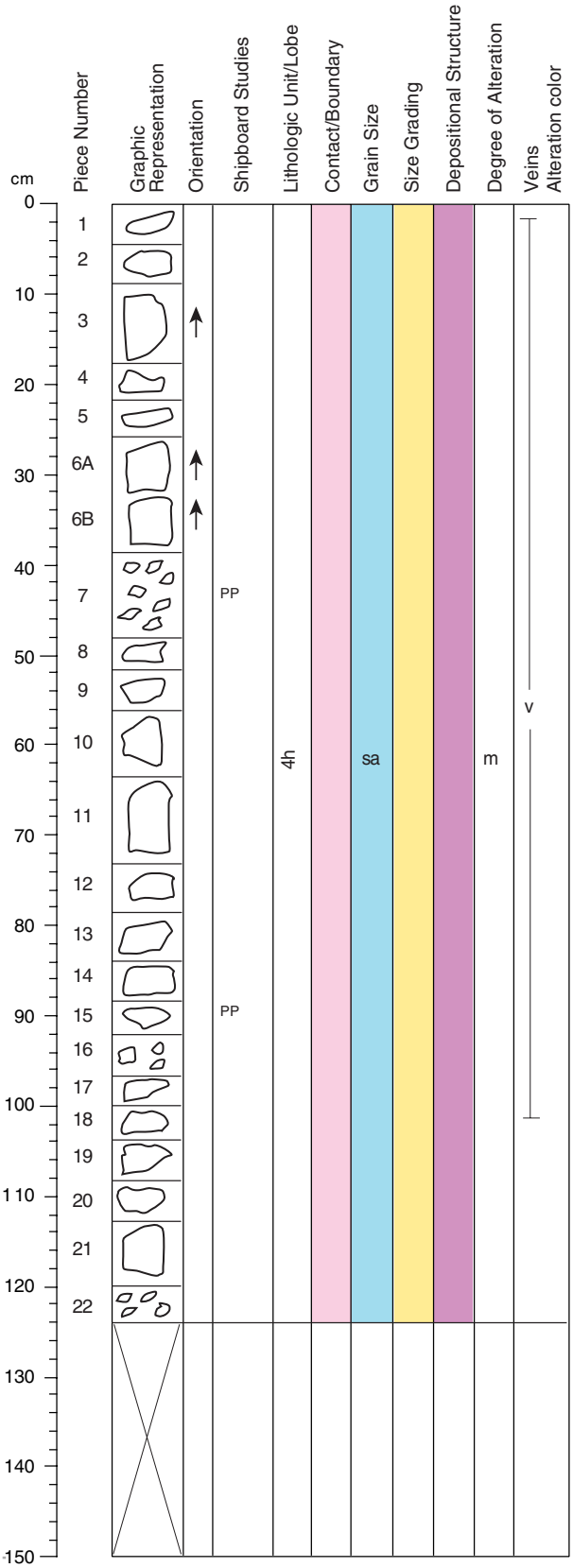
COMPONENTS:
>90%: Altered basalt glass shards, ash and lapilli particles.
<10%: Feldspar crystals and other unidentified components.
Cement: zeolites.

SEDIMENTARY TEXTURES: Well to moderately sorted, fine to coarse ash with a few dispersed 1–5 mm particles. Displays intervals with normal size grading.

SEDIMENTARY STRUCTURES: Bedded. Bedding is inferred from the sharp change in grain size from very fine ash at 90 cm.

COMMENTS: We interpret this unit to be a tephra fall deposit.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-22R-3 (Section top: 505.2 mbsf)

UNIT 4h: BASALT TUFF.

Pieces: 1–21

CONTACTS: None.

GENERAL DESCRIPTION: This unit is a well sorted massive basaltic tuff. The deposit is comprised of highly vesicular ash particles and glass shards.

COLOR: Dark gray to very dark gray (2.5Y 4/0 to 2.5Y 3/0).

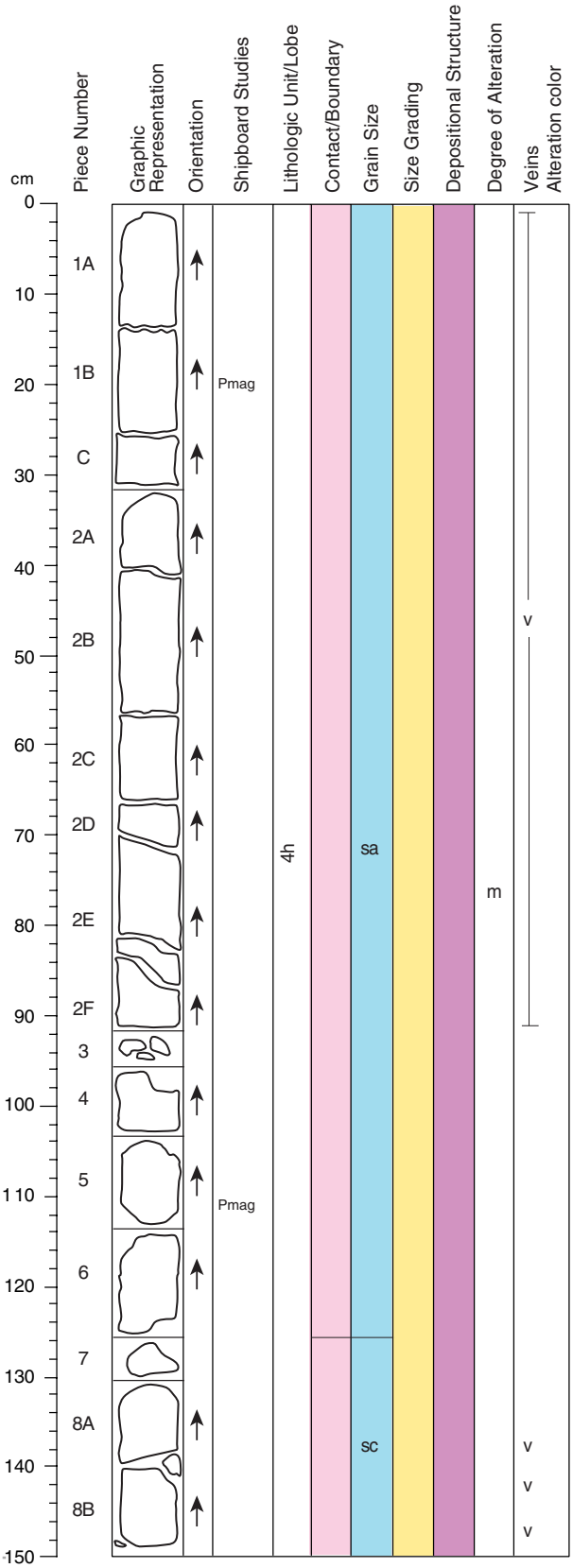
COMPONENTS:
>90%: Altered basalt glass shards, ash and lapilli particles.
<10%: Feldspar crystals and other unidentified components.
Cement: zeolites.

SEDIMENTARY TEXTURES: Well sorted fine ash with a few dispersed 2–4 mm particles.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: We interpret this unit to be a tephra fall deposit.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-22R-4 (Section top: 506.46 mbsf)

UNIT 4h: BASALT TUFF.

Pieces: 1–8

CONTACTS: None.

GENERAL DESCRIPTION: This unit is a bedded, moderately sorted massive basaltic tuff. The deposit is comprised of highly vesicular ash particles and glass shards.

COLOR: Dark gray to very dark gray (2.5Y 4/0 to 2.5Y 3/0).

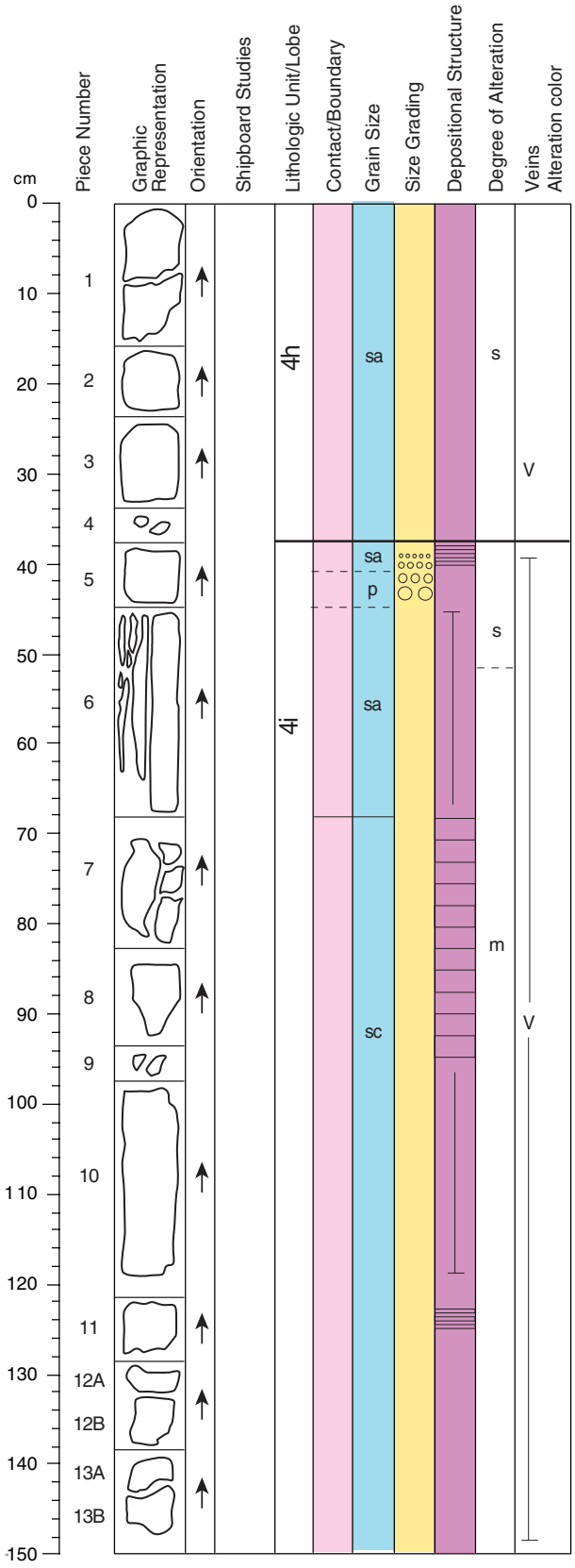
COMPONENTS:
>90%: Altered basalt glass shards, ash and lapilli particles.
<10%: Feldspar crystals and other unidentified components.
Cement: zeolites.

SEDIMENTARY TEXTURES: Well sorted fine ash with a few dispersed 0.5–1 mm particles. Displays normal intervals with normal size grading.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: We interpret this unit to be a tephra fall deposit.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-22R-5 (Section top: 507.96 mbsf)

UNIT 4h: BASALT TUFF.

Pieces: 1–4

CONTACTS: None observed. The contact between Units 4h and 4i is inferred to be between Pieces 4 and 5 at 38 cm.

GENERAL DESCRIPTION: This unit is well to moderately sorted basaltic tuff. It consists of highly vesicular ash particles and glass shards.

COLOR: Dark gray to very dark gray (2.5Y 4/0 to 2.5Y 3/0).

COMPONENTS:
>90%: Altered basalt glass shards, ash and lapilli particles.
<10%: Feldspar crystals and other unidentified components.
Cement: zeolites.

SEDIMENTARY TEXTURES: Well sorted, fine to medium ash.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: We interpret this unit to be a tephra fall deposit.

UNIT 4i: RESEDIMENTED-SYNVOLCANIC BASALT TUFF.

Pieces: 5-13

CONTACTS: None observed. The contact between Units 4h and 4i is inferred to be between Pieces 4 and 5 at 38 cm.

GENERAL DESCRIPTION: Thickly laminated tuff comprised of medium to fine ash alternating with layers of very fine ash. Individual laminae are well sorted and typically structureless (massive).

COLOR: Dark grayish black (2.5Y 3/1 to 4/1).

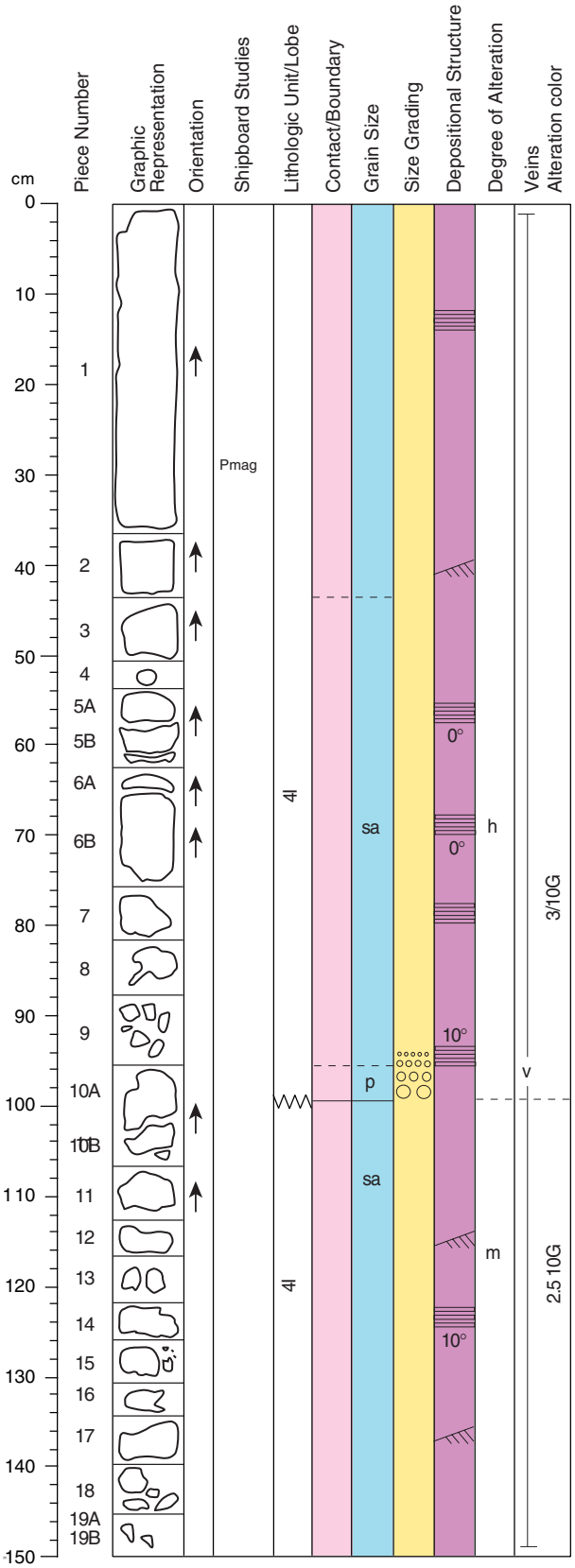
COMPONENTS:
>95%: Basaltic glass shards.
<5%: Feldspar crystals.

SEDIMENTARY TEXTURES: Alternating beds of very fine ash (<0.1 mm) and fine to medium ash (0.2-0.5 mm).

SEDIMENTARY STRUCTURES: Planar bedded tuff.

COMMENT: We interpret the unit to be resedimented basaltic tephra.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-23R-1 (Section top: 511.9 mbsf)

UNIT 4i: RESEDIMENTED-SYNVOLCANIC BASALT-TUFF.

Pieces: 1–19

CONTACTS: None.

GENERAL DESCRIPTION: Planar-bedded to laminated basaltic tuff comprised of medium to fine ash layers alternating with layers of very fine ash. Individual beds are well sorted and structureless or exhibit normal size grading. A few beds show fine-scale cross bedding.

COLOR: Dark grayish black (2.5Y 3/1 to 2.5Y 4/1).

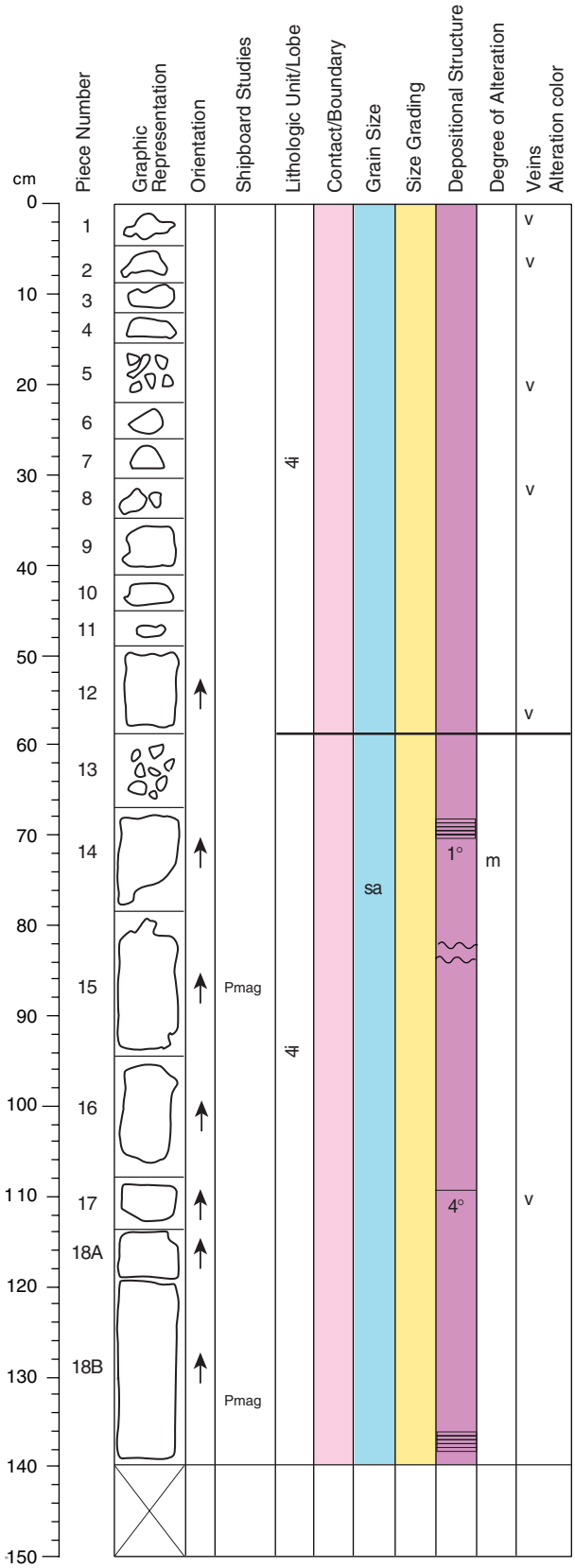
COMPONENTS:
>95%: basaltic glass shards.
<5%: feldspar crystals.

SEDIMENTARY TEXTURES: Alternating beds of very fine ash (<0.1 mm) and fine to medium ash (0.2–0.5 mm).

SEDIMENTARY STRUCTURES: Planar-bedded tuff intercalated with cross-bedded tuffaceous layers. Layering ranges from being thinly bedded (1–3 cm) to thickly laminated (0.3–1 cm).

COMMENTS: Cross-bedded layers are present in Pieces 5B, 6B, and 12. Soft sediment deformation is present at bed contacts in Pieces 2 and 5A. We interpret this unit to be resedimented basaltic tephra.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-23R-2 (Section top: 513.4 mbsf)

NIT 4i: RESEDIMENTED-SYNVOLCANIC BASALT-TUFF.

Pieces: 1–12

CONTACTS: Lower contact of subunit is at 58 cm. The unit is gradational and distorted by density-driven soft sediment deformation from loading and slumping.

GENERAL DESCRIPTION: Planar-bedded to laminated basaltic tuff comprised of medium to fine ash alternating with layers of very fine ash. Individual beds are well sorted and structureless or exhibit normal size grading. A few beds exhibit fine-scale cross bedding.

COLOR: Dark grayish black (2.5Y 3/1 to 2.5Y 4/1).

COMPONENTS:
>95% basaltic glass shards.
<5% feldspar crystals.

SEDIMENTARY TEXTURES: Alternating beds of very fine ash (<0.1 mm) and fine to medium ash (0.2–0.5 mm).

SEDIMENTARY STRUCTURES: Planar-bedded tuff intercalated with cross-bedded tuffaceous layers. Layering ranges from being thinly bedded (1–3 cm) to thickly laminated (0.3–1 cm). We interpret the unit to be resedimented basaltic tephra.

UNIT 4j: LAMINATED-THINLY BEDDED SILTSTONE-SANDSTONE.

Pieces: 13–18

CONTACTS: Upper contact at 58 cm is gradational and disturbed.

GENERAL DESCRIPTION: Thickly laminated to finely bedded siltstone with alternating green siliciclastic (partly volcanogenic), white siliceous and calcareous layers.

COLOR: Dark olive gray green (5Y 3/2) and white (2.5Y 8/2).

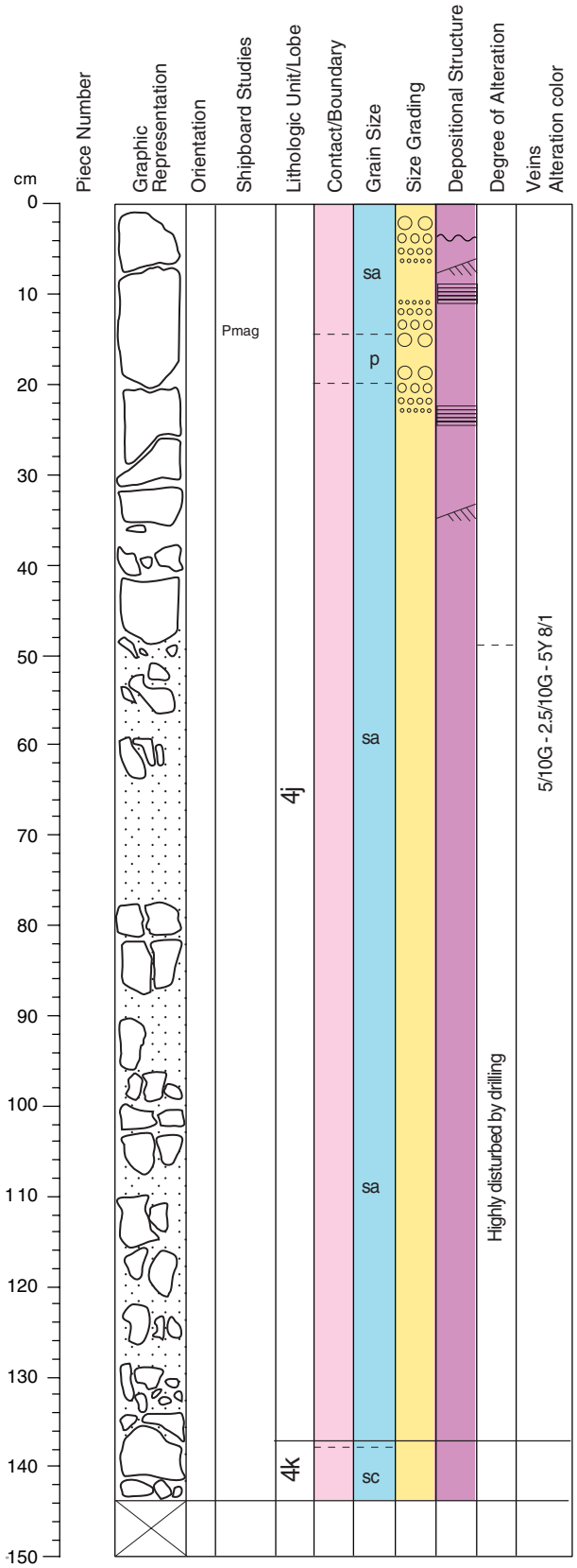
COMPONENTS: Siliciclastic material, basalt glass and various lithics. The carbonate and silica clasts may be biogenic.

SEDIMENTARY TEXTURES: Alternating from silt to sandstone layers.

SEDIMENTARY STRUCTURES: Planar bedding (primary structure). Varies from thick laminae to thin beds, with an interval of disturbed bedding present at 55–60 cm and 80–130 cm. Dip of bedding in undisturbed areas is 2°.

COMMENTS: Consists of biogenic and clastic sediments with an epiclastic component. Intervals with disturbed bedding exhibit classic loading structures, from deformation by loading of soft sediment, where sandstone overlies siltstone layer (see Photo 1203A-23R-2.jpg). Regions of highly disturbed bedding and mixing of layers across stratification are most likely caused by slumping, induced by rapid accumulation of the overlying tuff.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-23R-3 (Section top: 514.8 mbsf)

UNIT 4j: LAMINATED-THINLY BEDDED SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: Lower contact of Unit 4j at 137 cm is sharp and has a dip of 8–10°.

GENERAL DESCRIPTION: Thickly laminated to finely bedded siltstone and sandstone with alternating green siliciclastic (partly volcanogenic), white siliceous and calcareous layers.

COLOR: Dark green (5Y 3/2) and white (2.5Y 8/2).

COMPONENTS: Siliciclastic material, basalt glass and various lithic clasts. The carbonate and silica clasts may be biogenic.

SEDIMENTARY TEXTURES: Alternating layers of silt and sand.

SEDIMENTARY STRUCTURES: Planar bedding. Varies from thick laminae to thin beds.

COMMENTS: Consists of biogenic and clastic sediments with an epiclastic component. Intervals with disturbed bedding exhibit classic loading structures, from deformation by loading of soft sediment, where sandstone overlies siltstone layer (see Photo 1203A-23R-3.jpg). Regions of highly disturbed bedding and mixing of layers across stratification are most likely caused by slumping, induced by rapid accumulation of the overlying tuff.

UNIT 4k: RESEDIMENTED BASALT-TUFF(*).

Pieces: Cut as sediment core.

CONTACTS: Upper contact at 137 cm is sharp. Contact dips at 8–10°.

GENERAL DESCRIPTION: Massive green siltstone to sandstone with dispersed vesicular lapilli scoria clasts.

COLOR: Dark olive gray (5Y 4/2).

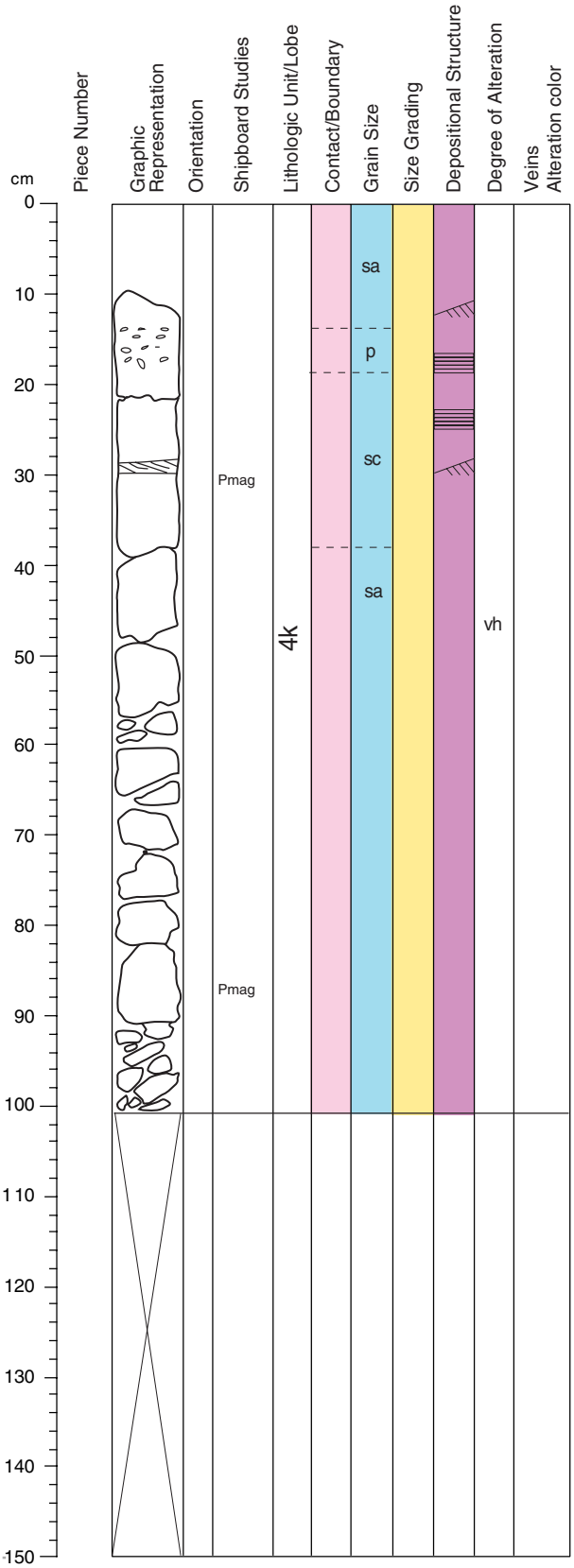
COMPONENTS:
>85%: Vesicular basalt glass particles.
<15%: Mineral fragments, predominantly plagioclase.

SEDIMENTARY TEXTURES: Silt to fine sand with dispersed lapilli scoria clasts. The unit is poorly sorted.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS:
(*)The interval 137 cm is the top of Unit 4k (see also Section 24R-1).

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-24R-1 (Section top: 521.5 mbsf)

UNIT4k: RESEDIMENTED BASALT-TUFF.

Pieces: Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: The section comprises vitric stuff: the upper 33 cm consists of planar and thinly bedded to laminated very fine-grained tuff, whereas the interval 33–101 cm consists of normally graded tuff (coarse to fine ash). The deposit is vitric sandstone that gradually coarsens down section from silt to sand-sized particles. It is composed of basaltic glass particles (now completely altered), along with subordinate mineral grains. Fine laminar bedding is present in the finer-grained fractions along with both cross and graded bedding.

COLOR: Dark olive gray (5Y 3/2) at the top of the section grading to very dark gray (5Y 3/1) at the base.

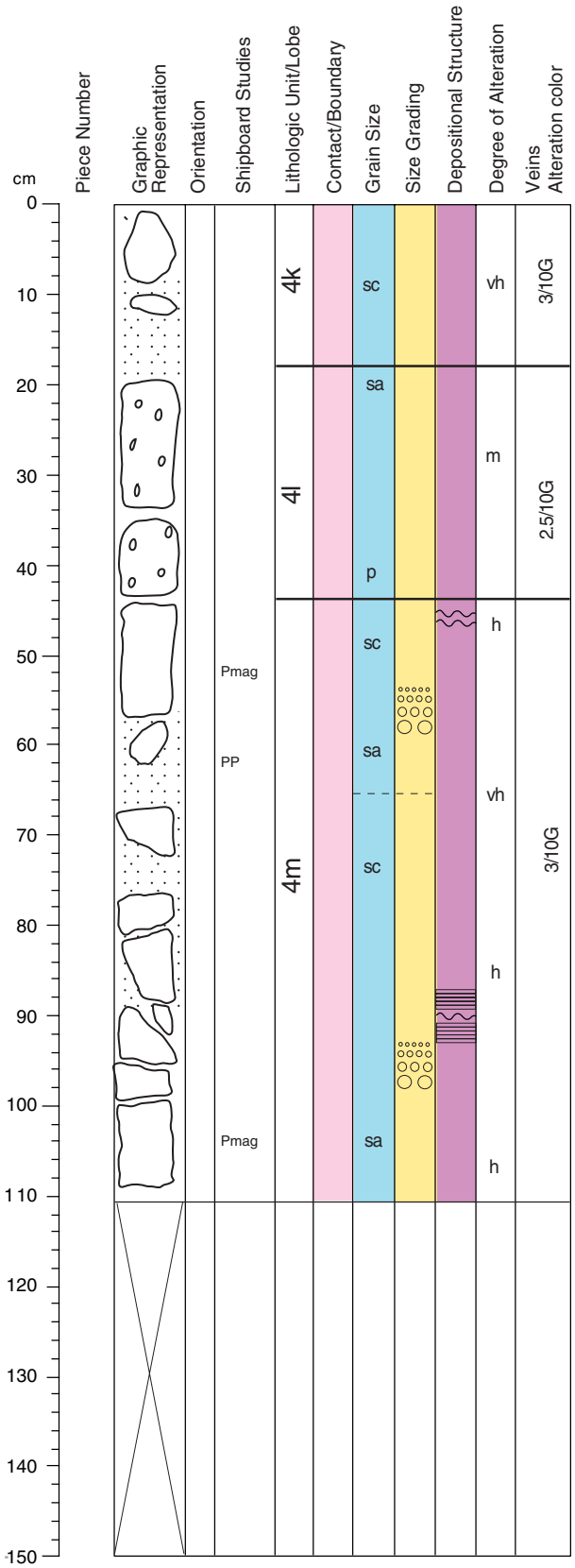
COMPONENTS:
>85%: Vesicular ash, tephra and glass.
<15%: Mineral fragments, particularly plagioclase.
~1%: 1–5 mm fragments of very fine-grained siliciclastic(?) material. Present from 1–3 cm.

SEDIMENTARY TEXTURES: Grain size is silt to fine sand. The Unit shows normal grading between 33 cm and 101 cm (coarse ash to fine ash), with three cycles present. Sequence is moderately sorted.

SEDIMENTARY STRUCTURES: The top of the section contains laminations dipping 4˚. Cross bedding occurs in narrow 0.5 cm bands at 11 cm and 27.5 cm with cross beds dipping 4˚.

COMMENTS: A zone containing elongate and rounded to subrounded tephra clasts (up to 4 mm long) is present between 12 cm and 17 cm.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-24R-2 (Section top: 522.5 mbsf)

UNIT 4k: RESEDIMENTED BASALT-TUFF.

Pieces: Cut as sediment core (0–19 cm).

CONTACTS: None. Contact with Unit 4L is inferred to be at 19 cm.

GENERAL DESCRIPTION: Medium-grained basalt tuff.

COLOR: Grayish black (N2).

COMPONENTS: Moderately sorted angular to subangular fragments of altered glass, volcaniclastic mudstone, and occasional plagioclase crystal fragments.

SEDIMENTARY TEXTURES: Grain size is silt to fine sand.

SEDIMENTARY STRUCTURES: Massive.

UNIT 4l: BASALT-LAPILLI-TUFF.

Pieces: Cut as sediment core (19–44 cm).

CONTACTS: None. Contacts between Units 4k, 4l, and 4m are not preserved.

GENERAL DESCRIPTION: Massive, fine- to medium-grained lapilli tuff, composed of basalt scoria.

COLOR: Grayish black (N2).

COMPONENTS: Consists of angular to rounded fragments up to 1–2 cm diameter in ash matrix. Clasts include moderately to extremely vesicular basalt scoria (see Comments below), glass shards, sandstone fragments and some plagioclase.

SEDIMENTARY TEXTURES: Moderately to poorly sorted fine to medium lapilli tuff. Clasts are typically angular, highly vesicular scoria clasts and vesicle-free glass shards.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: Some scoria clasts exhibit smooth lobate (fluidal) outlines and >90% vesicularity (reticulite-like scoria). We interpret the unit to be tephra fall deposit.

UNIT 4m: RESEDIMENTED-SYNVOLCANIC BASALT-TUFF.

Pieces: Cut as sediment core (44–110 cm).

CONTACTS: Contact between Units 4m and 4l is inferred to be at 44 cm.

GENERAL DESCRIPTION: Unit 4m is comprised of very fine- to medium-grained tuff. The interval 41–85 mm consists of thinly bedded to laminated very fine-grained tuff, whereas the interval 85–107 cm consists of normally graded fine- to medium-grained tuff.

COLOR: Grayish black (N2) to light grayish black (N4).

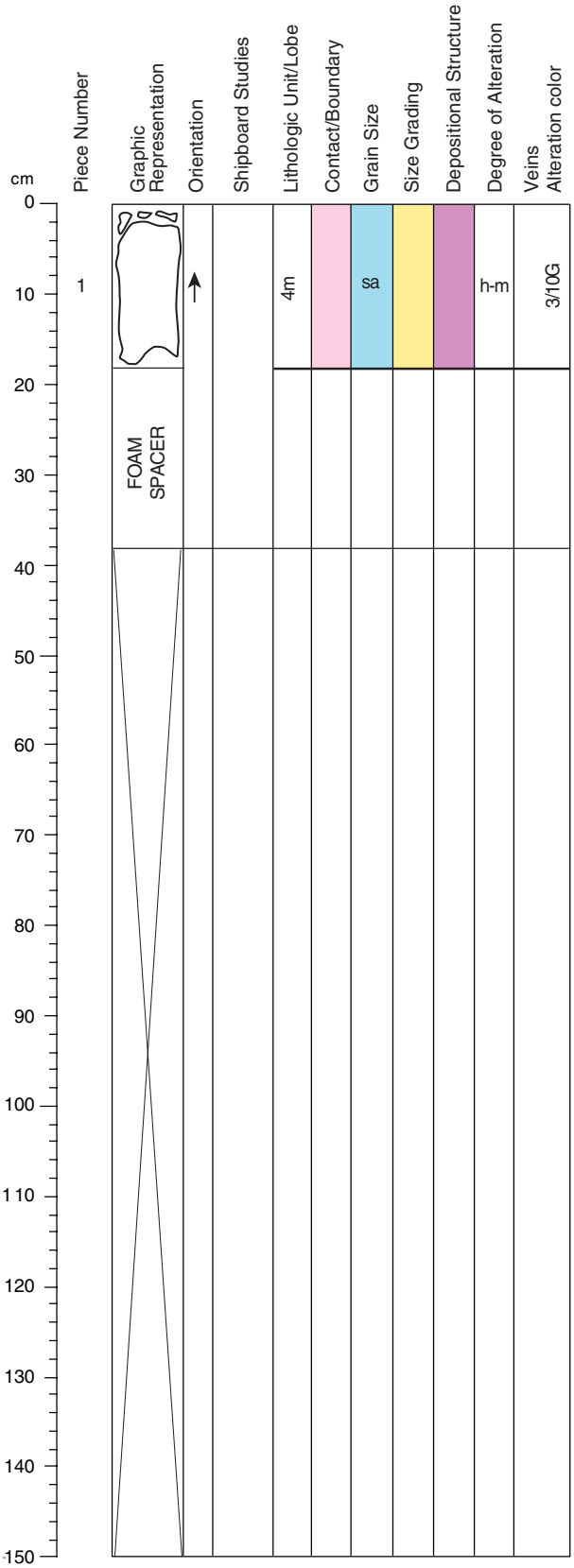
COMPONENTS: Poorly sorted angular to rounded fragments of altered basalt glass, fragments, and ash, <1 mm in diameter.

SEDIMENTARY TEXTURES: Grain size is very fine to fine ash. Normal size grading is observed at intervals 50–55 cm and 84–107 cm.

SEDIMENTARY STRUCTURES: Planar and undulating laminations are present at intervals 44–48 cm and 81–82 cm.

COMMENTS: Based on the fine grain size, high abundance of glass fragments and presence of rare siliciclastic fragments, along with its bedded nature, we interpret the sequence as a resedimented synvolcanic tuff.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-24R-3 (Section top: 523.59 mbsf)

UNIT 4m: RESEDIMENTED BASALT-TUFF.

Pieces: 1

CONTACTS: None.

GENERAL DESCRIPTION: Moderately consolidated, poorly sorted, medium to coarse basalt tuff.

COLOR: Light grayish black (N4).

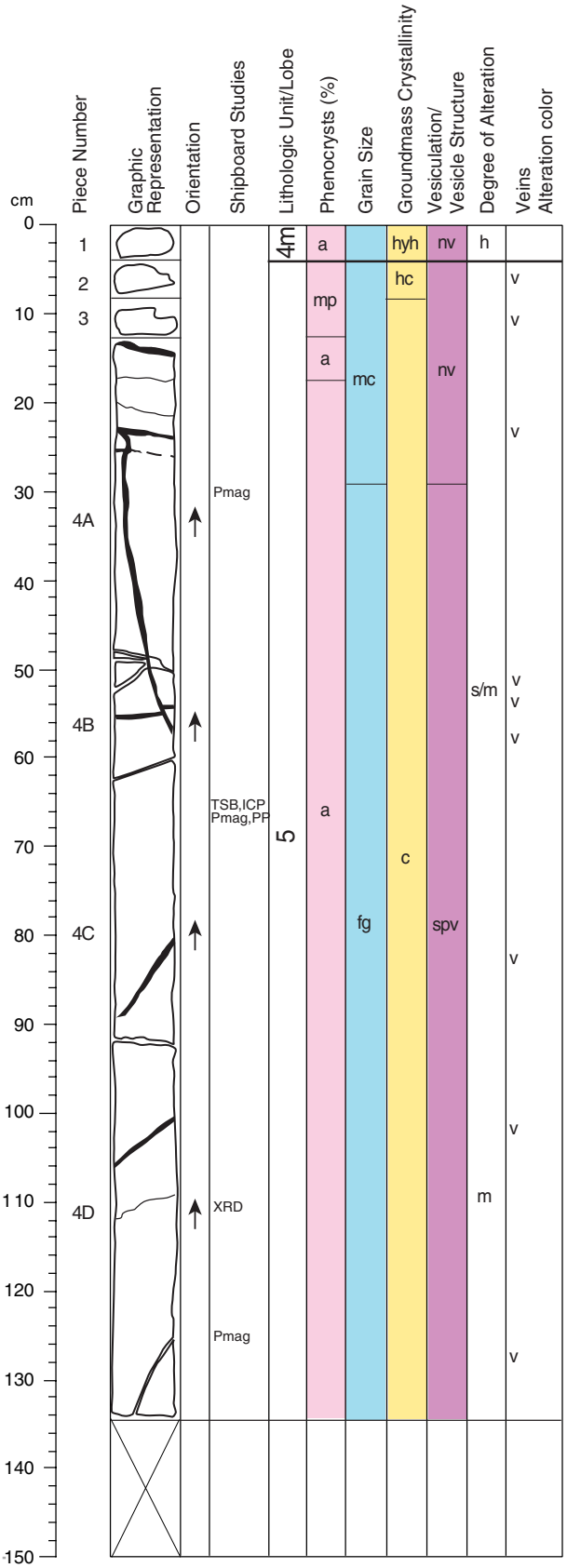
COMPONENTS: Subangular to angular, subequant to subelongate vesicular ash particles with rare mineral fragments.

SEDIMENTARY TEXTURES: Medium to coarse sand without bedding or grading.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: This section is identical to the bottom piece of Section 24R-2.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-25R-1 (Section top: 531.0 mbsf)

UNIT 4m: RESEDIMENTED BASALT-TUFF.

Pieces: 1

CONTACTS: None observed. The boundary between Unit 4m and Unit 5 is inferred to be between Pieces 1 and 2 at 8 cm.

GENERAL DESCRIPTION: Resedimented, basalt or tuff. It is highly altered and soft.

COLOR: Black (N1).

COMPONENTS:
>95%: Vesicular ash-size glass particles.
<5%: Mineral particles; plagioclase and black oxides are identifiable.
Cement: Silica?

SEDIMENTARY TEXTURES: Well to moderately sorted, consisting to fine to coarse ash-size grains.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: Individual clasts and/or fragments are 1 mm or less in size.

UNIT 5: MODERATELY PLAGIOCLASE-OLIVINE-PHYRIC TO APHYRIC BASALT(*).

Pieces: 2–4

CONTACTS: None observed. The boundary between Unit 4m and Unit 5 is inferred to be between Pieces 1 and 2.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7–8	1.8	0.5	1	Euhedral laths
Olivine:	3–4	1.2	0.3	0.5	Euhedral to subhedral; equant

GROUNDMASS: Variolitic in the finer-grained regions (Pieces 2 and 3). Intergranular to interstitial in the coarser-grained regions, where plagioclase, clinopyroxene, olivine(*) (unaltered), and black oxides are evident.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Sparsely vesicular	2–5	5	0.2	1	Round to irregular

COLOR: Medium gray (N5) to medium light gray (N6).

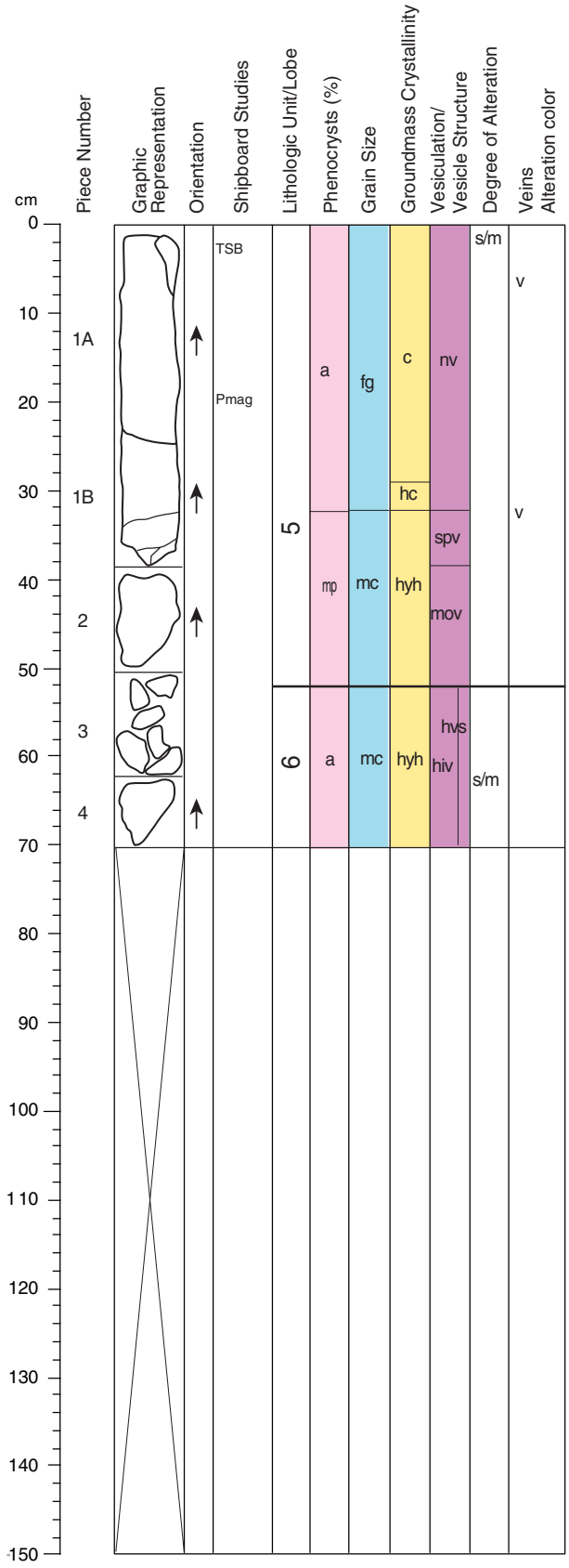
STRUCTURE: Massive. Grain size increases from Pieces 2 and 3 to Piece 4D.

ALTERATION: Slight to moderate. Pieces 2 and 3 are moderately altered and contain olivine phenocrysts completely replaced by white carbonate. Pieces 4A to 4D are coarser grained and are slightly to moderately altered, with the mesostasis replaced by dark green clay. Vesicles are filled with light green clay and pyrite.

VEINS/FRACTURES: Sparsely veined. Veins are randomly oriented, 0.1–3 mm wide, and are filled with white carbonate and/or pyrite. Pyrite is more prevalent in the coarser-grained regions (Pieces 4A to 4D).

COMMENTS: (*)Olivine is the phenocryst phase identified in the finer-grained regions. The groundmass has grown to the same size. Olivine is unaltered in Pieces 4A to 4D.
Rock name is given on phenocryst percentages in Pieces 2 and 3.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-25R-2 (Section top: 532.46 mbsf)

UNIT 5: MODERATELY PLAGIOCLASE-OLIVINE-PHYRIC BASALT(*).

Pieces: 1–2

CONTACTS: Not recovered. The end of Unit 5 is inferred to be at at 50 cm (Piece 2).

PHENOCRYSTS: (*)

GROUNDMASS: Fine grained with an intergranular texture, which becomes intersertal close to vesicular regions. Plagioclase, clinopyroxene, olivine(*), and black oxides are evident.

VESICLES:	% Mode	Size (mm) Max.	Min.	Avg.	Shape
Nonvesicular to sparsely vesicular (Pieces 1 and 2)	~1			1	Irregular

Highly vesicular 10-12 4 0.5 1.5 Round to irregular (Pieces 2-4); interval 37-70 cm, basal vesicular zone. (pipe vesicles)

COLOR: Medium gray (N5) to medium dark gray (N4).

STRUCTURE: Massive.

ALTERATION: Slight to moderate. Dark green clay is replacing mesostasis. White carbonate, pyrite and pale olive green clay fill vesicles in Piece 1.

VEINS/FRACTURES: Sparsely veined. Veins are up to 2 mm wide and filled with white carbonate.

COMMENTS: (*)This is a continuation of Unit 5 from Section 25R-1. The groundmass has grown to a size that makes distinguishing early crystallizing phases as phenocrysts impossible.
The bottom 2 cm of Piece 1 and Pieces 2 to 4 are highly vesicular and the vesicles are not filled with secondary minerals. The highly vesicular part of the core section could represent the base of Unit 5.

UNIT 6: SPARSELY PHYRIC BASALT(*).

Pieces: 3-4

CONTACTS: Not recovered. The start of Unit 6 is inferred to be at at 50 cm (Piece 3).

GROUNDMASS: Fine-grained, holocrystalline, with plagioclase and clinopyroxene showing an intergranular to intersertal texture.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	30	5	0.5	2	Irregular

COLOR: Gray (N2).

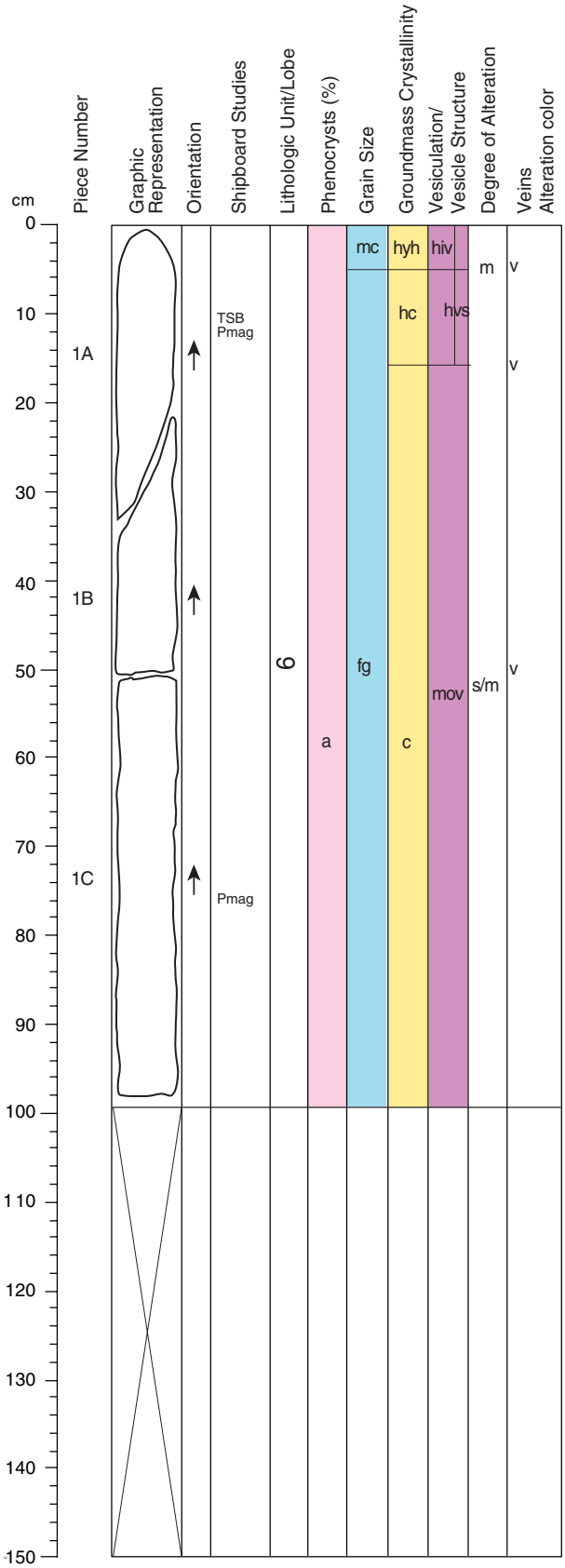
STRUCTURE: Highly vesicular fine to medium grained hypocrystalline basalt with 5-6 mm long plagioclase laths.

ALTERATION: Moderate. Vesicles are filled with carbonate, clay minerals, and pyrite.

VEINS/FRACTURES: None.

COMMENTS: (*)The top 33 cm of Unit 6 (see Sections 25R-2 and 26R-1) consists of vesicular basalt. The lava in this interval is significantly coarser-grained than in the massive (vesicle poor and holocrystalline) part of the lava, and contains randomly oriented 5–6 mm long plagioclase laths, with interstitial clinopyroxene and glass. The texture is subophitic (ophimottled) to hyalophitic. This zone is identified as a horizontal vesicle sheet (i.e., segregation vein) and implies that the upper vesicular crust of the lava has been completely removed (not recovered, or removed by erosion?) and thus the massive part of this lava represents the lobe interior.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-26R-1 (Section top: 534.8 mbsf)

UNIT 6: SPARSELY PLAGIOCLASE-PHYRIC BASALT(*).

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2	0.5	1	Subhedral; prismatic.

GROUNDMASS: Fine-grained, holocrystalline, with plagioclase and clinopyroxene showing an intergranular to intersertal texture.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Variable	2–30	5	0.5	2	Irregular

Topmost 13 cm contains a highly vesicular zone (*).

COLOR: Gray (N2).

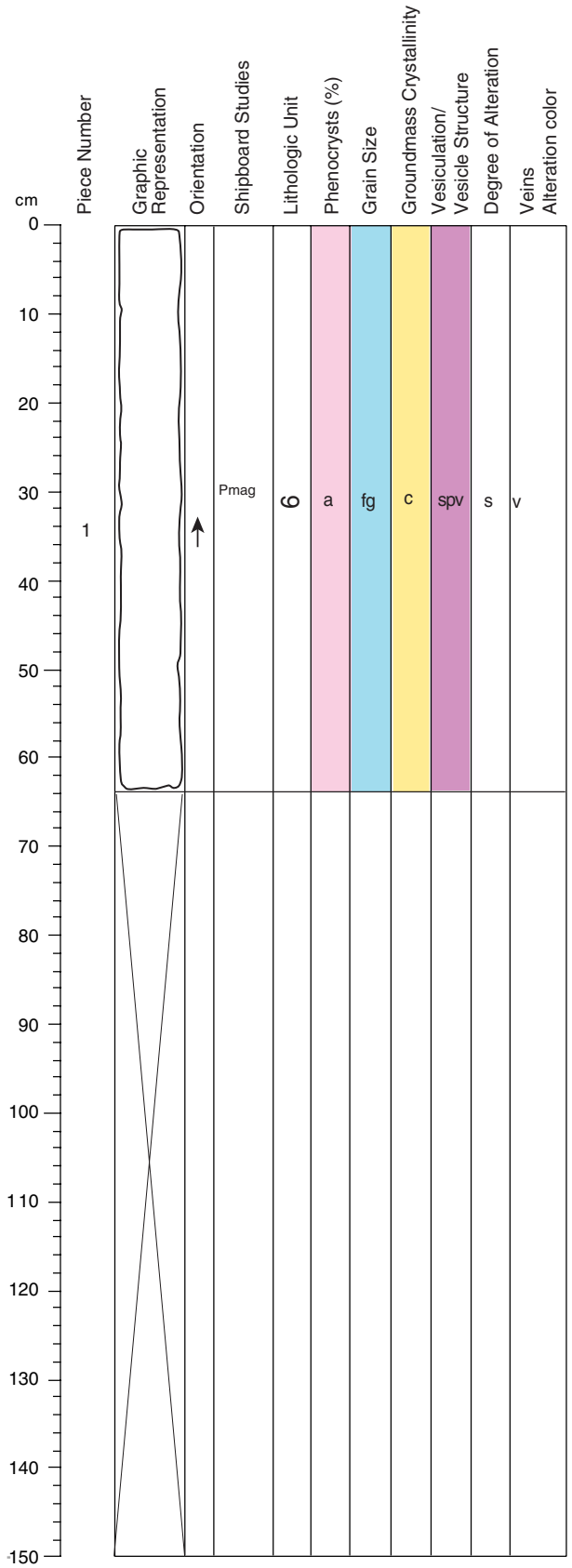
STRUCTURE: Massive (Pieces 1B and 1C). Upper part of Piece 1A is highly vesicular, but the contact between Units 5 and 6 was not recovered.

ALTERATION: Moderate. Vesicles are filled with carbonate, clay minerals, an pyrite.

VEINS/FRACTURES: Sparsely veined. Veins are lined with pyrite and carbonate.

COMMENTS: (*)The top 33 cm of this unit consists of vesicular basalt. In the top 13 cm of section 26R-1 the vesicularity decreases downwards from ~30% between 0–7 cm to ~20% between 7–9 cm and ~5% between 9–13 mm. The maximum vesicle size also decreases, from 5–11 mm (coalesced vesicles) at the top to ~2 mm (single vesicles) at the base. The lava in this interval is significantly coarser-grained than in the massive (vesicle poor and holocrystalline) part of the flow, and contains randomly oriented 5–6 mm long plagioclase laths, with interstitial clinopyroxene and glass. The texture is subophitic (ophimottled) to hyalophitic. This zone is identified as a horizontal vesicle sheet (i.e., segregation vein) and implies that the upper vesicular crust of the lava has been completely removed (not recovered, or removed by erosion?) and thus the massive part of this lava represents the lobe interior.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-26R-2 (Section top: 535.79 mbsf)

UNIT 6: SPARSELY PLAGIOCLASE-PHYRIC BASALT(*).

Pieces: 1

CONTACTS: None.

GROUNDMASS: Fine grained with an intergranular texture. Olivine, replaced by greenish white clay, makes up about 10% of the groundmass. The remainder is comprised of clinopyroxene (25%), plagioclase (25%), and altered mesostasis (40%).

VESICLES: Nonvesicular.

COLOR: Medium gray (N5).

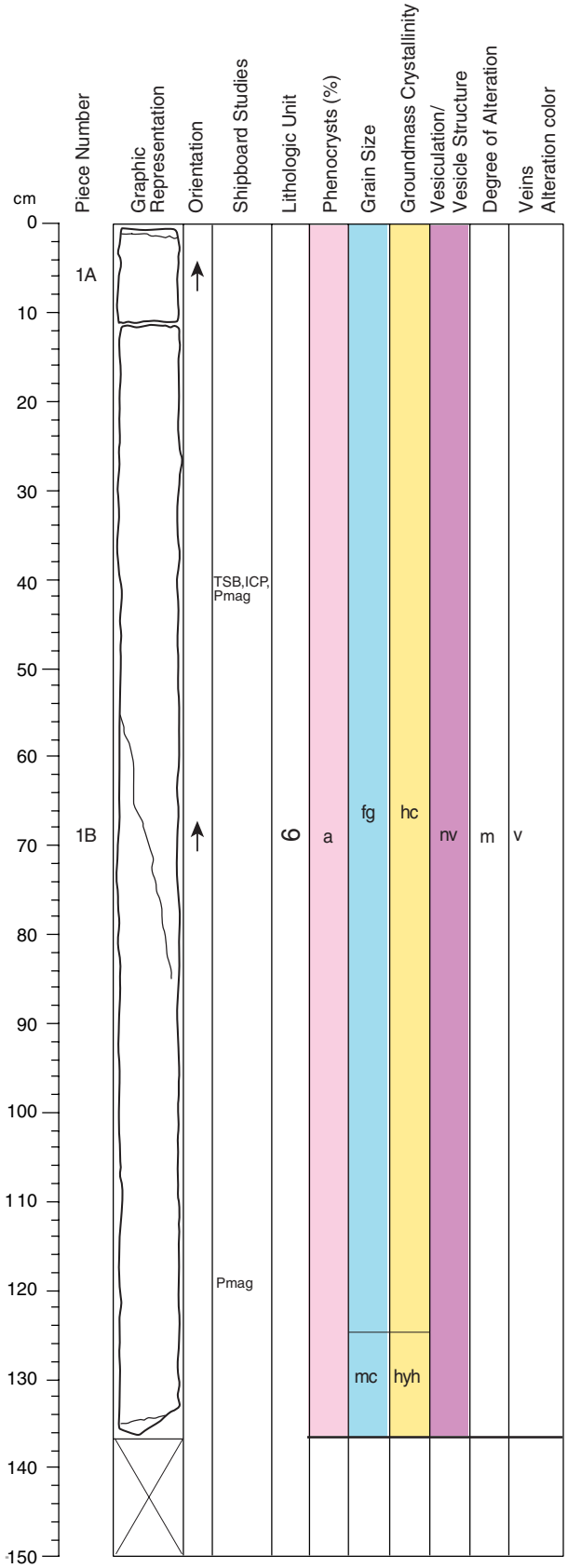
STRUCTURE: Massive.

ALTERATION: Moderate. Olivine and groundmass mesostasis is completely replaced by greenish white clay.

VEINS/FRACTURES: None.

COMMENTS: (*)The groundmass has grown to a size that makes distinguishing early crystallizing phases as phenocrysts impossible. This section is probably the interior of the same massive flow present in Section 26R-1.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-26R-3 (Section top: 536.43 mbsf)

UNIT 6: SPARSELY PLAGIOCLASE-PHYRIC BASALT (*).

Pieces: 1

CONTACTS: None.

GROUNDMASS: Fine grained with intergranular to intersertal texture, except aphanitic at the bottom of Piece 1B. Olivine(*), replaced by greenish white clay, makes up about 10% of the groundmass. The remainder is comprised of pyroxene (25%), plagioclase (25%), and altered mesostasis (40%).

VESICLES: Nonvesicular.

COLOR: Medium gray (N5).

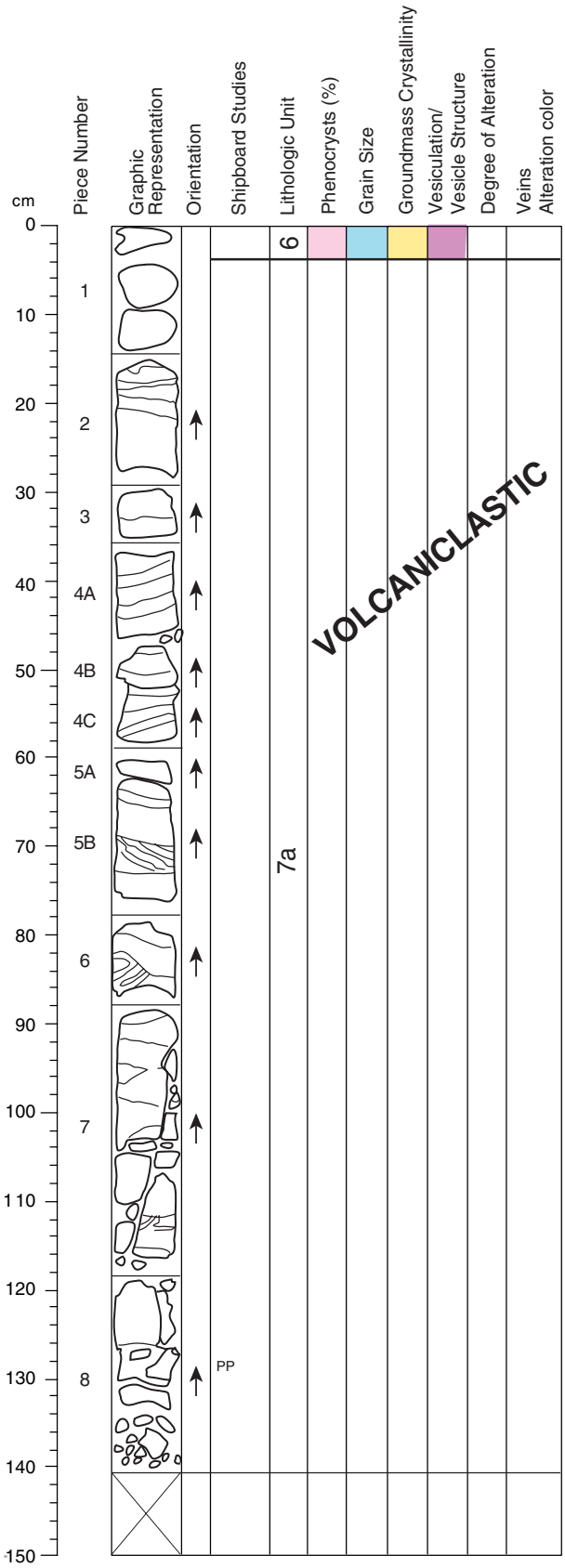
STRUCTURE: Massive.

ALTERATION: Moderate. Olivine(*) and groundmass mesostasis is completely replaced by greenish white clay.

VEINS/FRACTURES: Sparsely veined. One subvertical fracture at 55-85 cm and two subhorizontal fractures (one at 1 cm and one at 136 cm). All are <1 mm wide and filled with white carbonate, and greenish white minerals.

COMMENTS: (*)The groundmass has grown to a size that makes distinguishing early crystallizing phases as phenocrysts impossible. This section is probably the lower part of the same massive flow present in Sections 26R-1 and 26R-2. Piece 1 in Section 26R-4 is probably a piece of the chilled margin at the bottom of this same flow.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-26R-4 (Section top: 537.81 mbsf)

UNIT 6: SPARSELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1 (top piece of three cobbles that comprise Piece 1)

CONTACTS: None observed. The contact between Unit 6 and Unit 7 is inferred to be between the top piece of Piece 1 and the second piece of Piece 1 at 4 cm.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1-2	1.5	0.5	0.8	Subhedral laths

GROUNDMASS: Fine grained with intergranular to intersertal texture, except aphanitic at the bottom of Piece 1B where it is aphanitic. Olivine microphenocrysts, replaced by greenish white clay, makes up about 10% of the groundmass. The remainder is clinopyroxene (25%), plagioclase (25%), and altered mesostasis (40%) (see Comments below.)

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Sparsely vesicular	<5	1.8	0.4	0.8	Round

COLOR: Medium light gray (N6).

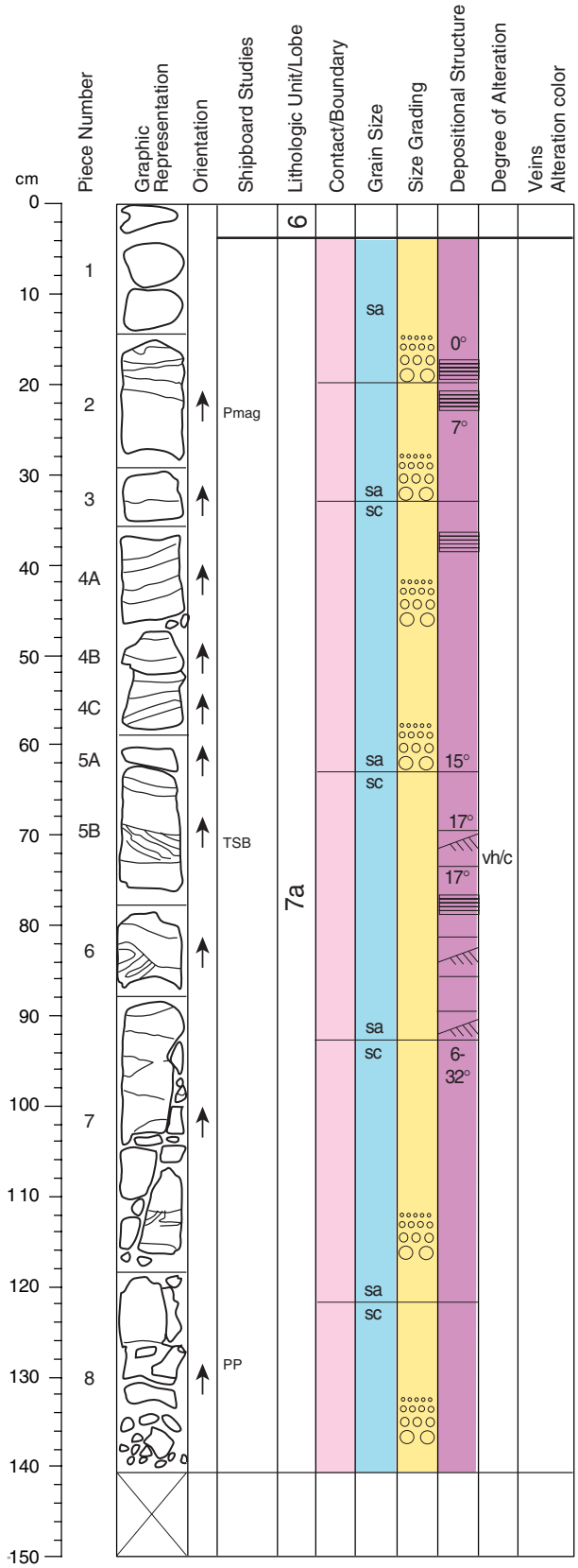
STRUCTURE: Massive.

ALTERATION: Moderate.

VEINS/FRACTURES: None.

COMMENTS: Groundmass becomes finer-grained across this piece. A rind of hypocrystalline lava occurs on its long side (i.e., the inner zone of the basal lobe margins).

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-26R-4 (Section top: 537.81 mbsf)

UNIT 7a: BEDDED VITRIC SILTSTONE-SANDSTONE.

Pieces: 1 (bottom two pieces)-8

CONTACTS: None observed. The contact between Unit 6 and Unit 7a is inferred to be between the top piece of Piece 1 and the second piece of Piece 1 at 4 cm.

GENERAL DESCRIPTION: Bottom two pieces of this unit are a highly altered, massive, moderately to poorly sorted vitric sandstone displaying normal grading, horizontal layering and flattening of clasts. Grain size is 0.5-2 mm, with occasional clasts ~1 cm. The components are predominantly vesicular basaltic glass particles. The remainder of the section is an alternating sequence of volcaniclastic claystones and siltstones, with sporadic sandstone horizons (e.g., Piece 3), that occasionally are cross bedded. Black claystone layers are between 0.5 cm and 2 cm thick.

COLOR: Coarser-grained areas are lighter in color: light greenish gray (5G 8/1), light olive gray (5Y 6/1), to greenish gray (5G 6/1). The coarser-grained tuff cobbles of Piece 1 are dark greenish gray (5GY 4/1). The claystones are black (N1) to grayish black (N2).

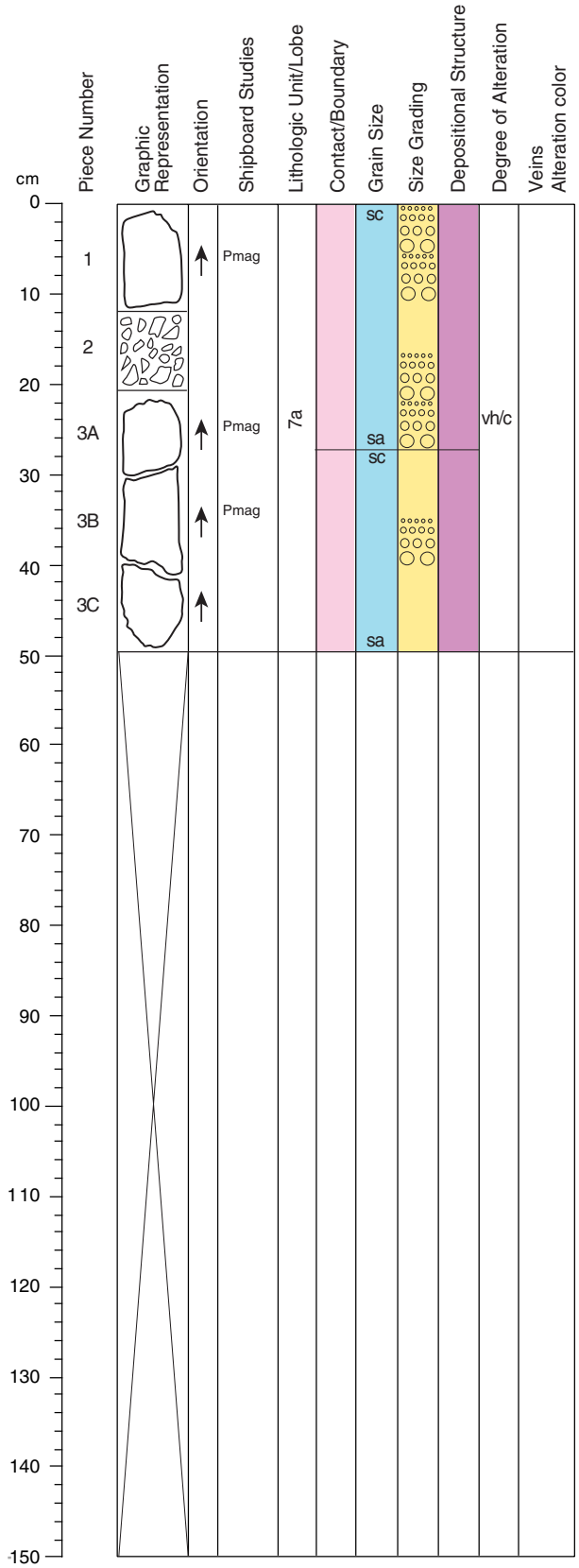
COMPONENTS: Variable proportions of tephra, altered basaltic glass and mineral fragments, which are very highly to completely altered. Clasts are subrounded to angular. The fine sandstone in Piece 3 contains abundant plagioclase(?), mineral fragments and glass. A pale green clay forms the cement in the two pieces that make up Piece 1, and black oxide minerals are present. Occasionally, the siltstone contains pristine igneous mineral fragments.

SEDIMENTARY TEXTURES: Normally graded from sandstone to siltstone. The grain size texture varies from coarse sand in Piece 1, to medium sand (at 4-14 cm), to fine and very fine sand (e.g., 28-30 cm).

SEDIMENTARY STRUCTURES: Thickly laminated to thinly bedded, with alternating planar to cross-bedded subsets. Normal grading is seen throughout Pieces 2-8. Cross bedding is present at 65-67 cm, 72-73 cm, 82-84 cm, and 91-92 cm.

COMMENTS: Tephra clasts are elongated (up to 4 mm long) parallel to the horizontal bedding in Piece 2 (22-26 cm). We interpret the deposit in the two bottom pieces of Piece 1 to be air fall tephra. The lower piece may contain fresh glass. Unit 7a, therefore, is interpreted as a resedimented basaltic tephra.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-26R-5 (Section top: 539.23 mbsf)

UNIT 7a: BEDDED VITRIC SILTSTONE-SANDSTONE.

Pieces: 1-3

CONTACTS: None.

GENERAL DESCRIPTION: The section consists of an alternating sequence of poorly sorted vitric siltstones and sandstones that exhibit horizontal planar bedding.

COLOR: Coarser-grained areas are lighter in color: light bluish gray (5B 7/1) to medium gray (N5). Claystone layers are black (N1) to grayish black (N2).

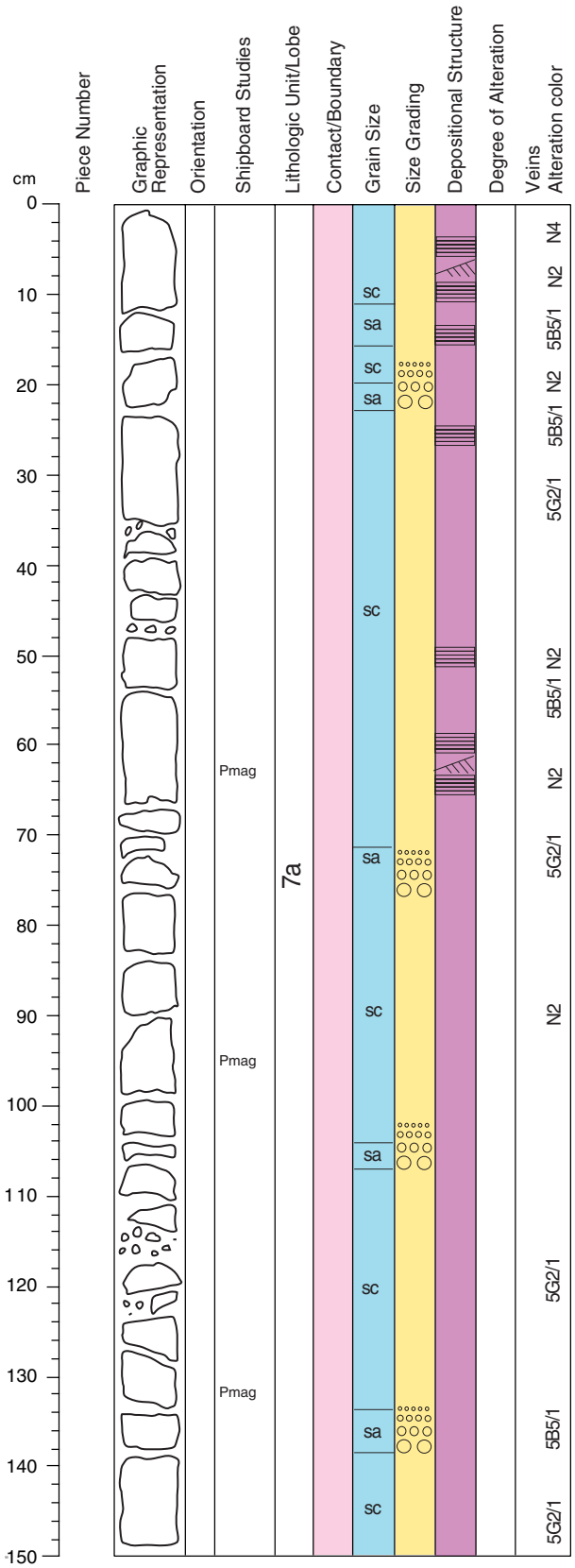
COMPONENTS: Variable proportions of basaltic glass fragments, lithics and rare mineral grains. Clasts are subrounded to angular and very highly to completely altered.

SEDIMENTARY TEXTURES: Beds are normally size-graded from sand to siltstone. Medium to coarse sands are present at 33-50 cm. The siltstone grades down through Pieces 3B and 3C to a fine sandstone.

SEDIMENTARY STRUCTURES: Generally horizontal to subhorizontal bedding. Occasionally the contact between beds is inclined. Black siltstone layers are between <0.1 cm and 2 cm thick. A sharp contact between and upper sandstone and a lower siltstone is present at 28 cm (Piece 3A).

COMMENTS: We interpret Unit 7a to be resedimented basaltic tephra.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-27R-1 (Section top: 540.8 mbsf)

UNIT 7a: BEDDED VITRIC SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: Sequence of thinly bedded to laminated, vitric sandstones and siltstones. Volcanic components are very highly to completely altered.

COLOR: Claystone beds are grayish black (N2); the siltstone and sandstone beds are medium bluish gray (5B 5/1).

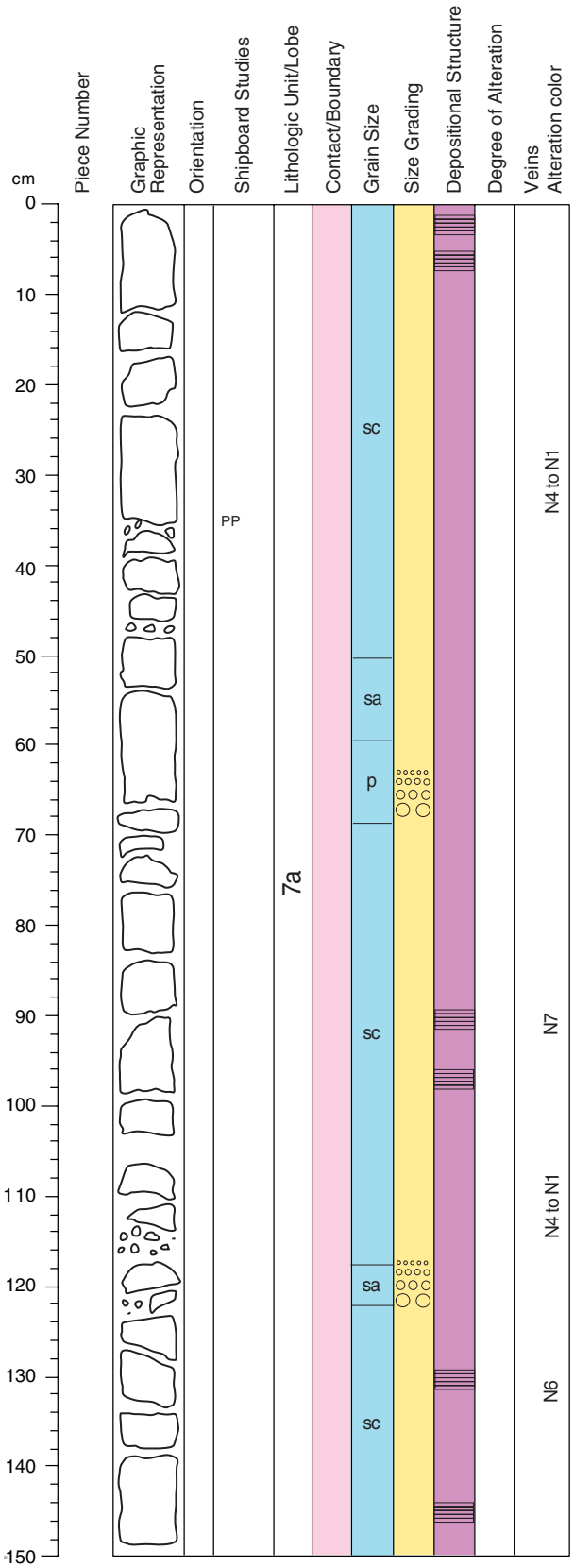
COMPONENTS: Sand to silt-size subrounded to angular fragments of vesicular basaltic glass along with sparse plagioclase crystals.

SEDIMENTARY TEXTURES: Well to moderately sorted sand and silt layers. Normally graded bedding is present at 22 cm, 78 cm, 108 cm, and 140 cm.

SEDIMENTARY STRUCTURES: Planar bedded with occasional cross-stratified intervals. Sequence is thinly bedded to finely laminated with distinct laminations in finer-grained intervals. Bedding is defined by sudden changes in grain size. Cross-bedding is present at 8 cm and 64 cm.

COMMENTS: Slightly disturbed by drilling. Intervals 73-83 cm, 109-111 cm and 137-141 cm consist of massive vitric tuffs. We interpret the Unit to be resedimented basaltic tephra.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-27R-2 (Section top: 542.3 mbsf)

UNIT 7a: VITRIC SILTSTONE AND SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: Sequence of thinly bedded to laminated and cross-bedded vitric sandstones and siltstones. Volcanic components are very highly to completely altered.

COLOR: Claystone beds are black (N1) to grayish black (N2); the siltstone and sandstone beds are medium light gray (N6) to light gray (N7).

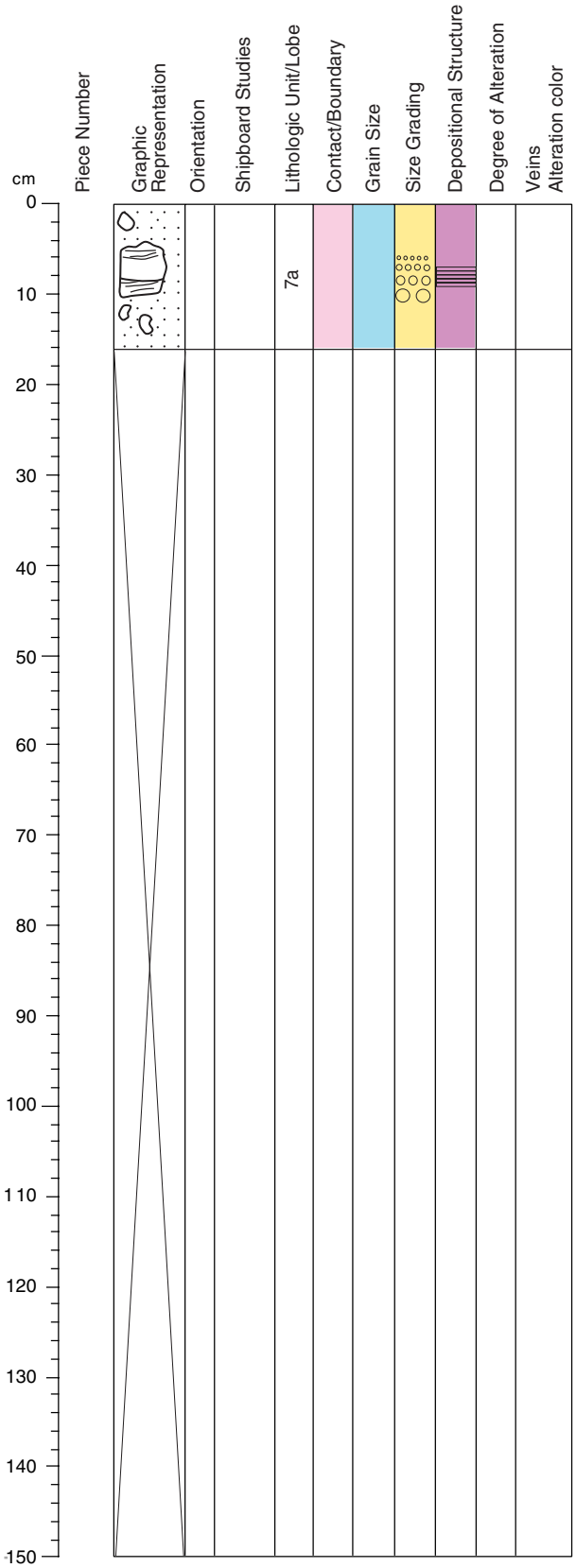
COMPONENTS: Sand to silt-sized subrounded to angular fragments of vesicular basaltic glass and sparse plagioclase crystals.

SEDIMENTARY TEXTURES: Well to moderately sorted sands and silt layers. Normally graded bedding is present at 70 cm, 84 cm, 120 cm, and 136 cm.

SEDIMENTARY STRUCTURES: The lower part of this section is characterized by the cyclical occurrence of ~2 cm thick beds of sub-cm laminae of tephra.

COMMENTS: Slightly disturbed by drilling. We interpret the Unit as resedimented basaltic tephra.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-27R-CC (Section top: 543.75 mbsf)

UNIT 7a: BEDDED VITRIC SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: Sequence of thinly bedded to laminated, vitric sandstones and siltstones. Volcanic components are very highly to completely altered.

COLOR: Claystone laminae are black (N1) to grayish black (N2); the siltstones and sandstones are medium light gray (N6) to light gray (N7).

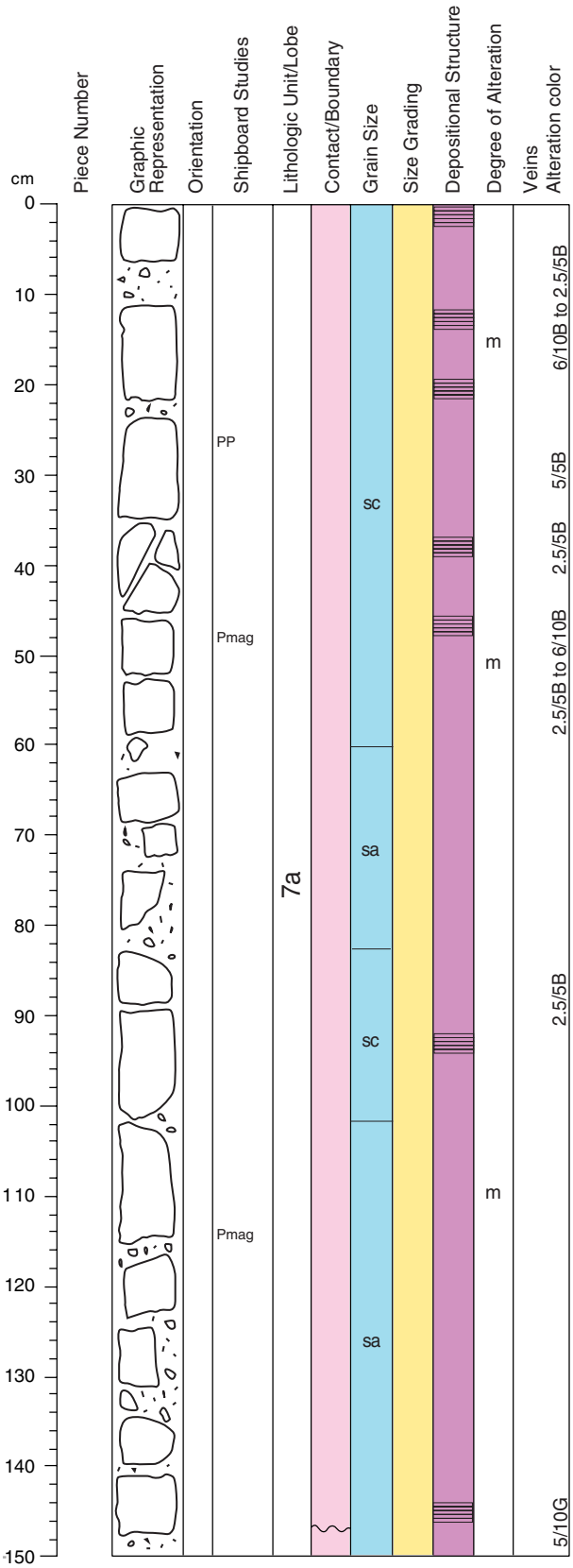
COMPONENTS: Sand to silt-sized subrounded to angular fragments of vesicular basaltic glass, along with sparse plagioclase crystals.

SEDIMENTARY TEXTURES: Well to moderately sorted sand and silt layers.

SEDIMENTARY STRUCTURES: Planar bedded with occasional cross-stratified intervals. Sequence is thinly bedded to finely laminated with distinct laminations in finer-grained intervals. Bedding is defined by sudden changes in grain size.

COMMENTS: Slightly disturbed by drilling. At 4-9 cm there is a section characterized by sub mm light-colored laminae with very disturbed material at the bottom and the top. We interpret the Unit to be resedimented basaltic tephra.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-28R-1 (Section top: 550.5 mbsf)

UNIT 7a: BEDDED VITRIC SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: Bedded vitric siltstone and sandstone.

COLOR: Black (N1), with gray (N2) intervals.

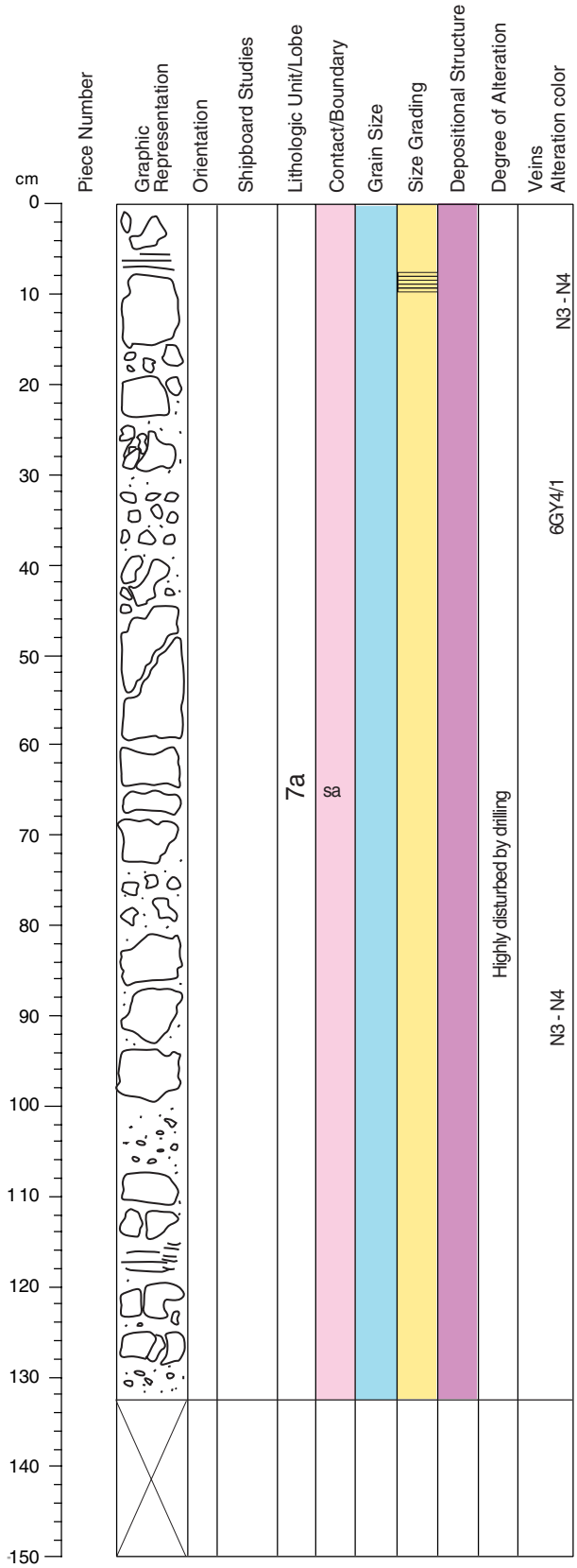
COMPONENTS: Angular to subrounded fragments (>90%) of altered glass particles (<0.5 mm) and minor (<10%) plagioclase and lithic fragments, which are very highly to completely altered.

SEDIMENTARY TEXTURES: Thinly bedded and laminated sequence, with well to moderately sorted sand and silt-sized layers. Bedding results from sudden changes in grain size from silt to sand. The dip of laminations is 0-2°.

SEDIMENTARY STRUCTURES: Loading structures are present at 146 cm.

COMMENTS: The entire section is highly disturbed by drilling. We interpret the Unit to be resedimented basaltic tephra.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-28R-2 (Section top: 552.0 mbsf)

UNIT 7a: BEDDED VITRIC SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: Bedded vitric siltstone and sandstone.

COLOR: Medium dark gray (N4) to dark gray (N3).

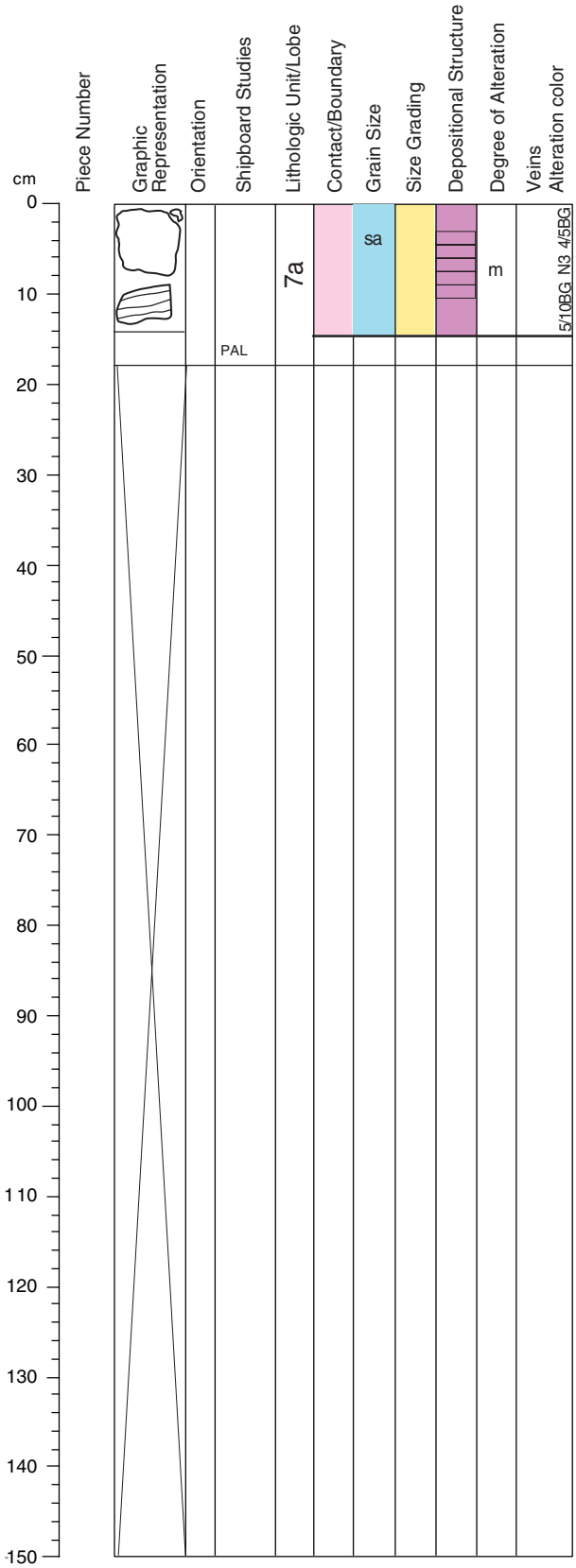
COMPONENTS: Angular to subrounded fragments (>90%) of altered glass particles (<0.5 mm) and minor (<10%) plagioclase and lithic fragments, which are very highly to completely altered.

SEDIMENTARY TEXTURES: Thinly bedded and laminated sequence, with well to moderately sorted sand and silt-sized layers. Bedding results from sudden changes in grain size from silt to sand. The dip of laminations is 0-2°. Planar laminations are present at the top of the section (10 cm).

SEDIMENTARY STRUCTURES: None.

COMMENTS: The entire section is highly disturbed by drilling. We interpret the Unit to be resedimented basaltic tephra.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-28R-CC (Section top: 553.33 mbsf)

UNIT 7a: BEDDED VITRIC SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: Volcaniclastic siltstone with some very fine sand-size grains. Volcanic components are highly to completely altered.

COLOR: Upper piece is bluish green (4/5 BG). Lower piece is mostly dusky bluish green (5/10 BG) with a bed of darker gray (N3) material at the upper end.

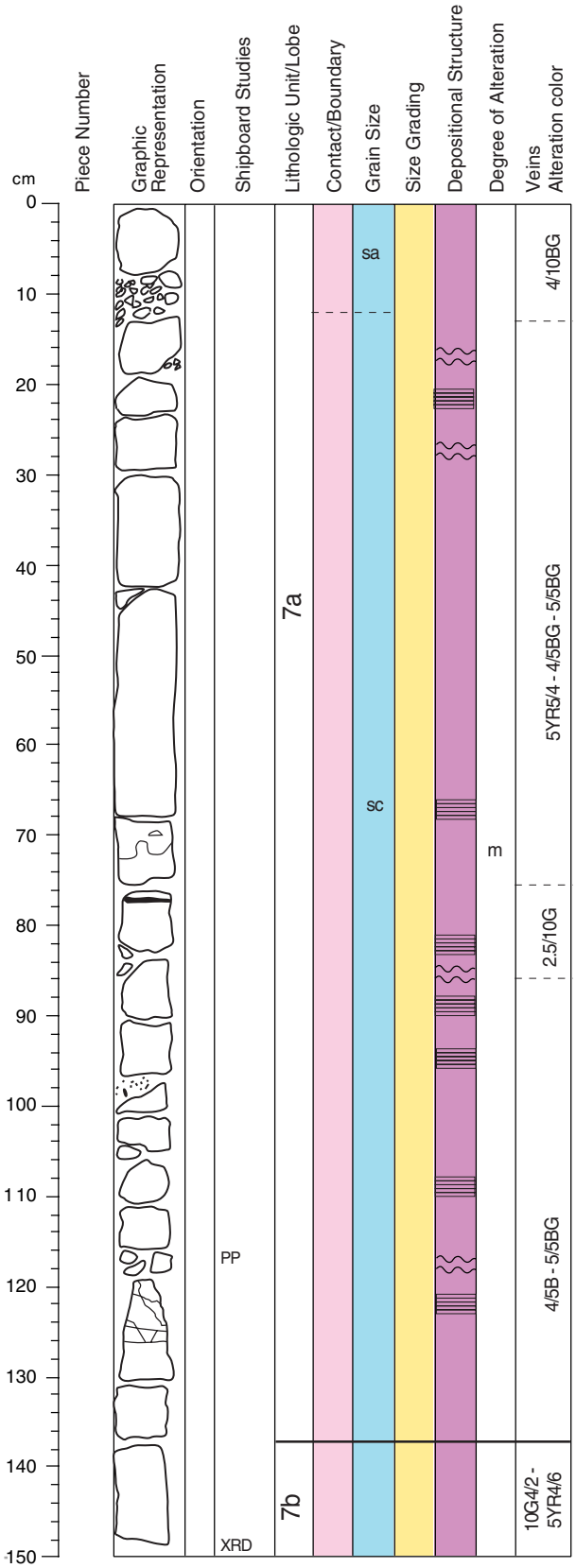
COMPONENTS: Silt-sized subrounded to angular ash-sized fragments of volcanic glass that are strongly altered.

SEDIMENTARY TEXTURES: None visible.

SEDIMENTARY STRUCTURES: Fine weakly horizontal to subhorizontal bedding in upper piece. Lower piece is more strongly bedded, especially the dark gray bed in the upper part of the lower piece.

COMMENTS: Other than two intact pieces, the core catcher material is completely disturbed by drilling. We interpret the Unit to be resedimented basaltic tephra.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-29R-1 (Section top: 560.2 mbsf)

UNIT 7a: BEDDED VITRIC SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: None observed. The boundary between Units 7a and 7b at 137 cm is defined on the basis of color differences.

GENERAL DESCRIPTION: Laminated volcaniclastic siltstone and sporadic sandstone intervals. Laminations are variably disturbed by slumping and loading, as evident from the abundance of soft sediment structures.

COLOR: Dark to light gray (2.5/10G to 5/5BG).

COMPONENTS: Poorly sorted plagioclase, glass and siltstone fragments, angular to subangular, <0.5 mm in diameter, which are very highly to completely altered.

SEDIMENTARY TEXTURES: Lamination is defined by variations in the grain size.

SEDIMENTARY STRUCTURES: Slumping and escape structures are present at 13-28 cm, and loading structures at 72-74 cm and 85-90 cm. Faulting of laminations is present at 80 84 cm.

COMMENTS: Subunit 7a is interpreted as representing resedimented basaltic tephra. We interpret the Unit to be resedimented basaltic tephra.

UNIT 7b: LAMINATED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core (139-149 cm).

CONTACTS: None observed. The boundary between Units 7a and 7b at 137 cm is defined on the basis of color differences.

GENERAL DESCRIPTION: Laminated volcaniclastic siltstone.

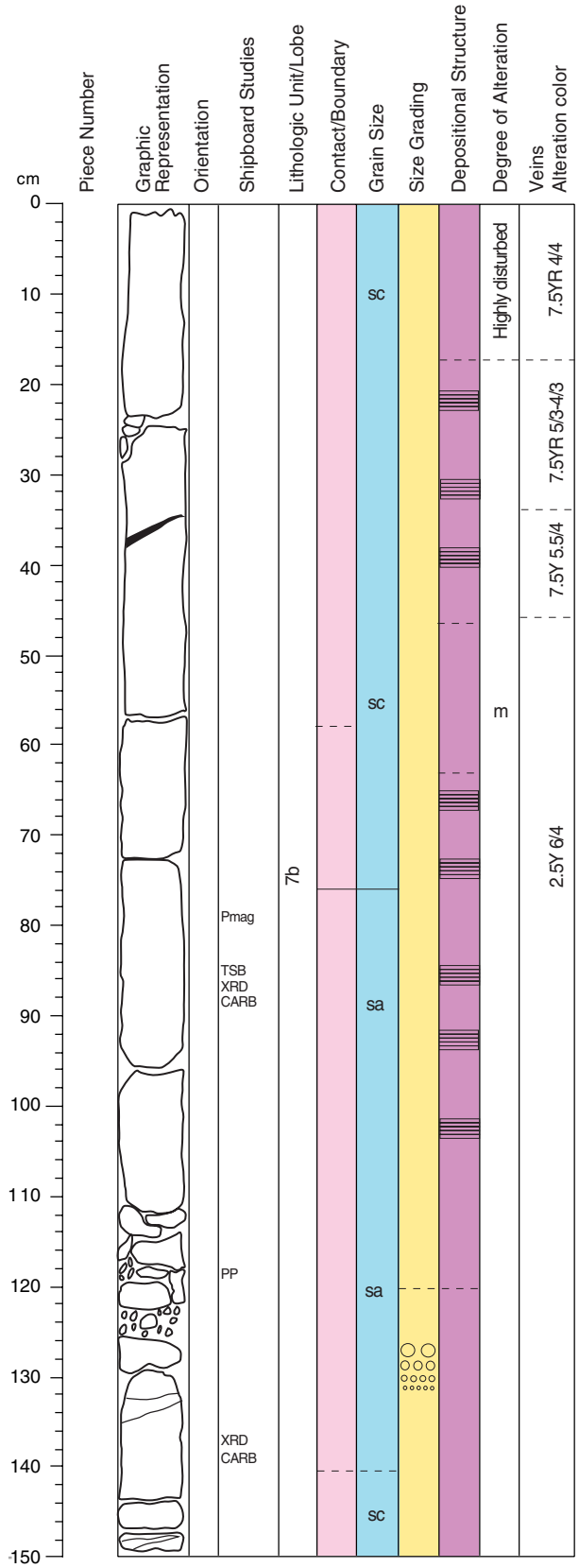
COLOR: Green to orange (10G 4/2 to 5YR 4/6).

COMPONENTS: Contains altered glass and lesser amounts of plagioclase fragments < 0.2 mm in diameter, along with some carbonate.

SEDIMENTARY TEXTURES: Moderately sorted silt to fine sand.

SEDIMENTARY STRUCTURES: Indistinct laminations.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-29R-2 (Section top: 561.7 mbsf)

UNIT 7b: LAMINATED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: None observed.

GENERAL DESCRIPTION: Laminated volcaniclastic siltstone.

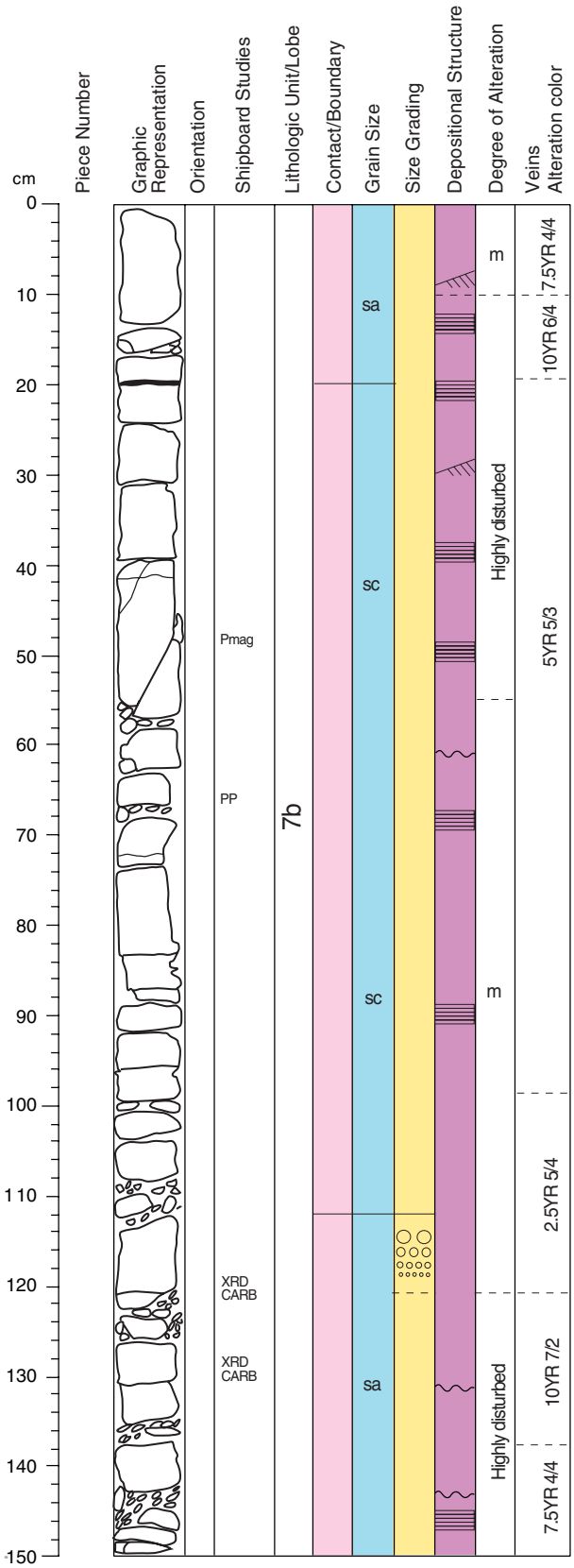
COLOR: Green to orange (10G 4/2 to 5YR 4/6).

COMPONENTS: Contains altered glass and lesser amounts of plagioclase fragments < 0.2 mm in diameter, along with some carbonate.

SEDIMENTARY TEXTURES: Moderately sorted silt to fine sand.

SEDIMENTARY STRUCTURES: Indistinct laminations.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-29R-3 (Section top: 563.2 mbsf)

UNIT 7b: LAMINATED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: None observed.

GENERAL DESCRIPTION: Laminated volcaniclastic siltstone.

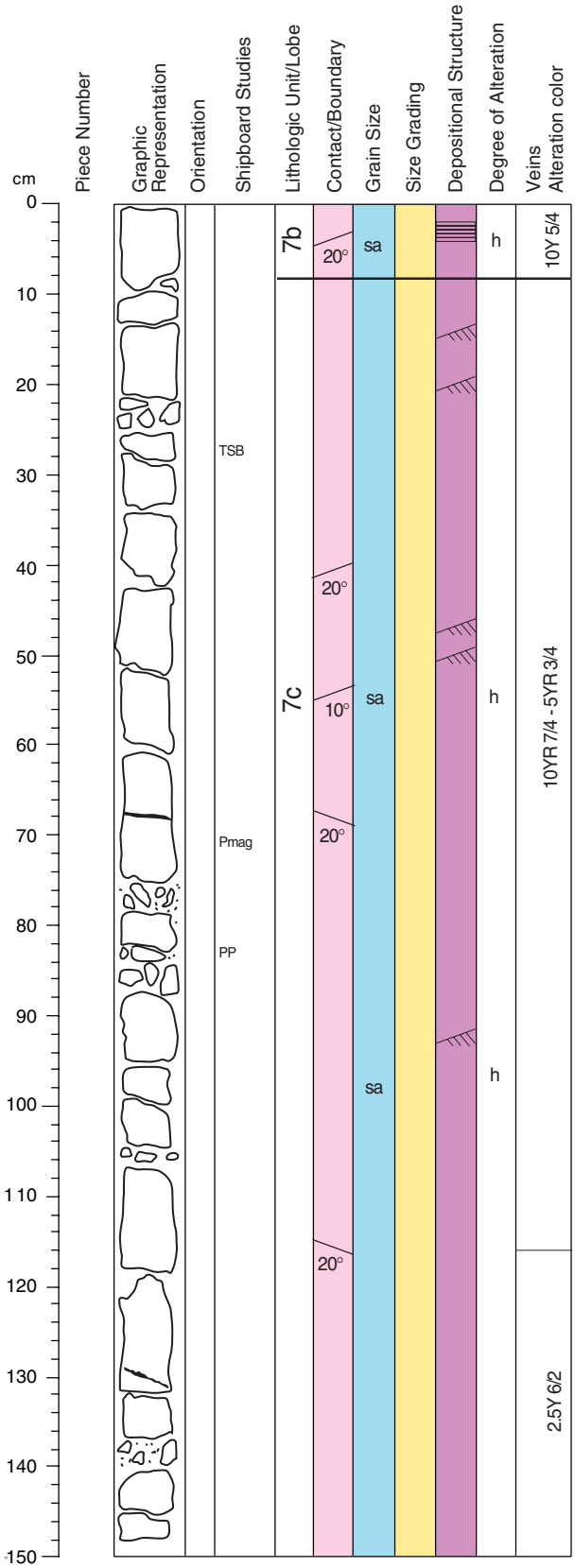
COLOR: Green to orange (10G 4/2 to 5YR 4/6).

COMPONENTS: Contains altered glass and lesser amounts of plagioclase fragments < 0.2 mm in diameter, along with some carbonate.

SEDIMENTARY TEXTURES: Moderately sorted silt to fine sand.

SEDIMENTARY STRUCTURES: Indistinct laminations.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-29R-4 (Section top: 564.7 mbsf)

UNIT 7b: LAMINATED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: Sediment interval from 0-8 cm.

CONTACTS: Sharp. Upper contact is not in this Section, but lower contact is marked by a 0.5 cm-thick medium brown vein that dips 20° at 8 cm.

GENERAL DESCRIPTION: Coarse volcaniclastic sandstone with indistinct planar bedding.

COLOR: Pale yellowish orange (10YR 8/6) with a vein of light olive green (10Y 5/4) at 10 cm. These are the bulk colors, which are the results of lighter colored fragments in a darker colored matrix.

COMPONENTS: Glass and minor lithic fragments, angular to subangular, <0.5 mm in diameter.

SEDIMENTARY TEXTURES: Coarse ash, moderately sorted.

SEDIMENTARY STRUCTURES: Weak planar bedding <1 cm thick and horizontal.

COMMENTS: Unit 7b continues from Section 3. The boundary between Units 7b and 7c at 10 cm is defined largely on the basis of color differences.

UNIT 7c: BASALT-TUFF.

Pieces: Sediment interval from 8 cm to bottom of Section.

CONTACTS: Sharp. Lower contact is not in this Section, but upper contact is marked by a
0.5 cm-thick finely laminated interval that dips 20°.

GENERAL DESCRIPTION: Massive coarse-grained basaltic tuff.

COLOR: Interval of 10-116 cm is grayish orange (10YR 7/4) with a vein of brown (5YR 3/4) at 68 cm. From 116 cm to the bottom of the Section is dark greenish gray (5G 6/1). These are the bulk colors, which are the results of lighter colored fragments in a darker colored matrix.

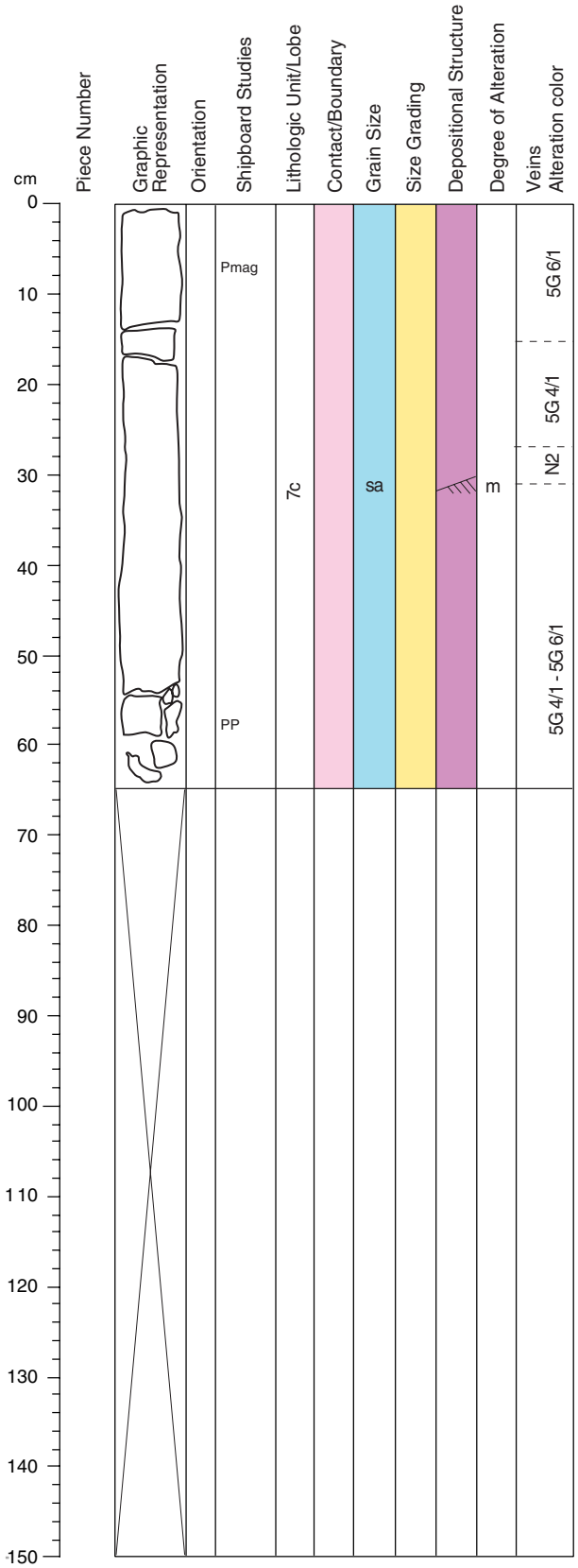
COMPONENTS:
90%: Vesicle-free to sparsely vesicular basalt glass, <2 mm in size.
5%: Plagioclase crystals.
3%: Lithic fragments.
2%: Secondary carbonate.

SEDIMENTARY TEXTURES: Moderately sorted medium to very coarse ash. The lower boundary of the coarser beds tend to be more distinct than the upper boundary, suggesting normal grading, although it is not obvious.

SEDIMENTARY STRUCTURES: Massive with occasional planar beds 1-4 cm thick and dipping 10-20°.

COMMENTS: Unit 7c continues into Section 29R-5. The boundary between Units 7b and 7c at 10 cm is defined largely on the basis of color differences. We interpret the Unit to be a hyaloclastite tuff.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-29R-5 (Section top: 566.2 mbsf)

UNIT 7c: BASALT-TUFF.

Pieces: Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: Massive fine-grained basaltic tuff. Coarser grained in the middle of the section (~30 cm).

COLOR: Greenish gray (5G 6/1) to dark greenish gray (5G 4/1) and gray black (N2), alternating thorough the section.

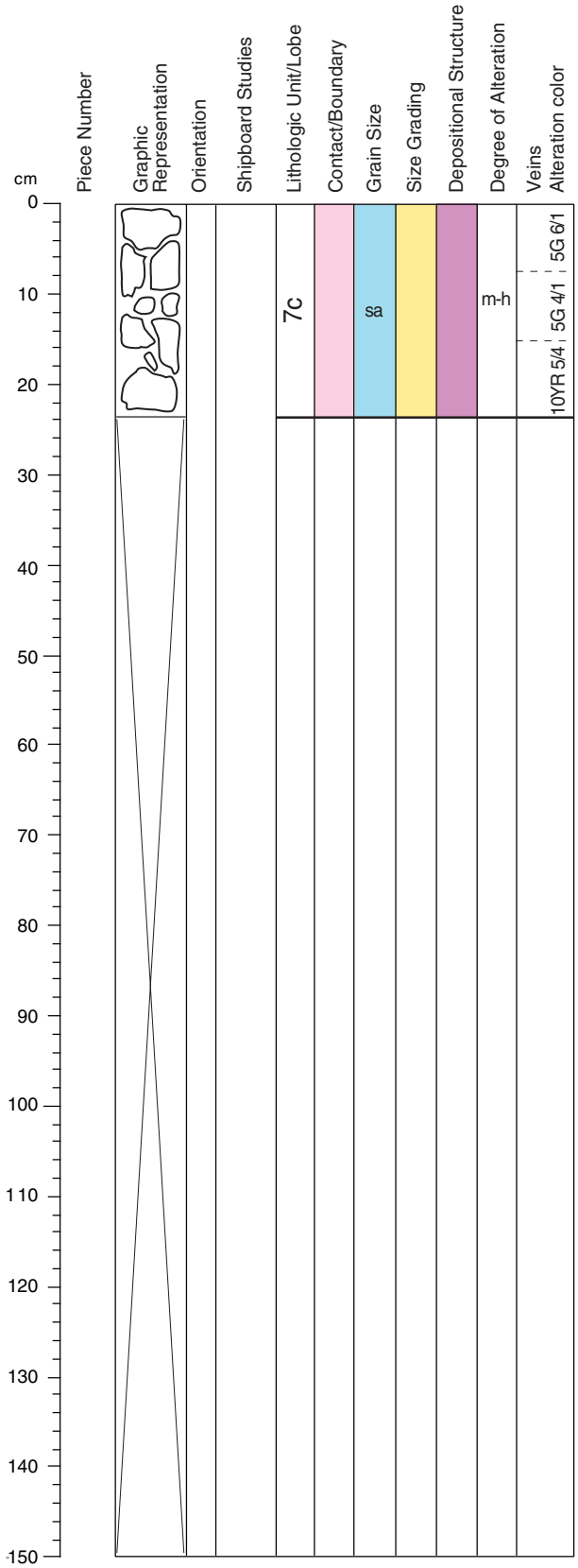
COMPONENTS:
90%: Vesicle free to sparsely vesicular basalt glass, <2 mm in size.
5%: Plagioclase crystals.
3%: Lithic fragments.
2%: Secondary carbonate.

SEDIMENTARY TEXTURES: Fine grained to more coarsely grained in the middle of the section.

SEDIMENTARY STRUCTURES: Massive. Cross bedding is present at 32 cm.

COMMENTS: We interpret the unit to be a hyaloclastite tuff.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-29R-6 (Section top: 566.85 mbsf)

UNIT 7c: BASALT-TUFF.

Pieces: Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: Massive basaltic tuff. Color change at the bottom of the section (last piece).

COLOR: Greenish gray (5G 6/1) to dark greenish gray (5G 4/1). Bottom piece is yellowish brown (10YR 5/4).

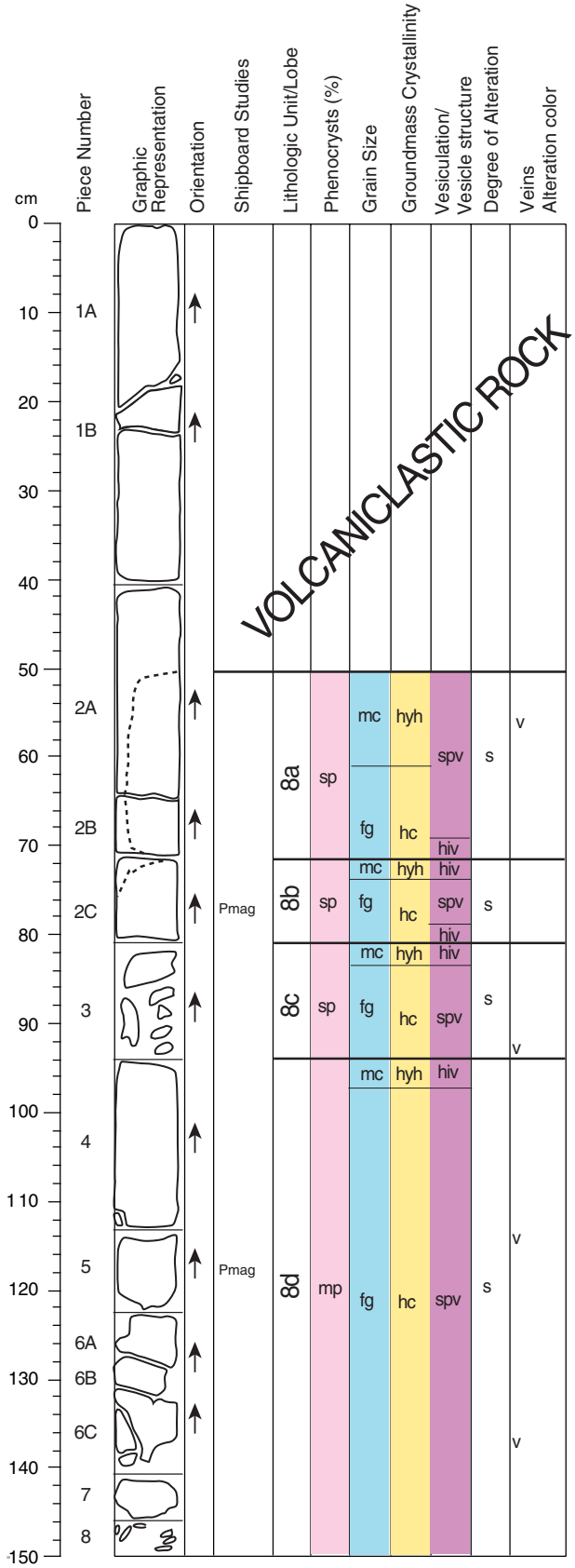
COMPONENTS:
90%: Vesicle free to sparsely vesicular basalt glass, <2 mm in size.
5%: Plagioclase crystals.
3%: Lithic fragments.
2%: Secondary carbonate. o coarse tuff/ash.

SEDIMENTARY TEXTURES: Moderately sorted fine to coarse ash.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: We interpret the Unit to be a hyaloclastite tuff.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-30R-1 (Section top: 569.8 mbsf)

UNIT 8: HIGHLY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 2-8

CONTACTS: Sharp, nonplanar contact between basalt and overlying vitric tuff present in Pieces 2 and 3. Transition zone above of hyaloclastite with calcite cement located between 35-76 cm (Pieces 1 and 2). Basalt begins at 50 cm. Documented in Photos 1203-1 to 1203 5.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10	5	<1	1.5	Anhedral
Olivine:	2	2	<1	1	Euhedral; equant

GROUNDMASS: Aphanitic and hypohyaline (lobe margins) to fine grained and holocrystalline (lobe interiors) with intermediate variolitic textures. The fine-grained regions contain plagioclase, clinopyroxene, black oxides and interstitial altered glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Near lobe margins (e.g., Piece 3, 97 cm)	4-6	5	1	2	Elongate
Lobe interiors	0-1	1	<1	<1	Round

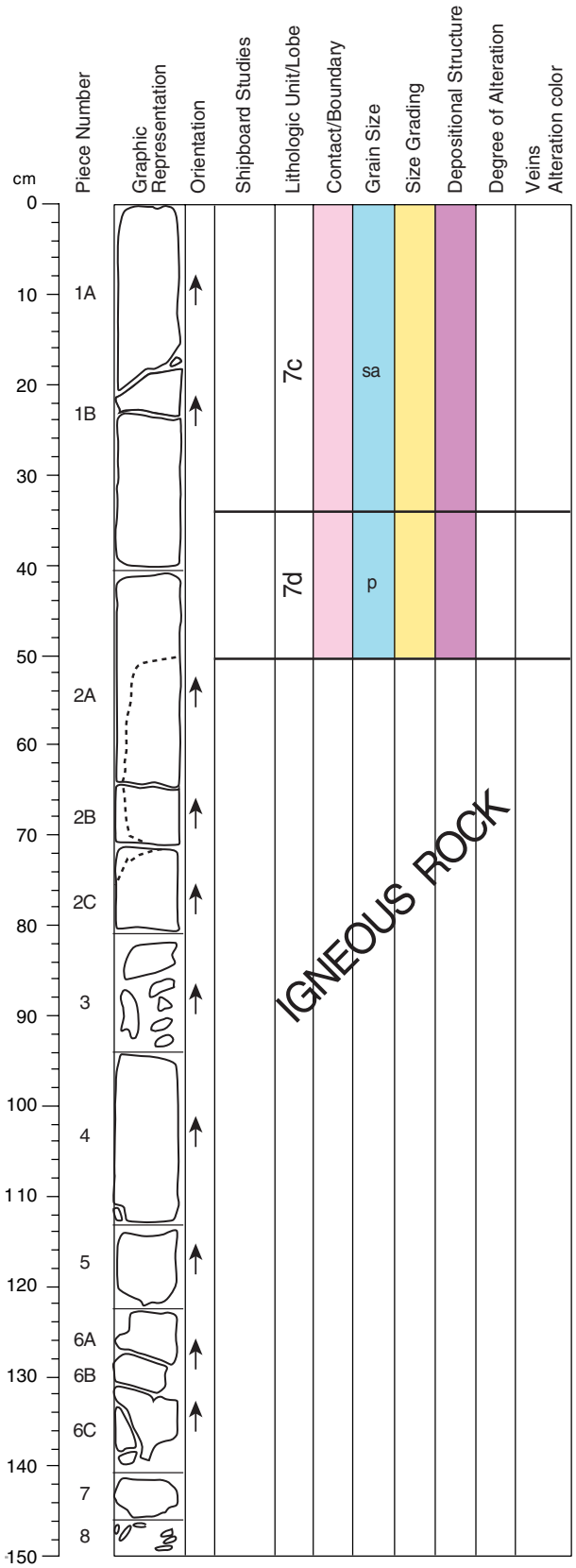
COLOR: Medium dark gray (N7) near lobe interiors to pale yellowish brown (10YR 6/2) near glassy lobe margins.

STRUCTURE: Consists of lobes ~30 cm in diameter. Individual lobes are defined on the basis of changes in grain size, vesicularity, and the presence of glassy margins. Glassy lobe margins preserved in Pieces 2, 3, and 4.

ALTERATION: Slight. Orange brown Fe-oxyhydroxide alteration is present adjacent to lobe margins and veins. Olivine is replaced by Fe-oxyhydroxide, dark greenish black clay and carbonate.

VEINS/FRACTURES: Sparsely veined. Moderately to highly veined near glassy lobe margins (e.g., Piece 6 at 140 cm). Polygonally oriented veins 1-3 cm apart and <1-3 mm wide are present in Pieces 1 and 2 near lobe margins, and are filled with carbonate.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-30R-1 (Section top: 569.8 mbsf)

UNIT 7c: BASALT-TUFF.

Pieces: 1, interval 0-36 cm.

CONTACTS: Gradational contact between vitric tuff at 32-36 cm; inclined dip (30°). The lower contact with basaltic lava (~50 cm) is sharp. This contact changes from horizontal to vertical along side of lobe (Photos 1203-1 to 1203-5).

GENERAL DESCRIPTION: Massive, moderately to well-sorted, medium to very coarse grained basalt hyaloclastite tuff, consisting of angular splinter-like clasts in a crystalline calcite cement. Contains dispersed moderately highly vesicular glass particles (tephra clast) and nonvesicular to moderately vesicular lava(?) fragments. The texture of deposit and clast morphologies are well preserved despite strong alteration.

COLOR: Light olive brown (2.5Y 5/4) to pale olive brown (5Y 6/4).

COMPONENTS:
>90%: Angular, equant to tabular, splinter-like non- to sparsely vesicular plagioclase-phyric basalt glass particles.
2-3%: Non- to moderately vesicular microcrystalline lava clasts, containing spherical vesicles <1 mm. Plagioclase laths are present in the groundmass.
<3%: Feldspar crystals.
<1%: Highly vesicular basalt glass particles (1-3 mm) with spherical vesicles <1 mm.

SEDIMENTARY TEXTURES: Sorting is good to moderate. Grain size is medium to very coarse ash (0.25-2 mm).

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: Glass and microcrystalline particles are strongly altered; plagioclase crystals are unaltered. The dominance of splintery clasts indicate origin by quenched fragmentation as lava came in contact with water. The presence of minor amounts of microcrystalline lithic clasts and feldspar crystals is consistent with this interpretation. However, highly vesicular basalt tephra clasts suggest derivation from a contemporary subaerial source.

UNIT 7d: HYALOCLASTITE TUFF[1].

Pieces: 1 (36-50 cm)[2]

CONTACTS: Sharp contact with glassy lobe margin of the underlying basalt.

GENERAL DESCRIPTION: Massive, moderately well sorted hyaloclastite, coarsening downwards from coarse ash to medium lapilli at contact with the underlying lava. Deposit consists of many angular non- to sparsely vesicular, equant to shard-like fragments, and features jigsaw-fit clasts within 2 cm of lobe contact. The Unit (along with 7c) is hyaloclastite tuff and lapilli tuff, formed by quench fragmentation of underlying lava.).

COLOR: Dark gray brown (2.5Y 4/2).

COMPONENTS:
>90%: Angular basalt glass particles and shards.
<5%: Non- to moderately vesicular cognate lava fragments.
<3%: Highly vesicular basalt tephra clasts.
<2%: Feldspar crystals

SEDIMENTARY TEXTURES: Grain size is coarse ash to medium lapilli, and there is normal graded bedding between the two. Sorting is moderate.

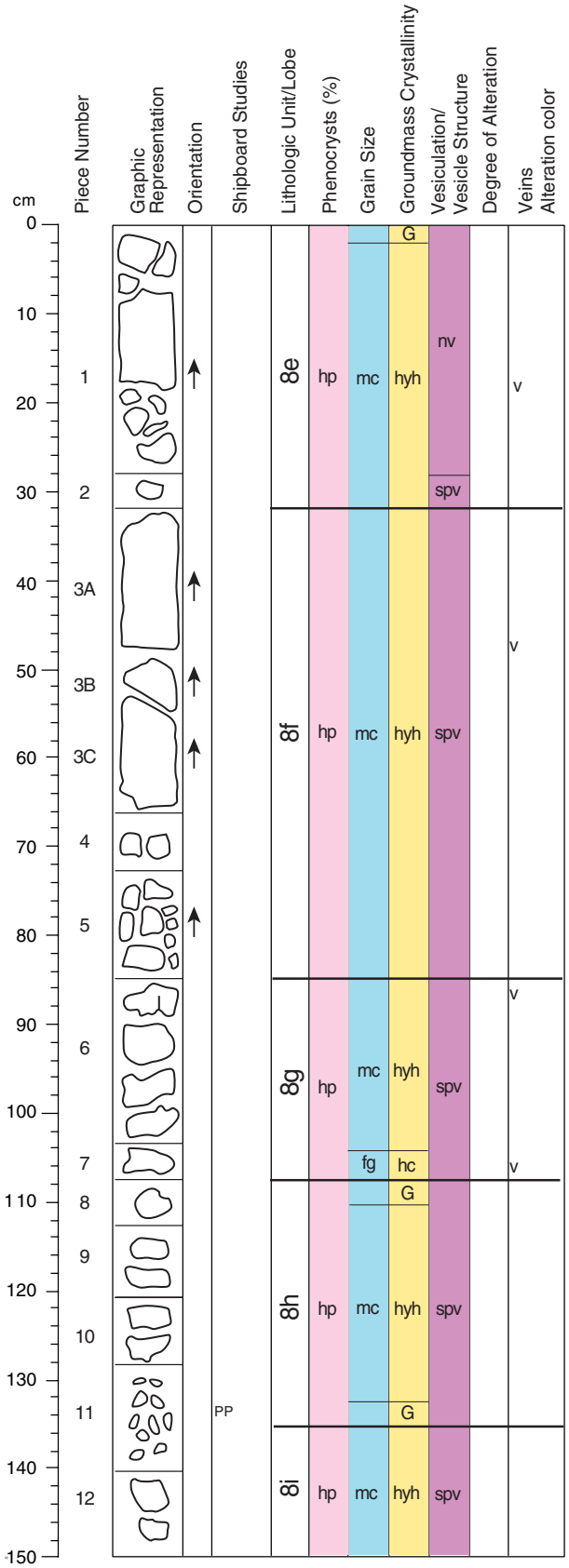
SEDIMENTARY STRUCTURES: Massive.

COMMENTS: Pieces 2A-2C show a snapshot of the process of spalling of glassy lobe margins into hyaloclastite. 0.5-2 cm jigsaw-fit lava and glass fragments grade outwards into <5 mm equant to elongate shard-like fragments. Photos 1203-1 to 1203-5 of lava-hyaloclastite contact.

[1]Clearly formed by quenched fragmentation of the underlying lava.

[2]The contact extends from 50-75 cm along the edge of Pieces 2A to 2C

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-30R-2 (Section top: 571.3 mbsf)

UNIT 8: HIGHLY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-12

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10	6	<1	1.5	Anhedral
Olivine:	2	2	<1	1	Euhedral; equant

GROUNDMASS: Aphanitic and hypohyaline (lobe margins) to fine grained and holocrystalline (lobe interiors) with intermediate variolitic textures. The fine-grained regions contain plagioclase, clinopyroxene, black oxides, and interstitial altered glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Near lobe margins (e.g., Piece 6A, 90 cm)	4-6	5	1	2	Elongate
Lobe interiors	0-1	1	<1	<1	Round

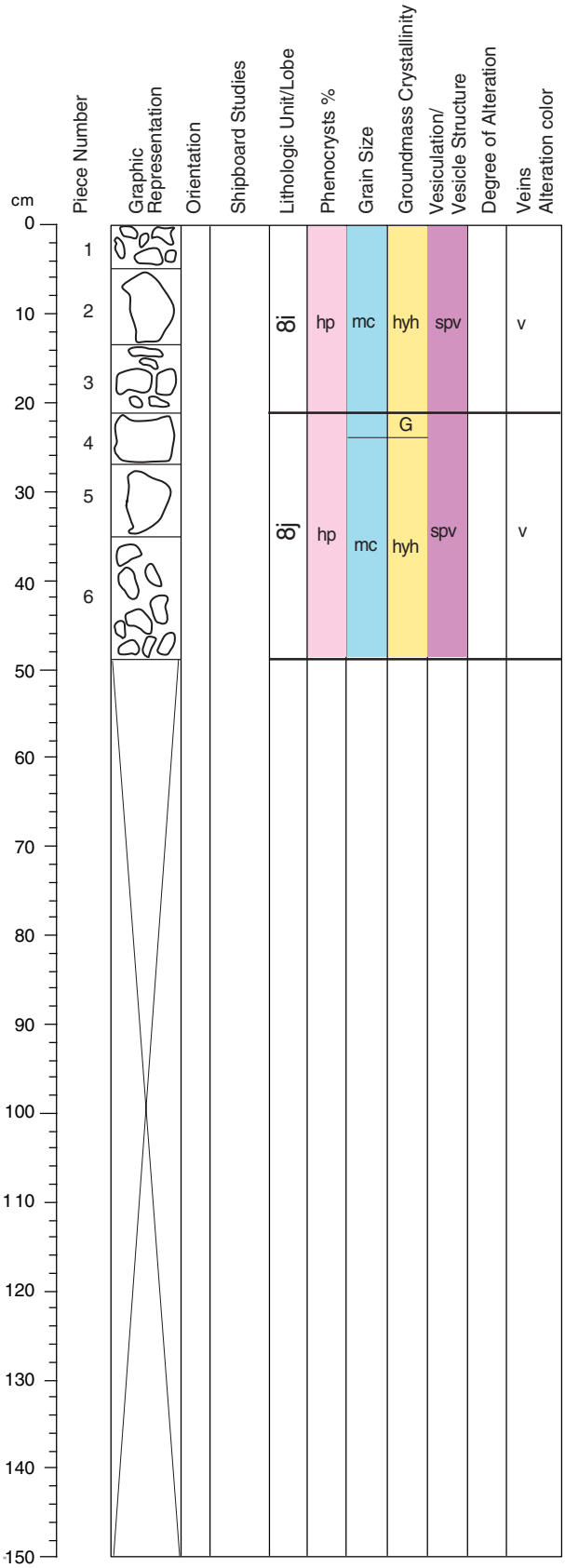
COLOR: Medium dark gray (N7) near lobe interiors to pale yellowish brown (10YR 6/2) near glassy lobe margins.

STRUCTURE: Consists of lobes ~30 cm in diameter. Individual lobes are defined on the basis of changes in grain size, vesicularity, and the presence of glassy margins. Glassy lobe margins preserved in Pieces 1 (29 cm), 2 (36 cm), 6 (90 cm) and 9 (117 cm).

ALTERATION: Slight. Orange-brown Fe-oxyhydroxide alteration is present adjacent to lobe margins and veins. Olivine is replaced by Fe-oxyhydroxide, dark greenish black clay, and carbonate.

VEINS/FRACTURES: Sparsely to moderately veined. Polygonally spaced veins 3-6 cm apart and <1-5 mm wide present in Pieces 3A and 3B (38-67 cm) in lobe interiors, and radial veins 3 mm wide present at lobe margins (Piece 6). Veins filled with carbonate and clays. Piece 7 consists solely of a 50 mm wide pale yellowish green (10GY 7/2), light bluish gray (5B 7/1) and white (N9) carbonate vein.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-30R-3 (Section top: 572.8 mbsf)

UNIT 8: HIGHLY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-6

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10	6	<1	1.5	Anhedral
Olivine:	2	2	<1	1	Euhedral; equant

GROUNDMASS: Fine grained and holocrystalline. Groundmass contains plagioclase, clinopyroxene, black oxides, and interstitial altered glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	0-1	1	<1	<1	Round

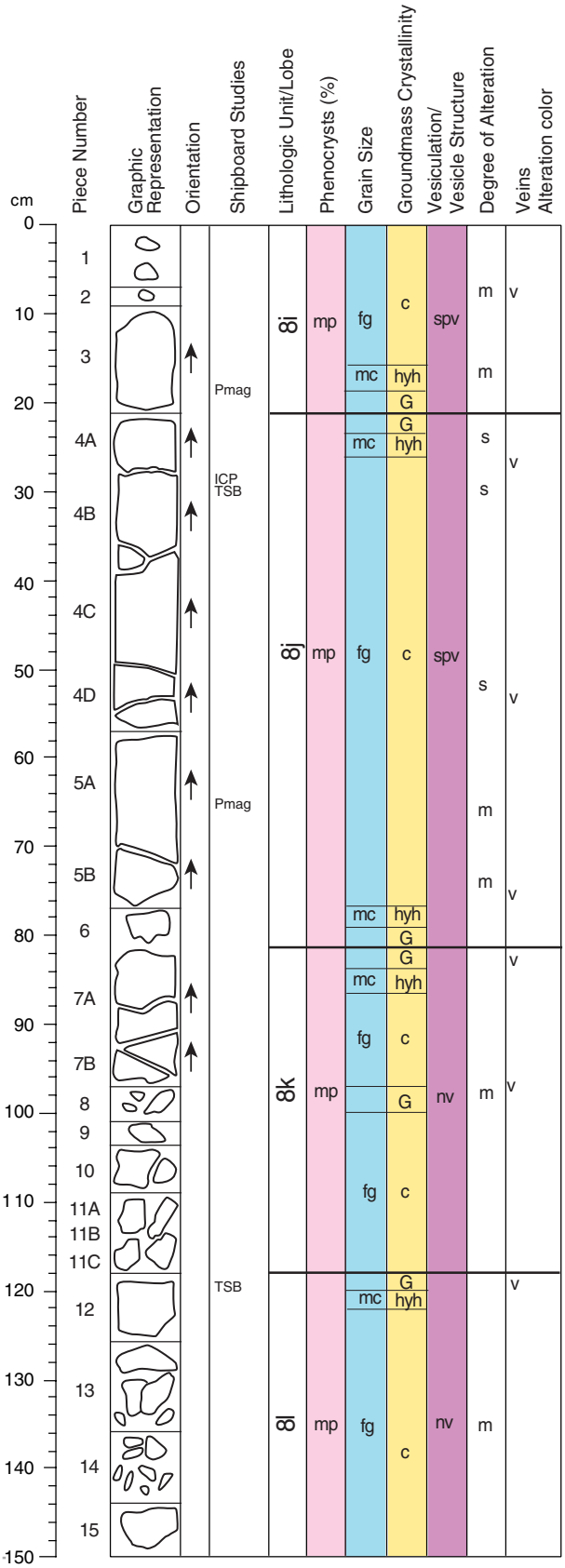
COLOR: Medium dark gray (N7).

STRUCTURE: Massive.

ALTERATION: Slight. Olivine is replaced by Fe-oxyhydroxide, dark greenish black clay, and carbonate.

VEINS/FRACTURES: Sparsely veined. Veins filled with brown clays and carbonate.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-31R-1 (Section top: 579.4 mbsf)

UNIT 8: HIGHLY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-15

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10	3	<1	1.5	Anhedral
Olivine:	2	1	<1	1	Euhedral; equant

GROUNDMASS: Aphanitic and hypohyaline (lobe margins) to fine grained and holocrystalline (lobe interiors) with intermediate variolitic textures. The fine-grained regions contain plagioclase, clinopyroxene, black oxides, and interstitial altered glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Near lobe margins (e.g., Piece 4, 23 cm)	4-6	5	1	2	Elongate
Lobe interiors	0-1	1	<1	<1	Round

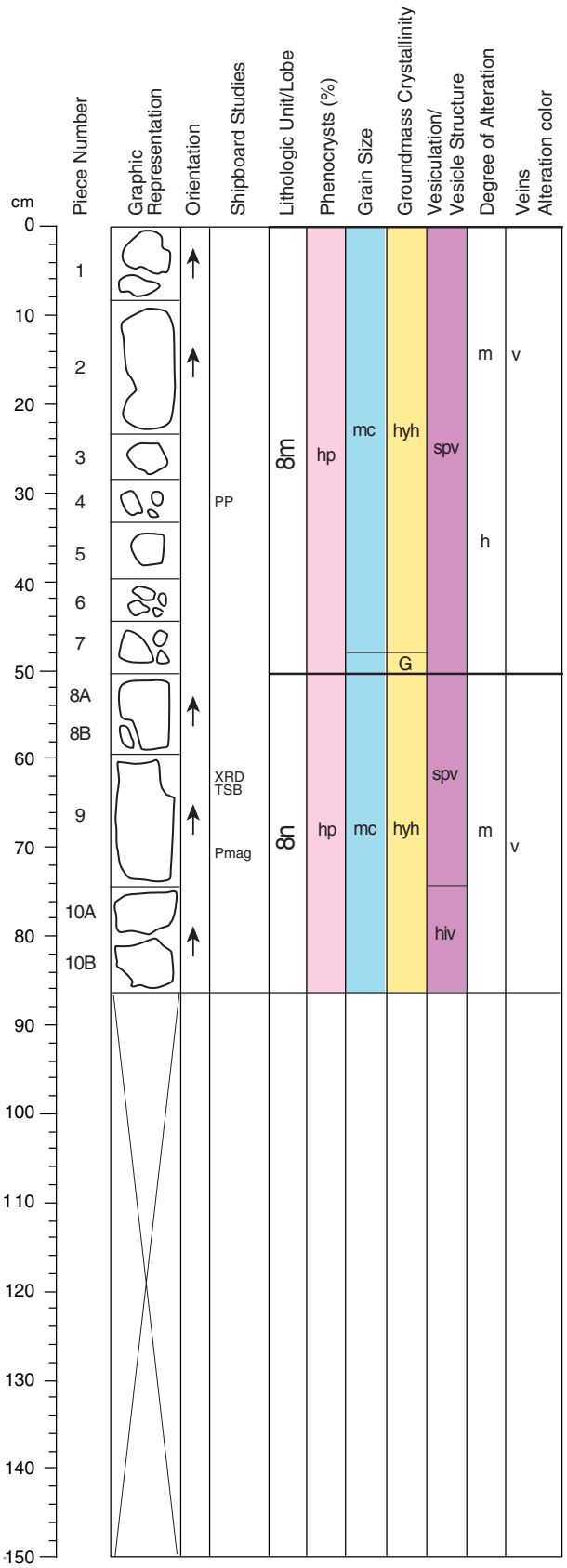
COLOR: Medium dark gray (N7) near lobe interiors to pale yellowish brown (10YR 6/2) near glassy lobe margins.

STRUCTURE: Consists of lobes ~30 cm in diameter. Individual lobes are defined on the basis of changes in grain size, vesicularity, and the presence of glassy margins. Lobe margins preserved in Pieces 3 (21 cm), 4 (23 cm), 6 (81 cm), 7, 12 (120 cm) and 13.

ALTERATION: Slight to moderate. Orange brown Fe-oxyhydroxide alteration is present adjacent to lobe margins (e.g., Piece 7, 97 cm) and veins. Olivine is replaced by Fe oxyhydroxide, dark greenish black clay, and carbonate.

VEINS/FRACTURES: Sparsely to moderately veined. Thin (<2 mm) veins bisect Pieces 5 and 7 and are filled with carbonates and clays. A thick (20 mm) white (N9) vein is present in Piece 8 and consists of coarse (>10 mm) carbonate.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-31R-2 (Section top: 580.9 mbsf)

UNIT 8: HIGHLY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1-10

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10	3	<1	1.5	Anhedral
Olivine:	2	1	<1	1	Euhedral; equant

GROUNDMASS: Aphanitic and hypohyaline (lobe margins) to fine grained and holocrystalline (lobe interiors) with intermediate variolitic textures. The fine-grained regions contain plagioclase, clinopyroxene, black oxides and interstitial altered glass.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Near lobe margins (e.g., Piece 10B)	4-6	5	1	2	Elongate
Lobe interiors	0-1	1	<1	<1	Round

COLOR: Medium dark gray (N7) near lobe interiors to pale yellowish brown (10YR 6/2) near glassy lobe margins.

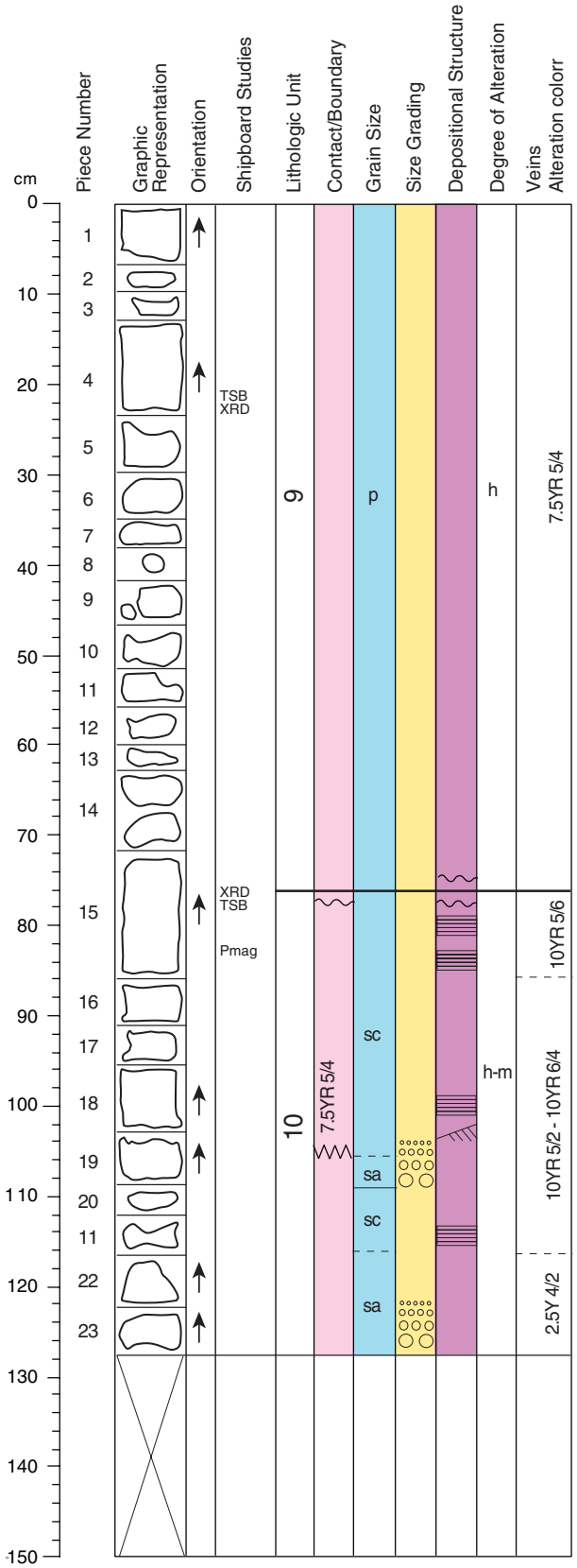
STRUCTURE: Consists of lobes ~30 cm in diameter. Individual lobes are defined on the basis of changes in grain size, vesicularity, and the presence of glassy margins. Lobe margins preserved in Pieces 2 and 10B.

ALTERATION: Slight to moderate. Orange brown Fe-oxyhydroxide alteration is present adjacent to lobe margins and veins. Olivine is replaced by Fe-oxyhydroxide, dark greenish black clay, and carbonate.

VEINS/FRACTURES: Sparsely to moderately veined. Thin polygonally oriented (<2 mm) veins bisect Pieces 3 and 9 and are filled with carbonates and clays. A thick (20 mm) white (N9) carbonate vein is present at the lobe margin (Piece 2).

COMMENTS: Plagioclase glomerocrysts appear to be larger (<6 mm) and more abundant near lobe margin in Piece 10B.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-32R-1 (Section top: 589.0 mbsf)

UNIT 9: BASALT-LAPILLI TUFF.

Pieces: 1-15

CONTACTS: The contact between Units 8 and 9 was not recovered. The contact between Units 9 and 10 is present at 77 cm and is sharp, undulating, with occasional load structures.

GENERAL DESCRIPTION: Strongly altered, massive, clast-supported basalt lapilli tuff, consisting of angular, moderately to highly vesicular lapilli clasts with straight to convoluted outlines. The deposit is monomictic, consisting of finely vesicular, basalt glass, and are multicolored due to alteration processes. The cement is not carbonate and may be silica.

COLOR: Brown (7.5Y 5/4).

COMPONENTS:
>95%: Relict vesicular mafic tephra clasts consisting of 25%-75% spherical to elongate (stretched) vesicles.
<5%: Lithic clasts.

SEDIMENTARY TEXTURES: The unit is moderately sorted, clast supported, and the grain size is fine to medium lapilli (2-15 mm) with occasional >25 mm clasts.

SEDIMENTARY STRUCTURE: Massive.

COMMENTS: We interpret the Unit to be a near-vent scoria-fall deposit.

UNIT 10: BEDDED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: 15-23

CONTACTS: Upper contact is sharp and convoluted with loading structures at 77 cm. The lower contact is present in Section 32R-2.

GENERAL DESCRIPTION: Planar to cross bedded, volcaniclastic silt-sandstone with two primary ash fall layers.

COLOR: Grayish orange (10YR 7/4) to olive green (5Y 6/2).

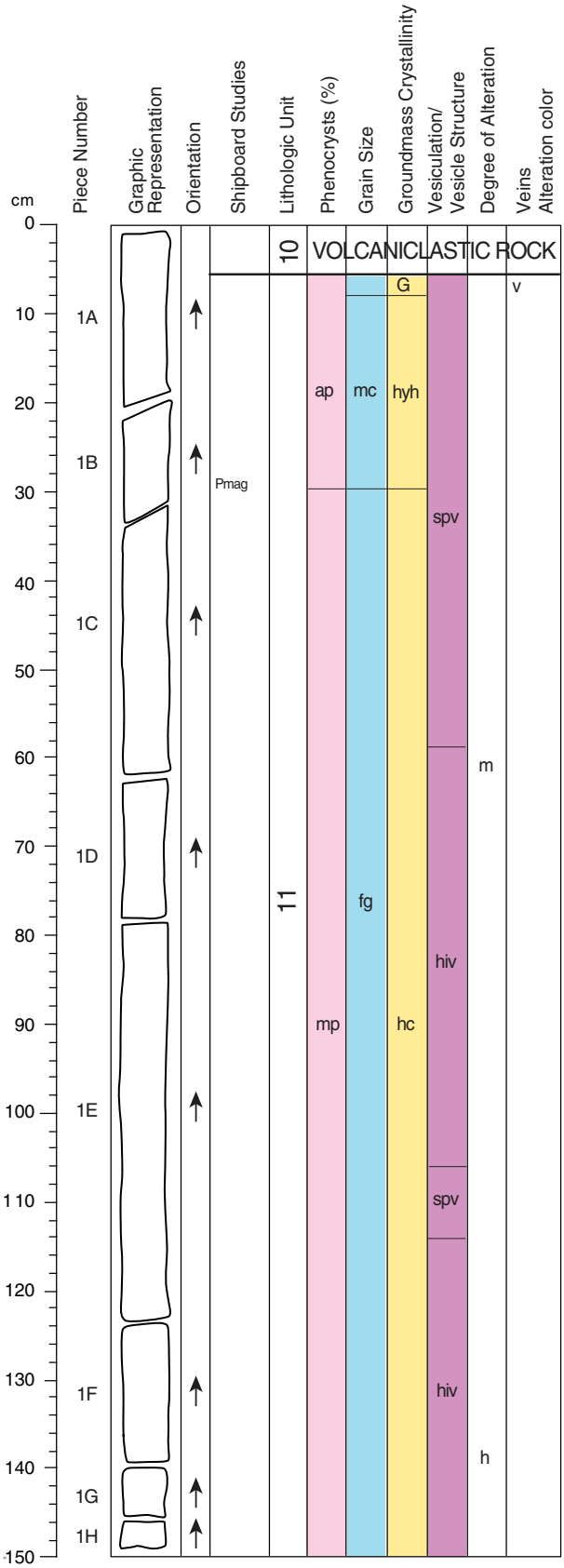
COMPONENTS: Range from vesicular basaltic glass fragments to rock fragments and silt-clay materials.

SEDIMENTARY TEXTURES: Grain size varies between silt-size layers and fine to coarse sand-size layers.

SEDIMENTARY STRUCTURE: Finely to moderately thinly bedded. Bedding planes dip at 4-6°. Sedimentary load structures are present at the upper contact, where the upper lapilli tuff sinks into the lower silty layer.

COMMENTS:
Piece 15A (78-80 cm): Siltstone layer containing highly vesicular, 1-3 mm mafic tephra clasts that are dispersed evenly throughout. Piece 19A (106-108 cm): Pale reddish brown vitric tuff consisting of strongly vesicular mafic tephra clasts. Piece 22-23 (116-127 cm): Olive green vitric tuff, as in Piece 19A. Continues into 32R-2 where it rests directly on the pahoehoe lava flow top.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-32R-2 (Section top: 590.28 mbsf)

UNIT 11: OLIVINE- PLAGIOCLASE-PHYRIC BASALT(*).

Pieces: 1

CONTACTS: Unit begins at 5 cm. Slightly undulating sharp contact on a mm scale with overlying Unit 10. A thin (1 mm) glassy lobe margin is present immediately below the contact.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:					
0-56 cm:	5-7	3	<1	2	Subhedral; glomerocrystic
56-150 cm:	1	4	<1	1.5	Subhedral; glomerocrystic

GROUNDMASS: Fine grained and holocrystalline. Consists of plagioclase, clinopyroxene, and olivine microphenocrysts.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
0-56 cm:	5-7	<1		<1	Round
56-60 cm:	1-2	<1		<1	Round
60-150 cm:	~20	<10	2	5	Round

COLOR: Gray black (15Y 2.5/2).

STRUCTURE: Massive.

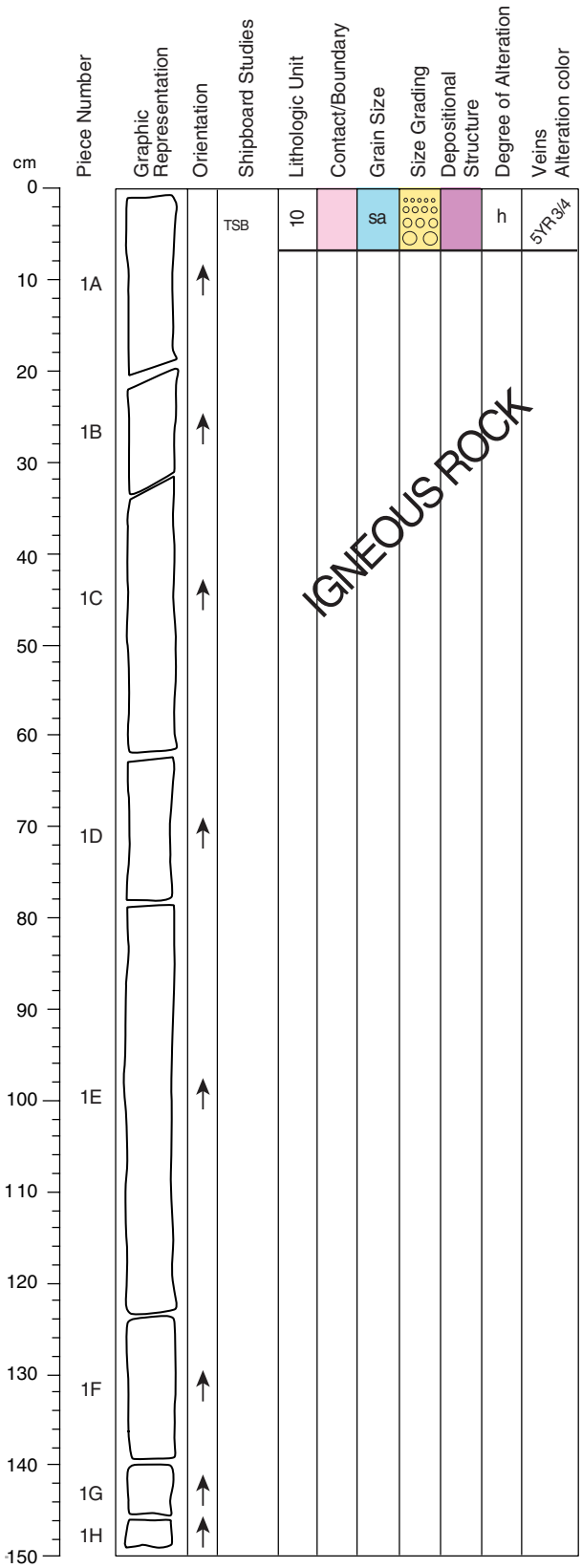
ALTERATION: Slight.

VEINS/FRACTURES: Sparsely veined. Veins are present from 0-10 cm and filled with carbonate and brown green clays.

COMMENTS: One megavesicle is present at 10 cm. It is round and partially filled with coarse calcite; irregular central vug remains unfilled. A segregation vesicle is present at 119 cm, irregular in shape, and <7 mm in length.

The entire unit (including Sections 32R-3, 32R-4, and 32R-5) is interpreted as representing a complete section through inflated pahoehoe sheet lobe (Fig. Exp-D-4). Presence of segregation/megavesicle at 71 cm denotes transition zone from upper lava crust above to massive lava interior (commences in Section 32R-3) below.
*Note: Whole unit is termed an Olivine-Phyric to Plagioclase-Phyric Basalt for consistency although phenocryst abundance varies substantially throughout the same unit from olivine phyric to plagioclase-phyric.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-32R-2 (Section top: 590.28 mbsf)

UNIT 10: BEDDED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: 1

CONTACTS: Lower contact is at 7 cm (Piece 1). It is sharp and conformable.

GENERAL DESCRIPTION: Planar to cross bedded, volcaniclastic silt-sandstone with two primary ash fall layers.

COLOR: Grayish orange (10YR 7/4) to olive green (5Y 6/2).

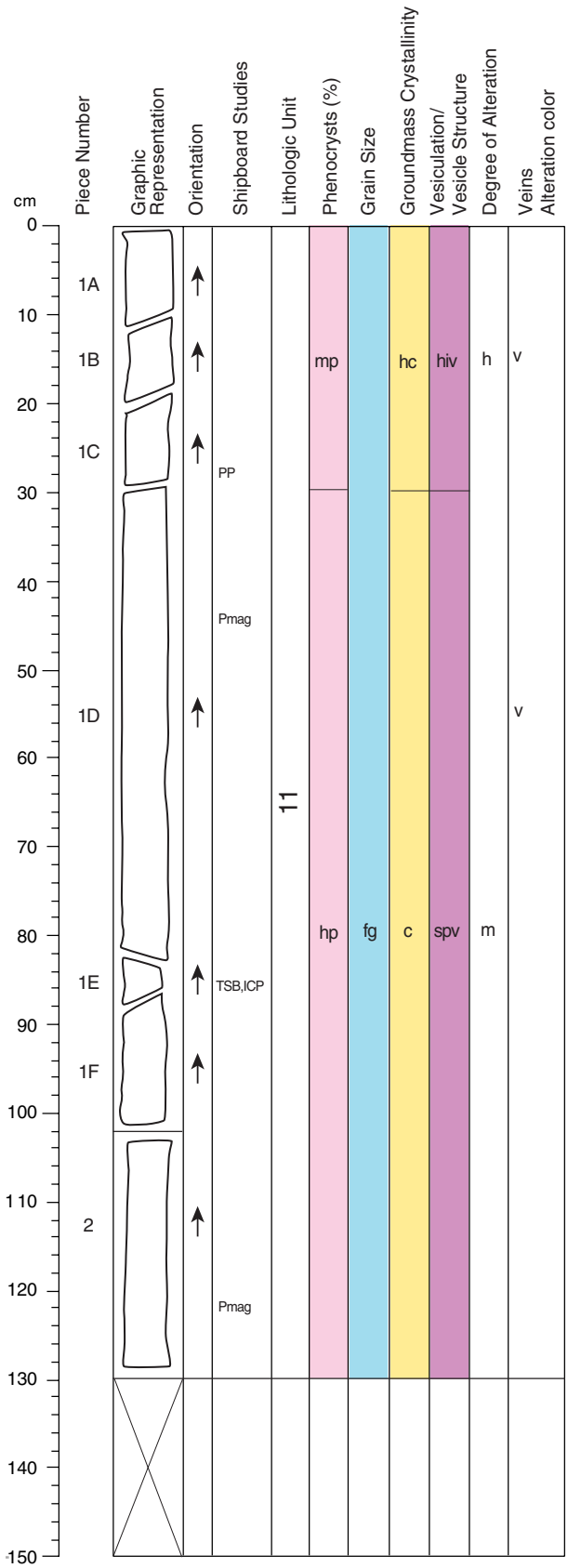
COMPONENTS: Range from vesicular basaltic glass fragments to rock fragments and silt-clay materials.

SEDIMENTARY TEXTURES: Grain size varies between silt-size layers and fine to coarse sand-size layers.

SEDIMENTARY STRUCTURE: Finely to moderately thinly bedded.

COMMENTS:
Unit 10 rests directly on the smooth glassy flow top of Unit 11 lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-32R-3 (Section top: 591.78 mbsf)

UNIT 11: OLIVINE-PLAGIOCLASE-PHYRIC BASALT(*).

Pieces: 1-2

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:					Euhedral
0-55 cm:	0				
55-101 cm:	20-30	6	<2	4	Increases in abundance to base.
102-130 cm:	30	6	<2	4	Euhedral
Plagioclase:					
0-27 cm:	1	2	<1	<1	Subhedral; glomerocrystic
28-55 cm:	10-12	4	<1	2	
55-101 cm:	10	3	<1	2	
Clinopyroxene:					
28-130 cm:	1	4	2	3	Euhedral; equant to elongate

GROUNDMASS: Fine grained and holocrystalline. Consists of plagioclase, clinopyroxene and olivine.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
0-27 cm	10	7	3	5	Round
28-130 cm	<1	<1			

COLOR: Gray black (5Y 2.5/2).

STRUCTURE: Massive.

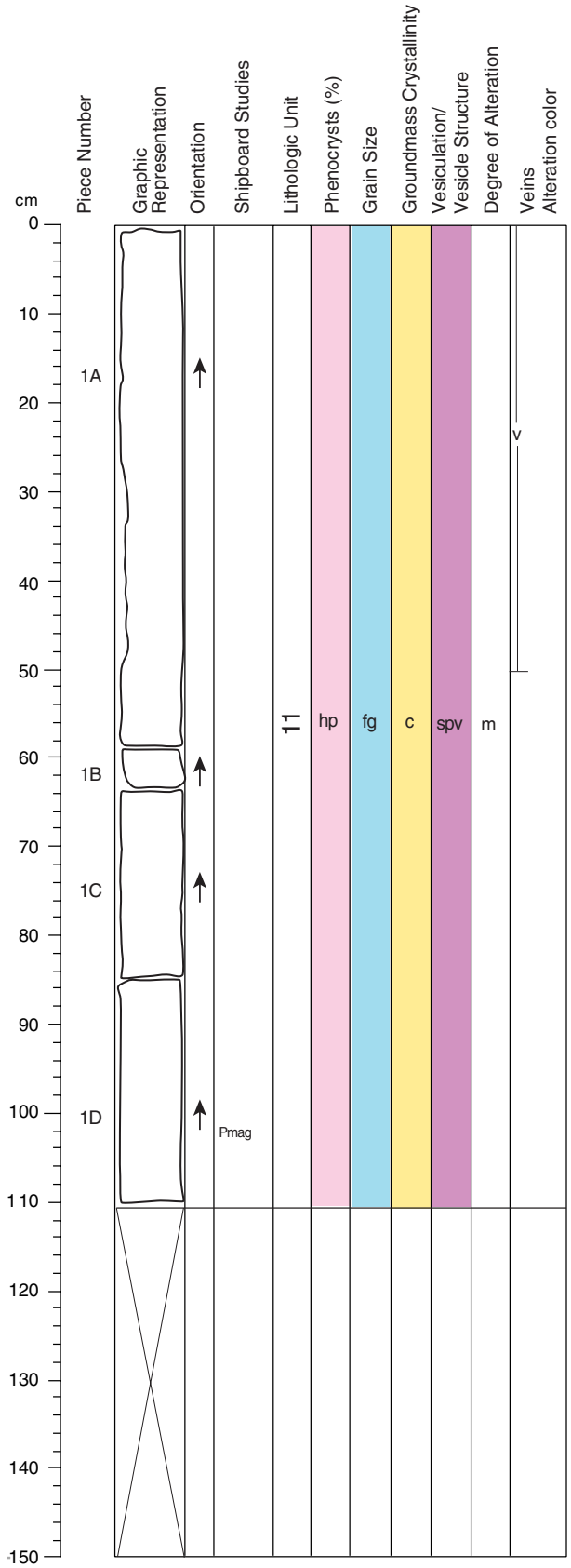
ALTERATION: Slight.

VEINS/FRACTURES: Sparsely veined. A subvertical vein is present 1-27 cm, 3 mm wide, and a horizontal vein is present at 55 cm, 2-3 mm in width. Both are filled with calcite.

COMMENTS: The whole unit (including 32R-2, 32R-4, and 32R-5) is interpreted as representing complete section through inflated pahoehoe sheet lobe (Fig. Exp-D-4). 27 cm is thought to represent the boundary between upper lava crust above (including transition zone) to massive lava interior below.

(*)Note: Whole unit is termed an Olivine-Phyric to Plagioclase-Phyric Basalt for consistency although phenocryst abundance varies substantially throughout the same unit from olivine phyric to plagioclase-phyric.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-32R-4 (Section top: 593.06 mbsf)

UNIT 11: OLIVINE-PLAGIOCLASE-PHYRIC BASALT(*).

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:					Euhedral
0-24 cm:	25	6	2	4	
25-61 cm:	25-10	6	<2	4	Decreases in abundance to base
62-87 cm:	10-5	6	<2	4	Decreases in abundance to base
88-116 cm:	<5	6	<2	4	
Plagioclase:					Subhedral; glomerocrystic
0-24 cm:	10	4	2	3	
25-61 cm:	10-20	4	2	3	Increases in abundance to base
62-87 cm:	~20	6	<2	3	
88-116 cm:	10-15	6	<2	3	Increases in abundance to base
Clinopyroxene:	1	3	2	2	Euhedral; equant to elongate

GROUNDMASS: Fine grained and holocrystalline. Consists of plagioclase, clinopyroxene, and olivine microphenocrysts.

VESICLES: Sparsely to nonvesicular. A large (2 cm) irregular cylinder vesicle is present at 98 cm.

COLOR: Gray black (15Y 2.5/2).

STRUCTURE: Massive.

ALTERATION: Slight.

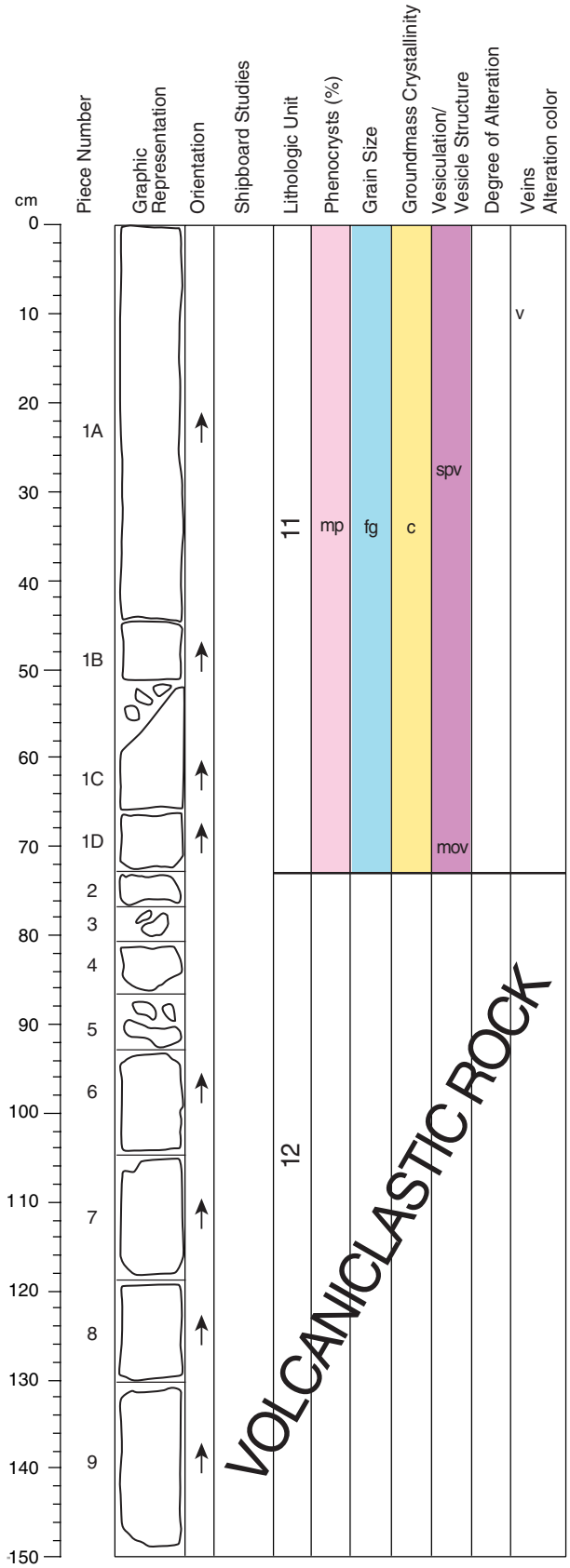
VEINS/FRACTURES: Sparsely veined. A thin (<2 mm) subvertical vein is present from 0-30 cm.

COMMENTS: Irregular gabbroic xenoliths <20 mm in diameter are present from 83-116 cm. They locally comprise up to 15% of the rock.

The whole unit (including Sections 32R-2, 32R-3, and 32-R5) is interpreted a representing complete section through inflated pahoehoe sheet lobe (Figure Exp-D-4). Section 32R-4 represents part of the massive lava interior.

(*)Note: The phenocryst abundance varies substantially from olivine-phyric tc plagioclase phyric.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-32R-5 (Section top: 594.17 mbsf)

UNIT 11: OLIVINE-PLAGIOCLASE-PHYRIC BASALT(*).

Pieces: 1

CONTACTS: The contact between Units 11 and 12 is present at 73 cm. It is a sharp horizontal contact, with a glassy lobe margin present in the basalt.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1-2	3	<1	1.5	Euhedral
Plagioclase:	3-10	2.5	1	0.5	Decreases in abundance to base. Glomerocrystic; subhedral
Clinopyroxene:	<1	2.5	2	1	Euhedral; equant to elongate

GROUNDMASS: Fine grained and holocrystalline. Consists of plagioclase, clinopyroxene and olivine microphenocrysts. Basal 11 cm (62-73 cm) is very fine grained to microcrystalline and hyaline at contact.

VESICLES: Nonvesicular.

COLOR: Gray black (5Y 2.5/2).

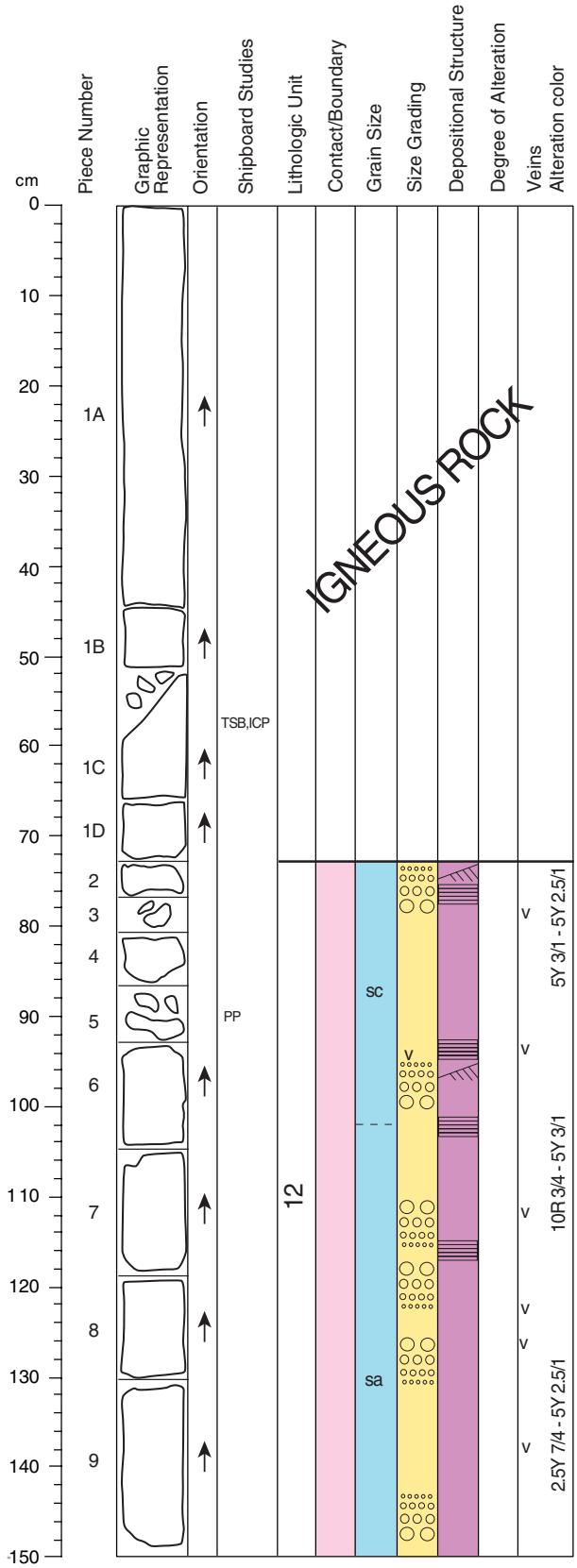
STRUCTURE: Massive.

ALTERATION: Slight.

VEINS/FRACTURES: Sparsely veined. A thin (<2 mm) diagonal vein is present from 4-15 cm. Thin (<<1 mm) horizontal fractures are present <10 mm in length in basal 11 cm of unit.

COMMENTS: Whole unit (including 31R-2, 32R-2, and 32-3) is interpreted as representing complete section through inflated pahoehoe sheet lobe (Figure Exp-D-4). Section 32R-5 represents part of the basal lava crust.
*Note: The phenocryst abundance varies substantially from olivine-phyric to plagioclase phyric.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-32R-5 (Section top: 594.17 mbsf)

UNIT 12: BEDDED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: 2-9

CONTACTS: The contact between Units 11 and 12 is a sharp boundary, present at 74 cm.

GENERAL DESCRIPTION: This interval consists of thinly bedded volcaniclastic sandstone alternating with siliceous siltstone.

COLOR: Varies from purple dark gray (5Y 3/1-5/1) to gray/dark gray (2.5Y 4/5/0) between beds. Beds with disturbed bedding have an overprint color of pale yellow brown (2.5 6/4).

COMPONENTS:
≤20%-80%: Vesicular basalt glass particles[1] and shards; vesicularity ranges from <10% (shards) to >50% (ash-size clasts[2]). Interval 115-116 cm contains 2-7 mm-size highly vesicular (60%-80%) tephra clasts with smooth lobate outlines.
≤20%-80%: Siliceous silt to clay-size material.
Cement: A carbonate cement is present in tephra-rich (sandstone) horizons.

SEDIMENTARY TEXTURES: Grain size ranges from silt to coarse sand; dominantly silt to fine sand. Sorting of individual beds range from good to moderate and the interval between 92-104 cm shows distinct normal grading (fine sand to silt).

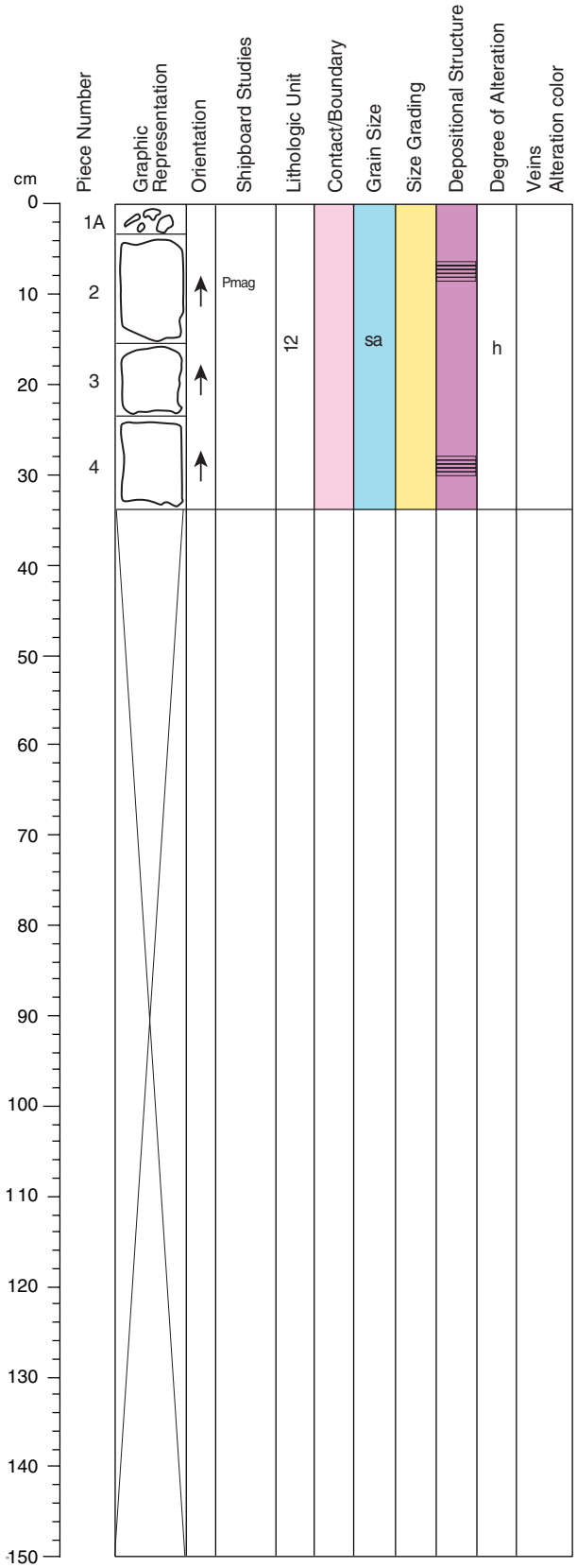
SEDIMENTARY STRUCTURE: Typically finely bedded, with layers ranging from 2-11 cm in thickness. Planar laminated intervals are found at 95-98 cm and 102-106 cm, consisting of <1-2 mm laminae of silt and fine sandstone. A cross-bedded interval at 98-102 cm consists of cm-thick cross bedded sets o fine to medium sand. Intervals with disturbed bedding due to loading are four at 74-76 cm, 107-11 cm, 115.5-117 cm and 122-127 cm.

COMMENTS: The basalt glass particles1 in the sandstone are dominantly ash-size mafic tephra clasts formed by a subaerial eruption, but deposited int water.

[1] The basalt glass particle morphology is typical of mafic tephra clasts, forme by explosive basalt volcanism, both in terms of shape and vesicularity, and is clearly derived from a subaerial eruption with minimal influence of external water.

[2] The tephra component dominates sand-size intervals (~80%) and features both lobate and highly vesicular mafic tephra clasts, with spherical vesicles <1mm in size.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-32R-6 (Section top: 595.67 mbsf)

UNIT 12: BEDDED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: 1-4

CONTACTS: None.

GENERAL DESCRIPTION: This interval consists of thinly bedded volcaniclastic sandstone alternating with siliceous siltstone.

COLOR: Varies from purple dark gray (5Y 3/1-5/1) to gray/dark gray (2.5Y 4/0-5/0) between beds. Beds with disturbed bedding have an overprint color o pale yellow brown (2.5 6/4).

COMPONENTS:
20%-80%: Vesicular basalt glass particles[1] and shards; vesicularity ranges from <10% (shards) to >50% (tephra clasts[2]).
20%-80%: Siliceous silt to clay-size material.
Cement: A carbonate cement is present in tephra-rich horizons.

SEDIMENTARY TEXTURES: Grain size ranges from silt to coarse sand; dominantly silt to fine sand. Sorting of individual beds range from good to moderate, and beds are normally graded.

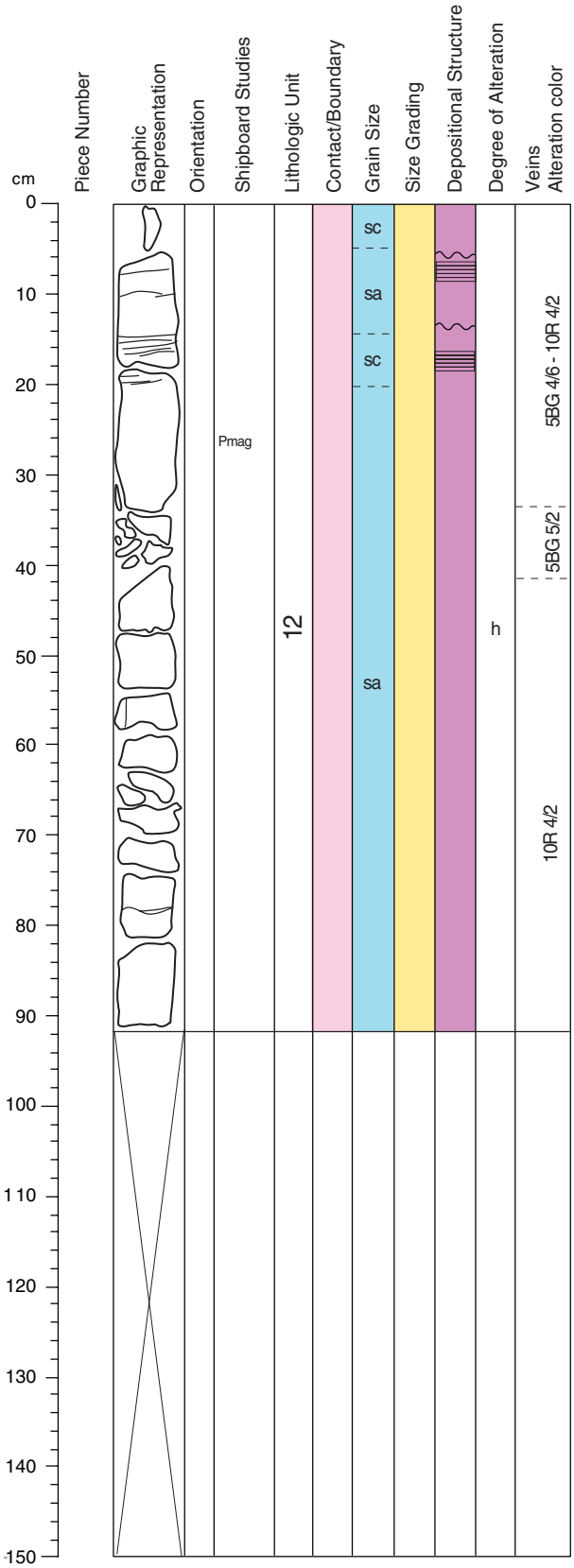
SEDIMENTARY STRUCTURE: Laminated siltstone is present in interval 12-13 cm.

COMMENTS: The basalt glass particles in the sandstone are dominantly ash-size mafic tephra clasts formed by a subaerial eruption, but deposited into water. The presence of highly vesicular mafic scoria clasts indicates close proximity to the vent.

[1] The basalt glass particle morphology is typical of mafic tephra clasts, formed by explosive basalt volcanism, both in terms of shape and vesicularity, and is clearly derived from a subaerial eruption with minimal influence of external water.

[2] The tephra component dominates sand-sized intervals ~80% and features both fluidal and highly vesicular mafic tephra clasts, with spherical vesicles, <1mm in size.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-33R-1 (Section top: 598.6 mbsf)

UNIT 12: BEDDED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: This interval consists of thinly bedded volcaniclastic sandstone alternating with siliceous siltstone.

COLOR: Grayish green (5BG 5/2) to grayish red (10R Y/2).

COMPONENTS:
20%-80%: Vesicular basalt glass particles and shards; these vary from nonvesicular to moderately vesicular, but are predominantly nonvesicular to slightly vesicular.

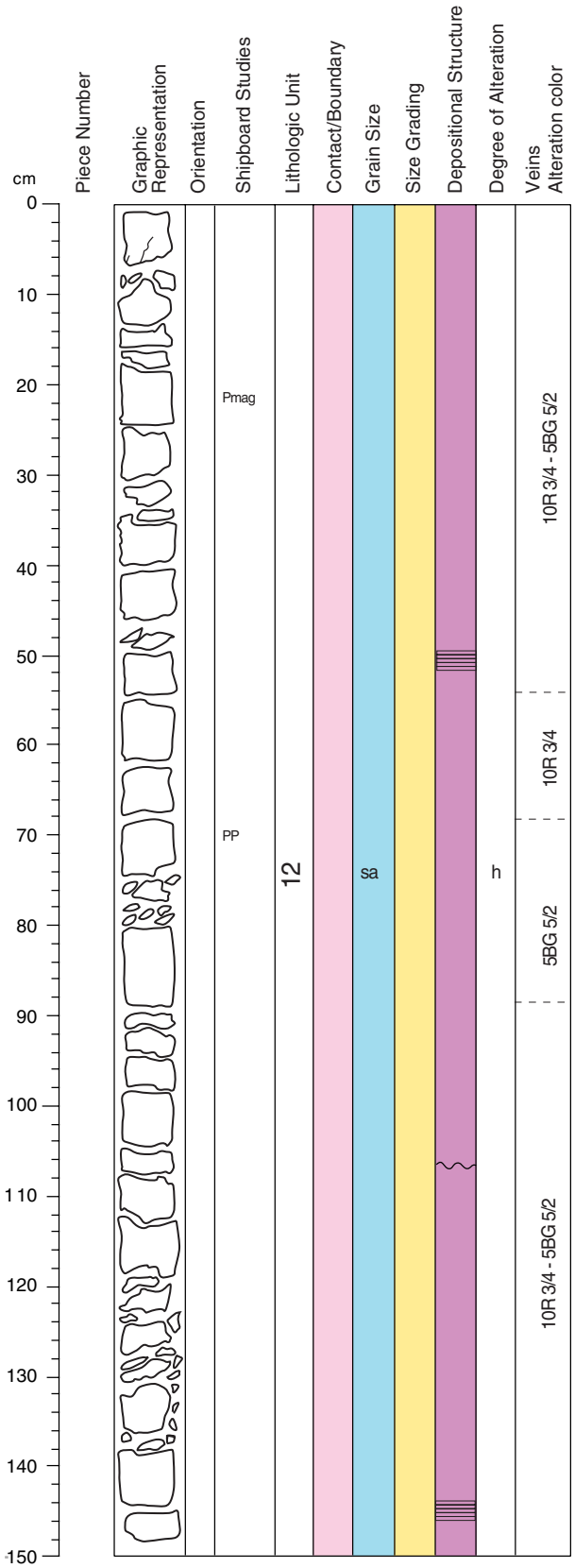
20%-80%: Siliceous silt to clay-size material.
Cement: A carbonate cement is present in tephra-rich (sandstone) horizons. The sandstone beds contain up to 20% lithic (lava) fragments.

SEDIMENTARY TEXTURES: Grain size ranges from silt to coarse sand, but is dominantly silt to fine sand. Sorting of individual beds range from good to moderate, and the interval between 92-104 cm shows distinct normal grading (fine sand to silt).

SEDIMENTARY STRUCTURE: Typically finely bedded, with layers ranging from 2-11 cm in thickness. Well-developed soft sediment loading structures (ball and pillow) are found at the contact between sandstone (above) and siltstone (below), at 16-17 cm.

COMMENTS: The brownish gray coloration of the lithic fragments is caused by penetrative alteration (oxidation). The basalt glass particles in the sandstone are dominantly ash-size mafic tephra clasts formed by a subaerial eruption, but deposited into water. The presence of highly vesicular mafic scoria clasts indicates close proximity to the vent.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-33R-2 (Section top: 599.53 mbsf)

UNIT 12: BEDDED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: This interval consists of thinly bedded volcaniclastic sandstone alternating with siliceous siltstone.

COLOR: Grayish green (5BG 5/2) to grayish red (10R 4/2).

COMPONENTS:
20%-80%: Vesicular basalt glass particles and shards; these vary from nonvesicular to moderately vesicular, but are predominantly nonvesicular to poorly vesicular.

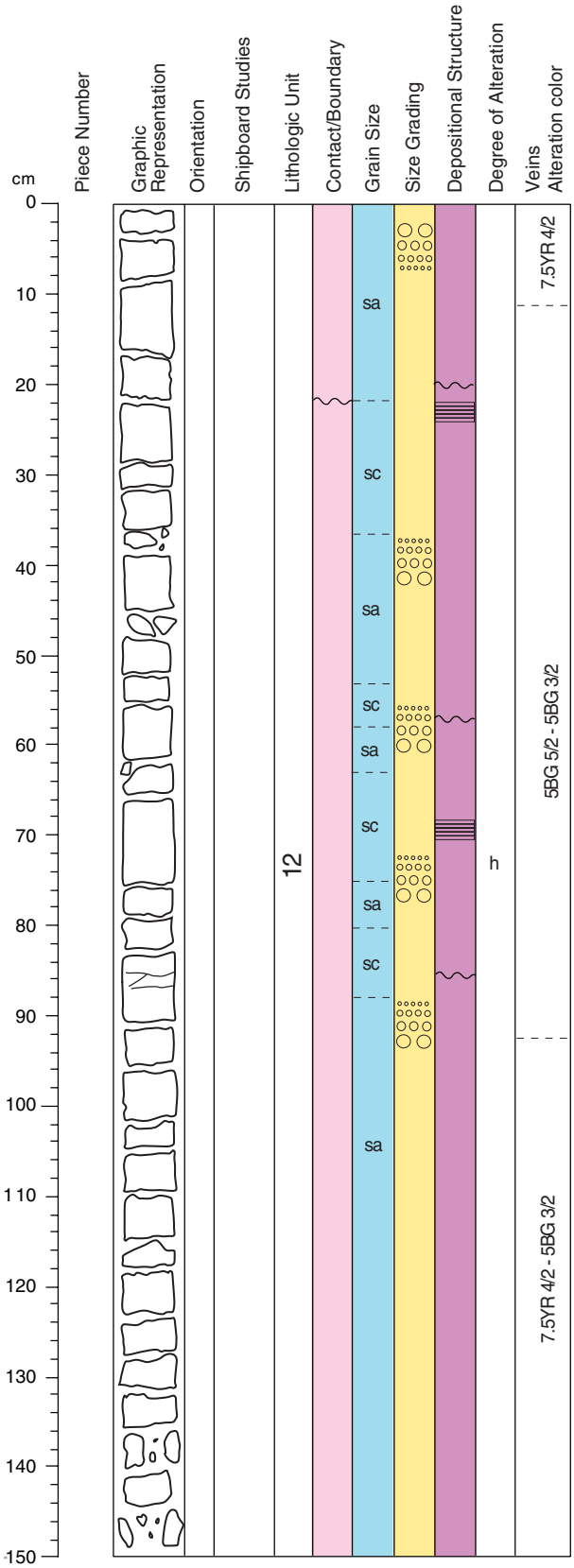
20%-80%: Siliceous silt to clay size material.
Cement: A carbonate cement is present in tephra rich (sandstone) horizons. The sandstone beds contain up to 20% lithic (lava) fragments.

SEDIMENTARY TEXTURES: Grain size ranges from silt to coarse sand, but is dominantly silt to fine sand. Sorting of individual beds range from good to moderate.

SEDIMENTARY STRUCTURE: Typically finely bedded, with layers ranging from 2-11 cm in thickness. A 30 cm thick massive sandstone is present at 10-40 cm.

COMMENTS: The brownish gray coloration of the lithic fragments is caused by penetrative alteration (oxidation). The basalt glass particles in the sandstone are dominantly ash-size mafic tephra clasts formed by a subaerial eruption, but deposited into water.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-33R-3 (Section top: 601.03 mbsf)

UNIT 12: BEDDED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: This interval consists of thinly bedded volcaniclastic sandstone alternating with siliceous siltstone.

COLOR: Grayish green (5BG 5/2) to grayish red (10R 4/2).

COMPONENTS:
20%-80%: Vesicular basalt glass particles[1] and shards; vesicularity ranges from <10% (shards) to >50% (tephra clasts[2]).
20-80%: Siliceous silt to clay sized material.
Cement: A carbonate cement is present in tephra-rich (sandstone) horizons.

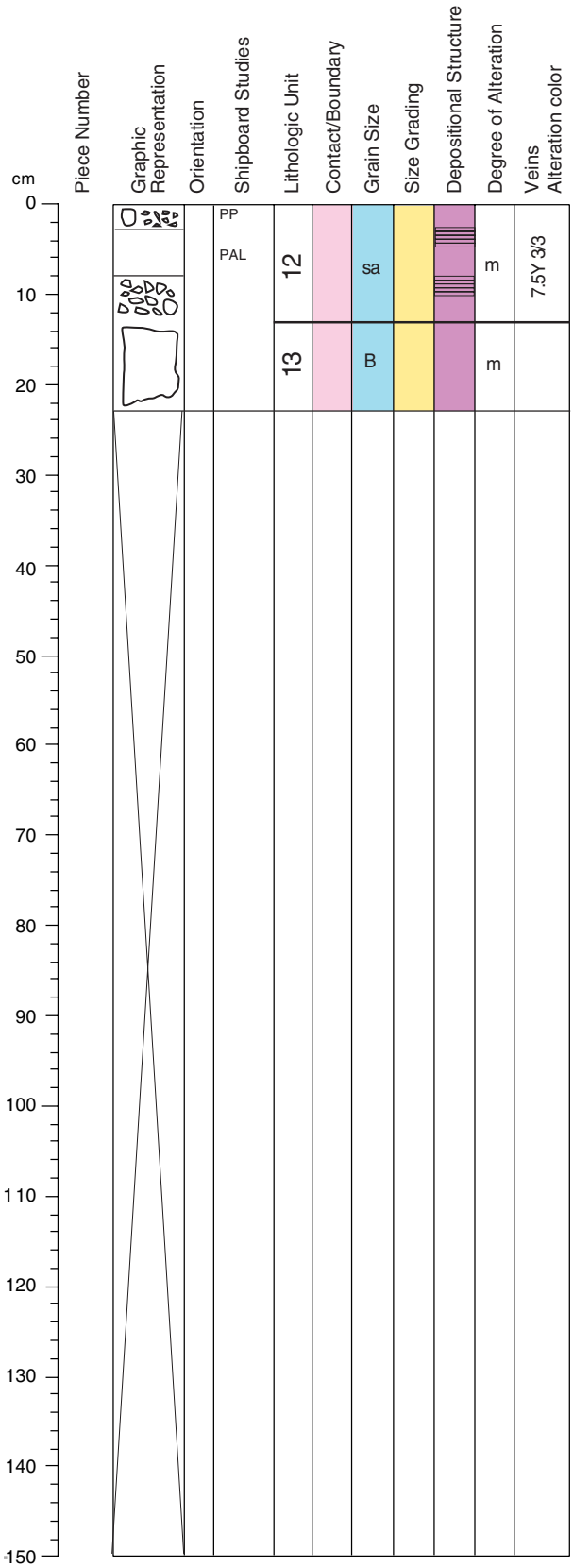
SEDIMENTARY TEXTURES: Grain size ranges from silt to coarse sand; dominantly silt to fine sand. Sorting of individual beds range from good to moderate and beds are typically normally graded.

SEDIMENTARY STRUCTURE: Typically finely bedded, with layers ranging from 2-11 cm in thickness.

COMMENTS: The basalt glass particles in the sandstone are dominantly ash size mafic tephra clasts formed by subaerial eruption, but deposited into water.

[1] The basalt glass particle morphology is typical of mafic tephra clasts formed by explosive basalt volcanism, both in terms of shape and vesicularity. It is clearly derived from a subaerial eruption with minimal influence of external water.
[2] The tephra component dominates sand-size intervals ~80% and features both fluidal and highly vesicular mafic tephra clasts, with spherical vesicles <1 mm in size.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-33R-CC (Section top: 602.53 mbsf)

UNIT 12: BEDDED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: (0-14 cm) Cut as sediment core.

CONTACTS: None observed. The contact between Units 12 and 13 is inferred to be at 14 cm, where there is a drastic change in lithology from volcaniclastic sandstone to volcanic breccia.

GENERAL DESCRIPTION: This interval consists of thinly bedded volcaniclastic sandstone alternating with siliceous siltstone.

COLOR: Reddish brown (7.5Y 3/3-4/3) and strongly oxidized.

COMPONENTS:
20%-80%: Vesicular basalt glass particles and shards; vesicularity ranges from <10% (shards) to >50% (tephra clasts).
20-80%: Siliceous silt to clay size material.

SEDIMENTARY TEXTURES: Grain size ranges from silt to coarse sand; dominantly silt to fine sand. Sorting of individual beds range from good to moderate.

SEDIMENTARY STRUCTURE: Typically finely bedded, with layers ranging from 2-11 cm in thickness. The basalt glass particles in the sandstone are dominantly ash size mafic tephra clasts formed by subaerial eruption, but deposited into water.

UNIT 13: PLAGIOCLASE-BASALT HYALOCLASTITE BRECCIA.

Pieces: Cut as sediment core (14-23 cm).

CONTACTS: None observed. The contact between Units 12 and 13 is inferred to be at 14 cm, where there is a drastic change in lithology from volcaniclastic sandstone to volcanic breccia.

GENERAL DESCRIPTION: Massive. Poorly sorted volcanic breccia with carbonate matrix. Clasts are angular to subangular, ranging from 0.1-2.5 cm.

COLOR: Variable. The carbonate matrix is white. Clasts range from reddish purple (5RP 4/2) to yellowish green (10GY 3/2).

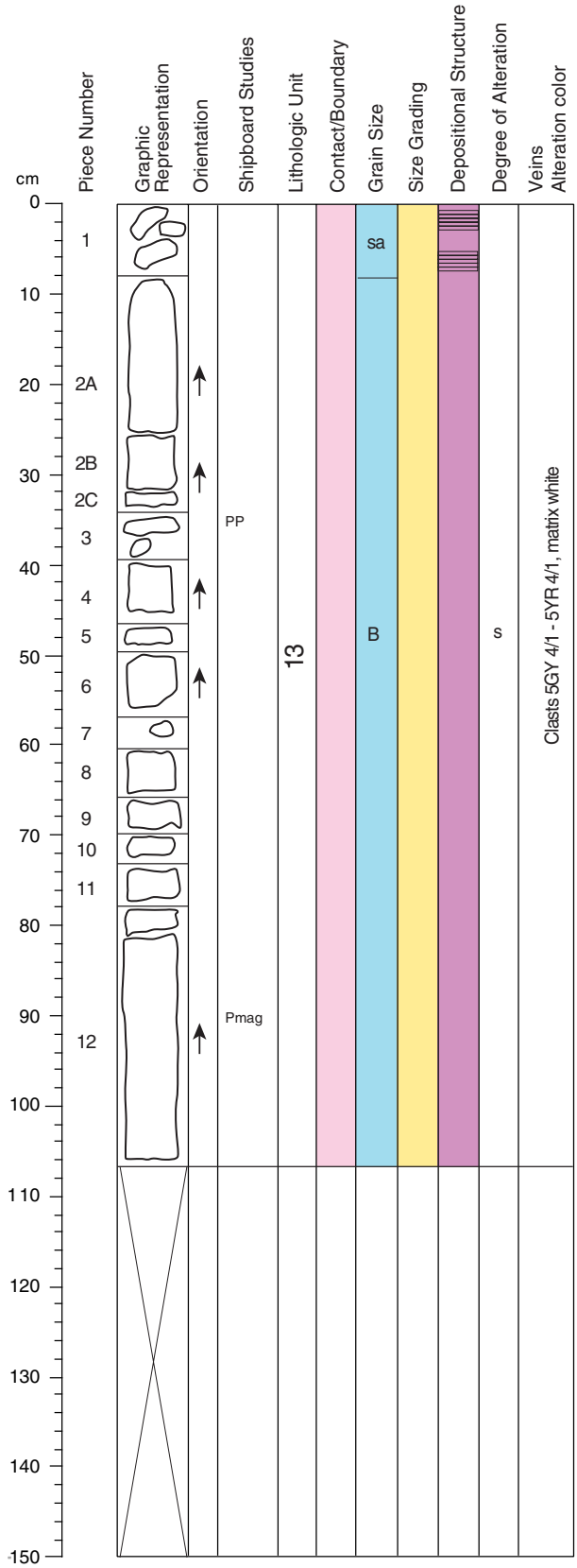
COMPONENTS:
90%: Tephra and basalt.
10%: Carbonate cement.
Basalts are aphyric, aphanitic, and sparsely to moderately vesicular.

SEDIMENTARY TEXTURES: Unsorted sand and gravel-size clasts.

SEDIMENTARY STRUCTURES: None.

COMMENTS: Piece 1 consists of reddish green volcaniclastic sandstone, similar to that which occurs at the top of Core 33R.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-34R-1 (Section top: 608.3 mbsf)

UNIT 13: PLAGIOCLASE-BASALT HYALOCLASTITE BRECCIA.

Pieces: 1-12

CONTACTS: None.

GENERAL DESCRIPTION: Massive, poorly sorted volcaniclastic breccia dominated by gravel size angular clasts (1-12 cm) of fine-grained plagioclase-phyric basalt clasts[1] resting in a fine lapilli (1-10 mm) matrix consisting of vesicle-free to moderately vesicular glass and microcrystalline lava fragments[2]. Clasts have a variety of colors reflecting different degrees of alteration.

COLOR: Variable. Clasts range from medium gray (N5), brownish gray (5YR 4/1) to dark greenish gray (5GY 4/1). The carbonate matrix is white.

COMPONENTS:
70%-80% matrix consisting of sparsely to moderately vesicular plagioclase phyric glass and microcrystalline (variolitic) lava fragments.
15%-30% Sparsely to moderately (1%-10%) plagioclase phyric, angular basalt lithic clasts.

SEDIMENTARY TEXTURES: Poorly sorted breccia, with 10-125 mm lithic clasts dispersed in fine lapilli matrix.

SEDIMENTARY STRUCTURES: Massive.

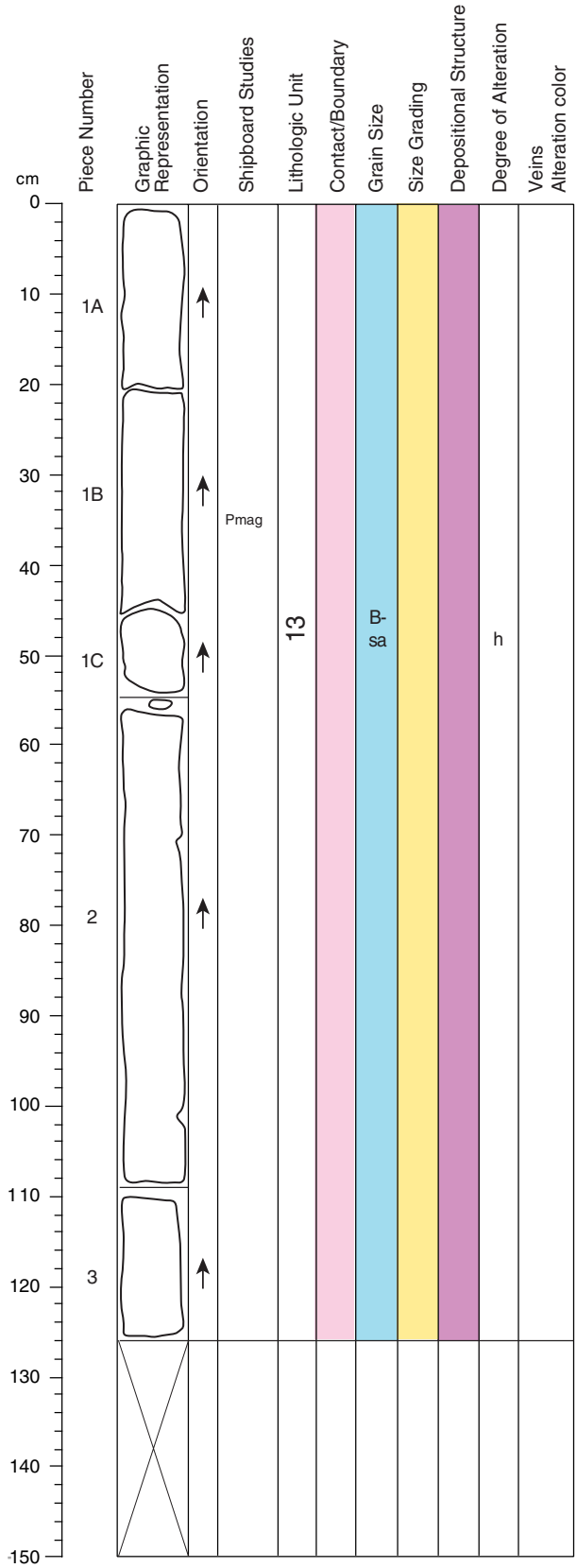
COMMENTS: The clast types that make up the breccia are all derived from the same lithologic unit (i.e., plagioclase phyric lava), and their differences reflect the variation in groundmass textures produced by cooling rates. Based on these observations and the lithologic similarity to the underlying lava flow, we interpret this Unit to be hyaloclastite breccia.

Piece 1 consists of reddish green volcaniclastic sandstone, similar to that which occurs in Core 33R.

[1] Many of the lava clasts have green glassy lobe selvages along one or more sides. The smaller fragments are typically sparsely plagioclase phyric and exhibit igneous textures identical to that of the underlying pillow lava.

[2] The lithology of the matrix clast population is identical to that found on smooth and glassy lobe margins.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-34R-2 (Section top: 609.37 mbsf)

UNIT 13: PLAGIOCLASE-BASALT HYALOCLASTITE BRECCIA.

Pieces: 1A-3

CONTACTS: None.

GENERAL DESCRIPTION: Massive, poorly sorted volcaniclastic breccia dominated by gravel size angular clasts (1-12 cm) of fine-grained plagioclase-phyric basalt clasts resting in a fine lapilli (1-10 mm) matrix consisting of vesicle-free to moderately vesicular glass and microcrystalline lava fragments. Clasts have a variety of colors reflecting different degrees of alteration.

COLOR: Variable. Clasts range from medium gray (N5), brownish gray (5YR 4/1) to dark greenish gray (5GY 4/1). The carbonate matrix is white.

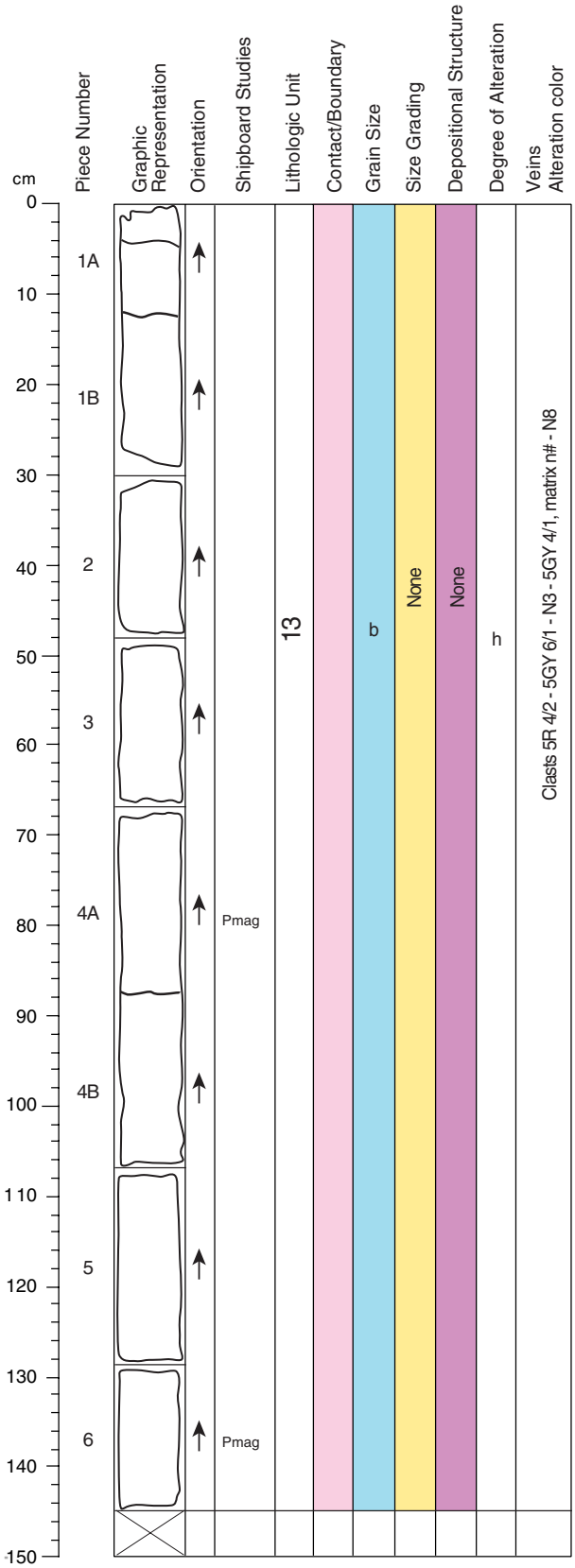
COMPONENTS:
70%-80% matrix consisting of sparsely to moderately vesicular plagioclase phyric glass and microcrystalline (variolitic) lava fragments.
15%-30% Sparsely to moderately (1%-10%) plagioclase phyric, angular basalt lithic clasts.

SEDIMENTARY TEXTURES: Poorly sorted breccia, with 10-125 mm lithic clasts dispersed in fine lapilli matrix.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: We interpret this Unit to be hyaloclastite breccia.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-34R-3 (Section top: 610.63 mbsf)

UNIT 13: PLAGIOCLASE-BASALT HYALOCLASTITE BRECCIA.

Pieces: 1-6

CONTACTS: None.

GENERAL DESCRIPTION: Massive, poorly sorted volcaniclastic breccia dominated by gravel size angular clasts (1-12 cm) of fine-grained plagioclase-phyric basalt clasts resting in a fine lapilli (1-10 mm) matrix consisting of vesicle-free to moderately vesicular glass and microcrystalline lava fragments. Clasts have a variety of colors reflecting different degrees of alteration.

COLOR: Variable. Clasts range from medium gray (N5), brownish gray (5YR 4/1) to dark greenish gray (5GY 4/1). The carbonate matrix is white.

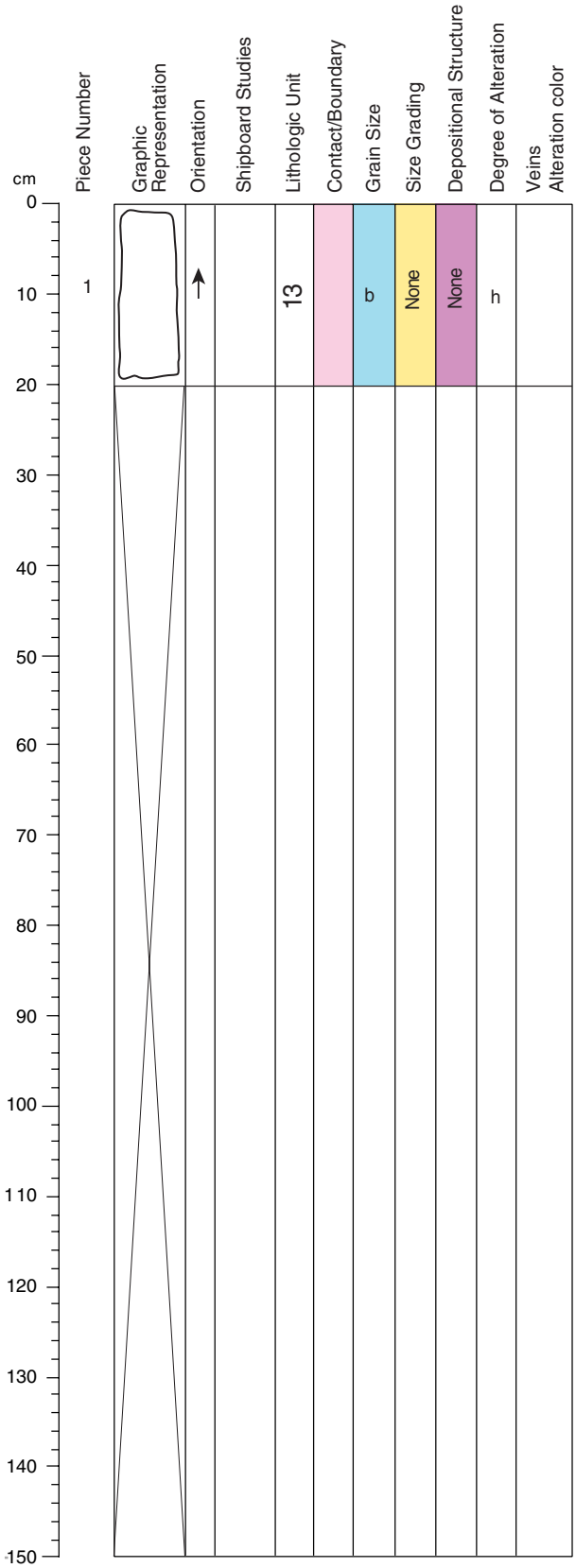
COMPONENTS:
70%-80% matrix consisting of sparsely to moderately vesicular plagioclase phyric glass and microcrystalline (variolitic) lava fragments.
15%-30% Sparsely to moderately (1%-10%) plagioclase phyric, angular basal lithic clasts.

SEDIMENTARY TEXTURES: Poorly sorted breccia, with 10-125 mm lithic clasts dispersed in fine lapilli matrix.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: We interpret this Unit to be hyaloclastite breccia.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-34R-4 (Section top: 612.08 mbsf)

UNIT 13: PLAGIOCLASE-BASALT HYALOCLASTITE BRECCIA.

Pieces: 1

CONTACTS: None.

GENERAL DESCRIPTION: Clast-supported breccia of volcanic clasts cemented by carbonate.

COLOR: Variable. Clasts range from dark greenish-gray (5GY 4/1),brownish-gray (5YR 4/1), and a few are dusky red (5R 3/4). The carbonate matrix is white.

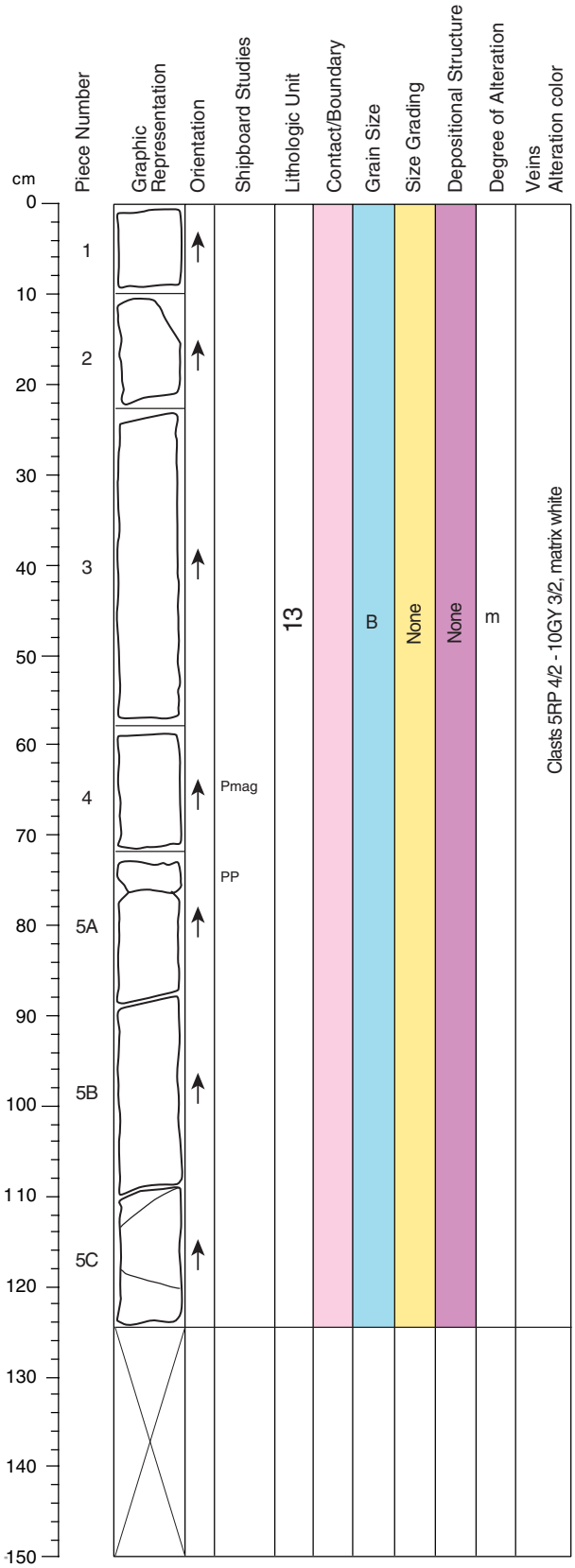
COMPONENTS: Clasts are typically angular to subangular, moderately to slightly altered, sand and gravel-size, aphanitic, vesicular to nonvesicular volcanic rocks. Matrix (cement) is carbonate. Most clasts are <1 cm wide, but ~10% are 1–2 cm, and a few are 2–4 cm.

SEDIMENTARY TEXTURES: Unsorted sand and gravel-size clasts.

SEDIMENTARY STRUCTURES: None.

COMMENTS: We interpret this Unit to be hyaloclastite breccia.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-35R-1 (Section top: 612.3 mbsf)

UNIT 13: PLAGIOCLASE-BASALT HYALOCLASTITE BRECCIA.

Pieces: 1-5C

CONTACTS: None.

GENERAL DESCRIPTION: Massive, poorly sorted volcaniclastic breccia dominated by gravel size angular clasts (1-12 cm) of fine-grained plagioclase-phyric basalt clasts resting in a fine lapilli (1-10 mm) matrix consisting of vesicle-free to moderately vesicular glass and microcrystalline lava fragments. Clasts have a variety of colors reflecting different degrees of alteration.

COLOR: Variable. Clasts range from medium gray (N5), brownish gray (5YR 4/1) to dark greenish gray (5GY 4/1). The carbonate matrix is white.

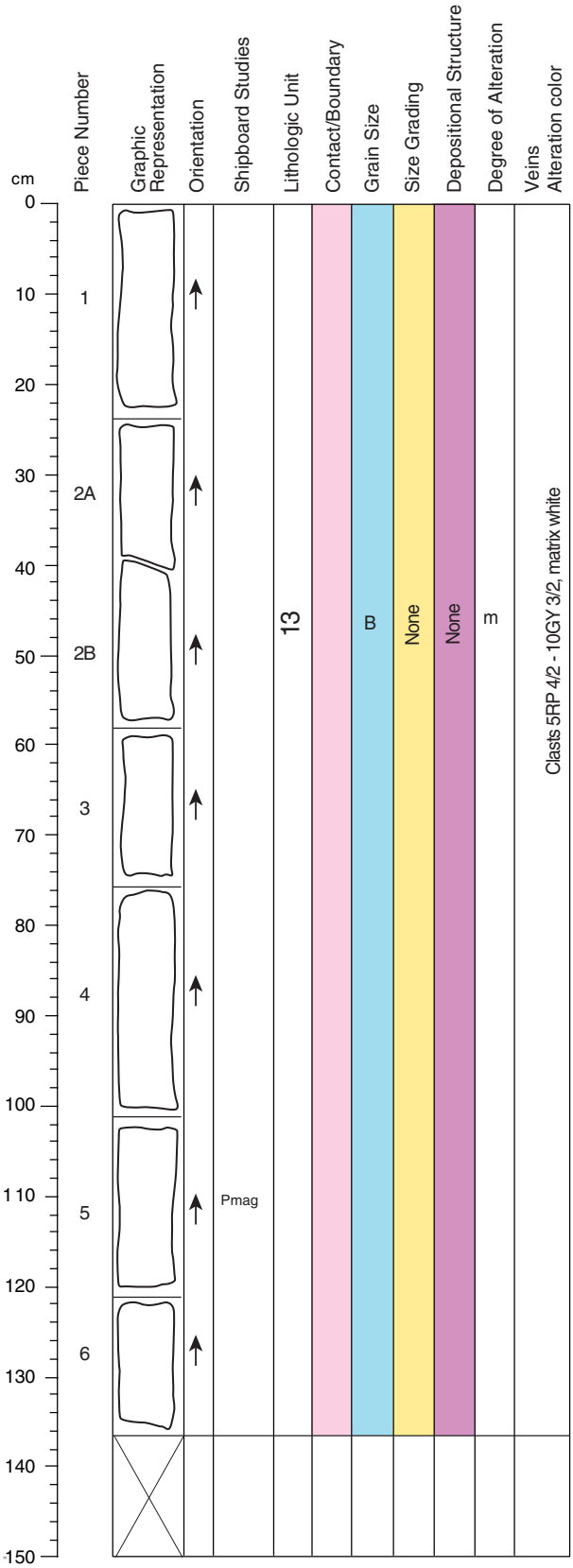
COMPONENTS:
70%-80% matrix consisting of sparsely to moderately vesicular plagioclase phyric glass and microcrystalline (variolitic) lava fragments.
15%-30% Sparsely to moderately (1%-10%) plagioclase phyric, angular basalt lithic clasts.

SEDIMENTARY TEXTURES: Poorly sorted breccia, with 10-125 mm lithic clasts dispersed in fine lapilli matrix.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: We interpret this Unit to be hyaloclastite breccia.
One large basalt clast between 109-121 cm is moderately vesicular, sparsely plagioclase phyric basalt. This is a continuation of the volcanic breccia in Core 34R.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-35R-2 (Section top: 613.55 mbsf)

UNIT 13: PLAGIOCLASE-BASALT HYALOCLASTITE BRECCIA.

Pieces: 1-6

CONTACTS: None.

GENERAL DESCRIPTION: Massive, poorly sorted volcaniclastic breccia dominated by gravel size angular clasts (1-12 cm) of fine-grained plagioclase-phyric basalt clasts resting in a fine lapilli (1-10 mm) matrix consisting of vesicle-free to moderately vesicular glass and microcrystalline lava fragments. Clasts have a variety of colors reflecting different degrees of alteration.

COLOR: Variable. Clasts range from medium gray (N5), brownish gray (5YR 4/1) to dark greenish gray (5GY 4/1). The carbonate matrix is white.

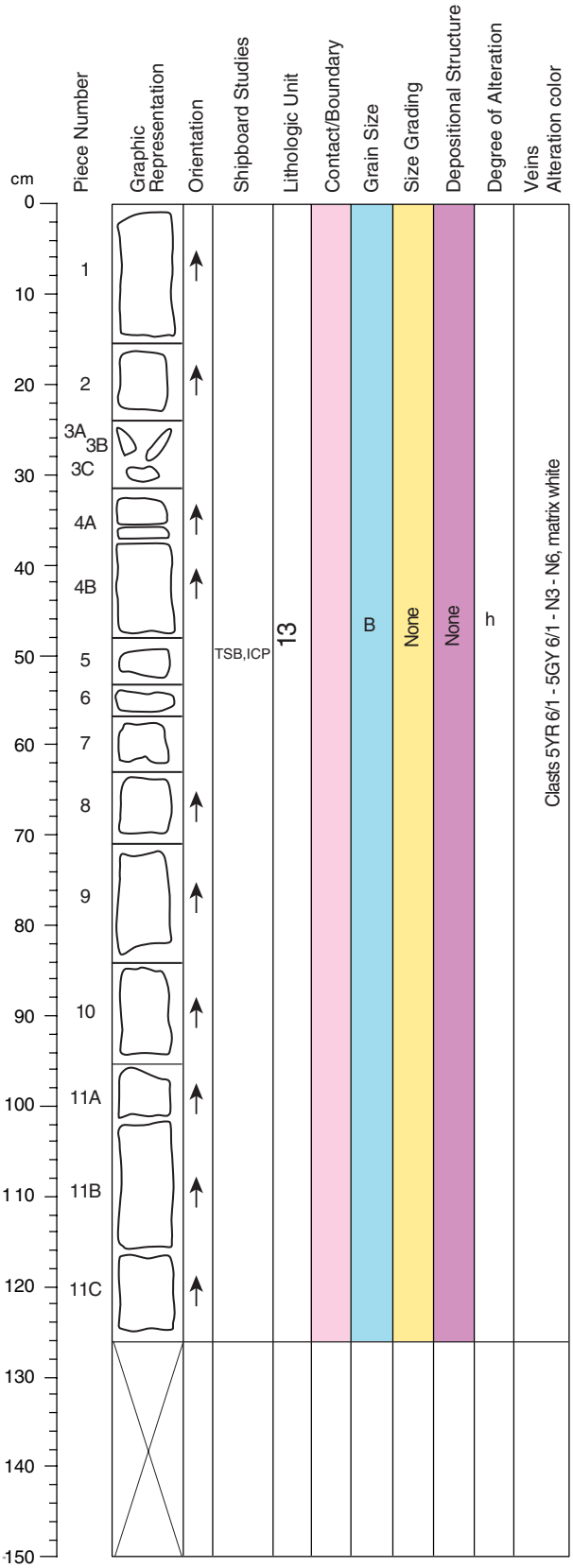
COMPONENTS:
70%-80% matrix consisting of sparsely to moderately vesicular plagioclase phyric glass and microcrystalline (variolitic) lava fragments.
15%-30% Sparsely to moderately (1%-10%) plagioclase phyric, angular basalt lithic clasts.

SEDIMENTARY TEXTURES: Poorly sorted breccia, with 10-125 mm lithic clasts dispersed in fine lapilli matrix.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: We interpret this Unit to be hyaloclastite breccia.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-35R-3 (Section top: 614.92 mbsf)

UNIT 13: PLAGIOCLASE-BASALT HYALOCLASTITE BRECCIA.

Pieces: 1-11C

CONTACTS: None.

GENERAL DESCRIPTION: Massive, poorly sorted volcaniclastic breccia dominated by gravel size angular clasts (1-12 cm) of fine-grained plagioclase-phyric basalt clasts resting in a fine lapilli (1-10 mm) matrix consisting of vesicle-free to moderately vesicular glass and microcrystalline lava fragments. Clasts have a variety of colors reflecting different degrees of alteration.

COLOR: Variable. Clasts range from medium gray (N5), brownish gray (5YR 4/1) to dark greenish gray (5GY 4/1). The carbonate matrix is white.

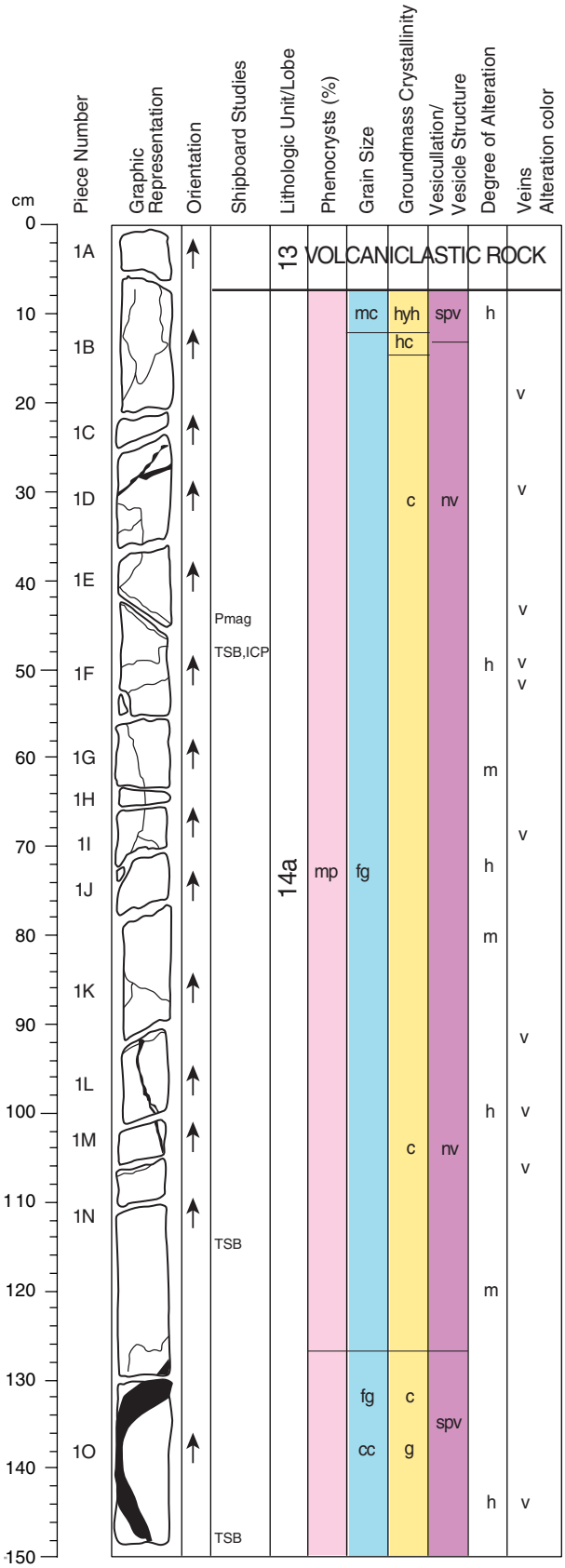
COMPONENTS:
70%-80% matrix consisting of sparsely to moderately vesicular plagioclase phyric glass and microcrystalline (variolitic) lava fragments.
15%-30% Sparsely to moderately (1%-10%) plagioclase phyric, angular basalt lithic clasts.

SEDIMENTARY TEXTURES: Poorly sorted breccia, with 10-125 mm lithic clasts dispersed in fine lapilli matrix.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: We interpret this unit to be hyaloclastite breccia.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-35R-4 (Section top: 616.18 mbsf)

UNIT 14: MODERATELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1B to 1O

CONTACTS: Upper contact is near the top of Piece 1B (6-8 cm), and dips at 15°. Lower contact may be represented by the subvertical glass rind in Piece 1O.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10	8	0.5	4	Euhedral to subhedral

GROUNDMASS: Aphanitic.

VESICLES: Nonvesicular.

COLOR: Medium gray (N5).

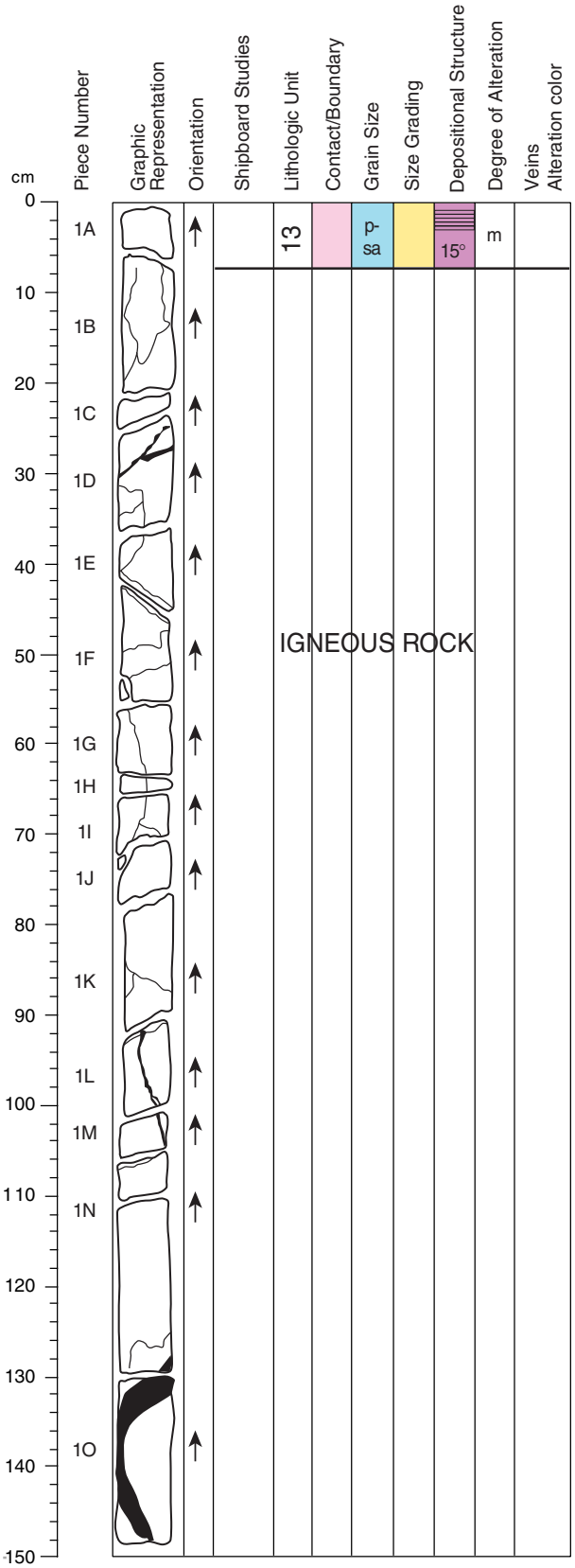
STRUCTURE: Massive.

ALTERATION: Slight. Minor Fe-oxyhydroxide staining near some veins and within 2 cm of the upper margin of the flow. Also, some greenish-gray alteration is present near some of the veins and within 2 cm of the glass rind ir Piece 1O. Glass rind in Piece 1O is highly altered. A 1 cm thick greenish-white carbonate rind is present in the bottom of Piece 1O.

VEINS/FRACTURES: Moderate. Veins are <1 mm to 5 mm wide, randomly oriented, and filled with greenish-white carbonate.

COMMENTS: This may be a basal lava flow associated with the breccia in Sections 35R-1 to 35R-3.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-35R-4 (Section top: 616.18 mbsf)

UNIT 13: PLAGIOCLASE-BASALT HYALOCLASTITE BRECCIA.

Pieces: 1.

CONTACTS: Contact between Unit 13 and Unit 14 is sharp, dipping at 15° and is present in Piece 1B between 6 cm and 8 cm.

GENERAL DESCRIPTION: Massive, poorly sorted volcaniclastic breccia dominated by gravel size angular clasts (1-12 cm) of fine-grained plagioclase-phyric basalt clasts resting in a fine lapilli (1-10 mm) matrix consisting of vesicle-free to moderately vesicular glass and microcrystalline lava fragments. Clasts have a variety of colors reflecting different degrees of alteration.

COLOR: Variable. Clasts range from medium gray (N5), brownish gray (5YR 4/1) to dark greenish gray (5GY 4/1). The carbonate matrix is white.

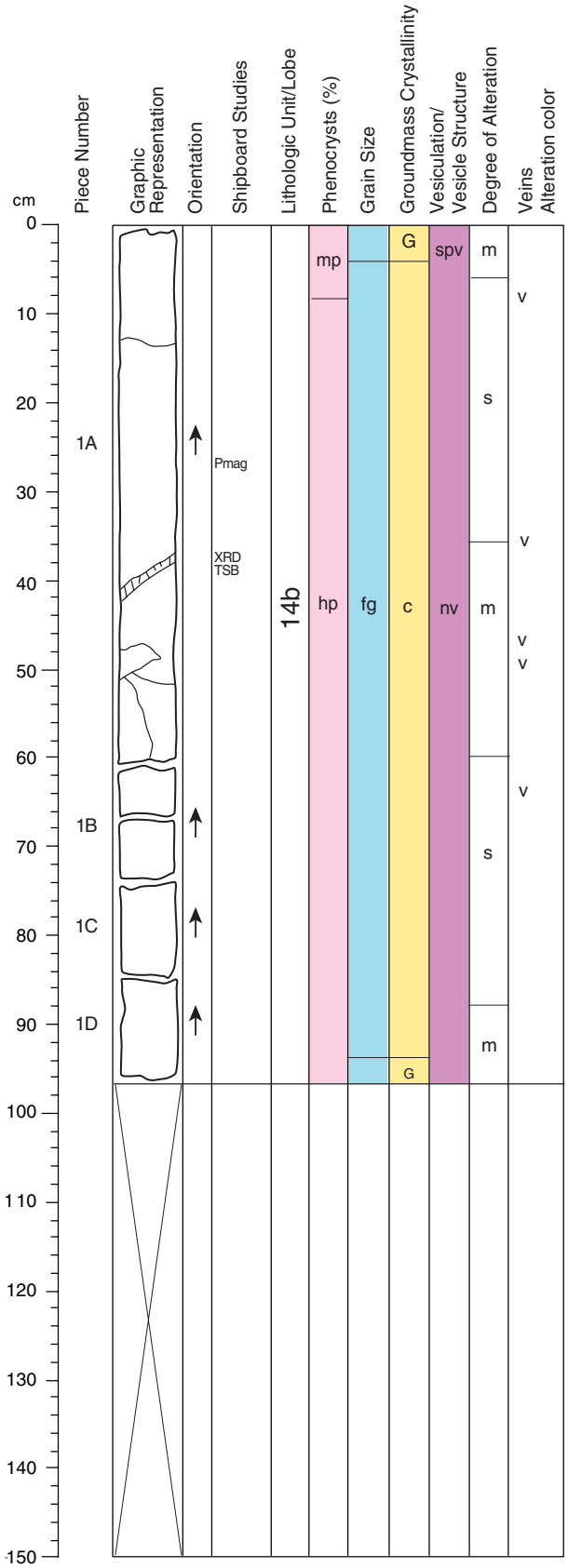
COMPONENTS:
70%-80% matrix consisting of sparsely to moderately vesicular plagioclase phyric glass and microcrystalline (variolitic) lava fragments.
15%-30% Sparsely to moderately (1%-10%) plagioclase phyric, angular basalt lithic clasts.

SEDIMENTARY TEXTURES: Poorly sorted breccia, with 10-125 mm lithic clasts dispersed in fine lapilli matrix.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: We interpret this unit to be hyaloclastite breccia.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-36R-1 (Section top: 617.9 mbsf)

UNIT 14: MODERATELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1A-1D

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-10	8	1	3	Subhedral to euhedral; blocky

GROUNDMASS: Aphanitic or microcrystalline. Plagioclase, clinopyroxene, and black oxides form an intergranular texture in the fine-grained regions. Approximately 1 cm from the glassy margins is a hypohyaline region with variolitic texture.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	<1	5	0.1	0.5	Round to subround

COLOR: Medium light gray (N6) and medium gray (N5) to dark yellowish orange (10YR 6/6) in more altered patches.

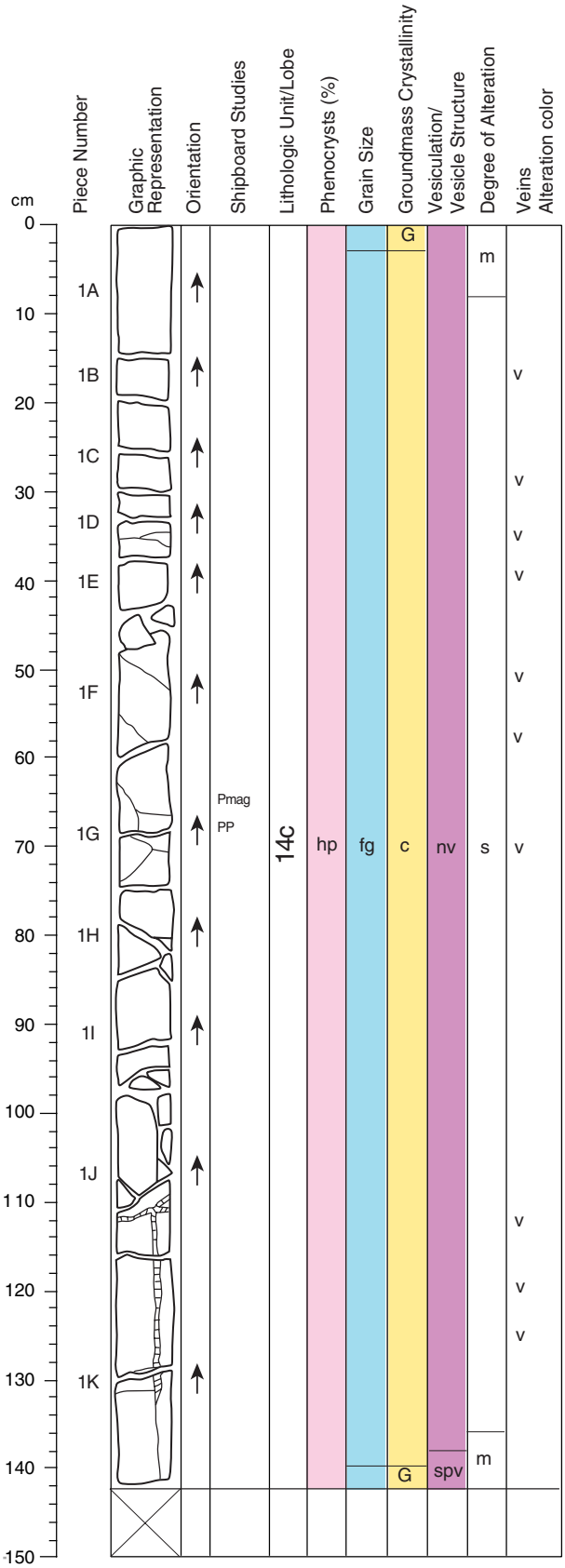
STRUCTURE: Lobed. Glassy lobe margins are present at the top of Piece 1A and the base of Piece 1D.

ALTERATION: Slight to moderate. Most intensely altered adjacent to veins. Rare vesicles are filled with carbonate and dark green clay.

VEINS/FRACTURES: Sparsely to moderately veined. Veins are randomly oriented, <0.1-5 mm wide, and are filled with white carbonate, green clay, and Fe-oxyhydroxide. One vein at 37 cm runs 45˚ across the core and is 1 cm wide.

COMMENTS: This core is a complete section through a basalt lobe. Rare vesicles are concentrated close and perpendicular to the glassy lobe margins. Plagioclase phenocrysts are present through the lobe, including the glassy lobe margins. Based on the presence of multiple lobes bounded by smooth glassy surfaces, overall nonvesicular nature of the lava, presence of variolitic texture, and distinct cube-jointed pattern of individual lobes, we interpret this Unit to be pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-36R-2 (Section top: 618.87 mbsf)

UNIT 14: MODERATELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1A-1K

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	8-10	6	3	5	Subhedral to euhedral; blocky

GROUNDMASS: Mainly fine grained. Plagioclase, clinopyroxene, and black oxides form an intergranular texture in the fine grained regions. Approximately 1 cm from the glassy lobe margins is a hypohyaline region with variolitic texture.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Nonvesicular	<1	2	0.1	1	Round

COLOR: Medium light gray (N6) to dark yellowish orange (10YR 6/6) in more altered patches.

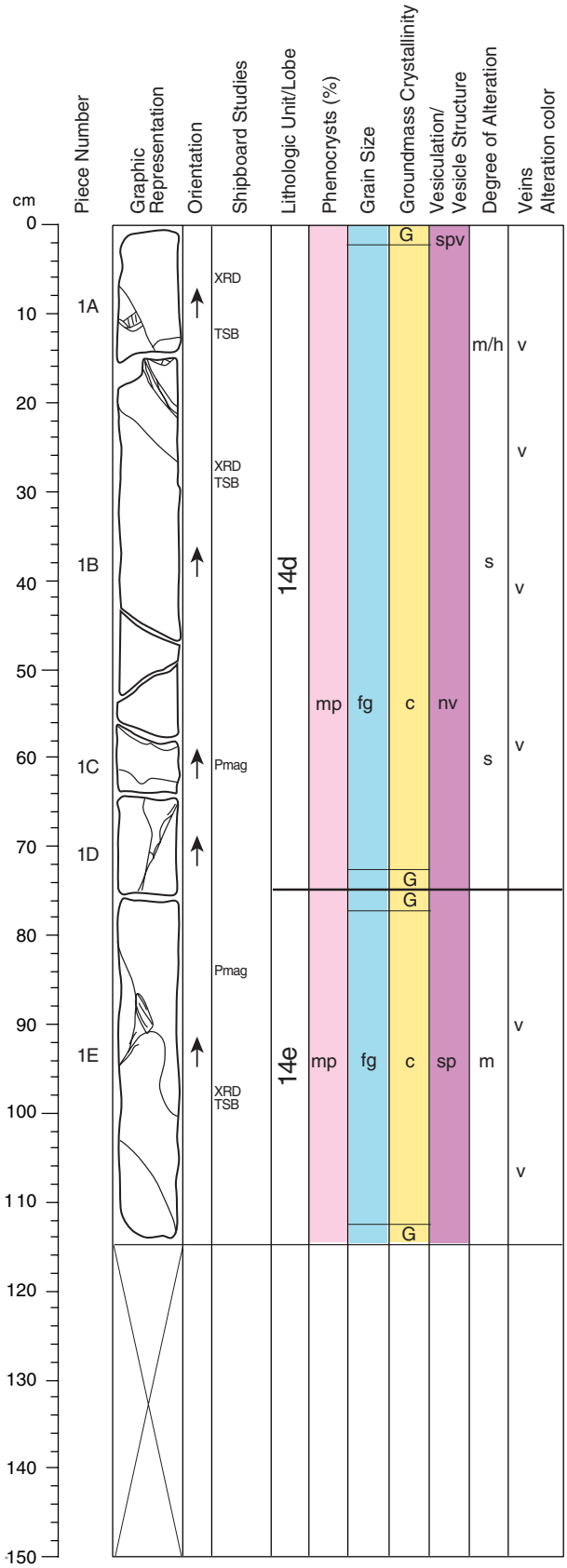
STRUCTURE: Lobed. Glassy lobe margins (1-2 mm thick) are present at the top of Piece 1A and the base of Piece 1K.

ALTERATION: Slight to moderate. Most intensely altered adjacent to veins, and the glassy lobe margins.

VEINS/FRACTURES: Moderately veined. Veins are randomly oriented, <0.1-6 mm wide, and are filled with white carbonate, green clay, Fe-oxyhydroxide and secondary sulfides. Most veins are oriented parallel and perpendicular to the glassy lobe margins.

COMMENTS: Based on the presence of multiple lobes bounded by smooth glassy surfaces, overall nonvesicular nature of the lava, presence of variolitic texture, and distinct cube jointed pattern of individual lobes, we interpret this Unit to be pillow lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-36R-3 (Section top: 620.3 mbsf)

UNIT 14: MODERATELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1A-1E

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-10	5	1	3	Subhedral to euhedral; blocky

GROUNDMASS: Mainly fine grained. Plagioclase, clinopyroxene, and black oxides form an intergranular texture in the fine-grained regions.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	<1	5	0.1	0.5	Round to irregular

COLOR: Medium light gray (N6) to dark yellowish orange (10YR 6/6) in more altered regions.

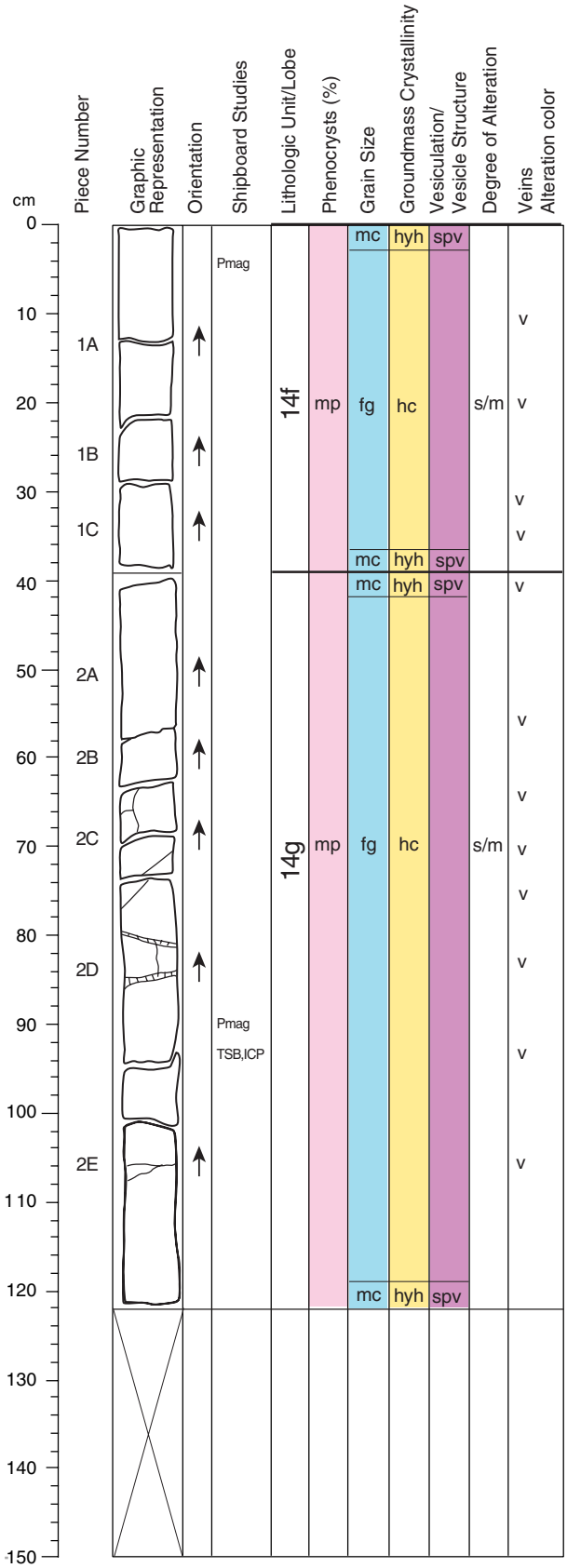
STRUCTURE: Lobed. Glassy lobe margins (1-2 mm thick) are present at the top of Piece 1A, the top of Piece 1D and the base of Piece 1E.

ALTERATION: Slight to moderate/high. Most intensely altered adjacent to veins. Vesicles are filled with carbonate and dark green clay.

VEINS/FRACTURES: Moderately veined. Veins are randomly oriented, <0.1-5 mm wide, and are filled with white carbonate, green clay, Fe-oxyhydroxide and secondary sulfides.

COMMENTS: Piece 1E represents an entire lobe. Plagioclase phenocrysts are present through the core, including the glassy lobe margins. Based on the presence of multiple lobes bounded by smooth glassy surfaces, overall nonvesicular nature of the lava, presence of variolitic texture, and distinct cube-jointed pattern of individual lobes, we interpret this Unit to be pillow lavas.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-36R-4 (Section top: 621.45 mbsf)

UNIT 14: MODERATELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1A-2F

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-10	8	1	4	Subhedral to euhedral; blocky

GROUNDMASS: Aphanitic to hypohyaline (with a variolitic texture) immediately adjacent to a glassy lobe margin at the top of Piece 1, at the base of Piece 1C, at the top of Piece 2A and the base of Piece 2F. The remainder is fine grained. Plagioclase, clinopyroxene, and black oxides form an intergranular texture in the fine-grained regions.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	<1	2	0.1	0.5	Round to subround

COLOR: Medium light gray (N6) and medium gray (N5) to dark yellowish orange (10YR 6/6) in more altered regions.

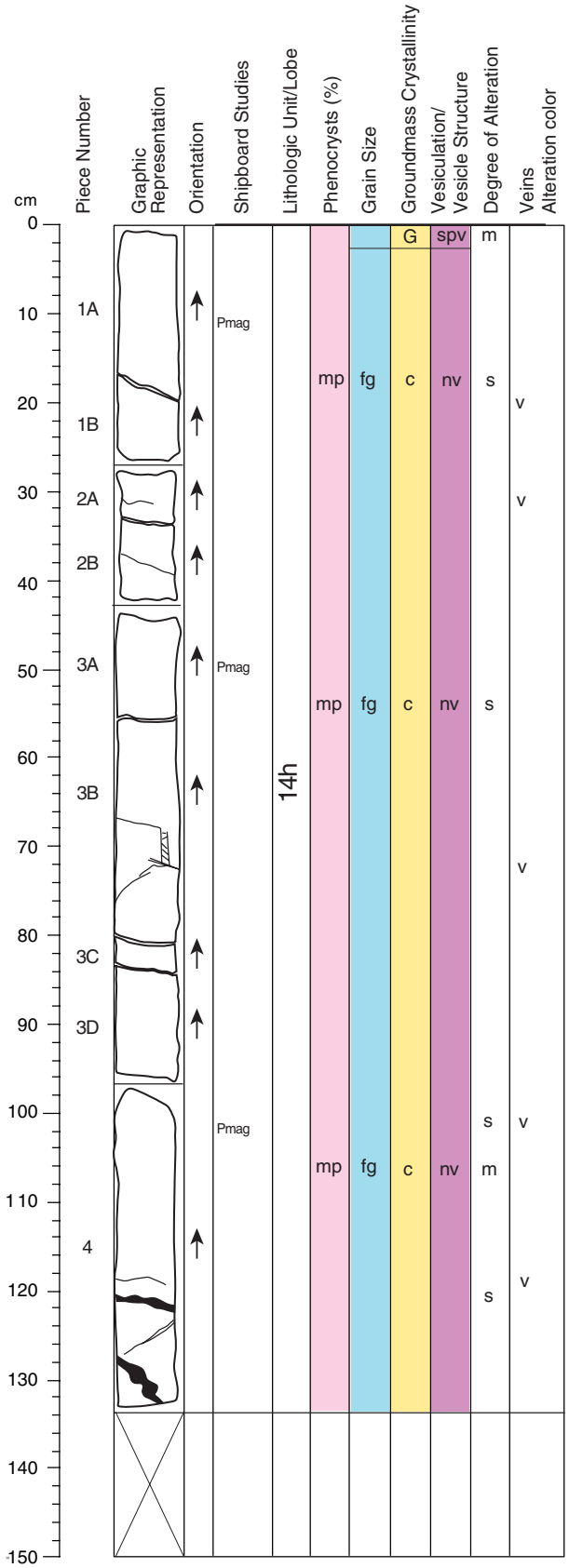
STRUCTURE: Lobed. A glassy lobe margin is present at the top of Piece 1A.

ALTERATION: Slight to moderate. Most intensely altered adjacent to veins. Rare vesicles are filled with carbonate and dark green clay.

VEINS/FRACTURES: Sparsely to moderately veined. Veins are randomly oriented, <0.1-8 mm wide, and are filled with white carbonate, green clay, and Fe-oxyhydroxide.

COMMENTS: This core contains two complete sections through basalt lobes. One lobe is in Pieces 1A to 1C, and the second is in Pieces 2A-2F. The base of the first and the top and base of the second lobe are defined by the presence of carbonate-filled vesicles and an aphanitic groundmass. Rare elongate vesicles are concentrated close to and perpendicular to the lobe margins. Plagioclase phenocrysts are present through the core, including the glassy lobe margins.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-36R-5 (Section top: 622.67 mbsf)

UNIT 14: MODERATELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1A-4

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-10	8	1	4	Subhedral to euhedral; blocky

GROUNDMASS: Aphanitic to hypohyaline (with a variolitic texture) immediately adjacent to glassy lobe margins (e.g., at the top of Piece 1A and at the base of Piece 3D). The remainder is fine grained. Plagioclase, clinopyroxene, and black oxides form an intergranular texture in the fine-grained regions.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	<1	1	0.1	0.5	Round to subround

COLOR: Medium light gray (N6) and medium gray (N5) to dark yellowish orange (10YR 6/6) in more altered patches.

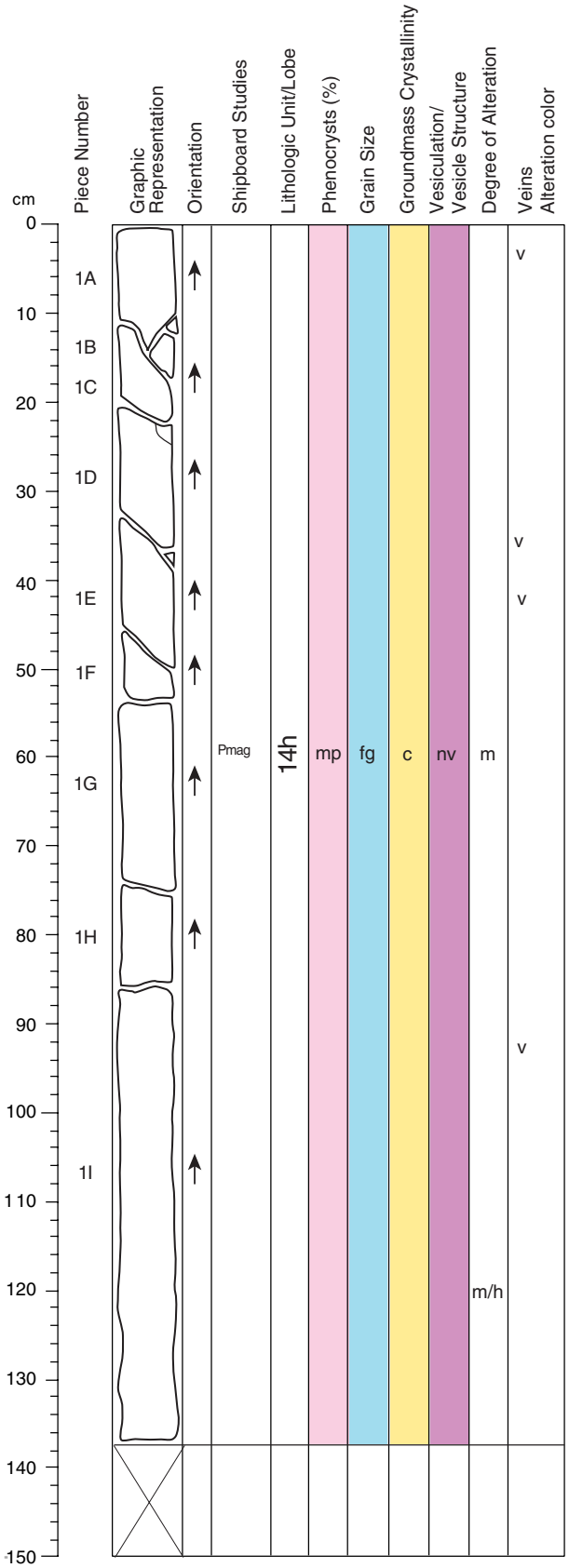
STRUCTURE: Lobed. A glassy lobe margin is present at the top of Piece 1A.

ALTERATION: Slight to moderate. Most intensely altered adjacent to veins. Rare vesicles are filled with carbonate and dark green clay.

VEINS/FRACTURES: Sparsely to moderately veined. Veins are randomly oriented and generally <0.1-5 mm wide and are filled with white carbonate, green clay, and Fe oxyhydroxide. Larger veins (0.5-2 cm wide) are present in Piece 4 at 120-132 cm, and also at 98-102 cm.

COMMENTS: This core contains one complete section through a basalt lobe contained in Pieces 1A-3D. It is defined by a glassy margin at the top of Piece 1A and an aphanitic, sparsely vesicular zone at the base of Piece 3D. Rare elongate vesicles are concentrated close to and perpendicular to the glassy lobe margins.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-36R-6 (Section top: 624.0 mbsf)

UNIT 14: MODERATELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1A-1I

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-10	8	1	4	Subhedral to euhedral; blocky

GROUNDMASS: Fine grained. Plagioclase, clinopyroxene, and black oxides form an intergranular texture.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Nonvesicular	<1			1	Round to subround

COLOR: Medium light gray (N6) and medium gray (N5) to dark yellowish orange (10YR 6/6) in more altered patches.

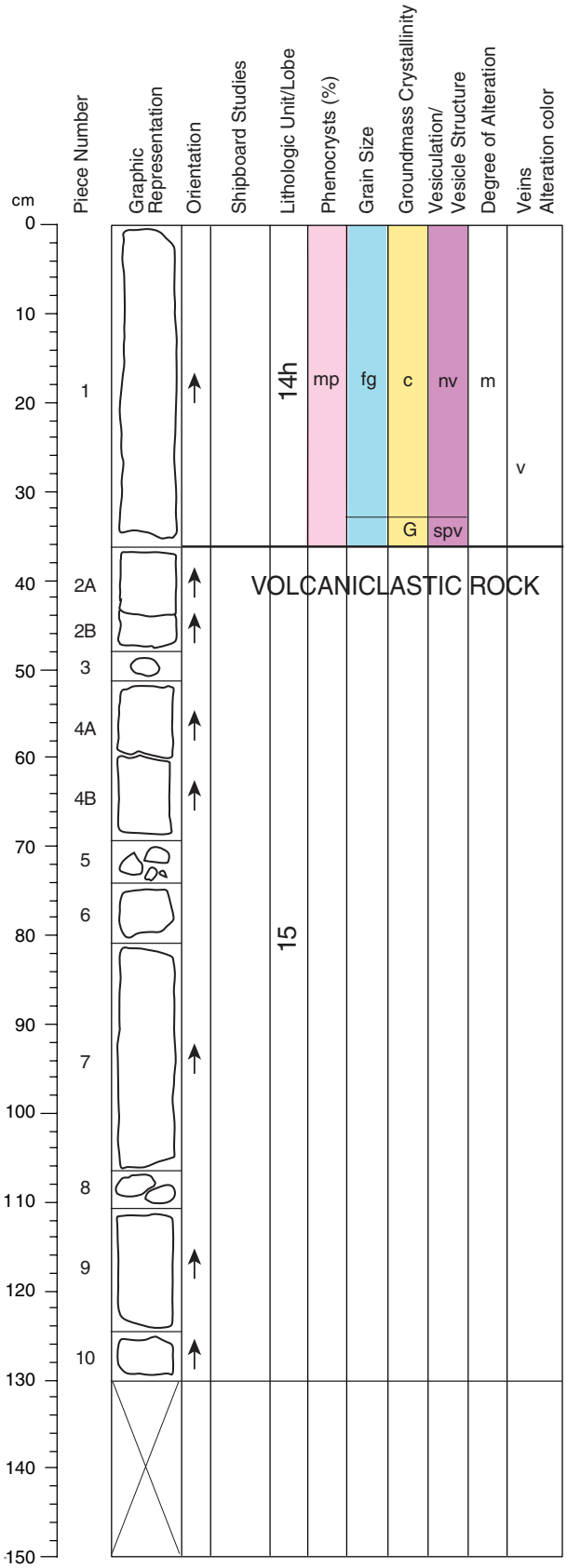
STRUCTURE: Massive, but this section represents a lobe continuing from Section 36R-5.

ALTERATION: Slight to moderate. Most intensely altered adjacent to veins. Rare vesicles are filled with carbonate and dark green clay.

VEINS/FRACTURES: Sparsely to moderately veined. Veins are randomly oriented, generally <0.1-2 mm wide, and are filled with white carbonate, green clay, and Fe-oxyhydroxide.

COMMENTS: This core is probably part of the fine-grained interior of a pillow lobe.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-36R-7 (Section top: 625.37 mbsf)

UNIT 14: MODERATELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None observed. The boundary between Units 14 and 15 is inferred to be between Pieces 1 and 2 at 36.5 cm.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-10	8	1	4	Subhedral to euhedral; blocky

GROUNDMASS: Fine grained. Plagioclase, clinopyroxene, and black oxides form an intergranular texture.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	<1			1	Round to subround

COLOR: Medium light gray (N6) and medium gray (N5) to dark yellowish orange (10YR 6/6) in more altered patches.

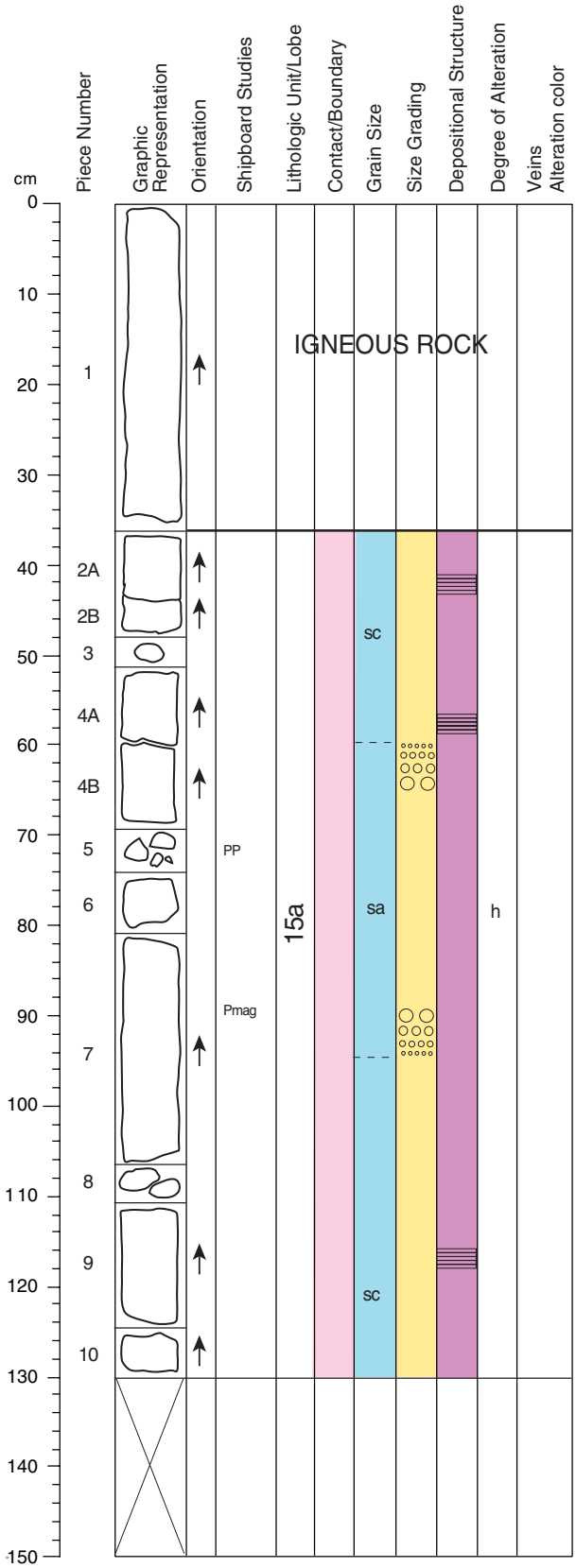
STRUCTURE: Lobed. A glassy lobe margin is present at the base of Piece 1.

ALTERATION: Slight to moderate. Most intensely altered adjacent to veins. Rare vesicles are filled with carbonate.

VEINS/FRACTURES: Sparsely veined. Veins are horizontal/subhorizontal and vertical, are 0.1-2 mm wide, and are filled with white carbonate, green clay, and Fe-oxyhydroxide.

COMMENTS: Vesicles occur in a zone ~1 cm wide adjacent to the glassy lobe margin.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-36R-7 (Section top: 625.37 mbsf)

UNIT 15a: BEDDED VITRIC SILTSTONE-SANDSTONE.

Pieces: 2A-10

CONTACTS: None recovered. Contact between Units 14 and 15 is inferred to be between Piece 1 and Piece 2A.

GENERAL DESCRIPTION: Thinly to medium bedded vitric siltstone and sandstone. Bedding results from sharp changes in grain size between beds. Internally, beds range from massive, to normal size grading, with rare cross lamination.

COLOR: Dark greenish gray (5GY 4/1) to greenish gray (5GY 6/1).

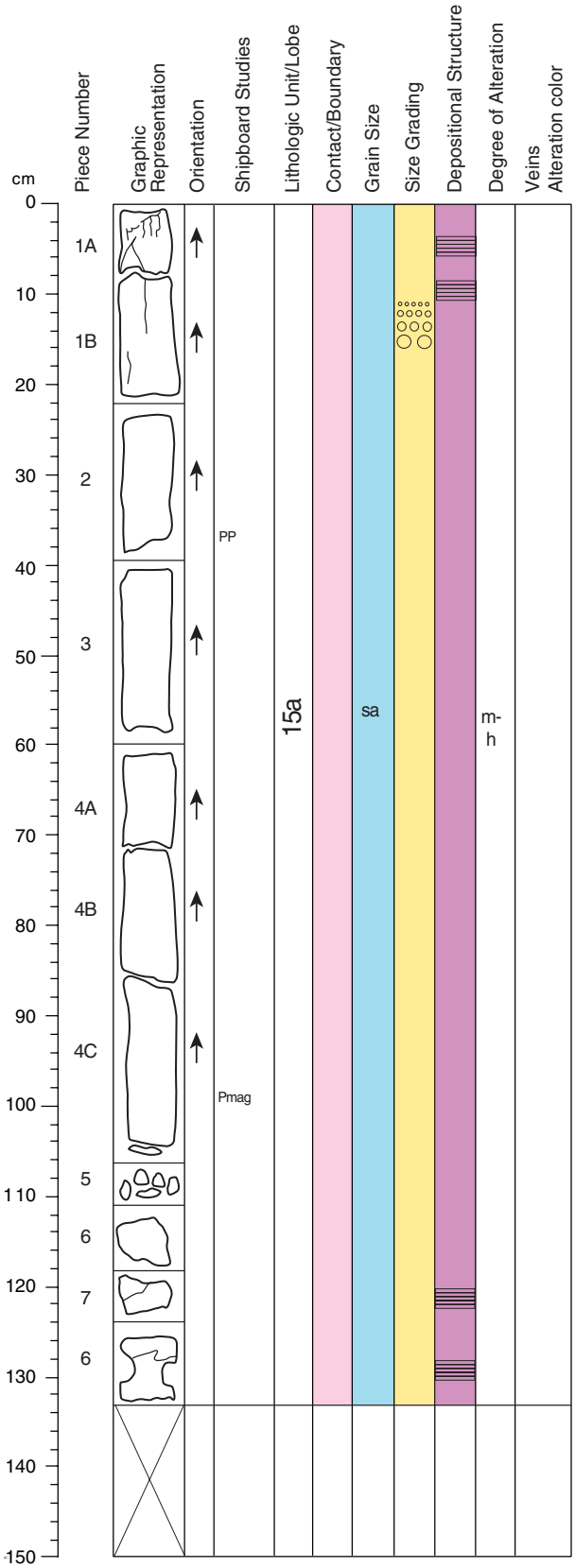
COMPONENTS: Predominantly angular to subround fragments (<0.5 mm) of altered glass fragments. Sorting in individual beds ranges from good to moderate.

SEDIMENTARY TEXTURES: The grain size in this section ranges from silt to coarse sand. Individual beds alternate from siltstone, fine to medium sandstone and medium to coarse sandstone. The sorting of individual beds is good to moderate, and beds in the top 30 cm typically display normal grading.

SEDIMENTARY STRUCTURES: Although the interval 41 cm to 105 cm consists of moderately sorted, massive, medium to coarse grained sandstone, planar bedding characterizes the section. Cross laminated beds are present at 5 c to 6 cm (Piece 1A); 111 cm to 117 cm (Piece 6); and 126 cm to 132 cm (Piece 8). Loading structures are present at bedding planes between coarse sandstone (above) and siltstone (below) at 5 cm (Piece 1B). Scour marks are present at 40 cm to 45 cm (Piece 3), cut into the top of the massive sand bed and filled with planar bedded siltstone-sandstone.

COMMENTS: We interpret this section to be resedimented basaltic tephra.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-36R-8 (Section top: 626.67 mbsf)

UNIT 15a: BEDDED VOLCANICLASTIC SILTSTONE-SANDSTONE.

Pieces: 1A-8

CONTACTS: None.

GENERAL DESCRIPTION: Thinly to medium bedded vitric siltstone and sandstone. Bedding results from sharp changes in grain size between beds. Internally, beds range from massive, to normal size grading, with rare cross lamination.

COLOR: Dark greenish gray (5GY 4/1) to greenish gray (5GY 6/1).

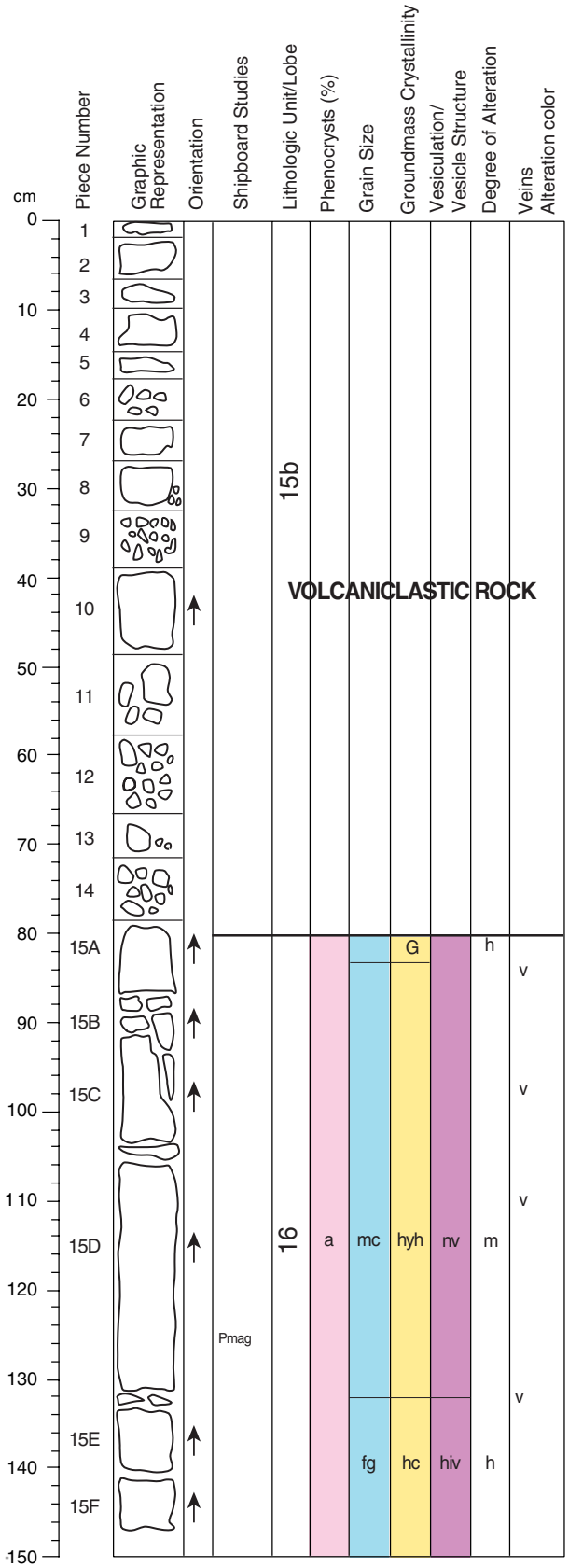
COMPONENTS: Predominantly angular to subround fragments (<0.5 mm) of altered glass fragments. Sorting in individual beds ranges from good to moderate.

SEDIMENTARY TEXTURES: The grain size in this section ranges from silt to coarse sand. Individual beds alternate from siltstone, fine to medium sandstone and medium to coarse sandstone. The sorting of individual beds is good to moderate, and beds in the top 30 cm typically display normal grading. Coarser beds (especially at 13 cm to16 cm) are normally graded.

SEDIMENTARY STRUCTURES: 1-3 cm-thick subhorizontal planar bedding present in Pieces 1-3 and 6-8. The rest of the section consists of massive, moderately sorted, medium to coarse grained sandstone.

COMMENTS: Same lithology as the lower part of Section 36R-7. We interpret this section to be resedimented basaltic tephra.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-37R-1 (Section top: 627.5 mbsf)

UNIT 16: APHYRIC TO HIGHLY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 15A-E.

CONTACTS: Upper contact with overlying sediment (80 cm) is sharp, consisting of a smooth pahoehoe flow surface and a 4 mm-thick glassy selvage.

PHENOCRYSTS: Aphyric.

GROUNDMASS: Fine grained and holocrystalline. Consists of plagioclase, clinopyroxene and olivine.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
0–128 cm	0–1	1	<1	1	Round
128–150 cm	5–25	10	1	4	Abundance increases downwards.

COLOR: Grayish black (5Y 2.5/2).

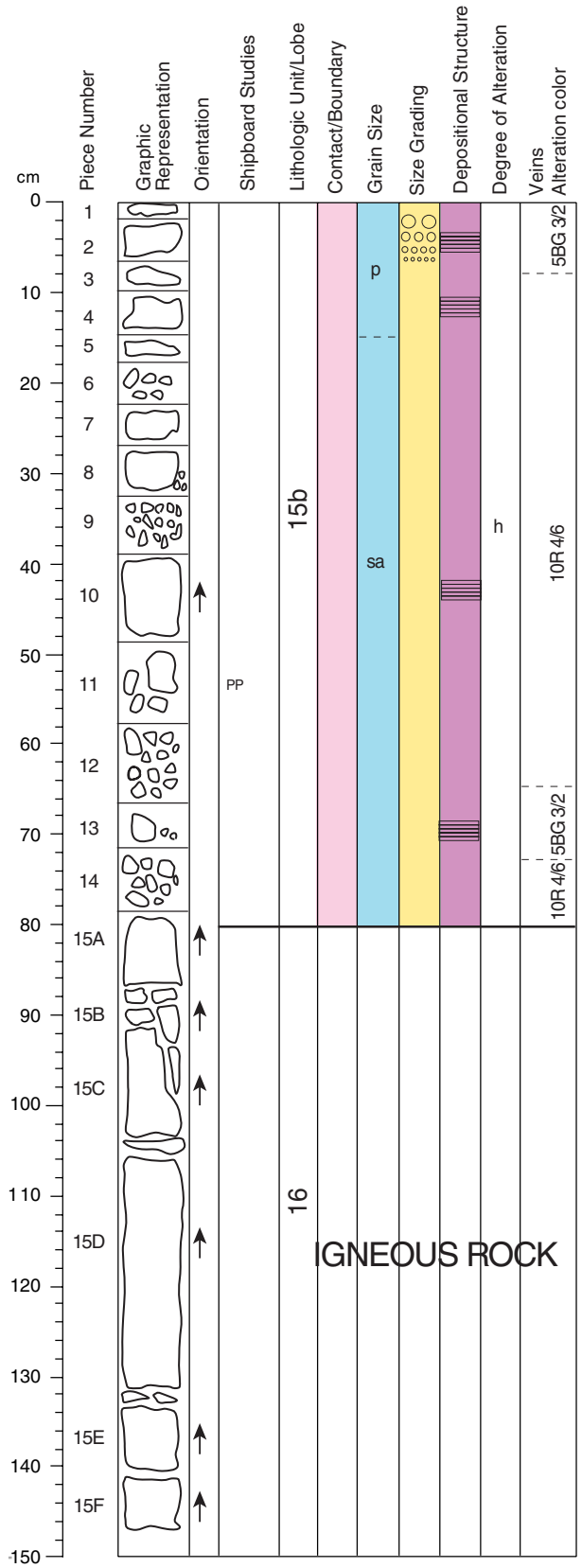
STRUCTURE: Massive.

ALTERATION: Slight.

VEINS/FRACTURES: Sparse. A horizontal calcite-filled 3 mm wide vein is present at 109 cm, and a meandering vertical vein 10 mm wide is present from 109 to 119 cm.

COMMENTS: Unit 16 is a classical pahoehoe sheet lobe. Sections 37R-1(>80 cm), 37R-2, 37R-3, 38R-1, and 38R-2 (<15 cm) show classical three-fold subdivision into upper (lava) crust, massive interior (lava core) and lower (basal) crust (Fig. 02_F14). Section 37R-1 contains the top 60 cm of the upper lava crust (interval 80–146 cm).

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-37R-1 (Section top: 627.5 mbsf)

UNIT 15b: CALCAREOUS VITRIC SILTSTONE AND SANDSTONE.

Pieces: 1–15A

CONTACTS: Lower contact with underlying lava flow is sharp (at 82 cm, Piece 15A) and slightly undulating.

GENERAL DESCRIPTION: This interval consists of thinly bedded volcaniclastic sandstone alternating with siliceous siltstone.

COLOUR: Varies from purple dark gray (5Y 3/1–5/1) to gray/dark gray (2.5Y 4/0–5/0) between beds. Beds with disturbed bedding have an overprint color of pale yellow brown (2.5 6/4).

COMPONENTS:
20%–80%: Vesicular vitric clasts and shards; vesicularity ranges from <10% (shards) to >50% (tephra clasts).
20%–80%: Siliceous silt to clay sized material.
A carbonate cement is present in tephra rich horizons.

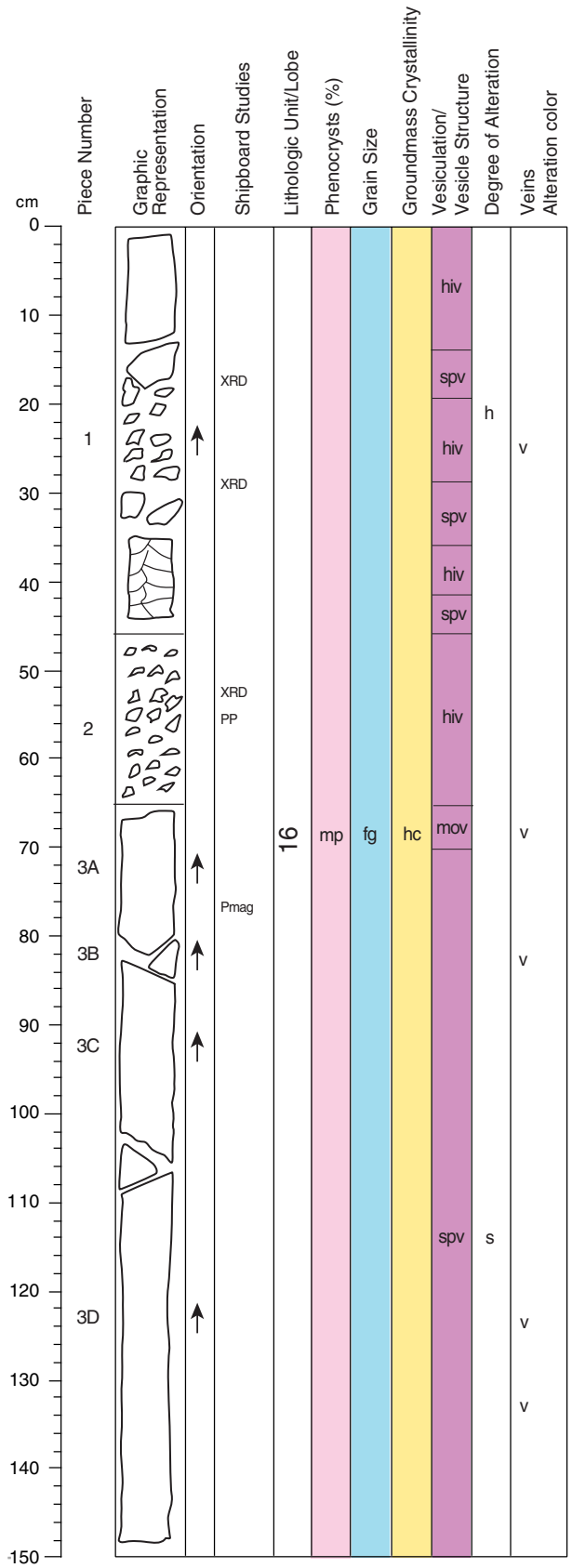
SEDIMENTARY TEXTURES: Grain size ranges from silt to coarse sand (dominantly silt to fine sand). Sorting of individual beds ranges from good to moderate.

SEDIMENTARY STRUCTURE: Typically finely bedded, with layers ranging from 2–11 cm in thickness. Planar laminated intervals are found at 3–7 cm (Piece 2) and 67–72 cm (Piece 13) consisting of <1–2 mm laminae of silt and fine sandstone.

COMMENTS: The vitric volcanic particles in the sandstone are dominantly ash-size mafic tephra clasts formed by a subaerial eruption, but deposited into water. The siliceous siltstone implies deposition in a low energy environment, which acts as a trap for airborne and/or resedimented tephra.

Interval 67–72 cm (Piece 13) consists of a finely laminated vitric sandstone consisting of nonvesicular glass particles and lava clasts in a carbonate cement. This may be a hyaloclastite, formed from glassy flow margins shattering from contact with water. In contrast, interval 78–80 cm (Piece 15A) is a vitric sandstone with a siliceous mud matrix and may be indicative of lava invading muddy sediment.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-37R-2 (Section top: 629.0 mbsf)

UNIT 16: APHYRIC TO HIGHLY OLIVINE-PLAGIOCLASE-PHYRIC BASALT(*).

Pieces: 1A-3D.

CONTACTS: None.

PHENOCRYSTS: Proportions vary substantially throughout.

	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	0–7	5	2	3	Euhedral; Increases in abundance to base

GROUNDMASS: Fine grained and holocrystalline. Consists of plagioclase, clinopyroxene and olivine.(*) Presence of olivine in groundmass indicates alkaline affinity for the lava.

VESICLES: Abundance varies substantially throughout.

	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
0–67 cm	15–20	10	1	4	Round
67–150 cm	~0				

COLOR: Grayish black (5Y 2.5/2).

STRUCTURE: Massive.

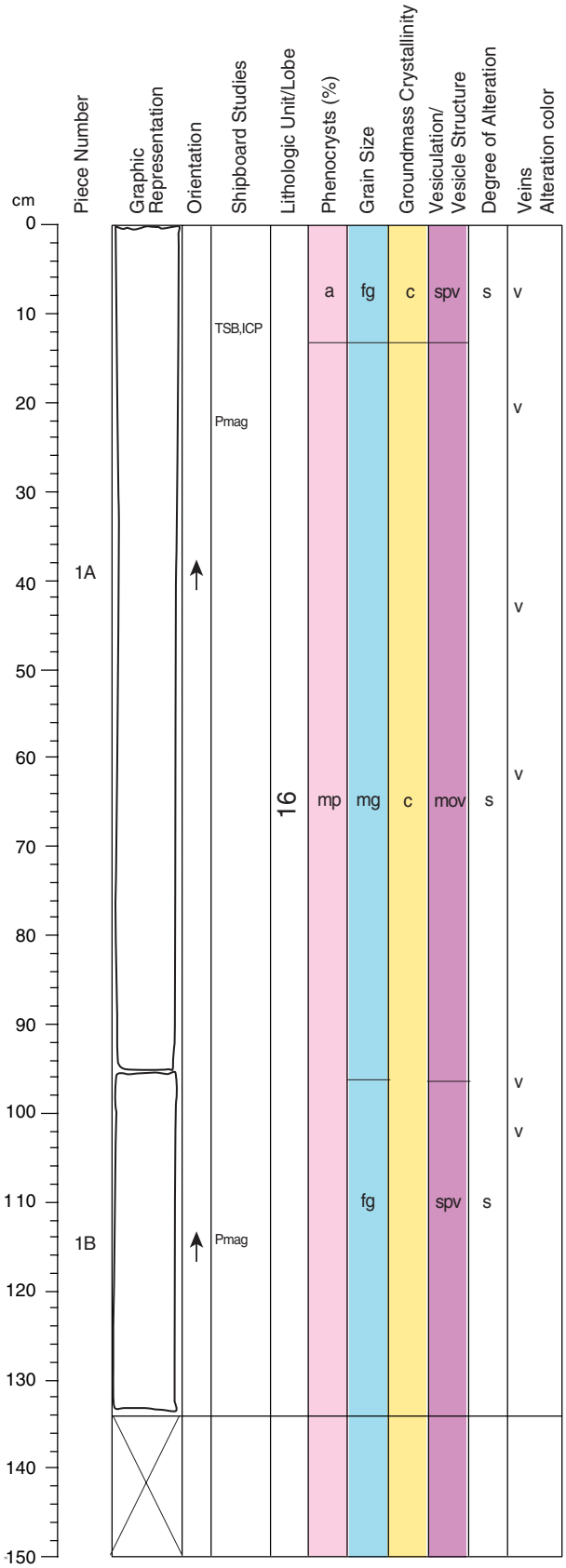
ALTERATION: Slight.

VEINS/FRACTURES: Sparsely veined. Horizontal calcite-filled 2 mm wide veins are present at 68, 121, 130, and 134 cm.

COMMENTS: Unit 16 is a classic pahoehoe sheet lobe. Section 37R-1(>80 cm), 37R-2, 37R 3, 38R-1, and 38R-2 (<15 cm) show a three-fold subdivision into upper (lava crust), massive interior (lava interior) and lower (basal crust) (Figure 02_F14). The transition from upper crust to massive interior occurs at 68 cm and is apparent by the abrupt reduction in vesicle abundance.

(*)Note: The phenocryst abundance varies substantially from olivine-phyric to plagioclase phyric.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-37R-3 (Section top: 630.5 mbsf)

UNIT 16: APHYRIC TO HIGHLY OLIVINE-PLAGIOCLASE-PHYRIC BASALT(*).

Pieces: 1A-1B

CONTACTS: None.

PHENOCRYSTS: Proportions vary substantially throughout.

	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	7–20	5	2	3	Euhedral; increases in abundance to base
Plagioclase:	1–2	4	1	3	Euhedral

GROUNDMASS: Fine grained and holocrystalline. Consists of plagioclase, clinopyroxene and olivine.(*) Presence of olivine in groundmass indicates alkaline affinity for the lava.

VESICLES: Abundance varies substantially throughout.

	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
0–67 cm 1	5–20	10	1	4	Round
67–150 cm	~0				

COLOR: Gray–black (5Y 2.5/2).

STRUCTURE: Massive.

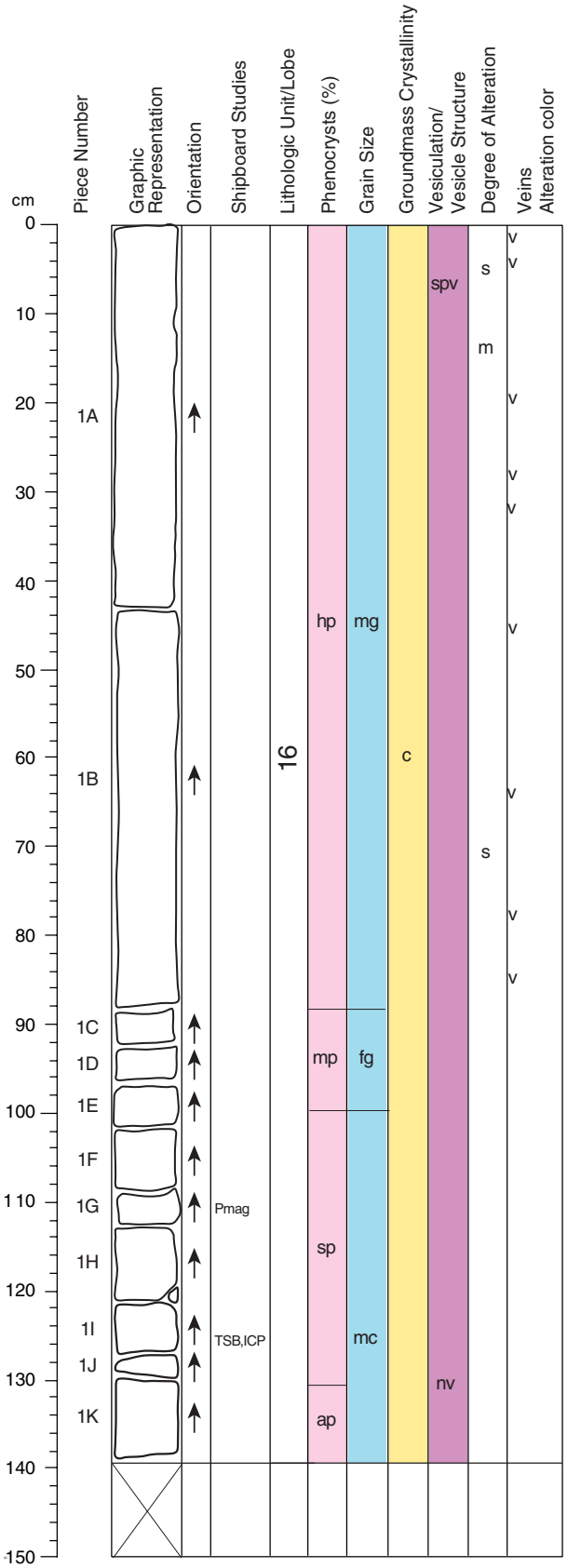
ALTERATION: Slight.

VEINS/FRACTURES: Sparsely veined. A series of ~3 mm wide calcite veins bisect the core.

COMMENTS: Unit 16 is a classic pahoehoe sheet lobe. Sections 37R-1(>80 cm), 37R-2, 37R-3, 38R-1, and 38R-2 (<15 cm) show a three-fold subdivision into upper (lava crust), massive interior (lava interior) and lower (basal crust) (Fig. 02_F14). The transition from upper crust to massive interior occurs at 68 cm and is apparent by the abrupt reduction in vesicle content. This Section represents part of the massive interior of the flow.

(*)Note: The phenocryst abundance varies substantially from olivine-phyric to plagioclase phyric.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-38R-1 (Section top: 637.1 mbsf)

UNIT 16: APHYRIC TO HIGHLY OLIVINE-PLAGIOCLASE-PHYRIC BASALT(*).

Pieces: 1A-1K.

CONTACTS: None.

PHENOCRYSTS: Abundance varies throughout. Aphyric after 89 cm.

	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	0-20	5	2	3	Euhedral; increases in abundance to base

GROUNDMASS: Fine grained and holocrystalline. Consists of plagioclase, clinopyroxene and olivine.(*) Presence of olivine in groundmass indicates alkaline affinity for the lava.

VESICLES: Abundance varies substantially throughout.

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
<1	1	<1	1	Round

COLOR: Grayish black (5Y 2.5/2).

STRUCTURE: Massive.

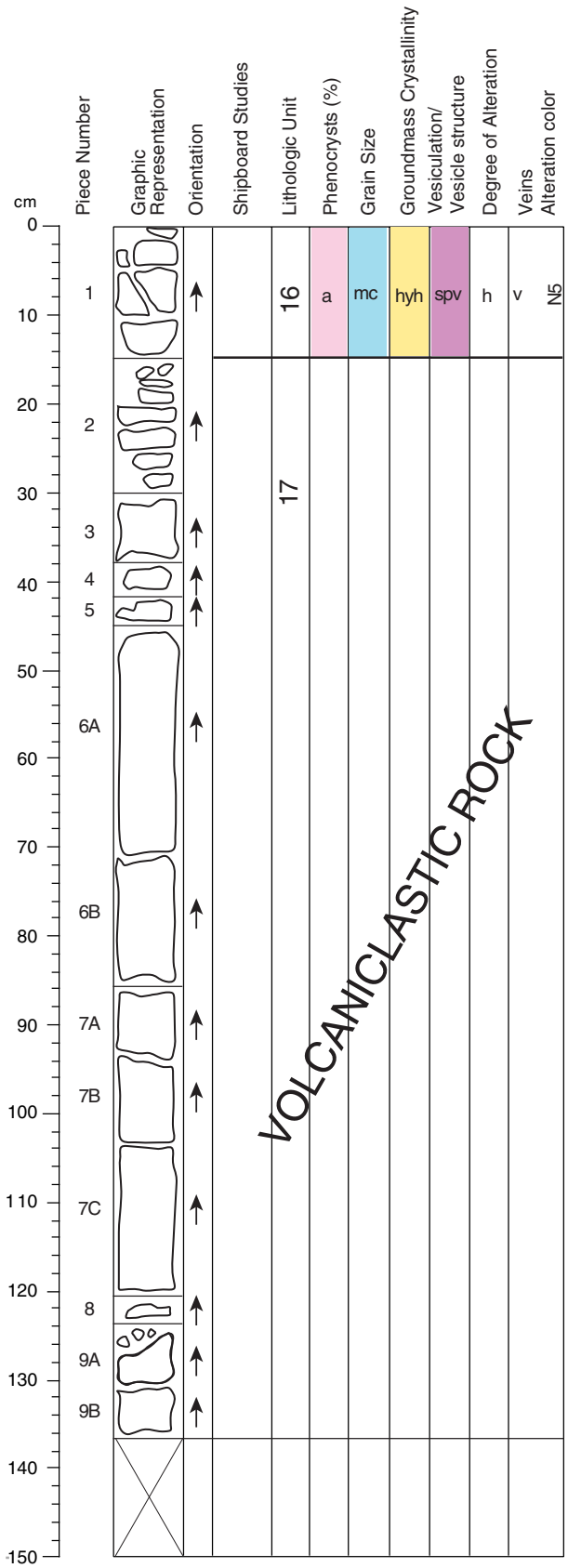
ALTERATION: Slight.

VEINS/FRACTURES: Sparsely veined. A series of 3 mm wide calcite veins are present throughout. All are horizontally oriented below 90 cm.

COMMENTS: Unit 16 is a classical pahoehoe sheet lobe. Sections 37R-1(>80 cm), 37R-2, 37R-3, 38R-1, and 38R-2 (<15 cm) show classical three-fold subdivision into upper (lava crust), massive interior (lava core) and lower (basal crust) (Fig. 02_F14). The transition from massive interior to basal crust occurs at ~90 cm and is apparent by the absence of phenocryst phases and presence of horizontal veins, infilling basal joints.

(*)Note: The phenocryst abundance varies substantially from olivine-phyric to plagioclase phyric.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-38R-2 (Section top: 638.51 mbsf)

UNIT 16: APHYRIC TO HIGHLY OLIVINE-PLAGIOCLASE-PHYRIC BASALT(*).

Pieces: 1

CONTACTS: Not recovered. Basal contact of lobe is taken to be at 15 cm (between Pieces 1 and 2).

PHENOCRYSTS: Aphyric.

	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	0-20	5	2	3	Euhedral; increases i abundance to base

GROUNDMASS: Fine grained and holocrystalline. Consists of plagioclase, clinopyroxene and olivine.(*) Presence of olivine in groundmass indicates alkaline affinity for the lava.

VESICLES: Abundance varies substantially throughout.

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
≤10	1	<1	1	Round

COLOR: Grayish black (5Y 2.5/2).

STRUCTURE: Massive.

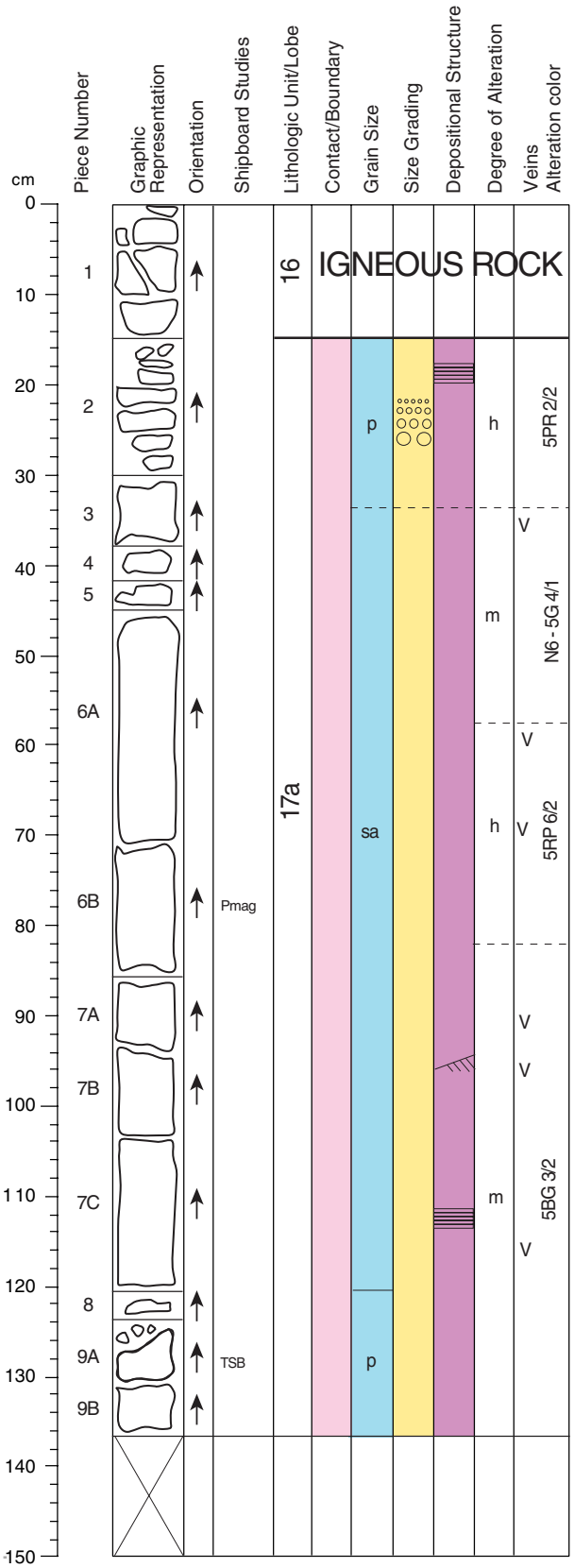
ALTERATION: Slight.

VEINS/FRACTURES: Sparsely veined. Small, 3 mm wide, calcite veins are present.

COMMENTS: This section contains the lowest part of the badsal crust of the Unit 16 lobe.

(*)Note: The phenocryst abundance varies substantially from olivine-phyric to plagioclase phyric.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-38R-2 (Section top: 638.51 mbsf)

UNIT 17: BEDDED OLIVINE-PLAGIOCLASE-BASALT TUFF.

Pieces: 2–9B

CONTACTS: Upper contact at 15 cm with overlying lava is seen in one fragment within Piece 2; it consists of a glassy lobe margin on planar laminated sediment. Subunit continues throughout this section.

GENERAL DESCRIPTION: Planar bedded hyaloclastite tuff consisting of sparsely to moderately vesicular olivine- and plagioclase-phyric clasts.

COLOR: Greenish gray (5G 4/1) to dusky reddish purple (5RP 2/2).

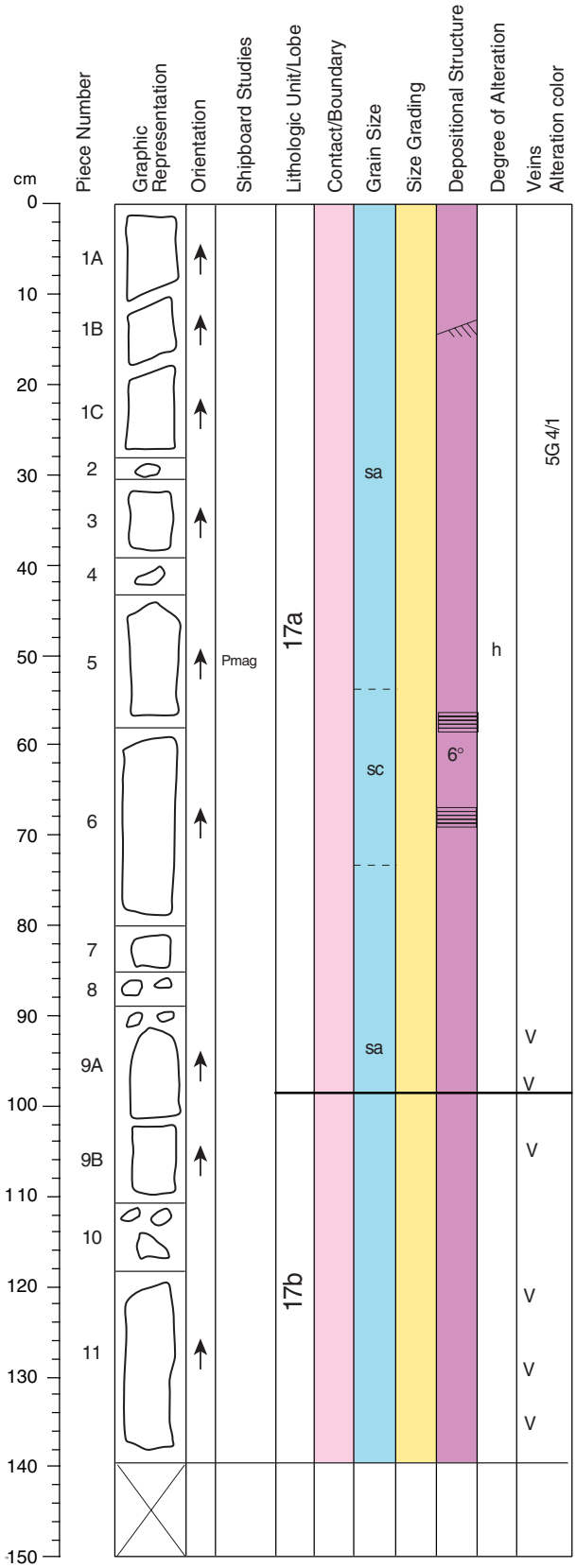
COMPONENTS:
60%–90%: Mafic vitric/glass particles and shards[1], non- to moderately vesicular[2] ash-size particles are highly olivine and plagioclase-phyric (20%–40%, <1 mm).[3]
5%–20%: Olivine and plagioclase crystals.
5%–20%: Poorly vesicular olivine-phyric lava lithics.
Cement is calcite, except for interval 15–38 cm below the lava.

SEDIMENTARY TEXTURES: Grain size alternates between moderately coarse ash and very fine ash beds with lapilli tuff interval at 124–136 cm.

SEDIMENTARY STRUCTURES: Upper 2 cm sediment layer exhibits mm-scale soft sediment deformation. Unit has thin to medium bedding from 3–20 cm. Planar-dominated intervals occur at 15–30 cm and 107–120 cm; dips are ~5°.

COMMENTS:
[1]Shards have splinter-like morphologies.
[2]Occasionally highly vesicular (50% to >70%) tephra clasts with smooth lobate outlines are present.
[3]These vitric clasts may be related to the overlying olivine-phyric lava ; i.e., hyaloclastite tuff formed by quenched fragmentation and spalling of glassy margins when lava lobes came into contact with water.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-38R-3 (Section top: 639.88 mbsf)

UNIT 17: BEDDED OLIVINE-PLAGIOCLASE-BASALT TUFF.

Pieces: 1–9A

CONTACTS: Contact between Lobes 17a and 17b at 98 cm is sharp.

GENERAL DESCRIPTION: Planar bedded hyaloclastite tuff consisting of poorly to moderately vesicular olivine and plagioclase-phyric clasts.

COLOR: Greenish gray (5G 4/1) to dusky reddish purple (5RP 2/2).

COMPONENTS:
60%–90%: Mafic vitric/glass particles and shard(*), nonvesicular to moderately vesicular ash-size particles are highly olivine and plagioclase-phyric (20%–40%, <1 mm).
5%–20%: Olivine and plagioclase crystals.
5%–20%: Poorly vesicular olivine-phyric lava lithics.
Cement is calcite.

SEDIMENTARY TEXTURES: Grain size alternates between moderately coarse ash and very fine ash beds with lapilli tuff at 1–10 cm, which is a continuation of the lapilli tuff interval at the base of Section 38R-2.

SEDIMENTARY STRUCTURES: Planar laminated interval at 58–67 cm with a horizontal dip.

COMMENTS: (*)Clasts are poorly vesicular, angular and marked by straight planar fracture surfaces whereas shards have splinter-like shapes. Clast morphology is consistent with origin by quenched fragmentation when lava comes into contact with water.

Pieces: 9A-11

CONTACTS: Upper contact at 98 cm is sharp.

GENERAL DESCRIPTION: Planar-bedded hyaloclastite tuff consisting of poorly to moderately vesicular olivine and plagioclase-phyric clasts.

COLOR: Greenish gray (5G 4/1).

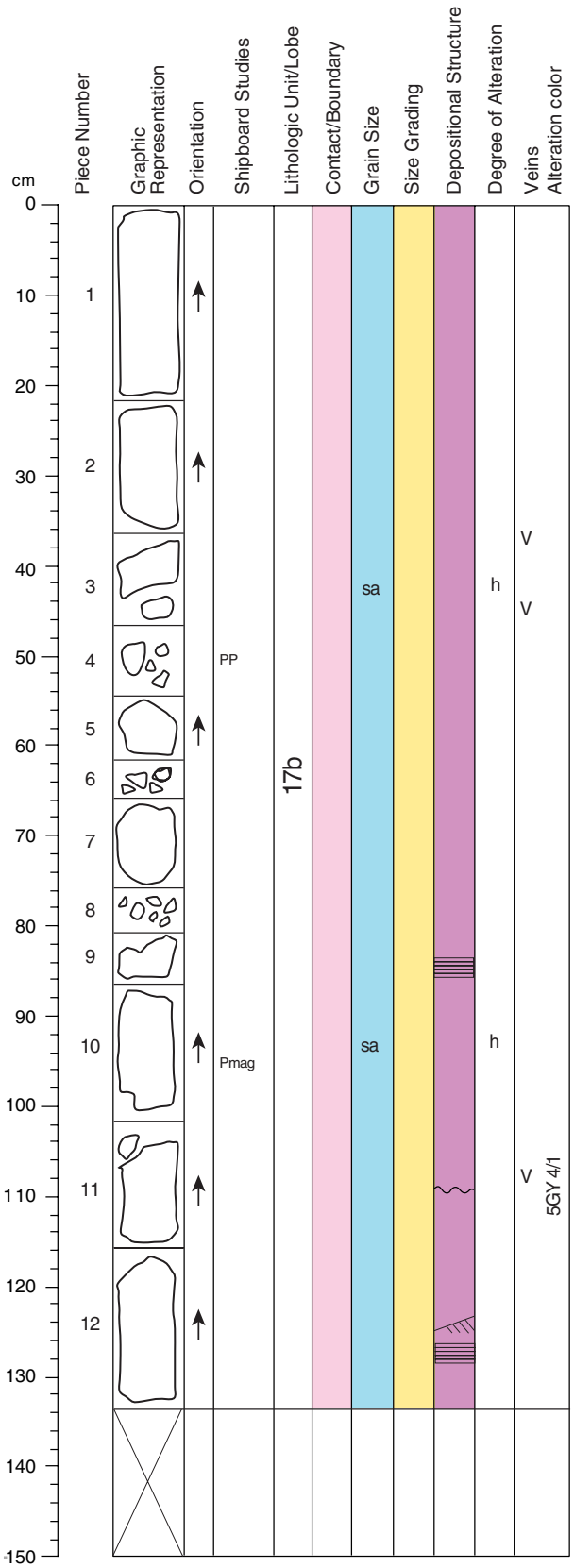
COMPONENTS:
60–90%: Mafic vitric/glass particles and shards(*), aphyric to sparsely olivine and plagioclase phyric.
5%–20%: Olivine and plagioclase crystals.
5%–20%: Poorly vesicular olivine phyric lava lithics
Cement is calcite.

SEDIMENTARY TEXTURES: Grain size alternates between moderately coarse ash and very fine ash beds.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: (*)Clasts are poorly vesicular, angular and marked by straight planar fracture surfaces whereas shards have splinter-like shapes. Clast morphology is consistent with origin by quenched fragmentation when lava comes into contact with water.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-38R-4 (Section top: 641.28 mbsf)

UNIT 17: BEDDED OLIVINE-PLAGIOCLASE-BASALT TUFF.

Pieces: 1–12

CONTACTS: None.

GENERAL DESCRIPTION: Planar bedded hyaloclastite tuff consisting of poorly to moderately vesicular olivine- and plagioclase-phyric clasts.

COLOR: Greenish gray (5G 4/1).

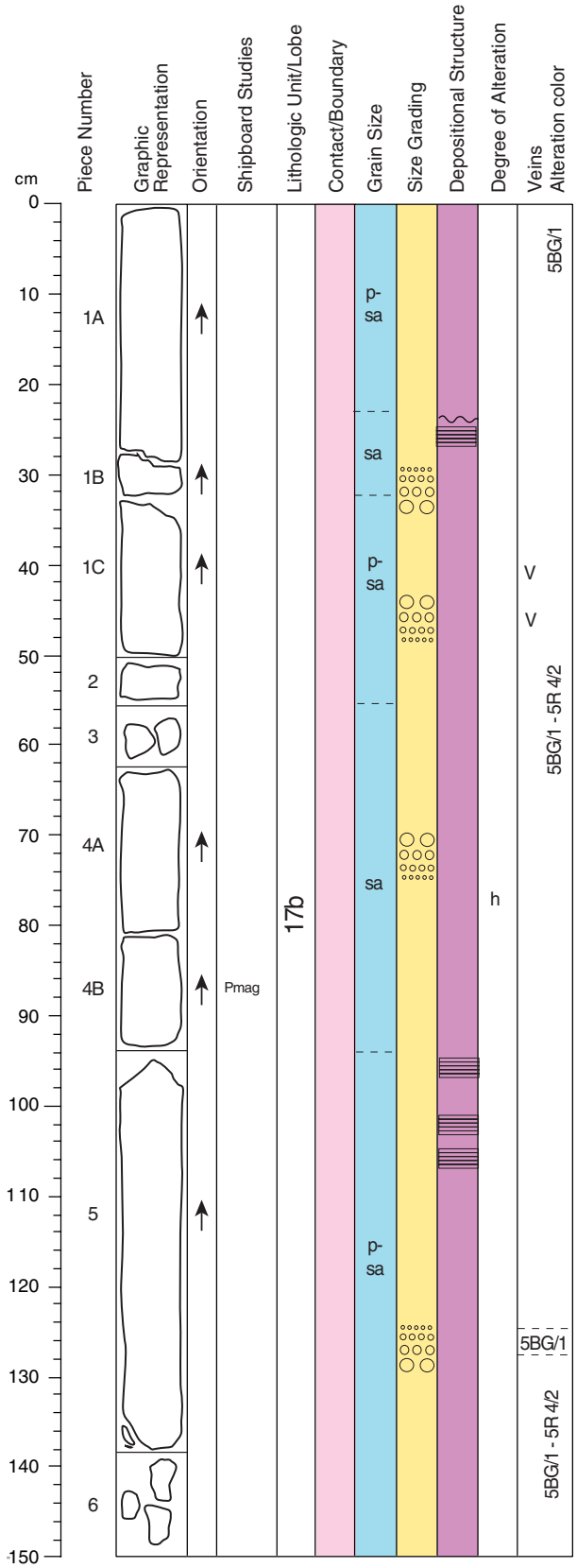
COMPONENTS:
60%–90%: Mafic vitric/glass particles and shards(*), nonvesicular, aphyric to sparsely olivine- and plagioclase-phyric.
5%–20%: Olivine and plagioclase crystals.
5%–20%: Poorly vesicular olivine phyric lava lithics.
Cement is calcite.

SEDIMENTARY TEXTURES: Grain size alternates between moderately coarse ash and very fine ash beds.

SEDIMENTARY STRUCTURES: Planar laminated interval at 85–87 cm. Microfaults at 108 cm across a 2 mm silt lamination interval. At 111 cm there is soft sediment deformation (ball and pillow) across a transition from overlying coarse sand to underlying fine sand.

COMMENTS: (*)Clasts are poorly vesicular, angular and marked by straight planar fracture surfaces whereas shards have splinter-like shapes. Clast morphology is consistent with origin by quenched fragmentation when lava comes into contact with water.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-38R-5 (Section top: 642.62 mbsf)

UNIT 17: BEDDED OLIVINE-PLAGIOCLASE-BASALT TUFF.

Pieces: 1-6A

CONTACTS: None.

GENERAL DESCRIPTION: Planar-bedded hyaloclastite tuff consisting of sparsely to moderately vesicular olivine-and plagioclase-phyric basalt clasts, except for interval 0–35 cm which consists of coarse hyaloclastite tuff, with high (>50%) concentration of olivine and plagioclase crystals in the lowest 3 cm. The lithology of this sublayer is similar to that of Unit 17a, and it has a distinct boundary with the underlying sediment.

COLOR: Greenish gray (5G 4/1); Pieces 2–6 are dusky purple red (5RP 2/2).

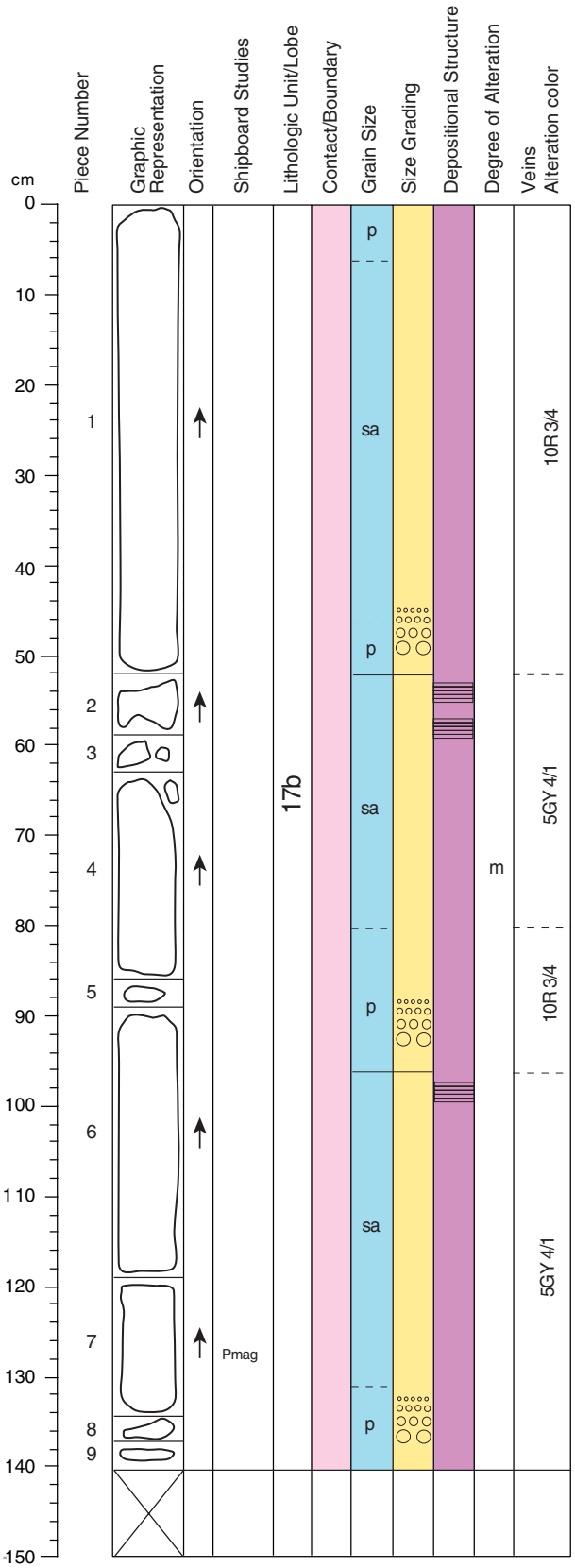
COMPONENTS:
60%–90%: Mafic vitric/glass particles and shards(*), nonvesicular, and sparsely olivine- and plagioclase-phyric.
5%–20%: Olivine and plagioclase crystals.
5%–20%: Poorly vesicular olivine phyric lava lithics.
Cement is calcite.
Interval 0–35 cm contains highly olivine- and plagioclase-phyric vitric clasts and concentrations of olivine and plagioclase crystals near the base; interval 94–98 cm is rich in microcrystalline lava lithics; interval 124–126 cm contains highly vesicular (>90%) lapilli (reticulite-like) clasts.

SEDIMENTARY TEXTURES: Grain size alternates between moderately coarse ash and very fine ash beds.

SEDIMENTARY STRUCTURES: Planar laminated interval at 98–115 cm.

COMMENTS: (*)Clasts are poorly vesicular, angular and marked by straight planar fracture surfaces whereas shards have splinter-like shapes. Clast morphology is consistent with origin by quenched fragmentation when lava comes into contact with water.

Core Photo



VOLCAN ICLASTIC VISUAL CORE DESCRIPTION

197-1203A-39R-1 (Section top: 646.6 mbsf)

UNIT 17: BEDDED OLIVINE-PLAGIOCLASE-BASALT TUFF.

Pieces: 1–9

CONTACTS: None.

GENERAL DESCRIPTION: Planar bedded hyaloclastite tuff consisting of poorly to moderately vesicular olivine- and plagioclase-phyric clasts.

COLOR: Dark green (5GY 4/1) to brownish red (10R 3/4).

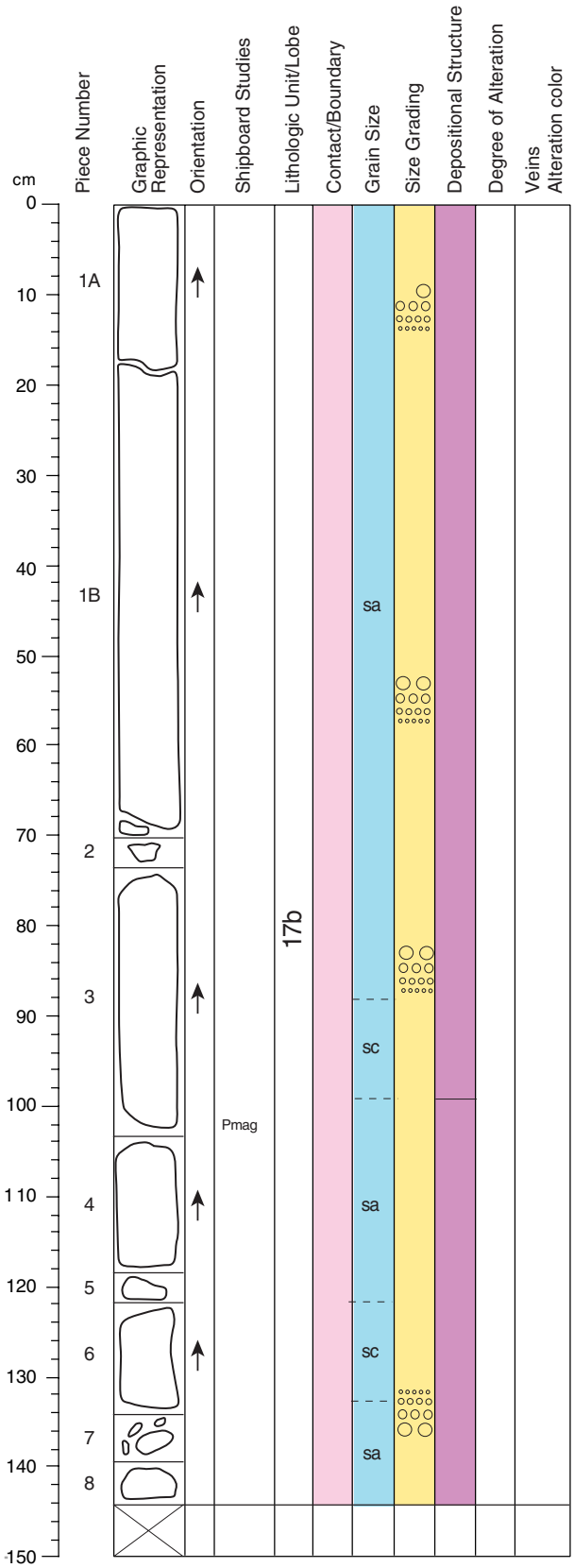
COMPONENTS:
60%–90%: Mafic vitric/glass particles and shards(*), nonvesicular, and sparsely olivine- and plagioclase-phyric.
5%–20%: Olivine and plagioclase crystals.
5%–20%: Poorly vesicular olivine phyric lava lithics.

SEDIMENTARY TEXTURES: Poorly sorted. Indistinct lamination is present in the finer grained parts of the Section (92–95 cm and 55–65 cm).

SEDIMENTARY STRUCTURES: Several normally-graded sequences are present. Contact between gravel tuff and the underlying sandstone is sharp; the gravel fines upward into volcaniclastic sandstone.

COMMENTS: (*)Clasts are poorly vesicular, angular and marked by straight planar fracture surfaces whereas shards have splinter-like shapes. Clast morphology is consistent with origin by quenched fragmentation when lava comes into contact with water.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-39R-2 (Section top: 648.01 mbsf)

UNIT 17: BEDDED OLIVINE-PLAGIOCLASE-BASALT TUFF.

Pieces: 1A–8

CONTACTS: None.

GENERAL DESCRIPTION: Planar bedded hyaloclastite tuff consisting of poorly to moderately vesicular olivine- and plagioclase-phyric clasts.

COLOR: Greenish gray (5GY 6/1), reddish brown (10R 4/6), grayish orange pink (10R 8/2) and light brownish gray (5YR 6/1) in alternating beds.

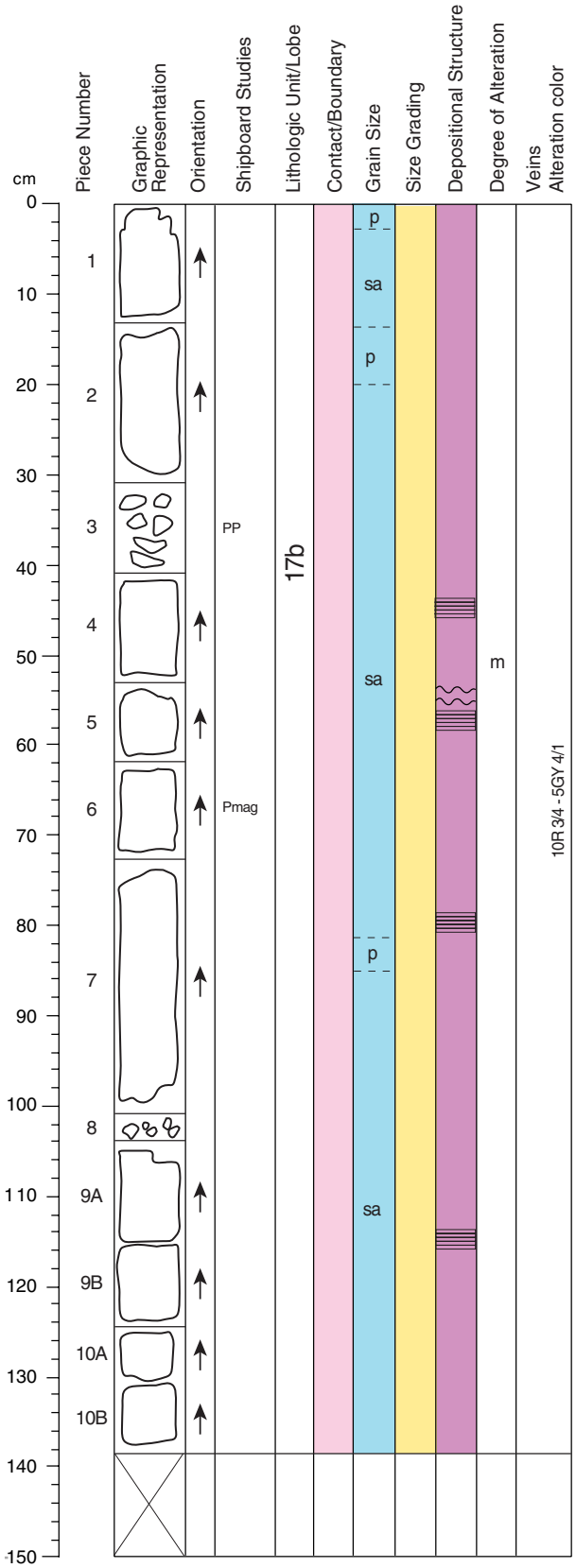
COMPONENTS:
60%–90%: Mafic vitric/glass particles and shard(*), nonvesicular, and sparsely olivine- and plagioclase-phyric.
5%–20%: Olivine and plagioclase crystals.
5%–20%: Poorly vesicular olivine phyric lava lithics.

SEDIMENTARY TEXTURES: Grain size alternates between moderately coarse grained layers and very fine ash beds.

SEDIMENTARY STRUCTURES: Planar bedding is present.

COMMENTS: (*)Clasts are poorly vesicular, angular and marked by straight planar fracture surfaces whereas shards have splinter-like shapes. Clast morphology is consistent with origin by quenched fragmentation when lava comes into contact with water.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-39R-3 (Section top: 649.46 mbsf)

UNIT 17: BEDDED OLIVINE-PLAGIOCLASE-BASALT TUFF.

Pieces: 1–10B

CONTACTS: None.

GENERAL DESCRIPTION: Planar bedded hyaloclastite tuff consisting of poorly to moderately vesicular olivine- and plagioclase-phyric clasts.

COLOR: Dark green to brownish red (5GY 4/1 to 10R 3/4).

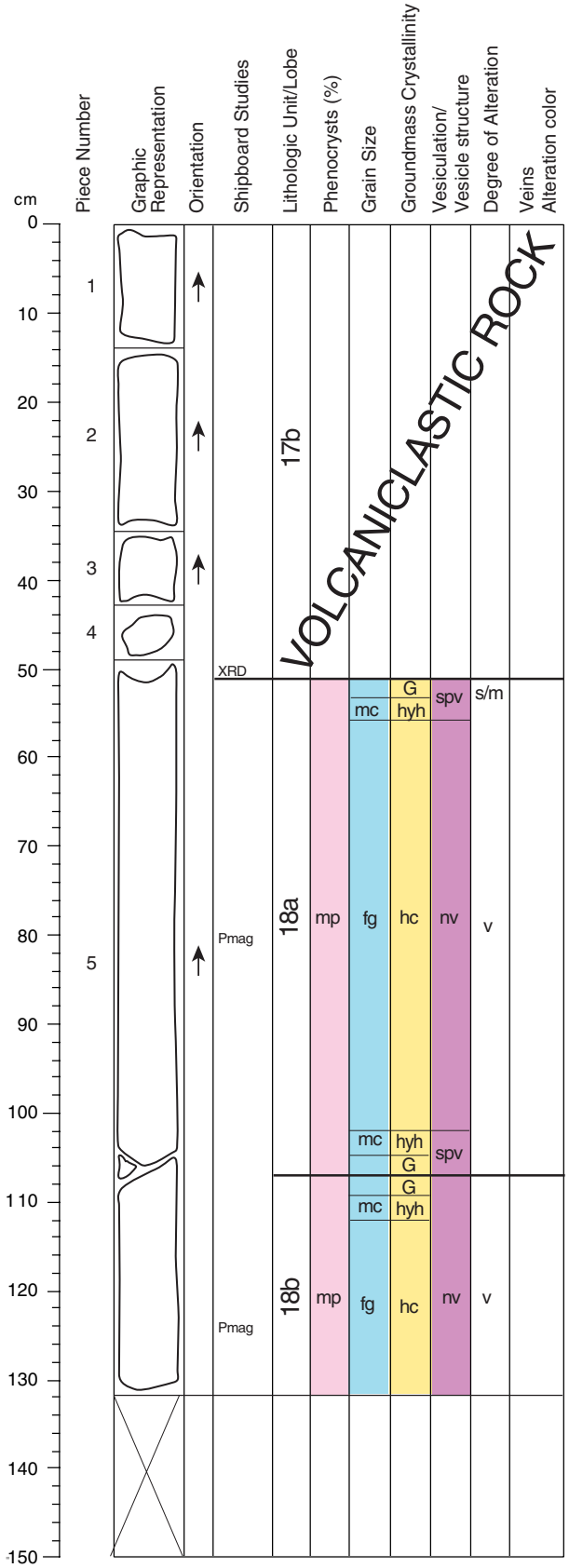
COMPONENTS:
60%–90%: Mafic vitric/glass particles and shards(*), nonvesicular, and sparsely olivine- and plagioclase-phyric.
5%–20%: Olivine and plagioclase crystals.
5%–20%: Poorly vesicular olivine phyric lava lithics.

SEDIMENTARY TEXTURES: Poorly sorted. Indistinct lamination in the finer grained parts of the section (92–95 cm and 55–65 cm). Dominant volcaniclastic sandstone contains coaser gravel horizons.

SEDIMENTARY STRUCTURES: Some slumping and disturbance of laminations is present in Piece 5 (54–60 cm).

COMMENTS: (*)Clasts are poorly vesicular, angular and marked by straight planar fracture surfaces whereas shards have splinter-like shapes. Clast morphology is consistent with origin by quenched fragmentation when lava comes into contact with water.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-39R-4 (Section top: 650.85 mbsf)

UNIT 18: MODERATELY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 5

CONTACTS: Contact between Units 17b and 18 is preserved at the top of Piece 5 between 49 cm and 53 cm. An altered glassy margin is in contact with the volcaniclastics of Unit 17. The glass is separated from the basalt by a 0.5–1 cm vein containing predominantly a white secondary mineral (magnesite?) that can be scratched with a knife, along with green clay.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	2–3	5	1	1.5	Euhedral to subhedral; blocky
Olivine:	1–2	1.5	0.2	0.5	Euhedral to subhedral; equant

GROUNDMASS: Aphanitic adjacent to glassy margins to fine-grained in lobe interiors. Plagioclase and clinopyroxene are present in the fine-grained regions in an intergranular texture.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Nonvesicular(*)	<1	4	0.2	0.4	Round to elongate

COLOR: Medium light gray (N6) in slightly altered regions. Light brown (5YR 6/4) in moderately altered regions around veins.

STRUCTURE: Lobed. Piece 5 contains one complete lobe and part of a second. Glassy lobe margins are present at 49–53 cm and 106–108 cm.

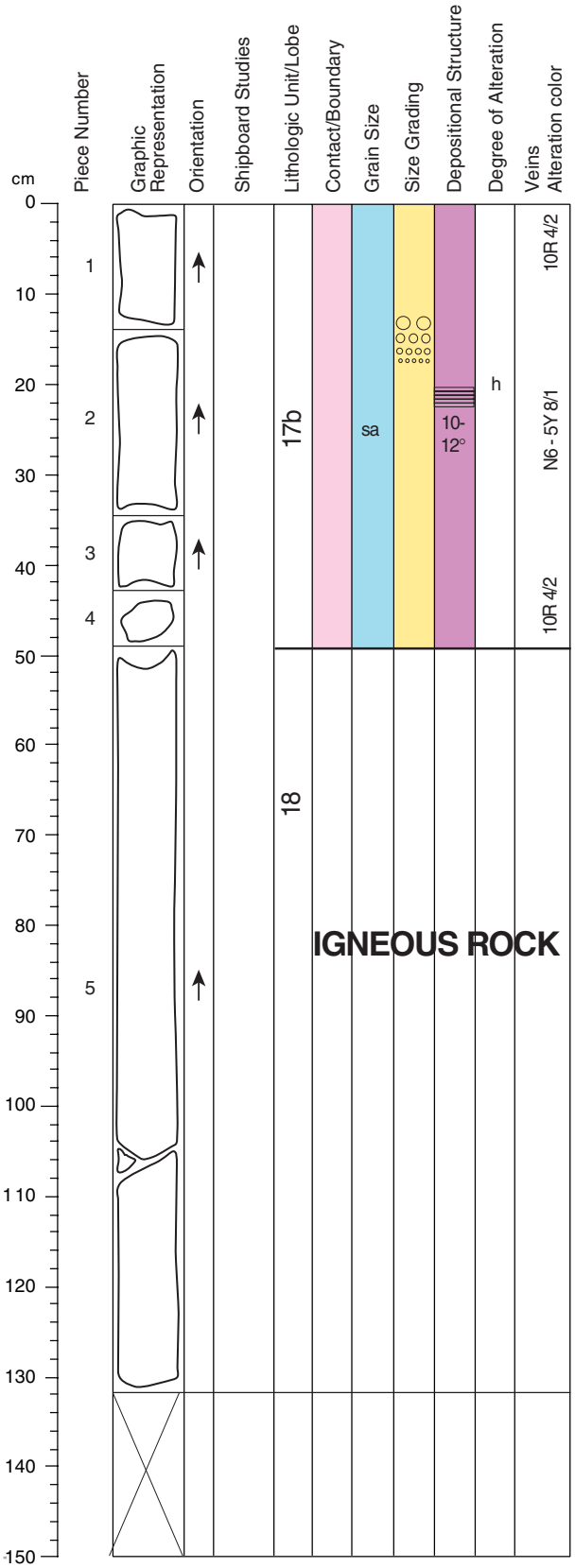
ALTERATION: Slight to moderate. Most intensely altered around veins and at the contact with Unit 17b. Olivine is replaced by white carbonate and Fe-oxyhydroxide. Unaltered olivine may be present away from veins. Vesicles are filled with white carbonate.

VEINS/FRACTURES: Moderately veined. Randomly oriented veins are <0.1–5 mm wide and filled with white carbonate, dark green clay, and Fe-oxyhydroxide. Brown alteration halos, rich in Fe-oxyhydroxide, are present around veins.

COMMENTS: Based on the presence of multiple lobes bounded by smooth glassy surfaces, varioloitic texture near lobe margins, overall low vesicularity, and distinct cubic jointing pattern of individual lobes, we interpret this unit to be pillow lava.

(*)Vesicles are present adjacent and parallel to glassy margins in sparsely vesicular zones ~1–2 cm wide.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-39R-4 (Section top: 650.85 mbsf)

UNIT 17: BEDDED OLIVINE-PLAGIOCLASE-BASALT TUFF.

Pieces: 1–4

CONTACTS: Sharp contact between Unit 17 and Unit 18 at 52 cm, the top of Piece 5.

GENERAL DESCRIPTION: Planar bedded hyaloclastite tuff consisting of poorly to moderately vesicular olivine- and plagioclase-phyric clasts.

COLOR: Grayish red (10R 4/2) and pale red (10R 6/2). Alternating beds of light gray (N6), greenish gray (5GY 6/1) and grayish red (10R 4/2) between 14 cm and 20 cm.

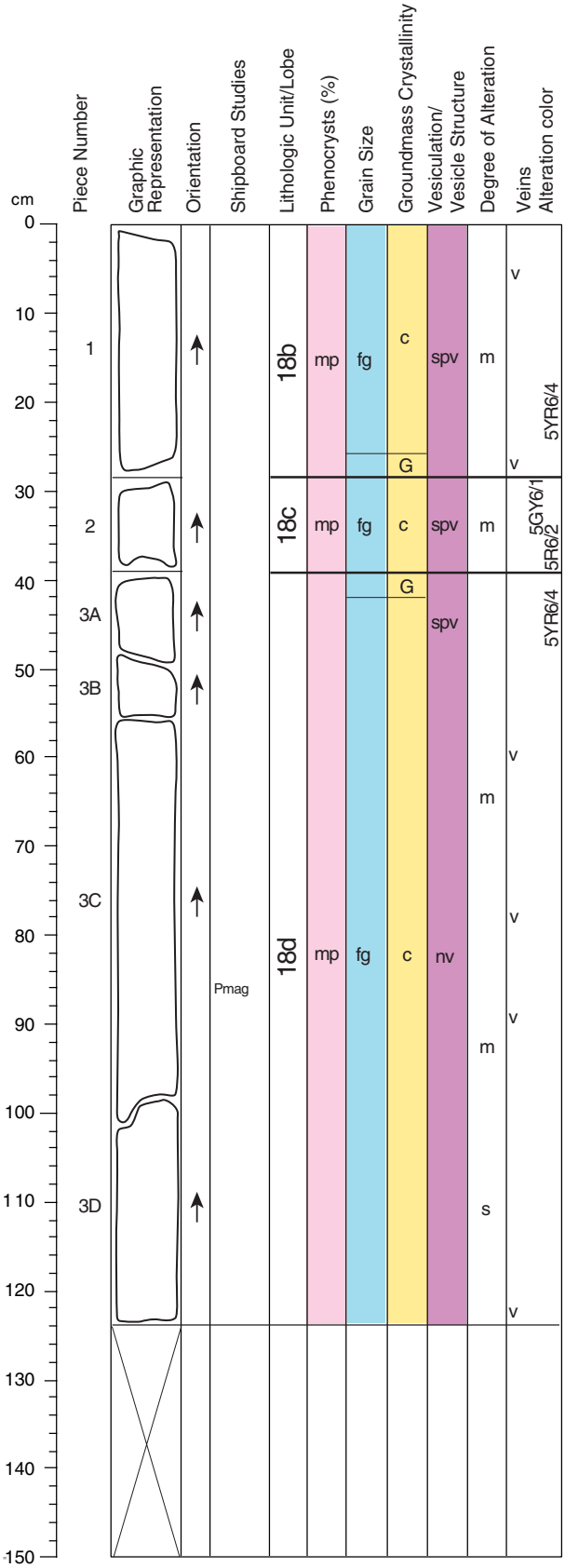
COMPONENTS:
60%–90%: Mafic vitric/glass particles and shards(*), nonvesicular, and sparsely olivine- and plagioclase-phyric.
5%–20%: Olivine and plagioclase crystals.
5%–20%: Poorly vesicular olivine phyric lava lithics.

SEDIMENTARY TEXTURES: Fine grained, ash-sized particles.

SEDIMENTARY STRUCTURES: Planar bedding, mostly in Piece 2. Depositional contact at 14 cm dips at 12–16°.

COMMENTS: (*)Clasts are poorly vesicular, angular and marked by straight planar fracture surfaces whereas shards have splinter-like shapes. Clast morphology is consistent with origin by quenched fragmentation when lava comes into contact with water.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-39R-5 (Section top: 652.16 mbsf)

UNIT 18: MODERATELY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1–3D

CONTACTS:

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	2–3	5	0.2	1–2	Euhedral to subhedral; blocky
Olivine:	<1	1	0.2	0.5	Euhedral to subhedral; equant

GROUNDMASS: Aphanitic adjacent to glassy margins to fine-grained in lobe interiors. Variolitic textures are present near glassy margins. Plagioclase and clinopyroxene are present in the fine grained regions in an intergranular texture.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular(*)	<1	3	0.2	1	Irregular

COLOR: Medium gray (N5) in slightly altered regions. Light brown (5YR 6/4) in moderately altered regions around veins.

STRUCTURE: Lobed. Glassy lobe margins are present at the bottom of Piece 1, and at the base of Piece 3A. Interlobe sediment is present between Piece 1 and Piece 3A.

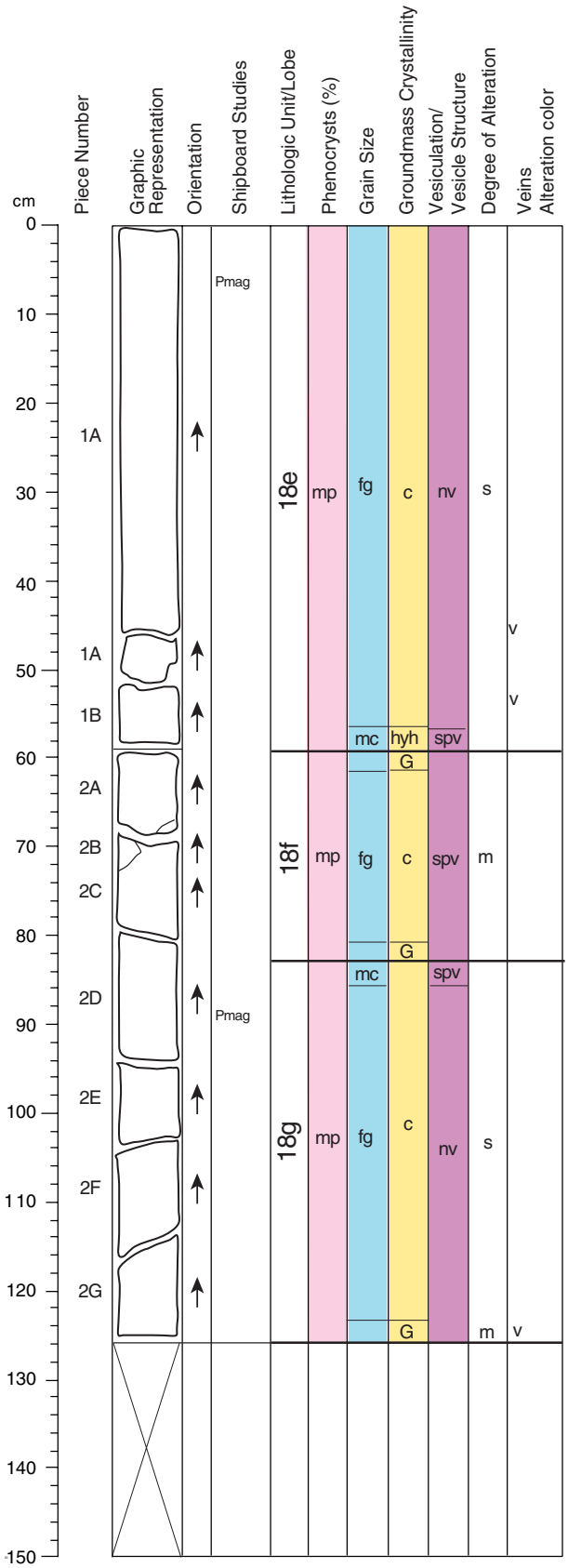
ALTERATION: Slight to moderate. Most intensely altered around veins. Olivine is replaced by white carbonate, Fe-oxyhydroxide and green clay minerals. Vugs and vesicles are filled with white carbonate, Fe-oxyhydroxides, and green clays.

VEINS/FRACTURES: Moderately veined. Randomly oriented veins are <0.1–5 mm wide and filled with white carbonate, dark green clay, and Fe-oxyhydroxide. Brown alteration halos, rich in Fe-oxyhydroxide, are present around veins.

COMMENTS: Contact with interlobe sediments is present at the top of Piece 2.

(*)Vesicles are present (3%–5%) adjacent and parallel to glassy margins in sparsely vesicular zones ~1–2 cm wide.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-39R-6 (Section top: 653.4 mbsf)

UNIT 18: MODERATELY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1A–2G

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	3–5	4	0.5	1.5	Subhedral; prismatic

Olivine: <1 2 0.5 1 Subhedral

GROUNDMASS: Fine grained. Aphanitic adjacent to glassy margins.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	<1	3	0.2	1	Round to irregular

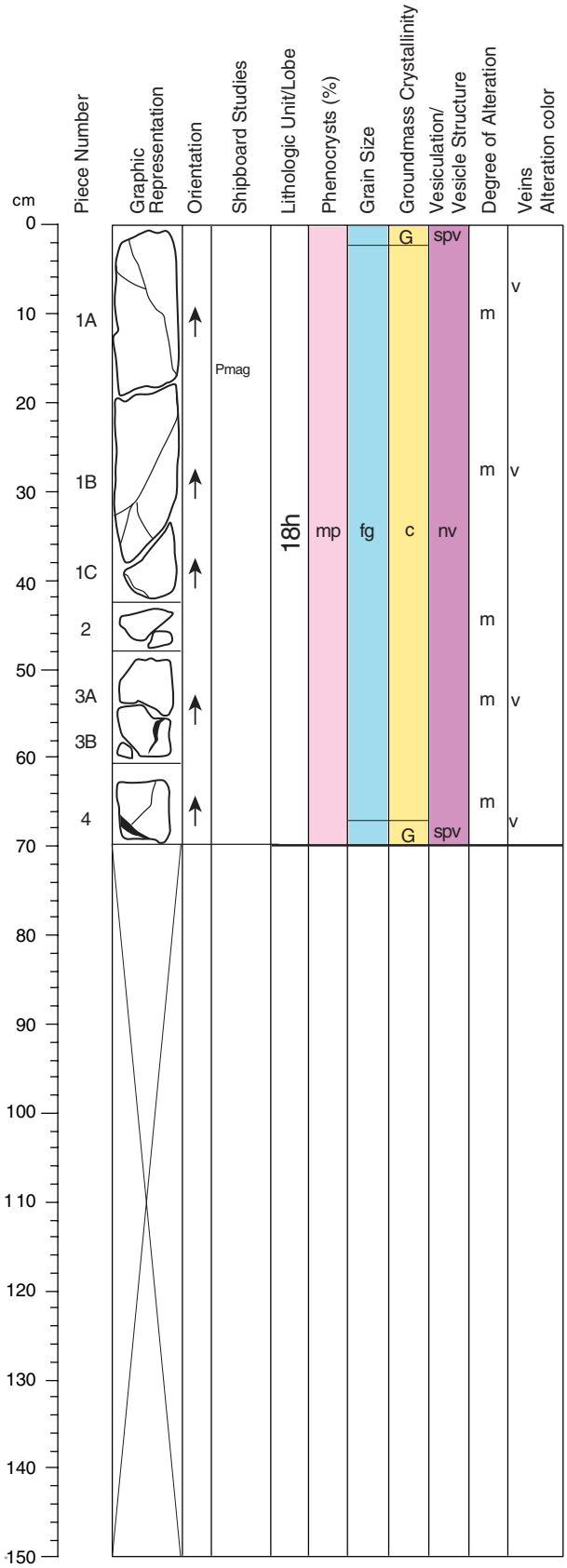
COLOR: Medium gray (N5).

STRUCTURE: Lobed. Glassy margins are present at the bottom of Piece 2G, top of Piece 2D, bottom of Piece 2C, top of Piece 2A, and bottom of Piece 1B (parts of at least three lobes are present in this section).

ALTERATION: Slight to moderate. Most intensely altered around veins, and close to glassy margins. Olivine is replaced by Fe-oxyhydroxide, and vesicles are filled with white carbonate, Fe-oxyhydroxides and green clays.

VEINS/FRACTURES: Moderately veined. Randomly oriented veins are <0.1–4 mm wide and filled with white carbonate, dark green clay, and Fe-oxyhydroxide. Brown alteration halos, rich in Fe-oxyhydroxide, are present around veins.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-40R-1 (Section top: 656.2 mbsf)

UNIT 18: MODERATELY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1A–4

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	3–5	3–4	0.5	1	Euhedral to subhedral; blocky
Olivine:	<1	2	0.5	0.5	Euhedral to subhedral

GROUNDMASS: Fine grained. Variolitic textures adjacent to glassy margins. Plagioclase, clinopyroxene, and black oxides are present in an intergranular texture in the fine grained regions.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	<1	3–4	0.5	1	Round to irregular

COLOR: Light gray (N6) to light brown (5YR 5/6) and dark yellowish orange (10YR 6/6) in alteration halos adjacent to glassy margins and around veins.

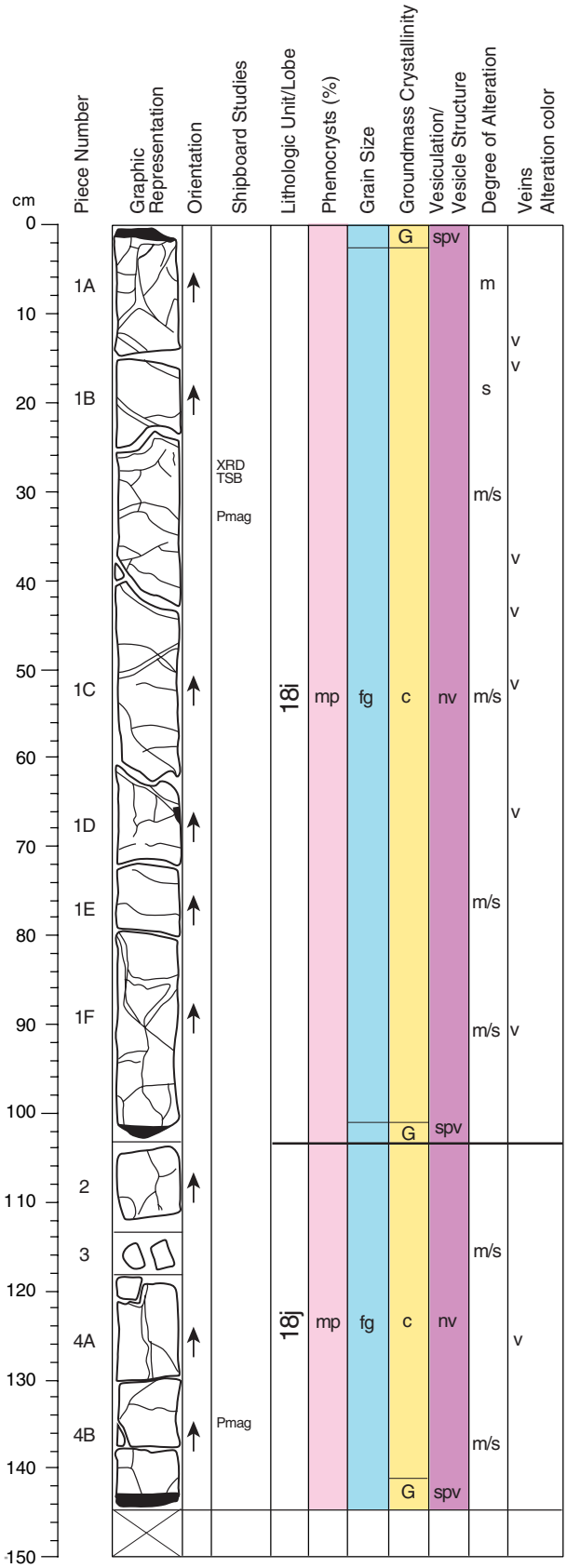
STRUCTURE: Pillowed. Glassy margins are present at the top of Piece 1A and at the bottom of Piece 4. This section represents an entire lobe.

ALTERATION: Slight to moderate. Most intensely altered around veins and adjacent to glassy margins. Olivine is replaced by Fe-oxyhydroxide, and vesicles are filled with white carbonate, Fe-oxyhydroxides and green clays.

VEINS/FRACTURES: Moderately veined. Randomly oriented veins are <0.1–4 mm wide and filled with white carbonate, green clay, Fe-oxyhydroxide and siderite(?). Brown alteration halos (1–5 mm wide), rich in Fe-oxyhydroxide, are present around veins.

COMMENTS: Vesicle abundance increases near glassy margins. Some unaltered olivines may be present away from veins.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-40R-2 (Section top: 656.9 mbsf)

UNIT 18: MODERATELY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1A–4B

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1-2	1.5	0.4	0.6	Euhedral to subhedral blocky
Olivine:	<1	0.6	0.2	0.3	Euhedral; equant

GROUNDMASS: Aphanitic and variolitic textured groundmass adjacent to glassy margins. Composed of plagioclase, clinopyroxene, and black oxides are present in an intergranular texture in the fine grained regions.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
					Round to elongate

COLOR: Medium light gray (N6) to light brown (5YR 5/6) and dark yellowish orange (10YR 6/6) in alteration halos and around veins.

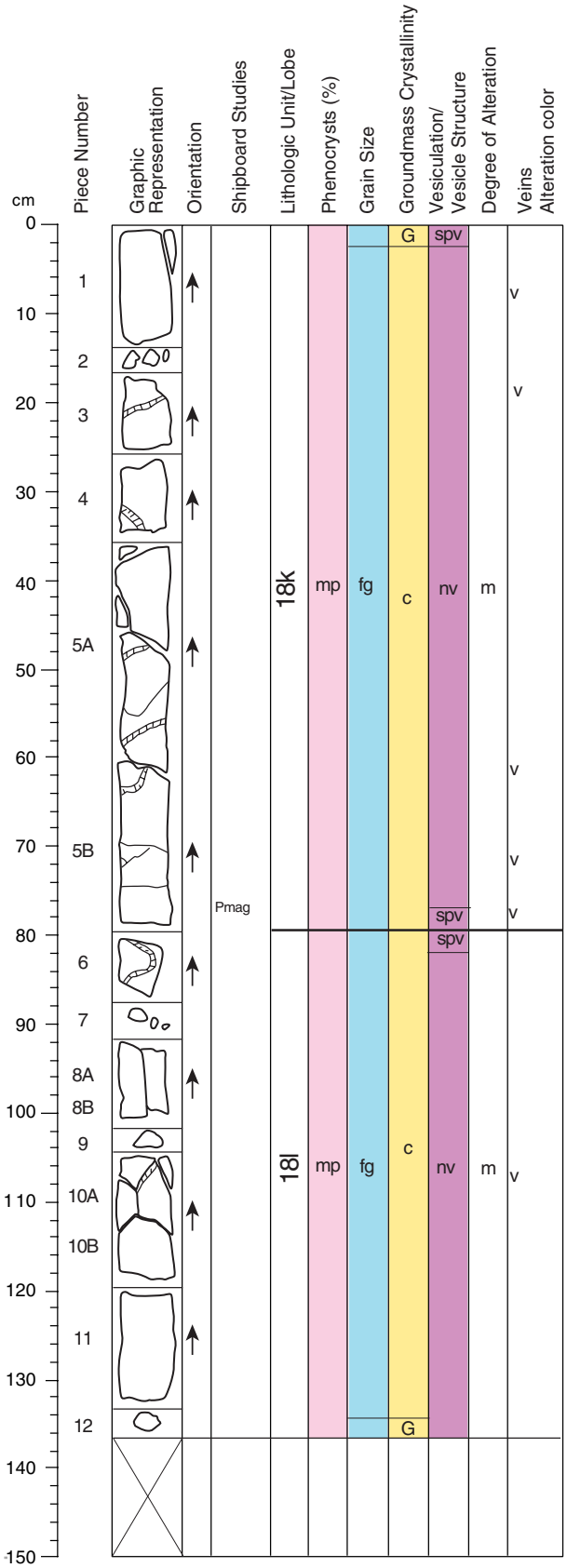
STRUCTURE: Pillowed. Glassy margins are present in Pieces 1A, 1F, and 4B. Pieces 1A–1F represent a continuous section through one pillow lobe.

ALTERATION: Slight to moderate. Most intensely altered around veins, and close to glassy margins. Olivine is replaced by Fe-oxyhydroxide, and vesicles are filled with white carbonate, Fe-oxyhydroxides and green clays.

VEINS/FRACTURES: Moderately to highly veined. Randomly oriented veins are <0.1–5 mm wide and filled with white carbonate, green clay, Fe-oxyhydroxide and siderite (?). Brown alteration halos (1–5 mm wide), rich in Fe-oxyhydroxide, are present around veins.

COMMENTS: Vesicle are present in 1–3 cm zones adjacent to and concentric with the glassy margins and can be used to define pillow lobe boundaries when the glass is not present (e.g., top of Piece 2).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-40R-3 (Section top: 658.36 mbsf)

UNIT 18: MODERATELY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1–12

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	3–5	2	0.5	1	Euhedral to subhedral; blocky
Olivine:	<1	1	0.5	0.7	Subhedral

GROUNDMASS: Fine grained. Variolitic textures adjacent to glassy margins. Composed of plagioclase, clinopyroxene, and black oxides are present an intergranular texture in the fine grained portions.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
					Irregular

COLOR: Light gray (N5) to moderate brown (5YR 4/4) close to veins.

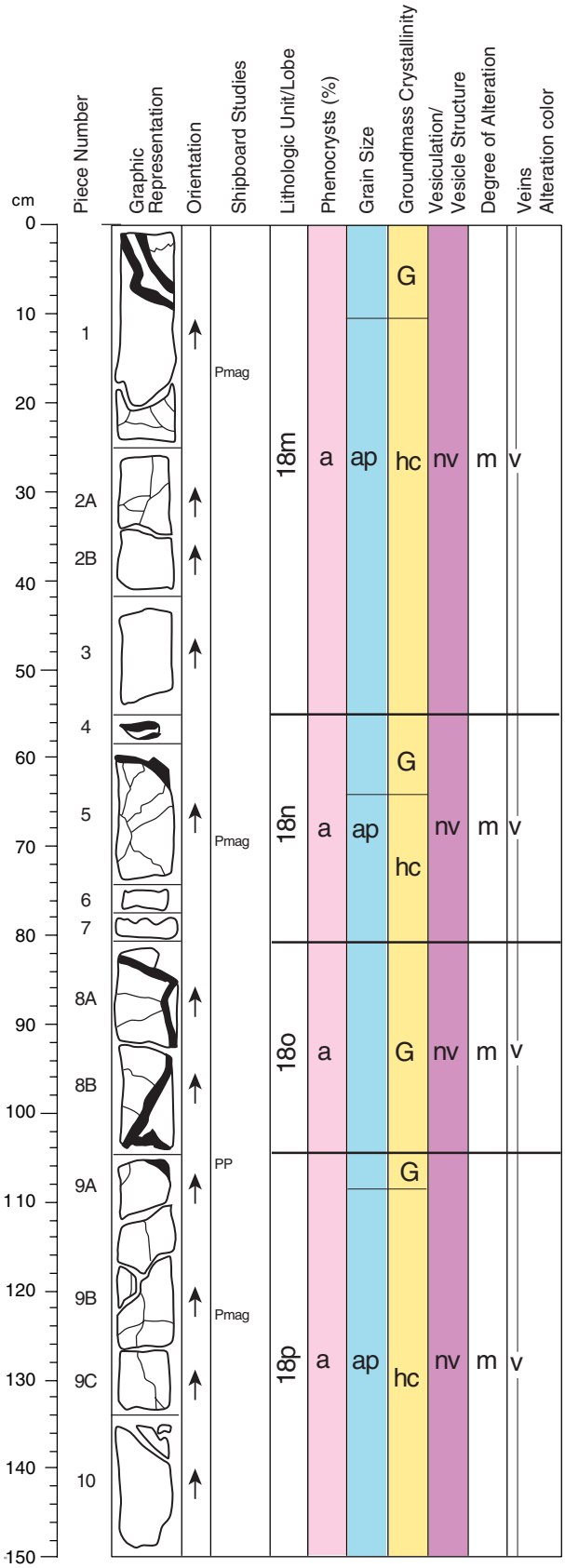
STRUCTURE: Pillowed. Unaltered glass occurs at the top of Piece 1, and in Piece 12. A lobe boundary may also occur between Pieces 5B and 6 (based on presence of a vesicular zone at the base of Piece 5B).

ALTERATION: Moderate. Most intensely altered within 1 cm of veins, and close to glassy margins. Olivine is completely replaced by Fe-oxyhydroxide, and vesicles are filled with white carbonate, Fe-oxyhydroxides and green clays.

VEINS/FRACTURES: Moderately veined. Veins occur throughout the section, but especially in Pieces 3, 5, and 6. Randomly oriented veins are <0.1–3 mm wide and filled with white carbonate, green clay, Fe-oxyhydroxide and siderite(?). Brown alteration halos (1–5 mm wide), rich in Fe-oxyhydroxide, are present around veins.

COMMENTS: (*)Sparsely vesicular zones are present adjacent to and concentric with glassy margins.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-40R-4 (Section top: 659.72 mbsf)

UNIT 18:MODERATELY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1–10

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	5	3	0.5	1	Euhedral to subhedral
Olivine:	<1	1	0.5	0.7	Subhedral

GROUNDMASS: FIne grained. Mainly plagioclase laths are visible.

VESICLES: Nonvesicular.

COLOR: Medium gray (N5), except brownish gray (5YR 4/1) within 1 cm of veins.

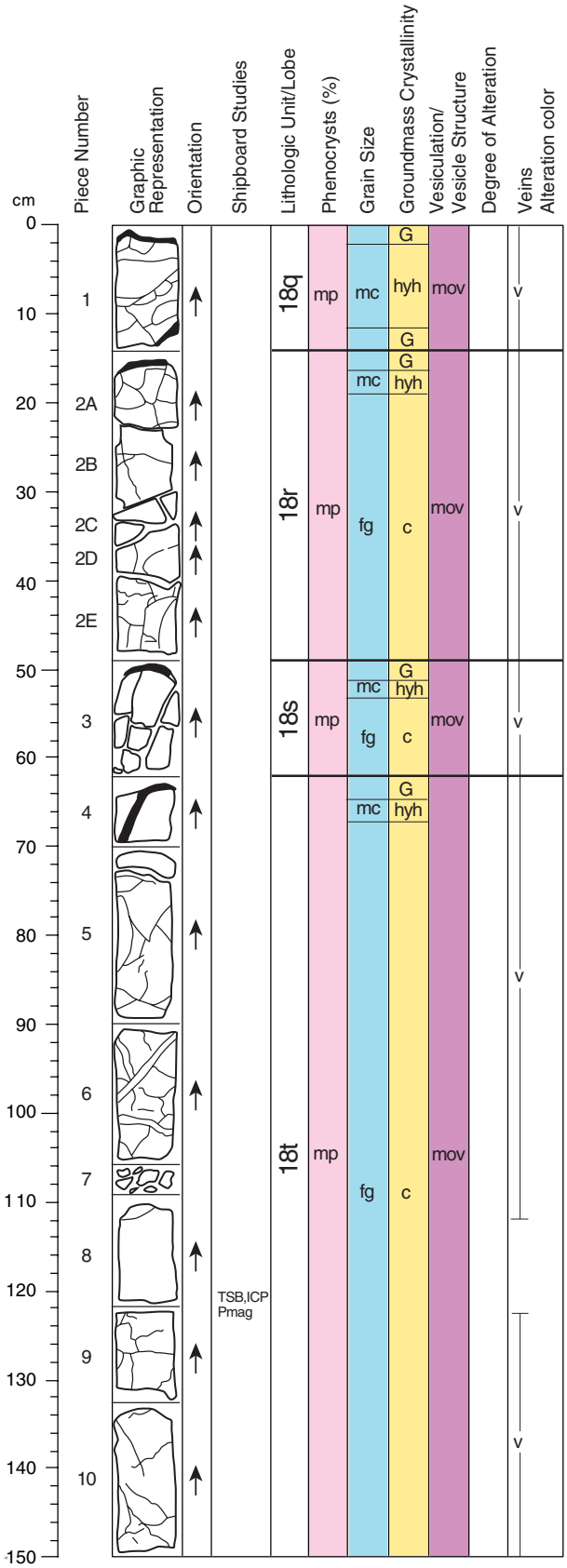
STRUCTURE: Pillowed. Numerous glassy rims, mostly dipping >70°, although some dip ~30°. Glass is present in Pieces 1, 4, 5, 7, 8A, 8B, and 9B.

ALTERATION: Moderate to high. Most intensely altered within 1 cm of veins, and close to glassy margins. Possible olivine is completely replaced by Fe-oxyhydroxide. Plagioclase phenocrysts are slightly altered. Clots of groundmass are hgihly altered to Fe-oxyhydroxide, while remainder is moderately altered. Glass is slightly altered (parts look devitrified).

VEINS/FRACTURES: Moderate veining. Veins occur throughout the section (except Piece 3), and are randomly oriented veins are <1–5 mm wide, and are filled with white carbonate and dark greenish-gray clay. Brown alteration halos (1–5 mm wide), rich in Fe-oxyhydroxide, are present near veins.

COMMENTS: Part of the same pillow pile as in Sections 40R-1 to 40R-3 above and 40-5 to 40R–6 below. Carbonate sediments occur between adjoining glass pillow rims in Pieces 1, 4, 7, and 8.
Completely altered olivine microphenocrysts are present that have a similar size to the length of the groundmass plagioclase laths in the fine-grained regions.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-40R-5 (Section top: 661.22 mbsf)

UNIT 18: MODERATELY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1–10

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1-4	8	0.8	1.5	Subhedral; blocky
Olivine:	1–2	0.8	0.3	0.5	Euhedral; equant

GROUNDMASS: Aphanitic and variolitic textured groundmass adjacent to glassy margins. Composed of plagioclase, clinopyroxene, and black oxides are present in an intergranular texture in the fine grained regions.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
					Round to elongate

COLOR: Medium light gray (N6) to light brown (5YR 5/6) and dark yellowish orange (10YR 6/6) in alteration halos and around veins.

STRUCTURE: Pillowed. Glassy margins are present in Pieces 2A, 3, and 4.

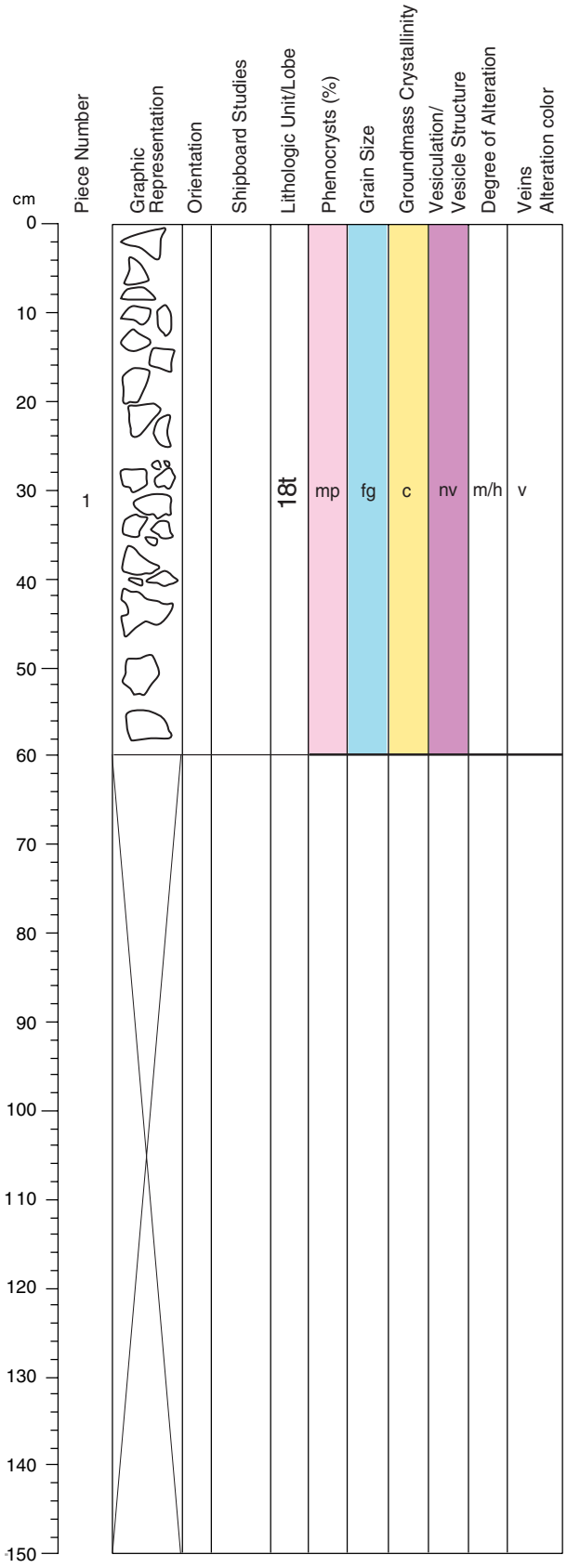
ALTERATION: Slight to moderate. Most intensely altered around veins, and adjacent to glassy margins. Olivine is replaced by Fe-oxyhydroxide adjacent to veins and dark green clay elsewhere. Vesicles are filled with white carbonate and dark green clays.

VEINS/FRACTURES: Moderately veined. Randomly oriented veins are <0.1–4 mm wide and are filled with white carbonate, green clay, Fe-oxyhydroxide and siderite(?). Brown alteration halos (1–8 mm wide), rich in Fe-oxyhydroxide, are present around veins.

COMMENTS: Olivine is a microphenocryst phase and unaltered crystals may be present away from veins.
Amount of plagioclase phenocrysts increases down the section: 1%–2% in Pieces 1 and 2; 3%–4% in Piece 10.

(*)Vesicle are present in 1–4 cm zones adjacent to and concentric with the glassy margins.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-40R-6 (Section top: 662.72 mbsf)

UNIT 18: MODERATELY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	3–5	2	0.5	1	Subhedral, prismatic
Olivine:	<1	0.5	0.2	0.4	Subhedral

GROUNDMASS: (*)

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
					Round

COLOR: Light gray (N5).

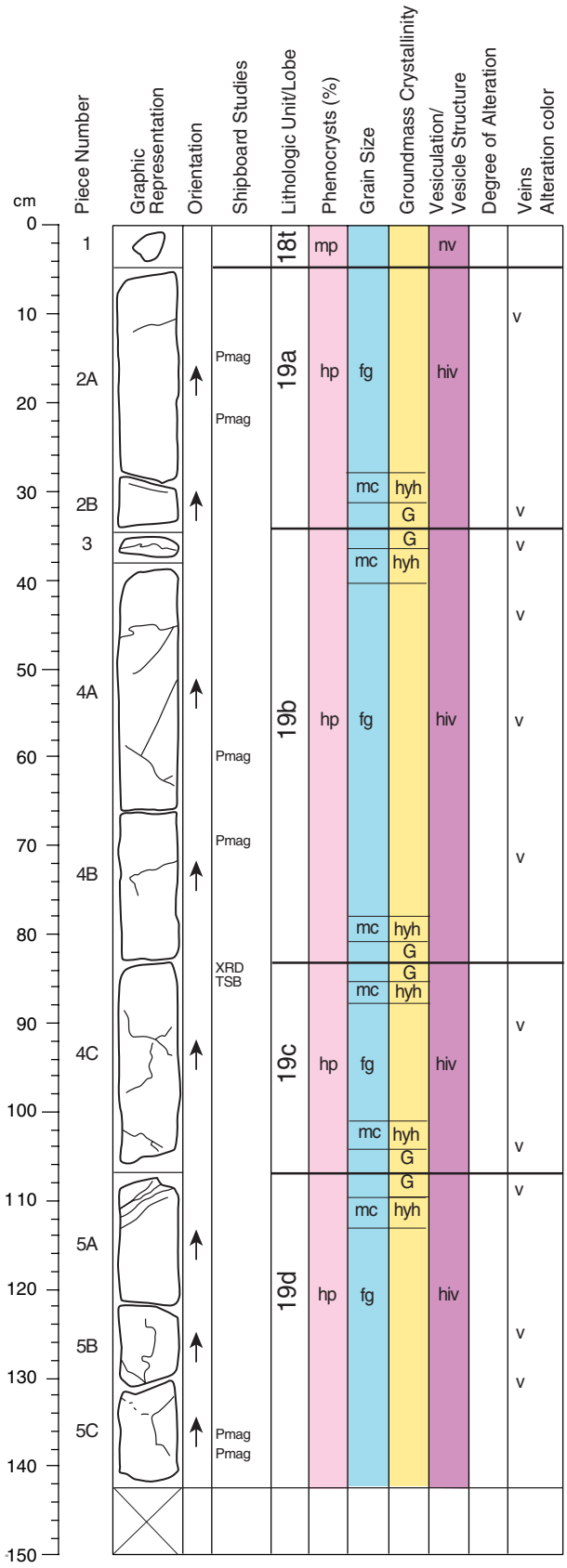
STRUCTURE: (*)

ALTERATION: Moderate to high. Most intensely altered within 1 cm of veins. Olivine is completely replaced by Fe-oxyhydroxide, and vesicles are filled with white carbonate, Fe oxyhydroxides and green clays.

VEINS/FRACTURES: Veins occur throughout the section, and the pieces have fractured along them. Veins are filled with white carbonate, green clay, Fe-oxyhydroxide.

COMMENTS: (*)This is a highly fragmented piece of the same pillow basalt material as in Section 40R-5. No glass is present.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-41R-1 (Section top: 665.9 mbsf)

UNIT 18: MODERATELY PLAGIOCLASE-OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None observed. The boundary between Units 18 and 19 is inferred to be between Pieces 1 and 2A at 4 cm.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	3-4	3	0.5	1	Subhedral; blocky
Olivine:	1-2	1	0.3	0.4	Euhedral to subhedral; equant

GROUNDMASS: Fine grained. Plagioclase, clinopyroxene, and black oxides are present in a subvariolitic texture.

VESICLES: Nonvesicular.

COLOR: Medium dark gray (N4) to pale brown (5YR 5/2) where moderately altered.

STRUCTURE: Massive. This is a small piece that is indistinguishable from the pillowed basalts of Unit 18 in Core 40R, but it does not contain glassy margins or grain size variations.

ALTERATION: Slight. Olivine phenocrysts are altered to Fe-oxyhydroxide. A 3-5 mm rim rich in Fe-oxyhydroxide is present on this piece.

VEINS/FRACTURES: None.

COMMENTS: Unaltered olivine crystals may be present. Olivine is a microphenocryst phase.

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 2A-5C

CONTACTS: None observed. The boundary between Units 18 and 19 is inferred to be between Pieces 1 and 2A at 4 cm.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	6-8	4	0.5	1.5	Subhedral; blocky
Olivine:	6-8	2	0.5	0.8	Euhedral; equant

GROUNDMASS: Fine grained. May contain quenched olivine needles. Plagioclase, defines a subvariolitic texture that grades to variolitic adjacent to the glassy margins.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	10-15	15	0.5	2	Round, elongate, irregular

COLOR: Variable. White, light brownish gray (5YR 6/1), dark yellowish orange (10YR 6/6), dark greenish gray (5G 4/1).

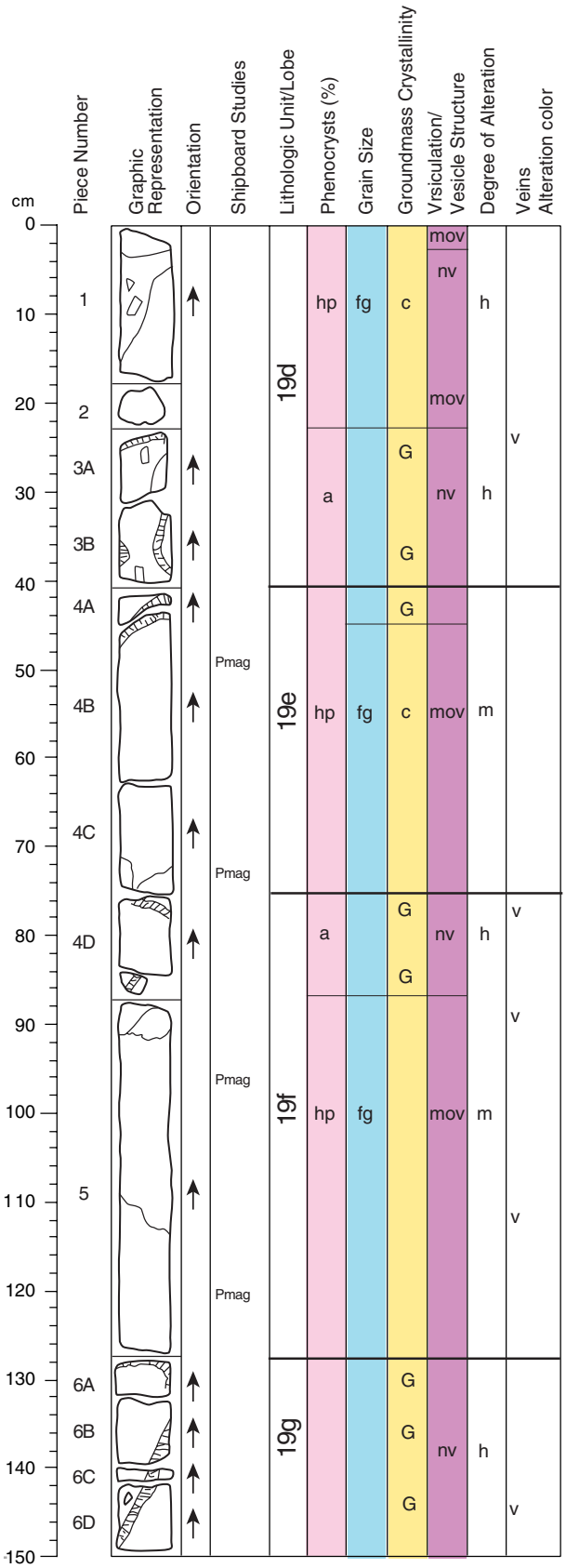
STRUCTURE: Pillowed. Altered glassy margins are present in Pieces 2A, 2B, 3, 4A, 4B, 4C, and 5.

ALTERATION: High. Color reflects alteration. Dark green clay, Fe-oxyhydroxide, and white carbonate are the main secondary minerals. Olivine is completely altered to Fe-oxyhydroxide and plagioclase is partially altered to green clay. Vesicles are filled with white carbonate or lined with dark green clay.

VEINS/FRACTURES: Sparsely veined. Randomly oriented veins, <0.1-6 mm wide, are filled with white carbonate and dark green clay.

COMMENTS: The top of Piece 2A contains the largest vesicles (4-15 mm) in a zone from 5-14 cm. The remainder of the core section is highly vesicular, but the vesicles are smaller (0.5-4 mm). Pipe vesicles are present in Piece 4C between 97-100 cm. Olivine and plagioclase phenocrysts are present in the altered glassy margins.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-41R-2 (Section top: 667.34 mbsf)

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-6D

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	5-6	4	0.5	1.5	Euhedral to subhedral; prismatic
Olivine:	5-6	3	0.5	1.5	Euhedral to subhedral; equant

GROUNDMASS: Fine grained. Plagioclase, clinopyroxene, and possibly quenched olivine are present in a subvariolitic to variolitic texture.

VESICLES:

	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	~15	5	0.5	1.0	Round to irregular

COLOR: Gray (10YR 5/1).

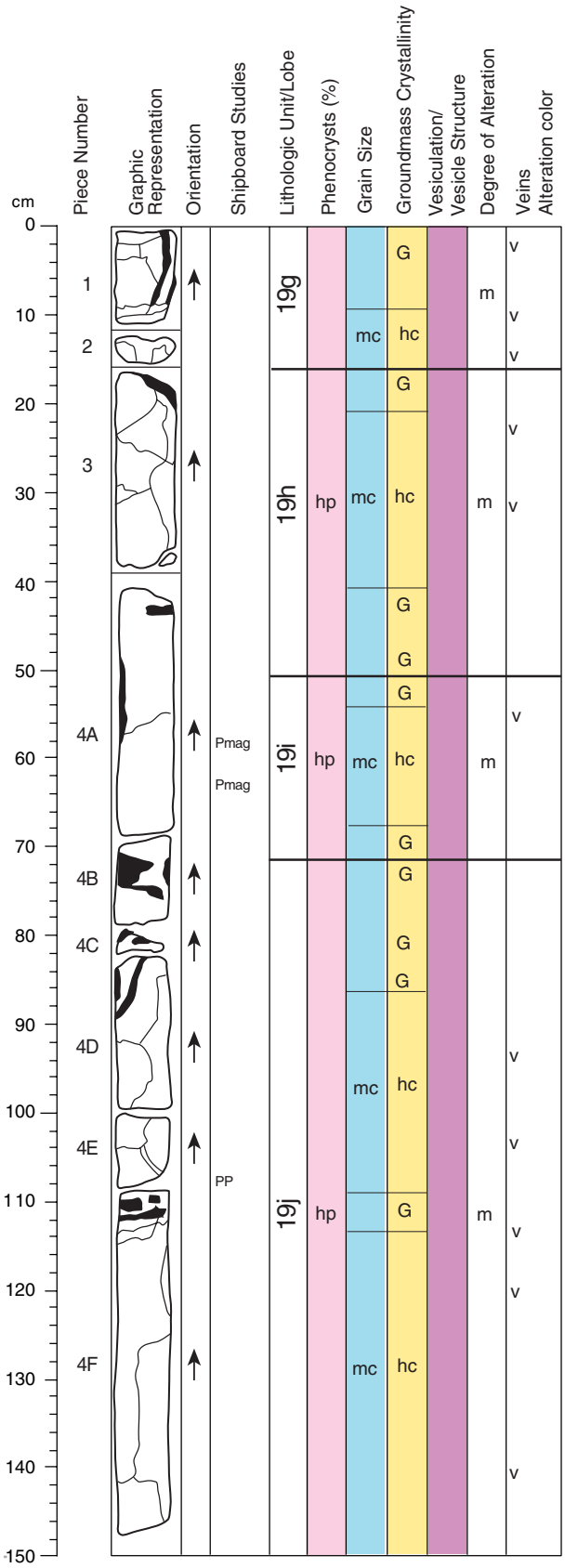
STRUCTURE: Pillowed. Devitrified glassy rims are present in Pieces 1, 3A, 3B, 4A, 6A-6D.

ALTERATION: Moderate. Most intensely altered close to veins and glassy margins. Olivine phenocrysts are completely replaced by Fe-oxyhydroxides and carbonate. Vesicles are partially to completely filled with calcite.

VEINS/FRACTURES: Moderately abundant throughout section, but especially close to pillow margins. Randomly oriented, 0.5-10 mm thickness, filled with calcite.

COMMENTS: Interpillow spaces are filled with recrystallized limestone, calcite, and basalt fragments.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-41R-3 (Section top: 668.85 mbsf)

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-4F

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	5-10	12	0.5	2	Euhedral to subhedral
Olivine:	5-10	3	0.5	1	Subhedral to euhedral

GROUNDMASS: Fine grained. Grades to aphanitic near glassy margins.

VESICLES:

	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	20	2	<0.5	1	Round

COLOR: Brownish gray (10YR 5/1), except altered glass rims are dark greenish-gray (5G 4/1).

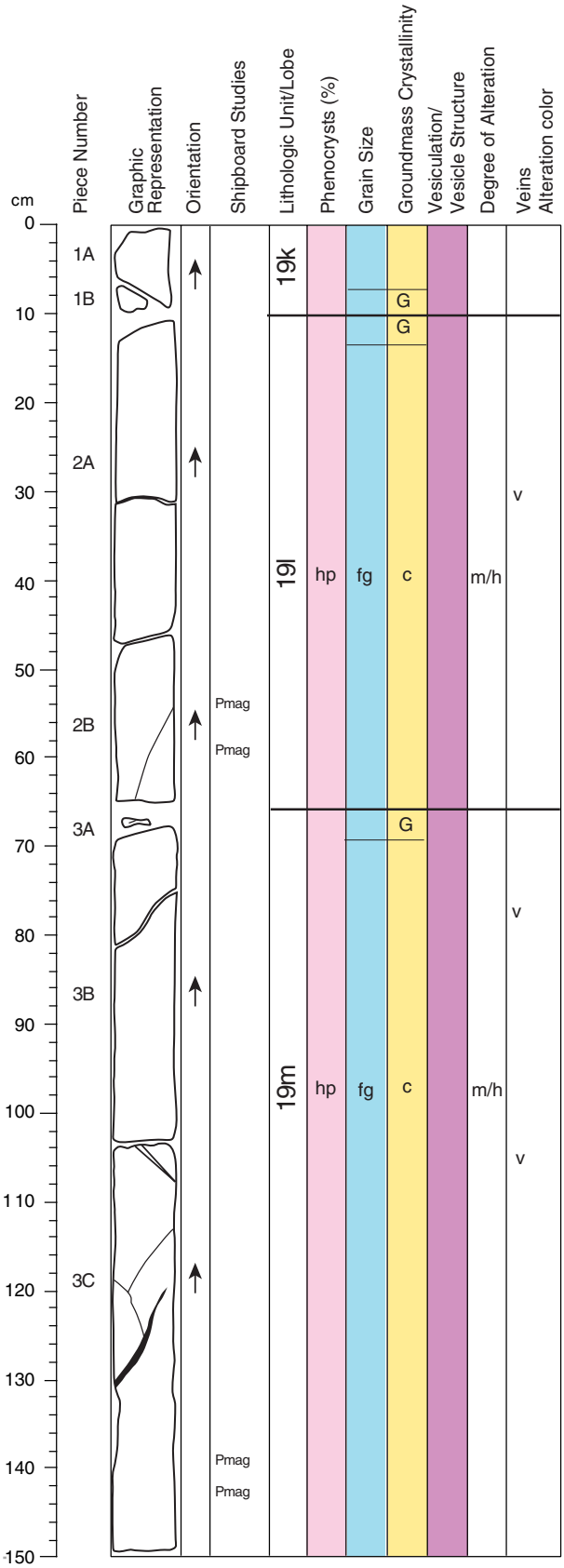
STRUCTURE: Pillowed. Altered glass margins in all pieces except 4E.

ALTERATION: Moderate. Olivine is completely replaced by Fe-oxyhydroxide. Approximately 50% of vesicles are filled with white carbonate, others are empty or thinly lined with gray green clays.

VEINS/FRACTURES: Moderately veined. Veins occur throughout the section and are <0.1-8 mm wide and filled with white carbonate.

COMMENTS: Size and concentration of olivine and plagioclase phenocrysts increase away from glass rims up to 10% of each in Piece 4F. Recrystallized limestone and alteration minerals fill interpillow voids in all pieces except Piece 4E.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-41R-4 (Section top: 670.35 mbsf)

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1A-3C

CONTACTS: None observed.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	6-8	3	0.5	1	Subhedral; blocky
Olivine:	6-8	2	0.5	1	Euhedral; equant

GROUNDMASS: Fine grained with an intergranular texture.

VESICLES:

	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	10-15	7	0.5	2	Round, elongate

COLOR: Variable. Medium light gray (N6) to light gray (N5). Light brown (5YR 5/6) and dark yellowish orange (10YR 6/6) in more altered zones.

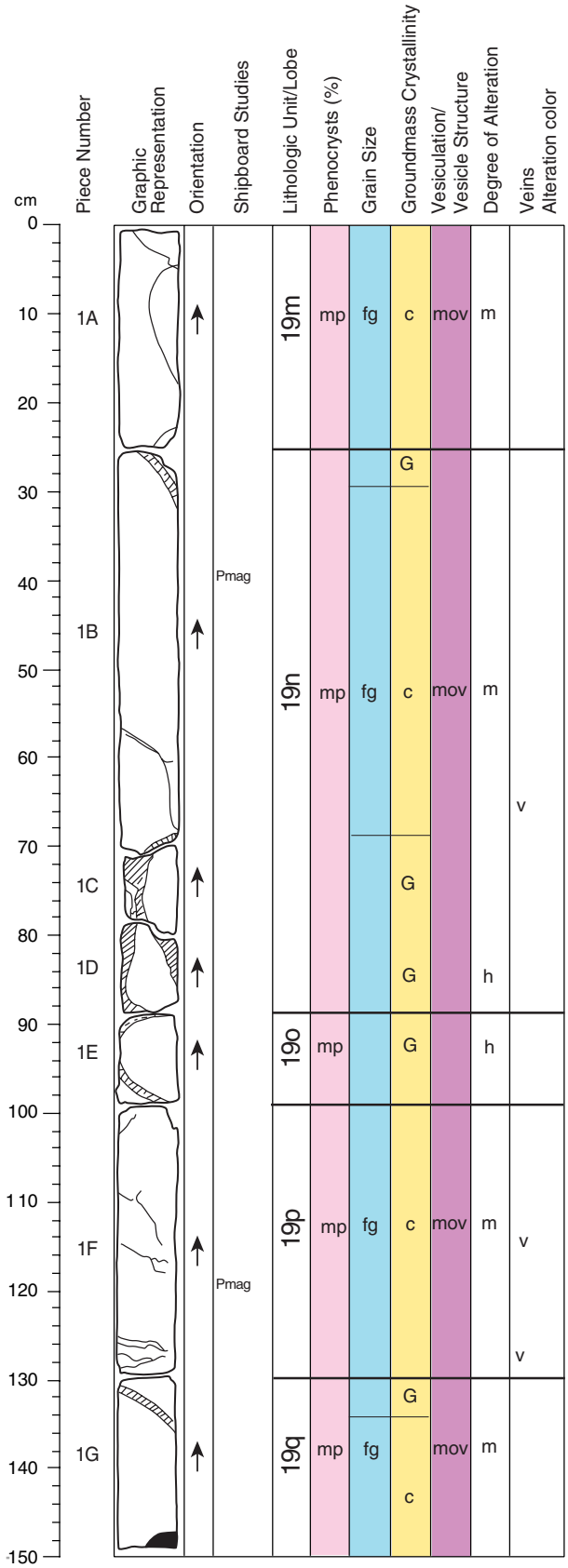
STRUCTURE: Pillowed. Altered glassy margins are present at the bottom of Piece 1B, the top of Piece 2A and the top of Piece 3A.

ALTERATION: Moderate to high. Color reflects alteration. Dark green clay, Fe-oxyhydroxide, and white carbonate are the main secondary minerals. Olivine is completely altered to Fe oxyhydroxide and plagioclase is partially altered to green clay. Vesicles are filled with white carbonate or lined with dark green clay.

VEINS/FRACTURES: Sparsely veined. Randomly oriented veins, <0.1-6 mm wide, are filled with white carbonate and dark green clay.

COMMENTS: Vesicles are elongated near the glassy margins. Contacts between lobes at 10 cm and 67 cm.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-41R-5 (Section top: 671.85 mbsf)

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1A-1G

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	5-7	4	1	1.5	Euhedral to subhedral, prismatic
Olivine:	5-7	3	0.5	1	Euhedral to subhedral, equant

GROUNDMASS: Fine grained, contains olivine and plagioclase.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	~15	5	0.5	1.0	Round to irregular

COLOR: Gray (10YR 5/1).

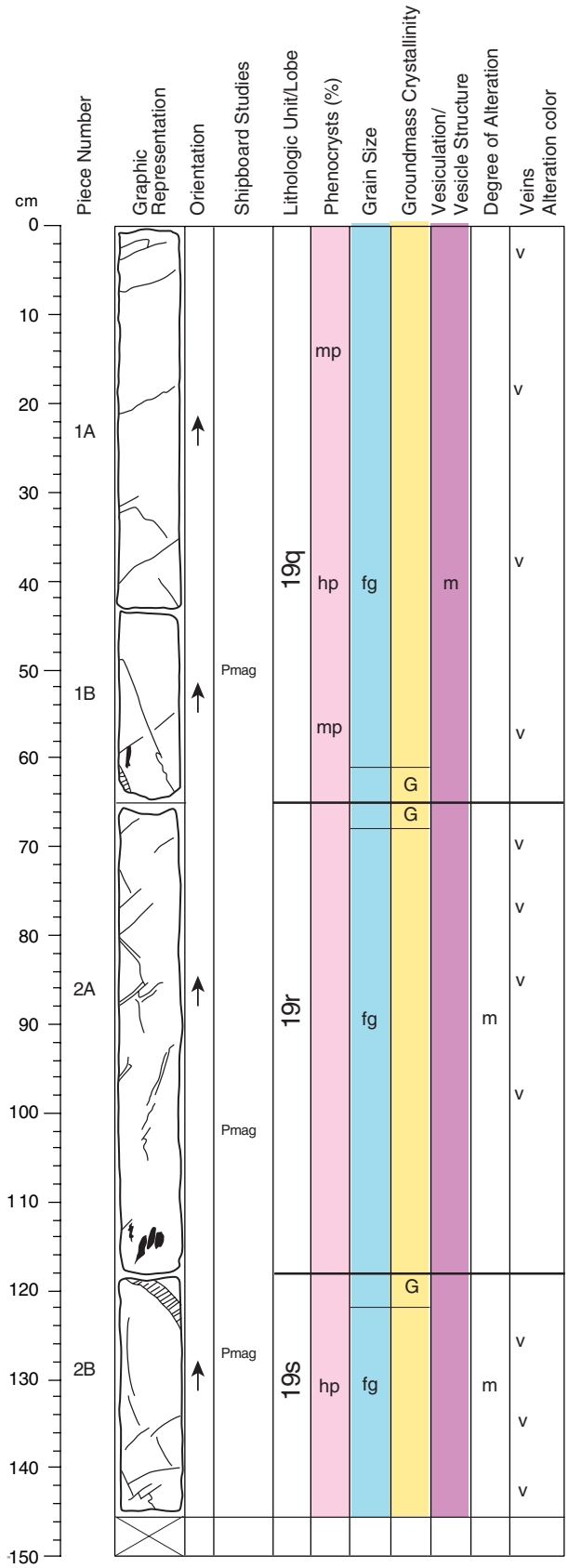
STRUCTURE: Pillowed. Devitrified glassy margins occur on all pieces.

ALTERATION: Moderate. Most intensely altered close to veins and glassy margins. Olivine phenocrysts are partially to completely replaced by Fe-oxyhydroxides and carbonate. About 75% of vesicles are filled with calcite. Glassy margins are completely devitrified.

VEINS/FRACTURES: Moderately veined. Randomly oriented, 0.5-6 mm thickness, filled with calcite.

COMMENTS: Interpillow voids are filled with recrystallized limestone, massive calcite and basalt fragments.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-41R-6 (Section top: 673.35 mbsf)

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1A-2B

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	5-10	6	0.5	2	Euhedral to subhedral
Olivine:	5-10	3	0.5	1	Subhedral to euhedral

GROUNDMASS: Fine grained. Grades to aphanitic near glassy margins.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	20	2	<0.5	1	Round

COLOR: Brownish gray (10YR 5/1), except altered glassy margins are dark greenish-gray (5G 4/1).

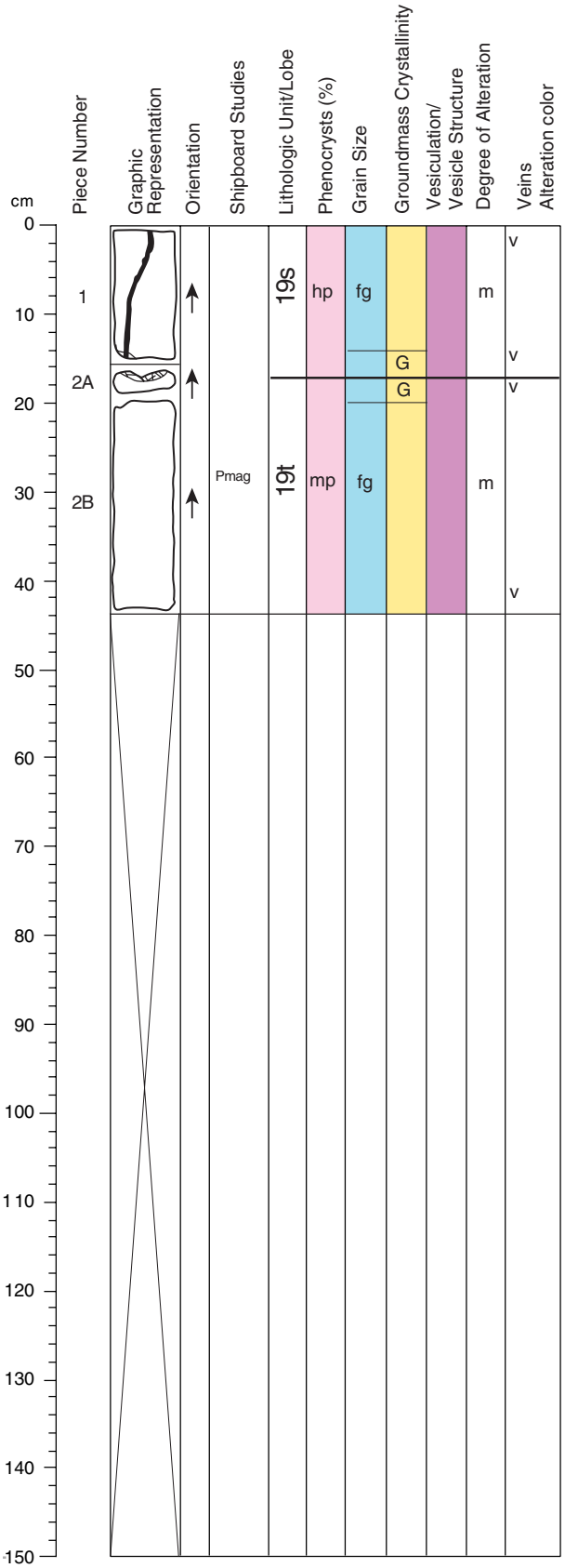
STRUCTURE: Pillowed. Altered glassy margins on bottom of Piece 1B, top and bottom of Piece 2A, and top of Piece 2B.

ALTERATION: Moderate. Olivine is completely replaced by Fe-oxyhydroxide. Approximately 50% of vesicles are filled with white carbonate, others are empty or thinly lined with gray green clays. Vesicles near glassy margins are generally not filled with secondary minerals.

VEINS/FRACTURES: Moderately veined. Veins occur throughout the section and are <0.1-4 mm wide and filled with white carbonate.

COMMENTS: Size and concentration of olivine and plagioclase phenocrysts increase away from glass rims up to 10% of each in Piece 1A.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-41R-7 (Section top: 674.82 mbsf)

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-2B

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	5-10	4	0.5	2	Euhedral to subhedral
Olivine:	5-10	2	0.5	1	Subhedral to euhedral

GROUNDMASS: Fine grained. Grades to aphanitic near glassy margins.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Highly vesicular	20	2	<0.5	1	Round

COLOR: Brownish gray (10YR 5/1), except altered glassy margins are dark greenish-gray (5G 4/1).

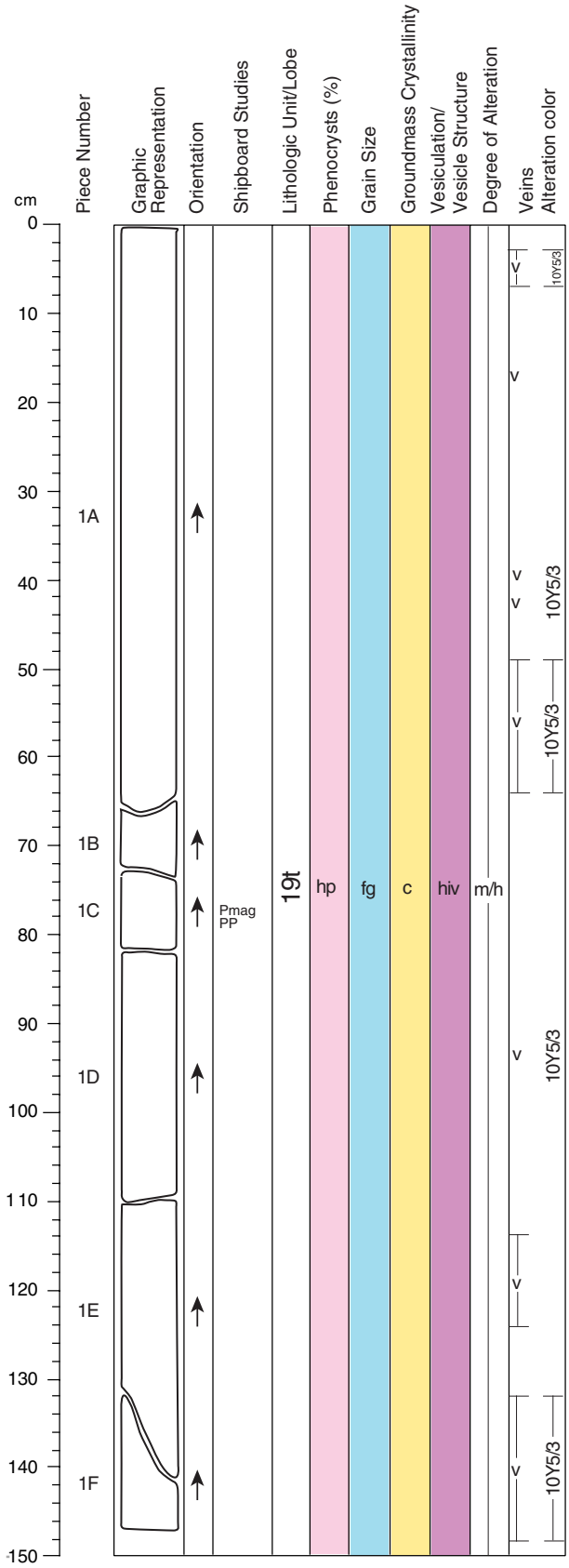
STRUCTURE: Pillowed. Altered glassy margins on bottom of Piece 1, on Piece 2A, and on top of Piece 2B.

ALTERATION: Moderate. Olivine is completely replaced by Fe-oxyhydroxide. Approximately 50% of vesicles are filled with white carbonate, others are empty or thinly lined with gray green clays. Vesicles near glassy margins are generally not filled with secondary minerals.

VEINS/FRACTURES: Moderate. Veins occur throughout the section and are <0.1-4 mm wide and filled with white carbonate.

COMMENTS: Size and concentration of olivine and plagioclase phenocrysts increase away from glassy margins up to 10% of each in Piece 1. Recrystallized limestone and alteration minerals fill interpillow voids in Piece 2A.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-42R-1 (Section top: 675.5 mbsf)

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE PHYRIC BASALT.

Pieces: 1A-1F

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-12	4	0.2	1-2	Euhedral
Olivine:	5-7	3	0.5	1	Subhedral to euhedral

GROUNDMASS: Fine grained, comprising plagioclase, clinopyroxene and olivine microphenocrysts.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
20-25	7	0.5 2	-3	Round

COLOR: Variable. Dominantly light gray (N6) with a greenish tint. A brownish gray (10Y 5/3) alteration halo is present around veins.

STRUCTURE: Massive. Consists of highly vesicular and phyric interior of ~2 m thick lobe[1].

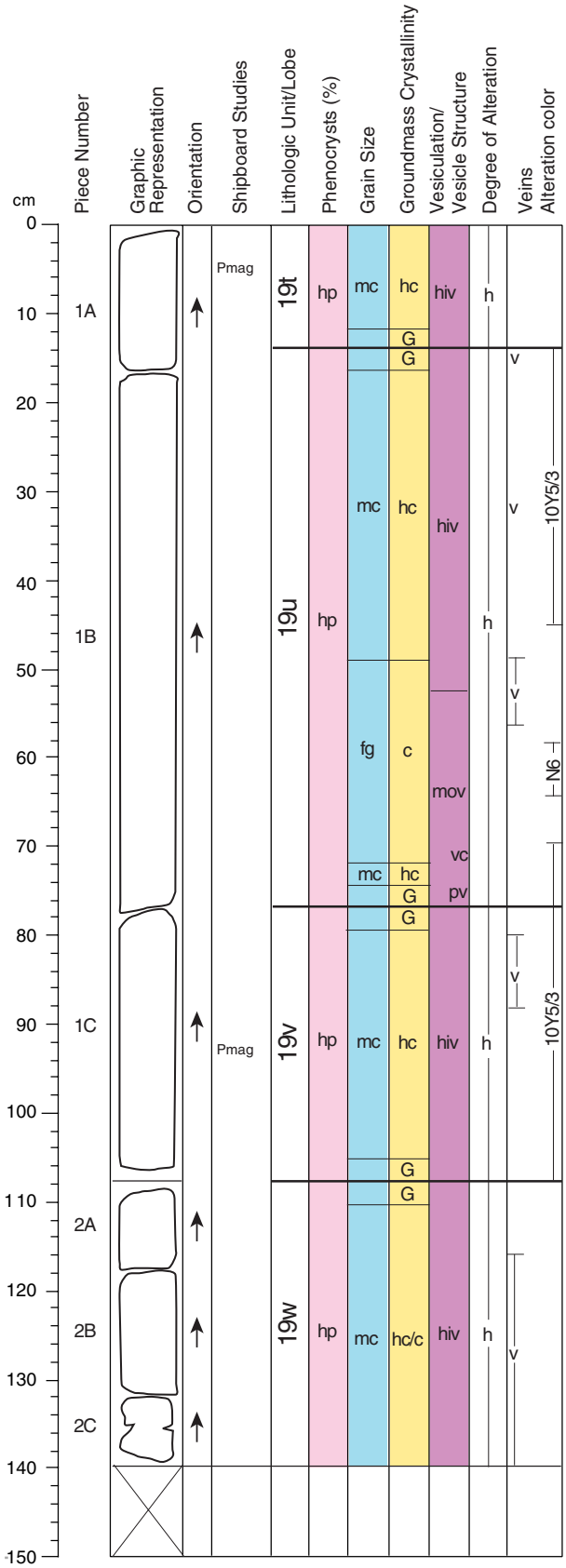
ALTERATION: Moderate to strong; olivine is completely altered to white (N9) carbonate (magnesite) or rusty brown carbonate (siderite?) near veins. Vesicles are filled by carbonate and/or talc.

VEINS/FRACTURES: Dispersed 1-3 mm wide veins (one 8 mm in width) are present throughout, filled with carbonate.

COMMENTS: Vesicles are evenly distributed throughout. Larger vesicles >3 mm often show evidence of growth by coalescence. Smaller vesicles (<2 mm) are spherical and well-rounded.

[1]Interpreted as a pahoehoe lobe.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-42R-2 (Section top: 677.0 mbsf)

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE PHYRIC BASALT.

Pieces: 1A-2C

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	10	4	0.3	1-2	Euhedral
Olivine:	7-15	3	0.5	1.5	Subhedral to euhedral

GROUNDMASS: Microcrystalline to fine grained comprising plagioclase, clinopyroxene and groundmass-sized olivine microphenocrysts.

VESICLES[1]:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	20-25	8	<1	1.5	Round

COLOR: Light gray (N6) and brownish gray (10Y 5/3) in more altered intervals.

STRUCTURE: Highly vesicular basalt lava lobes bounded by smooth glassy upper and lower surfaces 30-60 cm thick[2]. Three lobe contacts are present in this section, at ~13 cm, 78 cm and 108 cm.

ALTERATION: Moderate to strong; olivine is completely altered to white (N4) carbonate (magnesite?) or rusty brown carbonate (siderite?) near veins. Vesicles are filled by carbonate and/or talc.

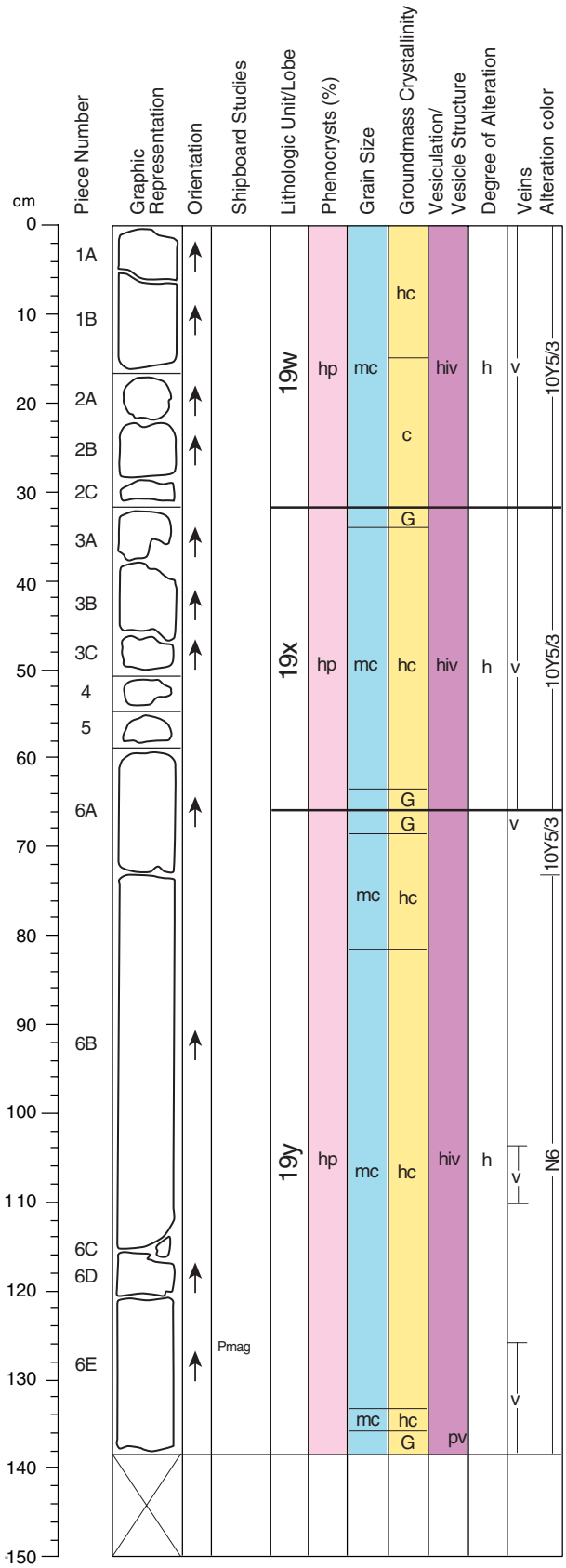
VEINS/FRACTURES: Dispersed 1-3 mm wide veins are present throughout, filled by carbonate. Wider (3-8 mm) veins occur in Pieces 2B and 2C (120-140 cm) and are filled by carbonate.

COMMENTS:
Small pipe vesicles occur at base of Lobes 19t (at ~10 cm) and 19u (at 77 cm) and small vesicles occur in Lobe 19u at 60-66 cm.

[1] Coalesced vesicles occur but are rare.

[2] These are pahoehoe lobes, typically sponge-like in form.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-42R-3 (Section top: 678.4 mbsf)

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE PHYRIC BASALT.

Pieces: 1A-6E

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7	4	0.3	1	Euhedral
Olivine:	10-15	9	0.5	1.5	Subhedral to euhedral

GROUNDMASS: Microcrystalline to fine grained comprising plagioclase, clinopyroxene and possibly groundmass-sized olivine microphenocrysts.

VESICLES[1]:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
20-25	3	<0.5	1	Round

COLOR: Light gray (N6) and brownish gray (10Y 5/3) in more altered areas.

STRUCTURE: Highly vesicular basalt lava lobes bounded by smooth glassy upper and lower surfaces 35-70 cm thick[2]. Three lobe contacts are present in this section; at 34 cm (Piece 3A; inferred); at 70 cm (Piece 6A) and 187 cm (Piece 6E).

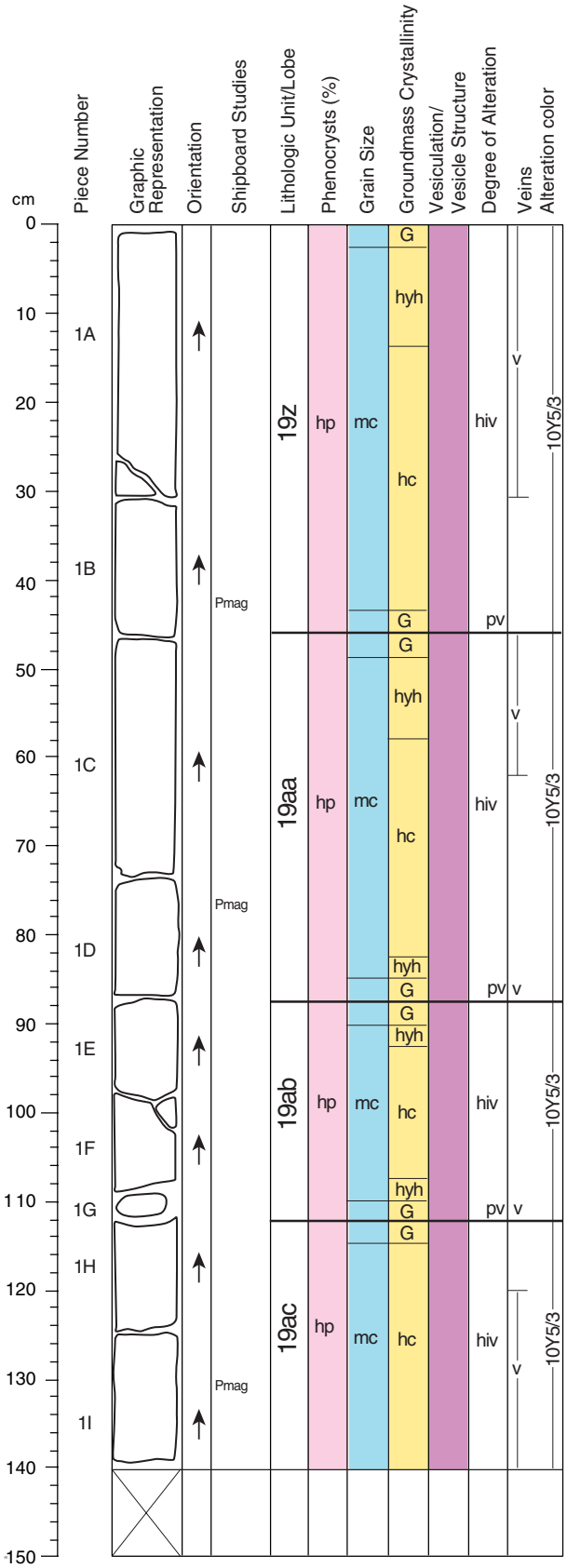
ALTERATION: Moderate to strong; olivine is completely altered to white (N4) carbonate (magnesite?) or rusty brown carbonate (siderite?) near veins. Vesicles are filled by carbonate and/or talc.

VEINS/FRACTURES: Dispersed 1-3 mm veins are present throughout, filled by carbonate. The unit is strongly veined from 0-66 cm, consisting of 10 mm wide carbonate veins.

COMMENTS:
[1] Small pipe vesicles occur at Lobe 19x (128-136 cm), up to 10 mm long and 3 mm wide.

[2] These are pahoehoe lobes, typically sponge-like in morphology.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-42R-4 (Section top: 679.78 mbsf)

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE PHYRIC BASALT.

Pieces: 1A-1I

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	7-10	6	0.3	2	Euhedral
Olivine:	7-15	4	0.5	1.5	Subhedral to euhedral

GROUNDMASS: Microcrystalline to fine grained comprising plagioclase, clinopyroxene and olivine microphenocrysts.

VESICLES[1]:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
20-25	5	<0.5	1	Round

COLOR: Brownish gray (10Y 5/3).

STRUCTURE: Highly vesicular basalt lava lobes bounded by smooth glassy upper and lower surfaces[2]. Four lobe contacts are present in this section; at 0 cm (Piece 1A); 45 cm (Piece 1B) 88 cm (Pieces 1D and 1E) and at 110 cm (Pieces 1F and 1G).

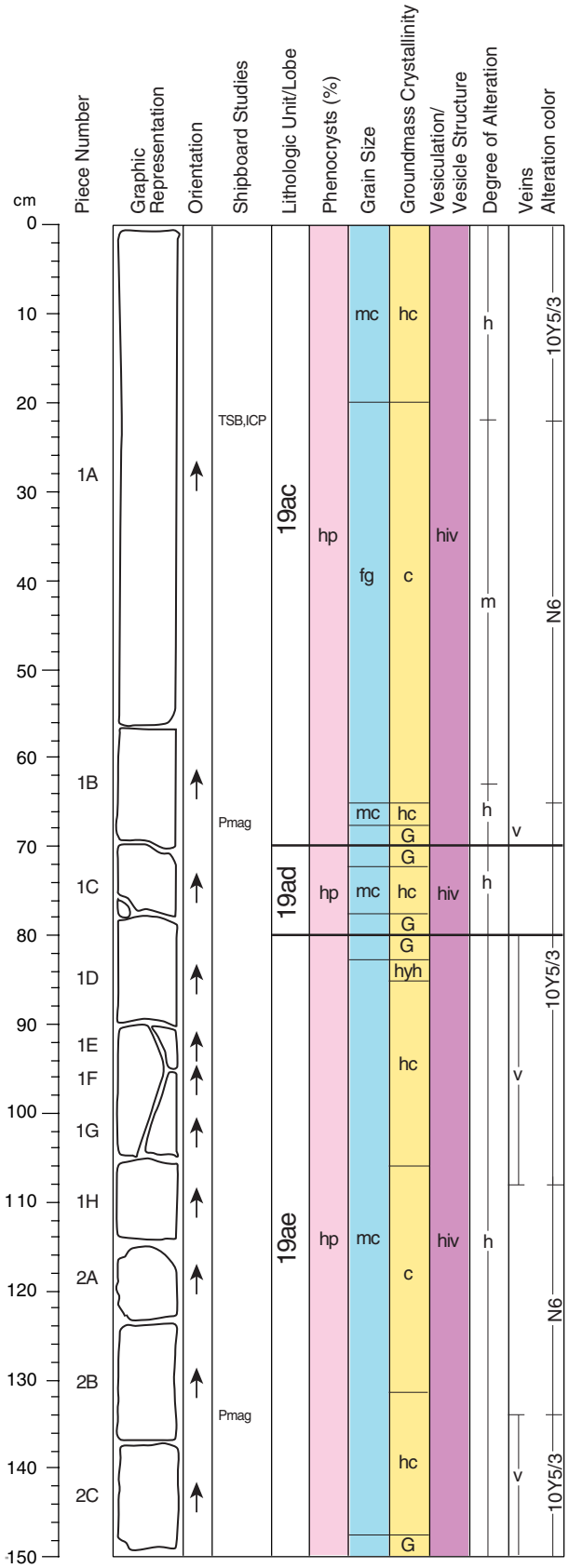
ALTERATION: Moderate to strong. Olivine is completely altered to white (N4) carbonate (magnesite?) or rusty brown carbonate (siderite?) near veins. Vesicles are filled by white carbonate.

VEINS/FRACTURES: Dispersed 1-6 mm wide carbonate filled veins occur sporadically throughout.

COMMENTS:
[1] Concentrated near center of lobe. Larger vesicles are 3-5 mm, irregular in shape and show evidence of growth by coalescence.

[2] These are pahoehoe lobes, typically sponge-like in morphology.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-42R-5 (Section top: 681.19 mbsf)

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE PHYRIC BASALT.

Pieces: 1A-2C

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	5-7	13	0.3	1.5	Euhedral
Olivine:	7-15	3	0.5	1	Subhedral to euhedral

GROUNDMASS: Microcrystalline to fine grained with plagioclase, clinopyroxene and groundmass-sized olivine microphenocrysts.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
20	5	<0.5	2.3	Round

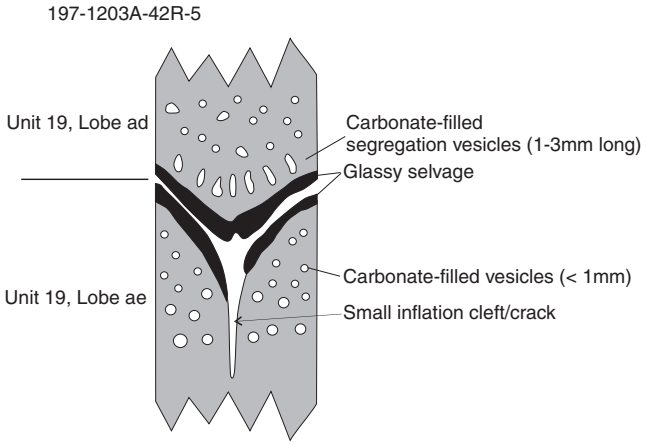
COLOR: Gray (6N) to brownish gray (10Y 5/3).

STRUCTURE: Highly vesicular basalt lava lobes bounded by smooth glassy upper and lower surfaces[1]. Two lobe contacts are present in this section; at 70 cm (Piece 1C); 83 cm (Piece 1D)[2]. This section features a 13 cm thick toe (see comments below) and portions of two lobes, 100 cm and >70 cm thick. The toe rests in a groove formed by a small inflation cleft.

ALTERATION: Moderate to strong. Olivine is completely altered to white (N4) carbonate (magnesite?) or rusty brown carbonate (siderite?) near veins. Vesicles are filled by carbonate and/or talc.

VEINS/FRACTURES: Dispersed 1-6 mm wide carbonate filled veins occur sporadically throughout.

COMMENTS:
[1] These are pahoehoe lobes, typically sponge-like in morphology.



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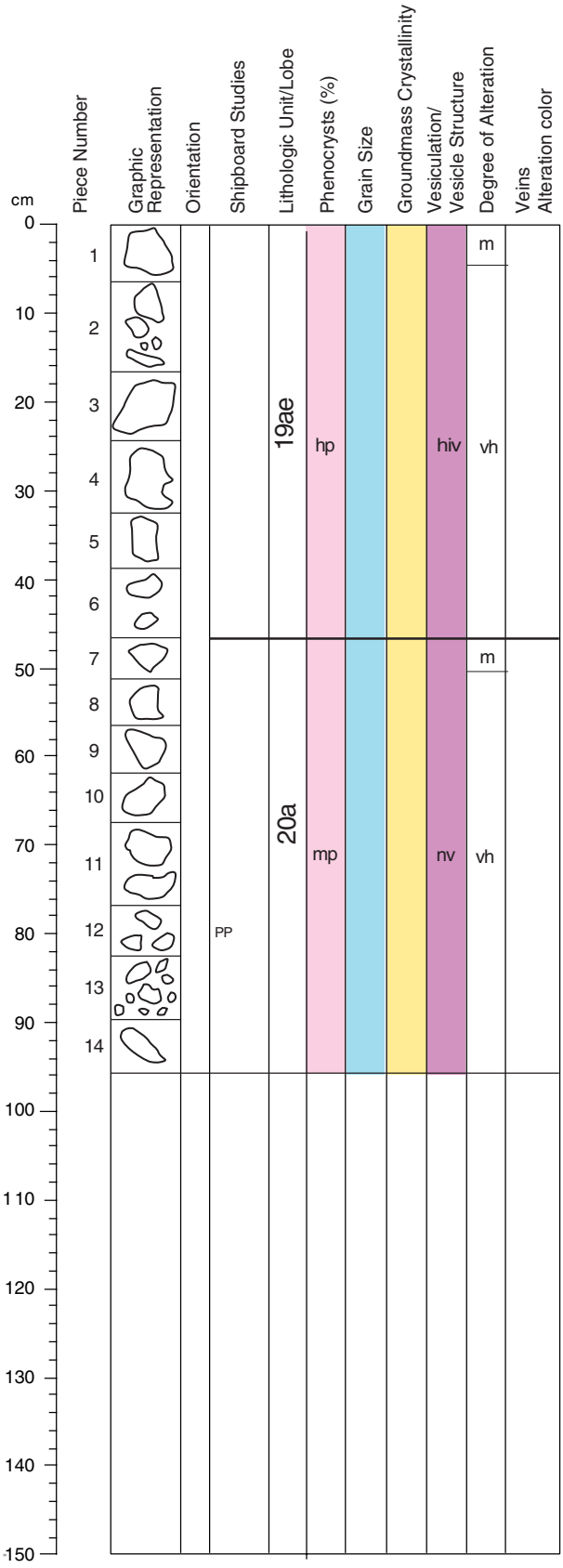


IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-43R-1 (Section top: 685.1 mbsf)

UNIT 19: MODERATELY OLIVINE-PLAGIOCLASE PHYRIC BASALT.

Pieces: 1-6

CONTACTS: None observed. Contact between Unit 19 and Unit 20 inferred to be at 46 cm.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	6-8	13	1	2	Subhedral
Olivine:	5-7	3	1	1	Equant

GROUNDMASS: Fine grained and holocrystalline, comprised of plagioclase, clinopyroxene and groundmass-sized olivine microphenocrysts.

VESICLES:

	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	15-25	<10	<1	2	Round

COLOR: Brownish gray (10Y 5/3) to pale yellowish brown (10YR6/2) on more altered margins.

STRUCTURE: Poor core recovery. Consists of loose 1-4 cm fragments.

ALTERATION: Moderate to strong. Olivine is usually altered to rusty brown carbonate (siderite?). Vesicles are filled by carbonate.

VEINS/FRACTURES: Sparsely veined. A 5 mm wide carbonate vein is present in Piece 1 (1-7 cm).

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 7-14

CONTACTS: None observed. Contact between Unit 19 and Unit 20 inferred to be at 46 cm.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	13	1	2	Subhedral
Olivine:	5-7	3	1	1	Equant

GROUNDMASS: Fine grained with plagioclase, clinopyroxene and groundmass-sized olivine microphenocrysts.

VESICLES:

	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Variable	1-25	<10	<1	2	Round

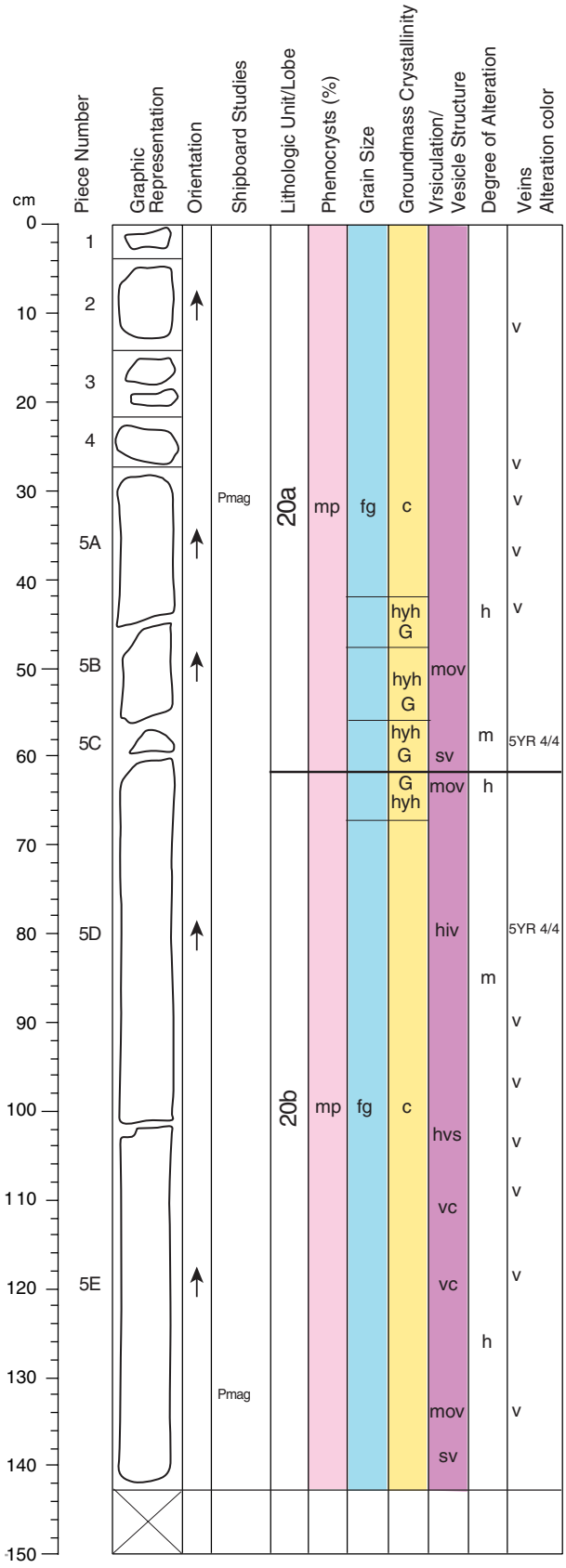
COLOR: Brownish gray (10Y 5/3) to pale yellowish brown (10YR 6/2) on more altered margins.

STRUCTURE: Poor core recovery. Consists of loose 1-4 cm fragments.

ALTERATION: Moderate to strong. Olivine is usually altered to rusty brown carbonate (siderite?). Vesicles are filled by carbonate.

VEINS/FRACTURES: Sparsely veined. Carbonate filled veins are present in Pieces 11 (5 mm wide) and 10 (2 mm wide).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-44R-1 (Section top: 694.7 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-5E

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1			~1	Euhedral
Olivine:	7-9	1	<0.3	0.5	Euhedral

GROUNDMASS: Microcrystalline to fine grained, consisting of plagioclase and interstitial clinopyroxene. The texture varies from variolitic near lobe margins (5-10 cm thick) to intergranular in lobe interiors. Segregation material is crypto to microcrystalline and hypohyaline, and contains olivine phenocrysts.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
<1-10	2	<0.3	0.5	Spherical

COLOR: Variable; brownish gray (5YR 4/4) to light gray in interior of lobes to dark greenish gray (5G 4/1) in glassy selvages at lobe margins.

STRUCTURE: Lobed, with horizontal to vertical lobe contacts, marked by 0.5-1 cm wide glassy selvages from 44-67 cm (Pieces 5A-5D, sketch below). Interval consists of 10-80 cm wide lobes bounded by smooth glassy surfaces[2].

ALTERATION: Moderate to strong. Glassy selvages are strongly altered but contain mm to cm wide domains of unaltered glass; generally alteration decreases towards lobe interiors. Olivine is usually altered to rusty brown carbonate (siderite?). Vesicles are filled by carbonate.

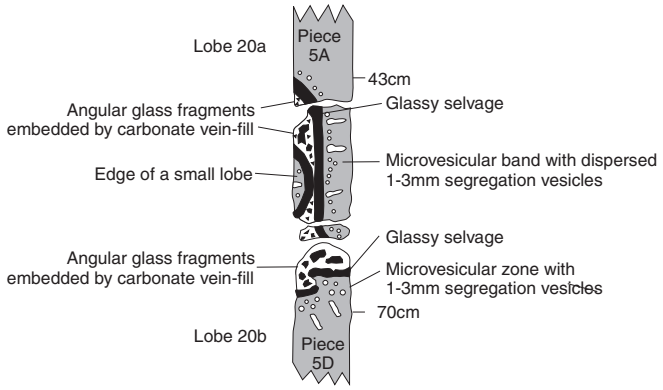
VEINS/FRACTURES: Strongly veined. Lobe interiors are characterized by randomly oriented <1-2 cm wide calcite veins that appear to follow cooling joints. Larger (2-5 mm) carbonate veins at lobe margins occasionally penetrate lobes along cooling joints. These veins contain dispersed angular glass fragments derived from adjacent glassy selvages[3].

COMMENTS:

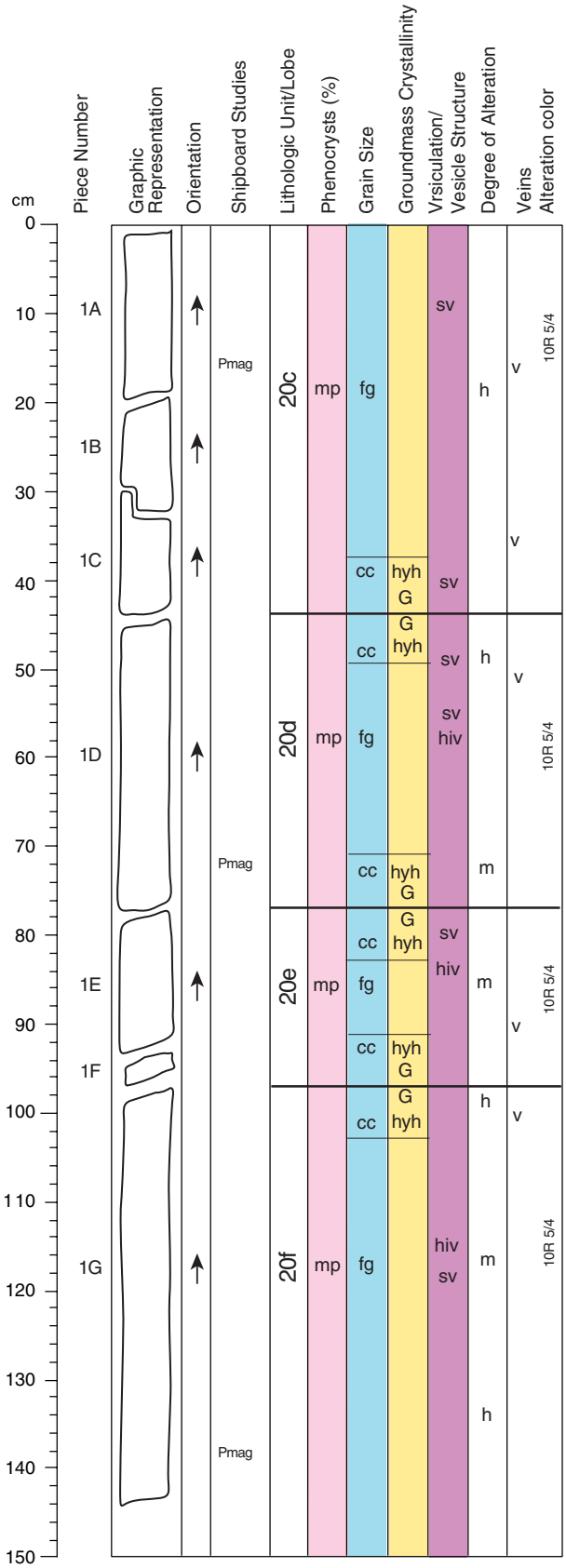
[1]The lava is generally nonvesicular to poorly vesicular, with 0.5-1 cm wide microvesicular (<1 mm) regions immediately inside the glassy lobe margins on all sides. This zone also features 1-2 mm thick and ~25 mm long pipe vesicles or small vesicle cylinders, filled with micro to finely vesicular segregated material. In lower half of Lobe 20b (112-132 cm) are trains of 2-5 mm wide and 5-12 mm long vesicle cylinders (filled with micro to finely vesicular laminated material). One such vesicle cylinder connects to an irregular 15 cm long pod of finely vesicular segregation material, in the upper middle of lobe. The vesicularity of this pod varies from 25%-40%, with individual vesicles <3 mm in size.

[2] Low vesicularity suggests subdued vesiculation and possibly lava emplacement into shallow water. The distribution of segregation structures shows that lava inflation was important during emplacement.

[3] These glass fragments appear to have been caused by vein-induced fragmentation.



Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-44R-2 (Section top: 696.13 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-1G

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1			~1	Euhedral
Olivine:	7-9	1	<0.3	0.5	Euhedral

GROUNDMASS: Microcrystalline to fine grained, consisting of plagioclase and interstitial clinopyroxene. The texture varies from variolitic near lobe margins (5-10 cm thick) to intergranular in lobe interiors. Segregation material is crypto to microcrystalline and hypohyaline, containing olivine phenocrysts.

VESICLES[1]:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
<1-10	2	<0.3	0.5	Round

COLOR: Variable. Brownish gray (5YR 4/4) to light gray in interior of lobes to dark greenish gray (5G 4/1) in glassy lobe margins.

STRUCTURE: Lobed. Glassy lobe margins at 7-10 cm (Piece 1A); 45 cm (Pieces 1C-1D); 78 cm (Pieces 1D-1E); at 99 cm (Pieces 1F-1G). This section consists of 20-45 cm wide lobes[2].

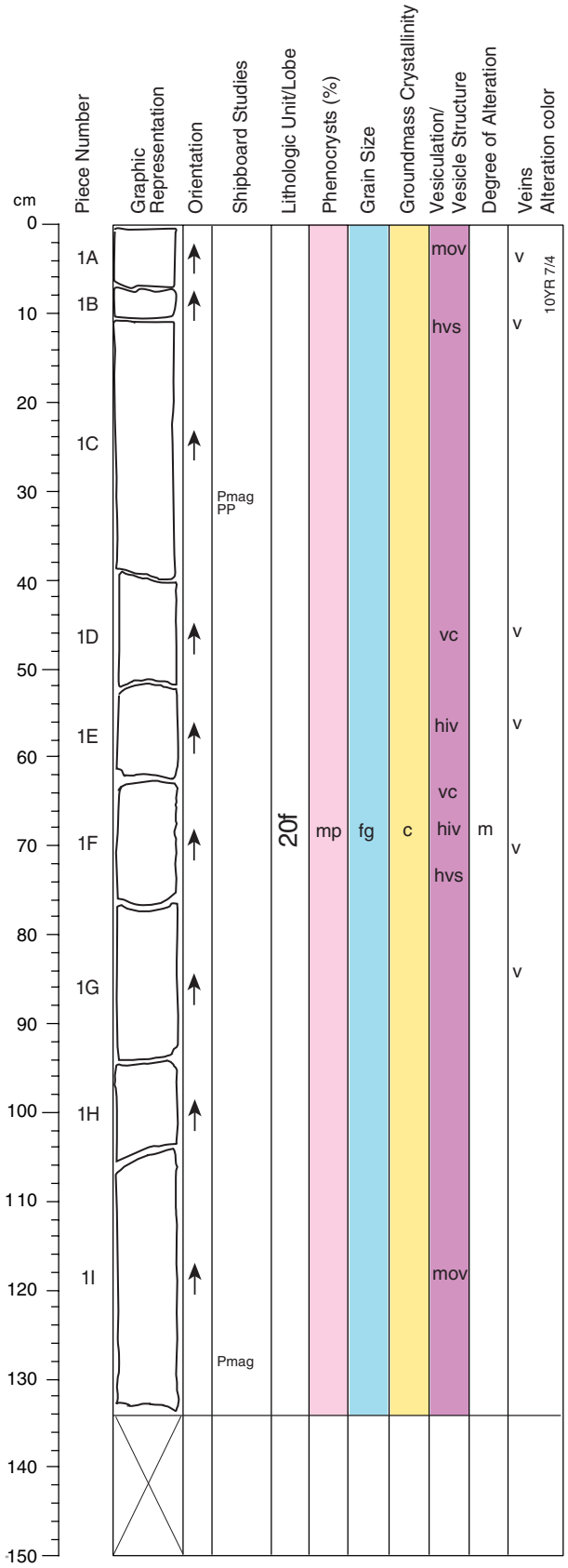
ALTERATION: Moderate to strong. Glassy lobe margins are strongly altered but contain mm to cm wide domains of unaltered glass; generally alteration decreases towards lobe interiors. Olivine is usually altered to carbonate and/or Fe-oxyhydroxide. Vesicles are filled with carbonate.

VEINS/FRACTURES: Strongly veined. Lobe interiors are characterized by randomly oriented <1-2 cm wide carbonate veins that appear to follow cooling joints.

COMMENTS:
[1]Microvesicular 1 cm thick zone occurs just inside glassy lobe margins (both tops and bases) with small (<1-2 mm wide; 5-20 mm long) pipe vesicles extending into the lobe interior. These typically contain segregation material. The lobe interiors contain irregular 1-3 mm wide and 1-4 cm long vesicle cylinders and irregular cm-sized pods of segregated material. These structures usually occur in the lower to upper middle parts of lobes.

[2] Low vesicularity of lava indicates the occurrence of subdued degassing upon emplacement (pillow lava). Occurrence and distribution of segregation structures indicates that lava inflation was an important process during lava emplacement.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-44R-3 (Section top: 697.63 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-1I[1]

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1			~1	Euhedral
Olivine:	7-9	1	<0.3	0.5	Euhedral

GROUNDMASS: Microcrystalline to fine grained, consisting of plagioclase and interstitial clinopyroxene. The texture varies from variolitic near lobe margins (5-10 cm thick) to intergranular in lobe interiors. Segregation material is hypohyaline, cryptocrystalline to microcrystalline, and contains olivine phenocrysts.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
<1-10	2	<0.3	0.5	Round

COLOR: Variable; brownish gray (5YR 4/4) to light gray in interior of lobes to dark greenish gray (5G 4/1) in glassy selvages at lobe margins.

STRUCTURE: Section represents interior of Lobe 20f[2], which is ~200 cm thick. It features two distinct horizontal vesicle sheets at 8-11 cm and 73-76 cm. Small vesicle cylinders (58 mm wide) link to base of each sheet.

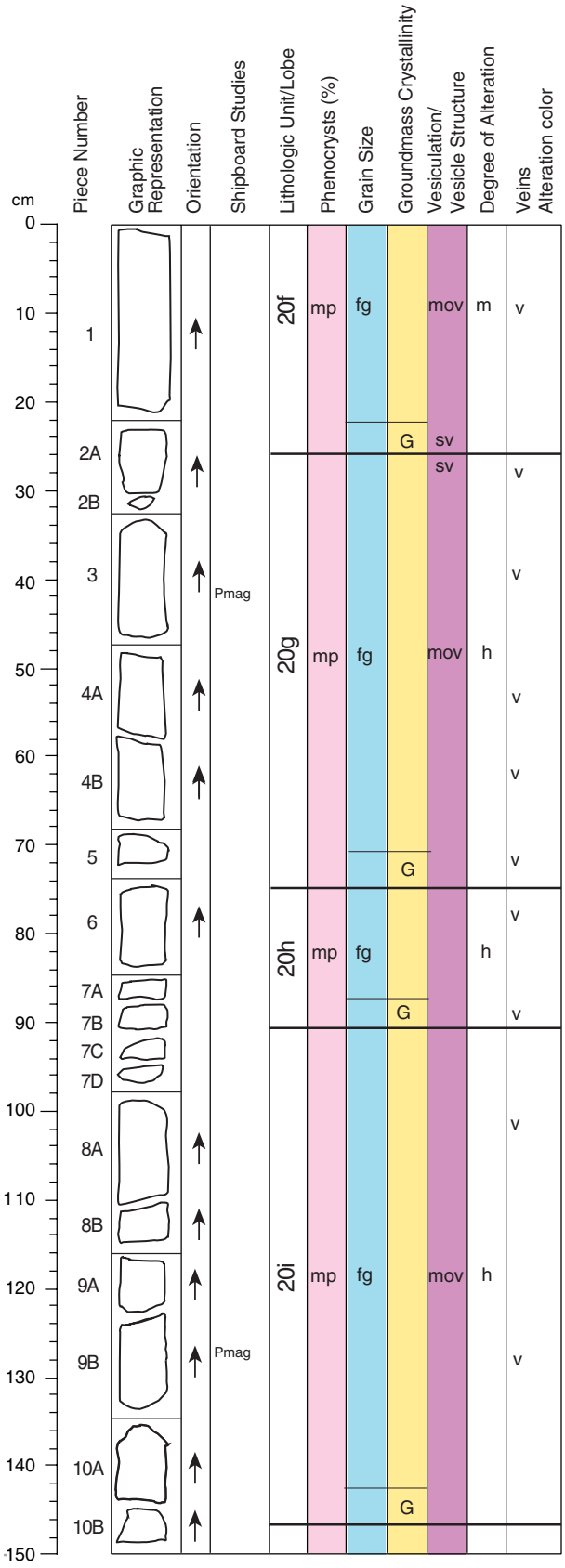
ALTERATION: Moderate to strong. Glassy lobe margins are strongly altered but contain mm to cm wide domains of unaltered glass; generally alteration decreases towards lobe interiors. Olivine is usually altered to carbonate and/or Fe-oxyhydroxide. Vesicles are filled with carbonate.

VEINS/FRACTURES: Strongly veined. Lobe interiors are characterized by randomly oriented <1-2 cm wide carbonate veins that appear to follow cooling joints.

COMMENTS:
[1]Lobe 20f represents interior of lobe.

[2] This lobe shows arrangement of segregation structures that is very similar to that found in inflated pahoehoe lavas. The nonvesicular nature of the lobe and its associated lobes suggest subdued exsolution of gases during emplacement and is therefore suggestive of arrestive degassing by advance into water (i.e., pillow lavas).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-44R-4 (Section top: 698.97 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-10B

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1	≤1			Euhedral
Olivine:	7-9	1	<0.3	0.5	Euhedral

GROUNDMASS: Microcrystalline to fine grained, consisting of plagioclase and interstitial clinopyroxene. The texture varies from variolitic near lobe margins (5-10 cm thick) to intergranular in lobe interiors. Segregation material is hypohyaline, cryptocrystalline to microcrystalline, and contains olivine phenocrysts.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	<1-10	2	<0.3	0.5	Round

COLOR: Variable. Brownish gray (5YR 4/4) to light gray in interior of lobes to dark greenish gray (5G 4/1) in glassy lobe margins.

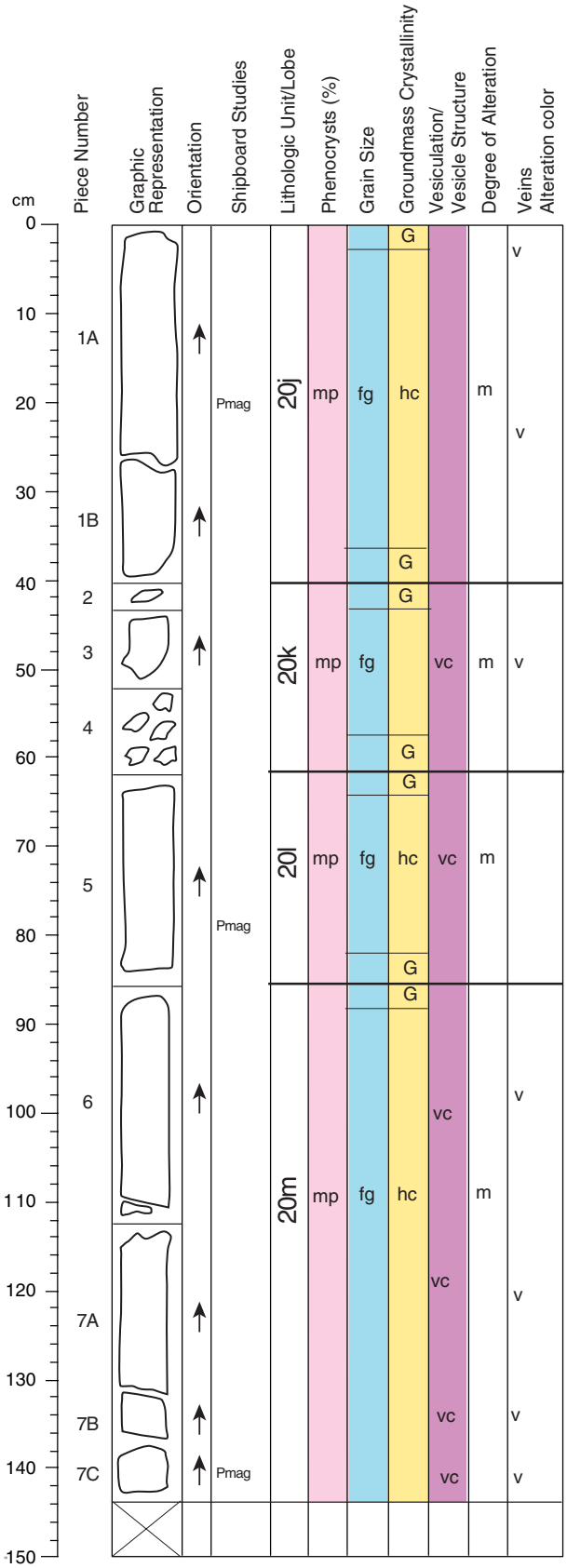
STRUCTURE: Lobed. Lobe contacts at 22 cm (Piece 1A); at 30 cm (Piece 3A); at 80 cm (Pieces 5A and 6A); at 88 cm (Piece 7B) and at 148 cm (Pieces 10A and 10B). Interval consists of 17-55 cm thick lobes, with pipe vesicles and small vesicle cylinders in lower parts of lobes. Between 22-30 cm (Piece 2A) is a small lobe (toe).

ALTERATION: Moderate to strong. Glassy lobe margins are strongly altered but contain mm to cm wide domains of unaltered glass; generally alteration decreases towards lobe interiors. Olivine is usually altered to carbonate and/or Fe-oxyhydroxide. Vesicles are filled with carbonate.

VEINS/FRACTURES: Strongly veined. Lobe interiors are characterized by randomly oriented <1-2 cm wide carbonate veins that appear to follow cooling joints.

COMMENTS: Small pillow lobes with segregation structures are well preserved in the lower half of Lobes 20g and 20h.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-44R-5 (Section top: 700.47 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-7C

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1			~1	Euhedral
Olivine:	7-9	1	<0.3	0.5	Euhedral

GROUNDMASS: Microcrystalline to fine grained, consisting of plagioclase and interstitial clinopyroxene. The texture varies from variolitic near lobe margins (5-10 cm thick) to intergranular in lobe interiors. Segregation material is hypohyaline, cryptocrystalline to microcrystalline, and contains olivine phenocrysts.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
<1-10	2	<0.3	0.5	Spherical

COLOR: Variable; brownish gray (5YR 4/4) to light gray in interior of lobes to dark greenish gray (5G 4/1) in glassy lobe margins.

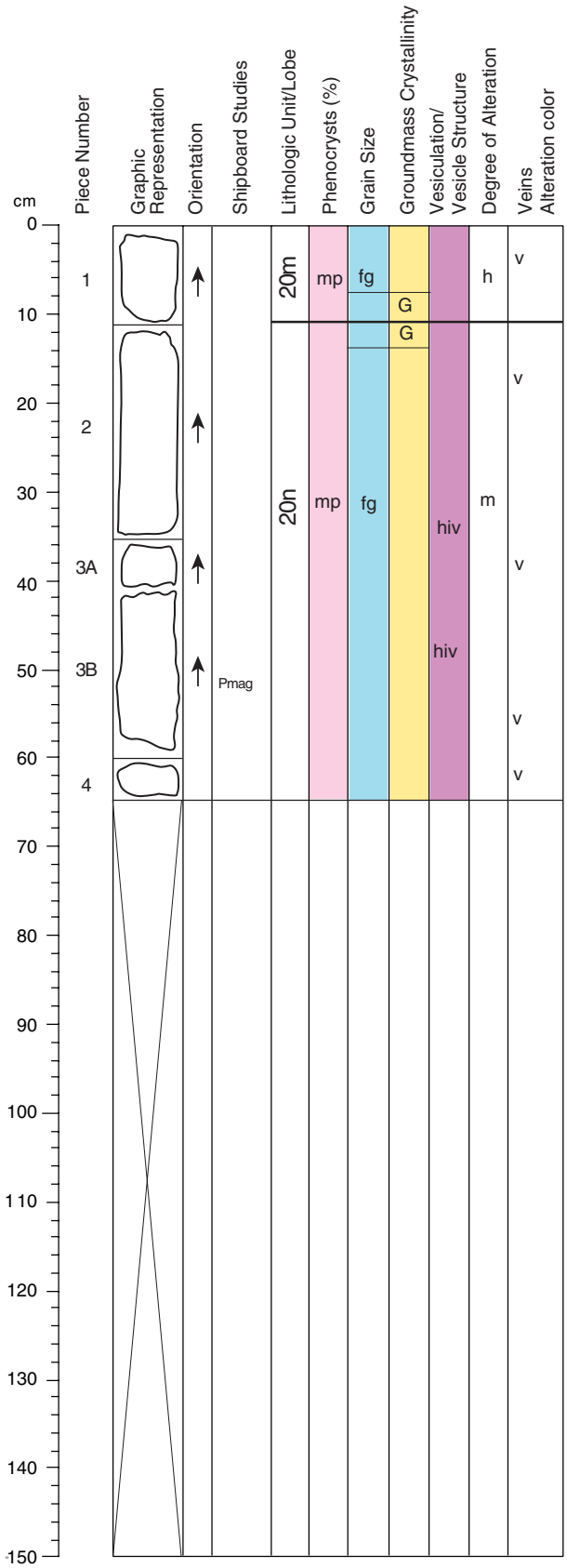
STRUCTURE: Lobed. Glassy lobe margins at 39 cm (Pieces 1B and 2A); 61 cm (Pieces 4-5); at 86 cm (Pieces 5A-6A). Interval consists of 20-40 cm thick lobes, however Lobe 20m is 70 cm thick. Lobes feature well developed segregation structures, pipe vesicles at lobe bases and small vesicle cylinders in lower half of lobes. Irregular segregation structures are present in the upper part of the lobes.

ALTERATION: Moderate to strong. Glassy lobe margins are strongly altered but contain mm to cm wide domains of unaltered glass; generally alteration decreases towards lobe interiors. Olivine is usually altered to carbonate and/or Fe-oxyhydroxide. Vesicles are filled with carbonate.

VEINS/FRACTURES: Strongly veined. Lobe interiors are characterized by randomly oriented <1-2 cm wide carbonate veins that appear to follow cooling joints. Larger (2-5 mm) carbonate veins at lobe boundaries occasionally penetrate lobes along cooling joints. These veins contain dispersed angular glass fragments derived from adjacent glassy lobe margins.

COMMENTS:
Small pillow lobes with segregation structures are well preserved in Lobes 20j, 20l and 20m.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-44R-6 (Section top: 701.93 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-4A

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1			~1	Euhedral
Olivine:	7-9	1	<0.3	0.5	Euhedral

GROUNDMASS: Microcrystalline to fine grained, consisting of plagioclase and interstitial clinopyroxene. The texture varies from variolitic near lobe margins (5-10 cm thick) to intergranular in lobe interiors. Segregation material is hypohyaline, cryptocrystalline to microcrystalline, and contains olivine phenocrysts.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
<1-10	2	<0.3	0.5	Spherical

COLOR: Variable. Brownish gray (5YR 4/4) to light gray in interior of lobes to dark greenish gray (5G 4/1) in glassy lobe margins.

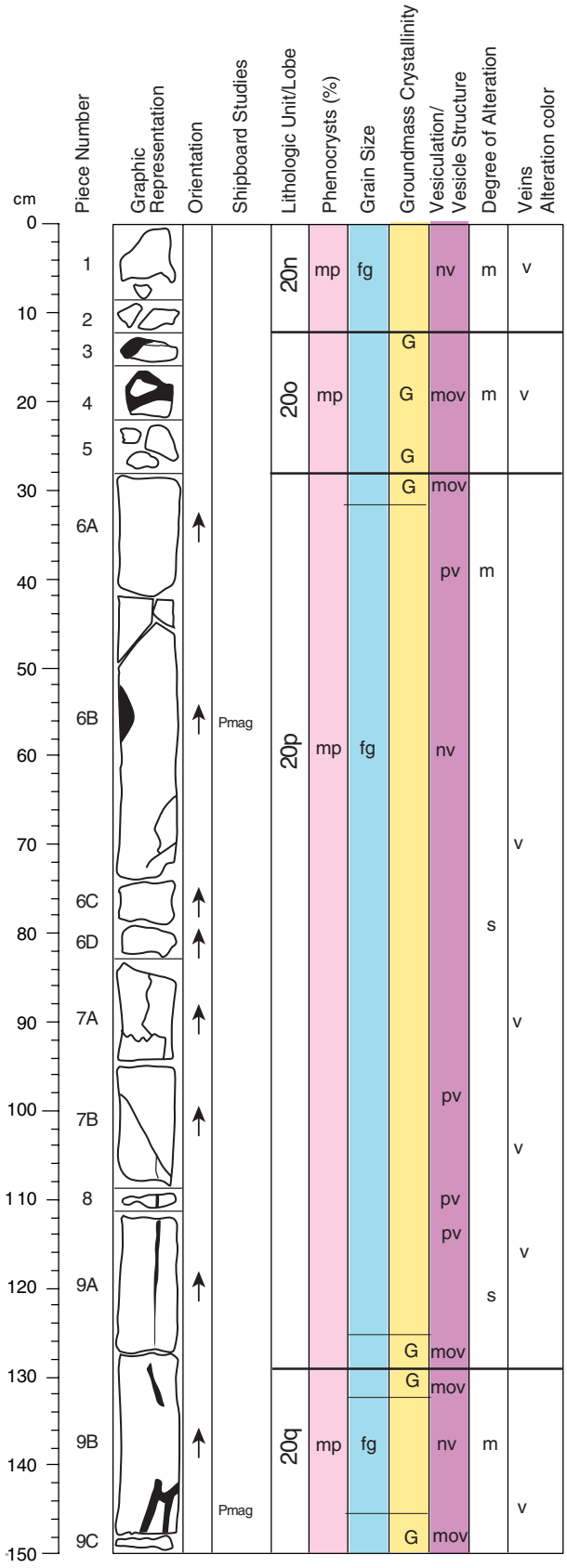
STRUCTURE: Lobed. Consists of the base and upper part of Lobe 20m (>50 cm thick); bottom of the lobe is not in section.

ALTERATION: Moderate to strong. Glassy lobe margins are strongly altered but contain mm to cm wide domains of unaltered glass; generally alteration decreases towards lobe interiors. Olivine is usually altered to carbonate and/or Fe-oxyhydroxide. Vesicles are filled with carbonate.

VEINS/FRACTURES: Strongly veined. Lobe interiors are characterized by randomly oriented <1-2 cm wide carbonate veins that appear to follow cooling joints. Larger (2-5 mm) carbonate veins at lobe boundaries occasionally penetrate lobes along cooling joints. These veins contain dispersed angular glass fragments derived from adjacent glassy lobe margins.

COMMENTS:
Small pillow lobes with segregation structures are well preserved in Lobes 20m and 20n.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-45R-1 (Section top: 703.1 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-4

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1			1.5	Euhedral laths
Olivine:	6-8	1.5	0.2	0.4	Euhedral; equant

GROUNDMASS: Aphanitic at glassy lobe margins. Fine grained in the lobe interiors. Plagioclase, clinopyroxene, and black oxides in variolitic to intergranular texture.

VESICLES(*):

% Mode	Size (mm): Max.	Min.	Avg.	Shape
0-10	100	0.1	5	Irregular

COLOR: Variable. Medium light gray (N6), dark yellowish brown (10YR 4/2), pale red (10R 6/2), dark greenish gray (altered glassy lobe margins, 5G 4/1).

STRUCTURE: Lobed. Glassy lobe margins are present (Pieces 4, 5, 6A, and 9A-9C).

ALTERATION: Moderate. Complete in the glassy lobe margins. Fe-oxyhydroxide is pervasive in alteration halos adjacent to glassy margins and around veins (up to 8 cm wide). Similar alteration haloes are present around vesicle cylinders, though these are narrower. Glassy margins are altered to dark green clay and Fe-oxyhydroxide. Mesostasis in fine grained regions is replaced with white carbonate (adjacent to veins) and dark green blue clay. Vesicles are filled with white carbonate and occasionally are lined with dark green blue clay. Olivine phenocrysts are completely replaced by white carbonate and/or Fe-oxyhydroxide.

VEINS/FRACTURES: Sparsely (Pieces 2, 5, 6A, 6C, 6D, 8, and 9A) to moderately (Pieces 1, 3, 4, 6B, 7A, 7B, 9B, and 9C) veined. Veins are randomly oriented, <0.1-22 mm wide, and filled with white carbonate and Fe-oxyhydroxide. Voids are present in several of the larger veins. Large area on the edge of the core in Piece 6B (52-58 cm) is composed of vein material.

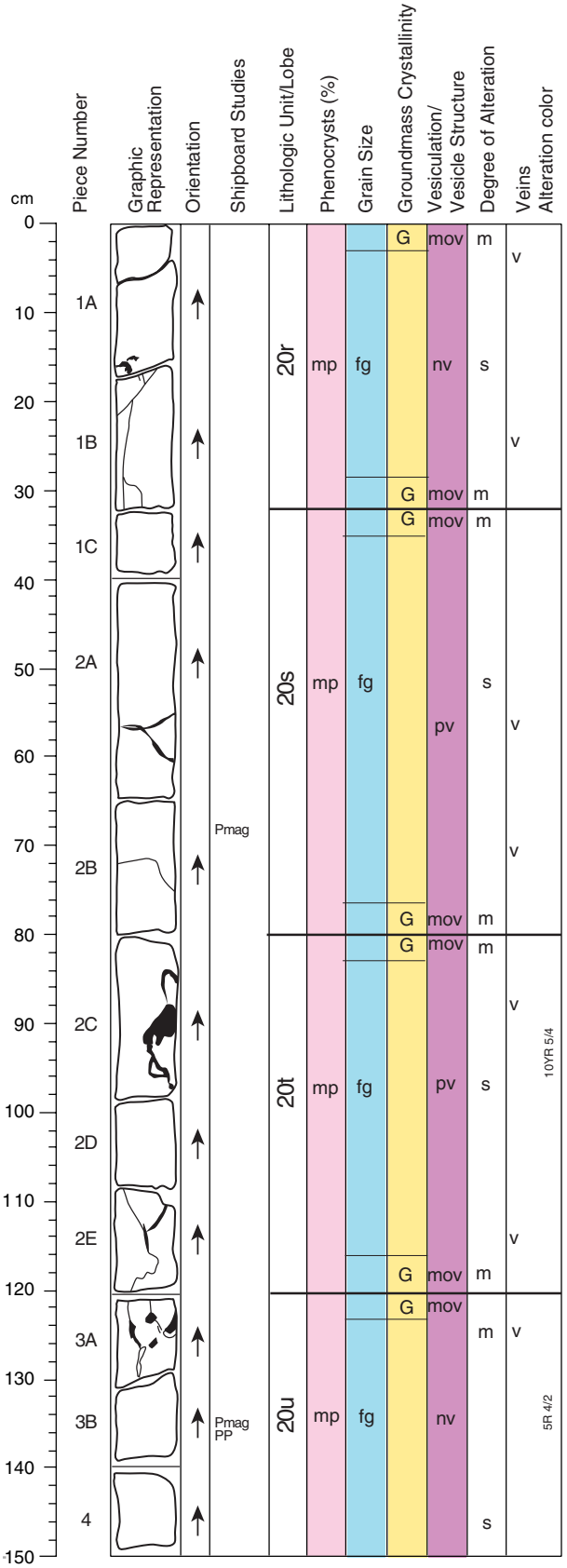
COMMENTS: (*)Largest vesicles are long, ~0.5 cm wide vesicle cylinders present in the interior of lobes. A 2-4 cm zone adjacent to the glassy margins is moderately vesicular. The lobe interiors are generally nonvesicular, except for the vesicle cylinders. Vesicle cylinders are present in Pieces 6A (38-41 cm), 7B (98-105 cm), 8 (108-110 cm) and 9A (111-113 cm).

Vesicle patterns and morphologies suggest this core section is part of a subaerial pahoehoe flow that could have flowed into water.

Olivine is a microphenocryst phase. Its shape defines it as an early crystallizing phase, but the groundmass has grown to approximately the same size.

Brecciation of the glassy lobe margins by carbonate veining is present between lobes (e.g., Piece 4).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-45R-2 (Section top: 704.6 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-4

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	4	0.5	1	Subhedral laths
Olivine:	5-8	1	0.2	0.4	Euhedral; equant

GROUNDMASS: Aphanitic at glassy margins. Fine grained in the lobe interiors. Plagioclase, clinopyroxene, and black oxides in variolitic to intergranular texture.

VESICLES(*):

% Mode	Size (mm): Max.	Min.	Avg.	Shape
0-20	130	1	4	Irregular

COLOR: Variable. Medium dark gray (N4), pale brown (5YR 5/2), dusky blue green (altered glassy lobe margins, 5BG 3/2).

STRUCTURE: Lobed. Glassy lobe margins are present (Pieces 1A-1C, 2B, 2C, 2E, and 3A).

ALTERATION: Moderate. Complete in the glassy lobe margins. Fe-oxyhydroxide is pervasive in alteration halos adjacent to glassy margins and around veins (up to 8 cm wide). Similar alteration haloes are present around vesicle cylinders, though these are narrower. Glassy lobe margins are replaced by dark green clay. Mesostasis in fine grained regions is replaced with white carbonate (adjacent to veins) and dark green blue clay. Vesicles are filled with white carbonate and occasionally are lined with dark green blue clay. Olivine phenocrysts are completely replaced by white carbonate and/or Fe-oxyhydroxide.

VEINS/FRACTURES: Moderately veined at glassy lobe margins, sparsely veined elsewhere. Veins are randomly oriented, <0.1-20 mm wide, and filled with white carbonate and Fe oxyhydroxide.

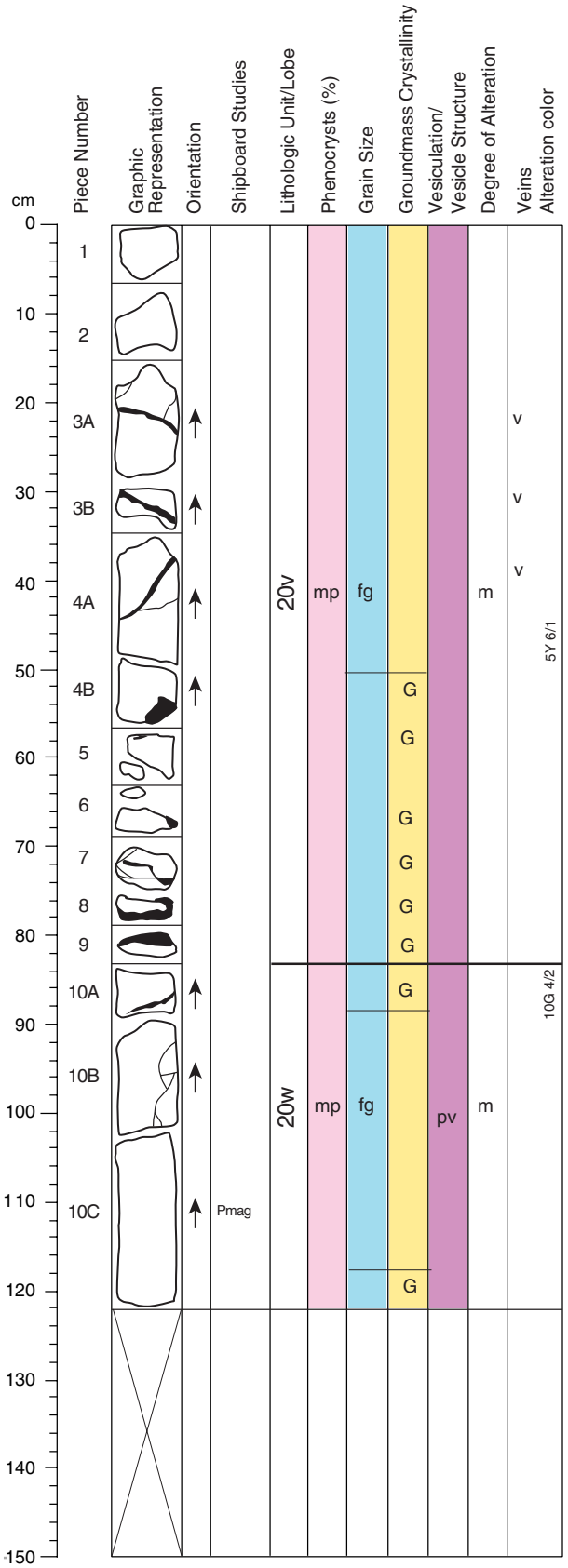
COMMENTS: (*)Largest vesicles are long, ~0.5 cm wide vesicle cylinders present in the interior of lobes. A 2-4 cm zone adjacent to the glassy lobe margins is moderately vesicular. The lobe interiors are generally nonvesicular, except for the vesicle cylinders. Vesicle cylinders are present in Pieces 2A (56-60 cm) and 2C-2D (93-106 cm).

Vesicle patterns and morphologies suggest this core section is part of a subaerial pahoehoe flow that may have flowed into water.

Olivine is a microphenocryst phase. Its shape defines it as an early crystallizing phase, but the groundmass has grown to approximately the same size.

Brecciation of the glassy lobe margins by carbonate veining is present between lobes (e.g., Piece 3a).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-45R-3 (Section top: 706.1 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-9C

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1			0.8	Subhedral; blocky
Olivine:	6-8	2	0.2	0.4	Euhedral; equant

GROUNDMASS: Aphanitic at glassy lobe margins. Fine grained in the lobe interiors. Plagioclase, clinopyroxene, and black oxides in variolitic to intergranular texture.

VESICLES(*):	%	Size (mm):		
Mode	Max.	Min.	Avg.	Shape
0-10	60	1	3	Irregular

COLOR: Variable. Medium light gray (N6), dark yellowish brown (10YR 4/2), light brownish gray (5YR 6/11), dark greenish gray (altered glassy lobe margins, 5G 4/1).

STRUCTURE: Lobed. Glassy lobe margins are present (Pieces 4B, 5, 6, 7A, 7B, 8, 9A, and 9C).

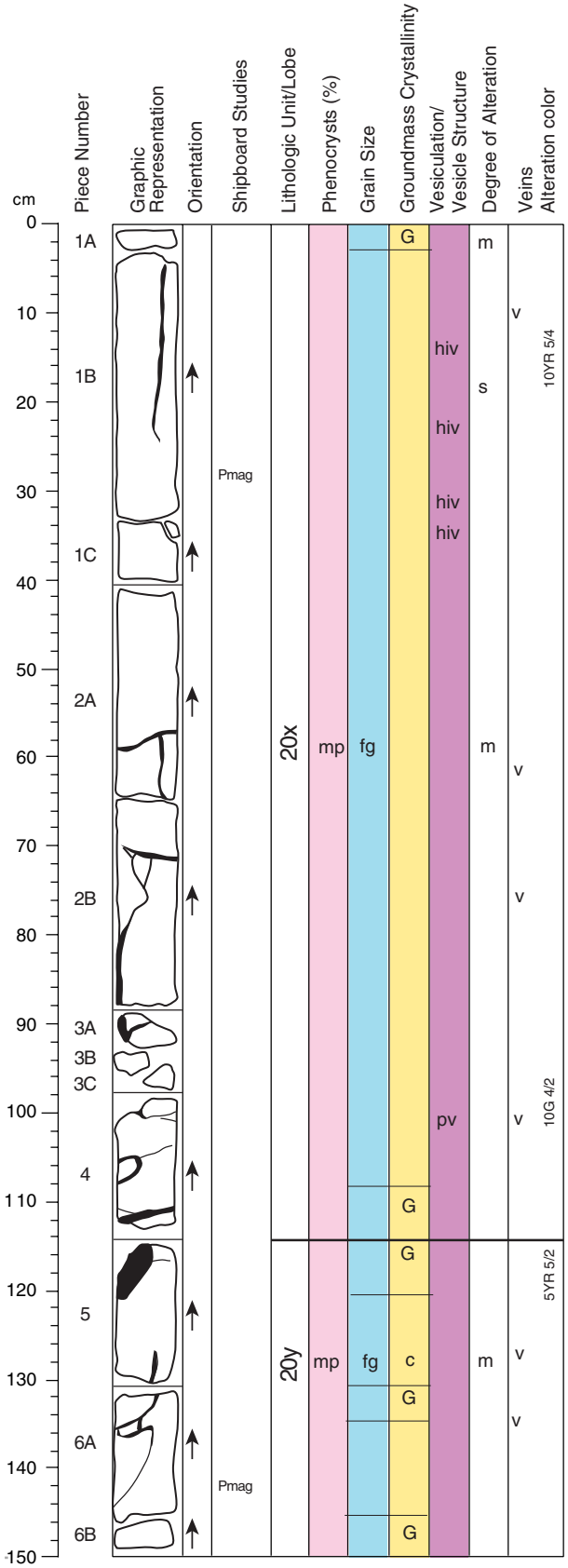
ALTERATION: Moderate. Complete in the glassy lobe margins. Fe-oxyhydroxide is pervasive in alteration halos adjacent to glassy margins and around veins. Similar alteration haloes are present around vesicle cylinders, though these are narrower. Glassy lobe margins are replaced by dark green clay. Mesostasis in fine grained regions is replaced with white carbonate (adjacent to veins) and dark green blue clay. Vesicles are filled with white carbonate and occasionally are lined with dark green blue clay. Olivine phenocrysts are completely replaced by white carbonate and/or Fe-oxyhydroxide.

VEINS/FRACTURES: Sparsely (Pieces 2, 5, 6A, 6C, 6D, 8, and 9A) to moderately (Pieces 1, 3, 4, 6B, 7A, 7B, 9B, and 9C) veined. Veins are randomly oriented, <0.1-22 mm wide, and filled with white carbonate and Fe-oxyhydroxide. Voids are present in the center of several of the larger veins. Large area on the edge of the core in Piece 6B (52-58 cm) is composed of vein material.

COMMENTS: (*)Largest vesicles are long, ~0.4 cm wide vesicle cylinders present in the interior of lobes. A 2-3 cm zone adjacent to the glassy lobe margins is moderately vesicular. The lobe interiors are generally nonvesicular, except for the vesicle cylinders. Vesicle cylinders are concentrated in Pieces 4A (vertical to subhorizontal). A vesicle cylinder present in Piece 9C extends across the width of the core from 102 cm to 106 cm and is ~5 mm wide. Vesicle cylinders are more apparent on the outer surface of the core. Vesicle patterns and morphologies suggest this core section is part of a subaerial pahoehoe flow that may have flowed into water.

Olivine is a microphenocryst phase. Its shape defines it as an early crystallizing phase, but the groundmass has grown to approximately the same size.
Brecciation of the glassy lobe margins by carbonate veining is present between lobes (e.g., Piece 8).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-45R-4 (Section top: 707.33 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-6B

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	8-10	1	0.2	0.4	Euhedral; equant

GROUNDMASS: Aphanitic at glassy lobe margins. Fine grained in the lobe interiors. Plagioclase, clinopyroxene, and black oxides in variolitic to intergranular texture.

VESICLES(*):

% Mode	Size (mm): Max.	Min.	Avg.	Shape
0-30	140	0.1	2	Irregular

COLOR: Variable. Greenish black (5G 2/1), dark yellowish brown (10YR 4/2), dark greenish gray (altered glassy lobe margins, 5G 4/1).

STRUCTURE: Lobed. Glassy lobe margins are present (Pieces 1A, 4, 5, 6A, and 6B).

ALTERATION: Moderate. Moderate to complete in the glassy lobe margins. Fe-oxyhydroxide is pervasive in alteration halos adjacent to glassy lobe margins and around veins. Similar alteration haloes are present around vesicle cylinders, though these are narrower. Glassy lobe margins are replaced by dark green clay. Mesostasis in fine grained regions is replaced with white carbonate (adjacent to veins) and dark green blue clay. Vesicles are filled with white carbonate and occasionally are lined with dark green blue clay. Olivine phenocrysts are completely replaced by white carbonate and/or Fe-oxyhydroxide.

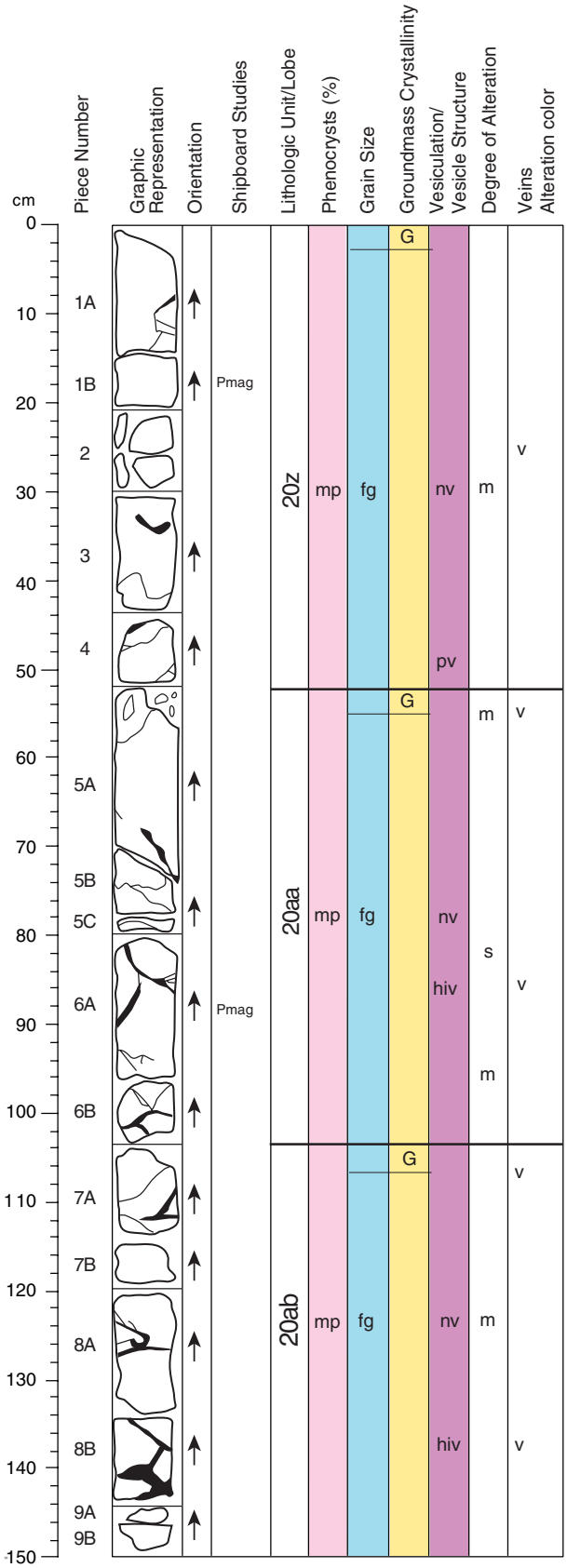
VEINS/FRACTURES: Moderately veined at glassy lobe margins, sparsely veined elsewhere. Veins are vertical and subhorizontal, <0.1-6 mm wide, and filled with white carbonate and Fe oxyhydroxide. Voids are present in the center of several of the larger veins. Large area (>3 cm) at the top of Piece 5 is composed of white carbonate vein material.

COMMENTS: (*)Largest vesicles are long, ~0.5 cm wide vesicle cylinders and segregation vesicles present in the interior of lobes (e.g., Piece 2B, 73-87 cm). A 2-3 cm zone adjacent to the glassy lobe margins is moderately vesicular. Segregation vesicles are present in distinct zones in Piece 1B-1C at 13-15 cm, 20-25 cm, 27-32 cm, and 34-37 cm. They are composed of highly vesicular basaltic material that has a sharp boundary with the host basalt. The lobe interiors are generally nonvesicular, except for the vesicle cylinders and irregular segregation structures. Vesicle cylinders are concentrated in Pieces 4A (vertical to subhorizontal).Vesicle patterns and morphologies suggest this core section is part of a subaerial pahoehoe flow that may have flowed into water.

Olivine is a microphenocryst phase. Its shape defines it as an early crystallizing phase, but the groundmass has grown to approximately the same size.

Brecciation of the glassy lobe margins by carbonate veining is present between lobes.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-45R-5 (Section top: 708.83 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-9B

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1			1.2	Subhedral; blocky
Olivine:	7-10	1.2	0.2	0.4	Euhedral; equant

GROUNDMASS: Aphanitic at glassy lobe margins. Fine grained in the lobe interiors. Plagioclase, clinopyroxene, and black oxides in variolitic to intergranular texture. Quenched olivine may be present in the groundmass.

VESICLES(*):

% Mode	Size (mm): Max.	Min.	Avg.	Shape
0-20	50	2	4	Irregular

COLOR: Variable. Medium gray (N5), dark yellowish brown (10YR 4/2), dark greenish gray (altered glassy lobe margins, 5G 4/1), moderate brown (5YR 3/4).

STRUCTURE: Lobed. Glassy lobe margins are present (Pieces 1A, 5A, 7A, 7B, 8A).

ALTERATION: Moderate. Moderate to complete in the glassy lobe margins. Fe-oxyhydroxide is pervasive in alteration halos adjacent to glassy lobe margins and around veins. Similar alteration haloes are present around pipe vesicles, though these are narrower. Glassy lobe margins are replaced by dark green clay. Mesostasis in fine grained regions is replaced with white carbonate (adjacent to veins) and dark green blue clay. Vesicles are filled with white carbonate and occasionally are lined with dark green blue clay. Olivine phenocrysts are completely replaced by white carbonate and/or Fe-oxyhydroxide.

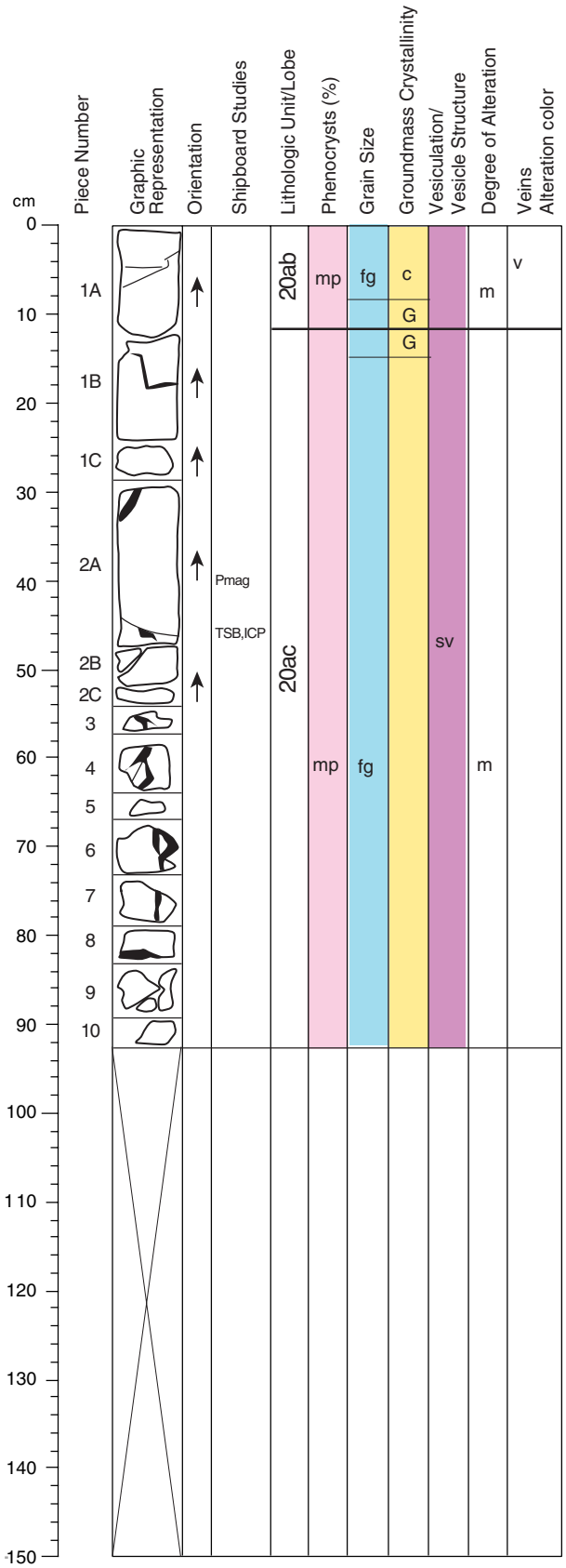
VEINS/FRACTURES: Moderately veined at glassy lobe margins and in Piece 8B, sparsely veined elsewhere. Veins are vertical and subhorizontal, <0.1-20 mm wide, and filled with white carbonate, dark green clay, and Fe-oxyhydroxide. Voids are present in the center of several of the larger veins.

COMMENTS: (*)Largest vesicles are long, ~0.5 cm wide vesicle cylinders and segregation vesicles present in the interior of lobes (e.g., Pieces 3, 4, 2B, 73-87 cm). A 2-3 cm zone adjacent to the glassy lobe margins is moderately vesicular. Segregation vesicles are present in Piece 6A (80-85 cm) and Piece 8B (136-139 cm). They are 0.5-1 cm wide and composed of highly vesicular basaltic material that has a sharp boundary with the host basalt. The lobe interiors are generally nonvesicular, except for the vesicle cylinders and segregation vesicles. Vesicle cylinders and segregation vesicles are concentrated in Pieces 4A. Vesicle patterns and morphologies suggest this core section is part of a subaerial pahoehoe flow that may have flowed into water.

Olivine is a microphenocryst phase. Its shape defines it as an early crystallizing phase, but the groundmass has grown to approximately the same size.

Brecciation of the glassy lobe margins by carbonate veining is present between lobes (e.g., Pieces 5A and 7A).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-45R-6 (Section top: 710.33 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-10

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2	0.5	1	Subhedral; blocky
Olivine:	7-10	1.2	0.2	0.4	Euhedral; equant

GROUNDMASS: Aphanitic at glassy lobe margins. Fine grained in the lobe interiors. Plagioclase, clinopyroxene, and black oxides in variolitic to intergranular texture. Quenched olivine may be present in the groundmass.

VESICLES(*):	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	0-10	50	1	3	Irregular

COLOR: Variable. Medium dark gray (N4), dark yellowish brown (10YR 4/2), dark greenish gray (altered glassy lobe margins, 5G 4/1), pale yellowish brown (10YR 6/2).

STRUCTURE: Lobed. Glassy lobe margins are present (Pieces 1B and 1C).

ALTERATION: Moderate. Moderate to complete in the glassy lobe margins. Fe-oxyhydroxide is pervasive in alteration halos adjacent to glassy lobe margins and around veins. Similar alteration haloes are present around vesicle cylinders, though these are narrower. Glassy lobe margins are replaced by dark green clay. Mesostasis in fine grained regions is replaced with white carbonate (adjacent to veins) and dark green blue clay. Vesicles are filled with white carbonate and occasionally are lined with dark green blue clay. Olivine phenocrysts are completely replaced by white carbonate and/or Fe-oxyhydroxide.

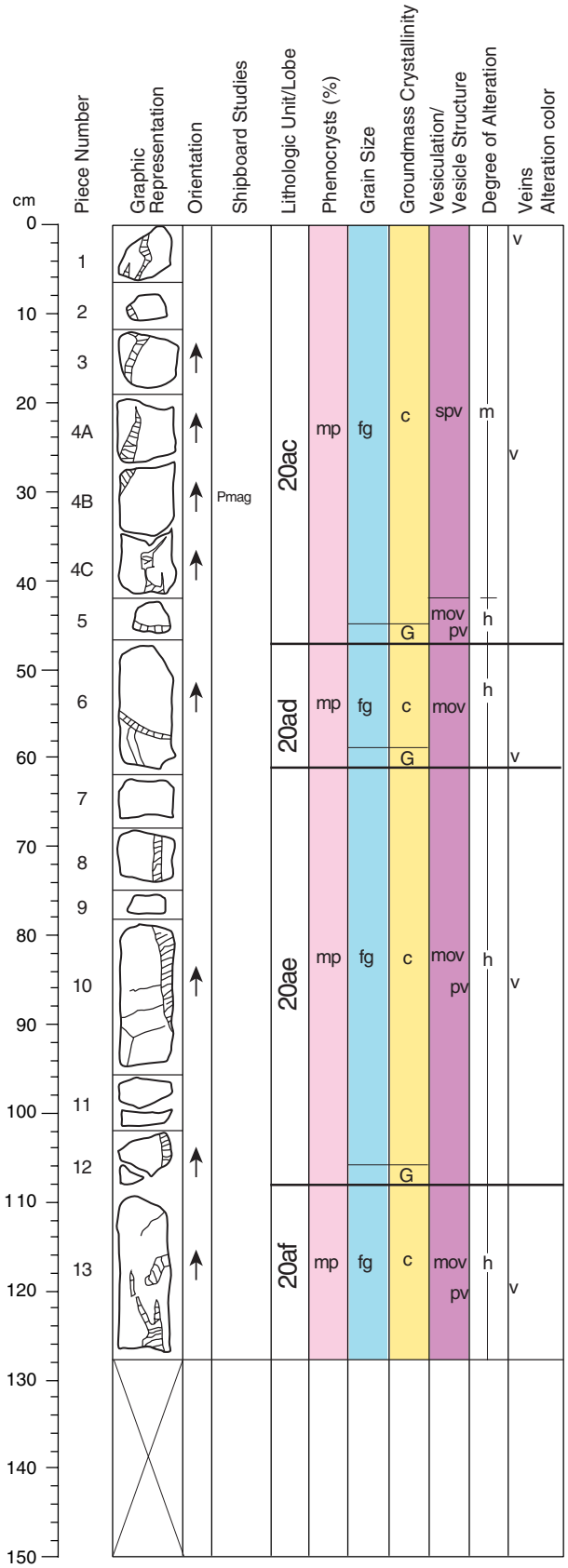
VEINS/FRACTURES: Moderately veined at glassy lobe margins and Pieces 1A and 6, sparsely veined elsewhere. Veins are vertical and subhorizontal, <0.1-20 mm wide, and filled with white carbonate, dark green clay, Fe-oxyhydroxide, and basalt fragments. Voids are present in the center of several of the larger veins.

COMMENTS: (*)Largest vesicles are long, 0.3-0.6 cm wide vesicle cylinders and segregation vesicles in the interior of lobes (e.g., Pieces 2A-2B, 45-50 cm). A 2-3 cm zone adjacent to the glassy lobe margins is moderately vesicular. Segregation vesicles are composed of highly vesicular basaltic material with a sharp boundary with the host basalt. The lobe interiors are generally nonvesicular, except for the vesicle cylinders and segregation vesicles. Vesicle patterns and morphologies suggest this core section is part of a subaerial pahoehoe flow that may have flowed into water.

Olivine is a microphenocryst phase. Its shape defines it as an early crystallizing phase, but the groundmass has grown to approximately the same size.

Brecciation of the glassy lobe margins by carbonate veining is present between lobes (e.g., Pieces 1B and 1C) and vein brecciation in the lobe interior is also present in Piece 1A.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-46R-1 (Section top: 712.7 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-13

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1			1	Subhedral; blocky
Olivine:	7-10	1.5	0.2	0.3	Euhedral; equant

GROUNDMASS: Glassy at lobe margins. Fine grained in the lobe interiors. Plagioclase, clinopyroxene, and black oxides in variolitic to intergranular texture. Quenched olivine may be present in the groundmass.

VESICLES(*):	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	0-10	30	1	4	Round to irregular

COLOR: Variable. Medium gray (N5), dark yellowish brown (10YR 4/2), dark greenish gray (altered glassy lobe margins, 5G 4/1), pale yellowish brown (10YR 6/2).

STRUCTURE: Lobed. Glassy lobe margins are present (Pieces 6, 10, 12, and 13).

ALTERATION: Moderate. Slight to complete in the glassy lobe margins. Fe-oxyhydroxide is pervasive in alteration halos adjacent to glassy lobe margins and around veins. Glassy lobe margins are replaced by dark green clay. Mesostasis in fine grained regions is replaced with white carbonate (adjacent to veins), Fe-oxyhydroxide, and dark green blue clay. Vesicles are filled with white carbonate and occasionally are lined with dark green blue clay. Olivine phenocrysts are completely replaced by white carbonate and/or Fe-oxyhydroxide.

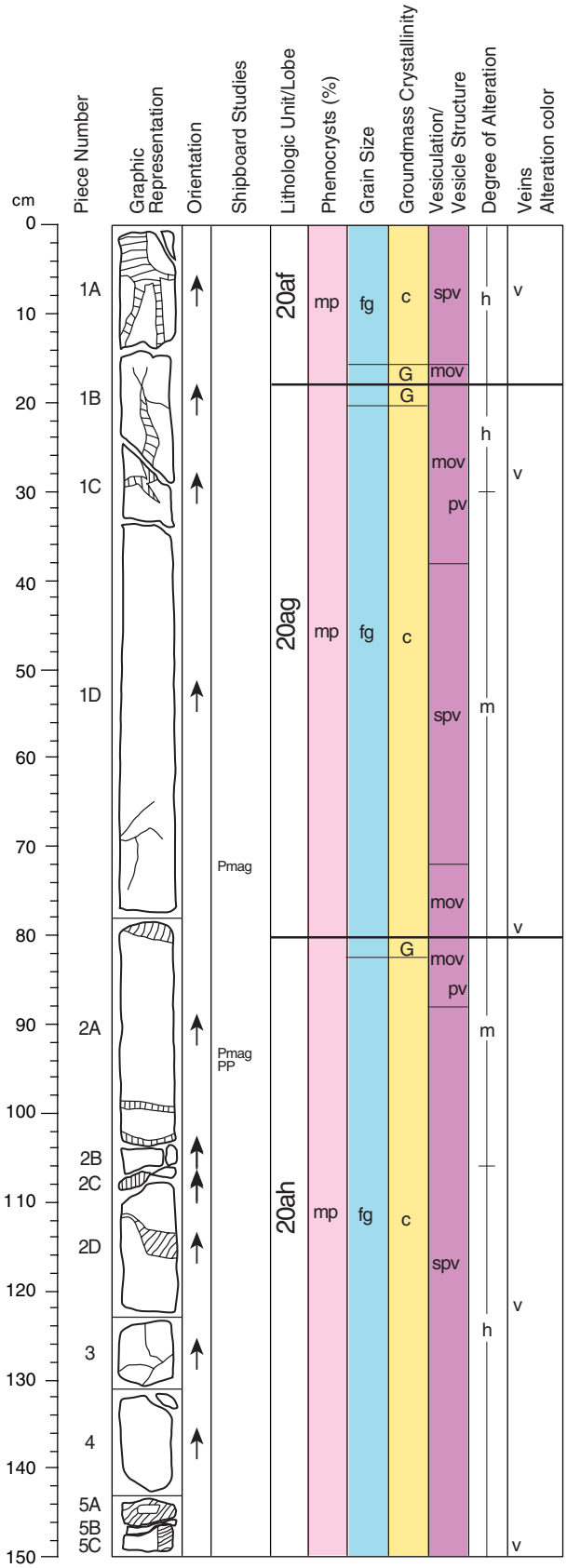
VEINS/FRACTURES: Moderately veined at glassy lobe margins and Pieces 2A-C and 13, sparsely veined elsewhere. Veins are randomly oriented, <0.1-30 mm wide, and filled with white carbonate, dark green clay, and basalt fragments. Voids are present in the center of several of the larger veins (e.g., Piece 4C).

COMMENTS: (*)The largest vesicle is a 4 mm wide segregation vesicle in Piece 2. A 2-3 cm zone adjacent to the glassy lobe margins is moderately vesicular. The segregation vesicle is composed of highly vesicular basaltic material that has a sharp boundary with the host basalt. The lobe interiors are generally nonvesicular. Vesicle patterns and morphologies suggest this core section is part of a subaerial pahoehoe flow that may have flowed into water.

Olivine is a microphenocryst phase. Its shape defines it as an early crystallizing phase, but the groundmass has grown to approximately the same size.

Brecciation of the glassy lobe margins by carbonate veining is present between lobes (e.g., Pieces 7, 10, and 12) and vein brecciation in lobe interiors is also present in Pieces 4A-4C, 10, and 13.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-46R-2 (Section top: 713.98 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-5B

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2	0.5	0.8	Subhedral; blocky
Olivine:	8-10	2.5	0.2	0.4	Euhedral; equant

GROUNDMASS: Aphanitic at glassy lobe margins. Fine grained in the lobe interiors. Plagioclase, clinopyroxene, and black oxides in variolitic to intergranular texture. Quenched olivine may be present in the groundmass.

VESICLES(*):

% Mode	Size (mm): Max.	Min.	Avg.	Shape
0-10	20	1	3	Round to irregular

COLOR: Variable. Medium dark gray (N4), pale red (10R 6/2), dark greenish gray (altered glassy lobe margins, 5G 4/1), pale yellowish brown (10YR 6/2).

STRUCTURE: Lobed. Glassy lobe margins are present (Pieces 1B, 2B, and 5A).

ALTERATION: Moderate. Moderate to complete in the glassy lobe margins. Fe-oxyhydroxide is pervasive in alteration halos adjacent to glassy lobe margins and around veins. Glassy lobe margins are replaced by dark green clay. Mesostasis in fine grained regions is replaced with white carbonate (adjacent to veins), Fe-oxyhydroxide and dark green blue clay. Vesicles are filled with white carbonate and occasionally are lined with dark green blue clay. Olivine phenocrysts are completely replaced by white carbonate and/or Fe-oxyhydroxide.

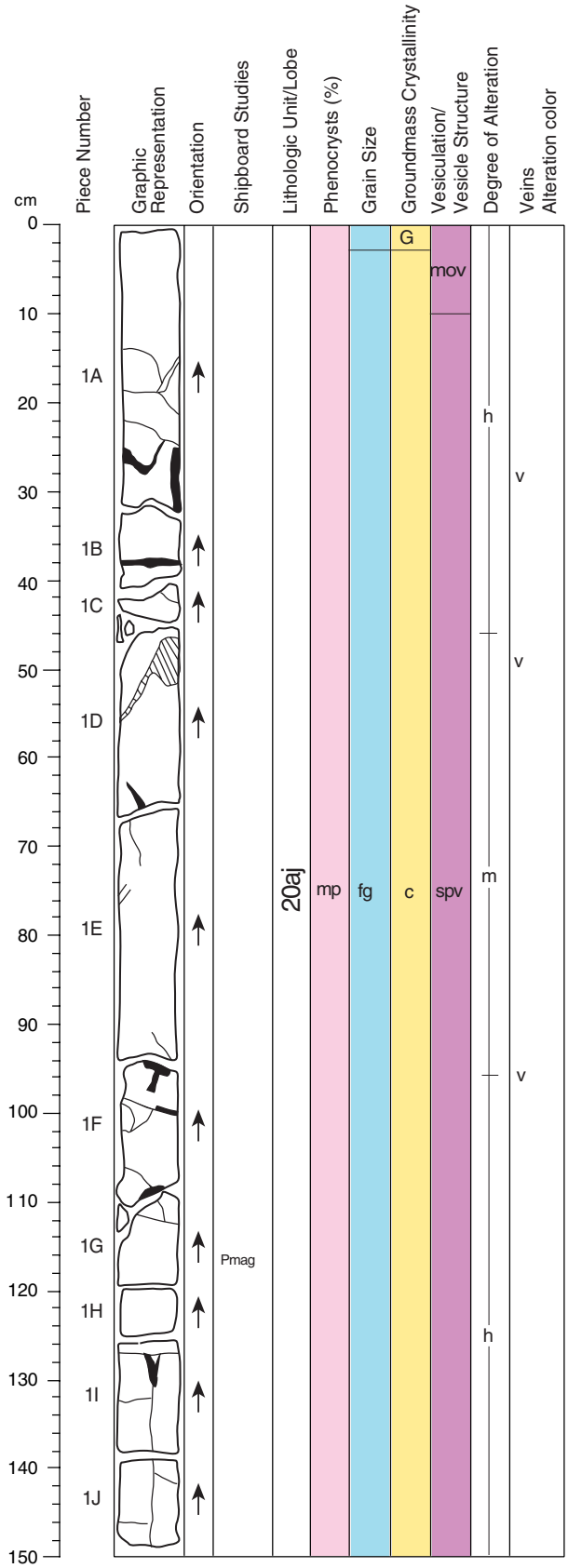
VEINS/FRACTURES: Moderately veined. Veins are randomly oriented, <0.1 mm to >20 mm wide, and filled with white carbonate, dark green clay, Fe-oxyhydroxide, and basalt fragments. Voids are present in the center of several of the larger veins. The widest veins are in Pieces 1A and 2C.

COMMENTS: (*)Largest vesicles are long, 0.3-0.6 cm wide segregation vesicles present in the interior of lobes (e.g., Pieces 1A and 2A). A 2-3 cm zone adjacent to the glassy lobe margins is moderately vesicular. Segregation vesicles are composed of highly vesicular basaltic material that has a sharp boundary with the host basalt. The lobe interiors are generally nonvesicular, except for the segregation vesicles. Vesicle patterns and morphologies suggest this core section is part of a subaerial pahoehoe flow that may have flowed into water.

Olivine is a microphenocryst phase. Its shape defines it as an early crystallizing phase, but the groundmass has grown to approximately the same size.

Brecciation of the glassy lobe margins by carbonate veining is present between lobes (e.g., Pieces 2A and 5A) and vein brecciation in the lobe interior is also present in Pieces 1B and 2C.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-46R-3 (Section top: 715.48 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-1H

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2.5	0.5	0.8	Subhedral; blocky
Olivine:	8-10	1.2	0.2	0.4	Euhedral; equant

GROUNDMASS: Glassy at lobe margins. Fine grained in the lobe interiors. Plagioclase, clinopyroxene, and black oxides in variolitic to intergranular texture. Quenched olivine may be present in the groundmass.

VESICLES(*):	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	0-10	90	1	3	Irregular

COLOR: Variable. Medium gray (N5), dark yellowish brown (10YR 4/2), dark greenish gray (altered glassy lobe margins, 5G 4/1), pale yellowish brown (10YR 6/2), pale red (10R 6/2).

STRUCTURE: Lobed. Glassy lobe margins are present (e.g., Piece 1A).

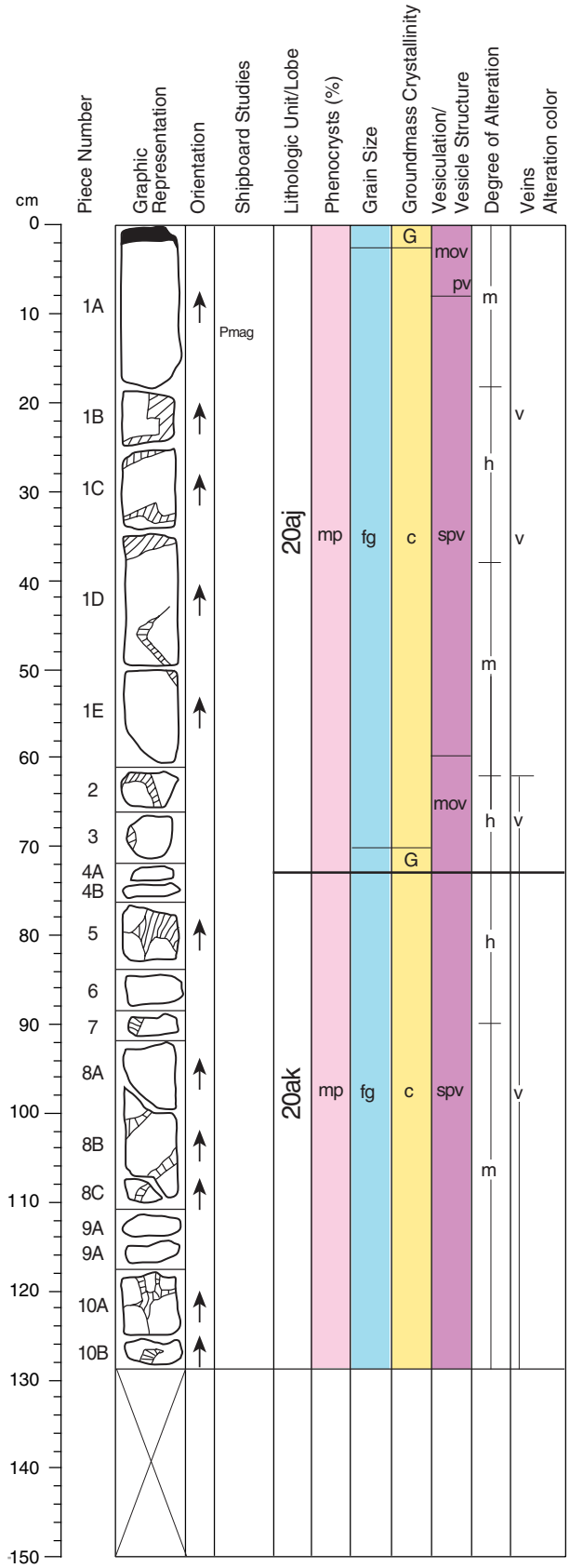
ALTERATION: Moderate. Moderate to complete in the glassy lobe margins. Fe-oxyhydroxide is pervasive in alteration halos adjacent to glassy lobe margins and around veins. Glassy lobe margins are replaced by dark green clay. Mesostasis in fine grained regions is replaced with white carbonate (adjacent to veins), Fe-oxyhydroxide, and dark green blue clay. Vesicles are filled with white carbonate and occasionally are lined with dark green blue clay. Olivine phenocrysts are completely replaced by white carbonate and/or Fe-oxyhydroxide.

VEINS/FRACTURES: Moderately veined. Veins are randomly oriented, <0.1-35 mm wide, and filled with white carbonate, dark green clay, Fe-oxyhydroxide, and basalt fragments. Voids are present in the center of several of the larger veins. The largest vein is in Piece 1D and is ~3.5 cm wide (46-50 cm).

COMMENTS: (*)Largest vesicles are long, 0.3-0.6 cm wide segregation vesicles in the interior of lobes (e.g., Piece 1A, 11-13 cm, and Piece 1H, 129-138 cm). A 2-3 cm zone adjacent to the glassy margins is sparsely vesicular. Segregation vesicles (concentrated in Piece 1D) are composed of highly vesicular basaltic material that has a sharp boundary with the host basalt and is free of the pervasive Fe-oxyhydroxide alteration. The lobe interiors are generally nonvesicular, except for the segregation vesicles. Vesicle patterns and morphologies suggest this core section is part of a subaerial pahoehoe flow that may have flowed into water.

Olivine is a microphenocryst phase. Its shape defines it as an early crystallizing phase, but the groundmass has grown to approximately the same size.
Vein brecciation in the lobe interiors is present in Pieces 1A and 1D.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-46R-4 (Section top: 716.98 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-10B

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2.2	0.8	1	Subhedral; blocky
Olivine:	7-10	1.2	0.2	0.4	Euhedral; equant

GROUNDMASS: Aphanitic at glassy lobe margins. Fine grained in the lobe interiors. Plagioclase, clinopyroxene, and black oxides in variolitic to intergranular texture. Quenched olivine may be present in the groundmass.

VESICLES(*):

% Mode	Size (mm): Max.	Min.	Avg.	Shape
0-15	30	1	4	Subround to irregular

COLOR: Variable. Medium dark gray (N4), dark yellowish brown (10YR 4/2), dark greenish gray (altered glassy lobe , 5G 4/1), pale yellowish brown (10YR 6/2).

STRUCTURE: Lobed. Glassy lobe margins are present (Pieces 1A and 4A).

ALTERATION: Moderate. Slight to complete in the glassy lobe margins. Fe-oxyhydroxide is pervasive throughout the core section. Glassy margins are partly replaced by dark green clay. Mesostasis in fine grained regions is replaced with white carbonate (adjacent to veins), Fe oxyhydroxide, and dark green blue clay. Vesicles are filled with white carbonate and occasionally are lined with dark green blue clay. Olivine phenocrysts are completely replaced by white carbonate, red clay, and/or Fe-oxyhydroxide.

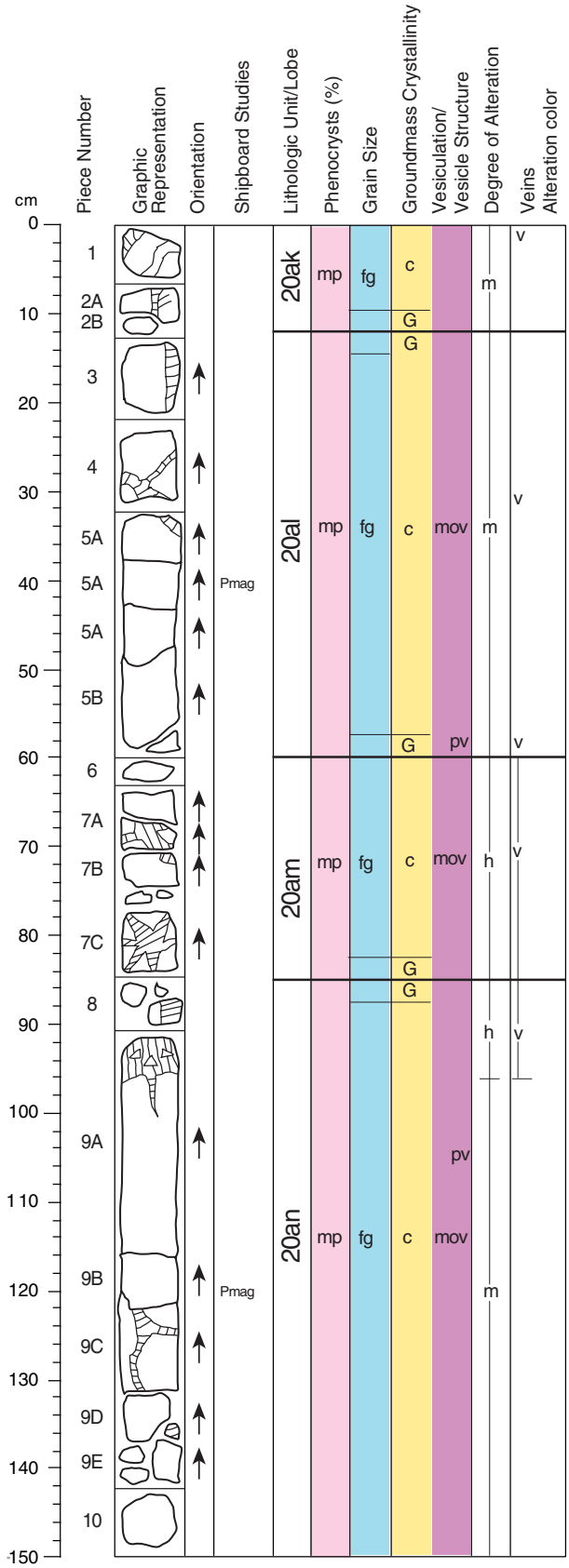
VEINS/FRACTURES: Moderately veined at glassy lobe margins and Pieces 1A and 6, sparsely veined elsewhere. Veins are randomly oriented, <0.5-30 mm wide, and filled with white carbonate, light green clay, Fe-oxyhydroxide, and basalt fragments. Voids are present in the center of several of the larger veins.

COMMENTS: (*)Largest vesicles are long, 0.3-0.6 cm wide segregation vesicles present in the interior of lobes (e.g., Piece 1A, 9-12 cm). A 2-3 cm zone adjacent to the glassy lobe margins is moderately vesicular. Segregation vesicles are vertical and subhorizontal and are composed of highly vesicular basaltic material that has a sharp boundary with the host basalt. The lobe interiors are generally nonvesicular, except for the segregation vesicles. Vesicle patterns and morphologies suggest this core section is part of a subaerial pahoehoe flow that may have flowed into water.

Olivine is a microphenocryst phase. Its shape defines it as an early crystallizing phase, but the groundmass has grown to approximately the same size.

Brecciation of the glassy lobe margins by carbonate veining is present between lobes (e.g., Piece 4A) and vein brecciation in the lobe interiors is also present (e.g., Pieces 1D and 9A).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-46R-5 (Section top: 718.27 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-10

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1			1	Subhedral; blocky
Olivine:	5-8	1	0.2	0.4	Euhedral; equant

GROUNDMASS: Aphanitic at glassy lobe margins. Fine grained in the lobe interiors. Plagioclase, clinpyroxene, and black oxides in variolitic to intergranular texture.

ESICLES(*):	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	0-15	15	0.5	4	Subround to irregular

COLOR: Variable. Dark yellowish brown (10YR 4/2), dark greenish gray (altered glassy margins, 5G 4/1), pale yellowish brown (10YR6/2).

STRUCTURE: Lobed. Glassy margins are present (Pieces 2A, 5, 5B, and 5C).

ALTERATION: Moderate to high. High to complete in the glassy lobe margins. Fe-oxyhydroxide is pervasive throughout the core section. Glassy lobe margins are replaced by light and dark green clay. Mesostasis in fine grained regions is replaced with white carbonate (adjacent to veins), Fe-oxyhydroxide, and dark green blue clay. Vesicles are filled with white carbonate and occasionally are lined with dark green blue clay. Olivine phenocrysts are completely replaced by white carbonate and/or Fe-oxyhydroxide.

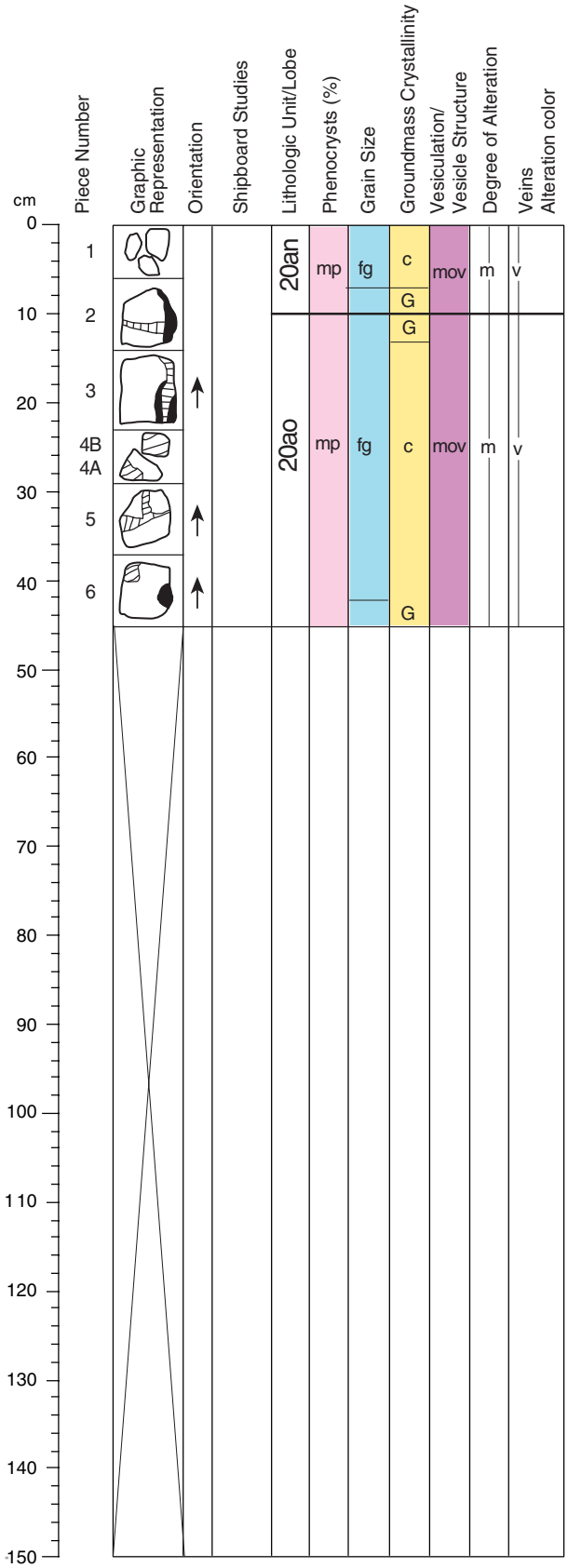
VEINS/FRACTURES: Sparsely to moderately veined. Highly veined and fractured between 77 cm and 97 cm. Veins are randomly oriented, <0.1-15 mm wide, and filled with white carbonate, Fe-oxyhydroxide, and basalt fragments. Voids are present in the center of several of the larger veins.

COMMENTS: (*)A 2-3 cm zone adjacent to the glassy lobe margins is sparsely to moderately vesicular. Segregation vesicles are present in Piece 3 (horizontal) 1-2 mm wide and 5-15 mm long. They are composed of highly vesicular basaltic material that has a sharp boundary with the host basalt. The lobe interiors are generally nonvesicular, except for the segregation vesicles.

Olivine is a microphenocryst phase. Its shape defines it as an early crystallizing phase, but the groundmass has grown to approximately the same size. Vesicle patterns and morphologies suggest this core section is part of a subaerial pahoehoe flow that may have flowed into water.

Brecciation of the glassy lobe margins by carbonate veining is extensive between lobes in Pieces 7C, 8, and 9A. Vein brecciation in the lobe interiors is also present in Pieces 1 and 2A.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-46R-6 (Section top: 719.77 mbsf)

UNIT 20: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-6

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	6-8	1.5	0.2	0.4	Euhedral; equant

GROUNDMASS: Aphanitic at glassy lobe margins. Fine grained in the lobe interiors. Plagioclase, clinopyroxene, and black oxides in variolitic to intergranular texture.

VESICLES(*):	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	0-10	50	1	3	Irregular

COLOR: Variable. Dark greenish gray (altered glassy lobe margins, 5G 4/1), moderate yellowish brown (10YR 5/4), black (unaltered glassy lobe margins, N1).

STRUCTURE: Lobed. Glassy lobe margins are present (Pieces 2, 3, and 6).

ALTERATION: Moderate to high. Slight to complete in the glassy lobe margins. Fe oxyhydroxide is pervasive throughout the core section. Glassy lobe margins are replaced by dark green clay. Mesostasis in fine grained regions is replaced with white carbonate (adjacent to veins) and Fe-oxyhydroxide. Vesicles are filled with white carbonate and occasionally are lined with dark green blue clay. Olivine phenocrysts are completely replaced by white carbonate and/or Fe-oxyhydroxide.

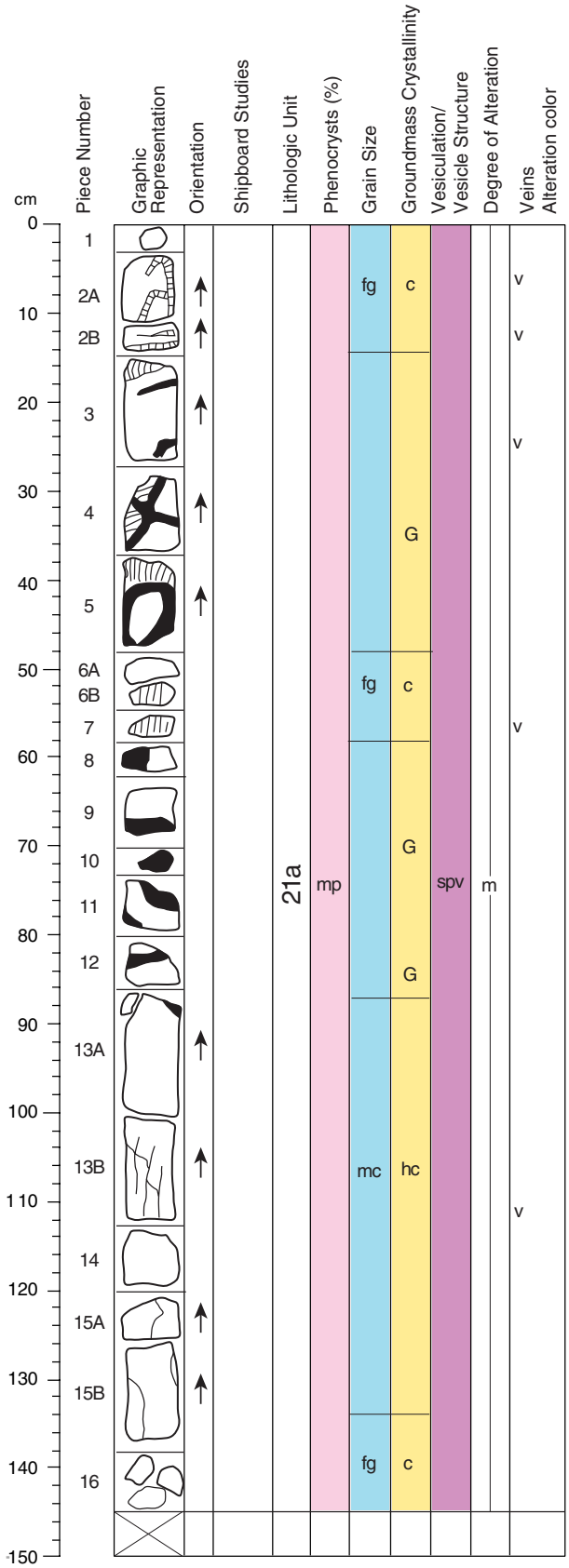
VEINS/FRACTURES: Moderately veined at glassy lobe margins and Pieces 1A and 6, sparsely veined elsewhere. Veins are vertical and subhorizontal, <0.1-20 mm wide, and filled with white carbonate, dark green clay, Fe-oxyhydroxide, and basalt fragments. Voids are present in the center of several of the larger veins.

COMMENTS: (*)A 1-2 cm zone adjacent to the glassy lobe margins is moderately vesicular and vesicles are elongated (4-8 mm) perpendicular to the glassy lobe margins. Segregation vesicles, 1-2 cm long, are present in Pieces 3 and 5. They are composed of highly vesicular basaltic material that has a sharp boundary with the host basalt. The lobe interiors are generally nonvesicular, except for the segregation vesicles. Vesicle patterns and morphologies suggest this core section is part of a subaerial pahoehoe flow that may have flowed into water.

Olivine is a microphenocryst phase. Its shape defines it as an early crystallizing phase, but the groundmass has grown to approximately the same size.

Brecciation of the glassy lobe margins by carbonate veining is present between lobes (e.g., Pieces 2, 3, and 6) and vein brecciation in the lobe interiors is also present in Pieces 2, 4, and 5.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-47R-1 (Section top: 722.3 mbsf)

UNIT 21 MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-16

CONTACTS: None observed. The boundary between Units 20 and 21 is inferred to be at the top of the section.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	5-7	0.5	<0.1	0.2	Subhedral

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene and black oxides.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Moderately vesicular	3-8	3	0.5	0.8	Round

COLOR: Medium gray (N5) to brownish gray (5YR 4/1).

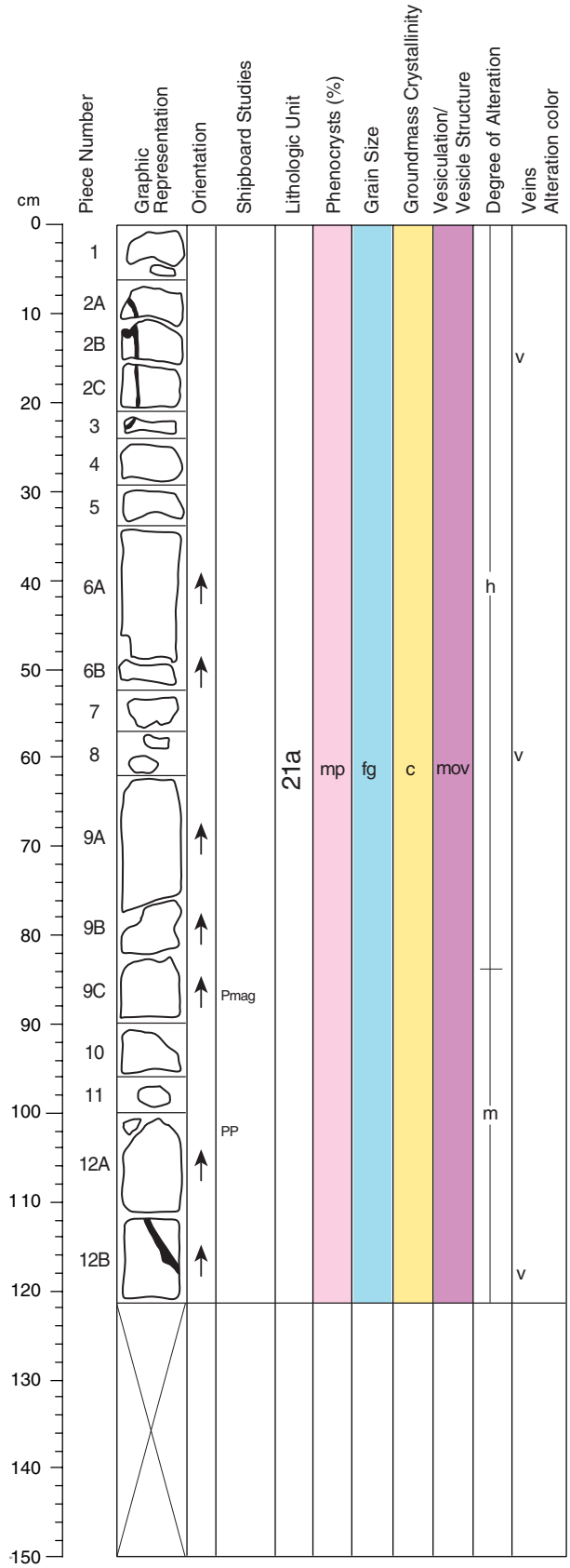
STRUCTURE: Brecciated flow top. The top 80 cm of the unit consists of small lava lobes (4-7 cm) bound by smooth glassy surfaces and interdispersed in hyaloclastite lapillistone, which occurs in core as 2 to 4 cm thick layers. Partially devitrified glass and calcite fills cavities between lava fragments in Pieces 3-13A.

ALTERATION: Moderately to highly altered, especially in upper 90 cm of the section.

VEINS/FRACTURES: Abundant throughout section, but especially in the upper 90 cm of the section.

COMMENTS: Olivine crystals are microphenocrysts. They are defined, from their shape, as an early crystallizing phase. Plagioclase and clinopyroxene in the groundmass are of approximately the same size.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-47R-2 (Section top: 723.77 mbsf)

UNIT 21: MODERATELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1A-12B

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	8-15	1	0.2	0.5	Euhedral; equant

GROUNDMASS: Aphanitic to fine grained with a subvariolitic to intergranular texture in the fine grained regions.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Sparsely to moderately vesicular	0-15	18	0.1	0.5	Round to irregular

COLOR: Pale yellowish brown (10YR 6/2), medium light gray (N6), light brownish gray (5YR 6/1).

STRUCTURE: Lobed. Defined on the basis of grain size variations (e.g., Piece 9A).

ALTERATION: Slight to moderate. Fe-oxyhydroxide is pervasive, especially around veins. Where filled, vesicles contain white carbonate. Alteration decreases down the core section. Olivine is replaced by Fe-oxyhydroxide and white carbonate in the top part of the section, but is unaltered in the lower part (e.g., Piece 9C).

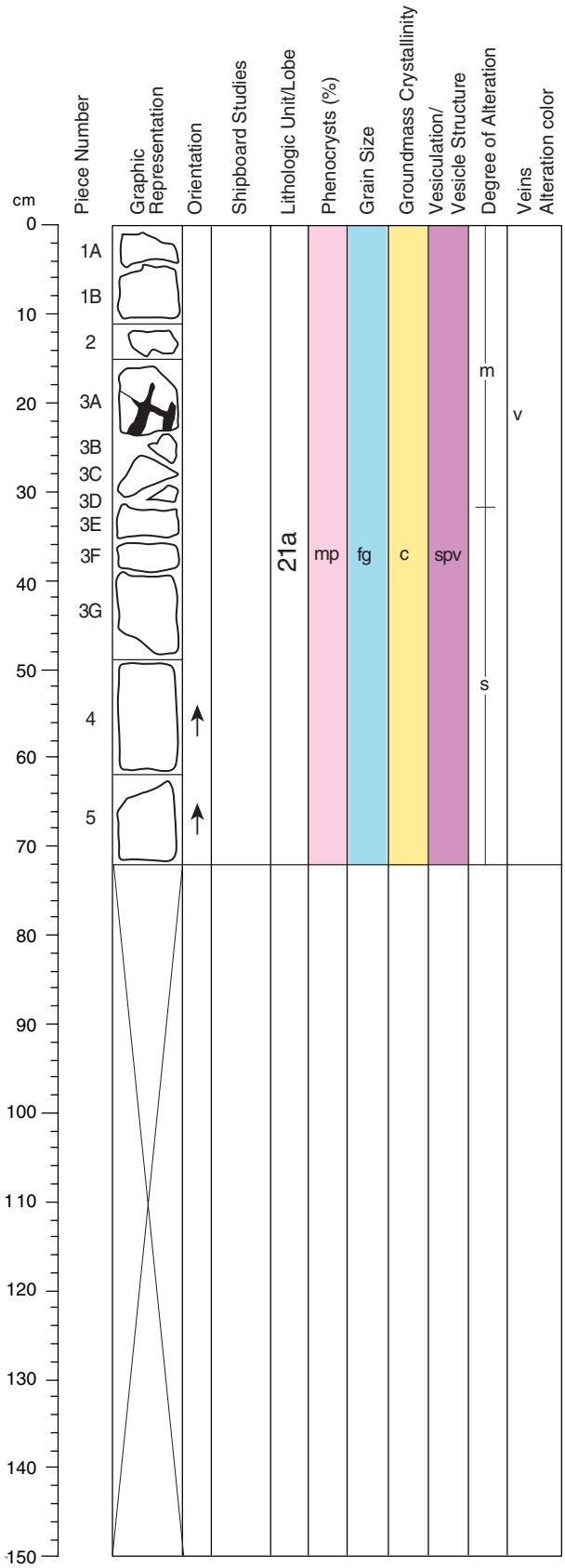
VEINS/FRACTURES: Sparsely veined, except in Pieces 2B, 2C, 6A, and 9A, which a moderately veined. Veins are 0.1 mm to >10 mm wide and are filled with predominantly white carbonate and green clay. Fe-oxyhydroxide alteration halos are present around the veins.

COMMENTS: Vesicles are generally unfilled.

Brecciation of the basalt by vein material is seen in Pieces 6A and 9A.

Olivine content increases down the core section from 8%-10% in the upper part to 12%-15% in the lower part.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-47R-3 (Section top: 724.98 mbsf)

UNIT 21: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-5

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	5-10(?)	1	0.2	0.5	Euhedral; equant

GROUNDMASS: Aphanitic to fine grained with a subvariolitic to intergranular texture in the fine grained regions.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
	0-15	18	0.1	0.5	Round to irregular

COLOR: Medium gray (N5), medium light gray (N6), light brownish gray (5YR 6/1).

STRUCTURE: Brecciated (0-29 cm) to massive (29-72 cm).

ALTERATION: Slight (massive) to high (brecciated). Fe-oxyhydroxide is pervasive and olivine is altered to green clay, Fe-oxyhydroxide, and replaced by white carbonate in the brecciated part of the section.

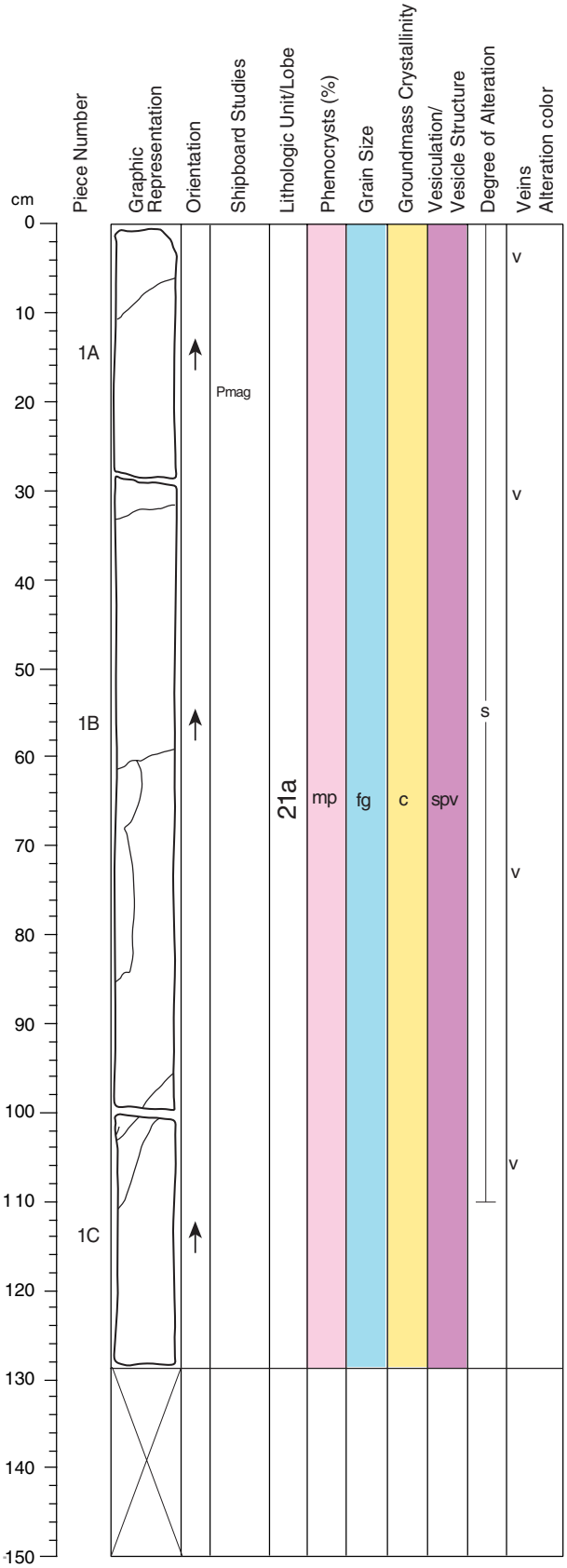
VEINS/FRACTURES: Sparse (massive) to moderately (brecciated) veined. Veins are randomly oriented, 0.1-15 mm wide, and generally filled with white carbonate, but secondary sulfide is present in the sparse veins of the massive part of the section.

COMMENTS: This core section contains the transition from a brecciated flow top to a massive interior.

Olivine is unaltered and the same size as the groundmass in the massive part of the section and the percent. present is difficult to estimate.

The massive region is nonvesicular, but contains several cm-sized segregation vesicles that are filled with basaltic material and white carbonate. The brecciated regions contain highly vesicular basalt.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-47R-4 (Section top: 725.69 mbsf)

UNIT 21: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-1C

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	6-8	0.5	<0.1	0.2	Euhedral

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene, and black oxide minerals.

VESICLES:

	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Nonvesicular	<1	5-8	3	5	Irregular

COLOR: Medium gray (N5) to medium dark gray (N4).

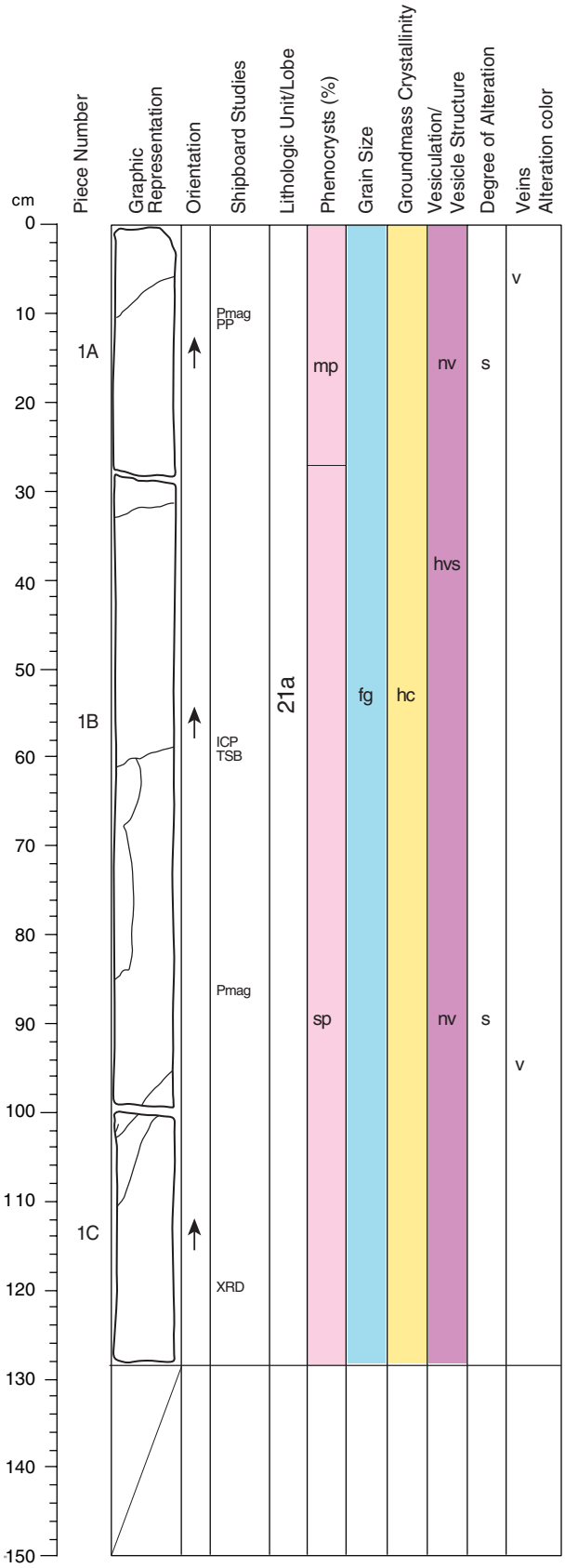
STRUCTURE: Massive. Interior of a flow.

ALTERATION: Slight to unaltered. Some olivine crystals are replaced by Fe-oxyhydroxides, but are generally unaltered.

VEINS/FRACTURES: Sparsely veined. Veins are randomly oriented and filled with white carbonates, green clay (?) minerals and secondary sulfides (pyrite?).

COMMENTS: Olivine crystals are microphenocrysts. They are defined, from their shape, as an early crystallizing phase. Plagioclase and clinopyroxene in the groundmass are of approximately the same size.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-48R-1 (Section top: 727.1 mbsf)

UNIT 21: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-2

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	4	1	3	Elongate laths
Olivine:	6-8	0.5	<0.1	0.2	Euhedral

GROUNDMASS: Very fine grained to glassy, composed of plagioclase, clinopyroxene, and black oxides. Groundmass consists of irregular patches ≤0.2 mm in size, some consisting of fine grained plagioclase and clinopyroxene and others consisting of glass-rich material with clinopyroxene needles.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Nonvesicular	<1	10	1	3	Irregular .

COLOR: Medium gray (N5) to medium dark gray (N4).

STRUCTURE: Massive. Interior of a flow.

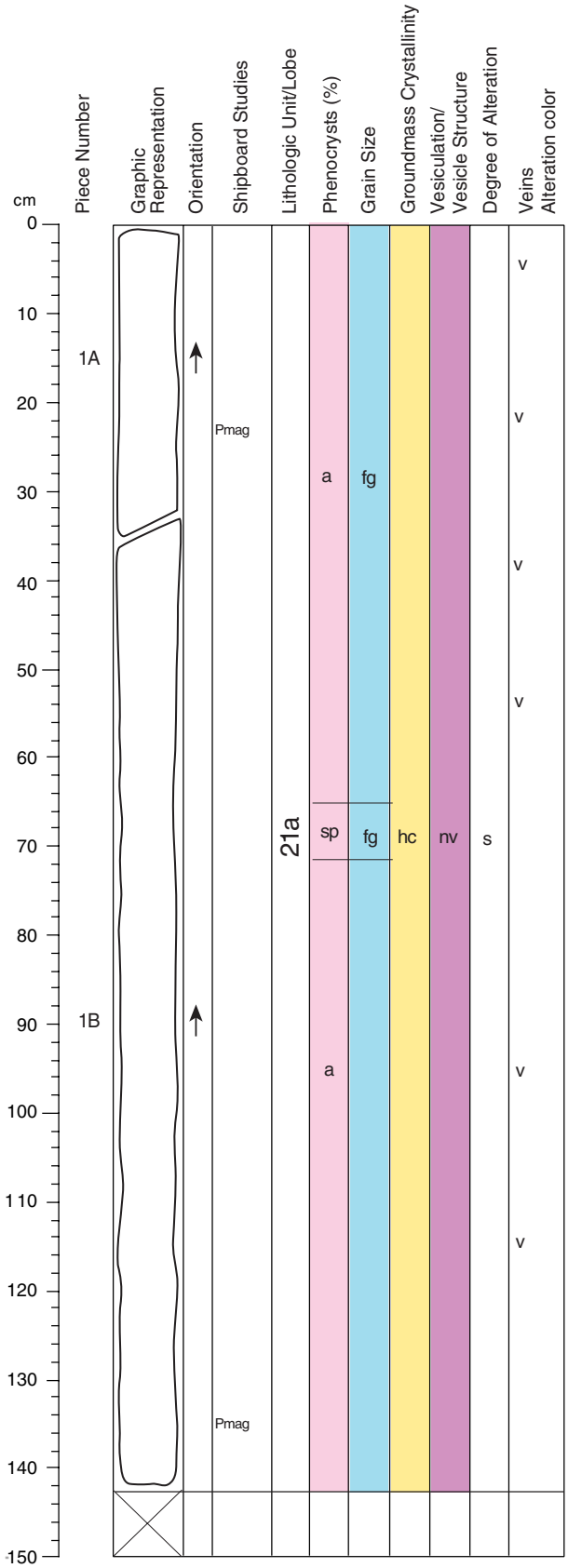
ALTERATION: Slight to unaltered. Some olivine crystals are replaced by Fe-oxyhydroxides, but are generally unaltered.

VEINS/FRACTURES: Sparsely veined. Veins are present at intervals 0-16 cm and 90-106 cm, and are 14 mm in width. They are randomly oriented and filled with white carbonates, green clay(?) minerals and pyrite.

COMMENTS: Olivine crystals are microphenocrysts. They are defined, from their shape, as an early crystallizing phase. Plagioclase and clinopyroxene in the groundmass are of approximately the same size.

The bimodal distribution in groundmass grain size is indicative of two stages of cooling- possibly a second quenching event due to interaction with water(?).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-48R-2 (Section top: 728.44 mbsf)

UNIT 21: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-1B

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	5	2	3	Subhedral; elongate
Olivine:	6-8	3 0.	1	1	Euhedral

GROUNDMASS: Fine grained to glassy, composed of plagioclase, clinopyroxene, and black oxides. Groundmass consists of irregular patches ≤0.2 mm in size, some consisting of fine grained plagioclase and clinopyroxene and others consisting of glass-rich material with clinopyroxene needles.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	<1	4	1	2	Round

COLOR: Medium dark gray (N4).

STRUCTURE: Massive. Interior of a flow.

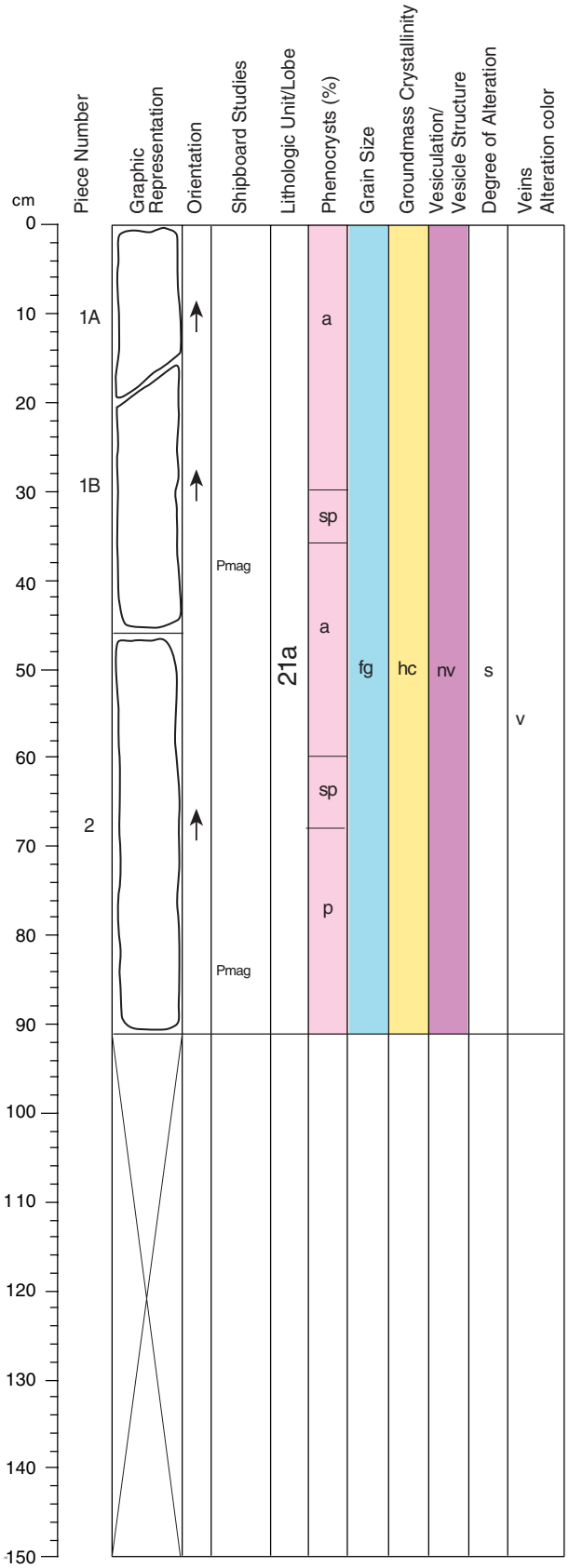
ALTERATION: Slight to unaltered. Some olivine crystals are replaced by Fe-oxyhydroxides, but are generally unaltered.

VEINS/FRACTURES: Sparsely veined. Subvertical veins are present throughout and are <3 mm in width, and are filled with white carbonates, green clay(?) minerals and pyrite.

COMMENTS: Phenocrysts are concentrated in the interval 62-70 cm.

The bimodal distribution in groundmass grain size is indicative of two stages of cooling- possibly a second quenching event due to interaction with water(?).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-48R-3 (Section top: 729.87 mbsf)

UNIT 21: SPARSELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-2

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	5	2	3	Subhedral; elongate
Olivine:	6-8	3	0.1	1	Euhedral; equant

GROUNDMASS: Fine grained to aphanitic. Composed of plagioclase, clinopyroxene, and black oxides. Groundmass consists of irregular patches ≤0.2 mm in size, some consisting of fine grained plagioclase and clinopyroxene and others consisting of glass-rich material with clinopyroxene needles.

VESICLES:

	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	<1	4	1	2	Round

COLOR: Gray (2.5Y 4/0).

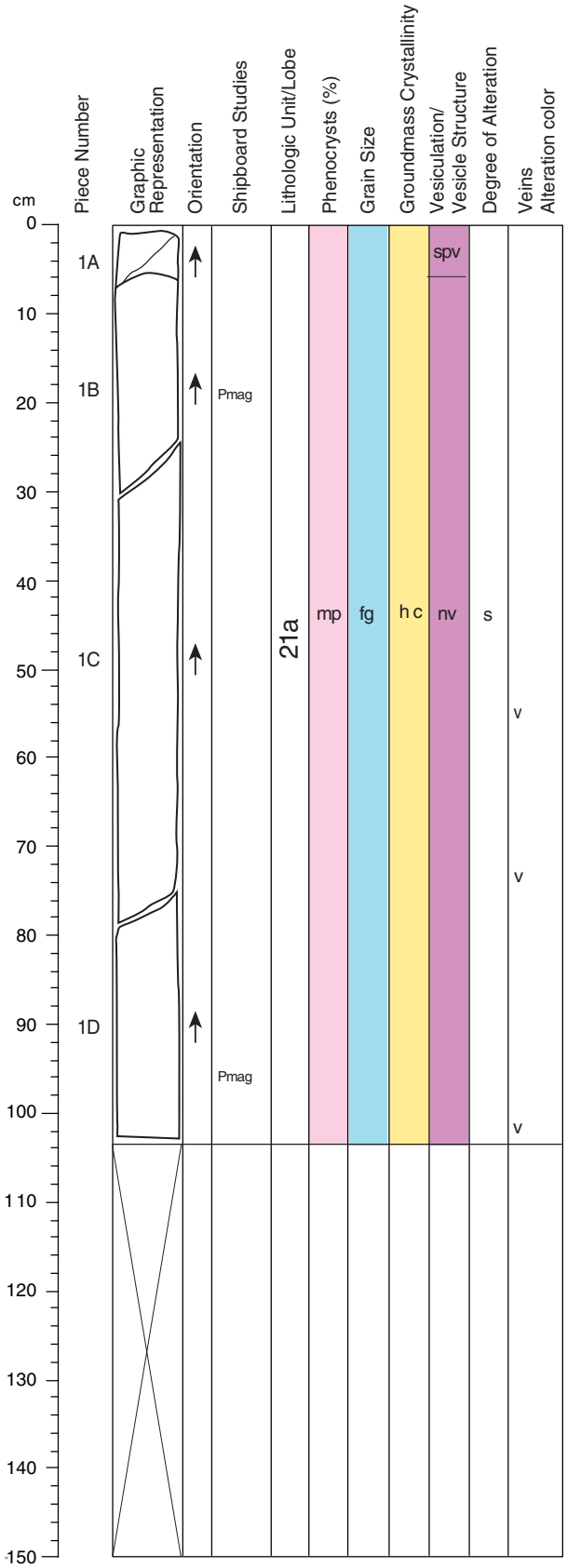
STRUCTURE: Massive.

ALTERATION: Slight. Veins are filled with calcite.

VEINS/FRACTURES: Sparsely veined. Subvertical veins are present between 50 cm and 57 cm. <1 mm in thickness are filled with calcite.

COMMENTS: Olivine microphenocrysts occur at 30 cm to 34 cm and 58 cm to 66 cm. They are defined, from their shape, as an early crystallizing phase. Plagioclase and clinopyroxene in the groundmass are of approximately the same size.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-49R-1 (Section top: 732.0 mbsf)

UNIT 21: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-1D

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	Euhedral			
Olivine:	5-6	1	0.1	0.2	Euhedral; equant

GROUNDMASS: Fine grained, composed of olivine(*), plagioclase, and clinopyroxene.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
3	1	0.3	1	Round to irregular

COLOR: Medium dark gray (N4) to dark gray (N3).

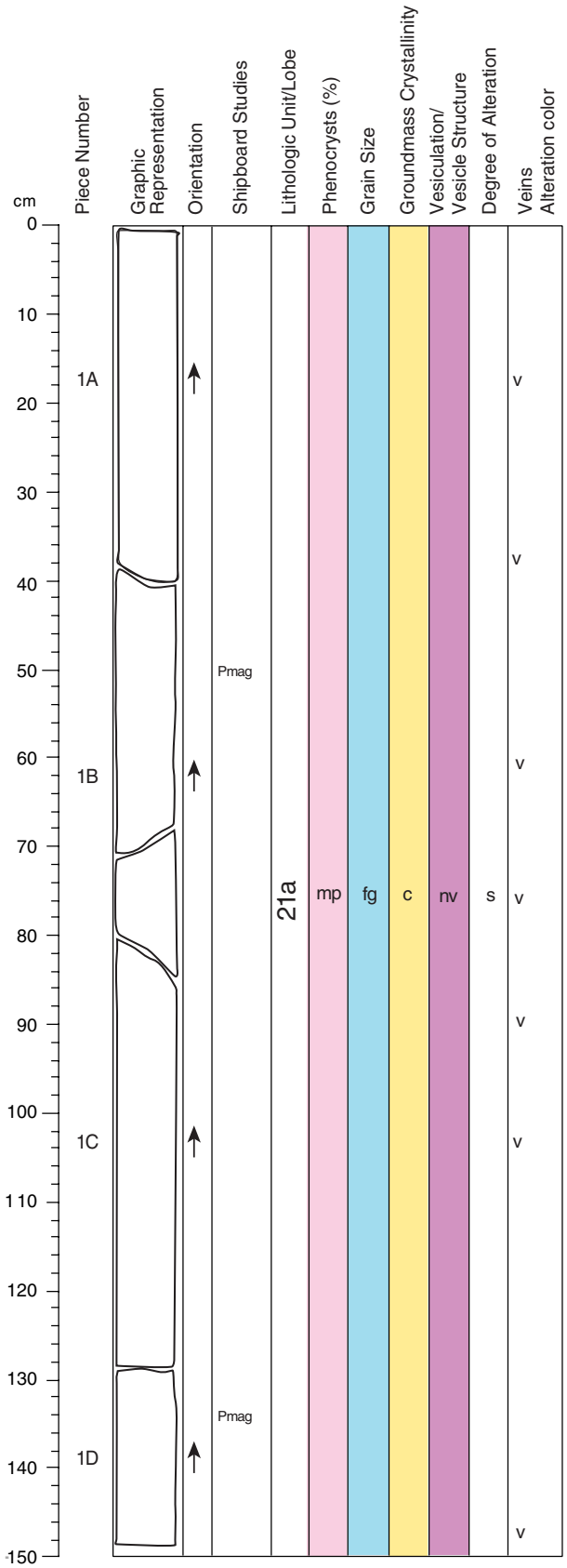
STRUCTURE: Massive.

ALTERATION: Slight.

VEINS/FRACTURES: Sparsely veined. Veins are filled by carbonate and sulfide. Thin (<1 mm wide) subvertical vein is present at 55-77 cm. A thin (<0.5 mm) subhorizontal vein present at 102 cm.

COMMENTS: (*)Olivine crystals are microphenocrysts. They are defined, from their shape, as an early crystallizing phase. Plagioclase and clinopyroxene in the groundmass are of approximately the same size.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-49R-2 (Section top: 733.04 mbsf)

UNIT 21: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-D

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1			1	Euhedral
Olivine:	6-8	1	0.1	0.2	Euhedral; equant

GROUNDMASS: Fine grained, containing olivine(*), plagioclase and clinopyroxene.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Nonvesicular	0				

COLOR: Medium gray (N-4) to dark gray (N-3).

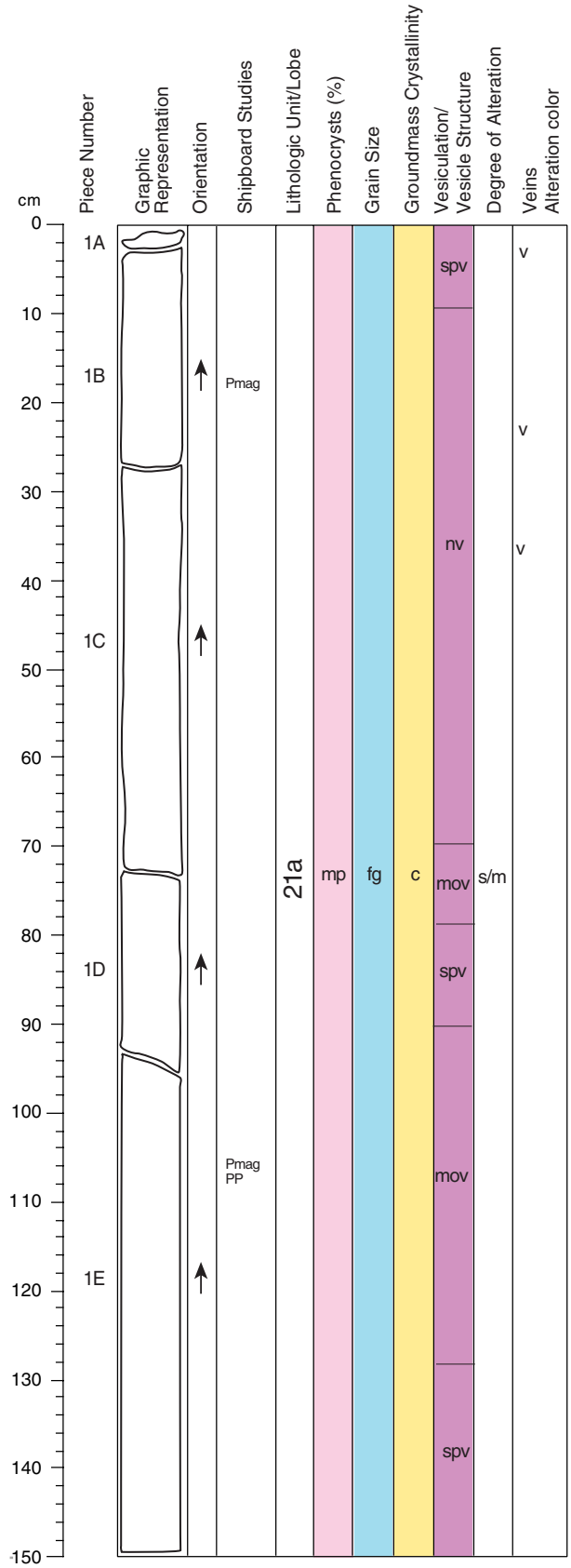
STRUCTURE: Massive.

ALTERATION: Slight. Veins contain secondary mineralization.

VEINS/FRACTURES: Sparsely veined. Veins are filled by carbonate and sulfide. A subhorizontal vein is present at 50 cm.

COMMENTS: (*)Olivine crystals are microphenocrysts. They are defined from their shape as an early crystallizing phase. Plagioclase and clinopyroxene in the groundmass are of approximately the same size.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-49R-3 (Section top: 734.55 mbsf)

UNIT 21: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-1E

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1				Euhedral
Olivine:	6-8	0.5	<0.1	0.2	Euhedral

GROUNDMASS: Fine grained, composed of olivine(*), plagioclase, and clinopyroxene.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
5	10	<1	0.5	Irregular

COLOR: Medium gray (N5) to medium dark gray (N3) with light brownish gray (5YR 6/1) in alteration halos.

STRUCTURE: Massive.

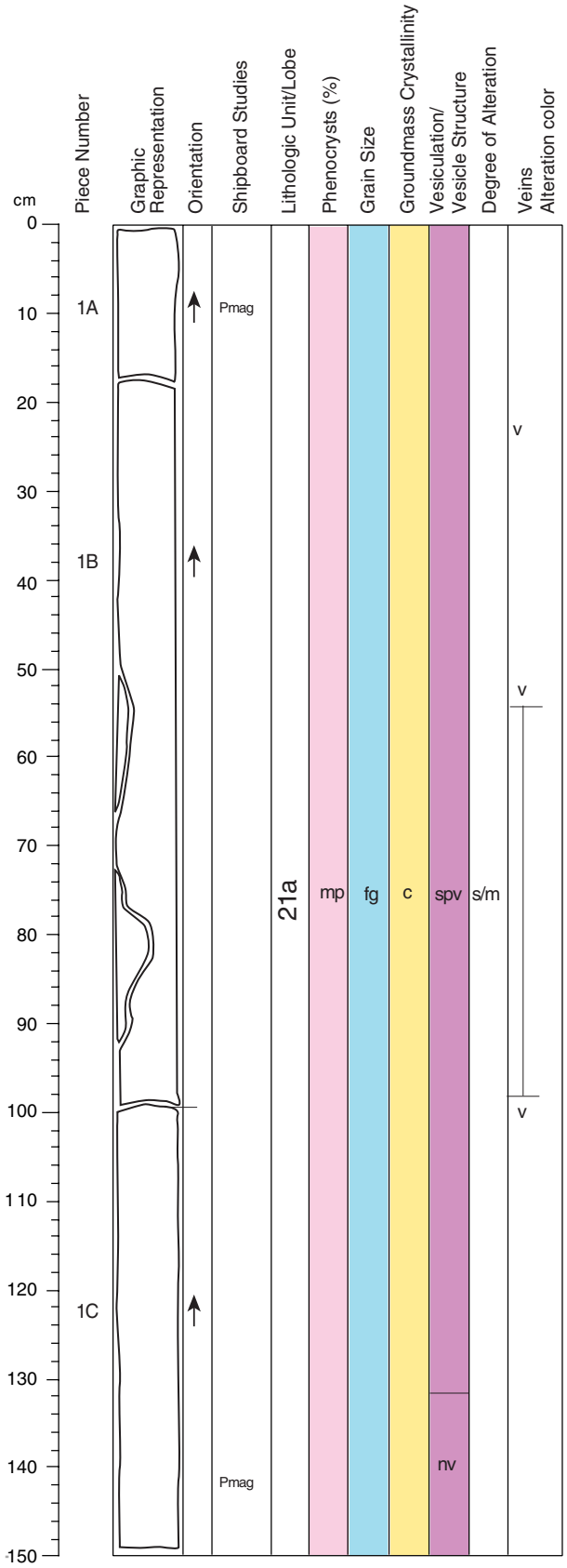
ALTERATION: Moderate alteration, with an increase in iron oxide around large vesicles.

VEINS/FRACTURES: Sparsely veined. Veins are subvertical from 23-40 cm and 1-5 cm. Veins are partially filled with carbonates and green clay (talc?).

COMMENTS: Vesicularity varies throughout the section, with vesicles as well as veins filled with green very fine grained material (talc?).

(*)Olivine crystals are microphenocrysts. They are defined from their shape as an early crystallizing phase. Plagioclase and clinopyroxene in the groundmass are of approximately the same size.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-49R-4 (Section top: 736.05 mbsf)

UNIT 21: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-1C.

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1			<1	Euhedral
Olivine:	6-8	1	0.1	0.2	Euhedral; equant

GROUNDMASS: Fine grained, containing olivine(*), plagioclase and clinopyroxene.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
4	2	<1	1	Spherical to irregular

COLOR: Medium gray (N5) to medium dark gray (N3) with light brownish gray (5YR 6/1).

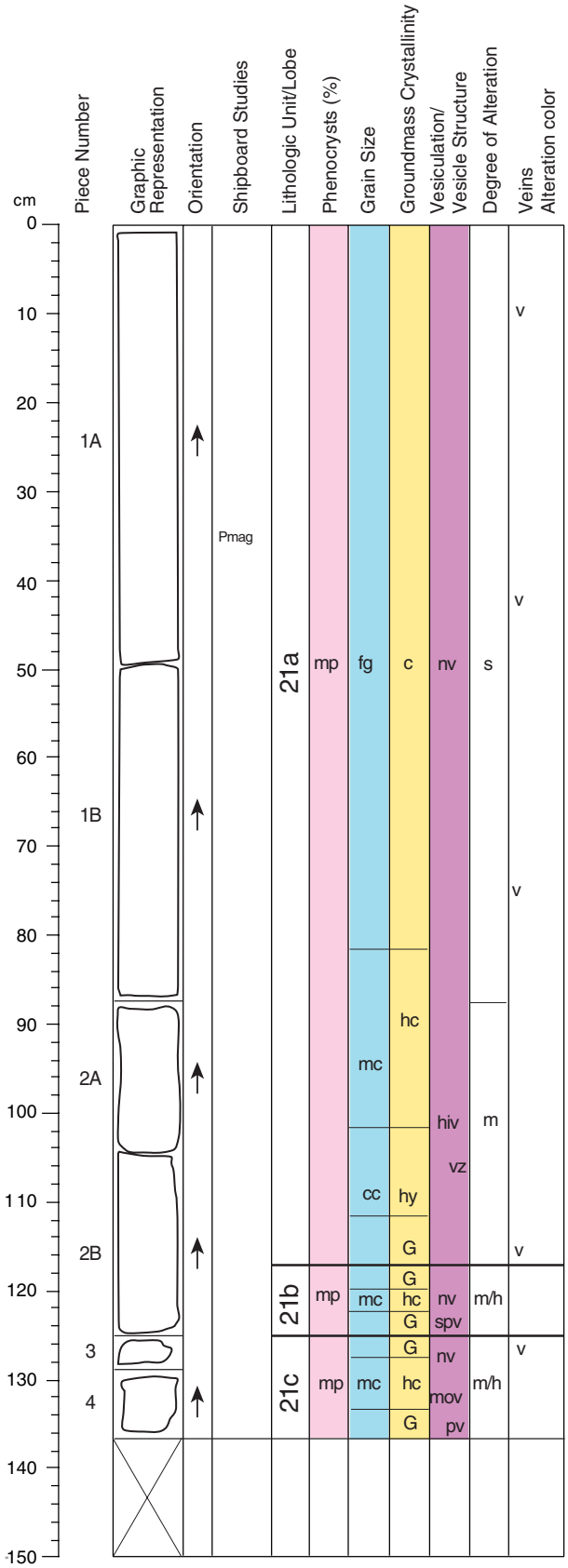
STRUCTURE: Massive

ALTERATION: Slight to moderate. Veins contain carbonates.

VEINS/FRACTURES: Sparsely veined. Veins are filled by carbonate and sulfide. A vein is subvertical along side of core from 51-98 cm. A subhorizontal vein is present from 24-28 cm.

COMMENTS: (*) Olivine crystals are microphenocrysts. They are defined from their shape as an early crystallizing phase. Plagioclase and clinopyroxene in the groundmass are of approximately the same size.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-49R-5 (Section top: 737.55 mbsf)

UNIT 21: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-4.

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	3	1	2	Elongate; lath-like
Olivine:	6-8	1	0.1	0.2	Euhedral; equant

GROUNDMASS: Glassy lobe margins, and fine grained in lobe interiors with olivine[1], plagioclase and clinopyroxene.

VESICLES[2]:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
10				

COLOR: Medium dark gray (N4) to medium gray (N5) to brownish gray (5 YR 4/1)

STRUCTURE: Lobed. Glassy lobe margin at 117 cm, (Piece 2B), also at 123 cm, (Piece 3A); and at 136 cm, (Piece 4A).

ALTERATION: Moderate. High in alteration halos near lobe margins.

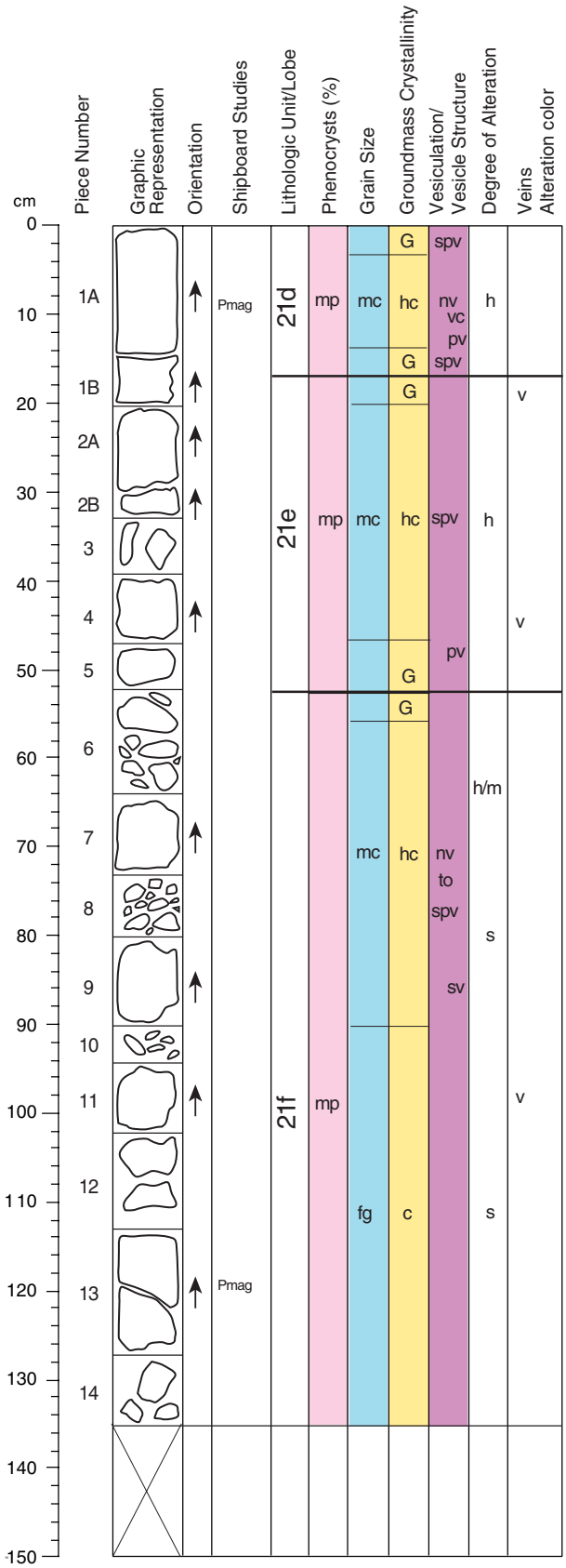
VEINS/FRACTURES: Moderately veined. Veins are randomly oriented, filled with carbonates and sulfides.

COMMENTS:
This section contains the lowest part of Lobe 21a in Unit 21 in addition to Lobes 21b and 21c.

[1] Olivine crystals are microphenocrysts. They are defined, from their shape, as an early crystallizing phase. Plagioclase and clinopyroxene in the groundmass are of approximately the same size.

[2] Vesicularity is variable. A distinct vesicular zone (vesicularity >20%)is present between 89-117 cm and the groundmass has variolitic texture between 10-116 cm. Two 8-10 cm thick lobes (21b and 21c) are present immediately below Lobe 21a boundary at 117 cm.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-49R-6 (Section top: 738.91 mbsf)

UNIT 21: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-14

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	3	1	2	Elongate; lath-like
Olivine:	6-8	1	0.1	0.2	Euhedral; equant

GROUNDMASS: Cryptocrystalline at glassy lobe margins; fine grained in lobe interiors consisting of olivine(*), plagioclase, and clinopyroxene.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
<1-10			<1	Spherical

COLOR: Dark gray (N4), with moderate brown 5YR 4/4 and moderate yellowish brown (10 YR 5/4) in alteration halos

STRUCTURE: Lobed, with glassy lobe margins present at 17-20 cm (Piece 1A), and at 52 cm (Pieces 5 and 6). Lobe interiors are nonvesicular, whereas within 1-2 cm of lobe margins the lava becomes sparsely to moderately vesicular (5%-10%).

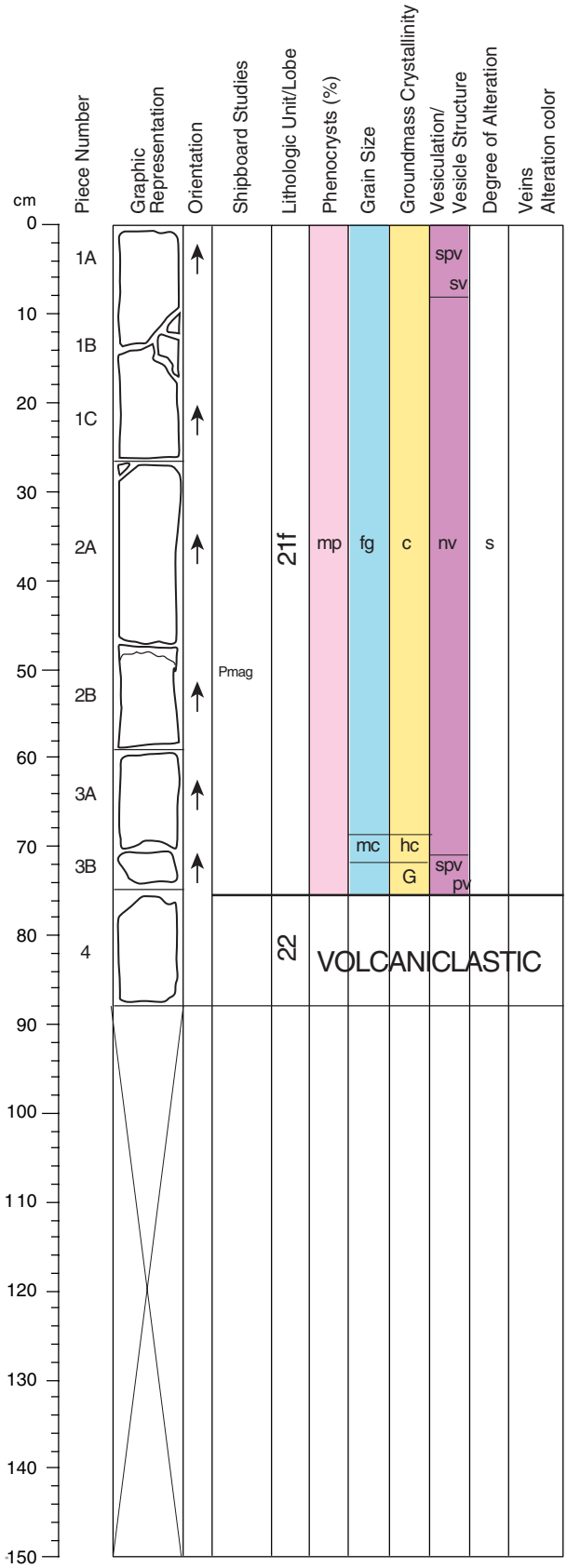
ALTERATION: Fe-oxyhydroxide alteration is present from 0-80 cm. Degree of alteration decreases to slight down the core section.

VEINS/FRACTURES: Moderately veined. Randomly oriented veins filled with calcite. Veins occur from 20-30 cm, 40-50cm and 92-100 cm.

COMMENTS:
A 2 cm ellipsoidal vesicle is filled by calcite in Piece 14.

(*)Olivine crystals are microphenocrysts. They are defined from their shape as an early crystallizing phase. Plagioclase and clinopyroxene in the groundmass are of approximately the same size.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-49R-7 (Section top: 740.26 mbsf)

UNIT 21: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1A-3B

CONTACTS: Base of Unit 21 is at 75 cm (Piece 3B).

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	3	1	2	Elongate; lath-like
Olivine:	6-8	1	0.1	0.2	Euhedral; equant

GROUNDMASS: Cryptocrystalline at glassy lobe margins; fine grained in lobe interiors consisting of olivine[1], plagioclase, and clinopyroxene.

VESICLES[2]:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
<1-10			<1	Spherical

COLOR: Dark gray (N4), with moderate brown 5YR 4/4 and moderate yellowish brown (10 YR 5/4) in alteration halos

STRUCTURE: The core section represents the massive interior of Lobe 21f.

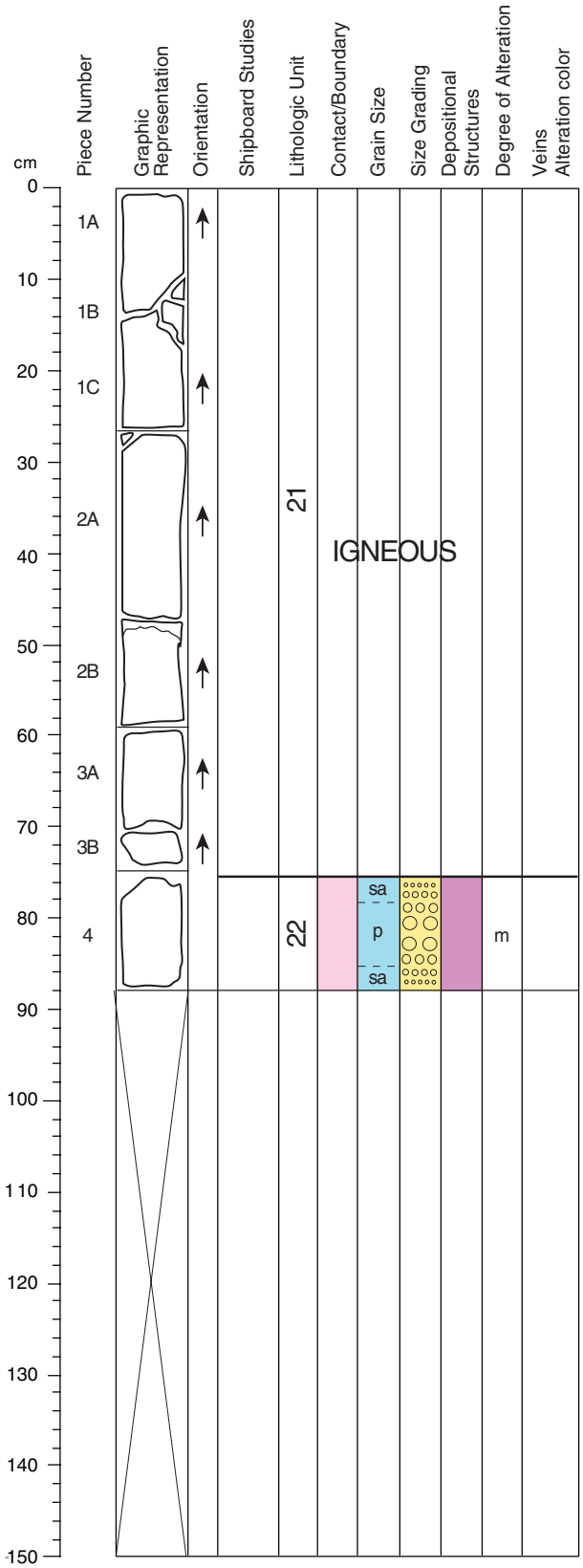
ALTERATION: Moderate. High in alteration halos near lobe margins.

VEINS/FRACTURES: None.

COMMENTS:
Olivine crystals are microphenocrysts. They are defined from their shape as an early crystallizing phase. Plagioclase and clinopyroxene in the groundmass are of approximately the same size.

[2] 2-10 cm spherical vesicles filled are present between 0-10 cm in Piece 1A.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-49R-7 (Section top: 740.26 mbsf)

UNIT 22a: VOLCANICLASTIC-VITRIC-LITHIC SANDSTONE.

Pieces: 4.

CONTACTS: The contact between Unit 21 and Unit 22 is placed at 75 cm on basis of the observed change in lithology from basalt lava (Piece 3B) to vitric-lithic sandstone (Piece 4).

GENERAL DESCRIPTION: Cross-bedded volcaniclastic vitric-lithic sandstone (resedimented tuff) consisting of highly vesicular glassy tephra clasts and basalt lava lithic fragments.

COLOR: Dark Greenish Gray 5G 4/1

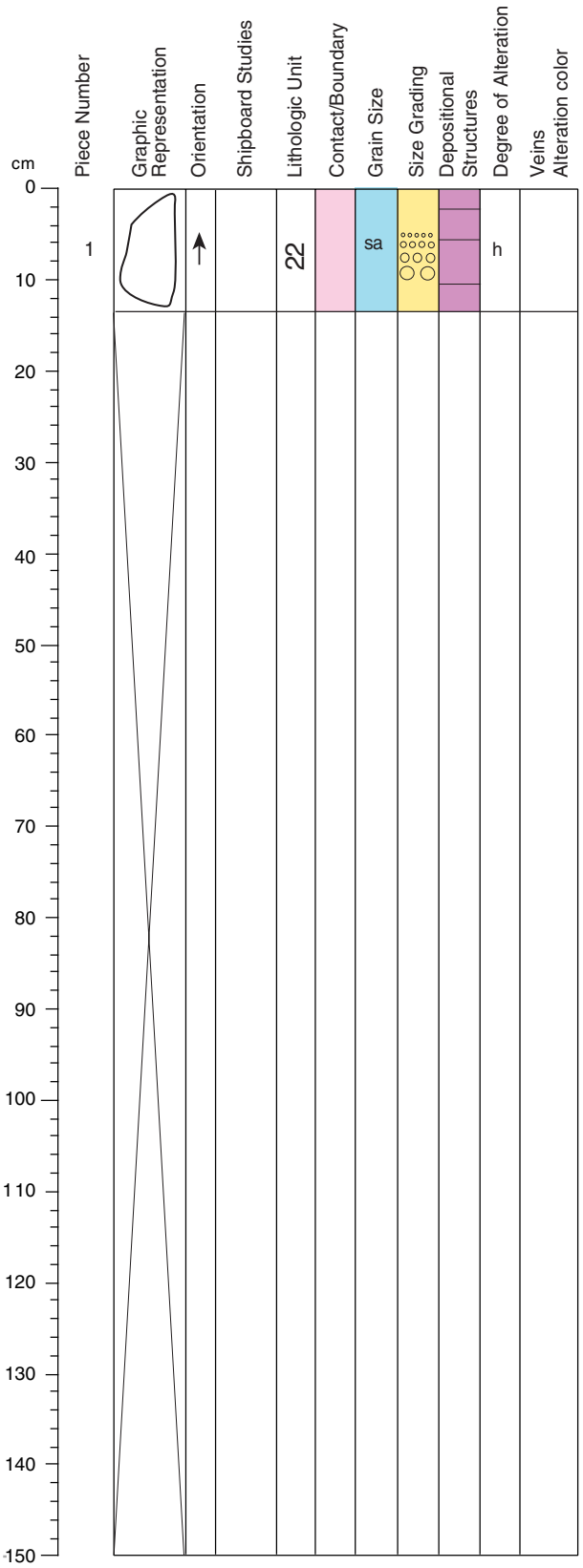
COMPONENTS:
Glass particles (~50%): Vesicular ash- to lapilli-size tephra clasts.
Basalt lava lithics (45%): Microcrystalline to fine grained basalt lava with groundmass consisting of plagioclase laths and clinopyroxene.
Mineral fragments (~5%): Pristine <1mm plagioclase crystals.
Sediment is cemented by carbonate.

SEDIMENTARY TEXTURES: Grain size ranges from medium to fine sand to fine gravel. Symmetric grading: Grain size coarsens upwards to center of piece 4, from fine sand at bottom to fine gravel (due to concentration of 1-4 mm highly vesicular scoria clasts) and then fines upward to medium sand.

SEDIMENTARY STRUCTURES: Faint cross bedding.

COMMENTS: Moderately to strongly altered.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-50R-1 (Section top: 741.6 mbsf)

UNIT 22: BASALT-LAPILLISTONE.

Pieces: 1

CONTACTS: None observed. The contact between Units 22a and 22b is inferred to be at the top of the core section.

GENERAL DESCRIPTION: Clast supported lapillistone with subangular to subrounded volcanic clasts and mineral fragments with a carbonate cement.

COLOR: Black (N1), medium bluish gray (5B 5/1), dark greenish gray (5G 6/1).

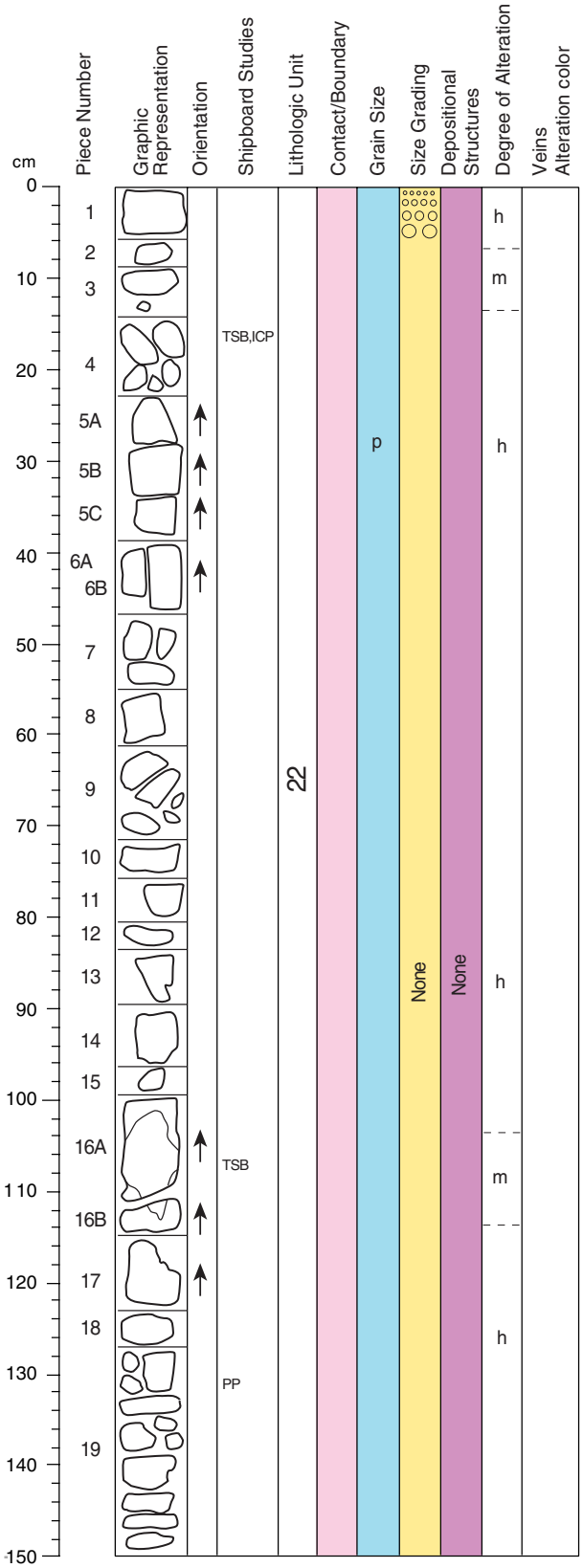
COMPONENTS:
Mineral fragments - olivine (only partially altered) and minor plagioclase: 15%.
Glass shards - completely altered to dark green clay: 10%.
Basalt ash and lapilli clasts- aphyric to sparsely plagioclase-phyric, nonvesicular to sparsely vesicular: 70%.
Carbonate cement: 5%.

SEDIMENTARY TEXTURES: Sand-sized clasts that are moderately sorted.

SEDIMENTARY STRUCTURES: There is no well defined graded bedding, but a series of coarser- (1-2 mm) and finer-grained (0.1-1 mm) layers. Coarser layers are present at 0-5 cm, 9-9.5 cm, and 10-12 cm. Finer layers are present at 5-9 cm and 9.5-10 cm. Elongate, very fine grained, light green clay segregations transgress the layers between 4 cm and 8 cm.

COMMENTS: Indistinct fine-scale bedding along with fine grain size and good sorting suggests that this part of the lapillistone has been resedimented.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-51R-1 (Section top: 751.2 mbsf)

UNIT 22: BASALT-LAPILLISTONE.

Pieces: 1-19

CONTACTS: None.

GENERAL DESCRIPTION: The section is of a clast-supported, green lapillistone with subround to angular clasts of moderately to highly vesicular basalt that are generally 1-15 mm. Several larger basalt clasts are present (Piece 3 and one piece of Piece 4, which are nonvesicular; Piece 10, which is highly vesicular). Alteration is slight (in some of the larger basalt clasts) to complete.

COLOR: Brownish black (basalt clasts, 5YR 2/1) to grayish blue green (5BG 5/2).

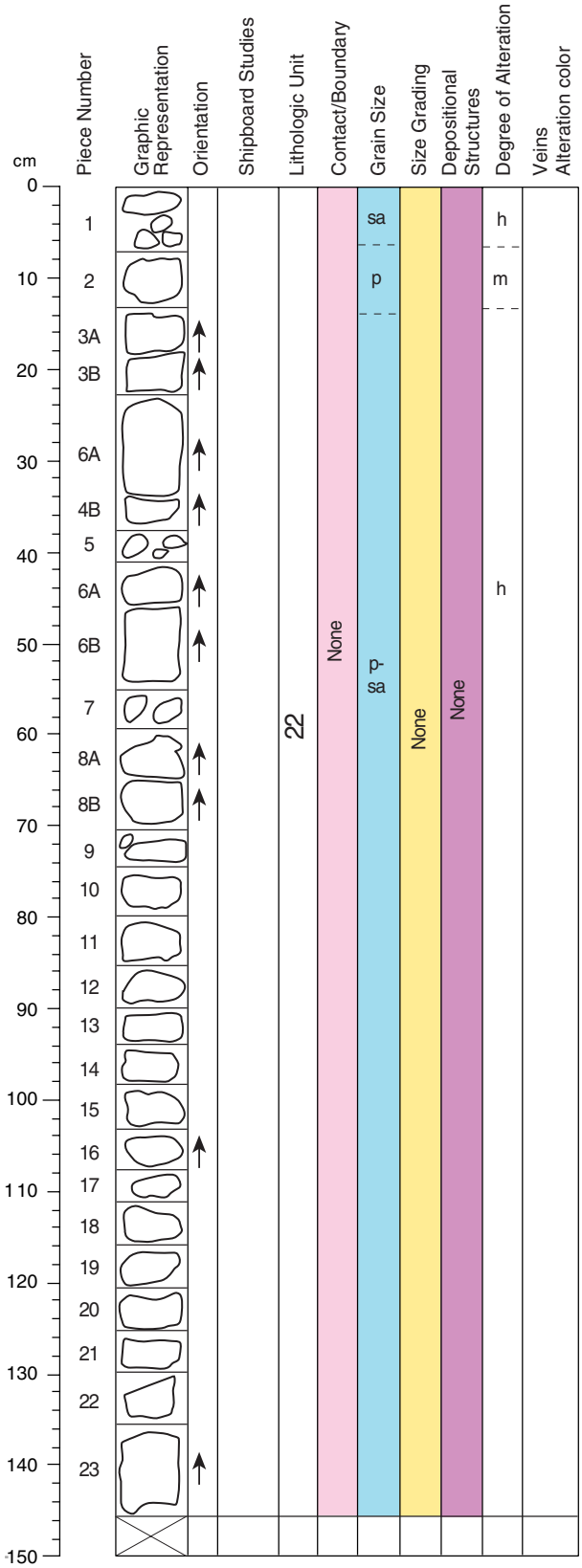
COMPONENTS:
Highly vesicular scoria/tephra: 75%
Basalt: 15%
Mineral fragments (plagioclase, olivine?): 5%
Cement (white carbonate and dark green clay): 5%

SEDIMENTARY TEXTURES: Poorly sorted gravel to sand size clasts. Only in Piece 1 is there graded bedding.

SEDIMENTARY STRUCTURES: None.

COMMENTS: White carbonate cement is present in the upper part of the section. This is replaced by dark green clay in the lower part.
Vesicles are unfilled, partially or totally filled with dark green clay and/or white carbonate.
The basalt clasts are plagioclase-phyric (e.g., Pieces 10 and 19), except for those in Pieces 3 and 4, which are similar to the massive portion of Unit 21.
The vesicles in these basalt scoria clasts are round to irregular, single and coalesced, and either unfilled or filled with carbonate. We interpret this part of Unit 22b to be a tephra fall deposit.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-51R-2 (Section top: 752.7 mbsf)

UNIT 22: BASALT-LAPILLISTONE.

Pieces: 1-23

CONTACTS: None.

GENERAL DESCRIPTION: The section is of a clast-supported, green lapillistone with subround to angular clasts of moderately to highly vesicular basalt that are generally 1-25 mm. Alteration is moderate (in the larger basalt clast) to complete.

COLOR: Brownish black (basalt clasts, 5YR 2/1) to grayish blue green (5BG 5/2).

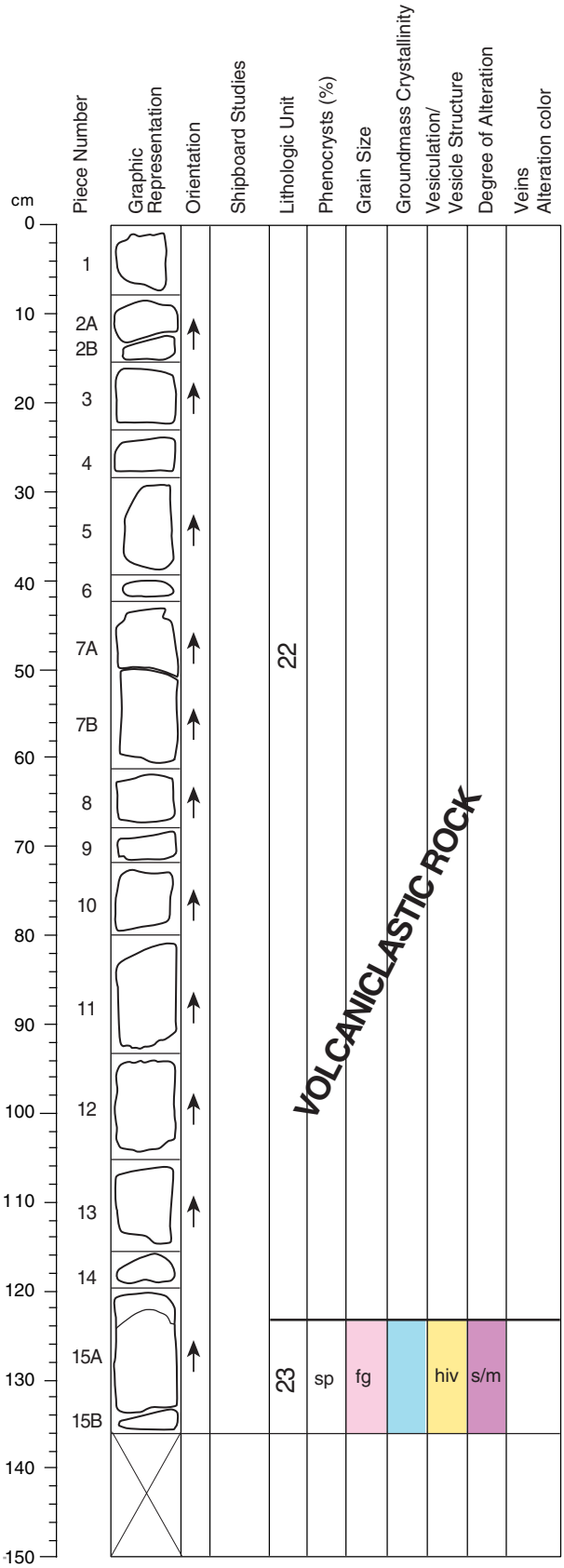
COMPONENTS:
Highly vesicular scoria/tephra: 80%
Basalt: 10%
Mineral fragments (plagioclase, olivine?): 5%
Cement (white carbonate and dark green clay): 5%

SEDIMENTARY TEXTURES: Poorly sorted gravel to sand size clasts.

SEDIMENTARY STRUCTURES: None.

COMMENTS: One larger basalt clast is present (Piece 2) is plagioclase phyric, highly vesicular, and exhibits a trachytic texture.
Vesicles are round to irregular, generally coalesced, and either unfilled, partially or totally filled with dark green clay.
Plagioclase laths are present in the tephra and basalt clasts giving them a trachytic texture.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-51R-3 (Section top: 754.16 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT.

Pieces: 15A-15B

CONTACTS: The contact between Units 22 and 23 is at the top of Piece 15A, where green lapillistone overlies vesicular basalt at 122 cm.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	<2	1	<0.2	0.5	Euhedral, equant

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene, and black oxide minerals.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Highly vesicular	20-25	8	0.5	2	Round

COLOR: Medium gray (N5).

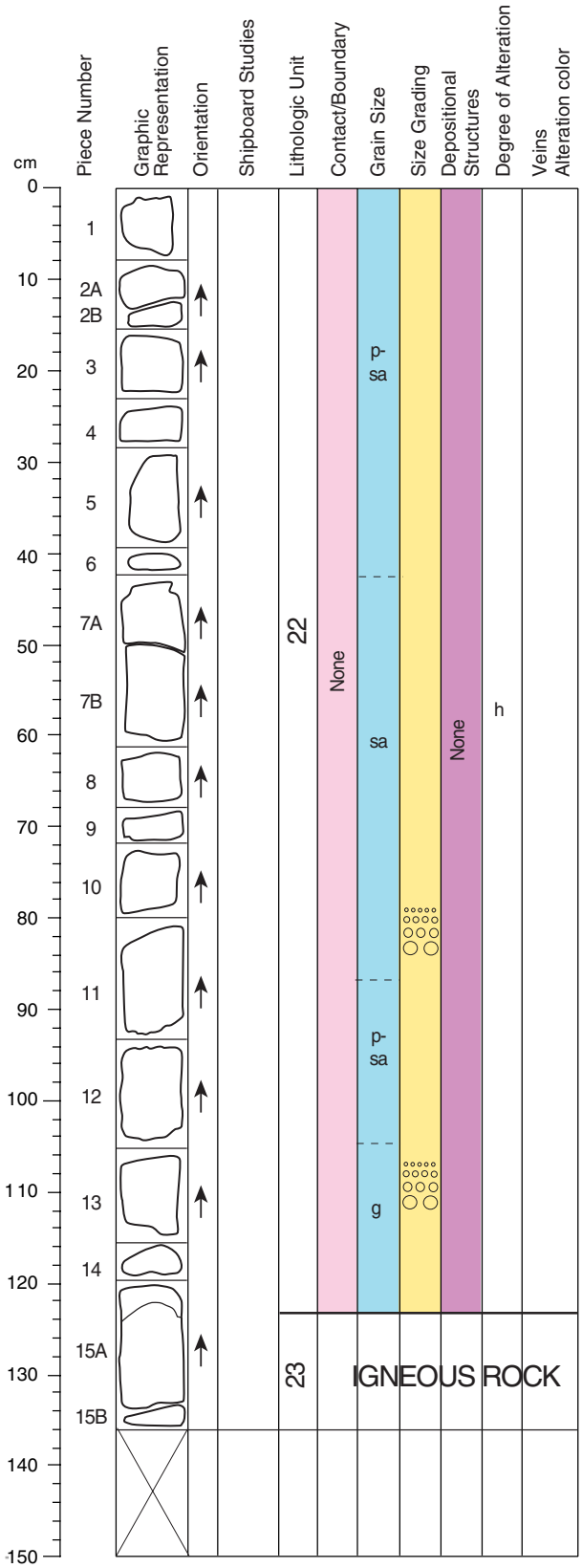
STRUCTURE: Massive.

ALTERATION: Slight to moderate. Vesicles are filled with carbonates, green clay minerals, Fe oxyhydroxides and secondary sulfides.

VEINS/FRACTURES: Sparsely veined, randomly oriented and filled with carbonates, green clay minerals, Fe-oxyhydroxides and secondary sulfides.

COMMENTS: From their shape, olivine are supposed to be an early crystallizing phase and are therefore counted as microphenocrysts despite their similar size to the crystals of the groundmass.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-51R-3 (Section top: 754.16 mbsf)

UNIT 22: BASALT-LAPILLISTONE.

Pieces: 1-14

CONTACTS: The contact between Units 22 and 23 is at the top of Piece 15A, where vesicular basalt is in contact with the green lapillistone at 122 cm.

GENERAL DESCRIPTION: The section is of a clast-supported, green lapillistone with subround to angular clasts of moderately to highly vesicular basalt that are generally 1-20 mm. Alteration is high (in the basalt clasts) to complete.

COLOR: Brownish gray (basalt clasts, 5YR 4/1) to dusky blue green (5BG 3/2) and dark greenish gray (5G 4/1).

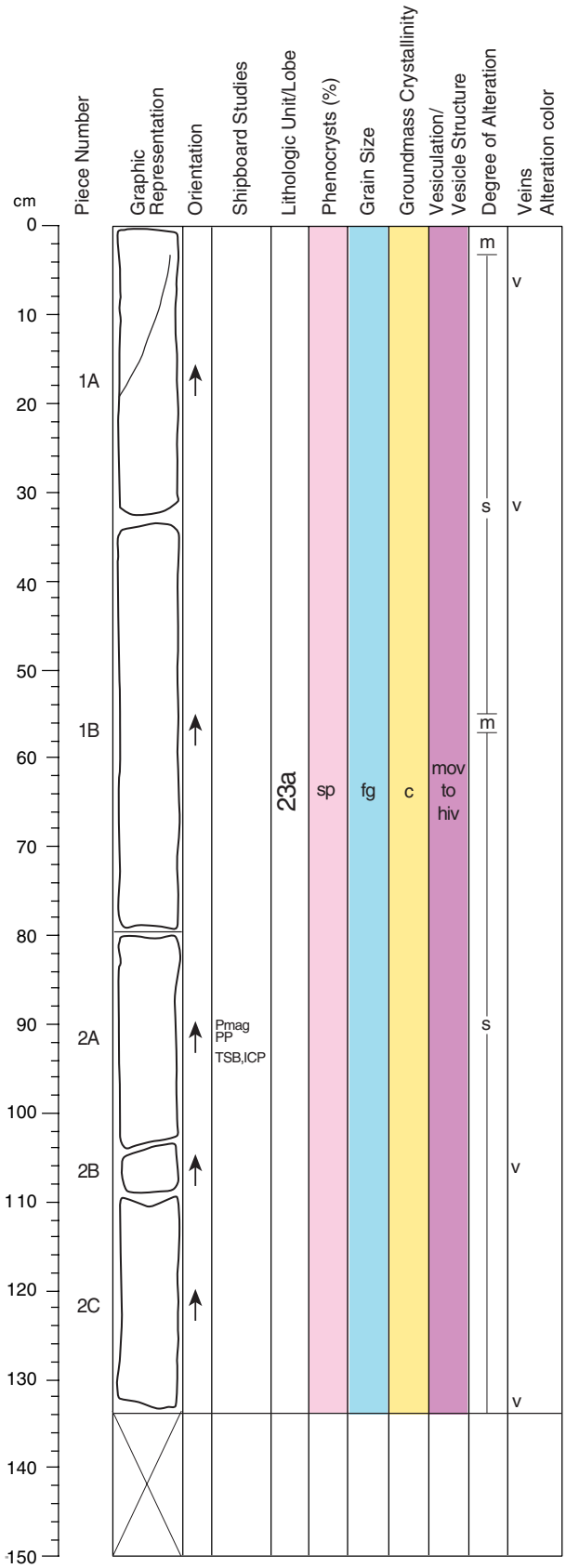
COMPONENTS:
Highly vesicular scoria/tephra: 85%
Basalt: 5%
Mineral fragments: 5%
Cement (white carbonate and dark green clay): 5%

SEDIMENTARY TEXTURES: Poorly sorted gravel to sand size clasts, but the core section contains a fining upward sequence from gravel in Piece 14 to sand in Piece 7A, although occasional cm-sized clasts are present. Pieces 1-6 exhibit no graded bedding.

SEDIMENTARY STRUCTURES: None.

COMMENTS: Vesicles in the tephra clasts are round to irregular, generally coalesced, and either unfilled, partially or totally filled with dark green clay.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-51R-4 (Section top: 755.52 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT.

Pieces: 1A-2C

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	<2 1	<0.2	0.5		Euhedral; equant

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene, and black oxide minerals.

VESICLES:

	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Highly vesicular	20-25	8	0.5	2	Round

COLOR: Medium light gray (N6) to medium gray (N5). Moderate reddish brown around veins (10R 4/6).

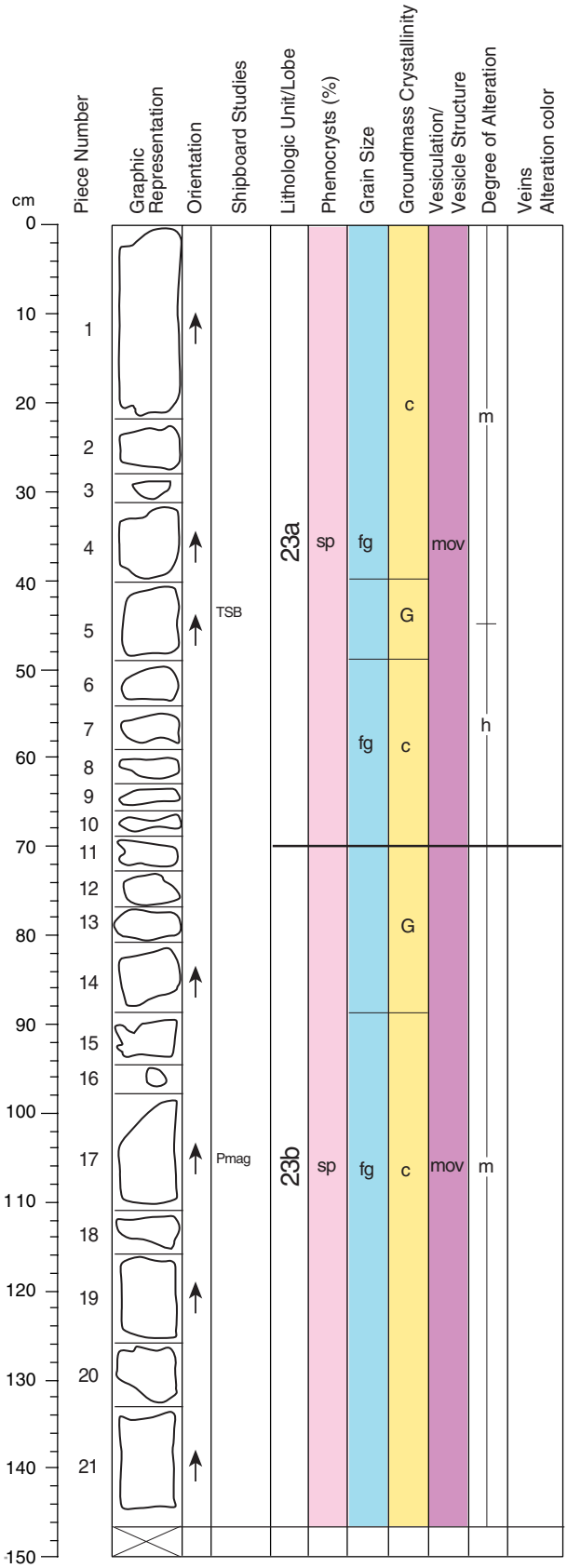
STRUCTURE: Massive.

ALTERATION: Slight to moderate. Vesicles are filled with carbonates, green clay minerals, Fe oxyhydroxides and secondary sulfides.

VEINS/FRACTURES: Sparsely veined. Veins are randomly oriented and filled with carbonates, green clay minerals, Fe-oxyhydroxides and secondary sulfides.

COMMENTS: From its shape, olivine is an early crystallizing phase and is therefore counted as microphenocryst despite similar size with the groundmass.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-51R-5 (Section top: 756.86 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT.

Pieces: 1-21

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	1-2	1	0.5	0.8	Subhedral; equant

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene, and black oxide minerals.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Highly vesicular	8-20	4	0.5	1.5	Round to irregular

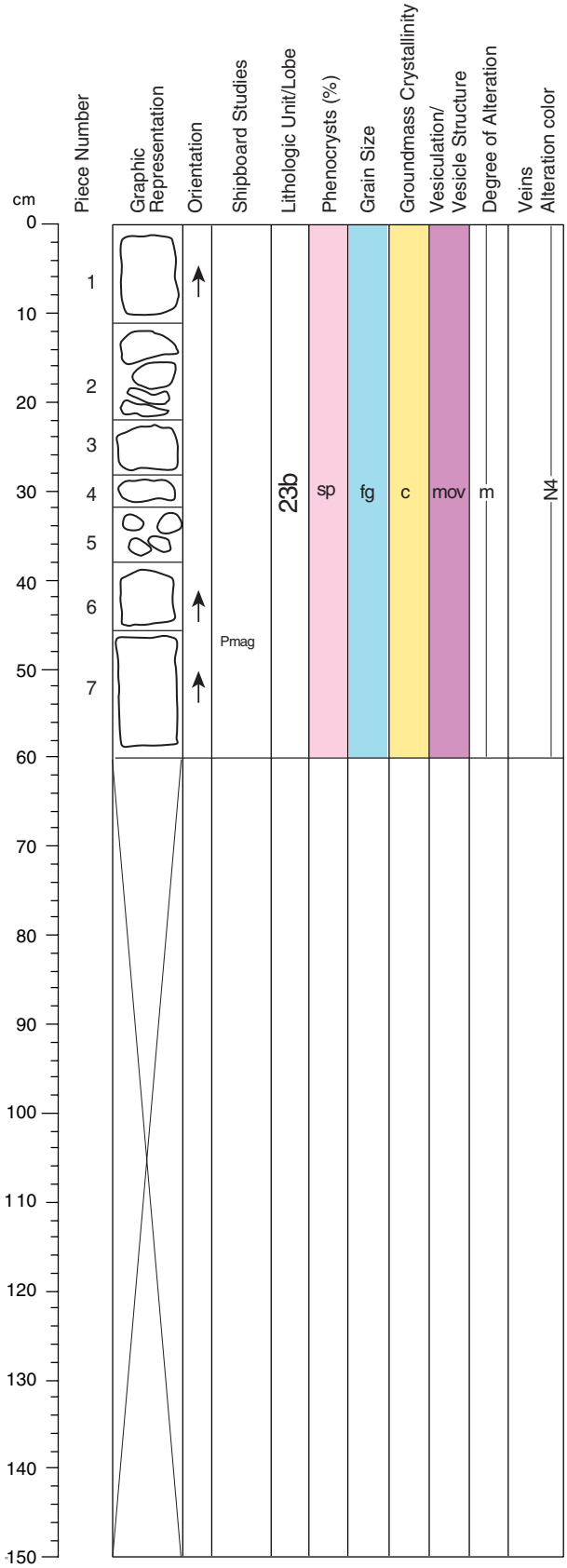
COLOR: Medium dark gray (N4).

STRUCTURE: Lobed. Completely devitrified glassy lobe margins are present in Pieces 5 and 9 14.

ALTERATION: Moderate to high. Most intensely altered in the central part of section (Pieces 5-10). Olivine microphenocrysts are completely replaced by carbonate and Fe-oxyhydroxides. Glass is completely devitrified. Calcite and zeolite minerals infill vesicles. A brown zeolite mineral occurs in Pieces 5-14.

VEINS/FRACTURES: Sparsely veined. Veins, <1 mm wide, are randomly oriented and filled with carbonate.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-51R-6 (Section top: 758.33 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT.

Pieces: 1-7

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<2			<0.5	

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene, and black oxide minerals.

VESICLES:

	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	15-20	4	0.5	1.5	Irregular

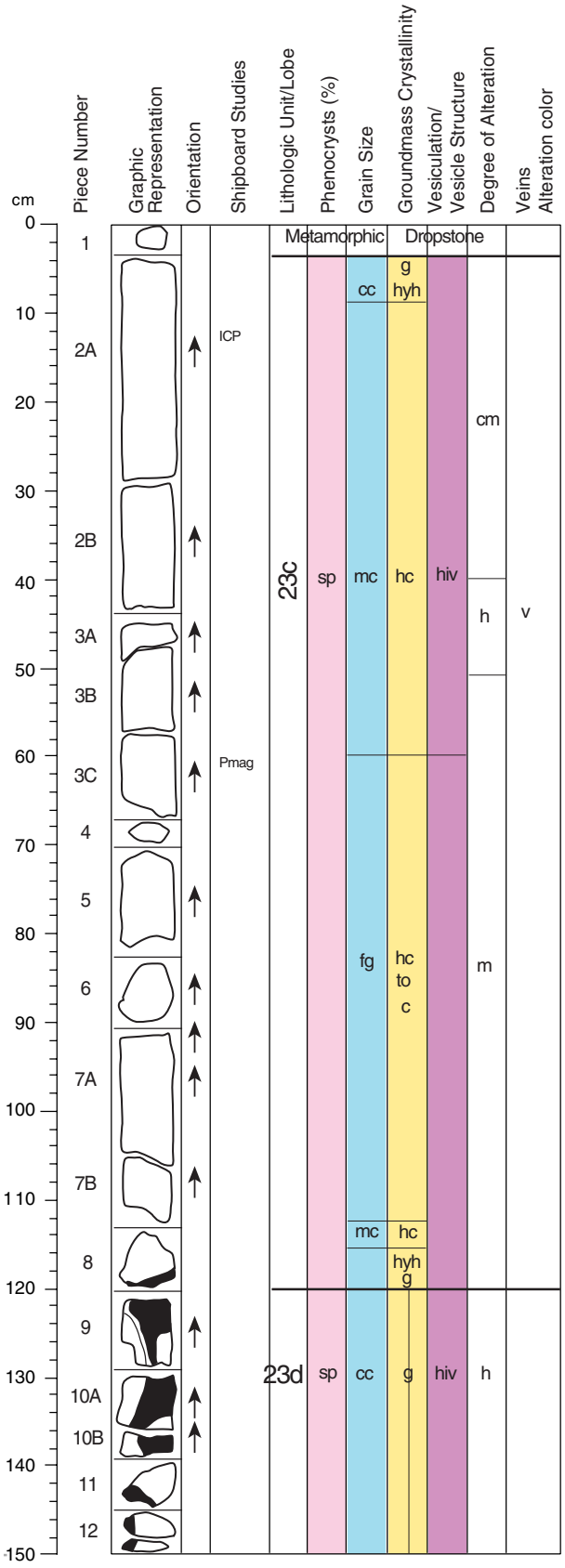
COLOR: Medium dark gray (N4).

STRUCTURE: Massive.

ALTERATION: Moderate. Olivine microphenocrysts are completely replaced by carbonate and Fe-oxyhydroxides. Carbonate fills vesicles and veins.

VEINS/FRACTURES: Sparsely veined. Veins occur throughout section, are <1 mm in thickness, randomly oriented, and filled with carbonate.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-52R-1 (Section top: 760.8 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT.

Pieces: 2A-12 (Piece 1 is a metamorphic dropstone)

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<2	3	2	2.5	Subhedral; tabular
Olivine:	<1	2	1	1.5	Euhedral; equant

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene and black oxide minerals.

VESICLES:

	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	10-20	10	1	2	Irregular

COLOR: Medium dark gray (N4).

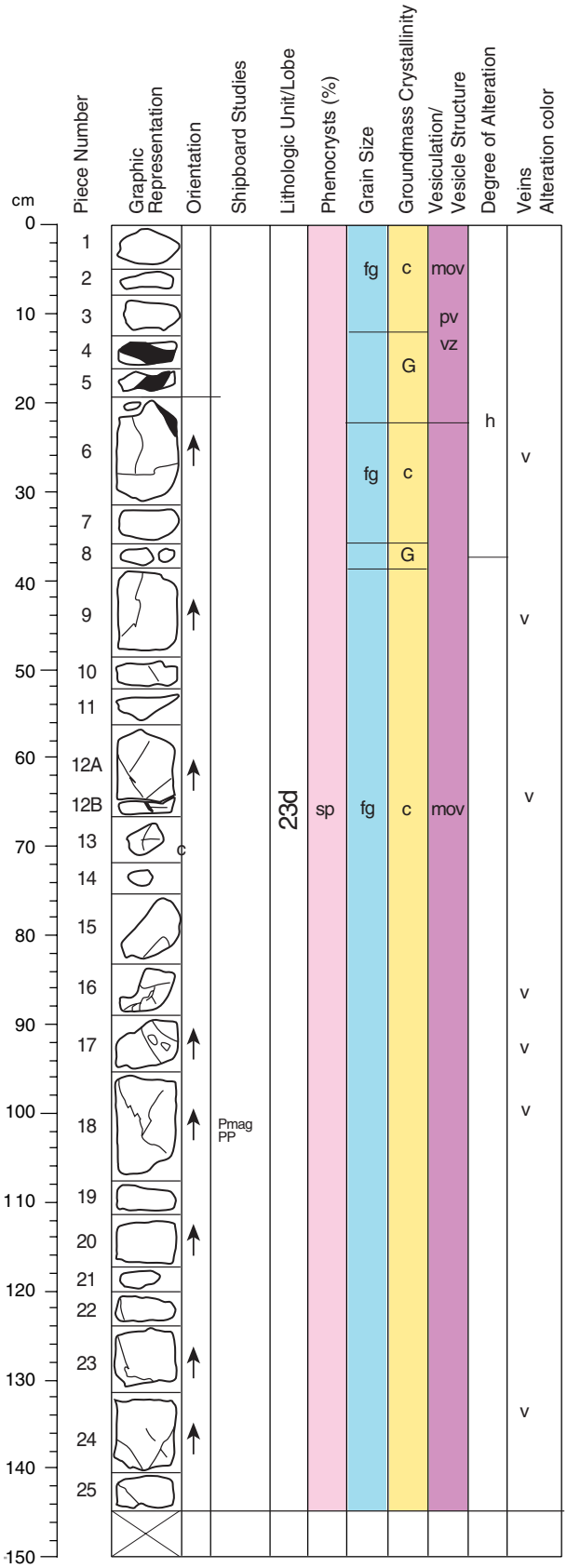
STRUCTURE: Lobed. Devitrified glassy lobe margins present at the top of Piece 1 and in Pieces 8 -12.

ALTERATION: Moderate to high. Most intensively altered close to glassy lobe margins. Vesicles are partially filled with carbonate and Fe-oxyhydroxides. Zeolite occurs in Pieces 8 to 10. Glassy lobe margins are completely devitrified.

VEINS/FRACTURES: Sparsely veined. Veins are randomly oriented, <3 mm wide and filled with carbonate, Fe-oxyhydroxide and secondary sulfides.

COMMENTS: No unaltered glass in this core section. Based on presence of glass, lobe boundaries (between Units 23b and 23c and Units 23c and 23d) are inferred to be present at 0 cm and 130 cm.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-52R-2 (Section top: 762.3 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT.

Pieces: 1-25

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<2	3	1	2	Subhedral; prismatic
Olivine:	<1	2	1	1.5	Euhedral; equant

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene and black oxide minerals.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Highly vesicular	10-15	34	1	2	Irregular

COLOR: Medium dark gray (N4).

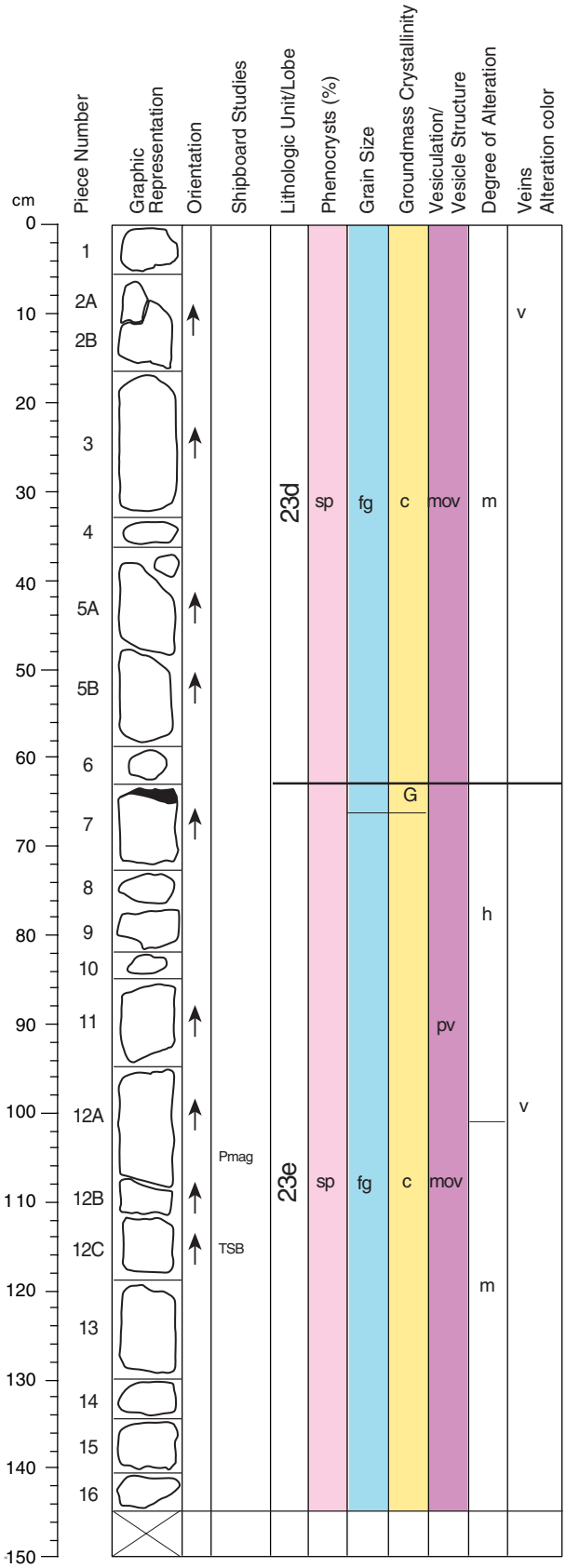
STRUCTURE: Massive.

ALTERATION: Moderate to high. Most intensively altered close to glassy lobe margins. Fragments of completely devitrified glass in Pieces 1, 4, 5, 6, and 8. Olivine is completely replaced by carbonate and Fe-oxyhydroxides. Vesicles are partially filled with carbonate, Fe oxyhydroxides, and green clay.

VEINS/FRACTURES: Sparsely veined. Randomly oriented veins are <2 mm wide and filled with carbonate, Fe-oxyhydroxide and secondary sulfides. A brecciated zone in Piece 16, Piece 17 is filled with carbonate.

COMMENTS: No unaltered glass in this core section.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-52R-3 (Section top: 763.74 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT.

Pieces: 1-16

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1	3	1	1	Euhedral to subhedral

GROUNDMASS: Fine grained.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	10-15	8	1	1	Subround

COLOR: Dark gray (N3), except brownish-gray (5Y 4/1) within 1 cm of veins at 30, 45, 98, and 110-115 cm. Altered glass is dark greenish-gray (5G 4/1).

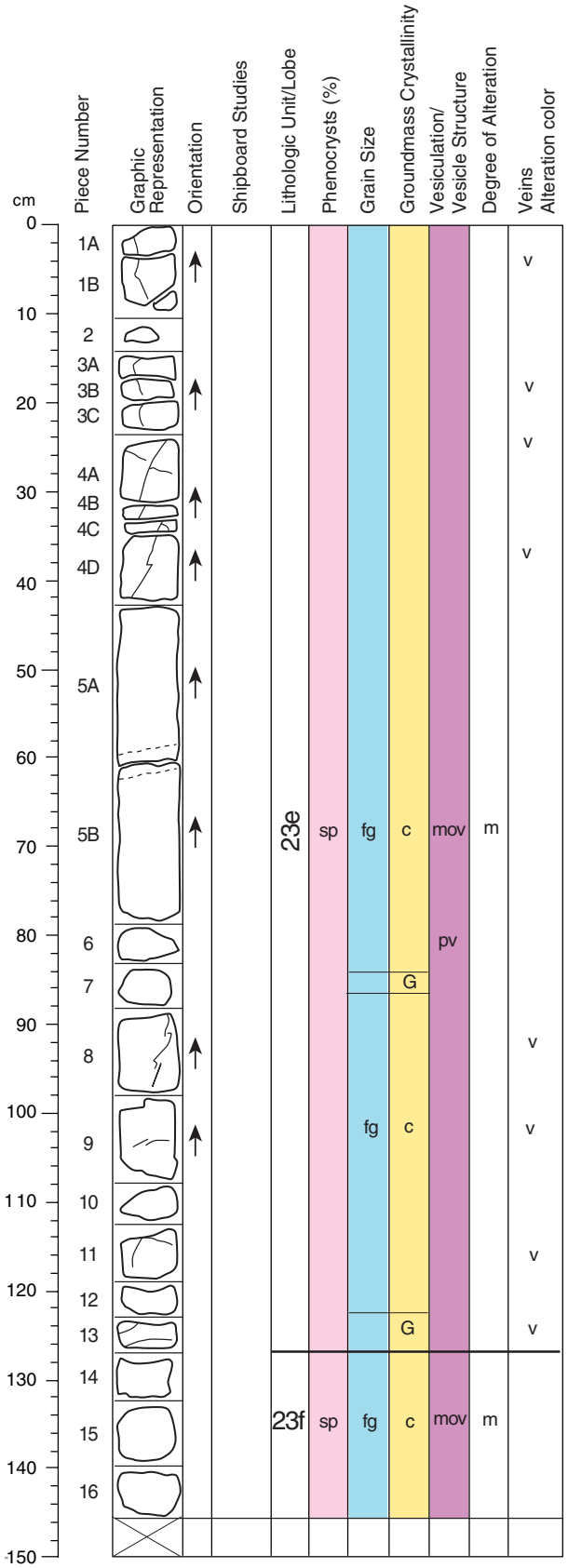
STRUCTURE: Lobed.

ALTERATION: Moderate to high. More altered near veins and glassy lobe margins. 20-70% of vesicles are filled with carbonates except within 1 cm of veins, where 100% are filled with Fe-oxyhydroxides. Glass is highly to completely altered.

VEINS/FRACTURES: Sparse. Veins are randomly oriented, <2 mm wide, and filled with carbonate and Fe-oxyhydroxides.

COMMENTS: Lobe boundaries are inferred based upon the occurrence of glass at 64 cm (top of Unit 23e). Vesicles are smaller and more abundant near glassy lobe margins.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-52R-4 (Section top: 765.19 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT.

Pieces: 1A-16

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1	10	1	2	Euhedral to subhedral

GROUNDMASS: Fine grained.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
2-15	8	1	1	Subround

COLOR: Dark gray (N3), except brownish-gray (5Y 4/1) within 1 cm of veins at 62, 90, and 132 cm. Altered glass is dark greenish-gray (5G 4/1). Carbonate between adjoining glassy lobe margins in Piece 13 is very light gray (N8).

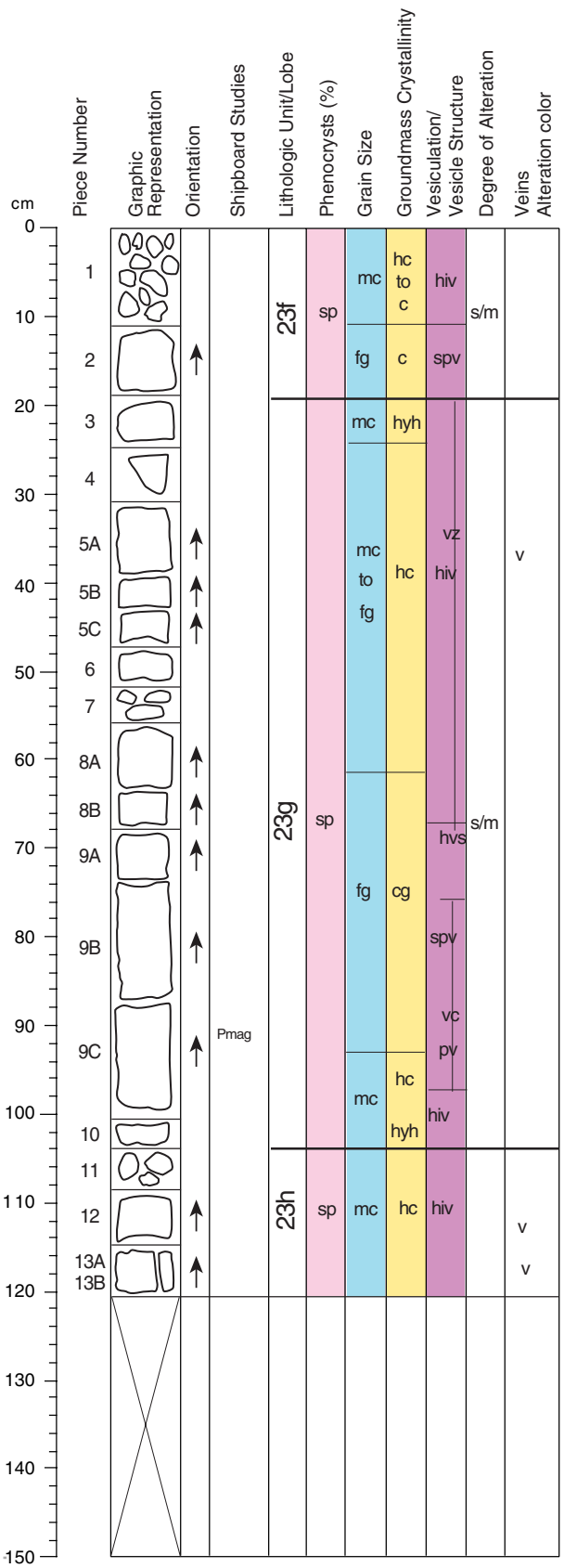
STRUCTURE: Lobed.

ALTERATION: Moderate to high. More altered near veins and glassy lobe margins. 20-70% of vesicles are filled with carbonates except within 1 cm of veins, where 100% are filled with Fe-oxyhydroxides. Glass is highly to completely altered.

VEINS/FRACTURES: Sparsely veined. Veins are randomly oriented, <2 mm wide, and filled with carbonate and Fe-oxyhydroxides.

COMMENTS: Lobe boundaries are inferred based upon the occurrence of glass at 126 cm (top of Unit 23f). Vesicles are smaller and more abundant near glassy lobe margins. Vesicles are least abundant and plagioclase phenocrysts are largest and most abundant from 25-60 cm.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-52R-5 (Section top: 766.66 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT.

Pieces: 1-13B.

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<2	3	2	2.5	Subhedral; tabular
Olivine:	<1	2	1	1.5	Euhedral; equant

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene and black oxide minerals.

VESICLES:

	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	10-15	8	1	2	Irregular

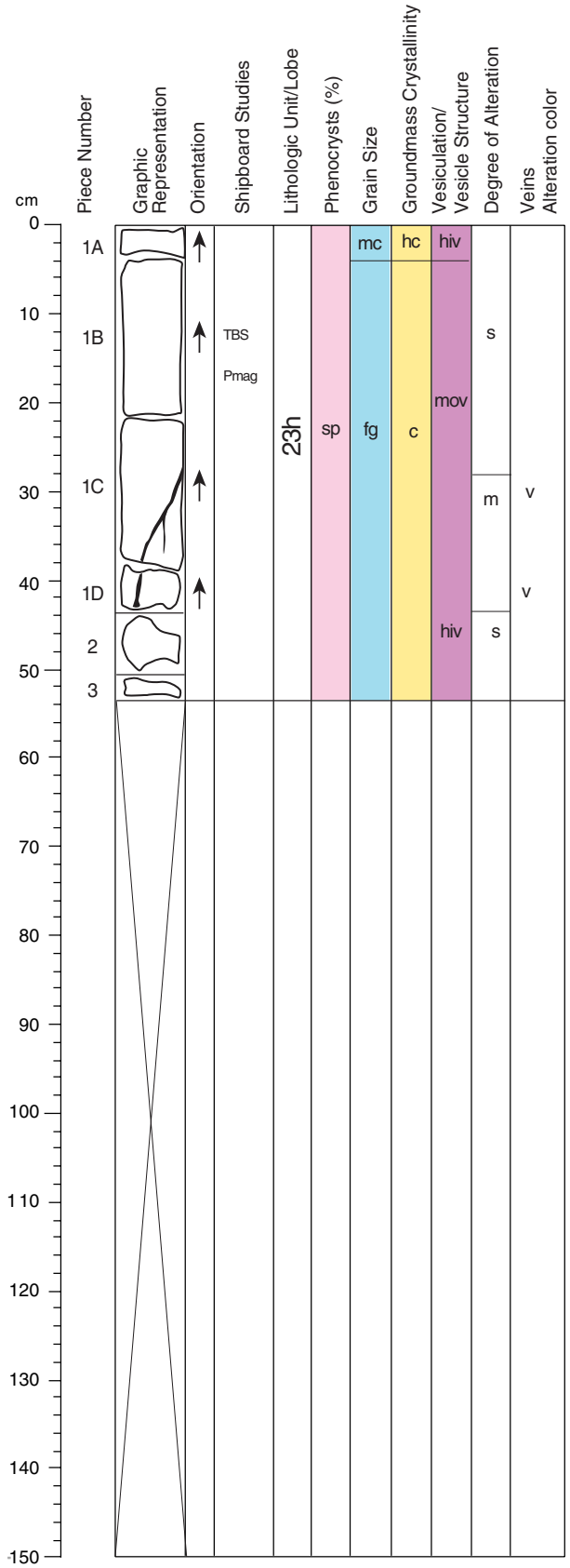
COLOR: Medium dark gray (N4).

STRUCTURE: Massive.

ALTERATION: Moderate to high. Vesicles are partially filled with carbonate, Fe oxyhydroxides, green clay and secondary sulfides.

VEINS/FRACTURES: Sparsely veined. Veins are randomly oriented, <3 mm wide and filled with carbonate, Fe-oxyhydroxide and secondary sulfides.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-52R-6 (Section top: 767.86 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT.

Pieces: 1A-3

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1	2	<0.2	1	Euhedral to subhedral
Olivine:	1	1	<0.2	1	Euhedral; equant

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene and black oxide minerals.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Sparsely vesicular	3	3	0.5	1	Round

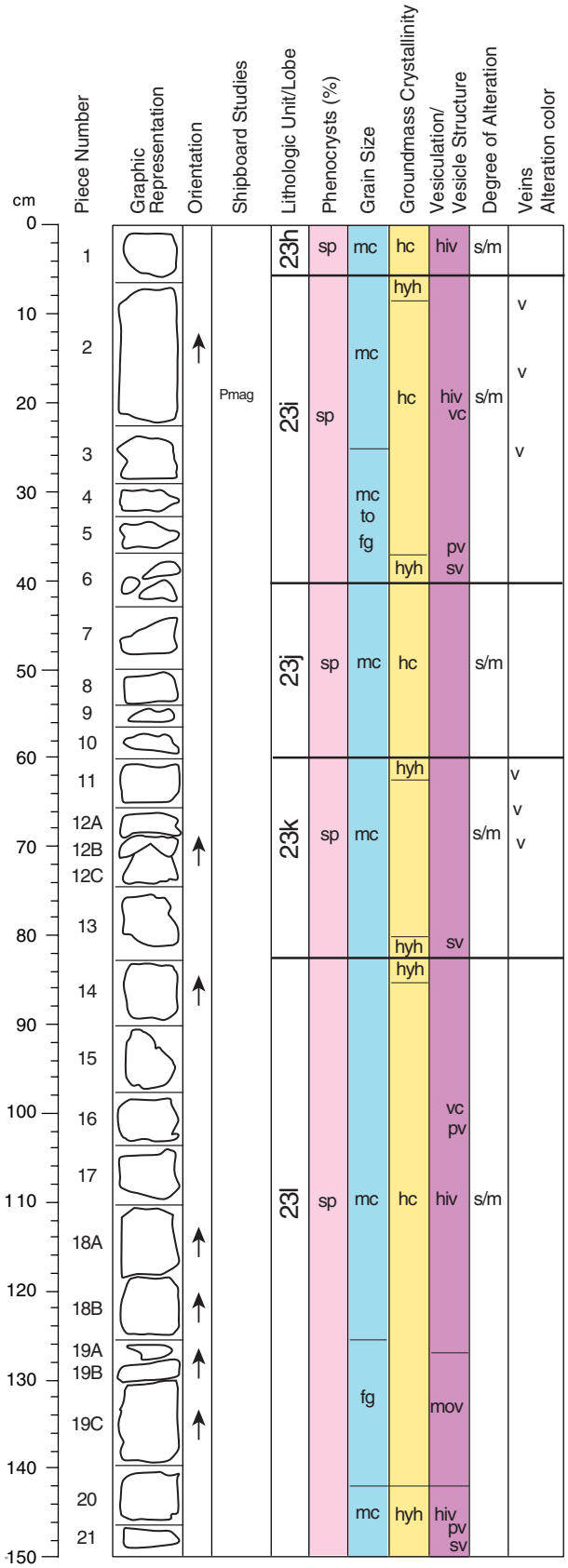
COLOR: Medium gray (N5) to medium dark gray (N4).

STRUCTURE: Massive.

ALTERATION: Slight to moderate around veins. Vesicles are filled with carbonates, green clays, black minerals and secondary sulfides.

VEINS/FRACTURES: Sparsely veined. Veins are randomly oriented, 1 mm wide, and filled with carbonate, green clays and secondary sulfides.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-53R-1 (Section top: 770.4 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A–21A

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2.0	0.5	1	Euhedral/tabular and laths.
Olivine:	<1	1		0.5	Euhedral/blades and equant.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES[2]:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	20-30	8	0.5	1	Spherical to rounded

COLOR: Light gray (N6).

STRUCTURE: Lobed[3]. When glassy margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. About 50% of vesicles filled with carbonate and more more rarely rusty brown very fine grained material with botroidal habit (usually in the proximity of veins). Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

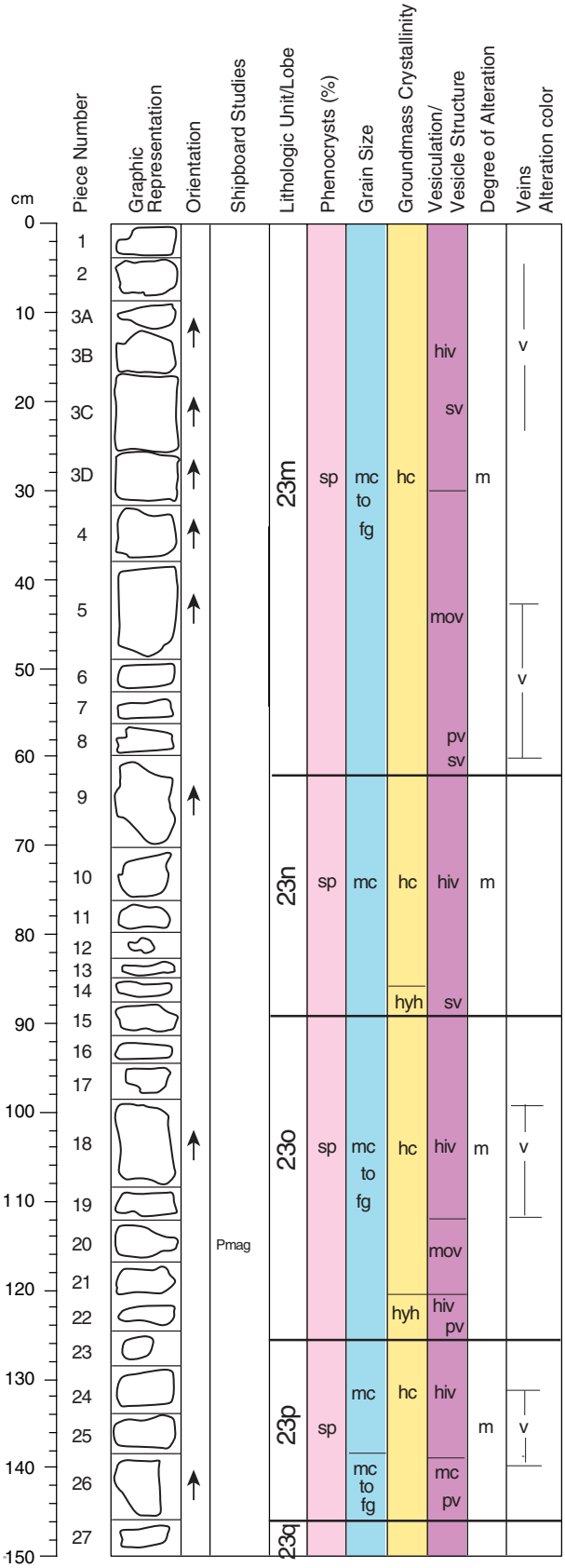
VEINS/FRACTURES: Moderately veined, where calcite fills in <2mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:
[1] Highly vesicular basalt with sparse (0.5–2 mm) plagioclase and relict olivine (replaced by carbonate) phenocrysts.

[2] Sparsely vesicular intervals occur at 20–26 cm, and 130 to 140 cm. Small pipe vesicles are present near lobe bases and small vesicle cylinders at 20 cm and 100 cm.

[3] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-53R-2 (Section top: 771.9 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-27A

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2.0	0.5	1	Euhedral/tabular and laths.
Olivine:	<1	1		0.5	Euhedral/blades and equant.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES [2]:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	20-30	8	0.5	1	Spherical to rounded

COLOR: Light gray (N6).

STRUCTURE: Lobed[3]. When glassy margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. About 50% of vesicles filled with carbonate and more rarely rusty brown very fine grained material with botroidal habit (usually in the proximity of veins). Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

VEINS/FRACTURES: Moderately veined, where calcite fills in <2 mm wide cracks that most likely are the original cooling joints of the lava.

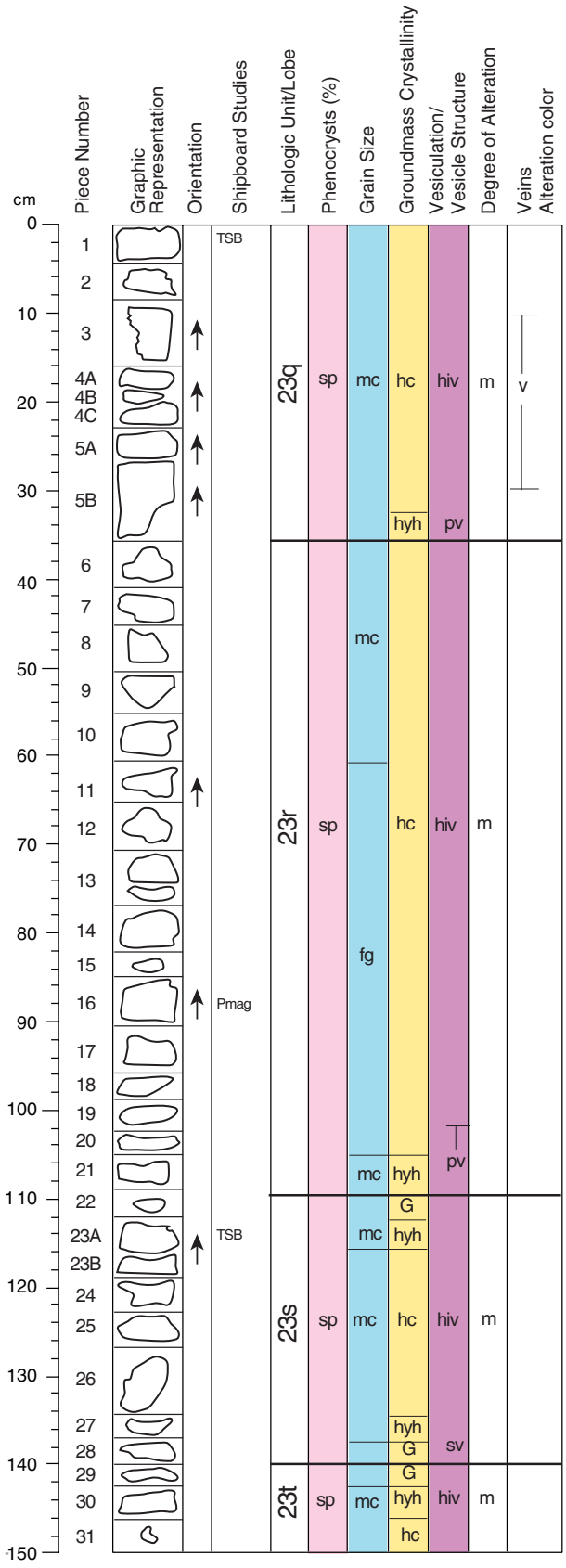
COMMENTS:

[1] Highly vesicular basalt with sparse (0.5-2 mm) plagioclase and relict olivine (replaced by carbonate) phenocrysts.

[2] Moderately vesicular intervals occur at 30-60 cm, 110-124, and 138-146 cm. Small pipe vesicles are present near lobe bases.

[3] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava. This core section contains four 25-60 cm thick lobes; n, (continuation from 53R-06), l, k, l.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-53R-3 (Section top: 773.4 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-31A

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2.0	0.5	1	Euhedral/tabular and laths.
Olivine:	<1	1		0.5	Euhedral/blades and equant.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES [2]:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	20-30	8	0.5	1	Spherical to rounded

COLOR: Light gray (N6).

STRUCTURE: Lobed[3]. When glassy margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. About 50% of vesicles filled with carbonate and more rarely rusty brown very fine grained material with botroidal habit (usually in the proximity of veins). Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

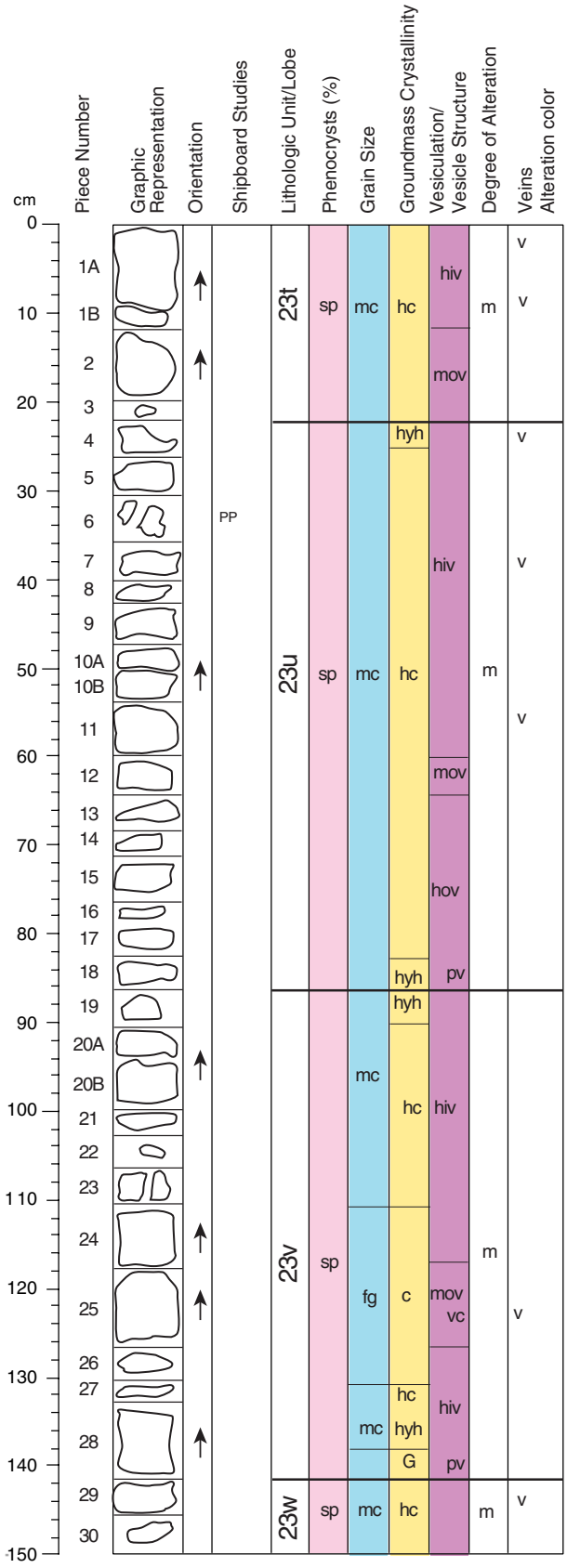
VEINS/FRACTURES: Moderately veined, where calcite fills in <2 mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:
[1] Highly vesicular basalt with sparse (0.5-2 mm) plagioclase and relict olivine (replaced by carbonate) phenocrysts.

[2] Well-developed pipe vesicles are present between 104-108 cm (Pieces 20-21).

[3] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-53R-4 (Section top: 774.9 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-30A[2]

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2.0	0.5	1	Euhedral/tabular and laths.
Olivine:	<1	1		0.5	Euhedral/blades and equant.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	20-30	8	0.5	1	Spherical to rounded

COLOR: Light gray (N6).

STRUCTURE: Lobed[3]. When glassy margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. About 50% of vesicles filled with carbonate and more rarely rusty brown very fine grained material with botroidal habit (usually in the proximity of veins). Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

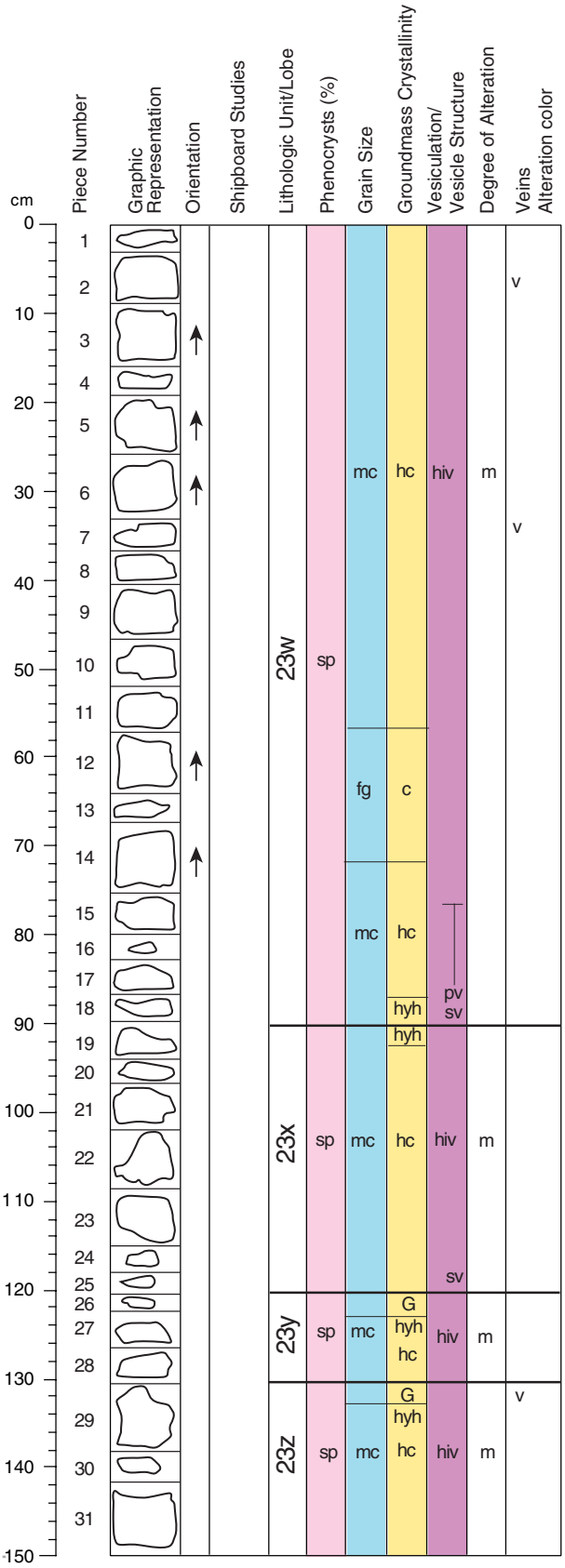
VEINS/FRACTURES: Moderately veined, where calcite fills in <2 mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:
[1] Highly vesicular basalt with sparse (0.5-2 mm) plagioclase and relict olivine (replaced by carbonate) phenocrysts.

[2] Piece 4A is a bright green fine grained vitric tuff, consisting of poorly to moderately vesicular glass clasts.

[3] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-53R-5 (Section top: 776.4 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-31A

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2.0	0.5	1	Euhedral/tabular and laths.
Olivine:	<1	1		0.5	Euhedral/blades and equant.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES [2]:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	20-30	8	0.5	1	Spherical to rounded

COLOR: Light gray (N6).

STRUCTURE: Lobed[3]. When glassy margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. About 50% of vesicles filled with carbonate and more rarely rusty brown very fine grained material with botroidal habit (usually in the proximity of veins). Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

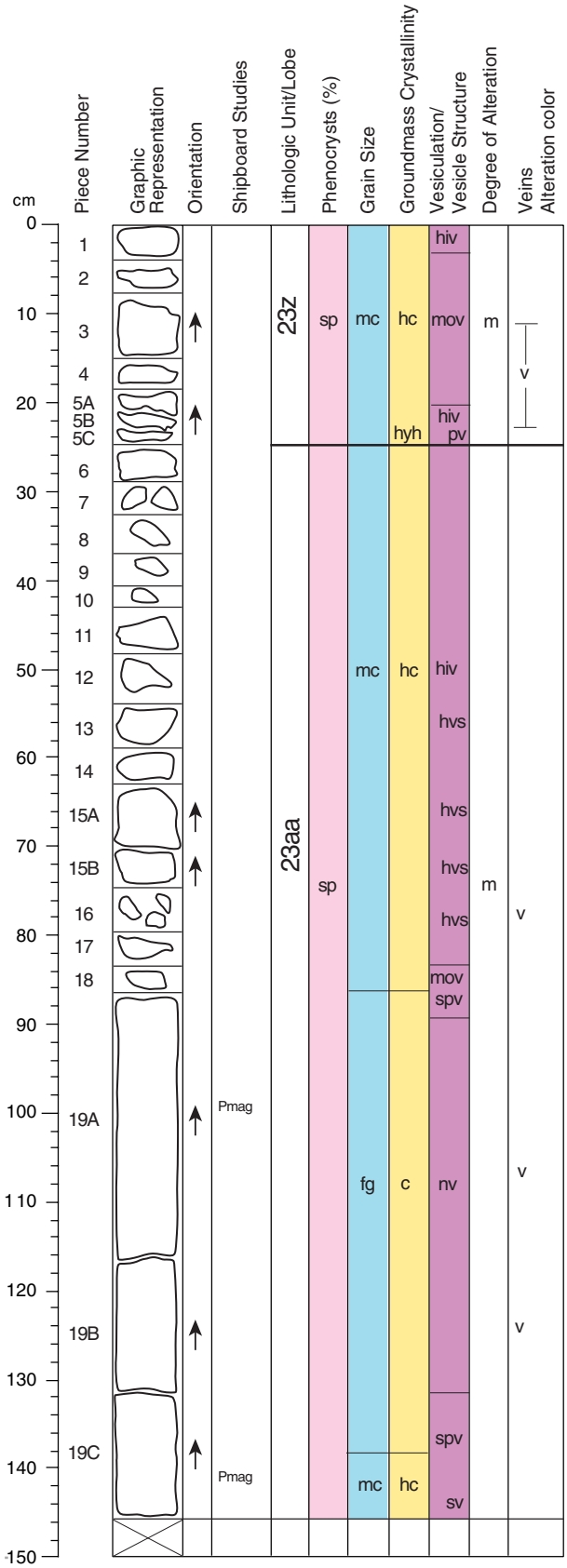
VEINS/FRACTURES: Moderately veined, where calcite fills in <2 mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:
[1] Highly vesicular basalt with sparse (0.5-2 mm) plagioclase and relict olivine (replaced by carbonate) phenocrysts.

[2] Well-developed pipe vesicles occur in interval 75-87 cm (Pieces 15-17).

[3] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-53R-6 (Section top: 777.9 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-19C

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2.0	0.5	1	Euhedral/tabular and laths.
Olivine:	<1	1		0.5	Euhedral/blades and equant.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES [2]:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	20-30	8	0.5	1	Spherical to rounded

COLOR: Light gray (N6).

STRUCTURE: Lobed. When glassy margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

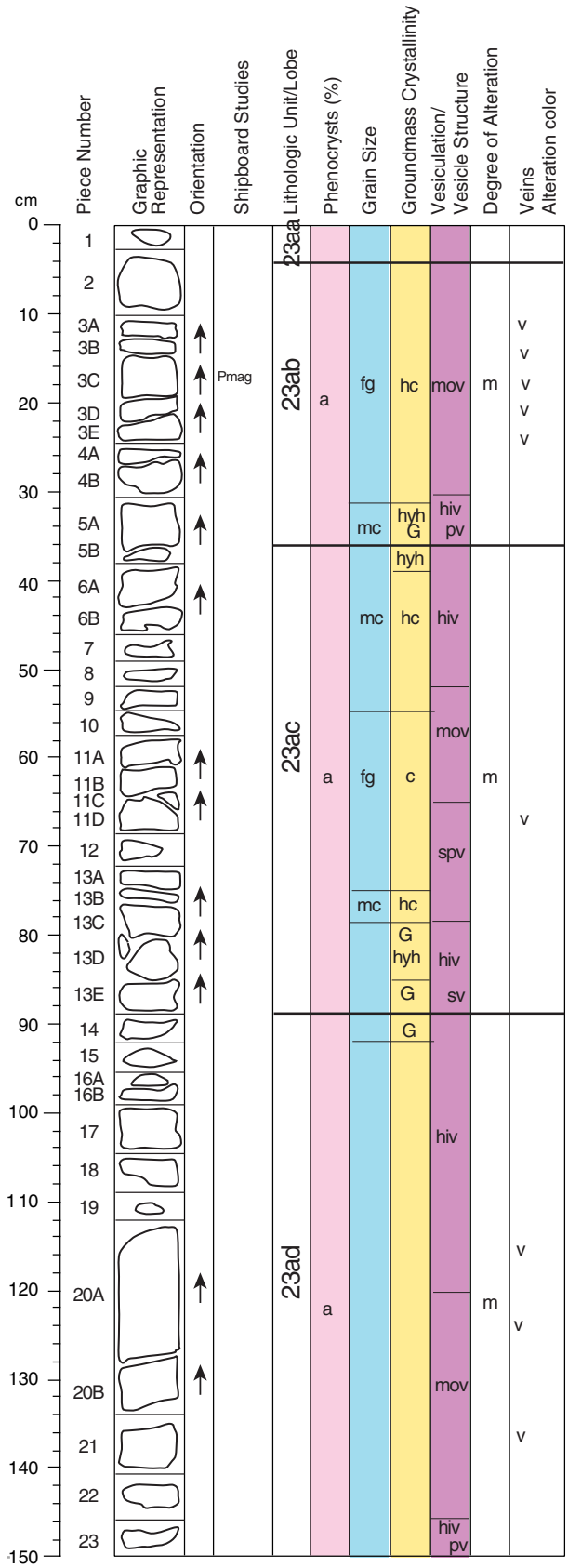
ALTERATION: Moderate. About 50% of vesicles filled with carbonate and more rarely rusty brown very fine grained material with botroidal habit (usually in the proximity of veins). Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

VEINS/FRACTURES: Moderately veined, where calcite fills in <2 mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:
[1] Highly vesicular basalt with sparse (0.5-2 mm) plagioclase and relict olivine (replaced by carbonate) phenocrysts.

[2] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-54R-1 (Section top: 780.0 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-23C

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2.0	0.5	1	Euhedral/tabular and laths.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
20-30	8	0.5	1	Spherical to rounded

COLOR: Light gray (N6).

STRUCTURE: Lobed[2]. When glassy margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. About 50% of vesicles filled with carbonate. Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

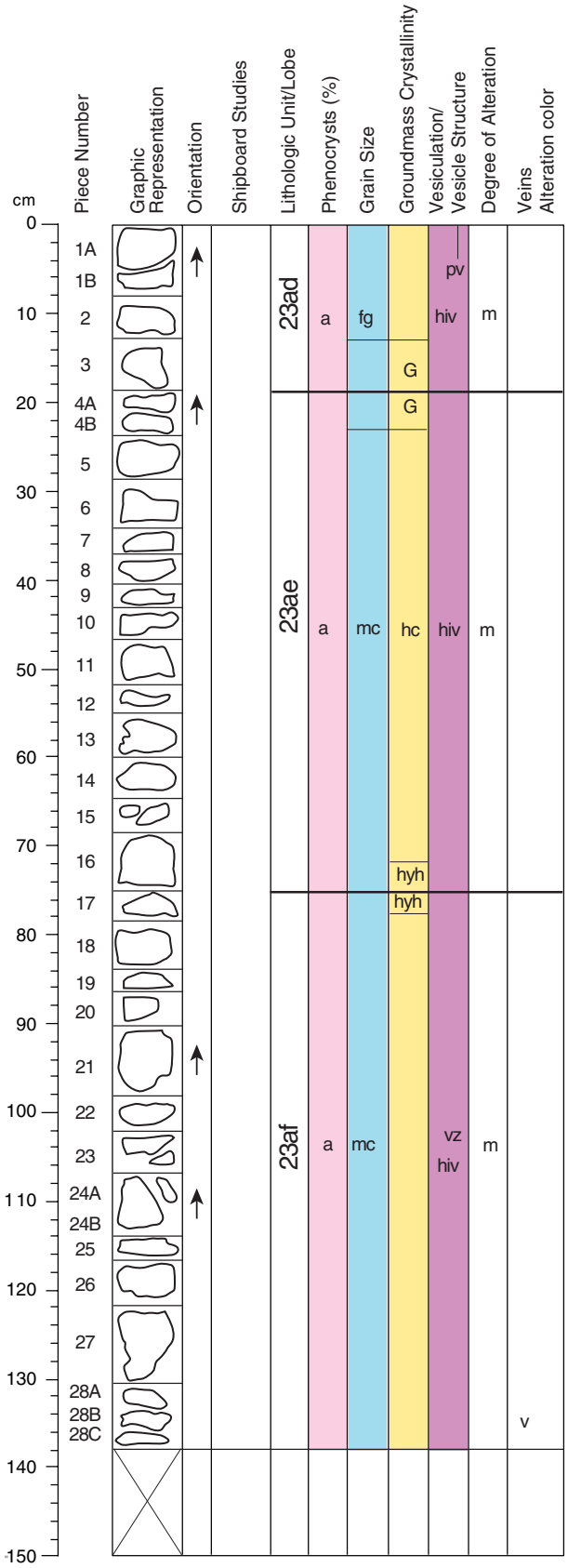
VEINS/FRACTURES: Moderately veined, where calcite fills in 1-3 mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:

[1] Highly vesicular basalt with sparse (0.5-2 mm) plagioclase phenocrysts. The amount of phenocrysts is below the sparsely phyric designation overall and the distribution of phenocrysts is not uniform. No olivine microphenocrysts could be identified. This is a continuation of Unit 23 as there is no obvious unit break between core sections.

[2] Lobe 23ac shows well-developed three-fold structure typical of inflated pahoehoe lava lobes (i.e., upper vesicular crust, massive lobe interior and lower vesicular crust). On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-54R-2 (Section top: 781.5 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-28C

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2.0	0.5	1	Euhedral/tabular and laths.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
	20-30	8	0.5	1	Spherical to rounded

COLOR: Light gray (N6).

STRUCTURE: Lobed[2]. When glassy margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

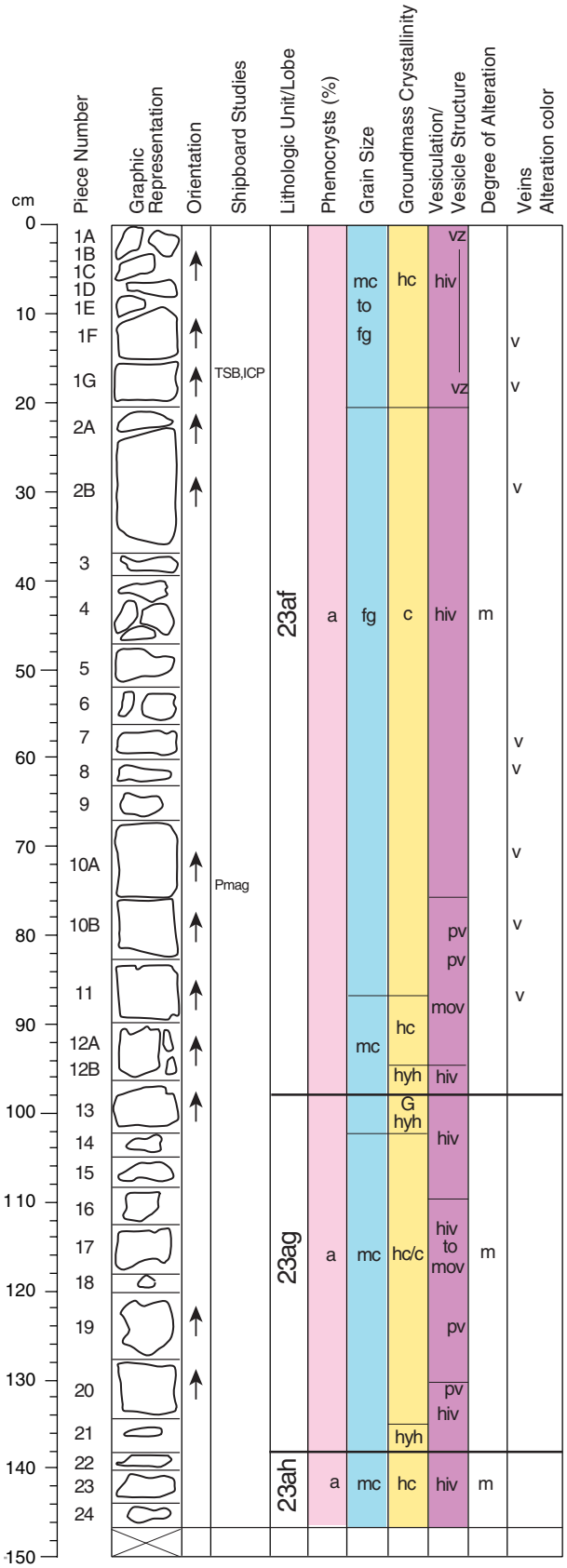
ALTERATION: Moderate. About 50% of vesicles filled with carbonate. Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

VEINS/FRACTURES: Sparsely veined, where calcite fills in <2 mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:
[1] Highly vesicular basalt with sparse (0.5-2 mm) plagioclase phenocrysts. The amount of phenocrysts is below the sparsely phyric designation overall and the distribution of phenocrysts is not uniform. No olivine microphenocrysts could be identified. This is a continuation of Unit 23 as there is no obvious unit break between core sections.

[2] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-54R-3 (Section top: 782.88 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-24A

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2.0	0.5	1	Euhedral/tabular and laths.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
20-30	8	0.5	1	Spherical to rounded

COLOR: Light gray (N6).

STRUCTURE: Lobed[2]. When glassy margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

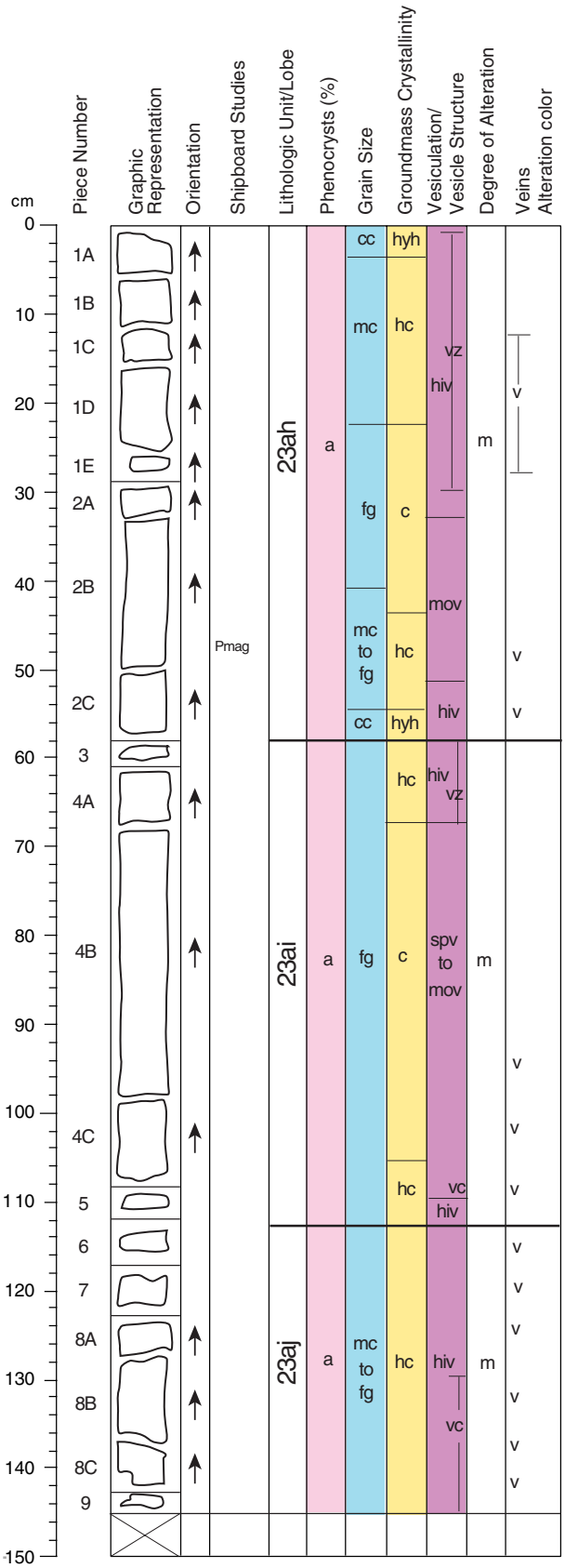
ALTERATION: Moderate. About 50% of vesicles filled with carbonate. Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

VEINS/FRACTURES: Sparsely veined, where calcite fills in 1-3 mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:
[1] Highly vesicular basalt with sparse (0.5-2 mm) plagioclase phenocrysts. The amount of phenocrysts is below the sparsely phyric designation overall and the distribution of phenocrysts is not uniform. No olivine microphenocrysts could be identified. This is a continuation of Unit 23 as there is no obvious unit break between core sections.

[2] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-54R-4 (Section top: 784.47 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-8D

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1			1	Euhedral/tabular and laths.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
5-25	6	0.5	1	Spherical to rounded

COLOR: Light gray (N6).

STRUCTURE: Lobed[2]. When glassy margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. About 50% of vesicles filled with carbonate. Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

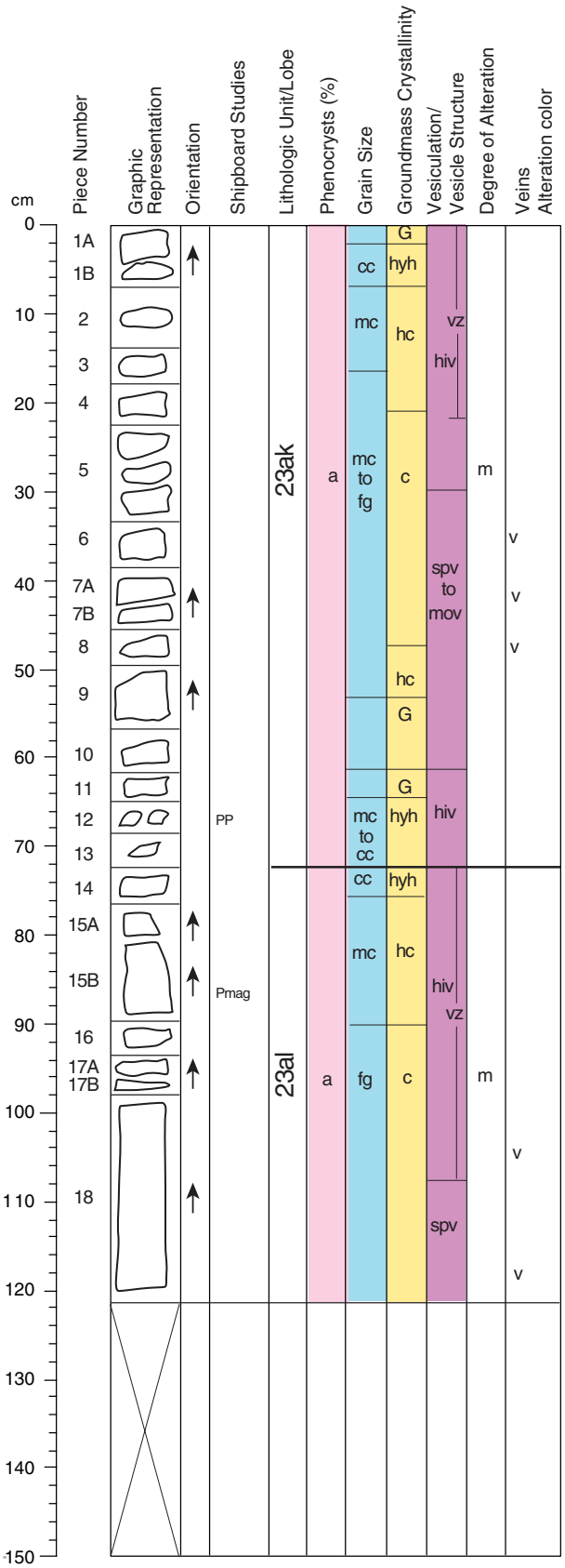
VEINS/FRACTURES: Sparsely veined, where calcite fills in 1-3 mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:

[1] Highly vesicular basalt with sparse (0.5-2 mm) plagioclase phenocrysts. The amount of phenocrysts is below the sparsely phyric designation overall and the distribution of phenocrysts is not uniform. No olivine microphenocrysts could be identified. This is a continuation of Unit 23 as there is no obvious unit break between core sections.

[2] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-54R-5 (Section top: 785.83 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-8D

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	~1	3.0	0.5	1	Euhedral/tabular and laths.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
5-30	12	0.5	1	Spherical to rounded

COLOR: Light gray (N6).

STRUCTURE: Lobed[2]. When glassy margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. About 50% of vesicles filled with carbonate. Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

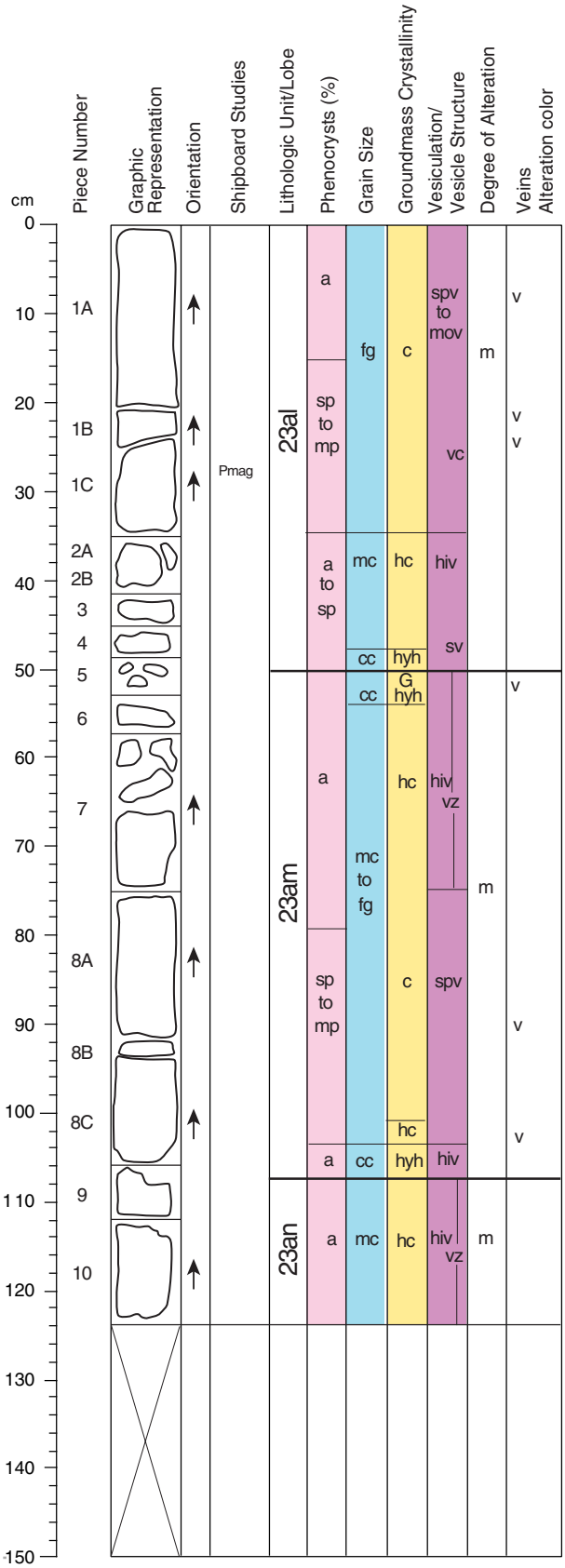
VEINS/FRACTURES: Sparsely veined, where calcite fills in 1-3 mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:

[1] Highly vesicular basalt with sparse (0.5-3 mm) plagioclase phenocrysts. The amount of phenocrysts is below the sparsely phyric designation. No olivine microphenocrysts could be identified. This is a continuation of Unit 23 as there is no obvious unit break between core sections.

[2] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-54R-6 (Section top: 787.05 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-10A

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1-5	8.0	1	3	Euhedral/tabular and laths.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
<5-30	12	0.5	1	Spherical to rounded

COLOR: Light gray (N6).

STRUCTURE: Lobed[2]. When glassy margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. About 50% of vesicles filled with carbonate. Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

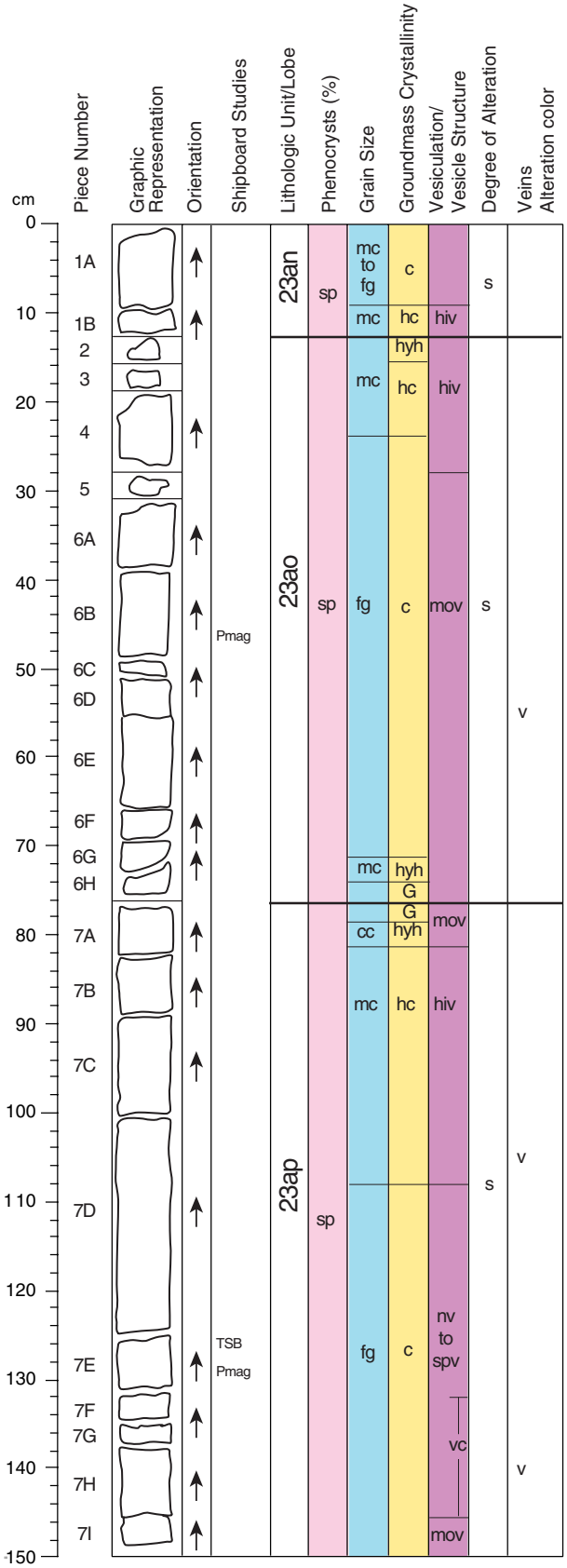
VEINS/FRACTURES: Sparsely veined, where calcite fills in 1-3 mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:

[1] Highly vesicular basalt with sparse (0.5-8 mm) plagioclase phenocrysts. The plagioclase phenocryst are concentrated in the massive lobe interiors (lower half) where their abundance is 3%-5%. No olivine microphenocrysts could be identified. This is a continuation of Unit 23 as there is no obvious unit break between core sections.

[2] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-55R-1 (Section top: 789.7 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT.

Pieces: 1A-7I.

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1	2	0.5	1	Subhedral; blocky
Olivine:	1	0.6	0.2	0.4	Euhedral; equant

GROUNDMASS: Microcrystalline to fine grained. Plagioclase, clinopyroxene, black oxides and glass (some of which may be unaltered) form a subvariolitic to intersertal texture. Light and dark patches are present representing plagioclase-rich and glass-rich regions, respectively.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
2-20	10	0.2	1	Subround to irregular

COLOR: Medium gray (N5) to dark gray (N3).

STRUCTURE: Lobed. Lobe boundaries are defined on the basis of changes in vesicularity, slight grain size variations, and the presence of alteration fronts.

ALTERATION: Slight. Fe-oxyhydroxide halos are present at the lobe contacts (e.g., Piece 6H) and around some veins (e.g., Piece 7A). Approximately 50% of the vesicles are filled with white carbonate and the remainder are unfilled. Sulfide is present in the groundmass.

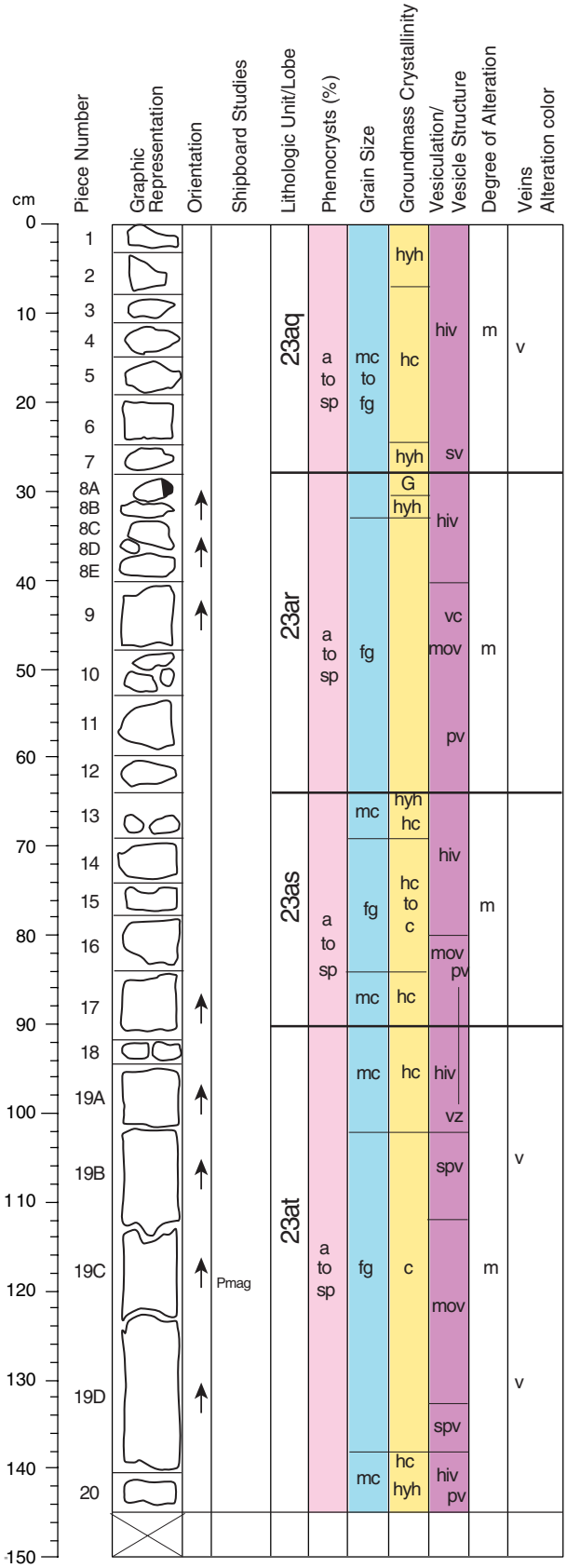
VEINS/FRACTURES: Sparsely veined. Subvertical and subhorizontal veins are present (e.g., Pieces 6A-6F and 7D) that are 0.1-4 mm wide and filled with white carbonate.

COMMENTS: Vesicularity ranges from sparsely vesicular in Pieces 7D-7H to highly vesicular in Pieces 4 and 7C.

From its shape, olivine is an early crystallizing phase and is designated as phenocryst phase despite similar size with the groundmass.

A long, vertical vesicle cylinder, up to 1 cm wide, is present is Pieces 7D-7F from 110-134 cm. In Piece 7F, it transitions to a pipe vesicle. It is filled with basaltic (segregated) material that is rich in plagioclase (and is lighter in color when wet than the surrounding basalt groundmass), is slightly coarser grained, and contains less glass than the surrounding groundmass. Some of the glass may be unaltered. Pipe vesicles are present on the outer core surface in Pieces 7F-7H.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-55R-2 (Section top: 791.2 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT(*).

Pieces: 1-20.

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2	0.5	1	Euhedral to subhedral; blocky
Olivine:	<1	0.5	0.2	0.4	Euhedral; equant

GROUNDMASS: Fine grained to aphanitic. Plagioclase, clinopyroxene, black oxides and glass (some of which may be unaltered) form a intergranular to intersertal texture in fine-grained regions.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	2-30	10	0.2	1	Subround to irregular

COLOR: Medium gray (N5) to medium light gray (N6). Moderate yellowish brown (10YR 5/4) in alteration halos.

STRUCTURE: Lobed. Lobe boundaries are defined on the basis of changes in vesicularity, slight grain size variations, the presence of alteration fronts and interlobe vitric tuff (e.g., Piece 8A).

ALTERATION: Slight to moderate. Occasional Fe-oxyhydroxide halos are present at the lobe contacts (e.g., Piece 8A) and around some veins (e.g., Pieces 17 and 19A). Approximately 60% of the vesicles are partially to totally filled with white carbonate and the remainder are unfilled, but lined with light green clay.

VEINS/FRACTURES: Sparsely veined. Subvertical and subhorizontal veins are present (e.g., Piece 19B) that are 0.1-3 mm wide and filled with white carbonate, Fe-oxyhydroxide, and emerald green clay.

COMMENTS: (*)The amount of phenocrysts is below the sparsely phyric designation overall, but the distribution of phenocrysts is not uniform. This is a continuation of Unit 23 as there is no obvious unit break between core sections.

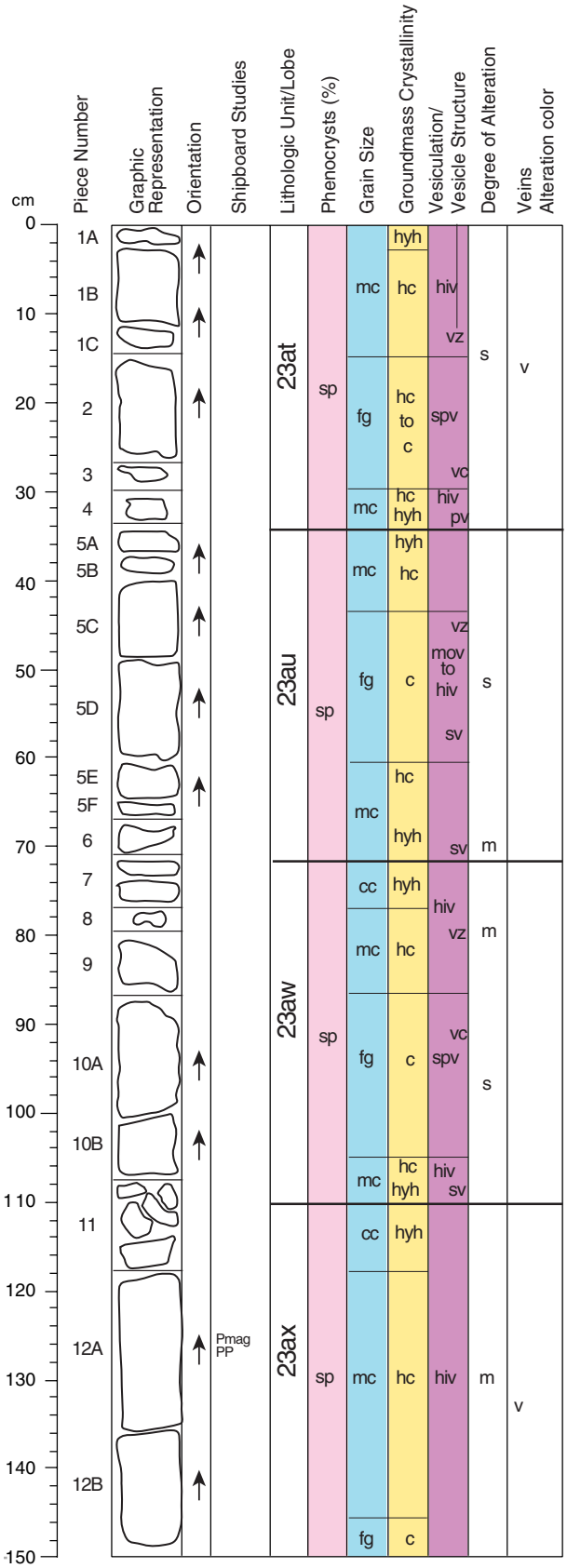
Vesicularity ranges from sparsely vesicular in Piece 19B, to highly vesicular in Pieces 6 and 14 .

From its shape, olivine is an early crystallizing phase and is designated as phenocryst phase despite similar size with the groundmass.

A 15 mm long, 3-4 mm wide vesicle cylinder is present in Piece 17. It is filled with basaltic material that is rich in plagioclase (and is lighter in color when wet than the surrounding basalt groundmass), is slightly coarser grained, and contains less glass. Some of the glass may be unaltered. Pipe vesicles of similar size are present in Pieces 9, 16, and 17, and are partially to totally filled with white carbonate.

In Pieces 19B and 19C (112-118 cm), there are angular pieces of very fine grained to aphanitic, moderately vesicular basalt wrapped in the coarser grained material typical of a lobe interior.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-55R-3 (Section top: 792.65 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT(*).

Pieces: 1A-12B.

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1	8	1	2	Euhedral to subhedral blocky

GROUNDMASS: Fine grained. Plagioclase, clinopyroxene, black oxides and glass (some of which may be unaltered) form a subvariolitic to intergranular texture.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
2-25	10	0.2	1	Subround to irregular

COLOR: Medium gray (N5) to medium dark gray (N4). Dark yellowish brown (10YR 4/2) in alteration halos.

STRUCTURE: Lobed. Lobe boundaries are defined on the basis of changes ir vesicularity, slight grain size variations, and the presence of interlobe vitric tuff (e.g., Piece 9A).

ALTERATION: Slight to moderate in alteration halos. Occasional Fe-oxyhydroxide halos are present at the lobe contacts (e.g., Piece 9A) and around veins (e.g., Piece 5D). Approximately 80% of the vesicles are filled with white carbonate and the remainder are unfilled. Zones of carbonate replacing glass in the groundmass are present (e.g., Piece 10A).

VEINS/FRACTURES: Sparsely veined. Subvertical and subhorizontal veins are present (e.g., Pieces 2, 5D, 10A, and 12A) that are 0.1-4 mm wide and filled with white carbonate, Fe oxyhydroxide, and light green clay.

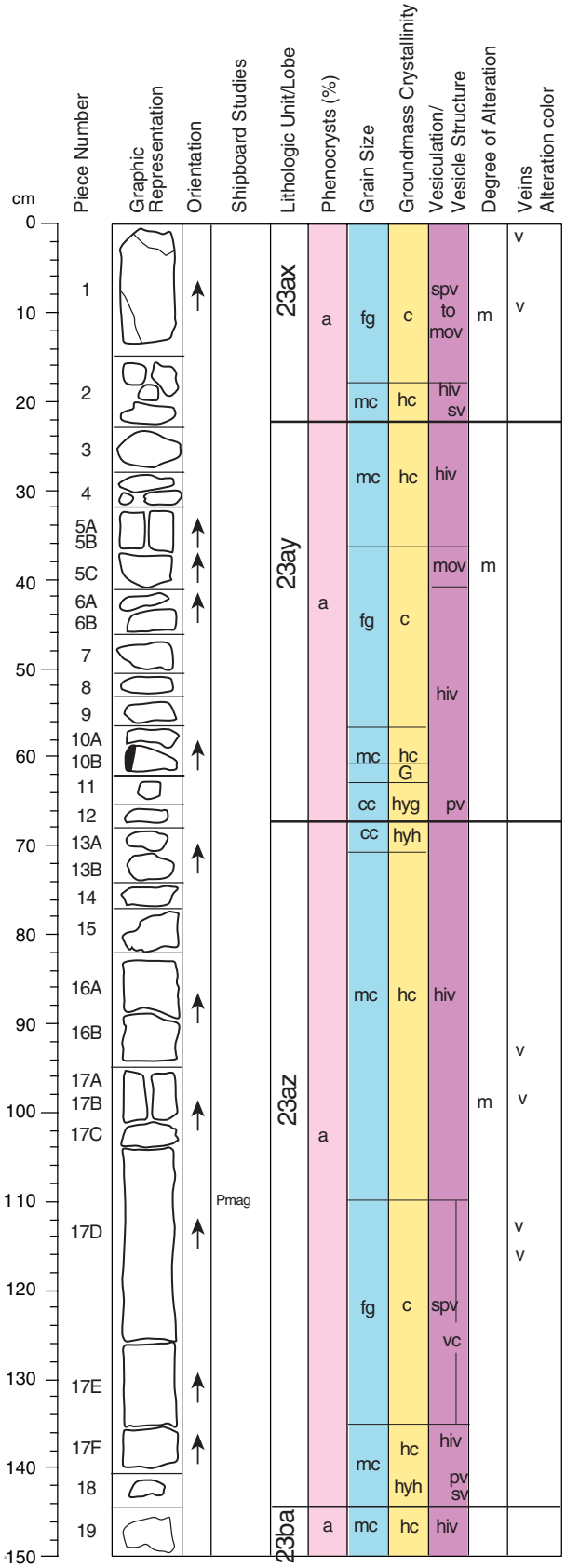
COMMENTS: (*)The amount of phenocrysts is below the sparsely phyric designation overall and the distribution of phenocrysts is not uniform. No olivine microphenocrysts could be identified. This is a continuation of Unit 23 as there is no obvious unit break between core sections.

Vesicularity ranges from sparsely vesicular in Pieces 2 and 5D, to highly vesicular in Pieces 1B, 9A, and 12B. Piece 5C (42-45 cm) contains a zone of coalesced vesicles filled with light green clay and white carbonate.

Vesicle cylinders (2 cm long and 2-4 mm wide) are present in Piece 2 (24-26 cm) and Piece 5D (57-60 cm). They are filled with basaltic material that is rich in plagioclase (and is lighter in color when wet than the surrounding basalt groundmass), is slightly coarser grained, and contains less glass.

Pipe vesicles (~1 cm long and ~3 mm wide) are present in Piece 10A, are lined with light green clay unfilled and are unfilled to partially or completely filled with white carbonate.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-55R-4 (Section top: 794.15 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT(*).

Pieces: 1A-19.

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	4	0.5	1.5	Euhedral to subhedral; blocky

GROUNDMASS: Fine grained. Plagioclase, clinopyroxene, black oxides and glass form a subvariolitic to intergranular texture.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	5-20	10	0.2	1	Subround to irregular

COLOR: Medium light gray (N6) to medium dark gray (N4). Moderate yellowish brown (10YR 5/4) in alteration halos.

STRUCTURE: Lobed. Lobe boundaries are defined on the basis of changes in vesicularity and slight grain size variations.

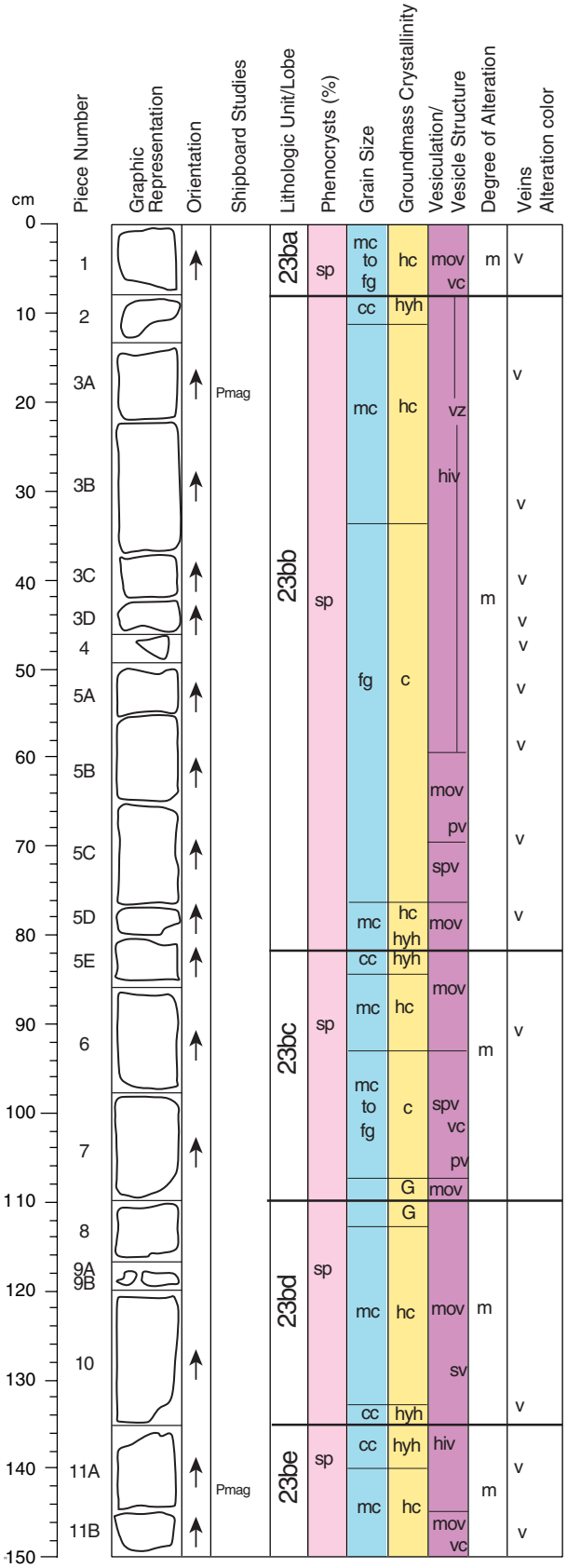
ALTERATION: Slight. Occasional Fe-oxyhydroxide halos are present around veins (e.g., Piece 1 and 17D). Approximately 60% of the vesicles are filled with white carbonate and lined with light green clay. The remainder are unfilled, but lined with light green clay. Sulfide is present in pipe vesicles (e.g., Piece 16) and in veins (e.g., Piece 17E).

VEINS/FRACTURES: Sparsely veined. Veins are randomly oriented (e.g., Pieces 5A-5C), are 0.1-2 mm wide and filled with white carbonate, Fe-oxyhydroxide, and sulfide.

COMMENTS: (*)The amount of phenocrysts is below the sparsely phyric designation overall, and the distribution of phenocrysts is not uniform. No olivine microphenocrysts could be identified.

A pipe vesicle is present in Pieces 16A and 16B (84-92 cm, 3-5 mm wide) filled with white carbonate and sulfide.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-55R-5 (Section top: 795.65 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT(*).

Pieces: 1-11B.

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	4	0.5	2	Euhedral to subhedral; blocky

GROUNDMASS: Fine grained. Plagioclase, clinopyroxene, black oxides and glass form an intergranular texture.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
1-15	10	0.2	1	Subround

COLOR: Medium dark gray (N4) to moderate yellowish brown (10YR 5/4) in alteration halos.

STRUCTURE: Lobed. Lobe boundaries are defined on the basis of changes in vesicularity, slight grain size variations, and the presence of alteration halos at lobe boundaries.

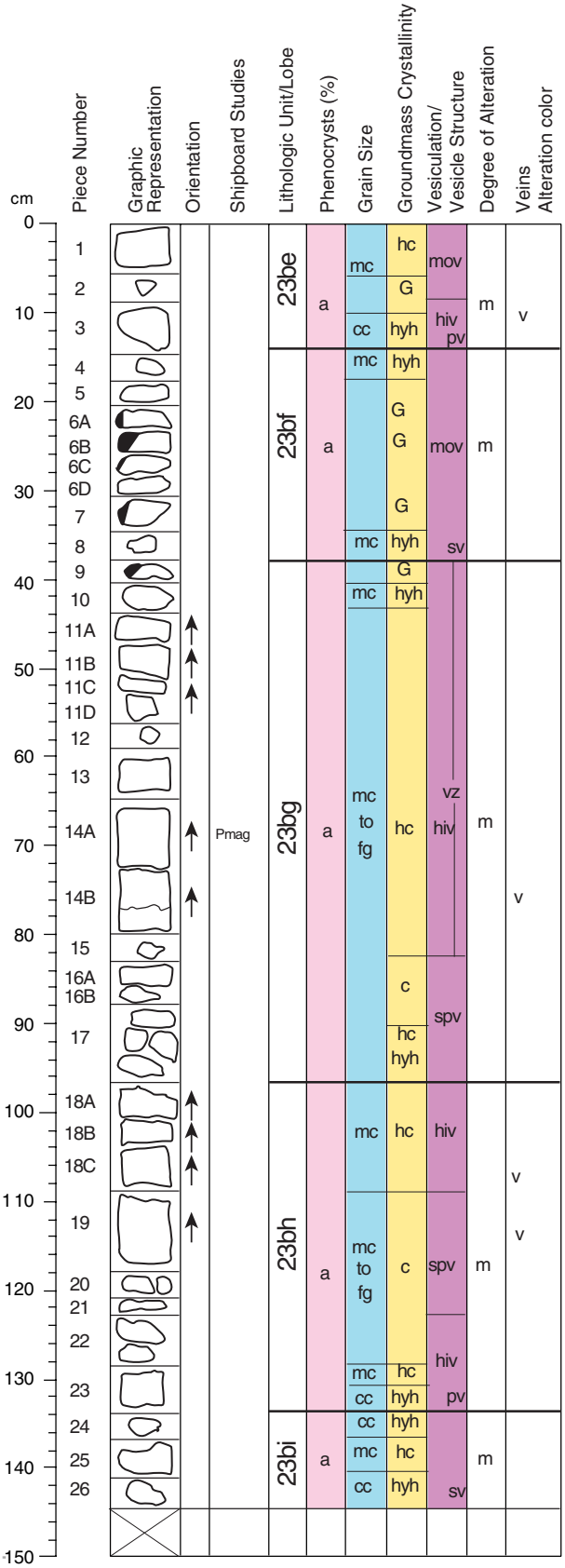
ALTERATION: Moderate. Most veins have 1-2 cm Fe-oxyhydroxide alteration halos are present around veins. Approximately 60% of the vesicles are filled with white carbonate and lined with light green clay. The remainder are unfilled, but lined with light green clay. Sulfide is present in pipe vesicles (e.g., Piece 7) and in veins.

VEINS/FRACTURES: Sparsely to moderately veined. Veins are randomly oriented, are <2 mm wide and filled with white carbonate, Fe-oxyhydroxide, and sulfide.

COMMENTS: (*)The amount of phenocrysts is below the sparsely phyric designation overall, and the distribution of phenocrysts is not uniform. A single 5 mm olivine phenocryst is present in Piece 1 (7 cm). This is a continuation of Unit 23 as there is no obvious unit break between core sections.

Pipe vesicles (3-5 mm wide) are present in Piece 5C (73-77 cm) and Piece 7 (99-104 cm) filled with white carbonate and sulfide.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-56R-1 (Section top: 799.3 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT(*).

Pieces: 1A-26.

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	3	0.5	1	Euhedral to subhedral; blocky

GROUNDMASS: Microcrystalline to fine grained. Plagioclase, clinopyroxene, black oxides and glass form a subvariolitic to intergranular texture in fine-grained regions. A subtrachytic texture is occasionally present around vesicles.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
2-30	10	0.2	1	Subround to irregular

COLOR: Medium gray (N5) to medium light gray (N6). Moderate yellowish brown (10YR 5/4) and greenish gray (5G 6/1) in alteration halos.

STRUCTURE: Lobed. Lobe boundaries are defined on the basis of changes in vesicularity, slight grain size variations, the presence of greenish gray alteration fronts and interlobe sediment (e.g., Pieces 6A, 6B, and 7-9).

ALTERATION: Slight to moderate. Occasional Fe-oxyhydroxide and light green clay alteration halos are present at the lobe contacts (e.g., Pieces 7-9). Approximately 50% of the vesicles are partially to totally filled with white carbonate and sulfide, and the remainder are unfilled, but lined with light green clay.

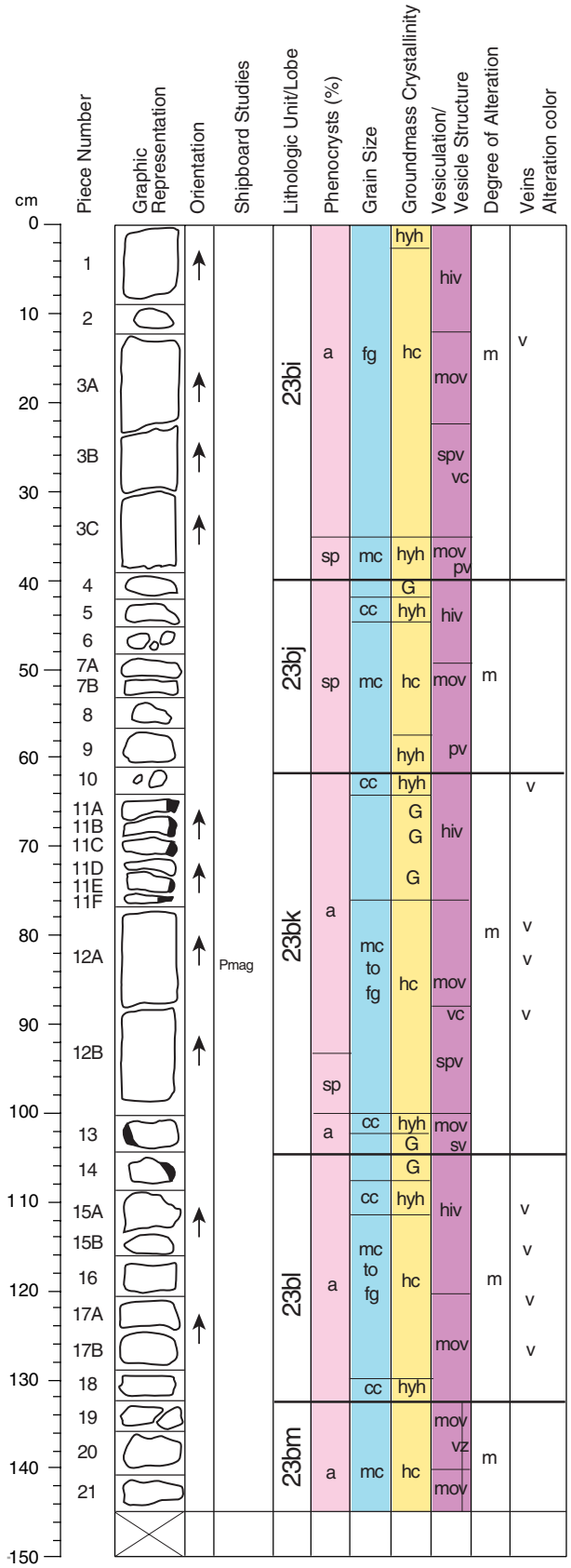
VEINS/FRACTURES: Veins are rare. Thin (0.1-2 mm wide) veins are present in Pieces 14B and 19. They are subvertical and subhorizontal and filled with white carbonate, Fe oxyhydroxide, and sulfide.

COMMENTS: (*)The amount of phenocrysts is below the sparsely phyric designation overall, but the distribution of phenocrysts is not uniform. This is a continuation of Unit 23 as there is no obvious unit break (i.e., change in mineralogy and lobe morphology) between the end of core 55R and the beginning of 56R.

Vesicularity ranges from sparsely vesicular (e.g., Piece 19A), to highly vesicular (e.g., Pieces 1, 14A, and 23).

Patches of coarser grained (segregation?) material (2 x 1 cm) is present in Piece 19. It is rich in plagioclase (and is lighter in color when wet than the surrounding basalt groundmass), but contains less glass.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-56R-2 (Section top: 800.75 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT(*).

Pieces: 1-21

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	3	0.5	1	Euhedral to subhedra blocky

GROUNDMASS: Fine grained to microcrystalline. Plagioclase, clinopyroxene black oxides and glass form a subvariolitic to intergranular texture in fine-grained regions. A subtrachytic texture is occasionally present around vesicles.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
5-30	10	0.2	1	Subround to irregular

COLOR: Medium gray (N5) to medium light gray (N6). Moderate yellowish brown (10YR 5/4) and greenish gray (5G 6/1) in alteration halos.

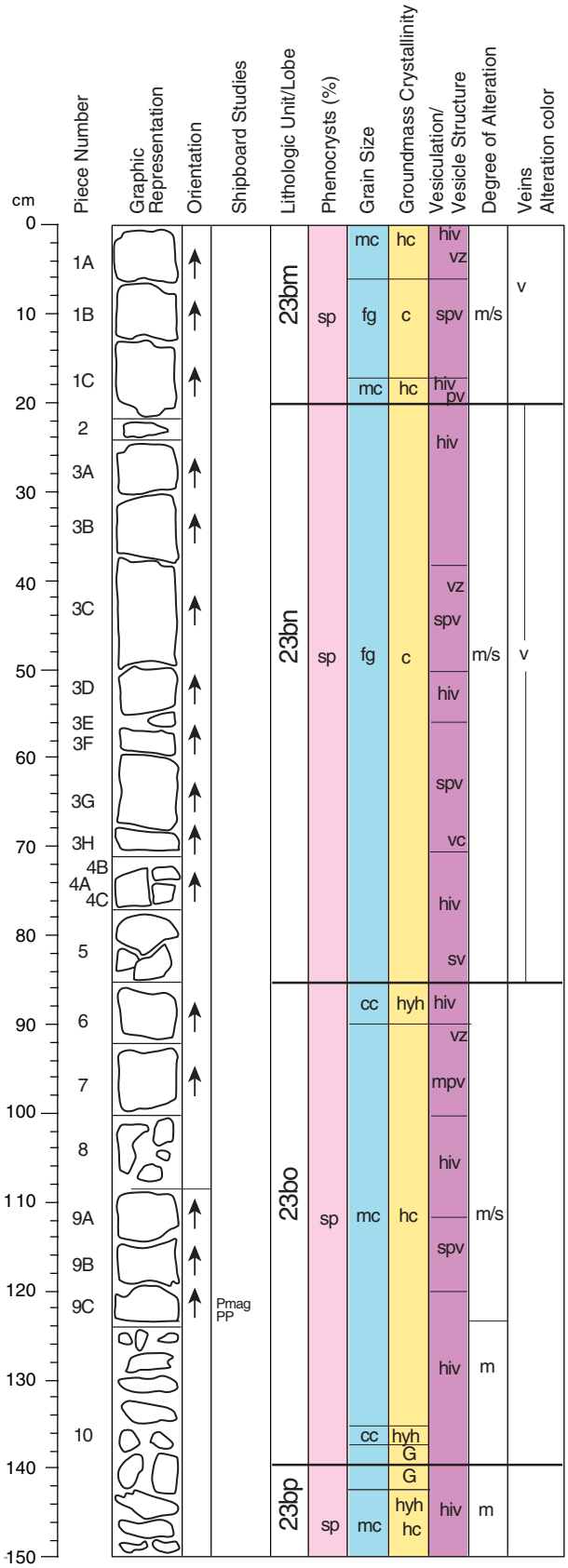
STRUCTURE: Lobed. Lobe boundaries are defined on the basis of changes vesicularity, slight grain size variations, and the presence of devitrified glassy margins on Pieces 11, 13, and 14.

ALTERATION: Slight to moderate. Fe-oxyhydroxide and light green clay alteration halos are present at the lobe contacts (no unaltered glass is preserved). Approximately 50% of the vesicles are partially to totally filled wit white carbonate and sulfide, and the remainder are unfilled, but lined with ligl green clay.

VEINS/FRACTURES: Veins are rare. Thin (0.1-2 mm wide) veins are presen in Pieces 3A, 12A, 12B and 15-18, and are filled with white carbonate, Fe-oxyhydroxide, and sulfide.

COMMENTS: (*)The amount of phenocrysts is below the sparsely phyric designation overall, but the distribution of phenocrysts is not uniform.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-56R-3 (Section top: 802.19 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT(*).

Pieces: 1A-10A.

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<2	8	0.5	3	Subhedral; blocky

GROUNDMASS: Fine grained to microcrystalline. Plagioclase, clinopyroxene, black oxides and glass form a subvariolitic to intergranular texture in fine-grained regions.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
5-30	10	0.2	1	Subround to irregular

COLOR: Medium gray (N5) to medium light gray (N6). Moderate yellowish brown (10YR 5/4) and greenish gray (5G 6/1) in alteration halos.

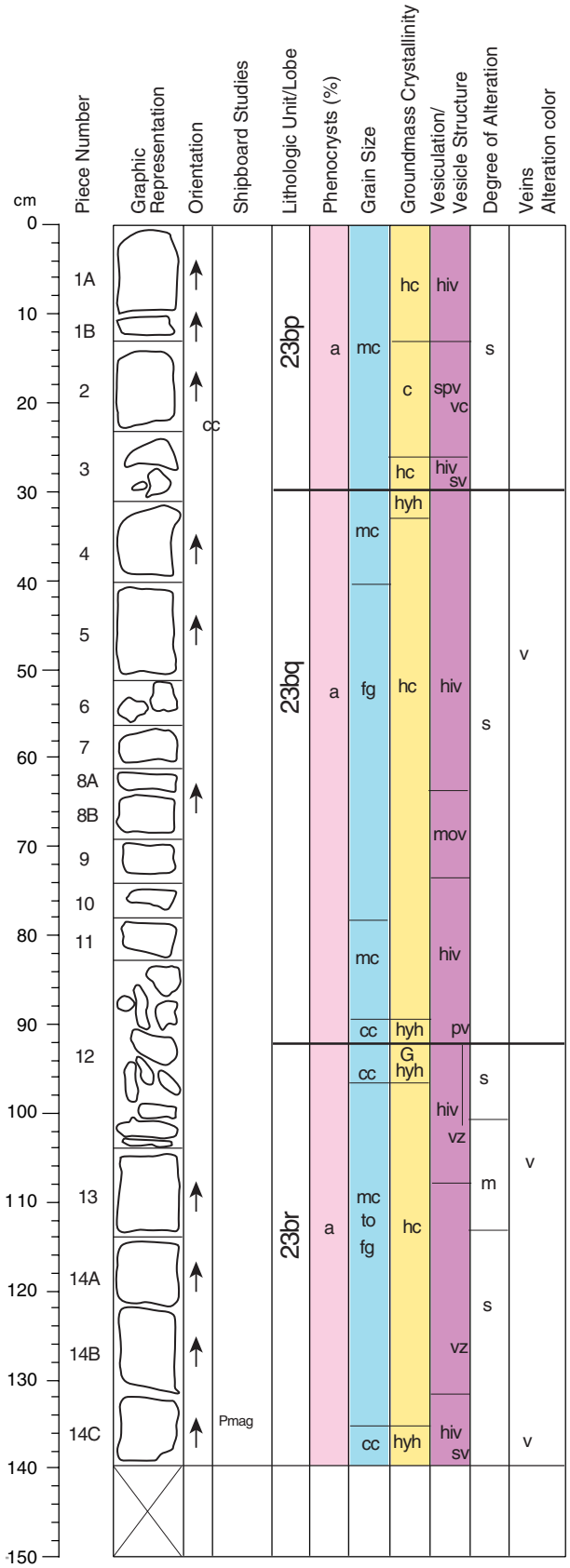
STRUCTURE: Lobed. Lobe boundaries are defined on the basis of changes in vesicularity, slight grain size variations, and the presence of alteration halos at lobe boundaries.

ALTERATION: Moderate. 1-2 cm Fe-oxyhydroxide alteration halos are present around veins. Approximately 60% of the vesicles are filled with white carbonate and lined with light green clay. The remainder are unfilled, but lined with light green clay. Sulfide is present in veins.

VEINS/FRACTURES: Veins are rare. Thin (0.1-2 mm wide) veins are present in Pieces 3 and 7. They are randomly oriented and filled with white carbonate, Fe-oxyhydroxide, and sulfide.

COMMENTS: (*)The amount of phenocrysts is below the sparsely phyric designation overall, but the distribution of phenocrysts is not uniform.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-56R-4 (Section top: 803.69 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT(*).

Pieces: 1A-14C.

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1	3	1	1.5	Euhedral; blocky

GROUNDMASS: Fine grained. Plagioclase, clinopyroxene, black oxides and glass form a subvariolitic to intergranular texture in fine-grained regions.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	2-30	10	0.2	1	Subround to irregular

COLOR: Medium dark gray (N4) to medium light gray (N6). Pale brown (5YR 5/2) in alteration halos.

STRUCTURE: Lobed. Lobe boundaries are defined on the basis of changes in vesicularity and slight grain size variations.

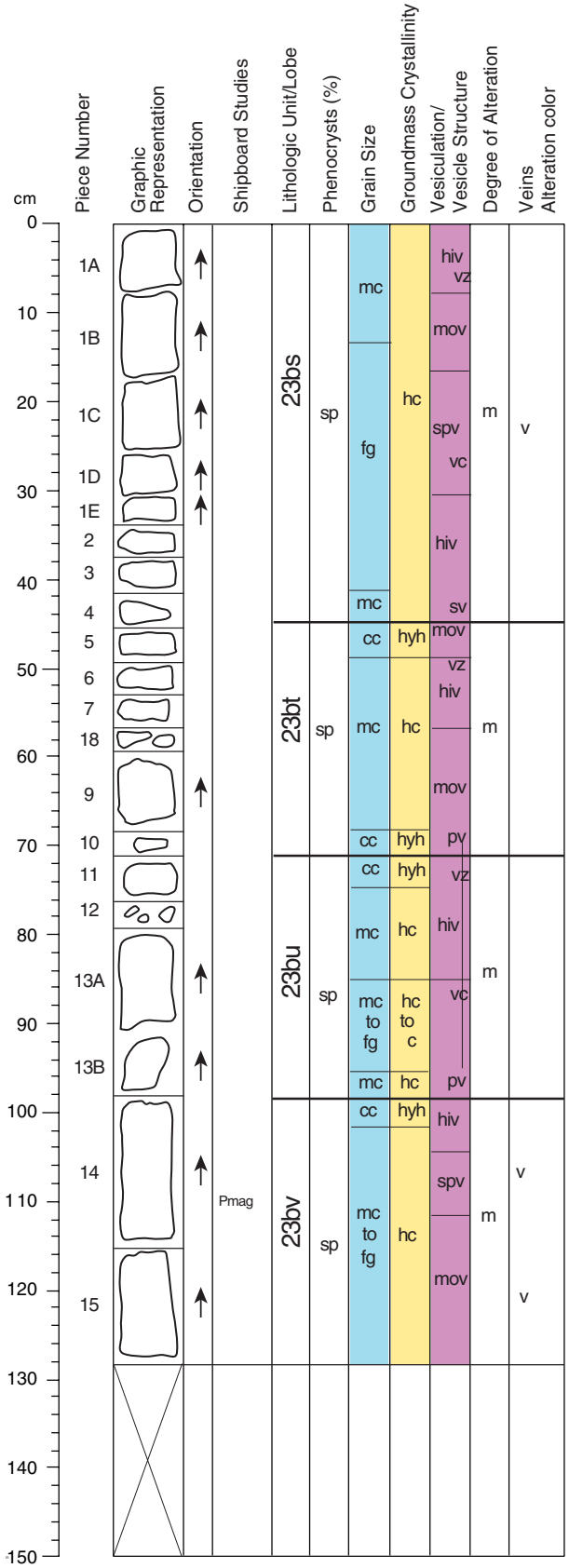
ALTERATION: Slight. Occasional Fe-oxyhydroxide alteration halos are present around veins (e.g., Pieces 13, and 14A-C). Approximately 50% of the vesicles are partially to totally filled with white carbonate and Fe-oxyhydroxide, and the remainder are unfilled, but lined with light blue-green clay.

VEINS/FRACTURES: Sparsely veined. Veins are <0.1 mm to >5 mm wide, are subvertical and subhorizontal, and filled with white carbonate, Fe-oxyhydroxide, and green clay.

COMMENTS: (*)The amount of phenocrysts is below the sparsely phyric designation overall, but the distribution of phenocrysts is not uniform. Vesicularity ranges from sparsely vesicular (e.g., Piece 14A) to highly vesicular (e.g., Piece 1A).

Pipe vesicles are present in Pieces 5 (42-45 cm), 8B (65-67 cm), and14B (124-132 cm). They are 1-3 cm long and 3-5 mm wide, and are partially to totally filled with white carbonate and Fe-oxyhydroxide, and lined with light blue-green clay. The pipe vesicles are present in sparsely vesicular regions.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-56R-5 (Section top: 805.08 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT(*).

Pieces: 1A-15A.

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1-2	5	0.5	2	Euhedral to subhedral; blocky

GROUNDMASS: Fine grained to aphanitic. Plagioclase, clinopyroxene, black oxides and glass form a subvariolitic to intergranular texture in fine-grained regions.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
5-30	10	0.2	1	Subround to irregular

COLOR: Medium gray (N5) to medium light gray (N6). Moderate yellowish brown (10YR 5/4) and greenish gray (5G 6/1) in alteration halos.

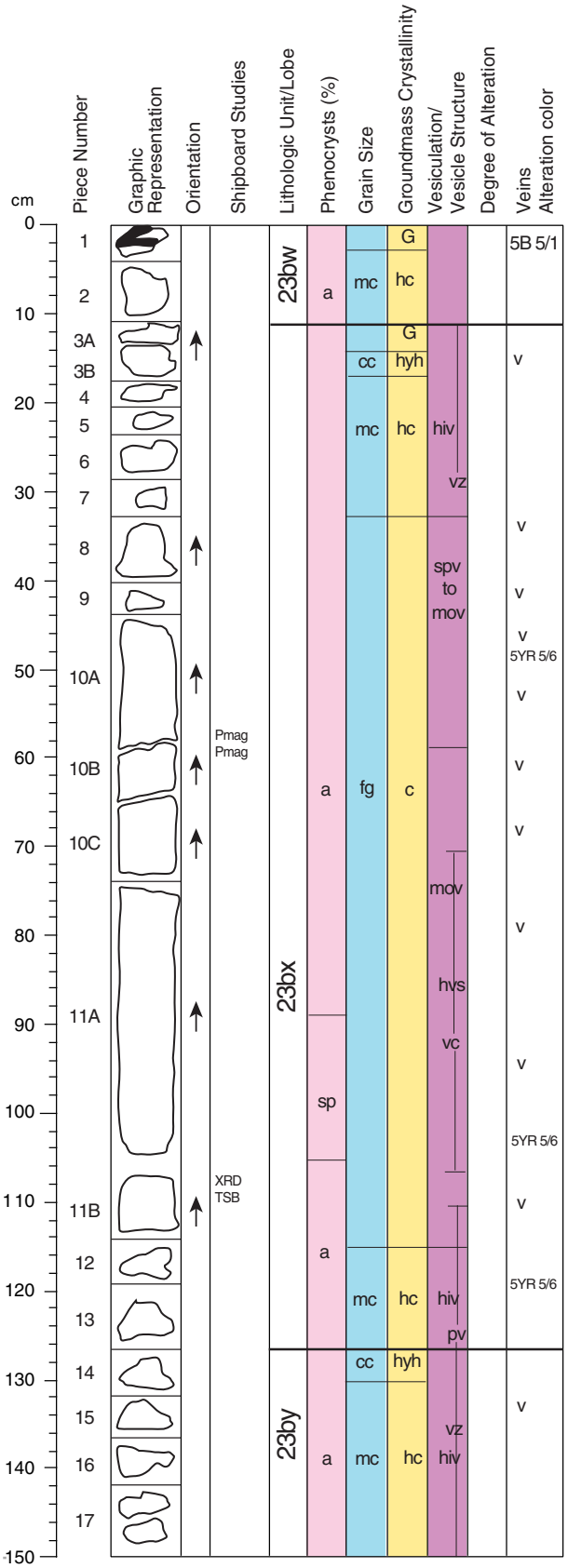
STRUCTURE: Massive.

ALTERATION: Slight to moderate. Fe-oxyhydroxide and light green clay alteration halos are present within 1 cm of veins. Approximately 50% of the vesicles are partially to totally filled with white carbonate and sulfide, and the remainder are unfilled, but lined with light green clay.

VEINS/FRACTURES: Thin (0.1-3 mm wide) veins are present in Pieces 1, 2, 3, 13, 14, and 15, and are filled with white carbonate, Fe-oxyhydroxide, and sulfide.

COMMENTS: (*)The amount of phenocrysts is below the sparsely phyric designation overall, but the distribution of phenocrysts is not uniform.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-57R-1 (Section top: 808.9 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-17B

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1-5	6.0	0.5	1-2	Euhedral/tabular.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
20-30	3	0.5	1-2	Round

COLOR: Light gray (N6).

STRUCTURE: Lobed[2]. When glassy lobe margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. Most of vesicles filled with carbonate and more rarely rusty brown clay with botroidal habit (usually in the proximity of veins). Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

VEINS/FRACTURES: Sparsely to moderately veined. Calcite fills in 1-3mm wide cracks that most likely are the original cooling joints of the lava. Veins in Pieces 10A and 11A are surrounded by a gray-brown alteration halo.

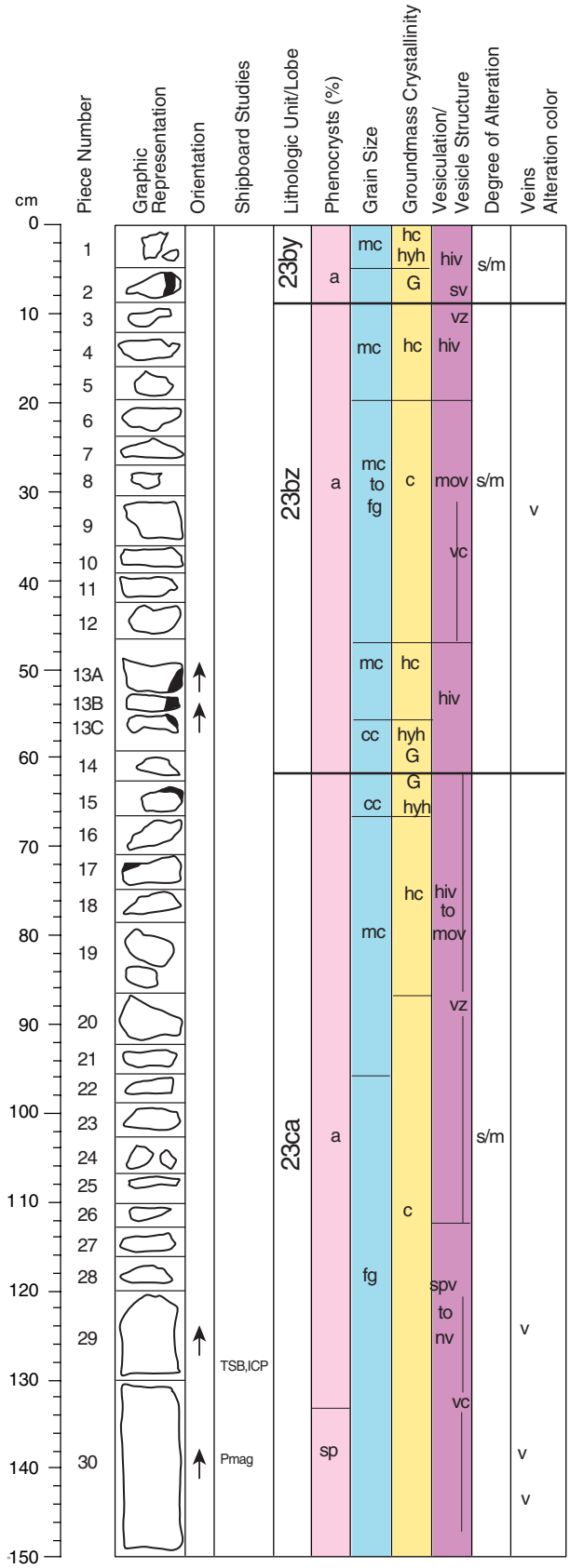
COMMENTS:

[1] Highly vesicular basalt with sparse (0.5-6 mm) plagioclase phenocrysts. The amount of phenocrysts is generally below the sparsely phyric designation, whereas higher concentrations (≤5%) are present in massive lobe interiors. No olivine microphenocrysts could be identified. This is a continuation of Unit 23 as there is no obvious unit break between Cores 56R and 57R.

[2] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

A >22 cm long and 2 cm wide vesicle cylinder occurs in Piece 11A (81-105 cm), and a 1 cm thick horizontal vesicle sheet extends from it at 86 cm. The vesicle cylinder originates from the pipe vesicle rich zone at 107-110 cm.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-57R-2 (Section top: 810.4 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-30A

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1-5	5	0.5	1-2	Euhedral; tabular.

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
5-25	3	0.5	1-2	Round

COLOR: Light gray (N6).

STRUCTURE: Lobed[2]. When glassy lobe margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. Most vesicles are filled with white carbonate. Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide. Veins typically are surrounded by a gray brown alteration halo.

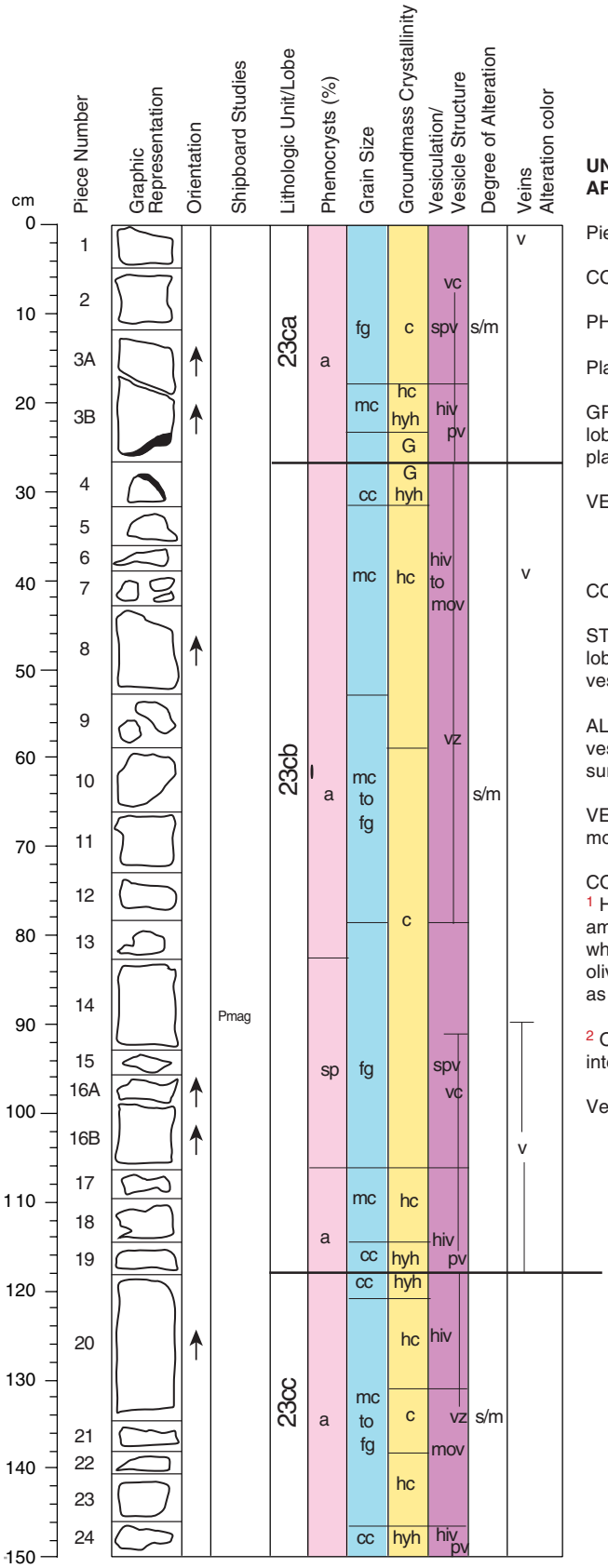
VEINS/FRACTURES: Sparsely veined, where calcite fills in 1-3mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:
[1] Highly vesicular basalt with sparse (0.5-5 mm) plagioclase phenocrysts. The amount of phenocrysts is generally below the sparsely phyric designation, whereas higher concentrations (≤5%) are present in massive lobe interiors. No olivine microphenocrysts could be identified. This is a continuation of Unit 23 as there is no obvious unit break between core sections.

[2] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Well-developed vesicle cylinders are present in Pieces 29, 30A, and 30B (120-148 cm).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-57R-3 (Section top: 811.9 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-24A

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1-5	6.0	0.5	1-2	Euhedral; tabular

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
5-25	3	0.5	1-2	Round

COLOR: Light gray (N6).

STRUCTURE: Lobed[2]. When glassy lobe margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. Most of vesicles filled with carbonate. Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide. Veins typically are surrounded by a gray-brown alteration halo.

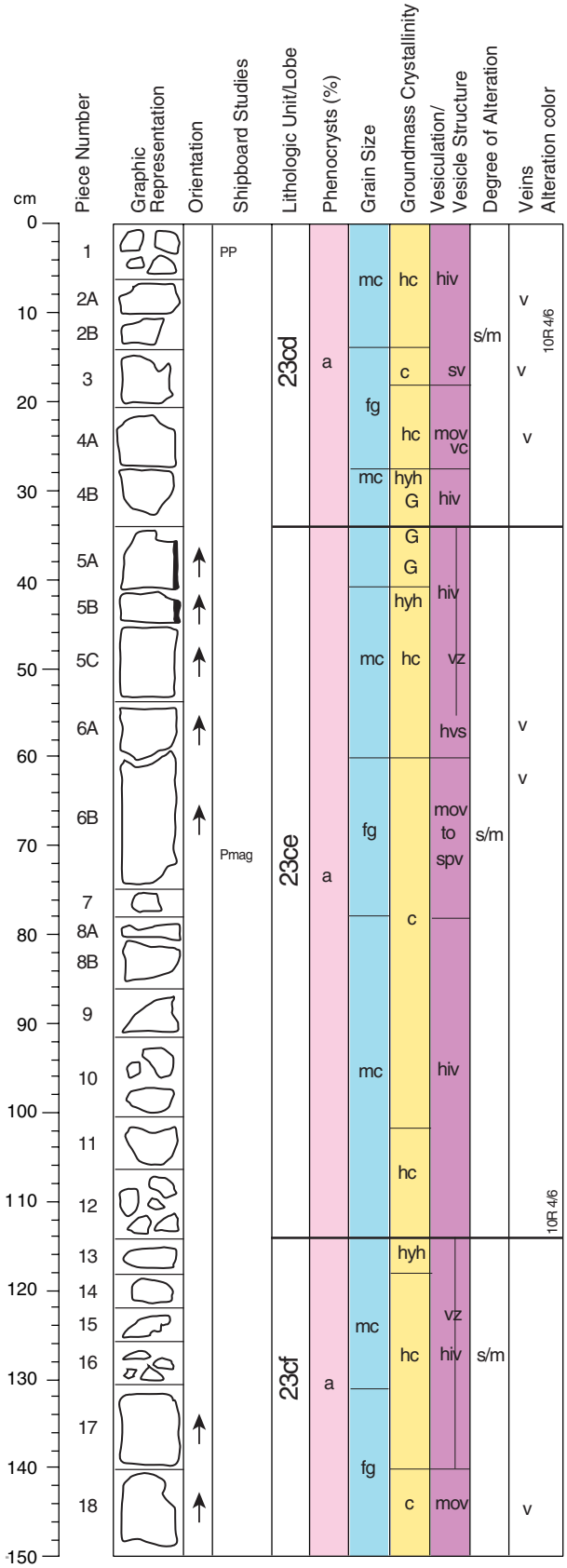
VEINS/FRACTURES: Sparsely veined. Calcite fills in 1-3mm wide cracks that most likely are the original cooling joints of the lava.

COMMENTS:
[1] Highly vesicular basalt with sparse (0.5-5mm) plagioclase phenocrysts. The amount of phenocrysts is generally below the sparsely phyric designation, whereas higher concentrations (≤5%) are present in massive lobe interiors. No olivine microphenocrysts could be identified. This is a continuation of Unit 23 as there is no obvious unit break between core sections.

[2] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Vesicle cylinders are present in Pieces 2, (6-11 cm), and 16B, (100-106 cm).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-57R-4 (Section top: 813.41 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT[1].

Pieces: 1A-18A

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	~1			1	Euhedral; tabular

GROUNDMASS: Microcrystalline to fine grained, typically hypohaline near lobe margins, hypocrystalline to holocrystalline in lobe interior. Consist of plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
5-25	5	0.5	1-2	Round

COLOR: Light gray (N6).

STRUCTURE: Lobed[2]. When glassy lobe margins were not recovered the lobe margins were inferred from changes in groundmass crystallinity and vesicularity, as well as from distribution of vesicle structures.

ALTERATION: Moderate. Most of vesicles filled with carbonate. Occasional vesicles contain sulfide, green clay and Fe-oxyhydroxide.

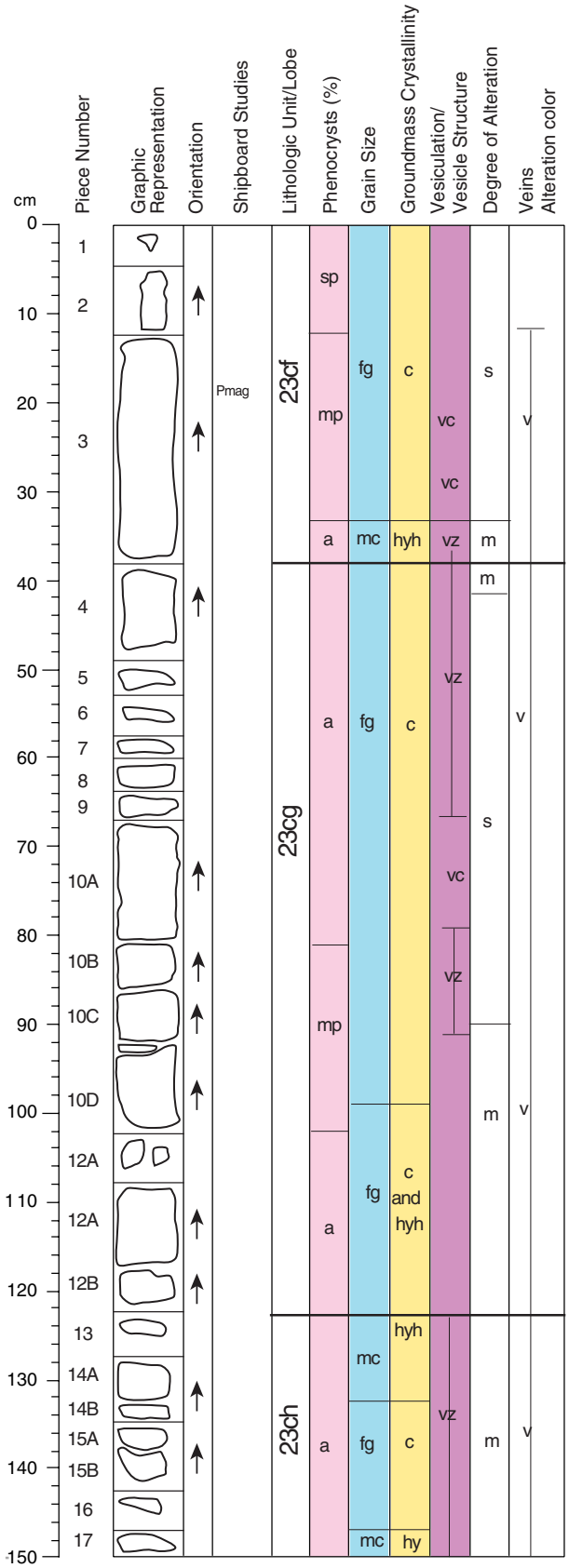
VEINS/FRACTURES: Sparsely veined. Calcite fills in 1-3mm wide cracks that most likely are the original cooling joints of the lava. Veins typically are surrounded by a gray-brown alteration halo.

COMMENTS:
[1] Highly vesicular basalt with occasional <1mm plagioclase phenocrysts. The amount of phenocrysts is generally below the sparsely phyric designation. No olivine microphenocrysts could be identified.
This is a continuation of Unit 23 as there is no obvious unit break between core sections.

[2] On basis of lobe sizes, vesicularity, and distribution of vesiculation we interpret this to be pahoehoe lava.

Vesicle cylinders are present in Piece 4A (22-27 cm).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-58R-1 (Section top: 814.5 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT(*).

Pieces: 1-17

CONTACTS: None.

PHENOCRYSTS: Variable abundance and distribution.

	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1-5	7	0.5	2	Euhedral to subhedral; blocky

GROUNDMASS: Fine grained to aphanitic. Plagioclase, clinopyroxene, black oxides and glass form an intergranular texture in fine-grained regions.

VESICLES:

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
0-30	8	0.2	1	Subround to irregular

COLOR: Medium gray (N5) to medium dark gray (N4). Pale yellowish orange (10YR 8/6) at lobe margins.

STRUCTURE: Lobed. Lobe boundaries are present at 38 cm and 122 cm, and are defined by presence of pipe vesicles and glassy margins.

ALTERATION: Slight to moderate. Fe-oxyhydroxide is present close to lobe boundaries and from 72-94 cm. Approximately 50% of the vesicles are partially to totally filled with white carbonate and the remainder are unfilled, but lined with light green clay.

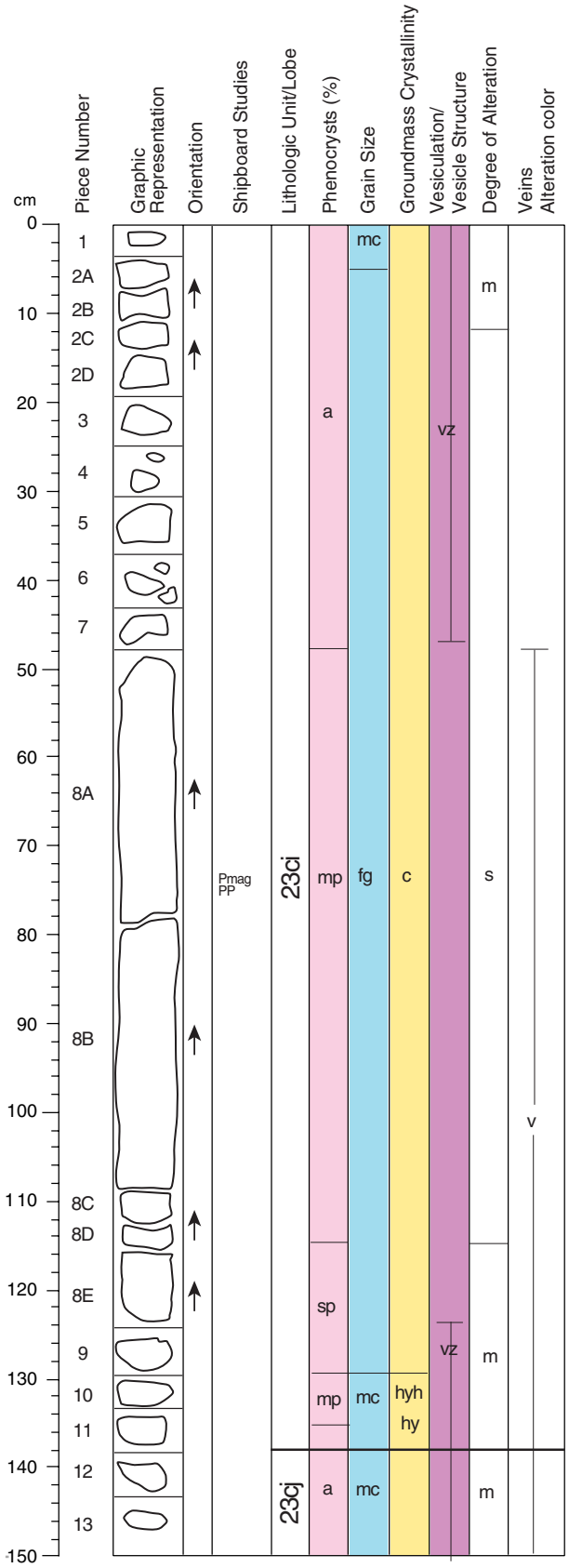
VEINS/FRACTURES: Thin (0.1-3 mm wide) veins are present throughout and are filled with white carbonate, Fe-oxyhydroxide and sulfide.

COMMENTS: (*)The amount of plagioclase phenocrysts is below the sparsely phyric designation overall, but distribution is not uniform. This is a continuation of Unit 23 as there is no obvious unit break (i.e., change in mineralogy and lobe morphology) between Cores 57R and 58R.

Plagioclase tends to be more abundant towards the upper part of the massive interior of each lobe (i.e., in the poorly vesicular zones).

Vesicle cylinders are present from 22-28 cm, and 70-76 cm.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-58R-2 (Section top: 816.01 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT(*).

Pieces: 1-13

CONTACTS: None.

PHENOCRYSTS: Variable abundance and distribution.

	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1-6	10	0.5	2	Euhedral to subhedral; blocky

GROUNDMASS: Fine grained to aphanitic. Plagioclase, clinopyroxene, black oxides and glass form an intergranular texture in fine-grained regions.

VESICLES:

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
0-30	6	0.2	1	Subround to irregular

COLOR: Medium gray (N5) to medium dark gray (N4).

STRUCTURE: Lobed. Lobe boundaries are present at 0 cm and 122 cm, and are defined by presence of glassy margins.

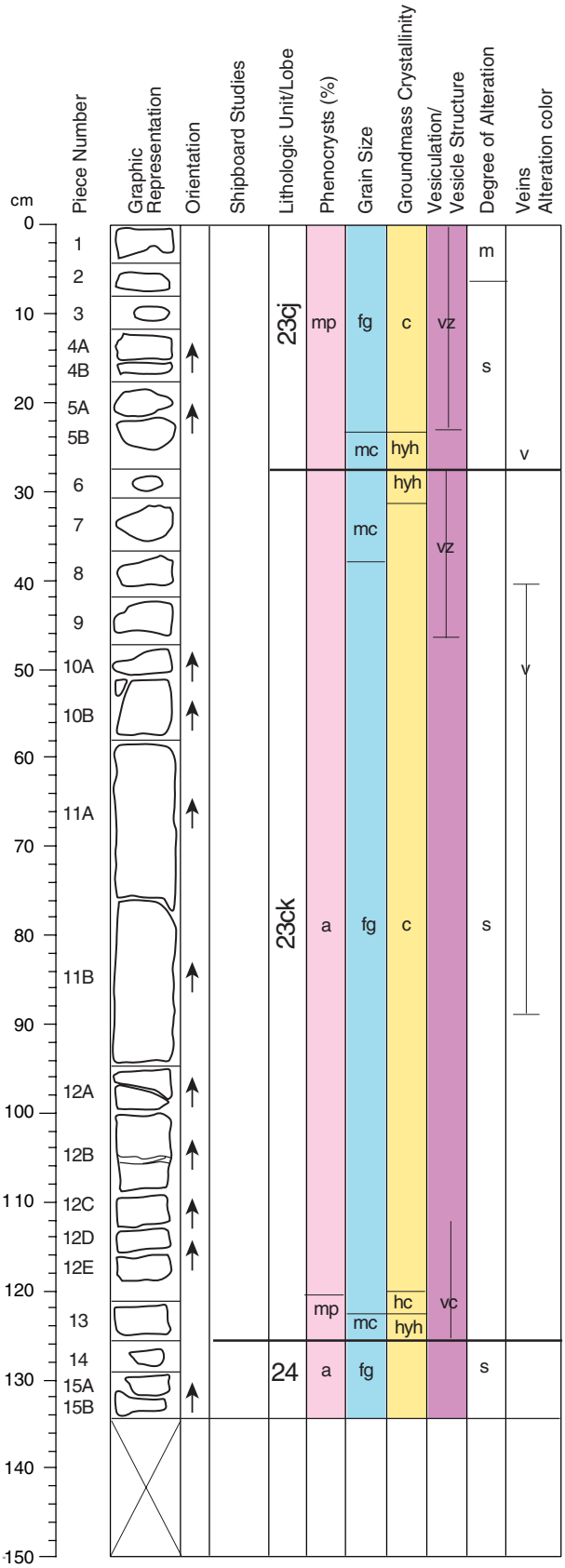
ALTERATION: Slight to moderate. Fe-oxyhydroxide is present close to lobe boundaries (e.g., 0-10 cm and 124-150 cm). Approximately 50% of the vesicles are partially to totally filled with white carbonate and the remainder are unfilled, but lined with light green clay.

VEINS/FRACTURES: Thin (0.1-3 mm wide) veins are present throughout and are filled with white carbonate, Fe-oxyhydroxide and sulfide.

COMMENTS: (*)The amount of plagioclase phenocrysts is below the sparsely phyric designation overall, but distribution is not uniform. This is a continuation of Unit 23 as there is no obvious unit break (i.e., change in mineralogy and lobe morphology) between core sections.

Vesicles tend to be concentrated in the upper 40 cm of each lobe. Plagioclase tends to be more abundant towards the upper part of the massive interior of each lobe (i.e., in the poorly vesicular zones).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-58R-3 (Section top: 817.51 mbsf)

UNIT 23: VESICULAR SPARSELY OLIVINE-PLAGIOCLASE PHYRIC TO APHYRIC BASALT(*).

Pieces: 1-13

CONTACTS: None observed. The boundary between Units 23 and 24 is inferred between Pieces 13 and 14 at 126 cm. Contact features planar and possibly eroded surface.

PHENOCRYSTS: Variable abundance and distribution.

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1-4	4	0.5	2	Euhedral to subhedral; blocky

GROUNDMASS: Fine grained to aphanitic. Plagioclase, clinopyroxene, black oxides and glass form an intergranular texture in fine-grained regions.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
0-20	4	0.2	1	Subround to irregular

COLOR: Medium gray (N5) to medium dark gray (N4).

STRUCTURE: Massive. Lobe boundaries are present at 28 cm and 123 cm, and are defined by presence of glassy margins and pipe vesicles.

ALTERATION: Slight to moderate. Fe-oxyhydroxide is present close to lobe boundaries (e.g., 29-36 cm and 127-150 cm). Approximately 50% of the vesicles are partially to totally filled with white carbonate and the remainder are unfilled, but lined with light green clay.

VEINS/FRACTURES: Thin (0.1-3 mm wide) veins are present from 40-88 cm and are filled with white carbonate, Fe-oxyhydroxide and sulfide. A wider 10 mm wide vein is present in Piece 6, and coincides with a lobe margin.

COMMENTS: (*)The amount of plagioclase phenocrysts is below the sparsely phyric designation overall, but distribution is not uniform. This is a continuation of Unit 23 as there is no obvious unit break (i.e., change in mineralogy and lobe morphology) between core sections.

Vesicles tend to be concentrated in the upper 20 cm of each lobe. Pipe vesicles occur at 114-124 cm, in the base of Lobe 23ck and are <8 mm in size.

UNIT 24: APHYRIC BASALT.

Pieces: 14-15 B

CONTACTS: None.

GROUNDMASS: Fine grained to aphanitic. Plagioclase, clinopyroxene and slightly altered glassy mesostasis.

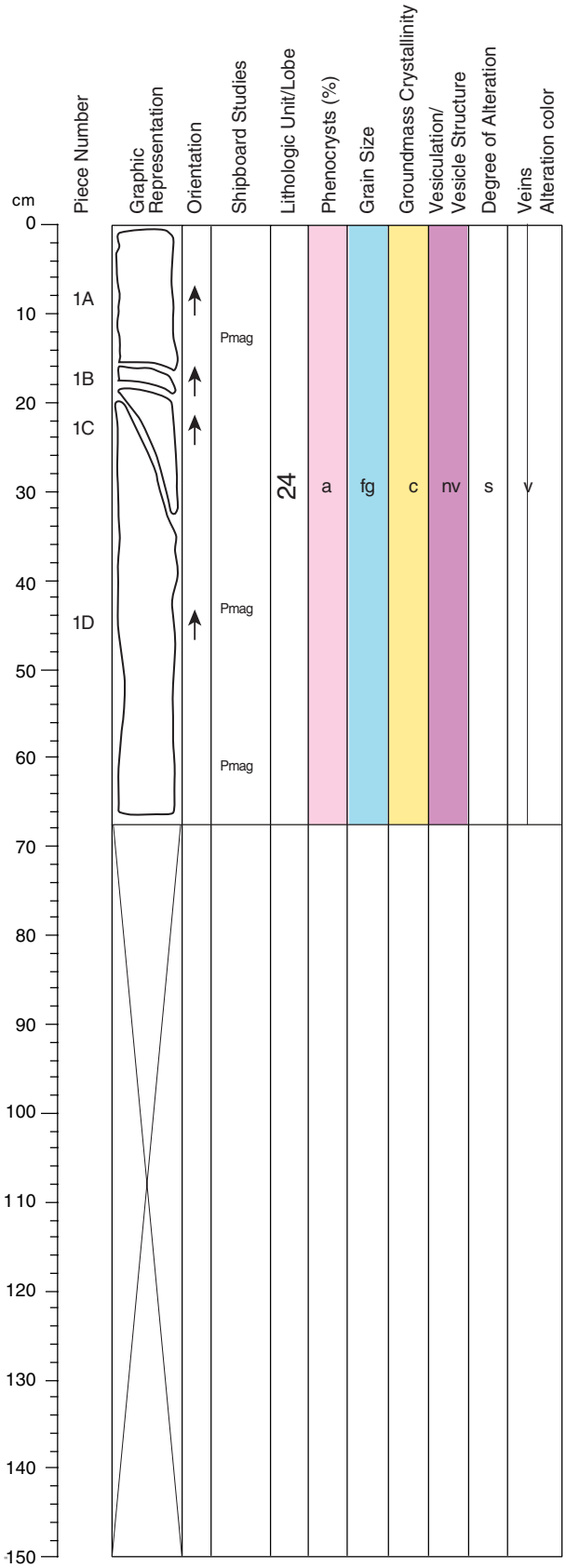
VESICLES: Nonvesicular

COLOR: Medium dark gray (N4).

STRUCTURE: Massive.

ALTERATION: Slight.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-58R-4 (Section top: 818.87 mbsf)

UNIT 24: VESICULAR APHYRIC BASALT.

Pieces: 1A-1D

CONTACTS: None.

GROUNDMASS: Fine grained to aphanitic. Plagioclase, clinopyroxene and slightly altered glassy mesostasis.

VESICLES: Nonvesicular

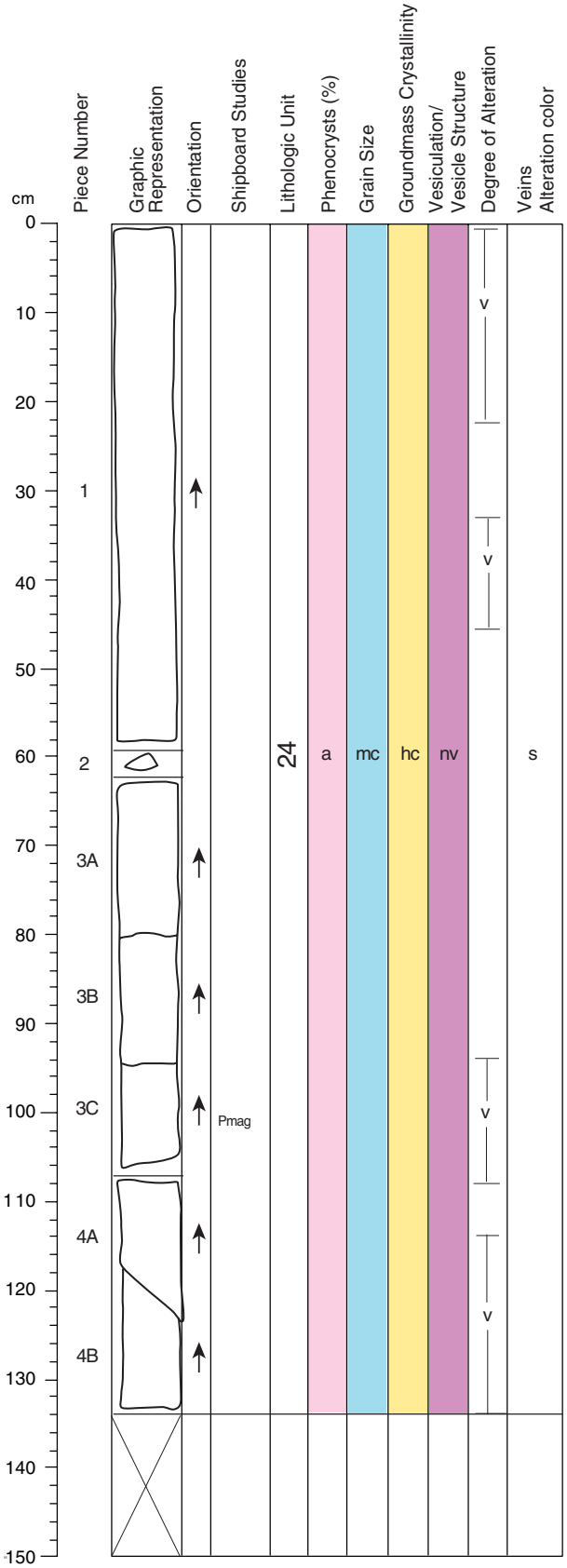
COLOR: Medium dark gray (N4).

STRUCTURE: Massive.

ALTERATION: Slight.

VEINS/FRACTURES: Sparsely veined. 0.2-3 mm wide carbonate filled veins are present throughout.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-59R-1 (Section top: 818.5 mbsf)

UNIT 24: APHYRIC BASALT.

Pieces: 1-4B

CONTACTS: None.

GROUNDMASS: Fine grained. Plagioclase, clinopyroxene, and black oxides form an intergranular texture.

VESICLES: Nonvesicular.

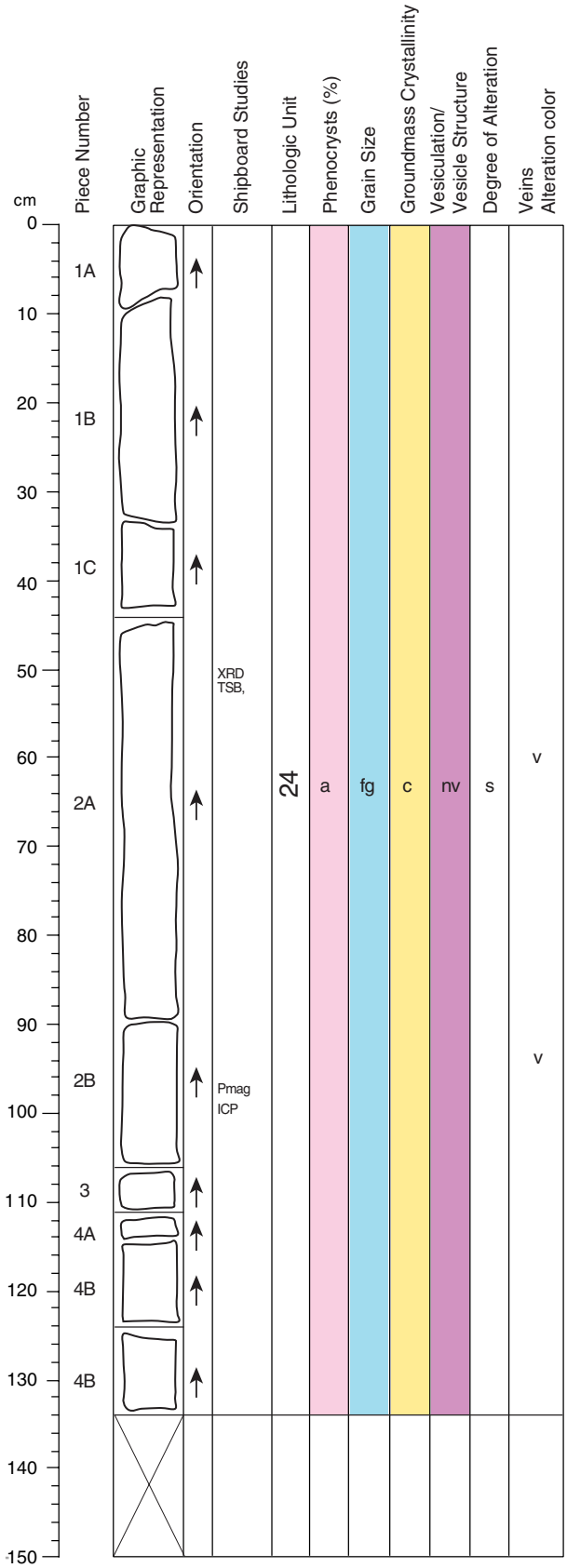
COLOR: Medium gray (N5) to medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Slight. The small amount of mesostasis has been altered to dark green clay adjacent to veins.

VEINS/FRACTURES: Sparsely veined. Veins are vertical, 0.1-3 mm wide, and filled with white carbonate and light green clay in Piece 1 and dark green clay in Piece 4.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-59R-2 (Section top: 819.86 mbsf)

UNIT 24: APHYRIC BASALT.

Pieces: 1A-5

CONTACTS: None.

GROUNDMASS: Fine grained. Plagioclase, clinopyroxene, and black oxides form an intergranular texture.

VESICLES: Nonvesicular.

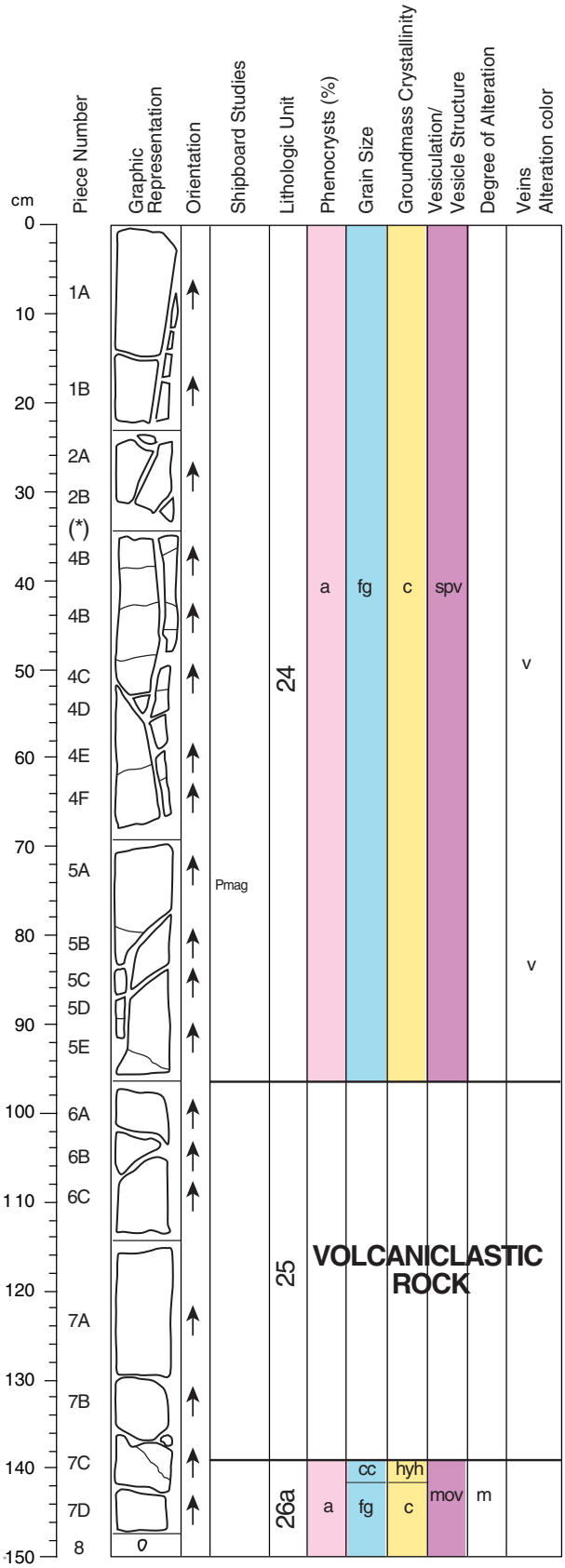
COLOR: Medium gray (N5) to medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Slight. The small amount of mesostasis has been altered to dark green clay adjacent to veins.

VEINS/FRACTURES: Sparsely veined. Veins are subvertical and horizontal, 0.1-2 mm wide, and filled with white carbonate and light green clay.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-59R-3 (Section top: 821.2 mbsf)

UNIT 24: APHYRIC BASALT.

Pieces: 1A-5E

CONTACTS: None observed. The contact between Units 24 and 25 is inferred to be between Pieces 5E and 6A at 95 cm.

GROUNDMASS: Fine grained, although grain size decreases between Piece 1A (~1.5 mm) and Piece 5E (~0.5 mm). Plagioclase, clinopyroxene, and black oxides form an intergranular texture.

VESICLES: Nonvesicular.

COLOR: Medium gray (N5) to medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Slight. The small amount of mesostasis has been altered to dark green clay adjacent to veins. Sulfide is present in small veins and the groundmass in Piece 5.

VEINS/FRACTURES: Sparsely veined. Veins are vertical and horizontal, <0.1-1.5 mm wide, and filled with white carbonate, light green clay, and sulfide.

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 7C-7D

CONTACTS: The contact between Units 25 and 26 preserved in Piece 7C. It is sharp and conformable with a maximum dip of 60°. It is present between 136 cm and 140 cm. Basalt at the contact, in a zone ~1 cm wide, is very highly to completely altered and is highly vesicular. Less altered centers of fragments indicate this zone is a glassy lobe margin.

GROUNDMASS: Fine grained. Plagioclase laths stand out because they are stained with Fe oxyhydroxide and give the appearance of being a phenocryst phase. A subtrachytic texture is evident in places, but alteration has obliterated much of the primary igneous texture.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Highly vesicular	20-30	4	1	2	Round to elongate and irregular

COLOR: Medium dark gray (N4).

STRUCTURE: Lobed. Defined on the basis of an altered glassy lobe margin and concentric veining in Piece 7C.

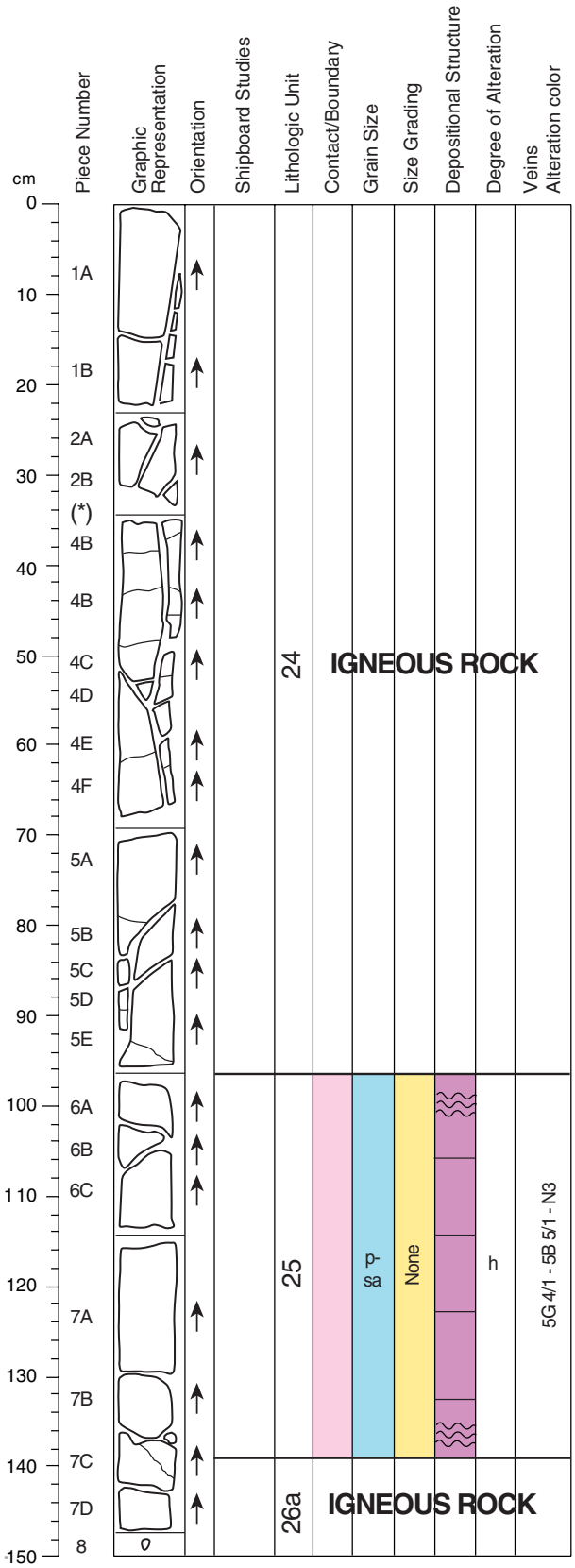
ALTERATION: High to complete. Vesicles are partially to totally filled with either white carbonate or light green clay, but are also unfilled and lined with green clay.

VEINS/FRACTURES: Sparsely veined. Thin (0.1 mm wide) veins are concentric with the unit boundary in Piece 7C and are filled with white carbonate and green clay.

COMMENTS: A fracture in Piece 7C is filled with angular silt-sized basalt fragments in a white carbonate cement.

(*) Note:Piece 3 does not exist. Piece labeling jumped from 2B to 4A.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-59R-3 (Section top: 821.2 mbsf)

UNIT 25: BASALT-TUFF.

Pieces: 6A-7C

CONTACTS: The contact between Units 24 and 25 is inferred to be between Pieces 5E and 6A at 95 cm. The contact between Units 25 and 26 is preserved in Piece 7C. It is sharp and curved (maximum dip is 60°) extending from 136 cm to 140 cm. This is a conformable contact because the vesicular glassy lobe margin is present.

GENERAL DESCRIPTION: The unit consists of bedded vitric tuff with 5-15 cm layers composed of fine to coarse sand (ash) size clasts alternating with 0.5-2 cm thick layers of silt (very fine grained ash) size clasts. The tuff is primarily made up of moderately to highly vesicular, angular glass fragments (sand size) and vesicle-free glass shards (silt size), with lesser amounts of angular, vesicular basalt lithic fragments. Dispersed throughout the unit are 5-15 mm clasts. In the lowest 10 cm (Pieces 7B and 7C, 130-140 cm) this coarse fraction is predominantly made up of lava lithics. In the upper portion of the unit (95-130 cm) the coarse fraction is composed of vesicular glass fragments.The degree of alteration makes distinguishing clasts difficult. They are defined by subtle changes in color and texture. The cement is predominantly carbonate. Alteration is very high to complete.

COLOR: Dark greenish gray (5G 4/1), medium bluish gray (5B 5/1), or dark gray (N3).

COMPONENTS:
Basalt clasts: 20%
Mineral fragments 1%
Tephra/glass clasts 59%
Cement 20%

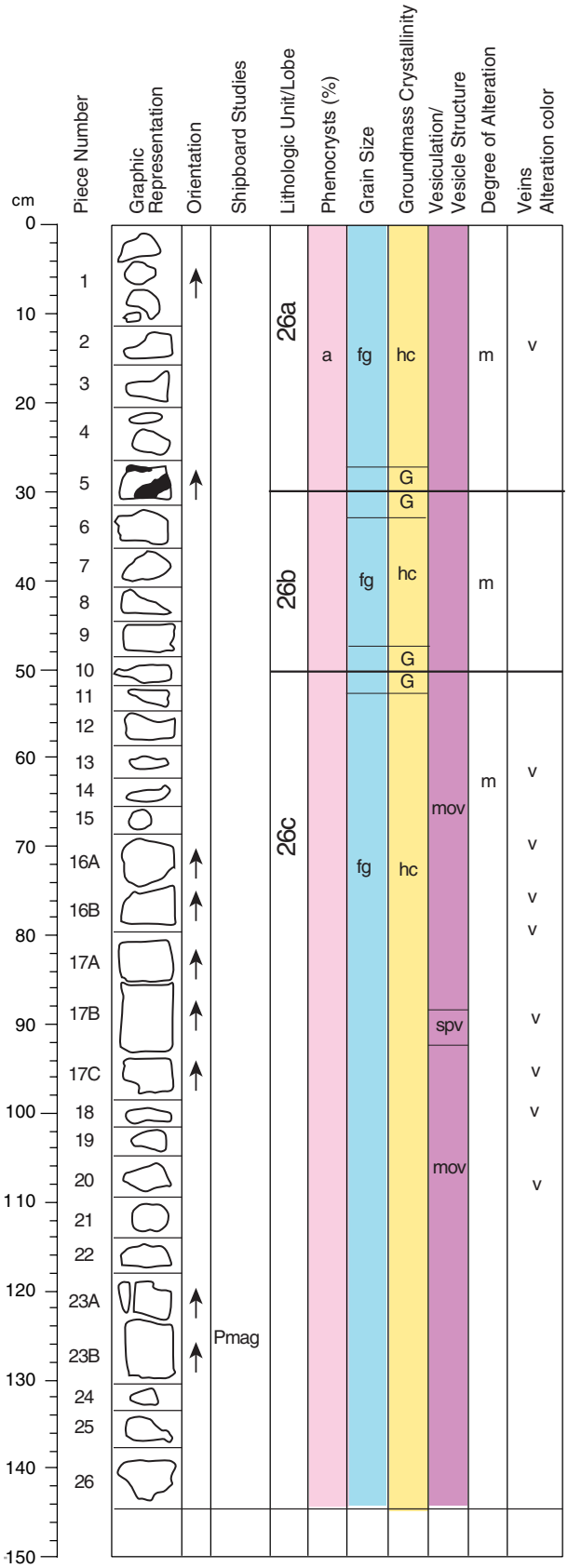
SEDIMENTARY TEXTURES: Piece 6C contains layers of very fine grained ash (96-100 cm and 110-112 cm) with disturbed bedding. The remainder of the unit is comprised of fine to coarse ash-size tuff, with scattered 5-15 mm phyric lava lithic clasts between 130 cm and 140 cm, with lapilli-size (2-12 mm) vesicular glassy clasts between 95-130 cm.

SEDIMENTARY STRUCTURES: Bedded. Alternation of 5-15 cm thick fine to coarse ash layers and 1-2 cm very fine grained ash layers. Each layer is massive. The upper contact of the very fine grained ash layer at 110-112 cm is undulating and disturbed and the bedding of the upper very fine grained tuff layer is highly disturbed.

COMMENTS: This unit most likely represents resedimented vitric tuff accumulated onto an a lava surface that had experienced little modification by weathering and/or erosion prior to deposition of Unit 25.

(*) Note:Piece 3 does not exist. Piece labeling jumped from 2B to 4A.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-59R-4 (Section top: 822.66 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-26

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase	<<1	3	1	2	Euhedral to subhedral

GROUNDMASS: Fine grained. Plagioclase, clinopyroxene, and possibly some completely altered microphenocrysts.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
2-10	5	0.5	2	Irregular

COLOR: Medium dark gray (N4).

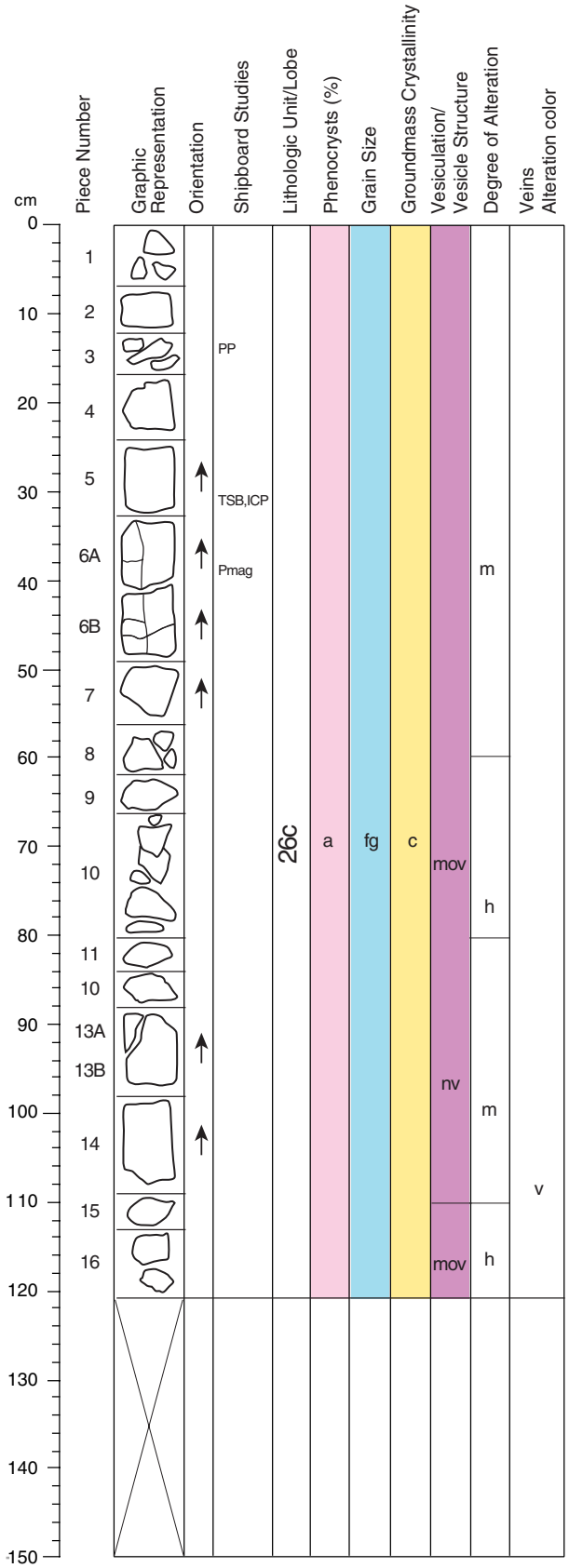
STRUCTURE: Lobed.

ALTERATION: Moderate. Sparse olivine is completely altered to Fe-oxyhydroxide. Mesostasis is altered to dark gray clay. Glass altered to dark greenish-gray clay. Most vesicles are filled with white carbonate.

VEINS/FRACTURES: Sparsely veined. Veins are 1-3 mm wide, mostly vertical, and filled with carbonate and Fe-oxyhydroxide.

COMMENTS: This section is the same as the last two pieces of Section 59R-3 and continues into Section 59R-5.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-59R-5 (Section top: 824.1 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-16

CONTACTS: None.

GROUNDMASS: Fine grained. Plagioclase, probably some clinopyroxene and possibly some completely altered olivine microphenocrysts(?).

VESICLES:

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
0-10	0.5	<0.1	0.5	Round

COLOR: Medium dark gray (N4).

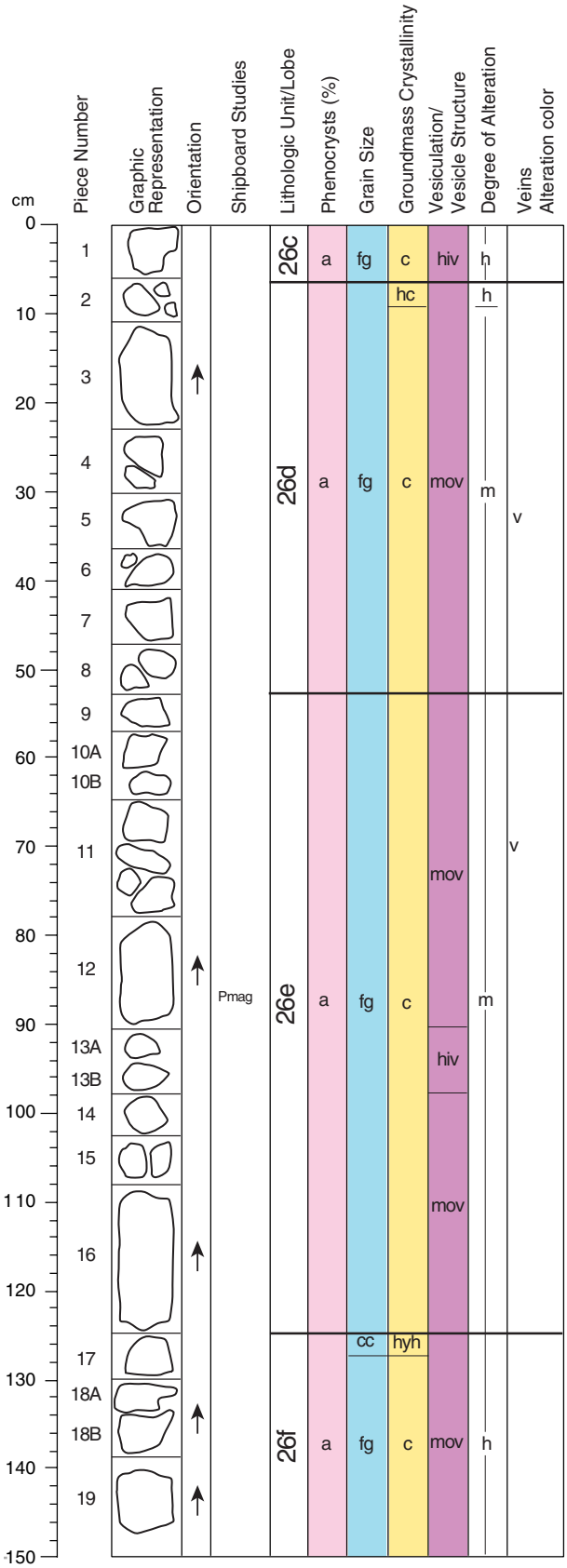
STRUCTURE: Lobed.

ALTERATION: Slight. Vesicles are filled with carbonates, green clay minerals and Fe oxyhydroxide.

VEINS/FRACTURES: Sparsely veined. Veins are 1-2 mm wide filled with carbonate, Fe oxyhydroxide and green clay minerals. They are randomly oriented.

COMMENTS: Vesicle abundance is variable in the section. Moderately vesicular in Pieces 1 to 4, 6 to 12, and 16; nonvesicular in Pieces 5, 13, and 14.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-60R-1 (Section top: 828.1 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-19

CONTACTS: None.

GROUNDMASS: Fine grained. Plagioclase laths define a subvariolitic to intergranular texture.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Highly vesicular	15-35	5	0.2	1.5	Round to irregular

COLOR: Dark gray (N3) to medium light gray (N6).

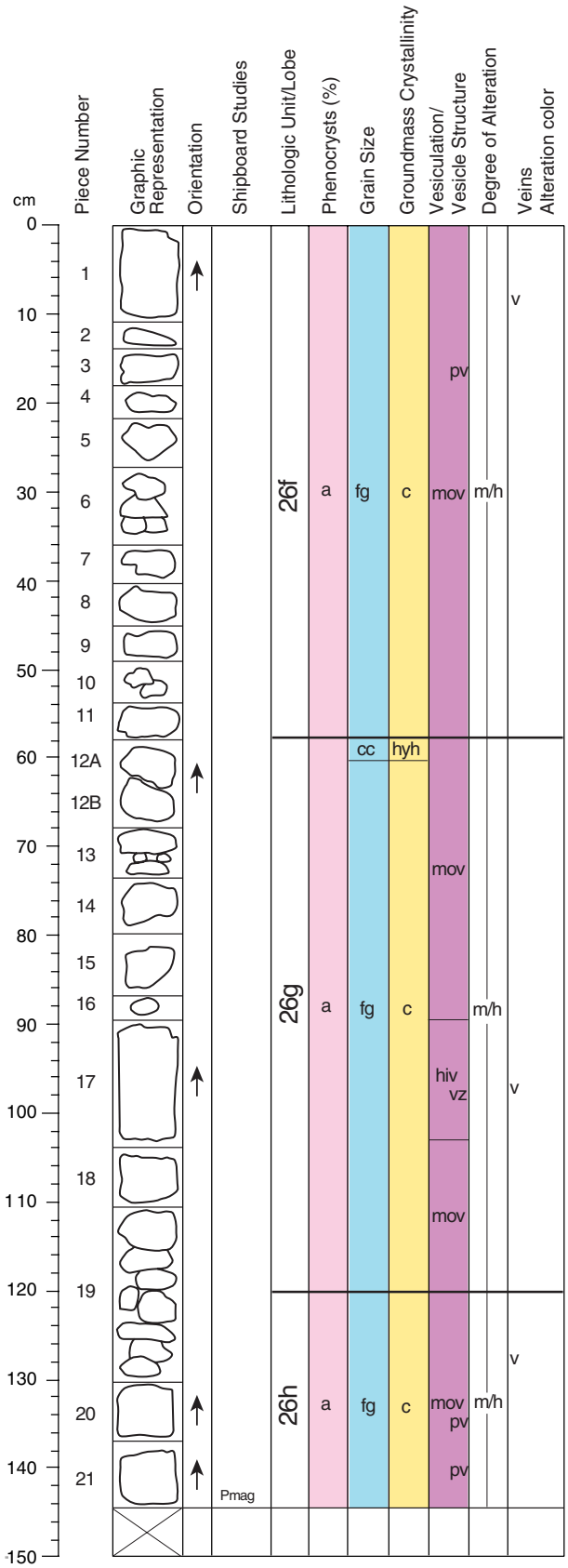
STRUCTURE: Lobed. Defined on the basis of slight variations in grain size (e.g., Piece 9), vesicle patterns and morphologies, and alteration halos concentric with the lobe margins (e.g., Piece 17).

ALTERATION: Slight. Moderate in alteration halos. Vesicles are filled with white carbonate, green clay, and Fe-oxyhydroxide. They are often unfilled but lined with green clay. Fe oxyhydroxide alteration halos are present adjacent to lobe boundaries (e.g., Piece 18).

VEINS/FRACTURES: Sparsely veined. Veins are vertical and horizontal, 0.1-1 mm wide, and filled with white carbonate, Fe-oxyhydroxide, and green clay.

COMMENTS: The largest vesicles are present in Pieces 1, 2, and 13A-13B. Horizontal trails of individual vesicles are present in Piece 18. A vertical vesicle cylinder in Piece 18 is filled with segregated, highly vesicular basaltic material.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-60R-2 (Section top: 829.6 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-21

CONTACTS: None.

GROUNDMASS: Fine grained. Consists of plagioclase, clinopyroxene and black oxides.

VESICLES:

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
5-15	3	1	2	Irregular

COLOR: Medium gray (N5).

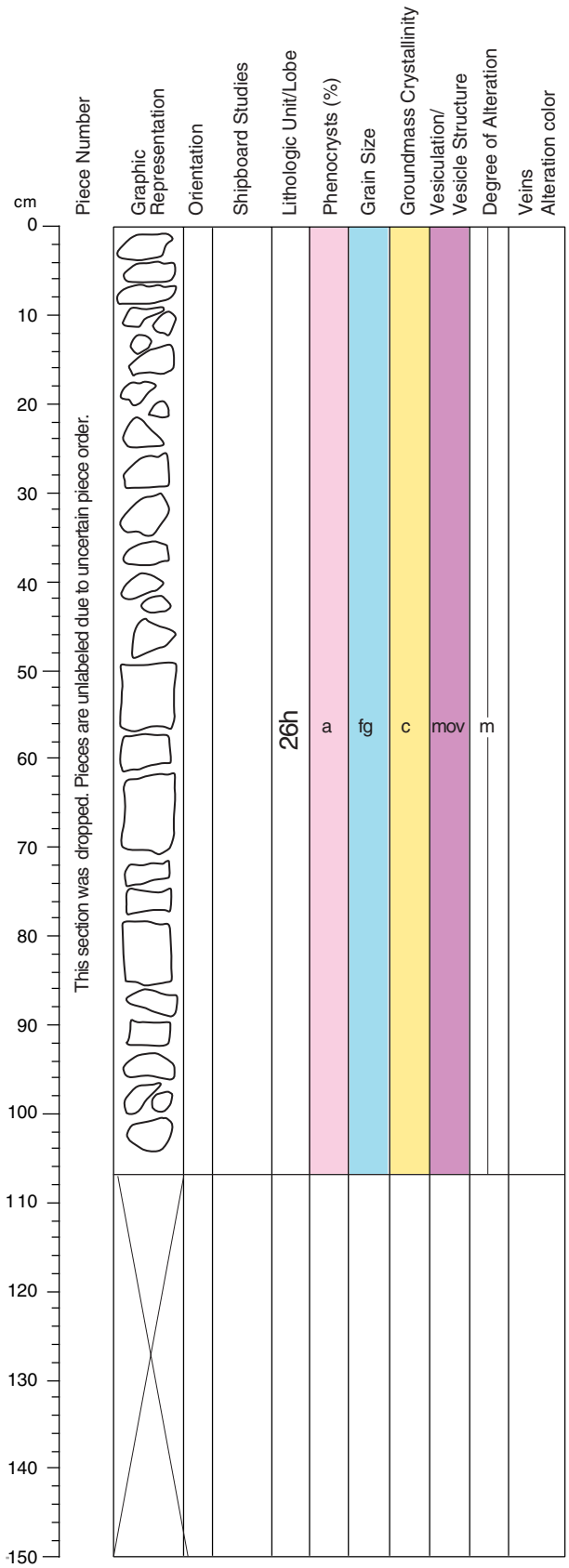
STRUCTURE: Lobed. Defined on the basis of altered flow top material (e.g., Pieces 12A and 19).

ALTERATION: Moderate. Vesicles are filled with carbonates, green clay minerals and Fe-oxyhydroxide. Lobe boundaries are more intensely altered.

VEINS/FRACTURES: Sparsely veined. Veins are present in Pieces 3, 17, an 18. They are 1-3 mm wide, subhorizontal and filled with carbonate and Fe-oxyhydroxides.

COMMENTS: Pipe vesicles partly filled with carbonate are present in Pieces 20 and 21.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-60R-3 (Section top: 831.05 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: This core section was dropped and the pieces mixed so no piece numbers were assigned. There are 27 pieces in this section.

CONTACTS: None.

GROUNDMASS: Fine grained. Plagioclase laths and clinopyroxene define a subvariolitic to intergranular texture.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Highly vesicular	15-30	6	0.1	2	Round to irregular

COLOR: Medium gray (N5) to medium light gray (N6).

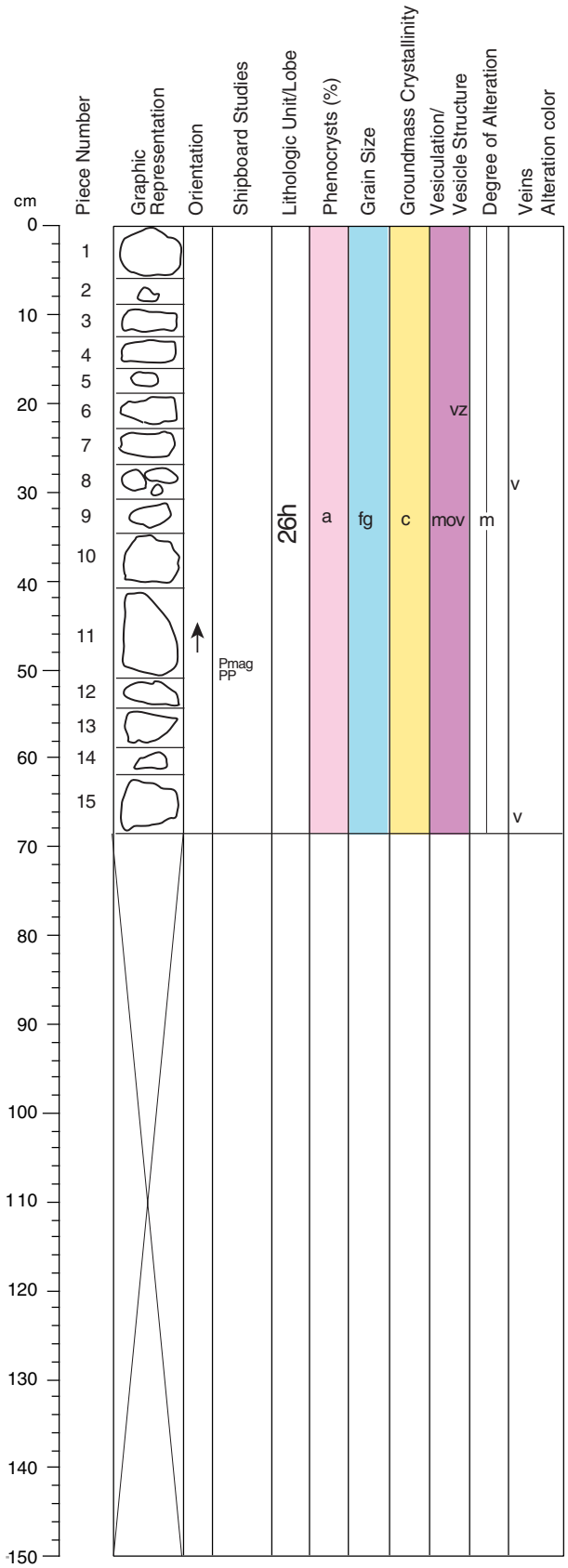
STRUCTURE: Lobed. Defined on the basis of similarities with the previous core section.

ALTERATION: Slight. Moderate in Fe-oxyhydroxide alteration halos. Vesicles are filled with white carbonate, green clay, and Fe-oxyhydroxide. They are often unfilled but lined with green clay.

VEINS/FRACTURES: Sparsely veined. Veins are vertical and horizontal, 0.1-mm wide, and filled with white carbonate, Fe-oxyhydroxide, and green clay.

COMMENTS: There is no change in lithology from the previous core section.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-60R-4 (Section top: 832.14 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-15

CONTACTS: None.

GROUNDMASS: Fine grained. Consists of plagioclase and altered mesostasis.

VESICLES:

	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
	10-20	4	0.5	2	Irregular

COLOR: Medium dark gray (N4).

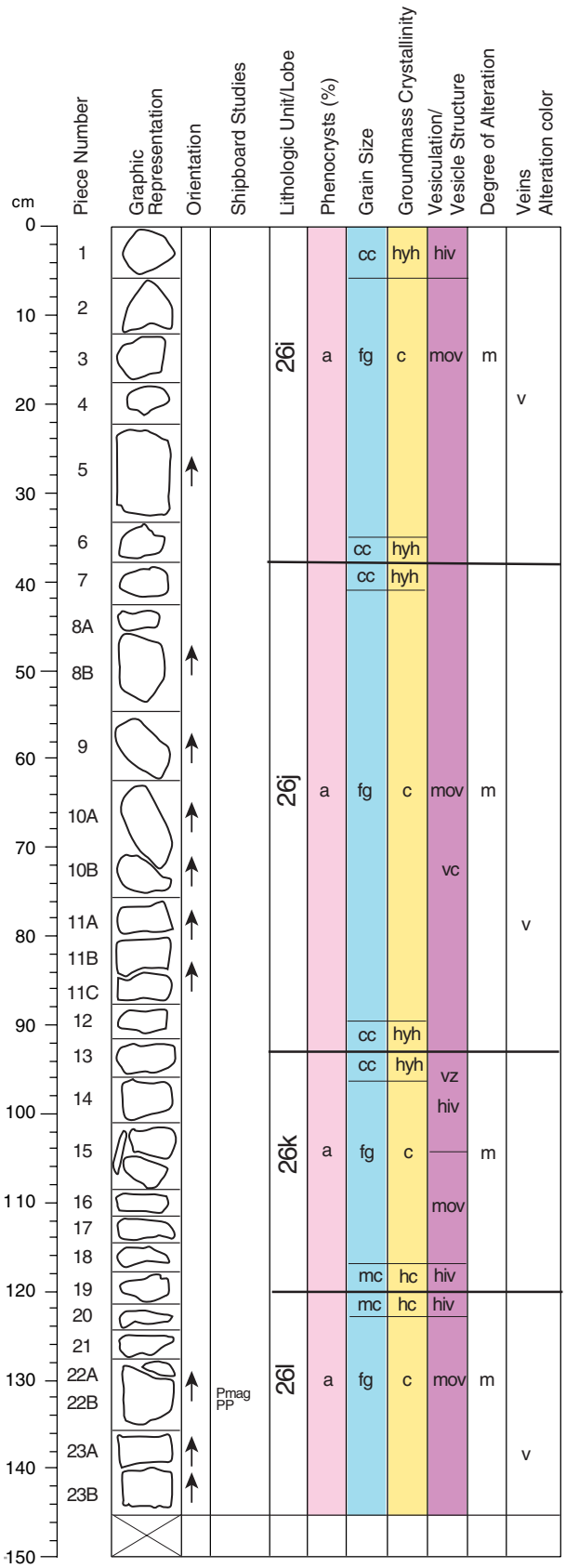
STRUCTURE: Probably lobed, but no margins were recovered. There is no change in lithology from Section 60R-2.

ALTERATION: Moderate. Mesostasis altered to dark gray clay. Variably 30%-50% of vesicles are filled with carbonate and rare sulfide.

VEINS/FRACTURES: Sparsely veined. 1-3 mm wide carbonate and Fe-oxyhydroxide filled veins are randomly oriented.

COMMENTS: Vesicle distribution is patchy. Also, presence of filling in vesicles varies. This basalt is the same as in Section 60R-2.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-61R-1 (Section top: 837.7 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-23B.

CONTACTS: None.

GROUNDMASS: Fine grained to cryptocrystalline. Consists of plagioclase, clinopyroxene and black oxides.

VESICLES:

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
5-15	3	0.5	1.5	Irregular

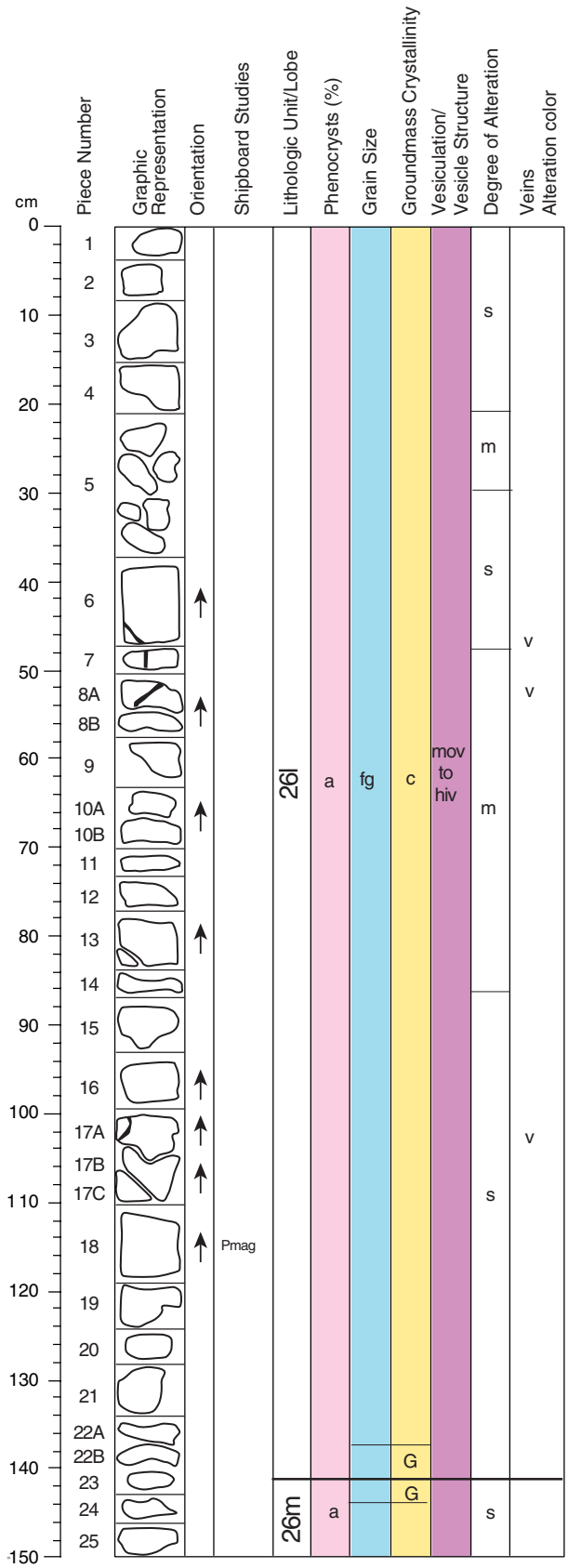
COLOR: Medium dark gray (N4).

STRUCTURE: Lobed. Altered glassy material defines lobe boundaries at 0 cm, 39 cm, 93 cm and 120 cm.

ALTERATION: Moderate to complete. About 50% of vesicles are filled with carbonate, Fe oxyhydroxide and green clay. Glassy lobe boundaries are completely altered.

VEINS/FRACTURES: Sparsely veined. Veins are present in Pieces 4, 10, 11, 23. They are 1 3 mm wide, and filled with carbonate, Fe-oxyhydroxide and green clay.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-61R-2 (Section top: 839.15 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-25

CONTACTS: None.

PHENOCRYSTS: None.

GROUNDMASS: Fine grained. Consists of plagioclase, clinopyroxene and back oxides.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Moderately vesicular	10	2	<0.2	1	Round

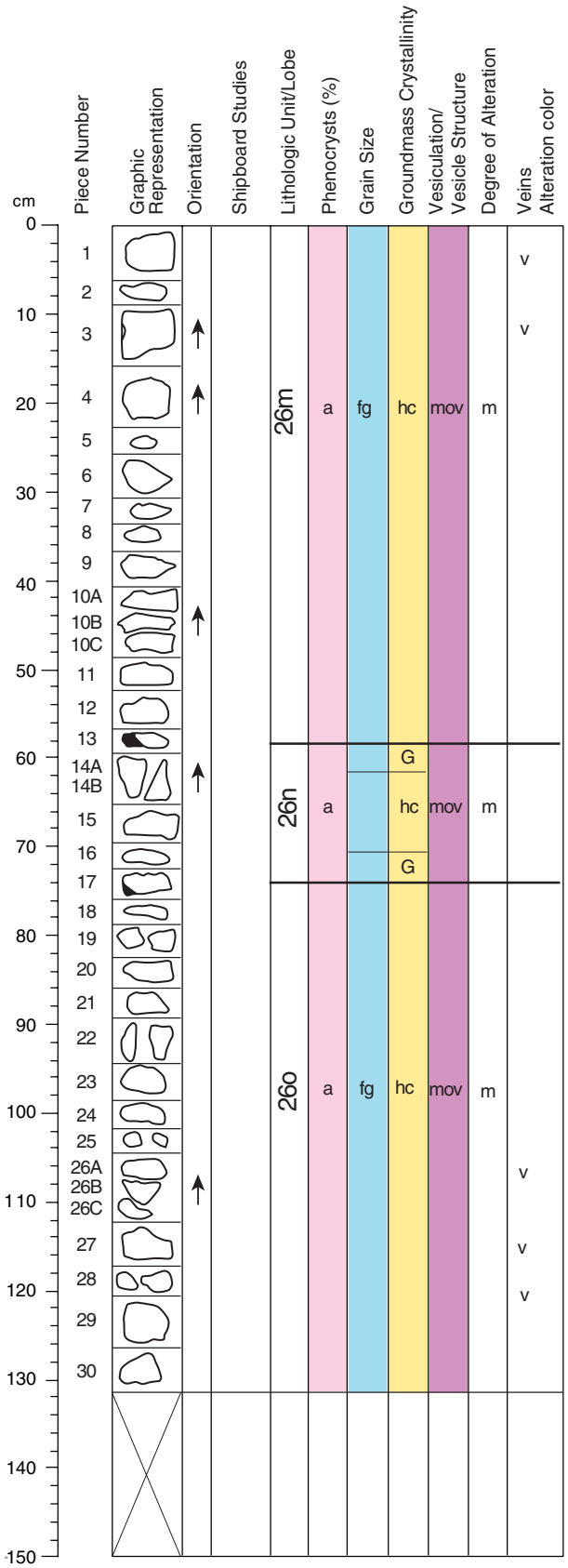
COLOR: Medium dark gray (N4) to medium gray (N5).

STRUCTURE: Lobed. A glassy lobe margin is present in Piece 23.

ALTERATION: Slight to complete. About 50% of vesicles are filled with carbonate, Fe oxyhydroxide and green clay. The glassy lobe margin is completely altered.

VEINS/FRACTURES: Sparsely veined. Veins are 1 mm wide and filled with carbonate, Fe oxyhydroxide and green clay.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-61R-3 (Section top: 840.65 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-30

CONTACTS: None.

GROUNDMASS: Fine grained. Consists of plagioclase and altered mesostasis.

VESICLES:

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
2-10	3	0.5	1	Irregular

COLOR: Medium dark gray (N4).

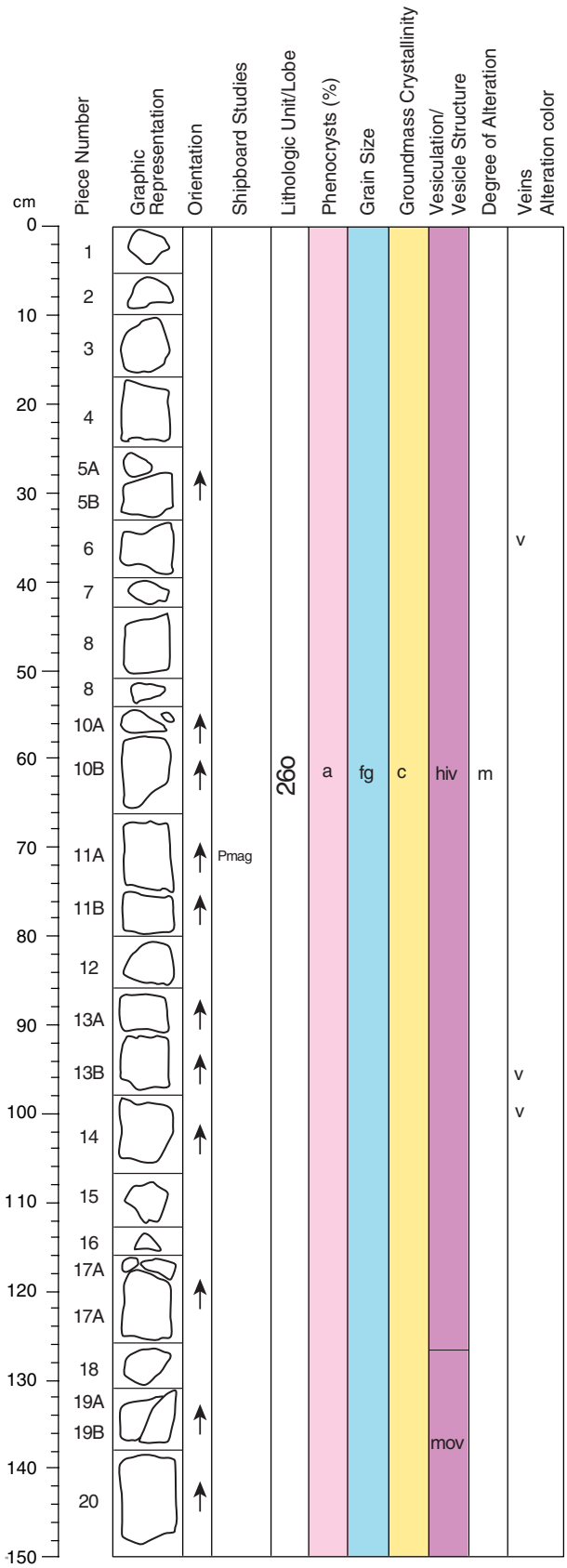
STRUCTURE: Lobed.

ALTERATION: Moderate. Mesostasis altered to dark gray clay. Variably 30%-50% of vesicles are filled with carbonate and rare sulfide.

VEINS/FRACTURES: Sparsely veined. 1-3 mm wide carbonate and Fe-oxyhydroxide filled veins are randomly oriented.

COMMENTS: Vesicle distribution is patchy and the presence of filling in vesicles varies.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-62R-1 (Section top: 847.4 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-20

CONTACTS: None.

GROUNDMASS: Fine grained. Consists of plagioclase, clinopyroxene and black oxides in an intergranular, occasionally subtrachytic texture.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Highly vesicular	15-30	4	0.5	2	Round to irregular

COLOR: Medium dark gray (N4) to medium gray (N5). Moderate yellowish brown (10YR 5/4) and medium bluish gray (5B 5/1) in alteration halos.

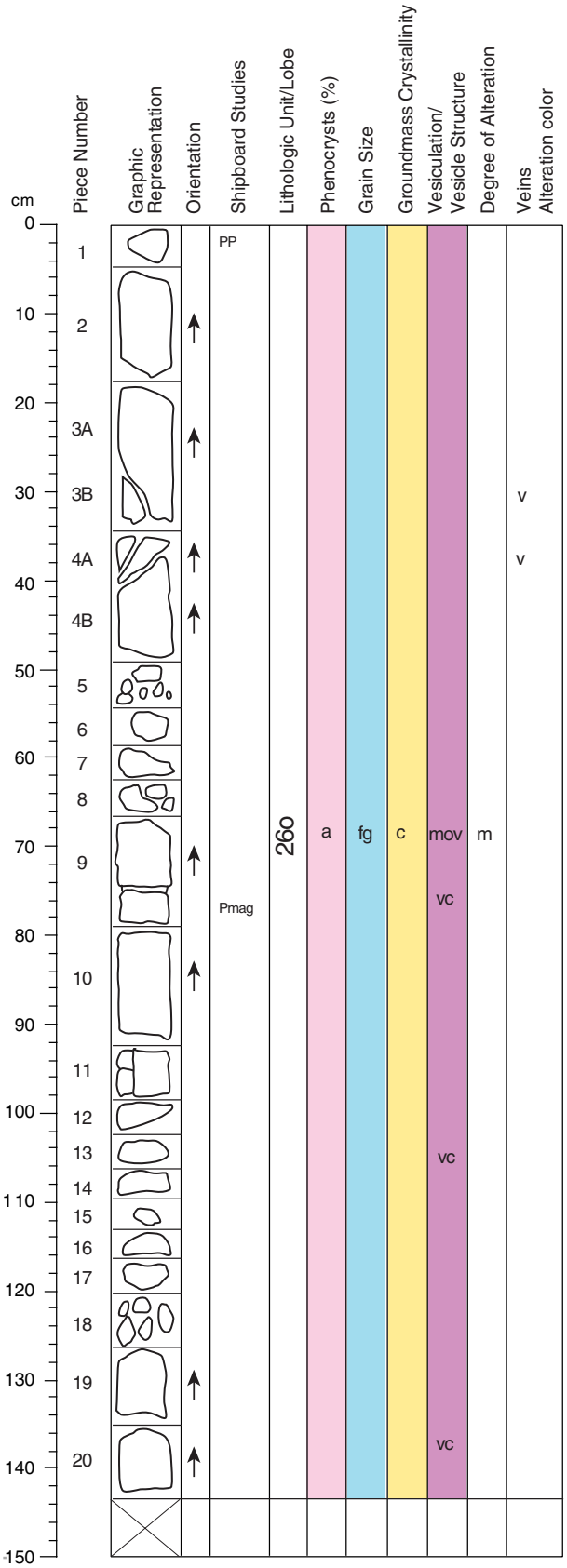
STRUCTURE: Lobed. Lobe boundaries are defined on the basis of variations in vesicle patterns and morphologies, and slight changes in grain size.

ALTERATION: Slight. Moderate in alteration halos adjacent to some veins (e.g., Pieces 6 and 20). Mesostasis is altered to dark green clay adjacent to veins. Voids are present in the center of some veins (e.g., Piece 6). Approximately 40% of the vesicles are filled with white carbonate and dark green clay. Where unfilled, vesicles are lined with dark green clay.

VEINS/FRACTURES: Sparsely veined. Veins are subvertical to subhorizonta 0.1-2 mm wide, and filled with white carbonate, Fe-oxyhydroxide, dark green clay, and sulfide.

COMMENTS: An irregular segregation of more plagioclase-rich and mesostasis-poor basaltic material is present in Piece 11A between 68 cm and 72 cm.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-62R-2 (Section top: 848.9 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-20

CONTACTS: None.

GROUNDMASS: Fine grained. Consists of plagioclase, clinopyroxene, and black oxides in an intergranular, occasionally subvariolitic texture.

VESICLES:

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
1-10	4	0.1	0.5	Round to irregular

COLOR: Medium dark gray (N4) to medium light gray (N6).

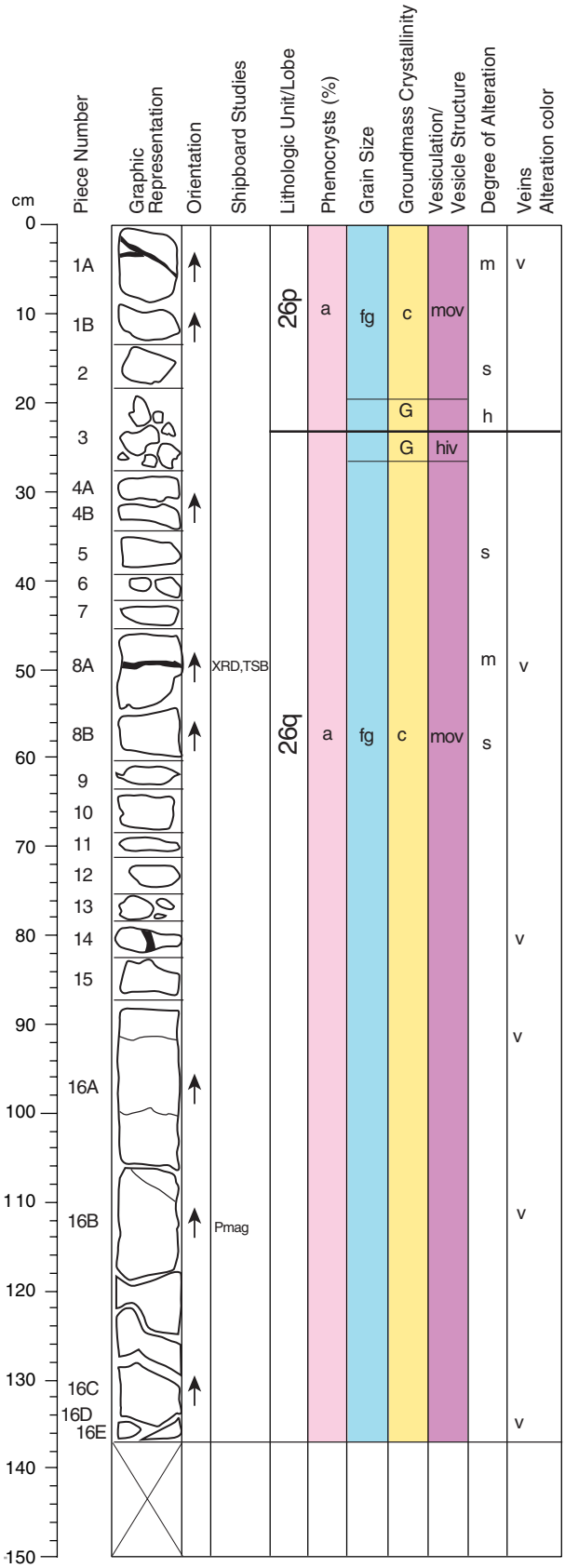
STRUCTURE: Lobed. Lobe boundaries are defined on the basis of variations in vesicle patterns and morphologies, and slight changes in grain size.

ALTERATION: Moderate. Mesostasis is pervasively altered to dark green clay. Alteration halos, rich in Fe-oxyhydroxide and dark green clay, are present adjacent to veins. Vesicles are filled with white carbonate, dark green clay, Fe-oxyhydroxide, and rare sulfide. Where vesicles are unfilled, they are lined with dark green clay.

VEINS/FRACTURES: Sparsely veined. Veins are subvertical to subhorizontal, 0.1-1.5 mm wide and filled with white carbonate, Fe-oxyhydroxide, dark green clay, and sulfide.

COMMENTS: Vesicle cylinders, 3-6 mm wide and filled with segregated basaltic material, are present in Pieces 4B (43-46 cm), 9 (67-74 cm), and 11 (94-96 cm). Pipe vesicles, 3-5 mm wide and partially filled with segregated basaltic material and/or white carbonate, are present in Pieces 9 (72-74 cm), 14 (108-109 cm), and 20 (136-143 cm). Vesicularity is variable: sparsely vesicular (e.g., Piece 10) to moderately vesicular (e.g., Piece 2).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-62R-3 (Section top: 850.33 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1A-16E

CONTACTS: None.

GROUNDMASS: Fine grained. Consists of plagioclase, clinopyroxenes, and black oxides.

VESICLES:

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
<1-10	2	0.2	1	Round

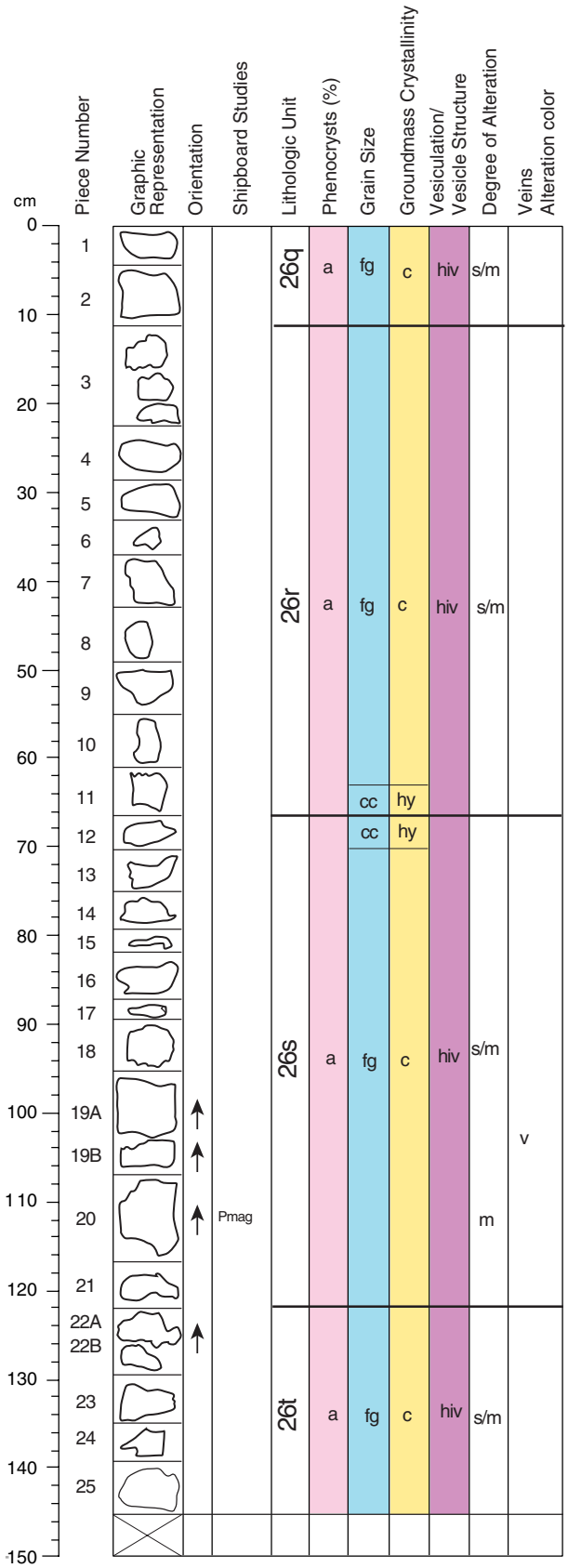
COLOR: Medium dark gray (N4) to medium gray (N5). Grayish orange (10R 7/4) adjacent to veins. Greenish black (5G 2/1) in Piece 3.

STRUCTURE: Lobed. Lobe boundary at about 20 cm. Boundaries are defined on the basis of variations vesicle patterns and morphologies.

ALTERATION: Slight to moderate. Mesostasis altered to dark green clay adjacent to veins. Vesicles are filled with white carbonate, brown and green clay minerals, and rare sulfide.

VEINS/FRACTURES: Sparsely veined. Veins are 1-2 mm wide and filled with white carbonate, Fe-oxyhydroxide, brown and green clay minerals, and rare secondary sulfides.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-63R-1 (Section top: 857.0 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-25

CONTACTS: None.

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene and interstitial patches of green clays which probably replace glass. Sulfide is rarely found in the groundmass.

VESICLES:

	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
	7-25	6	<1	1.5	Round to irregular

COLOR: Medium dark gray (N4) to medium gray (N5).

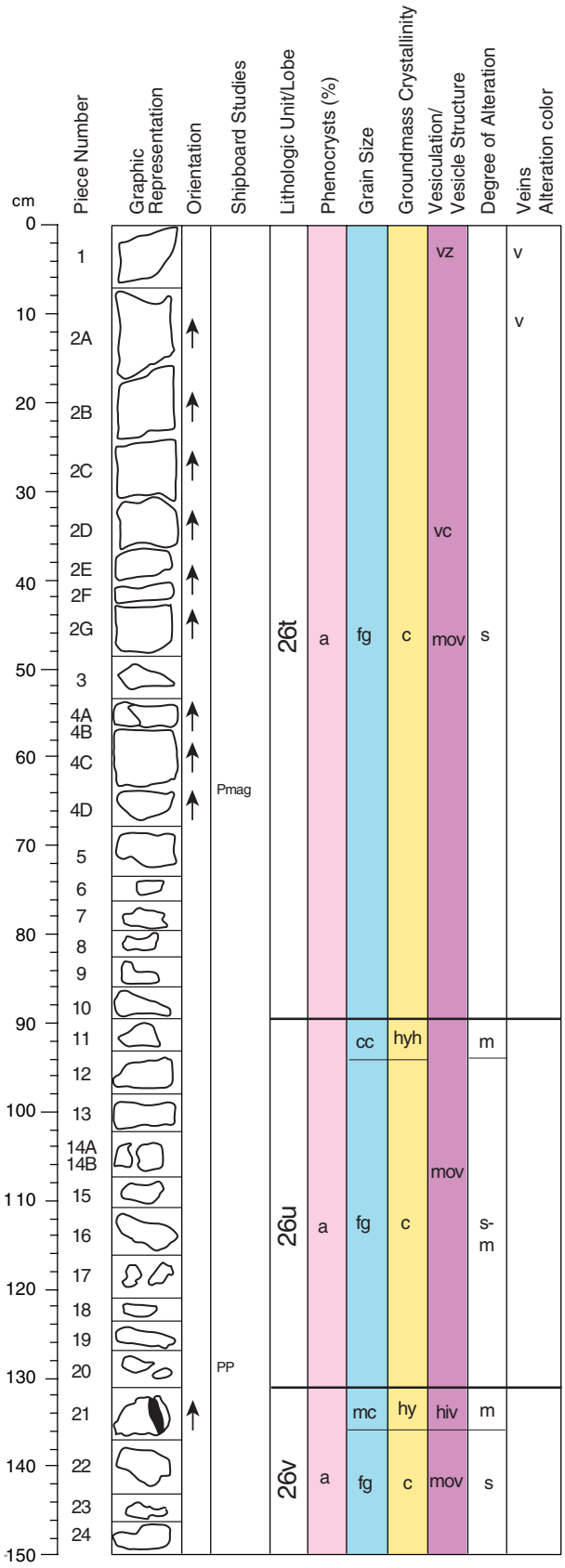
STRUCTURE: Lobed. Lobe boundaries occur at 10 cm, 67 cm and 122 cm. Defined by subtle changes in grain size and occasionally the presence of a glassy rind.

ALTERATION: Slight to moderate. Mesostasis altered to dark green clay. Vesicles are filled with white carbonate, brown and green clay minerals, and rare sulfide. Yellow brown alteration halos are present around thin veins from 94-104 cm and are up to 3 cm in width.

VEINS/FRACTURES: Sparsely veined. Veins occur from 88-94 cm and are up to 1 mm wide and filled with white carbonate and Fe-oxyhydroxide.

COMMENTS:
A highly vesicular zone is found from 11-22 cm, consisting of rounded to coalesced vesicles 2 6 mm in diameter and is interpreted as a gas escape structure.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-63R-2 (Section top: 858.46 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-24

CONTACTS: None.

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene and interstitial patches of green clays which probably replace glass. Sulfide is rarely found in the groundmass.

VESICLES:

	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
	7-25	4	<1	1.5	Round to irregular

COLOR: Medium dark gray (N4) to medium gray (N5).

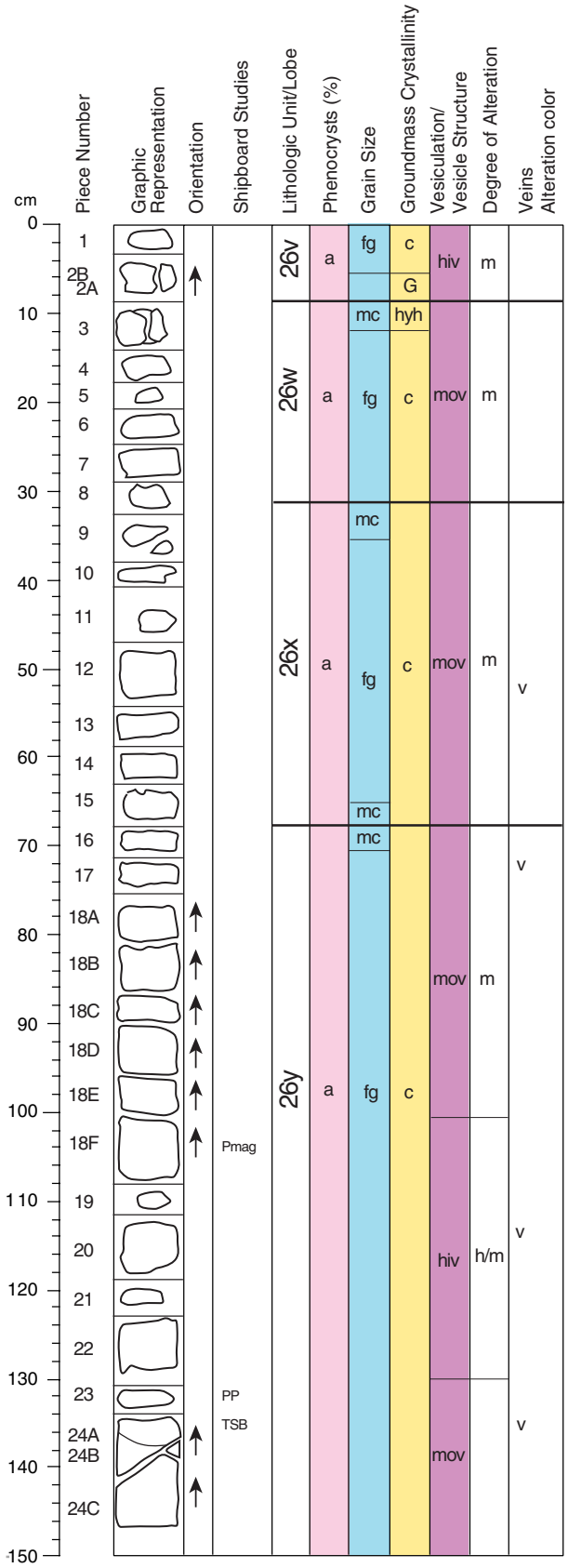
STRUCTURE: Lobed. Lobe boundaries occur at 90 cm and 131 cm. Defined by subtle changes in grain size and the presence of a yellow brown alteration color and a glassy rind (particularly at 131 cm).

ALTERATION: Slight to moderate. Mesostasis altered to dark green clay. Vesicles are filled with white carbonate, brown and green clay minerals, and rare sulfide. Yellow brown alteration halos are present around thin veins and are up to 3 cm in width.

VEINS/FRACTURES: Sparsely veined. Veins occur throughout, are up to 1 mm wide and filled with white carbonate and Fe-oxyhydroxide.

COMMENTS:
Two pipe cylinders are found in the interval 14-39 cm, and consist of fine-grained segregated material towards the top of the structure and calcite infilling towards the base.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-63R-3 (Section top: 859.96 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-24C

CONTACTS: None.

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene and interstitial patches of green clays which probably replace glass. Sulfide is rarely found in the groundmass.

VESICLES:

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
4-25	3	<1	1.5	Round to irregular

COLOR: Medium dark gray (N4) to medium gray (N5).

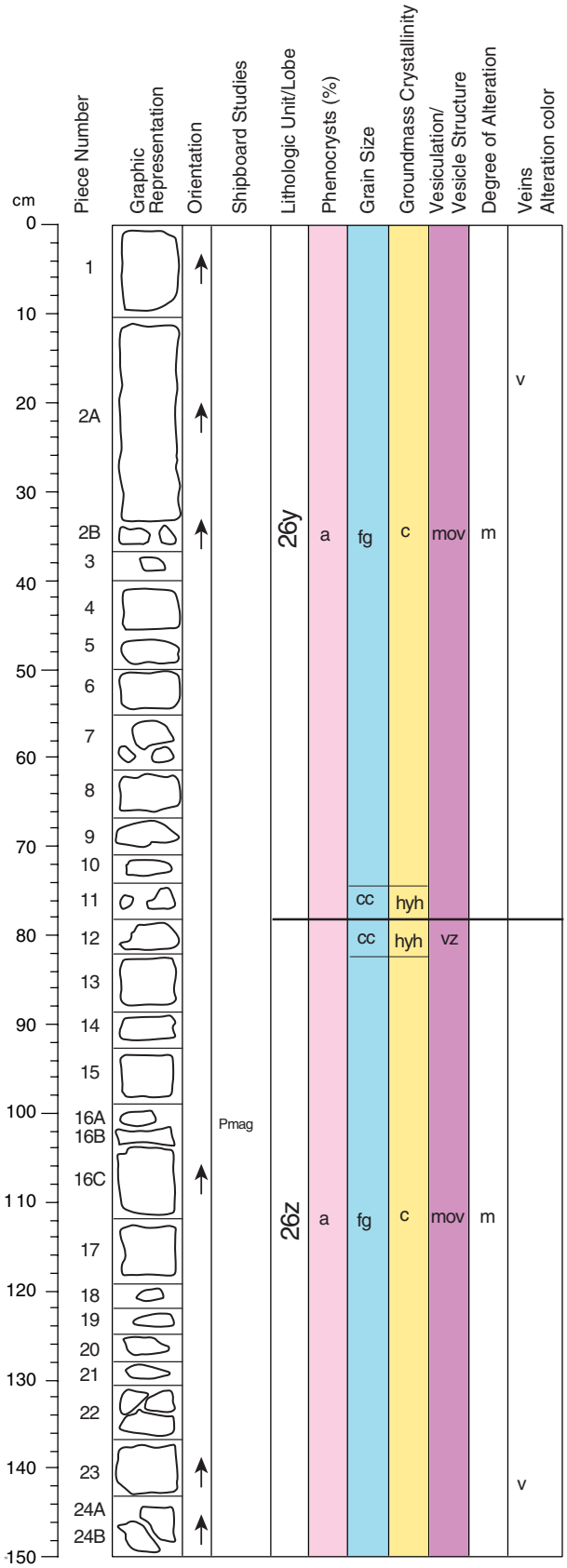
STRUCTURE: Lobed. Lobe boundaries occur at 8 cm, 31 cm, and 70 cm. Defined by subtle changes in grain size and the presence of a yellow brown alteration color and a glassy rind.

ALTERATION: Slight to moderate. Mesostasis altered to dark green clay. Vesicles are filled with white carbonate, brown and green clay minerals, and rare sulfide.

VEINS/FRACTURES: Sparsely veined. Veins occur from 50-65 cm, 76-102 cm and 140 150 cm, and are up to 2 mm wide and filled with white carbonate and Fe-oxyhydroxide.

COMMENTS:
An irregularly shaped vesicle cylinder is found in Piece 24C (144-166 cm) and contains segregated material. It continues to Piece 1 in Section 63R-4.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-63R-4 (Section top: 861.46 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-24B

CONTACTS: None.

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene and interstitial patches of green clays which probably replace glass. Sulfide is rarely found in the groundmass.

VESICLES:

	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
	4-25	3	<1	1.5	Round to irregular

COLOR: Medium dark gray (N4) to medium gray (N5). Alteration is moderate yellowish brown (10YR 5/4).

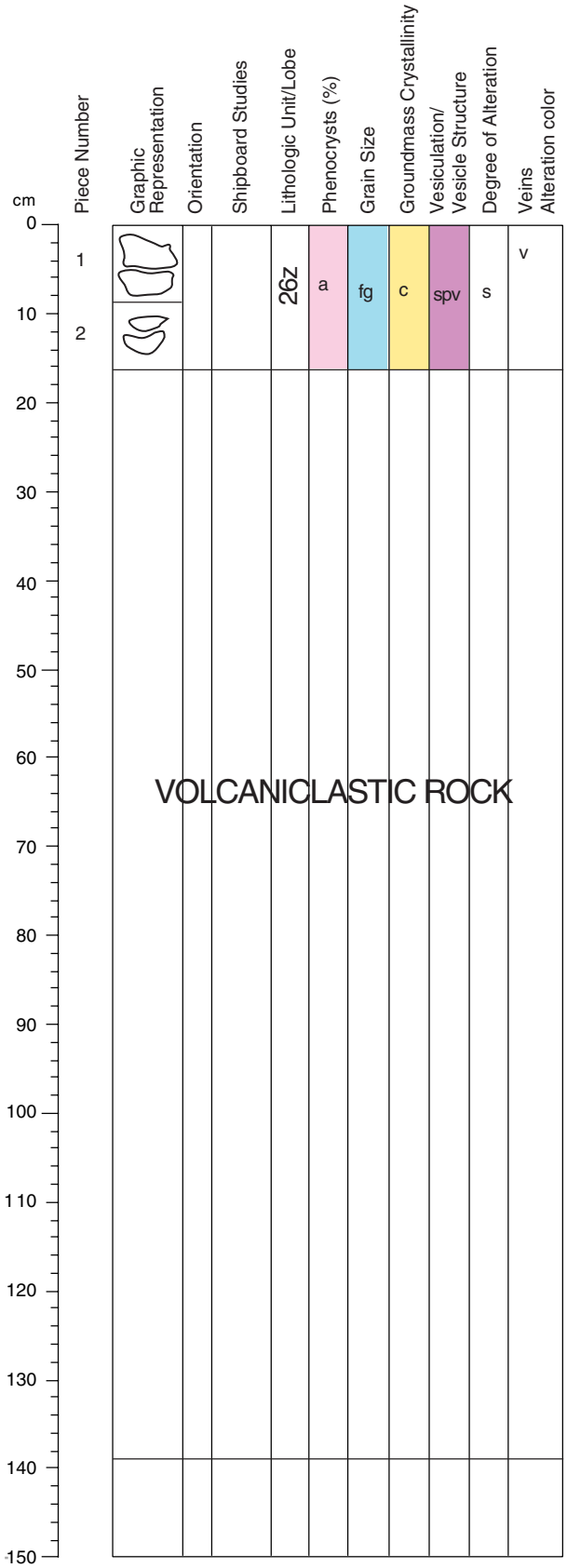
STRUCTURE: Lobed. Lobe boundaries occur at 40 cm and 79 cm. Defined by subtle changes in grain size and the presence of a yellow brown alteration color and a glassy rind.

ALTERATION: Slight to moderate. Mesostasis altered to dark green clay. Vesicles are filled with white carbonate, brown and green clay minerals, and rare sulfide.

VEINS/FRACTURES: Sparsely veined. Veins occur from 1-33 cm, 61-71 cm and 129-150 cm, and are up to 2 mm wide and filled with white carbonate and Fe-oxyhydroxide. Slight alteration halos appear in Pieces 8 and 23.

COMMENTS:
A large vesicle cylinder occurs in Piece 1 and is filled with segregated material, continued from Piece 24C of Section 63R-3.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-63R-5 (Section top: 862.97 mbsf)

UNIT 26: VESICULAR APHYRIC BASALT.

Pieces: 1-2

CONTACTS: None observed. The contact between Unit 26 and underlying volcaniclastic sandstone (Unit 27) is inferred to be at 14 cm.

GROUNDMASS: Fine grained, composed of plagioclase, clinopyroxene and interstitial patches of green clays which probably replace glass. Sulfide is rarely found in the groundmass.

VESICLES:

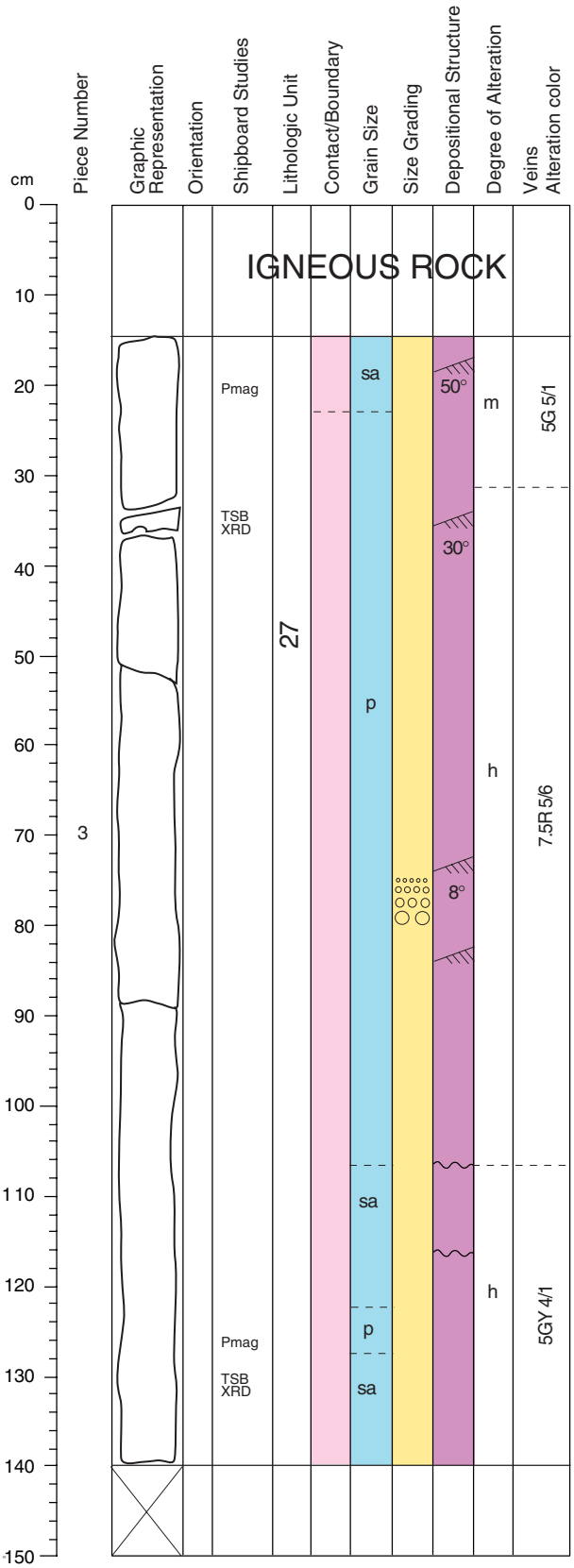
%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
1-3	3	<1	1.5	Round

COLOR: Medium dark gray (N4) to medium gray (N5).

ALTERATION: Slight. Mesostasis altered to dark green clay. Vesicles are filled with white carbonate and brown and green clay minerals.

VEINS/FRACTURES: Sparsely veined. Veins occur throughout, and are up to 2 mm wide and filled with white carbonate and Fe-oxyhydroxide.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-63R-5 (Section top: 862.97 mbsf)

UNIT 27: VOLCANICLASTIC SANDSTONE.

Pieces: 3 (14-39 cm; cut as sediment core.)

CONTACTS: None recovered. Upper boundary of Unit 27 is inferred to be at 14 cm.

GENERAL DESCRIPTION: Carbonaceous tuff, containing large carbonate clasts that increase in abundance from 5-20 cm, and vary in abundance throughout the remainder of the core.

COLOR: Color ranges from green (5G 5/1), red (7.5R 5/6), and gray (5B 5/1).

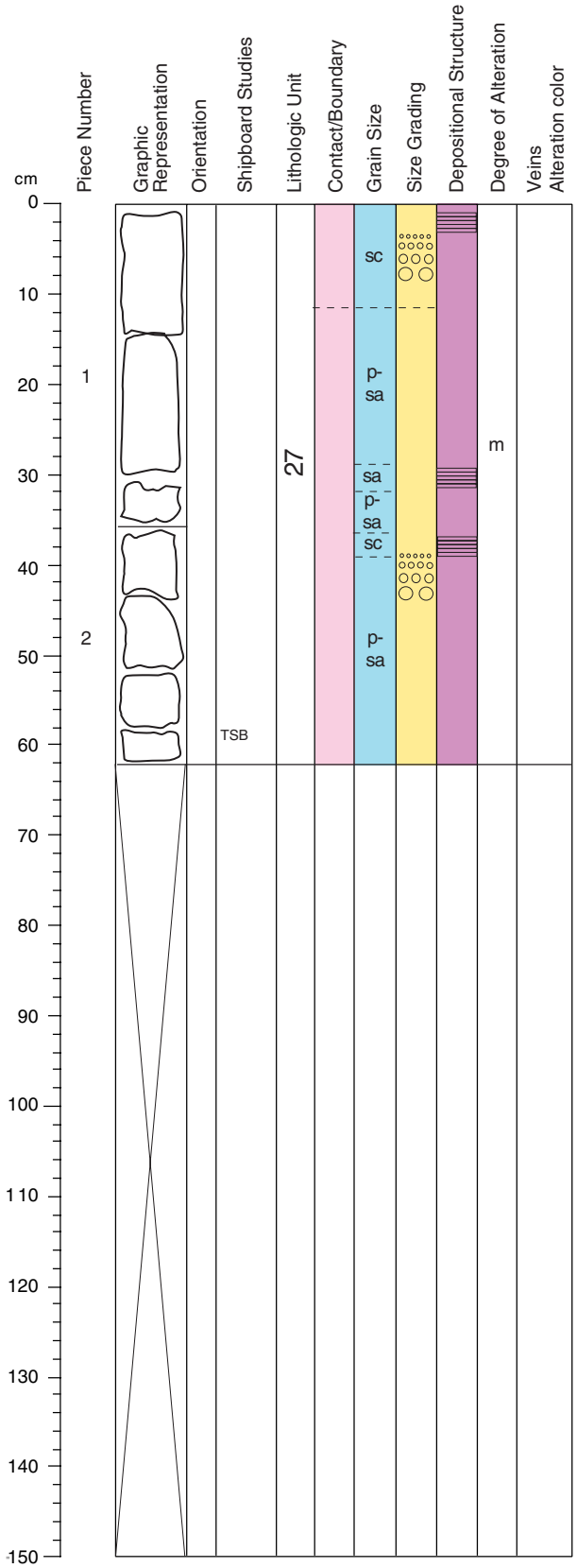
COMPONENTS: A fine layer of 100% vitric tuff; carbonaceous tuff consisting of 50% silt, and 10%-40% carbonate clasts; and gray vitric tuff with 10%-20% carbonate cement and 10% clasts.

SEDIMENTARY TEXTURES:
Graded bedding is present at 14 cm. Repeated bedding occurs from 74-82 cm. Diagenetic coloring is red due to presence of fine-grained iron oxides.

SEDIMENTARY STRUCTURES: A fault and slumping is present from 80-90 cm.

COMMENTS: This appears to be a sequence deposited in shallow water, resedimented in part by slumps and micro-faulting.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-63R-6 (Section top: 864.36 mbsf)

UNIT 27: VOLCANICLASTIC SANDSTONE.

Pieces: 1-2

CONTACTS: None.

GENERAL DESCRIPTION: Clay-rich volcaniclastic siltstone layer above fluvial rounded sand and gravel, mixed with lapilli and ash. Detrital heavy minerals are present.

COLOR: Color ranges from green (5G 5/1), red (7.5R 5/6), and gray (5B 5/1).

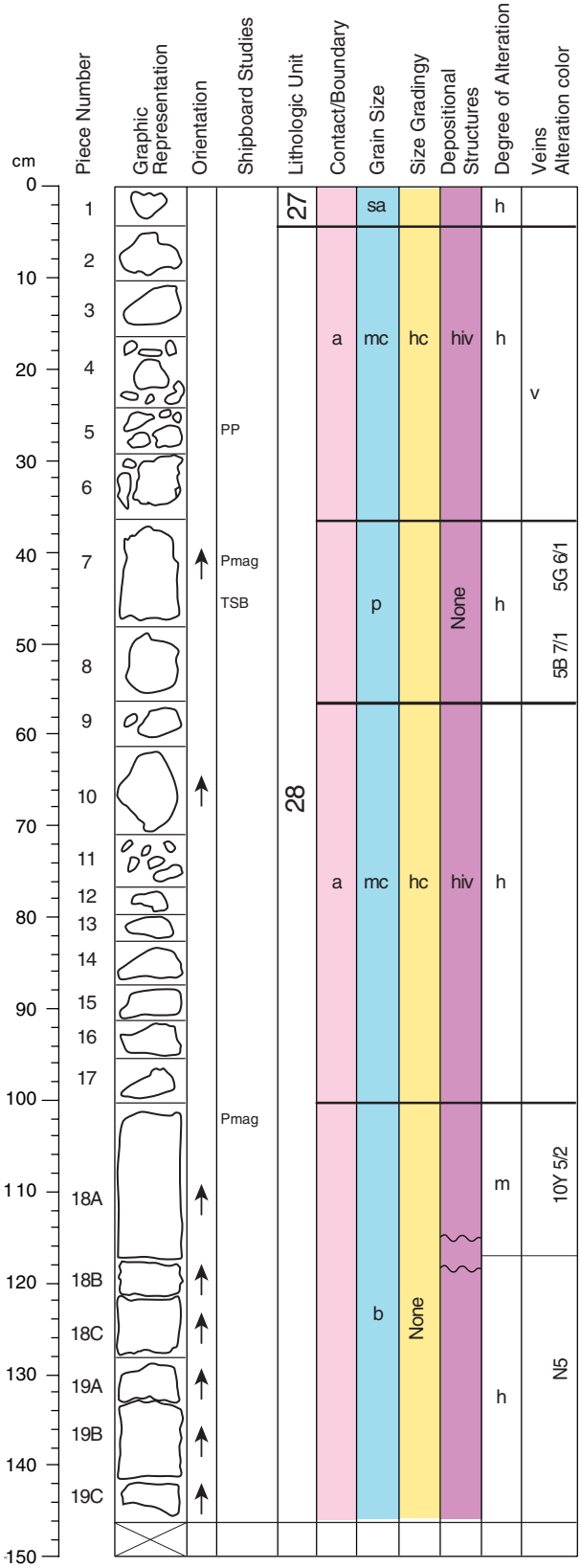
COMPONENTS: 30% vitric clasts, 50% rounded detrital minerals, and 5% heavy minerals.

SEDIMENTARY TEXTURES: A coarsening downward sequence is present at the boundaries. Grains are subrounded to angular and there is very little cement.

SEDIMENTARY STRUCTURES:

COMMENTS: Sedimentary characteristics suggest a fluvial to lagoonal depositional environment with additional input of tuff clasts and subrounded mineral grains. The environment appears to reflect variations in seasonal energy, i.e. an alternating fine and coarse-grained sequence.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-64R-1 (Section top: 866.6 mbsf)

UNIT 27: VOLCANICLASTIC SANDSTONE.

Pieces: 1

Same as Section 63R-6.

UNIT 28: VOLCANICLASTIC BRECCIA.

Pieces: 2-19

CONTACTS: None observed. Contact between Units 27-28 is inferred to be between Pieces 1 and 2 at 4 cm.

GENERAL DESCRIPTION: Volcaniclastic breccia consisting of large vesicula basalt clasts and lapilli sized vesicular glassy basalt clasts resting in a fine grained sandy matrix.

COLOR: Matrix is pale brown (10Y 5/2) with medium gray (N5) basalt clasts, and blackish red (5R 2/2) in more altered patches.

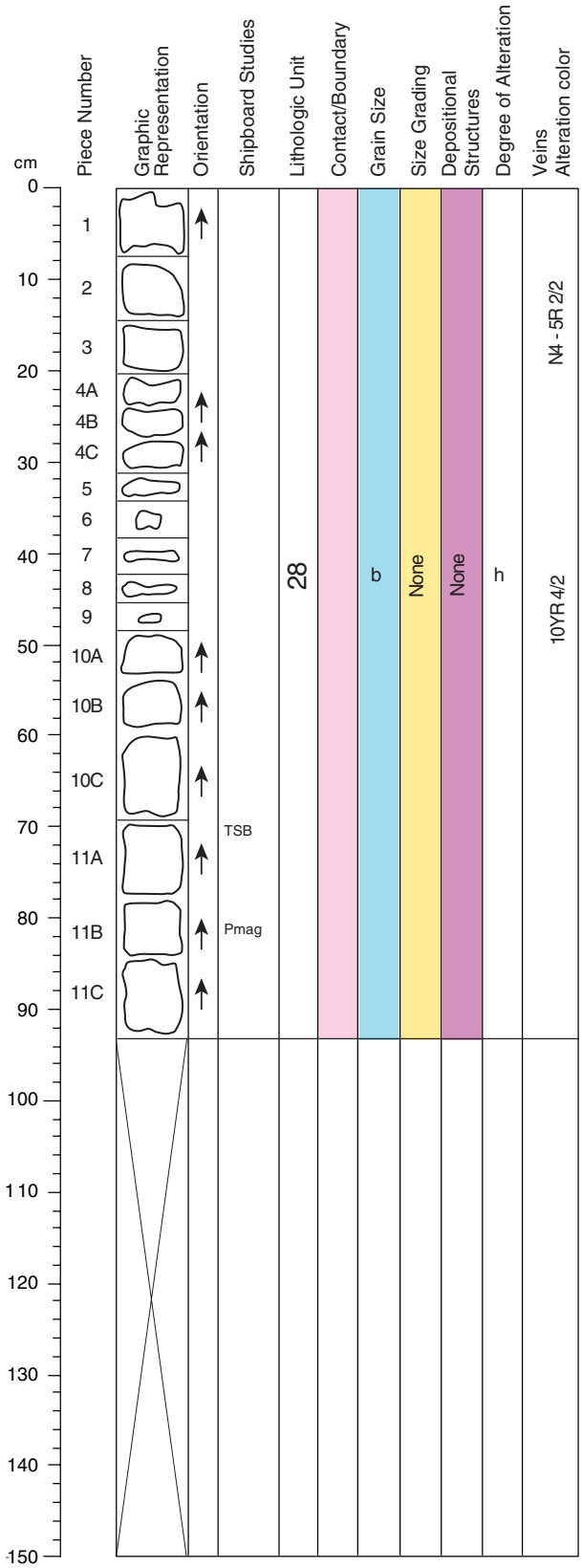
COMPONENTS:
25%: highly vesicular basalt clasts; subangular and equant. Clast size ranges from 0.2-44 cm in size.
65%: matrix of fine calcareous sandstone, including sand-sized vesicular basalt clasts and feldspar crystals.
10% sand size glassy vesicular clasts in matrix.

SEDIMENTARY TEXTURES: Grain size: 5-10 cm breccia clasts resting in a fine to coarse sandy matrix.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: Note that many of the aphyric basalt clasts present in the breccia are probably derived locally from the aphyric basalt unit beneath (Unit 27).

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-64R-2 (Section top: 868.06 mbsf)

UNIT 28: VOLCANICLASTIC BRECCIA

Pieces: 1-11

CONTACTS: None

GENERAL DESCRIPTION: Volcaniclastic breccia consisting of large vesicular basalt clasts and lapilli sized vesicular glassy basalt clasts resting in a fine grained sandy matrix.

COLOR: Matrix is pale brown (10 Y 5/2) with basalt clasts medium gray (N5), and alteration in blackish red (5R 2./2).

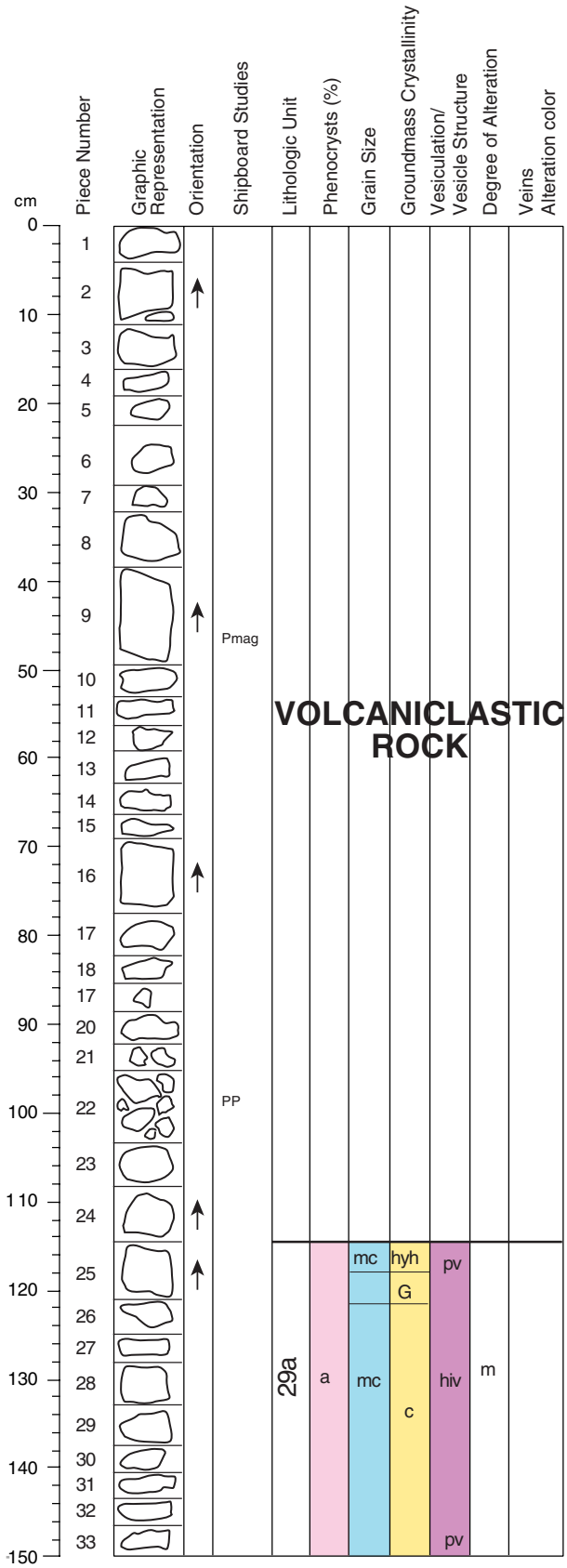
COMPONENTS:
65% highly vesicular basalt clasts; subangular and equant.
25% matrix of fine calcareous sandstone.
10% sand size glassy vesicular clasts in matrix.

SEDIMENTARY TEXTURES: Grain size: 5-10 cm breccia clasts resting in a fine to coarse sandy matrix.

SEDIMENTARY STRUCTURES: Massive (non-structured).

COMMENTS: Piece 8 is lava containing glassy lobe margin, indicating that it has not been transported a long distance. The clast lithology is identical to that of the underlying lava.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-65R-1 (Section top: 876.2 mbsf)

UNIT 29: VESICULAR APHYRIC BASALT.

Pieces: 25-33

CONTACTS: An irregular, unconformable contact between Unit 29 and the overlying Unit 28 (volcaniclastic breccia) is preserved at 118 cm in Piece 25.

GROUNDMASS: Fine grained. Consists of plagioclase and altered mesostasis.

VESICLES:

	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
	15-20	5	0.5	2	Irregular

COLOR: Medium dark gray (N4). Moderate brown (5YR 3/4) in highly altered areas.

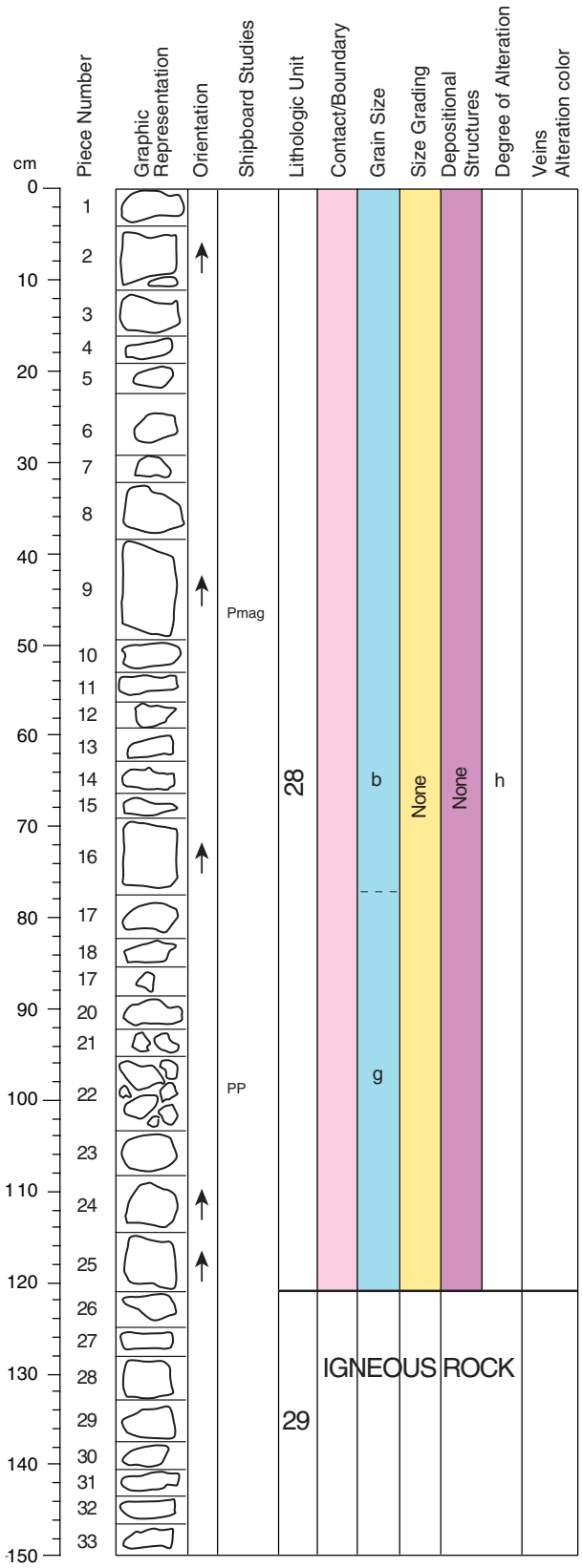
STRUCTURE: Lobed.

ALTERATION: Moderate. Mesostasis altered to dark green clay. Vesicles are filled with white carbonate, and brown and green clay minerals. Fe-oxyhydroxide occurs in Pieces 25 and 26 close to the contact with Unit 28.

VEINS/FRACTURES: None.

COMMENTS: Vesicle cylinders, up to 5 mm long, are present in Piece 33.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1203A-65R-1 (Section top: 876.2 mbsf)

UNIT 28: VOLCANICLASTIC BRECCIA.

Pieces: 1-25

CONTACTS: An irregular, unconformable contact between Unit 28 and the underlying Unit 29 (aphyric basalt) is preserved at 118 cm in Piece 25.

GENERAL DESCRIPTION: Poorly sorted, clast supported volcaniclastic breccia consisting of subangular pieces of aphyric vesicular basalt, and devitrified vesicular glass in a silty, carbonate matrix.

COLOR: Medium dark gray (N4) to grayish olive green (5GY 3/2).

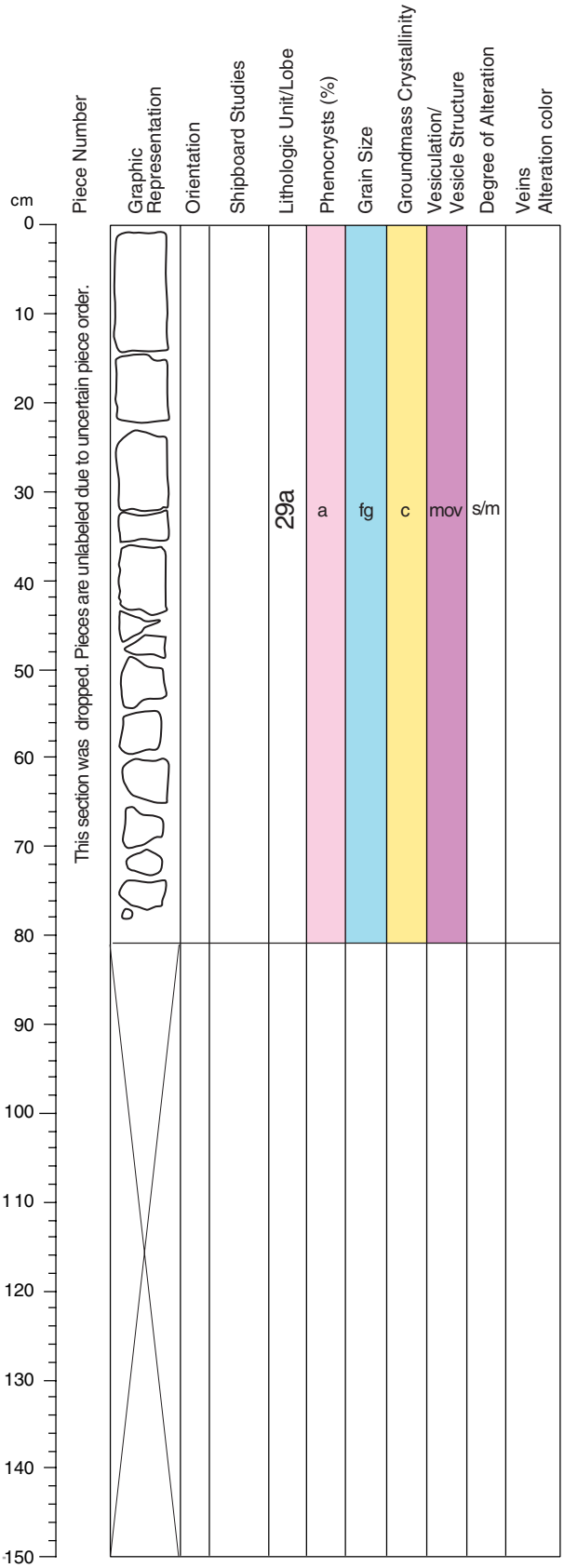
COMPONENTS:
40% clasts of aphyric vesicular basalt.
40% fragments of highly vesicular, devitrified glass.
20% fine grained silty matrix with carbonate cement.

SEDIMENTARY TEXTURES: None.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: The highly vesicular, devitrified glassy basalt fragments are more abundant in the lower part of this unit (80 cm to 118 cm).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-65R-2 (Section top: 877.7 mbsf)

UNIT 29: VESICULAR APHYRIC BASALT.

Pieces: Not labelled. Dropped core.

CONTACTS: None.

GROUNDMASS: Fine grained. Consists of plagioclase, clinopyroxene, and black oxides.

VESICLES:

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
10-15	3	<0.2	1	Round

COLOR: Medium gray (N5). Grayish orange (10R 7/4) adjacent to veins.

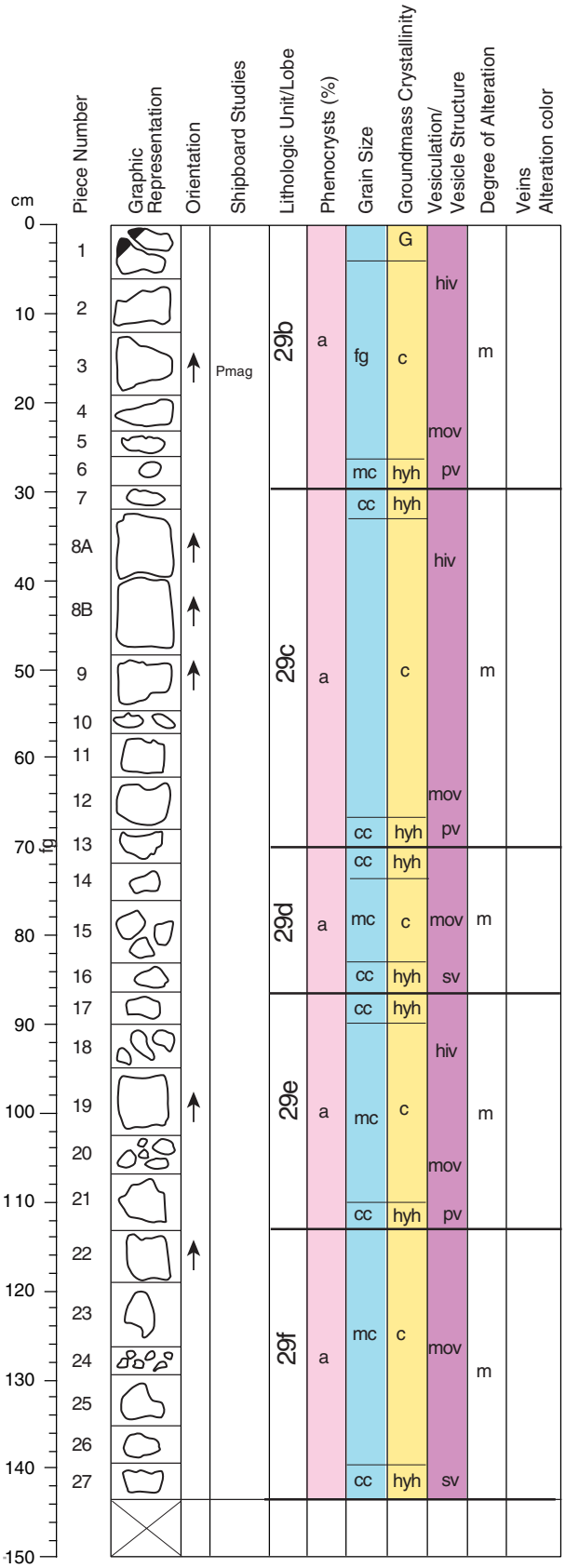
STRUCTURE: Lobed.

ALTERATION: Slight to moderate. Mesostasis altered to dark green clay adjacent to veins. Vesicles are filled with white carbonate, brown and green clay minerals.

VEINS/FRACTURES: Sparsely to moderately veined. Veins are 1-2 mm wide and filled with white carbonate, Fe-oxyhydroxide, and brown and green clay minerals.

COMMENTS: Nonoriented core.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-65R-3 (Section top: 878.5 mbsf)

UNIT 29: VESICULAR APHYRIC BASALT.

Pieces: 1-27

CONTACTS: None.

GROUNDMASS: Fine grained. Plagioclase and highly altered mesostasis.

VESICLES:

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
5-30	6	0.5	1	Irregular

COLOR: Medium dark gray (N4). Dark greenish-gray (5G 4/1) at altered glassy lobe margins, and moderate brown (5YR 3/4) in Fe-oxyhydroxide-rich areas.

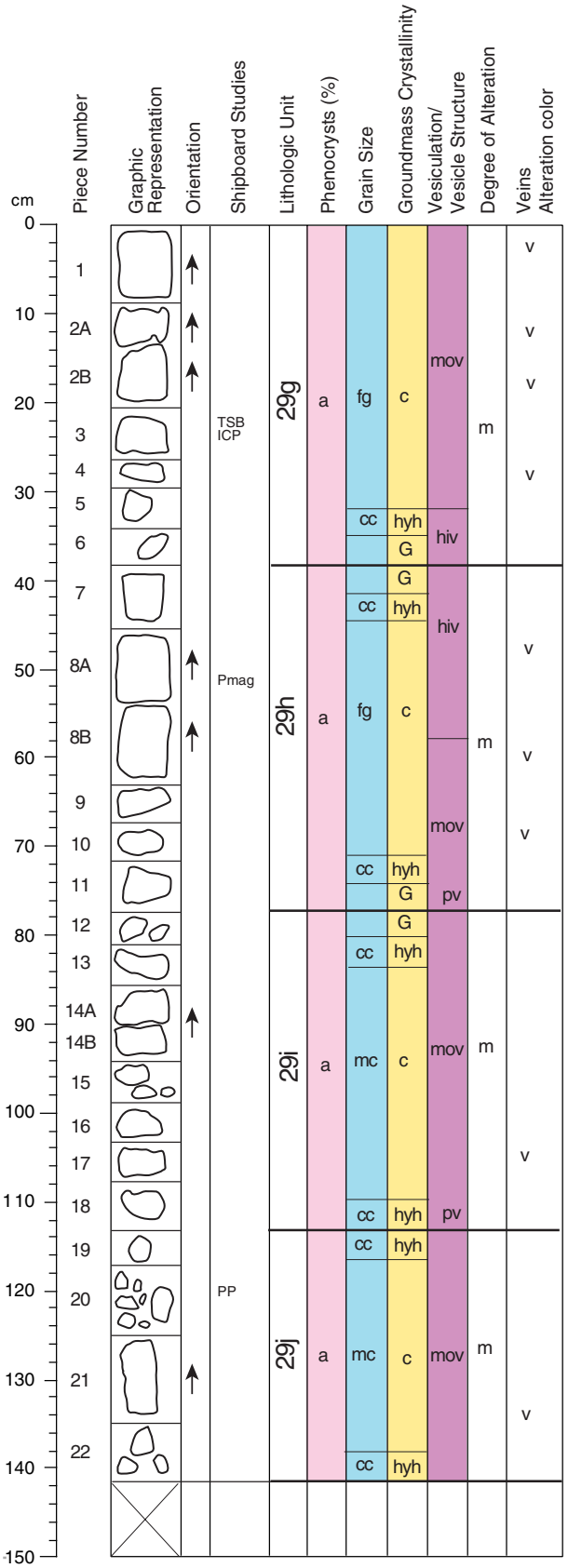
STRUCTURE: Lobed. An altered glassy lobe margin is present in Piece 1.

ALTERATION: Moderate. Mesostasis is altered to dark gray clay. Glass altered to dark greenish gray clay. Most vesicles are filled with white carbonate. Fe-oxyhydroxide alteration is pervasive adjacent to the glassy lobe margin and some veins.

VEINS/FRACTURES: Sparsely veined. Veins are 1-4 mm wide, randomly oriented, and filled with carbonate and Fe-oxyhydroxide.

COMMENTS: Vesicle distribution is very patchy, as is the proportion of vesicles that are filled.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-65R-4 (Section top: 879.94 mbsf)

UNIT 29: VESICULAR APHYRIC BASALT.

Pieces: 1-22

CONTACTS: None.

GROUNDMASS: Fine grained. Plagioclase and highly altered mesostasis.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
5-30	6	0.5	1	Irregular

COLOR: Medium dark gray (N4). Dark greenish-gray (5G 4/1) at altered glassy lobe margins, and moderate brown (5YR 3/4) in Fe-oxyhydroxide-rich areas.

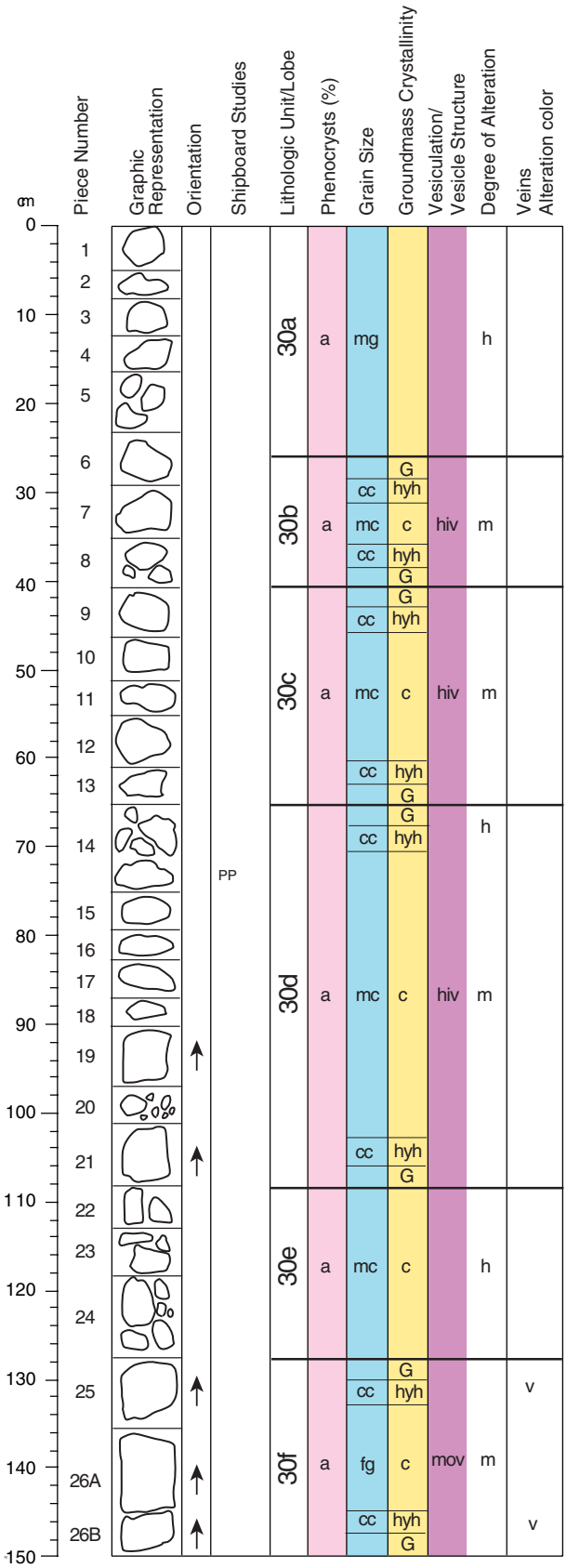
STRUCTURE: Lobed. Altered glassy lobe margins are present in Pieces 6, 11, and 13.

ALTERATION: Moderate. Mesostasis is altered to dark gray clay. Glass altered to dark greenish-gray clay. Most vesicles are filled with white carbonate. Fe-oxyhydroxide alteration is greatest adjacent to glassy lobe margins and some veins.

VEINS/FRACTURES: Sparsely veined. Veins are 1-4 mm wide, randomly oriented, and filled with carbonate and Fe-oxyhydroxide.

COMMENTS: Vesicle distribution is very patchy, as is the proportion of vesicles that are filled. A single 3 mm plagioclase phenocryst is near the bottom of Piece 8B.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-66R-1 (Section top: 885.8 mbsf)

UNIT 30: VESICULAR, SPARSELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-26B

CONTACTS: None observed. The contact between Units 29 and 30 is inferred to be at the top of Section 66R-1, where an altered and brecciated flow top is present.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1	1	0.2	0.8	Euhedral to subhedral; blocky

GROUNDMASS: Fine grained to aphanitic. Alteration makes primary textures difficult to define, but the plagioclase laths form an intergranular to intersertal texture.

VESICLES:	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
Highly vesicular	10-30	10	0.5	2	Round to irregular

COLOR: Medium gray (N5), light brown (5YR 6/4), grayish green (10GY 5/2), grayish blue green (5GB 5/2).

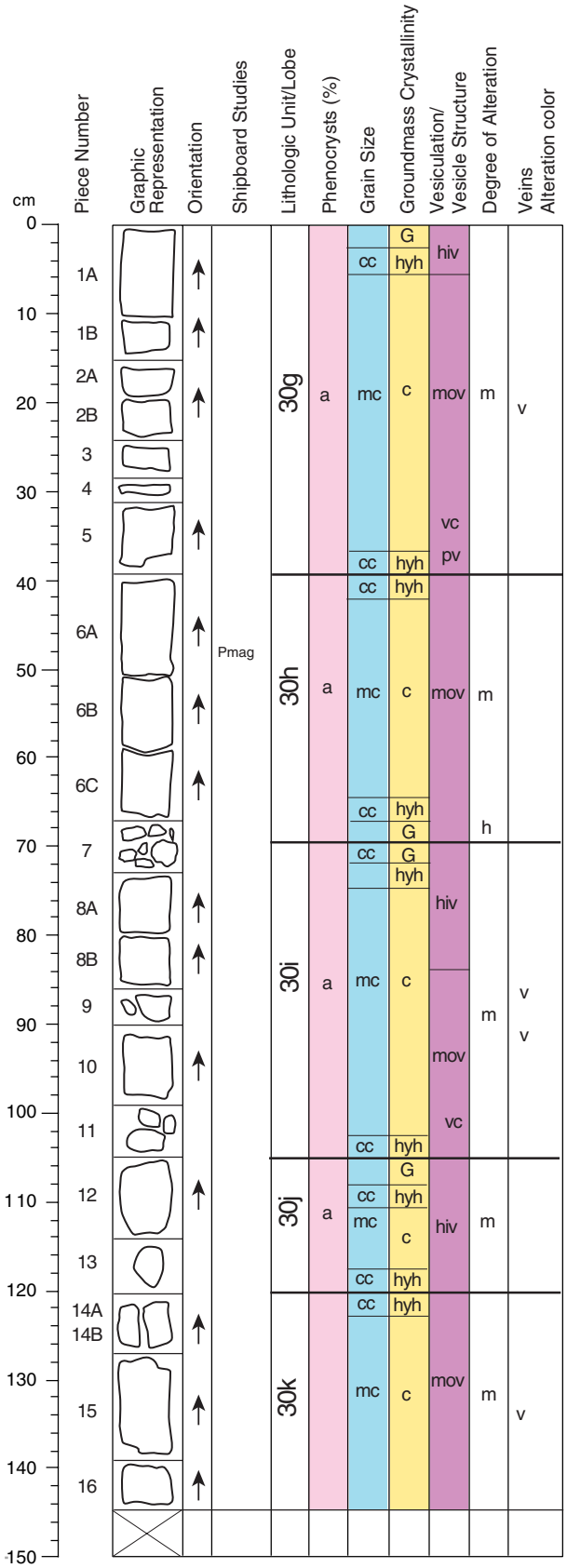
STRUCTURE: Brecciated to lobed. A glassy lobe margin is present in Piece 19. It is completely altered and spalling off into the breccia matrix.

ALTERATION: Moderate to complete. Glass clasts in the brecciated flow top and in lobe margins are completely altered to green and black clay. Zeolites are present in the breccia matrix. Vesicles are filled with white carbonate and green clay, although they are predominantly unfilled in Pieces 26A and 26B and are lined with dark green clay. The mesostasis and some groundmass clinopyroxene has been altered to clay minerals.

VEINS/FRACTURES: Moderately veined in Pieces 25-26B. Veins are approximately perpendicular to the lobe margins. They are 0.1-5 mm wide and filled predominantly with white carbonate, with subordinate amounts of green clay and Fe-oxyhydroxide.

COMMENTS: There is a change from aphyric basalt in Unit 29 to sparsely plagioclase-phyric basalt in Unit 30. Pieces 1-24 (0-127 cm) represent a brecciated flow top. Pieces 25-26B are of sparsely vesicular basalt. A fracture filled with breccia matrix is present in Piece 25 and the basalt contains no glassy lobe margin. Large (>5 cm), vesicular basalt clasts are present in the breccia, which are moderately altered. In Piece 22, there are 1-2 cm round clasts that may be the altered remains of nonvesicular glass. Some of the highly vesicular (and now completely altered) glass clasts exhibit flattening/stretching of the vesicles. A pipe vesicle (0.5 x 2 cm) filled with white carbonate is present in the basalt clast of Piece 17.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-66R-2 (Section top: 887.3 mbsf)

UNIT 30: VESICULAR, SPARSELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1A-16

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1	1.5	0.5	0.8	Euhedral to subhedral

GROUNDMASS: Fine grained. Alteration makes primary textures difficult to define, but the plagioclase laths (stained with Fe-oxyhydroxide) form an intergranular, occasionally subtrachytic texture.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
0-30	10	0.1	1	Round to elongate

COLOR: Medium dark gray (N4). Alteration halos are grayish green (10GY 5/2).

STRUCTURE: Lobed. One complete lobe is present from Piece 1A to Piece 6C (0-66 cm). Lobes are defined on the basis of changes in vesicle abundance and morphology, and the presence of completely altered glassy lobe margins (e.g., Pieces 1A and 6C).

ALTERATION: Moderate to complete. Approximately 60%-70% of the vesicles are filled with white carbonate and Fe-oxyhydroxide; where unfilled they are lined with dark green clay. Plagioclase phenocrysts are stained with Fe-oxyhydroxide.

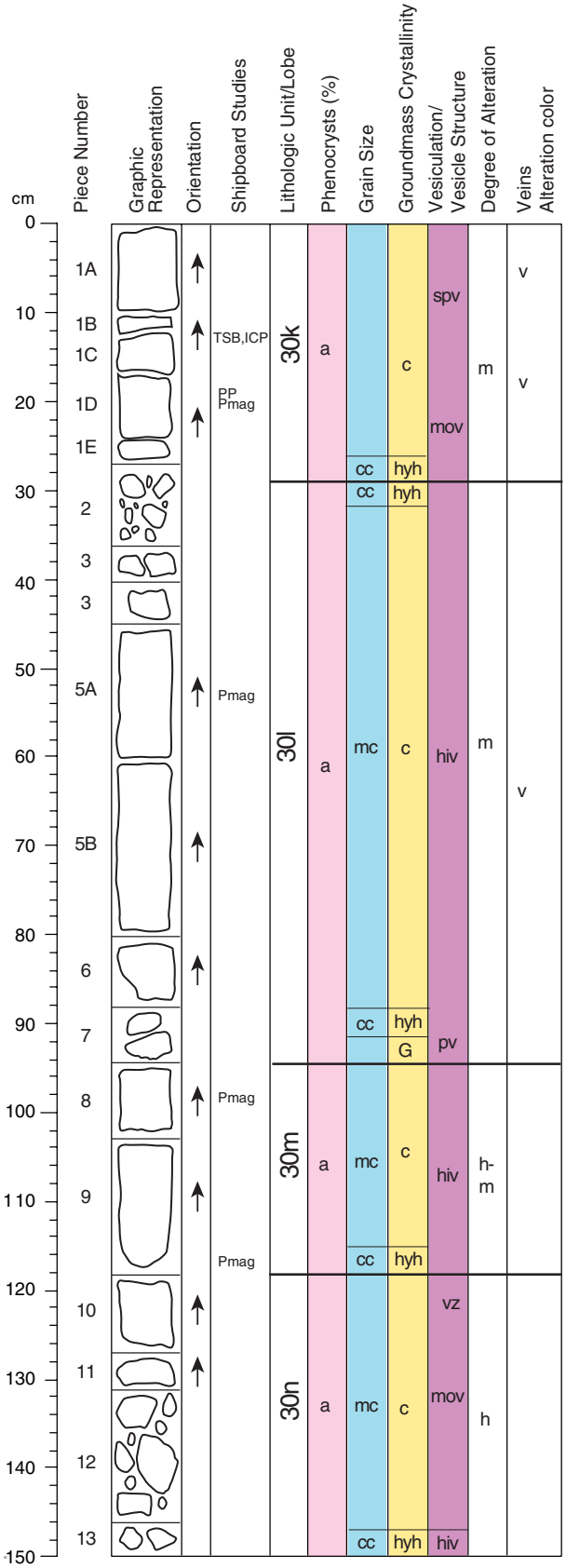
VEINS/FRACTURES: Sparsely veined. Subvertical veins, 0.1-1 mm wide are filled with white carbonate, dark green clay, and Fe-oxyhydroxide.

COMMENTS: An interlobe breccia is present in Piece 7.

Vesicularity is variable: nonvesicular in parts of Pieces 1A and 6C; highly vesicular in Pieces 3 and 12.

Pipe vesicles (1-3 cm long and 3-7 mm wide) filled with white carbonate are present in Pieces 2B, 5, and 15.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-66R-3 (Section top: 888.76 mbsf)

UNIT 30: VESICULAR, SPARSELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1A-13

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1	1.5	0.4	0.8	Euhedral to subhedral; blocky

GROUNDMASS: Fine grained. Alteration makes primary textures difficult to define, but the plagioclase laths form an intergranular to intersertal texture.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
	1-25	5	0.2	2	Round to irregular

COLOR: Medium dark gray (N4) to medium gray (N5). Alteration halos are moderate yellowish brown (10YR 5/4) to medium brown (5YR 3/4).

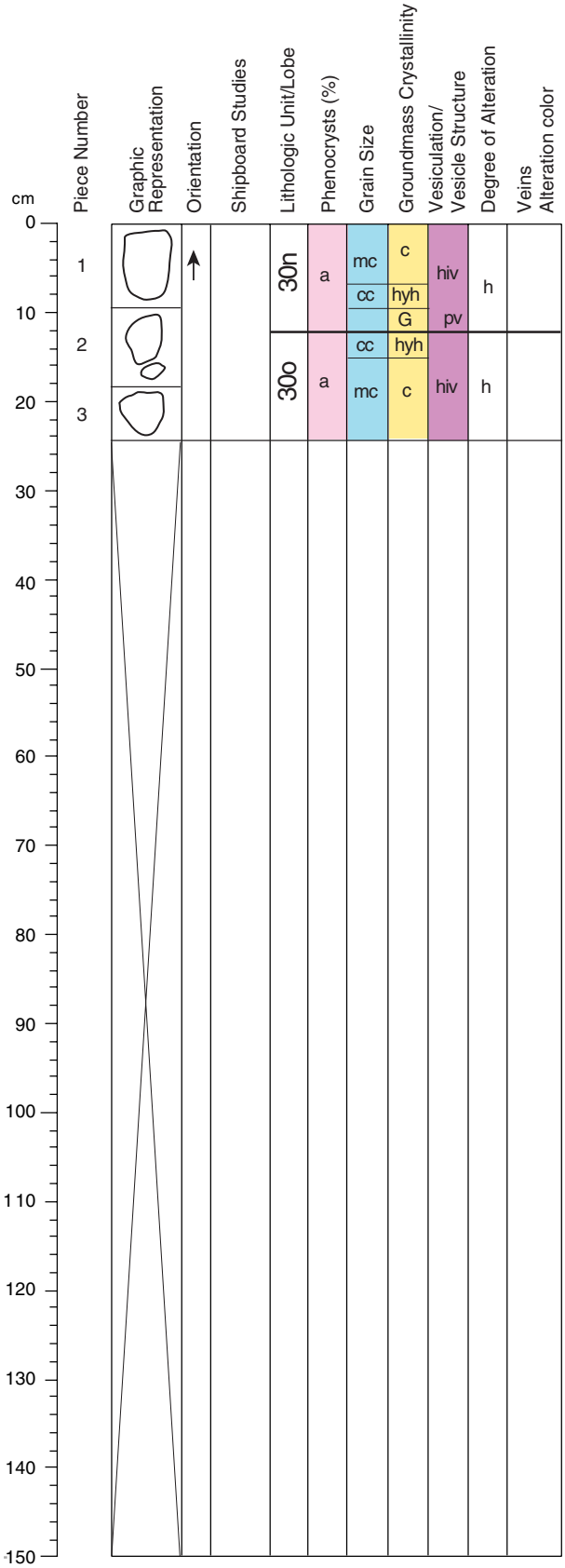
STRUCTURE: Lobed. Pieces 2 and 3 may represent a lobe boundary as they are comprised of brecciated interlobe(?) material. Lobes are defined on the basis of changes in vesicle abundance and morphology.

ALTERATION: Moderate to high. Dark green clay is pervasive. Fe-oxyhydroxide-rich alteration halos are present adjacent to veins. Approximately 70% of the vesicles are filled with white carbonate, dark green clay, and Fe-oxyhydroxide; where unfilled they are lined with dark green clay.

VEINS/FRACTURES: Sparsely veined. Subvertical to subhorizontal veins, 0.1-5 mm wide are filled with white carbonate, dark green clay, and Fe-oxyhydroxide.

COMMENTS: Vesicularity is variable: basalt is sparsely vesicular (e.g., Piece 6) to highly vesicular (e.g., Piece 10).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-66R-4 (Section top: 890.26 mbsf)

UNIT 30: VESICULAR, SPARSELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-3

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1	1	0.2	0.6	Euhedral to subhedral

GROUNDMASS: Fine grained. Alteration and density of vesicle cylinders makes primary textures difficult to define.

VESICLES:

	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	15-25	5	0.2	2	Irregular

COLOR: Medium dark gray (N4) to dark reddish brown (10R 3/4).

STRUCTURE: Assumed to be lobed and a continuation of Unit 30 from 66R-3

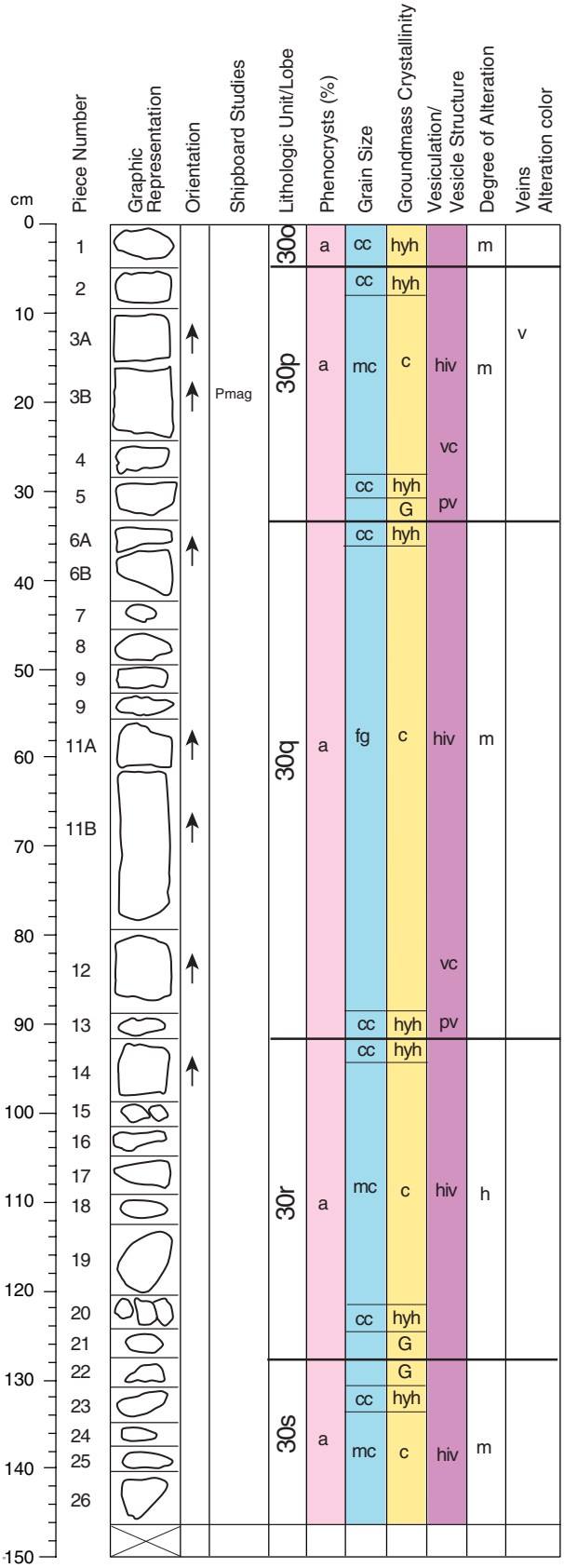
ALTERATION: Moderate to high. Zones of oxidation are present in all pieces that are 1-2 cm wide. Approximately 50% of the vesicles are filled with white carbonate, Fe-oxyhydroxide, and dark green clay; where unfilled they are lined with dark green clay.

VEINS/FRACTURES: Veins are indistinct because of vesicle coalescence.

COMMENTS:
Pieces 1 and 3 contain vesicle cylinders filled with segregated basaltic material that has a lighter alteration color.

Plagioclase phenocrysts are stained with Fe-oxyhydroxide.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-67R-1 (Section top: 895.4 mbsf)

UNIT 30: VESICULAR, SPARSELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-26

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1			0.5	Subhedral; blocky

GROUNDMASS: Fine grained. Plagioclase and highly altered mesostasis.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	10-20	7	0.5	2	Irregular

COLOR: Medium dark gray (N4). Dark greenish gray (5G 4/1) at altered glassy lobe margins.

STRUCTURE: Lobed. Traces of altered glass margins in Pieces 1, 5, 14, and 22.

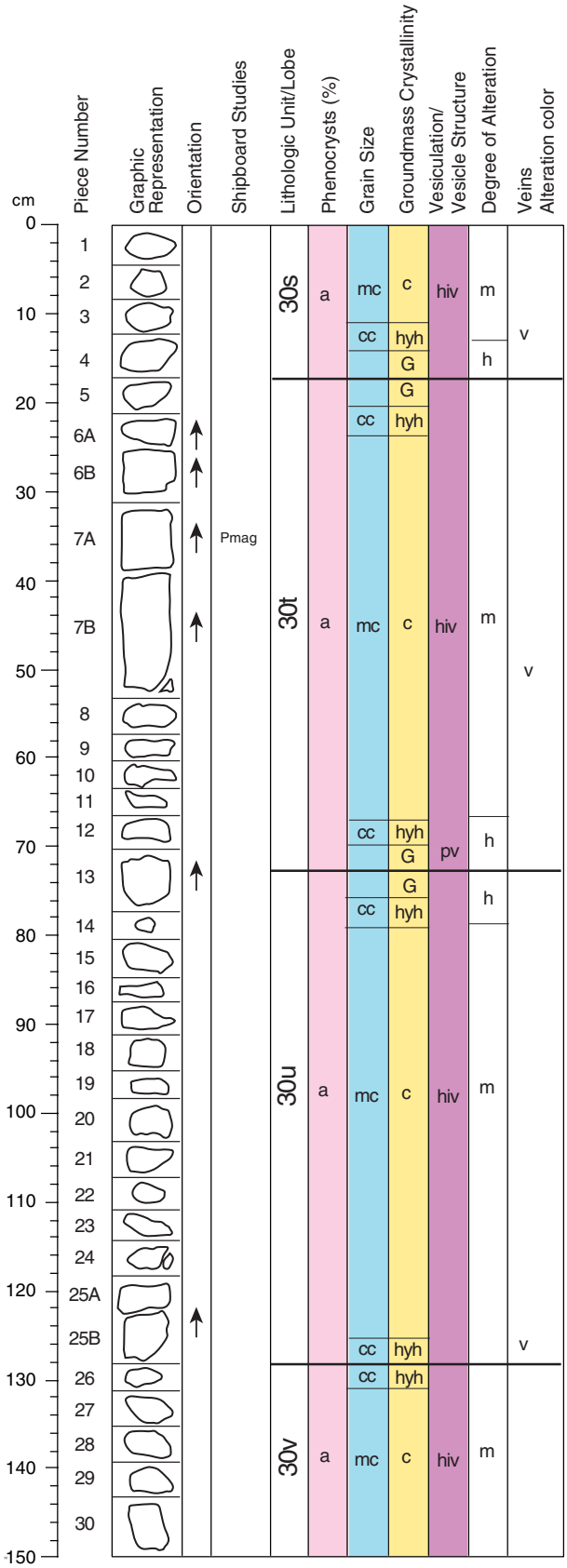
ALTERATION: Moderate. Mesostasis is altered to dark gray clay. Glassy lobe margins are altered to dark greenish-gray clay. Most vesicles are filled with white carbonate.

VEINS/FRACTURES: Sparsely veined. Veins are 1-3 mm wide, randomly oriented, and filled with carbonate and Fe-oxyhydroxide.

COMMENTS: Plagioclase phenocryst distribution is very patchy in this core section, but microphenocrysts of plagioclase stained with Fe-oxyhydroxide are present in Piece 12.

Vesicle distribution is also very patchy, as is the proportion of vesicles that are filled.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-67R-2 (Section top: 896.86 mbsf)

UNIT 30: VESICULAR, SPARSELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-30

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1	3	0.5	0.8	Subhedral; blocky

GROUNDMASS: Fine grained. Alteration makes primary textures difficult to define, but the plagioclase laths form an intergranular to intersertal texture.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	10-25	10	0.5	2	Round to irregular

COLOR: Medium dark gray (N4), dark reddish brown (10R 3/4), with dark greenish gray (5G 4/1) at altered glassy lobe margins.

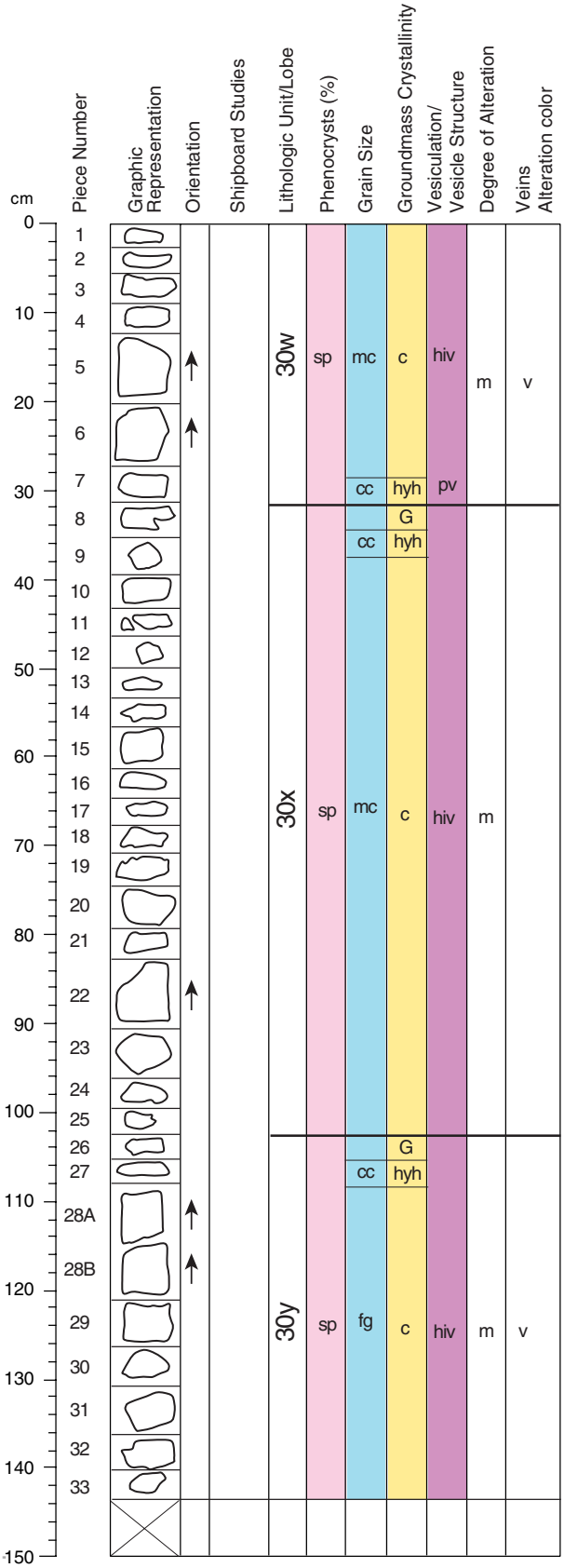
STRUCTURE: Lobed. Altered glassy lobe margins are present in Pieces 5, 12, 13, and 25B with elongate vesicles forming zones that are concentric with them.

ALTERATION: Moderate to complete. Glassy lobe margins are completely altered to dark greenish-gray clay. Mesostasis is altered to dark gray clay. Approximately 60% of the vesicles are filled with white carbonate, dark green clay and Fe-oxyhydroxide. The remainder are unfilled, but lined with dark green clay or Fe-oxyhydroxide.

VEINS/FRACTURES: Sparsely veined. Veins are up to 1 mm wide and are filled with white carbonate, Fe-oxyhydroxide, and occasionally green clay.

COMMENTS: Plagioclase phenocryst distribution is patchy and they are stained with Fe oxyhydroxide. Pipe vesicles, filled with white carbonate, are present in Pieces 7B, 25A, and 25B.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-67R-3 (Section top: 898.36 mbsf)

UNIT 30: VESICULAR, SPARSELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-33

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	1	1.2	0.4	0.6	Subhedral; blocky

GROUNDMASS: Fine grained. Alteration makes primary textures difficult to define, but the plagioclase laths form an intergranular to intersertal texture.

VESICLES:	% Mode	Size (mm): Max.	Min.	Avg.	Shape
Highly vesicular	15-25	12	0.2	1.5	Round to irregular

COLOR: Medium dark gray (N4), dark reddish brown (10R 3/4), with dark greenish gray (5G 4/1) at altered glassy lobe margins.

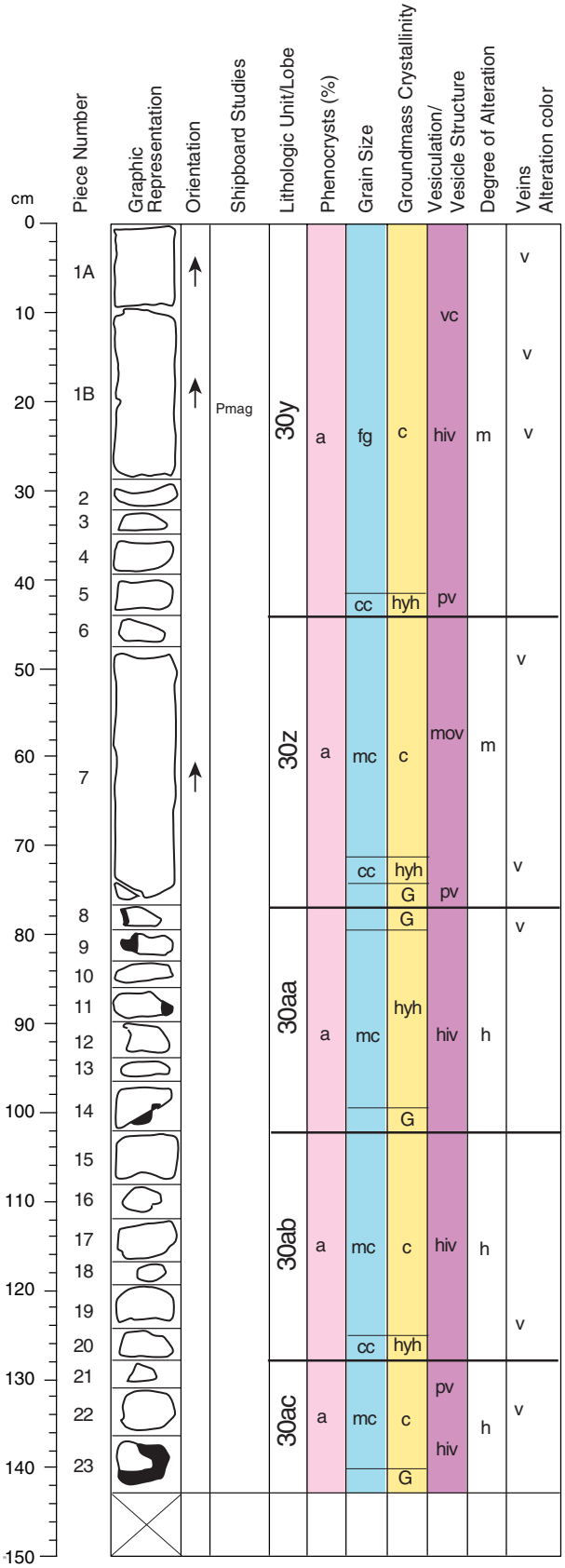
STRUCTURE: Lobed. Altered glassy lobe margins are present in Pieces 8, 26, and 27 with elongate vesicles forming zones that are concentric with them.

ALTERATION: Moderate to complete. Glassy lobe margins are completely altered to dark greenish-gray clay and Fe-oxyhydroxide (e.g., Piece 10). Mesostasis is altered to dark gray clay. Approximately 60% of the vesicles are filled with white carbonate, dark green clay and Fe-oxyhydroxide. The remainder are unfilled, but lined with dark green clay or Fe oxyhydroxide.

VEINS/FRACTURES: Sparsely veined. Veins are up to 1 mm wide and are filled with white carbonate, Fe-oxyhydroxide, and occasionally green clay.

COMMENTS: Plagioclase phenocrysts are stained with Fe-oxyhydroxide.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-67R-4 (Section top: 899.8 mbsf)

UNIT 30: VESICULAR, SPARSELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1A-23

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	~1	4	0.4	0.5	Subhedral; blocky

GROUNDMASS: Fine grained. Alteration makes primary textures difficult to define, but the plagioclase laths form an intergranular to intersertal texture.

VESICLES:

% Mode	Size (mm): Max.	Min.	Avg.	Shape
5-25	10	0.2	2	Round to irregular

COLOR: Medium dark gray (N4), dark reddish brown (10R 3/4), with dark greenish-gray (5G 4/1) at altered glassy lobe margins.

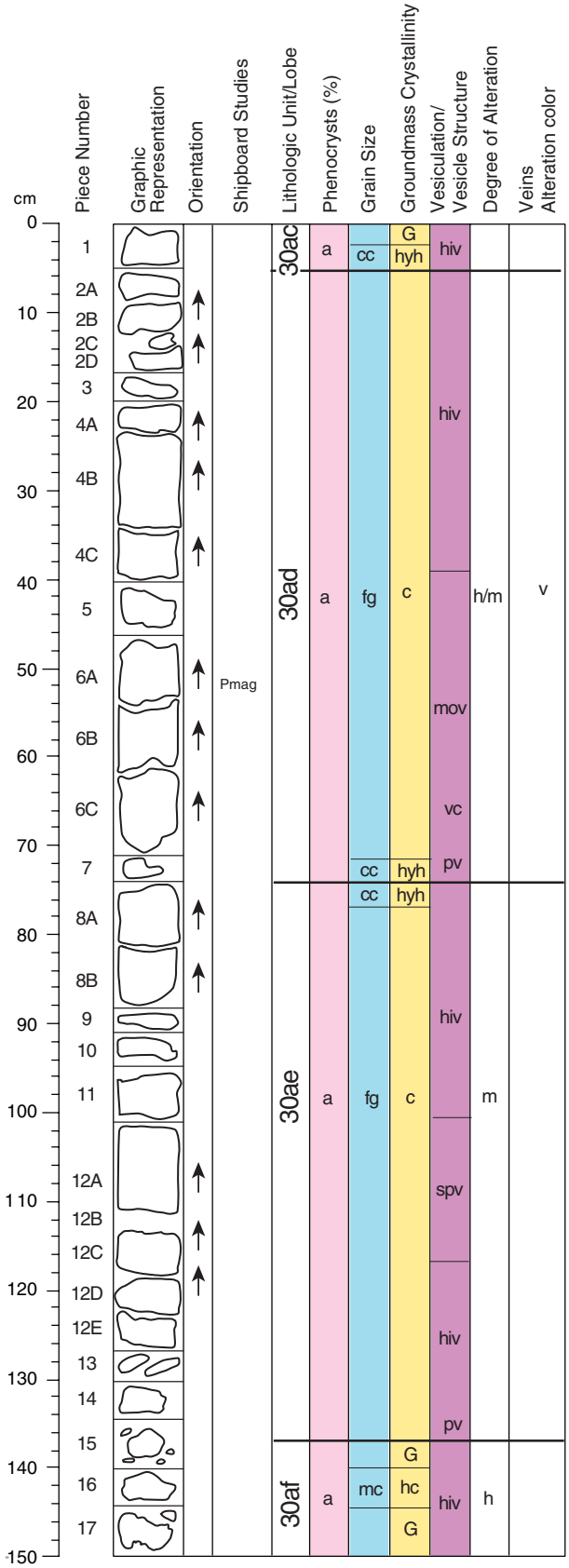
STRUCTURE: Lobed. Lobe boundaries are present at 44 cm and 77 cm. Altered glassy lobe margins are present in Pieces 8, 9, 11, and 23 and vesicles form zones that are concentric with them.

ALTERATION: Moderate to complete. Glassy lobe margins are completely altered to dark greenish-gray clay. Mesostasis is altered to dark gray clay. Approximately 70% of the vesicles are filled with white carbonate, dark green clay and Fe-oxyhydroxide. The remainder are unfilled, but lined with dark green clay or Fe-oxyhydroxide.

VEINS/FRACTURES: Sparsely veined. Veins are up to 2 mm wide, and oriented perpendicular to the lobe boundaries. They are filled with white carbonate, Fe-oxyhydroxide, and occasionally green clay.

COMMENTS: A vesicle cylinder is present in Pieces 1A and 1B (3-14 cm) containing segregated basaltic material and vesicles filled with white carbonate. Plagioclase phenocryst distribution is patchy.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-68R-1 (Section top: 905.0 mbsf)

UNIT 30: VESICULAR, SPARSELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-17

CONTACTS: None.

GROUNDMASS: Fine grained and aphyric consisting mainly of plagioclase and clinopyroxene.

VESICLES:

	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
	5-30	≤3	<1	1.25	Round to irregular

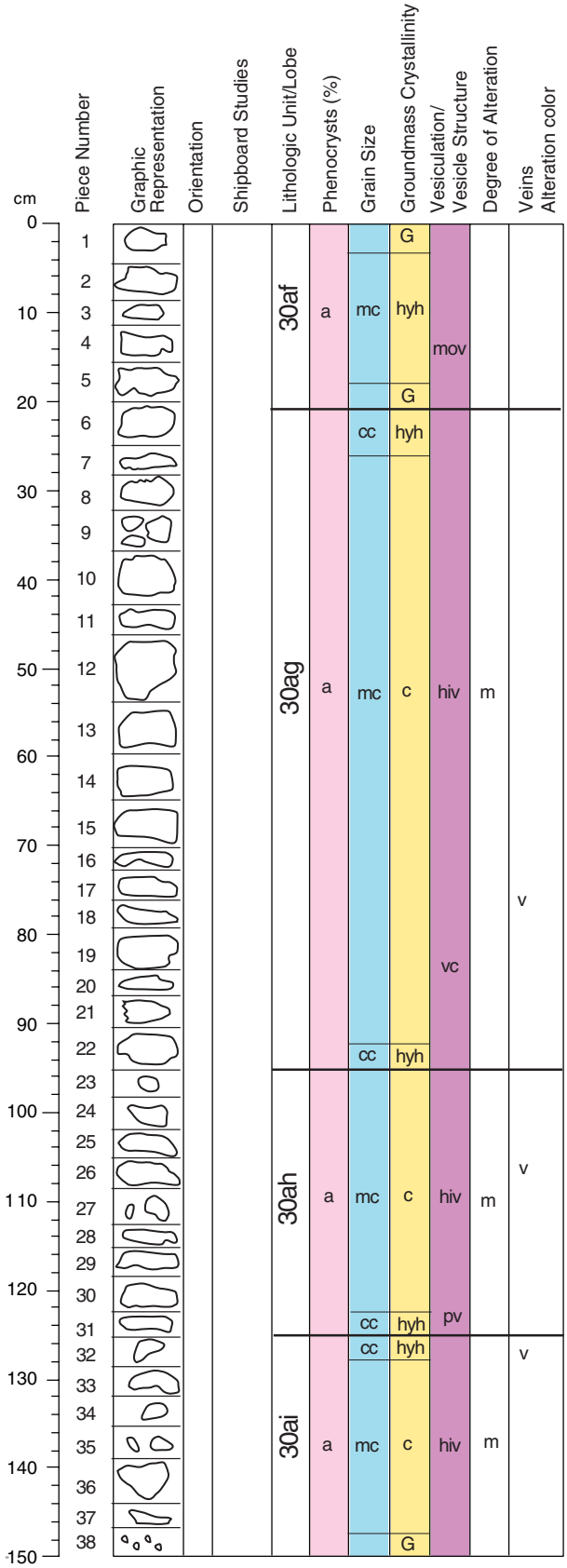
COLOR: Ranges from medium dark gray (N4) to brownish gray (5YR 4/1), with dark greenish gray (5G 4/1) at altered glassy lobe margins.

STRUCTURE: Lobed with a massive interior. Lobe boundaries are inferred by sparse glassy rinds on some pieces. Lobe boundaries are observed at 2 cm, 76 cm, and 127 cm.

ALTERATION: Moderate to complete. Glassy lobe margins are completely altered to dark greenish gray clay. Mesostasis is altered to dark gray clay. Approximately 70% of the vesicles are filled with white carbonate, dark green clay and Fe-oxyhydroxide. The remainder are unfilled, but lined with dark green clay or Fe-oxyhydroxide.

VEINS/FRACTURES: Sparse veins ~2 mm are randomly oriented; filled with white carbonate, Fe-oxyhydroxide, and green fine-grained clay.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-68R-2 (Section top: 906.5 mbsf)

UNIT 30: VESICULAR, SPARSELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-38

CONTACTS: None.

GROUNDMASS: Fine grained and aphyric consisting mainly of plagioclase and clinopyroxene.

VESICLES:

	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
	20	13	<1	1	Round to irregular

COLOR: Ranges from medium dark gray (N4) to brownish gray (5YR 4/1), with dark greenish gray (5G 4/1) at altered glassy lobe margins.

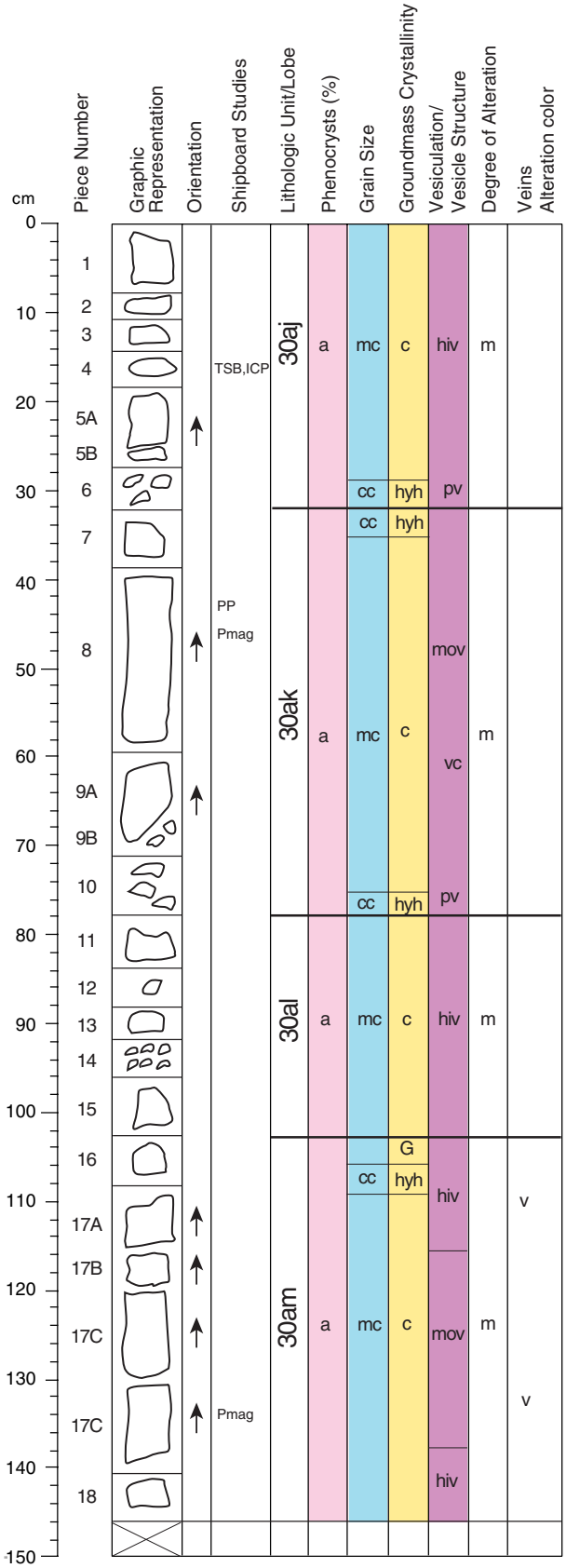
STRUCTURE: Lobed with a massive interior. Lobe boundaries are inferred by sparse glassy rinds on some pieces. Lobe boundaries are observed at 19 cm, 94 cm, 122 cm, and possibly 150 cm.

ALTERATION:Moderate to complete. Glassy lobe margins are completely altered to dark greenish gray clay. Mesostasis is altered to dark gray clay. Approximately 70% of the vesicles are filled with white carbonate, dark green clay and Fe-oxyhydroxide. The remainder are unfilled, but lined with dark green clay or Fe-oxyhydroxide. In the Piece 6, breccia clasts contain red radiating secondary mineralization (possibly clays?).

VEINS/FRACTURES: Sparsely veined. Discontinuous veins are ~1 mm in width. They are randomly oriented, filled with white carbonate, Fe-oxyhydroxide, green fine grained clay, and occasionally sulfides.

COMMENTS: Vesicles vary in size. Piece 28 contains large 11 mm vesicles. Piece 6 consists of green breccia containing glassy vesicular clasts in a carbonate matrix.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-68R-3 (Section top: 908.0 mbsf)

UNIT 30: VESICULAR, SPARSELY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-18

CONTACTS: None.

GROUNDMASS: Fine grained and aphyric consisting mainly of plagioclase and clinopyroxene.

VESICLES:

	%	Size (mm):			
	Mode	Max.	Min.	Avg.	Shape
	20-50	5	0.5	1	Irregular

COLOR: Ranges from medium dark gray (N4) to brownish gray (5YR 4/1), with dark greenish gray (5G 4/1) at altered glassy margins.

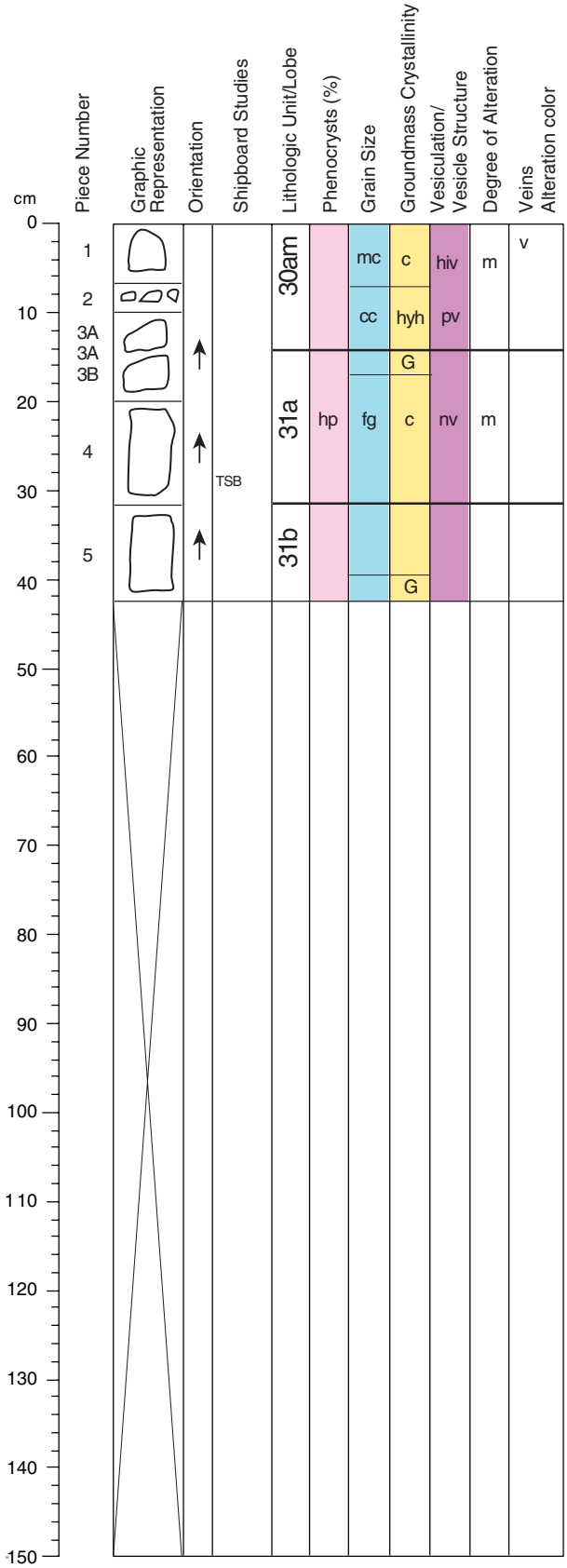
STRUCTURE: Lobed with a massive interior. Lobe boundaries are inferred by sparse glassy rinds on some pieces. Lobe boundaries are observed at 33 cm, and 104 cm.

ALTERATION: Moderate. Glassy lobe margins are completely altered to dark greenish gray clay, with adjacent Fe-oxyhydroxide alteration. Approximately 70% of the vesicles are filled with white carbonate, dark green clay and Fe-oxyhydroxide. The remainder are unfilled, but lined with dark green clay or Fe-oxyhydroxide.

VEINS/FRACTURES: A carbonate filled vein, ~2 mm wide is present from 125-134 cm.

COMMENTS: Distribution of vesicle fillings is patchy. A white carbonate filled pipe vesicle is present at 55-66 cm.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-68R-4 (Section top: 909.46 mbsf)

UNIT 30: VESICULAR, SPARSELY-PLAGIOCLASE PHYRIC BASALT.

Pieces: 1-3

CONTACTS: None.

GROUNDMASS: Fine grained and aphyric consisting mainly of plagioclase and clinopyroxene.

VESICLES:

%	Size (mm):			
Mode	Max.	Min.	Avg.	Shape
20-50	5	0.5	1	Irregular

COLOR: Ranges from medium dark gray (N4) to brownish gray (5YR 4/1).

STRUCTURE: Lobed.

ALTERATION: Moderate. Vesicles filled with carbonate, although vesicle filling is patchy.

VEINS/FRACTURES: A thin vein, <1 mm, and filled with white carbonate is present in Piece 1.

COMMENTS: Distribution of vesicle fillings is patchy.

UNIT 31a: BASALT HYALOCLASTITE-TUFF.

Pieces: 3-4

CONTACTS: Upper contact not recovered. Lower contact is curved, dipping at ~60 degrees, it is conformable[1].

GENERAL DESCRIPTION: A massive basalt vitric tuff made of highly angular vesicular, plagioclase-phyric glass fragments. Vesicularity is variable; smallest grains are close to vesicle free, whereas larger clasts are moderately to strongly vesicular[2].

COLOR: Dark olive gray (5Y 2/1).

COMPONENTS: ~95% glass fragments,with ~5% plagioclase crystals, and a cement consisting of silica and a minor amount of carbonates.

SEDIMENTARY TEXTURES: Coarse to very coarse grained tuff, with one 35 mm long and 8-9 mm wide glassy vesicular clast, (large fragment of a glassy lobe selvage.)

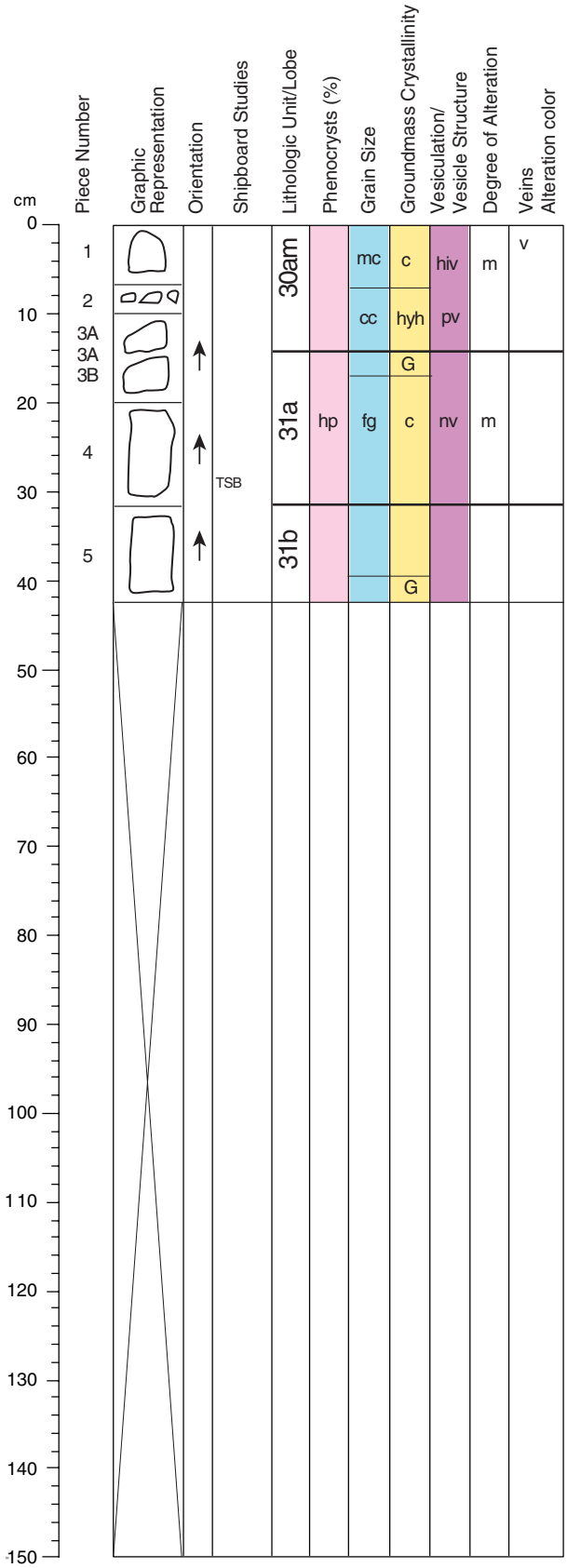
SEDIMENTARY STRUCTURES: Massive.

COMMENTS:
[1] The tuff is in direct contact with the glassy margin of underlying lobe in Piece 4, and at the contact the glass fragments show a jigsaw-fit arrangement, and indication of being spalled off the lobe surface.

[2] Based on the similarity of the tuff clasts and the glassy lobe margins of the underlying lava (including the plagioclase-phyric nature of both) the tuff clasts are derived from the underlying lava flow.

(Continued on next page.)

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1203A-68R-4 (Continued)

UNIT 31b: HIGHLY PLAGIOCLASE-PHYRIC BASALT.

Pieces: 4-5

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	15	4	1	2	Euhedral to subhedral
Olivine:	<1	1	1	1	Subhedral

GROUNDMASS: Fine grained and aphyric consisting mainly of plagioclase and clinopyroxene.

VESICLES: Nonvesicular

COLOR: Ranges from medium dark gray (N4) to pale reddish brown (10R 5/4).

STRUCTURE: Lobed with a massive interior. Lobe boundaries are inferred by sparse glassy rinds on some pieces. Lobe boundaries are observed at 20 cm, and 42 cm.

ALTERATION: High. Pale reddish brown color is pervasive in the groundmass.

VEINS/FRACTURES: None.

Hole 1203A Smear Slides

Sample						Mineral										Biogenic									
Core	Core Type	Section	Top (cm)	Depth (mbsf)	Lithology	Dolomite	Calcite	Gypsum	Fe Oxide	Pyrite	Opaques	Quartz	Feldspar	Volcanic Glass	Clay Minerals	Nannofossils	Foraminifers (whole)	Foraminifers Tests	Diatoms	Radiolarians	Dinoflagellates	Siliceous Sponge Spicules	Silicoflagellates	Organic Debris	Comments
1	R	1	3	300.03	D	0	0	0	0	0	0	0	0	0	0	69	0	0	26	0	0	5	0	0	Diatom nannofossil ooze
1	R	1	58	300.58	M	0	0	0	0	5	0	0	0	0	0	67	0	0	18	0	0	10	0	*	Nannofossil ooze with diatoms and sponge spicules
1	R	1	85	300.85	D	0	*	0	0	0	0	0	0	0	0	81	4	6	9	0	0	0	0	*	Nannofossil ooze with diatoms and foraminifers
1	R	1	117	301.17	D	0	0	0	0	1	0	0	*	0	0	27	0	*	72	0	0	0	0	0	Nannofossil diatom ooze
1	R	2	44	301.94	D	0	0	0	0	1	0	0	4	0	0	4	0	0	91	0	0	*	0	0	Diatom ooze
1	R	2	88	302.38	M	0	0	0	0	3	6	0	9	0	2	27	0	0	53	0	0	0	0	0	Nannofossil diatom ooze
1	R	2	120	302.70	M	0	0	0	0	0	0	0	0	0	0	71	*	*	29	0	0	0	0	*	Diatom nannofossil ooze
1	R	2	149	302.99	D	0	0	0	0	0	0	0	*	0	0	16	0	5	79	0	0	0	0	0	Diatom ooze with nannofossils
1	R	3	25	303.25	D	0	0	0	0	0	0	0	0	0	0	31	*	0	68	1	0	0	0	0	Nannofossil diatom ooze
1	R	3	52	303.52	M	0	0	0	0	15	0	0	0	0	0	62	0	0	23	0	0	0	0	0	Nannofossil ooze with pyrite and diatoms
1	R	3	139	304.39	D	0	0	0	0	0	0	0	0	0	0	56	*	4	40	0	0	0	0	*	Diatom nannofossil ooze
2	R	1	8	309.68	D	0	0	0	0	0	0	0	0	0	0	0	0	3	97	*	0	0	0	0	Diatom ooze
2	R	1	67	310.27	D	0	0	0	0	0	0	0	*	4	0	10	*	4	49	4	0	29	0	0	Spicular diatom ooze with nannofossils
2	R	2	19	311.29	M	0	0	0	0	24	13	0	0	0	29	0	0	0	30	0	0	4	0	0	Clay minerals-rich diatomaceous silty clay with opaques and pyrite
2	R	2	52	311.62	D	0	15	0	0	0	0	0	0	0	0	0	*	8	62	0	0	15	0	0	Diatom ooze with calcite and sponge spicules
2	R	2	103	312.13	D	0	1	0	0	0	0	0	0	0	19	0	0	0	51	6	0	23	0	*	Diatom ooze with clay minerals and sponge spicules
2	R	3	75	313.35	D	0	1	0	0	0	0	0	0	10	0	42	0	0	47	0	0	0	0	0	Nannofossil-diatom mixed ooze with vitric ash
2	R	3	115	313.75	D	0	6	0	0	0	0	0	0	6	0	52	0	0	24	0	0	12	0	0	Nannofossil ooze with sponge spicules and diatoms
2	R	3	139	313.99	D	0	0	0	0	0	0	0	0	0	0	42	0	0	48	0	0	10	0	0	Nannofossil-diatom mixed ooze with sponge spicules
2	R	4	9	314.19	D	0	1	0	0	0	0	2	0	0	0	5	0	0	65	11	0	16	0	0	Diatom ooze with radiolarians and sponge spicules
2	R	4	21	314.31	M	0	0	0	0	0	0	0	*	0	0	5	0	0	46	25	0	12	12	*	Radiolarian-diatom ooze with silicoflagellates and sponge spicules
2	R	4	22	314.32	D	0	0	0	0	0	0	0	0	5	0	14	*	5	71	5	0	0	0	0	Diatom ooze with nannofossils
2	R	4	48	314.58	D	0	9	0	0	0	0	0	0	5	5	8	2	8	51	0	0	12	0	0	Diatom ooze with foraminifers and sponge spicules
2	R	4	108	315.18	D	0	0	0	0	0	0	0	0	0	0	70	0	0	21	5	0	4	0	0	Diatom ooze with nannofossils
3	R	1	25	319.55	D	0	0	0	0	0	*	*	0	0	0	75	*	0	25	*	0	*	0	0	Diatom nannofossil ooze
3	R	1	44	319.74	D	0	0	0	0	0	1	0	*	0	0	62	*	0	37	0	0	*	0	0	Diatom nannofossil ooze
3	R	1	69	319.99	D	0	3	0	0	*	*	3	0	0	3	0	0	0	78	0	0	13	0	0	Diatom ooze with sponge spicules
3	R	1	82	320.12	D	0	7	0	0	0	0	0	0	0	0	2	0	0	91	0	0	0	0	0	Diatom ooze
3	R	1	146	320.76	D	0	4	0	0	0	0	0	0	0	0	6	0	0	80	0	0	10	0	0	Diatom ooze with sponge spicules
3	R	2	24	321.04	D	0	0	0	0	0	0	2	0	0	2	2	2	0	82	0	0	10	0	0	Diatom ooze with sponge spicules
3	R	2	47	321.27	D	0	2	0	0	0	0	0	*	0	0	71	0	0	27	0	0	0	0	0	Diatom nannofossil ooze
0	R	2	82	321.62	D	0	0	0	0	*	0	0	*	0	0	2	0	0	94	2	0	2	0	0	Diatom ooze
3	R	2	112	321.92	D	0	0	0	0	0	0	0	0	0	0	2	0	0	96	*	0	2	0	0	Diatom ooze
3	R	2	127	322.07	D	0	2	0	0	0	*	0	0	0	2	78	*	0	16	*	0	2	0	0	Nannofossil ooze with diatoms
3	R	2	135	322.15	D	0	0	0	0	*	0	0	0	0	0	56	0	0	43	0	0	1	0	0	Diatom nannofossil ooze
3	R	3	45	322.75	D	0	0	0	0	0	0	0	0	0	0	67	0	0	33	0	0	0	0	0	Diatom nannofossil ooze
3	R	3	65	322.95	D	0	0	0	0	5	0	0	0	0	0	71	*	0	24	0	0	0	0	0	Nannofossil ooze with diatoms
3	R	3	115	323.45	D	0	0	0	0	5	0	0	0	0	0	68	0	0	25	0	0	2	0	0	Diatom nannofossil ooze
3	R	3	124	323.54	D	0	0	0	0	0	0	0	0	0	0	49	*	0	49	0	0	2	0	0	Nannofossil-diatom mixed ooze
3	R	4	9	323.89	D	0	0	0	0	0	0	0	0	0	0	98	0	0	0	*	0	2	0	0	Nannofossil ooze
3	R	4	12	323.92	D	0	0	0	0	0	0	0	0	0	0	77	0	0	19	0	0	4	0	0	Nannofossil ooze with diatoms
3	R	4	58	324.38	D	0	0	0	0	0	0	0	0	0	0	85	0	0	11	0	0	4	0	0	Nannofossil ooze with diatoms
3	R	5	21	325.51	D	0	2	0	0	0	0	0	0	0	0	98	0	0	*	0	0	0	0	0	Nannofossil ooze
3	R	5	47	325.77	D	0	0	0	0	0	0	0	0	0	0	54	0	0	44	0	0	2	0	0	Diatom nannofossil ooze
3	R	5	60	325.90	D	0	3	0	0	0	0	0	0	0	0	65	0	0	32	0	0	0	0	0	Diatom nannofossil ooze
3	R	5	102	326.32	D	0	1	0	0	0	0	0	0	0	0	81	0	0	16	0	0	2	0	0	Nannofossil ooze with diatoms
3	R	6	31	327.11	D	0	0	0	0	0	0	0	0	0	0	54	0	0	43	1	0	2	0	0	Diatom nannofossil ooze

Hole 1203A Smear Slides

Sample						Mineral										Biogenic									
Core	Core Type	Section	Top (cm)	Depth (mbsf)	Lithology	Dolomite	Calcite	Gypsum	Fe Oxide	Pyrite	Opaques	Quartz	Feldspar	Volcanic Glass	Clay Minerals	Nannofossils	Foraminifers (whole)	Foraminifers Tests	Diatoms	Radiolarians	Dinoflagellates	Siliceous Sponge Spicules	Silicoflagellates	Organic Debris	Comments
3	R	6	65	327.45	D	0	0	0	0	0	0	0	0	0	0	58	0	0	38	2	0	2	0	0	Diatom nannofossil ooze
3	R	6	100	327.80	D	0	2	0	0	0	0	0	0	0	0	55	*	0	37	2	0	0	4	0	Diatom nannofossil ooze
3	R	6	119	327.99	M	0	3	0	0	0	0	0	0	0	0	74	0	0	19	*	0	4	0	0	Nannofossil ooze with diatoms
3	R	6	126	328.06	D	0	1	0	0	0	0	0	0	0	2	68	0	0	17	0	0	12	0	0	Nannofossil ooze with diatoms
3	R	CC	7	328.23	D	0	0	0	0	0	0	0	0	0	0	60	0	0	37	0	0	3	0	0	Diatom nannofossil ooze
4	R	1	70	329.70	D	0	0	0	0	*	*	1	7	7	0	31	0	0	53	*	0	0	1	0	Nannofossil diatom ooze
4	R	1	140	330.40	D	0	6	0	0	0	0	0	0	0	0	10	0	0	15	0	0	48	21	0	Spicular ooze with nannofossils, diatoms and silicoflagellates
4	R	2	8	330.58	D	0	0	0	0	0	0	0	0	0	0	17	0	13	44	4	0	13	9	0	Diatom ooze with foraminifers, sponge spicules and nannofossils
4	R	2	66	331.16	M	0	0	0	0	0	0	0	0	0	0	52	0	9	12	0	0	18	9	0	Nannofossil ooze with diatoms and sponge spicules
4	R	2	74	331.24	M	0	0	0	0	0	5	0	0	8	5	47	*	0	8	3	0	16	8	0	Nannofossil ooze with sponge spicules
5	R	2	127	331.77	D	0	*	0	0	0	0	0	0	0	0	98	2	0	0	0	0	0	0	0	Nannofossil ooze
4	R	CC	0	331.41	D	0	0	0	0	0	0	0	0	0	0	15	0	21	64	0	0	0	*	0	Diatom ooze with nannofossils and foraminifers
4	R	CC	7	331.48	D	0	14	0	0	0	0	0	0	0	0	0	0	0	69	14	0	0	3	0	Diatom ooze with calcite and radiolarians
5	R	1	29	338.99	D	0	0	0	0	0	0	*	*	0	0	0	0	0	95	0	0	5	0	0	Diatom ooze
5	R	1	130	340.00	D	0	3	0	0	*	0	0	0	0	3	0	0	0	88	3	0	3	0	0	Diatom ooze
5	R	2	18	340.38	M	1	0	0	0	0	0	0	*	0	0	55	0	0	41	*	0	3	0	0	Diatom nannofossil ooze
5	R	2	68	340.88	D	0	2	0	0	0	0	0	0	0	0	0	0	0	95	0	0	3	0	0	Diatom ooze
5	R	2	135	341.55	D	0	2	0	0	0	0	0	2	0	0	0	*	0	91	0	0	5	0	0	Diatom ooze
7	R	1	47	358.57	M	0	3	0	0	0	0	0	0	0	0	76	3	0	15	0	0	3	0	0	Nannofossil ooze with diatoms
7	R	2	111	360.71	M	0	2	0	0	0	0	0	0	0	0	64	0	0	32	0	0	2	0	0	Diatom nannofossil ooze
7	R	3	92	362.02	D	0	2	0	0	0	0	0	*	0	0	84	0	*	12	0	0	2	0	0	Nannofossil ooze with diatoms
7	R	4	34	362.94	D	0	3	0	0	0	*	0	0	0	0	77	*	0	17	0	0	3	0	0	Nannofossil ooze with diatoms
7	R	4	101	363.61	D	0	1	0	0	0	0	0	0	0	0	65	0	0	32	0	0	2	0	0	Diatom nannofossil ooze
7	R	5	60	364.70	D	0	8	0	0	0	0	0	0	0	0	10	0	0	74	0	0	8	0	0	Diatom ooze with nannofossils
7	R	5	100	365.10	D	0	0	0	0	0	0	0	0	0	0	76	0	0	18	3	0	3	0	0	Nannofossil ooze with diatoms
7	R	6	18	365.78	D	0	4	0	0	0	0	0	0	0	0	77	*	0	19	0	0	*	0	0	Nannofossil ooze with diatoms
7	R	6	109	366.69	D	0	3	0	0	0	3	0	0	0	0	81	0	0	10	0	0	3	0	0	Nannofossil ooze with diatoms
7	R	7	33	367.13	D	0	4	0	0	0	0	0	0	0	0	80	*	0	12	0	0	4	0	0	Nannofossil ooze with diatoms
8	R	1	62	368.42	D	0	0	0	0	*	0	0	0	0	0	86	*	0	11	0	0	3	0	0	Nannofossil ooze with diatoms
8	R	2	31	369.61	D	0	4	0	0	0	0	0	0	0	0	12	0	0	80	0	0	4	0	0	Diatom ooze with nannofossils
8	R	3	59	371.39	D	0	3	0	0	0	0	0	0	0	0	0	0	0	94	0	0	3	0	0	Diatom ooze
8	R	3	132	372.12	D	0	0	0	0	*	0	0	0	0	0	87	0	0	10	v	0	3	0	0	Nannofossil ooze with diatoms
8	R	4	62	372.92	D	0	2	0	0	0	0	0	0	0	0	70	*	0	26	0	0	2	0	0	Diatom nannofossil ooze
8	R	6	61	375.91	D	0	0	0	0	0	0	0	0	0	0	90	0	0	11	0	0	*	0	0	Nannofossil ooze with diatoms
9	R	1	43	377.93	D	0	0	0	0	0	0	0	0	0	0	74	0	3	19	0	0	4	0	0	Nannofossil ooze with diatoms
9	R	2	93	379.93	D	0	2	0	0	0	0	0	0	0	0	81	0	0	14	0	0	3	0	0	Nannofossil ooze with diatoms
9	R	3	30	380.80	M	0	*	0	0	0	0	0	0	0	0	83	0	0	13	0	0	4	0	0	Nannofossil ooze with diatoms
10	R	1	27	387.80	D	0	0	0	0	25	0	0	0	0	0	17	0	11	1	6	0	17	8	15	Pyrite-rich siliceous ooze with foraminifers, nannofossils and organic debris
10	R	1	113	388.33	D	0	0	0	3	1	0	0	0	14	2	52	0	0	*	1	0	26	0	1	Spicular nannofossil ooze with vitric ash
10	R	2	16	388.86	D	*	0	0	0	1	0	0	*	*	0	54	9	18	*	0	0	0	0	18	Foraminiferal nannofossil chalk with organic debris
10	R	2	98	389.68	D	0	1	0	0	0	0	0	0	0	0	78	*	0	0	0	0	2	0	19	Nannofossil chalk with organic debris
11	R	1	119	398.09	M	0	0	0	0	0	0	0	*	0	1	99	0	0	0	0	0	0	0	0	Nannofossil chalk
11	R	2	24	398.64	M	0	0	0	0	9	0	0	0	0	0	64	0	0	0	0	0	0	0	27	Organic-rich nannofossil chalk
11	R	3	7	399.97	D	0	0	0	0	0	0	0	*	0	0	82	6	0	6	0	0	6	0	0	Nannofossil chalk
11	R	4	61	402.01	D	0	0	0	0	0	0	0	0	0	0	88	0	6	*	0	0	6	0	0	Nannofossil chalk
12	R	1	1	406.61	D	0	0	0	0	0	0	0	0	0	50	50	*	0	0	*	0	0	0	0	Clay minerals-rich nannofossil chalk
12	R	1	26	406.86	M	0	0	0	0	0	24	0	0	0	5	71	*	0	0	0	0	0	0	0	Nannofossil chalk with opaques
12	R	1	126	407.86	D	0	*	0	0	21	0	*	0	0	26	52	*	1	0	0	0	0	0	0	Clay minerals-rich nannofossil chalk with pyrite

Hole 1203A Smear Slides

Sample						Mineral										Biogenic									
Core	Core Type	Section	Top (cm)	Depth (mbsf)	Lithology	Dolomite	Calcite	Gypsum	Fe Oxide	Pyrite	Opaques	Quartz	Feldspar	Volcanic Glass	Clay Minerals	Nannofossils	Foraminifers (whole)	Foraminifers Tests	Diatoms	Radiolarians	Dinoflagellates	Siliceous Sponge Spicules	Silicoflagellates	Organic Debris	Comments
12	R	2	18	408.07	D	0	0	0	*	*	0	0	0	0	47	53	0	0	0	0	0	0	0	0	Clay minerals-rich nannofossil chalk
12	R	2	77	408.66	M	*	*	0	*	2	4	0	0	0	62	32	*	0	0	0	0	0	0	0	Nannofossil-rich clay
12	R	3	1	409.40	D	0	0	0	0	0	0	0	0	0	33	67	*	0	0	*	0	0	0	0	Clay minerals-rich nannofossil chalk
12	R	3	36	409.75	M	*	*	0	0	0	0	0	2	0	14	84	*	0	0	0	0	0	0	0	Nannofossil chalk with clay minerals
13	R	1	5	416.35	D	0	0	0	0	11	0	*	4	0	0	78	0	7	0	0	0	0	0	0	Nannofossil chalk with pyrite
13	R	1	27	416.57	D	0	6	2	0	0	5	0	5	0	0	75	0	0	*	0	0	0	0	7	Nannofossil chalk
13	R	1	145	417.75	D	0	0	0	0	7	0	0	7	0	0	86	0	*	0	0	0	0	0	0	Nannofossil chalk
13	R	2	10	417.90	M	0	0	0	0	0	0	0	20	0	0	20	0	0	0	0	0	0	0	60	Carbonaceous clayey silt with feldspar and nannofossils
13	R	2	14	417.94	D	0	0	0	0	*	0	0	2	0	15	83	*	0	0	0	0	0	0	0	Nannofossil chalk with clay minerals
13	R	2	81	418.61	D	0	*	0	0	*	1	0	*	0	16	83	0	0	0	0	0	0	0	0	Nannofossil chalk with clay minerals
14	R	1	32	426.32	D	0	2	0	0	0	0	0	1	0	0	96	1	0	0	0	0	0	0	0	Nannofossil chalk
14	R	2	14	427.64	D	0	0	0	0	0	0	0	0	0	33	65	2	0	0	0	0	0	0	0	Clay minerals-rich nannofossil chalk
14	R	2	120	428.70	M	0	0	0	0	0	68	0	0	0	32	0	0	0	0	0	0	0	0	0	Opaques-rich clayey silt (material infilling burrows)
14	R	3	24	429.24	M	0	5	0	*	0	0	0	0	0	0	93	2	0	0	0	0	0	0	0	Nannofossil chalk
15	R	1	15	435.85	D	0	*	0	0	0	0	0	0	0	0	95	5	0	0	0	0	0	0	0	Nannofossil chalk
15	R	2	77	437.97	M	0	*	0	7	0	14	0	1	0	7	57	0	0	0	0	0	0	0	14	Nannofossil chalk with opaques and organic debris
15	R	3	99	439.69	M	0	0	0	0	*	*	23	16	0	25	28	0	0	0	0	0	0	0	8	Nannofossil-rich clayey silt with feldspar, quartz and clay minerals
16	R	1	45	445.55	D	0	*	0	7	0	1	0	*	0	0	92	0	*	0	0	0	0	0	*	Nannofossil chalk
16	R	1	47	445.57	D	0	*	0	0	0	1	0	*	0	0	97	0	0	0	0	0	0	0	2	Nannofossil chalk
16	R	1	49	445.59	D	0	0	0	0	0	0	0	*	*	0	100	0	0	0	0	0	0	0	0	Nannofossil chalk
16	R	1	66	445.76	D	0	*	0	0	0	*	*	*	0	0	98	0	*	0	0	0	0	0	*	Nannofossil chalk
16	R	1	68	445.78	D	0	*	0	0	0	0	0	0	*	0	100	0	0	0	0	0	0	0	0	Nannofossil chalk
16	R	2	18	446.78	D	0	11	0	0	0	0	0	0	0	0	89	0	0	0	0	0	0	0	0	Nannofossil chalk with calcite
16	R	2	21	446.81	D	2	0	0	0	0	0	0	0	0	0	98	*	0	0	0	0	0	0	0	Nannofossil chalk
16	R	3	4	447.64	D	0	5	0	*	0	17	0	3	0	0	75	*	0	0	0	0	0	0	0	Nannofossil chalk with opaques
16	R	3	6	447.66	M	0	3	0	0	0	20	1	1	0	0	11	0	25	0	0	0	0	0	39	Organic-rich foraminiferal silty clay with nannofossils and opaques
16	R	3	9	447.69	D	0	7	0	27	0	7	*	0	0	0	59	0	0	0	0	0	0	0	0	Fe-oxide-rich nannofossil chalk
16	R	3	64	448.24	M	0	5	0	18	1	8	0	0	0	0	63	0	0	0	0	0	0	0	5	Nannofossil chalk with Fe-oxides
16	R	3	73	448.33	M	0	0	0	0	20	0	0	0	0	21	32	0	0	0	0	0	0	0	27	Organic-rich nannofossil chalk with pyrite and clay minerals
17	R	1	33	454.63	D	*	13	0	0	8	0	0	0	0	0	63	0	8	0	0	0	0	0	8	Nannofossil chalk with calcite
17	R	2	2	455.82	D	0	26	0	0	0	0	0	0	0	0	74	0	0	0	0	0	0	0	0	Calcareous nannofossil chalk
17	R	2	3	455.83	D	2	0	0	4	0	0	0	0	0	0	75	0	19	0	0	0	0	0	0	Nannofossil chalk with foraminifers
17	R	2	18	455.98	D	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	Nannofossil chalk
17	R	2	34	456.14	M	0	4	0	74	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	Fe-oxide-rich silt clay with nannofossils
17	R	2	59	456.39	M	0	54	0	0	0	0	*	9	0	0	37	0	0	0	0	0	0	0	0	Nannofossil-rich calcareous clayey silt
17	R	2	80	456.60	D	0	20	0	0	0	0	0	0	0	0	80	0	0	0	0	0	0	0	0	Nannofossil chalk with calcite
17	R	2	82	456.62	M	0	*	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	Nannofossil chalk
17	R	2	92	456.72	M	0	10	0	80	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	Fe-oxide-rich clayey silt with calcite and nannofossils
17	R	3	12	457.06	D	3	28	0	0	0	0	0	0	0	0	69	0	0	0	0	0	0	0	0	Calcareous nannofossil chalk
17	R	3	17	457.11	M	4	5	0	56	4	*	*	*	0	0	21	0	0	0	0	0	0	0	10	Fe-oxide-rich silt clay with organic debris and nannofossils
17	R	3	32	457.26	D	6	19	0	1	0	0	0	0	0	0	74	0	0	0	0	0	0	0	0	Nannofossil chalk with calcite
17	R	3	39	457.33	M	5	0	0	26	0	0	0	5	0	0	51	0	0	0	0	0	0	0	13	Fe-oxide-rich nannofossil clay with organic debris
17	R	3	47	457.41	D	0	7	0	3	4	5	0	0	0	0	81	0	0	0	0	0	0	0	0	Nannofossil chalk
17	R	3	49	457.43	M	30	38	0	15	0	0	5	10	0	0	2	0	0	0	0	0	0	0	0	Calcareous silty sand with feldspar and Fe-oxide
17	R	3	53	457.47	M	35	46	0	0	0	1	0	14	0	0	3	0	0	0	0	0	0	0	1	Calcareous silty sand with feldspar

Thin Section Log

Leg	Site	Hole	Core	Type	Section	Top (cm)	Bot (cm)	Depth (mbsf)	Piece	Comments	ICP?	UNIT	Ship Code
197	1203	A	17	R	3	56	58	457.50		SED/PALEO		2	1430914
197	1203	A	17	R	4	34	36	457.90	1C	Next to PMAG	YES	1a	1430892
197	1203	A	18	R	2	23	25	465.53	5	Paleo slide of Interflow sediment		2	1430896
197	1203	A	18	R	3	46	48	467.26	4	Interior of flow		3d	1430897
197	1203	A	19	R	1	19	21	473.59	2A	Veins/Alteration	YES	3g	1430894
197	1203	A	19	R	2	24	26	475.14	3	Pillow margin with glass		3j	1430911
197	1203	A	19	R	2	136	138	476.26	15	Next to PMAG	YES	3l	1430909
197	1203	A	19	R	5	13	15	479.31	2	Veins/Alteration		3r	1430912
197	1203	A	20	R	4	44	47	487.70	1B	Veins/Alteration	YES	3ad	1430937
197	1203	A	20	R	6	18	20	490.27	4	SED/PALEO: Sandstone		4a	1430925
197	1203	A	20	R	6	92	94	491.01	10	SED/PALEO: Sandstone		4c	1430926
197	1203	A	21	R	1	139	141	493.99	12B	Volcaniclastic		4f	1430993
197	1203	A	21	R	2	74	77	494.84	4A	Volcaniclastic		4f	1430951
197	1203	A	21	R	2	141	143	495.51	12B	Volcaniclastic		4f	1430956
197	1203	A	21	R	3	128	130	496.88	7	Volcaniclastic		4g	1430955
197	1203	A	21	R	4	86	88	497.96	8	Volcaniclastic	YES	4h	1430953
197	1203	A	25	R	1	65	67	531.75	4C	Next to PMAG	YES	5	1430980
197	1203	A	25	R	2	3	5	532.49	1A	Veins/Alteration		5	1430979
197	1203	A	26	R	1	10	12	534.90	1A	Basalt in vesicular zone		6	1430990
197	1203	A	26	R	3	39	41	536.82	1B	Next to PMAG	YES	6	1430991
197	1203	A	26	R	4	70	72	538.51	5B	SED/PALEO: Laminated volcaniclastics		7a	1430994
197	1203	A	29	R	2	84	87	562.54		SED/PALEO: Sandstone		7b	1431025
197	1203	A	29	R	4	26	29	564.96		Alteration/Volcaniclastic		7c	1431020
197	1203	A	31	R	1	29	31	579.69	4B	Next to PMAG	YES	8j	1431046
197	1203	A	31	R	1	118	120	580.58	12	Pillow margin		8l	1431060
197	1203	A	31	R	1	120	122	580.60	12	Pillow margin		8l	1431061
197	1203	A	31	R	2	61	64	581.51	9	Veins/Alteration		8n	1431058
197	1203	A	32	R	1	22	24	589.22	4	Volcaniclastic		9	1431054
197	1203	A	32	R	1	74	77	589.74	15	Volcaniclastic		9	1431056
197	1203	A	32	R	2	3	5	590.31	1A	Veins/Alteration		10	1431067
197	1203	A	32	R	3	85	87	591.13	1E	Olivine-rich Basalt	YES	11	1431068
197	1203	A	32	R	5	86	88	595.03	1C	Fine grained base of Unit 11	YES	11	1431071
197	1203	A	35	R	3	49	52	615.41	5	Basalt clast in Volcanic Breccia	YES	13	1431080
197	1203	A	35	R	4	47	49	616.65	1F	Next to PMAG	YES	14a	1431082
197	1203	A	35	R	4	114	116	617.32	1N	Veins/Alteration		14a	1431084
197	1203	A	35	R	4	147	149	617.65	10	Veins/Alteration		14a	1431085
197	1203	A	36	R	1	37	39	618.27	1A	Veins/Alteration		14b	1431104
197	1203	A	36	R	3	10	13	620.40	1A	Veins/Alteration		14b	1431106
197	1203	A	36	R	3	29	32	620.59	1B	Veins/Alteration		14d	1431108
197	1203	A	36	R	3	97	100	621.27	1E	Veins/Alteration		14e	1431109
197	1203	A	36	R	4	92	95	622.37	2D	Next to PMAG	YES	14g	1431112
197	1203	A	37	R	3	10	13	630.60	1A	Olivine-rich part of Unit 16	YES	16	1431129
197	1203	A	38	R	1	125	128	638.35	1I	Fine grained part of Unit 16	YES	16	1431131
197	1203	A	38	R	2	131	134	639.82	9A	Volcaniclastic with olivine		17a	1431133
197	1203	A	40	R	2	26	29	657.16	1B	Veins/Alteration		18i	1431158
197	1203	A	40	R	5	119	121	662.41	9	Next to PMAG	YES	18t	1431156
197	1203	A	41	R	1	83	86	666.73	4C	Veins/Alteration		19c	1431181
197	1203	A	42	R	5	20	23	681.39	1A	Next to PMAG	YES	19ac	1431219
197	1203	A	45	R	6	45	47	710.78	2B	Next to PMAG	YES	20ac	1431244
197	1203	A	48	R	1	57	61	727.67	1B	Next to PMAG	YES	21a	1431271
197	1203	A	48	R	1	118	121	728.28	1C	Unit 21, Alteration	YES	21a	1431271
197	1203	A	51	R	1	14	17	751.34	4	Basalt clast in Volcanic Breccia	YES	22	1431301
197	1203	A	51	R	1	105	107	752.25	16A	Basalt clast in Volcanic Breccia		22	1431303
197	1203	A	51	R	4	93	96	756.45	2A	Next to PMAG	YES	23a	1431304
197	1203	A	51	R	5	43	45	757.29	5	Veins/Alteration - zeolite?		23a	1431309
197	1203	A	52	R	6	12	14	767.98	1B	Next to PMAG	YES	23h	1431312
197	1203	A	53	R	3	1	4	773.41	1	Alteration		23q	1431348

Thin Section Log

Leg	Site	Hole	Core	Type	Section	Top (cm)	Bot (cm)	Depth (mbsf)	Piece	Comments	ICP?	UNIT	Ship Code
197	1203	A	53	R	3	113	116	774.53	23A	Alteration		23s	1431349
197	1203	A	54	R	3	15	18	783.15	1G	Next to PMAG	YES	23af	1431357
197	1203	A	55	R	1	122	125	790.92	7D	Vesicle Cylinder		23ap	1431371
197	1203	A	57	R	1	108	111	809.98	11B	Veins/Alteration		23bx	1431396
197	1203	A	57	R	2	127	129	811.67	29		YES	23ca	1431394
197	1203	A	59	R	2	51	53	820.37	2A	Veins/Alteration		24	1431414
197	1203	A	59	R	2	99	102	820.85	2B	Unit 24 Next to PMAG	YES	24	1431410
197	1203	A	59	R	5	30	32	824.40	5	Basalt in piece above PMAG sample	YES	26c	1431412
197	1203	A	62	R	3	48	51	850.81	8A	Veins/Alteration		26g	1431427
197	1203	A	63	R	3	134	137	861.30	24A		YES	26y	1431437
197	1203	A	63	R	5	35	37	863.32	3	SED/PALEO: Laminated volcaniclastics		27	1431442
197	1203	A	63	R	5	130	131	864.27		SED/PALEO: Laminated volcaniclastics		27	1431444
197	1203	A	63	R	6	58	61	864.94	3	SED/PALEO: Laminated volcaniclastics		27	1431446
197	1203	A	64	R	1	45	47	867.05	7	Volcaniclastic		28	1431448
197	1203	A	64	R	2	69	72	868.75	11A	Volcaniclastic		28	1431449
197	1203	A	65	R	4	21	24	880.18	3	Next to ICP	YES	29g	1431461
197	1203	A	66	R	3	11	14	888.87	1C	Next to ICP	YES	30k	1431464
197	1203	A	68	R	3	16	18	908.16	4	Next to ICP	YES	30aj	1431456
197	1203	A	68	R	4	29	30	909.75	4	Plagioclase-phyric flow		31a	1431477

Sedimentary Thin Sections

Sample										Texture			Mineral											Biogenic	Rock		
Site	Hole	Core	Core Type	Section	Top (cm)	Bottom (cm)	Depth (mbsf)	Thin Section Number	Lithology	Sand	Silt	Clay	Accessory Minerals	Calcite	Carbonate	Clay Mineral	Fe Oxide	Feldspar	Opaques	Organic Calcite	Palagonite	Volcanic Glass	Zeolite	Nannofossils	Rock Fragment	Vitric Clasts	Comments
1203	A	17	R	3	56	58	457.50	5	D	60	10	30		60		35	2		2		1						Carbonate sandstone. Equal size calcite rhombic crystals cemented by clay. Clay is brown.
1203	A	18	R	2	23	25	465.57	2	D	10	80	10			30			40	10							20	Sandy/Silty Vitric Ash. Clastic sediment with silt and ash. Large vitric clasts at one end.
1203	A	20	R	6	18	20	490.27	10	D	30	50	20	1	10		34		2	3	45	5						Carbonate clayey silt. The organic calcite is fine grained and is composed of nannofossils as seen in smear slide sample.
1203	A	20	R	6	92	94	491.01	11	D	60	35	5	1	20		27	10	2			40						Carbonate cemented vitric tuff. Clay is 20% saponite and 7% brown clay.
1203	A	26	R	4	70	72	538.51	21	D	60	30	10				25	3	10	2		40	20					Clay cemented vitric tuff
1203	A	29	R	2	84	87	562.54	22	D	60	30	10		2		35	10		3		30	10	10				Fine grained vitric sandstone
1203	A	29	R	4	26	29	564.96	23	D	70	20	10				10	5	5			35	30	10		5		Coarse grained lithic sandstone. Coarse sand of vitric clasts with zeolite rim. The rock fragments are olivine altered to brown clay.

THIN SECTION: 197-1203A-17R-4, 34-36 **Piece No.: 1C** **Unit: 1a** **ODP TS#: 1** **OBSERVER: PT, JG, CRN, TT.**
ROCK NAME: Highly Plagioclase-Olivine Phyric Basalt
WHERE SAMPLED: Pillow interior
GRAIN SIZE: Fine grained
TEXTURE: Glomerocrystic; intergranular with subophitic domains

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Plagioclase	12	12	0.25	1.5	<1		Anhedral to subhedral; equant; fractured	Glomerocrystic. Forms branching aggregates of <20 crystals. Crystals have many fractures, show zoning, undulose extinction and are often fragmented. Evidence of xenocrystic origin?
Olivine	0	2	0.5	0.75	0.75		Euhedral; equant	Entirely pseudomorphed by carbonate/clays. Often associated with plagioclase in glomerocrysts.
GROUNDMASS								
Plagioclase	35	35	0.1	0.3	0.15		Elongate, euhedral to subhedral	Occasionally skeletal branching form.
Clinopyroxene	30	30					Anhedral	Intergrown with clinopyroxene. Suboikocrystic. Occasionally alters on margins to brown amorphous material.
Titanomagnetite	0	5			0.05		Skeletal and elongate	
Glass	0	16						

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Fe oxyhydroxide	15				Replacing glass in groundmass? Also infills vesicles	Amorphous.
Magnesite	1				Pseudomorphs olivine	
Siderite	1				Pseudomorphs olivine	
Calcite	1				Infills veins	
Maghemite	5				Replaces titanomagnetite	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vein	1				1	Brown amorphous clay/Fe oxyhydroxide	
Vesicles	1-2		0.5	1	0.75		

COMMENTS: Sample flagged for ICP analysis. Glass and olivine completely altered. Olivine usually pseudomorphed by carbonate (magnesite, siderite or calcite). One grain has radial infillings of silica (Photomicrograph 1203-6). Traces of primary sulfide as minute inclusions in silica and oxide minerals.

Photomicrograph 1203-6. Field of view 1.4 mm, XPL

THIN SECTION:	**197-1203A-18R-3, 46-48**		**Piece No.: 4**			**Unit: 3d**	**ODP TS#: 3**	**OBSERVER: CRN, SR, PT.**
ROCK NAME:	Highly Plagioclase-Olivine-Phyric Basalt							
WHERE SAMPLED:	Interior of flow							
GRAIN SIZE:	Fine grained; hypohyaline							
TEXTURE:	Intersertal							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	5	5	0.5	2.5	1		Subhedral; blocky	Glomerocrystic; individual crystals are sieve textured.
Clinopyroxene	1	1	0.4	0.6	0.5		Subhedral; equant	
Olivine	0	2	0.5	2	1		Euhedral to subhedral; equant	Completely altered and replaced by Fe oxyhydroxide.
GROUNDMASS								
Plagioclase	40	40	0.2	1	0.4		Subhedral laths	
Clinopyroxene	20	20	<0.1	0.2	0.1		Anhedral	
Titanomagnetite	0	5					Subhedral, skeletal	Completely replaced by maghemite.
Glass	0	27						

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Fe oxyhydroxide	24				Olivine, glass	
Smectite	5				Vesicles, glass	Brownish yellow.
Maghemite	5				Titanomagnetite	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vein	2	Top right corner			0.5	Calcite, green clay	
Vesicles	<1					Fe oxyhydroxide, clay	Concentrically zoned with clay lining the vesicle and Fe oxyhydroxide in the center.

COMMENTS: Slide is moderately altered and has a brown color due to the alteration of the glass and olivine phenocrysts. As this slide was taken from a PMAG sample, the magnetics will probably be affected.

THIN SECTION:	**197-1203A-19R-1, 19-21**	**Piece No.: 2A**	**Unit: 3g**	**ODP TS#: 4**
ROCK NAME:	Highly Plagioclase-Olivine-Phyric Basalt			
WHERE SAMPLED:	Pillow Interior			
GRAIN SIZE:	Fine grained			
TEXTURE:	Glomerocrystic; subophitic			

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Plagioclase	15	15	0.25	1.5	1		Subhedral to anhedral; equant	Glomerocrystic. Aggregates 2-3 mm in size. Grains are fractured and some show ~undulose extinction. Others are highly zoned. Clearly has been transported.
Olivine	0	2	0.5	1.25	0.75		Equant.	Olivine also forms glomerocrysts along with plagioclase.
GROUNDMASS								
Plagioclase	30	32	0.25		0.5		Elongate and occasionally skeletal-quenched	Often blades radiate out from central point. Forms subophitic texture along with pyroxene.
Clinopyroxene	30	32	0.2		0.4			Sub-oikocrystic.
Titanomagnetite	0	4	0.05		0.05		Octahedral; skeletal	Replaced by maghemite.
Glass	0	15						

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Fe oxyhydroxide	17				Replacing glass in groundmass?	Amorphous. Also replaces olivine (especially along fractures).
Magnesite	1				Pseudomorphs olivine, especially interiors	
Iddingsite	<1				Pseudomorphs olivine, especially interiors	
Calcite	1				Infills veins and replaces plagioclase	
Maghemite	4				Titanomagnetite	
Illite/Sericite	1				Plagioclase	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vein	1	Base of slide			1	Brown amorphous clay/Fe oxyhydroxide and calcite	
Vesicles	<1			<1		Brown amorphous clay/Fe oxyhydroxide	

COMMENTS: Sample flagged for ICP analysis. Photomicrograph 1203-7 of olivine showing several stages of alteration. Titanomagnetite is completely altered to maghemite. Photomicrograph 1203-24 shows herringbone titanomagnetite altering to maghemite. Photomicrograph 1203-25 is a general reflected light picture.

Photomicrograph 1203-7. Field of view 1.4 mm, PPL.
Photomicrograph 1203-24. Field of view 0.5 mm, RL.
Photomicrograph 1203-25. Field of view 2.5 mm, RL.

THIN SECTION:	**197-1203A-19R-2, 24-26**		**Piece No.: 3**			**Unit: 3j**	**ODP TS#: 6**	**OBSERVER: PT, JG, CRN, RK.**
ROCK NAME:	Highly Plagioclase-Olivine-Phyric Basalt							
WHERE SAMPLED:	Pillow rim							
GRAIN SIZE:	Hyaline/microcrystalline/very fine grained/fine grained.							
TEXTURE:	Variolitic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	18	18	0.5	1.5			Anhedral to subhedral; equant, fractured	Glomerocrystic.
Olivine	0	1					Euhedral; equant	Entirely pseudomorphed by carbonate/clay.
GROUNDMASS								
Plagioclase	5	5	0.1	0.25	0.2		Elongate; euhedral to subhedral	Occasionally skeletal branching form. Microlitic.
Clinopyroxene	2	2	0.25	0.5			Anhedral	Intergrown with plagioclase. Suboikocrystic. Occasionally alters on margins to brown amorphous material.
Variolites	15	15					Cubic	Replacing clinopyroxene?
Glass	18	59						Present in zone >2 mm in from top of slide. Partially palagonised after 10 mm.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Fe oxyhydroxide	20				Replacing glass in groundmass?	Amorphous.
Palagonite	20				Replacing glass in groundmass?	
Iddingsite	<1				Pseudomorphs olivine	
Calcite	1				Infills veins	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS: Sample taken (TT) to examine pillow margin. Transition from glassy/variolitic rim (Photomicrographs 1203-1, 1203-2) with elongate quenched plagioclase microlytes and some equant pyroxene to more palagonitised interior with plagioclase glomerocrysts (Photomicrographs 1203-3, 1203-26).

Chapter 3, Figure F20. Field of view 1.4 mm.
Photomicrograph 1203-2. Field of view 5.5 mm.
Photomicrograph 1203-3. Field of view 5.5 mm. XPL.
Photomicrograph 1203-26. Field of view 1.25 mm. RL.

THIN SECTION: 197-1203A-19R-2, 136-138 **Piece No.: 15** **Unit: 3l** **ODP TS#: 7** **OBSERVER: PT, JG, CRN.**
ROCK NAME: Highly Plagioclase-Olivine-Phyric Basalt
WHERE SAMPLED: Pillow Interior.
GRAIN SIZE: Fine grained.
TEXTURE: Glomerocrystic, interstitial, subophitic to intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Plagioclase	9	9	0.25	1.5	1		Subhedral to anhedral; equant	Glomerocrystic. Aggregates of up to 20 crystals, 2-3 mm in size. Grains are fractured and some show ~undulose extinction.
Olivine	0	1-2	0.5	1.25	0.75		Equant, one skeletal grain	Olivine also forms glomerocryst along with plagioclase.
GROUNDMASS								
Plagioclase	30	30	0.25		0.5		Elongate and occasionally skeletal	Often blades radiate out from central point. Forms subophitic texture along with pyroxene.
Clinopyroxene	30	30	0.2		0.4			Sub-oikocrystic.
Titanomagnetite	0	4	0.05		0.05		Octahedral; skeletal	Altered to maghemite.
Glass	0	25						
Sulfides	Trace							Occurs as anhedral blobs in titanomagnetite.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Fe oxyhydroxide	24				Replacing glass in groundmass?	Amorphous. Also replaces olivine (especially along fractures).
Magnesite	1				Pseudomorphs olivine, especially interiors	
Iddingsite	<1				Pseudomorphs olivine, especially interiors	
Calcite	1				Infills veins	
Maghemite	4				Titanomagnetite	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vein	1				1	Calcite or brown amorphous clay/Fe oxyhydroxide	
Vesicles	<<1			<1		Brown amorphous clay/Fe oxyhydroxide	

COMMENTS: Sample flagged for ICP analysis. Moderately altered. One rounded glomerocryst occurs on the right hand side, 2/3 way towards label. Looks like a large rounded quartz amygdale but is actually plagioclase; late stage overgrowth- significant resorption; xenocrystic (Photomicrograph 1203-4). Photomicrograph 1203-5 taken of subophitic groundmass.

Photomicrograph 1203-4. Field of view 5.5 mm, XPL.
Photomicrograph 1203-5. Field of view 1.4 mm, XPL.

THIN SECTION:	**197-1203A-19R-5, 13-15**	**Piece No.: 2**	**Unit: 3r**	**ODP TS#: 8**
ROCK NAME:	Plagioclase-Olivine Phyric Basalt			
WHERE SAMPLED:	Pillow- towards rim.			
GRAIN SIZE:	Fine grained.			
TEXTURE:	Glomerocrystic, Subophitic.			

OBSERVER: PT, SR.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Plagioclase	7	7	<1	1			Subhedral to anhedral; equant	Glomerocrystic. Aggregates of up to 20 crystals, 2-3 mm in size. Some disaggregated glomerocrysts are present. Some crystals are highly zoned.
Olivine	0	5	<1	4.5	1		Equant, one skeletal grain (aspect ratio=8:1)	Large glomerocryst (3 mm) near vein margin. Skeletal grain at top of section.
GROUNDMASS								
Plagioclase	22	22	0.25		0.5		Elongate and occasionally skeletal	Often blades radiate out from central point. Forms subophitic texture along with pyroxene.
Clinopyroxene	13	15	0.2		0.4			Sub-oikocrystic.
Titanomagnetite	13	13	0.05		0.05			
Glass		38						

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Fe oxyhydroxide	14				Replacing glass in groundmass?	Amorphous. Also replaces olivine (especially along fractures), clinopyroxene in groundmass and lines veins.
Magnesite	2				Pseudomorphs olivine, especially interiors	
Iddingsite	<1				Pseudomorphs olivine, especially interiors	
Saponite	1					
Calcite	13				Infills veins	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vein	20		<1	6		Brown amorphous clays and Fe-oxyhydroxide lines vein; mainly filled by calcite	
Vesicles	<<1			<1		Brown amorphous clays/Fe oxyhydroxide	

COMMENTS: Sample flagged for alteration study. Photomicrograph 1203-11 of olivine glomerocryst.

Chapter 3, Figure F27. Field of view 2.5 mm, PPL.

THIN SECTION:	**197-1203A-20R-4, 44-47**	**Piece No.: 1B**	**Unit: 3ad**	**ODP TS#: 9**
ROCK NAME:	Plagioclase-Olivine Phyric Basalt			**OBSERVER: PT, SR, CRN.**
WHERE SAMPLED:	Near veins and alteration			
GRAIN SIZE:	Fine grained.			
TEXTURE:	Glomerocrystic, Subophitic.			

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	10	10	0.5	2	1		Subhedral; equant to tabular	Forms glomerocrysts along with olivine, 2-3 mm in size. Some disaggregated glomerocrysts are present. Crystals show concentric zoning and many are fragmented. Crystals are fresher than those upsection.
Olivine	0	3	0.5	3	1		Equant	All pseudomorphed by secondary minerals (see below). Large relic olivine (3 mm) in center.
GROUNDMASS								
Plagioclase	26	29	0.25		0.5		Elongate and occasionally skeletal	Often blades radiate out from central point. Forms subophitic texture along with pyroxene.
Clinopyroxene	24	25	0.2		0.5		Equant	Sub-oikocrystic. Starting to alter to orange amorphous material at some grain margins.
Titanomagnetite	4	4	0.05	0.1				Brown-gray under reflected light.
Sulfide	Trace						Anhedral	Occurs as blobs in primary silicates. May be pentlandite?
Glass	0	29						

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Fe oxyhydroxide	29				Replacing glass in groundmass?	Amorphous. Also replaces olivine (especially along fractures) and clinopyroxene in groundmass.
Magnesite	1				Pseudomorphs olivine, especially interiors	
Talc	<1				Pseudomorphs olivine, especially interiors	Occurs along margins of large 3 mm relic olivine.
Calcite	5				Infills vein	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vein	5			4		Filled by calcite	
Vesicles	0						

COMMENTS: Sample flagged for ICP analysis. Appears fresh in thin section. Titanomagnetite is undergoing slight alteration to maghemite along cracks and cleavage planes. Photomicrograph 1203-12 of subophitic texture in groundmass.

Photomicrograph 1203-12. Field of view 2.5 mm, XPL.

THIN SECTION:	**197-1203A-21R-1, 139-141**	**Piece No.: 12B**	**Unit: 4f**	**ODP TS#: 16**	**OBSERVER: PT, TT**
ROCK NAME:	Basalt tuff.				
WHERE SAMPLED:					
GRAIN SIZE:	Medium ash.				
TEXTURE:	Clast supported, moderately sorted ash fall deposit.				

			SIZE (mm)					
COMPONENTS	**PERCENT PRESENT**	**PERCENT VESICLES**	**min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
GLASS PARTICLES								
Vesicular	70	40-80	0.25	1.6	0.8	Altered basalt glass	Angular to subrounded, with broken and fluidal outlines	Delicately shaped with spherical vesicles. Contains euhedral, tabular or lath-shaped, <0.5mm plagioclase crystals and pseudomorphs after olivine.
Blocky shards	7		0.05	0.4	0.2	Altered basalt glass	Angular, equant to elongate.	
Cuspate shards	20		0.05	0.2	0.1	Altered basalt glass	Angular, curved outlines.	
CRYSTALS	1		0.3	0.5	0.4	Plagioclase	Anhedral to subhedral.	Broken crystals
LITHICS	2	Non- to moderately vesicular	<0.1	0.5	0.3	pl-phyric basalt	Angular to subangular, equant.	Microcrystalline to glassy with plagioclase needles and rare holocrystalline (plagioclase, pyroxene, olivine) fragments.

SECONDARY MINERALS	**OCCURRENCE**	**COMMENTS**
Clay (smectite) Zeolites (Scolecite?)	As cement and vesicle fill.	

COMMENTS: Medium ash consisting of altered highly vesicular basalt tephra clasts featuring spherical vesicles and fluidal or scalloped outlines. The sideromelane glass is altered to gel (isotropic) or fibrous (slightly birefringent) palagonite and smectite clays. Center of one tephra clast is unaltered pale brown sideromelane glass (Photomicrograph 1203-209). Photomicrographs 1203-66 through 1203-69 show examples of clast morphologies. The deposit is cemented by zeolite (scolecite?) and clay (smectite?) which also fill vesicles in clasts. Angularity and delicate structure of most particles indicates they have not been transported great distances.

Photomicrograph 1203-209. Field of view 1.4 mm, PPL.
Photomicrograph 1203-66. Field of view 1.4 mm, PPL.
Photomicrograph 1203-67.
Photomicrograph 1203-68. Field of view 1.4 mm, PPL.
Photomicrograph 1203-69.

THIN SECTION:	**197-1203A-21R-2, 74-77**	**Piece No.: 4A**	**Unit: 4f**	**ODP TS#: 12**	**OBSERVER: PT, TT**
ROCK NAME:	Resedimented basalt tuff.				
WHERE SAMPLED:					
GRAIN SIZE:	Very fine ash.				
TEXTURE:	Clast supported, moderately to well sorted ash fall deposit.				

COMPONENTS	PERCENT PRESENT	PERCENT VESICLES	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
GLASS PARTICLES								
Vesicular								
Blocky shards	85		0.05	0.1	0.08	Altered Basalt Glass	Angular, equant to slightly elongate	Clasts are typically nonvesicular and characterized by smooth flat fracture surfaces. Contain rare plagioclase.
Cuspate shards	14		0.05	0.1	0.08	Altered Basalt Glass	Angular, irregular or scalloped outlines	Clasts are characterized by curved cuspate outlines, which are scalloped where fractures intersect vesicles.
CRYSTALS	1		0.3	0.5	0.4	Plagioclase, clinopyroxene and olivine.	Euhedral to anhedral	Plagioclase, rare clinopyroxene and olivine pseudomorphs are present as broken crystal fragments.
LITHICS								

SECONDARY MINERALS	OCCURRENCE	COMMENTS
Zeolites and clay		

COMMENTS:	Vitric ash consisting of angular non- to sparsely vesicular sideromelane fragments. The sideromelane is altered to gel (isotropic) or fibrous (anisotropic) palagonite and smectite clays. Highly vesicular tephra clasts are not present in this interval of Unit 4f; caused by selective sorting during settling through a water column? Photomicrograph 1203-210 shows the types of glass particles that characterize this unit. Note: Much of the slide has been plucked out in the alteration process.	**Photomicrograph 1203-210.** Field of view 1.25 mm, PPL..

THIN SECTION:	**197-1203A-21R-2, 141-143**	**Piece No.: 12B**	**Unit: 4f**	**ODP TS#: 13**	**OBSERVER: PT, TT**
ROCK NAME:	Basalt Tuff.				
WHERE SAMPLED:					
GRAIN SIZE:	Very coarse ash to fine lapilli.				
TEXTURE:	Clast supported, moderately sorted scoria fall deposit.				

COMPONENTS	**PERCENT PRESENT**	**PERCENT VESICLES**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
GLASS PARTICLES								
Vesicular	80	40-80	0.2	5	1.5	Altered Basalt Glass	Angular to subrounded, with broken and fluidal outlines	Delicately shaped with spherical vesicles. Contain euhedral, tabular or lath-shaped plagioclase and pseudomorphs after olivine.
Blocky shards	5		0.1	1	0.5	Altered Basalt Glass	Angular, equant to elongate	
Cuspate shards	13		0.1	1	0.5	Altered Basalt Glass	Angular, curved outlines	
CRYSTALS	1		0.3	0.5	0.4	Plagioclase and olivine	Suhedral to anhedral	Broken plagioclase crystals and pseudomorphs after olivine. Some rimmed by thin sliver of glass.
LITHICS	1	0-40	1	1.25	2	Alkali basalt?	Angular to subangular, equant	Cryptocrystalline to crystalline, equigranular basalt with groundmass of olivine, plagioclase, and pyroxene.

SECONDARY MINERALS	**OCCURRENCE**	**COMMENTS**
Clay (smectite)	As cement and vesicle fill.	
Zeolites		Zeolites possibly analcite and mesolite.

COMMENTS: Medium ash consisting of altered highly vesicular basalt tephra clasts featuring spherical vesicles and fluidal or scalloped outlines. The sideromelane glass is altered to gel (isotropic) or fibrous (slightly birefringent) palagonite and smectite clays. Photomicrographs 1203-70 to 73 show examples of clast morphologies. The deposit is cemented by zeolites (analcite and mesolite?) and clays (smectite?) which also fill vesicles in clasts. Angularity and delicate structure of most particles indicates they have not been transported great distances. Rocks almost appears like one large partially disaggregated pumice clast. One clast with strongly elongate vesicles is present (Photomicrograph 1203-72).

Photomicrograph 1203-70.
Chapter 3, Figure F11.
Photomicrograph 1203-72. Field of view 5.5 mm, PPL.
Chapter 3, Figure F10. Field of view 5.5 mm, PPL.

THIN SECTION:	**197-1203A-21R-3, 128-130**	**Piece No.: 7**	**Unit: 4g**	**ODP TS#: 14**	**OBSERVER: TT**
ROCK NAME:	Laminated Basalt Tuff.				
WHERE SAMPLED:					
GRAIN SIZE:	Fine ash.				
TEXTURE:	Well-sorted, laminated ash fall deposit.				

	PERCENT	PERCENT	SIZE (mm)			APPROXIMATE		
COMPONENTS	**PRESENT**	**VESICLES**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
GLASS PARTICLES								
Vesicular	5	30-60	0.3	0.8	0.5	Altered basalt glass	Angular, irregular outlines	Present as scattered medium to coarse ash particles.
Blocky shards	50		0.05	0.5	0.25	Altered basalt glass	Angular with straight fracture surfaces	Strongly altered. Contain relict olivine and plagioclase crystals.
Cuspate shards	45		0.05	0.5	0.25	Altered basalt glass	Curved, cuspate outlines	Strongly altered. Contain relict olivine and plagioclase crystals.
CRYSTALS						Plagioclase	Angular to subangular, subequant	Palagonite (after glass) fragments, containing vesicles with highly irregular outlines.
LITHICS						Plagioclase-phyric basalt. One rounded plagioclase and olivine(?) phyric basalt	Angular to subangular, equant	Occasionally nonvesicular and holocrystalline-equigranular.

SECONDARY MINERALS	**OCCURRENCE**	**COMMENTS**
Clay	As replacement of sideromelane glass, cement, and vesicle fill	Smectite?
Zeolites		Analcite and mesolite?

COMMENTS: Fine grained ash consisting of highly altered blocky to cuspate basaltic glass shards, containing scattered vesicular medium to coarse ash particles. Alteration is penetrative; the glass shards have been completely replaced by smectite clay and sometimes zeolites. The cement is predominatly zeolites.

THIN SECTION:	**197-1203A-21R-4, 86-88**	**Piece No.: 8**	**Unit: 4h**	**ODP TS#: 15**	**OBSERVER: TT**
ROCK NAME:	Basalt Tuff.				
WHERE SAMPLED:					
GRAIN SIZE:	Coarse ash to fine lapilli.				
TEXTURE:	Clast supported, moderately sorted ash fall deposit.				

	PERCENT	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
COMPONENTS	**PRESENT**	**VESICLES**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
GLASS PARTICLES								
Vesicular	>98	10-70.	0.4	5	1.5	Altered basalt	Angular to rounded/curved outlines; fluidal shapes.	Contain plagioclase and relict olivine crystals.
Cuspate shards	<2		0.1	0.4	0.2	Altered basalt	Angular and cuspate outlines	

SECONDARY MINERALS	**OCCURRENCE**	**COMMENTS**
Palagonite	Replacing sideromelane glass	Gel and fibrous palagonite.
Zeolites	Vesicle fill and cement	Analcite and Stilbite?
Clay	Alteration halos around margins of particles and vesicle walls.	Smectite?
Carbonate?	Replacing centers of some grains	

COMMENTS: Coarse ash consisting of moderately to highly vesicular, fluidal and broken droplet-shaped clasts of sideromelane glass altered palagonite and clay. Clasts contain variable amount of spherical vesicles.

Photomicrograph 1203-385. Field of view 5 mm., XPL.
Photomicrograph 1203-386. Field of view 5 mm., PPL.

THIN SECTION:	**197-1203A-25R-1, 65-67**		**Piece No.: 4C**			**Unit: 5**	**ODP TS#: 17**	**OBSERVER: PT, CRN.**
ROCK NAME:	Moderately Plagioclase-Olivine-Phyric Basalt							
WHERE SAMPLED:	Lobe interior							
GRAIN SIZE:	Fine grained							
TEXTURE:	Ophitic to subophitic; intergranular							

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Plagioclase	25	25	0.7	1.2	1		Subhedral, lath-like	Fractured.
Clinopyoxene	25	25	0.6	1.5	1		Subhedral/anhedral	Oikocrystic.
Titanomagnetite	5	5	0.1	0.3	0.15		Cubic, anhedral/subhedral	Interstitial
Glass	0	45						
Sulfide	<1	<1			<0.02		Anhedral	Interstitial.

SECONDARY		**SIZE (mm)**					
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**		**REPLACING / FILLING**	**COMMENTS**
Brown amorphous clay	45					Groundmass	Microcrystalline.

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS: Sample flagged for ICP analysis. Titanomagnetite alters to ilmenite along cleavage planes (Photomicrograph 1203-36). Sulfide (pyrite) is also present in the alteration.

Photomicrograph 1203-36. Field of view 0.5 mm, RL.

THIN SECTION:	**197-1203A-25R-2, 3-5**		**Piece No.: 1a**			**Unit: 5**	**ODP TS#: 18**	**OBSERVER: SR**
ROCK NAME:	Aphyric to moderately olivine-phyric basalt							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Subophitic to intergranular.							

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Olivine	0	3	0.2	0.5	0.5		Euhedral	Completely altered.
GROUNDMASS								
Clinopyroxene	5	5	0.2	2	0.5		Subophitic	
Plagioclase	7-10	7-10	0.1	1	0.5	An_{30-40}	Euhedral	
Titanomagnetite	1							
Glass	0	12-15						Completely altered.

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	3				Glass and vein	
Fe oxyhydroxide	8-10				Glass and vein	
Iddingsite	3				Olivine	
Sericite/Illite	1				Plagioclase	
Calcite	70				Vein	
Pyrite	<1				Vein	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	2					Fe-oxyhydroxide and brown clay minerals	
Vein		Middle	3	3	3	Filled with calcite, pyrite, brown clay minerals	

COMMENTS: From its shape, olivine is inferred to be an early crystallizing phase. Vein is filled with 70% calcite, 25% clays and 5% pyrite.

THIN SECTION: 197-1203A-26R-1, 10-12 **Piece No.:** 1A **Unit:** 6 **ODP TS#:** 19 **OBSERVER:** PT, CRN, SR.
ROCK NAME: Coarse grained segregated material in Sparsely-Plagioclase-Phyric Basalt
WHERE SAMPLED: Segregation Vesicle
GRAIN SIZE: Medium grained
TEXTURE: Subophitic, some quenched areas

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
Clinopyroxene	38	52	<1	5	2		Sub/anhedral, elongate	Oikocrystic. Show slight pink-green pleochroism.
Plagioclase	38	38	<1	3	2		Euhedral, lath-like	Fractured.
Titanomagnetite	2	2	0.25	1.25	1		Skeletal, acicular	Some exsolution of ilmenite?
Glass	0	8						

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown clay	22				Clinopyroxene, glass	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	30		2	10	5	None	Irregular in shape.

COMMENTS: Photomicrograph 1203-15 of acicular opaques. Very fine-grained areas are found throughout the section (15%), usually close to vesicles, and consist of acicular and skeletal clinopyroxene (sometimes curved, e.g., Photomicrographs 1203-13, 1203-14) skeletal plagioclase and acicular opaques. Titanomagnetite remains unaltered. Rare sulfide (pentlandite?) blebs occur <<0.1 mm in size, as inclusions in primary phases (Photomicrograph 1203-37).

Photomicrograph 1203-13. Field of view 0.7 mm, PPL.
Photomicrograph 1203-14. Field of view 0.7mm, XPL.
Photomicrograph 1203-15. Field of view 0.7 mm, PPL.
Photomicrograph 1203-37. Field of view 2.5 mm, RL.

THIN SECTION:	**197-1203A-26R-3, 39-41**	**Piece No.: 1B**	**Unit: 6**	**ODP TS#: 20**
ROCK NAME:	Sparsely-Plagioclase-Phyric Basalt			
WHERE SAMPLED:	Lobe interior			
GRAIN SIZE:	Fine grained			
TEXTURE:	Granular, ophitic, diabasic			

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
Plagioclase	34	34	0.5	1	0.75		Euhedral; lath-like	Forms chadacrysts. See alteration on some grains to clays. Are all clays from plagioclase alteration?
Olivine	0	?						
Clinopyroxene	21	35	0.5	2	1		Subhedral; elongate	Forms oikocrysts, surrounding blades of plagioclase. Well preserved.
Titanomagnetite	3	3					Cubic	
Glass	0	27						
Sulfide (pentlandite)	1	1			0.05		Anhedral blobs	Occurs as inclusions in primary minerals.

GROUNDMASS

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown clay	41				Clinopyroxene and glass	Some irregular holes have formed in the more altered clay-rich areas through the thin section process. Olivine was probably present in these holes and has unluckily been plucked out, on the basis of hand specimen analysis. Thus, the clays have replaced both olivine and plagioclase.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Cavities	5	Throughout	1	3	1.5	Filling has been plucked out; irregular	

COMMENTS: Sample flagged for ICP analysis and PMAG. Abundant 1-2 mm holes in thin section- clays (replacing olivine) removed during thin section preparation? Olivine is present in hand specimen. Titanomagnetite is unaltered, and primary pentlandite is present (Photomicrograph 1203-38). Possible zeolite present in groundmass.

Photomicrograph 1203-38. Field of view 0.5 mm, RL.

THIN SECTION:	**197-1203A-29R-4, 26-29**	**Piece No.: 3**	**Unit: 7c**	**TS#: 23**	**OBSERVER: PT, SL**
ROCK NAME:	Basalt Tuff.				
WHERE SAMPLED:					
GRAIN SIZE:	Fine to medium ash.				
TEXTURE:	Moderately to poorly sorted.				

COMPONENTS	**PERCENT PRESENT**	**PERCENT VESICLES**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
GLASS PARTICLES								
Vesicular	10					Basalt		
Blocky shards	83		0.2	1.5	1	Basalt	Angular, equant to elongate.	Contain euhedral plagioclase and relict olivine phenocrysts; 0.3-0.8 mm, 1-5 modal%.
Cuspate shards	5					Basalt		
CRYSTALS	1-2		0.1	0.8	0.4	Plagioclase	Angular to subangular, subequant.	Broken.
LITHICS								

SECONDARY MINERALS	**OCCURRENCE**	**COMMENTS**
Smectite	Replacing basalt tephra clasts	
Serpentine	Replacing olivne crystals in basalt tephra clasts	

COMMENTS: Dominance of nonvesicular, splinter-like glass fragments suggests origin by quenched fragmentation of lava erupted under water.

THIN SECTION: 197-1203A-31R-1, 29-31 **Piece No.: 4B** **Unit: 8j** **ODP TS#: 24** **OBSERVER: PT, CRN, SR**
ROCK NAME: Highly-Plagioclase- Olivine-Phyric Basalt
WHERE SAMPLED: Lobe margin
GRAIN SIZE: Very fine grained
TEXTURE: Porphyritic

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Plagioclase	3	3	0.5	3	1.5		Anhedral to subhedral; equant; fractured	Glomerocrystic, some fractured and highly zoned.
Olivine	0	1			0.75		Euhedral	Altered to green clay.
GROUNDMASS								
Plagioclase	39	39	0.07	0.15	0.1		Elongate; euhedral to subhedral	Occasionally skeletal branching form - indicative of quenching.
Clinopyroxene	30	34	0.05	0.15	0.1		Subhedral; some grains acicular and curved	Borderline variolitic texture defined by occasional radiating acicular clinopyroxenes.
Titanomagnetite	3	3			0.01		Cubic	
Glass	0	20						

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Chlorite	5				Vein; vesicles and in groundmass	
Clay (Celadonite)	19				Vein; vesicles and groundmass	
Calcite	1				Vesicles	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	1		1	2	1	Round; infilled with chlorite, siderite and amorphous clay	
Vein	2	Center of slide; E-W.			1	Chlorite; dark red/brown clays; Fe oxyhydroxide; Celadonite	

COMMENTS: Olivine is a microphenocryst phase. Titanomagnetite is unaltered. No sulfide is present.

THIN SECTION: 197-1203A-31R-1, 118-120 **Piece No.:** 12 **Unit:** 8l **ODP TS#:** 25 **OBSERVER:** PT
ROCK NAME: Highly-Plagioclase-Olivine-Phyric Basalt
WHERE SAMPLED: Pillow rim
GRAIN SIZE: Hyaline/microcrystalline/very fine grained/fine grained
TEXTURE: Variolitic in places

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Plagioclase	6	6	1	10	5		Anhedral to subhedral; equant; fractured	Glomerocrystic. Highly zoned.
GROUNDMASS								
Plagioclase	5	5	0.01	0.1	0.07		Elongate; skeletal	Occasionally skeletal branching form. Microlitic.
Clinopyroxene	2	2	0.01	0.07	0.05		Euhedral and equant immediately beside margin; plumose and acicular in variolitic zone.	Euhedral grains are very fresh. Small almost microlitic clinopyroxene in glassy rim.
Glass	82	87						Present in zone >2 mm from top of slide. Partially palagonized after 10 mm from margin.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Palagonite	3				Glass	
Calcite	2				Infills vein and vesicles	
Brownish/yellow Smectite	<1				Infills vesicles and groundmass	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	1	Throughout	<1	3	1.5	Calcite filled; elongate	Some coalesced.
Vein	1	Throughout	<1	2	1	Calcite filled; elongate	Many small veins towards glassy zone.

COMMENTS: Sample taken (TT) to examine pillow margin. Transition from 1. glassy/variolitic rim with elongate quenched plagioclase microlites and some equant pyroxene to 2. variolitic zone (5 mm from margin) with radiating plumose pyroxene surrounding plagioclase microlites (each variole 0.05-0.1 mm in diameter). Zone 3. consists of more palagonitized interior with plagioclase microlites (Photomicrograph 1203-16). The sample also contains Fe oxyhydroxide, with goethite?

Photomicrograph 1203-16. Field of view 0.7 mm, PPL.

THIN SECTION: 197-1203A-31R-1, 120-122 **Piece No.: 12** **Unit: 8l** **ODP TS#: 26** **OBSERVER: PT, JG, SR.**
ROCK NAME: Highly-Plagioclase-Olivine-Phyric Basalt
WHERE SAMPLED: Lobe boundary
GRAIN SIZE: Hyaline/microcrystalline/very fine grained/fine grained.
TEXTURE: Variolitic in places

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Plagioclase	7	7	1	10	5		Anhedral to subhedral; equant; fractured	Glomerocrystic. Highly zoned. Some fractured.
GROUNDMASS								
Plagioclase	9	9	0.01	0.1	0.07		Elongate; skeletal	Occasionally skeletal branching form. Microlitic.
Clinopyroxene	1	2	0.01	0.07	0.05		Euhedral and equant immediately beside margin, plumose and acicular in variolitic zone.	Forms varioles surrounding plagioclase microlites.
Glass	58	82						Partially palagonized.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Palagonite	19				Glass	
Calcite	4				Vein and vesicles	
Fe oxyhydroxide	<1				Vein	Well crystallized; contains no goethite.
Brown clay	1				Vein	
Smectite	<1					Brownish yellow.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	3	Throughout	0.07	3	0.1	Calcite filled; some elongate	Some coalesced.
Vein	1	Throughout	<1	2	1	Calcite and Fe oxyhydroxide	

COMMENTS: Sample taken (TT) to examine pillow margin. Transition from 1. variolitic zone with radiating brown patches <0.5 mm in size (plumose pyroxene) surrounding plagioclase microlites to 2. Skeletal plagioclase microlites in a glassy mesostasis.

THIN SECTION:	**197-1203A-31R-2, 61-64**		**Piece No.:9**			**Unit: 8n**	**ODP TS#: 27**	**OBSERVER: SR**
ROCK NAME:	Plagioclase phyric basalt							
WHERE SAMPLED:	Vein							
GRAIN SIZE:	Fine grained							
TEXTURE:	Intergranular							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	4	4	0.5	3	1	An_{40}	Euhedral	Highly zoned, sometimes form glomerocrysts of about 10 crystals. Some are deformed showing the two twin directions of albite and pericline.
GROUNDMASS								
Plagioclase	38	38	0.05	0.5	0.2	An_{30-40}	Euhedral and skeletal	
Clinopyroxene	38	38	0.05	0.5	0.2		Anhedral	
Titanomagnetite	4	4					Euhedral and skeletal	Partially altered to maghemite and/or ilmenite and rutile?
Glass	0	15						Completely altered.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown Fe oxyhydroxide	9				Replacing glass and groundmass.	
Brown clay	4				Replacing glass.	
Celadonite	3				Filling vesicles	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	3					Fe oxyhydroxide and brown and celadonite.	
Vein		Middle	3	3	3	Filled with calcite, pyrite, celadonite and chlorite	

COMMENTS: Vein is filled with 70% calcite, 15% celadonite, 10% chlorite and 5% pyrite. Complex zoning in the vein: interior filled with calcite. The vein is lined by chlorite with outlined by celadonite.

Photomicrograph 1203-82. Field of view 5.5 mm, PPL.
Photomicrograph 1203-83. Field of view 5.5 mm, XPL.
Photomicrograph 1203-84. Field of view 1.4 mm, PPL .
Photomicrograph 1203-85. Field of view 1.4 mm, XPL.

THIN SECTION:	**197-1203A-32R-1, 22-24**	**Piece No.: 4**	**Unit: 9**	**TS#: 28**	**OBSERVER: PT, TT**
ROCK NAME:	Basalt Lapilli Tuff.				
WHERE SAMPLED:					
GRAIN SIZE:	Medium to coarse-grained lapilli.				
TEXTURE:	Clast supported, moderately sorted scoria fall deposit.				

			SIZE (mm)					
COMPONENTS	**PERCENT PRESENT**	**PERCENT VESICLES**	**min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
GLASS PARTICLES								
Vesicular	95	50-90	1	6	3	Altered basalt glass	Angular to rounded/curved outlines; fluidal shapes	Contain plagioclase microlites.
Cuspate shards	5	0	0.2	0.5	0.4	Altered basalt glass	Angular and cuspate outlines	

SECONDARY MINERALS	**OCCURRENCE**	**COMMENTS**
Clay	Replacing sideromelane glass and as cement.	Plagioclase and alkali feldspar?
Calcite	As cement	

COMMENTS: Scoria lapilli fall deposit consisting of moderately to highly vesicular, fluidal and broken droplet-shaped clasts of sideromelane glass altered to clay. Clasts contain spherical vesicles and randomly oriented lath-shaped plagioclase microlite or elongate vesicles and aligned plagioclase laths.

Photomicrograph 1203-387. Field of view 5 mm, PPL.

THIN SECTION: 197-1203A-32R-1, 74-77 **Piece No.: 15** **Unit: 9/10 contact** **TS#: 29** **OBSERVER: PT**
ROCK NAME: Bedded Vitric Siltstone-Sandstone.
WHERE SAMPLED: Contact between microcrystalline ash unit and tephra fall deposit.
GRAIN SIZE: Fine-grained.
TEXTURE:

COMPONENTS	PERCENT PRESENT	PERCENT VESICLES	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
GLASS PARTICLES								
Vesicular	85	50-90	0.2	5	2	Altered to smectite.	Angular to rounded/curved outlines; fluidal shapes	Contain plagioclase microlites.
Cuspate shards	5		0.2	1.5	1		Angular and cuspate outlines	
CARBONATE	10							Detrital carbonate present as matrix.

SECONDARY MINERALS	OCCURRENCE	COMMENTS
Clay	Replacing sideromelane glass	Smectite?
Calcite	As cement	

COMMENTS: The top 1 cm of thin section is the base of the scoria lapilli fall deposit of Unit 9 and consists of moderately to highly vesicular, fluidal and broken droplet-shaped clasts of sideromelane glass altered to clay. Clasts contain spherical vesicles and randomly oriented lath-shaped plagioclase microlite or elongate vesicles and aligned plagioclase laths. The remainder of the slide is from the top of Unit 10 and comprises very fine grained volcaniclastic sandstone. Contact is subplanar and convoluted. Photomicrograph 1203-75 of pumice clasts.

Photomicrograph 1203-75

THIN SECTION:	**197-1203A-32R-2, 3-5**		**Piece No.: 1A**			**Unit: 10**	**ODP TS#: 31**	**OBSERVER: SR**
ROCK NAME:	Plagioclase olivine-phyric basalt							
WHERE SAMPLED:	Vein							
GRAIN SIZE:	Fine grained							
TEXTURE:	Intergranular to subophitic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	3-5	3-5	0.5	3	1.5		Euhedral	Highly zoned, sometime form glomerocryst of about 10 crystals. Most of them are deformed showing the two twin direction of albite and pericline.
Olivine	0	2	0.2	1	0.5		Euhedral	Completely altered to brown clay minerals.
GROUNDMASS								
Plagioclase	35	35	0.05	0.5	0.2		Euhedral and skeletal	
Clinopyroxene	35	35	0.05	0.5	0.2		Anhedral to subophitic	
Titanomagnetite	10	10					Euhedral and skeletal	Partially altered to hematite.
Glass	0	20						Completely altered.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown Fe oxyhydroxide	8				Glass	
Brown clay	12				Glass and olivine	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vein			3	3	3	Filled with calcite, pyrite, brown clay.	

COMMENTS: Vein is filled with 90% calcite, 5% brown clays and 5% pyrite.

THIN SECTION:	**197-1203A-32R-3, 85-87**		**Piece No.: 1E**			**Unit: 11**	**ODP TS#: 30**	**OBSERVER: PT, JG, CRN, SR.**
ROCK NAME:	Olivine-Plagioclase-Phyric Basalt							
WHERE SAMPLED:	Interior of flow							
GRAIN SIZE:	Medium grained							
TEXTURE:	Glomeroporphyritic; ophitic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Olivine	33	35	0.5	4	2.5		Euhedral; equant	Usually fresh. Clay alteration along fractures. Some are strained-e.g., Photomicrograph 1203-18.
Plagioclase	15	15	0.5	2	<1		Anhedral	Forms glomerocrysts up to 4 mm in size. Some have slightly ragged edges, indicating they are not in equilibrium with the groundmass.
GROUNDMASS								
Clinoyroxene	10	16	0.5	4	2		Anhedral; elongate	Forms chadacrysts enclosing plagioclase.
Plagioclase	28.5	28.5	0.1	0.7	0.4		Subhedral to euhedral; bladed	Often enclosed in pyroxene.
Magnetite	4	4					Octahedral	Occasional exsolution lamellae.
Chrome-spinel	1	1	0.2	0.05	0.05		Euhedral	Inclusions in olivine.
Pentlandite	0.5	0.5					Anhedral	Interstitial.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Clay	8				Filling fractures in olivine and interstitial areas in groundmass	
Serpentine	<1					

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	2	Throughout	<1	2	1	Typically unfilled	

COMMENTS: Sample flagged for ICP analysis. Olivine contains inclusions of chromite and occasional glass. The glass is typically devitrified, but at least one small fresh patch was observed. Photomicrograph 1203-17 shows texture of rock. Photomicrographs 1203-40: chrome-spinel in ppl, 1203-41: chrome spinel with titanomagnetite overgrowth, 1203-42: chrome spinel with titanomagnetite overgrowth, 1203-43: Titanomagnetite with maghemite alteration along cracks and cleavage planes.

Photomicrograph 1203-17. Field of view 5.5 mm. XPL.
Photomicrograph 1203-18. Field of view 5.5 mm, XPL.
Chapter 3, Figure F30. Field of view 2.5 mm, PPL.
Photomicrograph 1203-41. Field of view 0.5, RL.
Photomicrograph 1203-42. Field of view 0.7 mm, RL.
Chapter 3, Figure F36. Field of view 0.7 mm, RL.

THIN SECTION:	**197-1203A-32R-5, 86-88**		**Piece No.: 1C**			**Unit: 11**	**ODP TS#: 32**	**OBSERVER: PT**
ROCK NAME:	Olivine-Plagioclase-Phyric Basalt							
WHERE SAMPLED:	Flow interior							
GRAIN SIZE:	Fine grained							
TEXTURE:	Porphyritic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	9	9	0.5	3	1.25		Anhedral to subhedral; equant; fractured	Glomerocrystic, some are fractured, altered and highly zoned. Many glomerocrysts have a late-stage overgrowth (Photomicrographs 1203-19, 1203-20).
GROUNDMASS								
Plagioclase	25.5	29	0.07	0.15	0.1		Elongate; euhedral to subhedral	Occasionally skeletal branching form - indicative of quenching.
Clinopyroxene	25.5	29	0.2	1	0.7		Subhedral; elongate	Forms chadacrysts enclosing plagioclase.
Titanomagnetite	5	5	0.1	0.2	0.15		Cubic	
Glass	0	28						

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown amorphous clay	31				Groundmass	
Fe oxyhydroxide	<1					
Sericite/Illite	2					Occurs in altered plagioclase phenocrysts.
Calcite	<1				Vesicles	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	13	Top of slide	10	10	10	One large irregular coalesced vesicle is present	

COMMENTS:	Sample flagged for ICP analysis.	**Photomicrograph 1203-19.** Field of view 2.75 mm, XPL. **Photomicrograph 1203-20.** Field of view 0.7 mm, XPL.

THIN SECTION:	**197-1203A-35R-3, 49-52**		**Piece No.: 5**			**Unit: 13**	**ODP TS#: 33**	**OBSERVER: PT, RK, JG, SR.**
ROCK NAME:	Plagioclase-Phyric Basalt							
WHERE SAMPLED:	Basalt clast in volcanic breccia							
GRAIN SIZE:	Very fine grained							
TEXTURE:	Porphyritic							

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	1	1	0.5	2	1.5		Anhedral to subhedral; equant; fractured	Glomerocrystic, some are fractured, altered and highly zoned.
GROUNDMASS								
Plagioclase	40	?	0.07	0.15	0.1		Elongate; euhedral to subhedral	Highly altered.
Clinopyroxene	15	?	0.2	1	0.7			Highly altered.
Titanomagnetite	3		0.1	0.2	0.15		Cubic	

SECONDARY			**SIZE (mm)**				
MINERALOGY	**PERCENT**		**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown amorphous clay	18	0				Groundmass	
Fe oxyhydroxide (goethite?)	23	0					
Saponite	2					Rare vesicles and groundmass	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS:	This section was flagged for ICP analysis. Moderately altered.

THIN SECTION:	**197-1203A-35R-4, 47-49**		**Piece No.: 1F**			**Unit: 14a**	**ODP TS#: 34**	**OBSERVER: PT, RK, JG.**
ROCK NAME:	Moderately Plagioclase-Phyric Basalt							
WHERE SAMPLED:	Lobe interior							
GRAIN SIZE:	Fine grained							
TEXTURE:	Porphyritic, variolitic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	10	10	1	8	3		Anhedral to subhedral; equant; fractured	Glomerocrystic, some are fragmented, altered and highly zoned. May contain melt inclusions.
GROUNDMASS								
Plagioclase	22	22	0.07	0.15	0.1		Elongate; euhedral to subhedral	Occasionally skeletal branching form - indicative of quenching.
Clinopyroxene	42	?	0.2	1	0.7		Elongate; acicular	Patches of comb-textured clinopyroxene are visible in between plagioclase crystals (Photomicrograph 1203-21).
Opaques	3		0.1	0.2	0.15		Cubic	
Glass		?						
Titanomagnetite	1							

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown amorphous clay	23				Groundmass. Replacing clinopyroxene?	
Illite/Sericite	1				Replacing plagioclase along fractures	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS: **Chapter 3, Figure F31.** Field of view 0.7 mm, XPL.

THIN SECTION:	**197-1203A-35R-4, 114-116**		**Piece No.: 1N**			**Unit: 14a**	**ODP TS#: 35**	**OBSERVER: SR**
ROCK NAME:	Plagioclase-phyric basalt							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Intergranular to variolitic.							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	5	5	0.5	7	1		Euhedral	Highly zoned and deformed (two twin directions, albite and pericline).
GROUNDMASS								
Plagioclase	30	30						
Clinopyroxene	30	30						
Titanomagnetite	5	5						
Glass	0	35						Completely altered.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Sericite/Illite	<1				Plagioclase	
Brown clay	5				Glass	
Fe oxyhydroxide	6				Glass and vein	
Calcite	12				Vein and vesicles	
Celadonite	9				Vein and vesicles	
Saponite	3				Vein and vesicles	
Chlorite	<1				Vein	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS: There is no clear zonation in the vein.

Photomicrograph 1203-86. Field of view 1.4 mm, PPL.
Photomicrograph 1203-87. Field of view 1.4 mm, PPL.
Photomicrograph 1203-88. Field of view 1.4 mm, XPL.

THIN SECTION:	**197-1203A-35R-4, 147-149**		**Piece No.: 10**			**Unit: 14a**	**ODP TS#: 36**	**OBSERVER: SR**
ROCK NAME:	Plagioclase-phyric basalt							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Intergranular.							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	5	5	0.5	2	1		Euhedral	
GROUNDMASS								
Plagioclase	10	10	<0.1	0.2	0.1		Elongated	
Glass	0	80						Completely altered.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	15				Glass and vein	
Palagonite	15				Glass	
Fe oxyhydroxides	15				Glass	
Calcite	21				Vein	
Zeolite	11				Vein	
Saponite	2				Vein	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS:

Photomicrograph 1203-89. Field of view 1.4 mm, PPL.
Photomicrograph 1203-90. Field of view 1.4 mm XPL.

THIN SECTION:	**197-1203A-36R-1, 37-39**		**Piece No.: 1A**			**Unit: 14b**	**ODP TS#: 37**	**OBSERVER: SR**
ROCK NAME:	Plagioclase-phyric basalt							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Intergranular.							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	3	3	1	2	1		Euhedral	Slightly altered.
GROUNDMASS								
Plagioclase	30							
Clinopyroxene	30							
Titanomagnetite	10							Altered.
Glass	30							

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Celadonite	5				Glass and vein	
Fe oxyhydroxide	3				Glass and vein	
Calcite	17				Vein and vesicles	
Saponite	4				Vein and vesicles	
Chlorite	1				Vein	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS: **Photomicrograph 1203-91.** Field of view 1.4 mm, PPL.

THIN SECTION:	**197-1203A-36R-3, 10-13**		**Piece No.: 1A**			**Unit: 14b**	**ODP TS#: 38**	**OBSERVER: SR**
ROCK NAME:	Plagioclase-phyric basalt							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Intergranular to variolitic.							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	5-7	5-7					Euhedral	Sometimes forming glomerocrysts of up to 10 crystals.
GROUNDMASS								
Plagioclase	20-25						Elongated	
Glass	0	60						Completely altered.
Clinopyroxene	0	15					Completely altered	

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay Iddingsite	22				Glass and maybe clinopyroxene	
Fe oxyhydroxide	6				Glass	
Celadonite	16				Vein	
Pyrite	3				Vein	
Calcite	9				Vein	
Zeolite	3				Vein	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS:

Photomicrograph 1203-92. Field of view 0.7 mm, RL.
Photomicrograph 1203-93. Field of view 0.7 mm, RL.
Photomicrograph 1203-94. Field of view 1.4 mm, PPL.

THIN SECTION:	**197-1203A-36R-3, 29-32**		**Piece No.: 1B**			**Unit: 14d**	**ODP TS#: 39**	**OBSERVER: SR**
ROCK NAME:	Plagioclase-phyric basalt							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Intergranular to variolitic.							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	5-7	5-7					Euhedral	Sometimes forming glomerocrysts of up to 10 crystals.
GROUNDMASS								
Plagioclase	20-25						Elongated	
Glass	0	60						Completely altered
Clinopyroxene	0	15					Completely altered	

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay Iddingsite	25				Glass, maybe clinopyroxene and vein	
Fe oxyhydroxide	7				Glass and vein	
Celadonite	21				Vein	
Calcite	8				Vein	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS:

THIN SECTION:	**197-1203A-36R-3, 97-100**		**Piece No.: 1E**			**Unit: 14e**	**ODP TS#: 40**	**OBSERVER: SR**
ROCK NAME:	Plagioclase-phyric basalt							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Intergranular to variolitic.							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	5-7	5-7					Euhedral	Sometime forming glomerocryst of up to 10 crystals.
GROUNDMASS								
Plagioclase	20-25						Elongated	
Glass	0	60						Completely altered.
Clinopyroxene	0	15					Completely altered	

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	22				Glass, maybe clinopyroxene	
Fe oxyhydroxide	9				Glass and vein	
Iddingsite						
Chlorite	22				Vein	
Calcite	4				Vein	
Saponite	3				Vesicle	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS: **Photomicrograph 1203-95.** Field of view 1.4 mm XPL.

THIN SECTION:	**197-1203A-36R-4, 92-95**		**Piece No.: 1D**			**Unit: 14**	**ODP TS#: 41**	**OBSERVER: PT, SR.**
ROCK NAME:	Moderately Plagioclase-Phyric Basalt							
WHERE SAMPLED:	Lobe interior							
GRAIN SIZE:	Fine grained							
TEXTURE:	Porphyritic							

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	7	7	1	8	3		Anhedral to subhedral; equant; fractured	Glomerocrystic, some are fractured, altered and highly zoned.
GROUNDMASS								
Plagioclase	37	37	0.07	0.15	0.1		Elongate; euhedral to subhedral	Occasionally skeletal branching form - indicative of quenching.
Clinopyroxene	29	46	0.2	1	0.7		Elongate; acicular	Patches of comb-textured clinopyroxene are visible in between plagioclase crystals.
Glass		10						
Titanomagnetite	2		0.1	0.2	0.15		Cubic	

SECONDARY		**SIZE (mm)**					
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**		**REPLACING / FILLING**	**COMMENTS**
Brown amorphous clay	25					Groundmass; replacing clinopyroxene and glass?	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS: This sample was flagged for ICP analysis.

THIN SECTION:	**197-1203A-37R-3, 10-13**		**Piece No.: 1A**			**Unit: 16**	**ODP TS#: 42**	**OBSERVER: PT**
ROCK NAME:	Aphyric to Highly-Olivine-Phyric Basalt							
WHERE SAMPLED:	Interior of flow							
GRAIN SIZE:	Medium grained							
TEXTURE:	Porphyritic; ophitic							

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Olivine	26	26	1	2	1		Euhedral; equant	Usually fresh. Clay alteration along fractures. Some are strained. Others contain chrome spinels. Photomicrograph 1203-61.
GROUNDMASS								
Clinopyroxene	31.5	31.5	0.5	4	2		Anhedral; elongate	Forms chadacrysts enclosing plagioclase.
Plagioclase	31.5	31.5	0.1	0.7	0.4		Subhedral to euhedral; bladed	Usually surrounded by clinopyroxene.
Titanomagnetite	1	1					Cubic	
Glass	0	8						
Olivine	2	2	0.2	1	0.5			

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Clay	8				Filling fractures in olivine and interstitial areas in groundmass.	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS: This sample was flagged for ICP analysis. Olivine contains inclusions of chrome spinel and occasional glass. The glass is typically devitrified. Photomicrograph 1203-22 shows texture of rock.

Chapter 3, Figure F29. Field of view 5.5 mm, XPL.
Chapter 3, Figure F41. Field of view 0.5 mm, RL.

THIN SECTION:	**197-1203A-38R-1, 125-128**		**Piece No.: 1I**			**Unit: 16**	**ODP TS#: 43**	**OBSERVER: PT, SR.**
ROCK NAME:	Aphyric to Highly-Olivine-Phyric Basalt							
WHERE SAMPLED:	Interior of flow							
GRAIN SIZE:	Fine grained							
TEXTURE:	Subophitic; subtrachytic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Olivine	<1	1	0.2	0.5	0.25		Euhedral; equant	Typically fresh cores surround latered rim. Some clay alteration along fractures and margins of grains. Occasionally form glomerocrysts along with plagioclase.
Plagioclase	1	1	0.2	0.5	0.25		Subhedral	Fractured. Only occurs as rare glomerocysts with olivine.
GROUNDMASS								
Clinopyroxene	40	40					Anhedral; elongate	Forms chadacrysts partially enclosing plagioclase.
Plagioclase	40	40					Euhedral; bladed	Usually surrounded by pyroxene. Some extremely fresh. Forms subtrachytic domains.
Titanomagnetite	3	3					Cubic	
Olivine	7	15						

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	8				Surrounds cores of olivine phenocrysts and fresh olivine cores in groundmass.	
Talc	<1				Occasionally replaces olivine (e.g., center of glomerocrystic grain near LHS base of grain).	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS:	This sample was flagged for ICP analysis. Fresh plagioclase and clinopyroxene in groundmass.

THIN SECTION:	**197-1203A-38R-2, 131-134**	**Piece No.: 9A**	**Unit: 17a**	**TS#: 44**	**OBSERVER: TT**
ROCK NAME:	Bedded Olivine-Plagioclase Basalt-Tuff.				
WHERE SAMPLED:					
GRAIN SIZE:	Fine lapilli.				
TEXTURE:	Moderately to poorly sorted.				

	PERCENT	PERCENT	SIZE (mm)			APPROXIMATE		
COMPONENTS	**PRESENT**	**VESICLES**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
GLASS PARTICLES								
Blocky shards	85		0.2	5	1	Basalt	Angular, blocky	Contain relict olivine phenocrysts; 0.3-3 mm; 3-5 modal%?
LITHICS	15		0.1	0.8	0.4	Basalt	Angular, blocky	Hypocrystalline lava fragments with groundmass of plagioclase and pyroxene and relict phenocrysts of olivine.

SECONDARY MINERALS	**OCCURRENCE**	**COMMENTS**
Clay	Replacing basalt tephra clasts	Smectite?
Zeolites	As cement and replacing basalt tephra clasts	

COMMENTS: Dominance of nonvesicular, blocky glass fragments suggests hydrovolcanic origin for this deposit.

THIN SECTION:	**197-1203A-40R-2, 26-29**		**Piece No: 1B**			**Unit: 18i**	**ODP TS#: 45**	**OBSERVER: SR**
ROCK NAME:	Aphyric basalt.							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:								

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Plagioclase	50	40						
Olivine	0	10					Equant	replaced by calcite and Fe oxyhydroxide.
Clinopyroxene	5	20						
Glass	0	30						
Titanomagnetite	2							

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Fe oxyhydroxide Goethite	12				Vein and replacing glass, clinopyroxene and olivine	
Saponite	5				Vein	
Calcite	27				Vein and replacing olivine	
Pyrite	1				Vein	
Chlorite	5				Vein	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS:	Complex vein filling.

THIN SECTION:	**197-1203A-40R-5, 119-121**		**Piece No.: 9**			**Unit: 18t**	**ODP TS#: 46**	**OBSERVER: PT**
ROCK NAME:	Moderately Plagioclase-Olivine-Phyric Basalt							
WHERE SAMPLED:	Flow interior							
GRAIN SIZE:	Fine grained							
TEXTURE:	Porphyritic; variolitic							

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	5	5	0.4	2	<1		Anhedral to subhedral; equant; fractured	Glomerocrystic, some are fractured, altered and highly zoned.
Olivine	0	<<1	1	1	1		Subhedral; equant	Only one grain. Core altered to calcite and altered to clay along fracture.
GROUNDMASS								
Plagioclase	33	33	0.07	0.15	0.1		Elongate; euhedral to subhedral	Occasionally skeletal branching form - indicative of quenching.
Clinopyroxene	10	25	0.2	1	0.7		Elongate; acicular	Patches of comb-textured clinopyroxene are visible in between plagioclase crystals.
Glass	0	35						
Titanomagnetite	2	2	0.1	0.2	0.15		Cubic	

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown amorphous clay	30				Groundmass. Replacing clinopyroxene and plagioclase?	
Fe oxyhydroxide	20				Glass and clinopyroxene	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS: This sample was flagged for ICP analysis.

THIN SECTION:	**197-1203A-41R-1, 83-86**		**Piece No: 4C**			**Unit: 19e**	**ODP TS#: 47**	**OBSERVER: SL, SR**
ROCK NAME:	Plagioclase-olivine-phyric basalt.							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Subophitic.							

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	5	5						
Olivine	0	5	0.5	1	0.5		Equant.	Replaced by iddingsite.
GROUNDMASS								
Plagioclase	15	15	0.1	0.3	0.1			
Glass	0	50						
Titanomagnetite	5							Slightly altered to maghemite.

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Palagonite	13				Glass	
Calcite	20				Vein	
Brown clay	3				Glass	
Iddingsite	2				Replacing olivine	
Analcite	2				Vein	
Zeolite	10				Vein	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS:

THIN SECTION:	**197-1203A-42R-5, 20-23**		**Piece No.: 1A**			**Unit: 19ac**	**ODP TS#: 48**	**OBSERVER: PT, RK.**
ROCK NAME:	Vesicular Moderately Olivine-Phyric Basalt							
WHERE SAMPLED:								
GRAIN SIZE:	Fine grained							
TEXTURE:	Porphyritic; variolitic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	22	22	0.75	3	1.5		Anhedral to subhedral; equant; fractured	Glomerocrystic, some are fractured, altered and highly zoned (Photomicrograph 1203-62).
Olivine	1	8					Subhedral; equant	Olivine is very variably altered. Some grains very fresh, others totally replaced by clay.
Clinopyroxene	<1	<1	1	1	1		Euhedral; equant	Only one grain. Fresh. Occurs at base of slide.
GROUNDMASS								
Plagioclase	20	38	0.07	0.15	0.1		Elongate; euhedral to subhedral	Occasionally skeletal branching form - indicative of quenching.
Clinopyroxene	16	30	0.5	1	0.7		Subhedral	Surround plagioclase. Subophitic texture.
Titanomagnetite	1	1	0.05	0.2	0.1		Cubic	Occasionally forms sub-mm sized discontinuous veins. Concentration of opaque oxide needles around vesicle rims.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Amorphous clay	35				Replacing clinopyroxene and plagioclase?	
Calcite	3				Infilling vesicles	
Zeolites?	3					

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	10		0.5	2.5	1	Calcite, zeolites(?), clay	

COMMENTS:

Photomicrograph 1203-23. Field of view 1.4 mm, XPL.
Photomicrograph 1203-62. Field of view, 5.5 mm, XPL.

THIN SECTION:	**197-1203A-45R-6, 45-47**	**Piece No.: 2B**	**Unit: 20ac**	**ODP TS#: 49**	**OBSERVER: PT**
ROCK NAME:	Moderately Olivine-Phyric Basalt				
WHERE SAMPLED:	Interior of lobe				
GRAIN SIZE:	Fine grained; variolitic				
TEXTURE:					

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	1	1.5	<0.5	2	1		Euhedral	Fractured and altered to clay and carbonate.
GROUNDMASS								
Plagioclase	26.5	26.5	0.05	0.2	0.15		Elongate; euhedral	Occasionally skeletal branching form - indicative of quenching.
Clinopyroxene	6	32					Acicular	Relict variolitic/comb texture is visible: acicular ex-clinopyroxene fringing plagioclase needles. All fresh clinopyroxene is present in segregated area at top of section.
Titanomagnetite	1	1	0.01	0.2	0.03		Some elongate; generally euhedral; equant	Note that larger and more acicular black oxides are present in area of segregated material at top of slide.
Glass	0	39						Altered to Fe oxyhydroxide and green clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Fe oxyhydroxide	18				Glass	
Green clay (Saponite)	24				Glass; lines vesicles	
Calcite	4				Infills vesicles	
Brown clay	19.5				Vesicles and glass	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	4.5	Top 4 mm of section.	0.1	1	0.5	Irregular - single to coalesced. Lined with green clay and filled with calcite and chlorite.	Locally comprises 30% of section.

COMMENTS: Note: irregular dark rim present at top 3 mm of section. Segregation vesicle? Consists of abundant (30%, 0.1-1 mm in diameter) irregular vesicles, now infilled with calcite, surrounded by fresher groundmass - plumose aggregates of acicular clinopyroxene and elongate black oxide microlites, with only small amounts of plagioclase in a Fe oxyhydroxide mesostasis (replacing glass). Note that some plumose aggregates can be seen in section (perpendicular to their length), and can be distinguished by symmetrical groups of equant crystals in identical optical orientations. This sample was flagged for ICP analysis.

THIN SECTION:	**197-1203A-48R-1, 57-61**		**Piece No.: 1B**			**Unit: 21a**	**ODP TS#: 50**	**OBSERVER: JG, PT, SR.**
ROCK NAME:	Moderately Olivine-Phyric Basalt							
WHERE SAMPLED:	Lobe interior							
GRAIN SIZE:	Fine grained							
TEXTURE:	Subophitic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Plagioclase	37	37	0.9	0.13	0.5		Elongate; euhedral to subhedral; some acicular	Occasionally skeletal branching form - indicative of quenching.
Clinopyroxene	7	30	0.05	1	0.8		Subhedral to anhedral	Mostly altered to clay. Some subophitic texture is visible, with clinopyroxene chadacrysts enclosing plagioclase oikocrysts.
Titanomagnetite	3	3	<0.01	0.2	0.03		Cubic	
Glass	0	30						Altered to amorphous clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Green clay (Saponite)	53				Replaces glass and infills vesicles	
Zeolite	<1					

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	3	Throughout	<1	1.25	0.7	Irregular- single to coalesced; lined with green clay and filled with calcite	

COMMENTS: This sample was flagged for ICP analysis.

THIN SECTION:	**197-1203A-48R-1, 118-121**		**Piece No: 1C**			**Unit: 21a**	**ODP TS#: 51**	**OBSERVER: SR**
ROCK NAME:	Plagioclase-phyric basalt.							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Intergranular.							

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	0	10	0.8	2	1		Subhedral.	Completely replaced by calcite
GROUNDMASS								
Plagioclase	30	30					Elongated.	
Clinopyroxene	10	10						
Glass	0	60						

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Calcite	10				Plagioclase.	
Pyrite	15					
Brown clay	2					
Fe oxyhydroxide	3					
Zeolite	30				Groundmass and vesicles	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicle	10					Zeolite	

COMMENTS:

THIN SECTION:	**197-1203A-51R-1, 14-17**		**Piece No.: 4**			**Unit: 22**	**ODP TS#: 53**	**OBSERVER: PT, SR.**
ROCK NAME:	Sparsely Plagioclase-Phyric Basalt							
WHERE SAMPLED:	Basalt clast in volcaniclastic breccia							
GRAIN SIZE:	Fine grained							
TEXTURE:	Subophitic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	2	2	0.25	2	1		Subhedral	Some embayed, fractured and fragmented, altered.
Olivine	0	5	0.3	0.1	0.2		Euhedral	Microphenocrysts, now infilled with calcite.
GROUNDMASS								
Plagioclase	28	28	0.1	0.3	0.2		Elongate to nearly equant. Euhedral to subhedral.	Smaller aspect ratio than seen in most sections (e.g., Section 45R-6, 45-47 cm). Oikocrystic.
Clinopyroxene	17	36	0.05	0.3	0.25		Subhedral to anhedral	Mostly altered to clay. Some subophitic texture is visible, with clinopyroxene chadacrysts enclosing plagioclase oikocrysts.
Titanomagnetite	6	6	0.01	0.35	0.1		Cubic	Occasionally acicular in form and forms dendritic clusters (e.g., Photomicrograph 1203-28).
Glass	0	23						Altered to amorphous clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	42				Replaces glass and clinopyroxene and rims olivine pseudomorphs.	
Calcite	4				Replaces olivine; fills vesicles	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS:	This sample was flagged for ICP analysis.	**Photomicrograph 1203-28.** Field of view 0.7 mm, PPL.

THIN SECTION:	**197-1203A-51R-1, 105-107**		**Piece No.: 16A**			**Unit: 22**	**ODP TS#: 55**	**OBSERVER: PT**
ROCK NAME:	Sparsely Plagioclase-Phyric Basalt							
WHERE SAMPLED:	Basalt clast in volcaniclastic breccia							
GRAIN SIZE:	Fine grained							
TEXTURE:	Trachytic							

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	2	2	0.25	1	0.5		Subhedral	Some embayed, fractured and fragmented, altered.
Olivine	0	3	0.3	0.1	0.2		Euhedral	Microphenocrysts, now infilled with calcite. Euhedral shape suggests olivine, but hard to distinguish from calcite filled vesicles.
GROUNDMASS								
Plagioclase	35	35	0.1	0.3	0.2		Elongate to nearly equant. Euhedral to subhedral	Skeletal. Forms subtrachytic domains, with groundmass plagioclase radiating out from phenocrysts. (Photomicrograph 1203-168).
Clinopyroxene	10	30	0.05	0.2	0.15		Subhedral to anhedral	Mostly altered to clay.
Titanomagnetite	5	5	0.01	0.35	0.1		Skeletal	
Glass	0	25						Altered to amorphous clay.

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	36				Replaces glass and clinopyroxene and rims olivine pseudomorphs	
Calcite	12				Replaces olivine; fills vesicles	

VESICLES/			**SIZE (mm)**					
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**		**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	15	Throughout	0.2	0.5	0.3	Calcite		

COMMENTS:	This sample was flagged for ICP analysis.	**Photomicrograph 1203-168.** Field of view 1.4 mm, PPL.

THIN SECTION:	**197-1203A-51R-4, 93-96**		**Piece No.: 2A**			**Unit: 23a**	**ODP TS#: 54**	**OBSERVER: PT**
ROCK NAME:	Vesicular Sparsely Olivine-Plagioclase-Phyric to Aphyric Basalt							
WHERE SAMPLED:								
GRAIN SIZE:	Fine grained							
TEXTURE:	Subophitic, vesicular							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Plagioclase	30	30	0.2	0.8	0.5		Elongate to nearly equant; euhedral to subhedral	Smaller aspect ratio than seen in most sections (e.g., Section 45R-6, 45-47 cm). Oikocrystic.
Clinopyroxene	14	33	0.2	0.7	0.5		Subhedral to anhedral	Mostly altered to clay. Some subophitic texture is visible, with clinopyroxene chadacrysts enclosing plagioclase oikocrysts.
Titanomagnetite	5	5	0.01	0.3	0.05		Cubic; many equant, some skeletal	
Glass	0	32						Altered to amorphous clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Amorphous clay	46				Glass and clinopyroxene; rims vesicles	
Calcite	5				Occasionally fills vesicles	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	25	Throughout	1	6	3	Rounded to elongate. Some coalesced. Lined with clay. Some filled with calcite	Surrounded by segregated material (e.g. Photomicrographs 1203-29, 30)

COMMENTS: Interesting alteration texture seen: anhedral areas between plagioclase laths is lined by a unifom 0.1 mm wide coating of clay. The vesicle margins are typically surrounded by 0.5-1 mm wide zones of segregated material: comb-textured acicular clinopyroxene, acicular black oxides and some clay-lined vesicles with very little pyroxene.

Photomicrograph 1203-29. Field of view 5.5 mm, PPL.
Photomicrograph 1203-30. Field of view 0.7 mm, PPL.

THIN SECTION:	**197-1203A-51R-5, 43-45**		**Piece No: 5**			**Unit: 23**	**ODP TS#: 52**	**OBSERVER: SL, SR**
ROCK NAME:	Aphyric basalt.							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:								
TEXTURE:	Glassy rim.							

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Plagioclase	15	15						
Glass	0	80						
Titanomagnetite	5							

SECONDARY		**SIZE (mm)**					
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**		**REPLACING / FILLING**	**COMMENTS**
Calcite	5					Vesicle	
Saponite	10					Glass, vesicle	
Brown clay	50					Glass	
Zeolite	15					Vesicle	
Fe oxyhydroxide	5					Glass, vesicle	

VESICLES/			**SIZE (mm)**					
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**		**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicle	20						Zeolite, calcite and saponite	

COMMENTS:	Well crystallized zeolite.

THIN SECTION:	**197-1203A-52R-6, 12-14**	**Piece No.: 1B**	**Unit: 23h**	**ODP TS#: 57**	**OBSERVER: JG, PT.**
ROCK NAME:	Vesicular Sparsely Olivine-Plagioclase-Phyric to Aphyric Basalt				
WHERE SAMPLED:	Interior of flow				
GRAIN SIZE:	Fine grained				
TEXTURE:	Subophitic; variolitic				

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	1	1	<1	3.5	2		Euhedral to subhedral	Fractured, some display zoning and embayments but seem comparatively fresh (e.g., crystal at top of section).
GROUNDMASS								
Clinopyroxene	29	33	0.2	1	0.6		Euhedral to subhedral; some acicular	Often acicular in form. Some subophitic texture is visible, with clinopyroxene chadocrysts partially enclosing plagioclase oikocrysts.
Plagioclase	32	32	0.2	0.8	0.5		Elongate; euhedral to subhedral; some acicular	Frequently skeletal branching form - indicative of quenching.
Titanomagnetite	10	10	0.01	0.3	0.15		Cubic. Most are skeletal and acicular and cross each other, forming a spectacular texture	
Glass	0	24						Altered to amorphous clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Green amorphous clay	25					
Calcite	3					

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vein	2		1	2	1	Calcite	
Vesicles	2	near vein				Calcite	

COMMENTS: This sample was flagged for ICP analysis. Groundmass is fresher than seen in other sections (e.g., Section 51R-1, 14-17 cm). 0.8 mm wide orbital structure is present in middle of slide. Defined by rim of plagioclase needles and interior of finer-grained segregated material.

Photomicrograph 1203-31. Field of view 0.7 mm, PPL.
Chapter 3, Figure F44. Field of view 1.4 mm, PPL.

THIN SECTION:	**197-1203A-53R-3, 1-4**		**Piece No.: 1**			**Unit: 23q**	**ODP TS#: 58**	**OBSERVER: SL, SR**
ROCK NAME:	Aphyric to Plagioclase-phyric basalt.							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Subophitic.							

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	5	5						
GROUNDMASS								
Plagioclase	20-25	20-25	0.6	2	1			
Titanomagnetite	3	3						
Clinopyroxene	15	15						
Glass	0	55						

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Saponite	5				Glass, vein, vesicle	Line vesicle.
Calcite	35				Vein, vesicle	
Fe oxyhydroxide	3				Glass, vein	
Brown clay	3				Glass	
Chlorite	1				Glass, vein, vesicle	Incipient.
Zeolite	5				Vesicle	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicle			0.4	6	2	Calcite, saponite and chlorite	

COMMENTS:

THIN SECTION:	**197-1203A-53R-3, 113-116**		**Piece No.: 23A**			**Unit: 23s**	**ODP TS#: 56**	**OBSERVER: SL, SR**
ROCK NAME:	Aphyric basalt.							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Glassy rim							
TEXTURE:								

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Plagioclase	25	25	0.1	1	0.8			
Glass	0	70						
Titanomagnetite	5	5						

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	42				Glass	
Fe oxyhydroxide	3				Glass, vein	
Zeolite	14				Vesicle	
Saponite	14				Glass, vesicle	Lining vesicle.

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicle	20		0.2	5	1	Zeolite and saponite	

COMMENTS:

THIN SECTION:	**197-1203A-54R-3, 15-18**		**Piece No.: 1G**			**Unit: 23af**	**ODP TS#: 59**	**OBSERVER: JG, PT.**
ROCK NAME:	Vesicular Sparsely Olivine-Plagioclase-Phyric to Aphyric Basalt							
WHERE SAMPLED:								
GRAIN SIZE:	Fine grained							
TEXTURE:	Subophitic to intersertal							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	<1	<1	0.35	0.7	0.5		Euhedral-subhedral; equant	Slightly zoned and fractured.
GROUNDMASS								
Plagioclase	36	36	0.18	0.5	0.8		Subhedral; lath-like to acicular	Some crystals are branching and skeletal.
Clinopyroxene	14	19	0.1	0.4	0.3		Anhedral to subhedral	
Glass	0	41						Altered to clay.
Titanomagnetite	4	4					Acicular and extremely elongate to poorly formed cubic crystals	

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Calcite	3				Vesicle centers	
Brown Clay	43				Intestitial glass and vesicles	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	3	Throughout				Often filled with clay and calcite	Rimmed by segregated material- see comment below.

COMMENTS: This sample was flagged for ICP analysis. Vesicles are thickly rimmed by segregation material consisting of an outer rim of plagioclase and an inner core of acicular and dendritic black oxides, acicular clinopyroxene and green clay (altered glass) (e.g., Photomicrograph 1203-76). Patches of quenched segregated material are often present even without an obvious vesicle core, although a radiating mineral (pumpellyite?) is always present, and comprises up to 10% of the rock.

Chapter 3, Figure 33. Field of view 0.7 mm, PPL.

THIN SECTION:	**197-1203A-55R-1, 122-125**		**Piece No.: 7D**			**Unit: 23ap**	**ODP TS#: 60**	**OBSERVER: JG, PT.**
ROCK NAME:	Vesicular Sparsely Olivine-Plagioclase-Phyric to Aphyric Basalt							
WHERE SAMPLED:	Vesicle Cylinder							
GRAIN SIZE:	Fine grained							
TEXTURE:	Subophitic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	2	2	0.5	4	1		Euhedral to subhedral	
GROUNDMASS								
Plagioclase	30	30	0.2	1	0.4		Euhedral to subhedral	Lathlike to acicular.
Clinopyroxene	30	30	0.5	5	2		Subhedral to euhedral	Acicular and skeletal in segregated areas. Spectacular texture with plumose aggregates (Photomicrograph 1203-169).
Titanomagnetite	4	4	0.05	0.03	0.01			Skeletal.
Glass	0	34						

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Fe oxyhydroxide	10				Infilling vesicles	
Pumpellyite	5				Vesicles	Comb textured acicular crystals lining vesicles.
Calcite	6				Vein and vesicles	
Brown clay	13				Vesicles and interstitial areas	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	10	Throughout	0.3	1.4	0.4	Filled with calcite and/or radiating fibrous mineral, (pumpellyite?)	These may not be infilled vesicles but complete areas of altered groundmass.
Vein	8	Lower half			1.4	Filled with calcite and clay	

COMMENTS: The fibrous, comb textured, secondary mineral filling vesicles may be pumpellyite. Segregated material, rich in black oxides, is present around many of the vesicles.

Photomicrograph 1203-169. Field of view 1.4 mm, PPL.

THIN SECTION:	**197-1203A-57R-1, 108-111**		**Piece No: 11B**			**Unit: 23bx**	**ODP TS#: 61**	**OBSERVER: SR**
ROCK NAME:	Aphyric basalt.							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Subophitic.							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Plagioclase	30	30						
Glass	0	65						
Titanomagnetite	5	5						

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Fe oxyhydroxide Goethite	7				Vein, groundmass	
Calcite	35				Vein	
Zeolite	13				Vesicle and vein	
Chlorite	3				Vein	
Saponite	6				Replacing groundmass	Lining vesicle.

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicle						Zeolite	

COMMENTS:	Very complex vein filling.	**Photomicrograph 1203-96.** Field of view 1.4 mm, PPL. **Photomicrograph 1203-97.** Field of view 1.4 mm, XPL.

THIN SECTION: 197-1203A-57R-2, 127-129 **Piece No.: 29** **Unit: 23ca** **ODP TS#: 62** **OBSERVER: JG, PT.**
ROCK NAME: Vesicular Sparsely Olivine-Plagioclase-Phyric to Aphyric Basalt
WHERE SAMPLED: Vesicle Cylinder
GRAIN SIZE: Fine grained
TEXTURE: Subophitic

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Plagioclase	2	2	0.5	3	1		Euhedral to subhedral	Are often subrounded and show evidence for a xenocrystic origin.
GROUNDMASS								
Plagioclase	30	30	0.2	1	0.4		Euhedral to subhedral	Lath-like to acicular.
Clinopyroxene	3	31	0.5	5	2		Subhedral to euhedral	Acicular and skeletal in segregated areas.
Titanomagnetite	3	3	0.05	0.03	0.01			Skeletal.
Glass	0	34						

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Green clay	13				Vesicles and interstitial areas	
Pumpellyite	2				Lines vesicles	
Calcite	6				Vesicles	
Brown clay	40				Vesicles and interstitial areas	
Pyrite	1				Vesicles	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	20	Throughout	0.3	20	1	Some filled with calcite and lined with pumpellyite(?); others unfilled. Rare pyrite also present?	A large vesicle cylinder (filled with calcite) is present in the middle of the slide.

COMMENTS: Segregated material, rich in black oxides, is present in large abundances around many of the vesicles.

THIN SECTION:	**197-1203A-59R-2, 51-53**		**Piece No: 2A**			**Unit: 24**	**ODP TS#: 63**	**OBSERVER: SL, SR**
ROCK NAME:	Aphyric basalt.							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Subophitic.							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Plagioclase	25	25	0.1	0.6				
Clinopyroxene	10	10	0.2	0.8				
Titanomagnetite	5	5	0.01	0.2				
Glass	0	60						

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Calcite	34				Vein	
Zeolite	10				Groundmass, vein, vesicles.	
Brown clay	10				Groundmass, vein, vesicles	
Pyrite	7				Vein	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicle	5					Zeolite and brown clay	

COMMENTS: Groundmass altered to zeolite. Vein lined by zeolite.

THIN SECTION:	**197-1203A-59R-2, 99-102**		**Piece No.: 2B**			**Unit: 24**	**ODP TS#: 64**	**OBSERVER: PT**
ROCK NAME:	Vesicular Aphyric Basalt							
WHERE SAMPLED:	Lobe interior							
GRAIN SIZE:	Fine grained							
TEXTURE:	Subophitic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Clinopyroxene	34.5	34.5	0.5	2	1		Euhedral to subhedral	Fresh, showing clear subophitic texture, with clinopyroxene chadacrysts partially enclosing plagioclase oikocrysts. Photomicrographs 1203-49 and 1203-50.
Plagioclase	42.5	42.5	0.05	0.5	0.3		Elongate; euhedral	Occasionally skeletal branching form - indicative of quenching.
Titanomagnetite	3	3	0.01	0.1	0.05		Cubic	
Glass	0	20						Altered to amorphous clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Green clay	20				Glass in the groundmass	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**

COMMENTS:	Fresh slide. Very few alteration phases. This sample was flagged for ICP analysis.	**Chapter 3, Figure F32.** Field of view 1.4 mm, XPL. **Photomicrograph 1203-50.** Field of view 1.4 mm, PPL.

THIN SECTION:	**197-1203A-59R-5, 30-32**		**Piece No.: 5**			**Unit: 26c**	**ODP TS#: 65**	**OBSERVER: PT, SR.**
ROCK NAME:	Vesicular Aphyric Basalt							
WHERE SAMPLED:	Lobe interior							
GRAIN SIZE:	Fine grained							
TEXTURE:	Intergranular; vesicular							

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Clinopyroxene	1	15	0.2	0.6	0.3		Euhedral to subhedral	Mostly replaced by clay and Fe oxyhydroxide. Some subophitic texture is visible, with ex-clinopyroxene chadacrysts partially enclosing plagioclase oikocrysts.
Plagioclase	26	30	0.05	0.5	0.3		Elongate; euhedral; some acicular	Occasionally skeletal branching form - indicative of quenching.
Titanomagnetite	20	20	0.01	0.1	0.05		Cubic; acicular in places	Forms dense clusters in interstitial areas. Extreme form of acicular dendritic texture seen in Samples 52R-6, 12-14 cm, and 54R-3, 15-18 cm, and look like amorphous blobs.
Glass	0	35						Altered to amorphous clay.

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Green and brown clay	44				Replacing clinopyroxene and glass in the groundmass and lining vesicles	
Fe oxyhydroxide.	5				Replacing clinopyroxene and glass in the groundmass	
Goethite	<1					
Other clay	4				Replacing plagioclase along fractures and skeletal cores	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	30	Throughout	0.5	3	1.5	Infilled with green clay and/or pumpellyite and destabilized calcite.	Rimmed by concentrations of segregated material, particularly acicular masses of black oxides.

COMMENTS: Note: Slide is very rich (>30%) in irregular vesicles or cavities, now filled with radiating green clay/pumpellyite (?) and are surrounded, even on a sub-mm scale by surrounding segregated material, which is especially rich in dense acicular clumps of opaque minerals. Sample flagged for ICP. Chemical analysis may reflect degree of alteration and abundance of segregated material (especially black oxides).

THIN SECTION:	**197-1203A-62R-3, 48-51**		**Piece No: 8A**			**Unit: 26q**	**ODP TS#: 66**	**OBSERVER: SR**
ROCK NAME:	Aphyric basalt.							
WHERE SAMPLED:	Alteration.							
GRAIN SIZE:	Fine grained.							
TEXTURE:	Intergranular.							

			SIZE (mm)					
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Plagioclase	25	30	0.05	0.5	0.2		Elongated	Altered.
Clinopyroxene	0	15						Altered.
Glass	0	55						Altered.

		SIZE (mm)				
SECONDARY MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	8				Glass, clinopyroxene.	
Fe oxyhydroxide Goethite	18				Glass, clinopyroxene, vein.	
Calcite	4				Vein and vesicle.	
Chlorite	8				Vesicle.	
Saponite	20				Vein and lining vesicle.	

			SIZE (mm)				
VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicle						Calcite, saponite and chlorite	

COMMENTS:	Complex zoning in vein and vesicle filling.	**Photomicrograph 1203-102.** Field of view 1.4 mm, PPL. **Photomicrograph 1203-103.** Field of view 5 mm, PPL.

THIN SECTION:	**197-1203A-63R-3, 134-137**	**Piece No.: 24A**	**Unit: 26y**
ROCK NAME:	Calcareous tuff.		
WHERE SAMPLED:			
GRAIN SIZE:	Fine to very fine grained.		
TEXTURE:	Moderately well sorted.		

	PERCENT	**PERCENT**	**SIZE (mm)**			**APPROXIMATE**		
COMPONENTS	**PRESENT**	**VESICLES**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
GLASS PARTICLES								
Vesicular								
Blocky shards	5							Glass is altered to smectite and outline is difficult to distinguish.
Cuspate shards	5-10							
CRYSTALS	5-10		0.04	0.1	0.08	Mainly feldspar. Occasional clinopyroxene	Angular; fragmented	Most of feldspar fragments appear untwinned.
LITHICS	10-15		0.05	0.4	0.1	Mainly nonvesicular altered basalt.	Angular; fragmented	Most lithics too altered to determine composition.

MATRIX	**PERCENT**	**OCCURRENCE**	**COMMENTS**
Calcite	30-60		
Very fine ash	5		Small fragments in background.

COMMENTS: Volcanic tuff components cemented by calcite. Calcite origin probably detrital.

THIN SECTION:	**197-1203A-63R-5, 35-37**	**Piece No.: 3**	**Unit: 27**	**ODP TS#: 70**	**OBSERVER: PT, SL**
ROCK NAME:	Volcanic ash.				
WHERE SAMPLED:					
GRAIN SIZE:	Fine to very fine grained.				
TEXTURE:	Moderately well sorted.				

	PERCENT	PERCENT	SIZE (mm)			APPROXIMATE		
COMPONENTS	**PRESENT**	**VESICLES**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
GLASS PARTICLES								
Vesicular	5-10							Difficult to distinguish size of irregular glass shards.
Blocky shards	5-10		0.05	0.3	0.1			
Cuspate shards	5-10							
CRYSTALS	5					plagioclase, olivine		
LITHICS								

MATRIX	**PERCENT**	**OCCURRENCE**	**COMMENTS**
Smectite	5-10		Altered rims around glass.
Brown clay	5-20		
Calcite	10-40		Mainly in slumped clasts.
shell debris	2		

COMMENTS: Volcanic ash containing some elongate cm long rip-up clasts and occasional large pumices. Also clasts of calcareous very fine grained ash. Slumped and soft deformed sediment.

THIN SECTION: 197-1203A-63R-6, 58-61 **Piece No.:** 3 **Unit:** 27 **ODP TS#:** 70 **OBSERVER:** TT
ROCK NAME: Resedimented Volcaniclastic sandstone. ß
WHERE SAMPLED:
GRAIN SIZE: Very coarse sand.
TEXTURE:

COMPONENTS	PERCENT PRESENT	PERCENT VESICLES	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
LITHICS								
Felsic fragments	45		0.3	2	2	dacite?	Angular and blocky	Grains are characterized by felsitic texture (fine-grained intergrowth of feldspar and quartz from devitrification of silicic glass).
Mafic fragments	40		0.2	2	1.5	andesite?	Angular with blocky and irregular outlines	Highly altered plagioclase-phyric lithic fragments with variable crystallinity (cryptocrystalline to fine grained) and some exhibit pilotaxitic texture.
Palagonite fragments	10	20	0.2	1.5	0.8	andesite?	Vesicular and irregular outlines	Palagonite (after glass) fragments, containing vesicles with highly irregular outlines.
CRYSTALS								
Feldspar	5		0.3	0.5	0.2		Anhedral (broken)	Plagioclase and alkali feldspar?

COMMENTS:

THIN SECTION: **197-1203A-64R-1, 45-47** **Piece No.: 7** **Unit: 28** **ODP TS#: 71** **OBSERVER: TT**
ROCK NAME: Sandy matrix of Volcaniclastic Lithic Breccia from Interval 37-57 cm (Pieces 7, 8) in Section 64R-1.
WHERE SAMPLED:
GRAIN SIZE: Clay to coarse sand (<0.1 to 2 mm).
TEXTURE:

COMPONENTS	PERCENT PRESENT	PERCENT VESICLES	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
CRYSTALS								
Feldspar	5		0.1	1	0.5		anhedral (broken)	Plagioclase and alkali feldspar?
LITHICS								
Basalt fragments	20		0.2	2	1.5	basalt	angular with blocky and irregular outlines	Highly altered aphyric basalt lithic fragments with variable crystallinity (cryptocrystalline to fine grained). Crystalline variety has groundmass of plagioclase, pyroxene, and magnetite.
Felsic fragments	15		0.1	4	2	dacite?	angular and blocky	Grains are characterized by felsitic texture (fine-grained intergrowth of feldspar and quartz from devitrification of silicic glass).
Glass fragments	20	0-60	0.2	1.5	0.8	basalt	angular, blocky, irregular and cuspate.	Highly altered (to clay), non-vesicular to highly vesicular basalt tephra clasts.
MATRIX								
Carbonate	40				<0.05			Recrystallized carbonate mud.

COMMENTS: The matrix of this lithic breccia contains a well preserved specimen of red-coralline algae. **Chapter 3, Figure F15.**

THIN SECTION: 197-1203A-64R-2, 69-72 **Piece No.:** 11A **Unit:** 28 **ODP TS#:** 72 **OBSERVER:** TT
ROCK NAME: Carbonate-rich matrix from the Basalt Breccia in Sections 64R-1 to 65R-1.
WHERE SAMPLED:
GRAIN SIZE: <0.1 to >20 mm.
TEXTURE:

COMPONENTS	PERCENT PRESENT	PERCENT VESICLES	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
LITHICS								
Basalt lava clast	50	15			<20	basalt	angular with blocky outlines	Altered aphyric basalt with a groundmass of plagioclase, pyroxene, and magnetite.
MATRIX								
Carbonate	40				<0.05			Recrystallized carbonate mud.
Basalt fragments	4				<0.5	basalt	angular with blocky and irregular outlines	Highly altered aphyric basalt lithic fragments with variable crystallinity.
Felsic fragments	3				<0.5	dacite?	angular and blocky	Grains are characterized by felsitic texture.
Crystal fragments	3				<0.5	feldspar	angular (broken)	

COMMENTS: Lower half of this thin section is the matrix to the basalt breccia on top of Unit 29, whereas the upper half is a part of a larger lava clast. The matrix consists of recrystallized carbonate mud containing dispersed sand-size carbonate, basalt lithic and crystal fragments.

THIN SECTION:	**197-1203A-65R-4, 21-24**		**Piece No.: 3**			**Unit: 29g**	**ODP TS#: 73**	**OBSERVER: PT, SR, RD.**
ROCK NAME:	Vesicular Aphyric Basalt							
WHERE SAMPLED:	Lobe interior							
GRAIN SIZE:	Fine grained							
TEXTURE:	Intergranular; vesicular							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Clinopyroxene	2	25	0.2	1	0.6		Euhedral to subhedral; some acicular	Mostly replaced by clay and Fe oxyhydroxide. Some subophitic texture is visible, with clinopyroxene chadacrysts partially enclosing plagioclase oikocrysts.
Plagioclase	34	34	0.05	0.5	0.3		Elongate; euhedral; some acicular	Occasionally skeletal branching form - indicative of quenching.
Titanomagnetite	14	14	0.01	0.3	0.15		Cubic; acicular; forms radiating arrays	Titanomagnetite is altered.
Glass	0	27						Altered to amorphous clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Green clay (Saponite)	44				Replacing clinopyroxene and glass in the groundmass and lining vesicles and vein.	
Calcite	2				Vein	
Fe oxyhydroxide	4				Clinopyroxene and glass in the groundmass	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	35	Throughout	0.5	4	1	Green clay	Rimmed by segregated material and characteristically elongate and irregular in form, surrounded by smaller round vesicles (Photomicrograph 1203-48). Radiating pumpellyite(?) also present in vesicles.
Vein	2		1	2	1.5	Calcite	

COMMENTS:	Note: Slide is very rich in vesicles (filled with clay) and surrounding segregated material. Sample flagged for ICP. Chemical analysis may reflect degree of alteration.	**Photomicrograph 1203-48.** Field of view 1.4 mm, XPL.

THIN SECTION:	**197-1203A-66R-3, 11-14**		**Piece No.: 1C**			**Unit: 30k**	**ODP TS#: 74**	**OBSERVER: PT, SR, RD.**
ROCK NAME:	Vesicular, Sparsely Plagioclase-Phyric Basalt							
WHERE SAMPLED:	Lobe interior							
GRAIN SIZE:	Fine grained							
TEXTURE:	Intergranular; vesicular							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Clinopyroxene	3	25	0.2	1	0.6		Euhedral to subhedral; some acicular	Mostly replaced by clay and Fe oxyhydroxide. Some subophitic texture is visible, with clinopyroxene chadacrysts partially enclosing plagioclase oikocrysts.
Plagioclase	30	30	0.05	0.7	0.3		Elongate; euhedral; some acicular	Occasionally skeletal branching form - indicative of quenching.
Titanomagnetite	20	20	0.01	0.3	0.15		Cubic	Concentrated on margins of vesicles in segregated material (altered?).
Glass	0	25						Altered to amorphous clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Green clay (Saponite)	27				Replacing clinopyroxene and glass in the groundmass and lining vesicles	
Calcite	16				Vesicles	
Fe oxyhydroxide	4				Replacing clinopyroxene and glass in the groundmass and lining vesicles	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	25	Throughout	0.5	30	15	Infilled with radiating and blocky calcite or green clay; radiating serpentine and rare sulfides also present	Large (30 mm) vesicle cylinder is present in middle of slide. Rimmed by segregated material.
Vein						Infilled with calcite	

COMMENTS: Note: Vesicle cylinder is present through middle of slide. <3 cm in length, consisting of irregular 0.1-4 mm sized vesicles surrounded by segregated material. Segregated material is very rich in acicular black oxides. Sample flagged for ICP. Chemical analysis may reflect state of alteration.

THIN SECTION:	**197-1203A-68R-3, 16-18**		**Piece No.: 4**			**Unit: 30aj**	**ODP TS#: 75**	**OBSERVER: PT, SR, RD.**
ROCK NAME:	Vesicular, Sparsely Plagioclase-Phyric Basalt							
WHERE SAMPLED:	Lobe interior							
GRAIN SIZE:	Fine grained							
TEXTURE:	Intergranular; subvariolitic; subophitic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
GROUNDMASS								
Clinopyroxene	6	27	0.2	1	0.6		Euhedral to subhedral; some acicular	Mostly replaced by clay and Fe oxyhydroxide. Some subophitic texture is visible, with clinopyroxene chadacrysts partially enclosing plagioclase oikocrysts.
Plagioclase	33	33	0.05	0.7	0.3		Elongate; euhedral; some acicular	Occasionally skeletal branching form - indicative of quenching.
Titanomagnetite	12	12	0.01	0.3	0.15		Cubic	Concentrated in segregated material rimming vesicles.
Glass	0	28						Altered to amorphous clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Green clay (Saponite)	40				Replacing clinopyroxene and glass in the groundmass and lining vesicles	
Calcite	4				Filling vesicles	
Zeolite	1				Filling vesicles	
Fe oxyhydroxide.	4				Replacing clinopyroxene and glass in the groundmass and lining vesicles	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	10	Throughout	0.1	4	2	Partially infilled. Lined with clay and Fe oxyhydroxides, some filled with calcite	Rimmed by segregated material.

COMMENTS: Note: Vesicle cylinder is present through middle of slide. <3 cm in length, consisting of irregular 0.1-4 mm sized vesicles surrounded by segregated material. Sample flagged for ICP analysis.

THIN SECTION:	**197-1203A-68R-4, 29-30**		**Piece No.: 4**			**Unit: 31a**	**ODP TS#: 76**	**OBSERVER: PT**
ROCK NAME:	Highly Plagioclase-Phyric Basalt							
WHERE SAMPLED:	Interior of flow.							
GRAIN SIZE:	Fine grained							
TEXTURE:	Subophitic, variolitic							

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**APPROXIMATE COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS								
Plagioclase	10	10	3	3	2		Subhedral to anhedral	Glomerocrystic. Some round, zoned and fractured (e.g. Photomicrograph 1203-44).
Olivine	0	1	0.2	0.5	0.3		Equant; euhedral	Entirely replaced by an outer rim of Fe oxyhydroxide and an inner core of amorphous clay. Photomicrograph 1203-45 of olivine pseudomorphs.
GROUNDMASS								
Clinopyroxene	2	30	0.2	1	0.6		Euhedral to subhedral; some acicular	Mostly replaced by clay and Fe oxyhydroxide. Some subophitic texture is visible, with clinopyroxene chadacrysts partially enclosing plagioclase oikocrysts.
Plagioclase	34	34	0.03	0.1	0.05		Elongate; euhedral; some acicular	Occasionally skeletal branching form - indicative of quenching.
Titanomagnetite	1	1	0.01	0.3	0.15		Cubic	
Glass	0	24						Altered to amorphous clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Green clay (Saponite)	42				Replaces glass and clinopyroxene and groundmass. Infills veins.	
Fe oxyhydroxides	10				Glass and clinopyroxene	
Sericite/Illite	1				Within plagioclase	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vein	1	Throughout	1	2	1	Filled with amorphous green clay (saponite), and a small amount of calcite	
Vesicles	1	Throughout	<1	1.5		Saponite and Fe oxyhydroxide	Rimmed by segregated material.

COMMENTS:	Groundmass is highly altered.	**Photomicrograph 1203-44.** Field of view 5.5 mm, XPL. **Photomicrograph 1203-45.** Field of view 1.4 mm, PPL.

Hole 1203A **Alteration Log**

Unit	Core	Section	Section Top (mbsf)	Alteration Degree	FeOx	CaCO3	Brn C	Sap	Py	Cel	Zeol	Vesicularity	CaCO3	Brn C	GC	Py	DKGC	Zeol
1	17R	4	457.56	1.5	x	x	x					1	x					
1	18R	1	463.80	1		x	x						x					
1	18R	2	465.30	1	x	x	x					1	x					
3	18R	2	465.30	1	x	x	x					1	x					
3	18R	3	466.80	1	x	x	x					1	x					
3	18R	4	468.30	1	x	x	x					1	x		x			
3	19R	1	473.40	1.5	x	x	x					1	x		x			
3	19R	2	474.90	2	x	x	x	x				1.5	x		x			
3	19R	3	476.29	2	x	x						2	x		x			
3	19R	4	477.76	2.5	x			x				1.5	x		x			
3	19R	5	479.18	1.5	x	x	x	x				1	x		x			
3	19R	6	480.64	2	x	x						1			x			
3	20R	1	484.50	1.5	x	x		x				1	x		x			
3	20R	2	486.00	1.5	x	x		x				1	x					
3	20R	3	487.26	2.5	x	x				x		2	x					
3	20R	4	487.26	2	x	x	x	x				1	x		x			
3	20R	5	488.59	2	x	x						2	x					
3	20R	6	490.09	2	x			x				1	x					
5	25R	1	531.10	1.5	x		x		x			2			x	x		
5	25R	2	532.46	1.5	x	x	x		x			2	x			x		
6	26R	1	534.80	2	x		x					2	x		x	x		
6	26R	2	535.79	2								1						
6	26R	3	536.43	2	x		x					1						
6	26R	4	537.81	2		x						1						
8	30R	1	569.80	1	x	x	x					1.5	x					
8	30R	2	571.30	1	x	x	x					1.5	x					
8	30R	3	572.80	1	x	x	x					1.5						
8	31R	1	579.40	1.5	x	x	x					1.5	x					
8	31R	2	586.90	1.5	x	x	x	x				1.5	x		x	x		
11	32R	2	590.28	1	x		x		x			2	x			x		
11	32R	3	591.78	1	x		x	x			x	2	x		x			
11	32R	4	593.06	1								1.5						
11	32R	5	594.17	1	x	x	x					1						
14	35R	4	616.18	1	x	x	x	x		x		1	x		x		x	x
14	36R	1	617.90	1.5	x			x		x		1	x		x	x	x	
14	36R	2	618.87	1.5								1						
14	36R	3	620.30	2	x		x	x		x		1	x		x	x	x	
14	36R	4	621.45	1.5	x		x	x				1	x				x	
14	36R	5	622.67	1.5								1	x				x	
14	36R	6	624.00	1.5								1	x				x	
14	36R	7	625.37	1.5								1	x					
16	37R	1	627.50	1								1.5						
16	37R	2	629.50	1								1.5						
16	37R	3	630.50	1			x					1.5						
16	38R	1	637.10	1		x	x					1						
18	39R	4	650.85	1.5	x	x						1	x					
18	39R	5	652.16	1.5	x	x		x				1	x		x			
18	39R	6	653.40	1.5	x							1	x		x			
18	40R	1	656.20	1.5	x							1	x		x			
18	40R	2	656.90	1.5	x							1	x		x			
18	40R	3	658.36	2	x							1	x		x			
18	40R	4	659.72	2.5	x		x					1						
18	40R	5	661.22	1.5	x		x	x				1	x		x			
18	40R	6	662.72	2.5	x							1	x		x			
18	41R	1	665.90	1	x							1						
19	41R	1	665.90	3	x	x		x				3	x		x			
19	41R	2	667.34	2	x	x						3	x					
19	41R	3	668.85	2	x							3	x		x			
19	41R	4	670.35	2.5	x	x		x				3	x		x			

Hole 1203A **Alteration Log**

Unit	Core	Section	Section Top (mbsf)	Alteration Degree	FeOx	CaCO3	Brn C	Sap	Py	Cel	Zeol	Vesicularity	CaCO3	Brn C	GC	Py	DKGC	Zeol
19	41R	5	671.85	2	x	x						3	x					
19	41R	6	673.35	2	x							3	x		x			
19	41R	7	674.82	2	x							3	x		x			
19	42R	1	675.50	2.5	x	x						3	x					
19	42R	2	677.00	2.5	x	x						3	x					
19	42R	3	678.40	2.5	x	x						3	x					
19	42R	4	679.78	2.5	x	x						3	x					
19	42R	5	681.19	2.5	x	x						3	x					x
19	43R	1	685.10	2.5	x	x						3	x					
20	43R	1b	685.10	2.5	x	x						2	x					
20	44R	1	694.70	2.5	x	x						2	x					
20	44R	2	696.13	2.5	x	x						2	x					
20	44R	3	697.63	2.5	x	x						1.5	x					
20	44R	4	698.97	2.5	x	x						1.5	x					
20	44R	5	700.43	2.5	x	x						1.5	x					
20	44R	6	701.87	2.5	x	x						1.5	x					
20	45R	1	703.10	2	x	x				x		1.5	x				x	
20	45R	2	704.60	2	x	x				x		2	x				x	
20	45R	3	706.10	2	x	x				x		1.5	x				x	
20	45R	4	707.33	2	x	x				x		2.5	x				x	
20	45R	5	708.83	2	x	x				x		2	x				x	
20	45R	6	710.33	2	x	x	x	x				1.5	x		x			
20	46R	1	712.70	2	x	x				x		1.5	x				x	
20	46R	2	713.98	2	x	x				x		1.5	x				x	
20	46R	3	715.48	2	x	x				x		1.5	x				x	
20	46R	4	716.98	2	x	x				x		1.5	x				x	
20	46R	5	718.27	2.5	x	x				x		2	x				x	
20	46R	6	719.77	2.5	x	x						1.5	x				x	
21	47R	1	722.30	2.5	x	x						2	x					
21	47R	2	723.77	1.5	x	x						1.5	x					
21	47R	3	724.98	2	x	x		x				2	x					
21	47R	4	725.69	0.5	x							1	x					
21	48R	1	727.10	0.5	x		x	x			x	1	x		x			
21	48R	2	728.44	0.5	x							1	x					
21	48R	3	729.87	1								1						
21	49R	1	732.00	1								2	x			x		
21	49R	2	733.04	1								1	x			x		
21	49R	3	734.55	2	x							2	x		x			
21	49R	4	736.05	1.5								2	x			x		
21	49R	5	737.55	2.5								2.5	x			x		
21	49R	6	738.91	1.5	x							1.5	x					
23	51R	3	755.52	1.5	x	x		x	x			3	x		x	x		
23	51R	4	755.52	1.5	x	x		x	x			3	x		x	x		
23	51R	5	756.86	2.5	x	x						3	x					x
23	51R	6	758.33	2	x	x						3	x					
23	52R	1	760.80	2.5	x	x						3	x			x		x
23	52R	2	762.30	2.5	x	x						3	x		x	x		
23	52R	3	763.74	2.5	x	x						3	x					
23	52R	4	765.19	2.5	x	x						3	x					
23	52R	5	766.66	2.5								3	x		x	x		
23	52R	6	767.86	1.5	x	x		x				1.5	x		x	x		
23	53R	1	770.40	2								3	x		x	x		
23	53R	3	773.40	2								3	x		x	x		
23	53R	4	774.60	2								3	x		x	x		
23	53R	5	776.40	2								3	x		x	x		
23	53R	6	777.90	2								3	x		x	x		
23	54R	1	780.00	2								3	x		x	x		
23	54R	2	781.50	2								3	x		x	x		
23	54R	3	783.00	2								3	x		x	x		
23	54R	4	784.47	2								2	x		x	x		

Hole 1203A **Alteration Log**

Unit	Core	Section	Section Top (mbsf)	Alteration Degree	FeOx	CaCO3	Brn C	Sap	Py	Cel	Zeol	Vesicularity	CaCO3	Brn C	GC	Py	DKGC	Zeol
23	54R	5	785.95	2								2	x		x	x		
23	54R	6	787.17	2								2.5	x		x	x		
23	55R	1	789.70	1	x				x			2	x					
23	55R	2	791.20	1.5	x							2	x		x			
23	55R	3	792.65	1.5	x							2	x					
23	55R	4	794.15	1	x							2	x		x	x		
23	55R	5	805.08	2	x							1.5	x		x	x		
23	56R	1	799.30	1.5	x			x				2	x		x	x		
23	56R	2	800.75	1.5	x			x				2	x		x	x		
23	56R	3	802.19	2	x							2	x		x			
23	56R	4	803.69	1	x							2	x		x			
23	56R	5	805.08	1.5	x			x				2	x		x	x		
23	57R	1	808.90	2								3	x		x	x		
23	57R	2	810.40	2								2	x		x	x		
23	57R	3	811.90	2	x		x					2	x		x	x		
23	57R	4	813.41	2								2	x		x	x		
23	58R	1	814.50	1.5	x							2	x		x			
23	58R	2	816.01	1.5	x							2	x		x			
23	58R	3	817.51	1.5	x							2	x		x			
24	58R	3	819.01	1								1	x					
24	58R	4	818.87	1								1	x					
24	59R	1	818.50	1				x				1						
24	59R	2	819.86	1				x				1						
24	59R	3	821.20	1				x	x			1						
26	59R	3	821.20	3.5								3	x		x			
26	59R	4	822.66	2	x		x	x				1.5	x					
26	59R	5	824.10	1	x	x	x	x			x	1.5	x		x			
26	60R	1	828.10	1.5	x							3	x		x			
26	60R	2	829.60	2	x							2	x		x			
26	60R	3	831.05	1	x							3	x		x			
26	60R	4	832.14	2	x			x				2	x			x		
26	61R	1	837.70	3	x			x				2	x		x			
26	61R	2	839.15	2	x			x				2	x		x			
26	61R	3	840.65	2	x							1.5	x			x		
26	62R	1	847.40	1				x		x		3	x				x	
26	62R	2	848.90	2	x					x		1.5	x			x	x	
26	62R	3	850.33	1.5	x		x	x				1.5	x		x	x		
26	63R	1	857.00	1.5	x					x		2.5	x		x	x		
26	63R	2	858.46	1.5	x					x		2.5	x		x	x		
26	63R	3	858.46	1.5	x					x		2.5	x		x	x		
26	63R	4	859.46	1.5	x					x		2.5	x		x	x		
29	65R	1	876.20	2	x					x		3	x		x			
29	65R	2	877.70	1.5	x					x		2	x		x			
29	65R	3	878.50	2	x							2.5	x					
29	65R	4	879.94	2	x	x		x		x	x	2.5	x		x			
30	66R	1	885.80	3	x		x	x				3	x		x		x	x
30	66R	2	887.30	3	x							2	x				x	x
30	66R	3	888.78	2.5	x	x		x	x		x	2	x		x	x	x	x
30	66R	4	890.26	2.5	x							3	x				x	x
30	67R	1	895.40	2								3	x					x
30	67R	2	896.86	3						x		3	x				x	x
30	67R	3	898.36	3								3	x				x	x
30	67R	4	899.80	3								2.5	x				x	x
30	68R	1	905.00	3								2.5	x				x	x
30	68R	2	906.50	3								2.5	x				x	x
30	68R	3	908.00	2	x	x		x			x	3	x		x			x
31	68R	4	908.46	3	x	x	x	x				1				x		
31	68R	4	908.46	2								2	x					

Hole 1203A **Vein Log**

Identifiers				Position	Vein						Halo				
Unit	Core	Sec	Piece	Section	Top	Bot	Width	App.	Mineralogy	Proportions	Color	Width	Mineralogy	Proportions	
			#	Top	(cm)	(cm)	(mm)	Orient.		(%)		(mm)		(%)	
				(mbsf)											Comments
3	19R	1	2a	473.40	26	39	1-2	sv-sh	CaCO3-black oxide	90-10					Continue on 2b
3	19R	1	2b	473.40	46	-	1-2	sh	CaCO3-black oxide	90-10					
3	19R	1	8	473.40	131	-	1-2	sh	CaCO3-black oxide	90-10					
3	19R	2	7	474.90	60	61	1-2	sh-c	CaCO3-black oxide	90-10					
3	19R	2	14	474.90	115	-	1-2	sh	CaCO3-black oxide	90-10					Thick
3	19R	5	2	479.18	14	17	1-2	c	CaCO3-black oxide	90-10					Close up photo
3	19R	5	5a	479.18	64	65	1-2	sh	CaCO3-black oxide	90-10					Patch rather than vein
3	20R	2	14a	484.50	122	124	1-2	sh	CaCO3-GC	50-50					
3	20R	2	14b	484.50	136	138	1-2	i	CaCO3-black oxide	90-10	Brn	1.5	FeOx		Between 14a and b
3	20R	3	1a	486.00	2	3	1-2	sh	CaCO3	100					Contact oxidizing-reducing zone
3	20R	3	1c	486.00	58	59	1-2	sh	CaCO3-LBGC (cel)	50-50					Reducing zone
7C	30R	1	2abc	569.80	50	74	1-3		CaCO3	100					From cooling contact
8	30R	1	4a	569.80	95	113	0.5-1		CaCO3-FeOx-black oxide	70-20-10					Following cool break up
8	30R	1	5	569.80	116	122	1		CaCO3-GC	70-30					Following cool break up
8	30R	1	6c	569.80	134	190			CaCO3-GC	70-31					Composite vein
8	30R	2	1	571.30	11	20	1-3		CaCO3-GC-FeOx	60-30-10					Composite vein
8	30R	2	3a	571.30	36	51	1-3		CaCO3-FeOx	80-20					Joint fill
8	30R	2	6a	571.30	88	91	10		CaCO3-GC	80-20					Follow cooling rim, in cobbles
8	31R	1	4a	579.40	23	26	8		CaCO3-FeOx	50-50					
8	31R	1	4d	579.40	55	58	4		Black oxide-FeOx-CaCO3	50-40-10					
8	31R	1	7a	579.40	83	86	1-2		CaCO3	100					Tooth texture
8	31R	1	8	579.40	98	100	20		CaCO3-FeOx-G mineral (Chl?)	95-2-2					Open vug CaCo3 crystals
8	31R	1	12	579.40	120	125	<1		CaCO3	100	LBrn	12			CaCO3 vein within color zoning
8	31R	2	2	580.90	11	23	1-2		CaCO3-GC-FeOx	80-10-10	LBrn	<1			CaCO3 in thin separated veins
8	31R	2	9	580.90	61	74	2		CaCO3-GC-FeOx	80-10-10					
11	32R	2	1a	590.28	8	10	2		CaCO3	100					Geoid, vug with crystals
11	32R	3	1abc	590.28	2	29	4		CaCO3-talc ?	20-80					Zoned
11	32R	3	1d	590.28	54		3		Zeol						
14	35R	4	1b	616.18	13	19		sv	CaCO3-GC-FeOx	80-10-10	Brn FeOx	0.5			Oxidation zone
14	35R	4	1d	616.18	30	33	5	sh	CaCO3-DkGC (cel)-Py	90-5-5					
14	35R	4	1d	616.18	35	43	2	sv	CaCO3-DkGC (cel)-Py	90-5-5					
14	35R	4	1e	616.18	44	49	1-3	i	CaCO3-DkGC (cel)-Py	90-5-5					
14	35R	4	1f	616.18	53	57	2	i	CaCO3-DkGC (cel)-Py	90-5-5					
14	35R	4	1 gh	616.18	66	68	1	sh	CaCO3-FeOx	80-20	Brn FeOx	1			
14	35R	4	1l	616.18	93	94	3	sh	CaCO3-black oxide	90-10					
14	35R	4	1 lm	616.18	93	105	3	sv	CaCO3-black oxide	90-10					
14	35R	4	1 o	616.18	140	148	10		CaCo3-black-GC	20-30-50					Vug
14	36R	1	1a	617.90	37	42	10	i	CaCO3-DkGC (cel)-GC (sap)-FeOx	80-5-5-10					
14	36R	2	1ijk	618.87	110	140	1-8	sv	CaCO3-DkGC (cel)-FeOx	75-20-5					
14	36R	3	1ab	620.30	8	20	3	sv	CaCO3-GC (sap)-FeOx	75-20-5					
14	36R	3	1b	620.30	20	24	1-2	I	CaCO3-GC (sap)-FeOx	75-20-5					
14	36R	3	1b	620.30	43	46	3-4	sh/I	CaCO3-GC (sap)-FeOx	5-20-75					
14	36R	3	1e	620.30	90	112	1-10	c	CaCO3-sap-FeOx-black oxides	50-40-5-5					
14	36R	5	4	622.67	99	102	10	vug	CaCO3-GC (sap)-FeOx-black oxides	50-40-5-5					Zoning
14	36R	5	4	622.67	127	132	10-20	c	CaCO3-GC (sap)-black oxides	90-5-1					
16	37R	1	1a	627.50	82	86	1-3		CaCO3-FeOx-GC (sap)	80-15-5					
16	37R	1	1b	627.50	110	120	2-10		CaCO3-DkGC	80-20					
16	37R	3	1bk	630.50	12	62	1-4		CaCO3-DkGC	80-20					
16	38R	1	9-11	637.10	0	19	3		DkGC-CaCO3	90-10					
16	38R	1	3	637.10	53	54	6	sh	DkGC-CaCO4	40-60	Dk G	5-10			
16	38R	1	11	637.10	68	140	1-2	sh	DkGC-CaCO5	5-95					
16	38R	3	7ab	639.88	91	140	2	sv	CaCO3	100					
16	38R	4	4	641.28	40	42	1-4		CaCO3 pinkish color	100					
16	38R	4	9b-10	641.28	107	115	1		CaCO3-FeOx	70-30	Brn	5			
18	39R	4	5	650.85	50	55	12		CaCO3-GC-FeOx	60-20-20	LBrn	2-10			
18	39R	4	5	650.85	54	132	1-3	c	CaCO3	100	Brn	3-10			

Hole 1203A **Vein Log**

Identifiers				Position	Vein						Halo				
Unit	Core	Sec	Piece	Section Top (mbsf)	Top (cm)	Bot (cm)	Width (mm)	App. Orient.	Mineralogy	Proportions (%)	Color	Width (mm)	Mineralogy	Proportions (%)	Comments
18	39R	4	5	650.85	50	66	5		CaCO3-GC-FeOx	30-50-20	Brn	4-10			
18	39R	4	5	650.85	106	109	15-20		CaCO3-GC-FeOx	30-50-20					
18	39R	5	1-3d	652.16	0	124	1-3	c	CaCO3	100	Brn				
18	39R	6	1a-2f	653.40	0	123	1-5		CaCO3	100					
18	39R	6	2a	653.40	61	63	20	sh	CaCO3-FeOx	60-40	Dk G-Brn	15-20			
18	40R	1	1abc	656.20	5	30	3-5	sv	CaCO3-GC	70-30	LBrn	3	FeOx		
18	40R	2	1a	656.90	0	15	3	sv	CaCO3-GC-FeOx	60-20-20	LBrn	3	FeOx		
18	40R	2	1c	656.90	40	65	1-5	sv	CaCO3-GC-FeOx	70-15-15	LBrn	3	FeOx		
18	40R	2	4a	656.90	120	130	1-3	sv	CaCO3-GC-FeOx	80-10-10	LBrn	3	FeOx		
18	40R	3	1	658.36	0	15	1-5	sv	CaCO3-GC	90-10					
18	40R	3	1	658.36	55	60	1-5	i	CaCO3-GC	90-10	LBrn	2	FeOx		
18	40R	4	9b	659.72	114	118	1-5	i	CaCO3-GC	90-10	LBrn	2	FeOx		
18	40R	5	1	661.22	6	10	2-3	sh	CaCO3-GC	90-10					
18	40R	5	2e	661.22	42	50	2	sv	CaCO3-FeOx	90-10	LBrn	3-5	FeOx		
18	40R	5	6	661.22	101	102	3	sh	CaCO3-FeOx	80-20	LBrn	3-5	FeOx		
19	41R	1	4c-5a	665.90	108	111	1-10		CaCO3	100					
19	41R	2	1	667.34	0	15	1-10		CaCO3	100					
19	41R	2	2-4a	667.34	23	44	10		CaCO3	100					
19	41R	2	4d	667.34	76	87	80		CaCO3	100					
19	41R	2	5-6d	667.34	127	152	50		CaCO3	100					
19	41R	3	1	668.85	0	12	50		CaCO3	100					
19	41R	3	3	668.85	12	21	40		CaCO3	100					
19	41R	3	4a	668.85	40	52	30		CaCO3	100					
19	41R	3	4ac	668.85	67	89	15		CaCO3	100					
19	41R	3	4e	668.85	110	114	4-10		CaCO3	100					
19	41R	4	1ab	670.35	0	11	5		CaCO3	100					
19	42R	1	1a	675.50	0	17	1-2		CaCO3	100					
19	42R	1	1a	675.50	37	42	1-10		CaCO3	100					
19	42R	1	1af	675.50	43	150	1		CaCO3	100					
19	42R	2	1a	677.00	14	15	5		CaCO3	100					
19	42R	2	2ac	677.00	115	140	1-20		CaCO3-GC (sap)	80-20					
19	42R	3	1a-6a	678.40	0	72	1-50		CaCO3	100					
19	42R	4	1de	679.78	89	90	20		CaCO3	100					
19	42R	4	1f	679.78	110	112	20		CaCO3	100					
19	42R	5	1bg	681.19	69	107	6		CaCO3	100					
20	44R	1	5ad	694.70	43	64	1-10	sv	CaCO3	100					
20	44R	2	1d	696.13	43	49	10	sh	CaCO3-GC (sap)	80-20					
20	44R	2	1f	696.13	96	97	10	sh	CaCO3	100					
20	45R	1	6b	703.10	42	58	2-10	sv	CaCO3-black oxide-FeOx	70-20-10					
20	45R	2	1a	704.60	4	6	5	sh	CaCO3-black oxide-FeOx	70-20-10					
20	45R	2	1b	704.60	83	96	1-50	sv	CaCO3-black oxide-FeOx	70-20-10					
20	45R	2	2c	704.60	101	118	5	sv	CaCO3-GC	80-20					
20	45R	2	2de	704.60	20	21	1-5	sh	CaCO3-GC	80-20					
20	45R	3	3a	706.10	28	31	5	i	CaCO3	100					
20	45R	4	2b	707.33	70	70	2-7	sh	CaCO3-black oxide	90-10					
20	45R	5	3	708.83	33	35	1-4	i	CaCO3-FeOx-GC	50-30-20					
20	45R	5	8b	708.83	140	141	30	sh	CaCO3	100					
20	46R	1	6	712.70	57	61	10	c	CaCO3-black oxide	80-20					
20	46R	1	13	712.70	112	124	10	c	CaCO3	100					
20	46R	2	1	713.98	0	10	30	sv	CaCO3-black oxide-FeOx	90-5-5					
20	46R	2	1d	713.98	68	72	1-5	c	CaCO3-GC-FeOx	70-25-5					
20	46R	3	1a	715.98	21	26	1-5	c	CaCO3-GC-FeOx	70-25-5					
20	46R	3	1e	715.98	74	78	2-3	c	CaCO3-GC-FeOx	60-35-5					
20	46R	3	1hi	715.98	126	150	1-5	sv	CaCO3-GC-FeOx	70-30					
20	46R	4	1d	716.98	42	47	1-10	c	CaCO3-black oxide	70-20-10					
20	46R	4	8b	716.98	98	103	10	c	CaCO3-GC-FeOx	100					
20	46R	5	4	718.27	27	31	10	c	CaCO3	80-15-5					

Hole 1203A **Vein Log**

Identifiers				Position	Vein						Halo				
Unit	Core	Sec	Piece	Section	Top	Bot	Width	App.	Mineralogy	Proportions	Color	Width	Mineralogy	Proportions	
			#	Top	(cm)	(cm)	(mm)	Orient.		(%)		(mm)		(%)	
				(mbsf)											Comments
21	47R	2	12ab	723.77	109	120	5	sv	CaCO3-GC-black oxide	70-15-15	LBrn	5	FeOx		
21	47R	4	1a	725.69	6	10	1	i	CaCO3-Py	95-5					
21	47R	4	1b	725.69	31	33	1	i	CaCO3-Py	95-5					
21	47R	4	1b	725.69	57	61	1	i	CaCO3-Py	95-5					
21	47R	4	1b	725.69	60	89	1	sv	CaCO3-Py-black oxide	90-5-5					
21	47R	4	1c	725.69	97	110	1	sv	CaCO3-Py-black oxide	90-5-5					
21	48R	1	1-2	727.10	5	90			CaCO3-GC	30-70					
21	48R	2	1ab	728.44	0	80			CaCO3	100					
21	48R	2	1b	728.44	80	122			CaCO3	100					
21	49R	4	1bc	736.05	20	130	1-5	sv	CaCO3	100					
21	49R	5	2a-4	737.55	96	136	1-15	c	CaCO3	100					
21	49R	6	1a-12	738.91	0	112	1-3	c	CaCO3	100					
21	49R	7	1a	740.26	5	8	1		CaCO3-Py	95-5					
23	51R	4	1	755.52	2	21	2	sv	CaCO3-GC-FeOx	75-25-5	LBrn	3	FeOx		
23	51R	4	2abc	755.52	101	117	2-5	sv	CaCO3-GC-FeOx	75-25-5					
23	52R	2	10-12b	762.30	56	66	1-3		CaCO3	100					
23	53R	1	2	770.40	9	23	1-3		CaCO3	100					
23	53R	1	16-20	770.40	99	147	1-6	sv	CaCO3-FeOx-Brn C	75-25-5					
23	54R	1-6		780.00			1-3		CaCO3	100					
23	55R	1	5-6e	789.70	32	67	1-2	sv	CaCO3-Py	80-20					
23	55R	3	5c	792.65	41	46	2-5	c	CaCO3-GC-FeOx	75-20-5					
23	55R	3	12a	792.65	119	137	1-2	sv	CaCO3-GC-FeOx	75-20-5	LBrn	1-5	FeOx		
23	55R	4	1	794.15	5	14	2	sv	CaCO3-GC-FeOx	75-20-5					
23	55R	4	17d	794.15	110	119	2	c	CaCO3	100					
23	55R	5	3b	795.65	32	42	1-5	c	CaCO3-GC-FeOx	75-20-5	LBrn	1-5	FeOx		
23	55R	5	5ac	795.65	51	66	1	sv	CaCO3-GC-FeOx	75-20-5	LBrn	10	FeOx		
23	56R	2	11e-12a	795.65	76	88	0.5-2	sv	CaCO3-FeOx-Brn C	75-20-5					Also vugs
23	57R	1	11ab	808.90	75	112	1-2	sv	CaCO3	100	Dk G	8	cel ?		
23	57R	1	11b	808.90	110	112	2	c	CaCO3	100	LBrn	20	FeOx		
23	57R	2	29	810.40	120	130	2	c	CaCO3	100					
23	57R	3	13-19	811.90	83	117	1-2	sv	CaCO3	100					
23	57R	4	1-18	913.41	0	150	10-20	c	CaCO3	100					Several thin veins
24	58R	1-4		814.50					CaCO3	100					
26	59R	1	1	818.50	1	48	1-2	sv	CaCO3-GC	50-50					
26	59R	2	2a	829.60	56	65	1-2	sv	CaCO3-GC	50-50					
26	60R	2	1	829.60	1	9	2	c	CaCO3-FeOx	80-20	LBrn	2	FeOx		
26	61R	1	9-10b	837.70	63	70	2	c	CaCO3-FeOx	90-10					
26	61R	2	7-8b	839.15	51	56	2	i	CaCO3-FeOx	70-30					
26	62R	1-3		847.40			1-3		CaCO3	100					Small veins
26	62R	3	1b	850.33	0	6	2		CaCO3-FeOx	80-20	LBrn	3-50	FeOx		
26	62R	3	8a	850.33	46	53	2	sh	CaCO3-FeOx	80-20	LBrn	5-10	FeOx		
26	63R	1	18	857.00	90	95	1	i	CaCO3-FeOx	80-20					
26	63R	3	18ae	859.96	78	100	1-2	sv	CaCO3-FeOx	80-20					
26	63R	3	22-24c	859.96	139	148	2	c	CaCO3	70-30					
27	64R	2	9-10c	868.06	48	68			CaCO3	70-30					Irregular veins and vugs
29	65R	2	-	877.70	5	13	3	i	CaCO3	100					Pinkish color - not labelled
30	67R	4	7	909.46	65	75	1	sv	CaCO3-FeOx	50-50					
31	68R	1	12ab	905.00	103	111	2	sv	CaCO3-FeOx	70-30					