SILTY CLAY

Major Lithology:
SILTY CLAY, greenish gray (5GY 5/1)
to gray (5Y 5/1). Homogeneous except
for the occurrence of a few subtle pale
green lamina, which may be altered
ash, in Section 1 (72 cm; 110 cm) and
Section 2 (54 cm).
### Volumetric Magnetic Susceptibility

**SITE 856 HOLE A CORE 2H**

**CORED 2.7 - 12.2 mbsf**

<table>
<thead>
<tr>
<th>Meter</th>
<th>Graphic Lith.</th>
<th>Sample</th>
<th>Core</th>
<th>Description</th>
</tr>
</thead>
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<tr>
<td>1993</td>
<td></td>
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</table>

**Description**

**SILTY CLAY**

- **Major Lithology:**
  - Greenish gray SILTY CLAY containing a few pale green (5BG 5/1) lamina and a few small pockets of siliceous spiculite.

- **Minor Lithology:**
  - Dark gray QUARTZ AND FELDSPAR SILTY SAND turbidites. Scoured basal contacts with very finely serated interfaces. The sand fines upward to silty clay and forms a gradational contact with the overlying hemipelagic deposit.
<table>
<thead>
<tr>
<th>Sample</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>856A-3H.1</td>
<td>5Y3/2</td>
<td>CLAY WITH FELDSPAR AND QUARTZ SILT</td>
</tr>
<tr>
<td>856A-3H.2</td>
<td>5B</td>
<td>HEMEPILAGIC GRAY (5BG 5/1, 5B, 5/1, 5Y3/2, N4) CLAY.</td>
</tr>
<tr>
<td>856A-3H.3</td>
<td>5B5/1</td>
<td>QUARTZ AND FELDSPAR SILT turbidites of somewhat lighter colors than the surrounding clays.</td>
</tr>
</tbody>
</table>

**General Description:** Hemipelagic CLAY with turbidites throughout. Generally, the turbidites display sharp basal contacts and fine grain size. White pockets of sponge spicules occur near the bottom of the core. A few carbonate concretions occur at several places throughout the core.
SITE 856 HOLE A CORE 4H
CORED 21.7 - 31.2 mbsf

Volumetric Magnetic Susceptibility
(10^{-6} SI)

<table>
<thead>
<tr>
<th>Layer</th>
<th>Structure</th>
<th>Age</th>
<th>Sample</th>
<th>Core</th>
</tr>
</thead>
<tbody>
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<td>1</td>
<td>P</td>
<td>4/1</td>
<td>S</td>
</tr>
<tr>
<td>P</td>
<td>2</td>
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<td>4/1</td>
<td>P</td>
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<td>P</td>
<td>3</td>
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<td>4/1</td>
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<tr>
<td>P</td>
<td>7</td>
<td>M</td>
<td>4/1</td>
<td>M</td>
</tr>
</tbody>
</table>

MODERATELY INDURATED CLAY, QUARTZ PLAGIOCLASE SILTY SAND and CLAYEY QUARTZ FELDSPAR SAND

General Description:
Stacked fining upward sequences of dark blue gray (5B 4/1) to gray (N 5/) turbidite sand, silt, and clay (Tb-e). Individual turbidites have sharp (locally scoured) bases overlain by massive QUARTZ PLAGIOCLASE SILTY SAND (Tb,c) that grades upward into laminated SILTY SAND AND CLAYEY QUARTZ FELDSPAR SAND (Tc,d) and, finally into MODERATELY INDURATED CLAY (Td,e). Small (2-4 mm) nodules of pyrite are present in Sections 1, 46 cm; 1, 95 cm; 1, 33 cm; 4, 55 cm; and 5, 38 cm. Small calcite concretions are present in Section 2, 136-140 cm.
CLAY WITH CARBONATE SILT, QUARTZ FELDSPAR SAND WITH CLAY and SILTY CLAY

General description: Stacked gray (SY 5/1 to N 5) Tb-e, To-e turbiditic units with sharp to scoured bases overlain by QUARTZ FELDSPAR SAND WITH CLAY grading into SILTY CLAY and CLAY WITH CARBONATE SILT. Discontinuous silt laminations are common throughout the core. Small (2-6 mm) nodules are present in Section 2, at 32, 94, 120, and 145 cm. A larger (3 mm) nodule is present in Section 3, 130 cm.
<table>
<thead>
<tr>
<th>Section</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PO</td>
<td>CLAY and QUARTZ FELDSPAR SAND</td>
</tr>
</tbody>
</table>

Minor Lithologies:
A small concentration of CARBONATE SAND WITH QUARTZ AND FELDSPAR is present in Section 3 at 124 to 126 cm.

General Description:
Stacked turbiditic fining-upward units with sharp and locally scoured bases overlain by QUARTZ FELDSPAR SAND, SANDY SILT, and CLAY. Disseminated pyrite is present in the coarse, sandy intervals of some of the turbidites. Calcite concretions also are located preferentially in the coarser intervals.
General Description:
Fining-upward turbidite sequences with variably sharp and scoured bases overlain by gray (N 5' to 5B 5'/1) QUARTZ PLAGIOCLASE SAND which grades upward into CLAY. Disseminated pyrite is present in many of the coarser intervals as are small (1-3 mm) nodules of pyrite and calcite. Two distinct beds of fine sand are present in Section 6 at 4-6 cm and 15-17 cm. These beds have sharp (scoured) bases and sharp tops and exhibit no grain-size gradations.
### Volumetric Magnetic Susceptibility

<table>
<thead>
<tr>
<th>Water Lith.</th>
<th>Structure</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>+F</td>
<td></td>
<td>CLAY and SANDY SILT</td>
</tr>
</tbody>
</table>

**Major Lithologies:**

CLAY, gray, hemipelagic, interbedded with SANDY SILT turbidites. The turbidites have sharp basal contacts with a serrated interface. The thickest units are coarsest (about fine sand size) and often show parallel lamination. The turbiditic units are yellowish and more silty in Section 3.

**Minor Lithology:**

A few carbonate nodules are found, most frequently in the upper part of the turbidite units. The nodule at Section 4, 105 cm is very rich in pyrite.
CLAY and SILT AND SAND

Major Lithologies:
Hemipelagic CLAY is dark to medium gray (SY 5/1, NS). Bioturbation is evident in Section 4. Turbiditic SILT AND SAND horizons are frequent and well defined. Basal contacts are sharp and usually erosive. Upper contacts are gradational. Larger turbiditic units have internal parallel lamellae.

General Description:
Common carbonate concretions up to 2 cm in diameter. Common layers of indurated, carbonate-rich sediment.
**SITE 856 HOLE A CORE 10X**

**CORED 78.7 - 86.2 mbsf**

<table>
<thead>
<tr>
<th>Meter</th>
<th>Graphic Lith.</th>
<th>Section</th>
<th>Structure</th>
<th>Color</th>
<th>Sample</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>CLAY and SILT AND SAND AND CLAY</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Major Lithologies: Indurated, dark gray (5Y 3/1) turbidic units fine upward from fine SAND at the base through SILT, CLAYEY SILT AND SILTY CLAY. The turbidites have sharp basal contacts and gradational tops.</td>
</tr>
</tbody>
</table>

**SITE 856 HOLE A CORE 11X**

**CORED 86.2 - 95.7 mbsf**

<table>
<thead>
<tr>
<th>Meter</th>
<th>Graphic Lith.</th>
<th>Section</th>
<th>Structure</th>
<th>Color</th>
<th>Sample</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td></td>
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<td></td>
<td>SILTY CLAY</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Major Lithology: Dark gray (N4/) well-indurated SILTY CLAY, finely laminated in places and altered to pale gray (N6) along fracture planes and more permeable strata. The sediment may have been altered by hot fluids generated by the intrusion of a mafic sill into the sedimentary sequence.</td>
</tr>
</tbody>
</table>

**Minor Lithologies:**
Section 11X contains rhombic crystal molds (anhdyrite?) at 110-130 cm.
### Major Lithology:

Well indurated, dark gray (N4) SILTY CLAY. Induration was probably caused by thermal metamorphism from the underlying sill. Sediment is fractured and is bleached to a pale gray along fractures and permeable strata. Sediment is locally laminated. Small pyrite euhedra are visible at Section 1, 66 cm.

### Minor Lithologies:

Rhombic crystal molds (anhydrite?) are present at Section 1, 123-126 cm.

---

**Site 856, Hole A, Core 12X, Cored 95.7-105.3 mbsf**

<table>
<thead>
<tr>
<th>Meter</th>
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<th>Section</th>
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</table>

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**Sample 856A-12Xi**
CLAY WITH QUARTZ FELDSPAR
SILT, CLAY and SILTY SAND

General Description:
Core is brecciated by drilling and variably indurated. The coarser grained material is less well-indurated than the clay-size material and, as a result, has been squeezed around brecciated blocks of finer grained sediment. The CLAY is dark gray (N 4/), homogenous, and locally burrowed. Convolute bedding is present at Section 4, 41-43 cm and 50-52 and 5, 107-114 cm. Parallel to slightly wavy laminations are common in both the SILTY SAND and SILT intervals. Disseminated sulfide is present at irregular intervals throughout the core. Many of the lithified clasts have rectangular to rhombic holes left after the dissolution of an unknown mineral (anhydrite?).
SITE 856 HOLE B CORE 1H
CORED 0.0 - 1.8 mbsf

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<th>Meter</th>
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<th>Description</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>SI TY CLAY, CLAYEY SILT and MICACEOUS SILT</td>
</tr>
</tbody>
</table>

General Description:
Olive green (5Y 4/2) near-surface oxidized SI TY CLAY at Section 1, 0-11 cm. Surface layer is underlain by dark gray green (5Y 4/2 to 5G 4/1) SI TY CLAY with local layers and pockets of very dark gray (5Y 3/1) micaceous CLAYEY SILT. Concentrations of forams are present locally on bedding planes and as small (2-4 mm) lenses.
### General Description:
Gray (N 4-) to dark gray (N 5-) SILTY CLAY, SANDY Silt, and SILTY SAND in sharp-locally scour-based, fining-upward turbidite sequences.

Traces of disseminated pyrite are common in the coarser turbidite beds. Pyrite-filled burrows are present locally in the clayey intervals.
<table>
<thead>
<tr>
<th>Sample</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>SILTY CLAY, SANDY SILT, CLAY and RESEDIMENTED MASSIVE SULFIDE</td>
</tr>
<tr>
<td></td>
<td>General Description: Gray (5Y 4/1 to N 4/) turbiditic SILTY SAND, SILTY CLAY, and CLAY with local pyrite nodules, silty laminations, and disseminated pyrite.</td>
</tr>
<tr>
<td></td>
<td>Turbiditic sequence is underlain by, thinly bedded (1-3 cm), brownish black (5YR 2/1) RESEDIMENTED MASSIVE SULFIDE. The sulfide is interbedded with black (N 1/) and very light gray (N 8/) bands of stiff, waxy CLAY and contains fractures that are filled with white (N 9/) colliform material. Very dusky red (5R 2/6) magnetite zones are present locally and the sulfide beds exhibit pronounced grading at Section 6, 120-105 cm.</td>
</tr>
<tr>
<td></td>
<td>Beds in both the MASSIVE SULFIDE and the turbiditic units record dips of approximately 30 degrees.</td>
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</table>
**SITE 856 HOLE B CORE 4H**  
CORED 20.8 - 30.3 mbsf

### Volumetric Magnetic Susceptibility

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<td></td>
<td></td>
<td>S</td>
<td>S</td>
<td>SILTY CLAY, SANDY SILT, SILTY SAND and RESEDIMENTED MASSIVE SULFIDE.</td>
</tr>
<tr>
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<td>S</td>
<td>S</td>
<td>General Description: Beds dip approximately 30 degrees and have been sheared by coring. Gray (N 6/1) turbiditic SILTY CLAY, SILTY SAND and SANDY SILT are interbedded with dark greenish gray (5B 4/1) turbiditic RESEDIMENTED MASSIVE SULFIDE.</td>
</tr>
</tbody>
</table>

**Graphic Lith.**

- **Description:**
  - Beds dip approximately 30 degrees and have been sheared by coring.
  - Gray (N 6/1) turbiditic SILTY CLAY, SILTY SAND and SANDY SILT are interbedded with dark greenish gray (5B 4/1) turbiditic RESEDIMENTED MASSIVE SULFIDE.
### General Description:

Interbedded, fining-upward, gray (N 4/) to dark gray (N 6/) turbiditic SILTY CLAY, QUARTZ FELDSPAR SANDY SILT, and SILTY SAND WITH PYRITE. The strata are semi-lithified and commonly laminated. Pyrite is common in the silty and sandy intervals and rare nodules are present in the clayey intervals.

### Description Table

<table>
<thead>
<tr>
<th>Meter</th>
<th>Graphic Lith.</th>
<th>Age</th>
<th>Structure</th>
<th>Sample</th>
<th>Color</th>
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<tr>
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<td></td>
<td>SILTY CLAY, QUARTZ PLagioclase SANDY SILT, and SILTY SAND WITH PYRITE</td>
</tr>
</tbody>
</table>

The table above shows the lithological characteristics of the core samples from Site 856, Hole B, Core 5H, cored from 30.3 to 39.8 mbsf.
CLAST-SUPPORTED SILTY CLAY BRECCIA

Major Lithology:
CLAST-SUPPORTED SILTY CLAY BRECCIA contains disseminated pyrite throughout. Clay clasts are separated by a gray (N 6/) matrix of clay slurry. Lath-shaped crystal molds are common within this lithology. This was originally a hemipelagic mud which now contains recrystallized clay which underwent brittle deformation during overpressuring.

Minor Lithology:
CLAYEY SILT is the basal lithology of turbidite sequences. The CLAYEY SILT is commonly parallel bedded and locally convoluted and cross-bedded. Disseminated pyrite is commonly concentrated within these units probably due to their higher permeability. These beds were fluidized during overpressuring and they underwent plastic deformation.

General Description:
The sequence consists of turbidites interbedded with hemipelagic mud. The turbidites were apparently the locus of hydrothermal fluid migration. A typical "unit" consists of a basal laminated, silt turbidite overlain by more or less coherent hemipelagic CLAY which is overlain by more brecciated clay.
**SITE 856 HOLE B CORE 7H**

**Volumetric Magnetic Susceptibility**

\[(10^{-6} \text{ SI})\]

<table>
<thead>
<tr>
<th>Core Depth</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>49.3 - 58.8 mbsf</td>
<td><strong>SILTY CLAY</strong></td>
</tr>
</tbody>
</table>

**Major Lithology:**
Gray (N5) SILTY CLAY, commonly bioturbated with lath-shaped crystal molds (anhydrite or barite?) scattered throughout, especially common in the darker CLAY beds. A few intervals contain microcrystalline quartz-replaced bioclasts.

**Minor Lithology:**
Parallel laminated PLAGIOCLASE.
SILTY SAND and SILT are present as basal turbidites in a few intervals.

**General Description:**
There is a marked contrast between this core and Core 856B-6H. This core contains turbidites of finer grain size. There is also much more bioturbation evident. Rather than the intense brecciation observed in Core 6H-1, these sediments are fractured (almost totally), but rarely offset. Disseminated pyrite is abundant throughout. Pyrite-filled burrows are especially...
SITE 856 HOLE B CORE 8H

CORED 58.8 - 62.3 mbsf

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SILTY CLAY</td>
<td>Major Lithology: SILTY CLAY, dark gray (N 4), locally fractured or brecciated. Breccia clasts are well indurated and are angular to subrounded. The matrix is soft and lighter gray (N5/ and N6/) and consists of microbreccia of rounded SILTY CLAY clasts and altered CLAY. Pyrite occurs as clasts and as finely disseminated crystals and is most concentrated in the matrix.</td>
</tr>
<tr>
<td>SILT AND FINE SAND</td>
<td>Turbiditic units are pale gray (N5), display sharp lower contacts, and fine upwards into a gradational upper contact. BASALT WITH BAKED SEDIMENT occurs in core catcher.</td>
</tr>
<tr>
<td>BASALT WITH BAKED SEDIMENT</td>
<td>Pyrite occurs in nodules and as disseminated crystals throughout. Molds of lath-shaped crystals occur (anhydrite?) discontinuously throughout the core.</td>
</tr>
</tbody>
</table>
**SITE 856 HOLE B CORE 9X**

**CORED 62.3 - 70.8 mbsf**

**Volumetric Magnetic Susceptibility**

\[ (10^{-6} \text{SI}) \]

<table>
<thead>
<tr>
<th>Layer</th>
<th>Graphic Lith.</th>
<th>Structure</th>
<th>Age</th>
<th>Sample</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D</td>
<td></td>
<td>N</td>
<td></td>
<td></td>
<td>Major Lithology: Well-indurated SILTY CLAY, in places weakly laminated. Disseminated pyrite and molds of lath-shaped crystals (anhydrite?) are present locally. Near the base of the section the molds are filled with pyrite.</td>
</tr>
<tr>
<td>2</td>
<td>S</td>
<td></td>
<td>N</td>
<td></td>
<td></td>
<td>Minor Lithology: SILT AND CLAYEY SILT Turbiditic units have sharp bases, gradational upper contacts, and laminations or thin beds.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>General Description: Interbedded turbidites and hemipelagic clay. The clay units are often highly fractured or brecciated. Pyrite is present but less abundant than in overlying cores.</td>
</tr>
</tbody>
</table>

**Graphic Lith.**

- **Igneous**: D
- **Marine Clay**: F
- **Marine Silts**: N
- **Laminated Clay**: S
- **Polished Clay**: P

**Lithology**: Silty Clay

**Description**: Well-indurated SILTY CLAY, in places weakly laminated. Disseminated pyrite and molds of lath-shaped crystals (anhydrite?) are present locally. Near the base of the section the molds are filled with pyrite.

**Minor Lithology**: SILT AND CLAYEY SILT Turbiditic units have sharp bases, gradational upper contacts, and laminations or thin beds.

**General Description**: Interbedded turbidites and hemipelagic clay. The clay units are often highly fractured or brecciated. Pyrite is present but less abundant than in overlying cores.
**Volumetric Magnetic Susceptibility**

<table>
<thead>
<tr>
<th>depth (mbsf)</th>
<th>100 1000 10000 100000</th>
</tr>
</thead>
<tbody>
<tr>
<td>70.8-73.3</td>
<td>( \times 10^{-8} ) Si</td>
</tr>
</tbody>
</table>

**General Description:**
Moderately indurated gray (N 5/ to N 6/)
SILT, SILTY CLAY, and CLAY. The upper portion of core is very disturbed to soupy and contains scattered clasts of basalt (up to 2 cm) and local pyrite nodules (2 mm to 3 cm). The basalt clasts are fine grained with 3 mm plagioclase phenocrysts and small (1 mm) grains, probably spinel. Sharp-based, fining upward sequences of SILT and SILTY CLAY are visible in the less disturbed intervals.

**Material**

<table>
<thead>
<tr>
<th>Section</th>
<th>App.</th>
<th>Structure</th>
<th>Color</th>
<th>Description</th>
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<tbody>
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</table>

**Color**

- N 5/ to N 6/
<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SILTSTONE, SANDSTONE, CLAYSTONE and SILTY CLAYSTONE</td>
</tr>
<tr>
<td>General Description:</td>
</tr>
<tr>
<td>Moderately to well-indurated sediments becoming more indurated down core.</td>
</tr>
<tr>
<td>Sections 4 through CO are characterized by sequences of medium-grained</td>
</tr>
<tr>
<td>SANDSTONE grading upward into fine SANDSTONE, and SILTSTONE. The fining-upward units contain parallel laminations, flame structures, and convolute bedding, are locally pyritic, and are typically capped by gray SILTY CLAYSTONE.</td>
</tr>
</tbody>
</table>
Volumetric Magnetic Susceptibility ($10^{-6}$ SI)

<table>
<thead>
<tr>
<th>Meter</th>
<th>Graphic Lith.</th>
<th>Structure</th>
<th>Sample</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SANDSTONE, SILTSTONE and SILTY CLAYSTONE</td>
</tr>
</tbody>
</table>

**General Description:** Fining-upward sequences of medium- and fine-grained SANDSTONE, SILTSTONE, and SILTY CLAYSTONE. Sequences have sharp (locally scoured) bases, are locally massive at the base, and typically exhibit parallel to wavy laminations, crossbedding, convolute bedding with mud rip-up clasts, and micro cross-laminations. The SILTY CLAYSTONE is typically massive. The entire core is slightly pyritic and discrete pyrite nodules and grains are present at Section 3, 7 cm; Section 4, 0-3 cm; Section 5, 106-124 cm; and CC, 0-21 cm.
General Description:
Fining-upward sequences of SANDSTONE, SILTSTONE, and SILTY CLAYSTONE. Sequences typically have sharp bases (locally scouring) overlain by medium- to fine-grained SANDSTONE that commonly displays cross laminations, planar laminations, and convolute bedding. The SANDSTONE grades upward into planar laminated SILTSTONE and SILTY CLAYSTONE. The SILTSTONE and CLAYSTONE intervals are commonly bioturbated. The entire core contains disseminated pyrite; pyrite concentrations are typically less than 5%. Discrete, lamination-parallel layers of secondary pyrite are common, as are scattered large (1-4 mm) pyrite crystals and burrow-filling pyrite.
### Volumetric Magnetic Susceptibility

<table>
<thead>
<tr>
<th>Mass (10^-6 SI)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
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</tr>
<tr>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>10000</td>
<td></td>
</tr>
<tr>
<td>100000</td>
<td></td>
</tr>
</tbody>
</table>

### Description of Core 14X

**Structure:**
- **SILTSTONE AND SILTSTONE WITH SULFIDE, SANDSTONE AND SULFIDIC SANDSTONE AND SILTY CLAYSTONE AND SILTY CLAYSTONE WITH SULFIDE**

**General Description:**
- Stacked turbiditic SANDSTONE, SILTSTONE, and SILTY CLAYSTONE as in previous core from Hole 856B, but with more sulfide mineralization.
- Turbidite units contain massive, planar laminated, cross-laminated SANDSTONE and laminated, convolute bedded, and bioturbated SILTSTONES and SILTY CLAYSTONE. Black layers in the SANDSTONE from Section 3 down are probably marcasite and sphalerite. The sulfide in this core is more leached than in previous core and is tarnished to black. There is more marcasite here than up-hole, and disseminated sphalerite (unrecognized in previous cores) is present in this core.
**SITE 856 HOLE B CORE 15X**

**CORED 110.4 - 120.1 mbsf**

**Volumetric Magnetic Susceptibility**

**(10^-6 SI)**

**Graphic Lith.**

<table>
<thead>
<tr>
<th>Meter</th>
<th>Sample</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>SILICIFIED SILTSTONE, SILICIFIED SILTY CLAYSTONE and SILICIFIED SANDSTONE</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>General Description: Highly mineralized, fining-upward, gray (N 4/) to greenish gray (5GY 6/1) turbidite sequences. Alteration is pervasive: mineralization (pyrite, sphalerite, chalcopyrite, and pyrrotite are all present in this core) occurs along laminations, as fracture-filling, in burrows, veins, and as disseminated crystals and grains throughout the SILICIFIED, turbiditic, SANDSTONE, SILTSTONE, and SILTY CLAYSTONE. Sulfide minerals make up approximately 0.5% of the core. Some zones are completely silicified.</td>
</tr>
</tbody>
</table>

**Structure**

- P: Pale gray to greenish gray (5GY 6/1) | O: Orange | D: Dark gray
- P: Pale gray to greenish gray (5GY 6/1) | O: Orange | D: Dark gray

**Description**

- SILICIFIED SILTSTONE, SILICIFIED SILTY CLAYSTONE and SILICIFIED SANDSTONE
- General Description: Highly mineralized, fining-upward, gray (N 4/) to greenish gray (5GY 6/1) turbidite sequences. Alteration is pervasive: mineralization (pyrite, sphalerite, chalcopyrite, and pyrrotite are all present in this core) occurs along laminations, as fracture-filling, in burrows, veins, and as disseminated crystals and grains throughout the SILICIFIED, turbiditic, SANDSTONE, SILTSTONE, and SILTY CLAYSTONE. Sulfide minerals make up approximately 0.5% of the core. Some zones are completely silicified.
SITE 856 HOLE B CORE 16X
CORED 120.1 - 121.7 mbsf

Volumetric Magnetic Susceptibility
$10^{-6}$ SI

<table>
<thead>
<tr>
<th>Meter</th>
<th>Graphic</th>
<th>Lith.</th>
<th>Section</th>
<th>Structure</th>
<th>Disturb</th>
<th>Sample</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5G6Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SILTSTONE and BASALT CLASTS</td>
</tr>
</tbody>
</table>

General Description:
Drilling breccia. Silicified and altered SILTSTONE and BASALT clasts (probably from the core barrel) with aggregates of chalcopyrite and euhedral pyrite. Basalt clast in Section CC has a red zone of alteration between it and the sediments indicating that it is a sill.

SITE 856 HOLE C CORE 1H
CORED 0.0 - 2.0 mbsf

Volumetric Magnetic Susceptibility
$10^{-6}$ SI

<table>
<thead>
<tr>
<th>Meter</th>
<th>Graphic</th>
<th>Lith.</th>
<th>Section</th>
<th>Structure</th>
<th>Disturb</th>
<th>Sample</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5YR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SILT</td>
</tr>
</tbody>
</table>

Major Lithology:
Gray (5YR 2.4/1) SILT turbidite, badly disturbed by coring.

Minor Lithology:
MASSIVE PYRRHOTITE chunks with a grain size of 0.5 to 1.0 mm, equigranular, black color. A trace of chalcopyrite occurs.
### Major Lithology:

**AMORPHOUS SILICA AND SULFIDE SAND**

- Fine-grained AMORPHOUS SILICA AND SULFIDE SAND with some barite, chalcopyrite, or pyrrhotite. No obvious sedimentary structures. This sediment is thought to be derived from the disintegration of nearby chimney structures. Locally, the sediment is coarser breccia or large rubble, e.g. Section 3, 60 cm, 82 cm, 115 cm; Section 4, 32-45 cm, 60-85 cm, 110-140 cm; Section 5, 5-15 cm; Section 7, 60-80 cm.

### Minor Lithology:

**MASSIVE PYRRHOTITE** with pyrite and some sphalerite(?), Section 1, 0-60 cm. MASSIVE PYRRHOTITE is cemented by amorphous silica cement, Section 2, 40-65 cm.
**SITE 856 HOLE E CORE 1H**

<table>
<thead>
<tr>
<th>Structure</th>
<th>2.5Y 3/0</th>
<th>2.5Y 5/4</th>
<th>2.5Y 6/1</th>
<th>5GY 6/1</th>
<th>5Y 2.5/2</th>
<th>10YR 4/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2.4 mbsf</td>
<td>10000</td>
<td>1000</td>
<td>100</td>
<td>1000</td>
<td>100000</td>
<td>100</td>
</tr>
</tbody>
</table>

**Description**

**SULFIDE BRECCIA**

**Major Lithology:** Bronzy dark gray (approximately 5Y 2.5/2) massive SULFIDE BRECCIA composed of angular, variably-sized, clasts of massive chimney sulfides. Clast-supported with a matrix of fine-grain clastic sulfide. Clasts consist of an open network of hexagonal pyrrhotite that is infilled by sphalerite and Cu-Fe sulfides and that has been variably replaced by pyrite. Barite is minor. Interstitial silica cements the breccia.

**Minor Lithologies:**

**METALLIFEROUS SEDIMENTS**

The surface oxidized portion of the core consists of a surficial brown Fe-oxide layer with gray gelatinous sulfides that formed by the oxidation of clastic sulfide at the sea floor: Section 1, 0-37 cm. This zone also contains common diatoms and well-preserved foraminifers. No nannos were observed. A transition zone of light olive brown (2.5Y 5/4), Fe oxyhydroxides, sulfide grains and clasts is present at Section 1, 37-46 cm. Very dark gray (2.5Y 3/0) gelatinous sulfide clay with minor clasts of sulfide is present at Section 1, 46-50 cm. The greenish gray to olive yellow (5GY 6/1) gelatinous Fe oxyhydroxides in the core formed from the oxidation of sulfides.

**SITE 856 HOLE E CORE 1H**

<table>
<thead>
<tr>
<th>Meter</th>
<th>Graphic</th>
<th>Lith.</th>
<th>Section</th>
<th>Age</th>
<th>Structure</th>
<th>Disturb</th>
<th>Sample</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5Y 6/1</td>
<td>37-46</td>
<td>2.5Y 5/4</td>
<td>50-77</td>
<td>5GY 6/1</td>
<td>77-83</td>
<td>2.5Y 6/1</td>
<td>83-94</td>
<td>5GY 6/1</td>
</tr>
</tbody>
</table>

**Description**

**MASSIVE SULFIDE**

**Major Lithology:** Bronzy gray clasts of MASSIVE SULFIDE.
### SITE 856 HOLE F CORE 2X
**CORED 11.7 - 17.2 mbsf**

<table>
<thead>
<tr>
<th>Meter</th>
<th>Graphic</th>
<th>Lith.</th>
<th>Structure</th>
<th>Disturb</th>
<th>Sample</th>
<th>Color</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>MASSIVE SULFIDE</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Major Lithology: Bronzy gray clasts of MASSIVE SULFIDE composed of a black unidentified sulfide that has been infilled and veined by pyrite and amorphous (?) hydrothermal silica. Interpreted to be a sulfide sedimentary breccia that has been infilled, veined, and altered by hydrothermal fluids near the discharge conduit.</td>
</tr>
</tbody>
</table>

### SITE 856 HOLE F CORE 3X
**CORED 17.2 - 23.6 mbsf**

<table>
<thead>
<tr>
<th>Meter</th>
<th>Graphic</th>
<th>Lith.</th>
<th>Structure</th>
<th>Disturb</th>
<th>Sample</th>
<th>Color</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>MASSIVE SULFIDE BRECCIA</td>
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<td></td>
<td></td>
<td>Major Lithology: Bronzy gray MASSIVE SULFIDE BRECCIA consists dominantly of pyrite cemented by amorphous silica.</td>
</tr>
<tr>
<td>Depth (mbsf)</td>
<td>Description</td>
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</tr>
<tr>
<td>0.0-8.6</td>
<td>SULFIDE SAND, SULFIDE BRECCIA and SULFIDE SILT</td>
<td></td>
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</tbody>
</table>

**Major Lithologies:**
- Bronzy gray SULFIDE SAND or SULFIDE BRECCIA with clumps of coarser grained sulfide. Clasts consist of aggregates of pyrite, commonly growing on hexagonal pyrrhotite platelets. Clasts also contain minor amounts of black sphalerite and occasional barite. They occur in upward-fining units with BRECCIA or coarse SAND at the base and SAND or SILT at the top. Each unit is interpreted to represent a depositional cycle following the collapse of a chimney structure. Individual clasts are generally angular and poorly sorted.
<table>
<thead>
<tr>
<th>Meter</th>
<th>Graphic Lith.</th>
<th>Structure</th>
<th>P</th>
<th>S</th>
<th>P</th>
<th>856G-2R</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>SULFIDE SAND AND GRAVEL</td>
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<td></td>
<td>Major Lithology:</td>
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<td></td>
<td>SULFIDE SAND and GRAVEL</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>composed of pyrite, amorphous silica,</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>and barite grains. Bronzy gray color.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>Minor Lithologies:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BARITE, PYRITE, AND IRON</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HYDROXIDE coating on an indurated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>nodule or clast. Very oxidized, yellow-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>orange-red color. Occurs at Section 2,</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>69-65 cm.</td>
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<td></td>
<td></td>
<td></td>
<td>SPHALERITE, QUARTZ,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AMORPHOUS SILICA clast contains</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>many dissolution cavities and pyrite</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>overgrowths on pyrrhotite. Occurs at</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>Section 2, 95-1000 cm.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>CLAY clast occur in Sections 2, 3, and</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td>CC.</td>
</tr>
</tbody>
</table>
### SITE 856 HOLE H CORE 1R

**CORED 0.0 - 13.5 mbfs**

### General Description:
This core contains unconsolidated, equigranular, silt-to-small gravel-size fragments of pyrite, barite, silica, with minor pyrrhotite fragments. The entire "SAND" is a relict of the coring process.

### Table

<table>
<thead>
<tr>
<th>Meter</th>
<th>Graphic Lith.</th>
<th>Structure</th>
<th>Sample</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SULFIDE SAND</td>
</tr>
</tbody>
</table>

### Diagram

The diagram shows the core samples with color and structure annotations. The samples are marked with color codes and structure types. The core samples range from 0.0 to 13.5 meters below sea floor (mbsf).
UNIT 1: APHYRIC BASALT

Piece 1

CONTACTS: Sediment-basalt contact. Somewhat milled by drilling. Small (2-3 mm) glass chips in sediment.

PHENOCHRYS: None.

GROUNDMASS: Very fine-grained, aphyric, and homogeneous. Contains plagioclase (60%) and ferromagnesian minerals (40%). Average grain size is 0.2 mm, randomly oriented. A few sulfide grains are noted.

Feldspar is fresh and glassy.

VESICLES: None.

COLOR: Gray.

STRUCTURE: Massive, possible upper margin of sill.

ALTERATION: Slight to none.

VEINS/FRACTURES: None.

UNIT 1: APHYRIC DIABASE

Pieces 2A-2B

CONTACTS: Milled contact against deformed sediment.

PHENOCHRYS: None.

GROUNDMASS: Fine-grained aphyric, ophitic texture, very homogeneous, with 60% plagioclase, 40% ferromagnesian minerals. Average grain size is 0.2 mm, randomly oriented. Minor sulfide as tiny grains.

VESICLES: None.

COLOR: Gray.

STRUCTURE: Glassy pillow margin.

ALTERATION: Slight to none.

VEINS/FRACTURES: 0.1%, 0.2 mm, various orientation, filled with talc, quartz, and possible clay minerals.

UNIT 1: APHYRIC DIABASE

Piece 3

CONTACTS: None.

PHENOCHRYS: None.

GROUNDMASS: Fine-grained aphyric, ophitic texture, very homogeneous, with subequal amounts of plagioclase and ferromagnesian minerals. Similar to Piece 2 except for more crystalline mafic minerals.

VESICLES: None.

COLOR: Gray.

STRUCTURE: Glassy pillowed (?) margin.

ALTERATION: Slight to none.

VEINS/FRACTURES: 0.1%, 0.2 mm, parallel to core axis, filled with talc, 1% pyrite and smectite. Pyrite crystals are 0.8 mm, euhedral to subhedral crystals and grain aggregates. Silicate has botryoidal forms on fracture surface. Some quartz may also be present (clear glassy mineral with conchoidal fracture).

Pieces 4A-5

CONTACTS: None.

PHENOCHRYS: None.

GROUNDMASS: Fine-grained aphyric, ophitic texture, holocrystalline, very homogeneous, with subequal amounts of plagioclase and ferromagnesian minerals.

VESICLES: None.

COLOR: Gray.

STRUCTURE: Massive.

ALTERATION: Slight to none.

VEINS/FRACTURES: 1%, 0.1 mm, random orientation, veins found on fracture surfaces contain talc, silica, and smectite. A few sulfide grains evident on fracture surfaces.
UNIT 1: DIABASE

Piece 1

CONTACTS: None.
PHENOCRYSTS: None.
GROUNDMASS: Fine-grained, aphyric, and homogeneous. Contains subequal amounts of plagioclase and ferromagnesian minerals. The rock is equigranular, with equant to tabular plagioclase grains, anhedral equant ferromagnesian grains. There may be two ferromagnesian minerals, one brown, the other black.
VESICLES: None.
COLOR: Gray.
STRUCTURE: Massive.
ALTERATION: Slight to none.
VEINS/FRACTURES: 0.5%, 0.2 mm wide, subparallel to the core axis, filled with silica and chlorite-smectite.

Pieces 2–3

CONTACTS: None.
PHENOCRYSTS: None.
GROUNDMASS: Fine-grained aphyric with subequal amounts of plagioclase and ferromagnesian minerals. A few poikilitic feldspar grains, up to 0.4 mm. Groundmass is otherwise ophitic to subophitic.
VESICLES: None.
COLOR: Gray.
STRUCTURE: Massive.
ALTERATION: Slight to none.
VEINS/FRACTURES: None.

UNIT 1: MICRO-PORPHYRITIC DIABASE

Piece 4

CONTACTS: None.
PHENOCRYSTS: Plagioclase grains are milky white, indicating some possible alteration. Plagioclase - 0.5%, 4–5 mm, tabular to glomeroporphyritic grains.
GROUNDMASS: Fine-grained, equigranular. Contains subequal amounts of plagioclase and ferromagnesian minerals.
VESICLES: None.
COLOR: Gray.
STRUCTURE: Massive.
ALTERATION: Slight to none.
VEINS/FRACTURES: 0.5%, 0.2 mm wide, random orientation, zoned with chlorite centers and silica on the margin.

UNIT 1: DIABASE

Pieces 5–8

CONTACTS: None.
PHENOCRYSTS: None.
GROUNDMASS: Fine-grained, aphyric to microporphyritic, and homogeneous. Contains subequal amounts of plagioclase and ferromagnesian minerals. The rock is equigranular, with equant to tabular plagioclase grains, anhedral equant ferromagnesian grains.
VESICLES: None.
COLOR: Gray.
STRUCTURE: Massive.
ALTERATION: Slight to none.
VEINS/FRACTURES: 1%, 0.1–0.2 mm wide, random orientation, talc-coated fractures, some with silica.
UNIT 1: PLAGIOCLASE-PHYRIC DIABASE

Pieces 1A–10

CONTACTS: None.

PHENOCRYSTS: Plagioclase is white and fresh, milky on broken surface.
Plagioclase - 1%-2%, 0.5-1.5 mm, ovoid, some twinning.

GROUNDMASS: Medium- to coarse-grained, 0.3–0.8 mm, thin skeletal plagioclase microlites, intergranular texture.

VESICLES: None.

COLOR: Gray.

STRUCTURE: Massive.

ALTERATION: Some plagioclase grains may be altered (green color).

VEINS/FRACTURES: 1%, 0.2 mm wide, random orientation, coated with talc and chlorite-smectite.
UNIT 1: MODERATELY PLAGIOCLASE-PHYRIC METABASALT

Pieces 1–2C

CONTACTS: Relict pillow margin structure preserved.

PHENOCRYSTS: Plagioclase is especially abundant near the chilled margin. It is altered to milky blue.
- Olivine is altered to clay or talc.
- Plagioclase - 2%, 0.3–0.5 mm, ovoid.
- Olivine - 2%, 0.3–0.5 mm, ovoid.
- Spinel - 1%, 0.1 mm, euhedral, dark red.

GROUNDMASS: Fine-grained to cryptocrystalline, thin skeletal plagioclase microlites and partially altered mesostasis. Secondary pyrite and altered glass are abundant.

VESICLES: None.

COLOR: Medium gray.

STRUCTURE: Glassy margin and varicolitic zone are structurally preserved though mineralogically altered.

ALTERATION: Euhedral pyrite is conspicuous in silicified margin and matrix. Small quantities of clay, talc, and chlorite are also present.

VEINS/FRACTURES: 2%, <2 mm wide, sub-horizontal orientation (bottom of Piece 1), contain same minerals as replaced phenocrysts.
UNIT 1: SPARSELY PLAGIOCLASE-PHYRIC BASALT

Gravel

CONTACTS: Fragments in sediment, likely the bottom of a sill.

PHENOCRYSTs: Plagioclase is especially abundant near the chilled margin. It is altered to milky blue.
- Olivine is altered to clay or talc.

- Plagioclase - %, 1 mm, ovoid, appears greenish.

GROUNDMASS: Fine-grained and hydrothermally altered.

VESICLES: 1%-2%, <0.5 mm, spherical, evenly distributed.
- Euhedral pyrite is open fracture growth though original cavity not preserved.

COLOR: Greenish gray.

STRUCTURE: Glassy margin of sill?

ALTERATION: All surfaces are coated with talc, quartz, pyrite, and chlorite. Epidote could also be a fracture fill mineral.

VEINS/FRACTURES: Pieces are gravel and no fracture structure is preserved.

ADDITIONAL COMMENTS: Sample is unnumbered pieces of gravel in sediment core. The largest clast is 3x4 cm.
UNIT 1: SPARSELY OLIVINE-PLAGIOCLASE PHYRIC BASALT

Several small fragments

CONTACTS: Baked sediment contact with glassy basalt.

PHENOCRYSTS: Phenocrysts of plagioclase and olivine are only visible in a couple of clasts.
- Plagioclase: 1%-2%, 1 mm, tabular to columnar, white.
- Olivine: 1%-2%, 1-3 mm, oblong.

GROUNDMASS: Fine-grained to glassy. No groundmass minerals are visible.

VESICLES: None visible.

COLOR: Black to greenish gray.

STRUCTURE: Upper glassy margin of sill? Baked sediment on contact clearly visible in thin section.

ALTERATION: Extensive chloritization of glass. The sediment at the contact and the adjacent basalt both have disseminated sulfides. Red banding is visible in basalt clasts just below glassy margin, likely in the variolitic zone.

VEINS/FRACTURES: No veins or fractures are visible in individual clasts. Both sediment and basalt fragments are broken along conchoidal fracture. These fractures are visibly chloritized in the sediment.

ADDITIONAL COMMENTS: Sediment is indurated chloritic mudstone. Center of the mudstone clasts are gray and the fractures are green from chlorite formation. Basalt clasts are present as thick, partially altered glassy fragments. Basalt fragments are present between 21-23 cm, and 34-40 cm. Between 25-33 cm, sediment and glass fragments are mixed.
139-856G-3R-1

Piece 1
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Barite, 40%, 0.1 mm, equigranular euhedral crystal aggregate.
Pyrite, 40%, 0.05 mm, euhedral, cubic crystals, as clusters and in vugs.
Silica/smectite, 20%, aphanitic, coats barite grains.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Barite, 40%, 0.1 mm, granular aggregate.

TEXTURAL DESCRIPTION: Massive, equigranular aggregate.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Piece 2
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 60%, 0.2 mm, euhedral to subhedral crystals.
Barite, 40%, 0.1 mm, granular aggregate.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Hematite, 0.5%, 0.05 mm, replaces magnetite.
Chalcopyrite, 0.1%, 0.1 mm.

TEXTURAL DESCRIPTION: Pyrite is irregularly distributed; overall, a massive, equigranular aggregate.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Piece 3
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 83%, 0.2 mm, subhedral grain aggregates.
Carbonate, 8%, 0.1 mm, interstitial to sulfides, in discrete areas, subhedral to euhedral aggregates.
Barite, 2%, 0.1 mm, subhedral aggregates.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Magnetite, 3%, 0.5-1.0 mm, interstitial to pyrite.
Sphalerite, 1%, 0.5 mm, as discrete grains, and in magnetite areas.
Organic material(?), aphanitic, black coating on vein.
Silica/smectite, as minor interstitial material.
Hematite, 1%, 0.05 mm, as replacement(?) of magnetite.

TEXTURAL DESCRIPTION: Massive, equigranular aggregate.

STRUCTURES/VEINS/FRACTURES:
Size 5 mm width, length of sample.
Orientation Unknown.
Minerals Organic material, carbonate, sulfate, silica.

ADDITIONAL COMMENTS: Well-zoned vein.
Pieces 4 and 5
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 50%, 0.2 mm, vermicular aggregates, grains are anhedral to subhedral.
Chlorite, 25%, 0.05–0.1 mm, medium to dark green aggregate interstitial to pyrite, slightly greasy luster.
Carbonate, 20%, 0.5 mm, subhedral, locally encloses hematite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Magnetite, 3%, 0.2 mm, interstitial to pyrite.
Sphalerite, 2%, intergrown with magnetite.
Barite, 1%, 0.2 mm, in veins.

TEXTURAL DESCRIPTION: Semi-massive, equigranular aggregate.

STRUCTURES/VEINS/FRACTURES:
Size 0.1–0.2 mm
Orientation Unknown.
Minerals Barite cuts all other minerals.

ADDITIONAL COMMENTS: None.

Piece 4

Piece 6
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 75%, 0.2–0.8 mm, equigranular aggregate.
Magnetite, 8%, 0.5 mm, interstitial to pyrite.
Chlorite, 10%, 0.05–1 mm, interstitial to sulfides.
Carbonate, 5%, 0.2 mm.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 1%, intergrown with magnetite interstitial to pyrite.

TEXTURAL DESCRIPTION: Massive, equigranular aggregate.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Thin section.
Piece 7

**TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE**

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 60%</td>
<td>0.2–0.4 mm, euhedral to subhedral, vermicular aggregates.</td>
<td>Carbonate, 35%, 0.2 mm, equigranular, gray mineral. Smectite/talc, 5%, aphanitic, medium to light green, intergrown with carbonate.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Included in, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sphalerite, 1%</td>
<td>0.1 mm, interstitial to chlorite.</td>
</tr>
<tr>
<td>Chalcopyrite, 0.5%</td>
<td>0.2 mm, interstitial to pyrite, within pyrite, and in carbonate.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Equigranular aggregate.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.

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**Pieces 8–11**

**TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE**

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 60%</td>
<td>0.2 mm, anhedral to vermicular aggregates, irregularly distributed.</td>
<td>Chlorite, 15%, 0.05 mm, matrix to sulfide minerals. Sphalerite, 10%, 0.1 mm, anhedral grains. Magnetite/hematite, 5%, 0.2 mm, anhedral grains. Carbonate, 5%, 0.2 mm, groundmass.</td>
</tr>
<tr>
<td>Chlorite, 15%</td>
<td>Matrix to sulfide minerals.</td>
<td></td>
</tr>
<tr>
<td>Sphalerite, 10%</td>
<td>Anhedral grains.</td>
<td></td>
</tr>
<tr>
<td>Magnetite/hematite</td>
<td>Anhedral grains.</td>
<td></td>
</tr>
<tr>
<td>Carbonate, 5%</td>
<td>Groundmass.</td>
<td></td>
</tr>
</tbody>
</table>

**MINOR MINERALS:** None.

**TEXTURAL DESCRIPTION:** Pyrite aggregates are very irregular; hematite formed only in the matrix, seems very late; chlorite-barite(?) veins cut Piece 11.

**STRUCTURES/VEINS/FRACTURES:**

<table>
<thead>
<tr>
<th>Size</th>
<th>Orientation</th>
<th>Minerals</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 mm, irregular</td>
<td>Unknown</td>
<td>Chlorite-barite.</td>
</tr>
</tbody>
</table>

**ADDITIONAL COMMENTS:** Thin section, Piece 10.

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**Pieces 12 and 13**

**TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE**

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 85%</td>
<td>0.5 mm, massive aggregates.</td>
<td>Carbonate, 5%, 0.2 mm, matrix to sulfide minerals. Chlorite, 8% matrix mineral, dark green. Magnetite, hematite, sphalerite, 5%, irregularly distributed.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:** None.

**TEXTURAL DESCRIPTION:** Massive, equigranular aggregate.

**STRUCTURES/VEINS/FRACTURES:**

<table>
<thead>
<tr>
<th>Size</th>
<th>Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2–0.5 mm</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

**ADDITIONAL COMMENT:** None.
139-856G-4R-1

Piece 1
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 60%, 0.1–1.0 mm, mostly equant grains.
Carbonate and barite, 10%, 0.5–1.0 mm, locally in discontinuous veins 1.0–2.0 mm wide.
Dark green silicate, smectite(?), 30%, matrix between pyrite grains.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, trace.
TEXTUAL DESCRIPTION: Much of the interior of the cut face of the sample is porous due to leaching of some matrix phase.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Piece 2
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 40%, 0.1–1.0 mm, mostly equant grains.
Barite, 30%, 0.5–1.0 mm, locally in discontinuous veins 1.0–2.0 mm wide.
Dark greenish silicate, chlorite(?), 30%, matrix between pyrite grains.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, trace.
TEXTUAL DESCRIPTION: None.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: Four small pieces, three are baritic massive sulfide, one pyritic massive sulfide with 20% barite. Pyritic piece contains more sphalerite, approximately 5%.

Piece 3
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, 0.2–3.0 mm, anhedral grains.
Green silicate, chlorite(?), 20%, interstitial to pyrite.
MINOR MINERALS: None.
Name, Abundance(%), Included in, Characteristics
Barite, 5%, 0.5–3.0 mm, anhedral, possibly carbonate.
Sphalerite, 2%, subhedral brown grains.
Magnetite, <1%.
Hematite, fine dusting in some areas giving the sample a reddish color.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.
Piece 4
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, 0.2 mm, anhedral grains, massive. Some as 0.2–2.0 mm pseudomorphs of pyrrhotite, others as reticulate fine-grained pyrite overgrowing leached boxwork.
Sphalerite, 5%, 1–2 mm, more concentrated in area of pyrite, pseudomorphs of pyrrhotite. White and dark green clays, 5%, interstitial to pyrite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristic
Jarosite(?), 20%, fibrous yellow-brown aggregates of radiating crystals.

STRUCTURES/VEINS/FRACTURES: Some reticulate boxwork texture, pyrite pseudomorphing bladed pyrrhotite.

ADDITIONAL COMMENTS: None.

Piece 5
TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 80%, 0.2 mm, anhedral grains, massive. Some as 0.2–2.0 mm pseudomorphs of pyrrhotite, others as reticulate fine-grained pyrite overgrowing leached boxwork.
Sphalerite, 7%, 1–2 mm, more abundant on side of sample away from reticulate boxwork texture. White and dark green clays, 10%, interstitial to pyrite.

MINOR MINERALS: None.

STRUCTURES/VEINS/FRACTURES: Abundant reticulate boxwork texture, pyrite pseudomorphing bladed pyrrhotite.

ADDITIONAL COMMENTS: None.

Piece 6
TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, 0.2 mm, anhedral grains. Clay and amorphous silica, 30%, interstitial.

MINOR MINERALS: None.

TEXTURAL DESCRIPTION: None.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Multiple fragments of pyritic massive sulfide, one fragment lighter with abundant interstitial silica.
Piece 7
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 85%, fine-grained, dense.
Dark green silicate, chlorite(?), 15%, interstitial to pyrite.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, <1%.
Barite, <1%.
TEXTURAL DESCRIPTION: None.
STRUCTURES/VEINS/FRACTURES: None
ADDITIONAL COMMENTS: This piece is less magnetic than typical samples from this interval.

Piece 8
TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 85%, fine-grained, dense.
Dark green silicate, chlorite(?), 15%, interstitial to pyrite.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Barite, 0.2 mm, euhedral.
TEXTURAL DESCRIPTION: None.
STRUCTURES/VEINS/FRACTURES: None
ADDITIONAL COMMENTS: Coarser vuggy band cutting across the center of the sample. Some euhedral barite and pyritohedrons in vugs.

Piece 9
TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 85%, fine-grained, dense.
Dark green silicate, chlorite(?), 10%, interstitial to pyrite.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Magnetite, 3%, fine-grained in veins, locally magnetite octahedrons up to 0.8 mm.
Barite, <1%.
TEXTURAL DESCRIPTION:
Many areas with vuggy to reticulate boxwork texture.
STRUCTURES/VEINS/FRACTURES: Sample is laced by clay-magnetite veinlets, locally with hematite staining. Some barite in late veins with clay and magnetite.
ADDITIONAL COMMENTS: See sketch.
Piece 10
TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 85%, fine-grained, dense.
Dark green silicate, chlorite(?), 10%, interstitial to pyrite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Magnetite, 1%, fine-grained, in veins, locally magnetite octahedrons up to 0.8 mm.
Sphalerite, 1%. Psilomelane(?), see below.

TEXTURAL DESCRIPTION: Many areas with vuggy to reticulate boxwork texture. More vuggy than Piece 9.

STRUCTURES/VEINS/FRACTURES: One small fracture surface is covered with magnetite and overgrown by sooty black acicular crystals <10 µm wide and up to 0.05 mm long. Crystals are silvery black under the binocular microscope (Psilomelane?).

ADDITIONAL COMMENTS: None.

Pieces 11–13
TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 80%, medium-grained, reticulate.
Pyrrhotite, 5%, fine-grained.
Sphalerite, 4%. fine-grained.
Dark green silicate, smectite(?), 10%, interstitial to pyrite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Magnetite, 1%, fine-grained, in veins, locally magnetite octahedrons up to 0.8 mm.
Sphalerite, 1%

TEXTURAL DESCRIPTION: Many areas with vuggy to reticulate boxwork texture. More vuggy than Piece 9.

STRUCTURES/VEINS/FRACTURES: One small fracture surface is covered with magnetite and overgrown by sooty black acicular crystals <10 µm wide and up to 0.05 mm long. Crystals are silvery black under the binocular microscope (Psilomelane?).

ADDITIONAL COMMENTS: None.

Pieces 14–17, 19
TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 75%, medium- to coarse-grained, dense.
Pyrrhotite, 5%, in patches.
Dark green silicate, chlorite(?), 15%, interstitial to pyrite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Magnetite, 4%, fine-grained in veins, locally magnetite octahedrons up to 0.8 mm.
Marcasite, (Piece 14), 1%, coarse bladed crystals growing in pyrite matrix.
Psilomelane(?)
Sphalerite, 1%
Chalcopyrite, 1%

TEXTURAL DESCRIPTION: None.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Chalcopyrite 5% only in Piece 15.
Piece 18
TYPE: HOMOGENEOUS MEDIUM-TO-COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Pyrite, 80%, mostly fine-grained, subhedral.

MINOR MINERALS:
- Chalcopyrite, 7%, fine-grained anhedral masses.
- Pyrrhotite, 5%, 0.1-2.0 mm, compact anhedral masses, locally coarse euhedral crystals.
- Sphalerite, 3%, 0.5-2.0 mm, subhedral crystals.
- Magnetite, 3%, fine masses and 0.5 mm octahedra in late veins.
- Marcasite, 1%, 1.0-5.0 mm, radial fibrous crystals in botryoidal masses.

TRACE MINERALS
Name, Abundance(%), Included in, Characteristics
- Barite, Psilomelane(?), Jarosite(?).

TEXTURAL DESCRIPTION:
None.

STRUCTURES/VEINS/FRACTURES: The sample is locally vuggy and has some areas of reticulate boxwork texture defined by partitions coated by 0.1 mm pyrite grains. Some of the boxwork interiors contain partially dissolved pyrrhotite inclusions. Pyrrhotite was the original mineral comprising the bulk of the sample. Sphalerite rarely occurs with the same textural relationship. Original rock was composed of pyrrhotite, chalcopyrite, and sphalerite. There is late stage veining by magnetite and a white silicate and late vug filling barite. Uncut side of sample in archive half preserves a fluid channelway which is coated with sooty magnetite and locally overgrown by a 5 mm thick crust of botryoidal marcasite. Relict euhedral pyrrhotite occurs within the mm-sized needles of a black silvery mineral (psilomelane?). Some ocher colored radial fibrous aggregates of an alteration phase (jarosite?).

ADDITIONAL COMMENTS: None.
**Piece 1**

**TYPE:** HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 90%, 0.2 mm</td>
<td>anhedral grains in massive and reticulate zones.</td>
<td></td>
</tr>
<tr>
<td>Magnetite/hematite, 10%, 0.2 mm</td>
<td>interstitial to pyrite.</td>
<td></td>
</tr>
</tbody>
</table>

**MINOR MINERALS:** None.

**TEXTURAL DESCRIPTION:** Vugs, typically 0.5 mm in diameter, make up about 20% of sample. These have a sponge-like surface, and are formed of reticulate to boxwork pyrite aggregates.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.

**Piece 2**

**TYPE:** HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 90%, 0.2 mm</td>
<td>anhedral grains, massive.</td>
<td></td>
</tr>
<tr>
<td>Magnetite/hematite, 5%, 0.2 mm</td>
<td>interstitial to pyrite.</td>
<td></td>
</tr>
<tr>
<td>Chlorite, 1%, 0.05 mm</td>
<td>interstitial to pyrite.</td>
<td></td>
</tr>
<tr>
<td>Carbonate, 2%, 0.2 mm</td>
<td>interstitial to pyrite.</td>
<td></td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Included in</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barite(?)</td>
<td>as for carbonate.</td>
<td></td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Vugs, typically 1.0-0.0 mm in diameter, make up about 10% of sample. These have a sponge-like surface, and are formed of reticulate to boxwork pyrite aggregates.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.
Piece 3

TYPE: HOMOGENEOUS MEDIUM-TO COARSE-GRAINED PYRITE-PYRRHO-TITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 99%, 0.2 mm, anhedral grains in reticulate zones.

MINOR MINERALS: None.

TEXTURAL DESCRIPTION: Very well-developed reticulate texture throughout this sample; "blades" of pyrite aggregates define the texture. The sample has a boxwork-like appearance. Each "blade" of reticulate pyrite has a core of anhedral pyrite, with euhedral (cubic and pyritohedron) forms on their surfaces.

STRUCTURES/VEINS/FRACTURES:
Size 0.2 mm.
Orientation Orthogonal.
Minerals Magnetite, carbonate, goethite.

ADDITIONAL COMMENTS: Thin section.

[Diagram of Piece 3 with reticulate euhedral pyrite blades, magnetite veins, and fine-grained anhedral pyrite, 4 cm scale]
139-856G-5R-1

**Piece 1**
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 75%, fine-grained.
Smectite/amorphous silica, 15%, aphanitic.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Magnetite 5%.
Sphalerite 5%.

TRACE MINERALS:
Name, Abundance(%), Included in, Characteristic
Barite, carbonate, chalcopyrite.

TEXTURAL DESCRIPTION: Very fine-grained pyrite matrix with interstices and veins which are filled with magnetite, chlorite, and sphalerite. Sphalerite forms a distinct band.

STRUCTURES/VEINS/FRACTURES: Downhole surface is an open crack with large barite and pyrite crystals.

ADDITIONAL COMMENTS: None.

**Piece 2**
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 90%, fine-grained.

MINOR MINERALS: Name, Abundance(%), Included in, Characteristics
Sphalerite, 5%, barite, 5%.

TRACE MINERALS:
Name, Abundance(%), Included in, Characteristic
Goethite.

TEXTURAL DESCRIPTION: The groundmass is spongy pyrite with about 30% cavities. Cavity walls are covered with sphalerite and barite.

STRUCTURES/VEINS/FRACTURES: Smaller part of the sample is more compact with cracks cemented with sphalerite and goethite.

ADDITIONAL COMMENTS: None.

**Piece 3**
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, fine-grained.
Amorphous silica/smectite, 20%, aphanitic.
Carbonate, 5%, 0.1 mm.
Barite, 2%, 0.1 mm.

TRACE MINERALS:
Name, Abundance(%), Included in, Characteristics
Magnetite.

TEXTURAL DESCRIPTION: Fine-grained pyrite mixed with barite. No interstices.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
Piece 4
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 60%, fine-grained.
Amorphous silica, 30%, aphanitic.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 10%.

TEXTURAL DESCRIPTION: Rubble.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Piece 5
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 47%, 0.2 mm, massive, anhedral grains.
Amorphous silica/smectite, 35%, aphanitic.
Magnetite, 10%.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 5%.
Pyrrhotite, <1%.

TEXTURAL DESCRIPTION: Very fine-grained, spongy pyrite with about 10% cavities. Pyrite crystals on cavity walls. Amorphous silica/smectite in the groundmass. Some areas contain fine-bladed pyrrhotite replaced by pyrite.

STRUCTURES/VEINS/FRACTURES: One irregular vein, about 1 cm wide, crosses this piece. This vein is filled with large idiomorphic sphalerite crystals, chlorite, barite, and idiomorphic pyrite.

ADDITIONAL COMMENTS: Thin section.

Piece 6
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 45%, fine-grained.
Amorphous silica/green smectite, 45%.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 2%, in matrix.
Magnetite, 4%, fine-grained.
Pyrrhotite, 4%, fine-grained.
White chlorite, trace.

TEXTURAL DESCRIPTION: Vein of dark green smectite-chlorite with 1.0–2.0 mm pyrite cubes and patches of sphalerite, partly replaced by magnetite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
### Pieces 7 and 8

**TYPE:** HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** Yes, see below.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 45%</td>
<td>medium-grained; coarse-grained in veins, replacing pyrrhotite.</td>
</tr>
<tr>
<td>Amorphous silica/smectite, 30%</td>
<td>aphanitic.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Included in, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sphalerite, 5%</td>
<td>in matrix and veins.</td>
</tr>
<tr>
<td>Magnetite, 10%</td>
<td>replacing sphalerite, and in veins.</td>
</tr>
<tr>
<td>Chalcopyrite, 3%</td>
<td>in magnetite and pyrite.</td>
</tr>
<tr>
<td>Carbonate, 5%</td>
<td></td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Top part is spongy pyrite, fine-grained with scattered large grains of white silicate. Bottom part is a fine-grained pyrite matrix with scattered porphyroblastic pyrite, some sphalerite, and increasing amount of smectite towards bottom.

**STRUCTURES/VEINS/FRACTURES:** Between two different parts there is a filled crack about 5.0 mm wide, cemented with green silicate, idiomorphic pyrite.

**ADDITIONAL COMMENTS:** None.

### Piece 9

**TYPE:** HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 45%</td>
<td>0.5 mm, botryoidal and veins.</td>
</tr>
<tr>
<td>Chlorite/ Saponite, 33%</td>
<td>interstitial to sulfides, and in veins.</td>
</tr>
<tr>
<td>Magnetite 10%</td>
<td>0.2 mm.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Included in, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sphalerite, 5%</td>
<td></td>
</tr>
<tr>
<td>Hematite, 5%</td>
<td></td>
</tr>
<tr>
<td>Barite, 1%</td>
<td></td>
</tr>
<tr>
<td>Carbonate, 2%</td>
<td></td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Intensely veined with veins of banded pyrite surrounded by thin sphalerite bands. Material between veins is fine-grained pyrite with some sphalerite and 30% silicate, with increasing silica towards the bottom of the sample.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.

### Piece 10

**TYPE:** HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

**CONTACT:** None

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 50%</td>
<td>fine-grained.</td>
</tr>
<tr>
<td>Amorphous silica/chlorite, 25%</td>
<td></td>
</tr>
<tr>
<td>Carbonate, 10%</td>
<td></td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Included in, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrrhotite, minor.</td>
<td></td>
</tr>
<tr>
<td>Sphalerite, 3%</td>
<td>fine-grained.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Fine-grained spongy pyrite matrix with cavities (20%). Cavities are partly filled with fine-grained sphalerite and silica/chlorite.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.
139-856G-5R-1

Piece 11
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 95%, fine-grained as well as coarse-grained, idiomorphic.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Barite, 3%.
TEXTURAL DESCRIPTION: Large idiomorphic pyrite crystals are imbedded in a matrix of fine-grained pyrite with some barite.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Piece 12
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 90%, fine- to medium-grained, replacing pyrrhotite.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 2%
Amorphous silica/smectite, 8%.
TEXTURAL DESCRIPTION: Rubble.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Pieces 13 and 14
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 65%, medium-grained, reticulate.
Silica, 25%, aphanitic.
Chalcopyrite, 2%.
Carbonate, 5% (Piece 13 only).
TEXTURAL DESCRIPTION: Fine-grained, spongy pyrite with 25% cavities. The walls of cavities are covered with coarse idiomorphic pyrite crystals. Cavities are mostly filled with white, fine-grained amorphous silica and chlorite (clear).
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: Thin section, Piece 14.
**Piece 1**

**TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE**

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 80%</td>
<td>0.2 mm, equigranular aggregates of anhedral to subhedral.</td>
<td>Carbonate, 15%, 0.1 mm, interstitial to pyrite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Magnetite, 5%, 0.1 mm, interstitial to carbonate.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:** None.

**TEXTURAL DESCRIPTION:** None.

**STRUCTURES/VEINS/FRACTURES:**

<table>
<thead>
<tr>
<th>Size</th>
<th>Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 mm</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

**ADDITIONAL COMMENTS:** None.

---

**Piece 2**

**TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE**

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 90%</td>
<td>0.2 mm, massive anhedral aggregate.</td>
<td>Silica, 8%, aphanitic, interstitial to pyrite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chlorite, 2%, 0.05 mm, green, interstitial to pyrite.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Included in</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sphalerite, &lt;0.5%</td>
<td></td>
<td>Disseminated.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** None.

**STRUCTURES/VEINS/FRACTURES:**

<table>
<thead>
<tr>
<th>Size</th>
<th>Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0 mm</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

**ADDITIONAL COMMENTS:** Also 1.0 mm vein of unknown silicate cutting sample.

---

**Piece 3**

**TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE**

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 40%</td>
<td>0.2-0.4 mm, coarse pyrite aggregates form porphyroblastic texture.</td>
<td>Magnetite/hematite/sphalerite, 40%, 0.2 mm, interstitial to pyrite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chlorite, 20%, very fine-grained, probably mixed with silica, interstitial to sulfides.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** None.

**STRUCTURES/VEINS/FRACTURES:**

<table>
<thead>
<tr>
<th>Size</th>
<th>Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 mm</td>
<td>Random</td>
</tr>
</tbody>
</table>

**ADDITIONAL COMMENTS:** None.
139-856G-6R-1

Pieces 4 and 5
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(\%), Morphology, Characteristics
Pyrite, 90\%, 0.2-0.4 mm, equigranular, in aggregates that define a weak banding.
Silica, 10\%, aphanitic, in discrete lamellar patches.

MINOR MINERALS:
Name, Abundance(\%), Included in, Characteristics
Sphalerite, 0.5\%, 0.2 mm, occurs in silica patches.

TEXTURAL DESCRIPTION: Medium-grained massive pyrite, with local vugs where silica has been washed out, with about 10\% lamellar silica "veins" or patches; these form a distinct texture, giving a "pseudo-banded" appearance to the rock. The silica bands contain sphalerite. One stylolite appears near one side of the sample.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: See sketch, thin section.

---

Pieces 6 and 7
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(\%), Morphology, Characteristics
Pyrite, 90\%, 0.2 mm, anhedral grains.
Silica, 10\%, aphanitic, in vugs and irregular interstitial areas to pyrite.

MINOR MINERALS:
Name, Abundance(\%), Included in, Characteristics
Barite, 0.1\%, in veins.

TEXTURAL DESCRIPTION: Poorly banded, cuspate to irregular patches of silica, typically 0.2 to 0.8 mm wide. Pyrite is massive, compact.

STRUCTURES/VEINS/FRACTURES:
Size 0.5-1.0 mm, (Piece 6, 5.0 mm wide)
Orientation Unknown.
Minerals Silica, minor barite, disseminated pyrite.
ADDITIONAL COMMENTS: None.
Pieces 8 and 9

TYPE: HOMOGENEOUS MEDIUM-TO-COARSE-GRAINED PYRITE-PYRRHO-TITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 40%, 0.5 mm, in vermicular aggregates.
Silica, 30%, aphanitic, forms rims to chlorite patches.
Chlorite, 30%, fine-grained, forms centers of cusps to irregular patches.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 0.5%, 0.1–0.2 mm, with silica.
Carbonate, 2%.

TEXTURAL DESCRIPTION: Silica and chlorite form a groundmass to pyrite masses; the latter are evenly disseminated through the groundmass. A few vugs, up to 5.0 mm wide, contain euhedral pyrite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 10 and 11

TYPE: HOMOGENEOUS MEDIUM-TO-COARSE-GRAINED PYRITE-PYRRHO-TITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 55%, 0.8–1.0 mm, disseminated anhedral masses and porphyroblasts.
Carbonate, 15%, 0.2 mm, part of groundmass.
Chlorite, 20%, fine-grained, groundmass.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 1%, 0.1 mm, in Piece 10.
Barite, 0.1 mm, questionable determination.
Magnetite, 3%, 0.1 mm, in vugs.

TEXTURAL DESCRIPTION: Semi-massive, disseminated pyrite, locally porphyroblastic, in a groundmass that includes at least three minerals; carbonate-barite question not resolved.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Piece 12

TYPE: HOMOGENEOUS MEDIUM-TO-COARSE-GRAINED PYRITE-PYRRHO-TITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 60%, 0.5–1.5 mm, disseminated in anhedral masses and porphyroblasts.
Silica, 30%, aphanitic, locally discolored to green (smectite or chlorite?)
Carbonate/barite, 10%, 0.1 mm, part of groundmass.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, <0.5%, 0.1 mm, in silica.

TEXTURAL DESCRIPTION: Semi-massive sulfide, locally porphyroblastic.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
Pieces 13–15

TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 30%, 1.0–4.0 mm, euhedral to subhedral grains, disseminated.
Silica, 30%, aphanitic, groundmass.
Chlorite, 30%, fine-grained, groundmass.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Silica, 30%, aphanitic, groundmass.
Chlorite, 30%, fine-grained, groundmass.

TEXTURAL DESCRIPTION: Disseminated sulfide in a fine-grained matrix.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 16–20, and 21

TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 40%, 0.5–2.0 mm, euhedral with local aggregates.
Silica, 30%, aphanitic, groundmass.
Chlorite, 30%, fine-grained, groundmass.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 0.1%, 0.1 mm, in silica/chlorite groundmass.
Silica, 30%, aphanitic, groundmass.

TEXTURAL DESCRIPTION: Disseminated sulfide, fine-grained to aphanitic groundmass.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 22–24

TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 55%, 0.5 mm, disseminated to massive aggregates.
Silica, 40%, aphanitic, forms interstitial to pyrite, and as groundmass to sample.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 2%, 0.5–1.0 mm, shows good red internal reflection, in silica.
Barite/carbonate, 4%, 0.1–0.3 mm, in both vugs and groundmass.

TEXTURAL DESCRIPTION: Semi-massive sulfide, all minerals homogeneously distributed.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
Pieces 1–3

TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 80%, subhedral to euhedral, open network of crystal aggregates. Pyrite also occurs as euhedral cubes associated with clear carbonate filling pyrite interstices. Amorphous silica, 15%, pale green, felted masses filling open space.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Carbonate, 3%, clear euhedral crystals, lining interstices within pyrite crystalline network.

TEXTURAL DESCRIPTION: Massive, open network of pyrite crystal aggregate infilled by amorphous silica.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 4–7

TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 80%, subhedral to euhedral, open network of crystal aggregates. Pyrite also occurs as euhedral cubes associated with clear carbonate filling pyrite interstices. Amorphous silica, 15%, pale green, felted masses filling open space.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Carbonate, 3%, clear euhedral crystals, lining interstices within pyrite crystalline network.

TEXTURAL DESCRIPTION: Massive, open network of pyrite crystal aggregate infilled by amorphous silica.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 8–11

TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, subhedral to euhedral, open network of crystal aggregates. Pyrite also occurs as euhedral cubes associated with magnetite filling veins. Amorphous silica, 15%, pale green, felted masses filling open space. Also occurs in veins with magnetite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Magnetite, 5%, dark gray, subhedral to euhedral, in veins.
Hematite, 3%, anhedral, replaces pyrite.

TEXTURAL DESCRIPTION: Massive, open network of pyrite crystal aggregate infilled by amorphous silica and clay, and cut by magnetite-pyrite veins.

STRUCTURES/VEINS/FRACTURES: In Piece 11 vein 3.0–4.0 mm wide, open to partially filled with black-brown sooty pyrite intergrown with magnetite.

ADDITIONAL COMMENTS: None.
Piece 12

**TYPE:** HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**
- **Name, Abundance(%), Morphology, Characteristics**
  - Pyrite, 40%, subhedral to euhedral, open network of crystal aggregates.
  - Amorphous silica, 20%, pale green, felted masses filling open space.
  - Carbonate, 20%.

**MINOR MINERALS:**
- **Name, Abundance(%), Included in, Characteristics**
  - Magnetite, 10%, 0.5-1.0 mm, dark gray, subhedral to euhedral, replaces pyrite.
  - Sphalerite, traces, 300-500 µm, subhedral to anhedral, in the interstices of pyrite crystalline network.

**TEXTURAL DESCRIPTION:** Massive, open network of pyrite crystal aggregates with dark gray sphalerite, infilled by amorphous silica, carbonate, and clay.

**ADDITIONAL COMMENTS:** None.

Pieces 13 and 14

**TYPE:** HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**
- **Name, Abundance(%), Morphology, Characteristics**
  - Pyrite, 65%, 0.5-2.0 mm, subhedral to euhedral, open network of crystal aggregates forming collomorphic overgrowths in places.
  - Magnetite, 15%, 0.5-1.0 mm, subhedral to euhedral, replacing pyrite.
  - Amorphous silica, 15%, pale green, felted masses filling open space.

**MINOR MINERALS:**
- **Name, Abundance(%), Included in, Characteristics**
  - Sphalerite, 1%, 300-500 µm, subhedral to anhedral, in the interstices of pyrite crystalline network.
  - Clay, 2%, 200-300 µm, fibrous, in the interstices between pyrite grains.

**TEXTURAL DESCRIPTION:** Massive, open network of pyrite crystal aggregates with dark gray sphalerite, infilled by amorphous silica and clay. Collomorphic pyrite overgrowths give the rock a vertically banded appearance.

**ADDITIONAL COMMENTS:** Thin section.

Piece 15

**TYPE:** MASSIVE COLLOFORM AND VUGGY PYRITE

**CONTACTS:** None.

**MAJOR MINERALS:**
- **Name, Abundance(%), Morphology, Characteristics**
  - Pyrite, 65%, 0.5-2.0 mm, subhedral to euhedral, open network of crystal aggregates forming collomorphic overgrowths in places.
  - Pyrrhotite, 15%, fine-grained, anhedral, appears to replace pyrite.
  - Amorphous silica, 15%, pale green, felted masses filling open space.

**MINOR MINERALS:**
- **Name, Abundance(%), Included in, Characteristics**
  - Clay, 5%, 200-300 µm, fibrous, in the interstices between pyrite grains, post-dates pale green silica.

**TEXTURAL DESCRIPTION:** Massive, open network of pyrite crystal aggregates partly replaced by fine-grained pyrrhotite and infilled by amorphous silica and clay. Collomorphic pyrite overgrowths give the rock a vertically banded appearance.

**ADDITIONAL COMMENTS:** None.
Pieces 16–20
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 75%, 0.5–2.0 mm, subhedral to euhedral, open network of crystal aggregates forming collomorphic overgrowths in places.
Amorphous silica, 20%, pale green, felted masses filling open space.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Clay, 5%, 200–300 µm, fibrous, in the interstices between pyrite grains, post-dates pale green silica.
Carbonate, 2%, euhedral, clear crystals filling vugs.

TEXTURAL DESCRIPTION: Massive, open network of pyrite crystal aggregates partly infilled by amorphous silica, clay, and carbonate. Collomorphic pyrite overgrowths give the rock a vertically banded appearance.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Pieces 21 and 22
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, 0.5–2.0 mm, subhedral to euhedral, open network of crystal aggregates. This pyrite is partly replaced by finer grained pyrite that forms collomorphic overgrowths in places.
Magnetite, dark gray, 10%, subhedral to euhedral, replaces pyrite.
Amorphous silica, 15%, pale green, felted masses filling open space.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Clay, 5%, 200–300 µm, fibrous, in the interstices between pyrite grains, post-dates pale green silica.
Carbonate, 2%, euhedral, clear crystals filling vugs.

TEXTURAL DESCRIPTION: Massive, open network of pyrite crystal aggregates partly infilled by amorphous silica, clay, and carbonate. Collomorphic pyrite overgrowths give the rock a vertically banded appearance.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Piece 23
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 65%, 0.5–2.0 mm, subhedral to euhedral, open network of crystal aggregates.
Pyrrhotite, 15%, fine-grained, appears to replace pyrite.
Amorphous silica, 15%, pale green, felted masses filling open space.
Clay, 5%, 200–300 µm, euhedral, fibrous masses filling open space.

MINOR MINERALS: None.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite replacing an open network of pyrite crystal aggregates and infilled by amorphous silica.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Piece 24
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 60%, massive, fine-grained, replaces pyrite.
Pyrite, 20%, 0.5–2.0 mm, subhedral to euhedral, open network of crystal aggregates.
Amorphous silica, 20%, pale green, felted masses filling open space.

MINOR MINERALS: None.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite, open network of pyrite crystal aggregates partly replaced by pyrrhotite and infilled by amorphous silica and clay.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.
Piece 1
TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 50%, anhedral, fine-grained, compact, after pyrite.
Pyrite, 30%, 0.5-1.0 mm, subhedral to euhedral, open crystal aggregates.
Silica/smectite, 20%, aphanitic, fills matrix in pyrite network.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, <0.5%, 0.1 mm, anhedral aggregates, associated primarily with pyrrhotite.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite with pyrite.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Piece 2A
TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 75%, anhedral, fine-grained, compact, after pyrite.
Pyrite, 10%, 0.5-1.0 mm, subhedral to euhedral, open crystal aggregates.
Silica/smectite, 15%, aphanitic, fills matrix in pyrrhotite network.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, <0.5%, 0.1 mm, anhedral aggregates, associated primarily with pyrrhotite.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite with pyrite.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Piece 2B
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 80%, 0.5-1.0 mm, subhedral to euhedral, open crystal aggregates infilled with silica/smectite.
Pyrrhotite, 5%, anhedral masses in pyrite, fine-grained.
Silica/smectite, 15%, aphanitic, fills matrix in pyrrhotite network.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, anhedral fine-grained blebs in pyrrhotite/magnetite.

TEXTURAL DESCRIPTION: Massive crystalline pyrite with pyrrhotite.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Piece 3
TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 40%, 0.5-1.0 mm, subhedral to euhedral, open crystal aggregates infilled with silica/smectite and cut by magnetite.
Pyrrhotite, 30%, anhedral masses in pyrite, fine-grained.
Magnetite, 5%, 0.5-1.0 mm, subhedral to euhedral, 0.5-1.0 mm, intermixed with pyrite and as veins cutting pyrite.
Silica/smectite, 20%, aphanitic, fills matrix in pyrrhotite network.
Carbonate, 5%.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, anhedral fine-grained blebs in pyrrhotite/magnetite.

TEXTURAL DESCRIPTION: Massive crystalline pyrite with pyrrhotite and magnetite.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: Thin section.
Pieces 4–6
TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
- Pyrite, 60%, 0.5–1.0 mm, subhedral to euhedral, open crystal aggregates infilled with silica/smectite and cut by magnetite.
- Pyrrhotite, 10%, anhedral masses in pyrite, fine-grained.
- Magnetite, 15%, 0.5–1.0 mm, subhedral to euhedral, 0.5–1.0 mm, intermixed with pyrite and as veins cutting pyrite.
- Silica/smectite, 15%, aphanitic, fills matrix in pyrrhotite network. Also forms a pale green vein cutting sulfides.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics

TEXTURAL DESCRIPTION: Massive crystalline pyrite with pyrrhotite and magnetite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 7–10
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
- Pyrite, 80%, 0.5–1.0 mm, subhedral to euhedral, open crystal aggregates with vugs infilled with silica/smectite.
- Silica/smectite, pale green and white, 15%, aphanitic, fills matrix in pyrite network. Also forms a pale green vein cutting sulfides.
- Magnetite, 5%, 0.5–1.0 mm, subhedral to euhedral, intergrown with pyrite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics

TEXTURAL DESCRIPTION: Massive crystalline colloformic pyrite with magnetite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 11 and 12
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
- Pyrite, 75%, 0.5–1.0 mm, subhedral to euhedral, open crystal aggregates with vugs infilled with silica/smectite.
- Silica/smectite, pale green and white, 15%, aphanitic, fills matrix in pyrite network. Also forms a pale green vein cutting sulfides.
- Magnetite, 10%, 0.5–1.0 mm, subhedral to euhedral, intergrown with pyrite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics

TEXTURAL DESCRIPTION: Massive crystalline colloformic pyrite with magnetite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
Pieces 13–15
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 85%, 0.5–1.0 mm, subhedral to euhedral, open crystal aggregates with vugs infilled with silica/smectite.
Silica/smectite, pale green and white, 15%, aphanitic, fills matrix in pyrite network.
MINOR MINERALS: None.
TEXTURAL DESCRIPTION: Massive crystalline collomorphic pyrite.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Pieces 16–18
TYPE: HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 55%, 0.5–1.0 mm, subhedral to euhedral, open crystal aggregates with vugs infilled with silica/smectite.
Magnetite, 15%.
Silica/smectite, pale green and white, 15%, aphanitic, fills matrix in pyrite network.
Carbonate, 15%, interstitial.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, anhedral fine-grained blebs in pyrite.
TEXTURAL DESCRIPTION:
Massive crystalline collomorphic pyrite.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: Thin section, Piece 17.
**Piece 1**

**TYPE:** HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**

- **Name, Abundance(%), Morphology, Characteristics**
  - Pyrite, 70%, 0.5–1.0 mm, subhedral to euhedral, open crystal aggregates with vugs infilled with silica/smectite. Collomorphic banding.
  - Pyrrhotite, 10%, fine-grained anhedral grains.
  - Magnetite, 10%, subhedral to euhedral, 0.5–1.0 mm, associated with pyrite.
  - Silica/smectite, pale green and white, 10%, aphanitic, fills matrix in pyrite network.

**MINOR MINERALS:**

- **Name, Abundance(%), Included in, Characteristics**
  - Chalcopyrite, anhedral fine-grained blebs in pyrrhotite.

**TEXTURAL DESCRIPTION:** Massive crystalline collomorphic pyrite with pyrrhotite and magnetite.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.

---

**Piece 2**

**TYPE:** HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**

- **Name, Abundance(%), Morphology, Characteristics**
  - Pyrite, 50%, 0.5–1.0 mm, subhedral to euhedral, open crystal aggregates with vugs infilled with silica/smectite. Collomorphic banding.
  - Pyrrhotite, 15%, fine-grained anhedral grains.
  - Magnetite, 10%, subhedral to euhedral, 0.5–1.0 mm, associated with pyrite.
  - Silica/smectite, pale green and white, 10%, aphanitic, fills matrix in pyrite network. Fibrous white clay in vugs.
  - Carbonate, 15%, replaces magnetite.

**MINOR MINERALS:**

- **Name, Abundance(%), Included in, Characteristics**
  - Chalcopyrite, anhedral fine-grained blebs in pyrrhotite.

**TEXTURAL DESCRIPTION:** Massive crystalline collomorphic pyrite with pyrrhotite and magnetite.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.
**Pieces 1–4**

**TYPE:** HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** Yes, see below.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 45%</td>
<td>some idiomorphic cubes 0.2–2.0 mm.</td>
</tr>
<tr>
<td>Magnetite, 5%</td>
<td>interstitial to the pyrite.</td>
</tr>
<tr>
<td>Silicates, 10%</td>
<td>two types, infilling vugs and veinlets.</td>
</tr>
<tr>
<td>Carbonate, 35%</td>
<td>0.2 mm, interstitial to sulfides.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Included in, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sphalerite, &lt;1%</td>
<td>associated with magnetite.</td>
</tr>
<tr>
<td>Pyrrhotite, 0.5%</td>
<td>replaced by pyrite.</td>
</tr>
<tr>
<td>Hematite, 1%</td>
<td>replaces magnetite.</td>
</tr>
<tr>
<td>Marcasite, minor.</td>
<td></td>
</tr>
<tr>
<td>Chalcopyrite, 2%</td>
<td>in blebs with pyrite.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Magnetite and sphalerite form the matrix to the pyrite which shows a range in grain size and morphology from idiomorphic grains to anhedral blebs. The pyrite is vuggy, and in places colloform. Piece 4 shows a contact between the pyrite-magnetite ore and more massive pyrite (ca. 90% pyrite).

**STRUCTURES/VEINS/FRACTURES:** Some small silica veins.

<table>
<thead>
<tr>
<th>Size</th>
<th>0.3 mm wide.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>Crosscuts other minerals.</td>
</tr>
<tr>
<td>Minerals</td>
<td>Dark gray resinous silicate.</td>
</tr>
</tbody>
</table>

**ADDITIONAL COMMENTS:** Silicate minerals as yet unidentified. Sphalerite masked by the black magnetite, possibly greater abundances than apparent in hand specimen. Thin section, Piece 3. See sketch, Piece 3.

**Piece 5**

**TYPE:** MASSIVE COLLOFORM AND VUGGY PYRITE

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 65%</td>
<td>sometimes colloform, anhedral massive.</td>
</tr>
<tr>
<td>Carbonate, 28%</td>
<td>rhombohedral crystals, 0–1.0 mm, white.</td>
</tr>
<tr>
<td>Silicates, 5%</td>
<td>white, non-crystalline, soft, and powdery.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Included in, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amorphous silica, 2%</td>
<td></td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:**

Massive colloform pyrite with interstitial carbonate. Vuggy, some void, otherwise infilled with silica, others have a silica rim and a carbonate core.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.
139-856G-7R-1

Piece 6
TYPES: MASSIVE COLLOFORM AND VUGGY PYRITE and HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: Sharp contact between massive pyrite and massive pyrrhotite. Therefore two different types represented in this piece.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics

PYRRHOTITE PORTION:
- Pyrrhotite-pyrite intergrowth, 60%, fine-grained.
- Silicate/carbonate, 35%.
- Pyrite, 10%.

PYRITE PORTION:
- Pyrite, 60%.
- Silicate/chlorite, 40%.

MINOR MINERALS: None.

TEXTURAL DESCRIPTION: Contact (reaction front) between the fine-grained pyrrhotite rock and the coarse-grained pyrite rock is sharp and delineated by broken colloformic pyrite that is parallel to the contact. Small fragments of massive pyrrhotite and pyrite can also be seen along the contact zone. The rock is vuggy, the size and abundance of the vugs appear to increase down the section. Some vugs are infilled by silicate. The contact between the zones appears to be a reaction front between two sulfide types. The darker side, which contains pyrrhotite, has considerable fine-grained pyrite and hematite.

STRUCTURES/VEINS/FRACTURES: Vein.
- Size 0-1.0 mm wide.
- Orientation Perpendicular to long axis of sample.
- Minerals Silicate.

ADDITIONAL COMMENTS: See sketch for the pyrite-rich phase contact. Thin section.

![Diagram of Piece 6](image-url)

60% Pyrite, 40% hydrosilicate + silica (Mainly infilling vugs)

Vugs include: 70% pyrrhotite
20% silica + hydrosilicate
10% pyrite

Vein 1 mm (not to scale) hydrosilicate

Vuggy Pyrite (Vugs completely infilled) 1 cm

Pyrrhotite, but more vuggy

Sharp contact between massive pyrite and massive pyrrhotite

Pyrite
139-856G-7R-1

Pieces 7 and 8 (Piece 7 contains 6 samples)
TYPES: MASSIVE COLLOFORM AND VUGGY PYRITE
and HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: Between pyrrhotite-rich rock and pyrite-rich rock seen in many samples, as described for Piece 6 of this Section.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
PYRRHOTITE-RICH PORTION:
Pyrrhotite/pyrite intergrowth, 70%, small grains forming massive rock.
Silicate and carbonate, 30%, forming matrix to the pyrrhotite.
PYRITE-RICH PORTION:
Pyrite, 50%, as massive anhedral aggregates.
Pyrrhotite, 5%.
Silica/smectite and carbonate, 25%, in-filling vugs and interstitial to the sulfide.
Sphalerite, 15%, black, hard. Red streak.
Chalcopyrite, 3%.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Barite, ca. 1%, crystalline, rosette morphology.

TEXTURAL DESCRIPTION: Similar to Piece 6, anhedral fine-grained pyrite showing sharp contacts with fine-grained anhedral massive pyrrhotite. Carbonate is interstitial to the sulfide, and silicate/hydrosilicate in-fill vugs.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Thin section, Piece 7.

Piece 9
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: Between vuggy pyrite and massive pyrrhotite.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 50%, massive.
Pyrrhotite, 30%, forming a thick "vein", with hematite(?).
White silicate, 20% infilling vugs.

TEXTURAL DESCRIPTION: Very distinctive texture, large (1 cm) vugs in pyrite form a network like texture and these are infilled by brilliant white silicate.

STRUCTURES/VEINS/FRACTURES: Pyrrhotite may form vein, sample too small to show all of second pyrrhotite/pyrite contact.

ADDITIONAL COMMENTS: None.
139-856G-7R-1

Pieces 10–15
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, as idiomorphic crystals growing in vugs and as fine-grained massive masses.
Silicate and carbonate, 30%.

TEXTURAL DESCRIPTION: Heterogeneous, some samples show delicately laminated colloform texture. All samples are vuggy, locally infilled by white silicate.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

![Diagram of pieces 10-15 showing small and large vugs filled with pyrite and white silicate]

Pieces 16 and 17
TYPES: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE and MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 80%, as medium-grained clasts cemented by hydrosilicate and fine-grained pyrite.
Chalcopyrite, 1%.

MINOR MINERALS:
Magnetite, 2%.
Silicate, 15%.

TEXTURAL DESCRIPTION: Sulfide clasts of many shapes and sizes, mostly slightly rounded, incipiently crustiform. Some clasts are rimmed by black fine-grained pyrite-magnetite.

STRUCTURES/VEINS/FRACTURES: Fractures.
Size 3.0 mm wide.
Orientation Random.
Minerals infilled with crustiform silicate.
ADDITIONAL COMMENTS: None.
139-856G-7R-2

Pieces 1–12
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, colloform banding and crystals, framboids.
Silica and hydrosilicates, 25%, matrix and vug fillings, several generations.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Carbonate/silica, 5%, rhombohedral crystals and rounded concretions. Silica is pseudomorphous after carbonate.

TRACE MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrrhotite, traces.

TEXTURAL DESCRIPTION: Compact banded and boxwork texture.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Network of pyrite, often banded and with vugs infilled with silica, pseudomorphs of pyrite after pyrrhotite hexagonal crystals. Silica is coated with a shiny clay, possibly Mg-chlorite. Thin section, Piece 6.
139-856G-7R-2

Pieces 13–15B
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, colloform with minor crystals, frambooids.
Silica and hydrosilicates, 30%, matrix and vug fillings, green clay (chlorite?).

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrrhotite replaced by pyrite, traces.

TEXTURAL DESCRIPTION: Compact banded and boxwork texture; fair amount of gangue minerals in the matrix.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 16–17, 20
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 60%, colloform aggregates and crystals replacing pyrrhotite, frambooids; also as fine-grained replacement of pyrrhotite.
Silica and hydrosilicates, 10%, matrix and vug fillings, several generations.
Pyrrhotite, 1%, microcrystals. Most replaced by fine-grained pyrite.
Carbonate, 20%, 0.1 mm, in matrix.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Hydrosilicate and carbonate 10%, rhombohedral crystals and rounded concretions.
Sphalerite, 3%, rounded blebs in pyrrhotite.

TEXTURAL DESCRIPTION: Both collomorphic banding and boxwork texture.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 18–19
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 75%, microcrystals and fine-grained bladed to reticulate replacement of pyrrhotite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Hydrosilicate, perhaps silica, 20%, coating the vugs.
Pyrrhotite, 5%, fine-grained, partially replaced by pyrite.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite with less pyrite and gangue.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
**Piece 1**
**TYPE:** HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**
- Name, Abundance(%), Morphology, Characteristics
  - Silicate, 70%, white and gray.
  - Pyrite, 30%.

**MINOR MINERALS:**
- Name, Abundance(%), Included in, Characteristics
  - Fine-grained pyrrhotite, <1%.

**TEXTURAL DESCRIPTION:** Silicate gangue minerals make up much of this sample.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.

---

**Piece 2**
**TYPE:** HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** Two fairly sharp between pyrite-rich and silicate-rich zones.

**MAJOR MINERALS:**
- Name, Abundance(%), Morphology, Characteristics
  - Pyrite 50%, massive granular.
  - Silicate/carbonate 50%, gray minerals are carbonate, gray-white to white minerals possibly silicate.

**MINOR MINERALS:** None.

**TEXTURAL DESCRIPTION:** Vuggy sample, some vugs void, others filled by silicate. Relationship between pyrite-rich and gangue-rich zones difficult to determine in the sample, (?)layering or a fracture fill of gangue minerals.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** See sketch of contacts.

---

**Piece 3**
**TYPE:** HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**
- Name, Abundance(%), Morphology, Characteristics
  - Pyrite, 75%, fine-grained.
  - Magnetite, 10%, very fine-grained.
  - Carbonate, 10%, interstitial, irregularly distributed.

**MINOR MINERALS:**
- Name, Abundance(%), Included in, Characteristics
  - Silicate, 0.5%, interstitial.
  - Pyrrhotite, 5%, residual after replacement by pyrite.

**TRACE MINERALS:**
- Name, Abundance(%), Included in, Characteristic
  - Barite, crystalline, in voids.

**TEXTURAL DESCRIPTION:** Fine-grained aggregate, cut longitudinally by a fracture.

**STRUCTURES/VEINS/FRACTURES:** None.
  - Size 2 mm.
  - Orientation Parallel to the long axis of the sample.
  - Minerals Partially infilled by euhedral pyrite cubes.

**ADDITIONAL COMMENTS:** None.
Pieces 4–7
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, fine-grained aggregate, euhedral cubes in voids.
Carbonate, 23%, interstitial and filling narrow veins.
Sphalerite, 5%, in very fine-grained masses.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Silicate, 1%, interstitial and filling veins.
Chalcopyrite, in the matrix.
Barite, idiomorphic, in voids.

TEXTURAL DESCRIPTION: Fine-grained patchy structure, produced by dominantly pyritic aggregates. The latter are surrounded by anastomosing gangue mineral aggregates. Locally, almost pure pyrite in patches, giving the sample a coarse-crystalline appearance. Small dissolution cavities in gangue mineral aggregates.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: Dendritic pyrite textures in a larger void of Piece 4.
Piece 8
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 75%, fine-grained anhedral and subhedral and more coarse-grained euhedral in voids.
Silicate, 20%, greenish, interstitial, and forming platy crystals in voids.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Carbonate, 0.5%, interstitial.
Sphalerite, 5%, 0.5 mm, colloform banded.

TEXTURAL DESCRIPTION: Fine-grained crystalline sulfide with uneven layering, produced by bands of almost pure pyrite and aggregates of pyrite, magnetite, and silicate, emphasized by dissolution voids.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: See sketch.

Piece 9
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 75%, fine-grained and euhedral in voids.
Amorphous silica, 10%, interstitial and filling veinlets and voids.
Sphalerite, 15%, colloform banded, partially replaced by magnetite?

MINOR MINERALS: None.

TEXTURAL DESCRIPTION: Fine-grained pyrite-magnetite aggregate with narrow silica-filled veinlets and small voids.

STRUCTURES/VEINS/FRACTURES: None.
Size 1.0 mm.
Orientation Irregular.
Minerals White silica.

ADDITIONAL COMMENTS: None.
Piece 10
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 90%, fine-grained.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Silicate, 5%, interstitial, abundance locally increasing in bands.
Sphalerite, 4%, fine-grained.

TEXTURAL DESCRIPTION: Fine-grained pyrite with an uneven band of sphalerite and silicate enrichment in its central part.

ADDITIONAL COMMENTS: None.

Piece 11
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 85%, fine-grained aggregate.
Carbonate, 15%, interstitial.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, locally disseminated in pyrite.
Magnetite, minor.

TEXTURAL DESCRIPTION: Fine-grained sulfide, massive, after pyrrhotite.

ADDITIONAL COMMENTS: Three small pieces.

Pieces 12–14
TYPES: MASSIVE COLLOFORM AND VUGGY PYRITE and HOMOGENEOUS MEDIUM- TO COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: Two zones in sharp contact. A band of pyrite-magnetite-pyrrhotite-sphalerite on one side of sample.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, subhedral, fine to medium-crystalline, massive and intergrown with gangue minerals.
Magnetite, 20%, fine-crystalline, disseminated in pyrite. Larger euhedral crystals in voids.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Silicate, 5%, interstitial and in veinlets.
Carbonate, 5%, mainly in voids.
Chalcopyrite, disseminated in the matrix.
Covellite, coating on chalcopyrite.
Goethite, on the surface of one of the samples.

TEXTURAL DESCRIPTION: Mostly fine-grained pyrite with magnetite. A vertical zone of magnetite and silicate enrichment is on one side of all pieces, bordered by narrow (~5.0 mm) bands of medium-grained euhedral pyrite. Sphalerite occurs in bands, near contact between two parts.

ADDITIONAL COMMENTS: None.
Piece 15
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 80%, fine- and medium-crystalline, subhedral.
Sphalerite, 10%, disseminated in pyrite and comprising thin layers in one part of the piece.
Amorphous silica, 10%, interstitial and in small vugs.

MINOR MINERALS: None.

TEXTURAL DESCRIPTION: Fine- to medium-crystalline pyrite, locally with thin (1.0 mm) uneven sub-horizontal layers of sphalerite, emphasized by distribution of silica and voids.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 16 and 17
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, fine-grained, anhedral to subhedral, larger euhedral crystals in magnetite-enriched zones.
Magnetite, 20%, fine-crystalline, disseminated in pyrite, locally comprising the matrix. Euhedral crystals in voids.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Carbonate, 5%, interstitial and fine crystals in magnetite.
Silicate, 5%, interstitial and in blebs (up to 1 cm).

TEXTURAL DESCRIPTION: Fine-grained massive pyritic ore with patches of magnetite-dominated aggregate and patches of silicate. Elongated pyrite (marcasite?) crystals locally intergrown in magnetite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: See sketch.
Pieces 1–7
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 55%, locally collomorphic.
Silicate and carbonate, 30%, interstitial to the sulfide and infilling vugs.
Sphalerite, 15%, forming thin laminae within pyrite.

MINOR MINERALS: None.

TEXTURAL DESCRIPTION: Some pieces are laminated massive pyrite. The pyrite laminae are commonly collomorphic and locally dark red/black. Sphalerite (?) ±pyrrhotite is interlaminated within the pyrite. Vugs are commonly infilled with white silicate/hydrosilicate, but some are void with perfect pyrite cubes growing on the cavity walls. Carbonate and possibly some silicate form an interstitial matrix to the pyrite. In Piece 7, there is 20% pyrrhote occurring as patches within the pyrite, and this is crosscut by pyrite veins.

Piece 8
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 30%.
Pyrrhotite, 30%.
Magnetite, 25%, cements the pyrite and pyrrhotite in one part of the sample.
Silicates, 12%, infilling vugs and interstitial to the pyrite-pyrrhotite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 3%, within the magnetite matrix.

TEXTURAL DESCRIPTION: Heterogeneous sample, with areas that are more pyritic, and areas cemented by a magnetite and sphalerite matrix. Vuggy, with some silicate infillings, and in some silicate filled vugs, some euhedral magnetite crystals, 0.5 mm wide.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
Pieces 1–4
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 40%, microcrystalline with few hexagonal crystals.
Pyrite, 35%, concretions and crystals.
Carbonate and hydrosilicate 25%, crystals and coatings in vugs.

TRACE MINERALS (<0.1%):
Barite, few crystals in the vugs and as vein filling.

TEXTURAL DESCRIPTION: Compact fine mass of pyrrhotite with pyrite crystals and aggregates.
Carbonate and hydrosilicate fill the vugs and the veins.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Piece 5
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 40% crystals and macroframboids.
Pyrrhotite and magnetite, 25%, microcrystals and aggregates.
Carbonate and silicate, 35%, globular aggregates and matrix.

TEXTURAL DESCRIPTION: Crystals and aggregates of sulfide in a softer matrix of carbonate and silicate.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 6–9
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 35%, microcrystalline with few hexagonal crystals.
Pyrite, 30%, concretions and crystals, chains of macroframboids.
Magnetite, 30%, microcrystals bordering pyrite concretions.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Carbonate and hydrosilicate, 5%, in vugs and veins.

TEXTURAL DESCRIPTION: Micronodules of pyrrhotite lined by magnetite with pyrite concretions interspersed. (See sketch.)

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: See sketch.
139-856H-3R-1

**Pieces 1–2B**
**TYPE:** HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**
<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 40%</td>
<td>0.5-2.0 mm, subhedral to euhedral, open network of crystal aggregates.</td>
</tr>
<tr>
<td>Pyrrhotite, 40%</td>
<td>Massive, fine-grained, replaces pyrite.</td>
</tr>
<tr>
<td>Amorphous silica, 20%</td>
<td>Pale green, felted masses filling open space.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Massive fine-grained pyrrhotite partly replaced by porphyroblastic pyrite and magnetite, and infilled by amorphous silica and clay. Minor carbonate-silicate veining.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.

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**Pieces 3A–6**
**TYPE:** HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**
<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 37%</td>
<td>0.5-2.0 mm, subhedral to euhedral, open network of crystal aggregates, porphyroblastic.</td>
</tr>
<tr>
<td>Pyrite also forms veins with chalcopyrite.</td>
<td></td>
</tr>
<tr>
<td>Pyrrhotite, 30%</td>
<td>Massive, fine-grained, replaces pyrite.</td>
</tr>
<tr>
<td>Magnetite, 15%</td>
<td>Subhedral to euhedral, after iron sulfides.</td>
</tr>
<tr>
<td>Sphalerite, 8%</td>
<td>0.2 mm, with magnetite.</td>
</tr>
<tr>
<td>Amorphous silica, 10%</td>
<td>Pale green, felted masses filling open space.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**
<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Included in, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talc, 1%-2%</td>
<td>Fibrous, euhedral, occurs in the matrix.</td>
</tr>
<tr>
<td>Chalcopyrite, 200-400 µm</td>
<td>Anhedral, occurs in disseminated pyrite and in microveins.</td>
</tr>
<tr>
<td>Pyrrhotite, 3%</td>
<td>Occurs in disseminated pyrite and in microveins.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Massive fine-grained pyrite; pyrrhotite replaced by porphyroblastic pyrite and magnetite, and infilled by amorphous silica and clay. Minor carbonate-silicate veining.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** Thin section, Piece 3B. See sketch, Piece 6 of porphyroblastic pyrite, rimmed by chlorite, all in magnetite.

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**Piece 7**
**TYPE:** HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**
<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 70%</td>
<td>0.5-2.0 mm, subhedral to euhedral, reticulate network of crystal aggregates.</td>
</tr>
<tr>
<td>Amorphous silica, 20%</td>
<td>Pale green, felted masses filling open space.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**
<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Included in, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbonate, 10%</td>
<td>Fine-grained mixture with amorphous silica.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Open network of reticulate pyrite partly infilled by amorphous silica and carbonate.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.
Pieces 8A and 8B
TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 50%, fine-grained, massive, brecciated.  
Pyrite, 18%, 0.5–2.0 mm, subhedral to euhedral, porphyroblastic. 
Magnetite, 12%, subhedral to euhedral, replaces iron sulfides. 
Amorphous silica, 20%, pale green, felted masses filling open space.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 0–1%, 200–300 µm, anhedral, finely disseminated in pyrrhotite.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite with disseminated chalcopyrite, brecciated and partly replaced by porphyroblastic pyrite.

Piece 9
TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 40%, 0.5–2.0 mm, subhedral to euhedral, open network of crystal aggregates, porphyroblastic.  
Magnetite, 10%, subhedral to euhedral, after iron sulfides. Also forms veins with silica cutting pyrite.  
Carbonate, 15%, pale green, felted masses filling open space.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrrhotite, 15%, fine-grained and partially replaced.  
Sphalerite, 8%, 0.5 mm, with magnetite.  
Silica and possible talc, 2%, fibrous, euhedral, occurs in the matrix.  
Chalcopyrite, 4%, 200–400 µm, anhedral, occurs in disseminated pyrite.

TEXTURAL DESCRIPTION: Porphyroblastic pyrite partly altered to and veined by magnetite, with interstices filled by amorphous silica and possibly chlorite.
ADDITIONAL COMMENTS: Thin section.

Pieces 10 and 11
TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, 0.5–2.0 mm, subhedral to euhedral, open network of crystal aggregates, porphyroblastic.  
Magnetite, 15%, subhedral to euhedral, after iron sulfides. Also forms veins with silica cutting pyrite.  
Amorphous silica, 15%, pale green, felted masses filling open space.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 1%, 200–400 µm, anhedral, occurs in disseminated pyrite.

TEXTURAL DESCRIPTION: Porphyroblastic pyrite partly altered to and veined by magnetite, with interstices filled by amorphous silica and possibly chlorite.
139-856H-3R-1

Piece 12

TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
- Pyrite, 70%, 0.5–2.0 mm, subhedral to euhedral, open network of crystal aggregates, reticulate network. Pyrite also occurs as veins cutting reticulate pyrite.
- Magnetite, 10%, subhedral to euhedral, after iron sulfides. Also forms veins with silica cutting pyrite. Amorphous silica, 20%, pale green, felted masses filling open space.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
- Chalcopyrite, <1%, 0–400 μm, anhedral, occurs in disseminated pyrite.

TEXTURAL DESCRIPTION: Reticulate pyrite partly altered to and veined by magnetite, with interstices filled by amorphous silica and possibly talc.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
139-856H-3R-2

Pieces 1A–4B

**TYPE:** HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**
- Name, Abundance(%), Morphology, Characteristics
  - Pyrite, 50%, crystals and concretions of various sizes.
  - Pyrrhotite, 20%, micrite in nodules.
  - Magnetite, 20%, microcrystals in bands around sulfide concretions.

**MINOR MINERALS:**
- Name, Abundance(%), Included in, Characteristics
  - Carbonate, 10%, in vuggy porosity.

**TEXTURAL DESCRIPTION:** Three types of textures: (1) pyrrhotite concretions with less pyrite, coated by magnetite; (2) pyrite concretions, coated by magnetite; (3) pyrite-magnetite skeletal intergrowths.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** Thin section, Piece 1E.
139-856H-3R-3

Pieces 1–10

TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:

<table>
<thead>
<tr>
<th>Name, Abundance(%), Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 35%, fine-grained, globular distribution.</td>
</tr>
<tr>
<td>Pyrrhotite, 30%, fine-grained massive aggregates around pyrite.</td>
</tr>
<tr>
<td>Magnetite, 20%, well crystalline 0.1 mm crystals, matrix to the pyrite, pyrrhotite and sphalerite.</td>
</tr>
</tbody>
</table>

MINOR MINERALS:

<table>
<thead>
<tr>
<th>Name, Abundance(%), Included in, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbonate (effervesces with 50% HCl), 5%, interstitial to the sulfide and in veins.</td>
</tr>
<tr>
<td>Silicate, 5%, interstitial to the sulfide.</td>
</tr>
<tr>
<td>Sphalerite at least 2%, but difficult to see.</td>
</tr>
</tbody>
</table>

TEXTURAL DESCRIPTION: Veined and vuggy lithology. The veins crosscut the sulfide and oxide, and are therefore younger. The pyrite is globular; pyrite-pyrrhotite intergrowths form a dendritic texture.

STRUCTURES/VEINS/FRACTURES:

Size 0.5 mm wide.
Orientation Network texture or random.
Minerals Zoned infilling; crustiform, from rim to center magnetite and sphalerite, then pyrite and lastly calcite. These veins locally offset the host rock fabrics by a small amount (~0.1–0.5 mm.).

ADDITIONAL COMMENTS: None.

Pieces 11 and 12

TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:

<table>
<thead>
<tr>
<th>Name, Abundance(%), Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrite, 55%, subhedral to anhedral, apparently replacing pyrrhotite (40%) and as later euhedra (15%).</td>
</tr>
<tr>
<td>Minor pyrite veining.</td>
</tr>
<tr>
<td>Sphalerite, 10%, interstitial, some as discontinuous veins, sphalerite is intergrown with magnetite, possibly with hematite.</td>
</tr>
<tr>
<td>Chlorite, 20%, with amorphous silica.</td>
</tr>
</tbody>
</table>

MINOR MINERALS:

<table>
<thead>
<tr>
<th>Name, Abundance(%), Included in, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalcopyrite, 1%, anhedral and cut by magnetite-hematite veins.</td>
</tr>
<tr>
<td>Pyrrhotite, 5%, fine-grained anhedral.</td>
</tr>
<tr>
<td>Magnetite, 5%, fine-grained octahedra.</td>
</tr>
<tr>
<td>Carbonate, 5%, late vug filling.</td>
</tr>
<tr>
<td>White amorphous silica gel, 2%.</td>
</tr>
</tbody>
</table>

TRACE MINERALS (<0.1%): None.

TEXTURAL DESCRIPTION: None.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
Pieces 1–3
TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 60%, 0.5–2.0 mm, subhedral to euhedral, open network of crystal aggregates.
Magnetite, 20%, 0.5 to 1.0 mm, subhedral to euhedral, replaces pyrite.
Amorphous silica, 10%, pale green, felted masses filling open space. Also occurs as white vuggy silica veins.
Sphalerite, 3%, anhedral to subhedral, finely intermixed with magnetite.

MINOR MINERALS:
Name, Abundance (%), Included in, Characteristics
Talc, 5%, fibrous masses partly infilling open spaces.

TEXTURAL DESCRIPTION: Open vuggy network of crystalline pyrite.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Pieces 4A–6
TYPE: SEDIMENT WITH SULFIDE VEINING

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology,
Talcose sediment, 50%, cut by pyrite-pyrrhotite-magnetite veins.
Pyrite, 25%, 0.5–2.0 mm, subhedral to euhedral, open network of crystal aggregates filling vein.
Sphalerite, 10%, 0.2–2 mm, anhedral.
Pyrrhotite, 10%, fine-grained, associated with pyrite and magnetite in vein.
Magnetite, 5%, 0.5 to 1.0 mm, subhedral to euhedral, replaces pyrite in vein.

MINOR MINERALS: None.

TEXTURAL DESCRIPTION: Veins of pyrite, pyrrhotite, and magnetite cutting hydrothermally altered claystone.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: See sketches for Pieces 4 and 5.
SITE 856

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Pieces 7–9
TYPE: SEDIMENT WITH SULFIDE VEINING

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Talcose sediment, 40%, cut by pyrite-pyrrhotite-magnetite veins.
Pyrite, 20%, 0.5–2.0 mm, subhedral to euhedral, open network of crystal aggregates filling massive vein.
Magnetite, 10%, 0.5 to 1.0 mm, subhedral to euhedral, replaces pyrite in vein.
Pyrrhotite, 15%, fine-grained, associated with pyrite and magnetite in vein.
Sphalene, 5%, fine-grained, with pyrrhotite and pyrite-magnetite in veins.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Carbonate, 4%, 1 mm rhombohedral crystals lining vugs and veins.
Chalcopyrite, 1%, fine-grained, anhedral, associated with magnetite in veins. Also occurs as blebs in talc-altered claystone.

TEXTUAL DESCRIPTION: Massive veins of pyrite, pyrrhotite, and magnetite cutting hydrothermally altered claystone.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Thin section, Piece 9; see sketch, Piece 7.

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Pieces 10–12
TYPE: SEDIMENT WITH SULFIDE VEINING

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Silicified sediment, 80%, cut by pyrrhotite veins with disseminated chalcopyrite.
Pyrrhotite, 15%, fine-grained, forms veins cutting silicified sediment.
Pyrite, 1% subhedral to euhedral, crystalline network in veins.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalene, 2%, in veins with pyrrhotite.
Magnetite, 1%, subhedral to euhedral, associated with pyrrhotite and pyrite in some veins.
Chalcopyrite, 1%, anhedral blebs in pyrrhotite and as veinlets cutting altered sediment.

TEXTUAL DESCRIPTION: Veins of pyrrhotite, sphalene, and magnetite with chalcopyrite cutting hydrothermally altered claystone.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
Pieces 13 and 14

TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Silicified sediment, 30%, cut by pyrrhotite-pyrite-magnetite veins with disseminated chalcopyrite.
Pyrrhotite, 25%, fine-grained, forms veins cutting silicified sediment.
Pyrite, 20%, 0.5-2.0 mm, subhedral to euhedral, crystalline network in veins.
Sphalerite, 10%, subhedral to euhedral, with iron sulfides in vein.
Magnetite, 8%, with pyrite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 2%, anhedral blebs in pyrrhotite and occurs as veinlets cutting altered sediment.
Carbonate, 3% euhedral, filling vugs.

TEXTURAL DESCRIPTION:
Massive crystalline network of pyrite, pyrrhotite, sphalerite, magnetite, and chalcopyrite with a talcose matrix consisting of altered sediment. Chalcopyrite also forms small veinlets cutting magnetite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

---

Piece 14

Py, Po, Mt

Sediment

Mt and Qtz Vein
Pieces 15–17

TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 50%, 0.1 to 2 mm, highly variable, some euhedral, lath-shaped crystals.
Pyrite, 30%, massive.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 8%, 0.5 mm, with chalcopyrite and pyrite-magnetite.
Chalcopyrite, 2%, anhedral blebs in pyrrhotite and occurs as veinlets cutting altered sediment.
Carbonate and/or silica, 10%.

TEXTURAL DESCRIPTION:
Interpenetrating laths of pyrrhotite with all other minerals interstitial.

STRUCTURES/VEINS/FRACTURES: More sphalerite in Piece 17.

ADDITIONAL COMMENTS: Thin section, Piece 15.
139-856H-4R-2

Piece 1
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 50%, small crystals.
Pyrite, 40%, intergrowths with magnetite.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Magnetite, 5%.
Carbonates, 5%.
TEXTURAL DESCRIPTION: Intergrowths of magnetite-pyrite.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Pieces 2–10
TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 65%, macrocrystalline, replaces and cuts pyrrhotite.
Sphalerite, 10%, 0.3–0.5 mm, intergrown with magnetite.
Magnetite, 7%, macrocrystalline, in bands around pyrrhotite nodules.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 5%, usually as inclusions in pyrite or with magnetite or sphalerite.
Pyrrhotite, 2%, mostly replaced by pyrite.
Hydrosilicate and carbonate, 10%, in vugs and veins.
TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
TEXTURAL DESCRIPTION: Intergrowths of pyrrhotite-pyrite with the latter replacing the former; magnetite banding around pyrrhotite nodules.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS:
Secondary rock-type in Piece 8 is homogeneous massive fine-grained pyrrhotite; forms fragments.
Thin section of Piece 2. See sketch, Piece 9.
Pieces 11–13
TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 65%, intergrowths with magnetite and in macrocrystals along vugs.
Magnetite, 20%, small crystals in bands and around pyrrhotite concentrations.
Pyrrhotite, 15%, small crystals in bands and around pyrrhotite concentrations.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 3%.
Hydrosilicate and carbonates, variable up to 10%.

TEXTURAL DESCRIPTION: Reticulate texture of pyrite-magnetite, with pyrrhotite replaced by pyrite; interstices filled with hydrosilicate and carbonate.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Pieces 14–16
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 75%, 0.1–0.3 mm.
Magnetite, 15%, small crystals in bands and around pyrrhotite concentrations.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, up to 3%.
Hydrosilicate and carbonates, variable up to 7%.

TEXTURAL DESCRIPTION: Reticulate texture of pyrite-magnetite, with pyrrhotite replaced by pyrite; interstices filled with hydrosilicate and carbonate.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Thin section, Piece 15.

Pieces 17 and 19
TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 45%, 0.1–0.3 mm, replacing pyrrhotite.
Pyrrhotite, 25%, 0.1–0.3 mm.
Magnetite, 20%, 0.2–0.5 mm.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 2%.
Hydrosilicate and carbonate, variable up to 8%.

TEXTURAL DESCRIPTION: Reticulate texture of pyrite-magnetite, with pyrrhotite replaced by pyrite; interstices filled with hydrosilicate and carbonate.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Pieces 18, 20–22
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 90%, fine-grained, locally increasing to coarse-grained.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Carbonate and silicate, 10%.

TEXTURAL DESCRIPTION: Pyrrhotite mudstone with few vugs.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.
 PIECES 1–3

TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:

- Name, Abundance(%), Morphology, Characteristics
  - Pyrrhotite, 45%, in places coarse-grained (0.5 mm) platy crystals.
  - Pyrite 30%, as patches within the pyrrhotite.
  - Magnetite, 15%, interstitial to the pyrrhotite and pyrite, fine-grained.
  - Carbonate and silicate (some chlorite?), 8%.

MINOR MINERALS:

- Name, Abundance(%), Included in, Characteristics
  - Chalcopyrite, 3%, anhedral aggregates and grains within iron sulfide.

TEXTURAL DESCRIPTION:
The interlocking crystal network of coarse-grained pyrrhotite, pyrite, and magnetite. Low percentage of silicate and carbonate within the sulfide, much less than in some previous samples from Hole 856G. Some veins infilled by green silicate mineral (chlorite(?)), which contains disseminated sulfide and magnetite. These veins cut massive sulfide.

STRUCTURES/VEINS/FRACTURES: Silicate veins.

- Size 5.0 mm wide.
- Orientation random.
- Minerals Chlorite(?), some carbonate and disseminated iron sulfide and oxide.

ADDITIONAL COMMENTS: None.

PIECE 4

TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: Between coarse- and fine-grained pyrrhotite.

MAJOR MINERALS:

- Name, Abundance(%), Morphology, Characteristics
  - Pyrrhotite, 80%, fine-grained massive aggregate, and coarse-grained (0.5–1.0 mm).
  - Pyrite, 15%, fine-grained, massive, within the pyrrhotite.

MINOR MINERALS:

- Name, Abundance(%), Included in, Characteristics
  - Chalcopyrite, 3%, within the iron sulfides.
  - Silicates, 2%.

TEXTURAL DESCRIPTION: There is a sharp contact between the coarsely crystalline pyrrhotite and fine-grained pyrrhotite. Possibly this represents two separate hydrothermal events?

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
Piece 1

TYPE: SEDIMENT WITH SULFIDE VEINING

CONTACTS: None.

MAJOR MINERALS:
- **Name, Abundance(%), Morphology, Characteristics**
  - Quartz, 30%, recrystallized (?) and dihedral.
  - Mica, 10%.
  - Clay, 60%.

MINOR MINERALS:
- **Name, Abundance(%), Included in, Characteristics**
  - Pyrrhotite, 0.5%, mudstone, fine-grained blebs and disseminations.
  - Carbonate, 0.1%, mudstone, does not react with 10% HCl.

TRACE MINERALS (<0.1%):
- **Name, Abundance(%), Included in, Characteristics**

TEXTURAL DESCRIPTION:
Fine-grained, well indurated interlayer of mudstone, cut by 0.1 mm vein of sulfide. "Slump" feature (irregular bedding contact). Weathering rind surrounds half the sample. Sulfide disseminated through much of sample.

STRUCTURES/VEINS/FRACTURES:
- **Size**: 0.1 mm.
- **Orientation**: Perpendicular to long axis of sample.
- **Minerals**: Pyrrhotite.

ADDITIONAL COMMENTS:
Some discrete sulfide blebs, 2.0–5.0 mm in diameter, scattered on cut surface. Weathering rind is 2.0–3.0 mm wide, white, indurated.

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Piece 2

TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
- **Name, Abundance(%), Morphology, Characteristics**
  - Pyrrhotite, 65%, large subhedral crystals, tabular, 3.0–5.0 mm.
  - Pyrite, 15%, elongate "porphyritic" grains, 8.0–10.0 mm, randomly distributed.
  - Green clay/smectite, 10%, very fine-grained, irregularly distributed.

MINOR MINERALS:
- **Name, Abundance(%), Included in, Characteristics**
  - Carbonate, 5%, vugs and matrix, euhedral, open space filling crystal.
  - Magnetite, 1%.
  - Chalcopyrite, 3%, anhedral masses, 2.0–5.0 mm.

TEXTURAL DESCRIPTION:
Very coarse-grained equigranular aggregate of tabular pyrrhotite and euhedral, subhedral to anhedral pyrite. Magnetite and clay/smectite from matrix and veins.

STRUCTURES/VEINS/FRACTURES:
- **Size**: 2.0 mm.
- **Orientation**: Irregular, crosses sample.
- **Minerals**: Filled with white and gray mineral.

ADDITIONAL COMMENTS: None.
139-856H-5R-1

Piece 3
TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 45%, 3.0–5.0 mm, irregular masses.
Pyrite, 38%, 1.0–2.0 mm, large aggregate, vermicular, 5.0–8.0 mm.
Carbonate, 5%, 0.5 mm, interstitial.
Chlorite/amphibole, 5%, <0.1 mm, interstitial.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 3%, pyrrhotite and fractures, 2.0–5.0 mm blebs.
Magnetite, 2%.
Chalcopyrite, <0.1%, intergrown with magnetite and interstitial to pyrrhotite-pyrite.

TEXTURAL DESCRIPTION: Coarse-grained equigranular, with large tabular crystal of pyrrhotite, equant grains of pyrite that form vermicular aggregates.

STRUCTURES/VEINS/FRACTURES: Vein 0.8–1.0 cm wide across width of sample, contains three minerals: (1) white to light green crystalline carbonate, (2) clear, gray anhedral mineral (barite?), (3) medium to dark green aphanitic mineral in discrete patches (chlorite?).

ADDITIONAL COMMENTS: Thin section.

Pieces 4 and 5
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 80%, 1.0 mm, anhedral mass.
Amorphous silica, 15%, aphanitic, interstitial to sulfide.
Pyrite, 5%, 2.0 mm, subhedral aggregates, evenly distributed in piece.

TEXTURAL DESCRIPTION: Anhedral mass of pyrrhotite, with interstitial amorphous silica, pyrite porphyroblastic, evenly distributed.

STRUCTURES/VEINS/FRACTURES: (1) 2.0 mm wide, parallel to core axis, filled with fine-grained magnetite, (2) zone of recrystallized sulfide and magnetite.

ADDITIONAL COMMENTS: None.
Piece 6
TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 85%, 1.0 mm, anhedral mass.
Pyrite, 5%, 1.5 mm, subhedral discrete aggregates.
Amorphous silica, 10%, aphanitic, interstitial and vein filling.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Magnetite, 2%, 0.2 mm, veins and interstitial to sulfide.
Sphalerite, <0.2%, in amorphous silica vein at end of largest piece.

TEXTURAL DESCRIPTION: Massive, medium-grained, homogeneous to slightly porphyroblastic.
STRUCTURES/VEINS/FRACTURES: 2.0–3.0 mm wide, at end of largest sample, contains amorphous silica, possible carbonate, about 5% sphalerite and 10% pyrite grains.
ADDITIONAL COMMENTS: None.

Piece 7
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 95%, 1.0–2.0 mm, anhedral to bladed.
Pyrite, 2%, 1.0–2.0 mm, porphyroblastic.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, ~0.5%, interstitial to pyrrhotite, as dissemination in amorphous silica.
Magnetite, ~0.5%, veinlets and interstitial; also occurs in the center of amorphous silica mass.

TEXTURAL DESCRIPTION: Massive, anhedral to subhedral aggregate of pyrrhotite with rare pyrite porphyroblasts, magnetite generally surrounded by amorphous silica.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Piece 8
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 60%, 2.0–3.0 mm, anhedral mass, equigranular.
Magnetite/hematite, 30%, 0.1–0.2 mm, fine-grained, replacement of pyrrhotite.
Pyrite, 5%, rare, subhedral grain and aggregates.
Silica and other minerals, 5%, interstitial to sulfide.

TEXTURAL DESCRIPTION: Massive, with patches (irregular, 1.0–1.5 cm wide) of partially replaced (magnetite/hematite) pyrrhotite. Silicate occurs as a bleb (0.5x1.0 cm) and interstitial to pyrrhotite.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.
Piece 9
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 80%, laths, forms reticulate texture as aggregates of pyrrhotite. Also anhedral masses of pyrrhotite.
Magnetite, 15%, replacing pyrrhotite, plus euhedral to subhedral grains in vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrite, 2%, included in pyrrhotite, local porphyroblasts.
Silicate, 2%, vugs and interstitial.

TEXTURAL DESCRIPTION: Reticulate texture defined by randomly oriented laths of pyrrhotite. Vugs usually void, lined with silica, contain magnetite crystals (2.0 mm).

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: See sketch.
Pieces 1–5
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 85%, 0.2–4.0 mm, interpenetrating hexagonal plates.
Pyrite, 10%, 1.0–4.0 mm, cubic, porphyroblastic.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sulfate, (greenish), 2%, overgrows pyrrhotite, semi-translucent, light greenish blue, some botryoidal.
Amorphous silica, 2%, botryoidal spherical aggregates.
Barite, <1%, euhedral tubular crystals.
TEXTURAL DESCRIPTION: Porous due to interpenetrating pyrrhotite platelets.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: Typically of material dredged and cored at Middle Valley before Leg 139.

Piece 6
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 65%, 0.2–8.0 mm, blades on one side of sample, compact in mass on the other.
Pyrite, 25%, some as 1.0–3.0 mm porphyroblastic cubes, most as fine replacement of pyrrhotite, especially in fine-grained pyrrhotite.
Hematite, 10%, replacing pyrrhotite, mostly in fine-grained areas.
TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Magnetite, in hematite-rich areas.
TEXTURAL DESCRIPTION: None.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Pieces 7A and 7B
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 55% (Piece 7A), bladed, 0.1–1.0 mm, 50% (Piece 7B), compact, fine-grained.
Pyrite, 25% (Piece 7A), as coarse cubes or replacing pyrrhotite blades; 30% (Piece 7B), replacing fine pyrrhotite.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Hematite, 5% (Piece 7A), 10% (Piece 7B), replacing pyrrhotite-pyrite.
Chlorite(?), 10%, interstitial, dark green silicate.
TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Barite, euhedral plates.
TEXTURAL DESCRIPTION: None.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.
Piece 8
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 50%, fine compact masses, fine blades.
Pyrite, 20%, replacing fine bladed pyrrhotite.
Hematite, 20%, diffuse replacement of pyrite and pyrrhotite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrite, 50%, fine compact masses, fine blades.
Pyrrhotite, 20%, replacing fine bladed pyrrhotite.
Hematite, 20%, diffuse replacement of pyrite and pyrrhotite.

TEXTURAL DESCRIPTION: Bladed pyrrhotite replaced by pyrite.

ADDITIONAL COMMENTS: None.

Piece 9
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 65%, compact fine-grained, massive.
Pyrite, 15%, 5% as coarse pyrite cubes and 10% as replacement of pyrrhotite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Hematite, 10%, replacing pyrite-pyrrhotite, especially in pyrite-rich areas.
Chlorite(?), 10%, interstitial.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Fe-sulfate(?), minor green alteration product.

TEXTURAL DESCRIPTION: None.

ADDITIONAL COMMENTS: None.

Piece 10
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 30%, fine-bladed.
Pyrite, 50%, replacing pyrrhotite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Hematite, 15%, silvery replacement and overgrowth of pyrite and pyrrhotite.
Magnetite, 2%, euhedral crystals and fine black mass.
Silicate, 5%, dark to light green.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, some small patches in a few samples.

TEXTURAL DESCRIPTION: None.

ADDITIONAL COMMENTS: None.
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Pieces 11 and 12
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 70%, 0.1–1.0 mm, fine-bladed.
Pyrite, 15%, 0.5–3 mm, porphyroblastic cubes.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Hematite, 10%, not uniformly distributed in crosscutting zones replacing pyrrhotite.
Magnetite, 5%, as octahedra and fine black masses.

TEXTURAL DESCRIPTION: Interpenetrating bladed pyrrhotite with interstitial chlorite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Less pyrite replacement of pyrrhotite than pieces above.
Pieces 1 and 2
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 80%, 0.5-3.0 mm, fine- to medium-grained, intergrown with pyrrhotite, locally porphyroblastic.
Pyrrhotite, 20%, 0.1-1.0 mm, fine-bladed.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Green clay mineral, 10%, soft.

TEXTURAL DESCRIPTION: Interpenetrating bladed pyrrhotite with interstitial chlorite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 3 and 4
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite/pyrrhotite intergrowth, 90%, fine-grained.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Green clay mineral, 10%, soft.

TEXTURAL DESCRIPTION: Dense fine-grained intergrowth with small amount of cavities.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Piece 5
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite-pyrrhotite intergrowth, 95%, fine-grained.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrite, 5%, coarse-grained, idiomorphic.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Green clay mineral, soft.

TEXTURAL DESCRIPTION: Dense pyrite-pyrrhotite intergrowth with some idiomorphic pyrite on the cavity walls.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
Piece 6
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite-pyrrhotite intergrowth, 95%, fine-grained.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Clay mineral, 5%, botryoidal.

TEXTURAL DESCRIPTION: Dense pyrite-pyrrhotite intergrowth with some cavities. The cavity walls are covered with botryoidal clay mineral.

ADDITIONAL COMMENTS: None.

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Piece 7
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite-pyrrhotite intergrowth, 90%, fine-grained.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Greenish clay mineral, 10%, soft.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Pyrite, <0.1%, idiomorphic, coarse-grained.

TEXTURAL DESCRIPTION: Fine-grained intergrowth of pyrite-pyrrhotite with scarce cavities filled with greenish clay. Coarse-grained idiomorphic pyrite scattered in groundmass.

ADDITIONAL COMMENTS: Thin section.

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Piece 8
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite-pyrrhotite intergrowth, 95%, fine-grained matrix with cavities.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Green clay mineral (Fe-smectite?), 5%.

TEXTURAL DESCRIPTION: Fine-grained matrix with cavities. Walls of cavities covered with botryoidal clay mineral growth.

ADDITIONAL COMMENTS: None.
Pieces 9 and 10
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite-pyrrhotite intergrowth, 95%, fine-grained.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Amorphous silica, 5%, botryoidal.

TEXTURAL DESCRIPTION: Dense pyrite-pyrrhotite intergrowth with some cavities which are partly filled with botryoidal amorphous silica.
STRUCTURES/VEINS/FRACTURES: Cavities are most abundant in one porous zone.
ADDITIONAL COMMENTS: None.

Piece 11
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite-pyrrhotite intergrowth, 100%, fine-grained.

TEXTURAL DESCRIPTION: Dense pyrite-pyrrhotite intergrowth, almost no cavities.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Piece 12
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite-pyrrhotite intergrowth, 95%, fine-grained.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Amorphous silica, 5%, botryoidal.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Chalcopyrite.

TEXTURAL DESCRIPTION: Pyrite-pyrrhotite intergrowth, interpore areas filled with amorphous silica.
STRUCTURES/VEINS/FRACTURES: Pores most abundant in one part of sample.
ADDITIONAL COMMENTS: None.

Piece 13
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite-pyrrhotite intergrowth, 85%, fine-grained.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Amorphous silica, 10%.
Botryoidal clay mineral, 5%, fine-grained.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Pyrite, idiomorphic.

TEXTURAL DESCRIPTION: Matrix of fine-grained pyrite-pyrrhotite intergrowth. Idiomorphic pyrite form a few reticulate lamellae. Silica and clay mineral fill the interstices.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.
Pieces 14 and 15
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite-pyrrhotite intergrowth, 99%, fine-grained.
TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Amorphous silica, <0.1%, clay mineral.
TEXTURAL DESCRIPTION: Matrix of fine-grained pyrite-pyrrhotite intergrowth. In cavities amorphous silica and clay mineral.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Piece 16
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite-pyrrhotite intergrowth, 80%, fine-grained.
MINOR MINERALS
Name, Abundance(%), Included in, Characteristics
Magnetite, 20%, coarse-grained, idiomorphic.
TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Clay mineral, <0.1%.
TEXTURAL DESCRIPTION: Fine-grained matrix of pyrite-pyrrhotite intergrowth. Large magnetite crystals are scattered in this matrix.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Piece 17
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite-pyrrhotite intergrowth, 95%, fine-grained.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Amorphous silica, 5%.
TEXTURAL DESCRIPTION: Matrix of fine-grained pyrite-pyrrhotite intergrowth, interstices filled with clay mineral and amorphous silica.
STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.
Piece 1
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, fine-grained.
Silicate, 20%, interstitial.
Magnetite, 10%, crystalline in pyrite matrix and in voids.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Amorphous silica, 0.5%, included in voids, spherules.
Hematite, 1%, in voids, plated crystals.

TEXTURAL DESCRIPTION: Very fine-grained, with few small voids (up to 1.0 mm), three smaller pieces with patches of silicate (up to 5.0 mm) on surfaces.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Five small angular pieces.

Piece 2
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 85%, fine-grained, matrix and bladed crystals.
Pyrite, 10%, up to 1.0 mm, idiomorphic crystals in pyrrhotite matrix.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Silicate, 5%, interstitial.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Carbonate, 0.05%, in voids, translucent crystals.

TEXTURAL DESCRIPTION: Fine-grained massive sulfide with disseminated pyrite crystals; silicate in interstices in small patches.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Piece 3
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 50%, very thin, in anhedral masses.
Pyrrhotite, 20%, very fine-grained, in anhedral masses.
Sphalerite, 20%, subhedral, rimming pyrite masses.
Magnetite, 10%, subhedral, rimming pyrite masses.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Hematite, 0.2%, in matrix, bladed crystals.
Silicate, 0.5%, interstitial.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Carbonate, in voids, transparent crystals.

TEXTURAL DESCRIPTION: Extremely fine-grained outer part (pyrite, sphalerite, and magnetite intergrowth). Pyrrhotite dominating in the inner part slightly larger crystals, intergrowing with pyrite, sphalerite, and magnetite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Rounded piece.
139-856H-8R-1

Pieces 4 and 5
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRTE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 50%, anhedral masses and separate small euhedral crystals (another generation).
Pyrrhotite, 20%, in anhedral masses.
Sphalerite, 10%, subhedral.
Magnetite, 10%, subhedral.
Silicate, 10%, interstitial.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Carbonate, 1%, matrix, and as transparent crystals in voids. Unknown white mineral, in veinlets.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Amorphous silica, in voids, spherules in vein of Piece 5.

TEXTURAL DESCRIPTION: Fine-grained, with traces of collomorphic structure, produced by nonuniform distribution of pyrrhotite in Piece 4.

STRUCTURES/VEINS/FRACTURES: On one side of Piece 5, part of vein is filled mostly with silicate with euhedral pyrite.

ADDITIONAL COMMENTS: Four pieces, rounded during drilling. Thin section, Piece 5.

Piece 6A
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRTTE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 50%, anhedral mass and few cubic pyrites in silicate mass.
Pyrite, 25%, anhedral mass and few cubic pyrites in silicate mass.
Silicate, 20%, interstitial.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 5%, in matrix and silicate, subhedral.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Carbonate, in voids, white crystalline aggregates.

TEXTURAL DESCRIPTION: Very fine-grained sulfide with traces of collomorphic structure.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Piece 6B
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRTE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 80%, subhedral, aggregates.
Silicate, 20%, interstitial.

TEXTURAL DESCRIPTION: Fine- to medium-grained subhedral pyrite with silicate in interstices. Silicate dominating in small patches.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
Pieces 7 and 8
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 55%, in a single fine-grained mass. Euhedral crystals of pyrite in silicate and in voids.
Pyrrhotite, 20%, anhedral.
Sphalerite, 10%, anhedral.
Magnetite 10%, euhedral crystals in silicates and in voids.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Silicate, 5%, in matrix, interstitial.
TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Amorphous silica, in voids, transparent spherules.
Carbonate, in voids, rhombic crystals.

TEXTURAL DESCRIPTION: Very fine-grained massive sulfide, with vague patchy structures due to uneven distribution of pyrite and pyrrhotite.

STRUCTURES/VEINS/FRACTURES: Zones of silicate enrichment with chain of small voids and euhedral pyrite on the side of one piece.
ADDITIONAL COMMENTS: None.

Piece 9
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 90%, fine-grained, subhedral.
White silicate, 10%, interstitial.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 1%, fine-grained, only in small patches.
TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Amorphous silica, in voids, transparent spherules.
Carbonate, in voids, rhombic crystals.

TEXTURAL DESCRIPTION: Massive, fine crystalline pyrite with patches (~5.0 mm) of sphalerite enrichment, silicate in interstices.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: Very fine-grained pyrite of brighter color (marcasite?) overgrowing some pyrite grains in contact with silicate.

Pieces 10–15
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 85%, fine crystalline masses and intergrown with silica gel. Idiomorphic cubes in voids and in silica.
Silica gel, 10%, interstitial, in some pieces, soft.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Sphalerite, 3%, thin uneven bands, anhedral.
TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Hematite, in silica, fine, plated.

TEXTURAL DESCRIPTION: Fine-grained pyrite aggregate, massive in places with intergrowth structures of silica gel, pyrite crystals in voids.

STRUCTURES/VEINS/FRACTURES: In some pieces (e.g., Piece 14), uneven layering revealed by thin (1.0–2.0 mm) sphalerite bands, chains of voids. See sketch.
ADDITIONAL COMMENTS: Thin section, Piece 11.
Pieces 16 and 17
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 85%, anhedral, fine-grained masses, fine intergrowth with silicates, euhedral crystals coating voids.
Sphalerite, 10%, crystallinity not apparent.
MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Silica, 5%, interstitial, soapy, soft.
TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Carbonate, in void, white milky crystals cover a small void.
TEXTURAL DESCRIPTION: Local sub-concentric microtextures (collomorphic) of sphalerite surrounding pyrite and surrounded by voids.
STRUCTURES/VEINS/FRACTURES: Subhorizontal, uneven bands of mainly sphalerite.
ADDITIONAL COMMENTS: See sketches, Piece 17.

Pieces 18 and 19
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.
MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, subhedral, fine-grained, intergrown with sphalerite and silica and anhedral. Euhedral in vugs.
Sphalerite, 20%, anhedral.
Silica, 10%, interstitial, in veinlets.
TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Barite, thin platy crystals in silica mass.
Magnetite, in voids, idiomorphic crystals.
TEXTURAL DESCRIPTION: Thin, equigranular pyrite ore with anhedral sphalerite in patches, silica interstices.
STRUCTURES/VEINS/FRACTURES: Very thin veinlets of silica, of different orientation (up to 1.0 mm thick).
ADDITIONAL COMMENTS: Patch of relative enrichment of sphalerite, with gradational boundaries in Piece 18, about 5 cm in diameter. See sketch, Piece 18.
139-856H-9R-1

Piece 1
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 70%, fine-grained, mostly fine-scale mesh network texture, only minor cubic crystals, local colloform banding.
Silicate, 30%, white to light green, interstitial to pyrite.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Magnetite, trace, octahedral grains.

TEXTURAL DESCRIPTION: None.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 2-5
TYPE: HETEROGENEOUS AND VEINED COARSE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 60%, 1.0-5.0 mm porphyroblastic cubes, other as fine porous replacement of pyrrhotite.
Pyrrhotite, 20%, compact masses, locally highly replaced by pyrite-magnetite.
Magnetite, 3%, 0.1-1.0 mm octahedra, usually in pyrrhotite.
Hematite, possibly as much as 7%, can not be estimated accurately due to the fine grain size.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Silicate, 10%, white, very fine to aphanitic, interstitial to sulfide.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Carbonate.
Barite, more abundant than carbonate, both as vug filling.

TEXTURAL DESCRIPTION:

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 6-14
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 75%, fine mesh network locally grading to colloform banded sulfides.
Silica, 20%, soft, wet, gel-like, filling voids.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Siderite, 5%.

TEXTURAL DESCRIPTION: Mesh network of pyrite locally grading to colloform banding.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Piece 13 has a large vug partially filled with silica gel. Silica gel filled after and preserves the grain shape of rhombic carbonate crystals, up to 4.0 mm in diameter, which have been nearly completely removed by dissolution. One cavity contains the remnants of buff-tan siderite.

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Piece 1

TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 90%, mostly fine-grained.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Smectite, 5%, barite, 5%, idiomorphic.

TEXTURAL DESCRIPTION: Fine-grained pyrite with interstices which are filled with barite or smectite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 2–4

TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 90%, fine-grained.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Smectite, 10%, greasy luster.

TRACE MINERALS (<0.1%)
Name, Abundance(%), Included in, Characteristics:
Pyrrhotite, magnetite.

TEXTURAL DESCRIPTION: Fine-grained pyrite with interstices which are surrounded with coarse-grained idiomorphic pyrite and filled with smectite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 5–9

TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 90%, fine-grained.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Magnetite, 5%

TEXTURAL DESCRIPTION: Fine-grained pyrite forming intersertal texture. Walls of lamellae are covered with coarse-grained idiomorphic pyrite and less commonly with magnetite. Interstices are filled with smectite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
**139-856H-11R-1**

**Pieces 1 and 2**  
**TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE**

**CONTACTS:** None.

**MAJOR MINERALS:**
Name, Abundance(%), Morphology, Characteristics
Pyrite, 90%, 1.0 mm, anhedral, vermicular aggregate.
Silica/smectite, 10%, aphanitic, interstitial to pyrite aggregates.

**TEXTURAL DESCRIPTION:** Vermicular aggregates of pyrite, with interstitial silica (amorphous) and smectite(?). Local boxwork texture, possibly through removal of silica.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.

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**Pieces 3–5**  
**TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE**

**CONTACTS:** None.

**MAJOR MINERALS:**
Name, Abundance(%), Morphology, Characteristics
Pyrite, 95%, 0.1–1.0 mm, ovoid areas of very fine-grained massive to slightly reticulate pyrite. Matrix pyrite is medium-grained (0.5 mm), more open, vuggy, reticulate texture.
Silica, 5%, aphanitic, infilling to pyrite aggregates.

**TEXTURAL DESCRIPTION:** Ovoid areas, 1.0 to 3.0 cm (long axis) composed of very fine-grained reticulate massive pyrite with silica interstitial. Groundmass to ovoids is coarser-grained pyrite, also slightly reticulate, silica in-filled. Samples have a "pseudo-breccia" appearance.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** See sketch, Piece 4.

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**Pieces 6 and 7**  
**TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE**

**CONTACTS:** None.

**MAJOR MINERALS:**
Name, Abundance(%), Morphology, Characteristics
Pyrite, 80%, 0.5 mm, vermicular to massive aggregates, some very fine-grained pyrite forming an infilling of void space (possibly drill-fines introduced).
Silica, 20%, aphanitic, forms an infilling of space between pyrite aggregates.

**TEXTURAL DESCRIPTION:** Vermicular aggregates, locally massive. Fine-grained pyrite infill may be artifact of drilling.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.
139-856H-11R-1

Pieces 8–11
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 95%, 0.5 mm, anhedral aggregates, some vermicular aggregates.
Silica, 5%, anhedral, infill between pyrite aggregates.

TEXTURAL DESCRIPTION: Massive to vermicular aggregates of pyrite, with silica infill in the intertices.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Remarkably monomineralic.

Pieces 12–17
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 80%, 0.5 mm, vermicular to aggregate masses of fine- to medium-grained pyrite.
Silica, 20%, anhedral, infilling between pyrite aggregates.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 0.2%, 0.1.0 mm, in pyrite as small anhedral masses.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Sphalerite, <0.10 mm, with magnetite.
Magnetite, <0.10 mm.

TEXTURAL DESCRIPTION: Some large (0.5–0.8 cm.) silica-filled interstitial areas. Normally smaller (1.0 mm) interstitial and vuggy areas are infilled with silica also. Magnetite/sphalerite are very small areas, interstitial to pyrite aggregates.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 18 and 19
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 85%, 0.2 mm, vermicular aggregates and finer graded anhedral masses.
Silica, 15%, aphanitic, infill to vermicular aggregates.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Barite, 0.1%, 0.2 to 0.5 mm, infill material, euhedral, tabular clear crystals are rare.

TEXTURAL DESCRIPTION: Vermicular aggregates of very fine-grained pyrite; local anhedral masses, where the aggregates have apparently coalesced. Silica infill is similar to previous samples.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Thin section, Piece 18.
139-856H-12R-1

Piece 1

TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrite, 90%, fine-grained.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Smectite, 10%, greasy luster.

TEXTURAL DESCRIPTION: Fine-grained pyrite with interstices filled by smectite. Walls of interstices covered with coarse-grained idiomorphic pyrite.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
139-856H-13R-1

Pieces 1–3
TYPE: MASSIVE COLLOFORM AND VUGGY PYRITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
- Pyrite, 80%, 0.5–2.0 mm, subhedral to euhedral, open crystal network. Pyrite also lines vugs in pyrite. Silica, 10%, greenish gray, amorphous masses filling matrix.
- Carbonate, 5%, euhedral, clear, occurs in vugs, effervesces in 50% HCl.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
- Hematite, 5%, fine-grained, after pyrite.

TEXTURAL DESCRIPTION: Massive crystalline pyrite, equigranular, 20% porosity partly infilled with amorphous silicates and carbonate.

ADDITIONAL COMMENTS: None.

Piece 4
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
- Pyrrhotite, 55%, fine-grained, anhedral to subhedral, occurs as multiple intersecting veins. Pyrite, 10%, 0.5–1.0 mm, subhedral to euhedral, associated with pyrrhotite in veins. Silica, 20%, greenish gray, amorphous masses filling matrix.
- Clay, 5%, white, fibrous masses, 100–200 µm, partly fills open space after amorphous silica.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
- Chalcopyrite, 3%, fine-grained, anhedral, occurs in the interstices between pyrite and pyrrhotite. Magnetite, 5%, euhedral, equigranular, occurs in vugs.

TEXTURAL DESCRIPTION: Crosscutting network of pyrrhotite-pyrite veins with minor chalcopyrite.

Pieces 5–9
TYPE: HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
- Pyrrhotite, 50%, 0.5–2.0 mm, subhedral to euhedral, open interlocking network. Pyrite, 15%, 0.5–1.0 mm, subhedral to euhedral, lacy network after pyrrhotite and crystal aggregates in open space. Also occurs as veins cutting pyrrhotite. Silica, 10%, greenish gray, amorphous masses filling interstices in pyrrhotite network, and vugs. Clay, 15%, white, fibrous masses, 100–200 µm, partly fills open space after amorphous silica.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
- Chalcopyrite, 3%, fine-grained, anhedral, occurs as fine grains in pyrrhotite. Magnetite, 5%, subhedral to euhedral, equigranular, occurs in vugs.

TEXTURAL DESCRIPTION: Massive pyrrhotite partly replaced by pyrite with open space filled by hydrous silica and clay.

ADDITIONAL COMMENTS: Open interlocking network of tabular pyrrhotite crystals is similar to quenched pyrrhotite observed in chimneys. The subrounded patches of pyrrhotite with pyrite rims are remarkably similar to textures observed in clastic sulfide fragments from Piece 6.
Pieces 10 and 11

**TYPE:** HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrrhotite, 60%</td>
<td>fine-grained, densely packed, crystal network.</td>
</tr>
<tr>
<td>Pyrite, 25%</td>
<td>0.5–1.0 mm, equigranular, open crystalline aggregate.</td>
</tr>
<tr>
<td>Silica, 10%</td>
<td>greenish gray, amorphous masses filling interstices in pyrrhotite network, and vugs.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Included in, Characteristics</th>
</tr>
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<tbody>
<tr>
<td>Chalcopyrite, 2%</td>
<td>fine-grained, anhedral, occurs as fine grains in pyrrhotite.</td>
</tr>
<tr>
<td>Magnetite, 3%</td>
<td>subhedral to euhedral, equigranular, occurs in vugs.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Massive pyrrhotite and pyrite with open space filled by hydrous silica and clay.

**ADDITIONAL COMMENTS:** None.

Piece 12

**TYPE:** HOMOGENEOUS, MASSIVE FINE-GRAINED PYRITE-PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrrhotite, 55%</td>
<td>anhedral, fine-grained, densely packed, crystal network.</td>
</tr>
<tr>
<td>Pyrite, 25%</td>
<td>0.5–1.0 mm, equigranular, open crystalline aggregate.</td>
</tr>
<tr>
<td>Silica, 10%</td>
<td>greenish gray, amorphous masses filling interstices in pyrrhotite network, and vugs.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**

<table>
<thead>
<tr>
<th>Name, Abundance(%)</th>
<th>Included in, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalcopyrite, 3%</td>
<td>fine-grained, anhedral, occurs as fine grains in pyrrhotite. Also occurs as veinlets associated with magnetite.</td>
</tr>
<tr>
<td>Sphalerite, 6%</td>
<td>anhedral to subhedral, closely intermixed with magnetite.</td>
</tr>
<tr>
<td>Magnetite, 2%</td>
<td>subhedral to euhedral, equigranular, occurs in vugs and forms veins.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Massive pyrrhotite and pyrite with open space filled by hydrous silica and clay.

**ADDITIONAL COMMENTS:** None.
139-856H-14R-1

Pieces 1–5
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 75%, anhedral, fine-grained, densely packed, crystal network.
Pyrite, 5%, 0.5–1.0 mm, equigranular, open crystalline aggregate.
Silica, 5%, greenish gray, amorphous masses filling interstices in pyrrhotite and pyrite network, and vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 3%, fine-grained, anhedral, occurs as fine grains in pyrrhotite. Also occurs as veinlets associated with magnetite.
Sphalerite, 3%, anhedral to subhedral, closely intermixed with magnetite.
Magnetite, 3%, subhedral to euhedral, equigranular.

TEXTURAL DESCRIPTION: Massive pyrrhotite and pyrite with open space filled by hydrous silica.

ADDITIONAL COMMENTS: None.

Pieces 6–10
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 75%, anhedral, fine-grained, densely packed, crystal network.
Pyrite, 15%, 0.5–1.0 mm, equigranular, open crystalline aggregate. Pyrite also forms a vein cutting massive pyrrhotite.
Silica, 15%, greenish gray, amorphous masses filling interstices in pyrrhotite and pyrite network, and vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 1%, fine-grained, anhedral, occurs as fine grains in pyrrhotite. Also occurs as blebs in carbonate-magnetite-silicate-pyrite veins.
Sphalerite, 3%, anhedral to subhedral, closely intermixed with magnetite.
Magnetite, 3%, subhedral to euhedral, equigranular, occurs in vugs and forms veins.
Carbonate, 5%, clear, euhedral, occurs in veins.

TEXTURAL DESCRIPTION: Massive pyrrhotite and pyrite with open space filled by hydrous silica.

ADDITIONAL COMMENTS: None.

Piece 11
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 70%, anhedral, fine-grained, densely packed, crystal network.
Pyrite, 5%, 0.5–1.0 mm, equigranular, open crystalline aggregate.
Pyrite also forms a vein cutting massive pyrrhotite.
Silica, 10%, greenish gray, amorphous masses filling interstices in pyrrhotite and pyrite network, and vugs.
Clay, 3%, white, 100–200 µm, fibrous, fills vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 0.5%–1%, fine-grained, anhedral, occurs as fine grains in pyrrhotite. Also occurs as blebs in carbonate-magnetite-silicate-pyrite veins.
Sphalerite, 5%, anhedral to subhedral, closely intermixed with magnetite.
Magnetite, 2%, subhedral to euhedral, equigranular, occurs in vugs and forms veins.
Carbonate, 5%, clear, euhedral, occurs in veins.

TEXTURAL DESCRIPTION: Massive pyrrhotite with open space filled by amorphous silica and clay. Minor pyrite.

ADDITIONAL COMMENTS: None.
Piece 12
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 70%, anhedral, fine-grained, densely packed, crystal network.
Pyrite, 5%, 0.5–1.0 mm, equigranular, open crystalline aggregate.
Pyrite also forms a vein cutting massive pyrrhotite.
Silica, 10%, greenish gray, amorphous masses filling interstices in pyrrhotite and pyrite network, and vugs.
Clay, 3%, white, 100–200 µm, fibrous, fills vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 0.5–1.0 mm, fine-grained, anhedral, occurs as fine grains in pyrrhotite. Also occurs as blebs in carbonate-magnetite-silicate-pyrite veins.
Sphalerite, 4%, anhedral to subhedral, closely intermixed with magnetite.
Magnetite, 3%, subhedral to euhedral, equigranular, occurs in vugs and forms veins.
Carbonate, 5%, clear, euhedral, occurs in veins.

TEXTURAL DESCRIPTION: Massive pyrrhotite with open space filled by amorphous silica and clay. Minor pyrite.

ADDITIONAL COMMENTS: None.

Pieces 13–23
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 70%, anhedral, fine-grained, densely packed, crystal network.
Pyrite, 5%, 0.5–1.0 mm, equigranular, open crystalline aggregate.
Pyrite also forms a vein cutting massive pyrrhotite.
Silica, 10%, greenish gray, amorphous masses filling interstices in pyrrhotite and pyrite network, and vugs.
Clay, 5%, white, 100–200 µm, fibrous, fills vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Chalcopyrite, 0.5–1.0 mm, fine-grained, anhedral, occurs as fine grains in pyrrhotite. Also occurs as blebs in carbonate-magnetite-silicate-pyrite veins.
Sphalerite, 4%, anhedral to subhedral, closely intermixed with magnetite.
Magnetite, 3%, subhedral to euhedral, equigranular, occurs in vugs and forms veins.
Carbonate, 5%, clear, euhedral, occurs in veins.

TEXTURAL DESCRIPTION: Massive pyrrhotite cut by magnetite-sphalerite-pyrite-chalcopyrite-carbonate veins; open space filled by amorphous silica and clay.

ADDITIONAL COMMENTS: Massive fine-grained pyrrhotite has a clastic texture and may represent sedimentary sulfides that have been infilled, veined, and partly replaced in the zone of fluid upflow.
Pieces 1 and 2
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 75%, anhedral, fine-grained, densely packed, crystal network.
Silica, 10%, greenish gray, amorphous masses filling interstices in pyrrhotite and pyrite network, and
vugs.
Clay, 5%, white, 100–200 µm, fibrous, fills vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrite, 3%, 0.5–1.0 mm, equigranular, surrounds pyrrhotite, associated with magnetite.
Chalcopyrite, 0.5–1.0 mm, fine-grained, anhedral, occurs as fine grains in pyrrhotite and veinlets
cutting pyrrhotite. Also associated with magnetite.
Magnete, 5%, 0.5–1.0 mm, subhedral to euhedral, equigranular, occurs in vugs and forms veins.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite and an open network of crystalline pyrite and
magnetite with chalcopyrite; open space filled by amorphous silica and clay.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Pieces 3 and 4
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 70%, anhedral, fine-grained, densely packed, crystal network.
Silica, 15%, greenish gray, amorphous masses filling interstices in pyrrhotite and pyrite network, and
vugs.
Clay, 3%, white, 100–200 µm, fibrous, fills vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrite, 5%, 0.5–1.0 mm, equigranular, occurs as vein associated with magnetite.
Chalcopyrite, <1%, 0.2–0.3 mm, anhedral, fine grains in pyrrhotite.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite and an open network of crystalline pyrite and
magnetite with chalcopyrite; open space filled by amorphous silica and clay.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Piece 5
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 75%, anhedral, fine-grained, densely packed, crystal network.
Silica, 12%, greenish gray, amorphous masses filling interstices in pyrrhotite and pyrite network, and
vugs.
Clay, 3%, white, 100–200 µm, fibrous, fills vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrite, 6%, 0.5–1.0 mm, equigranular, aureole surrounding a silica vein.
Chalcopyrite, <1%, 0.2–0.3 mm, anhedral, fine grains in pyrrhotite.
Carbonate, white, 4%, late vein cutting pyrrhotite.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite with chalcopyrite; open space filled by
amorphous silica and clay.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.
Pieces 6–8
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 80%, anhedral, fine-grained, densely packed, crystal network.
Silica, 10%, greenish gray, amorphous masses filling interstices in pyrrhotite and pyrite network, and vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrite, 3%, 0.5–1.0 mm, equigranular, aureole surrounding a silica vein.
Magnetite, 2%, 0.5–1.0 mm, subhedral to euhedral, forms veins with pyrite.
Chalcopyrite, 1%, fine anhedral grains in pyrite; also occurs in magnetite-pyrite veins.
Carbonate, white, 3%, late vein cutting pyrrhotite.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite cut by pyrite veins; open space filled by amorphous silica and clay.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 9 and 10
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 75%, anhedral, fine-grained, densely packed, crystal network.
Silica, 15%, greenish gray, amorphous masses filling interstices in pyrrhotite network, and in veins.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrite, 6%, 0.5–1.0 mm, equigranular, aureole surrounding a silica vein.
Chalcopyrite, 2%, fine anhedral grains in pyrrhotite

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite cut by pyrite veins; open space filled by amorphous silica and clay.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.

Pieces 11–13
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 70%, anhedral, fine-grained, densely packed, crystal network.
Silica, 15%, greenish gray, amorphous masses filling interstices in pyrrhotite network, and between pyrite and magnetite in veins.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrite, 5%, 0.5–1.0 mm, subhedral to euhedral, equigranular, forms vein with magnetite.
Magnetite, 5%, 0.5–1.0 mm, subhedral to euhedral, equigranular, forms veins with pyrite.
Chalcopyrite, 3%, fine anhedral grains in pyrrhotite; also occurs as blebs in magnetite-pyrite veins.
Hematite, 2%, pale gray, fine-grained, after magnetite.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite cut by pyrite-magnetite veins with chalcopyrite; open space filled by amorphous silica and clay.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Magnetite is brecciated in veins. Thin section, Piece 11.
139-856H-15R-1

Pieces 14–18
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 75%, anhedral, fine-grained, densely packed, crystal network.
Silica, 15%, greenish gray, amorphous masses filling interstices in pyrrhotite network, and vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Pyrite, 5%, 0.5–1.0 mm, subhedral to euhedral, equigranular, forms vein with magnetite and crystalline patches in pyrrhotite.
Magnetite, 5%, 0.5–1.0 mm, subhedral to euhedral, equigranular, forms veins with pyrite.
Chalcopyrite, 2%, fine anhedral grains in pyrrhotite; also occurs as blebs in magnetite-pyrite veins.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite cut by pyrite-magnetite veins with chalcopyrite; open space filled by amorphous silica and clay.

ADDITIONAL COMMENTS: Magnetite is brecciated in veins.

Pieces 19–24
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 70%, anhedral, fine-grained, densely packed, crystal network.
Silica, 15%, greenish gray, amorphous masses filling interstices in pyrrhotite network, and vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Clay, white, 3%, 0.3–1.0 mm, fibrous, fills vein matrix.
Pyrite, 5%, 0.5–1.0 mm, subhedral to euhedral, equigranular, forms vein with magnetite and crystalline patches in pyrrhotite.
Magnetite, 3%, 0.5–1.0 mm, subhedral to euhedral, equigranular, forms veins with pyrite.
Chalcopyrite, 2%, fine anhedral grains in pyrrhotite; also occurs as blebs in magnetite-pyrite veins.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite cut by pyrite-magnetite veins with chalcopyrite; open space filled by amorphous silica and clay.

ADDITIONAL COMMENTS: Magnetite is brecciated in veins.
139-856H-15R-2

Pieces 1–4

TYPE: HOMOGENOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 75%, anhedral, fine-grained, densely packed, crystal network.
Silica, 10%, greenish and yellowish gray, amorphous masses filling interstices in pyrrhotite network, and vugs.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Clay, 3%, white, 0.3–1.0 mm, fibrous, fills vein matrix.
Pyrite, 5%, 0.5–1.0 mm, subhedral to euhedral, equigranular, forms vein with magnetite and crystalline patches in pyrrhotite.
Magnetite, 5%, 0.5–1.0 mm, subhedral to euhedral, equigranular, forms veins with pyrite.
Chalcopyrite, 4%, fine anhedral grains in pyrrhotite; also occurs as blebs in magnetite-pyrite veins.

TEXTURAL DESCRIPTION: Massive fine-grained pyrrhotite cut by pyrite-magnetite veins with chalcopyrite and sphalerite; open space filled by amorphous silica and clay.

STRUCTURES/VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: None.
139-856H-16R-1

Pieces 1–13
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 85%, fine-grained locally coarser crystals.
Pyrite, 20%, crystals and concretions in pyrrhotite.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Carbonate and hydrosilicate, 10%, in the matrix and in vugs.

TRACE MINERALS (<0.1%):
Name, Abundance(%), Included in, Characteristics
Magnetite, 3%, around pyrite concretions.
Chalcopyrite, 2%, inclusions in pyrite and in veins.

TEXTURAL DESCRIPTION: Fine-grained pyrrhotite with clusters and concretions of pyrite, often along veins.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.

Pieces 14–17
TYPE: HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

CONTACTS: None.

MAJOR MINERALS:
Name, Abundance(%), Morphology, Characteristics
Pyrrhotite, 75%, macrocrystals grading to microcrystals.
Pyrite, 10%, clusters along lines or random.

MINOR MINERALS:
Name, Abundance(%), Included in, Characteristics
Hydrosilicate, 10%, bluish green in the matrix and vug-filling.
Magnetite, 5%, around pyrite clusters.

TEXTURAL DESCRIPTION: Variation in crystal sizes for pyrrhotite, generally larger than 1.0 mm.
Pyrite forms agglomerates of crystals and framboids.

STRUCTURES/VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: None.
139-856H-17R-1

**Piece 1**

**TYPE:** HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrrhotite</td>
<td>70%</td>
<td>Fine-grained massive.</td>
</tr>
<tr>
<td>Pyrite</td>
<td>25%</td>
<td>As anhedral blebs and coarse idiomorphic crystals on side of sample.</td>
</tr>
<tr>
<td>Carbonate</td>
<td>5%</td>
<td>Interstitial to the pyrrhotite.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Blebs of pyrite in pyrrhotite.

**Pieces 2–4, and 6**

**TYPE:** HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrrhotite</td>
<td>50%</td>
<td>Fine-grained massive.</td>
</tr>
<tr>
<td>Pyrite</td>
<td>40%</td>
<td>Fine-grained within the pyrrhotite.</td>
</tr>
<tr>
<td>Carbonate</td>
<td>10%</td>
<td>As patches within the sulfide containing disseminated sulfide.</td>
</tr>
</tbody>
</table>

**MINOR MINERALS:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Abundance(%)</th>
<th>Included in, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phyllosilicates</td>
<td>1%-2%</td>
<td>Within the carbonate patches.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Mixed pyrite-pyrrhotite ore with patches of more carbonate-rich material.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.

**Piece 5**

**TYPE:** HOMOGENEOUS MASSIVE FINE-GRAINED PYRRHOTITE

**CONTACTS:** None.

**MAJOR MINERALS:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Abundance(%)</th>
<th>Morphology, Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrrhotite</td>
<td>40%</td>
<td>As clasts.</td>
</tr>
<tr>
<td>Pyrite</td>
<td>40%</td>
<td>Fine-grained host to pyrrhotite clasts.</td>
</tr>
<tr>
<td>Calcite</td>
<td>15%</td>
<td>In the pyrite matrix.</td>
</tr>
</tbody>
</table>

**TEXTURAL DESCRIPTION:** Sulfide breccia consisting of massive pyrrhotite clasts rimmed by pyrite and then calcite hosted in a pyrite-calcite matrix. Porous, many vugs.

**STRUCTURES/VEINS/FRACTURES:** None.

**ADDITIONAL COMMENTS:** None.