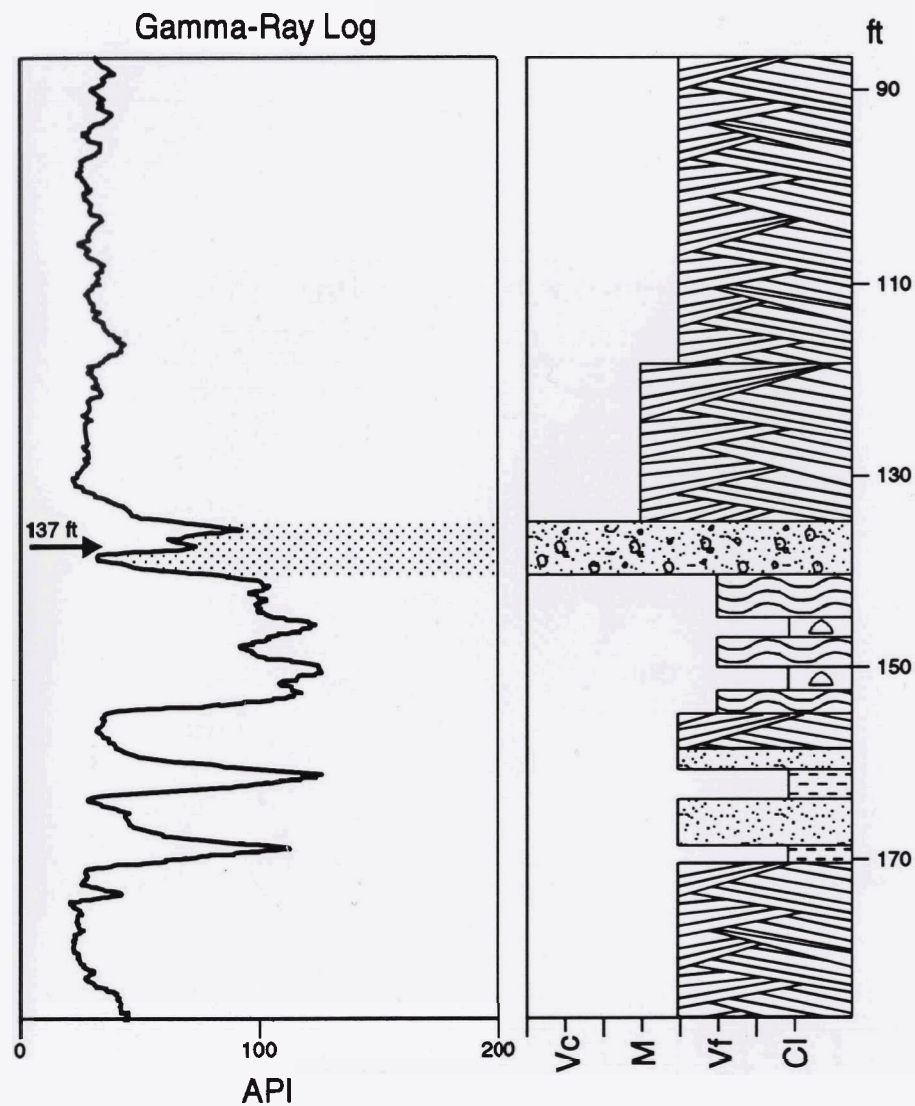


Indiana Geological Survey SDH-331
Sec. 29 - T23N - R8W
Warren County, Indiana



Massive Conglomerate



Gr m z 1 [754]

I. NAME: Massive conglomerate
Formation: Mansfield

Gr	m	z	1
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II. DESCRIPTION:

Texture: **Clasts** – granule to pebble-sized
(2 - 7 mm)
subangular to well-rounded

Matrix – fine-grained sand
(0.125 - 0.250 mm)
subangular to subrounded

Composition: **Clasts** – quartz, claystone, siltstone
Matrix – quartz sand with siderite
cement

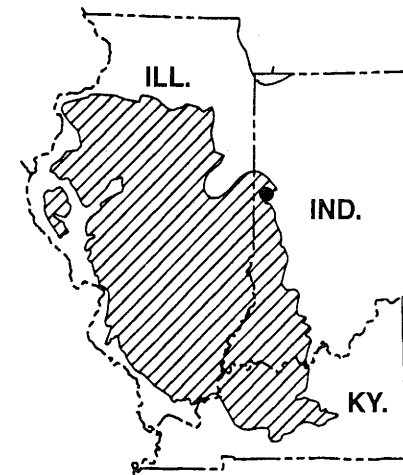
Sedimentary structures and features:

None observed

Fossils: None observed

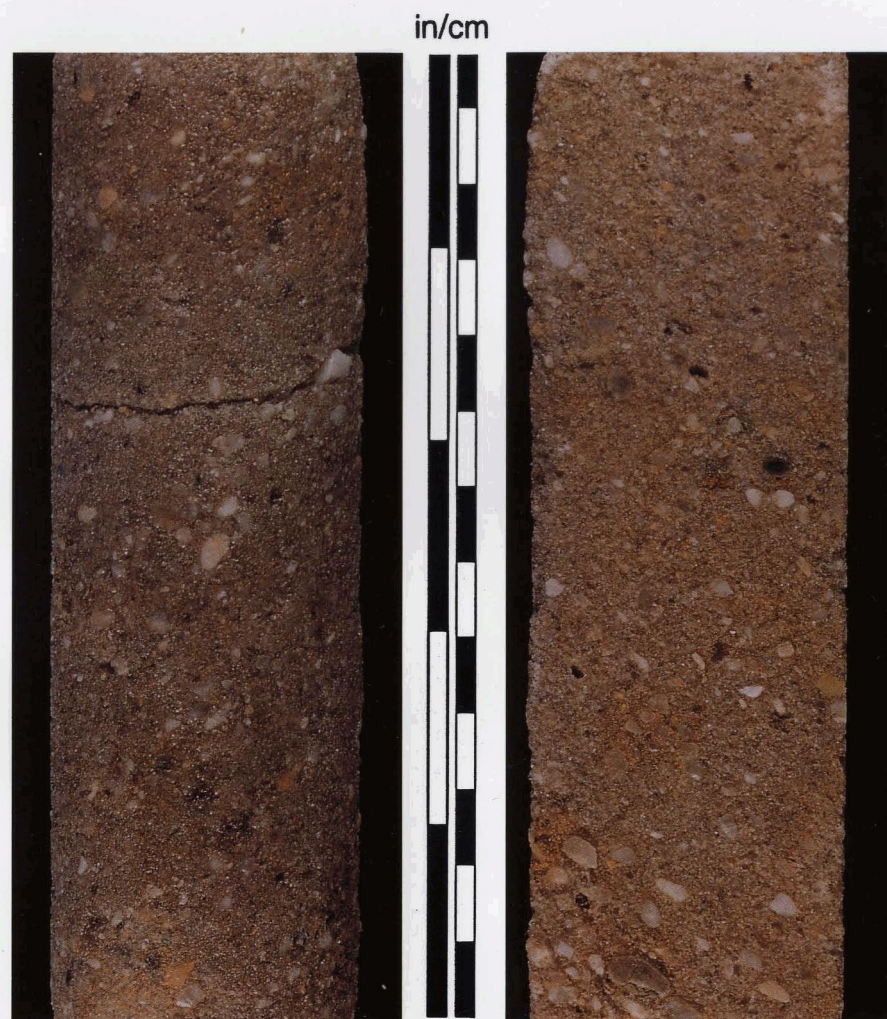
III. GAMMA-RAY WELL-LOG CHARACTERISTICS:

The clean, clay-free conglomerate results in an abrupt deflection of the gamma-ray curve towards the clean sand baseline. However, the presence of abundant claystone clasts at the top of the conglomerate results in a deflection towards the shale baseline. Compare this response with the shale below at 160 ft. The conglomerate shown here represents the basal part of a predominately clean sandstone succession that results in a cylindrical gamma-ray well-log signature.



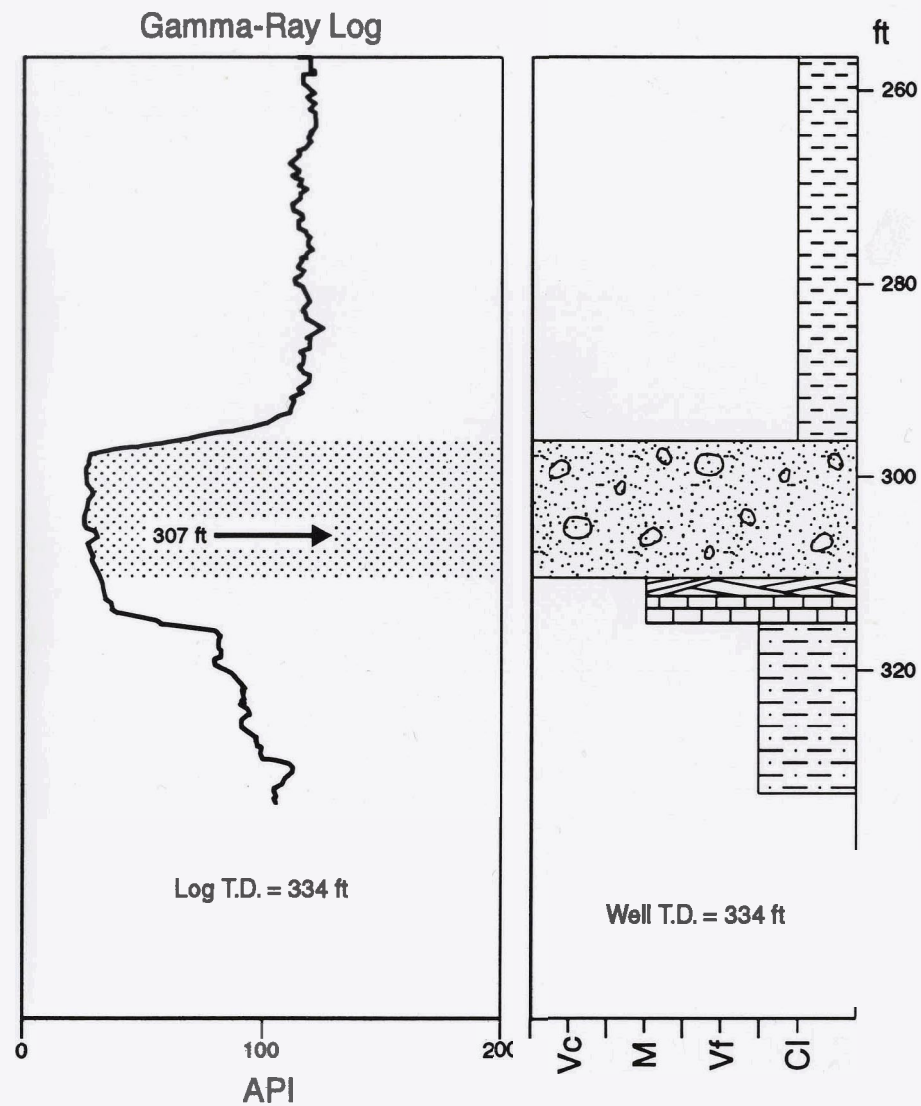
Map showing area of Pennsylvanian rocks and location of corehole.

Indiana Geological Survey SDH-354
Sec. 25 - T17N - R7W
Parke County, Indiana



Massive Conglomerate

Gr m z 2 [754]



I. NAME: Massive conglomerate
Formation: Mansfield

Gr	m	z	2
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II. DESCRIPTION:

Texture: **Clasts** – granule to pebble-sized
(2 - 9 mm)
subangular to well-rounded

Matrix – fine-grained sand
(0.125 - 0.250 mm)
angular to subrounded

Composition: Clasts – quartzite with minor
claystone and siltstone

Matrix – quartz sand with siderite
cement

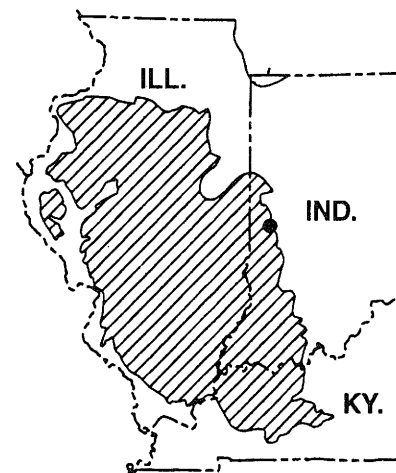
Sedimentary structures and features:

None observed

Fossils: None observed

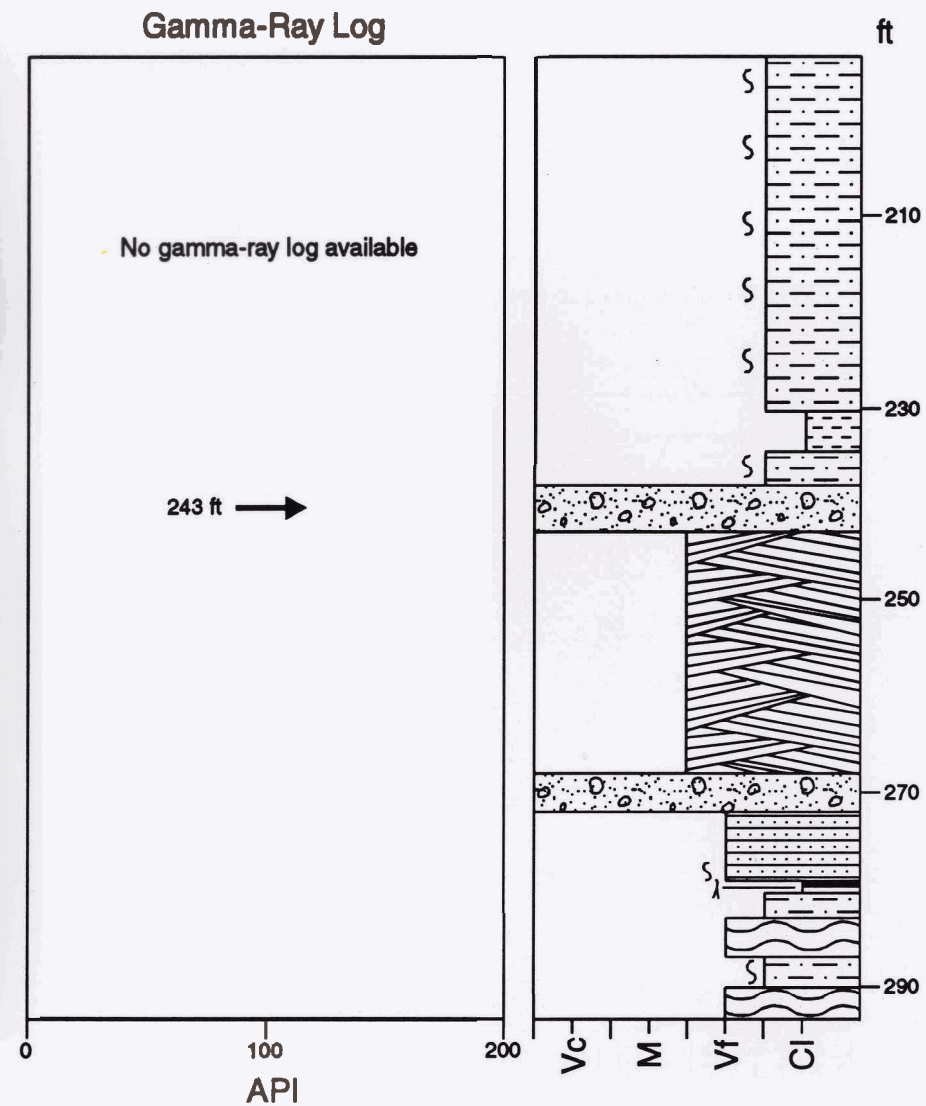
III. GAMMA-RAY WELL-LOG CHARACTERISTICS:

The clay-free nature of the breccia unit of which the conglomerate is a thin bed results in a low gamma count across this facies. The conglomerate bed itself shows a slightly higher gamma count than the rest of the breccia bed. The presence of a thin, finer-grained cross-bedded sandstone and limestone underlying the conglomerate results in a slight funnel-shaped gamma-ray well-log signature (314 ft to 296 ft). The sharp contact of the conglomerate with an overlying shale causes an abrupt increase in the gamma activity and a deflection of the gamma-ray curve towards the shale baseline.



Map showing area of Pennsylvanian rocks and location of corehole.

Illinois State Geological Survey COGEOMAP S-4
Sec. 25 - T11S - R4E
Johnson County, Illinois



Br m z 1 [751]

I. NAME: Massive breccia
Formation: Tradewater

Br	m	z	1
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II. DESCRIPTION:

Texture: **Clasts** – granule to pebble-sized
(2 - 50 mm)
angular to subangular
Matrix – fine-grained sand
(0.125 - 0.250 mm)
subangular to subrounded
Composition: **Clasts** – shale with minor siderite
Matrix – quartz sand with silica and
clay cement

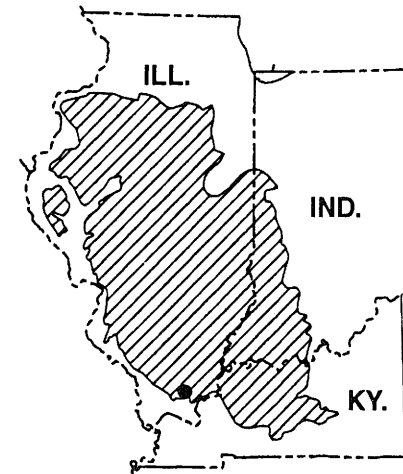
Sedimentary structures and features:

None observed

Fossils: None observed

III. GAMMA-RAY WELL-LOG CHARACTERISTICS:

No gamma-ray well-log available.



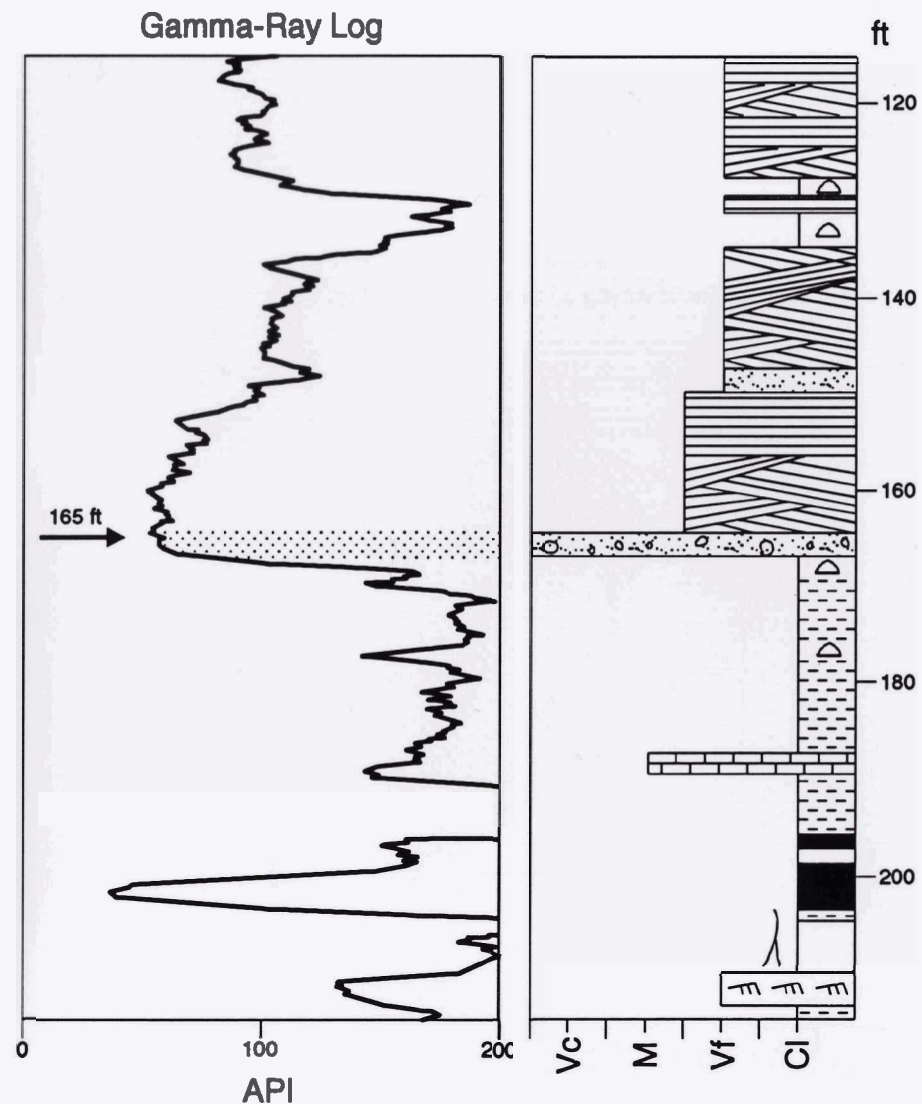
Map showing area of Pennsylvanian rocks
and location of corehole.

Indiana Geological Survey SDH-294
Sec. 34 - T3S - R9W
Gibson County, Indiana



Massive Breccia

Br m z 2 [751]



I. NAME: Massive breccia
Formation: Dugger

Br	m	z	2
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II. DESCRIPTION:

Texture: **Clasts** – granule to pebble-sized
(2 - 50 mm)
subangular to well-rounded
Matrix – medium-grained sand
(0.25 - 0.50 mm)
subangular

Composition: **Clasts** – claystone, siderite, coal
Matrix – quartz sand with siderite
cement

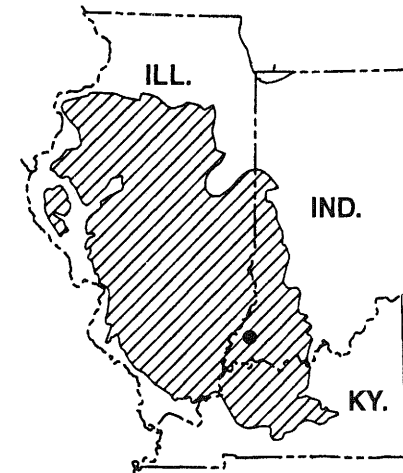
Sedimentary structures and features:

None observed

Fossils: None observed

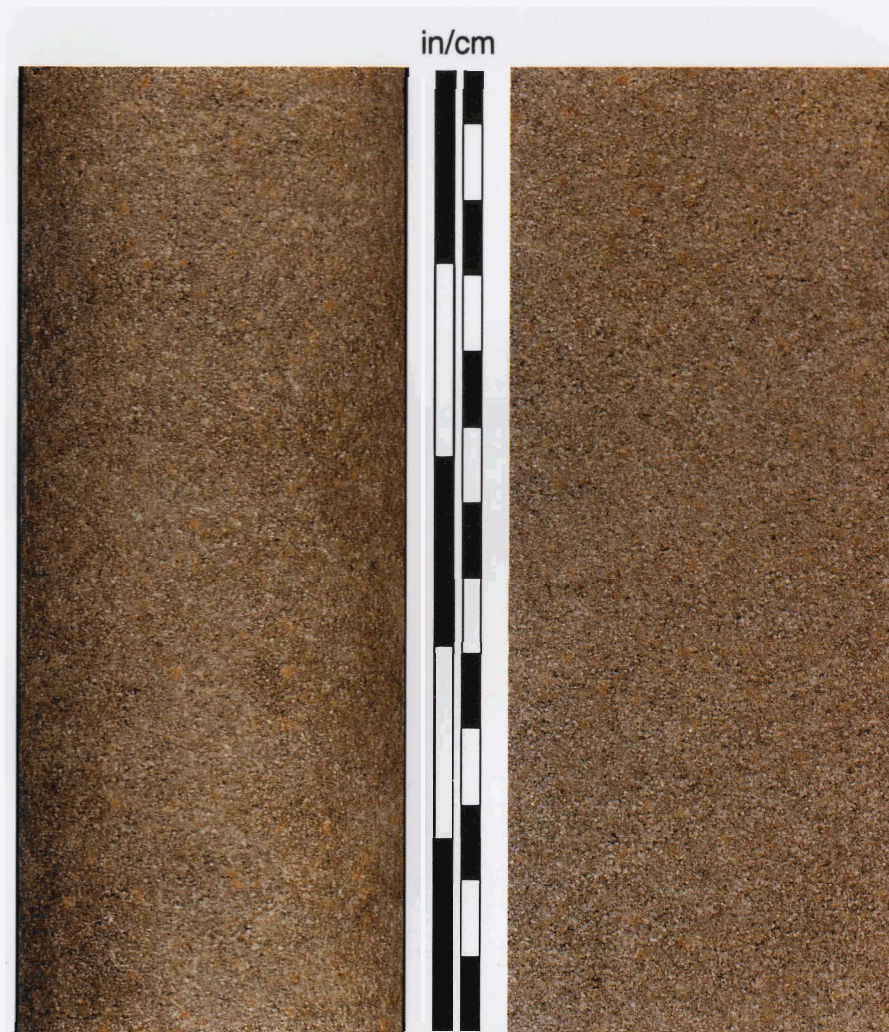
III. GAMMA-RAY WELL-LOG CHARACTERISTICS:

The coarse-grained nature of the breccia and sharp contact with the underlying shale result in abrupt deflection of the gamma-ray curve from the shale baseline toward the "clean" sand baseline. The intervals where the gamma-ray curve goes off scale at 191 ft and 203 ft are radioactive black shales. The upward-fining succession (166 ft to 130 ft), dominated by low-angle cross-bedding, is an excellent example of a bell-shaped gamma-ray well-log signature.

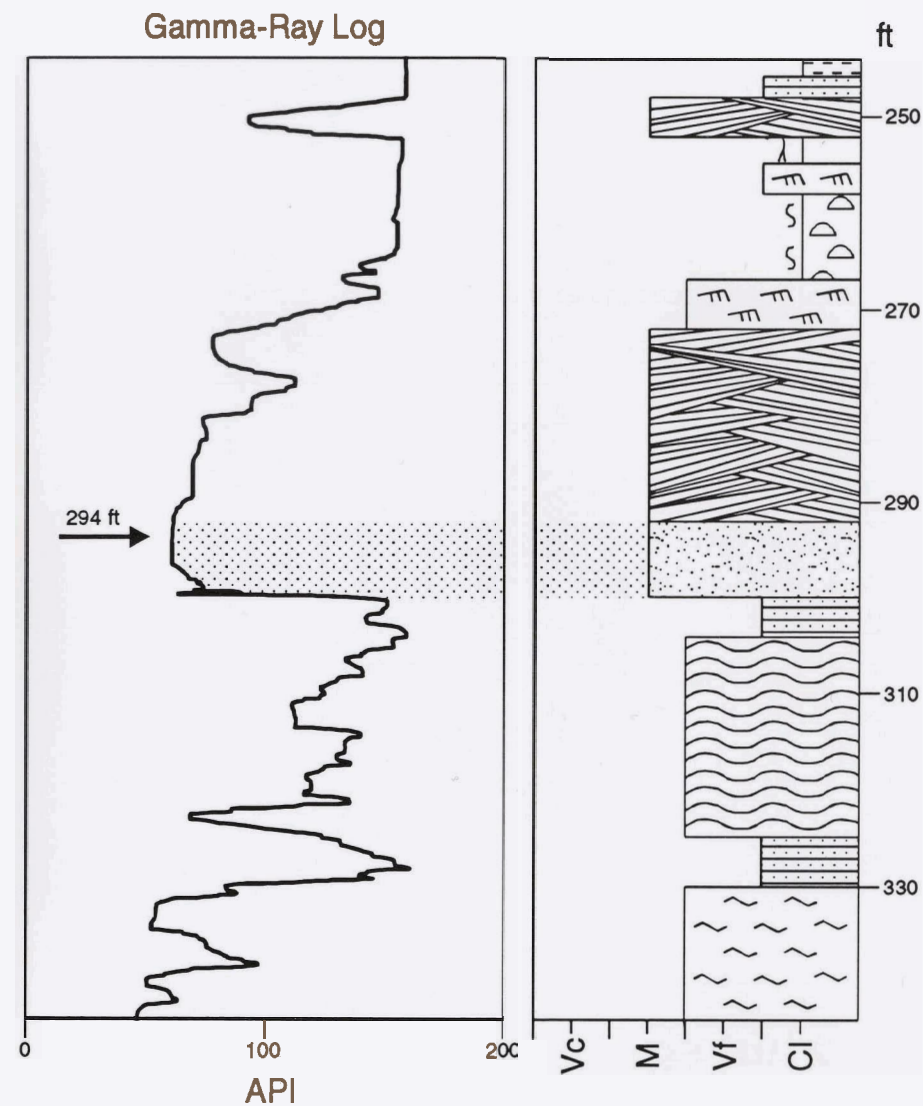


Map showing area of Pennsylvanian rocks and location of corehole.

Indiana Geological Survey SDH-212
Sec. 33 - T7N - R6W
Greene County, Indiana



Massive Sandstone



Ss m z 1 [564]

I. NAME: Massive sandstone
Formation: Mansfield

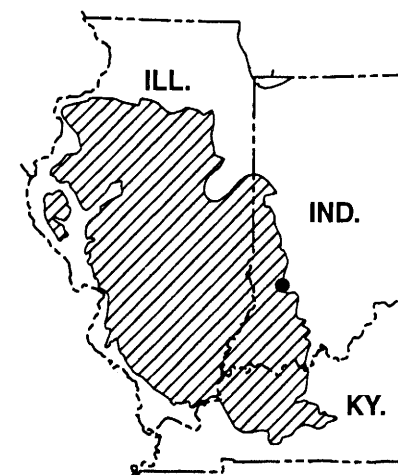
Ss	m	z	1
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II. DESCRIPTION:

Texture: Sand – medium-grained
(0.250 - 0.500 mm)
subangular to subrounded
Composition: Sand – quartz with silica and kaolinite
cement
Sedimentary structures and features:
Massive
Fossils: None observed

III. GAMMA-RAY WELL-LOG CHARACTERISTICS:

The gamma-ray well-log makes an abrupt deflection towards the “clean” sand baseline at the contact between the interlaminated siltstone and the overlying massive sandstone (300 ft). Beginning at this contact the gamma-ray curve shows a gradual, up-section increase in gamma activity reflecting a gradual increase in clay content. The gamma-ray well-log from 300 ft to 267 ft displays a bell-shaped signature.

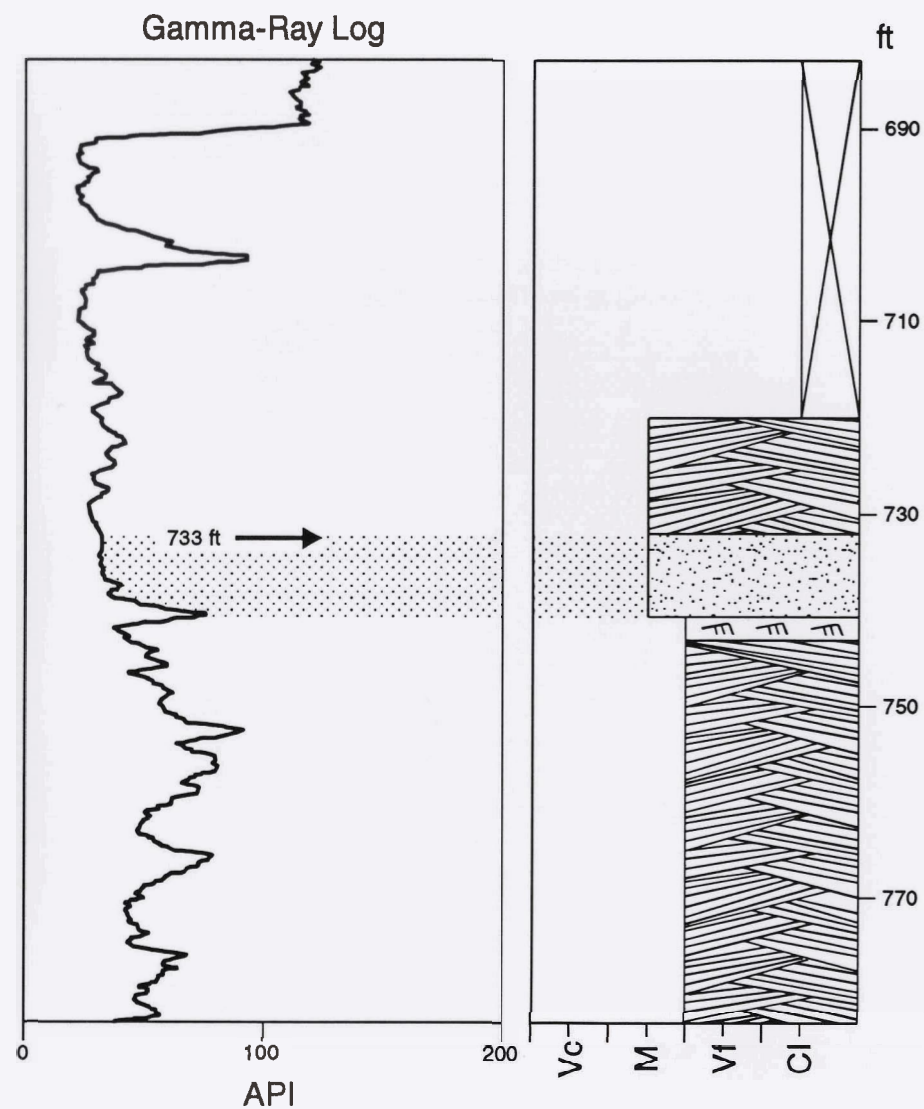


Map showing area of Pennsylvanian rocks and location of corehole.

Indiana Geological Survey SDH-300
Sec. 28 - T7N - R9W
Sullivan County, Indiana



Massive Sandstone



Ss m z 2 [564]

I. NAME: Massive sandstone
Formation: Mansfield

Ss	m	z	2
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II. DESCRIPTION:

Texture: Sand – medium-grained
(0.250 - 0.500 mm)
subangular to subrounded

Composition: Sand – quartz with silica, siderite,
and kaolinite cement

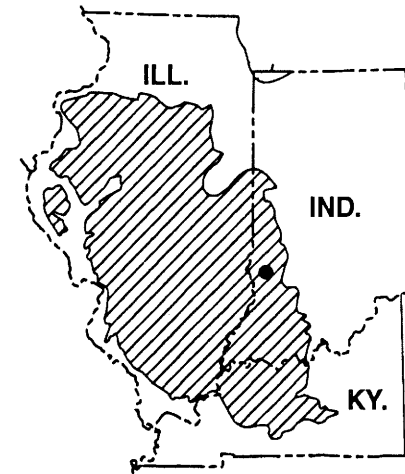
Sedimentary structures and features:

Massive

Fossils: None observed

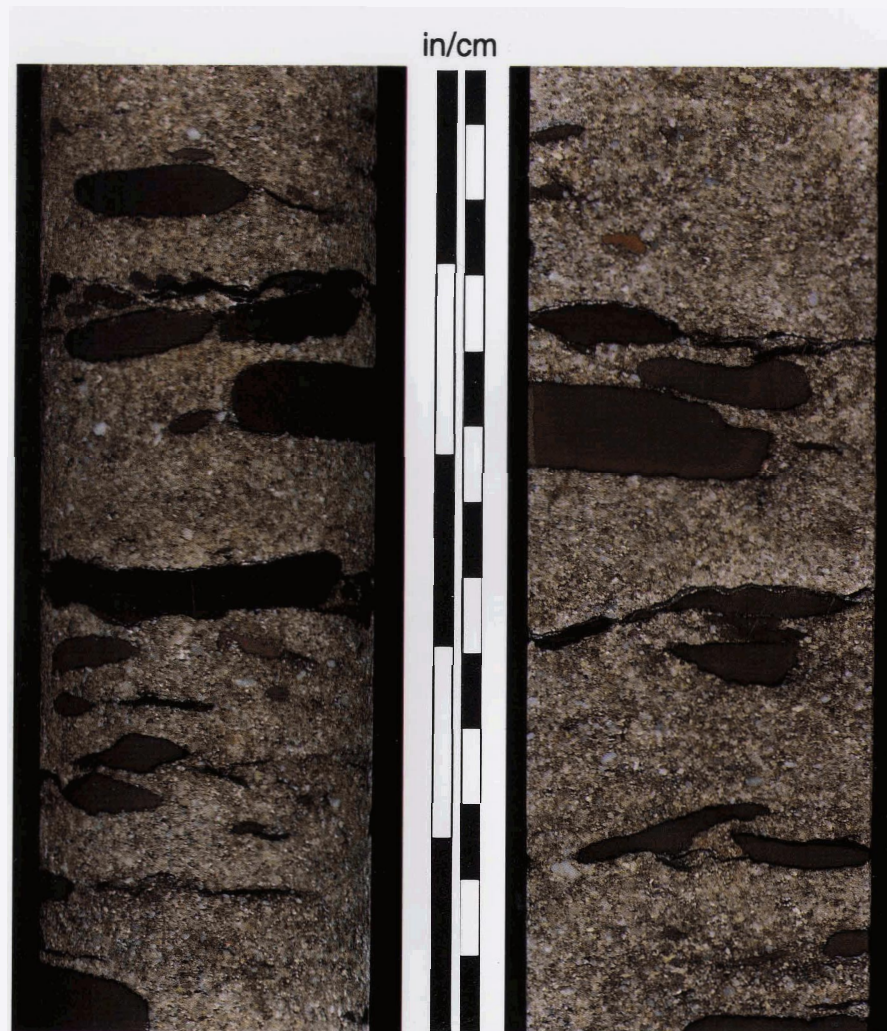
III. GAMMA-RAY WELL-LOG CHARACTERISTICS:

The massive-bedded sandstone represents part of an overall upward-coarsening succession. The result is a slight decrease in the gamma-count and gradual deflection of the gamma-ray curve towards the “clean” sand baseline. The gamma-ray well-log has a slightly funnel-shaped signature.



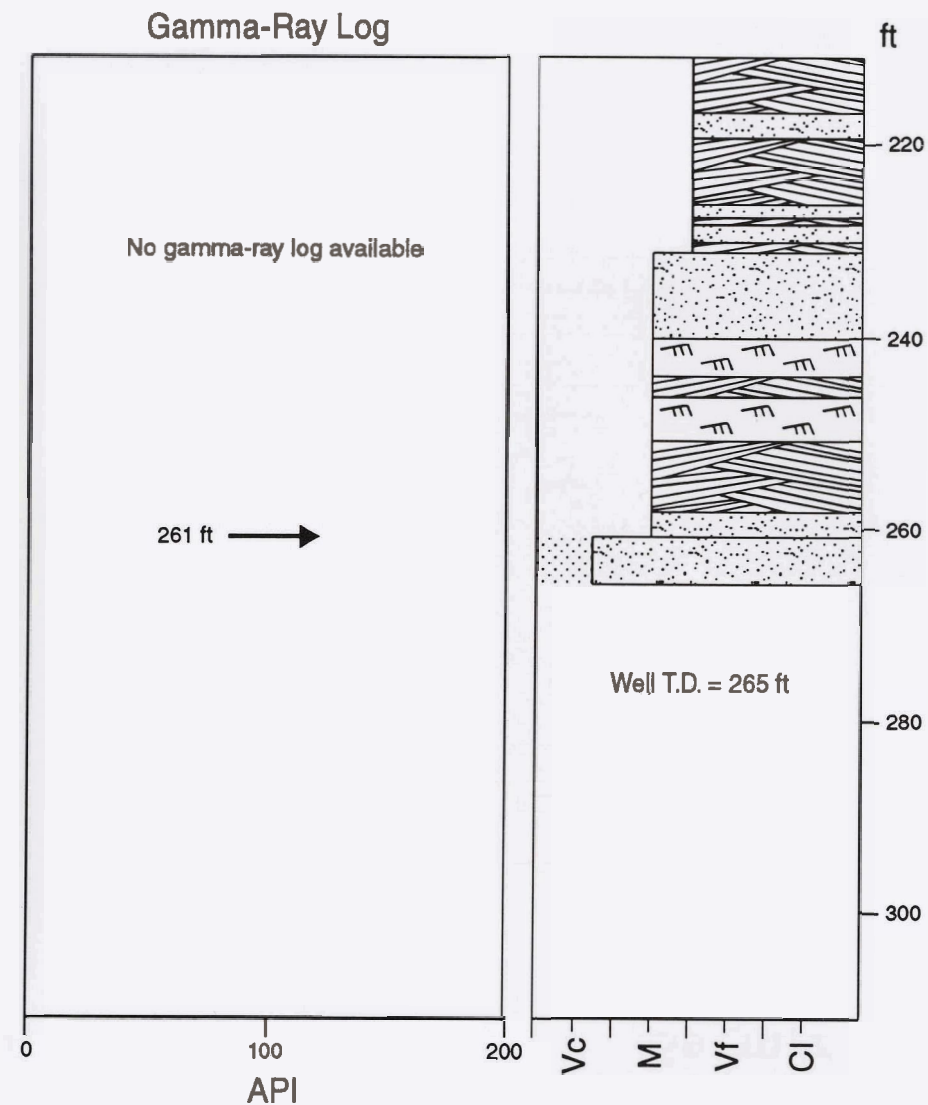
Map showing area of Pennsylvanian rocks and location of corehole.

Illinois State Geological Survey COGEOMAP S-2
Sec. 29 - T10S - R5E
Saline County, Illinois



Massive Sandstone

Ss m z 3 [753]



I. NAME: Massive sandstone
Formation: Tradewater

Ss	m	z	3
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II. DESCRIPTION:

Texture: Sand – fine- to coarse-grained
(0.125 - 2 mm)
subangular
Clasts – granule to pebble-sized
(5 - 38 mm)
subangular to well-rounded

Composition: **Clasts** – siderite
Sand – quartz with silica, siderite,
and kaolinite cement

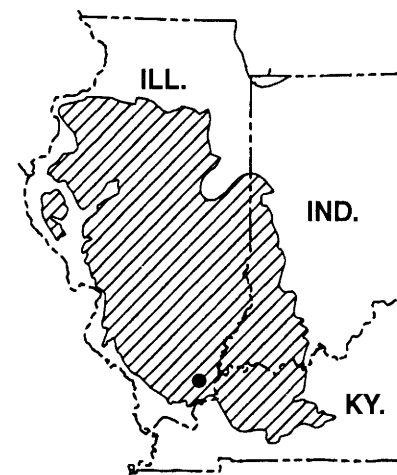
Sedimentary structures and features:

None observed

Fossils: None observed

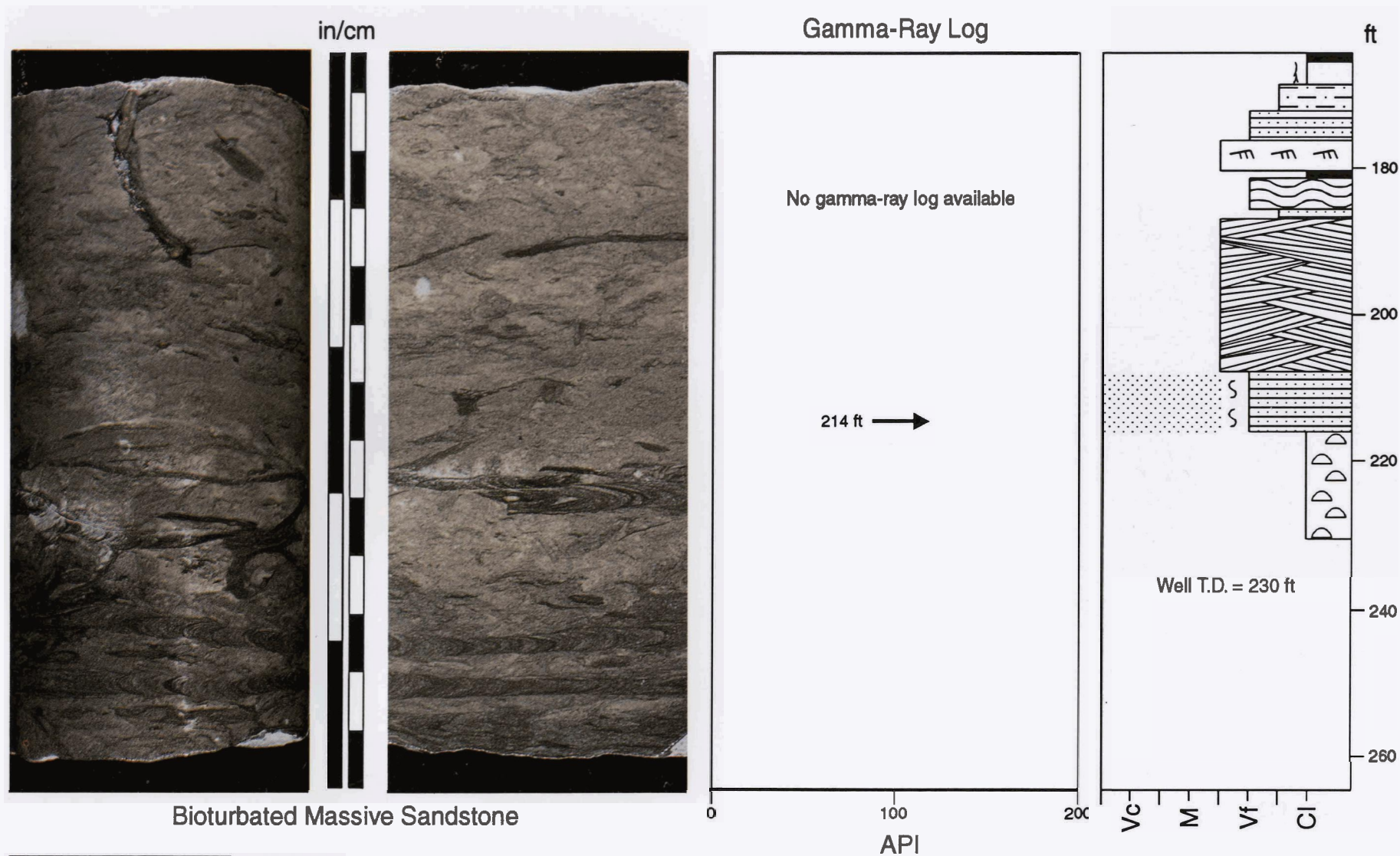
III. GAMMA-RAY WELL-LOG CHARACTERISTICS:

No gamma-ray well-log available.



Map showing area of Pennsylvanian rocks
and location of corehole.

Indiana Geological Survey SDH-217
 Sec. 36 - T9N - R7W
 Clay County, Indiana



Ss m b 1 [548]

I. NAME: Bioturbated massive sandstone
Formation: Mansfield

Ss	m	b	1
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II. DESCRIPTION:

Texture: Sand – very fine-grained
(0.0625 - 0.125 mm)
subangular to subrounded

Clay – (less than 0.0039 mm)

Composition: Sand – quartz with silica and kaolinite cement, pyrite common along burrows, carbonaceous material abundant, sparse calcite cement in some burrows

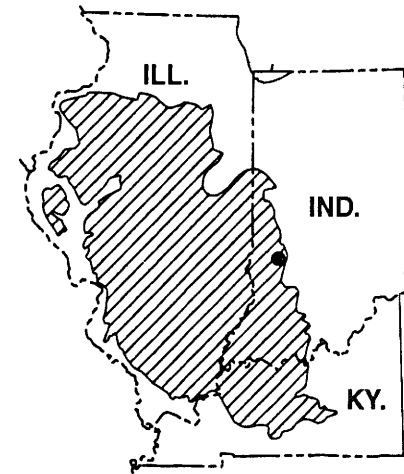
Sedimentary structures and features:

Bioturbation

Fossils: Trace fossils include *Zoophycus*, possible *Chondrites*

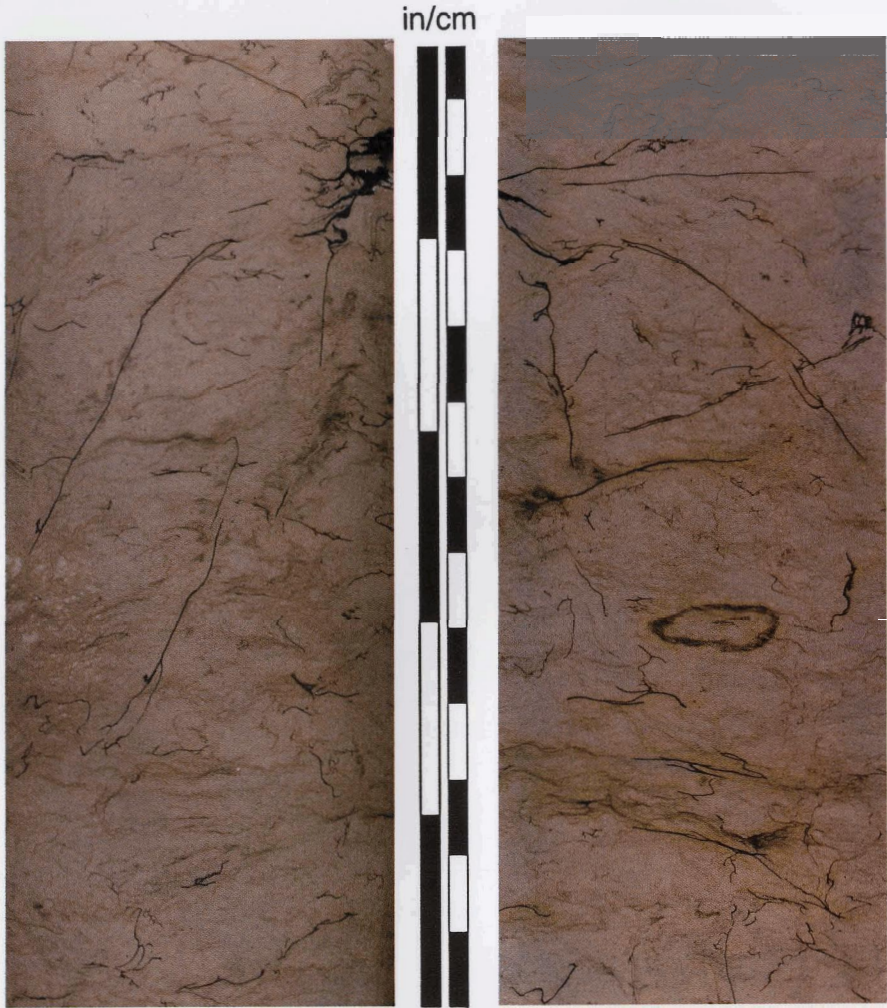
III. GAMMA-RAY WELL-LOG CHARACTERISTICS:

No gamma-ray well-log available.



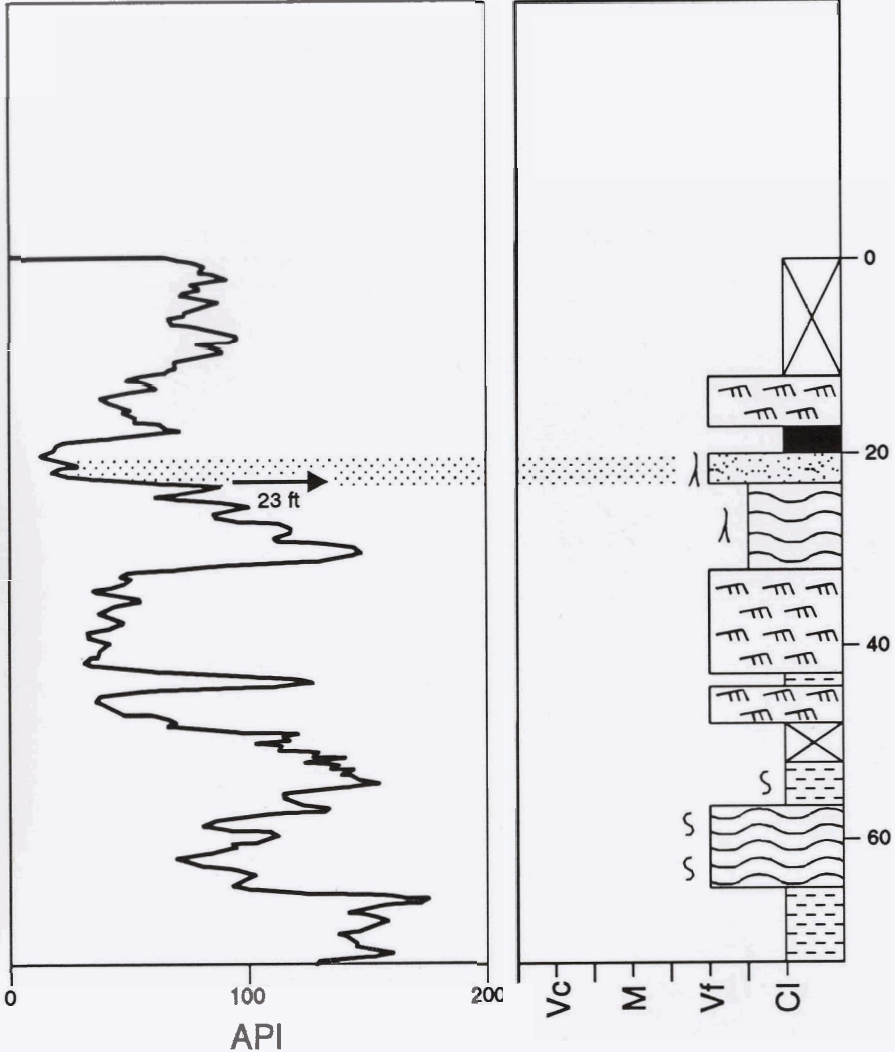
Map showing area of Pennsylvanian rocks and location of corehole.

NSWC Crane IGS(D)5
Sec. 20 - T5N - R3W
Martin County, Indiana



Rooted Massive Sandstone

Gamma-Ray Log



Ss m r 1 [547]

I. NAME: Rooted massive sandstone
Formation: Mansfield

Ss	m	r	1
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II. DESCRIPTION:

Texture: Sand – very fine-grained
(0.0625 - 0.125 mm)
subangular to subrounded

Composition: Sand – quartz with silica and kaolinite
cement

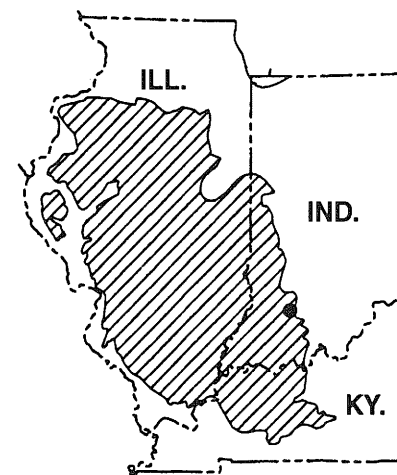
Sedimentary structures and features:

Rooting

Fossils: Fossil roots

III. GAMMA-RAY WELL-LOG CHARACTERISTICS:

The gamma-ray well-log displays a poorly developed, irregular to funnel-shaped gamma-ray well-log signature moving up-section from 68 ft to 15 ft in response to a general increase in the sand to shale ratio.



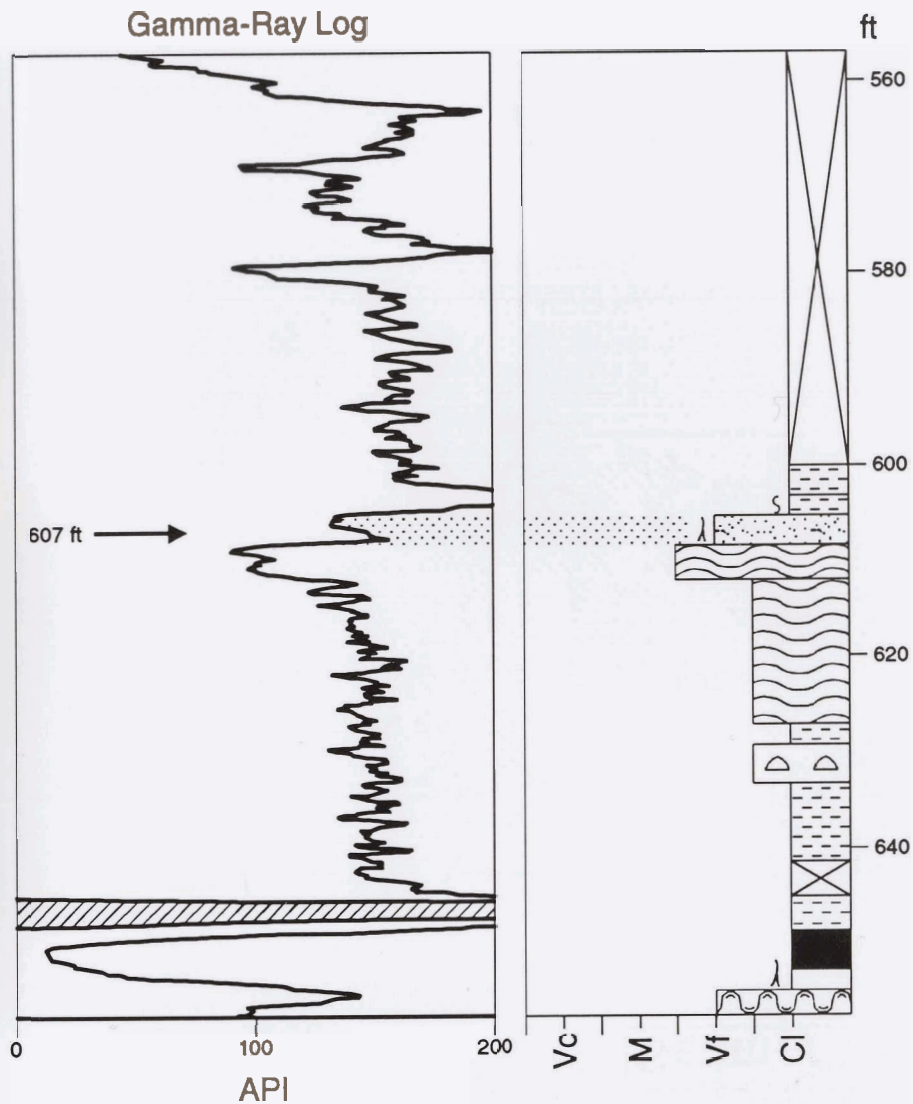
Map showing area of Pennsylvanian rocks and location of corehole.

Shot Point Services IN-4
Sec. 15 - T5S - R13W
Posey County, Indiana



Rooted Massive Sandstone

Ss m r 2 [547]



I. NAME: Rooted massive sandstone
Formation: Dugger

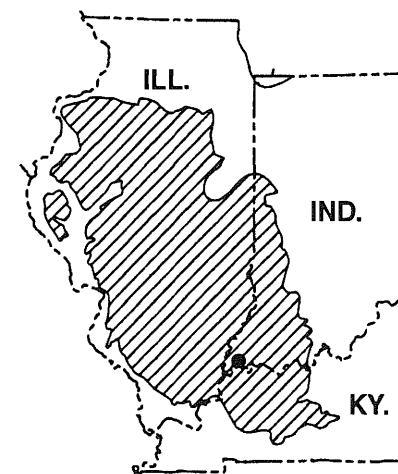
Ss	m	r	2
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II. DESCRIPTION:

Texture: Sand – very fine-grained
(0.0625 - 0.125 mm)
subangular to subrounded
Silt and clay – (less than 0.0625 mm)
Composition: Sand and silt – quartz and minor
mica with silica and
kaolinite cement
Clay – unknown
Sedimentary structures and features:
Bioturbation from rooting
Fossils: Fossil roots

III. GAMMA-RAY WELL-LOG CHARACTERISTICS:

The gamma-ray well-log shows a slightly funnel-shaped signature beginning just above the shale at 646 ft to the rooted interval at 606 ft. The poorly developed funnel-shaped character of the gamma-ray well-log from 646 ft to 606 ft is in response to the gradual up-section increase in grain size. The distinctly high gamma-ray curve spike at 624 ft above the coal indicates a radioactive black shale.



Map showing area of Pennsylvanian rocks and location of corehole.