

**APPENDIX III-C  
BRAZOS RIVER DRILLING 2005**

**CORE DESCRIPTIONS & CORE PHOTOS**

**WELL MULLINAX-3**

**31°06.55' N, 96°50.28' W**

**Lithology descriptions and core photos by  
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Mullinax-2 and 3 were drilled at the same location a few feet apart as overlapping cores for maximum recovery.

Top of core: 2.59 m (8.5 feet) subsurface

Base of core: 19.96 m (65.5 feet)

LINER SECTION 1                      1.83 to 5.03 m depth                      (-6 to -16.5 feet)

(Recorded in field as 6 to 16 feet. Depths modified to accommodate the actual thickness of core recovered in top 23.5 feet depth interval.)

Part 1-1                                      58 cm of core—2.59 to 3.20 m depth                      (-8.5 to -10.5 feet)

0–12 cm

no core

12–44 cm

Mudstone, sandy; light gray, spotted with tan (from alteration); poorly sorted; quartzose grains; thick bedded; gradational basal boundary.

Condition: Broken condition, with pieces mostly in place. Some quartzose pebbles (from Quaternary lag deposit) mixed into mass of core pieces. Quite weathered.

44–58 cm

Mudstone, sandy; light gray, spotted with tan (from alteration); poorly sorted; quartzose grains; thick bedded; a few weathered “pyrite concretions” (now iron oxide masses).

Condition: Partly broken, with pieces in place.

Part 1-2                      61 cm of core—3.20 to 3.81 m depth                      (-10.5 to -12.5 feet)

0–22 cm

Mudstone, sandy; light gray, much spotted with tan; poorly sorted; quartzose grains; thick bedded; lines of alteration spots suggest crossbedding in some places; sharp basal contact.

Condition: Partly broken, with pieces still in place. Large diameter (0.5 cm) vertical root penetration structure, from modern vegetation. Quite weathered.

22–61 cm

Sandstone; light brown, speckled appearance with common dark grains (pepper & salt appearance); fine grained, with some medium grains; moderately sorted; quartzose; a little mud matrix between grains; thick bedded; some gastropod steinkerns and phosphate nodules; many small burrows, mostly horizontal, and bioturbated (lamination lacking).

Condition: Moderately broken. Some root penetrations of modern vegetation and a few fine modern roots.

Part 1-3                      20 cm of core—3.81 to 3.96 m depth                      (-12.5 to -13 feet)

0–20 cm

Sandstone; same as above.

Condition: Moderately broken, but no rooting.

End of core section.

LINER SECTION 2                      3.96 to 4.88 m depth                      (Below -6 to -16 feet  
depth, part of the -6 to -16.5 feet depth interval [Field record says "add to base of 6'-16';  
first recovery"])

Part 2-1                                  36 cm of core—3.96 to 4.27 m depth                      (-13 to -14 feet)

0–23 cm

no core

23–36 cm

Sandstone; similar to above, but better sorted.

Condition: Partly broken and rounded pieces, but in place.

Part 2-2                                  60 cm of core—4.27 to 4.88 m depth                      (-14 to -16 feet)

0–20 cm

Sandstone; light brown, speckled appearance with common dark grains (pepper & salt appearance); fine grained, with some medium grains; moderately sorted; quartzose; a little mud matrix between grains; thick bedded; common gastropod steinkerns and phosphate nodules; bioturbated (lamination lacking); gradational basal contact.

Condition: Moderately broken, but pieces in place.

20–38 cm

Sandstone; light brown, speckled appearance with common dark grains (pepper & salt appearance); fine grained; moderate-well sorted; quartzose; a little mud matrix between grains; thick bedded; some lamination; some bioturbation; gradational basal contact.

Condition: Partly broken.

38–60 cm

Mudstone, silty and sandy; light brown, and mottled with shades of tan; poorly sorted; quartzose grains; thick bedded.

Condition: Partly broken. Much weathered. Some modern roots present along fracture surfaces.

End of core section.

LINER SECTION 3                      5.03 to 5.64 m depth                      (-16.5 to -18.5 feet)

[Recorded in field as 16 to 17.5 feet. Depths modified to accommodate the actual thickness of core recovered in top 23.5 feet depth interval.)

Part 3-1                      61cm of core—5.03 to 5.64 m depth                      (-16.5 to -18.5 feet)

0–20 cm

Mudstone, silty and sandy; light brown, and mottled with shades of tan; poorly sorted; quartzose grains; thick bedded; gradational basal contact.

Condition: Broken into pieces and shifted in position. Partly weathered. Many coarse quartzose pebbles mixed in with rock pieces.

20–61 cm

Mudstone, silty; light brown, with some dark gray patches in the center of larger pieces; poorly sorted; thick bedded(?).

Condition: Broken into small pieces with a few larger unbroken pieces present, but still in position. Very broken in lower 15 cm, consisting of small to very small pieces.

Weathered. Centers of large pieces not weathered.

End of core section.

LINER SECTION 4                      5.64 to 7.16 m depth                      (-18.5 to -23.5 feet)

[Recorded in field as 20.5 to 23.5 feet. Depths modified to accommodate the actual thickness of core recovered in top 23.5 feet depth interval.)

Part 4-1                      60 cm of core—5.64 to 6.25 m depth            (-18.5 to -20.5 feet)

0–2 cm

Mudstone. Continuation of above unit. Gradational basal contact. Roots.

Condition: Partly broken. Much weathered.

2–12 cm

Conglomeratic mudstone, sandy; light brown; poorly sorted; chunks of mudstone separated with thin coarser layers of mud containing sand-sized grains of phosphatic material, glauconite and rare spherules, possibly pieces of fish bone; some pyrite crystal masses, now altered to iron oxides; many gypsum-filled fractures and roots; gradational basal contact. This is the root zone also observed in Mullinax-2.

Condition: Much weathered; pyrite all oxidized and much secondary gypsum in sediment.

12–26 cm

Sanstone, conglomeratic and argillaceous; light brown; very poorly sorted; clasts of mudstone set in matrix of granular material; a few pebble size clasts of phosphatic material; coarse sand grains are mostly phosphatic, either pieces of fish bone or phosphatic steinkerns; some pieces of oyster shell; common pyrite crystal masses, now altered to iron oxides; common gypsum crystals scattered through granular matrix; sharp basal contact.

Condition: Much weathered; pyrite all oxidized and much secondary gypsum in sediment.

26–60 cm

Mudstone; light brown, with patches of medium gray; some lamination; thick bedded; many gypsum-filled fractures, with large masses of gypsum crystals.

Condition: Much weathered; much secondary gypsum in sediment, with small areas of non-oxidized sediment.

Part 4-2                      61 cm of core—6.25 to 6.86 m depth                      (-20.5 to -22.5 feet)

0–61 cm

Mudstone; light brown with patches of medium gray; color change at 45 cm level with sediment becoming dominantly gray in color; thick bedded; some fossils present in gray mudstone patches, increasing with depth; large amounts of secondary gypsum along fracture surfaces, but less gypsum in lower 15 cm, as color changes. Glauconite and spherules (?) in discrete layers with sharp undulose basal contact.

Condition: Much weathered; much secondary gypsum in sediment, with some areas of non-oxidized sediment. Gray areas not much leached.

Part 4-3                      35 cm of core—6.86 to 7.16 m depth                      (-22.5 to -23.5 feet)

0–8 cm

Mudstone, medium gray with brown streaks; fine grained. Continuation of above unit. Gradational basal contact. 1–2 cm light brown clay layer at 5–7 cm, roots.

Condition: Weathered, with some secondary gypsum in sediment and oxidized zones.

8–35 cm

Mudstone; dark gray; fine grained; thick bedded; scattered small fossils and fossil fragments; framboidal pyrite present near base.

Condition: partly weathered (near top); lower 10 cm quite broken into small pieces, but in place.

LINER SECTION 5                      7.16 to 8.69 m depth                      (-23.5 to -28.5 feet)

Part 5-1                      25 cm of core—7.16 to 7.47 m depth                      (-23.5 to -24.5 feet)

0–10 cm

Mudstone; dark gray; fine grained; thick bedded; scattered small macrofossils; framboidal pyrite in small and large masses; sharp basal contact.

Condition: Good.

10–25 cm

Mudstone; dark gray; fine grained; thick bedded, but breaks into thin layers; scattered small macrofossils.

Condition: Good, although breaks into small pieces.

Part 5-2                      60 cm of core—7.47 to 8.08 m depth                      (-24.5 to -26.5 feet)

0–60 cm

Mudstone; dark gray; fine grained; thick bedded, but breaks into thin layers; scattered small macrofossils; some large framboidal pyrite masses. Continuation of above unit.

Condition: Good, although breaks into small pieces.

Part 5-3                      60 cm of core—8.08 to 8.69 m depth                      (-26.5 to -28.5 feet)

0–60 cm

Mudstone; dark gray; fine grained; thick bedded, but breaks into thin layers; scattered small macrofossils. Continuation of above unit.

Condition: Good, although breaks into small pieces, with less breakage in lower portion.

LINER SECTION 6                      8.69 to 10.21 m depth                      (-28.5 to -33.5 feet)

Part 6-1                      60 cm of core—8.69 to 9.30                      (-28.5 to -30.5 feet)

0–60 cm

Mudstone; dark gray; fine grained; thick bedded; scattered small macrofossils; much framboidal pyrite in 57–60 cm interval.

Condition: Good, but much fractured with pieces still in position.

Part 6-2                      61 cm of core—9.30 to 9.91 m depth            (-30.5 to -32.5 feet)

0–61 cm

Mudstone; dark gray; fine grained; thick bedded; scattered small and large macrofossils; ammonite shells at 35 and 60 cm levels; some framboidal pyrite.

Condition: Good, but fractured with pieces still in position.

Part 6-3                      35 cm of core—9.91 to 10.21 m depth            (-32.5 to -33.5 feet)

0–20 cm

Mudstone, silty; dark gray; poorly sorted; thick bedded; scattered small and large macrofossils; ammonite shell at 3 cm level; much framboidal pyrite around and in interior of ammonite; gradational basal contact.

Condition: Good, except for some crumbling along some vertical fractures.

20–35 cm

Mudstone/sandstone, argillaceous; dark gray; poorly sorted; very fine grained; thick bedded; scattered small macrofossils and large benthic forams.

Condition: Good.

LINER SECTION 7            10.21 to 11.73 m depth            (-33.5 to -38.5 feet)

Part 7-1                      25 cm of core—10.21 to 10.52 m depth            (-33.5 to -34.5 feet)

0–25 cm

Mudstone/sandstone, argillaceous; dark gray; poorly sorted; very fine grained; thick bedded; scattered small and large macrofossils, with ammonite at 18 cm level.

Condition: Good, except for some breakage in middle interval, with pieces still in position.

Part 7-2                      58 cm of core—10.52 to 11.13 m depth    (-34.5 to -36.5 feet)

0–58 cm

Mudstone/sandstone, argillaceous; dark gray; very fine grained; moderate sorting; quartzose, with scattered dark grains; thick bedded, but parts into thinner pieces; obscure lamination; some larger benthic forams; a few small diameter sand-filled burrow near top.

Condition: Good, except for breakage, with pieces still in position.

Part 7-3                      60 cm of core—11.13 to 11.73 m depth    (-36.5 to -38.5 feet)

0–20 cm

Sandstone/mudstone, argillaceous and silty; dark gray; very fine grained; moderate sorting; quartzose, with scattered dark grains; thick bedded, but parts into thinner pieces; obscure lamination; some small fossils; gradational basal contact.

Condition: Good, except for breakage, with pieces still in position.

20–60cm

Mudstone, silty; dark gray; poorly sorted; thick bedded; scattered small macrofossils; moderately large framboidal pyrite masses at 52 cm level.

Condition: Good, except for breakage, with pieces still in position.

LINER SECTION 8              11.73 to 13.26 m depth                      (-38.5 to -43.5 feet)

Part 8-1                      61 cm of core—11.73 to 12.34 m depth    (-38.5 to -40.5 feet)

0–55 cm

Mudstone, silty; dark gray; poorly sorted; thick bedded; scattered small macrofossils and benthic forams; gradational basal contact.

Condition: Good, except for breakage, with pieces still in position.

55–61 cm

Sandstone/mudstone, argillaceous and silty; dark gray; very fine grained; moderate sorting; quartzose, with scattered dark grains; thick bedded, but parts into thinner pieces; some small fossils.

Condition: Good, except for minor breakage, with pieces still in position.

Part 8-2                      61 cm of core—12.34 to 12.95 m depth    (-40.5 to -42.5 feet)

0–61 cm

Sandstone/mudstone, argillaceous and silty; dark gray; very fine grained; moderate sorting; quartzose, with scattered dark grains; thick bedded, but parts into thinner pieces; some small fossils.

Condition: Good, except for minor breakage, with pieces still in position.

Part 8-3                      37 cm of core—12.95 to 13.26 m depth    (-42.5 to -43.5 feet)

0–37 cm

Sandstone/mudstone, argillaceous and silty; dark gray; very fine grained; moderate sorting; quartzose, with scattered dark grains; thick bedded, but parts into thinner pieces; some small fossils.

Condition: Good, except for minor breakage, with pieces still in position.

LINER SECTION 9            13.26 to 14.78 m depth                      (-43.5 to -48.5 feet)

Part 9-1                      24 cm of core—13.26 to 13.56 m depth    (-43.5 to -44.5 feet)

0–4 cm

Mudstone, argillaceous and silty; dark gray; poorly sorted; thick bedded, but parts into thinner pieces; some small fossils; gradational basal contact.

Condition: Good, except for minor breakage, with pieces still in position.

4–24 cm

Mudstone, silty; dark gray; poorly sorted; thick bedded; scattered small macrofossils.

Condition: Good, except for minor breakage.

Part 9-2                      60 cm of core—13.56 to 14.17 m depth    (-44.5 to -46.5 feet)

0–60 cm

Mudstone, silty; dark gray; poorly sorted; thick bedded; scattered small and large macrofossils.

Condition: Good, except for minor breakage, with pieces still in position.

Part 9-3                      61 cm of core—14.17 to 14.78 m depth    (-46.5 to -48.5 feet)

0–61 cm

Mudstone, silty; dark gray; poorly sorted; thick bedded; a few scattered small and large macrofossils, including a small coral at 12 cm level.

Condition: Good, except for minor breakage, with pieces still in position.

LINEAR SECTION 10        14.78 to 16.46 m depth                      (-48.5 to -54 feet)

Part 10-1                      60 cm of core—14.78 to 15.39 m            (-48.5 to -50.5 feet)

0–25 cm

Mudstone, silty; dark gray; poorly sorted; thick bedded; a few scattered small macrofossils; gradational basal contact.

Condition: Good.

25–60 cm

Mudstone, silty and sandy; dark gray; sand component very fine grained; sand quartzose, with scattered dark grains; thick bedded; some small fossils; some small diameter sand-filled burrows.

Condition: Good, except for minor breakage, with drilling mud injected along fractures.

Part 10-2                      61 cm of core—15.39 to 16.00 m depth      (-50.5 to -52.5 feet)

0–61 cm

Mudstone, silty; dark gray; poorly sorted; contains a few laminae of fine grained, sorted sand; thick bedded; a few scattered small macrofossils; a few small diameter sand-filled burrows.

Condition: Good.

Part 10-3                      42 cm of core—16.00 to 16.46 m                      (-52.5 to -54 feet)

0–42 cm

Mudstone, silty; dark gray; poorly sorted; contains some laminae of fine grained, sorted sand and a few bundles of sand laminae; thick bedded; a few scattered small macrofossils; a few small diameter sand-filled burrows and one larger diameter burrow; small amounts of framboidal pyrite.

Condition: Good.

LINER SECTION 11                      16.46 to 17.83 m depth                      (-54 to -58.5 feet)

Part 11-1                      18 cm of core—16.46 to 16.61 m depth    (-54 to -54.5 feet)

0–18 cm

Mudstone, silty; dark gray; poorly sorted; thick bedded; a few scattered small macrofossils.

Condition: Broken in pieces, shifted position, but roughly in place. Some drilling mud.

Part 11-2                      61 cm of core—16.61 to 17.22 m depth    (-54.5 to -56.5 feet)

0–48 cm

Mudstone; dark gray; a few scattered small fossils.

Condition: Broken into small to medium pieces and embedded in some drilling mud; much core lost and minor recovery. Pieces not in position.

48–61 cm

Mudstone; dark gray; a few scattered small fossils.

Condition: Broken into pieces and embedded in mass of drilling mud. Pieces shifted and only partly in position.

Part 11-3                      61 cm of core—17.22 to 17.83 m depth    (-56.5 to -58.5 feet)

0–12 cm

Mudstone; dark gray; a few scattered small fossils.

Condition: Broken into small pieces, but mostly in place. Much drilling mud embedded between pieces.

12–61 cm

Mudstone, silty; dark gray; poorly sorted; contains common laminae of fine grained, sorted sand and some bundles of sand laminae; thick bedded; a few scattered small macrofossils; a few small diameter and larger diameter sand-filled burrows.

Condition: Good.

LINEAR SECTION 12      17.83 to 19.35 m depth      (-58.5 to -63.5 feet)

Part 12-1                      61 cm of core—17.83 to 18.44 m depth      (-58.5 to -60.5 feet)

0–61 cm

Mudstone, silty; dark gray; poorly sorted; contains common laminae of fine grained, sorted sand and some bundles of sand laminae; thick bedded; a few scattered small macrofossils; a few small diameter and larger diameter sand-filled burrows; some areas with framboidal pyrite, mostly in sand laminae.

Condition: Good

Part 12-2                      61 cm of core—18.44 to 19.05 m depth      (-60.5 to -62.5 feet)

0–61 cm

Mudstone, silty; dark gray; poorly sorted; contains common laminae of fine grained, sorted sand and some bundles of sand laminae; thick bedded; a few scattered small macrofossils; a few small diameter and larger diameter sand-filled burrows; some areas with framboidal pyrite, mostly in sand laminae.

Condition: Good, except for some vertical fractures in middle of section.

Part 12-3                      36 cm of core—19.05 to 19.35 m depth      (-62.5 to -63.5 feet)

0–36 cm

Mudstone, silty; dark gray; poorly sorted; contains some laminae of fine grained, sorted sand; thick bedded; a few scattered small macrofossils; a few small diameter sand-filled burrows; some areas with framboidal pyrite in sand laminae.

Condition: Good, except for several vertical fractures.

LINEAR SECTION 13      19.35 to 19.96 m depth      (-63.5 to -65.5 feet)

Part12-1                      60 cm of core—19.35 to 19.96 m depth    (-63.5 to -65.5 feet)

0–60 cm

Mudstone, silty; dark gray; poorly sorted; contains many laminae of fine grained, sorted sand; thick bedded; roughly laminated; a few scattered small macrofossils and benthic forams; a few small diameter sand-filled burrows; some framboidal pyrite in sand laminae and filling small burrows.

Condition: Fair; core of small diameter (about 2/3 normal diameter). Many quartzose pebbles present in drilling mud surrounding core.

End of core section

Bottom of core