

SPECIAL CORE ANALYSIS, 33/9-9S
MOBIL EXPLORATION NORWAY, INC.

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This report contains preliminary data from the detailed examination of the cores from Mobil 33/9-9, Staffjord Field, Norway. The data has been reviewed in detail; however, it is subject to change prior to completion of all core measurements. The first section is a Mobil special report consisting of the written description and lithologic logs of the Brent and Staffjord formations. In the second section, the porosity, density, and permeability of selected vertical plug samples at the various uncorrected depths are given. Note that these samples are assigned FRL sample numbers which are given at the left. These numbers are used in succeeding sections of this report. Plots of the pore size distribution derived from mercury injection of many of these plug samples are presented in the third section. The compressional and shear velocities of the plugs for various confining pressures are in the fourth section. Most of these were run dry with a few brine saturated. Finally, the compressional and shear velocities of four full core samples are presented at various confining pressures and temperatures, both dry and brine saturated.

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RESEARCH REPORT NO. 5, 1979
AC. NO. 018491
RR790418-2FR
April 18, 1979

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MOBIL RESEARCH AND DEVELOPMENT CORPORATION
RESEARCH DEPARTMENT
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EXPLORATION RESEARCH
PROJECT 506-651

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DETAILED LITHOLOGIC DESCRIPTION OF THE CORE
FROM MOBIL 33/9-9, STATFJORD FIELD, NORWAY

ABSTRACT

The Brent and Statfjord Formations were cored in the Mobil 33/9-9 well, Statfjord Field, with 88 percent recovery. A detailed written description and a lithologic log of the 230.1 meters recovered are presented. The Brent Formation consists of thick beds of poorly cemented yellowish-brown sandstone with about 15 percent interbedded shale. The sandstones are very fine-grained at the base of the formation and become coarser grained upwards. The basal two-thirds of the Statfjord Formation consists of thin beds of well-cemented green, gray, and brown sandstone with about 30 percent interbedded shale and mudstone; the upper one-third consists of thick and thin beds of fairly well-cemented yellowish-brown sandstone with about 10 percent interbedded shale.

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MOBIL RESEARCH AND DEVELOPMENT CORPORATION

Field Research Laboratory
DATE April 18, 1979

TO Robert J. Watson

C.C.

REPORT RR790418-2FR
DETAILED LITHOLOGIC DESCRIPTION
OF THE CORE FROM MOBIL 33/9-9
STATFJORD FIELD, NORWAY

This report contains the written description and a lithologic log of the Brent and Statfjord Formations cored in the Mobil 33/9-9 well, Statfjord Field. This work was done in support of the well log calibration studies being conducted at FRL. One of the conditions imposed on making these cores available to Mobil for this study was that all measurements in the cores would be made available to the twenty participants in the Statfjord Field. This report constitutes partial fulfillment of this obligation and will be mailed to Mobil Exploration Norway for distribution to all participants.

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Attach.

DETAILED LITHOLOGIC DESCRIPTION OF THE CORE
FROM MOBIL 33/9-9, STATFJORD FIELD, NORWAY

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DETAILED LITHOLOGIC DESCRIPTION OF THE CORE
FROM MOBIL 33/9-9, STATFJORD FIELD, NORWAY

I. INTRODUCTION

A 261.1 meter (856.6 feet) interval was cored in the Mobil 33/9-9 well, Statfjord Field, in September, 1977. The Brent and Statfjord Formations, both of Jurassic age, were cored (recovery was 88 percent) and a small part of the intervening Dunlin shale was recovered. This is the first full core of the Statfjord Formation in this field.

The geologic description of the core is presented in two forms: first, a written megascopic rock description and second, a lithologic log showing schematically the character of the rock.

Cores 1 through 16 are "off depth" and a correction factor of +11.3 meters is required. In the written megascopic rock description all corrected depths are enclosed in parentheses. The sample locations noted on the lithologic log are vertical plugs. The depths given are log depths and the corrected depths are enclosed in parentheses.

II. ROCK DESCRIPTIONS

Statfjord 33/9-9
Core 1

- 2402.7 m 55 cm medium yellowish-gray coarse- to medium-grained poorly
(2414.0) sorted petroleum-stained sandstone with carbonaceous
 streaks; slightly friable, noncalcareous cement.
 Full core, 2402.7-2402.9 m, kept out for acoustic studies.
 Horizontal plug, 2402.8 m.
- 2403.1 70 cm sandstone as above; carbonaceous streaks up to 1 cm
(2414.4) thick at 2403.5 m; scattered shell fragments in next 20 cm;
 pyrite cement in rounded patches up to 2 cm in diameter
 scattered through lower 30 cm; large fragment of belemnite
 shell at 2403.9 m.
 Vertical plug, 2403.2 m.
- 2404.1 1 bag pieces (up to 8 cm in diameter) of sandstone as above
(2415.4) mixed with loose sand.
 1 bag pieces of dark-gray sandstone as above mixed with loose
 sand.
 10 cm medium yellowish-gray sandstone as above with carbona-
 ceous streaks; slightly friable, noncalcareous cement.
 3 bags muddy sand with a few small (1 cm diameter) pieces
 sandstone as above.
- 2404.8 7 bags muddy sand with a few small (1 cm diameter) pieces
(2416.1) sandstone as above.
- 2405.7 15 cm medium yellowish-gray coarse- to medium-grained poorly
(2417.0) sorted petroleum-stained sandstone with carbonaceous
 streaks; slightly friable, noncalcareous cement.
 5 bags muddy sand with several pieces (up to 10 cm diameter)
 sandstone as above.
- 2406.4 64 cm sandstone as above; cross-section through a belemnite
(2417.7) at 2406.7 m; 2 streaks mid-box are better cemented and
 lighter in color with less oil stain.
 Vertical plug, 2406.9 m.
- 2407.3 1 bag pieces (up to 8 cm in diameter) of sandstone as above
(2418.6) mixed with muddy sand.
 50 cm sandstone as above with a cross-section through a
 belemnite at 2407.8 m.

Statfjord 33/9-9
Core 1 - continued

- 2408.1 m (2419.4) 65 cm sandstone as above with 2 fragments of belemnite at 2408.6 m.
1 bag large pieces as above mixed with muddy sand.
- 2409.8 (2421.1) 32 cm yellowish-gray sandstone as above with decreasing grain size, mostly medium-grained, poorly sorted.
1 bag loose muddy sand with small (up to 1 cm diameter) pieces sandstone as above.
38 cm sandstone as above (with longitudinal section of belemnite at 2409.4 on 1" slab cut); a few lighter colored streaks mid-box.
Vertical plug, 2409.8 m.
- 2409.8 (2421.1) 70 cm sandstone as above; scattered dark-gray organic-rich streaks; last belemnite shell fragment at 2410.4 m.
Horizontal plug, 2410.2 m.
- 2410.6 (2421.9) 55 cm sandstone as above; streak lignitic material at 2411.0.
Full core, 2410.6-2410.8 m, kept out for acoustic studies.
Horizontal plugs, 2411.0 and 2411.4 m.
Vertical plug, 2411.0 m.
- 2411.5 (2442.8) 64 cm sandstone as above with 0.6 cm coal streak.
- 2412.3 (2423.6) 28 cm light yellowish-gray fine- to medium-grained subround to subangular sandstone, bimodal sorting, trace muscovite, abundant shiny black grains (indeterminant with binocular), friable, noncalcareous cement.
20 cm medium-gray medium- to coarse-grained subround to subangular sandstone, poorly sorted; friable, noncalcareous cement; more heavily oil-stained than sandstone above.
1 bag loose sand with a few pieces up to 5 cm diameter.
18 cm medium-gray medium- to coarse-grained subangular to subround sandstone, poorly sorted; slightly friable, noncalcareous cement with a few streaks of clay.
Vertical plug, 2412.4 m.
- 2413.0 (2424.3) 16 cm sandstone as above with trace chlorite (glaucinite?).
1 bag loose sand with sandstone pieces up to 3 cm diameter.
35 cm sandstone as above with 0.5 cm diameter pyrite nodule, scattered green grains (chlorite or glauconite), noncalcareous and well-cemented.
Vertical plug, 2413.2 m.

Statfjord 33/9-9
Core 1 - continued

- 2413.8 m (2425.1) 49 cm medium-gray medium- to coarse-grained subangular to subrounded poorly sorted sandstone with angular clay clasts and abundant nodules of pyrite ranging from 0.3 cm diameter to blebs with a few very fine crystals; well-cemented, noncalcareous cement.
Vertical plug, 2414.0 m.
- 2414.6 (2425.9) 50 cm light yellowish-gray medium- to fine-grained subround to subangular sandstone, fair sorting; well-cemented, noncalcareous cement.
1 bag muddy sand.
18 cm sandstone as above.
Vertical plug, 2414.8 m.
- 2415.2 (2426.5) 43 cm sandstone as above; one piece shows crossbedding.
1 bag loose sand with a few pieces of sandstone up to 1 cm diameter.
27 cm sandstone as above, becoming slightly friable.
- 2416.0 (2427.3) 52 cm sandstone as above with increasing amounts very fine sand; friable, noncalcareous cement.
Vertical plug, 2416.3 m.
- 2416.8 (2428.1) 10 cm sandstone as above.
2 bags loose sand, bimodal, medium- and very fine-grained.
22 cm sandstone as above, increasingly friable.
- 2417.6 (2428.9) 2 bags loose sand, strongly bimodal.
26 cm pieces sandstone as above, increasing grain size, mostly coarse- to medium-grained, very friable, abundant fine and very fine noncalcareous grains acting as cementing material.
Vertical plug, 2417.9 m.
- 2418.0 (2429.3) 1 bag loose sand.
8 cm yellowish-gray coarse-grained subround to subangular sandstone, poor sorting, friable, noncalcareous cement.
12 cm medium-gray medium-grained subround to subangular sandstone, fair sorting, trace muscovite; fairly well-cemented, noncalcareous cement.
28 cm yellowish-gray coarse- to fine-grained subround to subangular sandstone with a trace of very fine muscovite, friable, noncalcareous cement.

Statfjord 33/9-9
Core 1 - continued

2418.9 m 54 cm dark yellowish-gray medium-grained subrounded poorly
(2430.2) sorted sandstone; increasing muscovite with a few lamina
 of muscovite; fairly well-cemented, noncalcareous cement;
 several streaks quartz overgrowth cement with perfect
 crystal faces and unusual iridescence of dark-blue and
 purple.
 Vertical plug, 2419.2 m.

2419.4 1 bag loose sand, bimodal quartz with muscovite flakes.
(2430.7) 12 cm medium-gray coarse- to fine-grained poorly sorted
 sandstone; coarse grains subrounded; well-cemented,
 noncalcareous cement with streaks, patches and framboids
 of pyrite; abundant muscovite in laminae.
 9 cm medium-gray medium-grained subround to subangular
 fairly well-sorted sandstone with laminae and streaks
 up to 0.3 cm thick of abundant mica, mostly muscovite;
 well-cemented but breaks easily along micaceous layers.
 8 cm mixed lithology: 0.5 cm dark-gray mudstone; 0.5 cm
 layer of fine-grained micaceous sandstone underlain by
 a lamina rich in organic matter; 7 cm poorly sorted,
 coarse- to fine-grained, slightly friable sandstone;
 noncalcareous cement.
 18 cm yellowish-gray very fine-grained subangular silty
 sandstone; friable, noncalcareous cement; a few fine
 micaceous laminae.

2420.0 70 cm sandstone as above without micaceous laminae;
(2431.3) sandstone is speckled with round pellets (medium-grain
 size) of dark-gray clay, very friable, noncalcareous
 cement; a few fine clay laminae, some framboids of pyrite
 and possibly dark secondary quartz in the lower few
 centimeters.
 Horizontal plug, 2420.8 m.
 Vertical plug, 2420.9 m.

Full core recovery.

Statfjord 33/9-9
Core 2

- 2421.0 m
(2432.3) 45 cm sandstone as above.
Full core, 2421.4-2421.6 m, kept out for acoustic studies.
Horizontal plug, 2421.5 m.
Vertical plug, 2421.5 m.
- 2421.6
(2432.9) 52 cm sandstone as above.
17 cm sandstone with an abrupt color change to medium-gray,
no change in grain size; slightly friable, noncalcareous
cement and abundant muscovite.
- 2422.4
(2433.7) 1 bag medium-gray mudstone pieces up to 8 cm diameter.
25 cm medium-gray micaceous mudstone with thin laminations
of light-gray very fine-grained sandstone and a 1 cm oval
area of cream-colored calcareous clay with an adjacent
smaller oval of pyrite; thin discontinuous layers of
calcareous cement and a few thin discontinuous laminae
of bituminous material.
23 cm dark yellowish-gray fine-grained subround to subangular
sand; fair sorting, abundant muscovite scattered and in
irregular discontinuous laminae, well-cemented, non-
calcareous; bottom 5 cm becoming dark gray from an in-
crease in biotite.
- 2423.2
(2434.5) 63 cm sandstone as above; well-cemented with noncalcareous
cement; micaceous laminae are distorted and have
associated dark organic-rich silt and clay; increasing
biotite; core breaks easily along laminae. Burrow in
1" core slab.
Vertical plug, 2423.4 m.
- 2424.2
(2435.5) 30 cm sandstone as above with increasing mica as well as
stringers and patches of lignite and vitrinite, scattered
small patches of pyrite.
1 bag pieces (up to 10 cm diameter) medium-grained sandstone.
25 cm septarian nodule.
Vertical plug, 2424.3 m.
- 2424.8
(2436.1) 4 cm medium yellowish-gray fine-grained subround sandstone,
well-cemented with calcareous cement.
1 bag of dark-gray waxy noncalcareous shale fragments.
12 cm dark-gray noncalcareous shale with stringers of fine-
grained sand.

Statfjord 33/9-9
Core 2 - continued

- 2425.6 m
(2436.9)
- 10 cm coal with patches (up to 0.5 cm diameter) and stringers of pyrite.
 - 4 cm mixed lithology: medium-gray mudstone with abundant disseminated fine pyrite grading into 1 cm light-gray medium-grained sandstone in irregular contact with finely laminated organic material grading into coal.
 - 8 cm coal with slickensides and sulfur streaks.
 - 10 cm yellowish-gray fine-grained well-sorted subangular sandstone with laminae of organic material and very fine-grained pyrite, flecks of organic material and disseminated framboids of pyrite; slightly friable, noncalcareous cement; trace muscovite.
 - 17 cm medium-gray mudstone with abundant muscovite and dark-gray to black organic material.
 - 13 cm light yellowish-gray sandy siltstone with two layers of light-gray mudstone; thin stringers and wisps of bituminous material, bioturbated and contorted, abundant very fine muscovite; well-indurated and noncalcareous.
 - 4 cm dark-gray mudstone as above with increasing amounts of bituminous material and coal stringers.
- 2426.3
(2437.6)
- 17 cm light yellowish-gray sandy siltstone; bioturbated, with contorted and broken laminae of dull- to shiny-black bituminous material, abundant muscovite and a few patches of pyrite; diagonal healed fracture; well-indurated, noncalcareous cement.
 - 12 cm (approximately) medium-brown shale with abundant muscovite.
- Full core sample, 2426.9-2427.0 m, kept out for acoustic studies.
Horizontal plugs, 2426.4 and 2426.7 m.
- 2427.1
(2438.4)
- 5 cm mud compressed with shale fragments as above in various orientations (this appears to be a "wad" of drilling mud and shale fragments).
 - 13 cm light-creamy brown, fine-grained, well-sorted sandstone; abundant muscovite and dark bituminous grains with scattered pyrite; slightly friable, noncalcareous cement.
 - 3 cm calcareous mudstone and fine-grained sandstone in thin laminae, abundant muscovite; bottom 1 cm brownish-orange sandy mudstone.
 - 5 cm mixed lithology: 2 cm slightly calcareous mudstone as above in sharp contact with light creamy-brown fine-grained angular to subangular sandstone with bituminous streaks and calcareous cement.

Statfjord 33/9-9
Core 2 - continued

- 2427.1 m 8 cm sandstone as above, increasing grain size to medium,
(2438.4) soft sediment deformation.
continued 12 cm sandstone as above; top 2 cm has closely set bituminous
 laminae; 5 cm with a stringer of medium-gray clay and
 pyrite and without laminae; bottom 5 cm has scattered
 bituminous laminae and scattered pyrite within the laminae.
 8 cm sandstone as above with distorted bituminous laminae.
- 2428.0 10 cm sandstone as above with scattered clay clasts and de-
(2439.3) creasing bituminous laminae.
 12 cm sandstone as above with scattered stringers of bitumi-
 nous material and a 2 x 0.5 cm oval clay clast rimmed with
 pyrite.
 10 cm sandstone as above with a single stringer of bituminous
 material.
 10 cm sandstone as above with increasing amounts of bituminous
 material.
 28 cm sandstone as above; upper 6 cm contains a single 0.5 cm
 stringer of bituminous material and a stringer of dark-
 gray clay containing a 1 x 2 cm pyrite nodule.
 Vertical plug, 2428.0 m.
- 2428.8 20 cm sandstone as above; bottom 5 cm has abundant bituminous
(2440.1) and coaly material.
 27 cm light yellowish-brown medium-grained subangular to
 angular sandstone; well-sorted; well-cemented and non-
 calcareous.
 1 bag loose muddy sand.
 7 cm coal with sandstone stringers and abundant pyrite nodules
 up to 1 cm in diameter.
- 2429.8 15 cm sandstone as above; slightly friable and with scattered
(2441.1) blebs of bituminous material.
 1 bag pieces (up to 5 cm diameter) sandstone as above.
 27 cm sandstone as above.
 Full core, 2430.2-2430.3 m, kept out for acoustic studies.
 Horizontal plugs, 2430.1 and 2430.4 m.
- 2430.6 26 cm sandstone as above
(2441.9) 1 bag coal fragments up to 5 cm in diameter.
 14 cm light yellowish-gray siltstone with stringers and
 laminae of very fine-grained cream-colored sandstone;
 abundant healed fractures and soft sediment deformation.
 8 cm siltstone as above with 1 cm stringer of coal.

Statfjord 33/9-9
Core 2 - continued

2431.5 m 4 cm siltstone as above.
(2442.8) 24 cm coal with pyrite stringers and nodules (up to 0.3 cm diameter) and stringers of light yellowish-gray clay.
 10 cm mixed lithology: 3 cm light yellowish-gray medium-grained, well-sorted, subangular to subrounded sandstone with friable noncalcareous cement, in irregularly anastomosing contact with 7 cm medium-gray sandy siltstone containing pyrite nodules, pods of light yellowish-gray fine-grained well-sorted sandstone (probable burrow fillings), abundant blebs of bituminous material, one clay clast and clay lamina.
 15 cm sandstone as above with increasing stringers of bituminous material and clay clasts up to 0.5 cm diameter. (Core Lab photographs show the 15 cm piece immediately below the coal and reversed, followed by the 10 cm piece, also reversed.)
 Vertical plug, 2432.0 m.

2432.4 2 cm light-gray shale with abundant muscovite.
(2443.7) 13 cm yellowish-gray sandstone as above.
 2 cm light-gray shale with pyrite nodules.
 10 cm light-gray shale.

2432.65-2433.0 missing.
(2443.95-2444.3)

Statfjord 33/9-9
Core 3

2433.0 m 1 bag pieces up to 8 cm diameter of yellowish-gray medium-
(2444.3) grained subangular sandstone with clay streaks and clasts;
 trace muscovite and a few grains black bituminous material;
 friable, noncalcareous cement.
 1 bag pieces of sandstone as above with increasing muscovite.
 1 bag small pieces up to 1 cm diameter, a few are sandstone
 as above, mostly dark-gray waxy micaceous shale.

2433.5-2435.0 missing.
(2444.8-2446.3)

Statfjord 33/9-9
Core 4

- 2435.0 m (2446.3) 40 cm finely, intricately, irregularly interlaminated very fine-grained yellow sandstone and sandy muscovitic gray mudstone; fairly well-cemented (noncalcareous, somewhat fissile); no biotite; sandstone is muscovitic and moderately sorted; common coaly fragments and fine stringers in both the sandstone and the mudstone.
15 cm small pieces gray mudstone; in places fissile and/or shiny; noncalcareous; very slightly sandy; abundant muscovite; abundant disseminated carbonaceous material; no biotite.
- 2435.6 (2446.9) 2 bags of small pieces of gray mudstone as above; larger pieces have irregular stringers of sandstone.
1 small piece of gray mudstone as above.
1 bag of small pieces of gray mudstone as above.
- 2435.6 (2447.9) 1 bag of small pieces of gray mudstone with irregular sandstone stringers as above; stringers generally very thin (<5 mm) but rarely to 1 cm.
Several small pieces of gray mudstone as above.
1 bag of chips of gray mudstone as above.
- 2437.6 (2448.9) 1 small piece of gray mudstone with sandstone stringers as above.
1 bag of chips of gray mudstone as above.
Several pieces of gray mudstone as above; shiny planes of fissility in the mudstone are approximately horizontal and clearly at a low to moderate angle to sedimentary structures (defined by thin sand stringers and lenses, with much soft sediment deformation).
- 2438.3 (2449.6) 1 small piece of gray mudstone as above.
1 bag containing 2 large pieces of finely laminated mudstone and sandstone.
Several pieces, 1 large (10 cm), of fairly well-cemented sandstone with very fine carbonaceous and shaly laminae and stringers.
1 bag of chips of gray mudstone as above.
1 bag containing 1 large piece of gray mudstone with sandstone stringers as above.

Statfjord 33/9-9
Core 4 - continued

- 2439.0 m
(2450.3) 1 bag of small pieces of gray mudstone as above.
2 loose pieces (1 large) of gray mudstone as above.
1 bag containing 1 large piece of gray mudstone.
4 loose pieces (1 large) of gray mudstone as above.
Vertical plug, 2439.2 m (topmost loose large piece), rather atypical—discontinuously interlaminated very fine-grained sandstone and mudstone; laminae dipping 10-20°; abundant muscovite.
Vertical plug, 2439.7 m (bottommost loose large piece); typical of the mudstone; gray mudstone with very thin sandstone laminae and lenses.
- 2439.8
(2451.1) Several loose pieces of gray mudstone with sandstone stringers as above; some cross-bedding.
1 bag of small pieces of gray mudstone as above.
1 loose large piece of gray mudstone as above.
1 bag of small pieces of gray mudstone as above.
2 loose small pieces of gray mudstone as above.
- 2440.5
(2451.8) 2 bags chips of gray mudstone with thin discontinuous sandstone stringers and lenses as above; some soft sediment deformation.
2 bags of large pieces of gray mudstone as above.
2 loose small pieces of gray mudstone as above.
1 bag of chips of gray mudstone as above.
1 bag containing 1 small piece of gray mudstone as above.
3 loose pieces (1 large) of gray mudstone as above.
- 2441.2
(2452.5) 1 bag of chips of gray mudstone with sandstone stringers as above.
1 bag of chips and small pieces of gray mudstone as above.
1 bag of small pieces of gray mudstone as above.
1 loose piece of gray mudstone as above.
1 loose piece (approximately 5 cm) of medium- to fine-grained yellowish-brown sandstone; well-cemented, non-calcareous; rare muscovite; common thin organic-rich wisps and stringers; poorly sorted, subangular.
25 cm finely interlaminated very fine-grained, well-sorted yellow sandstone and greenish-gray sandy shale or muddy sandstone; finely but irregularly structured; well-cemented (but porous; not oil-wet; noncalcareous); abundant muscovite and small coaly fragments (some biotite?); rare disseminated pyrite (?).
Horizontal plug, 2441.8 m.

Statfjord 33/9-9
Core 4 - continued

2442.0 m 68 cm sandstone as above; finely, irregularly structured
(2453.3) with rare clay bands as thick as 3 cm; bedding dipping
 20-30°.
 Full core, 2442.0-2442.2 m, kept out for acoustic studies.
 Horizontal plug, 2442.2 m.
 Vertical plug, 2442.7 m; clay-free sandstone interval
 with dipping laminae marked by concentrations of coaly
 material; rather atypical.

2442.8 60 cm (approximately) sandstone as above; top 10 cm has
(2454.1) thin, regular coaly laminae as does basal approximately
 10 cm above; rest is irregularly structured with soft
 green clay and is more typical of this interval as a
 whole.
 Vertical plug, 2442.9 m.

2443.4 5 small pieces of sandstone as above.
(2454.7) 2 bags of pieces of sandstone as above.

Full core recovery.

Statfjord 33/9-9
Core 5

- 2444.0 m (2455.3) 62 cm finely, irregularly interlaminated sandstone (fine- to very fine-grained and slightly muddy) and greenish-gray shale as above; abundant soft sediment deformation and fine cross-bedding.
Vertical plug, 2444.5 m.
- 2444.7 (2456.0) 68 cm sandstone as above; rare coaly lenses as large as 2 cm; low-angle healed fractures toward base.
- 2445.6 (2456.9) 30 cm sandstone as above.
60 cm fine- to very fine-grained yellowish-brown sandstone; poorly cemented (slightly friable; oil-wet; noncalcareous); common muscovite; very rare biotite; widely spaced, thin black discontinuous and subparallel (slightly dipping) laminae and cross-bedding are of carbonaceous material; moderately to well-sorted, subangular.
Vertical plug, 2445.7 m.; sand interlaminations thicker than above; shale laminae somewhat less disturbed.
Vertical plug, 2446.1 m.
- 2446.4 (2457.7) 63 cm sandstone as above.
- 2447.0 (2458.3) 71 cm sandstone as above.
- 2447.8 (2459.1) 63 cm sandstone as above plus 1 bag loose sand 10 cm from top, as enclosing sandstone, fine- to very fine-grained; carbonaceous/shaly laminae here tend to be thicker and more regularly and closely spaced than above, though no clear trends.
Vertical plug, 2448.4 m.; bottom of piece was plugged; top is finely, regularly laminated and atypical.
- 2448.5 (2459.8) 83 cm sandstone as above; fine- to very fine-grained, yellowish-brown, muddy; abundant muscovite; very rare biotite; poorly cemented (slightly friable, noncalcareous); poorly sorted, subrounded; thin coaly laminae (dipping approximately 10°) are irregularly spaced and discontinuous toward top and more closely spaced and continuous toward base.

Statfjord 33/9-9
Core 5 - continued

- 2449.4 m 77 cm sandstone as above; no distinct change, but by center
(2460.7) is slightly coarser (fine- to medium-grained) and poorly
sorted, subrounded.
15 cm grayish sandstone much as above, with abundant, closely
spaced and thicker coaly laminae.
Vertical plug, 2449.8 m.; fine- to medium-grained.
- 2450.2 75 cm sandstone as above; grain size and muddiness variable;
(2461.5) largely fine- to medium-grained and slightly muddy.
Horizontal plugs, 2450.4 and 2450.8 m.
- 2451.0 63 cm sandstone as above; fairly well-cemented (very slightly
(2462.3) friable; noncalcareous); medium- to fine-grained; common
muscovite; massive; coaly laminae irregular and very rare;
moderately to poorly sorted, subrounded.
- 2451.7 60 cm sandstone as above; better cemented (not friable);
(2463.0) massive.
Full core, 2452.2-2452.6 m, kept out for acoustic studies.
Vertical plug, 2452.1 m.
- 2452.6 47 cm sandstone as above plus 1 bag loose sand and friable
(2463.9) pieces approximately in center; medium-grained; slightly
friable; common muscovite; no biotite; vague banding
(?; slightly dipping); poorly sorted, subrounded to sub-
angular.
Horizontal plug, 2452.6 m.
- 2453.5 54 cm sandstone as above plus 1 bag loose sand at base.
(2464.8)
- 2454.2 50 cm sandstone as above.
(2465.5) Vertical plug, 2454.8 m.
- 2455.0-2457.0 missing.
(2466.3-2468.3)

Statfjord 33/9-9
Core 6

- 2457.0 m (2468.3) 40 cm sandstone as above; yellowish-brown; medium-grained; fairly well-cemented (noncalcareous); abundant muscovite; no biotite; occasional dipping (approximately 10°) coaly laminae (maximum thickness approximately 2 mm); rare rock fragments to 0.5 cm; poorly sorted, subrounded.
2 bags medium-grained loose sand with occasional poorly cemented (noncalcareous; to approximately 3 cm) pieces.
- 2458.0 (2469.3) 1 piece (approximately 10 cm) of fairly well-cemented sandstone as above.
1 bag of medium-grained loose sand with common coaly material.
1 piece (approximately 10 cm) of fairly well-cemented sandstone as above.
1 bag of loose sand as above.
1 piece (approximately 10 cm) of fairly well-cemented sandstone as above.
1 bag of loose sand as above.
1 piece (approximately 10 cm) of fairly well-cemented sandstone as above.
- 2459.0 (2470.3) 6 bags of mostly loose sand, medium-grained except bag 5 (fine-grained); occasional coaly laminae observed in rare friable pieces.
- 2460.0 (2471.3) 5 bags mostly loose sand; bags 1-4, medium-grained, as above; bag 5, fine- to very fine-grained and lighter colored than above; abundant muscovite (and chlorite?); biotite in laminae in the occasional friable fragments; moderately sorted, subangular to angular.
- 2461.0 (2472.3) 1 bag of fine- to very fine-grained loose sand.
50 cm fine-grained, slightly yellowish-brown sandstone; well-cemented, noncalcareous; abundant biotite and muscovite; thin (approximately 3 mm) regular bands of relatively concentrated biotite, dipping approximately 30°; moderately to well-sorted, subangular to subrounded.
1 bag of fine- to very fine-grained loose sand.
Horizontal plug, 2461.2 m.
Vertical plug, 2461.5 m.
- 2462.0 (2473.3) 6 bags of loose sand, fine- to very fine-grained, as above.

Statfjord 33/9-9
Core 6 - continued

- 2463.0 m 5 bags of loose sand, fine- to very fine-grained, as above.
(2474.3)
- 2464.0 5 bags of loose sand, fine- to very fine-grained, as above;
(2475.3) scattered thin, dark-brown clayey and coaly laminae
 observed in occasional friable pieces.
- 2465.0 5 bags of loose sand, fine- to very fine-grained as above;
(2476.3) scattered thin, reddish-brown clayey laminae and small-
 scale cross-bedding observed in occasional friable pieces.
- 2466.0 5 bags of loose sand, fine- to very fine-grained, as above;
(2477.3) scattered, irregular reddish-brown clayey laminae observed
 in occasional friable pieces.
- 2467.0 5 bags of loose sand, fine- to very fine-grained, as above;
(2478.3) reddish-brown clayey laminae observed in occasional friable
 pieces; in bags 4 and 5, some pieces show thick (at least
 1 cm) grayish, clayey bands.
- 2468.0 5 bags of loose sand, fine- to very fine-grained, as above;
(2479.3) scattered reddish-brown clayey laminae and cross-bedding
 observed in occasional friable pieces.
- 2469.0 5 bags of friable pieces and loose sand; bag 1, fine- to
(2480.3) very fine-grained; in friable pieces, crude banding by
 concentrations of biotite (biotite still fairly uncommon);
 reddish-brown clay lines high- to low-angle faults, some
 branching; bags 2-5, fine- to very fine-grained, as above;
 in friable pieces, reddish-brown clay laminae and cross-
 bedding are common.
- 2470.0-2471.0 missing.
(2481.3-2482.3)

Statfjord 33/9-9
Core 7

- 2471.0 m (2482.3) 70 cm very fine-grained creamy brown sandstone; well-cemented (noncalcareous); common muscovite; poorly sorted, subrounded to rounded; abundant low- and high-angle healed fractures, most traceable over whole sample, some branching or stepped; rock vaguely banded by concentration of darker colored grains.
Vertical plug, 2471.15 m.
- 2471.8 (2483.1) 80 cm sandstone as above.
Full core, 2472.2-2472.4 m, kept out for acoustic studies.
Horizontal plugs, 2472.1 and 2472.5 m.
- 2472.6 (2483.9) 75 cm sandstone as above; healed fractures still present though less abundant; banding even more vague.
5-25 cm from base, band of very fine-grained gray sandstone; very well-cemented (calcareous); upper and lower contacts gradational over 1-2 cm and slightly dipping; disseminated pyrite.
- 2473.4 (2484.7) 93 cm sandstone as above; banding very vague or absent; healed fractures variable in abundance, abundant to rare.
Vertical plug, 2473.6 m.; no banding; scattered low-angle healed fractures.
- 2474.4 (2485.7) 100 cm sandstone as above, with vague or absent banding and scattered healed fractures.
Center, fractures closely spaced and discontinuous; soft sediment deformation.
0-10 cm from base, thin, regular, undisturbed laminae of biotite; approximately horizontal ($<10^{\circ}$ dip).
- 2475.3 (2486.6) 61 cm sandstone as above.
0-10 cm from top, thin, regular, approximately horizontal biotite laminae as above; some cross-bedding.
Center, interlaminated sandstone and carbonaceous shale; shale bands as thick as 0.5 cm.
0-20 cm from base, sandstone with healed fractures and cross-bedding.
Full core, 2475.5-2475.7 m, kept out for acoustic studies; the few small pieces left in box suggest it is interlaminated sandstone and shale, at least in part.

Statfjord 33/9-9
Core 7 - continued

- 2476.2 m 77 cm sandstone as above; regular, approximately horizontal
(2487.5) (slightly dipping) laminae and bands as thick as 0.5 cm,
most much thinner; rarely broken by high-angle healed
fractures; banding is by both concentration of biotite
and coaly material; scattered pyrite, some as coarse as
coarse sand-sized globules, associated with coaly bands.
Vertical plug, 2476.85 m.; finely, regularly laminated.
- 2477.0 83 cm light yellowish-gray, very fine-grained, subrounded to
(2488.3) rounded sandstone, well-cemented, noncalcareous cement;
abundant muscovite and biotite in thin laminae; distorted
zone of laminae about 1 cm thick in upper 12 cm.
- 2477.8 97 cm sandstone as above; healed fractures visible in 1/2
(2489.1) core cut, not visible in 1/4 cut.
- 2478.7 91 cm sandstone as above; more abundant micaceous streaks in
(2490.0) bottom 30 cm.
Vertical plug, 2478.9 m.
- 2479.5 91 cm sandstone as above.
(2490.8)
- 2480.4 90 cm sandstone as above.
(2491.7) Vertical plug, 2481.0 m.
- 2481.3 85 cm sandstone as above; healed fractures with mica filling;
(2492.6) color change at 2481.6 m to slightly grayer sandstone; in-
creasing mica content.
- 2482.1 75 cm sandstone as above; abundant irregular laminae of
(2493.4) micaceous shale; slightly calcareous cement in one 10 cm
piece, rest noncalcareous (original description made at
Core Lab lists half the box as bagged pieces of sandstone,
1/4 cut now has loose pieces, none in bags).
Vertical plug, 2482.2 m.

Statfjord 33/9-9
Core 7 - continued

- 2482.9 m 36 cm sandstone as above; micaceous shale laminae more abundant; abrupt color change at 2483.4 m.
(2494.2) 10 cm pod of creamy-brown, very fine-grained sandstone with calcareous cement and abundant clay; calcareous cement extends a few cm from the pod into sandstone with micaceous and carbonaceous laminae that terminate against the calcareous pod; very small framboidal patches of pyrite in the lower 2 cm of pod and in the laminae below the pod.
19 cm sandstone as at top.
1 bag pieces of sandstone as above.
Horizontal plug, 2483.1 and 2483.5 m.
- 2483.9 15 cm micaceous sandy siltstone, noncalcareous, unlaminated.
(2495.2) 40 cm yellowish-gray, very fine-grained, subangular to sub-round sandstone with light-gray, micaceous shale laminae that are fairly regular for 12 cm, becoming increasingly distorted and at approximately 30° angle to core side.
8 cm sandstone as above with 1 cm coal streak.
Vertical plug, 2484.1 m.
- 2484.8 35 cm in bags, large pieces (up to 7 cm) of noncalcareous, very micaceous, sandy mudstone.
(2496.1) 15 cm finely laminated sandstone shown in photograph of original core at 2485.2 m; 1/4 cut has two broken pieces with yellowish-gray, fine-grained sandstone with dark-gray, micaceous mudstone laminae, some very dark-gray, organic-rich layers up to 0.5 cm thick; all noncalcareous.
- 2485.6 18 cm sandstone as above except the micaceous laminae are irregular and horizontal.
(2496.9) 22 cm mixed lithology: 12 cm light-gray limestone, with a patch of pyrite and abundant lignitic pods cut by limestone-filled cracks and with pyrite in streaks along the long axes of pods; limestone changes with small-scale interfingering to 10 cm yellowish-brown, oil-stained, very fine-grained, subangular sandstone; slightly calcareous cement; thin micaceous laminae.
45 cm sandstone as above; abundant disseminated mica; 2 cm diameter pyrite nodule noted in 1/2 core at 2486.2.
Vertical plug, 2486.2 m.

Statfjord 33/9-9
Core 7 - continued

- 2486.3 m 82 cm sandstone as above; mica disseminated throughout;
(2497.6) several healed fractures.
- 2487.3 62 cm sandstone as above; bottom 17 cm abrupt change to
(2498.6) light-gray, very fine-grained sandstone irregularly lami-
nated with medium-gray silty shale; noncalcareous and
fairly well-cemented.
- 2488.1 64 cm sandstone as above with more abundant silty shale
(2499.4) laminae becoming dark-gray and carbonaceous and up to
0.5 cm thick in the last 15 cm, with scattered nodules
of pyrite.
Vertical plug, 2488.3 m.
- 2488.9 28 cm sandstone as above in photographs; this interval
(2500.2) missing from Mobil's 1/4 cut.

Full core recovery.

Statfjord 33/9-9
Core 8

- 2489.3 m
(2500.6) 2 bags of very dark-gray, slightly calcareous shale with abundant muscovite and scattered biotite; waxy appearance on broken surfaces parallel to laminae.
30 cm coarsely laminated, very dark-gray shale with very light-gray, fine- to very fine-grained sandstone; dark shale intervals up to 2 cm thick; few streaks of coaly material; scattered streaks of pyrite; few scattered nodules of sandy, yellowish-brown mudstone.
Vertical plug, 2490.0 m.
- 2490.0
(2501.3) 67 cm shale as above with increasing amount of sand (half or more is sandstone); all noncalcareous.
- 2490.9
(2502.4) 64 cm alternating shale and sandstone as above; bioturbated at 2491.4 m; bottom part of core badly broken as received by Core Lab. Mobil's 1/4 core completely shattered.
Horizontal plug, 2491.5 m.
- 2491.6
(2502.9) 44 cm alternating shale and sandstone with thin laminae in the top half; noncalcareous sandstone laminae have scattered grains of limonite and no visible pyrite.
10 cm very coarse-grained, angular, poorly sorted sandstone with a few pebbles up to 0.3 cm diameter, noncalcareous, well-cemented, oily; top and bottom of 10 cm piece are dark brownish-gray waxy shale with abundant mica.
10 cm of dark brownish-gray waxy micaceous shale pieces.
- 2492.6
(2503.9) 49 cm alternating shale and sandstone apparently dipping 3 or 4 degrees; sandstone in irregular stringers and pods; lithology mostly dark noncalcareous shale with abundant mica.
- 2493.6
(2504.9) 59 cm finely laminated, dark-gray noncalcareous shale with scattered pyrite nodules and abundant mica.
- 2494.1
(2505.4) 45 cm shale as above.
- 2495.0
(2506.3) 62 cm shale as above; siderite nodule at 2495.2 m.

Statfjord 33/9-9
Core 8 - continued

- 2495.8 m 65 cm shale as above; 4 cm by 2 cm, yellowish-brown slightly
(2507.1) calcareous nodule at 2496.8 m.
- 2496.8 52 cm shale as above; 0.5 cm oval nodule and pods and streaks of
(2508.1) sand at 2497.6 m.
- 2497.8 48 cm shale as above; fractures and wispy laminae at an angle;
(2509.1) abundant pyrite crystals at 2498.2 m.
23 cm shale as above.
- 2498.5 68 cm shale as above, laminae horizontal.
(2509.8)
- 2499.5 1 bag shale pieces as above.
(2510.8) 6 cm shale as above.
1 bag shale pieces as above.
27 cm shale as above, some laminae at an angle.
- 2500.1 58 cm shale as above, laminae horizontal.
(2511.4)
- 2500.9 80 cm shale as above.
(2512.2)
- 2501.8 70 cm shale as above.
(2513.1)
- 2502.6 1 bag shale pieces as above.
(2513.9) 33 cm shale as above; part of core missing from box.
- 2503.3 7.5 cm shale as above.
(2514.6) 10 cm dark-brown bedded siderite at 2503.4 m.
52 cm shale as above.
- 2504.2 33 cm shale as above; part of core missing from box.
(2515.5)

Statfjord 33/9-9
Core 8 - continued

2505.0 m 20 cm bed dark-brown siderite at 2505.0 m.
(2516.3) 29 cm shale as above.
 Vertical plug, 2505.0 m.

2505.6-2506.3 missing.
(2516.9-2517.6)

Statfjord 33/9-9
Core 9

- 2707.7 m 33 cm yellowish-brown very coarse-grained angular conglomeratic
(2719) sandstone with pyrite cement in patches and streaks.
5.5 cm sandstone as above with abrupt lithologic change as
pyrite cement stops along an irregular face.
7.5 cm sandstone as above without pyrite.
1 bag pieces of very poorly sorted very coarse- to fine-
grained sandstone with abundant pebbles and noncalcareous
cement.
Vertical plug, 2707.9 m.
- 2708.6 6 bags of loose muddy sand.
(2719.9)
- 2709.6 3 bags pieces up to 5 cm diameter dark-gray mudstone with
(2720.9) a few very coarse angular quartz grains.
- 2710.6-2711.0 missing.
(2711.9-2722.3)

Statfjord 33/9-9
Core 10

- 2711.0 m
(2722.3) 20 cm light-gray to white fine-grained angular sandstone, fairly well-cemented, with carbonaceous streaks and laminae.
10 cm light yellowish-brown fine-grained angular poorly sorted sandstone with thin carbonaceous layers up to 2.5 cm.
33 cm light yellowish-brown fine- to medium-grained angular poorly sorted sandstone with a few scattered grains of carbonate and a few streaks of carbonaceous material.
Full core, 2711.2-2711.4 m, kept out for acoustic studies.
Horizontal plug, 2711.4 m.
- 2712.0
(2723.3) 21.5 cm yellowish-brown coarse- to fine-grained very poorly sorted sandstone, coarse grains are subround; fairly well-indurated, with abundant clay which obscures most grains.
35 cm sandstone as above, becoming more friable and with a few discontinuous carbonaceous laminae.
10 cm yellowish-brown medium- to fine-grained poorly sorted friable sandstone with more abundant carbonaceous laminae.
Horizontal plug, 2712.0 m.
Vertical plug, 2712.2 m.
- 2712.9
(2724.2) 17.6 cm sandstone as above, finer grained with a few scattered calcareous grains.
15 cm sandstone as above, more friable, with 3 layers up to 0.6 cm thick of fine carbonaceous streaks.
20 cm sandstone as above with scattered carbonaceous laminae.
15 cm light yellowish-brown medium- to coarse-grained poorly-sorted sandstone, fairly well-cemented (this interval showed healed fractures in the 1/2 core cut).
- 2713.7
(2725) 39 cm coarse-grained sandstone as above with a few scattered streaks and patches of carbonaceous material.
8 cm sandstone as above with calcareous cement.
4 cm dark-gray fine-grained carbonaceous sandstone.
5 cm light-gray fine- to medium-grained carbonaceous sandstone.
Vertical plug, 2714.1 m.
- 2714.6
(2725.9) 30 cm medium-gray shale and light-gray fine-grained angular poorly sorted sandstone in alternate layers, some sandy streaks up to 2.5 cm thick.

Statfjord 33/9-9
Core 10 - continued

- 2714.6 m 51 cm yellowish-gray coarse- to medium-grained subround to
(2725.9) subangular poorly sorted sandstone with grains and patches
continued of carbonaceous material.
 9 cm medium-gray shale.
- 2715.5 68 cm shale as above with sandstone stringers and streaks,
(2726.8) a few discontinuous laminae of coal, in part fissile.
- 2716.3 36 cm shale as above.
(2727.6) 5 cm fine-grained poorly sorted sandstone; cross-bedded.
 10 cm shale as above.
- 2717.0 20 cm yellowish-brown very coarse-grained poorly sorted sand-
(2728.3) stone with abundant soft black carbonaceous material in
 laminae and patches.
 30 cm sandstone as above with slightly angled irregular car-
 bonaceous laminae.
 30 cm mixed lithology: 2.5 cm layer of coal with streaks
 of sulfur followed by yellowish-brown very coarse-grained
 subround to subangular poorly sorted sandstone with
 scattered pebbles.
 Vertical plug, 2717.0 m.
- 2717.9 20 cm sandstone as above without coaly streaks.
(2729.2) 16 cm light-gray fine-grained sandstone with dark-gray and
 greenish-gray mudstone clasts and nodules.
 12 cm yellowish-brown very coarse-grained friable sandstone.
 6 cm medium-gray shale.
- 2718.5 2 bags of pieces of gray shale and extremely friable sand-
(2729.8) stone as above.
- 2719.5-2721.0 missing.
(2730.8-2732.3)

Statfjord 33/9-9
Core 11

- 2721.0 m 5 bags dark-gray mudstone pieces; a few pieces have reddish
(2732.3) mottling and a trace of mica.
- 2722.0 5 bags mudstone pieces as above; bag 4 has increasing amounts
(2733.3) of mica of increasing size.
- 2723.0 3 cm mudstone as above.
(2734.3) 1 bag mudstone pieces as above with increasing mica.
20 cm dark-gray very fine- to fine-grained well-cemented
 micaceous sandstone with disseminated fine pyrite and
 limonite.
35 cm dark-gray sandstone in 1/2 core represented in 1/4 cut by a
 15 cm piece sandstone as above with decreasing mica.
1 bag pieces of sandy dark-gray mudstone.
Vertical plug, 2723.4 m.
- 2724.0 2 bags pieces dark-gray micaceous mudstone as above, a few
(2735.3) pieces with maroon mottling.
50 cm mottled dark-gray and dark-maroon silty mudstone with
 abundant mica increasing downward.
- 2725.0 45 cm (approximately) broken pieces mottled silty mudstone
(2736.3) as above.
- 2726.0 30.5 cm mottled silty mudstone as above.
(2737.3) 35 cm medium-gray shale with abundant mica.
15 cm mottled silty mudstone.
30 cm mudstone as above with increasing mica.
Vertical plug, 2726.9 m.
- 2727.0 23 cm dark-gray very fine-grained poorly sorted bioturbated
(2738.3) sandstone.
2 bags pieces of dark-gray micaceous shale.
15 cm dark-gray shale with healed fractures.
- 2728.0-2729.0 missing.
(2739.3-2740.3)

Statfjord 33/9-9
Core 12

- 2729.0 m 15 cm medium-gray sandstone as above.
(2740.3) 35 cm light-gray fine-grained poorly sorted micaceous sandstone with scattered carbonaceous streaks.
 46 cm light yellowish-brown fine-grained sandstone with dark laminae of mica at a slight angle and offset by a healed fracture.
- 2729.9 25 cm light-gray medium-grained subangular micaceous sandstone, fairly well-cemented with clay that swells when wet plus calcareous cement in streaks; discontinuous laminae of biotite and muscovite.
(2741.2) 31 cm sandstone as above without any calcareous streaks.
 10 cm sandstone as above with grain size increasing to coarse plus disseminated biotite instead of discontinuous laminae of mica.
 10 cm medium-grained sandstone as above with more abundant clay cement, abundant muscovite and biotite, both disseminated and in discontinuous laminae.
 Vertical plug, 2729.9 m., 2 plugs.
- 2730.85 69 cm light yellowish-gray medium- to coarse-grained angular
(2742.15) poorly sorted sandstone with abundant muscovite and biotite in streaks which increase in number downward.
 5 cm coarse-grained sandstone as above.
- 2731.5 110 cm coarse-grained creamy-brown sandstone; fairly well-cemented (non-calcareous); muscovitic, mostly massive; fines slightly downward.
(2742.8)
- 2732.4 75 cm sandstone as above; coarse-grained at base, with rare
(2743.7) clay clasts and pebbles (< 1 cm).
 Vertical plug, 2732.75 m.
- 2733.2 61 cm sandstone as above but coarser-grained (grit with a
(2744.5) few large clay clasts, to several cm); fairly well-cemented (noncalcareous); poorly sorted, subangular.
 1 bag friable sandstone as above.
- 2734.0 44 cm medium-grained, creamy-brown sandstone; well-cemented
(2745.3) (noncalcareous); in top 1/2, a few dark, irregular wispy clay (carbonaceous?) laminae and rare approximately 1 cm pebbles; bottom 1/2 finely, regularly laminated by biotite flakes; all moderately sorted, subangular.

Statfjord 33/9-9
Core 12 - continued

- 2734.0 m 48 cm very coarse-grained, yellowish-brown sandstone; lightly
(2745.3) cemented (noncalcareous); very poorly sorted, subrounded
continued to subangular; cobbles to approximately 3 cm (especially
abundant in top 1/2) and poorly defined clay clasts to a
few cm.
- 2735.0 75 cm very coarse-grained sandstone, as above, but fairly
(2746.3) well-cemented (noncalcareous); massive; muscovitic; poorly
sorted, subangular to subrounded; rare cm-sized pebbles.
- 2735.8 85 cm sandstone as above.
(2747.1) Vertical plug, 2736.0 m.
- 2736.7 79 cm sandstone as above; still fairly well-cemented (non-
(2748.0) calcareous); less well-cemented (more pieces) at base;
dark-colored, rare, discontinuous clayey-carbonaceous
stringers approximately in middle.
- 2737.4 5 cm hard dark-gray muscovitic siltstone with coaly lenses.
(2748.7) 56 cm plus 1 bag (at base) very coarse-grained sandstone as
above; still fairly well-cemented (noncalcareous); more
abundant irregular coaly stringers, some continuous and
some with disseminated sulfur (?).
- 2738.2 92 cm very coarse-grained sandstone, as above; still non-
(2749.5) calcareous cement; muscovitic, poorly sorted; subrounded
to subangular; rare pebbles to approximately 2 cm; top
10 cm has abundant, very irregular coaly stringers; top
1/4 less well-cemented (in pieces in Mobil's 1/4 cut);
gradationally becomes very well-cemented (calcareous)
and light-gray in bottom 1/2.
Vertical plugs, 2738.4 m and 2739.0 m.
- 2739.2 12 cm hard dark-gray muscovitic shale with a single coal
(2750.5) lens; irregularly interlaminated with coarse-grained
sandstone.
22 cm coarse-grained, yellowish-brown sandstone; fairly well-
cemented (noncalcareous); muscovitic; massive; moderately
sorted, subrounded.
1 bag poorly consolidated, coarse-grained sandstone with
better consolidated, thick dark-gray carbonaceous shale
layers.

Statfjord 33/9-9
Core 12 - continued

- 2739.2 m 20 cm medium- to fine-grained, light-brown sandstone; very
(2750.5) well-cemented (noncalcareous); slightly muscovitic; massive;
continued burrowed at top; thin, wavy gray shale laminae toward base;
abundant unoriented biotite; single high-angle healed
fracture.
- 2740.1 60 cm fine-grained, light grayish-brown sandstone; very well-
(2751.4) cemented (noncalcareous); slightly muscovitic; abundant
generally unoriented biotite; rare healed horizontal
fractures (?); thin shale laminae throughout, dipping
10-20°; grades downward into:
10 cm hard dark-gray shale.
15 cm medium-grained, yellowish-brown sandstone; less well-
cemented (noncalcareous) than above; common muscovite and
biotite; toward base, a few dark-gray shale laminae;
poorly sorted, subangular to subrounded.
- 2741.0 37 cm medium-grained, yellowish-brown sandstone; fairly well-
(2752.3) cemented (noncalcareous); several approximately 2 cm thick
dark-gray muscovitic shale bands throughout; poorly sorted,
angular to subangular.
40 cm hard (noncalcareous) dark-gray shale; bottom 2/3 inter-
laminated with and at very base, cross-bedded with, yellowish-brown sandstone.
- 2742.0-2743.5 missing.
(2753.3-2754.8)

Statfjord 33/9-9
Core 13

- 2743.5 m
(2754.8) 5 cm slickensided, shiny dark-gray muscovitic shale.
10 cm medium- to fine-grained, yellowish-brown sandstone; very well-cemented (noncalcareous); biotite and clay laminae throughout; grades downward into:
15 cm very dark-gray carbonaceous shale with sharp, sloping lower contact.
53 cm fine-grained, yellowish-brown sandstone; very well-cemented (noncalcareous); abundant biotite; common muscovite; moderately sorted, subangular; single healed fracture; rare thin stringers (generally dipping 10-20°) of biotite throughout; common patches and wispy stringers of gray clay dipping approximately 30° occur toward top.
- 2744.4
(2755.7) 70 cm medium-grained, creamy-brown sandstone; very well-cemented (noncalcareous); slightly muscovitic; throughout are thin, generally planar biotite laminae; rare cross-bedding (dip varies from approximately 30° to near horizontal); moderately sorted, subrounded; near base a single pea-sized green clay clast.
Vertical plug, 2744.75 m.
- 2745.3
(2756.6) 68 cm medium-grained, creamy-brown sandstone; very well-cemented (noncalcareous); common muscovite and biotite throughout; much as above, but with very rare thin wispy clay stringers and irregular biotite stringers throughout; alternate layers of coarser and finer material, generally coarser downward; poorly sorted, subangular.
38 cm medium-grained, grayish sandstone; very well-cemented (noncalcareous); slightly muscovitic throughout; single healed fracture at approximately 70° to horizontal; finely laminated throughout (dipping approximately 20°) by wavy biotitic and less biotitic laminae; rare coaly and clay lenses at top, where section is on the whole less finely laminated.
Horizontal plug, 2745.1 m.
Vertical plug, 2745.8 m.
- 2745.9
(2757.2) 30 cm sandstone much as above with rare, very irregular clayey and biotitic stringers.
10 cm sandstone as above but unlaminated, no stringers.
28 cm coarse- to very coarse-grained, yellowish-brown sandstone; well-cemented (noncalcareous); massive; very rare muscovite; rare irregular (flattened and slightly dipping) coaly lenses; poorly sorted, angular to subangular; approximately 5 cm from base is a single half dollar-sized patch of pyrite and calcareous cement.
Vertical plugs, 2746.0 m. and 2746.2 m.

Statfjord 33/9-9
Core 13 - continued

- 2746.6 m 77 cm sandstone as above.
(2757.9) Full core, 2747.1-2747.3 m, kept out for acoustic studies.
 Vertical plug, 2746.75 m.
- 2747.5 102 cm sandstone as above; grit-sized rock fragments and a
(2757.9) single 2 cm clay clast near top.
- 2748.4 82 cm sandstone as above.
(2759.7) Vertical plug, 2748.25 m.
- 2749.2 94 cm sandstone as above; very slight calcareous cement at
(2760.5) base; slightly finer grained (coarse to medium) and some-
 what better sorted than above; common muscovite and
 biotite, generally unoriented; scattered, rare, planar
 clay laminae.
- 2750.0 60 cm sandstone as above, coarse- to very coarse-grained;
(2761.3) single clay clast near top.
 20 cm fine-grained, creamy-brown sandstone; very well-
 cemented (noncalcareous); scattered fine, dark coaly (?)
 laminae, slightly dipping; subparallel biotite flakes
 throughout; moderately sorted, subrounded.
 Vertical plug, 2750.1 m.
- 2750.9 60 cm fine-grained sandstone much as above; very well-cemented
(2762.2) (noncalcareous); common biotite and muscovite; fine
 approximately horizontal laminae of biotite throughout;
 moderately sorted, angular to subangular.
 20 cm coarse-grained yellowish-brown sandstone; noncalcareous;
 poorly sorted; subrounded; massive.
 Vertical plug, 2751.4 m.
- 2751.8 80 cm sandstone as above; grades to very coarse-grained at
(2763.1) base; middle 10 cm has flattened clay clasts and common
 subparallel wispy organic seams; at base, quartzite
 pebbles to approximately 3 cm.
 Full core, 2751.9-2752.1 m, kept out for acoustic studies.
 Horizontal plug, 2751.8 m.

Statfjord 33/9-9
Core 13 - continued

- 2752.7 m 92 cm massive noncalcareous-cemented sandstone as above,
(2764.0) fining downward to coarse sand by base; rare clay wisps
and lenses; only very rare muscovite and biotite;
bottom 1/4 has a small patch of pyrite cement.
Horizontal plug, 2753.3 m.
- 2753.5 10 cm medium-grained sandstone, yellowish-brown as above;
(2764.8) slightly muscovitic; fairly well-cemented (noncalcareous);
unstructured; poorly sorted, subrounded to subangular.
50 cm poorly sorted, very coarse-grained, noncalcareous-
cemented sandstone as 2752.7 m; at top of bottom 1/3, a
10 cm interval of light-gray, muscovitic and biotitic
siltstone to very fine-grained sandstone.
- 2754.2 90 cm (approximately) sandstone as above; top 1/3 medium-
(2765.5) grained; then approximately 10 cm very coarse-grained;
at top of bottom 1/4, 5 cm interval with thin, regular,
slightly dipping biotite laminae, in part cross-bedded;
to base, a very coarse-grained sandstone; interval
poorly sorted and noncalcareous-cemented.
Horizontal plug, 2754.4 m (medium-grained).
- 2755.1 35 cm sandstone as above, grading to coarse-grained at base;
(2766.4) very poorly sorted; noncalcareous cement; some subangular
rock fragments.
3 bags of medium-grained sandstone in friable noncalcareous
pieces; poorly sorted, subangular to subrounded.
10 cm, medium-grained sandstone as above; fairly well-
cemented (noncalcareous); poorly sorted, subangular.
- 2755.9-2757.3 missing.
(2767.2-2768.6)

Statfjord 33/9-9
Core 14

2757.3 m 3 bags of small pieces of slightly muscovitic light-gray
(2768.6) shale; dull (not shiny); top bag (1) has larger pieces
 with narrow coarse-grained white sandstone stringers;
 both sandstone and shale are noncalcareous.

2757.8-2763.0 missing.
(2769.1-2774.3)

Statfjord 33/9-9
Core 15

- 2763.0 m
(2774.3) 5 bags of fine chips of mottled muscovitic, slightly sandy mudstone; green and black colors dominate at top; in bag 5 red dominates.
- 2764.0
(2775.3) 5 bags of fine chips of mottled, muscovitic, slightly sandy mudstone; red, green, and black in varying abundance; red dominates in bag 1.
- 2765.0
(2776.3) 5 bags of fine chips of mottled, muscovitic, slightly sandy mudstone; in bags 1 and 3 there are medium-grained sandstone stringers; bag 2 tested non-calcareous.
15 cm very fine-grained dark-green sandstone; very well-cemented (noncalcareous); massive; poorly sorted (?); one diffuse, slightly lighter colored patch in center is calcareous-cemented.
Uppermost green sandstone, very fine-grained, hard.
Vertical plug, 2765.9 m.
- 2766.0
(2777.3) 10 cm very fine-grained, dark-green sandstone as above; very well-cemented (calcareous).
3 bags of chips of green, red, and black mottled, muscovitic, slightly sandy mudstone.
Vertical plug, 2766.0 m.
- 2767.0
(2778.3) 22 cm very fine-grained, dark-green sandstone; very well-cemented; muscovitic; massive; poorly sorted; at very top, 1 large irregular lighter colored (tan) patch; both green and tan lithologies have calcareous cements in top 10 cm; below that, noncalcareous, rocks appear same, but clear change in cement type over a few cm; fell apart a bit at base when washed (small pieces bagged).
29 cm same lithology as above but with subtle color variations (lighter color from less biotite as well as lighter colored cement?) as well as complex lenses, stringers, and flattened wispy clasts of grayish-green clay; noncalcareous cement in both lighter and darker patches; two long pieces here atop one another, order unknown, grades rapidly downward into:

Statfjord 33/9-9
Core 15 - continued

- 2767.0 m
(2778.3)
continued
- 22 cm fine-grained yellowish sandstone; very well-cemented, mostly noncalcareous with scattered carbonate in patches; common muscovite and biotite; moderately sorted, angular; at base a thin (approximately 3 cm), irregular ("lensy") layer of medium-grained white, noncalcareous-cemented sandstone.
- 30 cm very fine-grained grayish-green sandstone; very well-cemented (noncalcareous); rare muscovite and biotite; subtle, small-scale color variations, some due to clay clasts (?) and stringers, but most to changes in cement color.
- 2768.0
(2779.3)
- 25 cm (1 bag) medium- to coarse-grained, dirty yellowish-brown, muddy sandstone; poorly consolidated; muscovitic; poorly sorted, subangular.
- 28 cm fine-grained, yellow sandstone; very well-cemented (noncalcareous); massive; poorly sorted, subangular; toward base, laminae of biotite flakes and toward top, single 3 cm gray band of relatively high biotite concentration; grades downward over 5 cm (carbonate-cemented zone) into:
- 23 cm fine-grained grayish sandstone; very well-cemented (noncalcareous); muscovitic; faintly laminated, by oriented biotite flakes; poorly sorted, subangular.
- 5 cm dark-gray shale; biotitic and muscovitic; <1 cm of this received in Mobil's 1/4 core.
- 2769.0
(2780.3)
- 15 cm (1 bag) dark-gray shale; fairly well-consolidated; large pieces; no bagged material in Mobil's 1/4 core.
- 20 cm dark-gray shale; muscovitic; no waxy sheen; bottom 5 cm is finely interlaminated and cross-bedded with yellow sandstone.
- 34 cm fine-grained at top, coarsening to medium-grained downward, yellowish-brown sandstone; very well-cemented (noncalcareous); common muscovite and less common biotite; massive; poorly sorted, subangular; near top, one approximately 5 cm diffuse band of calcareous-cemented gray sandstone; near base, rare pebbles to approximately 3 cm.
- 2769.8
(2781.1)
- 15 cm very fine-grained, dark-gray muddy sandstone; very well-cemented (noncalcareous); laminae of oriented biotite flakes; in addition, finely structured with subtle color variations and lenses; calcareous cement toward base where color becomes gradationally lighter; only approximately 10 cm received in Mobil's 1/4 core.
- 58 cm medium- to coarse-grained, yellowish-brown sandstone; massive; poorly sorted, subangular; well-cemented; top 5 cm is grayish and carbonate-cemented while rest is noncalcareous but for 3 approximately penny-sized carbonate-cemented nodules in center.
- Vertical plug, 2769.8 m.

Statfjord 33/9-9
Core 15 - continued

- 2770.3 m 87 cm sandstone much as above; finer grained (medium) toward
(2781.6) base; occasional small soft green clay clasts; rare grit-
 sized rock fragments; rare 1-2 mm carbonaceous/pyrite
 blebs.
- 2771.1 62 cm medium- to coarse-grained sandstone much as above;
(2782.4) noncalcareous cement; massive; poorly sorted, subrounded.
 Horizontal plugs, 2771.1 and 2771.3 m.
 Full core, 2771.6-2771.8 m, kept out for acoustic studies.
- 2772.0 30 cm fine-grained white sandstone; very well-cemented
(2783.3) (calcareous); massive; slightly muscovitic and biotitic;
 moderately sorted, subangular.
 55 cm coarse-grained, yellowish-brown sandstone; well-cemented
 (noncalcareous); massive; scattered large rock fragments;
 poorly sorted.
- 2772.8 94 cm coarse- to medium-grained sandstone as above, noncalcareous
(2784.1) cement; occasional 3 cm flattened clay clasts; massive; poorly
 sorted, subangular to angular.
 Vertical plug, 2773.2 m.
- 2773.6 87 cm sandstone as above; coarse- to medium-grained; yellowish-
(2784.9) brown, well-cemented (noncalcareous); poorly sorted, sub-
 angular; rare poorly defined (relatively clay-rich?) laminae.
- 2774.3 1 bag of large pieces of grayish-green, very slightly muscovitic
(2785.6) shale.
 1 small loose piece of shale as above.
 1 bag of chips and small pieces of shale as above.
 1 bag of shale chips as above with pieces of medium- to coarse-
 grained sandstone; well-cemented, noncalcareous, poorly sorted
 angular to subangular.
 Vertical plug, 2774.5 m. (small loose piece of shale).
- 2775.0 - 2775.3 missing.
(2786.3 - 2786.6)

Statfjord 33/9-9
Core 16

- 2775.3 m
(2786.6) 43 cm medium-grained light grayish-white sandstone; very well-cemented (calcareous); no muscovite; rare biotite; unstructured; rare pea-sized carbonaceous/pyrite blebs; moderately sorted, subangular.
53 cm medium-grained yellowish-brown sandstone; well-cemented (calcareous); slightly muscovitic and biotitic; very rare carbonaceous/pyrite blebs to pea-sized; poorly sorted, subangular.
Vertical plugs, 2775.4 m. and 2776.1 m.
- 2776.3
(2787.6) 15 cm sandstone as above; yellowish-brown; massive; cement very slightly calcareous.
3 bags sandy (coarse to medium) greenish-gray shale; muscovitic; very slight calcareous cement; small pieces in top 2 bags, single large hard piece in bottom bag.
5 cm very fine-grained, dark-green muddy sandstone; very well-cemented (noncalcareous); irregular, more greenish clay-rich patches; scattered pea-sized pyritic blebs with thin, white, calcareous halos; massive; moderately sorted.
1 bag of dark-gray, sandy muscovitic shale pieces, as bags above.
5 cm coarse-grained, dark-green, very muddy sandstone; very well-cemented (noncalcareous); massive; very poorly sorted, angular to subangular.
- 2777.3
(2788.6) 5 bags of fine chips of mottled dark-green and red muscovitic mudstone; almost all dark-green in top 2 bags; bag 4 tested, slightly calcareous.
- 2778.3
(2789.6) 5 bags fine chips of mottled dark-red, green, and black, slightly muscovitic mudstone; bag 3 tested, noncalcareous.
- 2779.3
(2790.6) 4 bags mudstone as above; bag 2 has slickensides with carbonate cement along surface; bag 3 tested, slightly calcareous.
- 2780.0
(2791.3) 4 bags of mudstone as above; bag 3 tested, slightly calcareous.

Statfjord 33/9-9
Core 16 - continued

2780.7 m 40 cm (2 bags) small friable pieces and loose sand; medium-
(2792.0) grained gray sandstone; very slightly muscovitic; poorly
sorted, subrounded to subangular.

20 cm fine-grained yellowish-gray sandstone; very well-
cemented (noncalcareous); unstructured; very slightly
muscovitic; poorly sorted, subangular.

20 cm medium-grained yellowish-brown sandstone; slightly
friable; noncalcareous cement; muscovitic; very poorly
sorted.

2781.5-2793.0 missing.
(2792.8-2793.0)

Statfjord 33/9-9
Core 17

- 2793.0 m 110 cm medium-grained, yellowish-gray sandstone; fairly well-cemented (noncalcareous); slightly muscovitic; very faintly laminated by parallel orientation of grain long axes (dipping 10-20°); poorly sorted, subrounded to subangular.
Vertical plug, 2793.4 m.
- 2794.0 10 cm sandstone as above.
61 cm medium- to coarse-grained, dark-green, slightly muddy sandstone; slightly muscovitic; unstructured; well-cemented (noncalcareous); large percent dark-green rock fragments(?); common wispy clay clasts (dark grayish-green); patches of lighter colored, still noncalcareous cement; very poorly sorted, subangular to subrounded.
Uppermost "graywacke".
Full core, 2794.0-2794.3 m, kept out for acoustic studies.
- 2795.0 96 cm sandstone as above.
Horizontal plug, 2795.0 m.
Vertical plug, 2795.1 m.
- 2796.0 45 cm sandstone as above, coarsening downward; distinct color change to a more grayish, lighter green downward.
22 cm medium- to coarse-grained sandstone; "patchy" gray and yellowish-brown, dominated by gray; well-cemented (calcareous); very slightly muscovitic; unstructured; very poorly sorted, subangular to angular.
25 cm medium-grained, grayish-green muddy sandstone, as top.
- 2797.0 30 cm sandstone as above, grading downward into:
60 cm coarse- to medium-grained sandstone; light-brown and well-cemented (noncalcareous) in top 1/3, grading to very well-cemented (calcareous) and light grayish-white in bottom 2/3; extremely rare muscovite and biotite; massive; rare, very small pyritic blebs; poorly sorted, subangular.
- 2798.0 10 cm (1 bag) soft dark-gray shale and friable medium-grained yellow sandstone (slightly muscovitic; moderately sorted, subrounded); noncalcareous cements; relationship and relative amounts of the two lithologies unclear.

Statfjord 33/9-9
Core 17 - continued

- 2798.0 m continued
- 15 cm fine-grained yellow sandstone; well-cemented (non-calcareous); biotitic and muscovitic; moderately sorted, subangular; grades over approximately 2 cm into:
 - 15 cm black muscovitic shale with stringers of very coarse-grained sandstone and with black carbonaceous casts (?); noncalcareous cement.
 - 60 cm coarse-grained light-gray sandstone; very well-cemented (calcareous); slightly muscovitic; unstructured; rare purple-red angular mineral (tourmaline?) in one patch; poorly sorted, angular to subangular; much less than 60 cm received with Mobil's 1/4 core.
- 2799.0
- 75 cm (3 bags) somewhat friable pieces of sandstone and loose sand; light yellowish-brown; at top, coarse-grained, slightly muscovitic, poorly sorted, subrounded; at base, fine-grained, noncalcareous cement, moderately sorted.
 - 25 cm fine-grained yellowish-gray sandstone; slightly biotitic, less common muscovite; unstructured; single pea-sized greenish-gray fine-grained sand bleb with calcareous cement; well-cemented (noncalcareous); moderately sorted, angular to subangular.
- Horizontal plug, 2800.0 m.

2800.0-2807.5 missing.

Included in Core 17, at end, are 2 pieces out of place in core:

- 2795 m - green muddy sandstone.
- 2797 m - white sandstone.

Statfjord 33/9-9
Core 18

- 2807.5 m 5 cm coarse- to very coarse-grained gray sandstone; well-cemented (calcareous); slightly muscovitic; unstructured; some green clay matrix (?); poorly sorted, angular to sub-angular; grades rapidly downward into:
5 cm fine-grained brown sandstone; well-cemented (very slight, scattered carbonate); "laminae" of flattened wispy clay clasts; moderately sorted, subangular; grades rapidly downward into:
35 cm coarse- to very coarse-grained sandstone, as at top of 2807.5; coarsens downward; green clay matrix (?) only at top.
20 cm (1 bag) chips of greenish-gray, slightly muscovitic sandy mudstone; in part mottled with greenish-black; non-calcareous.
Full core, 2807.5-2807.7 m, kept out for acoustic studies.
Horizontal plug, 2807.7 m (in the fine-grained sandstone).
- 2808.3 73 cm fine-grained yellowish-gray sandstone; well-cemented (mostly noncalcareous); slightly muscovitic; no biotite; unstructured; rare very thin irregular carbonaceous wisps; toward base are more yellowish and more greenish bands—yellowish, slightly calcareous and greenish, noncalcareous; well-sorted, angular to subangular.
- 2809.1 88 cm sandstone as above; coarsens slightly downward to medium-grained.
Vertical plug, 2809.1 m.
- 2809.8 55 cm sandstone as above but with common biotite; somewhat porous; calcareous cement.
15 cm sandstone as above but with disrupted laminae defined by biotite flakes; soft sediment deformation, burrowing, healed fractures.
20 cm coarse-grained yellowish-brown sandstone; well-cemented (noncalcareous); very rare muscovite and biotite; unstructured; common tourmaline (red-purple, angular) toward base; poorly sorted, subangular.
Vertical plug, 2810.1 m.
- 2810.7 7.5 cm sandstone as above; none received with Mobil's 1/4 core.
80 cm medium-grained light-gray sandstone; very well-cemented (calcareous); very slightly muscovitic and biotitic; rare tourmaline (red-purple, angular); moderately sorted, sub-angular; bottom 5 cm finely laminated with yellow sandstone.
Vertical plug, 2811.1 m.

Statfjord 33/9-9
Core 18 - continued

- 2811.5 m 70 cm coarse-grained yellowish-brown sandstone; well-cemented (calcareous); very slightly muscovitic; moderately sorted, angular to subangular; becomes gradationally downward: darker colored, finer grained (medium), less well-cemented (still calcareous); in addition, toward base are rare clay clasts and wisps of organic material.
- 20 cm very fine-grained yellowish-gray sandstone; very well-cemented (noncalcareous); abundant muscovite and biotite; moderately sorted; subtle, irregular color variations in white and greens (apparently from changes in percent clay or biotite); dominantly a light-colored rock irregularly more greenish downward.
- Vertical plug, 2811.65 m.
- 2812.4 50 cm sandstone much as above; mineral distribution very irregular, clayey patches and mafic-rich, coarser patches; downward becomes fine-grained, poorly sorted, less well-cemented (becoming calcareous); 3 approximately 5 cm bands of abundant subparallel biotite, dipping 10-20°.
- 20 cm fine- to medium-grained light yellowish-gray sandstone; very well-cemented (calcareous); common muscovite and biotite; unstructured; poorly sorted, subrounded.
- 10 cm fine-grained yellow sandstone; less well-cemented (more porous) than above; still calcareous-cemented; irregular biotite laminae; single pod of medium-grained, grayish, carbonate-cemented sandstone; moderately to well-sorted.
- 20 cm very fine-grained greenish-gray sandstone; well-cemented (noncalcareous); common muscovite; abundant biotite; moderately sorted; finely structured, defined by biotitic and less biotitic disrupted laminae; soft sediment deformation; healed fractures; at base, grades into biotitic, slightly sandy dark-gray mudstone.
- Vertical plug, 2812.7 m.
- 2813.4 10 cm (1 bag) poorly consolidated, waxy, slightly muscovitic, dark-gray mudstone (shale?).
- 20 cm very fine-grained, very dark-gray sandstone; very well-cemented (noncalcareous); abundant biotite; common muscovite; well-sorted; soft clay stringers and disrupted laminae as well as, at base, irregular less biotitic patches.
- 20 cm fine-grained green sandstone; very well-cemented (scattered calcareous patches); abundant biotite; common muscovite; well-sorted; in center, one approximately 3 cm band of abundant thin, irregular, disrupted (soft sediment deformation?) biotite laminae.

Statfjord 33/9-9
Core 18 - continued

2813.4 m 20 cm coarse- to medium-grained, green muddy sandstone; well-
continued cemented (scattered calcareous patches); unstructured;
 poorly sorted, subangular; distinct green clay cement/
 matrix (?) though rock is definitely grain-supported.

2814.2 5 bags of chips of mottled red, green, and black slightly
 muscovitic mudstone.

2815.2 5 bags of mudstone chips as above; bag 3 tested, slightly cal-
 careous.

2816.2-2818.4 m missing.

Statfjord 33/9-9
Core 19

- 2818.4 m 2 bags of pieces (< 1.5 cm diameter) of chocolate to reddish-brown noncalcareous mudstone.
 25 cm medium-gray sandy siltstone with light-gray calcareous mudstone nodules.
 10 cm reddish-brown mudstone with light-gray mudstone nodules.
 13 cm mixed reddish-brown and light-gray nodular mudstone.
 Vertical plug, 2818.6 m., (sandy siltstone).
- 2819.4 58 cm dark-gray very fine-grained angular sandstone with abundant muscovite and biotite; mottled and bioturbated.
 38 cm dark-gray fine- to medium-grained poorly sorted angular sandstone with abundant disseminated mica.
- 2820.4 30 cm light-gray fine-grained poorly sorted angular to sub-angular sandstone with abundant mica, both disseminated and in discontinuous laminae, as well as stringers of dark-gray clay.
 50 cm light-gray fine-grained subangular well-cemented sandstone with abundant disseminated mica.
 Vertical plug, 2820.8 m.
- 2821.3 14 cm light-gray slightly calcareous mudstone with light-brown mottling.
 25 cm very light-gray fine-grained subangular sandstone, well-cemented with calcareous cement; cross-bedding defined by laminae of biotite.
 1 bag pieces shown in Core Lab photographs not present in Mobil's 1/4 core.
- 2822.2 36 cm sandstone as above with a few small scale cross-beds defined by mica.
 2 bags of pieces of slightly calcareous dark-gray and dark-brown mudstone.
 1 bag pieces of dark-gray noncalcareous shale.
 Vertical plug, 2822.2 m.
- 2823.2 3 bags pebble-size pieces, light-gray mudstone mixed with sandy mud and a few fragments of brownish-maroon mudstone.
 2 bags mudstone as above with a few pieces of gray limestone.
- 2824.2 10 cm very light-gray calcareous mudstone with pinkish-maroon to white mottling.
 3 bags mudstone pieces as above.

Statfjord 33/9-9
Core 19 - continued

2825.2 m 2 bags mudstone pieces as above.
 7.5 cm light-gray very calcareous mudstone with abundant
 white calcareous nodules.
 1 bag mudstone pieces as above.
 6 cm mudstone as above with more white nodules than gray
 matrix.
 1 bag mudstone pieces as above.

Full core recovery.

Statfjord 33/9-9
Core 20

- 2826.2 m 5.6 cm in bag, medium-gray very fine-grained silty sandstone with noncalcareous cement and abundant mica.
8 cm dark reddish-brown sandy siltstone with noncalcareous cement and abundant mica.
1 bag fragments (<1 cm diameter) sandy slightly calcareous siltstone as above.
1 bag fragments sandy siltstone as above with calcareous cement and decreasing sand and mica.
24 cm very light-gray noncalcareous sandy siltstone with abundant muscovite and biotite.
Full core, 2826.8-2826.9 m, kept out for acoustic studies.
- 2827.2 11 cm medium-gray fine-grained sandstone; well-cemented, calcareous cement; abundant muscovite and biotite, both disseminated and in discontinuous laminae; the change in the amount of calcareous cement does not change the visible appearance between the 24 cm of sandy siltstone just above and this interval.
8 cm medium-gray and reddish-brown mottled sandy siltstone with slightly calcareous cement and abundant mica.
2 bags with pieces (<1.4 cm diameter) light-gray sandy siltstone mixed with reddish-brown mud flakes; slightly calcareous.
11 cm piece in bag, dark reddish-brown slightly calcareous mudstone with waxy surfaces having slickensideline striations.
- 2828.2 8 cm piece in bag, mudstone as above.
9 cm piece in bag, mudstone as above with abundant calcareous cement, gray mottling and a white calcareous nodule.
1 bag with soft wads of reddish-brown calcareous mud with intermixed white calcareous fragments.
12 cm light-gray and brownish-maroon mottled calcareous mudstone.
1 bag with soft wads of dark-maroon very calcareous mud.
8 cm piece in bag, slightly calcareous mudstone as above with abundant mica.
- 2829.2 1 bag with pieces of medium reddish-brown sandy calcareous mudstone with abundant mica.
1 bag with pieces mudstone as above, becoming slightly calcareous.
3 bags with soft wads of reddish-brown slightly calcareous mud and a few white calcareous nodules.

Statfjord 33/9-9
Core 20 - continued

- 2829.2 m
continued
- 10 cm medium-gray calcareous and micaceous mudstone with white calcareous nodules containing medium-sized angular clear quartz grains.
1 bag containing 1 piece of light-gray calcareous mudstone and 2 pieces reddish-brown calcareous mudstone.
- 2830.2
- 1 bag pieces (up to 5.5 cm diameter) of very light-gray limestone; one fragment has associated variegated gray and maroon mudstone.
1 bag pieces (up to 5 cm diameter) of limestone as above with smaller pieces variegated gray and maroon calcareous mudstone.
1/2 core cut, 15 cm maroon calcareous mudstone (containing subangular to subround fine- to coarse-sized quartz grains plus a trace of muscovite) in an irregularly anastomosing contact with pink nodular limestone with a network of cracks filled with white calcite.
2 bags of wet lumps of maroon and greenish-gray calcareous mudstone with quartz grains and muscovite plus a few white calcareous nodules.
- 2831.2
- 1 bag pieces of medium-brown slightly calcareous siltstone with abundant muscovite.
1 bag wet lumps of mixed dark reddish-brown micaceous mudstone, greenish-gray micaceous mudstone, and a few soft white nodules; all are calcareous.
8.5 cm (25 cm in original 1/2 core cut) white to light-gray mottled calcareous mudstone with stringers and patches of sparry calcite.
1 bag pieces calcareous mudstone as above with a few micaceous laminae.
1 bag wet lumps of dark reddish-brown and greenish-gray slightly calcareous mudstone with abundant muscovite.
- 2832.2
- 2 bags of pieces of dark-reddish brown noncalcareous siltstone with abundant muscovite.
1 bag with 11 cm piece of medium dark-gray very fine-grained subangular to subrounded poorly sorted sandstone with abundant muscovite and noncalcareous cement.
8.5 cm light-gray very fine-grained subangular to subround sandstone, well-cemented with calcareous cement.
50 cm light-gray fine-grained subangular sandstone; poorly sorted; scattered biotite and limonite-stained quartz grains, plus a few grains of glauconite or chlorite; well-cemented with calcareous cement.
Vertical plug, 2832.7 m.

Statfjord 33/9-9
Core 20 - continued

- 2833.2 m 14 cm medium-gray noncalcareous silty mudstone with abundant muscovite and biotite.
 2 cm waxy chocolate-brown claystone.
 8.5 cm medium-gray noncalcareous silty mudstone with abundant muscovite.
 1 bag fragments of dark-gray noncalcareous sandy mudstone with mica.
 11 cm medium-gray medium-grained subangular sandstone, poorly sorted, noncalcareous, abundant biotite.
 19 cm chocolate-brown noncalcareous silty mudstone with abundant mica.
- 2834.2 8 cm mixed lithology: 1.5 cm mudstone as above in irregular contact with medium-gray very fine-grained noncalcareous sandstone, abundant muscovite and biotite (biotite occurs in irregular discontinuous laminae); a few clasts of light-gray mudstone.
 7 cm chocolate-brown mottled mudstone.
 25 cm reddish-brown and gray-green mottled mudstone, non-calcareous with abundant very fine mica.
 1 bag pieces (<2.5 cm diameter) of gray and dark reddish-brown mottled sandy mudstone; slightly calcareous and with abundant mica.
 23 cm medium-gray very fine-grained calcareous sandstone with abundant muscovite and biotite; one burrow filled with darker gray, finer grained sediment.
 Vertical plug, 2835.2 m.
- 2835.2 1 bag pieces (<4 cm diameter) of dark-gray calcareous mudstone with abundant mica and a few mottles of reddish-brown.
 1 bag pieces as above; a few pieces have veinlets of calcite.
 1 bag pieces as above, increasingly calcareous.
 11 cm mottled reddish-brown and greenish-gray micaceous silty mudstone, calcareous cement in patches.
 15 cm medium-gray fine-grained angular to subangular poorly sorted sandstone; bioturbated, abundant mica and well-cemented with calcareous cement.
 Full core, 2835.6-2835.9 m, kept out for acoustic studies.
- 2836.2-2837.5 missing.

Statfjord 33/9-9
Core 21

- 2837.5 m 10 cm light-gray very fine-grained subangular poorly sorted sandstone; calcareous cement, biotite and abundant muscovite.
1 bag pieces of sandstone as above plus mottled reddish sandy mudstone with calcareous cement.
10 cm sandstone as above with an 8 cm burrow filled with yellow sand containing abundant biotite.
8 cm sandstone as above without burrows.
13 cm reddish-brown silty slightly calcareous mudstone with abundant very fine mica.
5 cm sandstone as above with two burrows filled with lighter gray slightly finer grained sediment.
23 cm reddish-brown and gray mottled mudstone, very calcareous with crack filling of sparry calcite.
- 2838.5 4 bags reddish-brown silty mud, noncalcareous with abundant mica.
1 bag mud as above with gray calcareous mudstone fragments.
- 2839.5 85 cm light-gray fine-grained subangular sandstone, well-sorted with abundant calcite cement, abundant disseminated muscovite and minor amounts of biotite.
- 2840.5 55 cm sandstone as above with calcareous cement in patches.
20 cm mixed lithology: light-gray medium- to very fine-grained angular to subangular well-cemented calcareous sandstone with abundant disseminated biotite; intercalated with and enclosing clasts of medium-gray noncalcareous mudstone up to 7 by 2.5 cm in size; rare tourmaline present in sandstone.
Vertical plug, 2840.5 m., 2 plugs.
- 2841.5 8 cm sandstone as above with increasing biotite and minor amounts of muscovite, calcite cement decreasing and discontinuous, no clasts of mudstone.
12 cm sandstone as above, few smaller clasts (maximum size 1 x 2 cm) and increasing calcareous cement and biotite plus abundant pinkish-orange grains of feldspar.
4 pieces dark reddish-brown silty mudstone, calcareous cement and abundant muscovite.
8 cm medium-gray to gray-green very fine-grained sandstone with abundant biotite and minor amounts of muscovite, calcareous cement decreases and occurs in thin discontinuous streaks.

Statfjord 33/9-9
Core 21 - continued

- 2841.5 m continued 10 cm medium-gray to dark-gray sandstone as above with clasts up to 1 by 5 cm, color boundaries irregular and intercalated; calcite cement in streaks.
18 cm mixed lithology: 7 cm medium-gray calcareous-cemented sandstone as above grading into reddish-brown sandy non-calcareous mudstone.
- 2842.3 20 cm mixed lithology: top 1 cm reddish-brown sandy mudstone grading into medium-gray fine-grained angular to sub-angular well-cemented sandstone with calcareous cement beginning 2 cm away from the mudstone and increasing downward; bottom 3 cm reddish-brown mudstone.
10 cm reddish-brown and gray mottled mudstone with abundant mica.
15 cm mixed lithology: mottled reddish-brown mudstone grades into medium-gray fine-grained angular noncalcareous sandstone with abundant biotite.
10 cm mixed lithology: mottled reddish-brown mudstone and sandstone as above with decreasing calcareous cement.
7 cm slightly calcareous mottled reddish-brown mudstone.
- 2843.3 2 bags pieces up to 10 cm diameter mottled reddish-brown and gray very calcareous mudstone with limey stringers and clasts, noticeably less mica than above.
1 bag with pieces of dark reddish-brown noncalcareous silty mudstone with abundant muscovite; one uncut core piece 6 cm thick of medium-gray fine-grained well-cemented non-calcareous sandstone with abundant muscovite.
7 cm medium-gray medium-grained subrounded noncalcareous friable sandstone with abundant mica.
10 cm (2 pieces) sandstone as above, becoming fine-grained.
- 2844.1 45 cm light-gray medium-grained subround calcareous sandstone with abundant disseminated biotite.
20 cm sandstone as above with a sharply defined decrease in calcite cement along a curving face.
20 cm sandstone as above with cement increasing in thin streaks downward.
10 cm sandstone as above with a "pod" of white calcite cement.
Vertical plugs, 2844.1 and 2844.7 m.
- 2844.7 2 bags of soft, wet fragments of reddish-brown silty mudstone, slightly calcareous in part plus a few fragments of limestone.

Statfjord 33/9-9
Core 21 - continued

- 2845.7 m 1 bag wet mudstone as above, noncalcareous.
 2 pieces, each 5 cm thick, reddish-brown slightly calcareous
 mudstone with abundant mica.
 1 bag wet mudstone as above, slightly calcareous.
 3 pieces (up to 7 cm diameter) of reddish-brown silty
 mudstone with calcareous streaks and abundant muscovite.
- 2846.7 24 cm light-gray fine-grained subround sandstone, well-
 cemented with noncalcareous cement; abundant disseminated
 biotite.
 2 bags of pieces (up to 5 cm diameter) of reddish-brown silty
 mudstone with abundant mica. A few pieces have calcitic
 streaks.
 Note: This is reversed in the Core Lab photographs and has
 probably been put in the box upside down.
- 2847.6 30 cm light yellowish-brown medium-grained subangular sand-
 stone, well-cemented with calcareous cement which reacts
 slowly with 10% HCl, possibly due to oil staining.
 30 cm sandstone as above with increased cement, correspondingly
 lighter color and containing scattered pyrite blebs.
 25 cm light yellowish-brown medium-grained subround to sub-
 angular sandstone; well-cemented with calcareous cement
 which increases downward in both gradational and inter-
 calated laminations; one 0.3 cm bleb pyrite.
- 2848.5 5 cm sandstone as above.
 12 cm sandstone as above with increasing calcareous cement.
 12 cm sandstone as above with decreasing calcareous cement,
 a few scattered grains of calcite and disseminated biotite.
 22 cm creamy white sandstone as above with calcareous cement
 which reacts slowly to 10% HCl; small blebs of pyrite.
- 2849.3 15 cm light-gray medium-grained well-cemented calcareous
 sandstone with a few blebs of pyrite.
 25 cm sandstone as above, bottom 0.4 cm coarse-grained.
 20 cm light creamy-brown coarse-grained angular to sub-
 angular well-cemented sandstone, calcareous cement dis-
 continuous.
 Vertical plug, 2849.7 m.

Statfjord 33/9-9
Core 21 - continued

- 2850.2 m 71 cm sandstone as above, increasing calcareous cement in patches; disseminated biotite, pyrite in blebs and patches up to 2 cm diameter.
Horizontal plug, 2850.2 m.
Vertical plug, 2850.4 m.
- 2851.0 75 cm sandstone as above, slight color change mid-box to darker creamy-brown.
Vertical plug, 2851.7 m.
- 2852.0 1 bag pieces medium-gray silty mudstone, traces calcareous cement, very fine mica.
1 bag lighter gray silty mudstone with increasing calcareous cement and increasing micas.
10 cm light-gray sandy slightly calcareous mudstone with abundant mica both disseminated and in discontinuous laminae.
- 2852.0-2853.5 missing.

Statfjord 33/9-9
Core 22

- 2853.5 m 1 bag with pieces of soft dark-gray sandy (fine-grained) mudstone; muscovitic; noncalcareous.
80 cm fine-grained greenish-gray sandstone; very well-cemented (noncalcareous); abundant muscovite; no biotite; common dark, needle-shaped mineral; unstructured; rare pea-sized pyrite/carbonaceous blebs; well-sorted, sub-angular.
Vertical plug, 2853.7 m.
- 2854.5 93 cm sandstone as above; slightly calcareous cement at top, gradually increasing downward; in bottom 1/2, calcareous cement is common and abundant in slightly lighter colored patches; by 2/3 way through, biotite is common; 5-10 cm from base is a lighter colored band; 0-5 cm from base is a dark-gray band (irregular, gradational top) with abundant subparallel biotite.
Vertical plug, 2854.7 m.
- 2855.4 5 cm sandy grayish-green mudstone; muscovitic and biotitic.
30 cm sandstone as base of 2854.5 m; very finely, horizontally laminated by concentrations of subparallel biotite; well-cemented but somewhat porous (slightly calcareous).
10 cm medium- to coarse-grained yellowish-gray sandstone; dipping approximately 30°; very well-cemented (calcareous); common muscovite and biotite; burrowed; cut by high-angle fault along which is approximately 1 cm of offset of upper and lower contacts of this band; poorly sorted, subangular; in bottom 5 cm, bedding marked by fine (to a few mm long) flattened green clay clasts.
5 cm fine-grained greenish-gray sandstone; well-cemented (calcareous); common muscovite; finely structured (dipping approximately 30°) alternate thin, wavy, irregular layers with abundant biotite; moderately sorted, subangular.
30 cm medium- to coarse-grained yellowish-gray sandstone; very well-cemented (calcareous); rare muscovite; "laminae" defined by flattened green clay clasts a few mm's wide and long, dipping approximately 30°; in bottom 15 cm, clasts much less common and define approximately horizontal bedding; poorly sorted, subangular.
- 2856.2 50 cm sandstone as above; clay clasts very rare; faint laminae dipping approximately 20°.

Statfjord 33/9-9
Core 22 - continued

2856.2 m continued
1 bag with pieces (maximum 3 cm) of dull-green, non-calcareous mudstone with very fine (mm-sized) brown blebs of limonite (?); along with larger pieces (maximum 8 cm) of both reddish-purple and light-green very fine-grained limestone, probably nodular; green carbonate encloses patches of green noncarbonate mudstone; reddish-purple carbonate encloses patches of shiny, slightly muscovitic dark-red mudstone.

20 cm sandy greenish-gray mudstone; well-cemented (non-calcareous); slightly muscovitic; unstructured; abundant blebs, wisps, and patches to 0.5 cm of black carbonaceous material along with irregular wispy patches of shiny, dark-green, slightly muscovitic clay (mm- to cm-sized); no regularity to shape, size, or distribution.

Vertical plug, 2856.2 m.

2857.2
1 bag with pieces of red and green mudstones; green more abundant and in smaller pieces. Small pieces (maximum 5 cm; most much smaller) of grayish-green sandy mudstone; noncalcareous; slightly muscovitic; bears fine, irregular sandy stringers (medium-grained, green carbonate-cemented, poorly sorted, subangular). Larger pieces (maximum 8 cm) of red mudstone; diffuse calcareous cement; shiny; slightly muscovitic.

1 bag with single large piece of sandy greenish-gray mudstone, as bottom 20 cm of 2856.2 m; clay and carbonaceous patches common but not abundant.

1 bag with pieces of green mudstone as above.

20 cm medium- to coarse-grained, light greenish- to yellowish-gray sandstone; well-cemented (scattered traces calcareous cement); very slightly muscovitic; common unoriented biotite; unstructured; rare mm-sized soft green clay clasts; poorly sorted, subangular.

2858.1
85 cm sandstone as above; common biotite; scattered, minor calcareous cement; subangular to angular; irregular, diffuse patches with slight green clay matrix along with rare clasts to 0.5 cm; near top, single approximately 1 cm irregular patch of reddish-brown iron oxide cement (?).

15-20 cm from top same sandstone, with scattered tiny "pinpoints" of "rust"; just below where "rust" first appears (approximately 20 cm from top) changes to abundant calcareous cement; color lightens somewhat; calcareous cement continues to base.

10-20 cm from base common "rusty" patches and especially common green clay clasts (to a few mm long) and patches of green clay cement.

Basal 10 cm with scattered "pinpoints" of "rust".

Vertical plugs, 2858.2 and 2858.9 m.

Statfjord 33/9-9
Core 22 - continued

- 2859.1 m 30 cm sandstone as above; bottom 10 cm faintly, regularly laminated (dipping approximately 10°); origin of laminae unclear, reddish-purple tourmaline (?) concentrated in some of the laminae; single pea-sized pyrite-cemented bleb approximately 5 cm from base.
1 bag with pieces of red and green mottled mudstone; slightly muscovitic; slightly calcareous.
50 cm red and green mottled mudstone; slightly muscovitic; also, fine yellowish-brown mottling throughout.
Vertical plug, 2859.3 m.
- 2860.1 36 cm red and green mottled mudstone; very slightly sandy; abundant muscovite; noncalcareous.
54 cm fine-grained greenish-gray sandstone; well-cemented (scattered calcareous cement); common muscovite; abundant biotite; unstructured; rare mm-sized light-green clay clasts; moderately sorted, angular to subangular.
- 2861.0 50 cm sandstone as above; scattered traces of calcareous cement; poorly sorted, irregularly muddy throughout; irregular (to several cm long) clay stringers and clasts and fine irregular brownish (iron oxide?) stringers. Middle approximately 5 cm irregular, muddy, red mottling; noncarbonate. 5-15 cm from base, medium-grained, white to light-gray sandstone; calcareous cement; rare muscovite; common biotite; scattered greenish clay clasts; poorly sorted, subangular; burrowing (?). Basal 5 cm irregular but fairly sharp contact; fine-grained, grayish-green muddy sandstone as at top; scattered traces of calcareous cement; poorly sorted.
1 bag with several large pieces of red and green mottled mudstone; very slightly sandy; muscovitic and biotitic; noncalcareous.
Vertical plug, 2861.0 m.
- 2861.9 2 cm fine-grained light yellowish-gray sandstone; very well-cemented (noncalcareous); common muscovite; abundant biotite; laminated (by concentrations of parallel biotite flakes), cross-bedded; well-sorted, subrounded to rounded.
28 cm finely, irregularly structured interval dominated by abundant parallel biotite in a muddy red matrix; irregular clasts and interlaminae of fine- to very fine-grained greenish-gray sandstone; common muscovite, abundant biotite, moderately sorted, subangular; burrowing; all noncalcareous.

Statfjord 33/9-9
Core 22 - continued

- 2861.9 m continued
- 30 cm fine-grained, dark-green muddy sandstone; very well-cemented (scattered traces of calcareous cement); common muscovite; abundant unoriented biotite; near top, single pea-sized white clay-free bleb; unstructured but for minor burrowing; mm-sized red clay clasts near base; poorly sorted, angular to subangular. Approximately 5 cm in center, medium-grained grayish-white sandstone; very well-cemented (scattered calcareous cement); burrowed; moderately sorted (not muddy), angular to subangular.
 - 30 cm mixed red and green interval much as the 28 cm near top, but more bioturbated and burrowed; both this and the 28 cm zone have irregular, in places gradational contacts with the intervening green sandstone. Red: mudstone; slightly calcareous; abundant muscovite and biotite. Green: very fine-grained muddy sandstone; scattered traces of calcareous cement, abundant muscovite and biotite; poorly sorted, rounded to subrounded.
- 2862.8
- 40 cm fine- to very fine-grained light yellowish-gray sandstone; very well-cemented (scattered traces of calcareous cement); common muscovite; abundant biotite (and chlorite?); slightly dipping (10-20°) laminae of concentrated, oriented biotite throughout, widely spaced at top and more closely downward; coarsening slightly downward, to fine-grained; well-sorted, subangular.
 - 10 cm very fine-grained sandstone; green at top, banded green and white in center, white at base; very well-cemented (in both, scattered traces of calcareous cement); rare muscovite; common biotite, generally oriented and dipping 10-20°; color seems due to presence or absence of very small amount of green clay cement/matrix (?); moderately sorted, angular.
 - 1 bag with large friable pieces of medium- to fine-grained light-green sandstone; slightly calcareous cement; red sandy clay and green clay patches with more abundant carbonate cement; slightly muscovitic and biotitic; poorly sorted, subrounded.
 - 10 cm fine-grained gray sandstone; well-cemented (scattered traces of calcareous cement); common muscovite; abundant biotite, oriented and concentrated in disrupted laminae dipping approximately 10°; burrowed; soft sediment deformation; poorly sorted, subangular.
- 2863.6
- 1 bag with large and small pieces, some friable and some fairly well-cemented, of fine- to medium-grained greenish-gray sandstone; common muscovite and abundant biotite, scattered throughout as well as concentrated in laminae; poorly sorted, subangular; scattered calcareous cement.

Statfjord 33/9-9
Core 22 - continued

- 2863.6 m continued 35 cm very fine-grained dark-gray sandstone; very well-cemented (noncalcareous); common muscovite; abundant biotite; very finely laminated, cross-bedded, and burrowed, marked by concentrates of oriented biotite; well-sorted, subangular; only approximately 10 cm received with Mobil's 1/4 core.
- 1 large piece and 1 bag of large pieces shiny red and green mottled mudstone; noncalcareous; common muscovite, biotite, and chlorite (?) along with irregular fine carbonaceous stringers; slickensides; in rare pieces, carbonaceous material forms a fine intersecting angular network.
 - 1 bag with pieces of 2 lithologies: the smaller pieces are of green, slickensided, very sandy mudstone (noncalcareous; slightly muscovitic) and larger pieces (to approximately 5 cm) are of medium-grained light greenish-gray sandstone (calcareous cement, poorly sorted, subrounded); this bag probably should be switched with the topmost one of 2864.5 m.
- Vertical plug, 2864.2 m.
- 2864.5 50 cm fine-grained greenish-gray sandstone; common muscovite; abundant biotite; rare mm-sized pyritic blebs; subtle color variations in grays, related to varying percent biotite or greenish clay matrix; poorly sorted, subangular; well-cemented and noncalcareous except for 1 irregular 3 cm wide band approximately 5 cm from top (not a different color than the noncalcareous portions).
- 1 bag with small pieces of medium- to coarse-grained very light-green sandstone; fairly well-cemented (calcareous); no muscovite; rare biotite; subangular, poorly sorted.
 - 1 bag with small pieces of slightly sandy green mudstone; noncalcareous; muscovitic; shiny; with intricate web of carbonaceous material; out of place? - possibly slipped over in core box from 2863.6.
 - 1 bag with small pieces, some fairly well-cemented and some friable, of medium-grained very light-green sandstone; calcareous cement; very rare muscovite; rare biotite (and chlorite?); poorly sorted, subangular.
 - 20 cm fine-grained light-gray sandstone; very well-cemented; rare muscovite; more common unoriented biotite (and chlorite?); unstructured; poorly sorted, angular.
- 2865.5-2866.0 missing.

Statfjord 33/9-9
Core 23

- 2866.0 m 70 cm green muddy sandstone; sand grains as large as very coarse though most approximately medium; well-cemented (slight, scattered carbonate); common biotite; green clay-rich stringers and patches throughout, as well as one band near top; muddiest in top 1/3 and much less so downward; nonmuddy, lighter green bands have relatively more, though still patchy, calcareous cement; poorly sorted, subangular to angular.
10 cm light-gray sandstone as base of 2864.5 m.
Vertical plug, 2866.35 m.
- 2866.8 60 cm fine- to very fine-grained green muddy sandstone much as above; fairly well-cemented (slight, scattered carbonate); common biotite; rare green clay stringers throughout; disseminated pyrite and limonite (?); mottled, in places, red and yellowish-brown; poorly sorted, subrounded; scattered nodular carbonate in bottom 1/2; 5-10 cm from base—fine-grained light yellowish-green sandstone; well-cemented (noncalcareous); rare tourmaline (?); dish-shaped (nearly hemispherical) clay laminae—orientation unclear; poorly sorted, angular to subangular.
10 cm fine-grained light-gray sandstone; very well-cemented (calcareous); common unoriented biotite; fairly sharp lower contact, dipping approximately 20°; poorly sorted, subangular to angular.
10 cm fine-grained yellowish-gray sandstone; well-cemented (calcareous; still porous); rare muscovite; common biotite; rare black clay- and organic-rich wisps; massive; poorly sorted, rounded.
- 2867.6 10 cm sandy green mudstone; soft, noncalcareous; in part shaly and slickensided; abundant very fine-grained muscovite, common biotite and rare chlorite (?); common coaly fragments and carbonaceous patches, many along bedding planes.
20 cm medium-grained light-gray sandstone; very well-cemented (calcareous); rare muscovite and biotite; massive; poorly sorted, subangular.
(Order of the above 2 units reversed in slab sent to Norway.)
5 cm coarse-grained green muddy sandstone; poorly cemented (friable; calcareous); rare muscovite; green muscovitic clay clasts (to approximately 1 cm) and stringers throughout; poorly sorted, subangular.
30 cm sandy green mudstone; well-cemented (noncalcareous); muscovitic and biotitic; in part slickensided; abundant coaly material; only approximately 5 cm received with Mobil's 1/4 core.

Statfjord 33/9-9
Core 23 - continued

- 2867.6 m 10 cm coarse- to medium-grained green slightly muddy sandstone; poorly cemented (calcareous); nodular, carbonate-cemented patches; rare muscovite; rare tourmaline (?); poorly sorted, rounded.
- 2868.5 44 cm fine- to medium-grained sandstone; finely structured ("lensy") with color variations in greens and whites; common muscovite; abundant biotite in patches; green muscovitic clay clasts and patches throughout; green clayey patches are noncalcareous; some of lighter colored areas have calcareous cement (patchy distribution); burrowed; poorly sorted, subangular.
- 44 cm very fine-grained green sandstone; rare muscovite, scattered very dark-green clay clasts with lighter colored halos; well-cemented; calcareous cement patchily distributed, with slightly lighter colored areas likely to have more carbonate; massive; poorly sorted, subangular; red and yellowish-brown mottling at 2869.1 m; rare small (approximately 1 cm) calcareous nodules occur below 2869.1 m. Measured core is in excess of depths marked on boxes.
- 2869.2 80 cm sandstone much as above; fine-grained and slightly muddy at top to very fine-grained at base; better sorted (moderate) downward; at top calcareous cement slight, patchy; at base, though no color change, better cemented and calcareous; no dark-green clay clasts, but mottled dark-red and yellowish-brown throughout.
- 10-15 cm from top—band of light grayish-green sandstone; calcareous cement; common muscovite, biotite, and chlorite.
- 20 cm mottled green, red, and yellowish-brown mudstone; well-cemented (calcareous); slightly sandy; muscovitic.
- Vertical plug, 2869.2 m.
- 2870.2 90 cm fine-grained light grayish-green sandstone; rare muscovite; common biotite and chlorite; subtle, slightly more clay-rich (greener) patches as well as distinct clasts throughout; well-cemented; clayier portions have only scattered carbonate; massive; burrowing; poorly sorted, angular to subangular.
- Top 20 cm mostly very light-colored; calcareous cement.
- 5 cm common dark-green clay-rich bands; bands and enclosing rock noncalcareous.
- 40 cm mostly gray; calcareous cement; vague more greenish patches have only slight, scattered carbonate.
- 25 cm mostly greenish; less well-cemented, with scattered, slight calcareous cement.
- Vertical plug, 2870.7 m.

Statfjord 33/9-9
Core 23 - continued

- 2871.1 m 7.5 cm medium-gray medium- to fine-grained well-cemented sandstone with abundant muscovite and biotite.
7.5 cm dark-gray and reddish-brown mottled silty mudstone with abundant mica.
19 cm medium-gray fine-grained subangular well-cemented sandstone with streak of calcareous cement; abundant mica, mostly biotite; discontinuous clay laminae; irregular contact with:
2 cm sandy mudstone.
18 cm sandstone as above, lighter gray due to decreasing biotite and increasing calcareous cement.
7.5 cm reddish-brown and dark-gray mottled noncalcareous mudstone.
10 cm medium-gray medium- to coarse-grained angular to subangular sandstone, well-cemented with calcareous cement, muscovite present but not abundant.
Vertical plug, 2871.2 m.
- 2872.0 13 cm mixed lithology: top 2.5 cm reddish-brown silty non-calcareous mudstone with abundant fine-grained mica;
7.5 cm medium- to light-gray fine-grained subangular well-cemented noncalcareous sandstone (with abundant muscovite and biotite) in gradational contact with 2.5 cm silty non-calcareous mudstone.
18 cm sandstone as above with one calcareous streak.
7.6 cm light yellowish-white medium-grained subangular poorly sorted sandstone with calcareous cement and disseminated biotite.
15 cm yellowish-white medium- to fine-grained subangular well-cemented calcareous sandstone with a few flakes muscovite, abundant biotite and scattered orange-stained quartz grains; grain size increase in last 1.3 cm.
15 cm mixed lithology: top 5 cm reddish-brown noncalcareous mudstone that grades into very poorly sorted medium- to coarse-grained medium-gray angular to subangular sandstone; well-cemented, noncalcareous, flakes of muscovite, scattered biotite and orange-stained quartz grains.
- 2873.0 53 cm medium-gray very coarse- to coarse-grained angular to subangular feldspathic sandstone with mixed calcareous and noncalcareous cement; decreasing mica.
10 cm light-gray very fine-grained noncalcareous sandstone with abundant fine-grained mica.
2 cm red silty mudstone.
7.6 cm mixed lithology: 0.7 cm silty mudstone grading downward into sandstone as above.
10 cm sandstone as above with slightly calcareous cement and abundant muscovite and biotite.
17 cm dark reddish-brown silty noncalcareous mudstone with abundant very fine-grained muscovite.

Statfjord 33/9-9
Core 23 - continued

2874.5 m 7.5 cm silty mudstone as above.
3 bags pieces mudstone as above.
17.5 cm reddish-brown mudstone as above.
10 cm mudstone as above with a 2.5 cm layer of gray mudstone
with coarse, angular white quartz sand.

2875.3 15 cm mudstone as above without sand streaks.
10 cm light-gray medium-grained micaceous sandstone;
well-cemented, calcareous cement increasing downward.
5 cm reddish-brown mudstone.
20 cm mixed lithology: 10 cm medium-gray fine-grained sub-
angular sandstone (with abundant disseminated biotite)
grading into 10 cm reddish-brown sandy mudstone with rip-
up clasts.
13 cm sandstone as above with muscovite, biotite, feldspars
and orange-stained quartz grains.
Vertical plug, 2876.2 m.

2876.3 9 cm mixed lithology: 5 cm dark-gray sandy mudstone (with
abundant muscovite) grading into 4 cm light-gray fine-
grained subangular sandstone; well-cemented, calcareous
cement; fair sorting; abundant biotite and muscovite.
6 cm sandstone as above.
25 cm creamy white fine- to medium-grained, subangular poorly
sorted sandstone with disseminated muscovite and biotite
plus stained quartz grains; well-cemented, calcareous.
7.5 cm medium-gray fine-grained noncalcareous sandstone with
abundant biotite and muscovite.
7.5 cm sandstone as above with streaks of calcareous cement
and lighter gray color.
15 cm creamy-white fine- to medium-grained sandstone; grain
size increasing downward to coarse and very coarse in the
last 1 cm.

Full core recovery.

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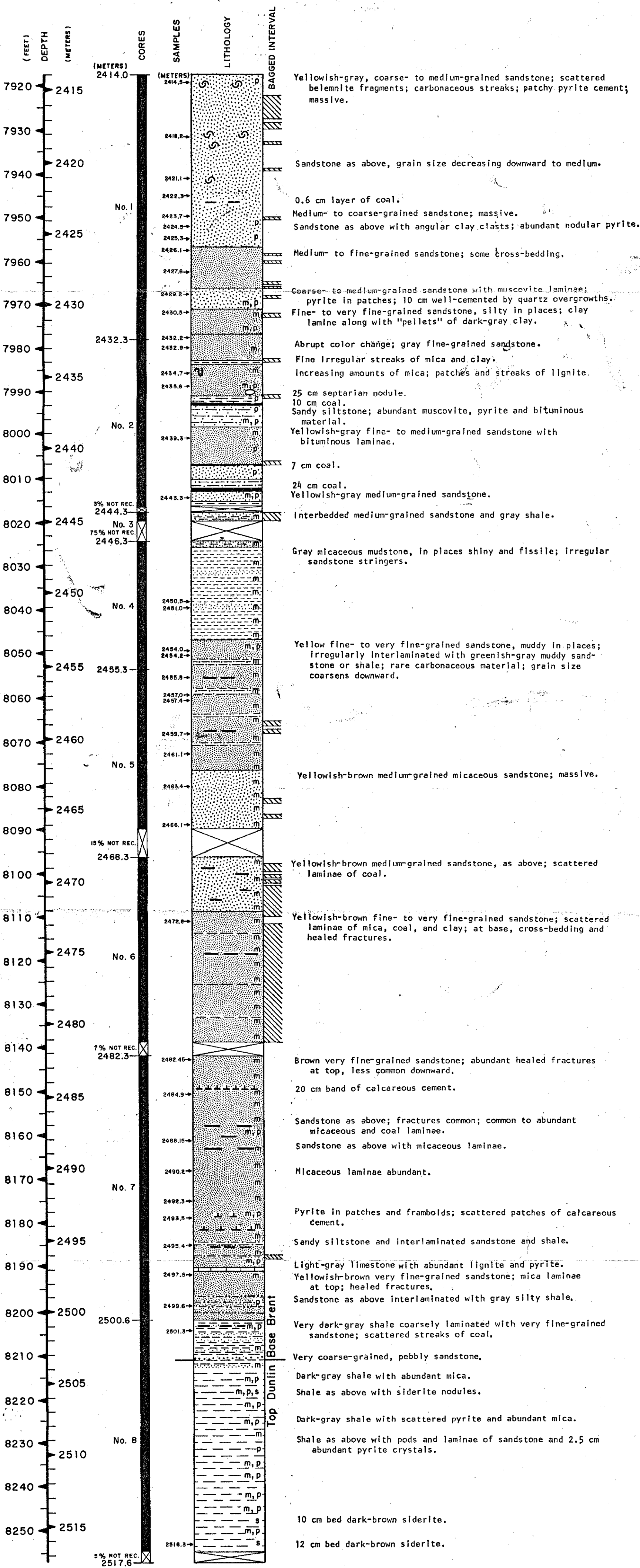
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 1 P. Kirkland

WELL 33/9 - 9
 STATFJORD FIELD
 BRENT FORMATION
 103.6 METERS



- | | | | |
|--|---------------------------------------|--|-------------------|
| | FINE- TO VERY FINE-GRAINED SANDSTONE | | COAL |
| | COARSE- TO MEDIUM-GRAINED SANDSTONE | | CALCAREOUS CEMENT |
| | VERY COARSE-GRAINED, PEBBLY SANDSTONE | | BURROWS |
| | SHALE | | FOSSILS |
| | SANDY SHALE | | MICA |
| | SILTSTONE | | PYRITE |
| | MUDSTONE | | SIDERITE |
| | LIMESTONE | | |

WELL 33/9-9
 STATFJORD FIELD
 STATFJORD FORMATION
 157.5 METERS

