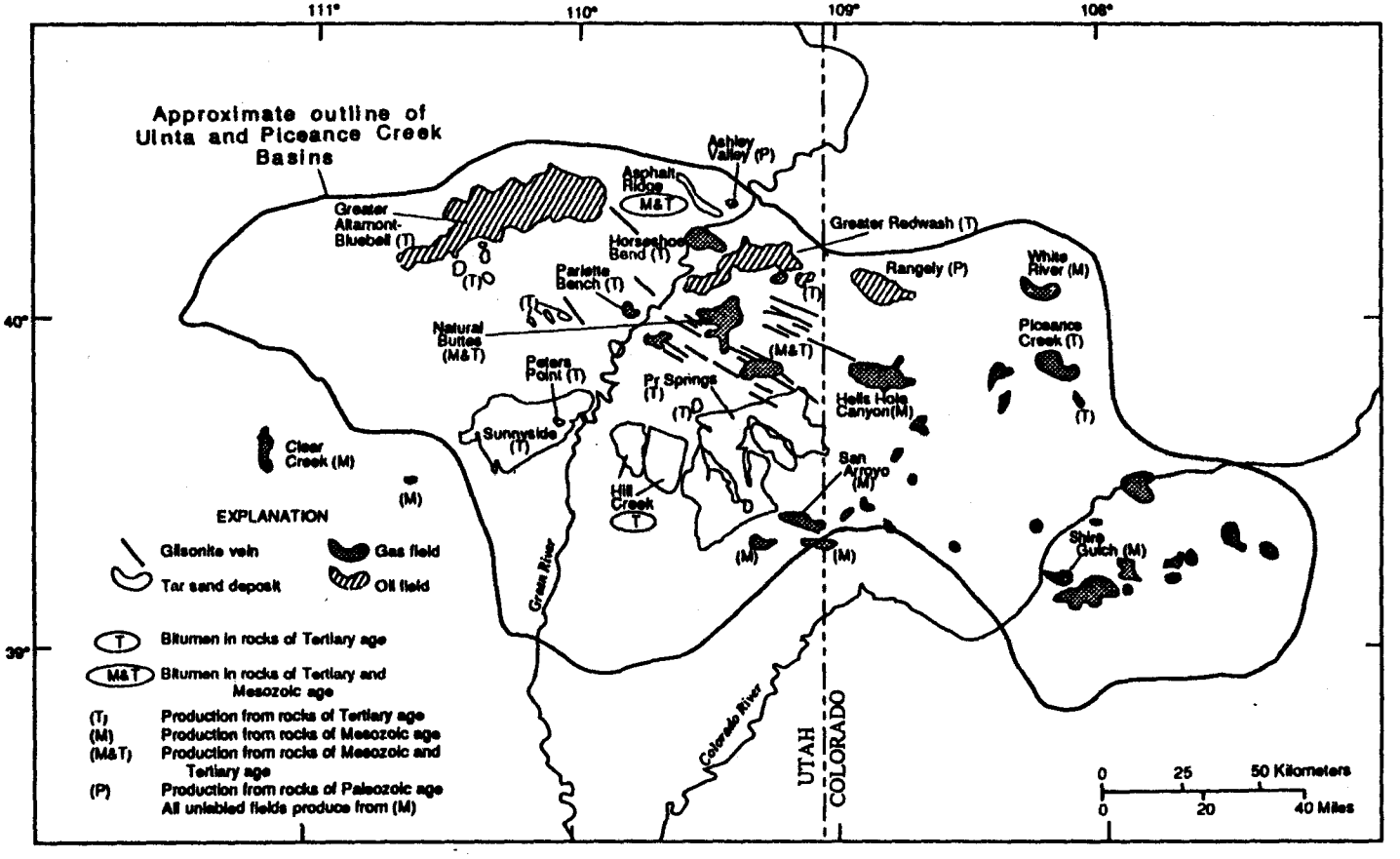
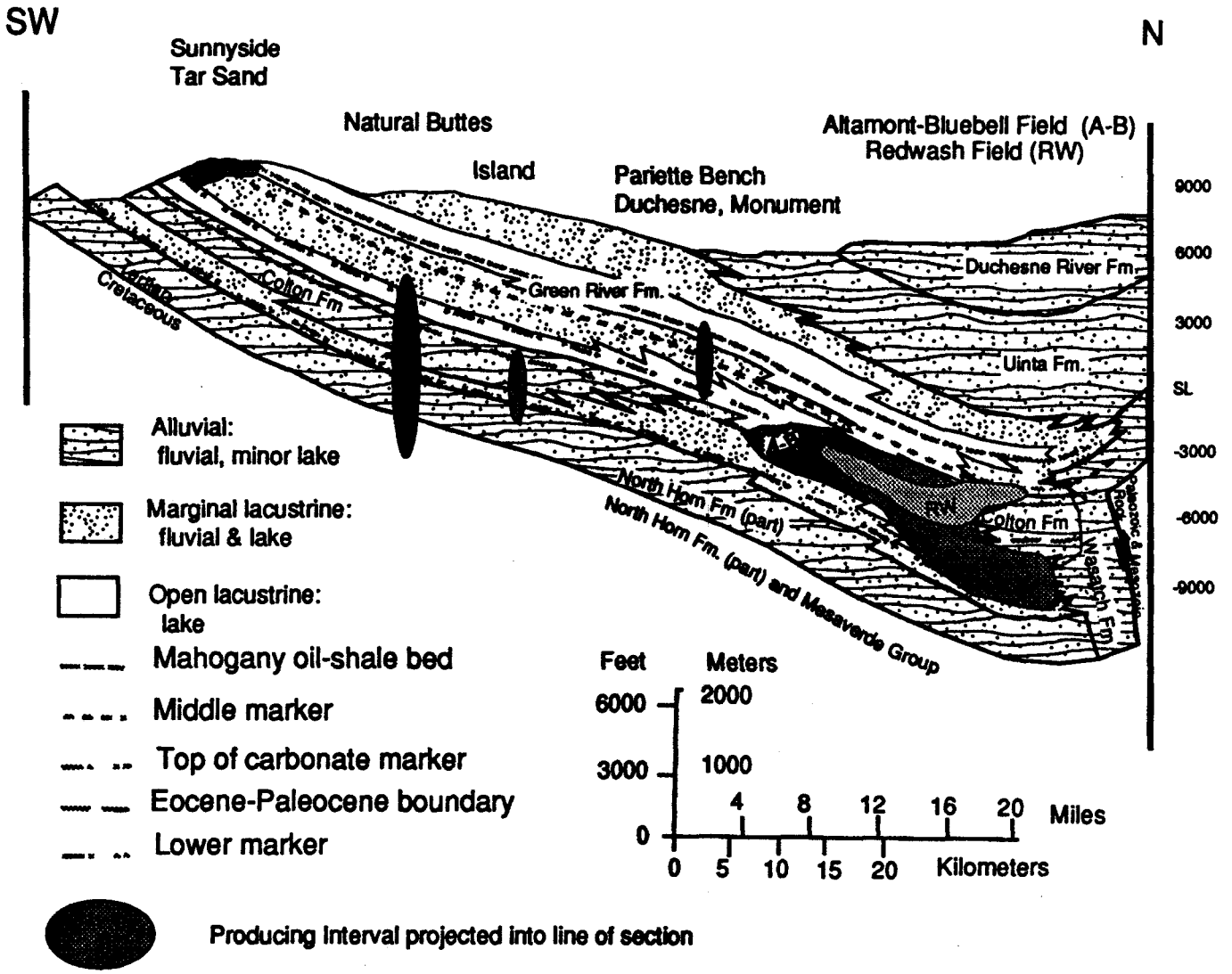
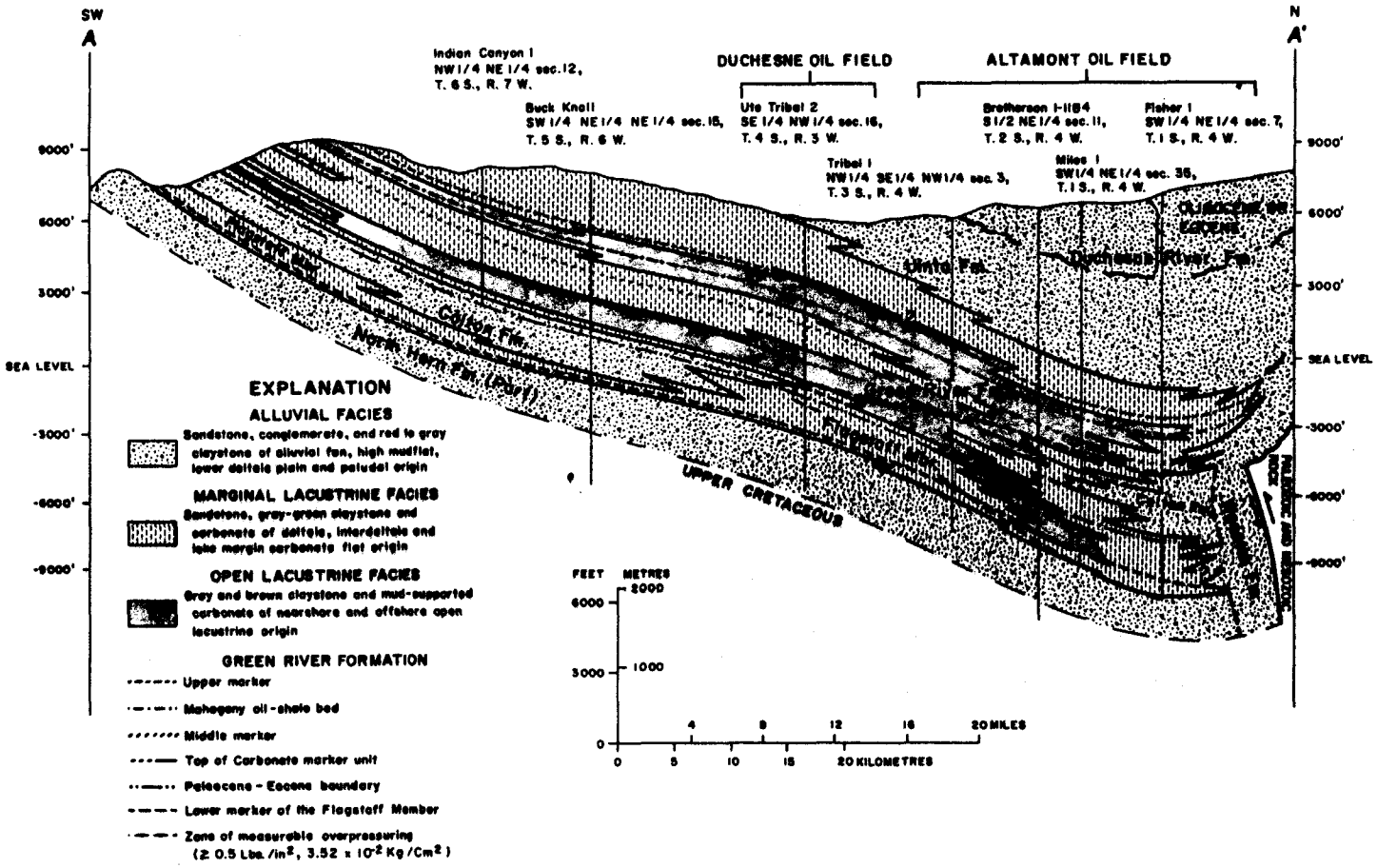
A 679


111°
110°
109°
108°
40°
39°
Approximate outline of Uinta and Piceance Creek Basins
Greater Altamont-Bluebell (T)
Asphalt Ridge M&T
Ashley Valley (P)
Horseshoe Bend (T)
Greater Redwash (T)
Rangely (P)
White River (M)
Pariette Bench (T)
Natural Buttes (M&T)
Peters Point (T)
Pr Springs (T)
(M&T)
Hells Hole Canyon (M)
Piceance Creek (T)
Sunnyside (T)
Clear Creek (M)
Hill Creek T
San Arroyo (M)
Shire Gulch (M)
Green River
Colorado River
UTAH
COLORADO
EXPLANATION
Gilsonite vein
Tar sand deposit
Gas field
Oil field
T Bitumen in rocks of Tertiary age
M&T Bitumen in rocks of Tertiary and Mesozoic age
(T) Production from rocks of Tertiary age
(M) Production from rocks of Mesozoic age
(M&T) Production from rocks of Mesozoic and Tertiary age
(P) Production from rocks of Paleozoic age
All unlabled fields produce from (M)
0 25 50 Kilometers
0 20 40 Miles




Cross section from Willow Creek-Indian Canyon to Altamont-Bluebell field with producing interval from several fields projected into line of section

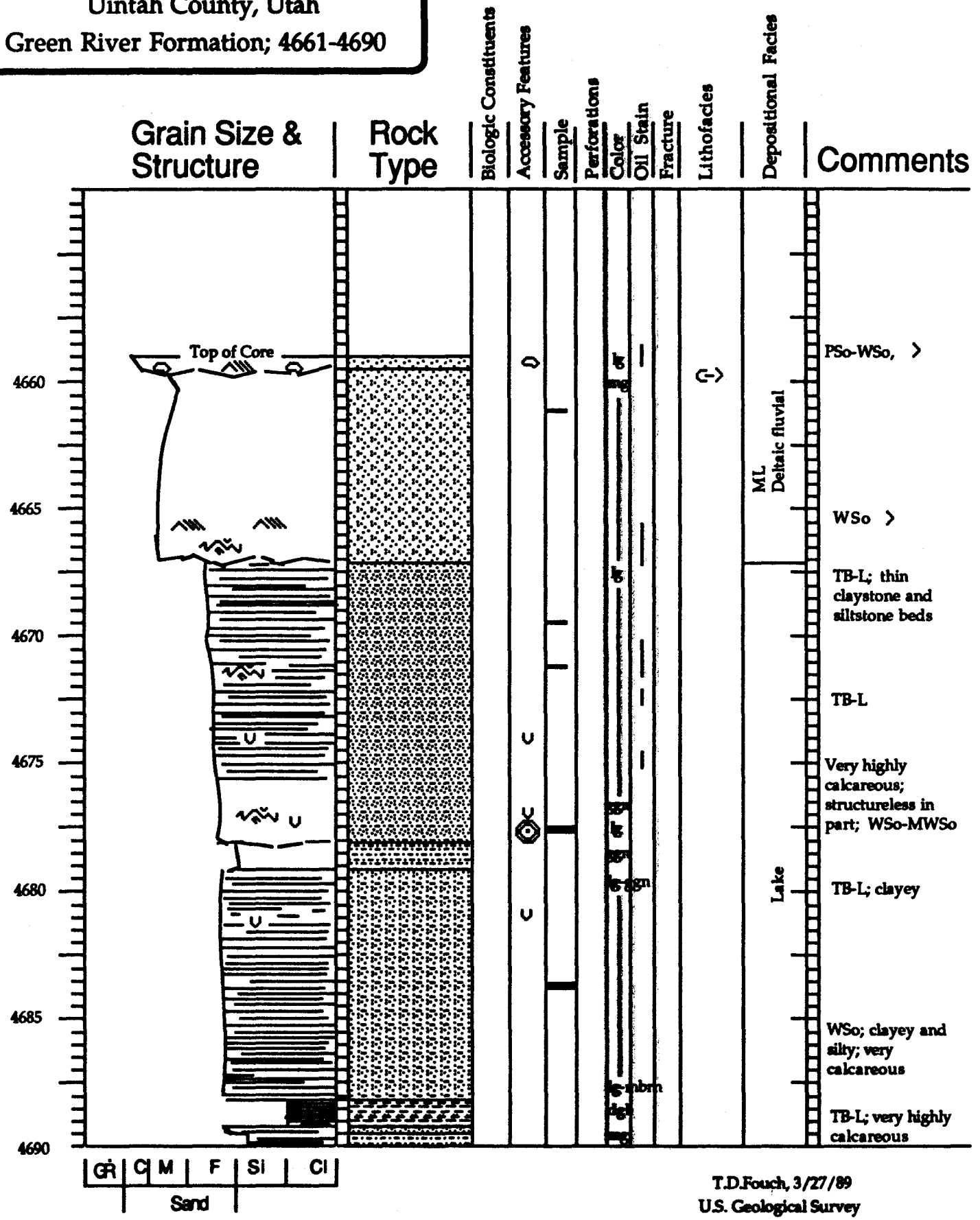

SW
A
N
A'
Indian Canyon 1
NW 1/4 NE 1/4 sec. 12,
T. 6 S., R. 7 W.
Buck Knoll
SW 1/4 NE 1/4 NE 1/4 sec. 15,
T. 5 S., R. 6 W.
DUCHESNE OIL FIELD
Ute Tribal 2
SE 1/4 NW 1/4 sec. 16,
T. 4 S., R. 3 W.
Tribal 1
NW 1/4 SE 1/4 NW 1/4 sec. 3,
T. 3 S., R. 4 W.
ALTAMONT OIL FIELD
Bretherson 1-11B4
S 1/2 NE 1/4 sec. 11,
T. 2 S., R. 4 W.
Miles 1
SW 1/4 NE 1/4 sec. 35,
T. 1 S., R. 4 W.
Fisher 1
SW 1/4 NE 1/4 sec. 7,
T. 1 S., R. 4 W.
9000'
6000'
3000'
SEA LEVEL
-3000'
-6000'
-9000'
Uinta Fm.
Duchesne River Fm.
Colton Fm.
North Horn Fm. (Part)
UPPER CRETACEOUS
EXPLANATION
ALLUVIAL FACIES
Sandstone, conglomerate, and red to gray claystone of alluvial fan, high mudflat, lower deltaic plain and paludal origin
MARGINAL LACUSTRINE FACIES
Sandstone, gray-green claystone and carbonate of deltaic, interdeltaic and lake margin carbonate flat origin
OPEN LACUSTRINE FACIES
Gray and brown claystone and mud-supported carbonate of nearshore and offshore open lacustrine origin
GREEN RIVER FORMATION
Upper marker
Mahogany oil-shale bed
Middle marker
Top of Carbonate marker unit
Paleocene - Eocene boundary
Lower marker of the Flagstaff Member
Zone of measurable overpressuring
(≥ 0.5 Lbs./in², 3.52 x 10⁻² Kg/Cm²)
FEET
METRES
6000
3000
0
2000
1000
4
8
12
16
20 MILES
0
5
10
15
20 KILOMETRES

# Pan Am Broadhurst 4

Sec. 9, T. 7S., R. 23E.
Uintah County, Utah
Green River Formation; 4661-4690

## Sedimentology

T.D. Fouch



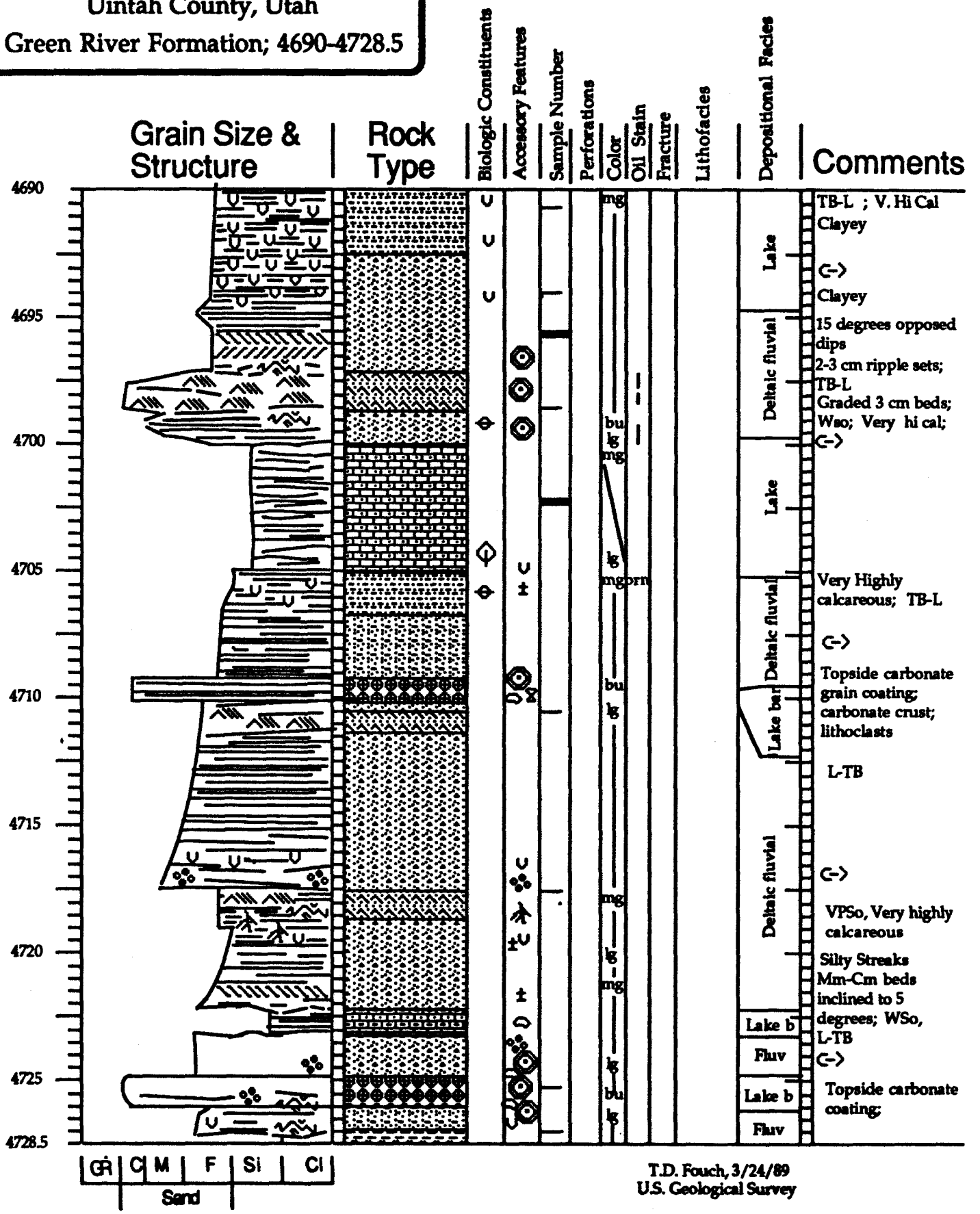

T.D.Fouch, 3/27/89
U.S. Geological Survey

# Pan Am Broadhurst 4

Sec. 9, T. 7S., R. 23E.
Uintah County, Utah
Green River Formation; 4690-4728.5

## Sedimentology

T.D. Fouch




T.D. Fouch, 3/24/89
U.S. Geological Survey

# Pan Am Broadhurst 4

Sec. 9, T. 7S., R. 23E.
Uintah County, Utah
Green River Formation; 4728.5-4764

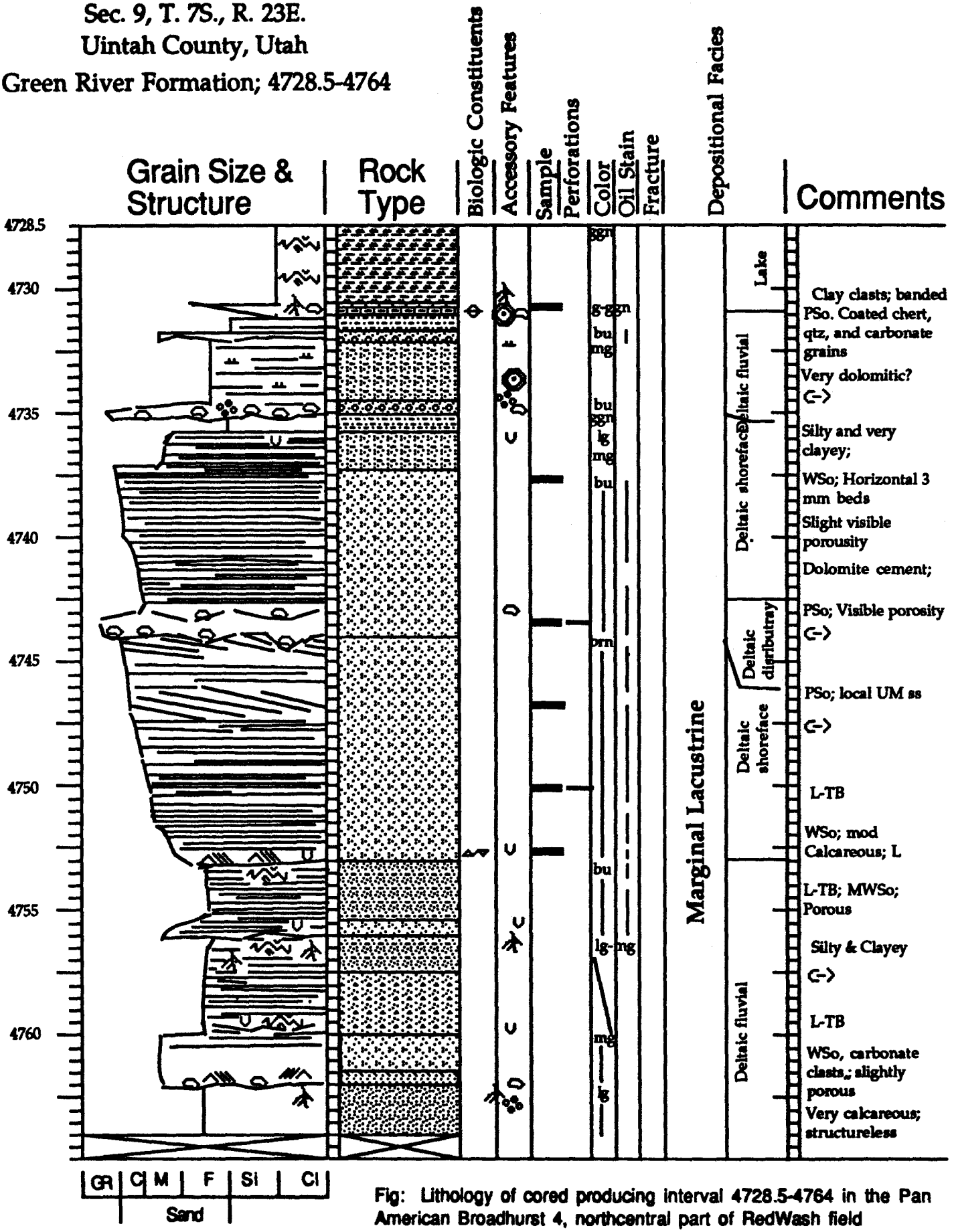


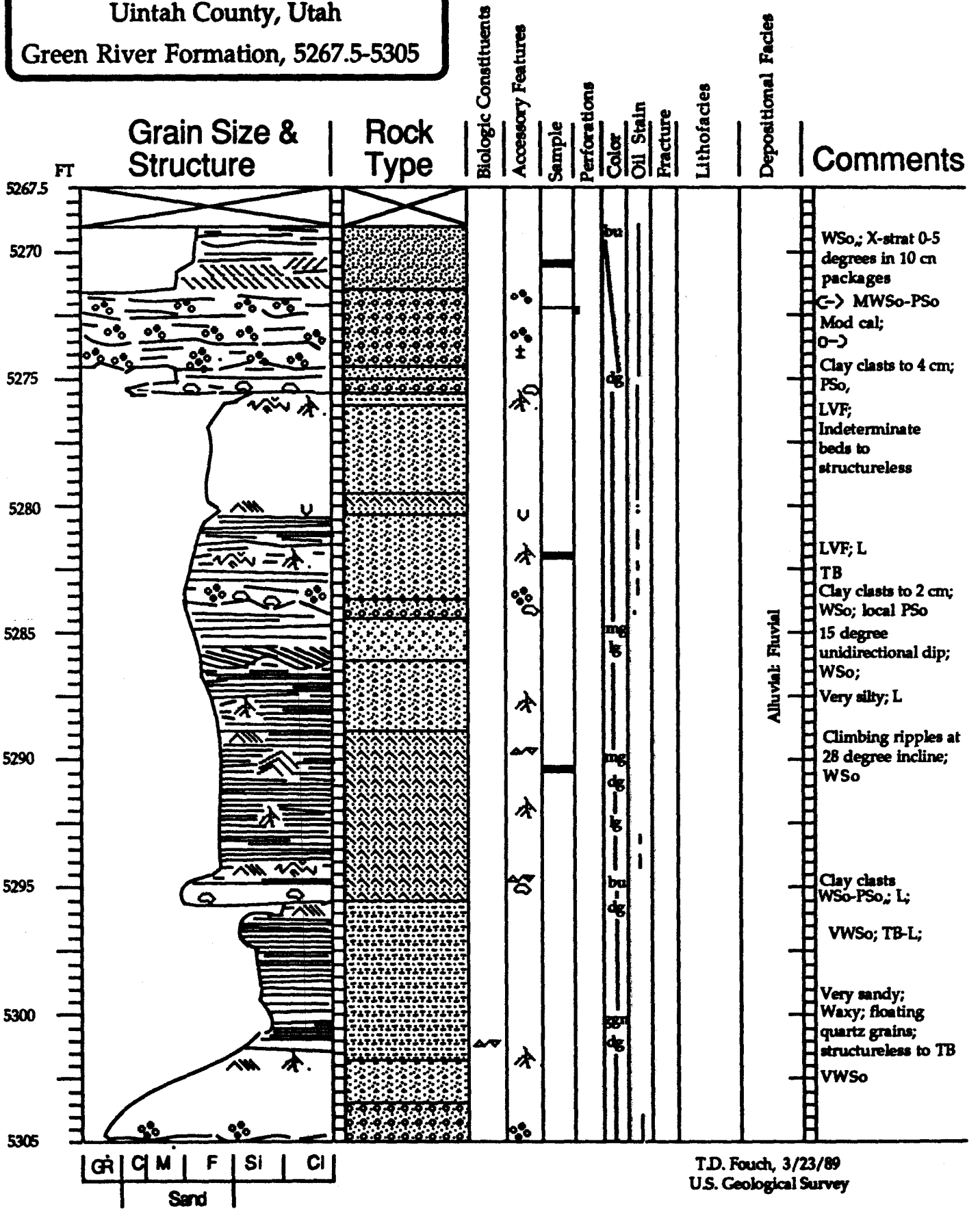

Fig: Lithology of cored producing interval 4728.5-4764 in the Pan American Broadhurst 4, northcentral part of RedWash field

# Pan Am Broadhurst 4

Sec. 9, T. 7s., R. 23E.
Uintah County, Utah
Green River Formation, 5267.5-5305

## Sedimentology

T.D. Fouch



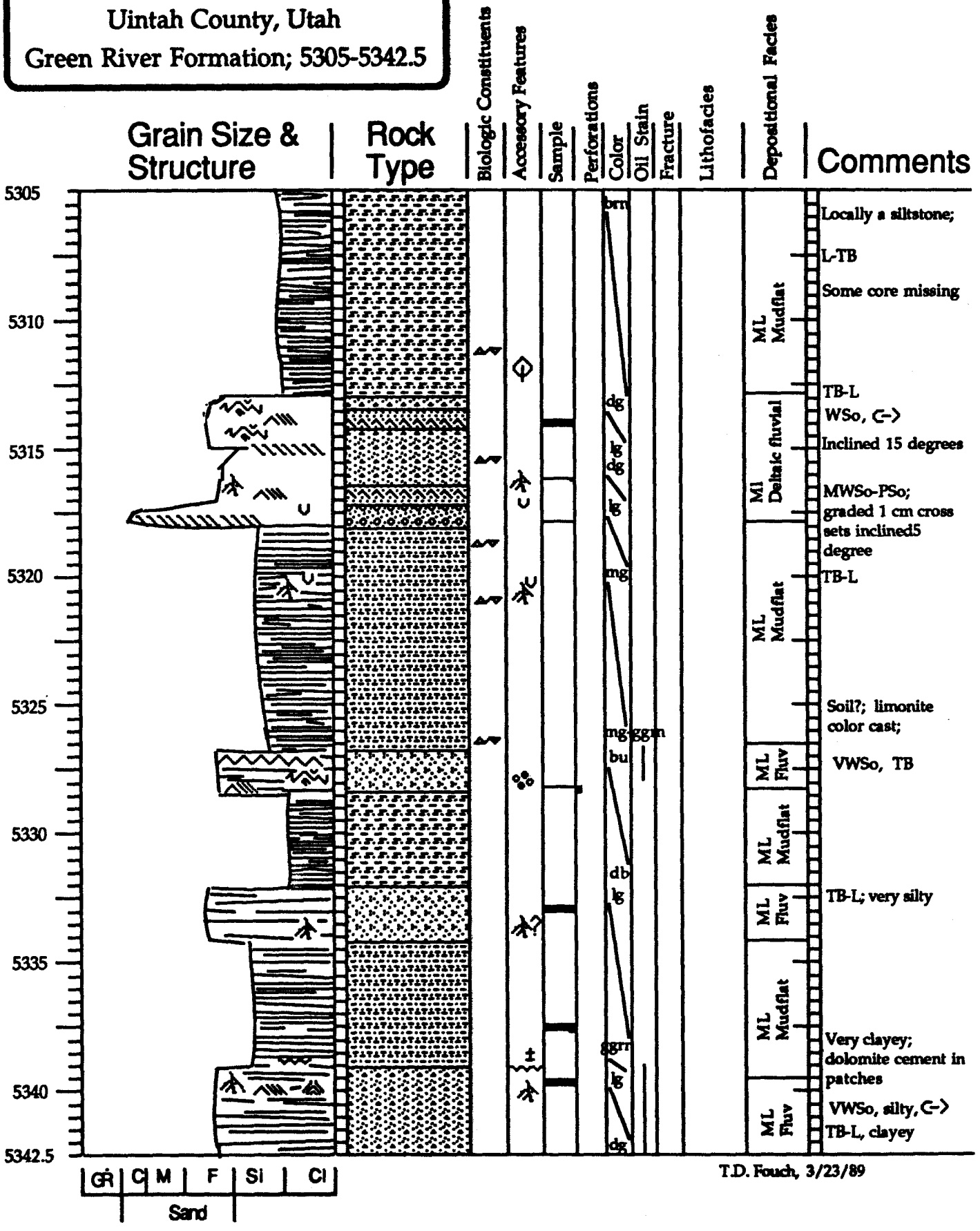

T.D. Fouch, 3/23/89
U.S. Geological Survey

# Pan Am Broadhurst 4

Sec. 9, T. 7S., R. 23E.
Uintah County, Utah
Green River Formation; 5305-5342.5

## Sedimentology

T.D. Fouch

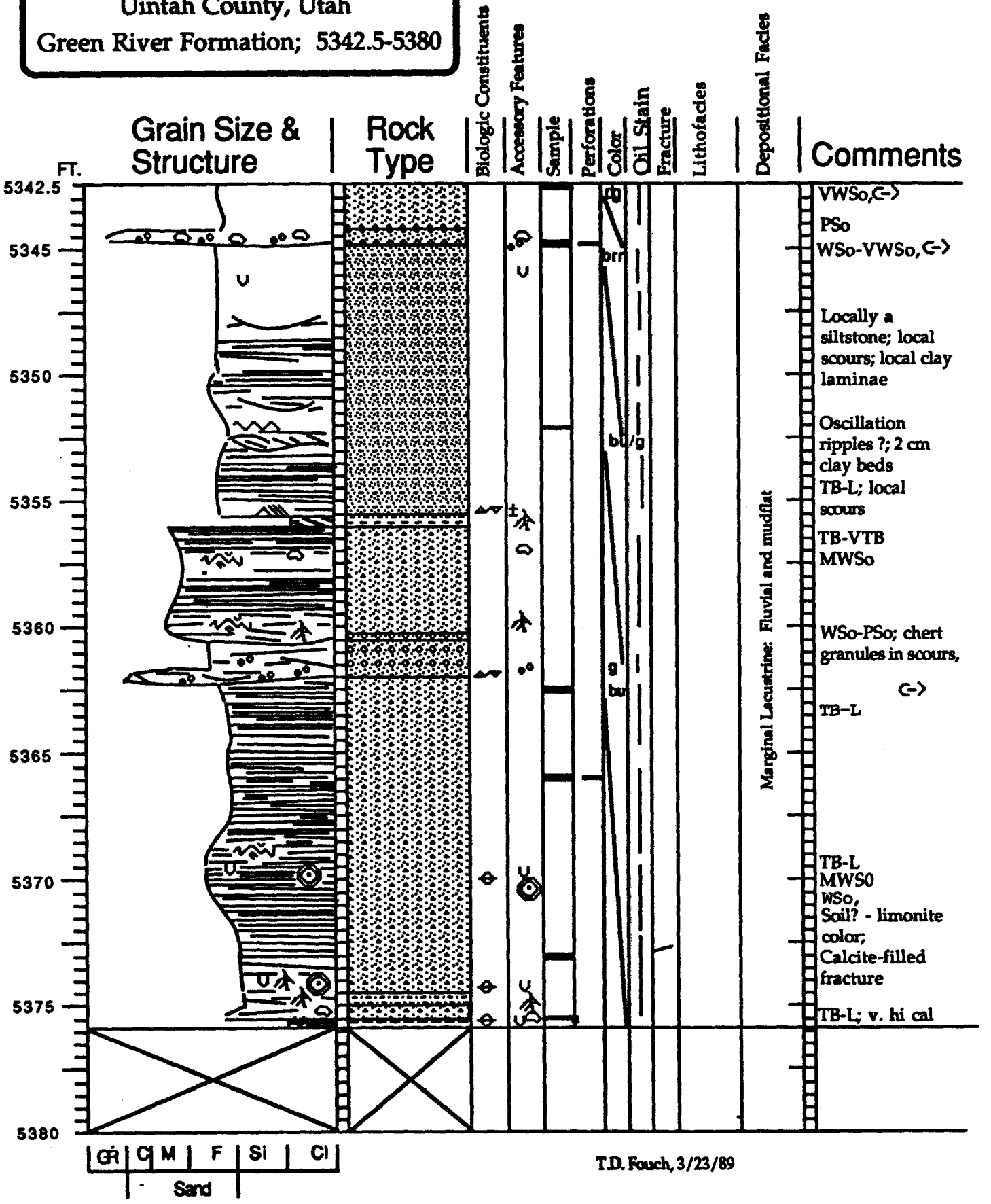



T.D. Fouch, 3/23/89

# Pan Am Broadhurst 4

Sec. 9, T. 7S., R. 23E
Uintah County, Utah
Green River Formation; 5342.5-5380

## Sedimentology




T.D. Fouch, 3/23/89

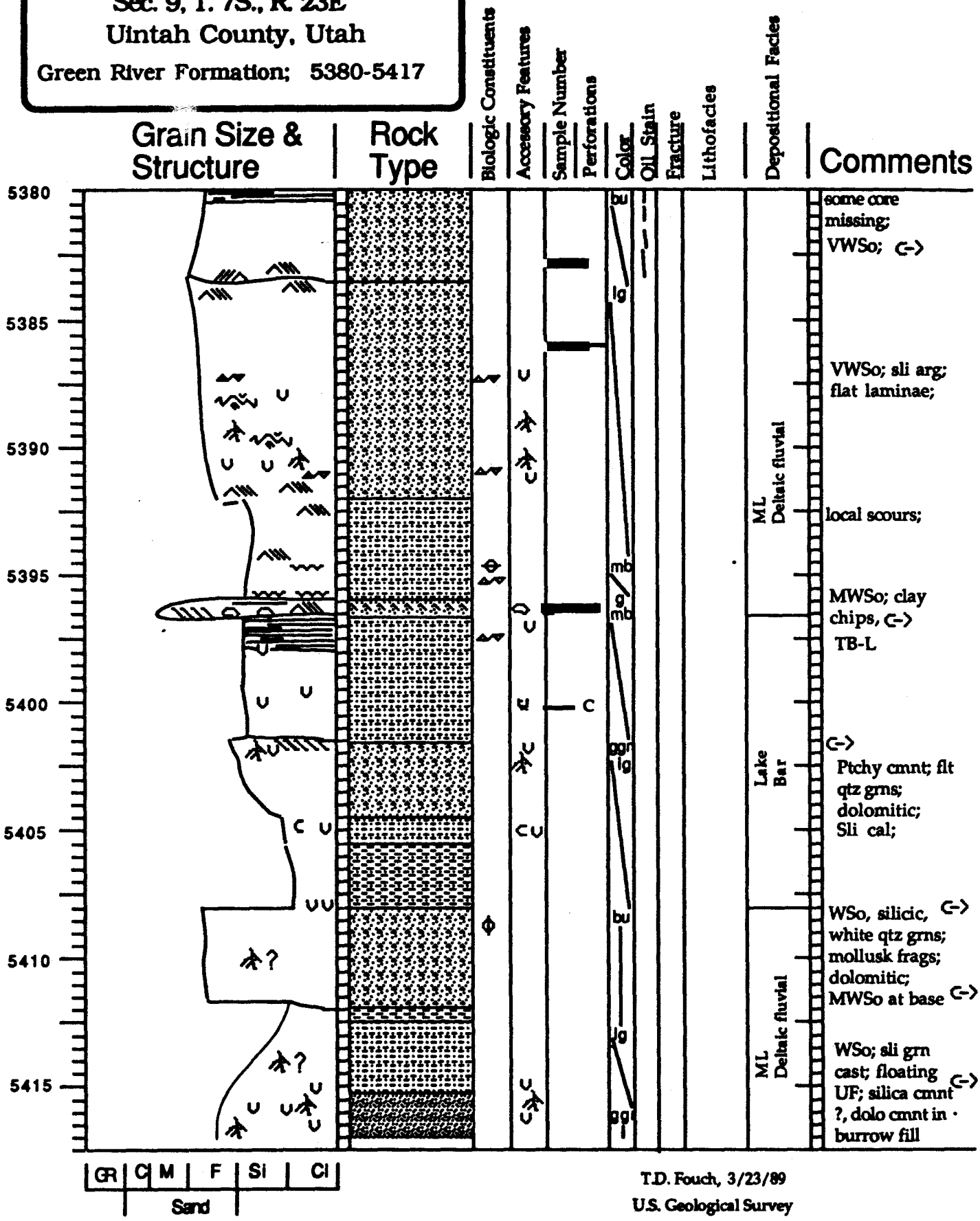
# Pan Am Broadhurst 4

Sec. 9, T. 7S., R. 23E

Uintah County, Utah

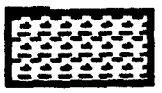
Green River Formation; 5380-5417

## Sedimentology

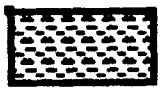



T.D. Fouch, 3/23/89

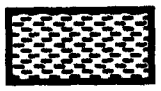
U.S. Geological Survey



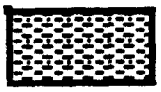
Claystone; dark grey to dark brown, slightly calcareous; thinly laminated to structureless; locally contains ostracod molds along laminae



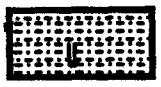
Claystone; dark grey to brown; moderately to very calcareous and is locally an argillaceous mud-supported carbonate rock; laminated to thinly bedded to structureless;



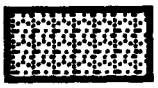
Claystone; generally shades of grey and/or brown but locally is grey green; noncalcareous to very slightly calcareous; generally indeterminately bedded to structureless to very thin bedded; blocky fracture common;



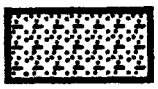
Claystone; dark to medium grey to darker shades of brown; locally is calcareous; commonly irregular to wavy laminae to thin bedded; locally contains sandstone and siltstone lenses;



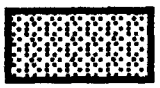
Siltstone; generally shades of grey; grades locally into sandstone or claystone; irregular thin beds to laminae are most common, laminae commonly marked by clay; generally calcareous to very calcareous;



Sandstone; silty to very silty and may locally be a siltstone; generally shades of grey and/ot brown; commonly calcareous; indeterminately to thin bedded to structureless;

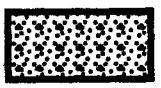


Sandstone: noncalcareous to very calcareous; generally darker shades of grey and brown; structureless to laminated and beds irregular to continuous and even; clayey and silty streaks common; ostracod molds where present concentrated along laminae;



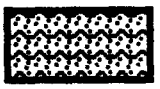
Sandstone; noncalcareous to slightly calcareous; light brown or tan to darker shades of grey; structureless to thin bedded to laminated; sorting may vary; argillaceous streaks locally developed; fossils are rare;

Sandstone; noncalcareous but local calcareous cement patches in burrows; dark and light shades of grey and brown and is locally grey green; generally well sorted; indeterminately bedded to structureless;

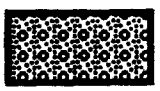


Sandstone; light brown to grey; commonly moderately calcareous; generally well to very well sorted; structureless to thin bedded to laminated;

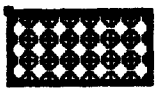
Sandstone; tan to light brown to grey; generally calcareous; commonly well to very well sorted; generally contains assymetric small scale cross laminae (current ripples);



Sandstone; tan to light brown to grey; generally calcareous; commonly well to very well sorted; symmetrical small scale cross laminae (oscillation ripples) common;

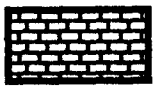


Sandstone; tan to light brown to grey; generally calcareous; commonly moderately well sorted but locally poorly sorted; irregular thin beded to laminated and it is locally structureless or laminated; granules and pebbles are most commonly of white, grey, and locally tan chert or some other siliceous subrounded to angular lithic material;

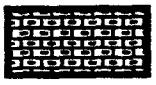


Grainstone and/or packstone; ostracodal, locally contains coated grains; generally light brown to tan, some units are dark brown, kerogenous and argillaceous; structureless to laminated; laminated units commonly are rich in clay;

Grainstone and/or packstone; contains coated grains, oolites, and/or pisoliths; coatings commonly developed on ostracod tests; generally light to dark shades of brown; local spar carbonate cement; commonly structureless to faintly thin bedded to laminated; locally argillaceous;

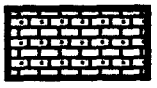


Carbonate mudstone and/or wackestone; locally contains abundant ostracod tests and molds along laminae; light to dark brown, locally tan; generally thin bedded to laminated, irregular to even bedded;



Carbonate mudstone and/or wackestone; generally clayey and kerogenous, and is locally a clay mudstone; ostracod tests and molds are locally common; fossiliferous rock is commonly laminated but structureless fossiliferous and nonfossiliferous units are common;

Carbonate mudstone and/or wackestone; commonly quite clayey, kerogenous, and sandy; rock is locally a very calcareous sandstone or clayey siltstone and contains thin lenses of these lithologies; rocks are generally darker shades of brown but is locally dark grey; bedding is commonly irregular and discontinuous;



Carbonate mudstone and/or wackestone; ostracod tests and molds common; commonly sandy and local sandstone lenses; some units are clayey; bedding is generally laminated to structureless and ranges from irregular to even;

# Rock Color

| | |
|---|---|
| g | Grey |
| dg | Dark Grey |
| lg | Light Gray |
| bl | Black |
| ggn | Gray green |
| ogr | Olive green |
| gr | Green |
| rgr | Red and green, mottled |
| r | Red |
| bu | Buff/tan |
| lb | Light brown |
| mb | Medium brown |
| db | Dark brown |
| db/r | Dark brown grading to red |

| | |
|---|---|
| ± | Pyrite or marcasite |
| | Calcareous; moderately to highly |
| | Calcareous; slightly to moderately |
| o -> | Grains rounded to subangular |
| o-> | Grains rounded to subrounded |
| c-> | Grains subrounded to subangular |
| | Lithoclasts; generally composed of indigenous carbonate rock type; commonly a broken carbonate crust where fragments are horizontally alligned |
| | Granules and pebbles composed of siliceous rock types; commonly tan to light grey chert; locally are of silicified sedimentary rock. |
| ? | Uncertain identification |
| ∪ | Burrow; vertical or at high angle to bedding |
| ⊂ | Burrow or track; horizontal or at low angle to bedding |
| | Coated ostracod; some grains have several coats. |
| | Ostracod test or mold |
| | Coated grain, pisolite, and/or oolite |
| | Gastropod |
| | Fossil; undifferentiated type |
| | Plant material; generally very small fragments or impressions, and/or carbonaceous matter |
| | Woody fragment |
| | Root bioturbation |
| | Laminated to very thinly bedded; continuous to discontinuous |
| | Ripples; current lamination |
| | Contorted beds or laminae; local dewatering and/or sediment loading |
| //// | Small Scale current lamination commonly in sets exceeding 3 cm high |

| | |
|---|---|
| ± | Pyrite or marcasite |
| | Calcareous; moderately to highly |
| | Calcareous; slightly to moderately |
| | Grains rounded to subangular |
| | Grains rounded to subrounded |
| | Grains subrounded to subangular |
| | Lithoclasts; generally composed of indigenous carbonate rock type; commonly a broken carbonate crust where fragments are horizontally alligned |
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| | Contorted beds or laminae; local dewatering and/or sediment loading |
| | Small Scale current lamination commonly in sets exceeding 3 cm high |

A679

Subject: Geochemistry Data
Pan Am Broadhurst #4

| Depth (ft) | TOC | TMAX | HI | OI |
|---|---|---|---|---|
| 5312.5 | 0.82 | 425 | 471 | 15 |
| 5321.4 | 0.13 | — | 130 | 69 |
| 5330.5 | 0.38 | — | 81 | 10 |
| 5337.2 | 0.10 | — | 130 | 60 |
| 5356.5 | 0.41 | 433 | 170 | 12 |
| 5392.7 | 0.17 | — | 58 | 17 |
| 5394.2 | 0.53 | 431 | 328 | 26 |

Notes:

1. TOC = Wt. percent Total Organic Carbon
2. Some Tmax values unavailable because of low yield.
3. HI = hydrogen index
4. OI = oxygen index

A679

**MEMORANDUM** GO-144

TO: MR. J. Castle P. E. Flynn 1/29/1987

FROM: MR. M. W. Smith

SUBJECT: XRD - Pan Am #4 Broadhurst 7S 23E Sec 9 OUR FILE:

YOUR FILE:

The mineralogy of the core samples analyzed by X-Ray Diffraction are listed below by depths.

5272.3': Illite, quartz, calcite, dolomite
5312.5': Smectite, illite, kaolinite, quartz, feldspar, calcite, dolomite, pyrite
5316.2': Smectite, illite, quartz, feldspar, calcite, dolomite
5318.2': Smectite, illite, quartz, feldspar, calcite, dolomite
5321.4': Smectite, illite, kaolinite, quartz, feldspar, calcite, dolomite
5328.3': Smectite, illite, quartz, feldspar, calcite, dolomite
5330.5': Smectite, illite, kaolinite, quartz, feldspar, calcite, dolomite
5337.2': Smectite, illite, kaolinite, quartz, feldspar, calcite, dolomite
5342.3': Smectite, illite, quartz, feldspar, calcite, dolomite
5351.7': Quartz, feldspar, calcite, dolomite
5356.5': Smectite, illite, kaolinite, quartz, feldspar, calcite, dolomite
5375.6': Illite, quartz, feldspar, calcite, dolomite
5392.7': Illite, kaolinite, quartz, feldspar, calcite, dolomite, pyrite
5394.2': Smectite, illite, kaolinite, quartz, feldspar, calcite, dolomite, pyrite
5399.2': Kaolinite, quartz, feldspar, calcite, dolomite
5411.9': Illite, kaolinite, quartz, feldspar, calcite, dolomite.

MWSON

WHEN REPLY IS REQUIRED, FORWARD ORIGINAL AND OUR COPY GO-144 (7/8)

A679 USGS

**MEMORANDUM** GO-144

TO: MR. J. Castle P. E. Flynn 1/29/1987

FROM: MR. M. W. Smith

SUBJECT: XRD - Pan Am #4 Broadhurst

OUR FILE:

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5316.2': Smectite, illite, quartz, feldspar, calcite, dolomite
5318.2': Smectite, illite, quartz, feldspar, calcite, dolomite
5321.4': Smectite, illite, kaolinite, quartz, feldspar, calcite, dolomite
5328.3': Smectite, illite, quartz, feldspar, calcite, dolomite
5330.5': Smectite, illite, kaolinite, quartz, feldspar, calcite, dolomite
5337.2': Smectite, illite, kaolinite, quartz, feldspar, calcite, dolomite
5342.3': Smectite, illite, quartz, feldspar, calcite, dolomite
5351.7': Quartz, feldspar, calcite, dolomite
5356.5': Smectite, illite, kaolinite, quartz, feldspar, calcite, dolomite
5375.6': Illite, quartz, feldspar, calcite, dolomite
5392.7': Illite, kaolinite, quartz, feldspar, calcite, dolomite, pyrite
5394.2': Smectite, illite, kaolinite, quartz, feldspar, calcite, dolomite, pyrite
5399.2': Kaolinite, quartz, feldspar, calcite, dolomite
5411.9': Illite, kaolinite, quartz, feldspar, calcite, dolomite.

MWSON

A679

MEMORANDUM GO-144

TO: MR. File 4/14/1987

FROM: MR. JWC

SUBJECT: Pan Am #4 Broadhurst 7S 23E Sec 9 OUR FILE:

Geochemistry Data YOUR FILE:

| Sample Number | Depth | *TOC |
|---|---|---|
| 5173-1 | 5312.5' | 0.82 |
| -2 | 5321.4' | 0.13 |
| -3 | 5330.5' | 0.38 |
| -4 | 5337.2' | 0.10 |
| -5 | 5356.5' | 0.41 |
| -6 | 5392.7' | 0.17 |
| -7 | 5394.2' | 0.53 |

* TOC = Total Organic Carbon (wt. percent)

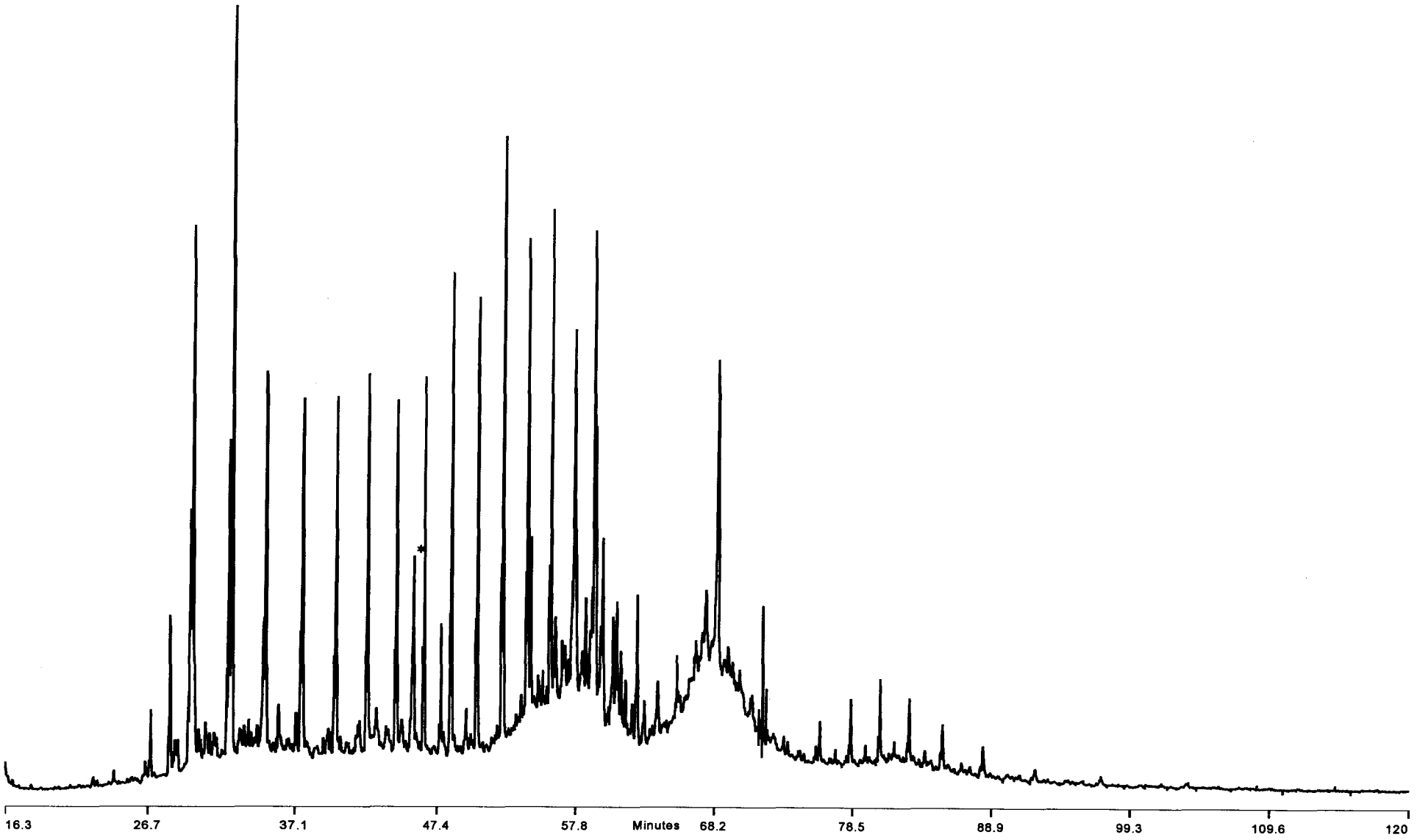
Pan Am Petroleum

WELL: Pan American 4 USA Pearl Broadhurst A679

depth: 4687

UINTH, UTAH
T7S - R23E - 9

TOC (%): 2.23 HI (mg HC/g $C_{org}$): 792 OI (mg $CO_2$/g $C_{org}$): 32 Tmax (°C): 432




* = Internal Standard $C_{24}D_{50}$
GC: 40-360°C @ 4°/min, 120 min, DB-1HT, 0.25 µm film

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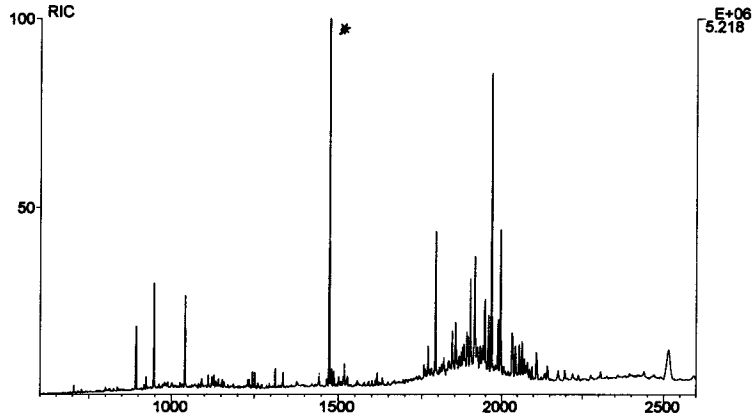
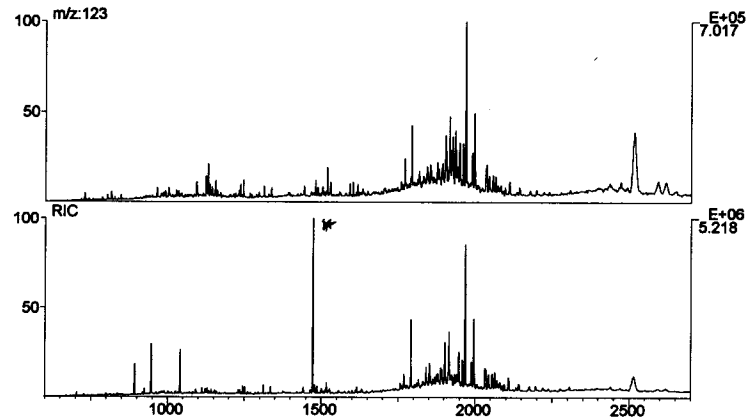
WELL: Pan American 4 USA Pearl Broadhurst
depth: 4,687 ft

* = Internal Standard $C_{24}D_{50}$

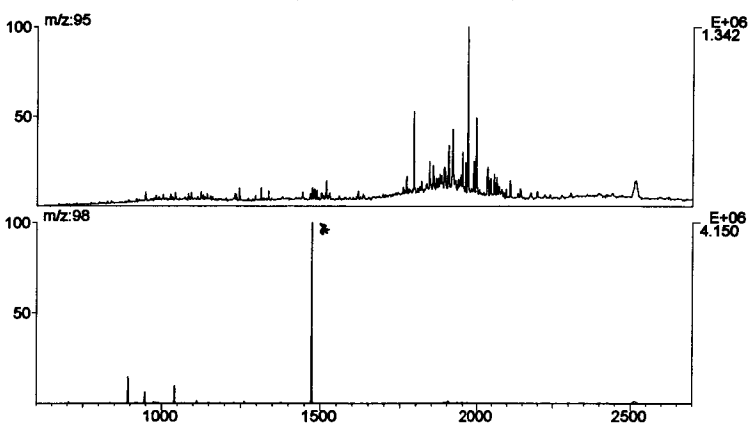
CHRO: em8213 28-MAY-97 Elapse: 01:04:40 1727
Samp: UB9E PanAm USA Pearl Broadhurst 4687ft Start: 00:09:49 2855
Comm: gc=gc310 icl=rppali/MID3 IS=C24D50
Mode: EI +Q3MS LMR UP LR Study: Uinta Basin
Oper: EM Client: EMueller Inlet: GC Vial 9
Peak: 1000.00 mmu Label wndw: 600 > 2600 Masses: 95 > 426
Area: 0, 4.00 Baseline : 0, 5 Label : 0, 0.00



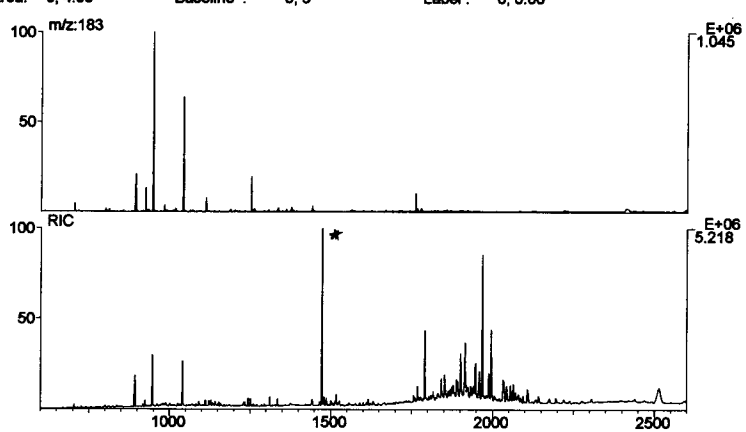

CHRO: em8213 28-MAY-97 Elapse: 01:04:40 1727
Samp: UB9E PanAm USA Pearl Broadhurst 4687ft Start: 00:09:49 2855
Comm: gc=gc310 icl=rppali/MID3 IS=C24D50
Mode: EI +Q3MS LMR UP LR Study: Uinta Basin
Oper: EM Client: EMueller Inlet: GC Vial 9
Peak: 1000.00 mmu Label wndw: 600 > 2700 Masses: 95 > 426
Area: 0, 4.00 Baseline : 0, 5 Label : 0, 0.00




CHRO: em8213 28-MAY-97 Elapse: 00:33:40.7 738
Samp: UB9E PanAm USA Pearl Broadhurst 4687ft Start: 00:09:49 2855
Comm: gc=gc310 icl=rppali/MID3 IS=C24D50
Mode: EI +Q3MS LMR UP LR Study: Uinta Basin
Oper: EM Client: EMueller Inlet: GC Vial 9
Peak: 1000.00 mmu Label wndw: 600 > 2700 Masses: 95 > 426
Area: 0, 4.00 Baseline : 0, 5 Label : 0, 0.00




CHRO: em8213 28-MAY-97 Elapse: 00:35:54.1 809
Samp: UB9E PanAm USA Pearl Broadhurst 4687ft Start: 00:09:49 2855
Comm: gc=gc310 icl=rppali/MID3 IS=C24D50
Mode: EI +Q3MS LMR UP LR Study: Uinta Basin
Oper: EM Client: EMueller Inlet: GC Vial 9
Peak: 1000.00 mmu Label wndw: 600 > 2600 Masses: 95 > 426
Area: 0, 4.00 Baseline : 0, 5 Label : 0, 0.00

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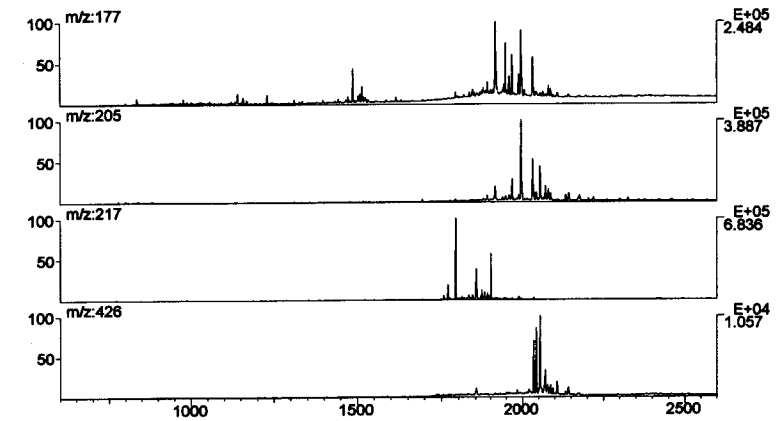
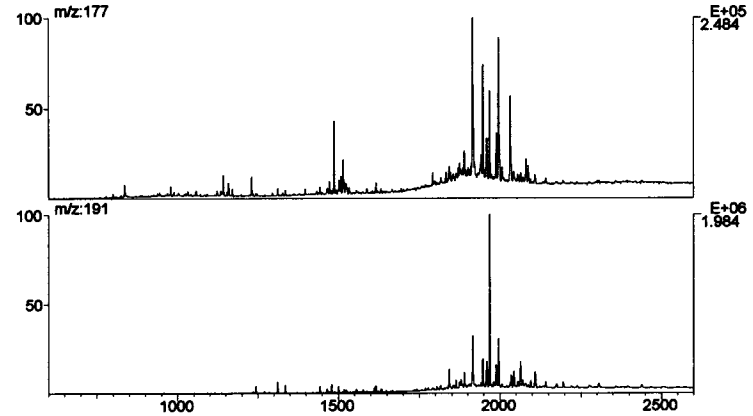
WELL: Pan American 4 USA Pearl Broadhurst
depth: 4,687 ft

* = Internal Standard $C_{24}D_{50}$

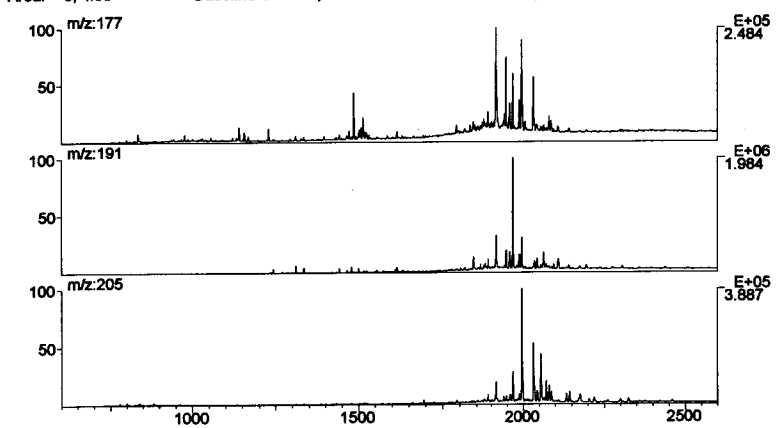
CHRO: em8213 28-MAY-97 Elapse: 01:01:19 1620
Samp: UB9E PanAm USA Pearl Broadhurst 4687ft Start: 00:09:49 2855
Comm: gc=gc310 icl=rppali/MID3 IS=C24D50
Mode: EI +Q3MS LMR UP LR Study: Uinta Basin
Oper: EM Client: EMueller Inlet: GC Vial 9
Peak: 1000.00 mmu Label wndw: 600 > 2600 Masses: 95 > 426
Area: 0, 4.00 Baseline : 0, 5 Label : 0, 0.00



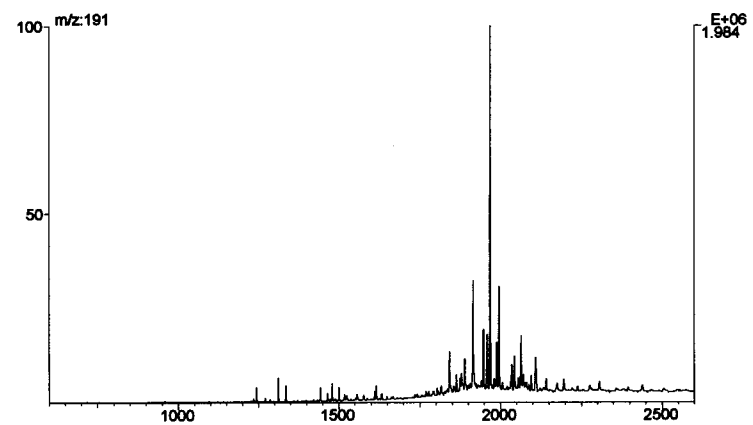

CHRO: em8213 28-MAY-97 Elapse: 00:33:40.7 738
Samp: UB9E PanAm USA Pearl Broadhurst 4687ft Start: 00:09:49 2855
Comm: gc=gc310 icl=rppali/MID3 IS=C24D50
Mode: EI +Q3MS LMR UP LR Study: Uinta Basin
Oper: EM Client: EMueller Inlet: GC Vial 9
Peak: 1000.00 mmu Label wndw: 600 > 2600 Masses: 95 > 426
Area: 0, 4.00 Baseline : 0, 5 Label : 0, 0.00




CHRO: em8213 28-MAY-97 Elapse: 00:33:40.7 738
Samp: UB9E PanAm USA Pearl Broadhurst 4687ft Start: 00:09:49 2855
Comm: gc=gc310 icl=rppali/MID3 IS=C24D50
Mode: EI +Q3MS LMR UP LR Study: Uinta Basin
Oper: EM Client: EMueller Inlet: GC Vial 9
Peak: 1000.00 mmu Label wndw: 600 > 2600 Masses: 95 > 426
Area: 0, 4.00 Baseline : 0, 5 Label : 0, 0.00




CHRO: em8213 28-MAY-97 Elapse: 00:42:44 1027
Samp: UB9E PanAm USA Pearl Broadhurst 4687ft Start: 00:09:49 2855
Comm: gc=gc310 icl=rppali/MID3 IS=C24D50
Mode: EI +Q3MS LMR UP LR Study: Uinta Basin
Oper: EM Client: EMueller Inlet: GC Vial 9
Peak: 1000.00 mmu Label wndw: 600 > 2600 Masses: 95 > 426
Area: 0, 4.00 Baseline : 0, 5 Label : 0, 0.00

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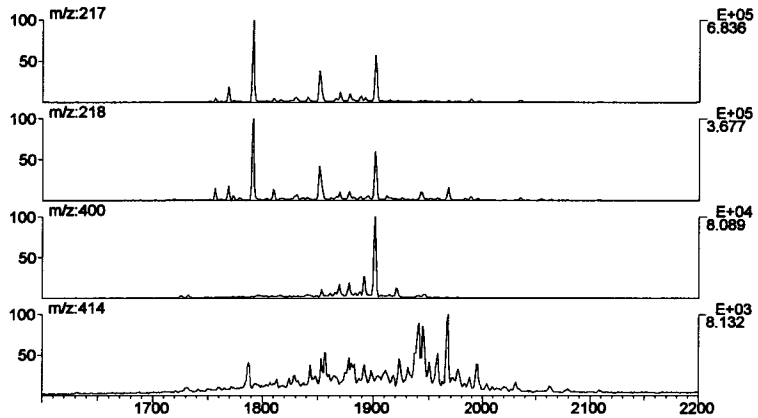
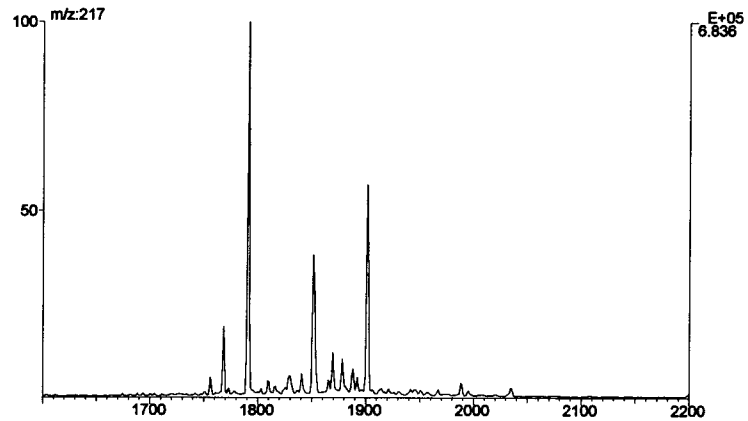
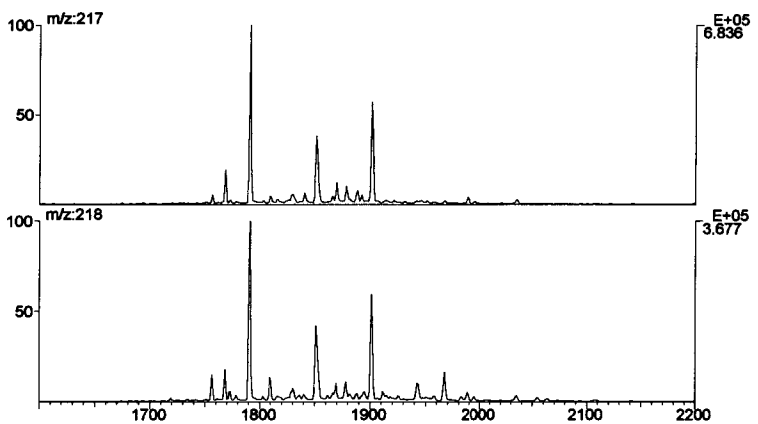
CHRO: em8213 28-MAY-97 Elapse: 00:42:44 1027
Samp: UB9E PanAm USA Pearl Broadhurst 4687ft Start: 00:09:49 2855
Comm: gc=gc310 icl=rppali/MID3 IS=C24D50
Mode: EI +Q3MS LMR UP LR Study: Uinta Basin
Oper: EM Client: EMueller Inlet: GC Vial 9
Peak: 1000.00 mmu Label wndw: 1600 > 2200 Masses: 95 > 426
Area: 0, 4.00 Baseline: 0, 5 Label: 0, 0.00




CHRO: em8213 28-MAY-97 Elapse: 01:01:19 1620
Samp: UB9E PanAm USA Pearl Broadhurst 4687ft Start: 00:09:49 2855
Comm: gc=gc310 icl=rppali/MID3 IS=C24D50
Mode: EI +Q3MS LMR UP LR Study: Uinta Basin
Oper: EM Client: EMueller Inlet: GC Vial 9
Peak: 1000.00 mmu Label wndw: 1600 > 2200 Masses: 95 > 426
Area: 0, 4.00 Baseline: 0, 5 Label: 0, 0.00




CHRO: em8213 28-MAY-97 Elapse: 00:42:44 1027
Samp: UB9E PanAm USA Pearl Broadhurst 4687ft Start: 00:09:49 2855
Comm: gc=gc310 icl=rppali/MID3 IS=C24D50
Mode: EI +Q3MS LMR UP LR Study: Uinta Basin
Oper: EM Client: EMueller Inlet: GC Vial 9
Peak: 1000.00 mmu Label wndw: 1600 > 2200 Masses: 95 > 426
Area: 0, 4.00 Baseline: 0, 5 Label: 0, 0.00

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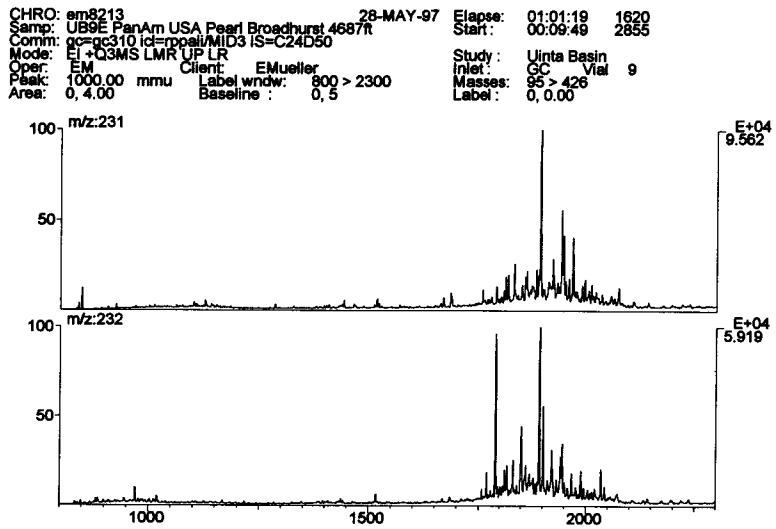


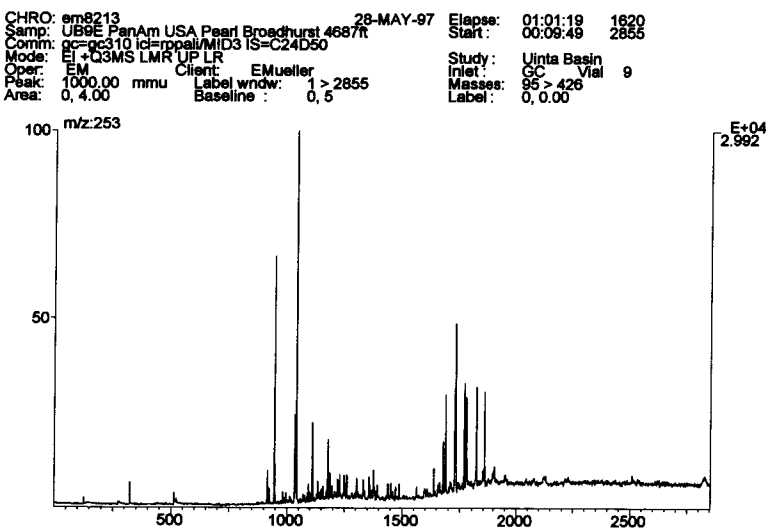


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