Figure 1.—Cross section showing correlations of Upper Cretaceous Fox Hills Sandstone and Lance Formation, and lower Tertiary Fort Union and Wasatch Formations, southeast Washakie Basin, Wyoming, and eastern Sand Wash Basin, Colorado.

Figure 2.—Chart showing intertonguing of upper part of the Fort Union Formation and the Wasatch Formation.
A–J, drill hole designations from table 1; SP, spontaneous potential log; RES, resistivity log; datums A and B, as shown on figure 1; correlation lines queried where uncertain; ★, drill holes used in figure 1.

Figure 3.—Chart showing major lithostratigraphic units between Baggs, Wyo., and Craig, Colo., and comparing nomenclature used in this report with nomenclatures used previously.

CROSS SECTION SHOWING CORRELATIONS OF UPPER CRETACEOUS FOX HILLS SANDSTONE AND LANCE FORMATION, AND LOWER TERTIARY FORT UNION AND WASATCH FORMATIONS, SOUTHEASTERN WASHAKIE BASIN, WYOMING, AND EASTERN SAND WASH BASIN, COLORADO

By
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EXPLANATION

- Lower Tertiary gray-green mudstone unit
- Upper Cretaceous and lower Tertiary sandstone unit
- Interval partly or wholly covered
- Conglomerate
- Sandstone
- Sandstone with lens of conglomerate
- Siltstone
- Mudstone
- Variegated mudstone
- Claystone
- Coal—Showing tentative correlation; queried where correlation uncertain
- Correlation line—Dashed where probable, queried where uncertain
- Intertongued formation or lithofacies
- Unconformity
- Datum plane for stratigraphic correlations
- ♦ 06473 Palynological sample locality
- ★ Fossil vertebrate locality

ABBREVIATIONS

Grain size
- v f very fine
- f fine
- m medium
- c coarse
- v c very coarse

Geophysical logs
- RES resistivity
- SP spontaneous potential
- GR natural gamma

VERTICAL SCALE: METERS 0–5; FEET 0–10; METERS 25–100; FEET 50–200

INTRODUCTION

This cross section shows surface and subsurface stratigraphic correlations of the Upper Cretaceous Fox Hills Sandstone and Lance Formation, and the lower Tertiary Fort Union and Wasatch Formations from near Baggs, Wyo. to near Craig, Colo., 30 miles to the south. Data from our field-mapping studies in the Baggs area suggest that certain changes should be made to previously published correlations of these stratigraphic units in the southeastern part of the Washakie and eastern part of the Sand Wash basins. Two major lithostratigraphic units, the unnamed Cretaceous and Tertiary sandstone unit and the unnamed upper Paleocene unit, are herein identified but not assigned to any previously named formation. We have been able to correlate the surface rocks in Wyoming to characteristic signatures on geophysical logs from nearby oil and gas drill holes. These signatures retain fairly consistant shapes, and are correlated southward to drill holes along the eastern side of the Sand Wash basin. Geophysical logs from 67 oil and gas holes in the eastern part of the Sand Wash basin and 20 holes in the southeastern part of the Washakie basin were studied; 68 of these holes, with depths to selected boundaries, are listed in table 1. The geophysical log data were supplemented with data from lithologic logs published by the American Stratigraphic Company (Amstrat). Columnar sections were constructed from measured surface sections north of Baggs, Wyo., (see location map for north-south cross section) and these sections were used to correlate lithostratigraphic units with geophysical log responses shown on the cross section. The results of this study are shown below on figure 3, the chart comparing the lithostratigraphic nomenclature used in this report to previously published nomenclatures in the Baggs, Wyo., and Craig, Colo. areas.

DISCUSSION OF LITHOSTRATIGRAPHIC UNITS

The Lance Formation of this report consists of interbedded fine- to medium-grained sandstone, and gray to brown siltstone, mudstone, shale, and carbonaceous shale. Several thin lenticular coal beds are usually present in the lower 100 ft of the Lance Formation. Near Baggs, the Lance can be informally divided into two parts. In the lower part of the Lance the sandstones are generally thin and more widely spaced, in the upper part the sandstones increase in number and thickness, and the thickest sandstones are from 50 to 80 ft thick. The distinction between the lower and upper parts of the Lance is lost near Craig.

A thick sandstone sequence of Upper Cretaceous and Tertiary ages overlies the Lance Formation and is referred to on figure 1 as the unnamed Cretaceous and Tertiary sandstone unit. This unit can be separated into lower and upper parts at a conglomeratic zone dividing the lower two-thirds and the upper one-third of the sequence (see measured section A). In the unnamed Cretaceous and Tertiary sandstone unit, individual sandstones are stacked in masses up to 150 or more feet thick that have blocky signatures on geophysical logs; these signatures are correlatable over long distances. The sandstones are medium to coarse grained. Chert pebbles are first found in the sandstones of the unnamed unit about 200 ft above the base at measured section A, they increase in abundance upwards to the conglomeratic zone, above which they are much less common. At measured section A, the sandstones exposed for 140 ft below the conglomeratic zone are predominantly trough cross-bedded, in the topmost 50 ft, the trough cross-bedding occurs in lenticular sand bodies that display pronounced lateral cross-cutting relations. The conglomeratic zone is from about 2- to 4-ft thick and forms a marker horizon in the Baggs area. The zone consists of a conglomerate or conglomeratic sandstone; the conglomerate is characteristically composed of pebbles of gray and black chert, with lesser amounts of white and pink quartzite, quartz, and porphyritic felsic igneous rock in a coarse-grained, iron-cemented, sandstone matrix. The thick sandstone overlying this conglomerate, and comprising the upper part of the unnamed Cretaceous and Tertiary sandstone unit, is trough cross-bedded and medium- to coarse grained. Continuous exposures north of measured section A show that rare chert pebbles are present only in the lower part of the sandstone overlying the conglomerate, and rapidly disappear higher in the sandstone.

The conglomeratic zone marks an unconformity at the Cretaceous-Tertiary boundary. Palynological samples D6473 and D6474 were collected 360 and 85 ft, respectively, below the conglomerate (see measured section A) and were identified by D. J. Nichols as late, but not latest, Cretaceous in age (table 2). Sample D6779–A and D6779–B were collected 140 ft above the conglomerate in the Red Rim(?) coal bed, and are of early Paleocene age (P2 zone of Nichols and Ott, 1978). Four miles northwest of section A, a palynological sample (D6860) was collected from a black clay shale about 50 ft above the conglomerate in the sandstone interval between the conglomerate zone and the Red Rim(?) coal bed in the upper part of the unnamed Cretaceous and Tertiary sandstone unit. Pollen from D6860 (not listed in table 2) was identified by D. J. Nichols as Paleocene, and probably early Paleocene, in age. The presence of *Momipites walbomensis* and *M. wyomingensis* in D6860 indicates that it is no older than the early Paleocene P2 zone of Nichols and Ott (1978). The P2 zone has also been identified by D. J. Nichols (written comm., 1987) on Chalk Bluff, 6.5 miles southeast of Baggs, based on samples collected by C. S. V. Barclay; one sample, D6051A may be near the P1/P2 boundary of Nichols and Ott (1978), based on the relative abundance of *Momipites leiflingwelii*. Presently however, none of the pollen samples analyzed have shown the definite occurrence of the early Paleocene P1 zone in the southeastern part of the Washakie basin. Thus, based on pollen, the time missing at the Cretaceous-Tertiary unconformity in the southeastern part of the Washakie basin includes the latest Maastrichtian and the earliest Paleocene.

The base of the Paleocene Fort Union Formation is here placed on top of the thick sandstones of the unnamed Cretaceous and Tertiary sandstone unit and below the Red Rim(?) coal bed. Previous subsurface correlations for the eastern parts of the Sand Wash and Washakie basins show the Lance/Fort Union contact at the base of, or below, the unnamed Cretaceous and Tertiary sandstone unit, from 350 to 1500 ft below the conglomeratic zone. Previous surface mapping studies in the Baggs area variously place the Lance/Fort Union contact from the bottom to the top of this unnamed sandstone unit, while in the Craig area, the Lance/Fort Union contact is mapped at the base of the conglomeratic zone (fig. 3). Future work north of the Baggs area may show that (1) the Cretaceous-Tertiary unconformity is regional in extent, although that is unknown at present, and (2) that there are consistant lithologic differences between the sandstones above and below the unconformity in the unnamed Cretaceous and Tertiary sandstone unit. If this is the case, the upper part of the unnamed Cretaceous and Tertiary sandstone unit may ultimately be assigned to the Fort Union Formation or become a separate formation.

The coal-bearing (lower) part of the Fort Union Formation consists of interbedded fine- to medium-grained sandstone, gray to brown siltstone and mudstone, carbonaceous shale, and coal; Honey (1984) described measured sections in the lower part of the Fort Union Formation northeast of Baggs. The coal beds in the eastern Washakie basin are partly continuous into the eastern Sand Wash basin. The lowest coal shown in measured section A, the Red Rim(?) coal bed, is lower Paleocene (table 2). The upper part of the coal zone near the Fillmore Ranch coal bed is of Tomjonian age (early Paleocene, using the time scale in Berggren and others, 1985), based on the fossil mammal fauna from Swain quarry, 5 mi northwest of measured section A (Rigby, 1980). In the vicinity of Craig, Newman (1964) has obtained Paleocene pollen from the Seymour coal bed (fig. 1).

A distinctive interval of low resistivities (shaded gray and labelled upper part of the Fort Union on figure 1) overlies the coal-bearing part of the Fort Union. This interval markedly thickens from north to south and corresponds to part of Beaumont's (1979, fig. 6) "upper shaly zone" of the Fort Union. In outcrops in Wyoming, and shown in measured section D, this unit consists predominantly of olive-gray to brown blocky mudstones and claystones, and some interbedded thin fine-grained sandstones. Lithologic logs, published by Amstrat for the eastern part of the Sand Wash basin, confirm that this unit is dominantly gray-green or brown claystone. A small outcrop of the unit near Craig also consists of greenish-gray, sandy mudstone. As shown on the cross section (fig. 1), this mudstone unit locally contains sandy intervals.

The Fort Union/Wasatch contact, in the Craig area, is placed below a series of arkosic sandstones with a conglomerate at the base (Datum B) containing pebbles of quartzite, chert, and felsic igneous rock (M. Brownfield, oral commun., 1985). The conglomerate rests on the greenish-gray, sandy mudstone described above. Amstrat subsurface lithologic logs also indicate that the basal sandstones of the Wasatch in the Craig area are coarse grained to conglomeratic, and are arkosic in composition. Lithologic logs sometimes describe red and yellow claystones in the rocks overlying the sandstones and conglomerates, but the claystones are predominantly gray and green. The Wasatch Formation in the Craig area is poorly exposed. Subsurface correlations north of Craig show that the basal sandstones of the Wasatch intertongue with claystones assigned to the upper part of the Fort Union Formation. Evidence for this intertonguing, which occurs between drill holes 5 and 6, is shown on figure 2.

In outcrops in Wyoming (measured section C), light-gray sandstones overlie the greenish-gray mudstones in the upper part of the Fort Union Formation. These sandstones vary in texture and thickness, but are always coarse grained or conglomeratic at their contact with the underlying greenish-gray mudstones. Locally, they contain abundant granules and pebbles of quartz and feldspar, marking the first occurrence of quartz and feldspar granules in Tertiary rocks in this area. Conglomerate layers are composed predominantly of chert pebbles. The sandstones are overlain by a sequence of light-gray, fine-grained, silty sandstones and mudstones that are often bioturbated. In Wyoming, this unit (basal coarse-grained sandstones and overlying mudstones in measured section C) lacks the reds and variegated colors typical of the main body of the Wasatch Formation. Palynological samples collected by C. S. V. Barclay from this nonvariegated unit at Chalk Bluff were identified by D. J. Nichols (written commun., 1987) as late middle Paleocene (zone P6 of Nichols and Ott, 1978) less than 20 ft above the basal contact (sample D4447), and late Paleocene (zone P6 of Nichols and Ott, 1978) from about 60 to 80 ft above the basal contact (sample D4446). A late Paleocene age was also determined by R. H. Tschudy for a sample (RT–78–13) collected from this unit in sec. 34, T. 17 N., R. 92 W., about 28 mi northwest of Chalk Bluff. Previous subsurface correlations in the southeastern Washakie and northeastern Sand Wash basins (Colson, 1969; Cronoble, 1969; Beaumont, 1979; Tyler, 1980) placed this unit in the Wasatch Formation of Eocene age; the Fort Union/Wasatch contact was usually placed at the base of the sandstones overlying the low resistivity greenish-gray mudstone unit (see interval 1500 ft to 1600 ft on log no. 13). In surface studies in Wyoming, however, this nonvariegated unit has been included in the upper part of the Fort Union Formation (Seain, 1957; Sanders, 1974; Edson, 1979). In Colorado, some lithologic logs (Kirby Royalties No. 1 Government Peak, shown on chart; Colorado Oil Company and Anadarko Production Company, Colorado Oil No. 31–9 Quy Federal, not shown) show extensive variegation in stratigraphically equivalent rocks. As shown on figures 1 and 2, the base of this unit in the Baggs area (Datum A) correlates with rocks over 200 ft above the base of the Wasatch Formation near Craig. In this report, this unit in the Baggs area is not assigned to any previously named formation, and is informally referred to as the unnamed upper Paleocene unit.

The main body of the Wasatch Formation is the uppermost unit shown in figure 1. The main body north of Baggs consists of a basal conglomerate that is overlain by light-gray sandstones and sanicolored mudstones; the basal conglomerate is composed mainly of chert pebbles with some quartz and quartzite pebbles, and rests directly on the light-gray, nonvariegated mudstones of the underlying unnamed upper Paleocene unit. Southeast of Baggs, along the Colorado border, the basal conglomerate is absent and the base of the main body is mapped at the change from white to variegated mudstones. In the Baggs area, the base of the main body is probably no younger than early early Eocene (early Wasatchian land mammal age); correlations to the Albert pocket localities of the early Wasatchian Four Mile fossil mammal fauna (McKenna, 1960), 3.1 (2 mi south of drill hole no. 11), show that the fossil sites are between 800 and 900 ft above the base of the main body. No fossils have been reported in the lowest 800 ft of the main body; therefore, the exact age is uncertain, but is assumed to be early Eocene also. The Paleocene-Eocene boundary probably occurs at the base of the Wasatch Formation; the basal conglomerate of the Wasatch north of Baggs was probably deposited unconformably on the underlying unnamed upper Paleocene unit. The upper part of the main body is late early Eocene (late Wasatchian) in age, based on fossil mammals collected from the Dad locality north of Baggs (Gazin, 1962).

SELECTED REFERENCES

Bass, N. W., Eby, J. B., and Campbell, M. R., 1955, Geology and mineral fuels of parts of Routt and Moffat Counties, Colorado: U.S. Geological Survey Bulletin 1027–D, p. 143–250.

Beaumont, E. A., 1979, Depositional environments of Fort Union sediments (Tertiary, northwest Colorado) and their relation to coal: American Association of Petroleum Geologists Bulletin, v. 63, no. 2, p. 194–217.

Berggren, W. A., Kent, D. V., Flynn, J. J., and Van Couvering, J. A., 1985, Cenozoic geochronology: Geological Society of America Bulletin, v. 96, p. 1407–1418.

Bergin, M. J., 1959, Preliminary geologic map of the Maybell-Lay area, Moffat County, Colorado: U.S. Geological Survey Open-File Map, scale 1:48,000.

Colson, C. T., 1969, Stratigraphy and production of the Tertiary formations in the Sand Wash and Washakie Basins, in Barlow, J. A. Jr., ed., Guidebook to Tertiary rocks of Wyoming, 21st annual field conference: Wyoming Geological Association, p. 121–128.

Cronoble, J. M., 1969, South Baggs-West Side Canal gas field, Carbon County, Wyoming, and Moffat County, Colorado, in Barlow, J. A. Jr., ed., Guidebook to Tertiary rocks of Wyoming, 21st annual field conference: Wyoming Geological Association, p. 137–141.

Edson, G. M., 1979, Preliminary geologic map and coal sections of the Seaverson Reservoir quadrangle, Carbon County, Wyoming: U.S. Geological Survey Open-File Report 79–1577, scale 1:24,000.

Gale, H. S., 1910, Coal fields of northwestern Colorado and northeastern Utah: U.S. Geological Survey Bulletin 415, 265 p.

Gazin, C. L., 1962, A further study of the lower Eocene mammalian faunas of southwestern Wyoming: Smithsonian Miscellaneous Collections, v. 144, no. 1, p. 1–98.

Haun, J. D., 1961, Stratigraphy of post-Mesaverde Cretaceous rocks, Sand Wash Basin and vicinity, Colorado and Wyoming, in Wiloth, G. J., ed., Symposium on Late Cretaceous rocks of Wyoming, 16th annual field conference: Wyoming Geological Association, p. 116–124.

Honey, J. G., 1984, Measured sections in the coal-bearing part of the Fort Union Formation near Baggs, Carbon County, Wyoming: U.S. Geological Survey Open-File Report 84–0087, 71 p.

Honey, J. G., and Hettinger, R. D., 1989, Stratigraphic sections showing coal correlations within the lower coal zone of the Paleocene Fort Union Formation, Fillmore Ranch and Seaverson Reservoir quadrangles, Carbon County, Wyoming: U.S. Geological Survey Coal Investigations Map C–127.

Love, J. D., and Christiansen, A. C., 1985, Geologic map of Wyoming: U.S. Geological Survey and the Geological Survey of Wyoming, scale 1:500,000.

McDonald, R. E., 1975, Structure, correlation and depositional environments of the Tertiary, Sand Wash and Washakie Basins, Colorado and Wyoming, in Bolyard, D. W., ed., Symposium on deep drilling frontiers of the central Rocky Mountains: Rocky Mountain Association of Geologists, p. 175–184.

McKenna, M. C., 1960, Fossil mammalia from the early Wasatchian Four Mile fauna, Eocene of northwest Colorado: California University Publications in Geological Sciences, v. 37, no. 1, 130 p.

Newman, K. R., 1964, Palynologic correlations of Late Cretaceous and Paleocene formations, northwest Colorado, in Cross, A. T., ed., Palynology in oil exploration: Society of Economic Paleontologists and Mineralogists Special Publication 11, p. 169–180.

Nichols, D. J., and Ott, H. L., 1978, Biostratigraphy and evolution of the Momipites-Caryapollenites lineage in the early Tertiary in the Wind River Basin, Wyoming: Palynology, v. 2, p. 93–112.

Prost, G. L., and Brownfield, M. E., 1983, Geologic map and coal sections of the Pine Ridge Quadrangle, Moffat County, Colorado: U.S. Geological Survey Open-File Report 83–633, scale 1:24,000.

Rigby, J. K. Jr., 1980, Swain Quarry of the Fort Union Formation, middle Paleocene (Tomjonian), Carbon County, Wyoming—geologic setting and mammalian fauna: Evolutionary Monographs [v.] 3, p. 1–179.

Sanders, R. B., 1974, Geologic map and coal resources of the Riner quadrangle, Carbon and Sweetwater Counties, Wyoming: U.S. Geological Survey Coal Investigations Map C–68, scale 1:24,000.

Sears, J. D., 1925, Geology and oil and gas prospects of part of Moffat County, Colorado, and southern Sweetwater County, Wyoming: U.S. Geological Survey Bulletin 751–G, p. 209–319.

Swain, B. W., 1957, Fort Union Formation, west flank of the Sierra Madre, Carbon County, Wyoming: Geological Society of America Bulletin, v. 68, no. 12, pt. 2, p. 1974.

Tyler, T. F., 1980, Preliminary chart showing electric log correlation section E–E′ of some Upper Cretaceous and Tertiary rocks, Cherokee Ridge, Wyoming: U.S. Geological Survey Open-File Report 80–791, 4 sheets.

Whitley, W. W., 1962, Correlation section of post Mancos formations, Sand Wash Basin, Colorado, in Amuedo, C. L., and Mott, M. R., eds., Exploration for oil and gas in northwestern Colorado: Rocky Mountain Association of Geologists, plate 1.

[1] The names Red Rim and Fillmore Ranch were established for coals cropping out from 17.5 to 18 miles north of measured section A, near Baggs, Wyo. Locally, correlation of the Red Rim coal bed near Baggs, Wyo. Locally, correlation of the Red Rim coal bed between adjacent wells or outcrops is difficult; therefore, the correlation of the Red Rim coal bed in measured section A and the coal of that name 17.5 miles to the north is considered probable, but not certain.

[2] The zones of Nichols and Ott (1978) are 6 sequential pollen biostratigraphic zones, established in the Paleocene Fort Union Formation in the Wind River Basin, Wyo. The zones are "... based on occurrence and relative abundance of pollen of the genus *Momipites* and its ancestral form *Caryapollenites*, and on ratio of specimens of species of each of these genera, and by the occurrence of certain other key species of angiosperm pollen" (p. 109–110). These zones have been correlated outside the Wind River Basin to some other areas with Paleocene strata in the western U.S.

Table 1.—*Drill holes used in correlating formations*

Drill hole designation	Name	Location Sec.	T.N.	R.W.	Selected depths (in feet) Wasatch base Baggs (main body)	Wasatch base Craig (Datum B)	Datum A	K-T boundary (probable)	Fox Hills top
13	True Oil Company, Hoo-State No. 1	18	14	91	1065		1605	2720	4350
	True Oil Company, Ivy 2 Craig	19	14	91	1390		1905	3080	4685
	True Oil Company, Vaughn A. No. 1	29	14	91	790		1240	2350	4160
	Trigg Drilling Company, Lowland No. 1	34	14	91	2275		2725	3850	5160
	Trigg Drilling Company, Lowland Sheep 1–4	4	13	91	875		1360	2410	4150
12	Brinkerhoff Drilling Company, No. 1 Unit	9	13	91	1210		1690	2780	4400
	True Oil Company, Moulds Creek Unit 1	8	13	91	2000		2500	3620	5140
	True Oil Company, No. 1 Grace	15	13	91	700		1145	2130	3930[1]
	Davis Oil Company, No. 1 Stanton	28	13	91	1000		1490	2510	4140
	Hanna and Mayer, Ogle Federal No. 1	28	13	91	1350		1795	2840	4400
	Kirby Royalties, Lewis and Clark Baker-Gov't No. 1	33	13	91	1000		1490	2510	4140
	Kenneth D. Luff, No. 1 Vernon	6	12	91	720		1085	2282	3770
	Kirby Royalties, 1 Ruth Swaze	7	12	91	550		825	1960	3415
	Kirby Royalties, No. 2 Maggie Baggs-Gov't	17	12	91	670		1040	2130[2]	3590
11	Snyder Oil Company, State 1–13	13	12	92	540[1]		970	2085	3495
	Pan American Petroleum, Four Mile Creek Unit No. 4	27	12	91			1385	2345	3510
	Pan American Petroleum, Four Mile Creek Unit No. 3	27	12	91			1380	2340	3690
10	Equity Oil Company, No. 1 Pole Gulch Unit	31	12	91			1085	2180	3495
	Pan American Petroleum, Four Mile Creek Unit 2	12	12	91			1210	2295	3615
	Foster-McVey, No. 5 Four Mile Creek Unit	3	11	91			1320	2400	3740
	Superior Oil Company, Four Mile Unit No. 1 State	3	11	91			1390	2430	3720
	Pan American Petroleum, Kirby-Gov't No. 1	3	11	91			1290	2410	3680
	Mobil Oil Corp., Wilson Creek State No. 1	10	11	91			1235	2310	3665
9	Midwest Oil Corp., Mitch-Skyline No. 1 Colorado 23-1-H	22	11	91			1640	2755	3970
8	Kirby Royalties, 1 Gov't-Peck	31	11	90			1430	2490	3735
	Pan American Petroleum, U.S.A.-G.L. Yates No. 1	12	10	91			1640	2640	3820
7	Tenneco Oil Co., Mud Springs Federal No. 1	14	10	91			1815	2825	4080
A	Wainoco Inc.-J.M. Huber Corp., 25–1 Fortification Federal	25	10	91	[1]1575	1370	2445	3675	
6	B Belco Petroleum Corp., Wolfe Peak No. 1	28	10	90	[1]1120	1490	2610	3845	
	C Belco Petroleum Corp., Wolfe Peak No. 2	28	10	90	[1]1150	1490	2610	3845	
	D Anadarko Production Co., Villard 1–27	27	10	90	[1]970	1850	2875	4090	
	E Anadarko Production Co., Villard-B 1–33	33	10	90	1895	[1]700	2760	3965	
	F C.I.G. Exploration and Anadarko Production Co., No. 3–B-90 Villard	3	9	90	2060	[1]870	3010	4165	
	G C.I.G. Exploration and Anadarko Production Co., Colorado Oil No. 31–I-B Day Federal	9	9	90	1880		2915	4180	
	G Gulf Oil Corp., Madera Federal No. 3	8	9	90	1460	[1]255	2485		
5	H Cities Service Oil Co., Daniels Federal CD–1	6	9	90	1620	[1]385	2495	3710	
	I Jack Grynberg and Associates, Blue Gravel No. 1–24 Federal	24	9	91	1095	[1]875	2130	3315	
	J Jack Grynberg and Associates, Grynberg-Fee No. 1–19 Federal	19	9	90	880	[1]670	1920	3135	
	Sauffie Chemical Co., Federal No. 1–25	25	9	91	1135		2190	3345	
4	Jack Grynberg and Associates, Blue Gravel 1–36 State	36	9	91	1225		2205	3450	
	C.I.G. Exploration, Inc., CIGE 1–2–B–91 Vieltstaner Sheep Co.	2	8	91	1080		2150	3305	
3	Mountain Fuel Supply Co., Cottonwood Gulch No. 1–15	16	8	91	1615		2775	3860	
	Colorado Oil Co. and Anadarko Production Co., No. 33–16 Colorado State	16	8	91	1605		2735	3855	
	Anadarko Production Co., A.P.C. No. 1 Smith "A"	15	8	91	1305		2445	3575	
2	U.S. Smelting, Refining and Mining Co., No. 1–22 Carter-Mobley	22	8	91	1020		2240	3400	
	Anadarko Production Co., Cottonwood Gulch Federal No. 1	26	8	91	725		1930	3080	
	Anadarko Production Co., Cottonwood Gulch Federal A No. 1	25	8	91	580		1815	3025	
1	U.S. Smelting, Refining and Mining Co., Federal-Fox 1–30	30	8	90	425		1670	2870	

[1] Number designation same as that given to drill hole on figure 1, the location map for figure 1, and figure 3, when designation same as that given to drill hole in figure 2 and location map for figure 2.
[2] Probable Cretaceous-Tertiary boundary. The stratigraphic position of this boundary was determined by us or measured section A in the Baggs area (see text). This boundary was then correlated to the other localities in the Baggs area on the basis of the relative abundance of the genus *Momipites* and the character of the geophysical signatures.
[3] Continuation of basal sandstone of the Wasatch (Datum B) as a correlation line only.
[4] Continuation of Datum A sandstone as a correlation line only.

Table 2.—*Fossil collections*

[Fossil identifications by D. J. Nichols, U.S. Geological Survey]

Number	Age	Fossils
D6473	Late Cretaceous (Maastrichtian)	*Aquilapollenites delicatus* *Aquilapollenites sp.* *Zlivisporis roseoviacuarum* *Islacates polie* *Trilete spores*
D6474	Late Cretaceous (Maastrichtian)	*Aquilapollenites delicatus* *Aquilapollenites truncatus* *Beltinaspollenites kondratskyae* *Momipites leiflingwellgensis* *Kurtzipites sp.* *Osmundacidites sp.* *Proteacidites sp.* *Schizosporis parvus* *Tricolpites microreticulatus* *Trisolpites sp.* *Triporopollenites sp.* *Umipollenites undulatus*
D6779–A	early Paleocene	*Arecipites tenuiexinous* *Corsilina sp.* *Cupuliferoidaepollenites sp.* *Cyathidites minimus/minor sp.* *Cyathidites sp.* *Erdtmanipollis sp.* *Fraxinoipollenites variabilis* *Gleicheniidites zenonicus* *Laevigatosporites sp.* *Momipites leiflingwelli (common)* *Momipites walbomensis* *Nyssapollenites sp.* *Rhoipotrites sp.* *Retitricolporites pseudomurii* *Retitricolpites angulaforminosus* *Stereisporites antiquasporites* cf. *T. trapius* *Tricolpites taeniolatus* *Triporopollenites sp.* *Umipollenites sp.*
D6779–B	early Paleocene	*Arecipites tenuiexinous* *Corsilina sp.* *Cyathidites sp.* *Erdtmanipollis sp.* *Fraxinoipollenites variabilis* *Gleicheniidites zenonicus* *Laevigatosporites sp.* *Momipites leiflingwelli (common)* *Momipites walbomensis* *Nyssapollenites sp.* *Rhoipotrites sp.* *Retitricolporites pseudomurii* *Retitricolpites angulaforminosus* *Stereisporites antiquasporites* cf. *T. trapius* *Tricolpites taeniolatus* *Triporopollenites sp.* *Umipollenites sp.*

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