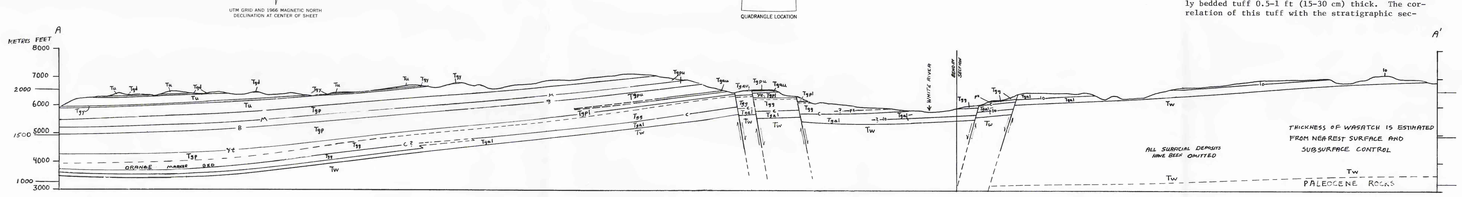
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF 76-736



PRELIMINARY GEOLOGIC MAP AND CORRELATION DIAGRAM OF THE WHITE RIVER CITY QUADRANGLE RIO BLANCO COUNTY, COLORADO

By

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CORRELATION OF MAP UNITS

DESCRIPTION OF MAP UNITS

Qal ALLUVIUM (HOLOCENE)--Unconsolidated silt, sand, and gravel

Qls LANDSLIDE DEPOSITS (PLEISTOCENE)--Found only on north side of White River

Qtg TERRACE DEPOSITS (PLEISTOCENE)--Mostly cobbles and pebbles in a sandy matrix; lime cemented and generally overlain by as much as 10 ft (3 m) of sandy silt. Cobbles and pebbles are derived mostly from Paleozoic sandstone, siltstone, and limestone, some clasts of volcanic rocks, and a minor number from from plutonic, igneous, and metamorphic rocks. At least three distinct terrace levels occur in the map area

Tu UINTA FORMATION (EOCENE)--Mostly sandstone; tuffaceous, brown to yellowish gray, medium to coarse grained, massive; several tongues of the Green River Formation consisting of marlstone and marly siltstone included in map unit. Uinta Formation replaces the abandoned term Evacuation Creek Member of the Green River Formation in Piceance Creek basin (Cashion and Donnell, 1974). The thickness of the formation ranges from about 1,050 ft (320 m) in the southwest corner of the quadrangle to about 675 ft (206 m) in the southeast corner, the top being the present surface of erosion

GREEN RIVER FORMATION (EOCENE)--Tongues of Green River Formation described in Duncan others (1973)

Tgt Thirteenmile Creek Tongue--Mostly light-gray marlstone and silty marlstone; contains a thin ostracodal limestone bed about 20 ft (6 m) above the base and a thin brecciated limestone bed near the base. The tongue is exposed on the south side of Dry Fork of Piceance Creek, along the southern boundary of the quadrangle, and caps one hill north of Dry Fork near the center W 1/2 NE 1/4 sec. 3, T. 1 S., R. 96 W. Thickness about 60 ft (18 m)

Tgd Dry Fork Tontue--Light-greenish-gray marlstone, silty marlstone, and calcareous siltstone. Contacts with the overlying and underlying Uinta Formation are gradational. Brown fossil wood commonly occurs at the basal contact with the underlying sandstone. Thickness varying from about 70 ft (21 m) in the southwestern part of the quadrangle to 30 ft (9 m) in the southeastern part

Tgy Yellow Creek Tongue--Mostly light-greenish-gray marlstone with varying amounts of sandstone, siltstone, and silty marlstone; locally contains a thin oil-shale bed at the top and a siltstone ledge near the middle. The unit thins eastward from 65 ft (20 m) along the western boundary of the quadrangle to about 20 ft (6 m) in the northern part of sec. 34, T. 1 N., R. 96 W., but rapidly thickens again southeastward to about 100 ft (30 m) in the NE 1/4 sec. 2, T. 1 N., R. 96 W. At this locality it comprises two marlstone sequences separated by a light-brown sandstone bed 27 ft (9 m) thick. The upper marlstone sequence is about 38 ft (11.6 m) thick. It is soft and greenish gray in the upper part, but porcellaneous and grayish white in the lower part. The lower marlstone sequence is about 27 ft (9 m) thick and is entirely light gray. In the southeastern area of the map only the base is shown

Tgp Parachute Creek Member--Oil shale and marlstone, several tuff beds, and a few siltstone beds. The oil shale is light brown to brownish black and weathers gray to bluish gray. Fresh and weathered surfaces of marlstone are light gray. Five of the tuff beds are relatively thick and persist throughout the map area. All are shown in the columnar section, but only the lowermost of these (yellow tuff bed; yt) is shown on the map. The other four tuffs are light gray to yellowish gray, 0.5-1 ft (15-30 cm) thick and occur 230 ft (70 m) above the top of the Mahogany ledge (M), 30 ft (9 m) below the top of the Mahogany ledge, 3-7 ft (1-2 m) above the base of the Mahogany ledge, and about 40 ft (12 m) below the B-groove (B). The upper three tuffs are equivalent to beds 202, 175, and 134, and the lowermost (yt) is equivalent to bed 22 of Brobst and Tucker (1973, p. 14-16, 18). Correlation of the tuff that occurs about 40 ft (12 m) below the B-groove with the stratigraphic section measured by Brobst and Tucker is uncertain. In the eastern part of the map area the Parachute Creek Member is divided into upper (Tgpu) and lower (Tgpl) parts by the upper part of the Anvil Points Member (Tgau). Thickness of member about 1,160 ft (354 m) at the surface along Piceance Creek, but unit thickens in subsurface to about 1,540 ft (469 m) in the Tintic Standard Mining Co. dry hole drilled in sec. 36, T. 1 N., R. 97 W. (see columnar section)

Tgpu Upper part--Extends to about 340 ft (72 m) below the base of the B-groove; thickness about 790-850 ft (241-259 m)

M Mahogany ledge--Top of rich oil-shale zone which forms conspicuous ledge about 440-275 ft (134-84 m) below the top of the Parachute Creek Member with the interval decreasing toward the southeast. Persistent irregularly bedded tuffs 0.5-1 ft (15-30 cm) thick occur 30 ft (9 m) below the top and about 3-7 ft (1-2 m) above the base (beds 174 and 134 of Brobst and Tucker, 1973, p. 15-16). The ledge is about 165 ft (50 m) thick in an east-west direction across the map area, but thickens southward in the subsurface to about 230 ft (70 m) in the Tintic Standard Mining Co. dry hole in sec. 36, T. 1 N., R. 97 W.

B Base of B-groove--The B-groove comprises a lean oil-shale and barren marlstone zone directly beneath the Mahogany ledge. The basal bed of the B-groove is distinctive; it consists of kerogen-rich dolomite that makes a ledge 0.5-1 ft (15-30 cm) thick; the ledge is hard, brittle, jointed, and weathers into fingerlike projections; it occurs about 38-44 ft (11.5-13.5 m) above a biotite-bearing irregularly bedded tuff 0.5-1 ft (15-30 cm) thick. The correlation of this tuff with the stratigraphic section measured by Brobst and Tucker (1973) is uncertain. The B-groove thickens, becomes more barren, and gets sandy eastward; it thins, becomes less barren and is less sandy southward. Thickness 40-55 ft (12-17 m)

Tgpl Lower part--Mostly medium-grade oil shale, medium-bedded to massive, weathers light gray; thickness ranges from about 40 ft (6 m) in the NE 1/4 SW 1/4 SE 1/4 sec. 25, T. 1 N., R. 96 W., on the north side of the White River, to about 325 ft (82 m) near where it merges with the upper part of the member near the center of sec. 17, T. 1 N., R. 96 W.

yt Yellow tuff bed--Tuff, 0.1-0.2 ft (3-6 cm) thick, weathers light yellow, occurs 1.25-2 ft (38-61 cm) above the base of a 10-20 ft (3-6 m) thick ledge-forming medium-grade oil-shale sequence whose weathered surfaces are studded by rusty-orange dolomitic low-grade oil-shale fragments. This ledge is split into two parts by a sandy dolomite or sandstone bed 1-11 ft (30 cm-3.4 m) thick. Consequently, it is informally referred to as the "split bench." Throughout the map area the split bench directly overlies a greenish-gray claystone bed 1-5 ft (30 cm-1.5 m) thick which grades downward into a barren light-gray-weathering marlstone sequence, making a hard-surfaced slope nearly bare of vegetation. This barren marlstone sequence in turn grades downward into brown paper shale that makes soft sage-, shrub-, and grass-covered slopes in the upper part of the Garden Gulch Member. The contact of the barren marlstone sequence with the brown paper shale is the contact of the Parachute Creek with the Garden Gulch Member. It is easily observed in the good exposures on either side of Piceance Creek, but very difficult or impossible to detect in the heavily vegetated more easterly part of the map area. For that reason the yellow tuff bed near the base of the split bench is shown on the map rather than the actual contact. The base of the split bench ranges from 20-70 ft (6-21 m) above the base of the Parachute Creek Member from east to west across the map area and appears to be as much as 260 ft (80 m) above the base of the member in the southwestern part of the mapped area in well 36

Tgg Garden Gulch Member--Mostly brown papery-fissile clayey noncalcareous oil shale containing a few sandstone and dolomite beds generally 1 ft (30 cm) or less thick; includes two beds of dolomitic medium-grade oil shale that make gray-weathering ledges in a zone 80-100 ft (24-30 m) below the top. The member includes several beds of ostracodal, oolitic, and pisolitic sandstone and limestone in the eastern part of the area. Throughout most of the area, the base of the Garden Gulch is placed at the top of a sandstone ledge about 30 ft (9 m) above the top of a zone of desiccated dolomite concretions (c) that is 10-16 ft (3-5 m) thick. Locally, however, it is not feasible to map either the ledge or the concretions, and the top of the pisolite ledge (pz), about 100 ft (30 m) stratigraphically higher, was arbitrarily mapped as the base of the member. The change from the lower to the upper mapping horizon was made along the White River in the NW 1/4 sec. 15, T. 1 N., R. 96 W. The member is 300-400 ft (91-122 m) thick on the surface, and thickens to about 450 ft (137 m) in well 36

1A First algal zone--Algal stromatolites, spheroidal or matlike, as much as 1 ft (30 cm) thick, which overlie a medium-grained sandstone ledge as much as 45 ft (14 m) thick. Locally the stromatolites are inconspicuous or absent; only the top of the ledge is shown; in this quadrangle it crops out only on the north side of the White River

pz Pisolite ledge--A light-gray sandstone ledge that becomes successively pisolitic, oolitic, and ostracodal in the upper 12-15 ft (3.5-4.5 m). Algal stromatolites are common in the upper 1 ft (30 cm). A conspicuous layer of pisolites about 0.5 ft (15 cm) thick under the stromatolites give the ledge its name. In this quadrangle the pisolite ledge crops out only along the White River in the eastern part of the area. It was not recognized in any exposures farther to the west. It extends from the eastern margin of the quadrangle, where it is about 40 ft (7.5 m) thick, to the SW 1/4 SW 1/4 sec. 15, T. 1 N., R. 96 W., where it is about 10 ft (3 m) thick

Anvil Points Member

Tgau Upper part--Mostly sandstone, siltstone, and claystone; a few beds of marlstone and low-grade oil shale. The sandstone is gray, medium bedded to massive, and forms ledges that commonly are ripple marked; claystone is olive gray, medium bedded to massive, and forms slopes. Siltstone is gray to tan and forms slopes. The unit is about 185 ft (50 m) thick at the eastern boundary of the quadrangle, but thins to the west and disappears within the Parachute Creek Member near the NW 1/4 SE 1/4 sec. 17, T. 1 N., R. 97 W.

Tgal Lower part--Mostly sandstone and siltstone; some claystone and shale; contains many beds of ostracodal sandstone and ostracodal and oolitic limestone. The sandstone is light yellowish gray, fine to medium grained, medium bedded to massive, and forms ledges. The tan siltstone and light-gray claystone generally form slopes. All the limestone and limy sandstone beds weather rusty brown and make ledges. Thickness of the unit about 100-500 ft (30-152 m); unit thins to the southwest. The contact of the Anvil Points Member with the underlying Wasatch Formation is gradational and intertonguing; it is placed at the approximate change form cliff-forming sandstone above to slope-forming variegated claystone and siltstone below

c Desiccated concretion zone--Concretions are very fine grained silty dolomite that weather orange yellow to greenish yellow; they are discoidal and as much as 8 in. (20 cm) long and 3 in. (7.6 cm) thick. The surface of most of them shows weathered shrinkage cracks a few millimetres wide. Along Piceance Creek the concretions occur in a claystone and clayey siltstone sequence about 30-45 ft (9-14 m) below the base of the Garden Gulch Member; in the eastern part of the area the concretions are about 10 ft (3 m) above the base of the member. North of White River, concretion zone overlies a thin tuff containing yellow analcite spherulites. This concretion-bearing claystone and siltstone sequence appears to correlate with the orange marker bed in the subsurface

1o Lower ostracode limestone--The lower ostracode limestone is the uppermost prominent bed in a sequence of gray, ostracodal, and oolitic limestone and sandy limestone ledges separated by slopes of gray to brown medium-grained sandstone. The lower ostracode limestone is 1-3 ft (30-90 cm) thick; in this quadrangle it crops out only on the north side of the White River. Total thickness of the sequence is about 20 ft (6 m)

Tw WASATCH FORMATION (EOCENE)--Mainly variegated claystone and siltstone containing lenses and channels of medium- to coarse-grained crossbedded sandstone. Throughout most of the map area a few thin beds of carbonaceous shale or siltstone occur in the upper part of the Wasatch, generally within 20 ft (6 m) of the overlying basal cliff of the Anvil Points Member. The variegated beds consist principally of ocher, light-purple, pale-red, light-gray, and light-grayish-green silty claystone and clayey siltstone. The sandstones are lenticular, channeled, and entirely of fluviatile origin. The base is not exposed in the map area. A study of the samples in well 25 suggests that the Eocene-Paleocene boundary occurs at a depth of about 1,300 ft (396 m). This boundary is not apparent in electric logs of well 25. Nevertheless the position of the boundary was estimated in well 3 and in two wells in the adjacent Buckskin Point quadrangle. From these control points thicknesses of Eocene part of the Wasatch were estimated and projected into the cross section north of the White River; it ranges from about 2,800 ft (855 m) near the White River, to about 3,350 ft (1,020 m) near the point A'. In hole 25, the thickness of the Paleocene part of the Wasatch rocks is estimated to be about 2,140 ft (652 m)

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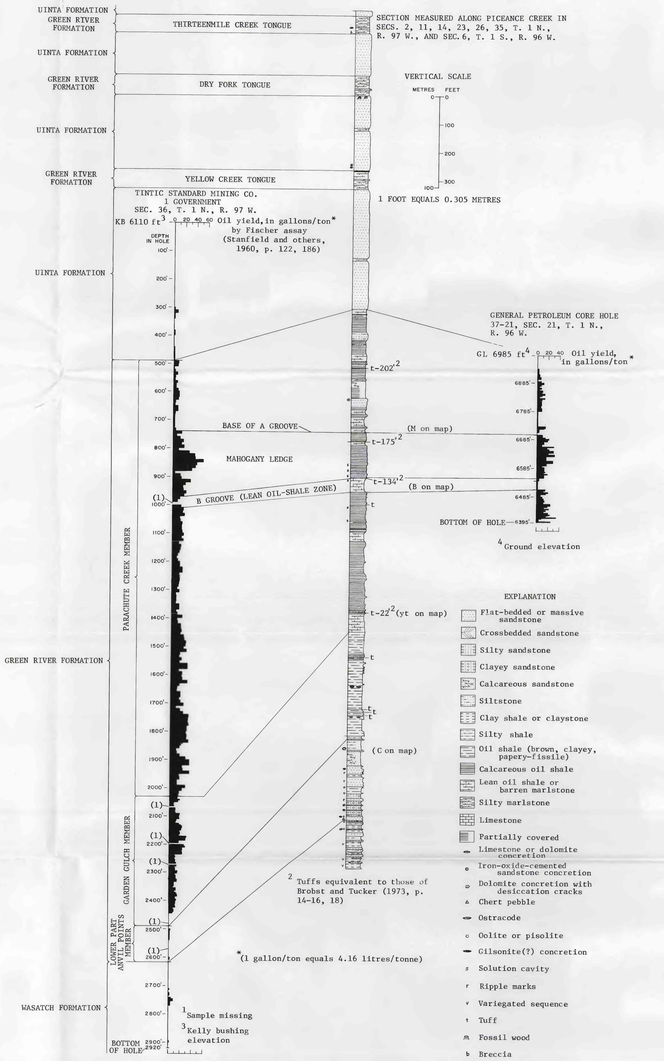
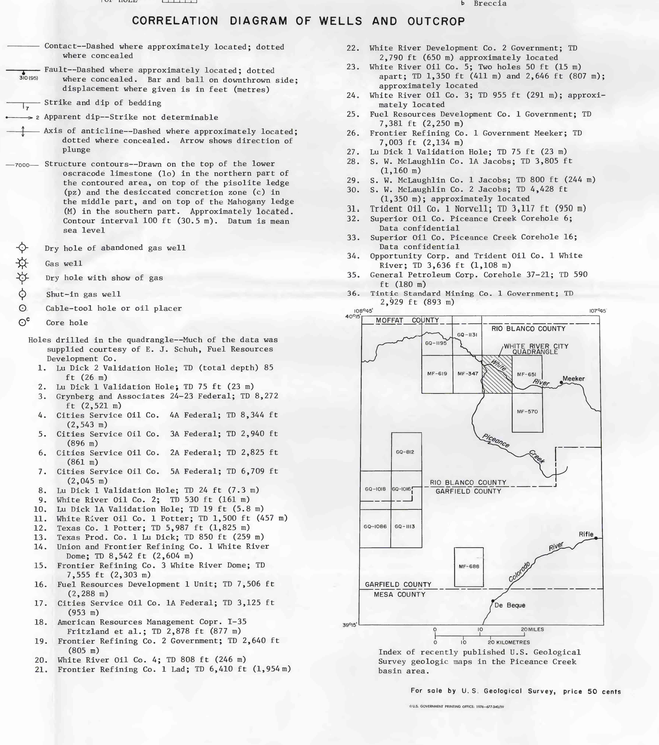


EXPLANATION

- Flat-bedded or massive sandstone
- Crossbedded sandstone
- Silty sandstone
- Clayey sandstone
- Calcareous sandstone
- Siltstone
- Clay shale or claystone
- Silty shale
- Oil shale (brown, clayey, papery-fissile)
- Calcareous oil shale
- Lean oil shale or barren marlstone
- Silty marlstone
- Limestone
- Partially silicified
- Limestone or dolomite concretion
- Iron-oxide-cemented sandstone concretion
- Dolomite concretion with desiccation cracks
- Chert pebble
- Ostracode
- Oolite or pisolite
- Gilsonite(?) concretion
- Solution cavity
- Ripple marks
- Variegated sequence
- Tuff
- Fossil wood
- Breccia

CORRELATION DIAGRAM OF WELLS AND OUTCROP



Contact--Dashed where approximately located; dotted where concealed

Fault--Dashed where approximately located; dotted where concealed. Bar and ball on downthrown side; displacement where given is in feet (metres)

Strike and dip of bedding

Apparent dip--Strike not determinable

Axis of anticline--Dashed where approximately located; dotted where concealed. Arrow shows direction of plunge

Structure contours--Drawn on the top of the lower oscracode limestone (1o) in the northern part of the contoured area, on top of the pisolite ledge (pz) and the desiccated concretion zone (c) in the middle part, and on top of the Mahogany ledge (M) in the southern part. Approximately located. Contour interval 100 ft (30.5 m). Datum is mean sea level

Dry hole of abandoned gas well

Gas well

Dry hole with show of gas

Shut-in gas well

Cable-tool hole or oil placer

Core hole

Holes drilled in the quadrangle--Much of the data was supplied courtesy of E. J. Schuh, Fuel Resources Development Co.

1. Lu Dick 2 Validation Hole; TD (total depth) 85 ft (26 m)
2. Lu Dick 1 Validation Hole; TD 75 ft (23 m)
3. Grynberg and Associates 24-23 Federal; TD 8,272 ft (2,521 m)
4. Cities Service Oil Co. 4A Federal; TD 8,344 ft (2,543 m)
5. Cities Service Oil Co. 3A Federal; TD 2,940 ft (896 m)
6. Cities Service Oil Co. 2A Federal; TD 2,825 ft (861 m)
7. Cities Service Oil Co. 5A Federal; TD 6,709 ft (2,045 m)
8. Lu Dick 1 Validation Hole; TD 24 ft (7.3 m)
9. White River Oil Co. 2; TD 530 ft (161 m)
10. Lu Dick 1A Validation Hole; TD 19 ft (5.8 m)
11. White River Oil Co. 1 Potter; TD 1,500 ft (457 m)
12. Texas Co. 1 Potter; TD 5,987 ft (1,825 m)
13. Texas Prod. Co. 1 Lu Dick; TD 850 ft (259 m)
14. Union and Frontier Refining Co. 1 White River Dome; TD 8,542 ft (2,604 m)
15. Frontier Refining Co. 3 White River Dome; TD 7,555 ft (2,303 m)
16. Fuel Resources Development 1 Unit; TD 7,506 ft (2,288 m)
17. Cities Service Oil Co. 1A Federal; TD 3,125 ft (953 m)
18. American Resources Management Corp. T-35 Fritzland et al.; TD 2,878 ft (877 m)
19. Frontier Refining Co. 2 Government; TD 2,640 ft (805 m)
20. White River Oil Co. 4; TD 808 ft (246 m)
21. Frontier Refining Co. 1 Lad; TD 6,410 ft (1,954 m)
22. White River Development Co. 2 Government; TD 2,790 ft (650 m) approximately located
23. White River Oil Co. 5; Two holes 50 ft (15 m) apart; TD 1,350 ft (411 m) and 2,646 ft (807 m); approximately located
24. White River Oil Co. 3; TD 955 ft (291 m); approximately located
25. Fuel Resources Development Co. 1 Government; TD 7,381 ft (2,250 m)
26. Frontier Refining Co. 1 Government Meeker; TD 7,003 ft (2,134 m)
27. Lu Dick 1 Validation Hole; TD 75 ft (23 m)
28. S. W. McLaughlin Co. 1A Jacobs; TD 3,805 ft (1,160 m)
29. S. W. McLaughlin Co. 1 Jacobs; TD 800 ft (244 m)
30. S. W. McLaughlin Co. 2 Jacobs; TD 4,428 ft (1,350 m); approximately located
31. Trident Oil Co. 1 Norvell; TD 3,117 ft (950 m)
32. Superior Oil Co. Piceance Creek Corehole 6; Data confidential
33. Superior Oil Co. Piceance Creek Corehole 16; Data confidential
34. Opportunity Corp. and Trident Oil Co. 1 White River; TD 3,636 ft (1,108 m)
35. General Petroleum Corp. Corehole 37-21; TD 590 ft (180 m)
36. Tintic Standard Mining Co. 1 Government; TD 2,929 ft (893 m)

Index of recently published U.S. Geological Survey geologic maps in the Piceance Creek basin area.

For sale by U.S. Geological Survey, price 50 cents

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