Utah Geological Survey
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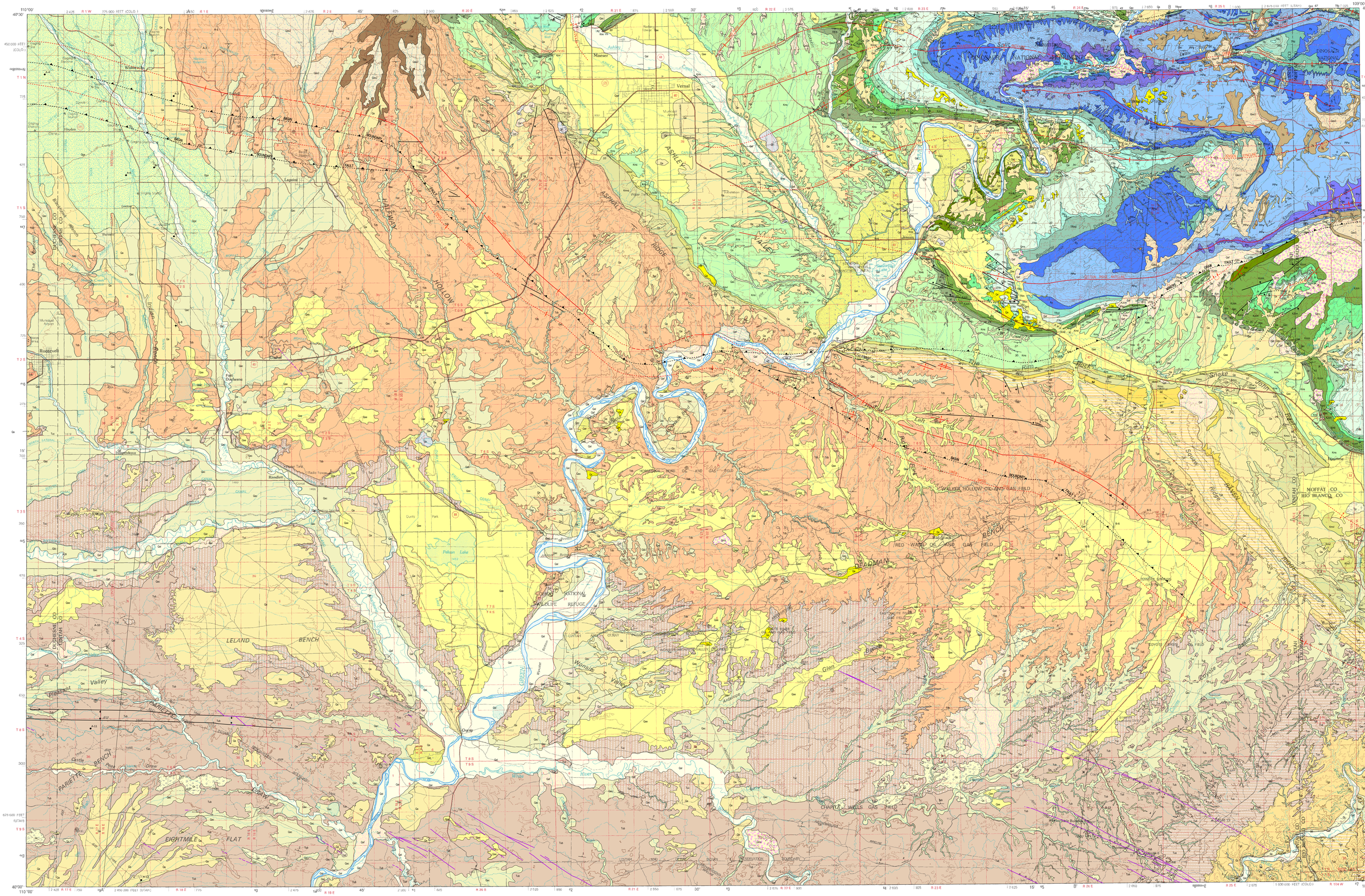
Utah Department of Natural Resources

Plate 1
Utah Geological Survey Open-File-Report 506DM
Interim Geologic Map of the Vernal 30' x 60' Quadrangle, Uintah and Duchesne Counties, Utah, and Moffat and Rio Blanco Counties, Colorado



GIS Data Preparation: Basia Matyjasik, Douglas A. Sprinkel, Lori J. Douglas, and Kent D. Brown

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INTERIM GEOLOGIC MAP OF THE VERNAL 30' x 60' QUADRANGLE, UINTAH AND DUCHESNE COUNTIES, UTAH, AND MOFFAT AND RIO BLANCO COUNTIES, COLORADO

by
Douglas A. Sprinkel

2007

This map is a plot of Geographic Information System (GIS) files created to visually represent the content of the GIS data files. It is not a published map and it contains many features that do not meet UGS cartographic standards, such as automatically generated labels that may overlap other labels and lines.

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Description of Map Units

Qf DISTURBED GROUND (HISTORICAL) - Gravel pit operations mostly along the flood plain of the Green River; material excavated is from unconsolidated deposits of Qal and Qaf; includes sewage lagoon along Ashley Creek and larger earthen dams for reservoirs.

Qmf DEBRIS-FLOW DEPOSITS (HISTORICAL) - Unconsolidated and poorly sorted heterogenous mixture of boulders, gravel, sand, silt, and mud; matrix supported; less than 2 m thick.

Qal FLOOD-PLAIN AND CHANNEL ALLUVIUM (HOLOCENE) - Unconsolidated silt, sand, and gravel in flood plains of Green River, Ashley and Brush Creeks, and Pleasant Valley Wash; locally grade into Qac; 1-30 m thick.

Qat TERRACE DEPOSITS (HOLOCENE) - Unconsolidated to locally cemented silt, sand, gravel, cobbles, and boulders; remnants of alluvial terraces along the Green River and Ashley and Brush Creeks; less than a few tens of meters thick.

Qaf ALLUVIAL-FAN DEPOSITS (HOLOCENE AND PLEISTOCENE) - Unconsolidated, poorly sorted boulder, gravel, sand, and silt; locally grade into Qac; less than 30 m thick.

Qac MIXED ALLUVIUM AND COLLUVIUM (HOLOCENE) - Unconsolidated mud, silt, sand, and gravel in intermittent stream drainages and in areas of low topographic relief. On the Mancos Shale or other soft formations, this unit is mostly reworked mud; locally grade into Qae, Qaf, and Qal; less than 10 m thick.

Qae MIXED ALLUVIUM AND EOLIAN DEPOSITS (HOLOCENE) - Unconsolidated alluvial mud, silt, and sand mixed with windblown sand and silt; many of these deposits are in tributary stream channels of the Green River, along smaller streams, and in other intermittent stream drainages and locally grade into Qac; less than 10 m thick.

Qe EOLIAN DEPOSITS (HOLOCENE) - Unconsolidated, well-sorted, fine-grained, windblown sand and silt; less than 10 m thick.

Qc COLLUVIUM (HOLOCENE) - Heterogeneous mixture of boulders, gravel, cobbles, sand, and silt that may grade into talus, landslide, and alluvial deposits; thin to a few tens of meters thick.

Qmt TALUS DEPOSITS (HOLOCENE AND PLEISTOCENE?) - Unconsolidated and unstratified angular rock fragments that accumulate at the base of cliffs. Colluvium is a locally significant part of this deposit; less than 5 m thick.

Qms SLIDES, SLUMPS AND FLOWS (HOLOCENE AND PLEISTOCENE) - Earth flow and rotational slumps and slides in formations prone to slope failure; some Qms units may include mass movements of slightly different age or may share a common boundary with an adjoining mass movement.

Qa PIEDMONT AND BASIN ALLUVIUM, UNDIVIDED (HOLOCENE AND PLEISTOCENE[?]) - Variably consolidated, poorly to moderately sorted sand, gravel, cobbles, and boulders deposited on near-planar bedrock surfaces; more than one level recognized but not subdivided so deposits of different ages can share a common boundary; poorly to well-developed soil profile developed in all levels with the best-developed profile in the topographically highest deposit; less than 2 m thick.

Qas1 YOUNGEST SOUTH FLANK PIEDMONT ALLUVIUM (HOLOCENE AND UPPER PLEISTOCENE) - Unconsolidated to poorly consolidated, poorly sorted sand, gravel, cobbles, and boulders; poorly developed soil profile and stage I pedogenic carbonate (caliche) coatings on undersides of clasts; mapped in the northern part of the quadrangle where traceable from Dutch John 30' x 60' quadrangle (Sprinkel, 2006); less than 2 m thick.

Qas2 YOUNGER SOUTH FLANK PIEDMONT ALLUVIUM (UPPER PLEISTOCENE) - Unconsolidated to moderately consolidated, poorly sorted sand, gravel, cobbles, and boulders; poorly to well-developed soil profile and stage II-III pedogenic carbonate (caliche) coatings of clasts in upper 1 m of deposit; mapped in the northern part of the quadrangle where traceable from Dutch John 30' x 60' quadrangle (Sprinkel, 2006) and topographically higher than Qas1; less than 3 m thick.

Qga GLACIAL ALLUVIAL OUTWASH, UNDIVIDED (PLEISTOCENE) - Unconsolidated, well-rounded, mostly red quartzose sandstone and quartzite (Uinta Mountain Group) boulders to pebbles and sand deposits in the Whiterocks Canyon drainage in the northwest part of the quadrangle (see Sprinkel, 2006) derived from the high-energy meltwaters of glaciers of undetermined age; thickness not determined but probably less than 10 m.

Qas3 OLDER SOUTH FLANK PIEDMONT ALLUVIUM (MIDDLE PLEISTOCENE) - Variably consolidated, poorly sorted, silt, sand, gravel, and cobble to boulder deposit; subangular to subrounded clasts dominated by quartz sandstone and quartzite of Uinta Mountain Group; mostly matrix-supported with clast-supported channel deposits; well-developed soil profile with stage III-IV carbonate (caliche) cementation; some clasts coated with iron-manganese deposits; boulders are scattered on surface as lag deposit; deposit typically "rests" on Bishop Conglomerate but does "rest" on pre-Bishop units in places; forms the highest and oldest gravel deposit that caps the Yampa Plateau in this quadrangle; also mapped in the Dutch John 30' x 60' quadrangle (Sprinkel, 2006); less than 10 m thick in quadrangle.

Tb BISHOP CONGLOMERATE (OLIGOCENE) - Light-gray to pinkish-gray, friable sandstone with tuffaceous interbeds, and poorly sorted, loosely cemented, boulder to pebble conglomerate mapped on the Yampa Plateau; an ash bed near the base of the Bishop on the Yampa Plateau yielded $^{40}Ar/^{39}Ar$ weighted mean age on sanidine of about 34 Ma (Kowallis and others, 2005); a stratigraphically higher ash bed on the Diamond Plateau in the adjoining Dutch John 30' x 60' quadrangle yielded an $^{40}Ar/^{39}Ar$ age on sanidine of 30.5 Ma (Kowallis and others, 2005), which is similar to K-Ar ages of 28.5 Ma (hornblende) and 29.5 Ma (biotite) reported by Hansen (1986); less than 50 m thick.

Tds STARR FLAT MEMBER OF DUCHESNE RIVER FORMATION (OLIGOCENE) - Reddish-brown, reddish-purple, yellowish-gray, and greenish-gray, fine- to coarse-grained sandstone, siltstone, mudstone, and conglomerate; sandstone and fine-grained beds dominate the member and coarsen upward; resistant and thick-bedded; Bryant and others (1989) obtained fission-track ages in zircon of 30.0 to 36.7 Ma from the member in the adjoining Duchesne and Kings Peak 30' x 60' quadrangles; Anderson and Picard (1972) defined the Starr Flat as the uppermost member of the Duchesne River Formation, but it is likely correlative with the Bishop Conglomerate because of similar stratigraphic relations and age (see Hansen, 1986; Bryant and others, 1989, Kowallis and others, 2005); 40-230 m thick.

Tdl LAPOINT MEMBER OF DUCHESNE RIVER FORMATION (OLIGOCENE AND EOCENE) - Light-reddish-brown and yellowish-gray, fine-grained sandstone, siltstone, and mudstone; contains abundant light-greenish-gray bentonite beds; mostly nonresistant and thin- to very thin bedded; late Eocene (Duchesnean) in age based on vertebrate fossil assemblage and K-Ar age (mineral not reported) of 39.3 Ma from an ashy siltstone bed at the Lapoint-Dry Gulch Creek contact (Anderson and Picard, 1972); three K-Ar ages on biotite of 35.7 to 40.3 were obtained from near the base of the Lapoint Member (McDowell and others, 1973; Mauger, 1977); exposed thickness 120 m, but as much as 300 m thick in subsurface of Uinta Basin.

Tdd DRY GULCH CREEK MEMBER OF DUCHESNE RIVER FORMATION (EOCENE) - Medium-reddish-brown and purplish-gray, fine-grained sandstone, siltstone, mudstone, and conglomerate; dominated by slope-forming siltstone and mudstone with ledge-forming thin-bedded sandstone; contains some vertebrate fossils (Anderson and Picard, 1972); less than 150 m thick.

Tdb BRENNAN BASIN MEMBER OF DUCHESNE RIVER FORMATION (EOCENE) - Light- to medium-red, light-reddish-brown, and yellowish-gray, fine- to medium-grained lithic sandstone and siltstone with minor amounts of mudstone and conglomerate; contains well-developed paleosols; the exposed basal part of the Brennan Basin Member intertongues with the underlying Uinta Formation and is as much as 60 m thick; the contact is placed at the base of a resistant reddish-brown sandstone bed that lies on the uppermost variegated mudstone bed of the Uinta Formation; the Brennan Basin Member, however, lies unconformably on beds of the Green River Formation near Squaw Ridge and Mesaverde Group along Asphalt Ridge; contains a diverse assemblage of vertebrate fossils of Late Eocene age; see Anderson and Picard (1972) for a summary of the fossils and age of the Brennan Basin Member; exposed thickness 220-600 m, but as much as 1040 m thick in subsurface of Uinta Basin.

Tu UINTA FORMATION (EOCENE) - Consists of three members but combined where members are too thin to show separately at map scale or where member identification uncertain; see below for unit description and thickness; combined exposed thickness of map unit is 335-745 m.

Tuc MEMBER C OF UINTA FORMATION (EOCENE) - Soft, light-gray, greenish-gray, white, grayish-purple, red, and pale-yellow shale, mudstone, claystone, and minor sandstone with local tuffaceous interbeds; consists mostly of Horizon C of Osborn (1929), Peterson and Kay (1931), and Kay (1934); informally referred to as the Myton member by some authors; the base of member C is placed near the Amynodon sandstone of Riggs (1912); forms the badlands topography characteristic of Fantasy Canyon (section 12, T. 9 S., R. 22 E., Uintah County); contains some gilsonite deposits; exposed thickness 60-250 m, but as much as 570 m thick in subsurface of Uinta Basin.

Tub MEMBER B OF UINTA FORMATION (EOCENE) - Light-gray, light-greenish-gray, light-brown, and light-purple, mudstone and claystone with interbeds of greenish-gray, yellow, and brown fine-grained sandstone; contains minor conglomerate and tuffaceous beds; forms nonresistant slopes and thin resistant ledges; consists mostly of Horizon B of Osborn (1929), Peterson and Kay (1931), and Kay (1934); these beds are included in the informal Wagonhound member of some authors; contains significant gilsonite deposits in southern part of quadrangle, particulary around Bonanza, Utah; exposed thickness about 275 m, but 108-508 m thick in subsurface of Uinta Basin.

Tua MEMBER A OF UINTA FORMATION (EOCENE) - Yellowish-gray and yellowish-brown, fine- to very fine grained sandstone and siltstone; contains minor conglomerate, shale, and tuffaceous interbeds; forms resistant beds; consists of Horizon A of Osborn (1929), Peterson and Kay (1931), and Kay (1934); these beds are included in the informal Wagonhound member of some authors; intertongues with the underlying Parachute Creek Member of the Green River Formation; the lower contact is irregular and bedding is contorted because of soft-sediment deformation; generally thins northward; 0-220 m thick.

Tgp PARACHUTE CREEK MEMBER OF GREEN RIVER FORMATION (EOCENE) - Moderately resistant, light- to medium-gray, light- to medium-brown, yellow, organic-rich marlstone, siltstone, sandstone, and oolitic limestone; contains pods of nahcolite, some of which have been leached leaving cavities; includes the Mahogany oil-shale zone; upper part intertongues with overlying Uinta Formation near the White River drainage in the southeast part of the quadrangle but pinches out and is unconformably overlain by the Duchesne Formation near The Rim Rock to the north; exposed thickness 0-270 m, but 335-1230 m thick in subsurface of Uinta Basin.

Tgd DOUGLAS CREEK MEMBER OF GREEN RIVER FORMATION (EOCENE) - Soft to moderately resistant, light- to medium-gray, light- to medium-brown, yellow, and light-gray siltstone, sandstone, shale, and cherty and oolitic limestone; base is light-brown ostracodal limestone of Long Point Bed (Johnson, 1984); unconformably overlain by the Duchesne Formation near Spring Hollow along the Green River; exposed thickness 0-150 m, but 284-425 m thick in subsurface of Uinta Basin.

Tgr-Tw GREEN RIVER-WASATCH FORMATIONS TRANSITION ZONE (EOCENE) - Intertonguing beds of Green River (lithotypes similar to Douglas Creek Member) and Wasatch Formations identified only in wells; represents interval between the base of Long Point Bed and the main body of the Wasatch Formation; shown on cross sections only; 75-265 m thick.

Tw WASATCH FORMATION (EOCENE AND PALEOCENE[?]) - Red, yellow, and light-gray friable sandstone, siltstone, claystone, and conglomerate; conglomerate clasts consist mostly of gray limestone (Paleozoic), sandstone (Mesozoic), and some red quartzose sandstone and quartzite (Uinta Mountain Group); upper part intertongues with overlying Douglas Creek Member of Green River Formation where the transition zone is not identified; lower part intertongues with underlying Flagstaff Member of Green River Formation where identified; 300-920 m thick where undivided, but is 245-620 m thick for main body of Wasatch Formation.

Tgf FLAGSTAFF MEMBER OF GREEN RIVER FORMATION (EOCENE) - Mostly medium- to dark-gray carbonate, light-gray sandstone, light-gray to green-gray claystone; only identified in subsurface from lithologic and geophysical well logs; intertongues with Wasatch Formation; shown on cross section only; 70-800+ m thick.

Kmvu UPPER UNIT OF MESAVERDE GROUP (UPPER CRETACEOUS) - Moderately resistant, light-gray to pale-grayish-orange, fine-grained, lenticular cross-bedded sandstone with carbonaceous shale and thick coal beds; may include beds of the Tuscher, Farrer, and Neslen Formations; exposed thickness 450-550 m, but as much as 695 m thick in subsurface of Uinta Basin.

Kmvl LOWER UNIT OF MESAVERDE GROUP (UPPER CRETACEOUS) - Resistant, light-gray, tan, and light-yellow, cross-bedded sandstone with subordinate gray carbonaceous shale and minor coal; likely includes beds of the Sego Sandstone, Buck Tongue of the Mancos Shale, and Castlegate Sandstone; locally defined by Walton (1944) as the Rim Rock Formation; exposed thickness 200-250 m, but 120-340 m thick in subsurface of Uinta Basin.

Kms MANCOS SHALE (UPPER CRETACEOUS) - Dark-gray, soft, slope-forming, calcareous shale containing beds of siltstone and bentonitic clay; 1360-1700 m thick.

Kfd FRONTIER SANDSTONE, MOWRY SHALE, AND DAKOTA SANDSTONE, UNDIVIDED - These formations are shown as one unit along part of the south flank of the Yampa Plateau; see below for descriptions and thickness; combined thickness of map unit is 75-235 m.

Kf FRONTIER SANDSTONE (UPPER CRETACEOUS) - Upper part resistant, light-brown to light-gray and yellow, fine-grained and ripple-marked sandstone with local petrified wood and fossils; lower part soft, light- to dark-gray calcareous shale; may include minor limestone and coal beds in the lower part; exposed thickness 50-85 m, but as much as 100 m thick in subsurface of Uinta Basin.

Kmd MOWRY SHALE AND DAKOTA SANDSTONE, UNDIVIDED - These formations are locally shown as one unit along Snake John Reef because they are too thin to show separately at map scale. See below for descriptions and thickness; combined thickness of map unit is 25-150 m.

Kmr MOWRY SHALE (UPPER AND LOWER CRETACEOUS) - Dark-gray, siliceous shale that weathers silver gray; contains abundant fossil fish scales; age based on Obradovich and Cobban (1975), Cobban and Kennedy (1989), Molenaar and Cobban (1991), and unpublished palynological data; 10-70 m thick.

Kd DAKOTA SANDSTONE (LOWER CRETACEOUS) - Upper and lower resistant, yellow and light-gray, medium- to coarse-grained sandstone beds separated by a carbonaceous shale; contains coal beds in exposures along the flank of Split Mountain (Doelling and Graham, 1972); 15-80 m thick.

KJcm CEDAR MOUNTAIN FORMATION AND MORRISON FORMATION - Cedar Mountain is mapped with the underlying Morrison Formation because it is generally thin and the contact with the underlying Morrison is difficult to determine despite being a major unconformity representing about 25 Ma; combined thickness of map unit is 245-350 m.

Cedar Mountain Formation (Lower Cretaceous) - Purple, gray, and greenish-gray mudstone, siltstone, and minor sandstone and limestone; contains calcrete beds that weather out as carbonate nodules; 0-60 m thick.

Morrison Formation (Upper Jurassic) - Upper Brushy Basin Member consists of soft, banded, variegated (light-gray, olive-gray, red, and light-purple) shale, claystone, siltstone, and minor cross-bedded sandstone, conglomerate, and bentonite. Lower Salt Wash Member consists of resistant, light-gray to white, cross-bedded sandstone; dinosaur remains are preserved in the Salt Wash Member at Dinosaur National Monument; exposed thickness 245-290 m thick, but as thin as 160 m in subsurface.

Jsc STUMP FORMATION, ENTRADA SANDSTONE, AND CARMEL FORMATION, UNDIVIDED - These formations are mapped as one unit where too thin to show separately at map scale; see below for unit description and individual formation thickness; combined thickness of map unit is 140-295 m.

Js STUMP FORMATION (UPPER JURASSIC) - Upper Redwater Member is greenish-gray and light-green, slope-forming shale with glauconitic, fossiliferous (belemnites) sandstone and limestone. Lower Curtis Member is resistant, light-gray to greenish-gray, cross-bedded, fossiliferous, glauconitic sandstone, oolitic limestone, and fissile shale; palynomorph assemblage from base of Curtis indicates Oxfordian age (Wilcox and Currie, 2006; Brian Currie, Miami University (Ohio), verbal communication, March 15, 2006); J-3 unconformity of Pipiringos and O'Sullivan (1978) is at base of Curtis Member; total thickness is 40-80 m.

Je ENTRADA SANDSTONE (MIDDLE JURASSIC) - Upper reddish-brown siltstone and fine-grained sandstone and a lower light-gray, pink, and light-brown sandstone; lower sandstone is resistant to erosion and forms cliffs and ridges; 15-75 m thick.

Jc CARMEL FORMATION (MIDDLE JURASSIC) - Medium- to dark-red, green, and gray sandy shale, sandstone, siltstone, limestone, and gypsum; upper part is mostly slope-forming red shale, siltstone, and sandstone underlain by a middle gypsiferous unit; lower part is mostly red siltstone and thin, ledge-forming limestone, which is commonly oolitic and fossiliferous; 85-140 m thick.

JŦn NUGGET SANDSTONE (LOWER JURASSIC AND UPPER TRIASSIC) - Pink, light-gray, and light-brown, resistant, massive-weathering, large-scale cross-bedded sandstone; locally contains carbonate lenses (playa) and fluvial lenses (wadi) near top; forms cliffs and ridges; mapped as Navajo Sandstone prior to 1964 by several workers, however, the nomenclature was changed to Glen Canyon Sandstone by Poole and Stewart (1964) and adopted by several workers; I have abandoned the use of Glen Canyon Sandstone and adopted Nugget Sandstone, which is present in the western Uinta Mountains. I have restricted the Nugget Sandstone to the upper eolian beds and included the lower flat-lying sandstone and carbonate beds in the underlying Chinle Formation; vertebrate tracks of Jurassic age preserved in a fluvial lens near the top of Nugget Sandstone near Red Fleet Resevoir (Hamblin and others, 2000) in Dutch John 30' x 60' quadrangle; casts of vertebrate tracks of Late Triassic age are preserved on underside beds near or at the base of typical Nugget Sandstone in this quadrangle near Dinosaur National Monument and at McConkie Ranch in Dutch John 30' x 60' quadrangle (Lockley and others, 1992); 155-275 m thick.

Ŧcd CHINLE, MOENKOPI, AND DINWOODY FORMATIONS, UNDIVIDED - Combined where formations are too thin to show at map scale; see below for descriptions and thickness; combined thickness of map unit is 255-550 m.

Ŧc CHINLE FORMATION (UPPER TRIASSIC) - Purplish-red, purple, light-gray, greenish-gray, light-green, ripple-marked siltstone, sandstone, claystone, shale, and conglomerate that locally contains abundant petrified wood; generally forms slopes; upper 26-36 m is light-reddish-brown planar laminated sandstone, cross-bedded sandstone, siltstone, and variegated mudstone that is correlated with Bell Springs Member of Nugget Sandstone by Jensen and Kowallis (2005); impressions of the vertebrate tracks of Late Triassic age (the mates of overlying casts found in overlying Nugget) may be preserved; base is resistant conglomerate unit named the Gartra Member; 85-125 m thick.

Ŧmd MOENKOPI AND DINWOODY FORMATIONS, UNDIVIDED - Combined as one map unit where formations are too thin to show separately at map scale; see below for descriptions and thickness; combined thickness of map unit is 170-425 m.

Ŧm MOENKOPI FORMATION (LOWER TRIASSIC) - Medium- to dark-red, reddish-brown, green, and gray, ripple-marked siltstone, fine-grained sandstone, and shale with gypsum and limestone beds; mostly "soft," slope-forming unit; 170-260 m thick.

Ŧd DINWOODY FORMATION (LOWER TRIASSIC) - Light-gray, greenish-gray, light-brown, and brown, thin-bedded, ripple-marked shale, siltstone, and sandstone with minor amounts of limestone. "Soft," slope-forming unit along the flanks of the Yampa Plateau; 0-165 m thick.

Pp PARK CITY AND PHOSPHORIA FORMATIONS (LOWER PERMIAN) - Combined thickness of Park City and Phosphoria Formations is 20-125 m.

Franson Member of Park City Formation - Gray, thick- to thin-bedded, cherty limestone and dolomite interbedded with brownish-gray sandstone and red to ochre shale; generally resistant and forms ledges and cliffs.

Meade Peak Phosphatic Shale Member of the Phosphoria Formation - Slope-forming, dark-gray, phosphatic shale with interbeds of sandstone and limestone.

Grandeur Member of Park City Formation - Light-gray to light-brownish-gray sandstone, dolomite, and limestone; generally resistant and forms ledges and cliffs.

PIPw WEBER SANDSTONE (LOWER PERMIAN TO MIDDLE PENNSYLVANIAN) - Light-gray to yellowish-gray, very thick bedded sandstone with interbeds of limestone in the lower part; highly cross-bedded sandstone in the upper part; forms steep cliffs and ridges; 230-475 m thick.

IPm MORGAN FORMATION (MIDDLE PENNSYLVANIAN) - Light- to medium-red, yellow, and gray shale and siltstone, light- to medium-gray fossiliferous and red cherty limestone, and light-red-gray, fine-grained, locally cross-bedded sandstone; 10-290 m thick.

IPrv ROUND VALLEY LIMESTONE (LOWER PENNSYLVANIAN) - Light-gray to light-blue-gray, thin- to very thick bedded limestone interbedded with soft, red shale; limestone is fossiliferous and cherty; chert is blue gray and yellowish gray, but red to pink jasperoid chert is common in the region; forms ledges and cliffs; only exposed in Split Mountain; 65-130 m thick.

Mdh DOUGHNUT SHALE AND HUMBUG FORMATION (UPPER MISSISSIPPIAN) - Combined thickness of map units is 160-185 m; only exposed in Split Mountain.

Doughnut Shale - Dark-gray shale, with some red shale near base, with beds of coarse sandstone, limestone, and "coal;" shale is slope forming and clayey; only exposed in Split Mountain; 85-95 m thick.

Humbug Formation - Light-gray to red, fine-grained to very fine grained, "soft" to resistant sandstone interbedded with light-gray limestone and red to black shale; sandstone is locally cross-bedded and hematitic near top of formation; 75-90 m thick.

Mm MADISON LIMESTONE (UPPER AND LOWER MISSISSIPPIAN) - Mostly dark-gray, medium to coarse crystalline, cherty limestone; chert is typically light gray; regionally contains numerous caves and sinkholes; only exposed in Split Mountain; base not exposed, regionally 130-300 m thick.

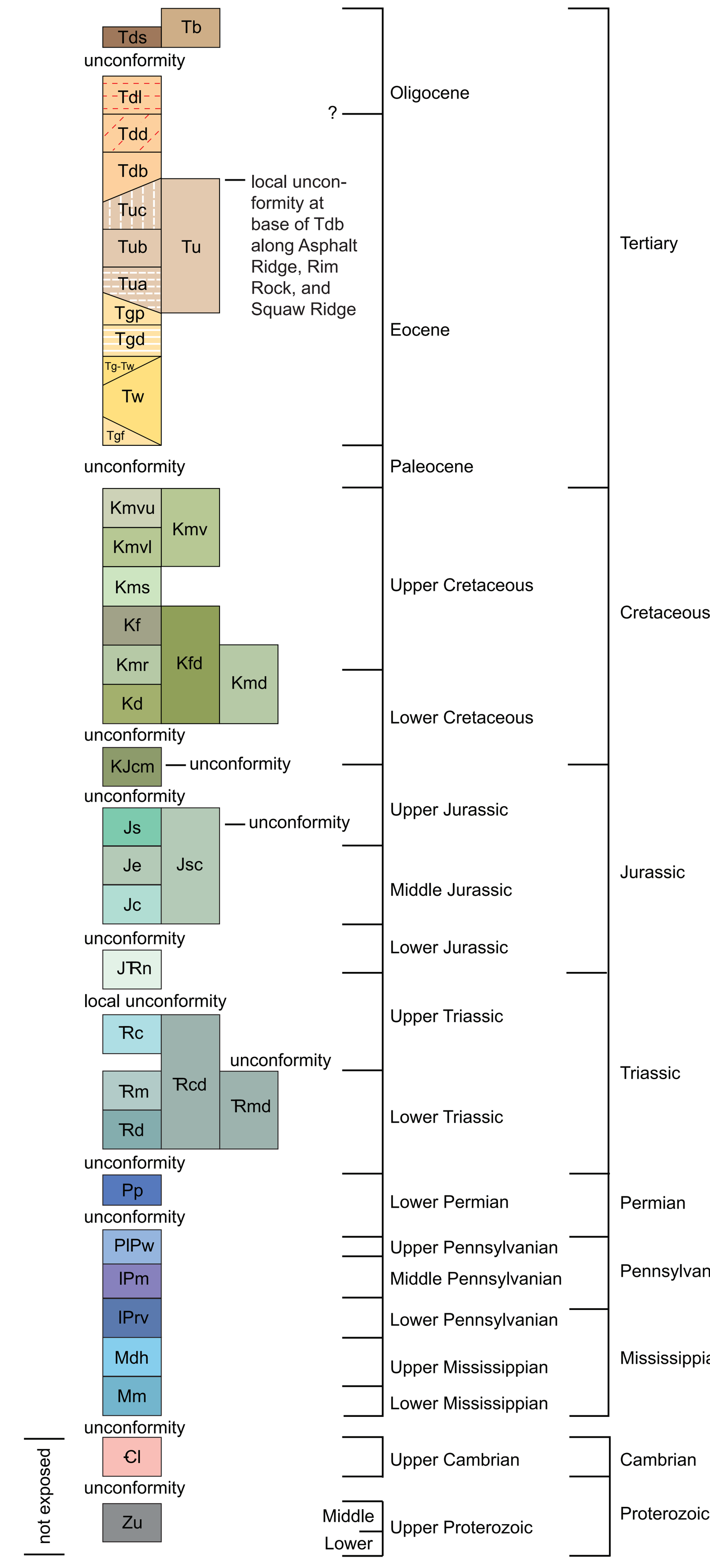
NOT EXPOSED IN VERNAL 30' X 60' QUADRANGLE

The formations below are exposed in the adjoining Dutch John 30' x 60' quadrangle and are likely present in subsurface of this quadrangle (see cross sections). In addition, some of these formations are the primary source of clasts for Quaternary and Tertiary units in the Vernal 30' x 60' quadrangle.

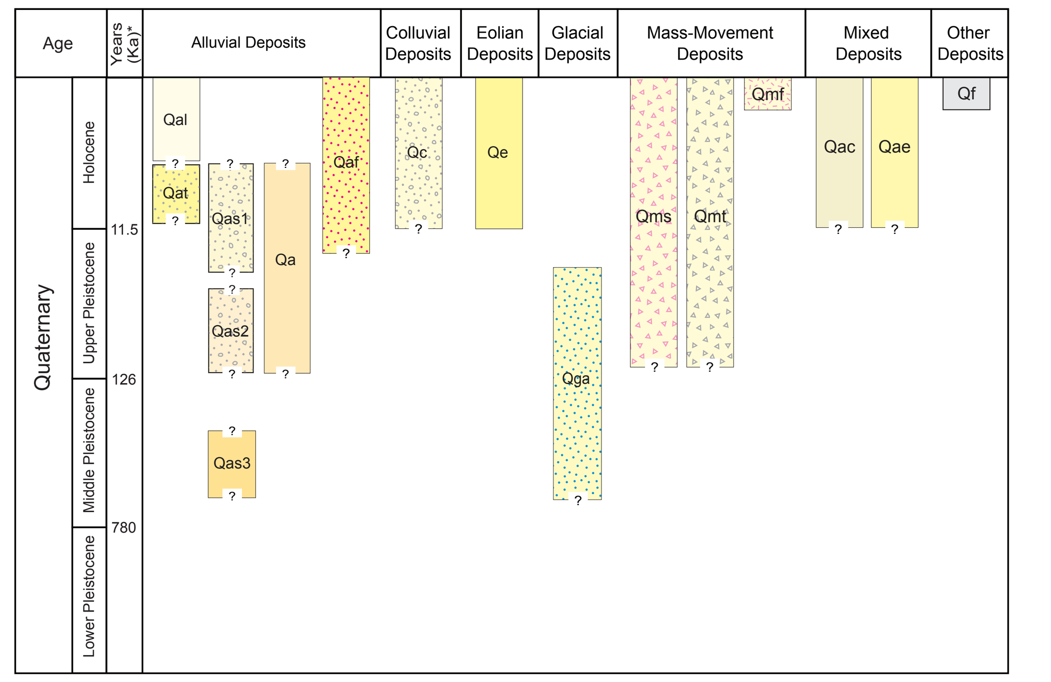
Ꞓl LODORE FORMATION (UPPER CAMBRIAN) - Light-brown to greenish-gray sandstone underlain by pink to tan to pale-greenish-gray glauconitic shale interbedded with tan to pale-green sandstone; base is variegated (pink, gray, and pale-green) coarse- to medium-grained cross-bedded sandstone; locally pebbly; Lodore pinches out to the west; 0-180 m thick.

Zu UINTA MOUNTAIN GROUP (NEOPROTEROZOIC [MIDDLE AND LOWER?]) - Dark- to light-red, fine- to coarse-grained, quartzose and lithic sandstone and quartzite; sandstone is thick to medium bedded with planar, contorted and cross-bedding; some beds contain tool and groove marks, ripples, and mudcracks; contains considerable red, green, and dark-gray micaceous shale interbeds and some conglomerate; age is based on palynomorphs recovered from near middle of formation in the Dutch John 30' x 60' quadrangle (Sprinkel and Waanders, 2005; Sprinkel, 2006) and detrital zircon grains (770 Ma) from lower part of the unit (Fanning and Dehler, 2005); as much as 3500 m thick, but thins southward; not likely present south of Asphalt Ridge and Snake John Reef.

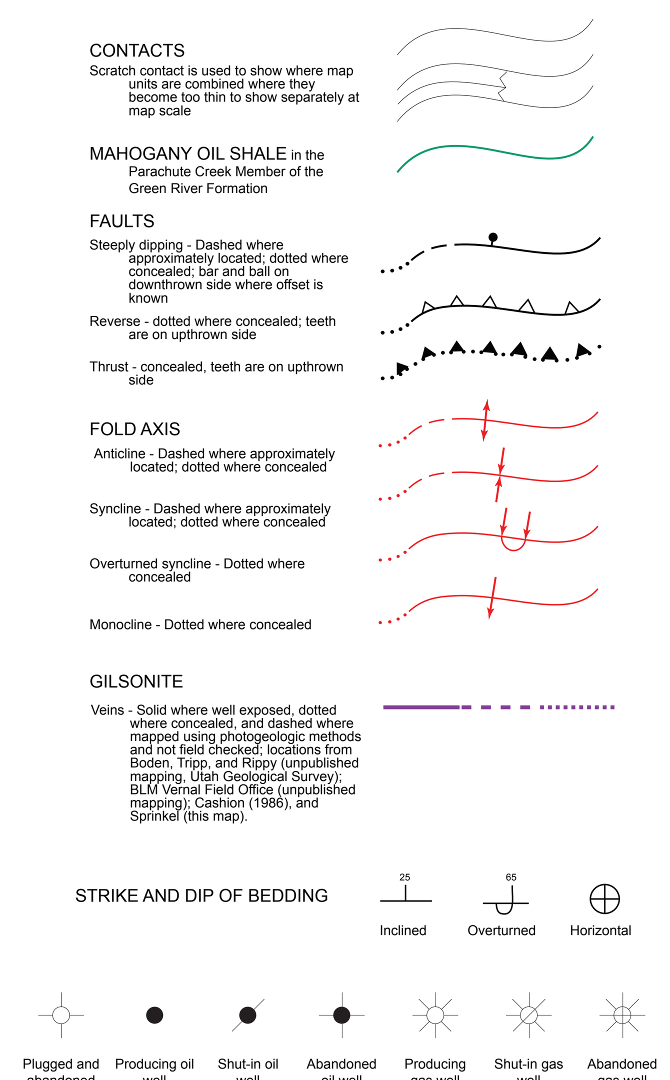
Correlation of Bedrock Units



Correlation of Quaternary Units



Map Symbols



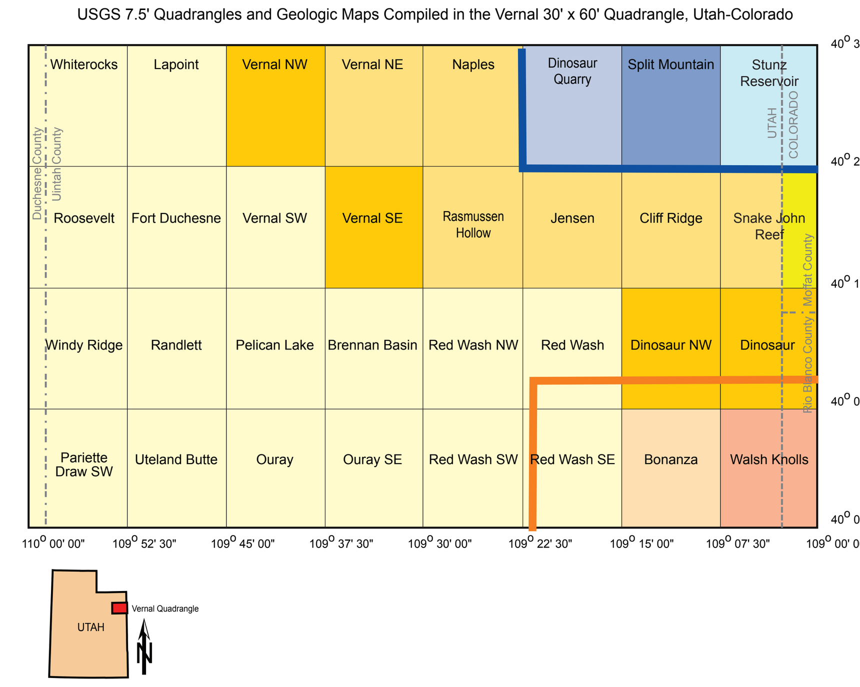
Stratigraphic Column

SYSTEM	SERIES	SYMBOL	FORMATIONS	Thickness* (meters) (not to scale)	NOTES
Quaternary	Holocene	Q**	Unconsolidated deposits	less than 50	Alpine glaciers in Uinta Mountains. Capture of Green River by Colorado River
	Pleistocene	Qas3	South Flank peidmont alluvium	less than 10	Crustal relaxation; Uinta Mountains down- dropped along Uinta fault zone and drainage patterns change in eastern Uintas
Tertiary	Oligocene	Tb	Bishop Conglomerate	less than 50	
		Tds	Starr Flat Member of Duchesne River Formation	40-230	Crustal stability; Gilbert Peak erosion surface forms and Bishop Conglomerate is deposited; Uinta Mountain Group is well exposed
	Eocene	Tdl	Lapoint Member of Duchesne River Formation	120	
		Tdd	Dry Gulch Creek Member of Duchesne River Formation	less than 150	
		Tdb	Brennan Basin Member of Duchesne River Formation	220-600	Local uplift near the northern margin of the Uinta Basin; the Duchesne River Fm unconformably overlies the Green River Fm through the Mesaverde Group from near Squaw Ridge to Asphalt Ridge; the Duchesne River Formation is interbedded with Uinta Formation in the Uinta Basin
		Tu: Tuc	Member C of Uinta Formation	60-250	
		Tu: Tub	Member B of Uinta Formation	about 275	Contains gilsonite deposits
		Tu: Tua	Member A of Uinta Formation	0-220	
		Tgp	Parachute Creek Member of Green River Formation	0-270	Mahogany oil shale zone
		Tgd	Douglas Creek Member of Green River Formation	0-150	Uinta Mountains continue to uplift and erode; creation of Lake Uinta as the Uinta Basin continues to subside; contains oil shale and oil reserves
		Tg-Tw	Green River-Wasatch Formations transition zone	75-265	
		Tw	Wasatch Formation	300-920	Uinta Mountains continue to uplift and erode locally exposing the Uinta Mountain Group; subsidence of Uinta Basin; gas reservoir in Uinta Basin
		Tgd	Flagstaff Member of Green River Formation	70-800+	Unconformity, about 6 m.y.; TK boundary and the extinction of dinosaurs; Uplift of Uinta Mountains begins near end of Cretaceous
Cretaceous	Upper	Kmvu	Upper unit of Mesaverde Group	450-550	Mesaverde Group is gas reservoir in Uinta Basin
		Kmvl	Lower unit of Mesaverde Group	200-250	contains minor coal
		Kms	Mancos Shale	1360-1700	End of Western Interior Seaway; Gas reservoir in Uinta Basin
		Kfd: Kf	Frontier Sandstone	50-85	Unconformity, about 5 m.y.
		Kfd: Kmr	Mowry Shale	10-70	Fossil fish scales in Mowry
	Lower	Kfd: Kd	Dakota Sandstone	15-80	Gas reservoir in Uinta Basin; K-1 unconformity, about 2 m.y.
		KJcm	Cedar Mountain Formation	0-60	K-0 unconformity, about 25 m.y.
Jurassic	Upper	KJcm	Morrison Formation	245-290	Abundant dinosaur remains
		Jsc: Js	Stump Formation	40-80	J-5 unconformity, about 2 m.y.; *Belemnites* fossils
	Middle	Jsc: Je	Entrada Sandstone	15-75	J-3 unconformity, about 1 m.y.
		Jsc: Jc	Carmel Formation	85-140	*Isocrinus* fossils
	Lower	JŦn	Nugget Sandstone	155-275	J-2 unconformity, about 14 m.y.; top of Nugget Sandstone may include Page Sandstone
Triassic	Upper	Ŧcd: Ŧc	Chinle Formation	85-125	Ankareh and Steinaker Formation of some workers; Gartra Member; Ŧ-3 unconformity, about 15 m.y.
	Lower	Ŧcd: Ŧm	Moenkopi Formation	170-260	
		Ŧcd: Ŧd	Dinwoody Formation	0-165	Ŧ-1 unconformity, about 6 m.y.
Permian	Lower	Pp	Park City and Phosphoria Formations	20-125	Contains phosphate deposits; Unconformity, about 3 m.y.
Pennsylvanian	Upper	PIPw	Weber Sandstone	230-475	Forms cliffs and important oil reservoir in the Rocky Mountains
	Middle	IPm	Morgan Formation	10-290	
	Lower	IPrv	Round Valley Limestone	65-130	
Mississippian	Upper	Mdh	Doughnut Shale	85-95	
		Mdh	Humbug Formation	75-90	
	Lower	Mm	Madison Limestone	130-300	Forms cliffs, contains marine fossils
Cambrian	Upper	Ꞓl	Lodore Formation	0-180	Unconformity, about 220-350 m.y.; Base of Madison Limestone and underlying formations are not exposed in the quadrangle
Neoproterozoic	Middle / Lower?	Zu	Uinta Mountain Group	0-3500	Unconformity, about 200 m.y.; Uinta Mountain group forms the core of Uinta Mountains; not likely preserved south of Asphalt Ridge and Snake John Reef

*Exposed thickness; does not include subsurface thickness

**See Correlation of Quaternary Units for symbols

USGS 7.5' Quadrangles and Geologic Maps Compiled in the Vernal 30' x 60' Quadrangle, Utah-Colorado



Source of Map Data

- Cashion, W.B., 1978, Geologic map of the Walsh Knolls quadrangle, Uintah County, Utah, and Rio Blanco County, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1013, scale 1:24,000.
- Cashion, W.B., 1986, Geologic map of the Bonanza quadrangle, Uintah County, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1865, scale 1:24,000.
- Cashion, W.B., and Brown, J.H., Jr., 1956, Geology of the Bonanza-Dragon oil shale area, Uintah County, Utah, and Rio Blanco County, Colorado: U.S. Geological Survey Oil and Gas Investigations Map OM-153, scale 1:62,500.
- Doelling, H.H, and Graham, R.L., 1972, Coal and geology map, Cliff Ridge, Jensen, Naples, Rasmussen Hollow, Snake John Reef, Steinaker Reservoir-Vernal NE, and Vernal NE-Vernal SE quadrangles, in Doelling, H.H., and Graham, R.L., Eastern and northern Utah coal fields: Utah Geological and Mineral Survey Monograph Series 2, scale 1:42,240; and Sprinkel, D.A, unpublished geologic mapping, scale 1:24,000.
- Hansen, W.R., and Rowley, P.D., 1980, Geologic map of the Stuntz Reservoir quadrangle, Utah-Colorado: U.S. Geological Survey Geologic Quadrangle Series Map GQ-1530, scale 1:24,000.
- Hansen, W.R., Rowley, P.D., and Carrara, P.E., 1983, Geologic map of Dinosaur National Monument and vicinity, Utah-Colorado: U.S. Geological Survey Miscellaneous Investigations Series Map I-1407, scale 1:50,000.
- Rowley, P.D., and Hansen, W.R., 1979, Geologic map of the Split Mountain quadrangle, Uintah County, Utah: U.S. Geological Survey Geologic Quadrangle Series Map GQ-1515, scale 1:24,000.
- Rowley, P.D., Kinney, D.M., and Hansen, W.R., 1979, Geologic map of the Dinosaur Quarry quadrangle, Uintah County, Utah: U.S. Geological Survey Geologic Quadrangle Series Map GQ-1513, scale 1:24,000.
- Sprinkel, D.A., 2003, unpublished geologic mapping of the eastern part of the Snake John Reef quadrangle, Moffat County, Colorado, scale 1:24,000.
- Sprinkel, D.A., 2004, unpublished geologic mapping of the Dinosaur quadrangle, Uintah County, Utah, and Moffat and Rio Blanco Counties, Colorado, and Dinosaur NW, Vernal SE, and Vernal NW quadrangles, Uintah County, Utah, scale 1:24,000.
- Sprinkel, D.A., 2005, unpublished geologic mapping of the Brennan Basin, Fort Duchesne, Lapoint, Ouray, Ouray SE, Pelican Lake, Randlett, Red Wash, Red Wash NW, Red Wash SE, Red Wash SW, Uteland Butte, and Vernal SW quadrangles, Uintah County, Utah, and Pariette Draw SW, Roosevelt, Whiterocks, and Windy Ridge quadrangles, Duchesne and Uintah Counties, Utah, scale 1:24,000.

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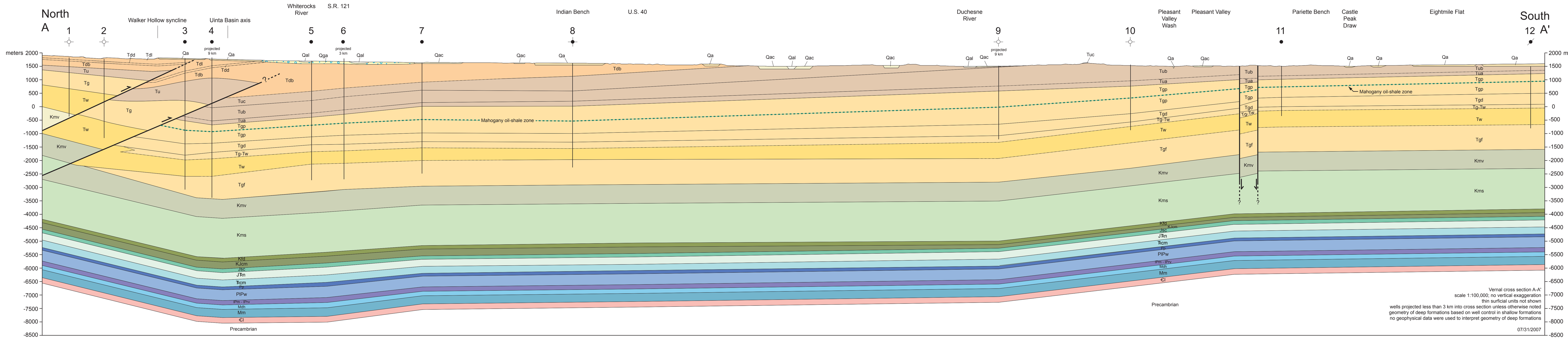

Table 1. Wells and well data used to constrain formation depths along cross section A-A'.

ID	Cross Section	Well Information	Formation	Map Unit Symbol	Top* (meters)	Thickness (meters)	Elevation (meters)	Top* (feet)	Thickness (feet)	Elevation (feet)	Comments
A-1	A-A'	Asher American Inc	Lapoint Member of Duchesne River Formation	Tdl	0	62	1811	0	205	5942	Ground elevation of well
		Asher N. Roosevelt 1	Dry Gulch Creek Member of Duchesne River Formation	Tdd	62	53	1749	205	175	5737	estimated from projecting surface outcrop, regional dip, and local thickness
		NE1/4NE1/4 Section 15, T. 1 N., R. 1 E.	Brennan Basin Member of Duchesne River Formation	Tdb	116	204	1695	380	668	5562	estimated from projecting surface outcrop, regional dip, and local thickness
		Uinta Special Base & Meridian	Uinta Formation	Tu	319	238	1492	1048	782	4894	
		Uintah County, Utah	Green River Formation	Tg	558	593	1253	1830	1945	4112	
		API: 4304730228	Wasatch Formation	Tw	1151	917	661	3775	3010	2167	
		Wildcat	Mesaverde Group	Kmv	2068	119	-257	6785	390	-843	
			Total Depth		2187	0	-376	7175		-1233	
A-2	A-A'	Paul T Walton	Lapoint Member of Duchesne River Formation	Tdl	0	85	1771	0	280	5810	Ground elevation of well
		Ute Tribal 1	Dry Gulch Creek Member of Duchesne River Formation	Tdd	85	82	1686	280	270	5530	
		SE1/4SW1/4 Section 15, T. 1 N., R. 1 E.	Brennan Basin Member of Duchesne River Formation	Tdb	168	203	1603	550	667	5260	
		Uinta Special Base & Meridian	Uinta Formation	Tu	371	269	1400	1217	883	4593	
		Uintah County, Utah	Green River Formation	Tg	640	655	1131	2100	2150	3710	
		API: 4304720228	Wasatch Formation	Tw	1295	297	475	4250	975	1560	
		Wildcat	thrust fault		1593	0	178	5225	0	585	
			Green River Formation	Tg	1593	736	178	5225	2415	585	
			Wasatch Formation	Tw	2329	604	-558	7640	1980	-1830	
			Total Depth		2932		-1161	9620		-3810	
A-3	A-A'	Quinex Energy Corporation	Qa/Lapoint Member of Duchesne River Formation	Tdl	0	157	1796	0	515	5892	Ground elevation of well
		1 BERT TOPOOF (28-2R)	Dry Gulch Creek Member of Duchesne River Formation	Tdd	157	55	1639	515	180	5377	estimated from projecting surface outcrop, regional dip, and local thickness
		NE1/4SW1/4 Section 28, T. 1 N., R. 1 E.	thrust fault		212	0	1584	695	0	5197	estimated from projecting faults in nearby wells and regional dip
		Uinta Special Base & Meridian	Lapoint Member of Duchesne River Formation	Tdl	212	264	1584	695	867	5197	estimated from projecting surface outcrop, regional dip, and local thickness
		Uintah County, Utah	Dry Gulch Creek Member of Duchesne River Formation	Tdd	476	85	1320	1562	278	4330	estimated from projecting surface outcrop, regional dip, and local thickness
		API: 4304730127	Brennan Basin Member of Duchesne River Formation	Tdb	561	302	1235	1840	990	4052	estimated from local thickness
		Robidoux field	Uinta Formation	Tu	863	711	933	2830	2332	3062	
			Green River Formation	Tg	1573	547	223	5162	1796	730	
			thrust fault		2121	0	-325	6958	0	-1066	
			Uinta Formation	Tu	2121	197	-325	6958	645	-1066	
			Parachute Creek Member of Green River Formation	Tgp	2317	859	-522	7603	2819	-1711	
			Mahogany oil-shale zone		2684	0	-888	8805		-2913	
			Douglas Creek Member of Green River Formation	Tgd	3177	425	-1381	10422	1393	-4530	top of middle marker
			Green River-Wasatch Formations transition zone	Tg-Tw	3601	173	-1805	11815	567	-5923	base Long Point Bed
			Wasatch (Colton) Formation	Tw	3774	611	-1978	12382	2003	-6490	base of ostracodal limestone
			Flagstaff Member of Green River Formation	Tgf	4385	492	-2589	14385	1615	-8493	includes North Horn Formation as identified by operators in nearby wells
			Total Depth		4877	0	-3081	16000		-10108	
A-4	A-A'	Flying J Oil & Gas Inc	Qga/Lapoint Member of Duchesne River Formation	Tdl	0	307	1827	0	1007	5995	Ground elevation of well
		1-22Z1 Houston R	Dry Gulch Creek Member of Duchesne River Formation	Tdd	307	75	1520	1007	246	4988	estimated from projecting surface outcrop, regional dip, and local thickness
		NE1/4SW1/4 Section 22, T. 1 N., R.1 W.	Brennan Basin Member of Duchesne River Formation	Tdb	382	385	1445	1253	1264	4742	estimated from projecting surface outcrop, regional dip, and local thickness
		Uinta Special Base & Meridian	Uinta Formation	Tu	767	943	1060	2517	3093	3478	estimated from local thickness
		Uintah County, Utah	fault		1710	0	117	5610	0	385	
		API: 4304730884	member C of Uinta Formation	Tuc	1710	155	117	5610	510	385	
		Bluebell field	member B of Uinta Formation	Tub	1865	492	-38	6120	1615	-125	
			member A of Uinta Formation	Tua	2358	149	-530	7735	490	-1740	
			Parachute Creek Member of Green River Formation	Tgp	2507	671	-680	8225	2201	-2230	
			Mahogany oil-shale zone		2755	0	-928	9040		-3045	
			Douglas Creek Member of Green River Formation	Tgd	3178	350	-1351	10426	1147	-4431	top of middle marker
			Green River-Wasatch Formations transition zone	Tg-Tw	3527	239	-1700	11573	783	-5578	base Long Point Bed
			Wasatch (Colton) Formation	Tw	3766	652	-1939	12356	2139	-6361	base of ostracodal limestone
			Flagstaff Member of Green River Formation	Tgf	4418	794	-2591	14495	2605	-8500	estimated from local thickness; includes North Horn Fm. as identified in nearby wells
			Total Depth		5212	0	-3385	17100		-11105	

*formation tops picked by D.A. Sprinkel unless otherwise noted in the comments

Table 1 (continued).

ID	Cross Section	Well Information	Formation	Map Unit Symbol	Top* (meters)	Thickness (meters)	Elevation (meters)	Top* (feet)	Thickness (feet)	Elevation (feet)	Comments
A-5	A-A'	Coastal Oil & Gas Corporation	Qga/Brennan Basin Member of Duchesne River Formation	Tdb	0	1118	1693	0	3668	5553	Ground elevation of well
		1-8A1E Ute	member C of Uinta Formation	Tuc	1118	345	575	3668	1132	1885	estimated from local thickness and regional dip
		SW1/4NE1/4 Section 8, T. 1 S., R. 1 E.	member B of Uinta Formation	Tub	1463	470	230	4800	1542	753	estimated from local thickness and regional dip
		Uinta Special Base & Meridian	member A of Uinta Formation	Tua	1933	149	-240	6342	490	-789	estimated from local thickness and regional dip
		Uintah County, Utah	Parachute Creek Member of Green River Formation	Tgp	2082	731	-390	6832	2398	-1279	estimated from local thickness and regional dip
		API: 4304730173	Mahogany oil-shale zone		2373	0	-680	7785		-2232	estimated from structure maps by Johnson and Roberts (2003)
		Bluebell field	Douglas Creek Member of Green River Formation	Tgd	2813	294	-1121	9230	963	-3677	top of middle marker (modified from Johnson and Johnson, 1991; Dubiel, 2003)
			Green River-Wasatch Formations transition zone	Tg-Tw	3107	261	-1414	10193	857	-4640	base of Long Point Bed estimated from structure maps by Johnson and Roberts (2003)
			Wasatch (Colton) Formation	Tw	3368	454	-1675	11050	1490	-5497	estimated from local thickness; Utah Division of Oil, Gas and Mining records
			Flagstaff Member of Green River Formation	Tgf	3822	597	-2130	12540	1960	-6987	estimated from local thickness; includes North Horn Fm. as identified by some operators
			Total Depth		4420	0	-2727	14500		-8947	
A-6	A-A'	Quinex Energy Corporation	Qga/Brennan Basin Member of Duchesne River Formation	Tdb	0	1097	1787	0	3600	5864	Ground elevation of well
		7-1 Michelle Ute	member C of Uinta Formation	Tuc	1097	320	690	3600	1050	2264	estimated from local thickness and regional dip
		NE1/4SW1/4 Section 7, T. 1 S., R. 1 E.	member B of Uinta Formation	Tub	1417	488	370	4650	1600	1214	estimated from local thickness and regional dip
		Uinta Special Base & Meridian	member A of Uinta Formation	Tua	1905	162	-118	6250	532	-386	estimated from local thickness and regional dip
		Uintah County, Utah	Parachute Creek Member of Green River Formation	Tgp	2067	771	-280	6782	2528	-918	Utah Division of Oil, Gas and Mining records
		API: 4304731390	Mahogany oil-shale zone		2400	0	-613	7875		-2011	estimated from structure maps by Johnson and Roberts (2003)
		Bluebell field	Douglas Creek Member of Green River Formation	Tgd	2838	349	-1050	9310	1145	-3446	top of middle marker (modified from Johnson and Johnson, 1991; Dubiel, 2003)
			Green River-Wasatch Formations transition zone	Tg-Tw	3187	241	-1399	10455	790	-4591	base of Long Point Bed estimated from local thickness and regional dip
			Wasatch (Colton) Formation	Tw	3427	465	-1640	11245	1525	-5381	estimated from local thickness and regional dip
			Flagstaff Member of Green River Formation	Tgf	3892	592	-2105	12770	1941	-6906	estimated from local thickness; includes North Horn Fm. as identified by some operators
			Total Depth		4484	0	-2697	14711		-8847	
A-7	A-A'	BHP Petroleum Inc	Qac/Brennan Basin Member of Duchesne River Formation	Tdb	0	721	1631	0	2365	5350	Ground elevation of well
		Roosevelt Unit 9-Wasatch	member C of Uinta Formation	Tuc	721	293	910	2365	960	2985	estimated from local thickness and regional dip
		NE1/4Nw1/4 Section 28, T. 1 S., R. 1 E.	member B of Uinta Formation	Tub	1013	464	617	3325	1523	2025	
		Uinta Special Base & Meridian	member A of Uinta Formation	Tua	1478	142	153	4848	467	502	
		Uintah County, Utah	Parachute Creek Member of Green River Formation	Tgp	1620	991	11	5315	3250	35	
		API: 4304731445	Mahogany oil-shale zone		2110	0	-479	6922		-1572	
		Bluebell field	Douglas Creek Member of Green River Formation	Tgd	2611	325	-980	8565	1065	-3215	top of middle marker
			Green River-Wasatch Formations transition zone	Tg-Tw	2935	227	-1305	9630	746	-4280	base Long Point Bed
			Wasatch (Colton) Formation	Tw	3163	471	-1532	10376	1544	-5026	base of ostracodal limestone
			Flagstaff Member of Green River Formation	Tgf	3633	482	-2003	11920	1580	-6570	estimated from local thickness; includes North Horn Fm. as identified by some operators
			Total Depth		4115	0	-2484	13500		-8150	
A-8	A-A'	Barrett Resources Corporation	Qa/Brennan Basin Member of Duchesne River Formation	Tdb	0	480	1612	0	1575	5288	Ground elevation of well
		B-1 Earl Gardner	member C of Uinta Formation	Tuc	480	549	1132	1575	1800	3713	
		NE1/4SW1/4 Section 9, T. 2 S., R. 1 E.	member B of Uinta Formation	Tub	1029	376	583	3375	1235	1913	
		Uinta Special Base & Meridian	member A of Uinta Formation	Tua	1405	192	207	4610	630	678	
		Uintah County, Utah	Parachute Creek Member of Green River Formation	Tgp	1597	1000	15	5240	3280	48	
		API: 4304730197	Mahogany oil-shale zone		2150	0	-539	7055		-1767	
		Bluebell field	Douglas Creek Member of Green River Formation	Tdg	2597	319	-985	8520	1048	-3232	top of middle marker
			Green River-Wasatch Formations transition zone	Tg-Tw	2916	235	-1305	9568	770	-4280	base Long Point Bed
			Wasatch (Colton) Formation	Tw	3151	427	-1539	10338	1402	-5050	base of ostracodal limestone
			Flagstaff Member of Green River Formation	Tgf	3578	285	-1967	11740	935	-6452	may include North Horn Formation as identified by some operators
			Total Depth		3863	0	-2252	12675		-7387	

References Cited in Unit Descriptions and Well Tables

Anderson, D.W., and Picard, M.D., 1972, Stratigraphy of the Duchesne River Formation (Eocene-Oligocene?), northern Uinta Basin, northeastern Utah: Utah Geological and Mineral Survey Bulletin 97, 29 p.
Bryant, Bruce, Naeser, C.W., Marvin, R.F., and Mehnert, H.H., 1989, Upper Cretaceous and Paleogene sedimentary rocks and isotopic ages of Paleogene tuffs, Uinta Basin, Utah: U.S. Geological Survey Bulletin 1787-J,K, p. J1-J22.
Cobban, W.A., and Kennedy, W.J., 1989, The ammonite Metengonoceras Hyatt, 1903, from the Mowry Shale (Cretaceous) of Montana and Wyoming: U.S. Geological Survey Bulletin 1787-L, 11 p.
Doelling, H.H., and Graham, R.I., 1972, Eastern and northern coal fields: Utah Geological and Mineral Survey Monograph 2, 411 p.
Dubiel, R.F., 2003, Geology, depositional models, and oil and gas assessment of the Green River total petroleum system, Uinta-Piceance Province, eastern Utah and western Colorado: U.S. Geological Survey Digital Data Series DDS-69-B, compact disc, chapter 5, p. 1-41.
Fanning, C.M., and Dehler, C.M., 2005, Constraining depositional ages for Neoproterozoic siliciclastic sequences through detrital zircon ages: A ca. 770 Ma maximum age for the lower Uinta Mountain Group [abs.]: Geological Society of America Abstracts with Programs, v. 37, no. 7. p. 42.
Hamblin, A.H., Bilbey, S.A., and Hall, J.E., 2000, Prehistoric animal tracks at Red Fleet State Park, northeastern Utah, *in* Sprinkel, D.A., Chidsey, T.C., Jr., and Anderson, P.B., editors, Geology of Utah's parks and monuments: Utah Geological Association Publication 28, p. 569-578.
Hansen, W.R., 1986, Neogene tectonics and geomorphology of the eastern Uinta Mountains in Utah, Colorado, and Wyoming: U.S. Geological Survey Professional Paper 1356, 78 p.
Jensen, P.H., and Kowallis, B.J., 2005, Piecing together the Triassic/Jurassic stratigraphy along the south flank of the Uinta Mountains, northeast Utah-a preliminary analysis, *in* Dehler, C.M., Pederson, J.L., Sprinkel, D.A., and Kowallis, B.J., editors, Uinta Mountain geology: Utah Geological Association Publication 33, p. 99-109.
Johnson, R.B., 1984, New names for units in the lower part of the Green River Formation, Piceance Creek basin, Colorado, in Contributions to stratigraphy: U.S. Geological Survey Bulletin, 1529-I, p. I1-I20.
Johnson, R.C., and Johnson, S.Y., 1991, Stratigraphic and time-stratigraphic cross sections of Phanerozoic rocks along line B-B', Uinta and Piceance Basin area, west-central Uinta Basin, Utah to eastern Piceance Basin, Colorado: U.S. Geological Survey Miscellaneous Investigations Series Map I-2184-B, 2 plates, scale 1:500,000.
Johnson, R.C., and Roberts, L.N.R., 2003, Depths to selected stratigraphic horizons in oil and gas wells for Upper Cretaceous and Lower Tertiary strata of the Uinta Basin, Utah: U.S. Geological Survey Digital Data Series DDS-69-B, compact disc, chapter 13 p. 1-30.
Kay, J.L., 1934, The Tertiary formations of the Uinta Basin, Utah: Carnegie Museum Annals, v. 23, p. 357-371.
Kowallis, B.J., Christiansen, E.H., Balls, Elizabeth, Heizler, M.T., and Sprinkel, D.A., 2005, The Bishop Conglomerate ash beds, south flank of the Uinta Mountains, Utah-are they pryoclasticfall beds from the Oligocene ignimbrites of western Utah and eastern Nevada?, *in* Dehler, C.M., Pederson, J.L., Sprinkel, D.A., and Kowallis, B.J., editors, Uinta Mountain geology: Utah Geological Association Publication 33, p. 131-145.
Lockley, M.G., Conrad, Kelly, Paquette, Marc, and Hamblin, A.H., 1992, Late Triassic vertebrate tracks in the Dinosaur National Monument area *in* Wilson, J.R., editor, Field guide to geologic excursions in Utah and adjacent areas of Nevada, Idaho, and Wyoming: Utah Geological Survey Miscellaneous Publication 92-3, p. 383-391.
Mauger, R.L., 1977, K-Ar ages of biotite from tuffs in Eocene rocks of the Green River, Washakie, and Uinta Basins, Utah, Wyoming, and Colorado: University of Wyoming Contributions to Geology, v. 15, p. 17-41.
McDowell, F.W., Wilson, J.A., and Clark, J., 1973, K-Ar data for biotite from two paleontologically significant localities; Duchesne River Formation, Utah, and Chadron Formation, South Dakota: Isochron/West, no. 7, p. 11-12.
Molenaar, C.M., and Cobban, W.A., 1991, Middle Cretaceous stratigraphy on the south and east sides of the Uinta Basin, northeastern Utah and northwestern Colorado: U.S. Geological Survey Bulletin 1787-P, 34 p, 1 plate.
Obradovich, J.D., and Cobban, W.A., 1975, A time-scale for the Late Cretaceous of the Western Interior of North America, *in* Caldwell, W.G.E., editor, The Cretaceous System of the Western Interior of North America: Geological Association of Canada Special Paper 13, p. 31-54.
Osborn, G.D., 1929, The titanotheres of ancient Wyoming, Dakota, and Nebraska: U.S. Geological Survey Monograph 55, v. 1, 701 p.
Peterson, O.A., and Kay, J.L., 1931, The upper Uinta Formation of northeastern Utah: Carnegie Museum Annals, v. 20, no. 3-4, p. 293-306.
Pipiringos, G.N., and O'Sullivan, R.B., 1978, Principal unconformities in Triassic and Jurassic rocks, Western Interior United States-a preliminary survey: U.S. Geological Survey Professional Paper 1035-A, 29 p.
Riggs, E.S., 1912, New or little known titanotheres from the lower Uintah formation: Field Museum of Natural History Publication 159, Geological Series, v. IV, no. 2, p.17-41.
Rowley, P.D., Hansen, W.R., Tweto, O., and Carrara, P.E., 1985, Geologic map of the Vernal 1º x 2º quadrangle, Colorado, Utah, and Wyoming: U.S. Geological Survey Miscellaneous Investigations Series Map I-1526, scale 1:250,000.
Sprinkel, D.A., 2006, Interim geologic map of the Dutch John 30' x 60' quadrangle, Daggett and Uintah Counties, Utah, Moffat County, Colorado, and Sweetwater County, Wyoming: Utah Geological Survey Open-File Report 491 DM, compact disc, 3 plates, scale 1:62,500.
Sprinkel, D.A., and Waanders, Gerald, 2005, Stratigraphy, organic microfossils, and thermal maturity of the Neoproterozoic Uinta Mountain Group in the eastern Uinta Mountains, northeastern Utah, *in* Dehler, C.M., Pederson, J.L., Sprinkel, D.A., and Kowallis, B.J., editors, Uinta Mountain geology: Utah Geological Association Publication 33, p. 63-73.
Walton, P.T., 1944, Geology of the Cretaceous of the Uinta Basin, Utah: Geological Society of America Bulletin, v. 55, p. 91-130.
Wilcox, W.T., and Currie, B.S., 2006, Depositional age and sequence stratigraphy of the Jurassic Curtis, Summerville, and Stump Formations, Utah and Colorado [abs.]: Geological Society of America Abstracts with Programs, v. 38, no. 7, p. 388.

Table 1 (continued).

ID	Cross Section	Well Information	Formation	Map Unit Symbol	Top* (meters)	Thickness (meters)	Elevation (meters)	Top* (feet)	Thickness (feet)	Elevation (feet)	Comments
A-9	A-A'	Gulf Oil Corporation	Qal/member B of Uinta Formation	Tub	0	747	1518	0	2450	4979	Ground elevation of well
		1 Meridian	member A of Uinta Formation	Tua	747	194	771	2450	635	2529	estimated from local thickness and regional dip
		SE1/4SE1/4 Section 27, T. 3 S., R. 1 W.	Parachute Creek Member of Green River Formation	Tgp	940	1233	577	3085	4044	1894	Utah Division of Oil, Gas and Mining records
		Uinta Special Base & Meridian	Mahogany oil-shale zone		1532	0	-14	5025		-46	estimated from structure maps by Johnson and Roberts (2003)
		Uintah County, Utah	Douglas Creek Member of Green River Formation	Tgd	2173	404	-655	7129	1326	-2150	top of middle marker (modified from Johnson and Johnson, 1991; Dubiel, 2003)
		API: 4304730085	Green River-Wasatch Formations transition zone	Tg-Tw	2577	155	-1059	8455	509	-3476	base of Long Point Bed estimated from structure maps by Johnson and Roberts (2003)
		Wildcat	Total Depth		2732	0	-1215	8964		-3985	
A-10	A-A'	Gulf Oil Corporation	member B of Uinta Formation	Tub	0	604	1563	0	1980	5129	Ground elevation of well
		1 Wash Valley-Ute	member A of Uinta Formation	Tua	604	197	960	1980	645	3149	estimated from local thickness and regional dip
		NW1/4SW1/4 Section 12, T. 4 S., R. 1 W.	Parachute Creek Member of Green River Formation	Tgp	800	1013	763	2625	3323	2504	Utah Division of Oil, Gas and Mining records
		Uinta Special Base & Meridian	Mahogany oil-shale zone		1241	0	323	4070		1059	estimated from structure maps by Johnson and Roberts (2003)
		Uintah County, Utah	Douglas Creek Member of Green River Formation	Tgd	1813	305	-250	5948	1002	-819	top of middle marker (modified from Johnson and Johnson, 1991; Dubiel, 2003)
		API: 4304720514	Green River-Wasatch Formations transition zone	Tg-Tw	2118	162	-555	6950	530	-1821	base Long Point Bed (modified from Johnson and Johnson, 1991; Dubiel, 2003)
		Wildcat	Wasatch Formation	Tw	2280	158	-717	7480	520	-2351	base of ostracodal limestone(modified from Johnson and Johnson, 1991; Dubiel, 2003)
			Total Depth		2438	0	-875	8000		-2871	
A-11	A-A'	Inland Production Company	member B of Uinta Formation	Tub	0	421	1514	0	1380	4967	Ground elevation of well
		32-25 Monument Butte	member A of Uinta Formation	Tua	421	125	1143	1380	410	3749	
		SW1/4NE1/4 Section 25, T. 8 S., R. 17 E.	Parachute Creek Member of Green River Formation	Tgp	546	680	1018	1790	2230	3339	
		Salt Lake Base & Meridian	Mahogany oil-shale zone		832	0	732	2729		2400	
		Uintah County, Utah	Douglas Creek Member of Green River Formation	Tgd	1225	345	338	4020	1132	1109	top of middle marker
		API: 4304732524	Green River-Wasatch Formations transition zone	Tg-Tw	1570	141	-7	5152	463	-23	base of Long Point Bed
		Pariette Draw field	Wasatch Formation	Tw	1711	194	-148	5615	635	-486	base of ostracodal limestone
			Total Depth		1905	0	-342	6250		-1121	
A-12	A-A'	Inland Production Company	Qa/member B of Uinta Formation	Tub	0	143	1485	0	470	4873	Ground elevation of well
		32-29 Federal	member A of Uinta Formation	Tua	143	102	1342	470	334	4403	estimated from local thickness and regional dip
		SW1/4NE1/4 Section 29, T. 9 S., R. 18 E.	Parachute Creek Member of Green River Formation	Tgp	245	735	1240	804	2411	4069	Utah Division of Oil, Gas and Mining records
		Salt Lake Base & Meridian	Mahogany oil-shale zone		547	0	939	1793		3080	estimated from structure maps by Johnson and Roberts (2003)
		Uintah County, Utah	Douglas Creek Member of Green River Formation	Tgd	980	425	505	3215	1395	1658	top of middle marker estimated from local thickness and regional dip
		API: 4304731175	Green River-Wasatch Formations transition zone	Tg-Tw	1405	134	80	4610	440	263	base of Long Point Bed estimated from structure map by Johnson and Roberts (2003)
			Wasatch Formation	Tw	1539	616	-54	5050	2020	-177	base of ostracodal limestone estimated from local thickness and regional dip
			Flagstaff Member of Green River Formation	Tgf	2155	131	-670	7070	430	-2197	estimated from local thickness; includes North Horn Fm. as identified by some operators
			Total Depth		2286	0	-801	7500		-2627	

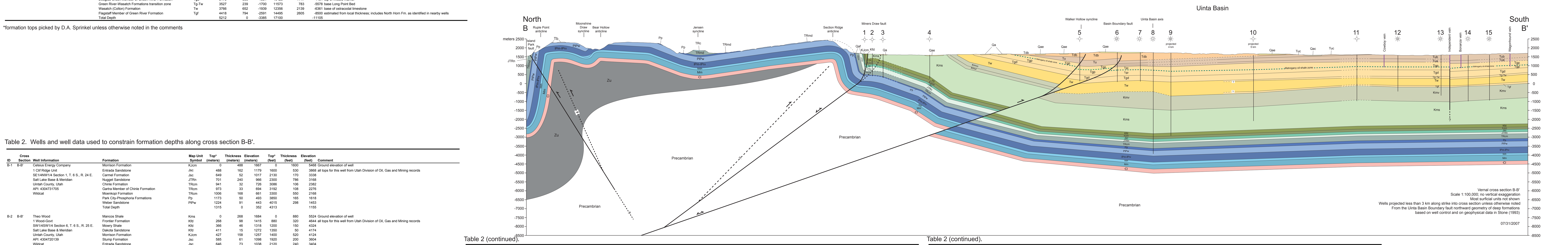

Table 2. Wells and well data used to constrain formation depths along cross section B-B'.

ID	Cross Section	Well Information	Formation	Map Unit Symbol	Top* (meters)	Thickness (meters)	Elevation (meters)	Top* (feet)	Thickness (feet)	Elevation (feet)	Comment
B-1	B-B'	Celsius Energy Company	Morrison Formation	KJcm	0	488	1667	0	1600	5468	Ground elevation of well
		1 Clif Ridge Unit	Entrada Sandstone	Jsc	488	162	1179	1600	530	3868	all tops for this well from Utah Division of Oil, Gas and Mining records
		SE1/4NW1/4 Section 1, T. 6 S., R. 24 E.	Carmel Formation	Jsc	649	52	1017	2130	170	3338	
		Salt Lake Base & Meridian	Nugget Sandstone	JTRn	701	240	966	2300	786	3168	
		Uintah County, Utah	Chinle Formation	TRcm	941	32	726	3086	106	2382	
		API: 4304731705	Gartra Member of Chinle Formation	TRcm	973	33	694	3192	108	2276	
		Wildcat	Moenkopi Formation	TRcm	1006	168	661	3300	550	2168	
			Park City-Phosphoria Formations	Pp	1173	50	493	3850	165	1618	
			Weber Sandstone	PIPw	1224	91	443	4015	298	1453	
			Total Depth		1315	0	352	4313		1155	
B-2	B-B'	Theo Wood	Mancos Shale	Kms	0	268	1684	0	880	5524	Ground elevation of well
		1 Wood-Govt	Frontier Formation	Kfd	268	98	1415	880	320	4644	all tops for this well from Utah Division of Oil, Gas and Mining records
		SW1/4SW1/4 Section 6, T. 6 S., R. 25 E.	Mowry Shale	Kfd	366	46	1318	1200	150	4324	
		Salt Lake Base & Meridian	Dakota Sandstone	Kfd	411	15	1272	1350	50	4174	
		Uintah County, Utah	Morrison Formation	KJcm	427	158	1257	1400	520	4124	
		API: 4304720139	Stump Formation	Jsc	585	61	1098	1920	200	3604	
		Wildcat	Entrada Sandstone	Jsc	646	73	1038	2120	240	3404	
			Carmel Formation	Jsc	719	24	964	2360	80	3164	
			Nugget Sandstone	JTRn	744	201	940	2440	660	3084	
			Chinle Formation	TRcm	945	66	739	3100	215	2424	
			Gartra Member of Chinle Formation	TRcm	1010	14	673	3315	45	2209	
			Moenkopi Formation	TRcm	1024	165	660	3360	540	2164	
			Park City-Phosphoria Formations	Pp	1189	40	495	3900	130	1624	
			Weber Sandstone	PIPw	1228	22	455	4030	71	1494	
			Total Depth		1250	0	434	4101		1423	
B-3	B-B'	West Toledo Mining Company	Mancos Shale	Kms	0	477	1657	0	1565	5435	Ground elevation of well
		1 Grethe	Dakota Sandstone	Kd	477	46	1180	1565	152	3870	all tops for this well from Utah Division of Oil, Gas and Mining records
		NW1/4NE1/4 Section 12, T. 6 S., R. 24 E.	Morrison Formation	KJcm	523	173	1133	1717	566	3718	
		Salt Lake Base & Meridian	Stump Formation	Jsc	696	25	961	2283	82	3152	
		Uintah County, Utah	Entrada Sandstone	Jsc	721	64	936	2365	209	3070	
		API: 4304720229	Carmel Formation	Jsc	785	11	872	2574	36	2861	
		Wildcat	Nugget Sandstone	JTRn	796	229	861	2610	750	2825	
			Chinle Formation	TRcm	1024	49	632	3360	160	2075	
			Gartra Member of Chinle Formation	TRcm	1073	10	584	3520	32	1915	
			Moenkopi Formation	TRcm	1083	179	574	3552	588	1883	
			Park City-Phosphoria Formations	Pp	1262	37	395	4140	120	1295	
			Weber Sandstone	PIPw	1298	23	358	4260	75	1175	
			Total Depth		1321	0	335	4335		1100	
B-4	B-B'	Hugh W Ford	Qae/Mancos Shale	Kms	0	1210	1603	0	3970	5260	Ground elevation of well
		1 Govt	Frontier Formation	Kfd	1210	125	393	3970	409	1290	all tops for this well from Utah Division of Oil, Gas and Mining records
		SE1/4SE1/4 Section 13, T. 6 S., R. 24 E.	Dakota Sandstone	Kfd	1335	6	269	4379	19	881	
		Salt Lake Base & Meridian	Total Depth		1341	0	263	4398		862	
		Uintah County, Utah									
		API: 4304710377									
		Wildcat									
B-5	B-B'	Sunray DX Oil Company	Duchesne River Formation	Td	0	268	1757	0	880	5766	Ground elevation of well
		F2 Utah-Federal	Uinta Formation	Tu	268	239	1489	880	785	4886	
		SE1/4SW1/4 Section 13, T. 7 S., R. 24 E.	thrust fault		507	0	1250	1665	0	4101	
		Salt Lake Base & Meridian	Uinta Formation	Tu	507	258	1250	1665	847	4101	
		Uintah County, Utah	Parachute Creek Member of Green River Formation	Tgp	766	504	992	2512	1653	3254	
		API: 4304720057	Mahogany oil-shale zone		969	0	788	3180		2586	
		Wildcat	Douglas Creek Member of Green River Formation	Tgd	1269	296	488	4165	972	1601	top of middle marker
			Wasatch Formation	Tw	1566	54	192	5137	178	629	base of Long Point Bed
			Total Depth		1620	0	137	5315		451	
B-6	B-B'	Hot Rod Oil	Qae/Duchesne River Formation	Td	0	326	1740	0	1070	5710	Ground elevation of well
		1 Utah-Fed D	member C of Uinta Formation	Tuc	326	159	1414	1070	522	4640	
		SW1/4SW1/4 Section 14, T. 7 S., R. 24 E.	member B of Uinta Formation	Tub	485	127	1255	1592	416	4118	
		Salt Lake Base & Meridian	thrust fault		612	0	1128	2008	0	3702	
		Uintah County, Utah	member B of Uinta Formation	Tub	612	92	1128	2008	302	3702	
		API: 4304715936	member A of Uinta Formation	Tua	704	84	1036	2310	277	3400	
		Red Wash field	Parachute Creek Member of Green River Formation	Tgp	789	521	952	2587	1708	3123	
			Mahogany oil-shale zone		991	0	750	3250		2460	
			Douglas Creek Member of Green River Formation	Tgd	1309	297	431	4295	975	1415	top of middle marker
			Wasatch Formation	Tw	1606	43	134	5270	140	440	base of Long Point Bed
			Total depth		1649	0	91	5410		300	

*formation tops picked by D.A. Sprinkel unless otherwise noted in the comments

Table 2 (continued).

ID	Cross Section	Well Information	Formation	Map Unit Symbol	Top* (meters)	Thickness (meters)	Elevation (meters)	Top* (feet)	Thickness (feet)	Elevation (feet)	Comment
B-7	B-B'	Chevron USA Inc	Duchesne River Formation	Td	0	439	1741	0	1439	5712	Ground elevation
		306 Red Wash	member C of Uinta Formation	Tuc	439	153	1302	1439	501	4273	
		NE1/4SW1/4 Section 23, T. 7 S., R. 24 E.	member B of Uinta Formation	Tub	591	108	1150	1940	355	3772	
		Salt Lake Base & Meridian	member A of Uinta Formation	Tua	700	51	1042	2295	167	3417	
		Uintah County, Utah	Parachute Creek Member of Green River Formation	Tgp	750	530	991	2462	1738	3250	
		API: 4304732629	Mahogany oil-shale zone		956	0	785	3135		2577	
		Red Wash field	Douglas Creek Member of Green River Formation	Tgd	1280	284	461	4200	932	1512	top of middle marker
			Wasatch Formation	Tw	1564	65	177	5132	214	580	base of Long Point Bed
			Total Depth		1629	0	112	5346		366	
B-8	B-B'	Chevron USA Inc	Qae/Duchesne River Formation	Td	0	404	1744	0	1325	5722	Ground elevation of well
		219 (44-21C) Red Wash	member C of Uinta Formation	Tuc	404	160	1340	1325	525	4397	estimated from local thickness and regional dip
		SE1/4SE1/4 Section 21, T. 7 S., R. 24 E.	member B of Uinta Formation	Tub	564	150	1180	1850	493	3872	estimated from local thickness and regional dip
		Salt Lake Base & Meridian	member A of Uinta Formation	Tua	714	67	1030	2343	219	3379	estimated from local thickness and regional dip
		Uintah County, Utah	Parachute Creek Member of Green River Formation	Tgp	781	513	963	2562	1683	3160	Utah Division of Oil, Gas, and Mining records
		API: 4304730149	Mahogany oil-shale zone		994	0	750	3260		2462	estimated from structure maps by Johnson and Roberts (2003)
		Red Wash field	Douglas Creek Member of Green River Formation	Tgd	1294	322	450	4245	1058	1477	estimated from local thickness and regional dip
			Wasatch Formation	Tw	1616	589	128	5303	1932	419	tops of Wasatch and older formations from Utah Division of Oil, Gas, and Mining records
			upper Mesaverede Group	Kmv	2205	644	-461	7235	2112	-1513	reported top of Mesaverde Groups appears too high (see cross section)
			Sego Sandstone of Mesaverde Group	Kmv	2849	183	-1105	9347	601	-3625	
			Buck Tongue of Mancos Shale	Kmv	3032	15	-1288	9948	48	-4226	
			Castlegate Sandstone of Mesaverde Group	Kmv	3047	140	-1303	9996	458	-4274	
			Mancos Shale	Kms	3186	1352	-1442	10454	4436	-4732	
			Frontier Formation	Kfd	4538	85	-2794	14890	280	-9168	
			Dakota Sandstone	Kfd	4624	98	-2880	15170	320	-9448	
			Morrison Formation	KJcm	4721	116	-2977	15490	380	-9768	
			Stump Formation	Jsc	4837	84	-3093	15870	276	-10148	
			Entrada Sandstone	Jsc	4921	49	-3177	16146	161	-10424	
			Carmel Formation	Jsc	4970	21	-3226	16307	70	-10585	
			Nugget Sandstone	JTRn	4992	186	-3248	16377	611	-10655	
			Chinle Formation	TRcm	5178	34	-3434	16988	112	-11266	
			Gartra Member of Chinle Formation	TRcm	5212	10	-3468	17100	32	-11378	
			Moenkopi Formation	TRcm	5222	154	-3478	17132	506	-11410	
			Park City-Phosphoria Formaitons	Pp	5376	129	-3632	17638	422	-11916	
			Weber Sandstone	PIPw	5505	167	-3761	18060	547	-12338	
			Total Depth		5671	0	-3927	18607		-12885	
B-9	B-B'	Chevron USA Inc	Duchesne River Formation	Td	0	350	1725	0	1148	5660	Ground elevation of well
		219 (41-29C) Red Wash	member C of Uinta Formation	Tuc	350	150	1375	1148	492	4512	estimated from local thickness and regional dip
		NE1/4NE1/4 Section 29, T. 7 S., R. 24 E.	member B of Uinta Formation	Tub	500	155	1225	1640	509	4020	estimated from local thickness and regional dip
		Salt Lake Base & Meridian	member A of Uinta Formation	Tua	655	125	1070	2149	411	3511	estimated from local thickness and regional dip
		Uintah County, Utah	Parachute Creek Member of Green River Formation	Tgp	780	536	945	2560	1760	3100	Utah Division of Oil, Gas, and Mining records
		API: 4304730391	Mahogany oil-shale zone		1035	0	690	3395		2265	estimated from structure maps by Johnson and Roberts (2003)
		Red Wash field	Douglas Creek Member of Green River Formation	Tgd	1317	323	408	4320	1060	1340	estimated from local thickness and regional dip
			Wasatch Formation	Tw	1640	786	85	5380	2578	280	tops of Wasatch and older formations from Utah Division of Oil, Gas, and Mining records
			Mesaverde Group	Kmv	2426	788	-700	7958	2585	-2298	
			Mancos Shale	Kms	3214	1366	-1488	10543	4482	-4883	
			Frontier Formation	Kf	4580	52	-2854	15025	170	-9365	
			Mowry Shale	Kmr	4631	12	-2906	15195	39	-9535	
			Total Depth		4643	0	-2918	15234		-9574	
B-10	B-B'	Chevron USA Inc	Qac/ Duchesne River Formation	Td	0	38	1568	0	125	5145	Ground elevation of well
		2 Federal (32-18F)	member C of Uinta Formation	Tuc	38	103	1530	125	337	5020	estimated from local thickness and regional dip
		SW1/4NE1/4 Section 18, T. 8 S., R. 24 E.	member B of Uinta Formation	Tub	141	210	1427	462	688	4683	
		Salt Lake Base & Meridian	member A of Uinta Formation	Tua	351	77	1218	1150	253	3995	
		Uintah County, Utah	Parachute Creek Member of Green River Formation	Tgp	428	595	1141	1403	1951	3742	
		API: 4304720084	Mahogany oil-shale zone		800	0	768	2625		2520	
		Red Wash field	Douglas Creek Member of Green River Formation	Tgd	1022	316	546	3354	1038	1791	top of middle marker
			Green River-Wasatch Formations transition zone	Tg-Tw	1339	63	230	4392	206	753	base of Long Point Bed
			Wasatch (Colton) Formation	Tw	1401	607	167	4598	1992	547	base of ostracodal limestone
			Flagstaff Member of Green River Formation	Tgf	2009	82	-440	6590	270	-1445	
			upper Mesaverde Group	Kmv	2091	454	-523	6860	1489	-1715	
			Sego Sandstone of Mesaverde Group	Kmv	2545	173	-977	8349	568	-3204	
			Buck Tongue of Mancos Shale	Kmv	2718	16	-1150	8917	53	-3772	
			Castlegate Sandstone of Mesaverde Group	Kmv	2734	139	-1166	8970	455	-3825	
			Mancos Shale	Kms	2873	788	-1305	9425	2585	-4280	
			Total Depth		3661	0	-2092	12010		-6865	

Table 1 (continued).

Table 2 (continued).

ID	Cross Section	Well Information	Formation	Map Unit Symbol	Top* (meters)	Thickness (meters)	Elevation (meters)	Top* (feet)	Thickness (feet)	Elevation (feet)	Comment
B-11	B-B'	Belco Petroleum	Qae/member B of Uinta Formation	Tub	0	381	1621	0	1250	5318	Ground elevation of well
		1 Coyote Wash Unit	member A of Uinta Formation	Tua	381	116	1240	1250	380	4068	estimated from local thickness and regional dip
		NW1/4NW1/4 Section 34, T. 8 S., R. 24 E.	Parachute Creek Member of Green River Formatiom	Tgp	497	357	1124	1630	1170	3688	estimated from local thickness and regional dip
		Salt Lake Base & Meridian	Mahogany oil-shale zone		673	0	948	2208		3110	estimated from structure maps by Johnson and Roberts (2003)
		Uintah County, Utah	Douglas Creek Member of Green River Formation	Tgd	853	347	767	2800	1140	2518	top of middle marker (modified from Johnson and Johnson, 1991; Dubiel, 2003)
		API: 4304715070	Green River-Wasatch Formations transition zone	Tg-Tw	1201	113	420	3940	370	1378	base of Long Point Bed estimated from structure maps by Johnson and Roberts (2003)
		North Bonanza	Wasatch (Colton) Formation	Tw	1314	347	307	4310	1140	1008	base of ostracodal limestone
			Flagstaff Member of Green River Formation	Tgf	1661	76	-40	5450	250	-132	estimated from local thickness and regional dip
			Mesaverde Group	Kmv	1737	802	-116	5700	2630	-382	estimated from structure maps by Johnson and Roberts (2003)
			Mancos Shale	Kms	2539	61	-918	8330	200	-3012	estimated from local thickness and regional dip
			Total Depth		2600	0	-979	8530		-3212	
B-12	B-B'	Triage Energy Corporation	member B of Uinta Formation	Tub	0	204	1586	0	670	5202	Ground elevation of well
		1-4 Little Bonanza-F	member A of Uinta Formation	Tua	204	181	1381	670	595	4532	
		NE1/4SE1/4 Section 4, T. 9 S., R. 24 E.	Parachute Creek Member of Green River Formation	Tgp	386	439	1200	1265	1441	3937	
		Salt Lake Base & Meridian	Mahogany oil-shale zone		655	0	930	2150		3052	
		Uintah County, Utah	Douglas Creek Member of Green River Formation	Tgd	825	355	761	2706	1164	2496	top of middle marker
		API: 4304731854	Green River-Wasatch Formations transition zone	Tg-Tw	1180	128	406	3870	420	1332	base of Long Point marker bed
		Devils Playground field	Wasatch (Colton) Formation	Tw	1308	390	278	4290	1280	912	base of ostracodal limestone
			Flagstaff Member of Green River Formation	Tgf	1698	78	-112	5570	255	-368	
			Mesaverde Group	Kmv	1775	267	-190	5825	875	-623	
			Total Depth		2042	0	-457	6700		-1498	
B-13	B-B'	Lone Mountain Production Company	member B of Uinta Formation	Tub	0	291	1611	0	955	5284	Ground elevation of well
		31-15A Dirty Devil Unit	member A of Uinta Formation	Tua	291	120	1319	955	395	4329	estimated from local thickness and regional dip
		NW1/4NE1/4 Section 15, T. 9 S., R. 24 E.	Parachute Creek Member of Green River Formation	Tgp	411	427	1199	1350	1402	3934	estimated from Johnson and Johnson (1991)
		Salt Lake Base & Meridian	Mahogany oil-shale zone		661	0	950	2168		3116	estimated from structure map by Johnson and Roberts (2003)
		Uintah County, Utah	Douglas Creek Member of Green River Formation	Tgd	839	347	772	2752	1138	2532	top of middle marker
		API: 4304731726	Green River-Wasatch Formations transition zone	Tg-Tw	1186	105	425	3890	345	1394	base of Long Point Bed
		Devils Playground field	Wasatch (Colton) Formation	Tw	1291	408	320	4235	1340	1049	base of ostracodal limestone
			Flagstaff Member of Green River Formation	Tgf	1699	70	-89	5575	229	-291	
			upper Mesaverde Goup	Kmv	1769	451	-158	5804	1479	-520	
			Sego Sandstone of Mesaverde Group	Kmv	2220	34	-609	7283	112	-1999	
			Buck Tongue of Mancos Shale	Kmv	2254	31	-643	7395	101	-2111	
			Total Depth		2285	0	-674	7496		-2212	
B-14	B-B'	Lone Mountain Production Company	member B of Uinta Formation	Tub	0	308	1598	0	1010	5243	Ground elevation of well
		23-17 Federal	member A of Uinta Formation	Tua	308	155	1290	1010	510	4233	
		NE1/4SW1/4 Section 17, T. 9 S., R. 24 E.	Parachute Creek Member of Green River Formation	Tgp	463	409	1135	1520	1342	3723	
		Salt Lake Base & Meridian	Mahogany oil-shale zone		655	0	943	2150		3093	
		Uintah County, Utah	Douglas Creek Member of Green River Formation	Tgd	872	347	726	2862	1138	2381	top of middle marker
		API: 4304730568	Green River-Wasatch Formations transition zone	Tg-Tw	1219	98	379	4000	320	1243	base of Long Point Bed
		Devils Playground field	Wasatch (Colton) Formation	Tw	1317	367	281	4320	1205	923	base of ostracodal limestone
			Flagstaff Member of Green River Formation	Tgf	1684	70	-86	5525	230	-282	
			upper Mesaverde Goup	Kmv	1754	694	-156	5755	2277	-512	
			Sego Sandstone of Mesaverde Group	Kmv	2448	27	-850	8032	88	-2789	
			Buck Tongue of Mancos Shale	Kmv	2475	34	-877	8120	111	-2877	
			Castlegate Sandstone of Mesaverde Group	Kmv	2509	58	-911	8231	191	-2988	
			Mancos Shale	Kms	2567	14	-969	8422	47	-3179	
			Total Depth		2581	0	-983	8469		-3226	
B-15	B-B'	Lone Mountain Production Company	member B of Uinta Formation	Tub	0	240	1605	0	787	5266	Ground elevation of well
		23-20 Federal	member A of Uinta Formation	Tua	240	172	1365	787	563	4479	estimated from local thickness and regional dip
		NE1/4SW1/4 Section 20, T. 9 S., R. 24 E.	Parachute Creek of Green River Formation	Tgp	411	404	1194	1350	1325	3916	estimated from Johnson and Johnson (1991)
		Salt Lake Base & Meridian	Mahogany oil-shale zone		634	0	971	2080		3186	estimated from structure map by Johnson and Roberts (2003)
		Uintah County, Utah	Douglas Creek of Green River Formation	Tgd	815	343	790	2675	1125	2591	top of middle marker (estimate modified from Johnson and Johnson, 1991)
		API: 4304731009	Green River-Wasatch Formations transition zone	Tg-Tw	1158	84	447	3800	274	1466	base of Long Point Bed
		Devils Playground field	Wasatch (Colton) Formation	Tw	1242	369	363	4074	1209	1192	base of ostracodal limestone
			Flagstaff Member of Green River Formation	Tgf	1610	109	-5	5283	357	-17	
			upper Mesaverde Goup	Kmv	1719	655	-114	5640	2150	-374	
			Sego Sandstone of Mesaverde Group	Kmv	2374	36	-769	7790	117	-2524	
			Buck Tongue of Mancos Shale	Kmv	2410	33	-805	7907	109	-2641	
			Castlegate Sandstone of Mesaverde Group	Kmv	2443	58	-838	8016	189	-2750	
			Mancos Shale	Kms	2501	54	-896	8205	177	-2939	
			Total Depth		2555	0	-950	8382		-3116	

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