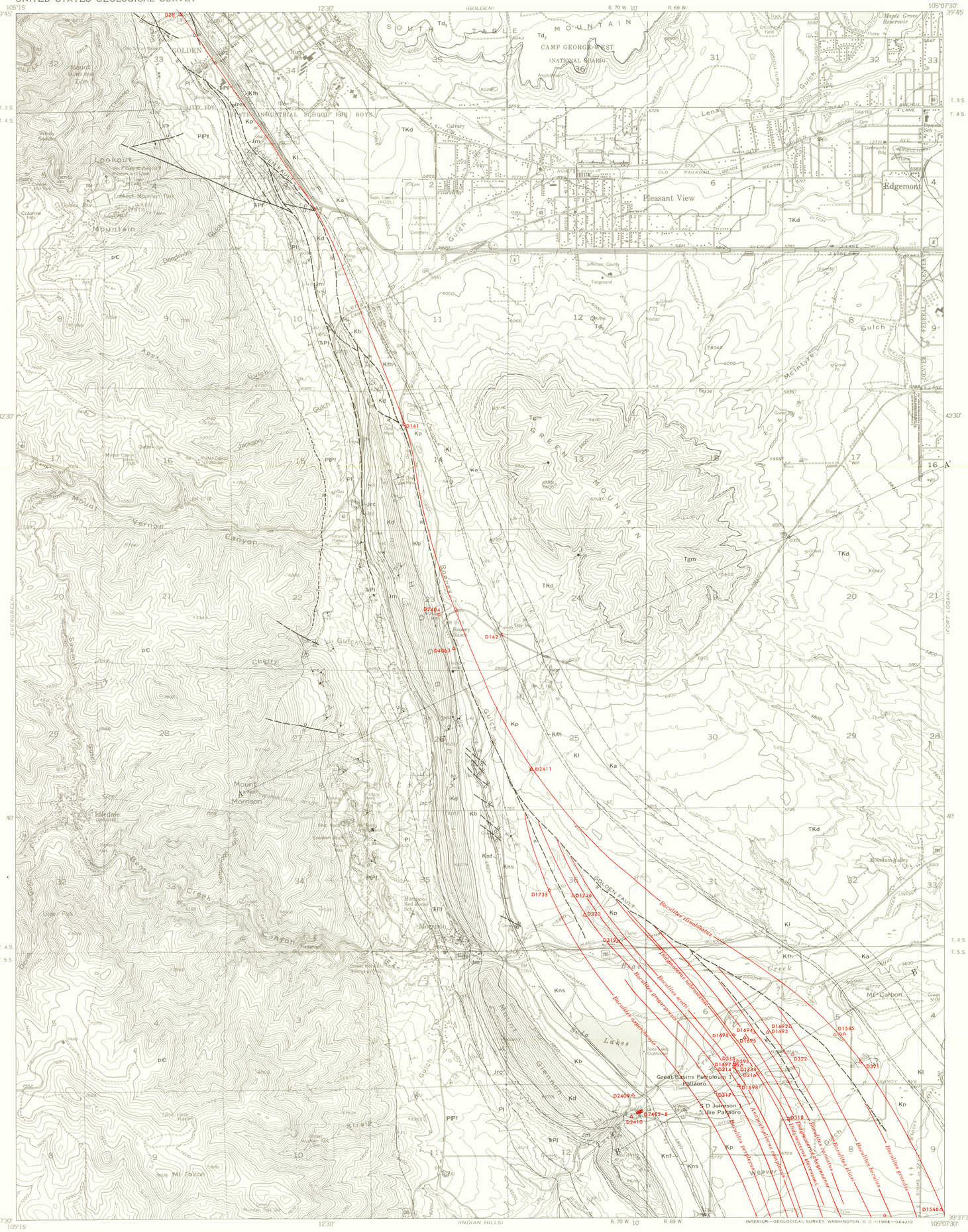
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-428



Base by U.S. Geological Survey, 1957

Geology mapped in 1955–59

SCALE 1:24 000

1 ½ 0 1 MILE

1 5 0 1 KILOMETER

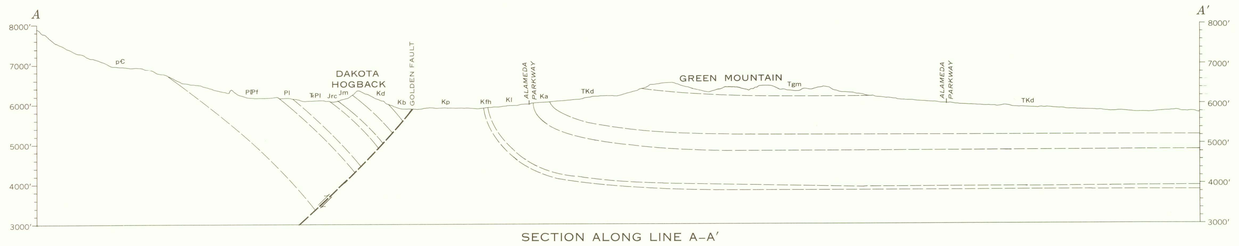
CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION, 1964

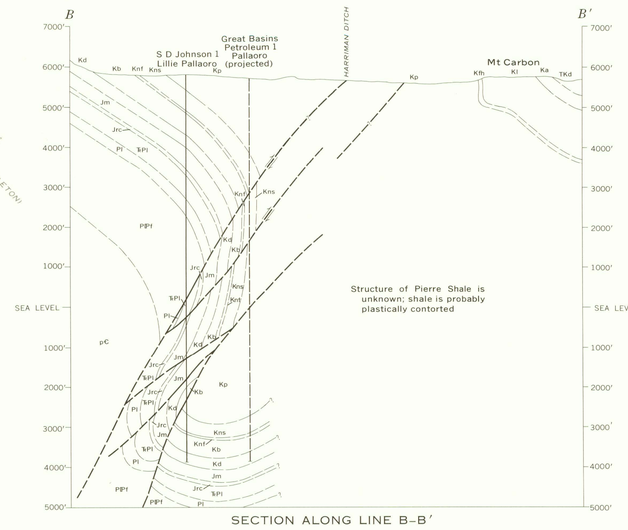
EXPLANATION

AGE	GROUP OR FORMATION	MEMBER	THICKNESS	LITHOLOGY
LATE CRETACEOUS	PALEOCENE	Green Mountain Conglomerate of LeRoy (1946)	600	Upper 200 ft mainly conglomerate; some sandstone and claystone. Middle 250 ft, claystone, siltstone, fine-grained sandstone, and conglomerate in thin beds. Lower 150 ft comprised of about 50 ft of thick-bedded cobble and boulder conglomerate overlain by 100 ft of conglomerate and loose sandstone in thin lenses. Conglomerates composed of gneiss, pegmatite, quartzite, sandstone, and volcanic rocks. Formation contains plant fossils of Paleocene age, and abundant silicified wood.
		Denver Formation	950	Yellowish-gray to moderate-brown, poorly sorted, tuffaceous, fossiliferous claystone, siltstone, mudstone, arkosic sandstone, conglomerate beds, and interlayered latite flows. Conglomerate constitutes 10 percent of formation; contains pebbles to 8 in. in diameter, but averaging 1½ in. Dark-gray aphanitic to porphyritic andesite pebbles predominate. Dark yellowish-brown latite pebbles from the Table Mountain flows are common. Granite pebbles abundant near base. Matrix of pebbles is tuffaceous claystone or coarse-grained sandstone. Heulandite occurs locally as euhedral crystals and fills cavities in the pebbles and sandstone. Sandstone and mudstone comprise 50 percent of formation. Sandstone composed of plagioclase, quartz, augite, hornblende, oxyhornblende, magnetite, and biotite. Light-yellow montmorillonitic, locally tuffaceous, claystone constitutes 40 percent of formation. Contains fossil leaves, dinosaur bones, and silicified wood. Two flows of latite are included in the formation on South Table Mountain. This rock is grayish-brown, fine-grained, porphyritic, augite latite containing phenocrysts of augite, plagioclase, olivine, and magnetite. Cavities in latite contain zeolite minerals.
		Arapahoe Formation	400	Upper two-thirds is coarse- to fine-grained sandstone and mudstone consisting of quartz, abundant dark and white mica, and minor feldspar; locally pebbly. Lower third is poorly sorted pebble conglomerate containing subrounded to rounded pebbles of dark-gray chert, quartz, granite, pegmatite, and older sedimentary rocks; shows cut-and-fill structures; contains ironstone concretions.
		Laramie Formation	700–1000	Sandstone, claystone, and coal. Sandstone, light-gray to yellowish-brown, silty to clayey, fine- to medium-grained; composed of subangular to rounded grains of white and clear quartz and abundant chert. Claystone and associated micaceous siltstone, light-gray to light olive- and pinkish-gray; some browish-gray and organic-rich; massive to blocky structure; claystone is extensively quarried as pottery clay. Coal in many thin seams in lower 200 ft of formation; subbituminous and impure lignite. Formation contains fossil leaves.
		Fox Hills Sandstone	180	Upper 105 ft is olive-gray to dark yellowish-brown shale and interbedded sandstone. Lower 75 ft is yellowish-brown massive to thin-bedded friable fine-grained locally cross-bedded sandstone and interbedded dark olive-gray shale and claystone. Contains large reddish-brown hard calcareous sandstone concretions about 65 ft above base.
		Pierre Shale	6200	Upper part of formation is interbedded yellowish-brown to olive-gray silty sandstone, sandy shale, and shale. Middle part is grayish-brown clayey fine-grained sandstone of Hygiene Sandstone Member. Lower part is olive-gray to yellowish-brown shale containing ironstone and limestone concretions. Concretions contain fossils.
		Niobrara Formation — Smoky Hill Shale Member	410	Pale-brown to reddish-brown soft thin-bedded calcareous shale and interbedded thin layers of limestone. Upper part contains silty yellowish-orange chalk, and middle part some yellowish-gray chalk.
		Niobrara Formation — Fort Hays Limestone Member	35	Light yellowish-gray dense hard fine-grained limestone in beds 1 to 7 ft thick. Contains small nodules of limonite after pyrite. Contains *Inoceramus deformis*.
		Benton Shale	530	Dark-gray to black shale, silty claystone, sandstone, calcarenite, thin beds of bentonite, siltstone, and massive limestone. Upper part is chalky and silty shale and sandstone that constitute Carlile equivalent. Middle part is fossiliferous calcareous shale, calcarenite, and limestone that constitute Greenhorn equivalent. Lower part is noncalcareous black shale that contains cone-in-cone concretions and constitutes Graneros equivalent; light- to dark-gray platy siltstone in lower 15 ft is equivalent to Mowry Shale.
	EARLY CRETACEOUS	Dakota Group — South Platte Formation and Lytle Formation	300	Tan to light yellowish-gray medium-grained crossbedded sandstone and interbedded well-indurated siltstone and claystone. Forms a prominent hogback. South Platte Formation contains 4 sandstone members separated by 3 shale members. Sandstone, well-sorted, porous; composed of well-rounded to subrounded fine to medium quartz sand. Lytle Formation contains local conglomerate or medium- to fine-grained iron-stained sandstone; conglomerate contains quartz, quartzite, gray chert, limestone, and granite. Pyrite and asphaltic material abundant along shears in sandstone in uranium mines along Turkey Creek. Dinosaur footprints in South Platte and silicified tree trunks in upper part of Lytle.
LATE JURASSIC		Morrison Formation	300	Gray and red shale and gray claystone that contain sandstone and thin charophyte-bearing limestone beds. Sandstone and shale in uppermost unit of Waldschmidt and LeRoy (1944) are traceable into pebble conglomerate that seems to be part of Lytle. At base of formation, fine-grained lenticular cross-bedded brown sandstone 7 to 31 ft thick.
		Ralston Creek Formation	90	Grayish-yellow siltstone and dull-red and greenish-yellow variegated mudstone. Local thin lenses of dense medium-gray argillaceous lithographic limestone or yellowish-brown siltstone. Gypsum common in lower part south of Morrison; mudstone and fine-grained sandstone predominate north of Morrison. Blebs and bands of chalcedony in lower 65 ft of formation form key stratigraphic horizon.
PERMIAN(?) AND TRIASSIC(?)		Lykins Formation	450	Moderate reddish-brown, thin-bedded silty shale with several thin beds of limestone. Grayish-orange-pink dense ripple-marked intricately folded laminated limestone 130 ft above base is Glennon Limestone Member of LeRoy (1946), 15 ft thick. Yellowish-gray thinly laminated porous limestone 75 ft above base is Falcon Limestone Member of LeRoy, 3 ft thick.
PERMIAN		Lyons Sandstone	115–200	Grayish-orange to yellowish-gray or white massive medium- to fine-grained friable crossbedded quartz sandstone. Twelve-ft bed of conglomerate locally at top, lenses of arkosic conglomerate and reddish-brown siltstone in lower part, and locally entire unit is conglomerate. Low-angle crossbeds truncated by high-angle crossbeds. Sand grains are rounded frosted quartz cemented by iron or calcium carbonate.
PENNSYLVANIAN AND EARLY PERMIAN		Fountain Formation	1650	Moderate reddish-brown to yellowish-gray conglomerate, akrosic sandstone, and thin layers of micaceous siltstone. Cross-bedded; cut and fill channels. Pebbles are granite, pegmatite, quartzite, quartz, feldspar, and gneiss. Resists erosion where cemented by iron; easily eroded where cemented by calcite.

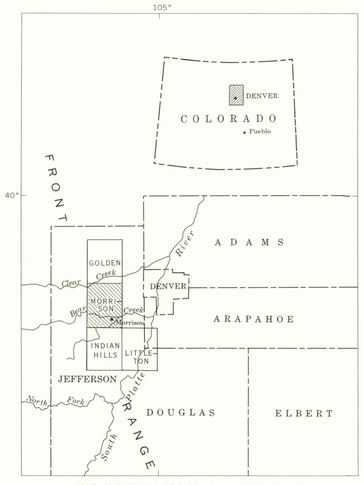
TABLE 1.—DESCRIPTION OF THE STRATIGRAPHIC UNITS



SECTION ALONG LINE A–A'



SECTION ALONG LINE B–B'



MAP SHOWING MORRISON QUADRANGLE AND OTHER PLACES MENTIONED IN TEXT

GEOLOGY OF THE SEDIMENTARY ROCKS OF THE MORRISON QUADRANGLE, COLORADO

By
J. Hiram Smith

1964

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