PREPARED IN COOPERATION WITH
THE WYOMING STATE ENGINEER

GENERALIZED SECTION OF THE GEOLOGIC FORMATIONS

ERA	SYSTEM	SERIES	SUBDIVISION[1]	LITHOLOGY AND DISTRIBUTION[2]	GROUND-WATER POSSIBILITIES[3]
CENOZOIC	QUATERNARY	Pleistocene and Recent	Alluvial deposits (0–50±)	Clay, silt, sand, and gravel, unconsolidated; includes some slopewash material. The coarser alluvial deposits occur in the Little Snake River valley and in or adjacent to highlands	Contains small quantities of water in many stream valleys; generally small yields and a wide range in D. S[2] can be expected, but larger yields are possible in the Little Snake River valley
			Wind-blown sand (0–70±)	Sand and silt, unconsolidated. Both active and inactive sand dunes are widely scattered throughout the basins and some highlands (Pipiringos, 1961)	In areas where the dunes are relatively thick and extensive, such as south of the Ferris Mountains, wells and springs have yields ranging from 1 to 20 gpm. D. S. of water in the sand dunes throughout the area ranges from 200 ppm to about 2000 ppm. Dunes act as infiltration areas for recharge to underlying formations
			Lake deposits (0–25±)	Clay, silt, and sand (Pipiringos, 1961). Extensive lake deposits are present in the Great Divide Basin	Ground-water possibilities poor. Probably would provide stock water to wells at favorable locations; however, yields probably would be less than 10 gpm
			Glacial deposits (thickness unknown)	Clay, silt, sand, gravel, and boulders. Present in Sierra Madre uplift	Ground-water possibilities not known, but some of deposits probably contain water of good quality
		Pleistocene	Gravel deposits (0–50±)	Sand and gravel, poorly consolidated to unconsolidated, and some conglomerate. Extensive, but scattered, outcrops are present in the Great Divide Basin, southeast of the basin, and in the Rawlins uplift (Pipiringos, 1961; and Masursky, 1962). They are not mapped in a large part of the area. Masursky (1962) suggests that some of the conglomerate may be correlative with the basal conglomerate of the Browns Park Formation	Ground-water possibilities not known, but probably poor because deposits are generally topographically high and probably well drained
	TERTIARY	Pliocene(?)	Igneous flows and plugs (thickness unknown)	Alkalic intrusive and extrusive rocks north of Rock Springs; basalt flows and intrusive masses east of Baggs (Love, and others, 1955)	Ground-water possibilities not known, but probably very poor
			North Park(?) Formation (0–800±)	Sandstone, fine- to medium-grained, tuff, and limestone; contains a basal conglomerate member as much as 100 feet thick. Present in the northwest Sierra Madre uplift (Vine and Prichard, 1959)	Ground-water possibilities good. Yields water of excellent quality to springs that supply the city of Rawlins. Maximum yields from favorably located wells probably would be about 400 gpm
		Miocene to upper Pliocene	South Pass Formation (0–200)	Conglomerate, pebble- to boulder-sized material in fine-grained, ashy sandstone matrix. Present in small outcrops in T. 27 N., R. 102–103 W., (Zeller and Stephens, 1964d-f). Zeller and Stephens(1964b-d)also mapped 220 to 800 feet of unnamed predominantly tuffaceous sandstone of Miocene age in very small areas of T. 27 N., R. 99–102 W. (not included in South Pass Formation)	Ground-water possibilities not known, but probably good
		Miocene(?)	Browns Park Formation (0–1200±)	Sandstone, tuffaceous, sandy claystone, and conglomerate. Present in the Rock Springs uplift, southern Washakie Basin, western Sierra Madre uplift, and possibly along the northern edge of the Great Divide Basin (Bradley, 1961; Pipiringos, 1961; and Vine and Prichard, 1959)	Ground-water possibilities largely unknown but probably good. Yields may be as high as 300 gpm in favorable areas and the water probably has D. S. less than 1000 ppm
		Oligocene or Miocene	Bishop Conglomerate (0–200±)	Conglomerate containing well-rounded boulders and cobbles of quartzite, limestone, and schist (Bradley, 1961). Present in the southern Rock Springs uplift	Ground-water possibilities not known, but probably fair. One well in the area yields 42 gpm; the water from the well has D. S. of about 600 ppm
		Upper Eocene	Uinta Formation (250±)	Claystone, varicolored, and tuffaceous; contains lenticular fine-grained sandstone (Bradley, 1961; and McGrew, 1951). Restricted to the Washakie Basin	Ground-water possibilities not known, but probably poor
		Middle and upper(?) Eocene	Bridger Formation (thickness unknown)	Claystone, varicolored, and tuffaceous; contains tuffaceous fine-grained sandstone and minor amounts of shale, limestone, and dolomite (Bradley, 1961; and Zeller and Stephens, 1964b-f). Present in the Washakie Basin and the northern Great Divide Basin. The American Stratigraphic Company's lithologic log of Forrest Oil Company's No. 29-1 Government oil test (14–98–29ab) indicated that 1873 feet of the Bridger Formation was penetrated in the Washakie Basin; the interval, however, might include part of the Laney Shale	Ground-water possibilities not known, but probably poor. Only one well (13–98–lad) is known to tap the Bridger in the area
		Lower and middle Eocene	Wasatch and Green River Formations: Laney Shale Member of the Green River Formation (0–1900+)	Laney Shale Member—Marlstone, shale, oil shale, muddy sandstone, tuffaceous sandstone, and algal limestone (Bradley, 1961). Subsurface mapping, although inconclusive, indicates that the Laney may be as much as 3000 feet thick in the Washakie Basin. Also present in northern Great Divide Basin	Ground-water possibilities poor to good. Wells in the western Washakie Basin have reported yields as high as 200 gpm and D. S. ranging from 500 to 900 ppm. Wells tapping the Laney elsewhere in the Washakie Basin have lower yields and the water has a higher D. S.
			Wilkins Peak Member of the Green River Formation (0–1200)	Wilkins Peak Member—Marlstone, claystone, oil shale, siltstone, tuff, and arkosic sandstone (Culbertson, 1961). Mapped separately in the northwest and southwest, but probably mapped with the Tipton elsewhere in the area (written communication, W. H. Bradley, 1964)	Wilkins Peak Member—Ground-water possibilities probably poor
			Cathedral Bluffs Tongue of the Wasatch Formation (0–2500±)	Cathedral Bluffs Tongue—Claystone and shale, gray, green, and red; contains coarse arkosic sandstone in northern Great Divide Basin and fine-grained sandstone in the Washakie Basin (Bradley, 1961)	Cathedral Bluffs Tongue—Very low yields of mineralized water can be expected in most of the area
			Battle Spring Formation (1000(?)–4500±)	Battle Spring Formation—Sandstone, arkosic, fine- to coarse-grained and green claystone; contains conglomerate and boulders in the Green Mountains. (M. L. Dickey, 1962, unpublished thesis, University of Wyoming; Masursky, 1962; and Pipiringos, 1961). Present in eastern Great Divide Basin; interfingers to west with Wasatch and Green River Formations	Battle Spring Formation—Ground-water possibilities very good, especially in the northeast Great Divide Basin. Maximum yields of wells penetrating the entire formation might exceed 1000 gpm. D. S. ranges from about 1000 ppm in the southeast to less than 200 ppm in the northeast
			Tipton Tongue and Tipton Shale Member of the Green River Formation (0–400±)	Tipton Tongue and Tipton Shale Member—Oil shale, fine-grained calcareous sandstone, clay, shale, and algal limestone (Bradley, 1961). Present in the northwestern Great Divide Basin, the Washakie Basin, and north and south of the Rock Springs uplift	Tipton Tongue and Tipton Shale Member—Ground-water possibilities probably poor
			Main body of the Wasatch Formation (1000–4000±)	Main body of the Wasatch Formation—Claystone and siltstone, brightly colored; fine- to medium-grained calcareous sandstone; carbonaceous shale, oil shale, and coal (Bradley, 1961; and Pipiringos, 1961). In this report the main body of the Wasatch includes the Niland and Red Desert Tongues and the Hiawatha Member of Nightingale (1930) of the Wasatch Formation. The Luman Tongue of the Green River Formation is mapped with the unit. Present extensively in the Great Divide and Washakie Basins	Main body of the Wasatch Formation—A good source of water in the area, particularly in the western Great Divide Basin. Contains more than one aquifer; wells tapping the deeper aquifers flow in some areas. About 90 wells having yields from 5 to 250 gpm of water produce from the Wasatch. The maximum yield of a favorably located well might be as much as 500 gpm. D. S. ranges from 500 to 2800 ppm
		Paleocene	Fort Union Formation (700–2700±)	Sandstone, fine- to coarse-grained, carbonaceous shale, and coal; contains varicolored siltstone and claystone in upper part (Berry, 1960; Paul Mogensen, 1959, and Barbara Swain, 1957, unpublished theses, University of Wyoming). Present in Great Divide and Washakie Basin	A relatively good source of water in the area. Yields of 11 wells ranged from 3 to 300 gpm. A well penetrating the entire formation where the sandstones are thickest might yield as much as 500 gpm. D. S. of water from 4 wells ranged from about 800 to 3320 ppm

ERA	SYSTEM	SERIES	SUBDIVISION[1]	LITHOLOGY AND DISTRIBUTION[2]	GROUND-WATER POSSIBILITIES[3]
MESOZOIC	CRETACEOUS	Upper	Lance Formation (0–4500±)	Sandstone, very fine to fine grained, lenticular, clayey, calcareous; dark-gray or brown shale; coal; and lignite (Berry, 1960; Haun, 1961; and W. P. Severn, 1959, unpublished thesis, University of Wyoming). Underlies the Great Divide and Washakie Basins. Equivalent in part to Medicine Bow Formation in northeast	Ground-water possibilities largely unknown. Seven stock wells in the east outcrop area have estimated yields of 5 to 30 gpm. It is unlikely that maximum yields of favorably located wells would be as large as 300 gpm
			Lewis Shale (0–2700±)	Shale, light- to dark-gray, calcareous to noncalcareous, carbonaceous; contains beds of siltstone and very fine grained sandstone. Numerous sandstones occur in the Lewis Shale in the vicinity of T. 16 N., R. 93 W. in eastern Washakie Basin (Berry, 1960; Barlow, 1961; and Hale, 1961. Underlies the Great Divide and Washakie Basins	Ground-water possibilities generally are poor, but sandstones in the Lewis, however, probably will yield small quantities of water.
			Mesaverde Group (west part of area): Almond Formation (0–1000±)	Almond Formation—Sandstone, siltstone, carbonaceous shale, and coal (Barlow, 1961; and Schultz, 1920)	Almond Formation—Ground-water possibilities are largely unknown but probably fair. Yields of 20 to 100 gpm and D. S. of 500 to 1500 ppm can be expected
			Mesaverde Group: Ericson Formation (400–700±)	Ericson Formation—Sandstone, fine-grained to conglomeratic; contains a middle rusty sandstone, siltstone, and shale unit (Smith, 1961; and Sears, 1926)	Ericson Formation—Ground-water possibilities are good. Yields of 10 wells range from 10 to about 200 gpm. D. S. probably ranges from 300 to 1200 ppm
			Mesaverde Group: Rock Springs Formation (900–1700±)	Rock Springs Formation—sandstone, fine- to medium-grained, interbedded with carbonaceous shale and coal (Douglass and Blazzard, 1961, and Hale, 1955)	Rock Springs Formation—Ground water possibilities good. Maximum yields probably range from 20 to as much as 800 gpm. D. S. probably ranges from 600 to about 6000 ppm
			Mesaverde Group: Blair Formation (900–1800±)	Blair Formation—Shale, sandy, interbedded with siltstone and fine- to medium-grained sandstone (Douglass, and Blazzard, 1961; and Schultz, 1920)	Blair Formation—Yields of less than 60 gpm of highly mineralized water can be expected
			Mesaverde Formation (300–2800±) (east part of area)	Mesaverde Formation—Sandstone, light-gray to brown, very fine to medium grained, calcareous, silty; interbedded dark shale, lignite, and coal (Barlow, 1959; and Berry, 1960)	Mesaverde Formation—Ground-water possibilities largely unknown. Two wells have yields of about 5 and 40 gpm, and the water has D. S. of 5300 and 1300 ppm, respectively
			Baxter Shale (3600±) (west part of area)	Baxter Shale—Shale, dark-gray; contains a small amount of interbedded sandstone, siltstone, and limestone (Hale, 1961; Smith, 1961; and Schultz, 1920)	Niobrara Formation and Baxter, Cody, and Steele Shales—Ground-water possibilities not known, but generally poor. Sandstones may yield water, but it is probably highly mineralized
			Cody Shale (5000±) (northeast part of area)	Cody Shale—Shale, dark-gray; contains beds of siltstone and sandstone and a small amount of bentonite (Weimer and Guyton, 1961)	
			Steele Shale (4000±) (southeast part of area)	Steele Shale—Shale, dark-gray; silty; contains a small amount of fine-grained glauconitic sandstone (Barlow, 1959; Berry 1960; and Hale, 1961)	
			Niobrara Formation (2000±) (southeast part of area)	Niobrara Formation—Shale, dark-gray, calcareous; contains some limestone (Barlow, 1959; Berry, 1960; and Hale, 1961)	
			Frontier Formation (190–900+)	Sandstone and dark-gray shale; contains a few beds of bentonite and lenses of chert-pebble conglomerate (Goodell, 1962). Underlies most of the project area	Yields 50 gpm to 1 well near Miller Hill; the water has a D. S. of 720 ppm (Berry, 1960). Oil-field waters north of Rawlins (T. 23–26 N., R. 86–89 W.) generally have D. S. of 1300 to 3200 ppm. To the west, D. S. generally is 10,000 to 57,000 ppm (Crawford and Davis, 1962)
		Lower	Mowry Shale (150–525)	Shale, dark-gray to black, siliceous; contains siltstone and bentonite. Fish scales are common (Stephens, 1964)	Ground-water possibilities not known, but probably very poor
			Thermopolis Shale (40–235)	Shale, dark-gray to black, fissile; contains a few thin beds of sandstone, siltstone, and bentonite. The Muddy Sandstone Member in the upper part of the formation is 20 to 155 feet thick; it consists of fine-grained shaly sandstone and interbedded siltstone and shale (Gudim, 1956)	Ground-water possibilities not known, but probably poor. In the northeast part of the project area oil-field waters from the Muddy Sandstone Member (4 analyses) have D. S. of about 3500 to 10,000 ppm (Crawford and Davis, 1962)
			Cloverly Formation (45–240)	Sandstone, shale, conglomerate, and a lesser amount of siltstone (Berry, 1960)	Yields of 25 to 85 gpm are obtained from 4 wells in the Miller Hill area; the water has D. S. of 223 to 557 ppm (Berry, 1960). Cloverly oil-field waters have D. S. of about 8000 to 36,000 ppm in the Rock Springs uplift, and about 3000 to 17,000 ppm in the northeast part of the project area (Crawford, 1940; and Crawford and Davis, 1962)
	JURASSIC	Upper	Morrison Formation (170–450±)	Variegated claystone, shale, lenticular sandstone, and lesser amounts of conglomerate and limestone (Gudim, 1956; D. E. Lawson 1949, and R. J. Weimer, 1949, unpublished theses, University of Wyoming)	Ground-water possibilities not known, but probably poor
			Sundance Formation (130–450±)	Sandstone, shale, siltstone, and limestone; upper part is glauconitic (Gudim, 1956)	Ground-water possibilities not known. The Sundance Formation yields 28 gpm from 1 well near Miller Hill. The water from this well has D. S. of 1100 ppm; it is high in fluoride (6.0 ppm) and iron (4.2 ppm) (Berry, 1960). Post-Chugwater and pre-Morrison sandstones, undifferentiated, yield water having D. S. of 7800 to 50,000 ppm in the Rock Springs uplift, and about 4000 ppm in the Lost Soldier Field (T. 26 N., R. 90 W.) (Crawford, 1940)
		Lower	Nugget (?) Sandstone (0–650±)	Sandstone, fine- to medium-grained, and a small amount of interbedded shale and siltstone. The correlation and age of rocks referred to as "Nugget" in different parts of the map area are questionable (Anderman, 1956; Gudim, 1956; Love, 1957; D. E. Lawson, 1949, and R. J. Weimer, 1949, unpublished theses, University of Wyoming)	
	TRIASSIC		Chugwater Formation (900–1500±)	Shale, siltstone, and fine-grained sandstone, interbedded, predominantly red; includes Alcova Limestone Member (Gudim, 1956; D. E. Lawson, 1949, and R. J. Weimer, 1949, unpublished theses, University of Wyoming)	Ground-water possibilities not known, but probably poor
		Lower	Undifferentiated rocks (170–460±)	Shale, siltstone, sandstone, and limestone, interbedded, red and gray. In the eastern part of the project area, rocks of the Goose Egg Formation of central Wyoming intertongue with the Permian Park City and Early Triassic Dinwoody Formations of western Wyoming (Anderman, 1956; Maugham, 1964; and Sheldon, 1963)	Ground-water possibilities not known. One well near Rawlins yields water with D. S. of 6660 ppm (Berry, 1960)
PALEOZOIC	PERMIAN ? / CARBONIFEROUS: PENNSYLVANIAN		Tensleep Sandstone (0–840±)	Sandstone, medium- to fine-grained, locally quartzitic, and lesser amounts of thin interbedded limestone and dolomite. The formation is missing in the southeastern part of the area (Gudim, 1956; Ritzma, 1951; D. E. Lawson, 1949, and R. J. Weimer, 1949, unpublished theses, University of Wyoming)	Ground-water possibilities not known. One spring in the Rawlins area has a reported yield of 200 gpm and the water has D. S. of 339 ppm (Berry, 1960). In basins to the north and east, D. S. ranges generally from 200 to 5000 ppm (Crawford, 1940 and Crawford, 1957)
	CARBONIFEROUS: PENNSYLVANIAN	Lower and Middle	Amsden Formation (0–260±)	Sandstone, shale, and siltstone, predominantly red; contains cherty limestone. About 60 feet of fine-grained sandstone (Darwin Sandstone Member) is present at the base of the formation in most of the area. The Amsden is missing in the southeastern part of the area (Gudim, 1956; Ritzma, 1951; D. E. Lawson, 1949, and R. J. Weimer, 1949, unpublished theses, University of Wyoming)	Ground-water possibilities not known, but probably poor
	CARBONIFEROUS: MISSISSIPPIAN	Lower and Upper	Madison Limestone (5±–325±)	Limestone, dolomite, and lesser amounts of thin-bedded sandstone and chert (Gudim, 1956; Ritzma, 1951; D. E. Lawson, 1949, and R. J. Weimer, 1949, unpublished theses, University of Wyoming)	Ground-water possibilities not known. In other parts of the State, caverns and solution cavities in the Madison have produced large yields. Chemical analyses in other areas show D. S. ranging generally from 300 to 4000 ppm (Crawford, 1940, and Crawford, 1957)
	CAMBRIAN	Middle and Upper	Undifferentiated rocks (0–800±)	Sandstone, quartzitic and conglomeratic in lower part; upper part consists of glauconitic sandstone and interbedded siltstone, shale, and limestone (Berry, 1960; Gudim, 1956; D. E. Lawson, 1949, and R. J. Weimer, 1949, unpublished theses, University of Wyoming)	Yields water for domestic, stock, and public supplies near Rawlins to 1 well and 1 spring having reported yields of 150 and 100 gpm, respectively; chemical analyses show the D. S. of water from the well to be 663 ppm and water from the spring to be 214 ppm (Berry, 1960). Ground-water possibilities elsewhere in the map area are not known
Precambrian			Igneous and metamorphic rocks	Granite, gneiss, and schist (Love and others, 1955)	Ground-water possibilities not known, but probably will yield water of good quality where weathered or fractured in mountain areas

[1] Thickness (in feet) and lithology based upon geologic literature and subsurface data
[2] Rocks of Paleozoic, Triassic, Jurassic, and Early Cretaceous age crop out in less than 5 percent of the area and generally are deeply buried.
[3] Yield, in gallons per minute and total dissolved-solids content, D. S., in parts per million

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GROUND-WATER RECONNAISSANCE OF THE GREAT DIVIDE AND WASHAKIE BASINS AND SOME ADJACENT AREAS, SOUTHWESTERN WYOMING

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